UMTRI TRANSPORTATION RESEARCH INSTITUTE UNIVERSITY OF MICHIGAN

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# Safety Pilot Model Deployment: WSU Basic Safety Messages

cmisst
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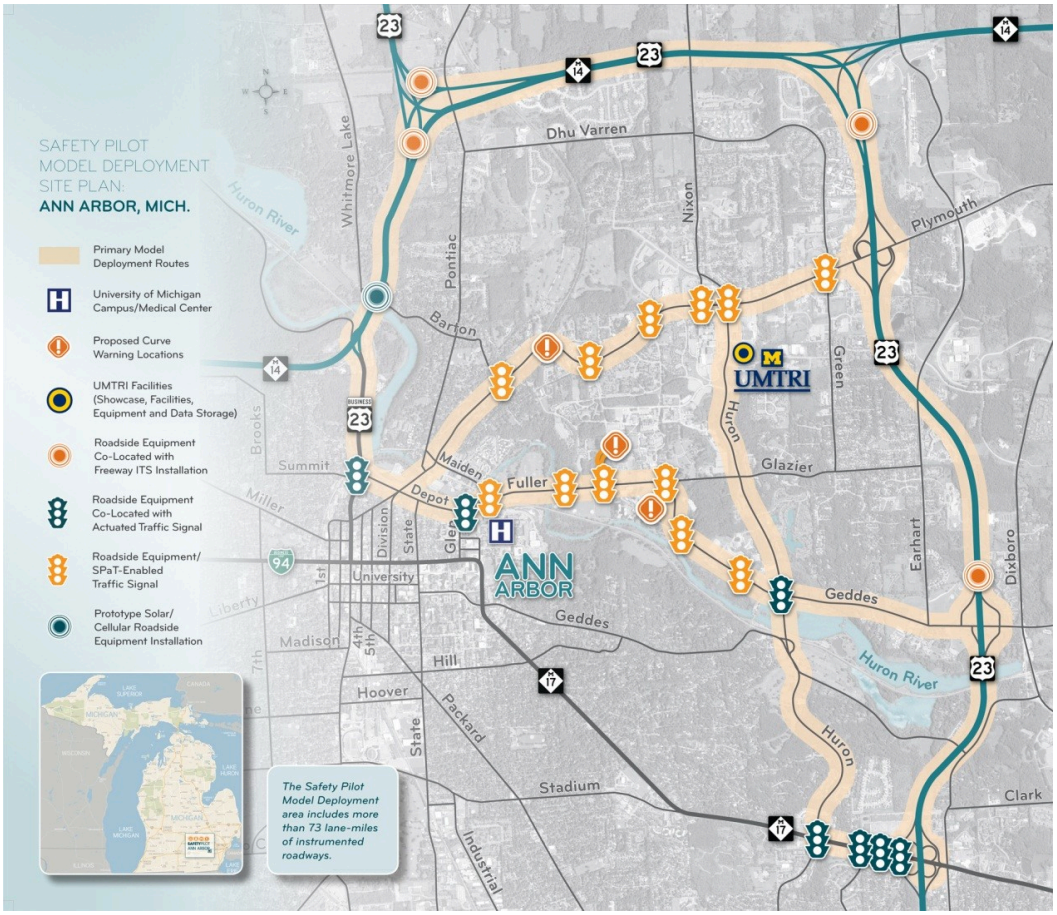
# INTRODUCTION

The Safety Pilot Model Deployment (SPMD) study was run in the Ann Arbor, MI area and involved over 2,000 vehicles. The study goal was to pilot a connected-vehicle system that included roadside units (RSUs) fixed to specific intersections and vehicle-based communication units. Data were collected from RSUs as well as vehicles.

Each vehicle was equipped with one of four unique device packages which provide a series of data elements which communicate the vehicle's location and motion. The packages are referenced as the Integrated Safety Device (ISD); Aftermarket Safety Device (ASD); Retrofit Safety Device (RSD) and Vehicle Awareness Device (VAD). More than 75 percent of the total equipped vehicles used a VAD, which is the most primitive device. Vehicles with VAD can only transmit the data being generated and collected by their host vehicle; they are not able to receive messages transmitted from other vehicles. They mainly transmit "here I am" messages while increasing the likelihood of vehicle-to-Vehicle (V2V) and vehicle-to-infrastructure (V2I) interactions. More detailed vehicle-based data came from vehicles equipped with ISD, ASD, and RSD packages with the ability to collect, receive and transmit. Those vehicles had more advanced safety features and they also collected video data files.

