TRANSPORTATION SCIENCES
CRASH DATA RESEARCH CENTER

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GENERAL DYNAMICS ON-SITE CERTIFIED ADVANCED-208 COMPLIANT VEHICLE CRASH INVESTIGATION

SCI CASE NO. – CA04-033

SUBJECT VEHICLE – 2004 GMC YUKON

LOCATION - STATE OF DELAWARE

CRASH DATE – JUNE 2004

Contract No. DTNH22-01-C-17002

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
Washington, D.C. 20590

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points are coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract This on-site investigation focused on the performance of the Certified Advanced 208-Compliant (CAC) occupant protection system in a 2004 GMC Yukon. The frontal air bags in the vehicle were certified by the manufacturer to be compliant with the advanced FMVSS 208 ruling. This advanced occupant protection system was comprised of dual-stage frontal air bags, seat track position sensors for both front seats, front safety belt buckle switches, a front right occupant detection sensor, and a seat belt tension retractor sensor (for the front right manual restraint). The vehicle's Sensing and Diagnostic control Module (SDM) tailored the deployment of the frontal air bags based upon the crash severity and inputs from these sensors. The SDM had Event Data Recorder (EDR) capabilities that captured pre-crash and crash data related to the event. The EDR recorded a non-deployment event and a deployment event that were downloaded during the inspection and were used as a supplement to the on-site investigation. The GMC, **Figure 1**, was involved in a single vehicle run-off-road/fixed object crash with a brick house. The crash resulted in moderate frontal damage to the GMC that warranted the deployment of the vehicle's advanced driver air bag. The GMC Yukon was driven by a 12 year old unrestrained male at the time of the crash. The driver's reported height and weight was 160 cm (63 in) and 91 kg (200 lb). He was the vehicle's sole occupant. The young driver fled the scene after the crash and was found by the investigating police officers in his home, located approximately 0.8 km (0.5 miles) from the crash site. He sustained a forehead contusion and a concussion (AIS 1) as a result of the impact.			
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ON-SITE CERTIFIED ADVANCED 208-COMPLIANT VEHICLE CRASH INVESTIGATION
CALSPAN CASE NO.: CA04-033

VEHICLE: 2004 GMC YUKON DENALI
LOCATION: DELAWARE
CRASH DATE: JUNE, 2004

BACKGROUND

This on-site investigation focused on the performance of the Certified Advanced 208-Compliant (CAC) occupant protection system in a 2004 GMC Yukon. The frontal air bags in the vehicle were certified by the manufacturer to be compliant with the advanced FMVSS 208 ruling. This advanced occupant protection system was comprised of dual-stage frontal air bags, seat track position sensors for both front seats, front safety belt buckle switches, a front right occupant detection sensor, and a seat belt tension retractor sensor (for the front right manual restraint). The vehicle's Sensing and Diagnostic control Module (SDM) tailored the deployment of the frontal air bags based upon the crash severity and inputs from these sensors. The SDM had Event Data Recorder (EDR) capabilities that captured pre-crash and crash data related to the event. The EDR recorded a non-deployment event and a deployment event that were downloaded during the inspection and were used as a supplement to the on-site investigation. The GMC, **Figure 1**, was involved in a single vehicle run-off-road/fixed object crash with a brick house. The crash resulted in moderate frontal damage to the GMC that warranted the deployment of the vehicle's advanced driver air bag. The GMC Yukon was driven by a 12 year old unrestrained male at the time of the crash. The driver's reported height and weight was 160 cm (63 in) and 91 kg (200 lb). He was the vehicle's sole occupant. The young driver fled the scene after the crash and was found by the investigating police officers in his home, located approximately 0.8 km (0.5 miles) from the crash site. He sustained a forehead contusion and a concussion (AIS 1) as a result of the impact.

Figure 1: 2004 GMC Yukon.

This crash was identified from a list of claims provided by an insurance company to the National Highway Traffic Safety Administration (NHTSA). The list identified Certified Advanced 208 Compliant vehicles that had been involved in traffic crashes. The Crash Investigation Division of the NHTSA analyzed the list based on crash type and configuration and then forwarded a list of selected crashes to the Calspan Special Crash Investigations (SCI) team for follow-up investigation. The subject vehicle was located in a salvage yard and cooperation was established with the local insurance adjuster. An on-site investigation was assigned to the Calspan SCI team on July 26, 2004 and the GMC was inspected August 2, 2004.

VEHICLE DATA

2004 GMC Yukon

The 2004 GMC Yukon Denali was identified by the Vehicle Identification Number (VIN): 1GKEK63UX4J (production sequence deleted). The four-wheel drive, four door sport utility vehicle was configured with a 295 cm (116.2 in) wheelbase. The Gross Vehicle Weight Rating (GVWR) was 3,175 kg (7,000 lb). The power train consisted of a 5.3 liter/V8 engine linked to a four-speed automatic transmission with overdrive. The vehicle was also equipped with power steering, power assist four-wheel disc brakes with ABS, power windows, power door locks, adjustable pedals, and six-way power front bucket seats. The Yukon was configured for four passenger seating. The manual restraint system consisted of seat-integrated 3-point lap and shoulder belts in the front outboard positions. The second row manual restraints consisted of continuous loop 3-point lap and shoulder belts with B-pillars mounted switchable retractors. The Supplemental Restraint System consisted of driver and front right passenger air bags certified by the manufacturer to be compliant with the advanced FMVSS 208 occupant protection standard. The vehicle's date of manufacture was December 2003. The owner reported that the vehicle was purchased approximately three months prior to the date of the crash and had been driven approximately 4,000 km (2,500 miles). The vehicle did not have a prior crash history. The Yukon was equipped with Goodyear Wrangler HP P265/70R17 tires on OEM alloy wheels. The manufacturer's recommended tire pressure was 221 kpa (32 psi). The specific tire data measured at the time of the inspection was as follows:

Tire	Measured Pressure	Tread Depth	Restricted	Damage
LF	0 kpa (0 psi)	8.7 mm (11/32)	No	Debeaded, Rim damage
LR	254.9 kpa (37.0 psi)	8.7 mm (11/32)	No	None
RF	0 kpa (0 psi)	8.7 mm (11/32)	No	Debeaded
RR	254.9 kpa (37.0 psi)	8.7 mm (11/32)	No	None

SUMMARY

Crash Site

This single-vehicle crash occurred during the nighttime hours of June 2004 in a residential setting. At the time of the crash, it was dark without artificial lighting and the weather was not a factor. The asphalt road surface was dry. The crash occurred at the three-leg intersection of a two lane north/south road and a two lane east/west road. The road surfaces were straight and level in the area of the crash. Private residences bordered the roadways at the scene. **Figure 2** is a southbound trajectory view leading into the crash site. A brick house surrounded by trees and shrubbery was located 20 m (66 ft) south of the termination of the north/south road, **Figure 3**. During the off-road trajectory through the yard, the front right corner of the GMC impacted and uprooted a 13 cm (5 in) diameter tree. This minor impact resulted in the EDR stored non-deployment event. The GMC then continued its off-road trajectory and impacted the corner of the house. This impact resulted in the deployment of the Yukon's advanced driver air bag. The EDR reported time between the non-deployment event and deployment event was 0.9 seconds.

Figure 2: Southbound trajectory view 46 m (150 ft) from impact.

Figure 3: GMC trajectory view though the yard to impact.

CRASH SEQUENCE

Pre-Crash

The owner of the GMC lived approximately 0.8 km (0.5 miles) north of the crash site on the north/south road. For unknown reason's, the owner's 12 year old son (while unsupervised) decided to take the vehicle for a joy-ride. The owner reported that the child driver had never attempted to take the keys before and that he had no previous driving experience. The 12 year old started the GMC, exited the driveway and began driving south. The driver was not utilizing the vehicle's 3-point lap and shoulder belt; he was unrestrained.

The driver accelerated the GMC and reached an EDR reported speed of 130 km/h (81 mph) five seconds (T-5) prior to Algorithm Enable (AE). Reconstruction of the EDR data indicated the GMC was approximately 128 m (420 ft) from impact at this time. The inexperienced driver began braking late in the pre-crash envelope approximately four seconds (T-4) prior to AE, 92 m (302 ft) from the impact. The GMC was traveling approximately 122 km/h (76 mph) at the time of the brake application. The GMC passed through the three-leg intersection and departed the south roadside.

Crash

A 13 cm (5 in) diameter tree located 13 m (43 ft) from the house was impacted by the front right corner of the GMC and uprooted. This impact resulted in the recorded non-deployment event (Event 1). The vehicle was traveling approximately 60 km/h (37 mph) at this time and was decelerating (the brakes were on).

The GMC continued forward in a tracking mode and left and center aspects of the Yukon's frontal plane impacted the northeast corner of the house, **Figure 4**. The force of the impact cracked the brick and mortar structure over a 1.5 m x 1.8 m (5 ft x 6 ft) area on the north and east faces of the building. The vehicle's direct contact to the north face of the house measured 144 cm x 122 cm (45 in x 48 in), width by height. A gas main located at the corner of the house was severed by the interaction with the front of the vehicle. The EDR recorded maximum delta V for

the impact was -36.24 km/h (-22.52 mph). The GMC rotated counterclockwise approximately 25 degrees and came to rest in close proximity to the corner of the house. **Figure 9** is a schematic of the crash.

Figure 4: View of the point of impact

Post-Crash

Alerted by the occupants of the house, the police responded to the crash site. Upon their arrival, the investigators found the GMC unoccupied. Using registration records, the police determined the vehicle's ownership and proceeded to that location. The owner resided 0.8 km (0.5 miles) north of the crash site on the intersecting road. At that location, the police found the 12 year old male driver alone at the house. The driver's mother (the vehicle's owner) was contacted by telephone and she returned home. Initially, the 12 year old driver offered little information. However, he eventually reported that he had taken the vehicle on an unauthorized drive and had a crash. He knew he was going to get into trouble and fled the scene. He had exited the vehicle under his own power and ran from the crash scene to back to his house. As a precaution, the driver was transported to a medical center for examination and released. The driver sustained a forehead contusion (AIS 1) and a concussion (AIS 1) as a result of the impact.

EXTERIOR DAMAGE

2004 GMC Yukon

Figures 5 and 6 are a front view and a left lateral view of the 2004 GMC Yukon. The GMC Yukon sustained moderate damage to the frontal plane during the crash sequence. Examination of the frontal profile identified two regions of direct contact damage that related to this multi-event crash. At impact, the bumper fascia had fractured and separated from the vehicle. The separated fascia exposed the fiberglass bumper reinforcement. The reinforcement bar was fractured on both ends, outboard the respective frame rails. The impact to the house (Event 2) resulted in a combined direct and induced damage pattern that extended across the entire 168 cm (66.0 in) front end width. The induced damage from this impact overlapped the damage from the

tree impact (Event 1). Therefore, a single frontal profile was measured along the reinforcement to assess the severity of the crash.

The direct damage to the right aspect of the front plane was related to the impact with the 13 cm (5 in) diameter tree, Event 1. The location of the direct damage was identified by localized pocketing and buckling of the hood face. The pocketing measured 25 cm (10 in) in diameter and began 39 cm (15.5 in) right of center. The maximum crush of the deformed area measured 2.0 cm (0.8 in). The Collision Deformation Classification (CDC) for this event was 12-FREN-1. The EDR reported longitudinal delta V for this impact was -1.66 km/h (-1.03 mph).

