**CHIP-LEVEL FORENSICS ATTACHMENT**

**Exemplar 1 Original CDR Report**

**Etna, OH**

**HWY24MH001**

(13 pages)

## CDR File Information

| | |
|---|---|
| User Entered VIN | 5N1AZ2MHXFN███████ |
| User | Jason Zeitler |
| Case Number | HWY24MH001 |
| EDR Data Imaging Date | 02/22/2024 |
| Crash Date | |
| Filename | 5N1AZ2MHXFN██████  ACM.CDRX |
| Saved on | Thursday, February 22 2024 at 14:14:51 |
| Imaged with CDR version | Crash Data Retrieval Tool 23.4.1 |
| Imaged with Software Licensed to (Company Name) | NTSB, Office of Highway Safety |
| Reported with CDR version | Crash Data Retrieval Tool 23.4.1 |
| Reported with Software Licensed to (Company Name) | NTSB, Office of Highway Safety |
| EDR Device Type | Airbag Control Module |
| Event(s) recovered | Event Record 1 |

## Comments

Original Download
Exemplar 1
Spoof VIN
DTM 387/780

## Data Limitations

### General Information:

Data limitations are intended to assist in reading event data that has been imaged from the vehicle's Air bag Control Unit (ACU). Event data should be considered in conjunction with other available physical evidence from the vehicle and scene.

### Airbag Control Unit (ACU)

- The Air bag Control Unit (ACU) can store two types of events: Non-Deployment Events and Deployment.
    - A Non-Deployment Event is a crash or other physical occurrence which causes the ACU algorithm to be activated, but in which deployment thresholds are not reached.
    - A Deployment Event is a crash or other physical occurrence which causes ACU deployment thresholds to be reached or exceeded. Depending on the vehicle model, one or more of the following may be activated during a Deployment Event: front air bags, seat-mounted side airbags, roof-mounted or door-mounted curtain air bags, pretensioners, or pop-up roll bars.

- The ACU can record up to two events. If additional events occur subsequently, the older of the two events already recorded (i.e. the one which occurred first) is overwritten.
    - A Non-Deployment Event can be overwritten by another Non-Deployment event, or by a Deployment Event.
    - A Deployment Event has higher priority than a Non-Deployment Event, and cannot be interrupted or overwritten by another event.
    - The data pertaining to a Deployment Event is locked after being recorded. However, a second event can still be recorded subsequently in the portion of the event memory which is not locked.

- Event data includes both pre-crash data and crash data.
    - If the power supply to the ACU is lost during an event, all or part of the event data may not be recorded.
    - In addition to the recording of event data, the ACU has the ability to perform diagnostics and record Diagnostic Trouble Codes (DTCs).

### Data Element Sign Convention:

The following table provides an explanation of the sign convention for data elements in the CDR report.

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

- "Life Time Counter (sec)" indicates the elapsed time, in seconds, from the vehicle's first ignition activation until the start of the first recorded event. The counter is incremented whenever the vehicle's ignition is on. The counter is reset to 0 if the ACU is replaced.
- "Complete File Recorded" indicates whether a complete EDR data set has been stored after the event. "Yes" indicates that a complete data set has