This dataset contains data from the onboard wireless safety units (WSUs). This file primarily consists of GPS-based data elements and those that are obtained from the vehicle's Controller Area Network (CAN) Bus. Different brands of WSUs were used but all of the data were stored in one dataset. A series of data elements that present vehicle performance information and the state of a few of its components are also included.

The proposed layout of the test site and the location of the roadside equipment capable of communicating via Dedicated Short Range Communication (DSRC) is below:




Citation for SPMD:
Bezzina, D., & Sayer, J. (2015, June). *Safety pilot model deployment: Test conductor team report* (Report No. DOT HS 812 171). Washington, DC: National Highway Traffic Safety Administration.

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## THE PRIMARY J2735 BRAKE STATUS EVENTS VARIABLES

| BrakeByte1Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| BrakeByte1Events J2735 Brake Status (primary) | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the current state of specific components of the brake system per J2735 standard: the first four bits are 0 or 1 for not-applied or applied respectivey for left front, right front, left rear, and right rear, in order; the fifth bit is one if brake information is unavailable; the sixth bit is unused and set to 0; and the last two bits represent the status of the Traction Control System (00=unavailable, 01=off, 10=on, 11=engaged) | N/A | N/A | N/A | No Special Values |

## THE MISCELLANEOUS J2735 BRAKE STATUS EVENTS VARIABLES

| BrakeByte2Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| BrakeByte2Events J2735 Brake Status (miscellaneous) | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the current state of specific components of the brake system: the first two bits represent the status of the Antilock Brake System (00=unavailable, 01=off, 10=on, 11=engaged); the third and fourth bits represent the status of the Stability Control Unit (00=unavailable, 01=off, 10=on); the fifth and sixth bits represent the status of BrakeBoost (00=unavailable, 01=off, 10=on); and the last two bits represent the status of the Auxiliary (parking) Brake (00=unavailable, 01=off, 10=on) | N/A | N/A | N/A | No Special Values |

## THE BASIC SAFETY MESSAGE UNUSUAL EVENT FLAG VARIABLES

| BsmEventFlag Event Flag | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EventFlag<br>Indicates the type (or types) of unique events that have occured per the J2735 standard: leftmost bit indicates active hazard lights; second bit indicates that the vehicle anticipates passing the stop line at an intersection without coming to a full stop before reaching it; third bit indicates the anti-locking braking system has been activated for more than 100ms; fourth bit indicates the traction control system has been activated for more than 100ms; fifth bit indicates the stability control system has been activated for more than 100ms; sixth bit indicates the presence of hazardous materials; seventh bit indicates that the vehicle is an authorized public safety vehicle engaged in a service call and moving; eighth bit indicates the vehicle has decelerated or is decelerating at a rate of greater than 0.4g; ninth bit indicates the external lighting (headlights, park lights) of the vehicle has changed recently; tenth bit indicates the status of the front of rear wipers of the vehicle has changed recently; eleventh bit indicates the presence of a flat tire; twelfth bit indicates the vehicle has declared itself disabled; thirteenth bit indicates airbag deployment | N/A | N/A | N/A | No Special Values |

## THE BASIC SAFETY MESSAGE HIGHLY-DYNAMIC VARIABLES VARIABLES

| BsmP1 Time of Basic Safety Message Generation | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: GenTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| BsmP1 Transmitting Device ID (Randomized) | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: TxRandom<br>Randomly assigned ID to mask the device ID of the transmitting device for security purposes | N/A | N/A | N/A | No Special Values |

| BsmP1 Message Count | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: MsgCount<br>Message ID that gets incremented by one with each BSM<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| BsmP1 Deciseconds Since Ignition | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: DSecond<br>Time in deciseconds since ignition started<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| BsmP1 Latitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Latitude<br>Current latitude of the vehicle<br>Minimum: -90<br>Maximum: 90 | N/A | N/A | N/A | No Special Values |

| BsmP1 Longitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Longitude<br>Current longitude of the vehicle<br>Minimum: -180<br>Maximum: 180 | N/A | N/A | N/A | No Special Values |

