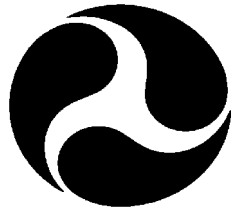




Data Reference Guide
Version 4
Volume I: Vehicle Tests

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U.S. Department of Transportation

<http://www-nrd.nhtsa.dot.gov/nrd10/software>

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PREFACE

This guide documents the format of magnetic media (3.5 inch high density diskettes) to be submitted to the National Highway Traffic Safety Administration (NHTSA) for vehicle crash tests. This guide is designated Volume I. NHTSA Data Reference Guide (Vehicle). Three other volumes exist; they correspond to the other NHTSA databases: II. NHTSA Data Reference Guide (Biomechanics), III. NHTSA Data Reference Guide (Component), and IV. NHTSA Data Reference Guide (Signal Waveform Generator).

While the four databases are similar, they differ significantly as well. Your data submission will be returned as unacceptable if you submit data in the wrong format for a particular data base.

The first step in creating a data submission is to determine which volume of the guide (vehicle crash tests, biomechanics tests, component tests, or signal waveform generator tests) to use. The surest method of determining which volume is appropriate for your use is to check with the Contracting Officer's Technical Representative (COTR) who should be able to identify the appropriate data base format. The following guidelines will help to explain the differences between the four data bases.

Information in the vehicle data base relates to the performance and response of vehicles and other structures in impacts.

The biomechanics data base contains information used (1) to evaluate human impact response, (2) to evaluate prototype dummy designs, or (3) to evaluate standard dummy designs in new impact environments.

A component test identifies a specific vehicle component and/or dummy part and summarizes test conditions. Component tests are conducted on various internal or external components of automobiles to provide force deflection or time series data for use in computer simulation models available to NHTSA.

Information in the signal waveform generator data base relates to the evaluation of data acquisition systems at sites performing vehicle crash and biomechanics tests.

A biomechanics test always has exactly one occupant; a vehicle test may have zero occupants or many occupants but normally utilizes dummy occupants.

Raw data is required unless submission of filtered data is authorized by the Contracting Officer's Technical Representative (COTR).

Several examples may help to illustrate where certain types of tests fit into the data bases:

- ▶ Tests done as part of the new car assessment program are always vehicle tests.
- ▶ Pendulum tests to cadavers are always biomechanics tests.
- ▶ Lateral vehicle-to-vehicle impacts are vehicle tests.
- ▶ Sled tests with new dummy designs are biomechanics tests.
- ▶ Calibration tests are component tests.
- ▶ Tests featuring a car body on a sled designed to evaluate occupant response are biomechanics tests.
- ▶ Tests using dummy components are always component tests.
- ▶ Tests (either static or dynamic) measuring deformation impact of a particular interior or exterior component of an automobile by dummy or dummy part are component tests.
- ▶ Tests evaluating data acquisition systems are signal waveform generator tests.
- ▶ Tests to record a standard waveform using new car assessment conditioning amplifiers are signal waveform generator tests.

Always check with the COTR in determining which format to use. In all cases where the COTR's advice is contrary to this guide, check with Barbara Hennessey at (202)366-4714.

When a diskette has been generated according to the appropriate guide, it should be sent via CERTIFIED MAIL to:

The COTR

-or-

Barbara Hennessey
NHTSA, NRD11, Room 6226
400 Seventh Street, S.W.
Washington, DC 20590

More than one submission may be mailed at one time. The following must be supplied for each mailing:

- ▶ A cover letter containing a description of each test on each diskette or series of diskettes. This description should contain the data base into which the test should be loaded, the contractor's test reference number, the date of the tests, the test vehicles, component part and the test configuration.
- ▶ A label on each diskette listing all tests, along with the contractor's test reference numbers.
- ▶ A sheet containing a dump of the specification data for each test.
- ▶ A copy of the plot of each channel of measurement data identifying the curve number and the location and axis of each instrument. These plots do not have to be report quality since they will only be used to verify the test data for each channel.

As soon as possible after each test, a copy of the final test report (if a report has been generated) should be sent to the above address. The COTR should be consulted if different arrangements for the test film and report are required, as would be the case for a test not conducted under DOT auspices.

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INTRODUCTION

BACKGROUND

In September of 1966, the National Traffic and Motor Vehicle Safety Act (15 U.S.C. 1381) was signed into law in the United States. The Act specifies that the Secretary of Transportation shall establish appropriate Federal Motor Vehicle Safety Standards that would lead to the reduction of the number of deaths and injuries resulting from motor vehicle accidents. In prescribing standards, the Secretary was to consider: (1) relevant motor vehicle safety data, (2) whether the proposed standard is reasonable, practical, and appropriate for the particular type of motor vehicle equipment for which it is prescribed, and (3) the extent to which such standards contribute to carrying out the purposes of the Act.

In order to meet the above requirements, the National Highway Traffic Safety Administration (NHTSA) has been mandated to develop safety standards. For each proposed regulation, an extensive research program is undertaken to ensure that the proposed standard satisfies the requirements of the Act. An analytical tool that has been utilized to support the research program is the NHTSA crash test data base. For each test conducted for the agency, a formatted magnetic data submission on diskette is generated. The diskette contains specifications about the test as well as the measurement data acquired from the test instrumentation. The specification data is loaded into a data base which has routine data base functions. Analysis techniques are developed for evaluation of the measurement data. This data base was initiated in 1978 and currently contains results from over 2,300 crash tests. An important attribute of this data base is that it provides a standardized format that allows for exchange of data among participating researchers.

This reference guide has been written for two reasons. The first is to document the requirements for the generation of a data diskette. The second is to encourage the adoption of this standardized format so that the exchange of data by the safety research community is readily accomplished and ultimately leads to new and better ways for reducing the fatalities and injuries in motor vehicle accidents.

ORGANIZATION

The guide is divided into two portions: the first consists of the definitions of the data gathered during tests (for use as a reference tool by new users), and the second consists of a series of appendices. In addition to definitions, the definition section includes, for each field, the number of allowable characters, the type of field (integer, text, coded text, and real), and the acceptable units for the entry.

Included in the pocket under the front cover of the guide is a diskette containing the PC-based data entry program, ENTREEW, which may be used to generate the data files described in this document.

The data to be collected during the testing are grouped into six general categories: general test information; vehicle information; barrier information; occupant information; restraint information; and instrumentation information. The organization of the first portion of the guide corresponds to this data grouping scheme, with each chapter comprising one category of data elements:

Chapter 1, **GENERAL TEST INFORMATION**, includes the definitions of data elements identifying the test (type, configuration, date, performing contractor) as well as some elements that identify test conditions (closing speed or impact angle).

Chapter 2, **VEHICLE INFORMATION**, contains information about the vehicle being tested (make, model, year, engine type) as well as data gathered during testing (travel angle, vehicle damage index, bumper engagement).

Chapter 3, **BARRIER INFORMATION**, identifies the barrier type and the test characteristics related to type (rigid or deformable, angle).

Chapter 4, **OCCUPANT INFORMATION**, defines the data elements for describing the occupant (age, size, height, weight), giving the occupant's location in relation to the interior components of the vehicle, and recording the effect of the crash on parts of the occupant's body.

Chapter 5, **RESTRAINTS INFORMATION**, lists the restraints used by each of the vehicle occupants and includes information on the type, attachment and deployment status of each restraint.

Chapter 6, **INSTRUMENTATION INFORMATION**, describes the sensor used in each test by type of instrument, location on the component being tested, attachment points, and other information about how the sensor data is transmitted.

Four appendices appear at the end of this guide:

Appendix A, **MAGNETIC MEDIA FORMAT**, gives an explanation for formatting the data and provides a brief description of the data entry program, ENTREEW, which may be used to generate the required data files in either NHTSA's own binary format or in ASCII format.

Appendix B, **CODES**, is a listing of the valid codes for each field.

Appendix C, **FIELD FORMATS**, lists each field, in sequence, the data type, and the maximum field length.

Appendix D, **DATA COORDINATE SYSTEM**, explains the rules for determining sign conventions and lists pertinent SAE recommended practices, Instrumentation for Impact Test -- SAE J211/1 MAR95, and Collision Deformation Classification--SAE J224, which provide helpful information for the preparation of data submissions.

DATA REQUIREMENTS

Data is collected during testing for eventual transmission to diskette. The format is fixed, thus the data must be transcribed with precision so that it can be read by the processing software.

Users are encouraged to utilize the data entry program, ENTREEW, which formats the specification data files automatically and performs validity checks to avoid cross field compatibility and numeric range errors, omissions and miscodings.

ENTREEW output files may be written in one of two ways; either in a special binary format, which NHTSA's in-house processing software loads directly into the NHTSA data bases, or the files may be written in ASCII, for purposes of data exchange outside the agency.

(The format is described in detail in Appendix A: Magnetic Media Format.)

Updates to the ENTREEW program and to this guide may be downloaded from the Internet

<URL <http://www-nrd.nhtsa.dot.gov/nrd10/software>>

Optional Information Groups

Some of the information groups are optional. Groups 1, 2 and 6 are required for all tests. Groups 3, 4 and 5 are optional. Group 3 (Barrier Information) applies only to tests involving barriers, such as guard rails or poles. Group 4 (Occupant Information) applies only to tests in which an occupant is present for the test. Group 5 (Restraint Information) applies only to restraints (belts and air bags) for occupied seating positions.

Optional groups that are not applicable to the test in question should be skipped altogether.

Empty Channels

Instrument channels having no data are not of interest. If channels are bad or empty, an indication of their status should be made in DASTAT (see Appendix B for the allowable codes for DASTAT). Further comments on the status of the data should be made in INSCOM (instrument commentary) -- a code of MN (meaningless) requires an explanation in INSCOM, for example.

CONVENTIONS FOR CODING

The conventions underlying the preparation of this guide concern the distinction between a vehicle and a barrier, the system for numbering test vehicles, and the assumptions structuring the system for coding test conditions. These factors will be described in more detail below.

Movement differentiates a vehicle from a barrier: a vehicle moves; a barrier does not. Entities previously known as "moving barriers" are now considered impactors. An impactor is now treated as a moving "vehicle," but is not a highway vehicle; it is now coded in the vehicle information group. An immobile object struck or otherwise contacted by a vehicle is a barrier.

Test vehicles are numbered 1 or 2. If the test involves a single vehicle, the vehicle will always be coded Vehicle 1. If a test involves two vehicles, Vehicle 1 will always be the striking (bullet) vehicle and Vehicle 2 will always be the struck (target) vehicle. If, in a two-vehicle test, the distinction between the striking and struck vehicles is unclear, then the vehicle numbering is arbitrary.

NOT APPLICABLE Code Option

Some of the coded fields include NOT APPLICABLE and OTHER codes as options. The NOT APPLICABLE code should be used only if the category is not relevant to the data being collected. For example, in the field STRSEP (Steering Column Shear Capsule Separation), the allowable codes are NO (no separation); NA (not applicable); SP (separation) and UN (unknown). The NOT APPLICABLE category would be used only if the vehicle had no steering column shear capsule. NOT APPLICABLE numeric fields will be left blank. If the data file is written in ASCII rather than the NHTSA ENTREE binary format, empty fields are delimited by the pipe (|) character. For text fields, a left-justified NOT APPLICABLE will be entered.

OTHER Code Option

The code option, OTHER, should be used if the data element is applicable but none of the codes is appropriate. For TKSURF, for example, choosing the OTHER code would be appropriate if the test track surface were composed of some material other than asphalt, concrete, dirt, or sand, such as gravel. Any time the option OTHER is chosen, a brief explanation must be included in the general comment field for that group.

EMPTY FIELDS

Some numeric and free text fields may be left blank if no data is available or the field is not applicable to the test. For example, since TTI (the Thoracic Trauma Index) is not calculated for frontal impact tests, the TTI field in section 4, Occupant Information, may be left blank.

Coded text fields may not be left blank, since there are codes which indicate when a field is either not applicable or no data is available.

MEASUREMENT UNITS

Use metric units only.

For a list of acceptable units and corresponding codes, see Table 1 - 1.

CERTIFICATION REQUIREMENTS

In order to raise and maintain the level of quality of data diskettes being submitted for inclusion in the NHTSA data bases and to insure more efficient processing, a certification process is being instituted effective with this new data format. Each contractor must complete this certification process before we will accept data in the new format. To complete the certification process, contractors will follow the steps listed below:

▶ **Submit Data in Appropriate Format**

Each contractor will submit data in the new format for certification approval. The diskette will be submitted in the Vehicle Data Base format (or the format for which certification approval is desired). The test written to this diskette may be an old test, a new test submission, or a sample test if an old or new test is not available.

▶ **Repeat Submissions Until Certification is Achieved**

The diskette will be checked for compliance with the magnetic media processing guidelines. If the data submission is found to be acceptable, a certificate will be sent to the contractor denoting compliance with the current version of the NHTSA magnetic media format. If the data submission is not acceptable, the contractor may repeat the submission until an acceptable diskette is produced.

▶ **Earn Certification for Each Format**

A certificate will be required for each format: vehicle crash test, biomechanics test, component test, or signal waveform generation. A contractor submitting diskettes in more than one format will require a certificate for each. The certificate may be revoked whenever it is evident that a contractor is not maintaining the required level of quality in data submission.

▶ **Do Not Submit Diskettes Without Being Certified**

Only after a contractor has completed this certification process will data be accepted for inclusion in the OCR data bases.

▶ **Submit Certificate with Future Bids**

For Research and Development contracts, this certificate will be kept on file in the NHTSA Office of Contracts and Procurement and must be submitted as evidence of compliance when bidding for future contracts. If a proposal on a Research and Development-sponsored RFP is received from a bidder without a valid certificate, the proposal will be rejected as non-responsive to the solicitation. Each Research and Development RFP requiring the submission of data should contain a statement to this effect.

▶ **Incur Costs for Unacceptable Data Submissions**

For all NHTSA contracts, including Research and Development contracts, when a data submission is returned to the contractor as unacceptable because of errors, a resubmittal may be validated at a specified cost to the contractor per data resubmission. If required, payment to the Government for this shall be made by offset against the contractor's invoices. Each NHTSA contract which requires the submission of data diskettes will contain a clause to this effect.

RETURN POLICY

If a data diskette cannot be processed or has too many errors flagged by the loading and checkout programs, the submission will be returned to the contractor to be corrected and resubmitted. Two categories of errors lead to the return of a data submission.

MAJOR ERRORS

The first category is major errors. If one major error occurs during the processing of a diskette, the submission will be returned. Examples of major errors are:

- ▶ Inability to read or load the diskette.
- ▶ Missing data without which the data submission cannot be processed, such as DELT, IMPANG, NFP, etc.
- ▶ Omitted data where data fields have been left out. Examples include leaving out an instrument channel, or data shifted as a result of a field delimiter being omitted.

- ▶ Split channels, which occur when one test is artificially split into two on the diskette with part of the measurement data filed under each.
- ▶ The rejection of one test on a diskette containing multiple tests.

MINOR ERRORS

The second class of errors is minor errors. If ten or more minor errors occur on a diskette, it will be returned. Examples of minor errors are:

- ▶ Conversion errors in the measurement data whereby one of the values cannot be read.
- ▶ Incorrect codings, such as entering a nonvalid sensor attachment code in the SENATT field.
- ▶ Missing or incorrect information not critical to the processing of the tests such as pretest or post-test measurements.
- ▶ Anything else not listed here that is flagged by the loading or checkout programs.

1. GENERAL TEST INFORMATION

The data elements defined below comprise the first test group, General Test Information. Appendix B contains a list of valid codes.

TSTNO - Test Number

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

VERSION NUMBER

The number of this version of the NHTSA Data Tape Reference Guide is a preassigned code (V4). This code should be chosen for all vehicle crash tests.

Coded text, fixed length, 2 characters.

TITLE - Contract or Study Title

TITLE is the title of the contract or study.

Free text, variable length, maximum 70 characters.

TSTOBJ - Test Objectives

TSTOBJ is a description of the purpose of the test.

Free text, variable length, maximum 70 characters.

TSTDAT - Test Date (DD/MMM/YYYY)

TSTDAT is the date the test was performed.

Date text, fixed length, 11 characters.

TSTPRF - Test Performer

TSTPRF is the code for the name of the organization performing the test.

Coded text, fixed length, 3 characters.

CONNO - Contract Number

CONNO is the Department of Transportation contract number (for example, DTNHxx-xx-x-xxxxx in the case of a NHTSA contract or some similar number assigned by the sponsoring organization).

Free text, variable length, maximum 17 characters.

TSTREF - Test Reference Number

TSTREF is an alphanumeric code number assigned to the test by the test performer.

Free text, variable length, maximum 10 characters.

TSTTYP - Test Type

TSTTYP indicates the type of test conducted, such as NCA for a new car assessment test.

Coded text, fixed length, 3 characters.

TSTCFN - Test Configuration

TSTCFN describes the test setup. A vehicle-to-vehicle impact would be coded as VTV, for example.

Coded text, fixed length, 3 characters.

TKSURF - Test Track Surface

TKSURF describes the test track surface. If a test is performed over a photo pit, the type of surface surrounding the pit which would primarily affect post impact trajectories is indicated.

Coded text, fixed length, 3 characters.

TKCOND - Test Track Condition

TKCOND describes the test track condition.

Coded text, fixed length, 3 characters.

TEMP - Ambient Temperature (degrees Celsius)

TEMP is the temperature at the test location at the time of the test.

Numeric field, integer.

RECTYP - Type of Recorder

RECTYP is the type of data recorder being used in the test.

Coded text, fixed length, 3 characters..

LINK - Data Link to Recorder

LINK is the type of connection from the transducer to the recorder.

Coded text, fixed length, 3 characters..

CLSSPD - Closing Speed (Kilometers per hour)

CLSSPD is the actual (measured) closing speed reached by vehicle 1 before impact with a barrier. For two-vehicle impacts, it is defined as the velocity of approach of the two centers of gravity before contact.

Numeric field, real.

IMPANG - Impact Angle (degrees)

IMPANG is the impact angle, measured as the magnitude of the angle between the longitudinal axis of vehicle 2 and the longitudinal axis of vehicle 1 or a barrier in a clockwise direction. A head-on impact is defined as 0 degrees and is the reference point for angle measurement. All impact angles are between 0 and 359 degrees, except rollover tests, for which IMPANG is coded 999. Figure 1-1 shows sample IMPANGs.

Numeric field, integer.

OFFSET - Offset Distance (millimeters)

OFFSET is the distance between the centerlines of a vehicle and another vehicle, an impactor, or a narrow, fixed object, such as a pole. Offset is applicable only in the case of frontal or rear end collisions and when the longitudinal axes of the vehicles or barrier are parallel. Offsets to the right of the centerline of vehicle 1 are defined to be positive whereas offsets to the left of the centerline of vehicle 1 are defined to be negative. Figure 1-2 shows samples of possible offsets. OFFSET is equal to 0.0 in the case of front-to-front or front-to-rear collisions in which no offset occurs. In the case of side impacts, OFFSET is NOT APPLICABLE and should be left blank.

Numeric field, integer.

IMPNT - Side Impact Point (millimeters)

IMPNT is the point on the side of vehicle 2 where it is impacted by the longitudinal centerline of vehicle 1. The point of impact is measured from the center of gravity of vehicle 2.

This distance is positive when the point is in front of the center of gravity and negative when it is behind the center of gravity. Figure 1-3 shows an illustrative case, in which vehicle 2 is struck from both sides indicating both positive and negative IMPNTs.

IMPNT applies only to side collisions.

Numeric field, integer.

TOTCRV - Total Number of Curves

TOTCRV is the total number of recorded instrument channels (curves) in the test.

Numeric field, integer.

TSTCOM - Test Commentary

TSTCOM is the field used to describe any peripheral test information for which a coded field does not exist, including anomalies or problems. The reason for coding OTHER or NOT APPLICABLE in any of the coded fields in this group should be recorded in this field as well. If no comments are to be made, code the field NO COMMENTS (left justified).

Free text, variable length, maximum 70 characters.