been recorded. "No" indicates that only a portion of the data set has been recorded, for example due to the power to the ACU being lost during the event.
- "Multi-Event, Number of Events (1, 2)" indicates the number of events which are stored during a given ignition cycle. A Multi-Event occurs whenever the time between Event 2 trigger threshold and Event 1 trigger threshold is less than or equal to 5 seconds during the same ignition cycle, and "2" will be recorded in this case. Otherwise, "1" will be recorded.
- "Air Bag Warning Lamp (On, Off)" indicates whether the ACU was in trouble mode or in normal operation mode at the time of the event. "On" indicates that the air bag warning lamp was illuminated at the time of the event, and the ACU was in trouble mode. "Off" indicates that the air bag warning lamp was not illuminated at the time of the event, and the ACU was in normal operation mode.
- "Frontal Air Bag Suppression Switch Status" indicates whether front passenger air bag deployment was suppressed at the time of the event. "On" indicates that the front passenger air bag was suppressed at the time of the event (deployment inhibited). "Off" indicates that the front passenger air bag was not suppressed at the time of the event (deployment enabled). This data will not be available for all vehicles.
- "Delta-V, Longitudinal" indicates the cumulative change in velocity along the longitudinal direction.
- "Acceleration, Longitudinal" indicates the rate of change of velocity with time along the longitudinal direction.
- "Delta-V, Lateral" indicates the cumulative change in velocity along the lateral direction.
- "Acceleration, Lateral" indicates the rate of change of velocity with time along the lateral direction.
- "Engine Throttle, % full" indicates the position of the accelerator pedal as a percentage of the fully depressed position.
- "Service Brake (On, Off)" indicates whether the service brake is activated ("On") or not activated ("Off").
- "Steering Input (deg)" indicates the angular displacement of the steering wheel measured in degrees. -250 deg indicates a 250 degree turn to the right of the steering wheel, 0 deg indicates the straight-ahead steering wheel position, and 250 deg indicates a 250 degree turn to the left of the steering wheel.
- The notation "CLP" indicates that the measurement captured by a sensor exceeded the design range of the sensor.
- "Seat Track Position Switch, Foremost, Status, Driver (Yes/No)" indicates whether the driver's seat is positioned within a designated threshold value of the most forward adjustment position. "Yes" indicates that the driver's seat is positioned within a designated threshold value of the most forward adjustment position. For all other adjustment positions, "No" is displayed. This data will not be available if the seat track position switch is not installed in the vehicle.
- "Occupant Size Classification, Right Front Passenger, Child (Yes/No)" indicates whether or not the right front passenger is classified as a child (as defined in 49 CFR part 572, subpart N or smaller). This data will not be available for all vehicles.
- "e-pedal ON/OFF Status" indicates whether "e-pedal" is activated (ON), or not activated (OFF). This data will not be available for all vehicles.
- "ABS Warning lamp, on/off" indicates whether "Anti-lock Brake System" was in trouble mode or in normal operation mode at the time of the event. This data will not be available for all vehicles.
- "AEB/FCW switch status ON/OFF (from ADAS)" indicates whether the switch of "Automatic Emergency Braking or Forward Collision Warning controlled by ADAS unit" was ON, or OFF at the time of the event. This data will not be available for all vehicles.
- "AEB Warning lamp (from ADAS)" indicates whether "Automatic Emergency Braking controlled by ADAS unit" was in trouble mode or in normal operation mode at the time of the event. This data will not be available for all vehicles.
- "ABS regulation status" indicates whether "Anti-lock Brake System" was activated (ABS in regulation), or not activated (no ABS regulation). This data will not be available for all vehicles.
- "VDC switch status ON/OFF" indicates whether the switch of "Vehicle Dynamic Control" in ON, or OFF. This data will not be available for all vehicles.
- "VDC status/warning" indicates whether "Vehicle Dynamic Control" was in normal operation mode and not activated (No failure and no control), in trouble mode and not activated (Failure), or in normal mode and activated (In active control). This data will not be available for all vehicles.
- "Adaptive Cruise Control status" indicates whether "Intelligent Cruise Control status" was activated (ACC activated), waiting (ACC waiting), suspended (ACC suspended), or not activated (No display request). This data will not be available for all vehicles.
- "AEB operating capability" indicates whether "Automatic Emergency Braking" was in trouble mode (Impossible to execute request) or in normal operation mode (Braking fully operational). This data will not be available for all vehicles.
- "AEB Brake request (from ADAS)" indicates whether "Automatic Emergency Braking controlled by ADAS unit" was activated (Brake Torque AEB Maximum), or not activated (No Brake Request). This data will not be available for all vehicles.
- "VIN retrieval from other ECU " indicates VIN data retrieval from other ECU when CDR connect to vehicle by using OBD system if available.
- "VIN retrieval from ACU " indicates VIN data retrieval from ACU. It will not be available for all vehicles.
- "Engine RPM (Gearbox Input Shaft) " indicates RPM of motor used for vehicle drive on electric or hybrid vehicles. In case of ICE vehicles, this indicates input shaft revolution that is input to Gearbox. This data will not be available for all vehicles.
- "Engine RPM (Front Electrical Motor) " indicates RPM of motor used for vehicle drive on electric vehicles. This data will not be available for all vehicles.
- "Engine RPM (Rear Electrical Motor)" indicates RPM of motor used for 4WD vehicle drive on electric vehicles. This data will not be available for all vehicles.
- "Engine RPM" indicates RPM of engine used for vehicle drive on electric vehicles. This data will not be available for all vehicles.
- "Airbag Deployment Time" indicates deployment time of each airbag. This data will not be available for all vehicles.
- "Seat Track Position Switch, Foremost, Status, Passenger" indicates whether the passenger's seat is positioned within a designated threshold value of the most forward adjustment position. "Yes" indicates that the passenger's seat is positioned within a designated threshold value of the most forward adjustment position. For all other adjustment positions, "No" is displayed. This data will not be available if the seat track position switch is not installed in the vehicle.