The direct damage related to Event 2 began 35.6 cm (14.0 in) left of center and extended 48.3 cm (19.0 in) to the left corner. Due to the angular orientation of the vehicle relative to the house at impact, this direct contact wrapped around the left corner and extended 74.9 cm (29.5 in) onto the left side. The residual crush profile measured along the bumper reinforcement beam was as follows: C1 = 57 cm (22.4 in), C2 = 30 cm (11.8 in), C3 = 20 cm (7.9 in), C4 = 10 cm (3.9 in), C5 = 0, C6 = 0. The maximum crush was located at the left corner of the reinforcement beam. The CDC of the impact was 12-FLEW-3. The left front fender was crushed and shifted rearward 11 cm (4.5 in). There was a 24 cm (9.5 in) reduction of the left wheelbase. The lower left aspect of the windshield was fractured by the exterior impact force. The side window glazings remained intact and all the doors remained operational. The EDR reported longitudinal delta V for the impact was -36.24 km/h (-22.52 mph). The delta V calculated by the Damage Algorithm of the WINSMASH model was 23.6 km/h (14.7 mph). The longitudinal and lateral components were -23.6 km/h (-14.7 mph) and 0, respectively. The WINSMASH calculation underestimated the severity of the crash.

Figure 5: Front view of the GMC.

Figure 6: Left lateral view of the deformation.

INTERIOR DAMAGE
2004 GMC Yukon
The interior damage to the GMC Yukon consisted of minor severity intrusion of the driver's toe pan and left instrument panel, and the deployment of the advanced driver air bag. No evidence of occupant contact was identified on the vehicle's interior.

Figures 7 and 8 are views of the left front interior. The intrusion of the central aspect of the toe pan extended to the back side of the brake pedal and measured 9.4 cm (3.7 in). The intrusion of the left corner of the instrument panel measured 2.0 cm (0.8 in). There was no intrusion into the center or front right occupant space.

Figure 7: View of the front left interior.

Figure 8: Driver interior view.

At inspection, the four-spoke, tilt steering wheel was adjusted to the full-up position. There was no deformation of the steering wheel rim and there was no evidence of loading to the steering column's shear capsules. The Yukon was equipped with adjustable foot pedals. The pedals were adjusted to a forward position that measured 6 mm (0.25 in) aft of full forward. The total adjustment range measured 5 cm (2.0 in).

The powered, ten-way adjustable driver seat was located in a mid-track position at the time of the inspection. The seat position measured 27 cm (4.1 in) rearward of full forward. The total seat track travel measured 22 cm (8.5 in). The seat back angle measured 30 degrees aft of vertical. The horizontal distance from the center of the air bag module to the seat back measured 69 cm (27.0 in). This distance was measured 46 cm (18 in) above the seat bight.

MANUAL RESTAINT SYSTEM
2004 GMC Yukon
The manual restraint system in the front row of the GMC consisted of integrated 3-point lap and shoulder belts with continuous loop webbing and sliding latch plates. The driver's restraint was stowed within the ELR retractor upon inspection. Examination of the latch plate revealed minor

indications of historical use consistent with the age of the vehicle. Historical evidence was not an indicator of the subject driver's safety belt use due to the fact that this was his first driving experience. Examination of the webbing did not yield any crash related usage evidence. The SCI inspection determined the driver was unrestrained at the time of the crash. This determination was consistent with the downloaded EDR data and the driver's interview.

CERTIFIED ADVANCED 208-COMPLIANT FRONTAL AIR BAG SYSTEM
2004 GMC Yukon

The frontal air bags in the 2004 GMC Yukon were certified by the manufacturer to be compliant with the advanced FMVSS 208 ruling. The deployment of the dual-stage air bags was controlled by a Sensing and Diagnostic Module (SDM) that had Event Data Recording (EDR) capabilities. The EDR was downloaded as a supplement to this investigation. The SDM assessed the severity of the crash and tailored the air bag deployment based on input from the following: seat position sensors (for both the driver and the front right passenger seats), front right passenger detection sensor, seat belt buckle switch sensors, and a seat belt tension retractor sensor (for the front right manual restraint).

The driver air bag deployed from an H-configuration module that was designed into the center hub of steering wheel. The height and width of the symmetrical cover flaps measured 12 cm x 6 cm (4.7 in x 2.5 in), respectively. There was no evidence of occupant contact to the flaps. The deployed driver air bag measured 66 cm (26.0 in) in its deflated state. It was vented by two 3 cm (1.1 in) diameter ports located on the back side of the bag in the 11/1 o'clock sectors. The face of the bag was tethered by two 11 cm (4.5 in) wide straps in the bags 3/9 o'clock sectors. The face of the air bag was lightly soiled over 13 cm x 10 cm (5.0 in x 4.0 in) area in the 10 to 11 o'clock sector from post-crash handling. There was no evidence of driver contact identified to the face of the air bag. The driver air bag was identified by the manufacturer's bar code label bearing the designation: *GMTG 16872189.*

At the time of the inspection, the data stored within the Event Data Recorder in the GMC was downloaded using the Vetronix Crash Data Retrieval tool. A non-deployment event and deployment event were downloaded on Ignition Cycle 509. Both recovered events were recorded on ignition cycle 508 and were related to the subject crash. The downloaded data indicated that during these events the status of the driver's safety belt was unbuckled. Analysis of the data indicated that the non-deployment event occurred first followed by the deployment event. The two events were separated in time by 0.9 seconds. A Stage 1 driver air bag deployment was commanded 25 msec after Algorithm Enable. The downloaded EDR data is attached to the end of this report.