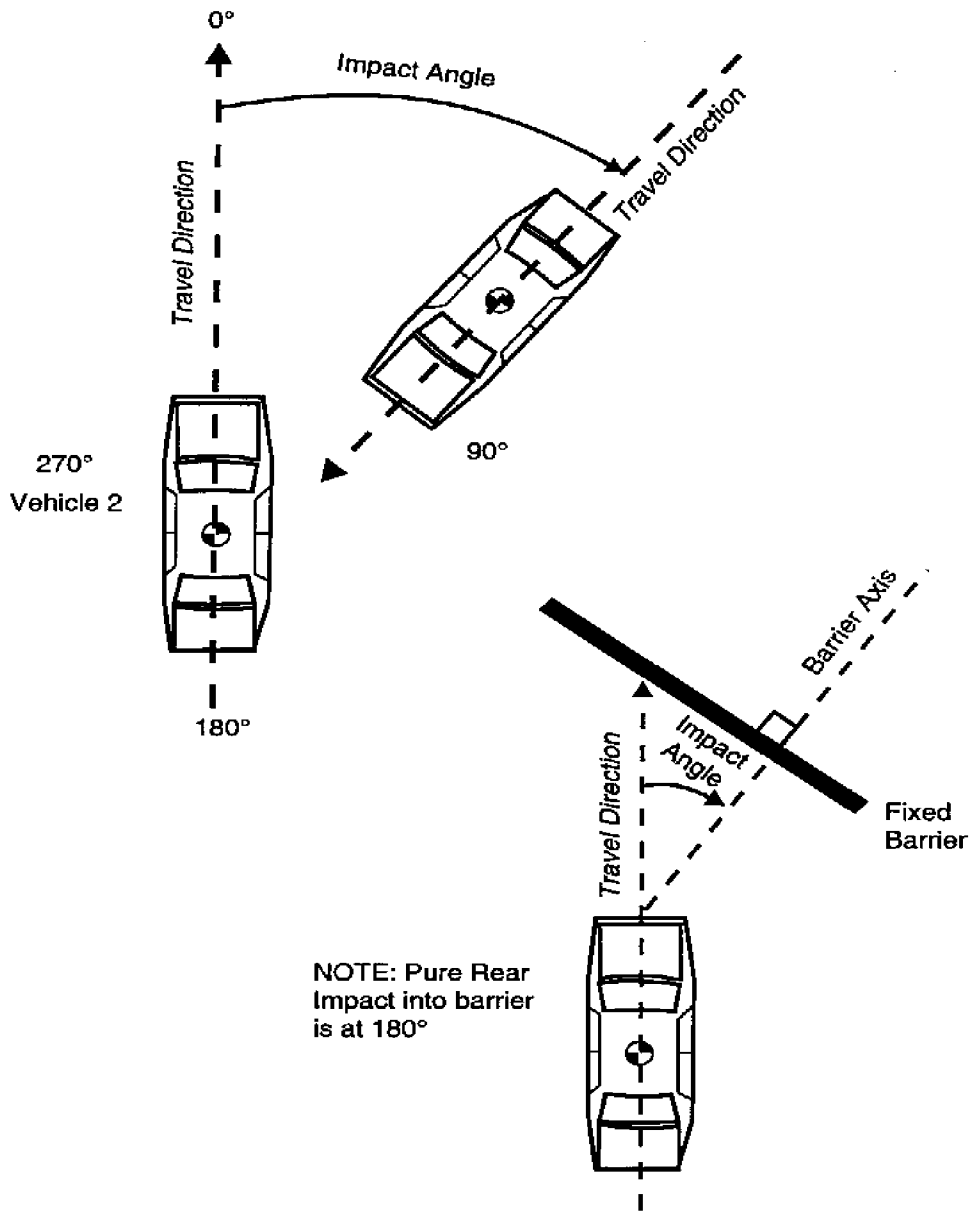
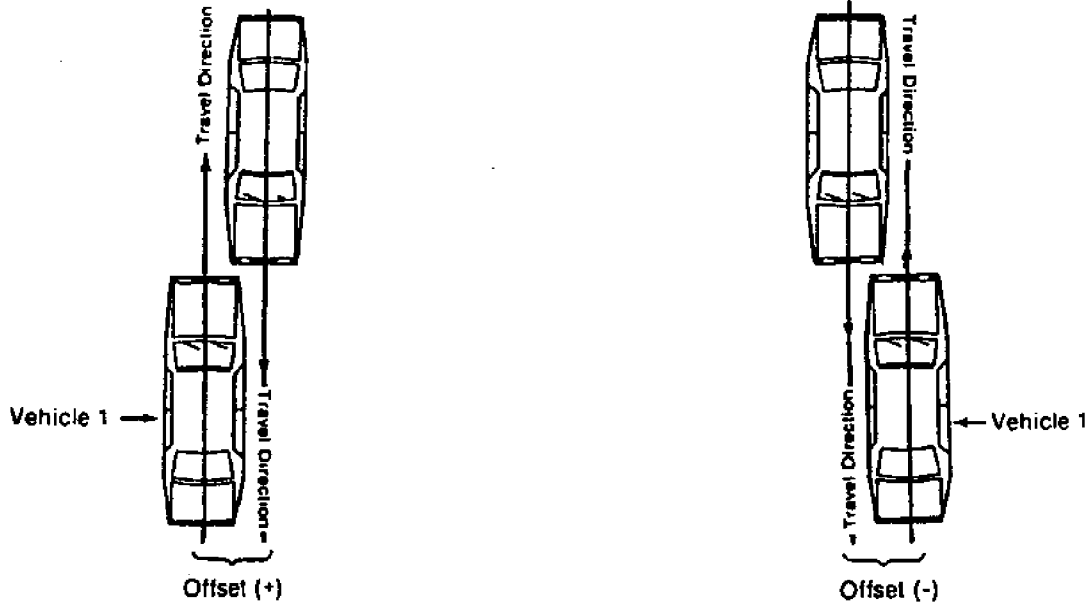


Figure 1-1. Impact Angle (IMPANG)

HEAD-ON COLLISION



REAR-END COLLISION

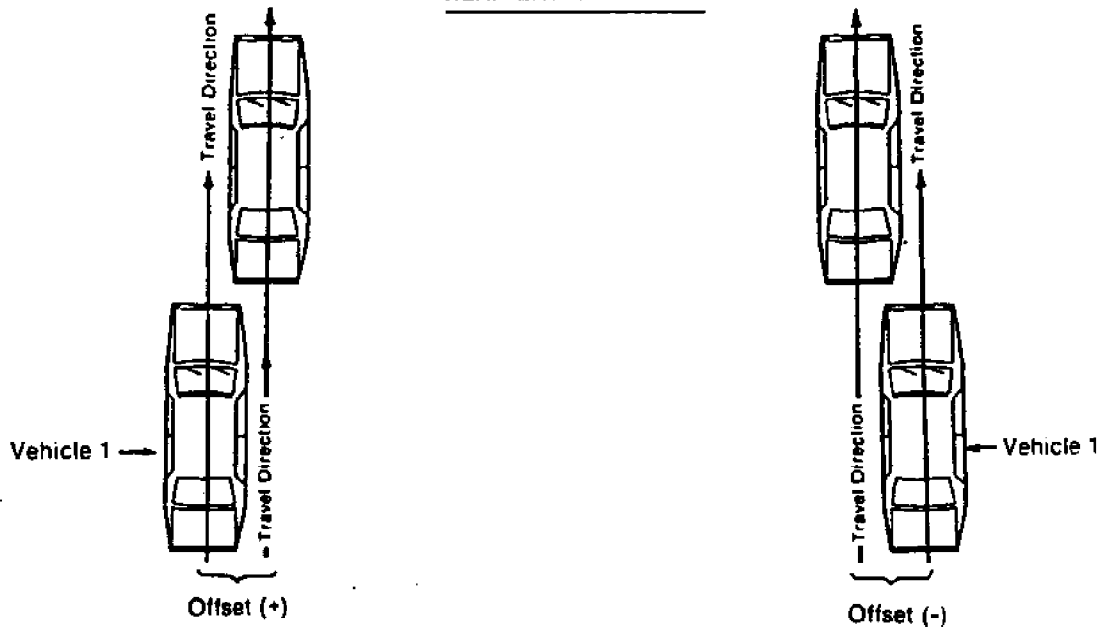


Figure 1-2. Offset Distance (OFFSET)

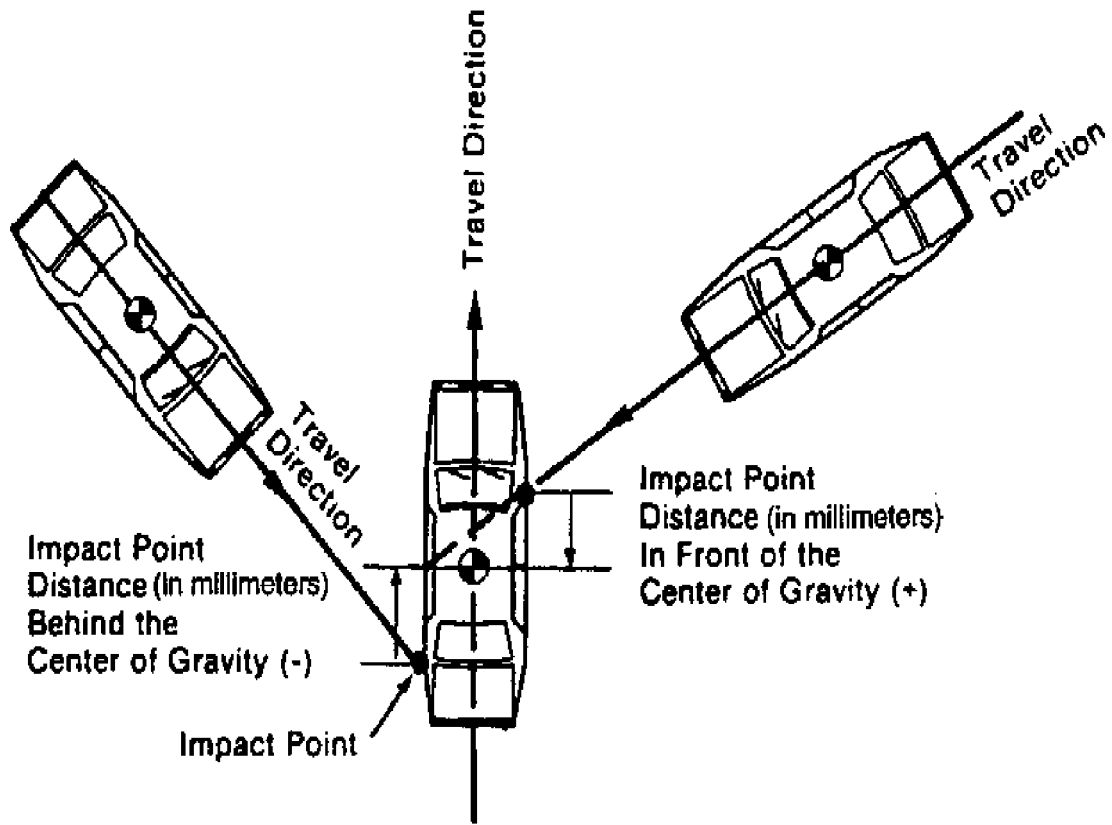


Figure 1-3: Side Impact Points (IMPPNT)

Table 1-1. Table of Units

Measurement Quantity	Unit of Measure	Standard Metric Code*(MET)
Absolute Pressure	Kilopascals	KPA
Acceleration	G's	G'S
Angular Acceleration	Degrees/second**2	DP2
Angular Displacement	Degrees	DEG
Angular Velocity	Degrees/second	DPS
Curvature	Reciprocal millimeters	RMM
Displacement	Millimeters	MM
Force	Newtons	NWT
Gauge Pressure	Kilopascals	KPG
Impulse	Newton-seconds	NSC
Noise	Decibels	DEC
Strain	Micrometers/meter	MPM
Temperature	Degrees Celsius	CEN
Time	Seconds	SEC
Torque	Newton-meters	NWM
Velocity	Kilometers/hour	KPH
Voltage	Volts	VOL

* Codes used must be in uppercase.

2.

VEHICLE INFORMATION

The data elements defined below constitute the second test group, Vehicle Information. Appendix B contains a list of valid codes.

TSTNO - Test Number

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

VEHNO - Test Vehicle Identification Number

VEHNO is the number that identifies the vehicle as 1 or 2. See the Introduction for an explanation of the numbering convention ("Conventions for Coding").

Numeric field, integer.

MAKE - Vehicle Make

MAKE is the manufacturer of the vehicle; for instance, 01 represents a Chevrolet.

Coded text, fixed length, 2 characters.

MODEL - Vehicle Model

MODEL is the model of the vehicle; 06 represents an Impala, for example.

Coded text, fixed length, 2 characters.

YEAR - Vehicle Model Year

YEAR is the model year of the vehicle.

Numeric field, integer.

NHTSANO - NHTSA Number

NHTSANO is the NHTSA test vehicle numbering system, a six-character alpha numeric identifier assigned to NHTSA-owned vehicles for the purpose of tracking them through purchase, testing and disposal. All vehicles delivered for testing under NHTSA contract are accompanied by a preassigned NHTSA number.

Free text, fixed length, 6 characters.

BODY - Body Type

BODY is the body type of the vehicle. A four-door sedan would be coded as 4S.

Coded text, fixed length, 2 characters.

VIN - Manufacturer Vehicle Identification Number

VIN is the identification number of the vehicle that has been assigned by the manufacturer.

Free text, variable length, maximum 20 characters..

ENGINE - Engine Type

ENGINE represents the engine type of the vehicle. 4CEF would represent a four-cylinder inline front engine.

Coded text, fixed length, 4 characters.

ENGDSP - Engine Displacement (liters)

ENGDSP indicates the engine displacement within the vehicle, measured in liters -- for instance, 2.2 LITERS.

Free text, variable length, maximum 12 characters.

TRANSM - Transmission Type

TRANSM is the type of transmission in the vehicle.

Coded text, fixed length, 2 characters.

VEHTWT - Vehicle Test Weight (kilograms)

VEHTWT is the measured test weight of the vehicle or the impactor including all payload.

Numeric field, integer.

WHLBAS - Wheelbase (millimeters)

WHLBAS is the measured or published value of the vehicle or impactor's wheelbase.

Numeric field, integer.

VEHLEN - Vehicle Length (millimeters)

VEHLEN is the measured or published value for the length of the vehicle or impactor.

Numeric field, integer.

VEHWID - Vehicle Width (millimeters)

VEHWID is the measured or published maximum width of the vehicle or impactor.

Numeric field, integer.

VEHCG - Vehicle Center of Gravity Distance Behind Front Axle (millimeters)

VEHCG is the distance from the front axle to the center of gravity, measured along the longitudinal axis to the front axle of the vehicle or impactor. The distance is calculated by multiplying the weight on the rear wheels by the wheelbase and dividing the product by the total weight.

Numeric field, integer.

STRSEP - Steering Column Shear Capsule Separation

STRSEP indicates the post-test degree or presence of steering column shear capsule separation in the vehicle. A code of SP would indicate that separation has occurred.

Coded text, fixed length, 2 characters.

COLMEC - Steering Column Collapse Mechanism

COLMEC is the steering column collapse mechanism of the vehicle. For example, convoluted tube would be coded as CON.

Coded text, fixed length, 3 characters.

MODIND - Vehicle Modification Indicator

MODIND is the vehicle modification indicator of the vehicle; for instance, P would indicate an unmodified production vehicle.

Coded field, fixed length, 1 character.

MODDSC - Description of Vehicle Modification

MODDSC is the description of modifications to the vehicle. Structural, interior, or restraint system modifications are described in this field. If the vehicle has not been modified in any way, enter UNMODIFIED.

Free text, variable length, maximum 70 characters.

BX1 - BX21 - Pretest Vehicle Measurement Data (millimeters)

The fields BX1 through BX21 represent a range of vehicle measurements required for determining the extent of damage to the vehicle. The measurements taken before testing are the length of the vehicle and distances between vehicle components:

- BX1 - Total Length of Vehicle at Centerline
- BX2 - Rear Surface of Vehicle to Front of Engine
- BX3 - Rear Surface of Vehicle to Firewall
- BX4 - Rear Surface of Vehicle to Upper Leading Edge of Right Door
- BX5 - Rear Surface of Vehicle to Upper Leading Edge of Left Door
- BX6 - Rear Surface of Vehicle to Lower Leading Edge of Right Door
- BX7 - Rear Surface of Vehicle to Lower Leading Edge of Left Door
- BX8 - Rear Surface of Vehicle to Upper Trailing Edge of Right Door
- BX9 - Rear Surface of Vehicle to Upper Trailing Edge of Left Door
- BX10 - Rear Surface of Vehicle to Lower Trailing Edge of Right Door
- BX11 - Rear Surface of Vehicle to Lower Trailing Edge of Left Door
- BX12 - Rear Surface of Vehicle to Bottom of A Post of Right Side
- BX13 - Rear Surface of Vehicle to Bottom of A Post of Left Side
- BX14 - Rear Surface of Vehicle to Firewall, Right Side
- BX15 - Rear Surface of Vehicle to Firewall, Left Side
- BX16 - Rear Surface of Vehicle to Steering Column
- BX17 - Center of Steering Column to A Post
- BX18 - Center of Steering Column to Headliner
- BX19 - Rear Surface of Vehicle to Right Side of Front Bumper
- BX20 - Rear Surface of Vehicle to Left Side of Front Bumper
- BX21 - Length of Engine Block

Figure 2-1 illustrates these measurements.

Numeric fields, real.

VEHSPD - Vehicle Speed (kilometers per hour)

VEHSPD is the resultant speed of the vehicle immediately before impact.

Numeric field, real.

CRBANG - Crabbed Angle (degrees)

CRBANG is the magnitude of the crabbed angle measured clockwise from the longitudinal axis to the velocity vector of the vehicle. The angle is between 0 degrees and 359 degrees.

The crabbed angle will normally be 0 (forward motion) unless a special test method is employed to introduce an initial yaw. Figure 2-2 shows an example of CRBANG in which the direction of travel of the vehicle does not correspond to the longitudinal axis.

Numeric field, integer.

PDOF - Principal Direction of Force (degrees)

PDOF is the angle (measured clockwise positive) between the vehicle's longitudinal axis and the impulse vector. The angle is between 0 degrees and 359 degrees.

The principal force is the resultant of forces acting on the vehicle at the point of application. Figure 2-3 shows an example of the impulse vector resulting from an impact to a forward-moving vehicle from the left side.

Numeric field, integer.

BMPENG - Bumper Engagement

BMPENG describes the bumper engagement of vehicle 1 and vehicle 2. BMPENG applies only to collisions in which two vehicles moving along the same longitudinal axis collide. A code of DE would indicate direct engagement of the bumpers.

Coded text, fixed length, 2 characters.

SILENG - Sill Engagement

SILENG is the engagement of the side sill (rocker panel area) of vehicle 2 by the bumper of vehicle 1. SILENG applies only to side impacts.

Coded text, fixed length, 2 characters.

APLENG - A-Pillar Engagement

APLENG describes the engagement of the A-pillar of a vehicle that has been impacted from the side. APLENG applies only to side impacts.

Coded text, fixed length, 2 characters.

DPD1-DPD6 - Damage Profile Distances (millimeters)

Figures 2-4 and 2-5 illustrate the crush profile of the damaged vehicle. The dimensions of the crush are determined by finding the values of L, D, and the DPD's. L is the length of the damaged area; D is the distance from the midpoint of L to the vehicle center of gravity, measured laterally from the X axis for frontal damage and longitudinally from the Y axis for side damage; and DPD (damage profile distance) specifies the depth of the crush. (L and D are represented elsewhere in the coding as LENCNT and DAMDST.)

The DPDs are a series of points that define the dimensions of the crush. Equally spaced, the DPDs represent damage profile distance points from which the depth of crush is measured. The depths are measured from the outline that the vehicle would follow were it not damaged to the final crushed position.

Figure 2-4 portrays the two dimensional coordinate system employed in estimating the crush dimensions. As an illustrative example, in Figure 2-4, a vehicle has sustained frontal and right side damage.

To determine D for the right side damage, L, the length of the damage, is measured and divided in half, to locate the midpoint of the damage; the distance from the midpoint of L to the lateral, or Y, axis is then measured to determine the value of D. To determine D for the frontal damage, L is measured and divided in half, the distance from the midpoint of L to the longitudinal, or X, axis is measured, yielding the value of D.

Figure 2-5 shows DPD dimensions for frontal and right side damage. The DPDs are equally spaced along the length of L (L is divided into five equal parts if six points are necessary to estimate the damage; four points are used if the length of the damage is 400 mm or less.)

For side impacts, the six DPD measurements are numbered from the rear to the front. DPD I corresponds to the beginning of the damage. Unless the damage includes the rear corner of the vehicle, DPD I is 0.0. Unless the damage extends to the front corner, DPD 6 is 0.0. For front and rear damage, the DPD measurements are taken from the vehicle's left to the vehicle's right.

If the orientation of L, D, and DPD is difficult to judge, consult the CDC Column 3 code, which applies certain standards in determining the orientation of the damage. The CDC document, also known as 'Collision Deformation Classification,' is contained in Appendix E.

Numeric field, integer.