**Hexadecimal Data:**

All data that has been specified for retrieval is shown in the Hexadecimal Data section of this report. However, the Hexadecimal Data section may contain data that is not translated by the CDR tool.

**Data Sources:**
- Crash data is measured internally in the ACU.
- Pre-crash data is not measured internally in the ACU, but is transmitted from other control units through the Controller Area Network (CAN).
- Pre-crash data and crash data are asynchronous.

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## System Status At Time Of Retrieval

| | |
|---|---|
| VIN retrieved from ACU | Not Available |
| VIN Retrieval from other ECU | Not Available |

## DTCs at Time of Retrieval

| DTC | Status | Description |
|---|---|---|
| B1421 | Current | FRONTAL COLLISION DETECTION |
| B1429 | Current | SEAT BELT BUCKLE SW RH CIRCUIT [OPEN] |
| B1429 | Current | SEAT BELT BUCKLE SW RH CIRCUIT [UNDEFINED] |
| U1000 | Current | (CAN COMMUNICATION FAILER) |
| B0091 | Current | B-PILLAR SATELLITE SENSOR LH [DISCONNECT] |
| B0096 | Current | B-PILLAR SATELLITE SENSOR RH [DISCONNECT] |
| B0092 | Current | C-PILLAR SATELLITE SENSOR LH [DISCONNECT] |
| B0097 | Current | C-PILLAR SATELLITE SENSOR RH [DISCONNECT] |
| B0001 | Current | DRIVER AIRBAG MODULE CIRCUIT [OPEN] |
| B0010 | Current | ASSIST AIRBAG MODULE CIRCUIT  [OPEN] |
| B1431 | Current | FRONT PRE-TEN RH CIRCUIT [OPEN] |
| B1430 | Current | FRONT PRE-TEN LH CIRCUIT [OPEN] |
| B00D5 | Current | PASSENGER AIRBAG INDICATOR CIRCUIT [OPEN] |
| B1433 | Current | FRONT PRE-TEN2 RH CIRCUIT [OPEN] |
| B1434 | Current | KNEE AIRBAG MODULE LH CIRCUIT [OPEN] |
| B0002 | Current | DRIVER AIRBAG MODULE 2ND CIRCUIT  [OPEN] |
| B1421 | Past | FRONTAL COLLISION DETECTION |
| U1000 | Trouble Diag. Record | (CAN COMMUNICATION FAILER) |

## System Status at Event (Event Record 1)

| | |
|---|---|
| Life Time Counter (sec) | 5352542 |
| Complete File Recorded (Yes/No) | No (Not Complete) |
| Ignition Cycle, Crash | 6587 |
| Ignition Cycle, Download | 6588 |
| Multi-Event, Number of Events (1, 2) | 1 |
| Time from Event 1 to 2 (sec) | N/A |
| Safety Belt Status, Driver | On (Fastened) |
| Safety Belt Status, Right Front Passenger (buckled, not buckled) | Off (Unfastened) |
| Frontal Air Bag Warning Lamp (On, Off) | Off |
| Frontal Air Bag Suppression Switch Status | On (AS airbag inhibit) |
| Maximum Delta-V, Longitudinal (MPH [km/h]) | -37 [-59] |
| Time, Maximum Delta-V, Longitudinal (msec) | 152.5 |
| Maximum Delta-V, Lateral (MPH [km/h]) | 11 [ 18] |
| Time, Maximum Delta-V, Lateral (msec) | 137.5 |
| Maximum Acceleration, Longitudinal (g) | -49 |
| Time, Maximum Acceleration, Longitudinal (msec) | 30 |
| Maximum Acceleration, Lateral (g) | 49 |
| Time, Maximum Acceleration, Lateral (msec) | 30 |
| Occupant Size Classification, Right Front Passenger, Child (Yes/No) | No |