OCCUPANT DEMOGRAPHICS
2004 GMC Yukon

	Driver
Age/Sex:	12 year old/Male
Height:	160 cm (63 in)
Weight:	91 kg (200 lb)
Seat Position:	Mid track
Manual Restraint Use:	None
Usage Source:	SCI inspection, EDR
Medical Treatment:	Transported and released

DRIVER INJURY
2004 GMC Yukon

Injury	***Injury Severity (AIS 98 Update)***	***Injury Source***
Concussion without loss of consciousness, GCS=15	Moderate (160402.1,0)	Steering wheel rim
Forehead contusion	Minor (290402.1,7)	Steering wheel rim

Note: the above injuries were identified in the Emergency Room records of the treating hospital.

DRIVER KINEMATICS
2004 GMC Yukon

The 12 year old unrestrained male driver of the GMC was seated with an upright posture in a mid-track position. The driver was inexperienced and unfamiliar with the handling of the vehicle. Reportedly, this was his first driving experience. The driver accelerated the vehicle and reached a maximum EDR recorded speed of 130 km/h (81 mph) five seconds prior to Algorithm Enable (AE). The driver then began braking late in the pre-crash envelope, passed through the Tee intersection, departed the road and entered the yard of a private residence.

The front right corner of the GMC struck and uprooted a small diameter tree along its trajectory. Given the momentum of the vehicle, this impact had very little effect on the driver's kinematics. His arm/grip strength on the steering wheel rim and his probable bracing helped to maintain the driver in an upright position. The GMC then continued along a tracking trajectory and impacted a brick house with the front of the vehicle. The speed of the GMC was approximately 32 km/h (20 mph) at the time of the impact. The force of the impact resulted in a Stage 1 deployment of the advanced driver air bag.

The unrestrained driver exhibited a forward trajectory in response to the 12 o'clock direction of the impact force. The driver's head and chest loaded the deployed driver air bag and he rode down the force of the impact. The driver loaded through the deployed driver air bag and contacted the steering wheel rim with his head. The driver sustained a forehead contusion and a concussion sourced to the steering wheel rim contact. The driver then rebounded back into his seat. After the crash, the young driver exited vehicle under his own power and fled the scene.

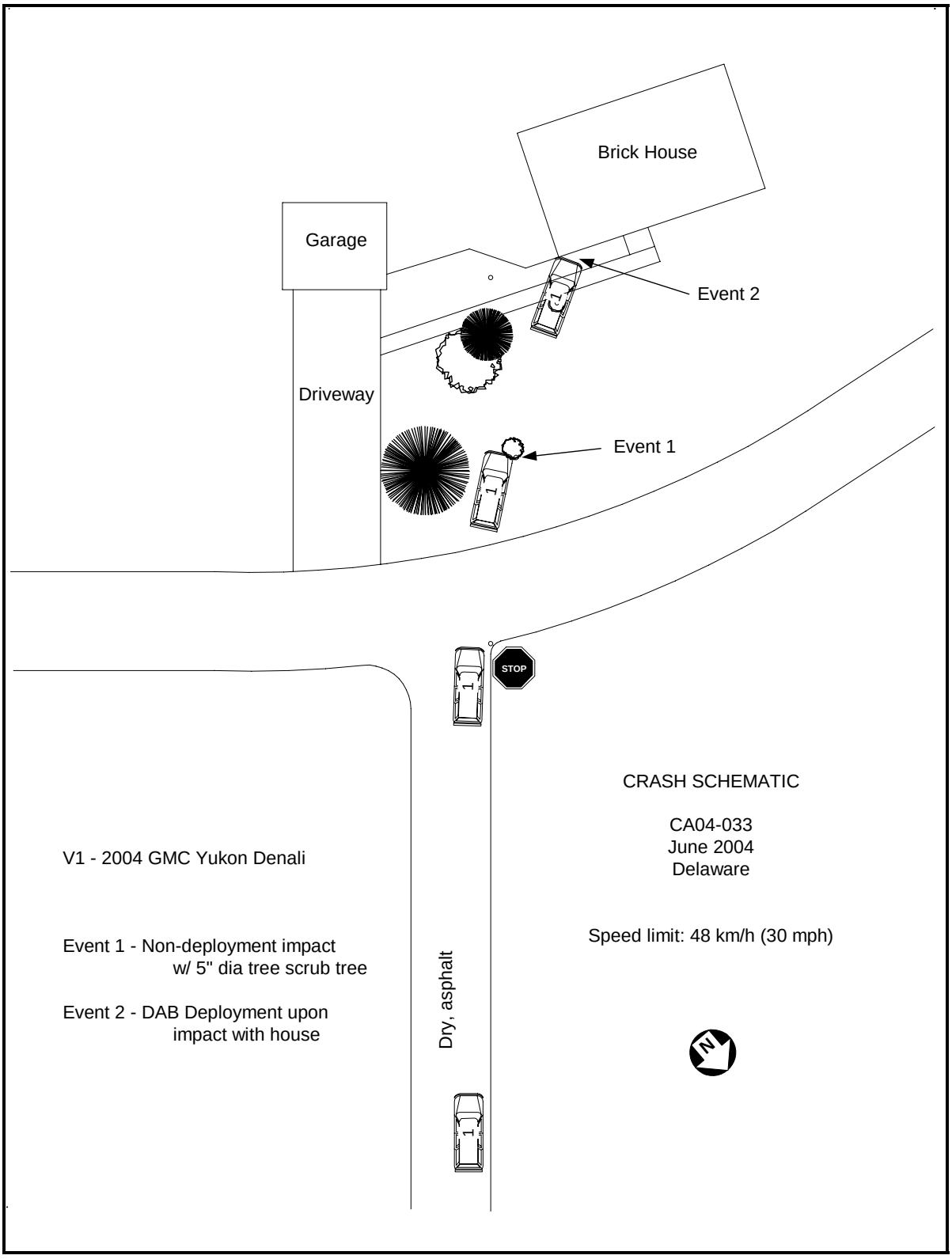


Figure 9: Crash Schematic.