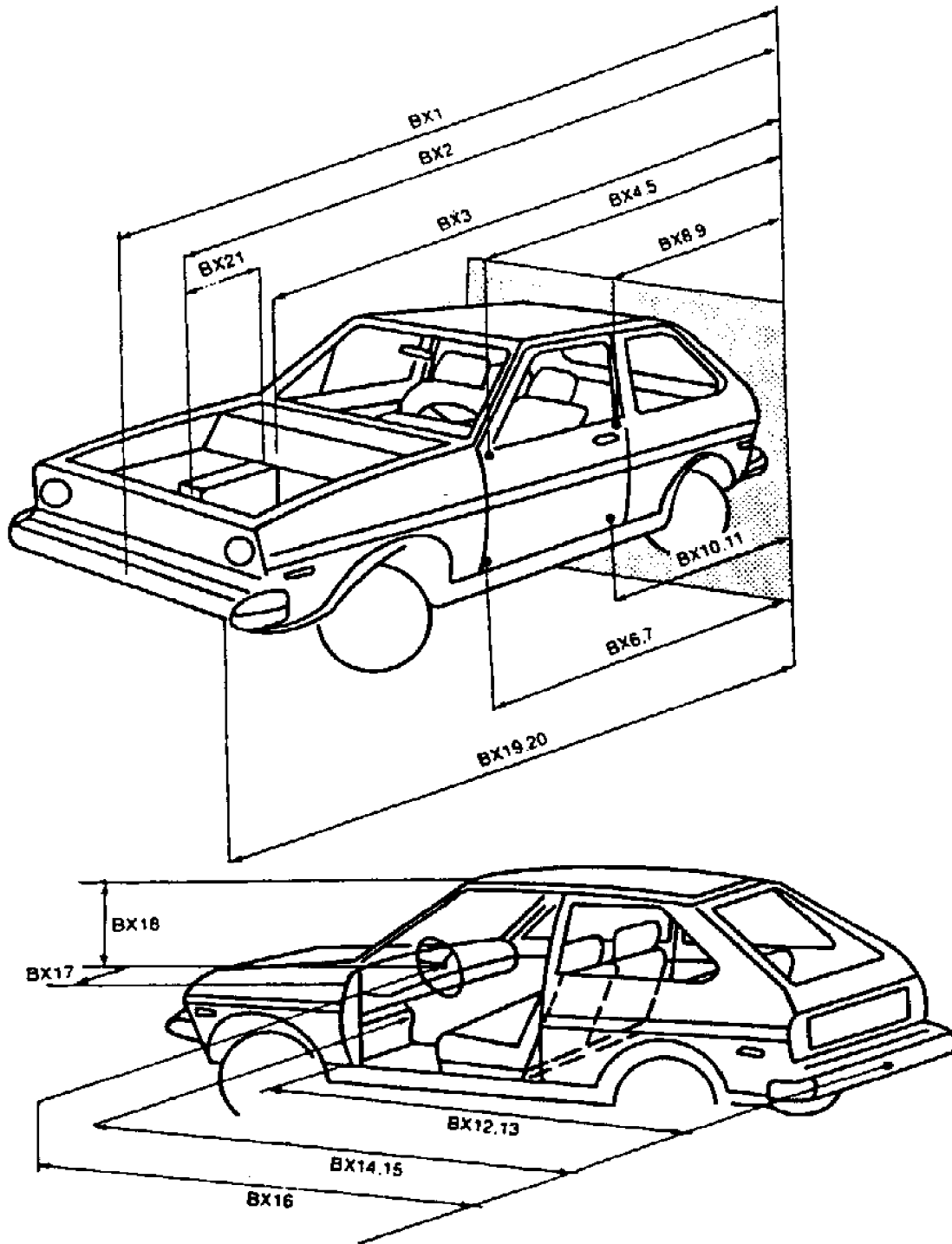


Figure 2-1. Pretest Measurement Data (BX1 - BX21)

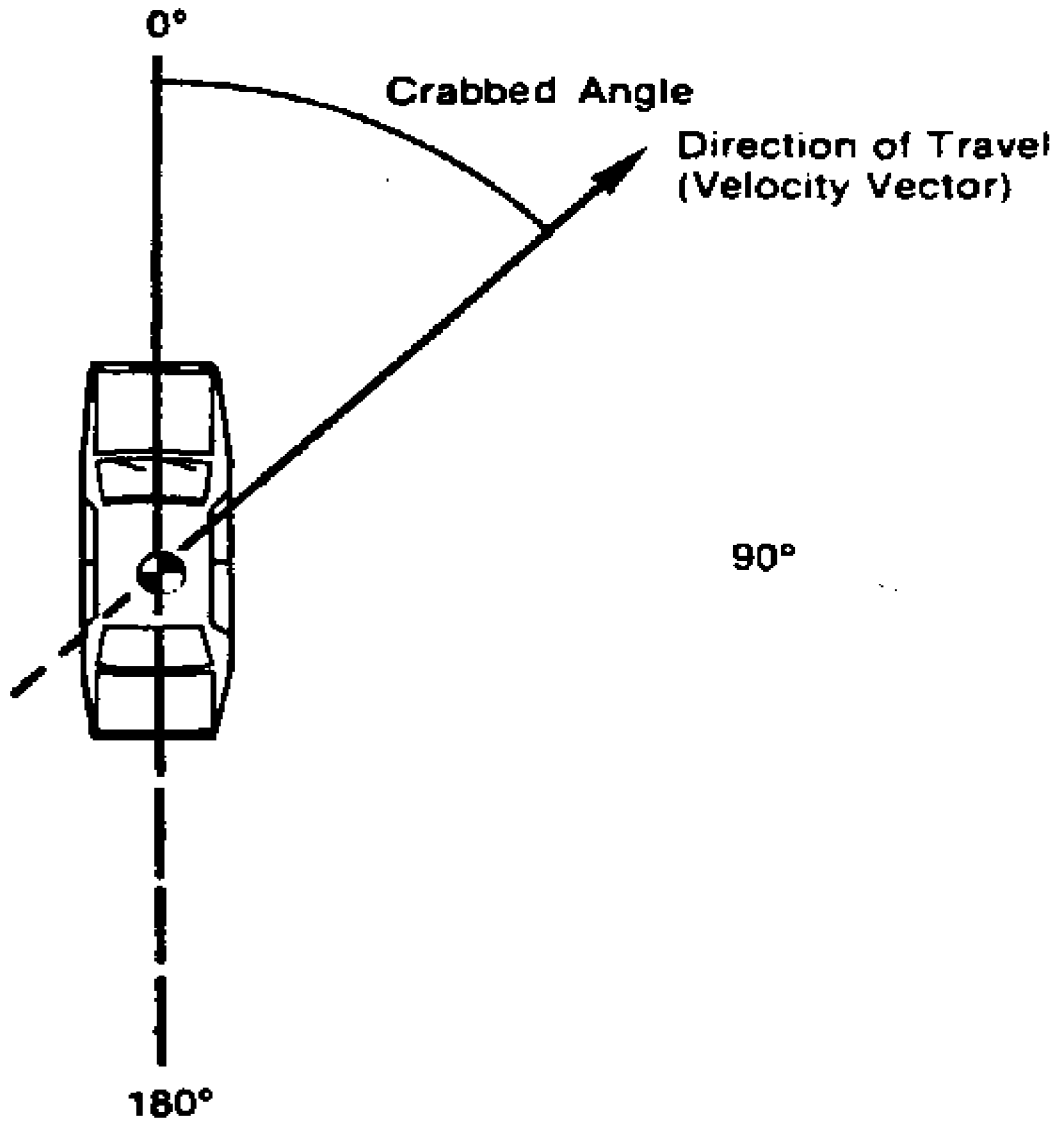


Figure 2-2. Crabbed Angle (CRBANG)

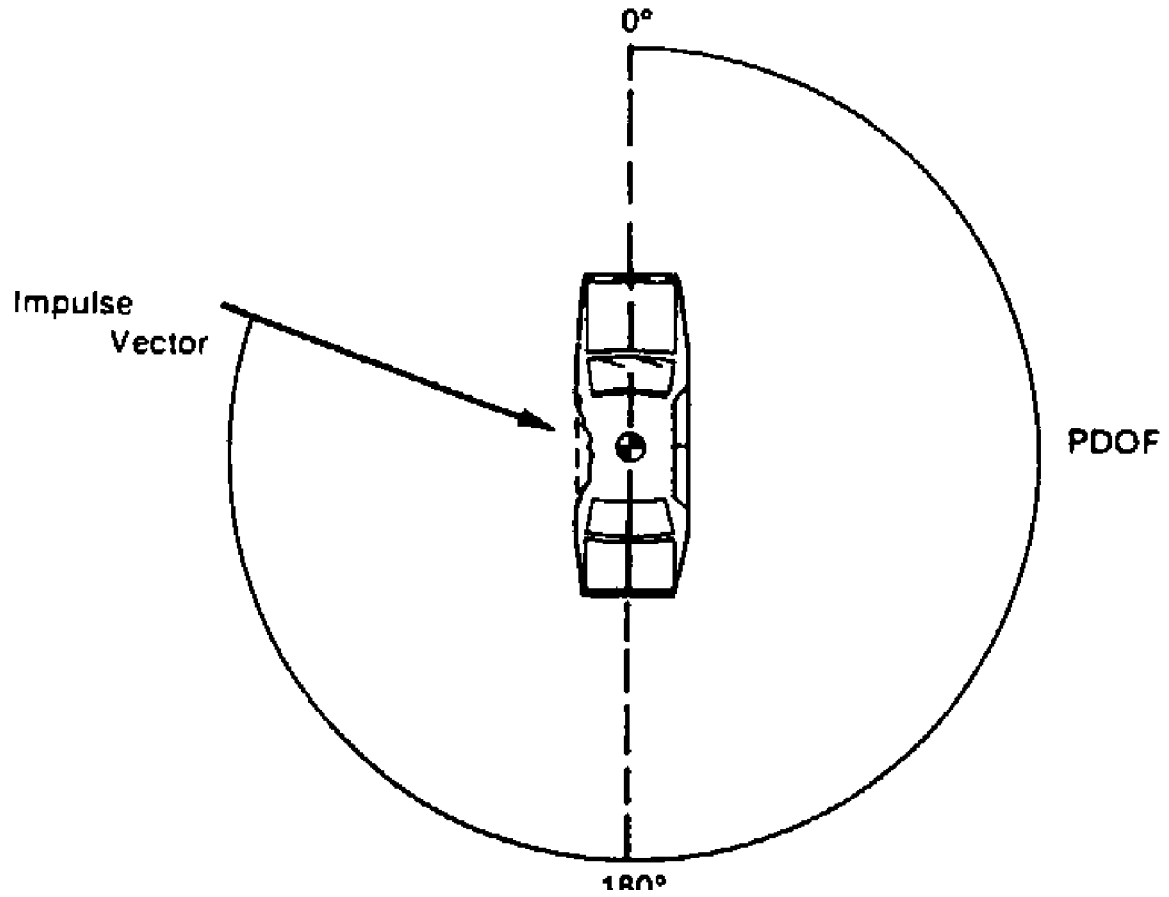


Figure 2-3. Principle Direction of Force (PDOF)

VDI - Vehicle Damage Index (Collision Deformation Classification)

VDI is the vehicle damage index.

SAE Recommended Practice (SAE J224a), 'Collision Deformation Classification' uses this index, composed of seven categories of information, as a basis for uniformly classifying the extent of deformation caused in vehicle accidents.

Free text, fixed length, 7 characters.

LENCNT - Total Length of Indentation (millimeters)

LENCNT is the length of the total contact damage incurred by the vehicle. Figure 2-6 shows an example of how the total length of the indentation is the combination of direct and induced damage.

In that example, vehicle 1 impacts vehicle 2. The portion of vehicle 2 that is in direct contact with vehicle 1 represents the direct damage length; while the induced damage is that damage to vehicle 2 that results from the impact but that is not in direct contact with vehicle 1.

This definition for the total length of indentation is used except in the following examples:

If a vehicle impacts a vehicle or barrier at 0 degrees (full-frontal impact), the total length of indentation cannot be greater than the width of the vehicle.

If a narrow object, such as a pole, is impacted by a vehicle and the vehicle 'wraps around' the object such that the total length of indentation is less than the width of the object, then the corrected total length of indentation will be the width of the object.

Numeric field, integer.

DAMDST - Distance Between Center of Damaged Area and Center of Gravity Axis (millimeters)

DAMDST is the distance between the center of the damaged area and the center of gravity axis. The measurement is made along the longitudinal axis for side damage and along the lateral axis for frontal damage. (See Figure 2-4 for possible instances of DAMDST.)

If the center-most point of damage is to the right or front of the center of gravity, the distance is positive. If the center-most point of damage is to the left or rear of the center of gravity, the distance is negative. In estimating front or rear damage, assume that the center of gravity lies on the centerline.

Numeric field, integer.

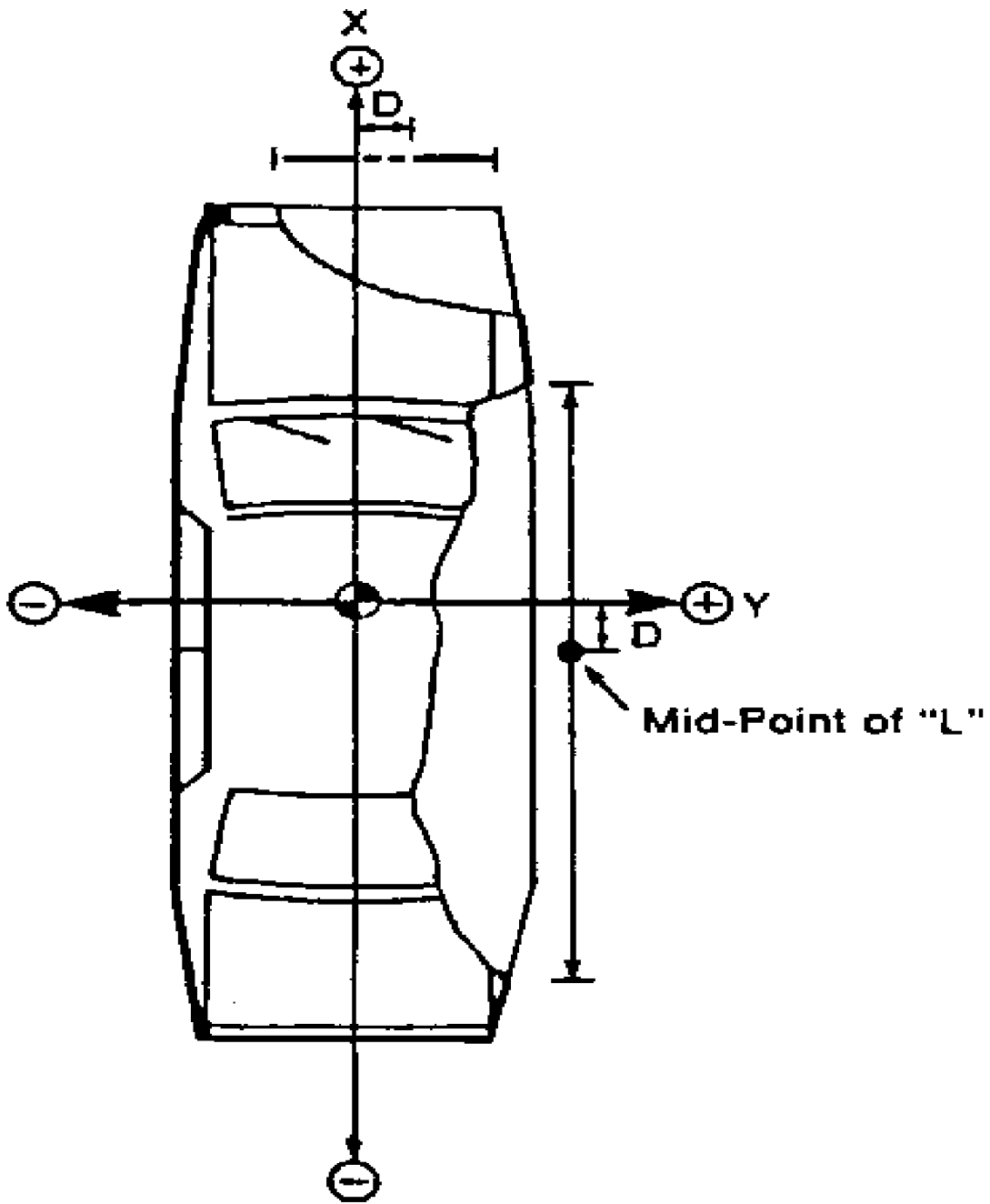


Figure 2-4: D Dimensions for Frontal and Right Side Damage

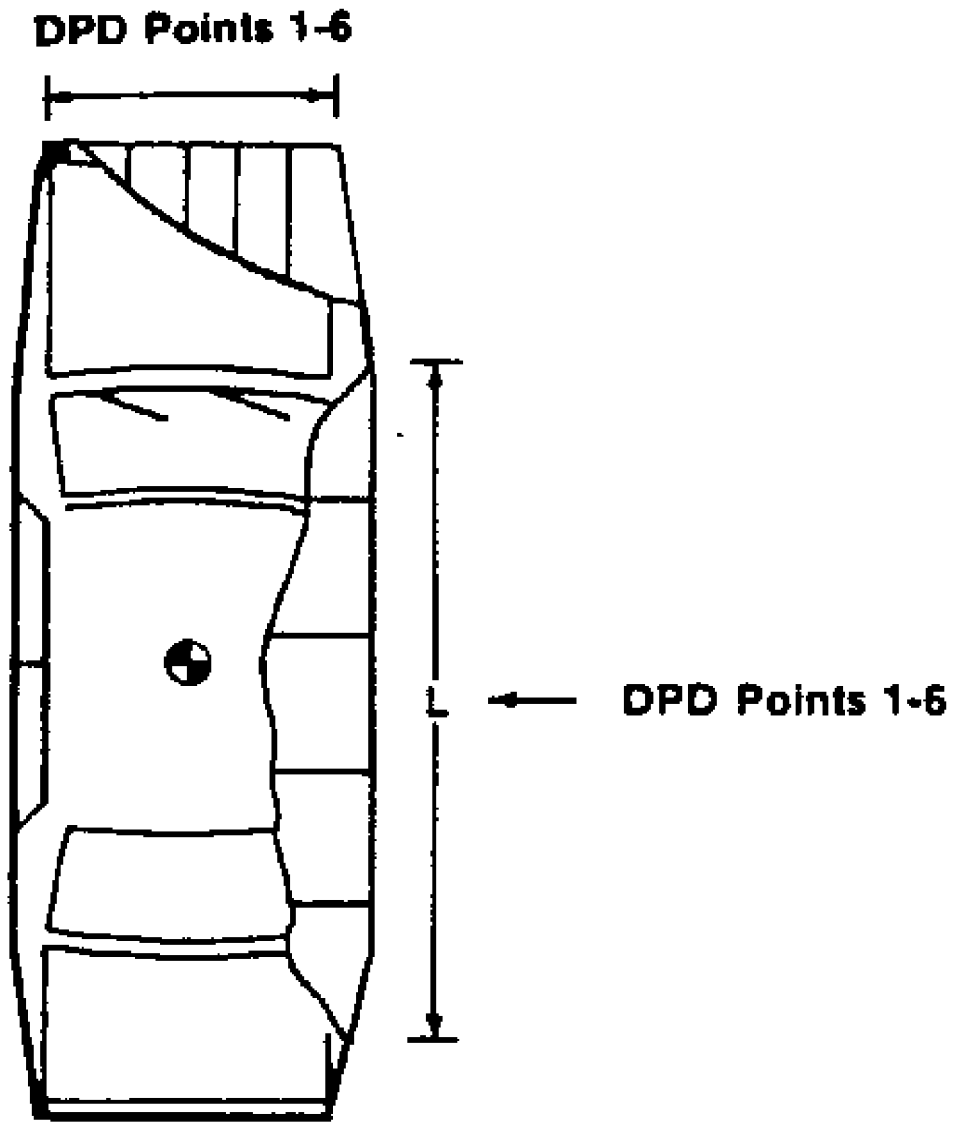


Figure 2-5. DPD Dimensions for Frontal and Right Side Damage

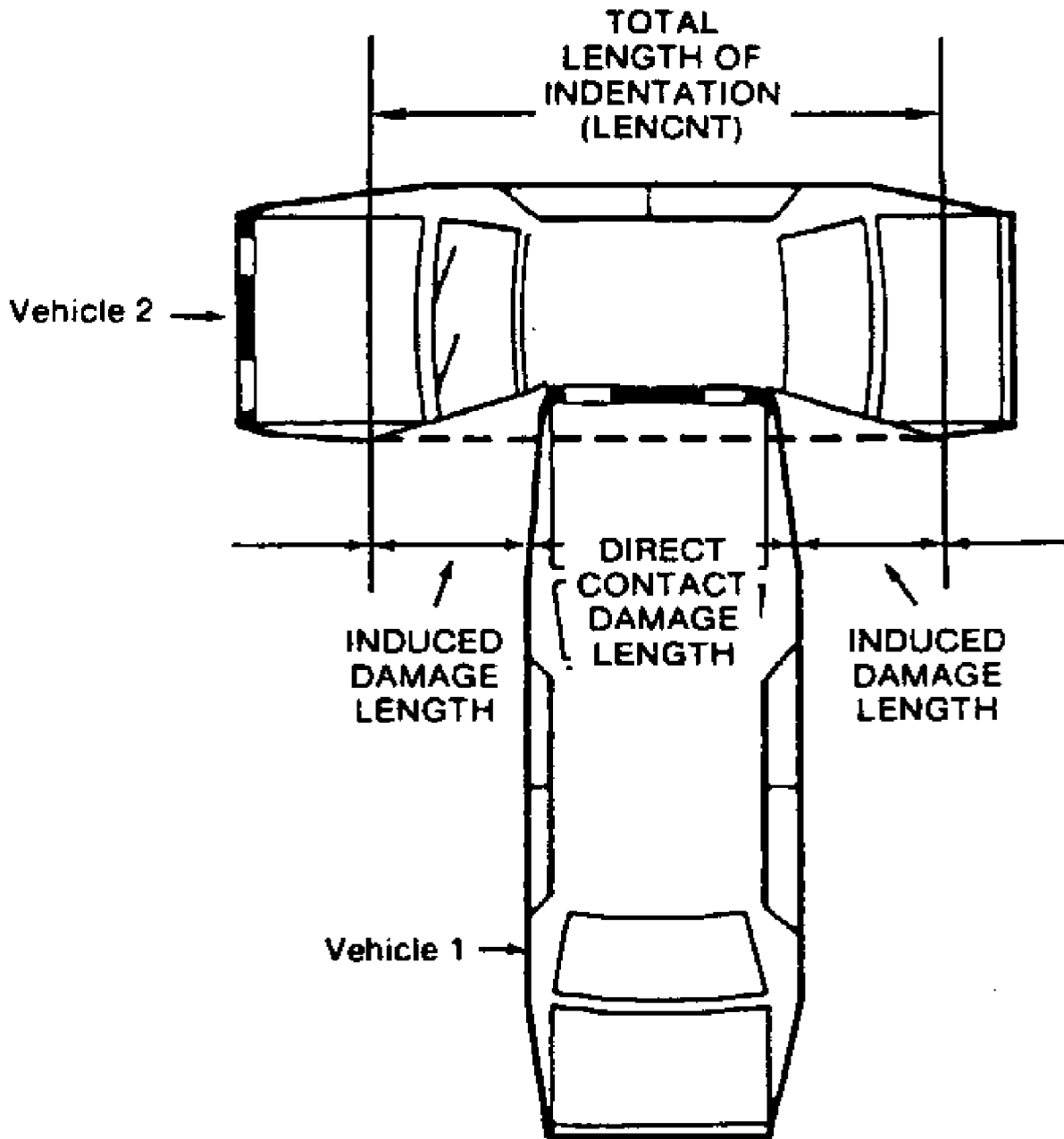


Figure 2-6: Length of Direct Contact Damage (LENCNT)

CRHDST - Maximum Crush Distance (millimeters)

CRHDST indicates the maximum static crush distance (damage penetration), regardless of its location.