## Deployment Command Data (Event Record 1)

| | |
|---|---|
| Frontal Air Bag Deployment, Time to Deploy/First Stage, Driver (msec) | 19 |
| Frontal Air Bag Deployment, Time to Deploy/First Stage, Passenger (msec) | N/A |
| Frontal Air Bag Deployment, Time to 2nd Stage, Driver (msec) | 22 |
| Frontal Air Bag Deployment, Time to 2nd Stage, Right Front Passenger (msec) | N/A |
| Side Air Bag Deployment, Time to Deploy, Driver (msec) | 29 |
| Side Air Bag Deployment, Time to Deploy, Right Front Passenger (msec) | 29 |
| Side Curtain/Tube Air Bag Deployment, Time to Deploy, Driver Side (msec) | 29 |
| Side Curtain/Tube Air Bag Deployment, Time to Deploy, Right Side (msec) | 29 |
| Pretensioner Deployment, Time to Fire, Driver (msec) | 19 |
| Pretensioner Deployment, Time to Fire, Right Front Passenger (msec) | 19 |

## Pre-Crash Data -5 to 0 sec [2 samples/sec] (Event Record 1)
(the most recent sampled values are recorded prior to the event)

| Time Stamp (sec) | Speed, Vehicle Indicated (MPH [km/h]) | Accelerator Pedal, % full | Engine RPM | Motor RPM | Service Brake (On, Off) | Steering Input (deg) |
|---|---|---|---|---|---|---|
| -5.0 | 33 [ 53] | 10 | 1100 | 1100 | Off (Brake Not Activated) | -5 |
| -4.5 | 34 [ 54] | 10 | 1100 | 1100 | Off (Brake Not Activated) | -5 |
| -4.0 | 34 [ 54] | 7 | 1100 | 1100 | Off (Brake Not Activated) | -2.5 |
| -3.5 | 34 [ 55] | 5 | 1000 | 1000 | Off (Brake Not Activated) | -2.5 |
| -3.0 | 34 [ 55] | 0 | 1000 | 1000 | Off (Brake Not Activated) | 0 |
| -2.5 | 34 [ 55] | 0 | 1000 | 1000 | Off (Brake Not Activated) | 0 |
| -2.0 | 34 [ 54] | 0 | 1000 | 1000 | Off (Brake Not Activated) | 0 |
| -1.5 | 33 [ 53] | 0 | 1100 | 1100 | Off (Brake Not Activated) | 5 |
| -1.0 | 33 [ 53] | 0 | 1100 | 1100 | Off (Brake Not Activated) | 5 |
| -0.5 | 32 [ 52] | 0 | 1100 | 1100 | Off (Brake Not Activated) | 2.5 |
| 0.0 | 32 [ 51] | 0 | 1100 | 1100 | On (Brake Activated) | -37.5 |