CDR File Information

Vehicle Identification Number	1GKEK63UX4J******
Investigator	
Case Number	
Investigation Date	
Crash Date	
Filename	CA04-033.CDR
Saved on	Monday, August 2 2004 at 09:29:32 AM
Collected with CDR version	Crash Data Retrieval Tool 2.321
Collecting program verification number	4CFCF183
Reported with CDR version	Crash Data Retrieval Tool 2.800
Reporting program verification number	9238B95E
Interface used to collected data	Block number: 00 Interface version: 3C Date: 05-20-04 Checksum: ED00
Event(s) recovered	Deployment Non-Deployment

SDM Data Limitations

SDM Recorded Crash Events:
There are two types of SDM recorded crash events. The first is the Non-Deployment Event. A Non-Deployment Event is an event severe enough to "wake up" the sensing algorithm but not severe enough to deploy the air bag(s). It contains Pre-Crash and Crash data. The SDM can store up to one Non-Deployment Event. This event can be overwritten by an event that has a greater SDM recorded vehicle forward velocity change. This event will be cleared by the SDM after the ignition has been cycled 250 times.
The second type of SDM recorded crash event is the Deployment Event. It also contains Pre-Crash and Crash data. The SDM can store up to two different Deployment Events, if they occur within 25.4 seconds of one another. Deployment Events cannot be overwritten or cleared from the SDM. Once the SDM has deployed the air bag, the SDM must be replaced.
The data in the Non-Deployment Event file will be locked after a Deployment Event, if the Non-Deployment Event occurred within 5 seconds before the Deployment Event. If multiple Non-Deployment Events occur within 5 seconds prior to a Deployment Event, then the most severe Non-Deployment Event will be recorded and locked. If multiple Non-Deployment Events precede a Deployment Event, and multiple Non-Deployment Events occur within 5 seconds of each other (but not necessarily all within 5 seconds of the Deployment Event), and subsequent Non-Deployment Events are less severe than prior Non-Deployment Events, and the last of the multiple Non-Deployment Events occurs within 5 seconds of a Deployment Event, then the most severe of the Non-Deployment Events (which may have occurred more than 5 seconds prior to the Deployment Event) will be recorded and locked.

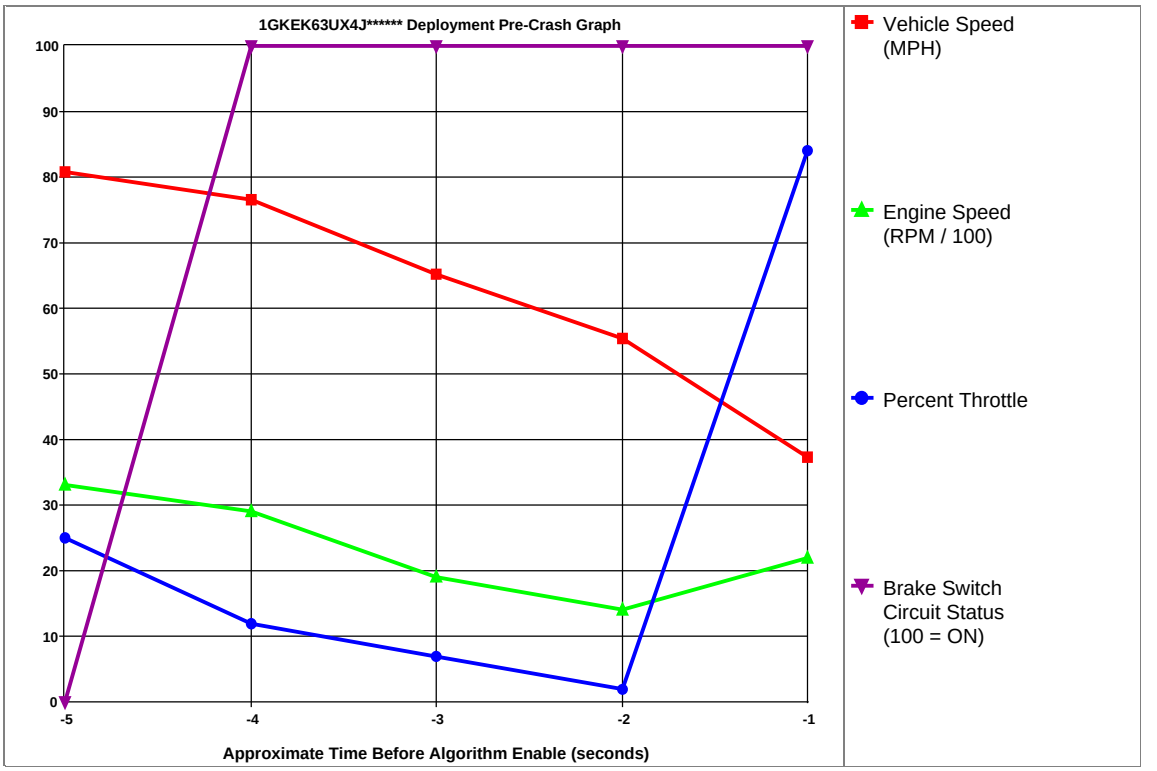
SDM Data Limitations:
-SDM Recorded Vehicle Forward Velocity Change reflects the change in forward velocity that the sensing system experienced during the recorded portion of the event. SDM Recorded Vehicle Forward Velocity Change is the change in velocity during the recording time and is not the speed the vehicle was traveling before the event, and is also not the Barrier Equivalent Velocity. This data should be examined in conjunction with other available physical evidence from the vehicle and scene when assessing occupant or vehicle forward velocity change. For Deployment Events and Deployment Level Events, the SDM will record 100 milliseconds of data after deployment criteria is met and up to 50 milliseconds before deployment criteria is met. For Non-Deployment Events, the SDM will record the first 150 milliseconds of data after algorithm enable.
-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 if the vehicle has had the tire size or the final drive axle ratio changed from the factory build specifications.
-Brake Switch Circuit Status indicates the status of the brake switch circuit.
-Pre-Crash Electronic Data Validity Check Status indicates "Data Invalid" if the SDM receive an invalid message from the module sending the pre-crash data.
-Driver's and Passenger's Belt Switch Circuit Status indicates the status of the seat belt switch circuit. If the vehicle's electrical system is compromised during a crash, the state of the Belt Switch Circuit may be reported other than the actual state.
-The Time Between Non-Deployment and Deployment Events is displayed in seconds. If the time between the two events is greater than 25.4 seconds, "N/A" is displayed in place of the time.
-If power to the SDM is lost during a crash event, all or part of the crash record may not be recorded.
-Multiple Events Associated with this Record: This parameter will indicate whether one or more associated events preceded the recorded event.
-One or More Associated Events Not Recorded: If a single event is recorded, this parameter will indicate whether one or more associated events, prior to the recorded event, was not recorded.
If two associated events are recorded, this parameter for the first event will indicate whether one or more associated events, prior to the first event, was not recorded.