Numeric field, integer.

AM - AX21 - Post-test Vehicle Measurement Data (millimeters)

The fields AX I through AX21 represent a range of vehicle measurements required for determining the extent of damage to the vehicle. The measurements taken after testing involve the length of the vehicle and distances between vehicle components:

- AX1 - Total Length of Vehicle at Centerline
- AX2 - Rear Surface of Vehicle to Front of Engine
- AX3 - Rear Surface of Vehicle to Firewall
- AX4 - Rear Surface of Vehicle to Upper Leading Edge of Right Door
- AX5 - Rear Surface of Vehicle to Upper Leading Edge of Left Door
- AX6 - Rear Surface of Vehicle to Lower Leading Edge of Right Door
- AX7 - Rear Surface of Vehicle to Lower Leading Edge of Left Door
- AX8 - Rear Surface of Vehicle to Upper Trailing Edge of Right Door
- AX9 - Rear Surface of Vehicle to Upper Trailing Edge of Left Door
- AX10 - Rear Surface of Vehicle to Lower Trailing Edge of Right Door
- AX11 - Rear Surface of Vehicle to Lower Trailing Edge of Left Door
- AX12 - Rear Surface of Vehicle to Bottom of A Post of Right Side
- AX13 - Rear Surface of Vehicle to Bottom of A Post of Left Side
- AX14 - Rear Surface of Vehicle to Firewall, Right Side
- AX15 - Rear Surface of Vehicle to Firewall, Left Side
- AX16 - Rear Surface of Vehicle to Steering Column
- AX17 - Center of Steering Column to A Post
- AX18 - Center of Steering Column to Headliner
- AX19 - Rear Surface of Vehicle to Right Side of Front Bumper
- AX20 - Rear Surface of Vehicle to Left Side of Front Bumper
- AX21 - Length of Engine Block

Figure 2-7 illustrates these measurements.

Numeric fields, integer.

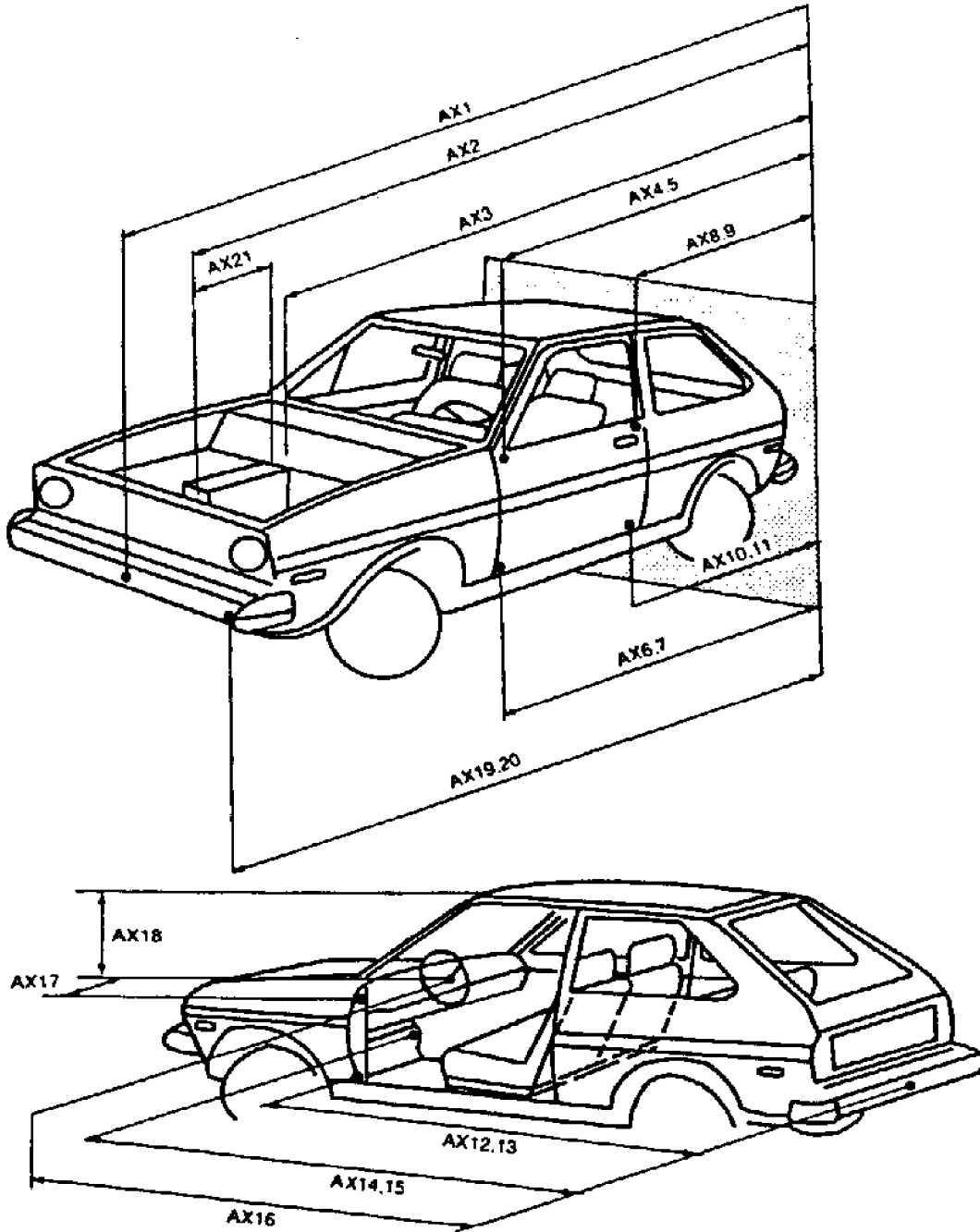


Figure 2-7. Posttest Vehicle Measurement Data (AX1 - AX2)

CARANG - Angle of Moving Test Cart (degrees)

CARANG is the magnitude of the angle between the surface of a rollover test cart and the ground. The standard angle specified in FMVSS 208 is 23 degrees.

Numeric field, integer.

VEHOR - Vehicle Orientation on Moving Cart (degrees)

VEHOR is the magnitude of the angle of the vehicle orientation in relation to the test cart surface. If the vehicle is positioned sideways on the cart, the magnitude of the angle of orientation is defined as 90 degrees, according to FMVSS 208. The angle is between 0 degrees and 90 degrees, as illustrated in Figure 2-8.

Numeric field, integer.

VEHCOM - Vehicle Commentary

VEHCOM is used to describe any special features of the vehicle. The reason for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments are to be made, enter NO COMMENTS in this field.

Free text, variable length, maximum 70 characters.

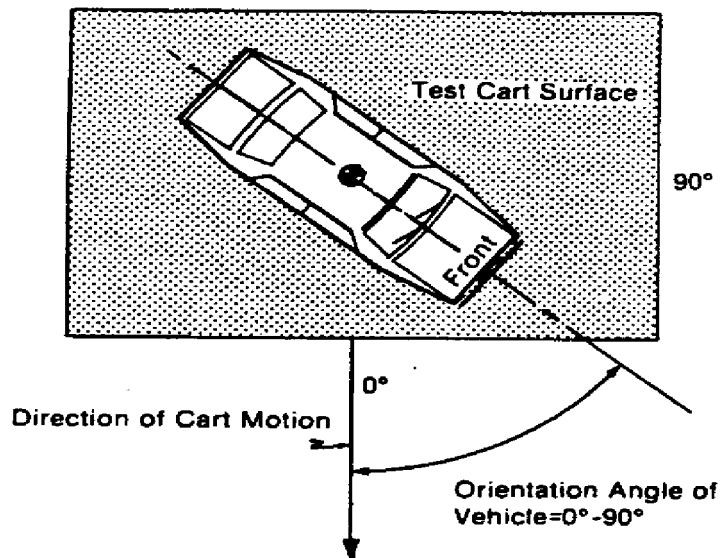


Figure 2-8. Vehicle Orientation on Test Cart (VEHOR)

3.

BARRIER INFORMATION

The data elements defined below constitute the third test group, Barrier Information. These elements apply only to a fixed object that doesn't move, such as a bridge rail; a flat angled barrier; a flat barrier; a guard rail; a guard rail terminal; an impact attenuator; a load cell barrier; a luminare; a median barrier; a pole; a rollover ramp; or a sign support.

If no barrier is present in a test, section 3, Barrier Information, should be omitted from the data submission. The specification file should not include this missing information group by referring to it at all; section 2, Vehicle Information, should be followed directly by section 4, Occupant Information.

Appendix B contains a list of valid codes.

TSTNO - TEST NUMBER

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

BARRIG - Rigid or Deformable Barrier

BARRIG indicates a rigid or deformable barrier.

Coded text, fixed length, 1 character.

BARSHP - Barrier Shape

BARSHP indicates the type of barrier.

Coded text, fixed length, 3 characters.

BARANG - Angle of Fixed Barrier (degrees)

BARANG is the magnitude of the angle between the vehicle path and the perpendicular to a barrier that is fixed and flat. If the vehicle path and the perpendicular are the same, the magnitude of the angle is 0. All other possibilities from 0 to 90 degrees are positive.

Numeric field, integer.

BARDIA - Diameter of Pole Barrier (millimeters)

BARDIA is the diameter of a pole barrier.

Numeric field, integer.

BARCOM - Barrier Commentary

BARCOM is further commentary on a particular barrier test procedure. For instance, if the barrier is deformable, a brief indication of the design and force/deflection characteristics could be indicated here. The reason for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments, are to be made, enter NO COMMENTS in this field.

Free text, variable length, maximum 70 characters.

4.

OCUPANT INFORMATION

The data elements defined below constitute the fourth test group, Occupant Information. This information group may be omitted from the data submission if no occupant was present for the test. If no occupant information is to be included in the specification file, skip this group and go directly to 5, Instrumentation Information.

Appendix B contains a list of valid codes.

TSTNO - TEST NUMBER

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

VEHNO - Test Vehicle Identification Number

VEHNO is the number that identifies the vehicle containing the test occupant as 1 or 2.

Numeric field, integer.

OCCLOC - Occupant Location

OCCLOC indicates the location of the test occupant in the vehicle. A code of 01 would be entered for a left front seat passenger (driver).

Coded text, fixed length, 2 characters.

OCCTYP - Occupant Type

OCCTYP is the type of test occupant, such as the type of dummy or other occupant including a cadaver or human volunteer. A code of SD would be used for an HSRI side impact dummy.

Coded text, fixed length, 2 characters.

OCCAGE - Occupant Age

OCCAGE is the age of the nondummy test occupant that applies to a cadaver or human volunteer.

Numeric field, integer..

OCCSEX - Occupant Sex

OCCSEX is the sex of the test occupant, applicable to all test occupants except child dummies.

Coded text, fixed length, 1 character.

OCCHT - Occupant Height (millimeters)

OCCHT is the height of the nondummy test occupant, measured as the test occupant stands.

Numeric field, integer.

OCCWT - Occupant Weight (kilograms)

OCCWT is the weight of the nondummy test occupant.

Numeric field, integer.

MTHCAL - Method of Calibration

MTHCAL indicates which method was used to calibrate the dummy test occupant. A standard Part 572 calibration would be coded as P5.

Coded text, fixed length, 2 characters.

DUMSIZ - Dummy Size Percentile

DUMSIZ indicates the size of the dummy test occupant, measured either as a standard size percentile or by age classification for child dummies.

Coded text, fixed length, 2 characters.

DUMMAN - Dummy Manufacturer

DUMMAN is the manufacturer and the serial number of the dummy occupant. The information should be entered as MFG: (manufacturer's name), S/N (dummy serial number).

Free text, variable length, maximum 70 characters.

DUMMOD - Dummy Modification

DUMMOD is the description of the modifications to a prototype dummy test occupant. If no modifications were made, enter UNMODIFIED.

Free text, variable length, maximum 70 characters.

DUMDSC - Description of the Dummy

DUMDSC is the description of the calibration and substitution of parts in a dummy test occupant. If no comments are to be made, enter NO COMMENTS in this field.

Free text, variable length, maximum 70 characters.

CLEARANCE DISTANCES - Clearance Distances Between Test Occupant and Vehicle Components (millimeters)

Clearance distances are the distances between the test occupant and the interior components of the vehicle before the test is conducted. Each dimension is generally defined below and illustrated in Figures 4-1 and 4-2 for front and rear seat test occupants.

- ▶ **HH - Head to Windshield Header** - Distance from the point where the nose meets the forehead (between the eyes) to the farthest point forward on the header. (Applicable to front seat occupants only.)
- ▶ **HW - Head to Windshield** - Horizontal distance from the point where the nose meets the forehead (between the eyes) to the point on the windshield immediately in front of the test occupant. (Applicable to front seat occupants only.)
- ▶ **HR - Head to Side Header** - The shortest distance from the point where the nose meets the forehead (between the eyes) to the header (or pillar) immediately to the side of the test occupant. (Applicable to front and rear seat occupants.)
- ▶ **HS - Head to Side Window** - Horizontal distance from the point where the nose meets the forehead (between the eyes) to the point on the window (or pillar) immediately to the side of the test occupant. (Applicable to front and rear seat occupants.)
- ▶ **CD - Chest to Dash** - Horizontal distance from the chest of the test occupant (near the sternum) to the dashpanel. (Applicable to front seat occupants only.)
- ▶ **CS - Chest to Steering Wheel** - Distance from the chest (near the sternum) to the hub of the steering wheel for a test occupant seated in the driver's position. (Applicable to front seat driver side occupants only.)

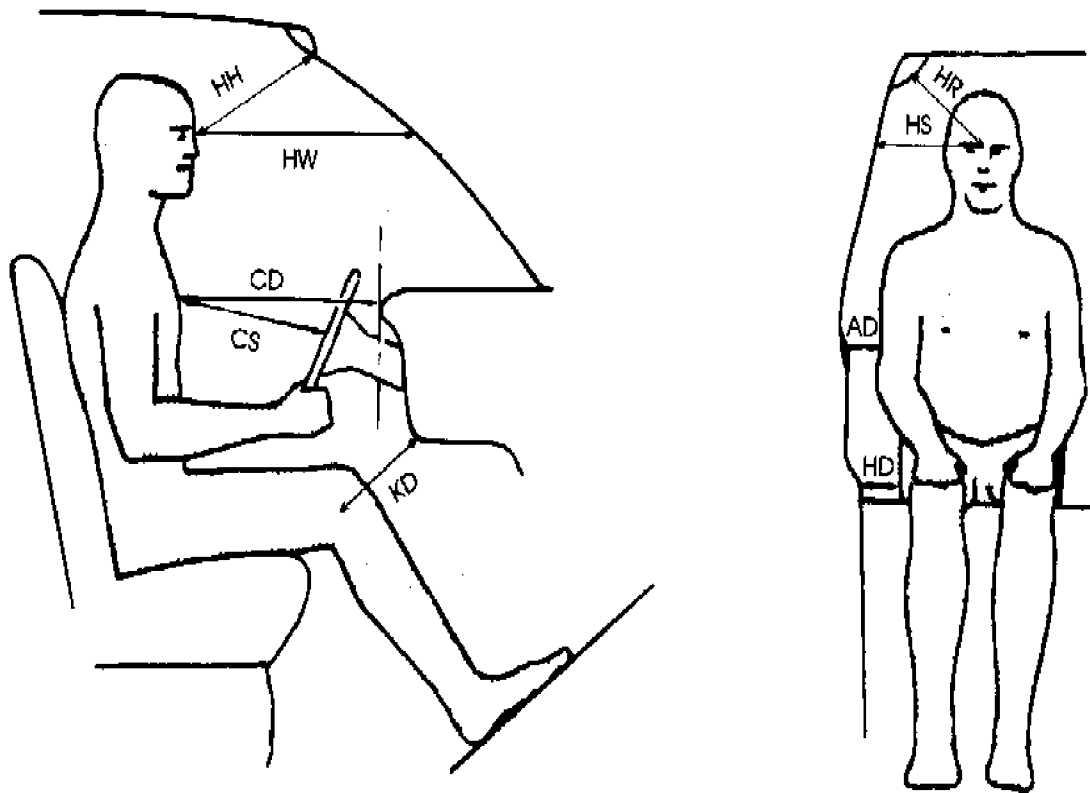


Figure 4-1. Front Seat Occupant Clearance Distances

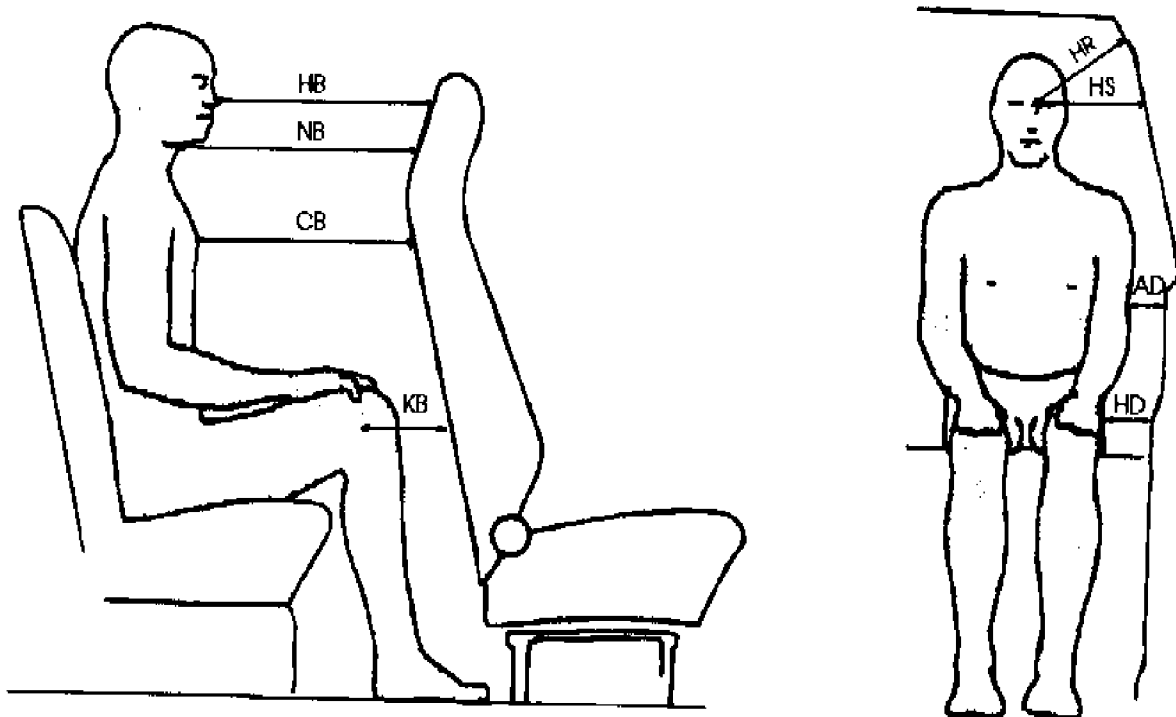


Figure 4-2. Rear Seat Occupant Clearance Distances

CLEARANCE DISTANCES (continued)

- ▶ **AD - Arm to Door** - Horizontal distance from the midpoint of the upper arm to the door or the side of the vehicle immediately to the side of the test occupant. (Applicable to front and rear seat occupants.)
- ▶ **HD - Hip to Door** - Horizontal distance from the hip (H-point) to the door or the side of the vehicle immediately to the side of the test occupant. (Applicable to front and rear seat occupants.)
- ▶ **KD - Knees to Dash** - The shortest distance from the center of the knee pivot bolt's outer surface to the lower dash panel immediately in front of the test occupant. (Applicable to front seat occupants only.)
- ▶ **HB - Head to Seatback** - The horizontal distance from the point where the nose meets the forehead (between the eyes) to the seatback immediately in front of the test occupant. (Applicable to rear seat occupant only.)
- ▶ **NB - Neck to Seatback** - Horizontal distance from the neck to the seatback immediately in front of the test occupant. (Applicable to rear seat occupants only.)
- ▶ **CB - Chest to Seatback** - Horizontal distance from the chest (near the sternum) to the seatback immediately in front of the test occupant. (Applicable to rear seat occupants only.)
- ▶ **KB - Knee to Seatback** - Horizontal distance from the center of the knee pivot bolt's outer surface to the back of the front seat. (Applicable to rear seat occupants only.)

Numeric field, integer.

SEPOSN - Seat Position

SEPOSN is the position of the seat at the initiation of the test.

Coded text, fixed length, 2 characters.

CNTRH1 - First Contact Region for Head

CNTRH I is the first point of contact for the test occupant's head.

Coded text, fixed length, 2 characters.

CNTRH2 - Second Contact Region for Head

CNTRH2 is the second point of contact for the test occupant's head.

Coded text, fixed length, 2 characters.

CNTRC1 - First Contact Region for Chest or Abdomen

CNTRC I is the first point of contact for the test occupant's chest or abdomen.

Coded text, fixed length, 2 characters.

CNTRC2 - Second Contact Region for Chest or Abdomen

CNTRC2 is the second point of contact for the test occupant's chest or abdomen.

Coded text, fixed length, 2 characters.

CNTRL1 - First Contact Region for Legs

CNTRL1 is the first point of contact for the test occupant's legs.

Coded text, fixed length, 2 characters.

CNTRL2 - Second Contact Region for Legs

CNTRL2 is the second point of contact for the test occupant's legs.

Coded text, fixed length, 2 characters.

HIC - Head Injury Criterion

HIC is the computed value of the head injury criterion, based on the resultant acceleration pulse for the head center of gravity. In computing this value, the contractor shall use the HIC algorithm supplied by NHTSA.

Numeric, integer.

T1 - Lower Boundary of HIC Time Interval (milliseconds)

TI is the lower boundary of the time interval over which the HIC was computed.

Numeric, real.