## Delta V, Longitudinal (Event Record 1)
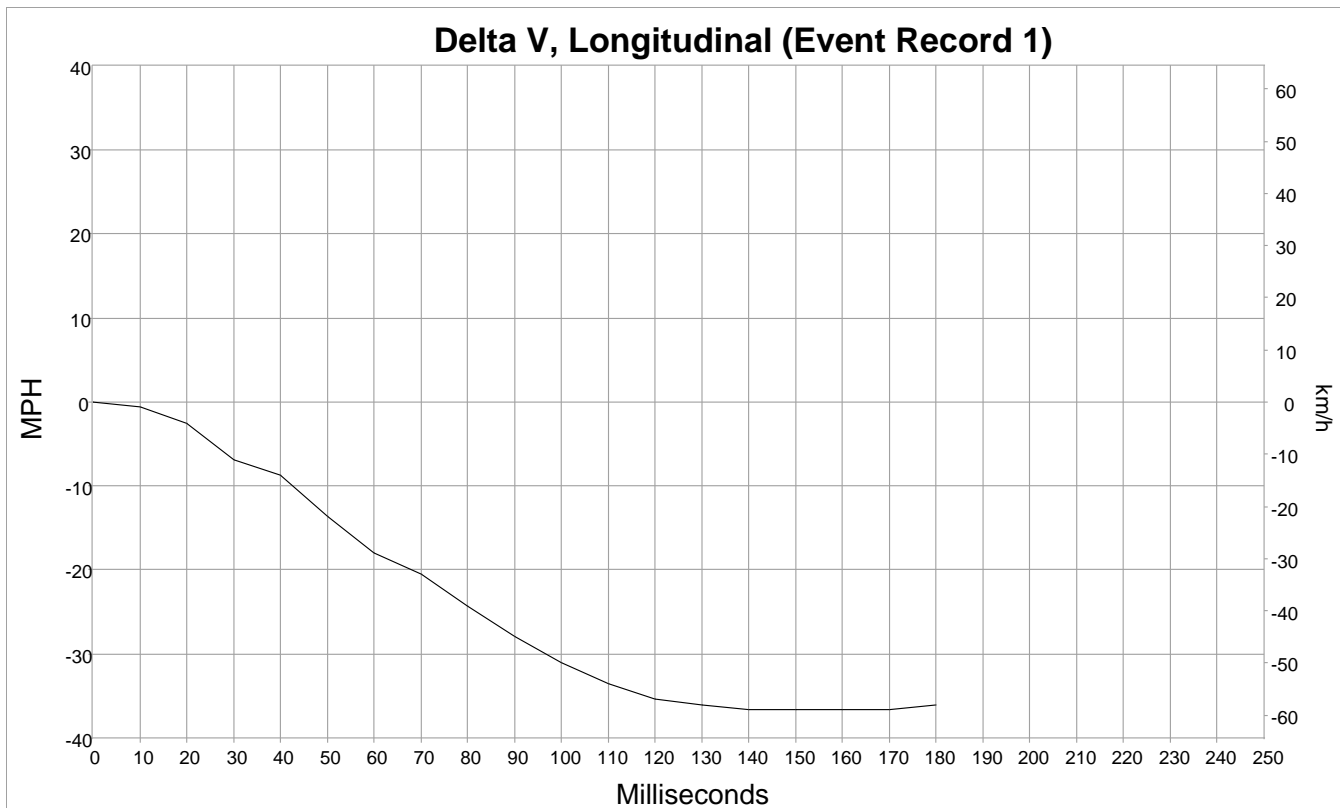


## Longitudinal Delta V (Event Record 1)

| Time (msec) | MPH [km/h] |
|---|---|
| 0 | 0 [ 0] |
| 10 | -1 [-1] |
| 20 | -2 [-4] |
| 30 | -7 [-11] |
| 40 | -9 [-14] |
| 50 | -14 [-22] |
| 60 | -18 [-29] |
| 70 | -21 [-33] |
| 80 | -24 [-39] |
| 90 | -28 [-45] |
| 100 | -31 [-50] |
| 110 | -34 [-54] |
| 120 | -35 [-57] |
| 130 | -36 [-58] |
| 140 | -37 [-59] |
| 150 | -37 [-59] |
| 160 | -37 [-59] |
| 170 | -37 [-59] |
| 180 | -36 [-58] |
| 190 | N/A |
| 200 | N/A |
| 210 | N/A |
| 220 | N/A |
| 230 | N/A |
| 240 | N/A |
| 250 | N/A |