If two associated events are recorded, this parameter, for the second event, will indicate whether one or more associated events, between the first and second events, was not recorded.

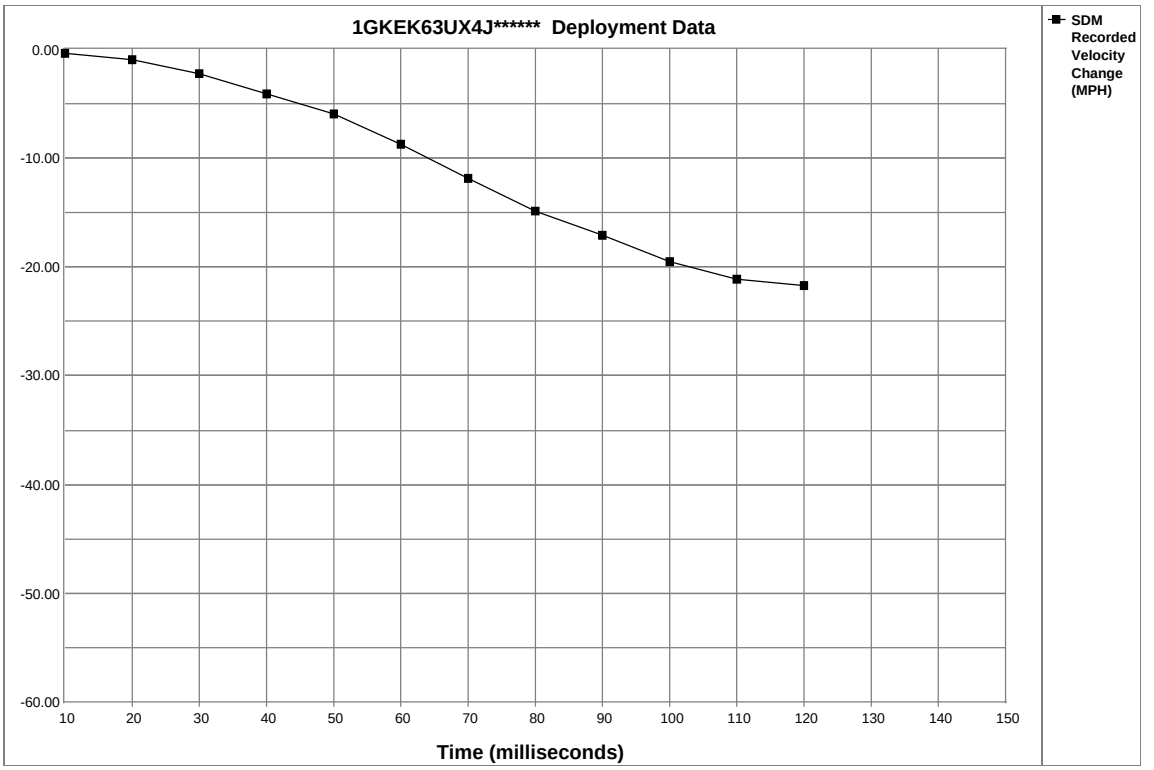
SDM Data Source:
All SDM recorded data is measured, calculated, and stored internally, except for the following:
-Vehicle Speed, Engine Speed, and Percent Throttle data are transmitted once a second by the Powertrain Control Module (PCM), via the vehicle's communication network, to the SDM.
-Brake Switch Circuit Status data is transmitted once a second by either the ABS module or the PCM, via the vehicle's communication network, to the SDM.
-The SDM may obtain Belt Switch Circuit Status data a number of different ways, depending on the vehicle architecture. Some switches are wired directly to the SDM, while others may obtain the data from various vehicle control modules, via the vehicle's communication network.