| BsmP1 Elevation | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Elevation<br>Current elevation (in meters) of vehicle according to GPS | N/A | N/A | N/A | No Special Values |

| BsmP1 Speed | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Speed<br>Vehicle speed<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| BsmP1 Heading | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Heading<br>Vehicle heading/direction<br>Minimum: 0<br>Maximum: 360 | N/A | N/A | N/A | No Special Values |

| BsmP1 Longitudinal Acceleration | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Ax<br>Longitudinal acceleration | N/A | N/A | N/A | No Special Values |

| BsmP1 Lateral Acceleration | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Ay<br>Lateral acceleration | N/A | N/A | N/A | No Special Values |

| BsmP1 Vertical Acceleration | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Az<br>"Vertical" acceleration | N/A | N/A | N/A | No Special Values |

| BsmP1 Yaw Rate | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Yawrate<br>Vehicle yaw rate | N/A | N/A | N/A | No Special Values |

## THE BASIC SAFETY MESSAGE HIGHLY-DYNAMIC VARIABLES VARIABLES

| BsmP1 Path Count | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: PathCount<br>Number, between 1 and 23, representing a group of points that communicate a vehicle's position and motion. Each group of points is of non-uniform size.<br>Minimum: 0<br>Maximum: 23 | N/A | N/A | N/A | No Special Values |

| BsmP1 Radius Of Curve | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: RadiusOfCurve<br>Estimate of the radius of a curve being negotiated (in centimeters), which is derived from a number of systems and sensors. Positive and negative values reflect right and left turns, respectively, and +/- 32767 for straight paths.<br>Minimum: -32767<br>Maximum: 32767 | N/A | N/A | N/A | No Special Values |

| BsmP1 Confidence | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Confidence<br>Signals the accuracy and non-steady state and steady state of curvature estimate. In steady state (straight roadways or curves with constant radius of curvature), a high confidence value is reported.<br>Minimum: 0<br>Maximum: 100 | N/A | N/A | N/A | No Special Values |

## THE EXTERIOR LIGHTS EVENTS VARIABLES

| ExteriorLightsEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| ExteriorLightsEvents Light Status | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Describes the states of the nine exterior lights via an 8-bit string: each bit from left to right is 1 or 0 for on and off respectively, corresponding to, in order, parking lights, fog lights, daytime running lights, automatic lights, right turn signal, left turn signal, high beam headlights, and low beam headlights; bits 5 and 6 (right and left turn signal respectively) both being on signifies hazard lights | N/A | N/A | N/A | No Special Values |

## THE NODE DISTANCE VERSION 2 VARIABLES

| NodeDistanceV2 Latitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Latitude<br>Current latitude of the vehicle<br>Minimum: -90<br>Maximum: 90 | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 Longitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Longitude<br>Current longitude of the vehicle<br>Minimum: -180<br>Maximum: 180 | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 PrMilePt | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: PrMilePt<br>Location of point on HMPS (in miles along path) | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 Distance to Node | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: DistToNode<br>Current distance to specified node | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 Trip Distance | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: TripDistance<br>Running total distance of current trip (unused; set to zero) | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 Road Name | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: RoadName<br>Name of road | N/A | N/A | N/A | No Special Values |

| NodeDistanceV2 Road Type ID | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: RoadTypeId<br>The type of road, based on HMPD specifications | N/A | N/A | 1 | City/Village Local |
| | N/A | N/A | 2 | City/Village Primary |
| | N/A | N/A | 3 | County Local |
| | N/A | N/A | 4 | County Primary |
| | N/A | N/A | 5 | Trunkline - collector/ distributor |
| | N/A | N/A | 6 | Trunkline - directional turnaround |
| | N/A | N/A | 7 | Trunkline - mainline |
| | N/A | N/A | 8 | Trunkline - maintenance garage |
| | N/A | N/A | 9 | Trunkline - other |
| | N/A | N/A | 10 | Trunkline - ramp |
| | N/A | N/A | 11 | Trunkline - rest area |
| | N/A | N/A | 12 | Trunkline - service drive |
| | N/A | N/A | 13 | Trunkline - weigh station |
| | N/A | N/A | 14 | Uncertified |
| | N/A | N/A | 15 | Uncertified - Functional Class Road |