# Delta V, Lateral (Event Record 1)
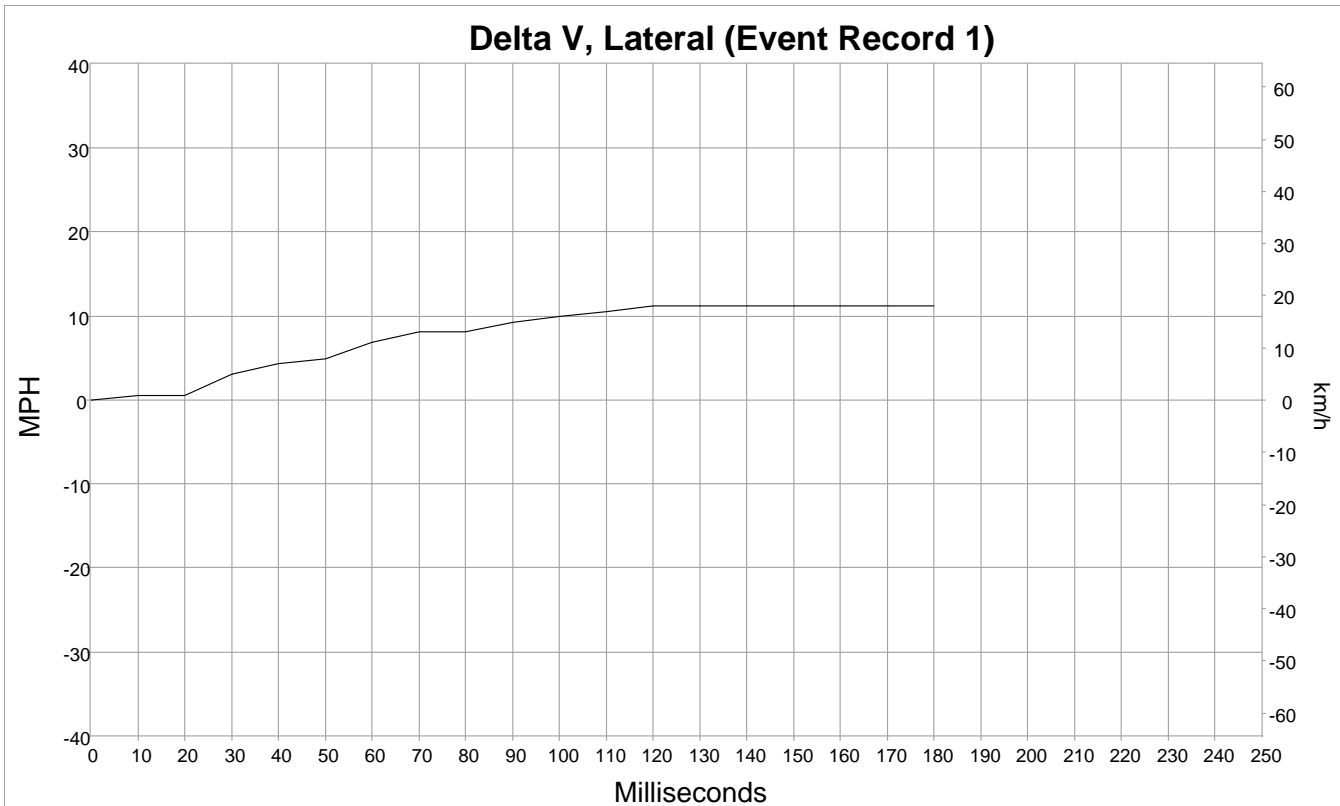


## Lateral Delta V (Event Record 1)

| Time (msec) | MPH [km/h] |
|---|---|
| 0 | 0 [ 0] |
| 10 | 1 [ 1] |
| 20 | 1 [ 1] |
| 30 | 3 [ 5] |
| 40 | 4 [ 7] |
| 50 | 5 [ 8] |
| 60 | 7 [ 11] |
| 70 | 8 [ 13] |
| 80 | 8 [ 13] |
| 90 | 9 [ 15] |
| 100 | 10 [ 16] |
| 110 | 11 [ 17] |
| 120 | 11 [ 18] |
| 130 | 11 [ 18] |
| 140 | 11 [ 18] |
| 150 | 11 [ 18] |
| 160 | 11 [ 18] |
| 170 | 11 [ 18] |
| 180 | 11 [ 18] |
| 190 | N/A |
| 200 | N/A |
| 210 | N/A |
| 220 | N/A |
| 230 | N/A |
| 240 | N/A |
| 250 | N/A |