T2 - Upper Boundary of HIC Time Interval (milliseconds)

T2 is the upper boundary of the time interval over which the HIC was computed.

Numeric, real.

CLIP3M - Thorax Region Peak Acceleration Measurement (g's)

CLIP3M is the maximum 3-millisecond 'clip' value of the chest resultant acceleration, in g's, after filtering with a Class 180 filter (300 Hz Butterworth, low pass, refer to SAE Standard J211 B). In computing the CLIP3M measurement, the contractor shall use the 'clip' algorithm supplied by NHTSA.

Numeric, real.

LFEM - Left Femur Peak Load Measurement (newtons)

LFEM indicates the maximum compression load for the left femur. Listed as a negative number.

Numeric, integer.

RFEM - Right Femur Peak Load Measurement (newtons)

RFEM indicates the maximum compression load for the right femur. Listed as a negative number.

Numeric, integer.

CSI - Chest Severity Index

CSI indicates the computed value of the chest severity index.

Numeric, integer.

LBELT - Lap Belt Peak Load Measurement (newtons)

LBELT indicates the maximum tension load on the lap belt.

Numeric, integer.

SBELT - Shoulder Belt Peak Load Measurement (newtons)

SBELT indicates the maximum tension load on the shoulder belt.

Numeric, integer.

TTI - Thoracic Trauma Index

TTI is the thoracic trauma index value. For a dummy, TTI(d) is computed from the maximum rib and lower spine peak accelerations. In computing this value, the contractor shall use the TTI algorithm supplied by NHTSA.

Numeric field, real.

PELVG - Pelvic G's

PELVG, the pelvis injury criterion, is the peak lateral acceleration on the pelvis. It is obtained after filtering with the FIR100 filtering software supplied by NHTSA.

Numeric field, real.

OCCCOM - Occupant Commentary

OCCCOM is used to describe any distinguishing features of the test occupant. The reason for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments are to be made, enter NO COMMENTS in this field.

Free text, variable length, 70 characters.

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5.

OCUPANT RESTRAINTS INFORMATION

The data elements defined below comprise the fifth data group, Occupant Restraints Information. Appendix B contains a list of valid codes.

Restraint information is required for each test occupant. For unrestrained occupants, RESTYP = NON. Belts should be coded only if they were used in the test. Inflatable restraints should be coded whether the test resulted in deployment or not. If an occupant is protected by three restraints, e.g. a 3 point belt, and front and side air bags, three restraint records should be generated for that occupant.

TSTNO - TEST NUMBER

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

VEHNO - Test Vehicle Identification Number

VEHNO is the number that identifies the vehicle containing the test occupant as 1 (striking vehicle) or 2 (target vehicle).

Numeric field, integer.

OCCLC - Occupant Location

OCCLC indicates the location of the test occupant within the vehicle. A code of 01 would be entered for a left front seat driver.

Coded text, fixed length, 2 characters.

RSTNO - Restraint Number

RSTNO is the sequential number assigned to each restraint system in use for a given occupant at the time of the test. RSTNO = 1 for the first restraint listed for each occupant.

Numeric field, integer.

RSTTYP - Restraint Type

RSTTYP is the type of restraint system in use at a given occupant location. Inflatable restraints are considered to be “in use” for occupied seating positions. [RSTTYP is the type of restraint system currently coded in the OCCUPANT section as RESTR1 and RESTR2, i.e. ABG, 3PT, 3PS, ITS (for BMW’s inflatable tubular structure), etc.]

Coded text, fixed length, 3 characters.

RSTMNT - Restraint Mount

RSTMNT indicates the interior component(s) to which the restraint is mounted or from which it originates. For a driver frontal air bag, RSTMNT is the steering wheel hub (SH). Side air bags/air belts could be mounted in the seatback (SB), door (DR), or side header (HS).

DEPLOY - Inflator/Belt Pretensioner Deployment

DEPLOY describes the deployment performance of inflatable restraints or the firing of the belt pretensioner during the test.

Coded text, fixed length, 2 characters.

RSTCOM - Restraint Commentary

RSTCOM is used to describe any distinguishing features of the restraint system. If OTHER is used to code the any of the restraint system fields, descriptive information may be added here. If no comments are to be made, enter NO COMMENTS here.

Free text, variable length, maximum 70 characters.

6.

INSTRUMENTATION INFORMATION

The data elements defined below constitute the sixth test group, Instrumentation Information. Appendix B contains a list of valid codes.

Approximately twenty milliseconds of data prior to time zero should come with all measurement data; data shall meet the class 1000 specifications of the SAE J211 recommendation; and all data should be truncated at a common time value to avoid extending the pulse well past the period of significant activity.

The minimum sample rate shall be 10000 Hz. A sample rate should be chosen such that the DELT value does not have to be rounded off.

TSTNO - TEST NUMBER

TSTNO is a preassigned code (0) which is utilized by the data processing software when loading ASCII format input files into the NHTSA Vehicle database.

Coded text, fixed length, 1 character.

VEHNO - Test Vehicle Identification Number

VEHNO is the number that identifies the vehicle containing the sensor as 1 or 2. VEHNO should be coded 0 if the sensor is attached to a barrier.

Numeric field, integer.

CURNO - Curve Number

CURNO is the sequential number (1,2,3 ...) assigned to a specific sensor and data curve.

Numeric field, integer.

SENTYP - Sensor Type

SENTYP indicates the type of sensor used for collecting the measurements at the time of the test, such as AC for accelerometer.

Coded text, fixed length, 2 characters.

SENLOC - Sensor Location

SENLOC indicates the location of the test occupant or corresponding occupant restraint to which the sensor is attached. SENLOC should correspond to a previously entered value of OCCLOC.

Coded text, fixed length, 2 characters.

SENATT - Sensor Attachment

SENATT indicates where the sensor is attached. For example, the code APLR would be entered for an attachment on the right A-pillar.

Coded text, fixed length, 4 characters.

AXIS - Axis Direction of the Sensor

AXIS is the axis direction for sensors measuring vector quantities. The global coordinate systems are vehicle fixed; the local systems are local within the vehicle global system. With respect to the vehicle longitudinal axis, X is positive forward, Y is positive right, (toward the passenger's door) and Z is positive down. These can differ depending on the component. For example, with the steering assembly, positive X is down the column axis and Y is positive right (toward the passenger's door).

AXIS is always applicable when the measurement is a vector quantity (acceleration, force, velocity, and so forth). Figure 6-1 illustrates the body- and vehicle-based coordinate system. Note that the head accelerometer array is a local coordinate system. The distance, *d*, is the length of the arm between HD90 and HD9Y, measured along the Y arm. The reporting of this value of *d* is described in the INSCOM field. The length of the X arm and the Z arm are reported in the same manner. All signals from anatomical sensors, (HDCG, etc.), are local coordinate systems.

Included in Appendix D are the required sign conventions for various possible measurements. Only these sign conventions are acceptable.

Coded text, fixed length, 2 characters.

UNITS - Data Measurement Units

UNITS indicates the units used to measure the signal of the sensor data. (Refer to Table 1-1 for the only acceptable units.)

Coded text, fixed length, 3 characters.

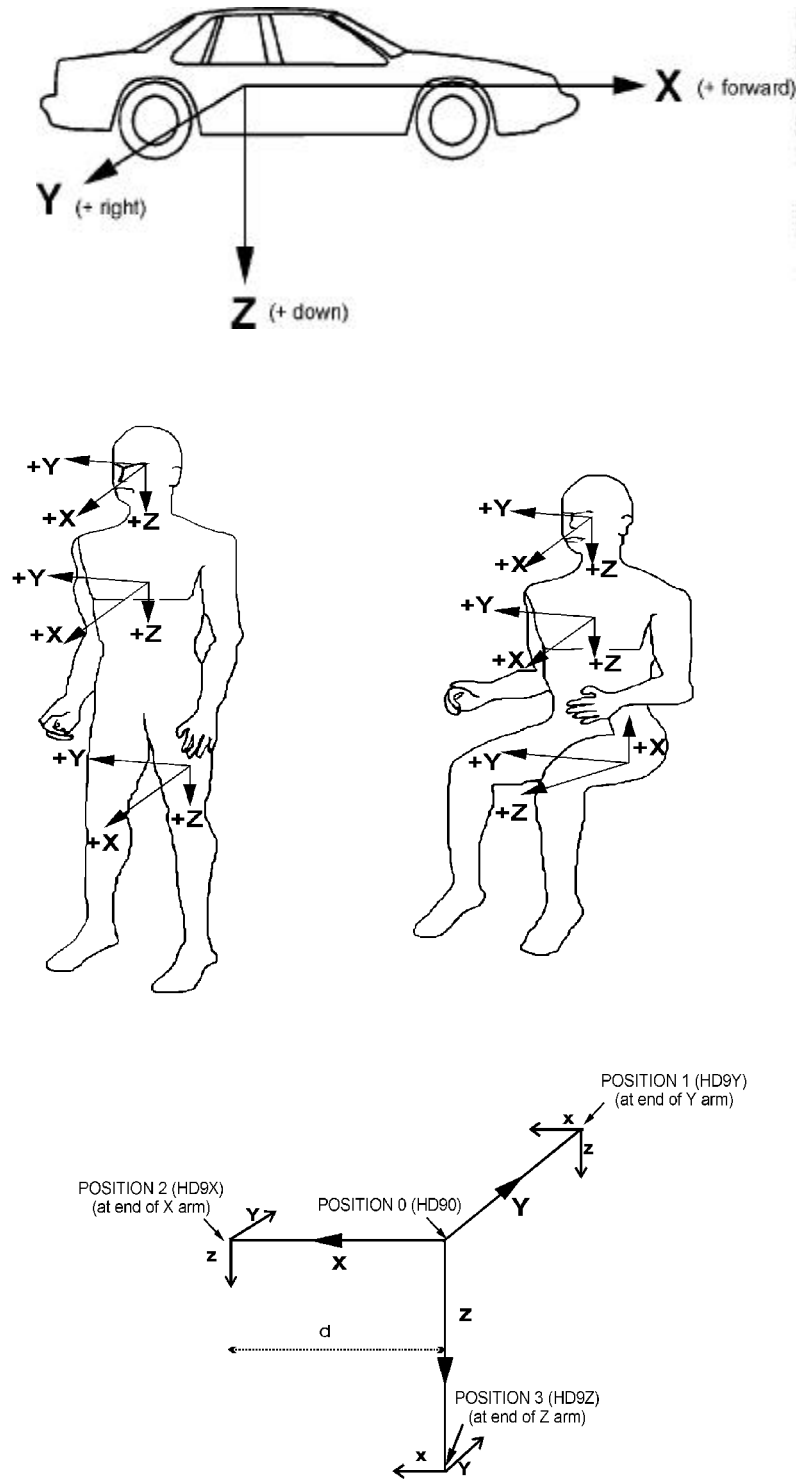


Figure 6-1: Vehicle, Body, and Head 9-Accelerometer Array

PREFIL - Prefilter Frequency

PREFIL is the corner (or cutoff) frequency in Hz of a low-pass filter used for digitizing data. This frequency is defined as where filter gain equals 70 percent (-3dB).

Numeric field, integer.

INSMAN - Manufacturer of the Instrument

INSMAN describes the manufacturer of the instrument. The model and serial number should also be included. The format for this field should be: MFG: manufacturer name, S/N: serial number.

Free text, variable length, maximum 70 characters.

CALDAT - Calibration Date (DD/MMM/YYYY)

CALDAT is the most recent calibration date of the instrument.

Date text, fixed length, 11 characters.

INSRAT - Instrument Rating

INSRAT represents the maximum value that can be accurately measured by the recording system for a channel. INSRAT should be in the same units as the data channel, except in the case of barrier load cell data where the units of INSRAT are kilonewtons.

Numeric field, integer.

CHLMAX - Channel Maximum Rating

CHLMAX represents the full-scale value of the data based upon the actual test setup, including signal conditioning, as a percentage of INSRAT.

Numeric field, integer.

INIVEL - Initial Velocity (kilometers per hour)

INIVEL is the initial (time zero) velocity of the sensor along its axis and applies only to linear accelerometers. If the sensor is a load cell attached to a barrier, the entry for this field should be zero (0.0).

Numeric field, real.

NFP - Number of First Point

NFP represents the index number of the first point in the data array (less than or equal to 0). Time zero always has an index number of 0. If no data exists prior to time zero, NFP is equal to 0; if 20 data points exist prior to time zero, NFP is equal to -20. There may never be more than 10,000 points before time zero.

Numeric field, integer.

NLP - Number of Last Point

NLP represents the index number of the last point in the data array. If 1,000 points were digitized, and NFP is equal to -100, then NLP is equal to 899. NLP can never be greater than 99,999.

Numeric field, integer.

DELTA - Time Increment (microseconds)

DELTA is the time increment in microseconds between each data point. DELTA is assumed to be constant for all data points for a given sensor (uniform sampling frequency).

Numeric field, integer.

DASTAT - Data Status

DASTAT indicates the status of the data as it appears in the data submission. This field is used to indicate a signal which is invalid (code MN for meaningless), or which becomes questionable or invalid part of the way through a signal (code CF and explained in INSCOM). If a signal is computed, DASTAT is CM. An example of a computed signal would be the resultant acceleration or the rotational acceleration of the head measured with a nine linear accelerometer array.

Coded text, fixed length, 2 characters.

CHSTAT - Channel Status

CHSTAT indicates whether the data channel is primary or redundant. If, for example, the dummy is instrumented with a backup triaxial accelerometer in the head, the redundant channels should be labeled R. The occupant's HIC value would be calculated using the primary head channels, labeled P.

Coded text, fixed length, 1 character.

INSCOM - Instrumentation Commentary

INSCOM is any further commentary on the instrumentation data, including any unusual conditions affecting the data or a reference to a document that describes problems with a particular curve. The reasons for coding any of the coded fields in this group OTHER or NOT APPLICABLE should be recorded in this field as well. If no comments are to be made, enter NO COMMENTS.

For Head 9 array accelerometers, INSCOM contains dimensions that precisely locate the given instrument. The HD90, X-axis accelerometer, will locate the center of the Head 9 array relative to the head CG; then the entry in INSCOM for HD90 would read: CG: X: 33MM, Y: 2.5MM, Z: -5.0 MM.

The X-axis of HD9Y, HD9X, and HD9Z will contain the distance, d, shown in Figure 6-1, which is the length of the arm. Units must be shown. For example, if the Y arm is 110 mm long, then the entry in INSCOM for HD9Y, X direction would read: Y-ARM: 110 MM.

Free text, variable length, maximum 70 characters.

APPENDIX A: MAGNETIC MEDIA FORMAT

Each data submission consists of two types of data: descriptive specification data defined in the previous sections of this Guide, and the measurement data digitized from the test instrumentation signal traces. Several disks may be required to record the specification and measurement files for a test submitted on diskette.

USING THE ENTREEW PROGRAM TO CREATE SPECIFICATION FILES

NHTSA has developed the data entry program, ENTREEW, in order to facilitate preparation of the specification data defined in the previous sections of this Guide. A diskette containing the ENTREEW program, Version 4.0, is included in the front of the Guide. Because ENTREEW contains built-in, on-line checkers for data validation, it is highly recommended that specification data be generated using the ENTREEW program.

Equipment Requirements for ENTREEW

ENTREEW is a Windows-based application which has the following minimum requirements:

- ▶ IBM PC or compatible with 80386 or better processor.
- ▶ 10 Megabytes of disk space.
- ▶ Microsoft Windows 3.1 or later.
- ▶ 8 Megabytes of memory.

ENTREEW should also run properly under Microsoft Windows 95, Windows NT 3.51 or Windows NT 4.0.

ENTREEW Conversion Utilities

The ENTREEW program output file is in NHTSA's own binary format (file extension .ENT). The included EWCONV utility supports the export of binary .ENT files to the ASCII .EV4 format .EV4 files, which is the accepted data format specified under SAE J211. EWCONV also supports the import of .EV4 ASCII data files into the binary .ENT format for editing using ENTREEW.

An optional utility, EWCV32, provides the ability to convert from the older Entree V3 ASCII format to the EV4 format as specified under SAE J211. This utility is not included with the ENTREEW distribution, but is available for download from the Internet at

<URL <http://www-nrd.nhtsa.dot.gov/nrd10/software/entreew>>

EWCV32 requires Microsoft Windows 95, or Microsoft Windows NT 4.0 for proper execution.

ENTREEW Specification File Format Options

ENTREEW output for a given test may be formatted one of two ways: as either a single file in NHTSA's own binary format (<filename>.ENT), or as an ASCII file (<filename>.EV4) for data exchange outside the agency. Data submitted for inclusion in the NHTSA Vehicle Database must be written in the binary format.

The data files should be written to 3.5 inch high density floppies.

ASCII FORMAT SPECIFICATION FILE

The ASCII file for a specific test consists of groups of records from each of the categories listed below:

Record Type	Group
TEST	1
VEHICLE	2
BARRIER	3
OCCUPANT	4
RESTRAINT	5
INSTRUMENTATION	6

For example, a vehicle test might consist of specification records for TEST, VEHICLE, BARRIER, OCCUPANT, RESTRAINT and INSTRUMENTATION. The EWCONV utility may be used to create the ASCII file automatically from an ENTREEW generated binary file.

Omitting Information Groups from the ASCII File

Not all tests require data for all information groups. The optional information groups for the Vehicle Crash Test data base are 3, Barrier Information, 4, Occupant Information, and 5, Restraint Information. If the test configuration is vehicle-to-vehicle, for example, then no barrier information records would be written to disk.

Record Layout for ASCII Specification File

Appendix C lists the fields and their positions in each of the specification data records. The first line of the ASCII (.EV4) specification file should be the string

“----- EV4 -----”

or

“-----”+space+ “EV4”+space+“-----”

Each section within an EV4 file should begin with a “key” line indicating the type of records following the key. These keys have the form

“----- KEY -----”

or

“-----”+space+ “KEY”+space+ “-----”

where KEY is appropriate to a particular record type. (KEY equals TEST, VEHICLE, BARRIER, etc..)

Fields within a record are delimited by the pipe character (|), records are delimited by a line feed. Comment lines may also be included in the file. A comment line should start with the # (pound) sign and end with a line feed.

The ASCII specification file should terminate with the line

“----- END -----”

Fields for which no information is available should contain one blank character. In other words, an empty field begins after the pipe delimiter of the previous field, and consists of a single blank followed by another pipe delimiter. All text should be uppercase.

Table A-1 is an example of an ASCII specification file for a vehicle crash test.

LAYOUT FOR MEASUREMENT DATA ON DISK

Each subsequent file after the specification data files contains unfiltered, digitized data collected from the sensors used in the tests. The order of the measurement files corresponds to the order of the instrumentation records in the instrumentation group specification records. The measurement files are made up of ASCII records of 1 data point each, delimited by a line feed character (ASCII decimal 10, hexadecimal \x0a, octal \012). The point specification will allow for any floating point format, but the preferred format is the C format %12.5E. Thus, each record will be 12 characters long, e.g. +1.23400E-01. The maximum number of points for one channel is 110,000. There cannot be more than 10,000 data points prior to time zero, nor more than 99,999 after time zero.

The name of the ASCII measurement data files should be the same given to the specification file described above (ENTREEW binary file with extension .ENT or ASCII file with extension .EV4). The file extension should be the curve number of the curve contained in the file, and should correspond to the curve number in the instrumentation record in the instrumentation specification group. There should be no leading zeros in the file extensions.

If the specification file is named TSTABC.ENT (binary) or TSTABC.EV4 (ASCII), and there are 35 measurement (curve) files, the curve files should be named TSTABC.1 through TSTABC.35.