| NodeDistanceV2 Road Class ID | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: RoadClassId<br>The class of road, based on HMPD specifications | N/A | N/A | 1 | Rural Local |
| | N/A | N/A | 2 | Rural Major Collector |
| | N/A | N/A | 3 | Rural Minor Arterial |
| | N/A | N/A | 4 | Rural Minor Collector |
| | N/A | N/A | 5 | Rural Principal Arterial |
| | N/A | N/A | 6 | Rural Principal Arterial - Interstate |
| | N/A | N/A | 7 | Rural Principal Arterial - Other Freeway |
| | N/A | N/A | 8 | Uncertified |
| | N/A | N/A | 9 | Urban Collector |
| | N/A | N/A | 10 | Urban Local |
| | N/A | N/A | 11 | Urban Minor Arterial |
| | N/A | N/A | 12 | Urban Principal Arterial |
| | N/A | N/A | 13 | Urban Principal Arterial - Interstate |
| | N/A | N/A | 14 | Urban Principal Arterial - Other Freeway |

| NodeDistanceV2 GPS heading | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: GpsHeading<br>Heading with respect to true north | N/A | N/A | N/A | No Special Values |

## THE NODE DISTANCE VERSION 2 VARIABLES

| NodeDistanceV2 Direction | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: DirNum | N/A | N/A | 1 | N |
| A simplified direction based on | N/A | N/A | 2 | NW |
| GPS heading | N/A | N/A | 3 | W |
| | N/A | N/A | 4 | SW |
| | N/A | N/A | 5 | S |
| | N/A | N/A | 6 | SE |
| | N/A | N/A | 7 | E |
| | N/A | N/A | 8 | NE |

| NodeDistanceV2 Road Type | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Roadtype | N/A | N/A | 1 | limited access highway |
| A simplified road type based on | N/A | N/A | 3 | major surface |
| Road Type ID and Road Class ID | N/A | N/A | 4 | minor surface |
| | N/A | N/A | 5 | local |
| | N/A | N/A | 6 | ramp |

## THE POSITIONAL ACCURACY RELATIVE TO SEMI-MAJOR AXIS VARIABLES

| PosAccurByte1Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| PosAccurByte1Events Axial Quality Measure | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Quality measure, reflecting the positional accuracy with respect to the semi-major axis | N/A<br>N/A | N/A<br>N/A | 254<br>255 | 12.7 meters or more<br>unavailable accuracy |

## THE POSITIONAL ACCURACY RELATIVE TO SEMI-MINOR AXIS VARIABLES

| PosAccurByte2Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| PosAccurByte2Events Axial Quality Measure | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Quality measure, reflecting the positional accuracy with respect to the semi-minor axis | N/A<br>N/A | N/A<br>N/A | 254<br>255 | 12.7 meters or more<br>unavailable accuracy |

## THE POSITIONAL ACCURACY SEMI-MAJOR AXIS ORIENTATION MOST SIGNIFICANT BYTE VARIABLES

| PosAccurByte3Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| PosAccurByte3Events Semi-Major Axis Orientation | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Orientation measure of semi-major axis relative to true north (use in conjunction with PosAccurByte4Events.Value – AxisOrientation = ((...Byte3Value*256) + ...Byte4Value)*0.0054932479; only unavailable accuracy if both values equal to 255) | N/A | N/A | 255 | unavailable accuracy |

## THE POSITIONAL ACCURACY SEMI-MAJOR AXIS ORIENTATION LEAST SIGNIFICANT BYTE VARIABLES

| PosAccurByte4Events End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| PosAccurByte4Events Semi-Major Axis Orientation | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Orientation measure of semi-major axis relative to true north (use in conjunction with PosAccurByte3Events.Value – AxisOrientation = ((...Byte3Value*256) + ...Byte4Value)*0.0054932479; only unavailable accuracy if both values equal to 255) | N/A | N/A | 255 | unavailable accuracy |

## THE STEERING WHEEL ANGLE EVENTS VARIABLES

| SteerAngleEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| SteerAngleEvents Steering Wheel Angle | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>to be converted to degrees to communicate steer angle | N/A | N/A | 126 | 189 degrees or more |
| | N/A | N/A | 127 | unavailable steering angle |
| | N/A | N/A | 128 | -189 degrees or more |