## Roll Angle (Event Record 1)
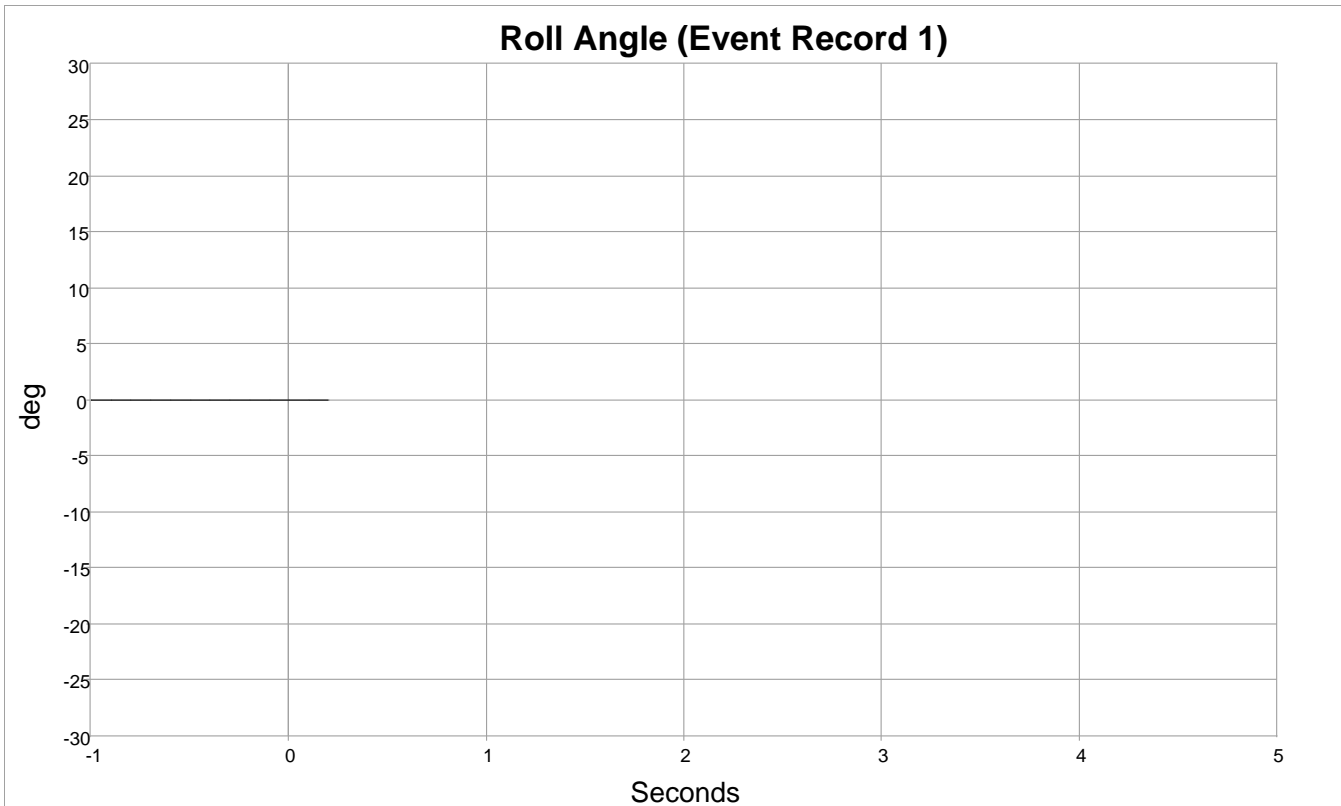


## Roll Angle (Event Record 1)

| Time (sec) | deg |
|---|---|
| -1.0 | 0 |
| -0.9 | 0 |
| -0.8 | 0 |
| -0.7 | 0 |
| -0.6 | 0 |
| -0.5 | 0 |
| -0.4 | 0 |
| -0.3 | 0 |
| -0.2 | 0 |
| -0.1 | 0 |
| 0.0 | 0 |
| 0.1 | 0 |
| 0.2 | 0 |
| 0.3 | N/A |
| 0.4 | N/A |
| 0.5 | N/A |
| 0.6 | N/A |
| 0.7 | N/A |
| 0.8 | N/A |
| 0.9 | N/A |
| 1.0 | N/A |
| 1.1 | N/A |
| 1.2 | N/A |
| 1.3 | N/A |
| 1.4 | N/A |
| 1.5 | N/A |
| 1.6 | N/A |
| 1.7 | N/A |
| 1.8 | N/A |
| 1.9 | N/A |