Right:	TSTABC.1	TSTABC.12	TSTABC.101
Wrong:	TSTABC.T0	TSTABC.012	TSTABCDAT

Table A-1. Sample ASCII Specification File

```

# This is a comment field for a sample ASCII format specification data file
----- EV4 -----
----- TEST -----
0|V4|COMPLIANCE TEST FRONTAL BARRIER IMPACT FOR FMVSS 208|TO OBTAIN VEHICLE
CRASHWORTHINESS AND OCCUPANT RESTRAINT
PERFORMANCE|07/NOV/1996|CAL|DTNH22-93-D-11089|RUN1650|COM|VTB|CON|DRY|21|FMT
|UMB|47.2|0|0| |4|NO COMMENTS
----- VEHICLE -----
0|1|01|99|97| |CV|3C3EL45X5VTS22681|4CTF|2.4|AF|1717|2692|4902|
|1145|UN|UNK|P|NO COMMENTS|4902|
4107|3891|3467|3457|3404|3391|2093|2088|2164|2154|3406|3401|3838|3861|2921|4
32|389|4740|4724|521|47.2|0|180|DE|NA|NA|140|280|330|343|356|224|12FDEW2| |0|
503|4564|3950|3835|3442|3447|3388|3388|2057|2080|2149|2151|3399|3396|3752|38
10|2929|432|351|4488|4521|521| | |1997 CHRYSLER SEBRING CONV
----- BARRIER -----
0|R|FLB|0| |3.048*3.66*1.5 METER CONCRETE BARRIER.

----- OCCUPANT -----
0|1|01|H3|99|M| | |H3|50|MFG:HUMANIOD S/N:290|NO MODIFICATIONS|NO COMMENTS
|429|673|269|274|549|361| |239|191| | |
|CN|AB|NO|AB|NO|DP|NO|445|56.5|83.5|52.0|8202|7408|444| | |0.0| 0.0|NO
COMMENTS
0|1|02|H3|99|M| | |H3|50|MFG:HUMANIOD S/N:313|NO COMMENTS |NO
COMMENTS|406|570|277|259|538| |36|221|201| | |
|CN|AB|NO|AB|NO|DP|NO|483|57.8|82.6|51.7|6365|7056|353| | |0.0|0.0|NO
COMMENT
----- RESTRAINT -----
0|1|01|1|ABG| |DP|NO COMMENTS
0|1|01|2|SWE| |NA|NO COMMENTS
0|1|02|1|ABG| |DP|NO COMMENTS
0|1|02|2|DPL| |NA|NO COMMENTS
----- INSTRUMENTATION -----
0|1|1|AC|01|HDCG|XL|G'S|1650|MFG: ENDEVCO S/N:
A33F|22/OCT/1996|195|49|47.2|-749|2999|120|AM| |HEAD X
0|1|2|AC|01|HDCG|YL|G'S|1650|MFG: ENDEVCO S/N:
AC2RC|22/OCT/1996|182|12|0.0|-749|2999|120|AM| |HEAD Y
0|1|3|AC|01|HDCG|ZL|G'S|1650|MFG: ENDEVCO S/N:
A27F|22/OCT/1996|190|22|0.0|-749|2999|120|AM| |HEAD Z
0|1|4|LC|01|FMRL|ZL|NWT|1650|MFG:GSE S/N: 77|01/JUL/1996|19306|43|
|-749|2999|120|AM| |LEFT FEMUR
----- END -----

```

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APPENDIX B: CODES

APLENG

CODE	DESCRIPTION	COMMENT
DE	DIRECT ENGAGEMENT	BY COLLIDING OBJECT
NA	NOT APPLICABLE	
NO	NO DIRECT ENGAGEMENT	
UN	UNKNOWN	

AXIS

CODE	DESCRIPTION	COMMENT
NA	NOT APPLICABLE	
RS	RESULTANT	
XG	X-GLOBAL	
XL	X-LOCAL	INCLUDES A-P
YG	Y-GLOBAL	
YL	Y-LOCAL	INCLUDES M-L
ZG	Z-GLOBAL	
ZL	Z-LOCAL	INCLUDES I-S
OT	OTHER	

BARRIG

CODE	DESCRIPTION	COMMENT
D	DEFORMABLE	
R	RIGID	

BARSHP

CODE	DESCRIPTION	COMMENT
BRL	BRIDGE RAIL	
FAB	FLAT ANGLED BARRIER	FIXED
FLB	FLAT BARRIER	FIXEDB
GRL	GUARD RAIL	
GRT	GUARD RAIL TERMINAL	
IAT	IMPACT ATTENUATOR	
LCB	LOAD CELL BARRIER	FIXED

BARSHP (continued)

CODE	DESCRIPTION	COMMENT
LUM	LUMINARE	LIGHT
MBR	MEDIAN BARRIER	
POL	POLE	FIXED
ROR	ROLLOVER RAMP	NOTE IF NOT SAE STANDARD
SGN	SIGN SUPPORT	
UNK	UNKNOWN	
OTH	OTHER	

BMPENG

CODE	DESCRIPTION	COMMENT
DE	DIRECT ENGAGEMENT	
NA	NOT APPLICABLE	
OR	OVERRIDE	OF OTHER BUMPER
UN	UNKNOWN	
UR	UNDERRIDE	OF OTHER BUMPER

BODY

CODE	DESCRIPTION	COMMENT
2C	TWO DOOR COUPE	
2S	TWO DOOR SEDAN	
3H	THREE DOOR HATCHBACK	
4S	FOUR DOOR SEDAN	
5H	FIVE DOOR HATCHBACK	
BU	BUS	
CV	CONVERTIBLE	
LM	LIMOUSINE	
MH	MOTOR HOME	
NA	NOT APPLICABLE	
PU	PICKUP TRUCK	
SW	STATION WAGON	
TR	TRUCK	LARGER THAN PICKUP
UV	UTILITY VEHICLE	
VN	VAN	
OT	OTHER	

CNTRC1

CODE	DESCRIPTION	COMMENT
AB	AIR BAG	
AP	A PILLAR	
AR	ARM REST	
BP	B PILLAR	
DP	DASHPANL	
DR	DOOR PANE	
NO	NONE	NO CONTACT
SB	SEAT BACK	FOR REAR SEAT OCCUPANT
SP	SIDE PANEL	FOR REAR SEAT OCCUPANT IN 2 DOOR VEHICLE
SS	SIDE WINDOW SILL	
SW	STEERING WHEEL	
UN	UNKNOWN	CONTACT UNDETERMINED
OT	OTHER	

CNTRC2

CODE	DESCRIPTION	COMMENT
AB	AIR BAG	
AP	A PILLAR	
AR	ARM REST	
BP	B PILLAR	
DP	DASHPANL	
DR	DOOR PANEL	
NO	NONE	NO CONTACT
SB	SEAT BACK	FOR REAR SEAT OCCUPANT
SP	SIDE PANEL	FOR REAR SEAT OCCUPANT IN 2 DOOR VEHICLE
SS	SIDE WINDOW SILL	
SW	STEERING WHEEL	
UN	UNKNOWN	CONTACT UNDETERMINED
OT	OTHER	

CNTRH1

CODE	DESCRIPTION	COMMENT
AB	AIR BAG	
AP	A PILLAR	
BP	B PILLAR	
CP	C PILLAR	
DP	DASHBOARD	
HC	CHEST	
HK	KNEE	
HS	HEADER - SIDE	
HW	HEADER - WINDSHIELD	
NO	NONE	NO CONTACT
OC	ANOTHER OCCUPANT	
OV	OTHER VEHICLE	
SB	SEATBACK	FOR REAR SEAT OCCUPANT
SD	SIDE WINDOW	
SH	STEERING WHEEL HUB	
SR	STEERING WHEEL RIM	
SS	SIDE WINDOW SILL	
SW	STEERING WHEEL	BOTH RIM AND HUB
UN	UNKNOWN	CONTACT UNDETERMINED
WS	WINDSHIELD	
OT	OTHER	

CNTRH2

CODE	DESCRIPTION	COMMENT
AB	AIR BAG	
AP	A PILLAR	
BP	B PILLAR	
CP	C PILLAR	
DP	DASHBOARD	
HC	CHEST	
HK	KNEE	
HS	HEADER - SIDE	
HW	HEADER - WINDSHIELD	
NO	NONE	NO CONTACT
OC	ANOTHER OCCUPANT	
OV	OTHER VEHICLE	
SB	SEAT BACK	FOR REAR SEAT OCCUPANT
SD	SIDE WINDOW	
SH	STEERING WHEEL HUB	

CNTRH2 (continued)

CODE	DESCRIPTION	COMMENT
SR	STEERING WHEEL RIM	
SS	SIDE WINDOW SILL	
SW	STEERING WHEEL	BOTH RIM AND HUB
UN	UNKNOWN	CONTACT UNDETERMINED
WS	WINDSHIELD	
OT	OTHER	

CNTRL1

CODE	DESCRIPTION	COMMENT
AR	ARM REST	
DP	DASHBOARD	
DR	DOOR PANEL	
KR	KNEE RESTRAINT	
NO	NONE	NO CONTACT
SB	SEAT BACK	FOR REAR SEAT OCCUPANT
SC	STEERING COLUMN	
SP	SIDE PANEL	
UN	UNKNOWN	CONTACT UNDETERMINED
OT	OTHER	

CNTRL2

CODE	DESCRIPTION	COMMENT
AR	ARM REST	
DP	DASHBOARD	
DR	DOOR PANEL	
NO	NONE	NO CONTACT
SB	SEAT BACK	FOR REAR SEAT OCCUPANT
SC	STEERING COLUMN	
SP	SIDE PANEL	
UN	UNKNOWN	CONTACT UNDETERMINED
OT	OTHER	

COLMEC

CODE	DESCRIPTION	COMMENT
BWU	BEHIND WHEEL UNITS	
CON	CONVOLUTED TUBE	
CYL	CYLINDRICAL MESH TUBE	
EMB	EMBEDDED BALL	
EXA	EXTRUDED ABSORBER	
NAP	NOT APPLICABLE	
NON	NONE	NOT COLLAPSIBLE
UNK	UNKNOWN	
OTH	OTHER	

DASTAT

CODE	DESCRIPTION	COMMENT
AM	AS MEASURED	A
CF	CHANNEL FAILED	F
CM	COMPUTED	C
MN	MEANINGLESS	M
NO	NO DATA	N
QD	QUESTIONABLE DATA	Q
SC	SCALING FACTOR APPLIED	S
SF	SYSTEM FAILED	NOTE CAUSE OF FAILURE

DEPLOY

CODE	DESCRIPTION	COMMENT
DP	DEPLOYED PROPERLY	
NA	NOT APPLICABLE	
ND	NOT DEPLOYED PROPERLY	
UN	UNKNOWN	

DUMSIZ

CODE	DESCRIPTION	COMMENT
05	5 PERCENTILE	
3C	3 YEAR OLD CHILD	3C
50	50 PERCENTILE	
6C	6 YEAR OLD CHILD	6C
95	95 PERCENTILE	
NA	NOT APPLICABLE	OCCUPANT NOT A DUMMY
OT	OTHER	
UN	UNKNOWN	

ENGINE

CODE	DESCRIPTION	COMMENT
3CTF	3 CYLINDER TRNSVERSE FRONT	
4CIF	4 CYLINDER INLINE FRONT	
4CLM	4 CYLINDER MID	UNSPECIFIED ORIENTATION
4CLR	4 CYLINDER REAR	UNSPECIFIED ORIENTATION
4CTF	4 CYLINDER TRANSVRSE FRONT	
ELEC	ELECTRIC MOTOR	
NAPP	NOT APPLICABLE	
ROTR	ROTARY	
S5IF	STRAIGHT 5 INLINE FRONT	
S6IF	STRAIGHT 6 INLINE FRONT	
S6TF	STRAIGHT 6 TRANSVERSE FRONT	
UNKN	UNKNOWN	
V6IF	V6 INLINE FRONT	
V6TF	V6 TRANSVERSE FRONT	
V8IF	V8 INLINE FRONT	
OTHR	OTHER	

LINK

CODE	DESCRIPTION	COMMENT
TEL	TELEMETRY	
UCT	UMBILICAL CABLE AND TELEMETRY	
UMB	UMBILICAL CABLE	
UNK	UNKNOWN	
OTH	OTHER	

MAKE

CODE	DESCRIPTION	COMMENT
73	ACURA	
11	AMERICAN	
12	AUDI	
53	BATTRONICS	
27	BMW	
04	BUICK	
10	CADILLAC	
68	CARPENTER	SCHOOLBUS
35	CHAMPION	
36	CHECKER	
01	CHEVROLET	
37	CHINOOK	
79	CHOO-CHOO	
21	CHRYSLER	
75	COLLINS	
29	COMUTA	
39	DAIHATSU	
38	DELOREAN	
07	DODGE	
70	EAGLE	
55	EEVC	
58	EVA	
19	FIAT	
02	FORD	
63	GEO	
40	GMC	
23	HONDA	
34	HYUNDAI	
41	IH	
72	INFINITI	
42	ISUZU	
44	JEEP	
54	JET	
77	KIA	
80	LAND ROVER	
22	LECTRA	
59	LECTRIC	

MAKE (continued)

CODE	DESCRIPTION	COMMENT
65	LEWIS	
64	LEXUS	
13	LINCOLN	
18	MAZDA	
28	MERCEDES	
09	MERCURY	
25	MG	
62	MINI	
32	MITSUBISHI	
15	NHTSA	
48	NISSAN	
06	ODYSSEY	
14	OLDSMOBILE	
05	PEUGEOT	
03	PLYMOUTH	
81	PONTIAC	
17	RENAISSANCE	
30	RENAULT	
69	SAAB	
78	SATURN	
76	SEBRING	
26	SOLECTRIA	
33	SUBARU	
67	SUZUKI	
74	THOMAS	
16	TIARA	
31	TOYOTA	
56	TRIUMPH	
08	UM	
20	VOLKSWAGEN	
71	VOLVO	
66	WARD	
60	WAYNE	SCHOOLBUS
24	WINNEBAGO	
99	YUGO	
	OTHER	

MODEL

CODE	DESCRIPTION	COMMENT
▶ <u>ACURA</u>	(make code 73)	
02	INTEGRA	
01	LEGEND	
04	TL	
03	VIGOR	
99	OTHER	
▶ <u>AMERICAN</u>	(make code 11)	
03	ALLIANCE	
06	AMX	
11	CONCORD	
01	GREMLIN	
02	HORNET	
09	MATADOR	
12	PACER	
14	SPIRIT	
99	OTHER	
▶ <u>AUDI</u>	(make code 12)	
08	A4	
01	100	LS, GL
03	200	
05	4000	
04	5000	
06	80	
07	90	
02	FOX	
99	OTHER	
▶ <u>BATTRONICS</u>	(make code 53)	
01	VAN	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>BMW</u> (make code 27)		
08	2002	
05	3.0 SI	
09	318	
01	320 I	
10	325 I	
02	528 I	
06	530 I	
07	630 CSI	
03	633 CSI	
04	733 I	
99	OTHER	
▶ <u>BUICK</u> (make code 04)		
06	CENTURY	
04	ELECTRA	225
09	ESTATE	
02	LE SABRE	
16	OPEL	STD, GT, KADETT, 1900, MANTA
07	PARK AVENUE	
17	REGAL	
05	RIVIERA	
08	ROADMASTER	
11	SKYHAWK	
01	SKYLARK	
03	SOMERSET	
99	OTHER	
▶ <u>CADILLAC</u> (make code 10)		
05	BROUGHAM	
09	CIMARRON	
10	CONCOURSE	
08	DE VILLE	
04	ELDORADO	
03	FLEETWOOD	60, 75
02	SEVILLE	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>CARPENTER</u> (make code 68)	
02	CADET	
01	CONVENTIONAL	
99	OTHER	
▶	<u>CHECKER</u> (make code 36)	
01	TAXICAB	
99	OTHER	
•	<u>CHAMPION</u> (make code 35)	
01	MOTOR HOME	
99	OTHER	
▶	<u>CHEVROLET</u> (make code 01)	
01	ASTRO	
40	BEAUVILLE	
15	BELAIR	
17	BERETTA	
28	BLAZER MPV	C10, K5, K10, C20, K10
33	C10 PICKUP	
34	C1500 PICKUP	
25	C30 PICKUP	
08	CAMARO	
07	CAPRICE	
31	CAVALIER	
32	CELEBRITY	
02	CHEVELLE	
13	CHEVETTE	
38	CHEVY II	
23	CITATION	
16	CORSICA	
09	CORVETTE	
20	EL CAMINO	
19	FULL SIZE	
26	G10 VAN	
29	G30 VAN	
06	IMPALA	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>CHEVROLET</u> (make code 01 continued)	
35	K10 PICKUP	
36	K20 PICKUP	
30	LUMINA	
22	LUV PICKUP	
04	SPECTRUM	
27	SPORTVAN	C20, G15, G20, G25
05	SPRINT	
11	SUBURBAN	
41	TAHOE	
12	VEGA	
99	OTHER	
▶	<u>CHINOOK</u> (make code 37)	
01	MOTOR HOME	
99	OTHER	
▶	<u>CHOO-CHOO</u> (make code 79)	
01	CUSTOM	
99	OTHER	
▶	<u>CHRYSLER</u> (make code 21)	
03	300	
13	CIRRUS	
12	CONCORDE	
10	CONQUEST	
07	CORDOBA	
09	FIFTH AVENUE	
06	IMPERIAL	
08	LE BARON	
01	NEWPORT	CUSTO

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>CHRYSLER</u> (make code 21)		
04	NEW YORKER	
05	TOWN AND COUNTRY	
99	OTHER	
▶ <u>COLLINS</u> (make code 75)		
01	SUPER BANTAM	
99	OTHER	
▶ <u>COMUTA</u> (make code 29)		
01	CAR ELECTRIC	
99	OTHER	
▶ <u>DAIHATSU</u> (make code 39)		
01	CHARADE	
99	OTHER	
▶ <u>DELOREAN</u> (make code 38)		
01	COUPE	
99	OTHER	
▶ <u>DODGE</u> (make code 07)		
29	400	
08	600	
19	ARIES	
14	ASPEN	
11	CARAVAN	
27	CELESTE	
05	CHALLENGER	
06	CHARGER	
07	COLT	
22	COLT PICKUP	D50
02	CORONET	
30	D150 PICKUP	
23	DAKOTA	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>DODGE</u> (make code 07) continued	
01	DART	
13	DAYTONA	
10	DIPLOMAT	
32	DYNASTY	
34	INTREPID	
12	LANCER	
15	MAGNUM	XE
16	MINIRAM VAN	
18	MIRADA	
04	MONACO	
24	024	
09	OMNI	DE TOMASO
31	PICKUP	
28	RAM50	
36	RAM 150	
37	RAM 250 VAN	
26	RAMCHARGER MPV	AD100, AW100
03	RAMPAGE	
33	RAM WAGON VAN	
21	SHADOW	
25	SPIRIT	
20	SPORTSMAN VAN	B100, B150, B200, B250, B300, B350
17	ST. REGIS	
35	STEALTH	
39	T300	
99	OTHER	
•	<u>EAGLE</u> (make code 70)	
04	MEDALLION	
01	MPV	
02	PREMIER	
03	SUMMIT	
05	TALON	
06	VISION	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
• <u>EEVC</u> (make code 55)		
01	DEFORMABLE IMPACTOR	
99	OTHER	
▶ <u>EVA</u> (make code 58)		
02	EVCORT	
01	FAIRMONT	
99	OTHER	
▶ <u>FIAT</u> (make code 19)		
03	124	
02	128	
10	131	
11	132	
09	BRAVA	
05	SPIDER	850, 2000
08	STRADA	
06	X19	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>FORD</u> (make code 02)	
06	AEROSTAR	
43	ASPIRE	
21	BRONCO	
22	BRONCO II	
32	CLUBWAGON MPV	E100, E150
44	CONTOUR	
35	COURIER	
40	CROWN VICTORIA	
24	E100VAN	
25	E150VAN	
19	ELITE	
27	ESCORT	
33	EXP	
41	EXPLORER	
36	FI 50 PICKUP	
37	F250 PICKUP	
38	F350 PICKUP	
17	FAIRMONT	
11	FESTIVA	
14	FIESTA	
18	FULL SIZE	
31	GALAXIE	500
20	GRANADA	
34	LASER	
07	LTD	II
02	MAVERICK	
03	MERKUR	
05	MUSTANG II	
39	PICKUP	
13	PINTO	
12	PROBE	
15	RANCHERO	
10	RANGER	R100
08	TAURUS	
01	TEMPO	
09	THUNDERBIRD	
04	TORINO	
23	VAN	E250,E350,P500
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>GEO</u> (make code 63)		
01	METRO	
02	PRIZM	
03	STORM	
04	TRACKER	
99	OTHER	
▶ <u>GMC</u> (make code 40)		
06	ASTRO TRUCK	
01	JIMMY MPV	C15, C25, K15, SUBURBAN
02	PICKUP	C15, C25, CABALLERO, K15, K25
07	S15 PICKUP	
04	SPORTVAN	G15, G25, G35
03	SPRINT MPV	
05	VANDURA	G1500, G2500
99	OTHER	
▶ <u>HONDA</u> (make code 23)		
02	ACCORD	
01	CIVIC	CVCC
06	DEL SOL	
07	ODYSSEY	
08	PASSPORT	
05	PRELUDE	
99	OTHER	
▶ <u>HYUNDAI</u> (make code 34)		
06	ELANTRA	
03	EXCEL GLS	
01	PONY EXCEL	
05	SCOUPE	
04	SONATA	
02	STELLAR	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>IH</u> (make code 4 1)		
01	SCOUT MPV	
02	SS MPV	
03	TERRA MPV	
04	TRAVELER MPV	
99	OTHER	
▶ <u>INFINITI</u> (make code 72)		
01	G20	
04	J30	
02	M30	
03	Q45	
99	OTHER	
▶ <u>ISUZU</u> (make code 42)		
06	AMIGO	
01	I-MARK	
03	IMPULSE	
09	PICKUP	
02	PUP	
08	RODEO	
05	SPACECAB	LS
07	STYLUS	
04	TROOPER II	
99	OTHER	
▶ <u>JEEP</u> (make code 44)		
01	CHEROKEE MPV	WAGONEER
02	CJ MPV	5, 7, 8
05	COMANCHE	
03	PICKUP	J10, J20
04	TOWNSIDE MPV	
06	VJ	
07	WRANGLER MPV	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>JET</u> (make code 54)		
02	COURIER	
03	ELECTRICA	MERCURY, ETC.
01	ELECTRICA 007	
99	OTHER	
▶ <u>KIA</u> (make code 77)		
01	SETHIA	
99	OTHER	
▶ <u>LAND ROVER</u> (make code 80)		
01	DISCOVERY	
99	OTHER	
▶ <u>LECTRA</u> (make code 22)		
01	400	
02	CENTAURI	
99	OTHER	
▶ <u>LECTRIC</u> (make code 59)		
01	LEOPARD	
99	OTHER	
▶ <u>LEWIS</u> (make code 65)		
01	REDDIBUS	
99	OTHER	
▶ <u>LEXUS</u> (make code 64)		
01	ES250	
02	ES300	
06	GS300	
05	LS400	
03	SC300	
04	SC400	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>LINCOLN</u> (make code 13)		
01	CONTINENTAL	FULL SIZE
02	MARK	H, W, V, VI
06	TOWN CAR	
05	VERSAILLES	
09	OTHER	
▶ <u>MAZDA</u> (make code 18)		
02	323	
15	323-PROTEGE	
07	626	
01	808	
03	929	
14	B2000 PICKUP	
09	COSMO	
05	GLC	
08	MIATA	
17	MILLENNIA	
11	MIZER	
06	MPV	
16	MX3	
12	MX6	
13	PICKUP	
04	RX	2,3,4,5, 6,7
99	OTHER	
▶ <u>MERCEDES</u> (make code 28)		
03	190	
14	230	
01	240	
06	280	CE, E, SE
02	300	CD, D, SD, TD
15	380	SL,SLC,SEL
09	450	SE, SEL, SL, SLC
12	6.9	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>MERCURY</u> (make code 09)	
04	BOBCAT	
13	CAPRI	
10	COMET	
07	COUGAR	XR7
16	LN7	
15	LYNX	
09	MARQUIS	FULL SIZE
12	MONARCH	
01	MONTEGO	
03	SABLE	
05	TOPAZ	
02	TRACER	
08	ZEPHYR	
99	OTHER	
▶	<u>MG</u> (make code 25)	
03	MGB	GT
01	MIDGET	
99	OTHER	
▶	<u>MINI</u> (make code 62)	
12	3000 GT	
03	CORDIA	
11	DIAMANTE	
10	ECLIPSE	
05	GALANT	
07	MIRAGE	
13	MIGHTY MAX	
02	MONTERO	
01	PICKUP	
08	PRECIS	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
• <u>MITSUBISHI</u> (make code 62) continued		
06	STARION	
04	TREDIA	
09	VAN	
99	OTHER	
▶ <u>NHTSA</u> (make code 32)		
02	CALSPAN RSV	
09	CONTOURED IMPACTOR	MOVING; NOTE IF NOT SAE STANDARD
01	DEFORMABLE IMPACTOR	MOVING
06	FLAT IMPACTOR	MOVING; NOTE IF NOT SAE STANDARD
03	LOAD CELL IMPACTOR	MOVING
04	MINICARS RSV	
10	ROLLOVER CART	NOTE IF NOT SAE STANDARD
11	SLED	NON-BIOMECHANICS TEST
08	TRUCK SIMULATOR	
99	OTHER	
▶ <u>NISSAN</u> (make code 15)		
▶	18	1200
13	200 SX	
06	2000	ROADSTER
08	210	B210, HLB
30	240	SX
10	260	Z
11	280	Z, ZX
03	300	ZX
15	310	
12	510	
07	610	
26	710	
16	810	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>NISSAN</u> (make code 15 - continued)	
35	ALTIMA	
31	AXXESS	MODEL
24	F10	
28	KING CAB PICKUP	
25	MAXIMA	
37	NX	
34	PATHFINDER	
29	PICKUP	
01	PULSAR	
36	QUEST	
02	SENTRA	
07	STANZA	XE
17	VAN	
99	OTHER	
▶	<u>ODYSSEY</u> (make code 48)	
01	MOTOR HOME	
99	OTHER	
▶	<u>OLDSMOBILE</u> (make code 06), continued	
03	98	
07	ACHIEVA	
01	CALAIS	
14	CUSTOM	
05	CUTLASS	
02	DELTA 88	
15	FIRENZA	10 OMEGA
06	ROYALE	
11	STARFIRE	
04	TORONADO	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>PEUGEOT</u> (make code 14)	
02	405	
01	504	TURBO
04	505	TURBO
03	604	
99	OTHER	
▶	<u>PLYMOUTH</u> (make code 05)	
07	ACCLAIM	
19	ARROW PICKUP	
05	CARAVELLE	
17	CHAMP	
26	COLT	
02	COLT VISTA	
03	CONQUEST	
20	CRICKET	
21	FARGO PICKUP	150,250
12	FURY	GRAN FURY
16	HORIZON	
25	LASER	
18	RELIANT	
10	SAPORO	
04	SCAMP	
▶	<u>PLYMOUTH</u> (make code 05) continued	
06	SUNDANCE	
22	TC3	TURISMO
23	TRAILDUSTER MPV	PD150, PW150
01	VALIANT	
14	VOLARE	
24	VOYAGER VAN	B150, B250, B350, PB OR PH 150, 250, 350
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>PONTIAC</u> (make code 03)	
18	6000 LE	
04	BONNEVILLE	
02	CATALINA	
03	FIERO	
06	FIREBIRD	
13	FULL SIZE	
14	GRAND AM	
05	GRAND PRIX	
16	J2000	
12	LEMANS	
01	PARISIENNE	
08	PHOENIX	
07	SUNBIRD	
17	T1000	
19	TRANS SPORT	
11	VENTURA	
99	OTHER	
▶	<u>RENAISSANCE</u> (make code 81)	
01	TROPICA	ELECTRIC CAR
99	OTHER	
▶	<u>RENAULT</u> (make code 17)	
03	12	
04	15	
05	17	GORDINI
02	18	I
06	5	
09	ALLIANCE	
08	ENCORE	
07	FUEGO	
01	LECAR	
11	MEDALLION	
10	SPORTSWAGON	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>SAAB</u> (make code 30)		
02	900	
03	9000	
01	99	
99	OTHER	
▶ <u>SATURN</u> (make code 69)		
01	SL2	
99	OTHER	
▶ <u>SEBRING</u> (make 78)		
01	ZEV	ELECTRIC CAR (DODGE)
99	OTHER	
▶ <u>SOLECTRIA</u> (make code 76)		
01	FORCE	
99	OTHER	
▶ <u>SUBARU</u> (make code 26)		
07	BRAT MPV	
03	DL	
04	FE	
05	GF	
02	GL	
08	GLF	
13	IMPREZA	
10	JUSTY	
11	LEGACY	
12	LOYALE	
09	WAGON	
01	XT	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
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- ▶ SUZUKI (make code 33)
 - 01 SAMURAI
 - 02 SIDEKICK
 - 03 SWIFT
 - 99 OTHER