System Status At Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Seat Position Switch Circuit Status	Rearward
Ignition Cycles At Deployment	508
Ignition Cycles At Investigation	509
Maximum SDM Recorded Velocity Change (MPH)	-22.52
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	162.5
Driver First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	25
Driver Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	N/A
Passenger First Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	Suppressed
Passenger Second Stage Time Algorithm Enabled to Deployment Command Criteria Met (msec)	N/A
Time Between Non-Deployment And Deployment Events (sec)	.9
Frontal Deployment Level Event Counter	1
Event Recording Complete	Yes
Multiple Events Associated With This Record	Yes
One Or More Associated Events Not Recorded	No



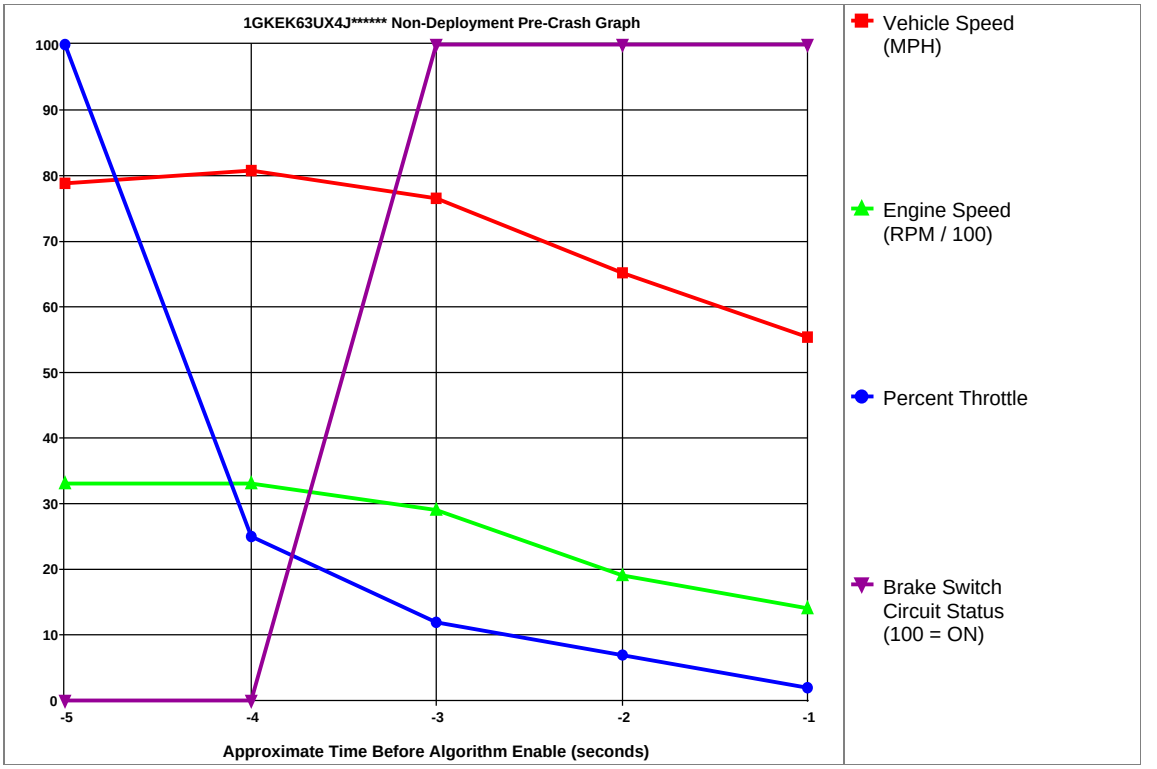
Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	81	3264	25	OFF
-4	76	2944	12	ON
-3	65	1856	7	ON
-2	55	1408	2	ON
-1	37	2240	84	ON



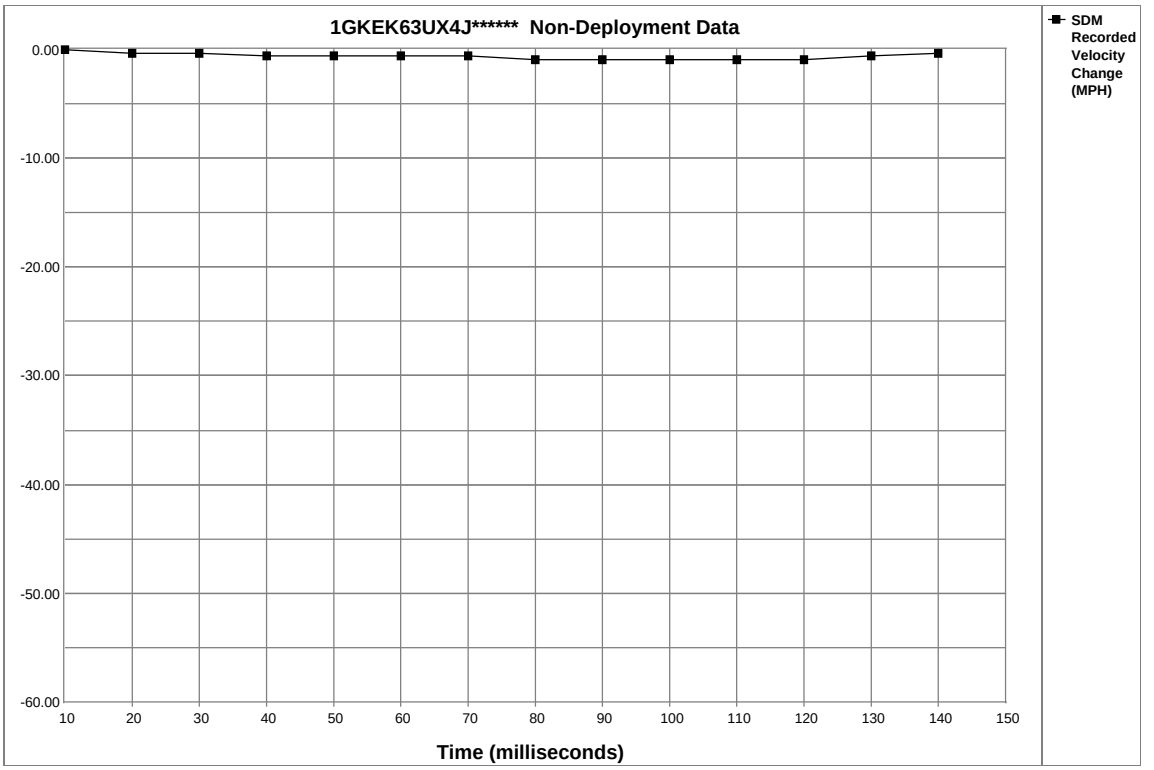
Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	-0.31	-0.93	-2.17	-4.03	-5.89	-8.68	-11.78	-14.88	-17.05	-19.53	-21.08	-21.70	N/A	N/A	N/A