| 2.0 | N/A |
|-----|-----|
| 2.1 | N/A |
| 2.2 | N/A |
| 2.3 | N/A |
| 2.4 | N/A |
| 2.5 | N/A |
| 2.6 | N/A |
| 2.7 | N/A |
| 2.8 | N/A |
| 2.9 | N/A |
| 3.0 | N/A |
| 3.1 | N/A |
| 3.2 | N/A |
| 3.3 | N/A |
| 3.4 | N/A |
| 3.5 | N/A |
| 3.6 | N/A |
| 3.7 | N/A |
| 3.8 | N/A |
| 3.9 | N/A |
| 4.0 | N/A |
| 4.1 | N/A |
| 4.2 | N/A |
| 4.3 | N/A |
| 4.4 | N/A |
| 4.5 | N/A |
| 4.6 | N/A |
| 4.7 | N/A |
| 4.8 | N/A |
| 4.9 | N/A |
| 5.0 | N/A |

## Hexadecimal Data

```
DID    Data

2001   FF 90 1C 94 21 00 94 29 13 94 29 00 D0 00 01 80
       91 88 80 96 88 80 92 88 80 97 88 80 01 13 80 10
       13 94 31 13 94 30 13 80 D5 13 94 33 13 94 34 13
       80 02 13 14 FF FF FF FF 00 05 00 EF

2002   94 21 00 00 00 01 12 01 2F 12 01 01 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

2003   D0 00 01 00 00 01 1B 01 27 CF 00 00 00 00 00 00
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       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00

2004   00 00 02 81 1C 00 00 FF FD CC 4A 00 00 00 00

2006   00 01 00 10 10 10 10 10 10 10 10 10 10 10 10 13
       16 13 FF 13 16 FF FF FF FF FF 0B 05 05 05 FF FF
       FF FF FF FF 05 05 05 FF FF FF FF FF FF 1D 1D 1D
       1D 7E 7F 7F FF FF FF FF 7F 7F 7F 7F 00 00 00 00
       00 00 00 00 00 00 FF FF FF FF FF FF B8 00 00 00
       00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
       00 00 00 00 00 00 00 00

2019   00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 01
       00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 01
       00 00 00 01 00 00 00 01 00 00 00 01 00 00 00 01
       00 00 00 01 00 00 00 01

201A   00 01 04 0B 0E 16 1D 21 27 2D 32 36 39 3A 3B 3B
       3B 3B 3A 7F 7F 7F 7F 7F 7F 7F 3B 3D 00 35 00 36
       00 36 00 37 00 37 00 37 00 36 00 35 00 35 00 34
       00 33 00 0A 00 0A 00 07 00 05 00 00 00 00 00 00
       00 00 00 00 00 00 00 00 01 01 01 01 01 01 01 01
       01 01 00 19 BB 19 BC 00 01 13 FF 01 FF 01 01 00
       16 FF 1D 1D 1D 1D 13 13 80 80 80 80 80 80 80 80
       80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80
       80 80

201B   80 80 80 80 80 80 80 80 80 80 80 80 80 80 80 80
       80 80 80 80 80 80 80 80 80 80 00 01 01 05 07 08
       0B 0D 0D 0F 10 11 12 12 12 12 12 12 12 7F 7F 7F
       7F 7F 7F 7F 12 37 00 0B 00 0B 00 0B 00 0A 00 0A
       00 0A 00 0A 00 0B 00 0B 00 0B 00 0B

201C   00 00 00 00 00 00 00 00 00 00 00 00 00 7F 7F 7F
       7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F
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        7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F
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201D    7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F
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        7F  7F

201E    7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F  7F
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        FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF
        FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF  FF
        FF  FF  FF  FF  FF  FF  FF

F1A0    20

        59  02  09  94  21  00  09  94  29  13  09  94  29  00  09  D0
        00  01  09  80  91  88  09  80  96  88  09  80  92  88  09  80
        97  88  09  80  01  13  09  80  10  13  09  94  31  13  09  94
        30  13  09  80  D5  13  09  94  33  13  09  94  34  13  09  80
        02  13  09

        59  02  09  94  21  00  09

        59  0F  08  D0  00  01  08

        30  01  BF  FF  FB  C1  98  07  FF  FF  FF  FF  45  FF  19  FF
        FF  C3  FF  1F  DF  FF  FF  BF  FF  D7  FF  08  86  32  10  00
        00  3F  FF  FF  FF  FF  04  7F  FF  FF  00  FF  FF  FF  FF  FF
        FF  FF  FF  FF
```

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