- ▶ THOMAS (make code 67)
 - 01 CONVENTIONAL
 - 02 MIGHTY MITE
 - 99 OTHER ▶

- ▶ TIARA (make code 74)
 - 01 STEALTH
 - 99 OTHER

- ▶ TOYOTA (make code 16)
 - 16 4X4
 - 13 4RUNNER
 - 19 AVALON
 - 03 CAMRY
 - 06 CELICA
 - 02 COROLLA
 - 04 CORONA
 - 08 CRESSIDA
 - 01 LAND CRUISER
 - 05 MARK II
 - 14 MR2
 - 17 PASEO

MODEL (continued)

<u>CODE</u>	<u>DESCRIPTION</u>	<u>COMMENT</u>
▶ <u>TOYOTA</u> (make code 16) continued		
09	PICKUP	
15	PREVIA	
12	STARLET	
07	SUPRA	
18	T100	
20	TACOMA	
10	TERCEL	
11	VAN	
99	OTHER	
▶ <u>TRIUMPH</u> (make code 31)		
01	SPITFIRE	
02	TR7	
99	OTHER	
▶ <u>UM</u> (make code 56)		
01	ELECTREK	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶	<u>VOLKSWAGEN</u> (make code 08)	
02	BEETLE	
20	CABRIOLET	
19	CARRADO	
04	DASHER	
21	EUROVAN	
03	FOX	
01	GOLF	
14	JETTA	
18	PASSAT	
16	PICKUP	
05	POLO	
17	QUANTUM	
09	RABBIT	
10	SCIROCCO	
08	THE THING	
15	VANAGON	BUS
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>VOLVO</u> (make code 20)		
04	164	
06	240	
10	244	DL, 242
15	245	
07	260	
16	265	
17	740 GLE	
19	850	
18	940	
11	COUPE	
12	DL	
13	GLE	
14	GLT	
99	OTHER	
▶ <u>WARD</u> (make code 71)		
01	VANDURA.	
99	OTHER	
▶ <u>WAYNE</u> (make code 66)		
01	CONVENTIONAL	
02	FORWARD CONTROL	
99	OTHER	
▶ <u>WINNEBAGO</u> (make code 60)		
01	TREKKER	
99	OTHER	

MODEL (continued)

CODE	DESCRIPTION	COMMENT
▶ <u>YUGO</u> (make code 24)		
01	GV	
99	OTHER	
▶ <u>OTHER</u> (make code 99)		
99	OTHER	

MODIND

CODE	DESCRIPTION	COMMENT
M	MODIFIED VEHICLE	STRUCTURAL AND/OR INTERIOR MODIFICATIONS
P	PRODUCTION VEHICLE	UNMODIFIED
R	RESEARCH VEHICLE	IMPACTOR OR RSV
U	UNKNOWN	

MTHCAL

CODE	DESCRIPTION	COMMENT
H3	HYBRID III	
HS	HSRI	
NA	NOT APPLICABLE	OCCUPANT NOT A DUMMY
NO	NONE	NO CALIBRATION
P5	PART 572	
UN	UNKNOWN	
OT	OTHER	

OCCLOC

CODE	DESCRIPTION	COMMENT
01	LEFT FRONT SEAT	
02	RIGHT FRONT SEAT	
03	RIGHT REAR SEAT	
04	LEFT REAR SEAT	
05	CENTER FRONT SEAT	
06	CENTER REAR SEAT	
07	LEFT THIRD SEAT	STATION WAGON/VAN
08	CENTER THIRD SEAT	STATION WAGON/VAN
09	RIGHT THIRD SEAT	STATION WAGON/VAN
OT	OTHER	OR OUT OF POSITION

OCCSEX

CODE	DESCRIPTION	COMMENT
F	FEMALE	
M	MALE	
N	NOT APPLICABLE	OCCUPANT NOT AN ADULT DUMMY
U	UNKNOWN	

OCCTYP

CODE	DESCRIPTION	COMMENT
AO	APR OMNIDIRECTIONAL DUMMY	APROD
AS	APR SIDE IMPACT DUMMY	APRSID
BS	BIO-SID DUMMY	
CD	CADAVER	CADAVER
CH	CHILD DUMMY	CHLDDM
ES	EURO-SID DUMMY	
H3	HYBRID HI DUMMY	HYB3DM
HP	HUMANOID PEDESTRIAN DUMMY	HMNPED
P5	PART 572 DUMMY	P572DM
SD	HSRI SIDE IMPACT DUMMY	SID
TR	TRRL DUMMY	TRRLDM
OT	OTHER	OTHER

RECTYP

CODE	DESCRIPTION	COMMENT
DIG	DIGITAL TAPE RECORDER	
FMM	FM MULTIPLEXOR TAPE RECORDER	
FMT	FM TAPE RECORDER	
OSC	OSCILLOGRAPH	
UNK	UNKNOWN	
OTH	OTHER	

RSTMNT

CODE	DESCRIPTION	COMMENT
AP	A PILLAR	
BI	BELT - INTEGRATED SEAT MOUNT	
BC	BELT - CONVENTIONAL MOUNT	
BD	BELT - DOOR MOUNT	
BP	B PILLAR	
CP	C PILLAR	
AR	ARM REST	
DR	DOOR PANEL	
HR	HEAD REST	
HS	HEADER - SIDE	
HW	HEADER - WINDSHIELD	
DM	DASH PANEL - MID	
DT	DASH PANEL - TOP	
DP	DASH PANEL - UNSPECIFIED	
OT	OTHER	
NA	NOT APPLICABLE	
SB	SEAT BACK	
SP	SIDE PANEL	
SS	SIDE WINDOW SILL	
SW	STEERING WHEEL	

RSTTYP

CODE	DESCRIPTION	COMMENT
3PT	3 POINT BELT	LAP AND SHOULDER
ABG	AIR BAG	
ABT	AIR BELT	
APP	APR PADDING	
CHD	CHILD RESTRAINT	
DPL	DASHBOARD	
FHP	FIBERGLASS HONEYCOMB PADDING	FIBERGLASS HONEYCOMB
KNE	KNEE RESTRAINT	NOTE IF NOT PROVIDED BY MANUFACTURER
LAP	LAP BELT	NO SHOULDER BELT
MCP	MINICARS PADDING	
NON	NONE	UNRESTRAINED
PAD	PADDING	NOT APR,MINICARS,OR FIBERGLASS HONEYCOMB
PS2	PASSIVE 2 POINT BELT	
PS3	PASSIVE 3 POINT BELT	
RIG	RIGID WALL	
SBK	SEAT BACK	FOR REAR SEAT OCCUPANT
SCE	STR. COLUMN - EA	ENERGY ABSORBING
SCN	STR. COLUMN - NO EA	NOT ENERGY ABSORBING
SWE	STR. WHEEL - EA	ENERGY ABSORBING
SWN	STR. WHEEL - NO EA	NOT ENERGY ABSORBING
UNK	UNKNOWN	
OTH	OTHER	

SENATT (continued)

CODE	DESCRIPTION	COMMENT
DSRF	SILL - RIGHT FRONT	
DSRR	SILL - RIGHT REAR	
ENGN	ENGINE	
FFNL	FENDER FRONT LEFT	
FFNR	FENDER FRONT RIGHT	
FLLF	FLOORPAN - LEFT FRONT	
FLLR	FLOORPAN - LEFT REAR	
FLRF	FLOORPAN - RIGHT FRONT	
FLRR	FLOORPAN - RIGHT REAR	
FLTU	FLOORPAN TUNNEL	
FMRL	FEMUR - LEFT	
FMRR	FEMUR - RIGHT	
FOTL	FOOT - LEFT	
FOTR	FOOT - RIGHT	
FRCF	FRAME CROSSMEMBER - FRONT	
FRCR	FRAME CROSSMEMBER - REAR	
FRRF	FRAME RAIL - FRONT	
FRRR	FRAME RAIL - REAR	
FRSL	FRAME SIDE RAIL - LEFT	
FRSR	FRAME SIDE RAIL - RIGHT	
FWLL	FIREWALL	
HD90	HEAD 9 ARRAY - CENTER	
HD9X	HEAD 9 ARRAY - X ARM	FORMERLY HD92, Y AND Z AXES ONLY
HD9Y	HEAD 9 ARRAY - Y ARM	FORMERLY HD9 1, X AND Z AXES ONLY
HD9Z	HEAD 9 ARRAY - Z ARM	FORMERLY HD93, X AND Y AXES ONLY
HDCG	HEAD CG	
HDOT	HEAD OTHER	USE FOR OTHER THAN 9 ACCEL. ARRAY OR CG
HDRL	HEADER - LEFT	
HDRR	HEADER - RIGHT	
HLCR	HOOD LATCH CROSSMEMBER	
KNEL	KNEE - LEFT	
KNER	KNEE - RIGHT	

SENATT (continued)

CODE	DESCRIPTION	COMMENT
LCA0	LOAD CELL A10	
LCA1	LOAD CELL A1	
LCA2	LOAD CELL A2	
LCA3	LOAD CELL A3	
LCA4	LOAD CELL A4	
LCA5	LOAD CELL A5	
LCA6	LOAD CELL A6	
LCA7	LOAD CELL A7	
LCA8	LOAD CELL A8	
LCA9	LOAD CELL A9	
LCB0	LOAD CELL B10	
LCB1	LOAD CELL B1	
LCB2	LOAD CELL B2	
LCB3	LOAD CELL B3	
LCB4	LOAD CELL B4	
LCB5	LOAD CELL B5	
LCB6	LOAD CELL B6	
LCB7	LOAD CELL B7	
LCB8	LOAD CELL B8	
LCB9	LOAD CELL B9	
LCC0	LOAD CELL C10	
LCC1	LOAD CELL C1	
LCC2	LOAD CELL C2	
LCC3	LOAD CELL C3	
LCC4	LOAD CELL C4	
LCC5	LOAD CELL C5	
LCC6	LOAD CELL C6	
LCC7	LOAD CELL C7	
LCC8	LOAD CELL C8	
LCC9	LOAD CELL C9	
LCD0	LOAD CELL D10	
LCD1	LOAD CELL D1	

SENATT (continued)

CODE	DESCRIPTION	COMMENT
LCD2	LOAD CELL D2	
LCD3	LOAD CELL D3	
LCD4	LOAD CELL D4	
LCD5	LOAD CELL D5	
LCD6	LOAD CELL D6	
LCD7	LOAD CELL D7	
LCD8	LOAD CELL D8	
LCD9	LOAD CELL D9	
LPBI	LAP BELT - INBOARD	
LPBO	LAP BELT - OUTBOARD	
NEKL	NECK - LOWER	
NEKU	NECK - UPPER	
POLE	POLE	
PULM	PULMONARY SYSTEM	
PVCN	PELVIS - CENTER	
PVHP	PELVIS - H-POINT	TROCHANTERION
PVIL	PELVIS - ILIAC	
PVPS	PELVIS PUBIC SYMPHYSIS	
PVSA	PELVIS, SACRUM	
RAXL	REAR AXLE	
RBLA	RIB - LOWER ABDOMEN	
RBLL	RIB - LEFT LOWER	
RBLM	RIB - LEFT MIDDLE	
RBLU	RIB - LEFT UPPER	
RBRL	RIB - RIGHT LOWER	
RBRM	RIB - RIGHT MIDDLE	
RBRU	RIB - RIGHT UPPER	
RBUA	RIB - UPPER ABDOMEN	
REDK	REAR DECK	
ROLC	ROLLOVER CART	
RRLF	ROOF RAIL LEFT FRONT	
RRLR	ROOF RAIL LEFT REAR	
RRRF	ROOF RAIL RIGHT FRONT	
RRRR	ROOF RAIL RIGHT REAR	
SECF	SEAT - CENTERFRONT	
SECR	SEAT - CENTER REAR	
SELF	SEAT - LEFT FRONT	
SELR	SEAT - LEFT REAR	
SERF	SEAT - RIGHT FRONT	

SENATT (continued)

CODE	DESCRIPTION	COMMENT
SERR	SEAT - RIGHT REAR	
SHBE	SHOULDER BELT EXTENS'N	
SHBT	SHOULDER BELT	
SHLL	SHOULDER - LEFT	
SHLR	SHOULDER - RIGHT	
SLED	SLED	
SNML	STERNUM - LOWER	
SNMU	STERNUM - UPPER	
SPNL	SPINE - LOWER	T12
SPNM	SPINE - MIDDLE	T04
SPNU	SPINE - UPPER	T01
STCL	STEERING COLUMN	
STLF	SEAT TRACK - LEFT FRONT	
STLR	SEAT TRACK - LEFT REAR	
STRF	SEAT TRACK - RIGHT FRONT	
STRR	SEAT TRACK - RIGHT REAR	
SULF	SUSPENSION - LEFT FRONT	
SULR	SUSPENSION - LEFT REAR	
SURF	SUSPENSION - RIGHT FRONT	
SURR	SUSPENSION - RIGHT REAR	
SWHB	STEERING WHEEL HUB	
SWRM	STEERING WHEEL RIM	
TIBL	TIBIA - LEFT	
TIBR	TIBIA - RIGHT	
TRFC	TRUCK FLOOR - CENTER	
TRFL	TRUCK FLOOR - LEFT	
TRFR	TRUCK FLOOR - RIGHT	
VECG	VEHICLE CG	
OTHR	OTHER	

SENLOC

CODE	DESCRIPTION	COMMENT
01	LEFT FRONT SEAT	
02	RIGHT FRONT SEAT	
03	RIGHT REAR SEAT	
04	LEFT REAR SEAT	
05	CENTER FRONT SEAT	
06	CENTER REAR SEAT	
07	LEFT THIRD SEAT	STATION WAGON/VAN
08	CENTER THIRD SEAT	STATION WAGON/VAN
09	RIGHT THIRD SEAT	STATION WAGON/VAN
NA	NOT APPLICABLE	
OT	OTHER	OR OUT OF POSITION

SENTYP

CODE	DESCRIPTION	COMMENT
AA	ANGULAR ACCELEROMETER	
AC	ACCELEROMETER	
AD	ANGULAR DSPLCMNT TRANSDUCER	
AV	ANGULAR VELOCITY TRANSDUCER	
DS	DISPLACEMENT TRANSDUCER	
ET	EVENT TIME INDICATOR	ON/OFF STYLE SWITCH
HL	HIGH LEVEL	
LC	LOAD CELL	
PR	PRESSURE TRANSDUCER	
SG	STRAIN GAUGE	
TB	TIME BASED CHANNEL	
VL	VELOCITY TRANSDUCER	
OT	OTHER	

SEPOSN

CODE	DESCRIPTION	COMMENT
CN	CENTER POSITION	OF ADJUSTMENT RANGE
FW	FORWARD OF CENTER POSITION	
NO	NONADJUSTABLE SEAT	
RW	REARWARD OF CENTER POSITION	
UN	UNKNOWN	

SILENG

CODE	DESCRIPTION	COMMENT
DE	DIRECT ENGAGEMENT	BY COLLIDING OBJECT
NA	NOT APPLICABLE	
NO	NO DIRECT ENGAGEMENT	
UN	UNKNOWN	

STRSEP

CODE	DESCRIPTION	COMMENT
NA	NOT APPLICABLE	NO STEERING COLUMN SHEAR CAPSULE
NO	NO SEPARATION	OF STEERING COLUMN SHEAR CAPSULE
SP	SEPARATION	OF STEERING COLUMN SHEAR CAPSULE
UN	UNKNOWN	

TKCOND

CODE	DESCRIPTION	COMMENT
DRY	DRY	
ICY	ICY	
MUD	MUDDY	
SAN	SANDY	
SNO	SNOWY	
UNK	UNKNOWN	
WET	WET	
OTH	OTHER	

TKSURF

CODE	DESCRIPTION	COMMENT
ASH	ASPHALT	
CON	CONCRETE	
DOS	DIRT OR SAND	
UNK	UNKNOWN	
OTH	OTHER	

TRANSM

CODE	DESCRIPTION	COMMENT
A4	AUTOMATIC - FOUR WHEEL DRIVE	
AF	AUTOMATIC - FRONT WHEEL DRIVE	
AR	AUTOMATIC - REAR WHEEL DRIVE	
M4	MANUAL - 4 WHEEL DRIVE	
MF	MANUAL - FRONT WHEEL DRIVE	
MR	MANUAL - REAR WHEEL DRIVE	
NA	NOT APPLICABLE	
UN	UNKNOWN	
OT	OTHER	

TSTCFN

CODE	DESCRIPTION	COMMENT
ITB	IMPACTOR INTO BARRIER	
ITI	IMPACTOR INTO IMPACTOR	
ITV	IMPACTOR INTO VEHICLE	
ROL	ROLLOVER	
SLB	SLED WITH VEHICLE BODY	
VTB	VEHICLE INTO BARRIER	
VTI	VEHICLE INTO IMPACTOR	
VTV	VEHICLE INTO VEHICLE	
OTH	OTHER	