# THE TRIP SUMMARY VARIABLES

| Summary2 End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| Summary2 Basic Safety Messages Count | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: BsmCount<br>Number of BSMs transmitted<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| Summary2 Duration | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Duration<br>Total time duration, in seconds, of a trip<br>Minimum: 0 | N/A | N/A | 999999 | data unavailable |

| Summary2 Distance | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Distance<br>Total distance traveled, in feet, during a trip<br>Minimum: 0 | N/A | N/A | 999999 | data unavailable |

| Summary2 Maximum Speed | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: MaxSpeed<br>Maximum speed recorded during trip<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| Summary2 First Latitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: FirstLat<br>Latitude of the record(er) at start of trip<br>Minimum: -90<br>Maximum: 90 | N/A | N/A | N/A | No Special Values |

| Summary2 First Longitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: FirstLong<br>Longitude of the record(er) at start of trip<br>Minimum: -180<br>Maximum: 180 | N/A | N/A | N/A | No Special Values |

| Summary2 First Speed | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: FirstSpeed<br>Speed at start of trip<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| Summary2 Last Latitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: LastLat<br>Latitude of the record(er) at end of trip<br>Minimum: -90<br>Maximum: 90 | N/A | N/A | N/A | No Special Values |

| Summary2 Last Longitude | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: LastLong<br>Longitude of the record(er) at end of trip<br>Minimum: -180<br>Maximum: 180 | N/A | N/A | N/A | No Special Values |

| Summary2 Last Speed | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: LastSpeed<br>Speed at end of trip<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| Summary2 Trip Start | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: TripStart<br>Number of days since December 30 1899 | N/A | N/A | N/A | No Special Values |

## THE TRIP SUMMARY VARIABLES

| Summary2 Minimum Generated Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: MinGenTime<br>Timestamp of first BSM of trip | N/A | N/A | 0 | not applicable |

| Summary2 Maximum Generated Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: MaxGenTime<br>Timestamp of last BSM of trip | N/A | N/A | 0 | not applicable |

| Summary2 Basic Safety Message Count (All) | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: BSMCountAll<br>Number of BSMs issued during trip<br>Minimum: 0 | N/A | N/A | N/A | No Special Values |

| Summary2 Duplicate Trip | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: DuplicateTrip<br>TRUE iff the trip in question is redundant | N/A | N/A | N/A | No Special Values |

## THE THROTTLE POSITION EVENTS VARIABLES

| ThrottlePositionEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| ThrottlePositionEvents Relative Throttle Position | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the relative position of the throttle over a given trip | N/A | N/A | N/A | No Special Values |

## THE TRANSMISSION STATE EVENTS VARIABLES

| TransStateEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| TransStateEvents Transmission State | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the current state of specific components of the transmission | N/A | N/A | 0 | Transmission is in the neutral position |
| | N/A | N/A | 1 | Transmission is in the park position |
| | N/A | N/A | 2 | Transmission has engaged one of its forward gears |
| | N/A | N/A | 3 | Transmission has engaged one of its reverse gears |
| | N/A | N/A | 4 | Reserved for future use |
| | N/A | N/A | 5 | Reserved for future use |
| | N/A | N/A | 6 | Reserved for future use |
| | N/A | N/A | 7 | Unavailable value or not equipped with a transmission |

## THE VEHICLE LENGTH EVENTS VARIABLES

| VehicleLengthEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| VehicleLengthEvents Vehicle Length | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the length of the vehicle | N/A | N/A | N/A | No Special Values |

## THE VEHICLE WIDTH EVENTS VARIABLES

| VehicleWidthEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| VehicleWidthEvents Vehicle Width | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Details the width of the vehicle | N/A | N/A | N/A | No Special Values |

## THE FRONT WINDSHIELD WIPER STATUS EVENTS VARIABLES

| WiperStatusFrontEvents End Time | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: EndTime<br>A more secure form of Epoch time, which is influenced by 1609.2 of the IEEE 1609 family of standards-related network management and security | N/A | N/A | N/A | No Special Values |

| WiperStatusFront Wiper Status | Count | Percent | Code | Value/Description |
|---|---|---|---|---|
| SAS Name: Value<br>Length of vehicle | N/A | N/A | 0 | Unavailable |
| | N/A | N/A | 1 | Off |
| | N/A | N/A | 2 | Intermittent |
| | N/A | N/A | 3 | Low |
| | N/A | N/A | 4 | High |
| | N/A | N/A | 126 | Washer In Use |
| | N/A | N/A | 127 | Automatic Washer Equipped |