System Status At Non-Deployment

SIR Warning Lamp Status	OFF
Driver's Belt Switch Circuit Status	UNBUCKLED
Passenger's Belt Switch Circuit Status	UNBUCKLED
Passenger Seat Position Switch Circuit Status	Rearward
Ignition Cycles At Non-Deployment	508
Ignition Cycles At Investigation	509
Maximum SDM Recorded Velocity Change (MPH)	-1.03
Algorithm Enable to Maximum SDM Recorded Velocity Change (msec)	77.5
Crash Record Locked	Yes
Event Recording Complete	Yes
Multiple Events Associated With This Record	No
One Or More Associated Events Not Recorded	No



Seconds Before AE	Vehicle Speed (MPH)	Engine Speed (RPM)	Percent Throttle	Brake Switch Circuit Status
-5	79	3328	100	OFF
-4	81	3264	25	OFF
-3	76	2944	12	ON
-2	65	1856	7	ON
-1	55	1408	2	ON



Time (milliseconds)	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150
Recorded Velocity Change (MPH)	0.00	-0.31	-0.31	-0.62	-0.62	-0.62	-0.62	-0.93	-0.93	-0.93	-0.93	-0.93	-0.62	-0.31	N/A

Hexadecimal Data

This page displays all the data retrieved from the air bag module.
It contains data that is not converted by this program.

```
$01  F0 39 33 A9 B1 64
$02  F1 F1 3C 3C A8 00
$03  41 53 33 33 35 31
$04  4B 44 57 35 41 32
$05  00 00 00 00 00 00
$06  15 13 06 07 00 00
$07  00 00 00 00 00 00
$08  00 00 00 00 00 00
$09  00 00 00 00 00 00
$0A  00 00 00 00 00 00
$0B  00 00 00 00 00 00
$0C  00 00 00 00 00 00
$0D  00 00 00 00 00 00
$0E  00 00 00 00 00 00
$0F  00 00 00 00 00 00
$10  FF C0 E0 00 00 00
$11  81 80 82 7C 7C 7D
$12  99 87 88 20 20 11
$13  FF 02 00 00 00 00
$14  03 03 00 00 6C 00
$15  FA FA FA FA FA FA
$16  FA FA FA FA FA FA
$17  FA FA 00 00 00 00
$18  00 3F 55 EC F5 00
$19  09 00 0A 00 00 64
$1A  00 00 00 00 00 00
$1B  00 00 00 00 00 00
$1C  00 0C 00 00 00 00
$1D  00 00 00 00 00 00
$1F  FE 00 00 00 00 00
$20  92 FE 00 00 FF FF
$21  FF FF FF FF FF FF
$22  FF FF FF FF FF FF
$23  FF FF FF FF FF FF
$24  00 00 35 00 1F 07
$25  0D 00 00 00 FF FF
$26  00 01 01 02 02 02
$27  02 03 03 03 03 03
$28  02 01 00 0E FF C0
$29  F0 A5 FF FF FF FF
$2A  FF FF FF FF FF FF
$2B  FF FF FF FF FF FF
$2C  FF FF FF FF FF FF
$2D  FF FF 00 00 00 00
$30  BA FD 00 00 FF FF
$31  FF FF FF FF FF FF
$32  FF FF FF FF FF FF
$33  FF FF FF FF FF FF
$34  00 00 33 15 0A 03
$35  00 00 00 00 00 00
$36  00 00 00 00 00 00
$37  00 00 00 04 89 41
$38  41 0B 5E 2F F6 00
$39  01 00 00 00 FF FF
$3A  01 03 07 0D 13 1C
$3B  26 30 37 3F 44 46
$3C  00 00 00 0C FF C0
$3D  F0 A5 00 00 00 00
$40  59 69 7B 82 7F 00
$41  E0 00 05 12 1F 40
$42  FF 00 16 1D 2E 33
$43  34 00 3F FC 00 00
```

```
$44  3C 59 69 7B 82 00
$45  F0 00 D6 05 12 1F
$46  40 00 23 16 1D 2E
$47  33 00 3F FC 00 00
$48  FF FF FF FF FF FF
$49  FF FF FF FF FF FF
$4A  FF FF FF FF FF FF
$4B  FF FF FF FF 00 00
$4C  FF FF FF FF FF FF
$4D  FF FF FF FF FF FF
$4E  FF FF FF FF FF FF
$4F  FF FF FF FF 00 00
$50  FF FF FF FF FF FF
$51  FF FF FF FF FF FF
$52  FF FF FF FF FF FF
$53  FF FF FF FF FF FF
$54  FF FF FF FF FF FF
```

Comments