TSTPRF

CODE	DESCRIPTION	COMMENT
BAS	BUNDESANTALT FUER STRASSENWESE	
CAL	CALSPAN	
CAN	TRANSPORT CANADA	
DYS	DYNAMIC SCIENCE	
ENS	ENSCO	
FOI	FEDERAL OUTDOOR IMPACT LABORATORY	
FRD	FORD MOTOR COMPANY	
GMC	GENERAL MOTORS CORP.	
HDL	HEIDELBERG	
MCR	MCR TECHNOLOGY	FORMERLY MINICARS
MCW	MEDICAL COLLEGE OF WISC	
MGA	MGA RESEARCH	
MSE	MOBILITY SYSTEMS	
NTC	NTS - CALIFORNIA	FORMERLY AETL - CALIFORNIA
NTV	NTS - VIRGINIA	FORMERLY AETL - VIRGINIA
ONS	ONSER	
SWR	SWRI	
TNO	TNO-RD.VEH. RES'RCH INST.	
TRC	TRC OF OHIO	
TTI	TEXAS TRANSP. INSTITUTE	
UVA	UNIVERSITY OF VIRGINIA	
VWG	VOLKSWAGEN AG	
OTH	OTHER	

TSTTYP

CODE	DESCRIPTION	COMMENT
208	COMPLIANCE - FMVSS 208	OCCUPANT CRASH PROTECTION COMPLIANCE TEST
214	COMPLIANCE - FMVSS 214	SIDE IMPACT PROTECTION COMPLIANCE TEST
301	COMPLIANCE - FMVSS 214	FUEL SYSTEM INTEGRITY COMPLIANCE TEST
303	COMPLIANCE - FMVSS 303	FUEL SYSTEM INTEGRITY OF CNG VEHICLES
BAS	BASELINE TEST	CONVENTIONAL VEHICLE(S)
CLB	CALIBRATION TEST	
COM	COMPLIANCE TEST	OTHER
CRC	CRASH RECORDER TEST	
DEV	TEST PROCEDURE DEVEL.	
ELE	ELECTRIC VEHICLE TEST	
ENC	EXPERIMENTAL NEW CAR ASSESSMENT TEST	
INV	INVALIDATED TEST	
MOD	MODIFIED VEHICLE TEST	STRUCTURAL AND/OR INTERIOR MODIFICATIONS
NCA	NEW CAR ASSESSMENT TEST	
OCC	OCC PERFORMANCE TEST	
ONC	OPTIONAL NEW CAR ASSESSMENT TEST	
RSB	ROADSIDE BARRIER TEST	
RSV	RESEARCH SAFETY VEH. TEST	
RWS	REAL WORLD SIMULATION	
UNK	UNKNOWN	
OTH	OTHER	

UNITS

CODE	DESCRIPTION	COMMENT
CEN	DEGREES CELSIUS	TEMPERATURE
DEC	DECIBELS	SOUND
DEG	DEGREES	ANGULAR DISPLACEMENT
DP2	DEG/SEC(2)	ANGULAR ACCELERATION
DPS	DEG/SEC	ANGULAR VELOCITY
G'S	G'S	ACCELERATION
KPA	KILOPASCALS	ABSOLUTE PRESSURE
KPG	KILOPASCALS	GAUGE PRESSURE
KPH	KILOMETERS/HOUR	VELOCITY

UNITS (continued)

CODE	DESCRIPTION	COMMENT
MM	MILLIMETERS	DISPLACEMENT
MPM	MICROMET/MET	STRAIN
NON	DIMENSIONLESS	DIMENSIONLESS
NSC	NEWTON-SECONDS	IMPULSE
NWM	NEWTON-METERS	TORQUE
NWT	NEWTONS	FORCE
PST	PERCENT STRAIN	STRAIN
RMM	RECIPROCAL MM	CURVATURE
SEC	SECONDS	TIME
VOL	VOLTS	VOLTAGE
OTH	OTHER	OTHER

APPENDIX C: FIELD FORMATS

1. TEST INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
VERNO	predefined coded text=V4	2 char
TITLE	free text	70 char
TSTOBJ	free text	70 char
TSTDAT	date text (DD/MMM/YYYY)	11 char
TSTPRF	coded text	3 char
CONNO	free text	17 char
TSTREF	free text	10 char
TSTTYP	coded text	3 char
TSTCFN	coded text	3 char
TKSURF	coded text	3 char
TKCOND	coded text	3 char
TEMP	integer	-99 to 99
RECTYP	coded text	3 char
LINK	coded text	3 char
CLSSPD	float	0 to 200.00
IMPANG	integer	0 to 359
OFFSET	integer	-9999 to 9999
IMPPNT	integer	-9999 to 9999
TOTCRV	integer	1 to 200
TSTCOM	free text	70 char

2. VEHICLE INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
VEHNO	integer	1 to 2
MAKE	coded text	4 char
MODEL	coded text	4 char
YEAR	integer	4 char
NHTSANO	free text	9 char
BODY	coded text	2 char
VIN	free text	20 char
ENGINE	coded text	4 char
ENGDSP	float	0 to 9999
TRANSM	coded text	2 char
VEHTWT	integer	0 to 99999
WHLBAS	integer	0 to 99999
VEHLEN	integer	0 to 99999
VEHWID	integer	0 to 9999
VEHCG	integer	0 to 9999
STRSEP	coded text	2 char
COLMEC	coded text	3 char
MODIND	coded text	1 char
MODDSC	free text	70 char
BX1	integer	0 to 99999
BX2	integer	0 to 99999

2. VEHICLE INFORMATION (continued)

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
BX3	integer	0 to 99999
BX4	integer	0 to 99999
BX5	integer	0 to 99999
BX6	integer	0 to 99999
BX7	integer	0 to 99999
BX8	integer	0 to 99999
BX9	integer	0 to 99999
BX10	integer	0 to 99999
BX11	integer	0 to 99999
BX12	integer	0 to 99999
BX13	integer	0 to 99999
BX14	integer	0 to 99999
BX15	integer	0 to 99999
BX16	integer	0 to 99999
BX17	integer	0 to 99999
BX18	integer	0 to 99999
BX19	integer	0 to 99999
BX20	integer	0 to 99999
BX21	integer	0 to 99999
VEHSPD	float	0 to 99999
CRBANG	integer	0 to 359
PDOF	integer	0 to 359

2. VEHICLE INFORMATION (continued)

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
BMPENG	coded text	2 char
SILENG	coded text	2 char
APLENG	coded text	2 char
DPD1	integer	-9999 to 9999
DPD2	integer	-9999 to 9999
DPD3	integer	-9999 to 9999
DPD4	integer	-9999 to 9999
DPD5	integer	-9999 to 9999
DPD6	integer	-9999 to 9999
VDI	free text	7 char
LENCNT	integer	0 to 99999
DAMDST	integer	-9999 to 99999
CRHDST	integer	0 to 9999
AX1	integer	0 to 99999
AX2	integer	0 to 99999
AX3	integer	0 to 99999
AX4	integer	0 to 99999
AX5	integer	0 to 99999
AX6	integer	0 to 99999
AX7	integer	0 to 99999
AX8	integer	0 to 99999

2. VEHICLE INFORMATION (continued)

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
AX9	integer	0 to 99999
AX10	integer	0 to 99999
AX11	integer	0 to 99999
AX12	integer	0 to 99999
AX13	integer	0 to 99999
AX14	integer	0 to 99999
AX15	integer	0 to 99999
AX16	integer	0 to 99999
AX17	integer	0 to 99999
AX18	integer	0 to 99999
AX19	integer	0 to 99999
AX20	integer	0 to 99999
AX21	integer	0 to 99999
CARANG	integer	0 to 359
VEHOR	integer	0 to 90
VEHCOM	free text	70 char

3. BARRIER INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
BARRIG	coded text	1 char
BARSHP	coded text	3 char
BARANG	integer	0 to 90
BARDIA	integer	0 to 9999
BARCOM	free text	70 char

4. OCCUPANT INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
VEHNO	integer	1 to 2
OCCLOC	coded text	2 char
OCCTYP	coded text	2 char
OCCAGE	integer	0 to 99
OCCSEX	coded text	1 char
OCCHT	integer	0 to 9999
OCCWT	integer	0 to 999
MTHCAL	coded text	2 char
DUMSIZ	coded text	2 char
DUMMAN	free text	70 char

4. OCCUPANT INFORMATION (continued)

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
DUMMOD	free text	70 char
DUMDSC	free text	70 char
HH	integer	0 to 9999
HW	integer	0 to 9999
HR	integer	0 to 9999
HS	integer	0 to 9999
CD	integer	0 to 9999
CS	integer	0 to 9999
AD	integer	0 to 9999
HD	integer	0 to 9999
KD	integer	0 to 9999
HB	integer	0 to 9999
NB	integer	0 to 9999
CB	integer	0 to 9999
KB	integer	0 to 9999
SEPOSN	coded text	2 char
CNTRH1	coded text	2 char
CNTRH2	coded text	2 char
CNTRC1	coded text	2 char
CNTRC2	coded text	2 char
CNTRL1	coded text	2 char

4. OCCUPANT INFORMATION (continued)

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
CNTRL2	coded text	2 char
HIC	integer	0 to 9999
T1	float	0 to 999999 (max)
T2	float	0 to 999999 (max)
CLIP3M	float	0 to 99999
LFEM	integer	-99999 to 0
RFEM	integer	-99999 to 0
CSI	integer	0 to 9999
LBELT	integer	0 to 99999
SBELT	integer	0 to 99999
TTI	float	0 to 99999
PELVG	float	0 to 99999
OCCCOM	free text	70 char

5. RESTRAINTS INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
VEHNO	integer	1 to 2
OCCLOC	coded text	2 char
RSTNO	integer	1 to 9
RSTTYP	coded text	3 char
RSTMNT	coded text	2 char
DEPLOY	coded text	2 char
RSTCOM	free text	70 char

6. INSTRUMENTATION INFORMATION

FIELD NAME	DATA TYPE	MAXIMUM FIELD LENGTH/RANGE
TSTNO	predefined text=0	1 char
VEHNO	integer	1 to 2
CURNO	integer	1 to 200
SENTYP	coded text	2 char
SENLOC	coded text	2 char
SENATT	coded text	4 char
AXIS	coded text	2 char
UNITS	coded text	3 char
PREFIL	integer	0 to 99999
INSMAN	free text	70 char
CALDAT	date text (DD/MMM/YYYY)	11 char
INSRAT	integer	-999999 to 999999
CHLMAX	integer	0 to 100
INIVEL	float	-200 to 200
NFP	integer	-10000 to 0
NLP	integer	0 to 99999
DELT	integer	0 to 999999
DASTAT	coded text	2 char
CHSTAT	coded text	1 char
INSCOM	free text	70 char

APPENDIX D: DATA COORDINATE SYSTEM

With the introduction of this version (V4) of the NHTSA data format, all submissions will conform to SAE J211/1 MAR95 Instrumentation for Impact Test. Please refer to SAE J211 for a complete description of the coordinate system and signal polarities for vehicle occupants.

USING THE COORDINATE SYSTEM CORRECTLY

The rules for determining the sign conventions described below will enable anyone involved in NHTSA-sponsored testing to determine the proper sign and coordinate axis for any measured quantity.

All coordinate systems are orthogonal, three-dimensional, and right handed. The global coordinate systems for the vehicle and the test occupants are shown in Figure D-1. The coordinate system for the nine accelerometer head array is shown in Figure D-2, along with the proper SENATT codes. Table D-1 lists the polarity of the sensor output from various dummy manipulations when using this coordinate system.

VEHICLE GLOBAL COORDINATE SYSTEM

- ▶ X is positive forward
- ▶ Y is positive right (toward the passenger side door)
- ▶ Z is positive down

OCCUPANT GLOBAL COORDINATE SYSTEM (all occupant types - OCCTYP)

- ▶ X is positive forward (posterior to anterior)
- ▶ Y is positive right
- ▶ Z is positive down

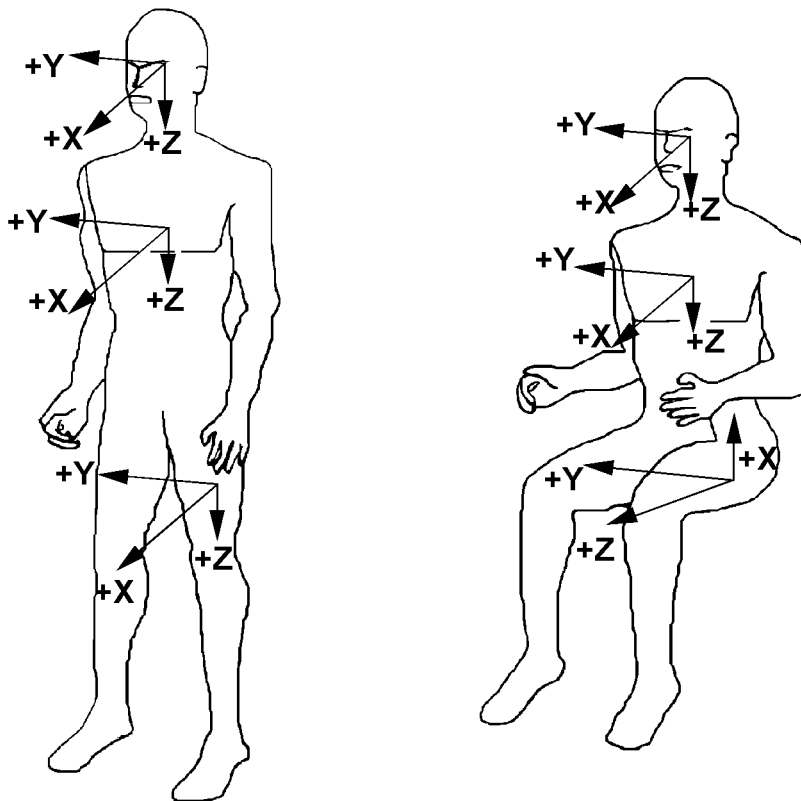
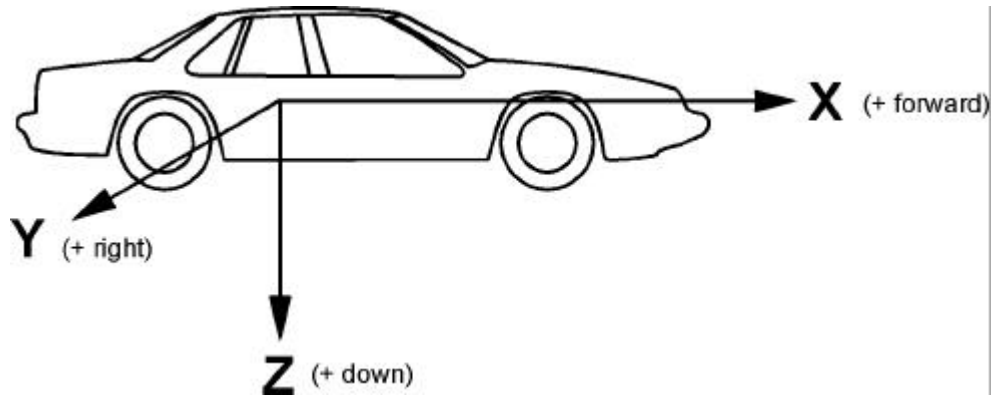


Figure D-1: Vehicle and Body-Based Coordinate Systems

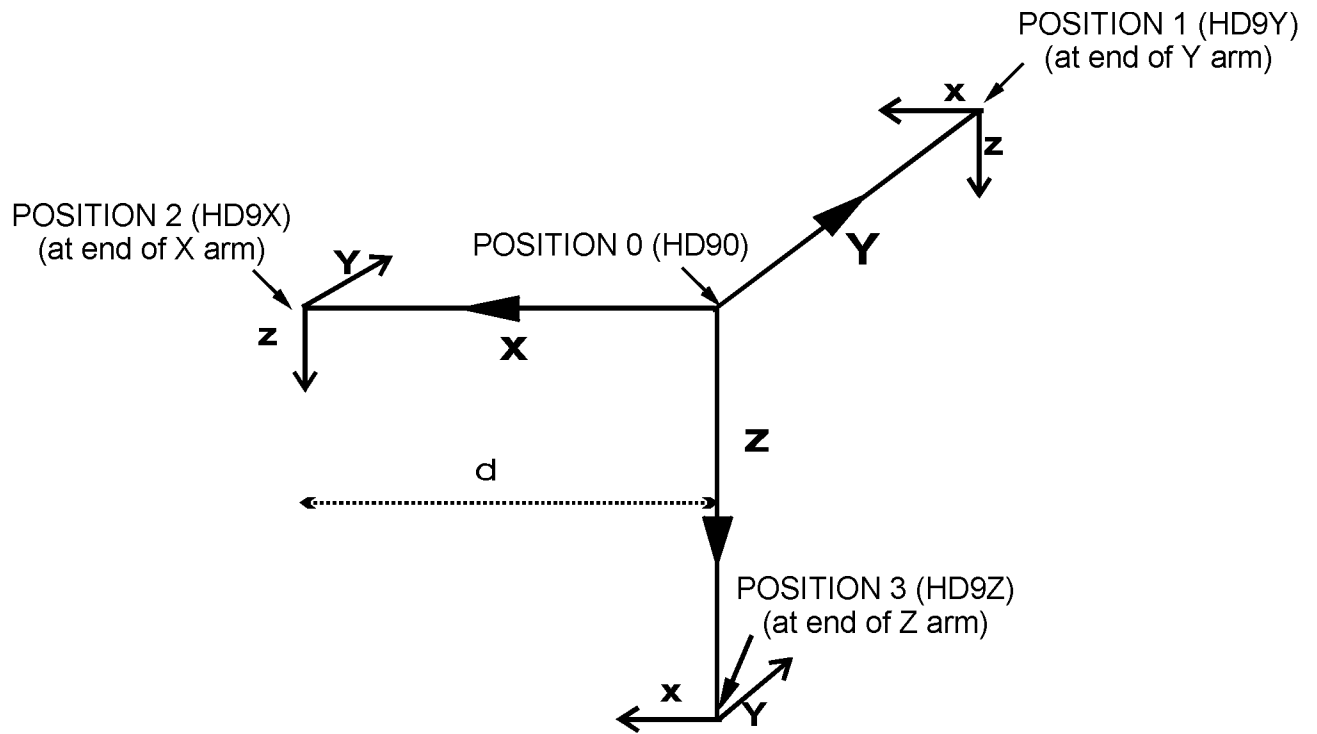


Figure D-2: Coordinate System for 9-Accelerometer Array

TABLE D.1
 Dummy Manipulations for Checking Recorded Load Cell
 Polarity Relative to Sign Convention

Load Cell	Measure	Dummy Manipulations	Polarity
Upper and lower neck loads	Fx	Head rearward, chest forward	+
	Fy	Head leftward, chest rightward	+
	Fz	Head upward, chest downward	+
	Mx	Left ear toward left shoulder	+
	My	Chin toward sternum	+
	Mz	Chin toward left shoulder	+
Left shoulder loads (BIOSID)	Fx	Left shoulder forward, chest rearward	+
	Fy	Left shoulder rightward, chest leftward	+
	Fz	Left shoulder downward, chest upward	+
Right shoulder loads (BIOSID)	Fx	Right shoulder forward, chest rearward	+
	Fy	Right shoulder rightward, chest leftward	+
	Fz	Right shoulder downward, chest upward	+
Clavicle loads	Fx	Shoulder forward, chest rearward	+
	Fz	Shoulder downward, chest rearward	+
Upper and lower lumbar spine	Fx	Chest rearward, Pelvis forward	+
	Fy	Chest leftward, pelvis rightward	+
	Fz	Chest upward, pelvis downward	+
	Mx	Left shoulder toward left hip	+
	My	Sternum toward front of legs	+
	Mz	Right shoulder forward, left shoulder rearward	+
Sacrum load (BIOSID)	Fy	Left H-point pad leftward, chest rightward	+
Left iliac load (BIOSID)	Fy	Left iliac rightward, chest leftward	+

TABLE D.1 (continued)

Load Cell	Measure	Dummy Manipulations	Polarity
Right iliac load (BIOSID)	Fy	Right iliac rightward, chest leftward	+
Pubic load (side impact)	Fy	Right H-point pad leftward, left pad rightward	(-)
Crotch belt loads	Fx	Pubic rearward, pelvis forward	(-)
	Fz	Pubic upward, chest downward	(-)
Iliac lap belt loads	Fx	Upper iliac spine rearward, chest forward	(-)
	My	Upper iliac spine rearward, chest forward	+
Left side abdominal load (Eurosid-1)	Fy	Left side of abdomen rightward, chest leftward	+
Right side abdominal load (Eurosid-1)	Fy	Right side of abdomen leftward, chest rightward	(-)
Femur loads (dummy in seated position, femurs horizontal)	Fx	Knee upward, upper femur downward	+
	Fy	Knee rightward, upper femur leftward	+
	Fz	Knee forward, pelvis rearward	+
	Mx	Knee leftward, hold upper femur in place	+
	My	Knee upward, hold upper femur in place	+
Knee clevis	Mz	Tibia leftward, hold pelvis in place	+
		Tibia downward, femur upward	+
Upper tibia loads	Fz	Tibia downward, femur upward	+
	Mx	Ankle leftward, hold knee in place	+
	My	Ankle forward, bottom of knee clevis rearward	+
Lower tibia loads	Fx	Ankle forward, knee rearward	+
	Fy	Ankle rightward, knee leftward	+
	Mx	Ankle leftward, hold knee in place	+
	My	Ankle forward, bottom of knee clevis rearward	+