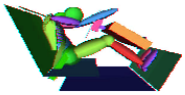
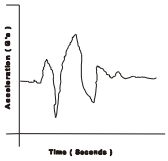
NHTSA
Test Reference Guide
Version 5

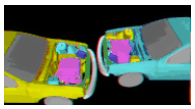
Volume II : Biomechanics Tests

Prepared for:

U.S. Department of Transportation
(DOT)







National Highway Traffic Safety Administration (NHTSA)

Office of the Associate Administrator for Research and Development

Revision — June 2013

Prepared by:

Vehicle Safety Research

Copyright © 1998-2013 NHTSA / US DOT

[This page intentionally left blank.]

Table of Contents

Table of Contents — *i*

List of Figures — *vii*

List of Tables — *ix*

Preface — *1*

Release Notes — *4*

Content — **4**

Code Library — **5**

Introduction — *6*

Background — **6**

Data Organization — **6**

Digital Media Formats and Software Tools — **7**

Other Media Formats — **7**

Return Policy — **7**

Chapter 1 : Media Formats and Software Tools — *8*

1.1 Media Types and Layout — **8**

1.2 A Data Entry Software – Entrée V5 for Windows — **9**

1.2.1 System Requirements — 9

1.2.2 A Customer Developed Software — 9

1.3 A Database for NHTSA Codes — **10**

Chapter 2 : File Formats and Information Records — *11*

2.1 Field Types — **11**

2.2 Specification Files and Signal Files — **12**

2.2.1 Structures of Specification Files — 12

2.2.2 Specification File Examples — 14

2.2.3 Signal Data — 23

2.3 General Test Information — **25**

1. VERNO — Version Number — 25
2. TITLE — Contract or Study Title — 25
3. TSTOBJ — Test Objectives — 26
4. TSTDAT — Test Date — 26
5. TSTPRF — Test Performer — 26
6. CONNO — Contract Number — 26
7. TSTREF — Test Reference Number — 26
8. TSTCFN — Test Configuration — 26
9. TEMP — Ambient Temperature — 26

10. RECTYP — Type of Recorder 27
11. LINK — Data Link to Recorder 27
12. CLSSPD — Closing Speed 27
13. IMPANG — Impact Angle 27
14. TOTCRV — Total Number of Curves 28
15. OCCTYP — Occupant Type 28
16. TSTCOM — Test Commentary 28

2.4 Dummy Occupant Information 29
1. DOCCLOC — Dummy Occupant Location 29
2. DOCCSEX — Dummy Occupant Sex 29
3. DSEPOSN — Dummy Seat Position 29
4. HIC — Head Injury Criterion 29
5. T1 — Lower Boundary of HIC Time Interval 30
6. T2 — Upper Boundary of HIC Time Interval 30
7. CLIP3M — Thorax Region Peak Acceleration Measurement 30
8. LFEM — Left Femur Peak Load Measurement 30
9. RFEM — Right Femur Peak Load Measurement 30
10. CSI — Chest Severity Index 30
11. LBELT — Lap Belt Peak Load Measurement 31
12. SBELT — Shoulder Belt Peak Load Measurement 31
13. TTI — Thoracic Trauma Index 31
14. PELVG — Pelvic G's 31
15. CTI — Combined Thoracic Index 31
16. VC — Viscous Criterion 31
17. CMAX — Maximum Chest Compression 32
18. NIJ — NHTSA Neck Injury Criterion 32
19. MTHCAL — Method of Calibration 32
20. DUMSIZ — Dummy Size 32
21. DUMMAN — Dummy Manufacturer and Serial Number 32
22. DUMMOD — Dummy Modification Description 1 32
23. DUMDSC — Dummy Description 2, 33
24. DCOMPWT — Dummy Component Weight 33
25. DOCCOM — Occupant Commentary 33

2.5 Biological Specimen Occupant Information 34
1. BOCCLOC — Biological Occupant Location 34
2. BOCCSEX — Biological Occupant Sex 34
3. BSEPOSN — Biological Seat Position 34
4. OCCAGE — Occupant Age 34
5. OCCWT — Occupant Weight 34
6. BCOMPWT — Biological Component Mass 35
7. FRCTRB — Number of Fractured Ribs 35
8. RBFRCT — Number of Rib Fractures 35
9. OCCREF — Occupant Reference Number 36
10 NOTEST — Number of Tests 36
11. DTEDTH — Occupant Date of Death 36
12. CSEDTH — Occupant Cause of Death 36

13. CADAPP — Occupant Appearance 36
14. BEDCON — Length of Bed Confinement 36
15. CADAN — Occupant Anomaly 37
16. AORPRE — Presence of Cardiovascular Pressurization 37
17. CERPRE — Presence of Head Pressurization 37
18. PULPRE — Presence of Pulmonary Pressurization 37
19. BMC — Bone Mineral Content 37
20. BMCLOC — BMC Measurement Location 37
21. BMCUNITS — BMC Measurement Units 38
22. BMCMETHOD — BMC Measurement Method 38
23. BMCCOM — BMC Commentary 38
24. BOCCOM — Occupant Commentary 38

2.6 Rib Bending Test Information 39
1. RIBNO — Rib Number 39
2. RIBLOC — Rib Location 39
3. RIBIN — Moment of Inertia for Rib 39
4. NADIS — Neutral Axis Distance of the Rib 39
5. SPLEN — Rib Length of Span 40
6. DEFL — Deflection of the Rib 40
7. LOAD — Load on the Rib 40
8. BRKLD — Breakload for the Rib 41
9. ARMAR — Area of Bone Marrow of Rib Segment 41
10. RAREA — Total Cross-sectional Area of the Rib 41

2.7 Anthropometric Information 42
1. STATUR — Stature 42
2. SHLDHT — Acromial Shoulder Height 42
3. VRTSYM — Vertex to Symphysion Length 43
4. WASTHT — Waist Height 43
5. SHLDBD — Biacromial Shoulder Breadth 43
6. CHSTBD — Chest Breadth 44
7. WASTBD — Waist Breadth 44
8. HIPBD — Hip Breadth 44
9. SHLDEL — Shoulder to Elbow (Acromion to Radiale) Length 45
10. FARMHD— Forearm - Hand Length 45
11. TIBLHT — Tibiale Height 46
12. ANKLHT — Ankle Height 46
13. FOOTBD — Foot Breadth 47
14. FOOTLN — Foot Length 47
15. HDTROC — Head to Trochanterion Distance 48
16. SEATHT — Seated Height 48
17. KNEEHT — Knee Height, Seated 49
18. HEADLN — Head Length 49
19. HEADBD — Head Breadth 50
20. HEADCH — Head Height (Vertex - Mentum) 50
21. BICPCR — Bicep Circumference 50
22. ELBWCR — Elbow Circumference 51

23. FARMCR — Forearm Circumference 51
24. WRSTCR — Wrist Circumference 51
25. THGHCR — Thigh Circumference 52
26. LTGHCR — Lower Thigh Circumference 52
27. KNEECR — Knee Circumference 53
28. CALFCR — Calf Circumference 53
29. ANKLCR — Ankle Circumference 54
30. NECKCR — Neck Circumference 54
31. SCYECR — Scye (Armpit to Shoulder) Circumference 54
32. CHSTCR — Chest Circumference 55
33. WASTCR — Waist Circumference 55
34. BUTTCR — Buttock Circumference 55
35. CHSTDP — Chest (Bust) Depth 56
36. WASTDP — Waist Depth 56
37. BUTTDP — Buttock Depth 56
38. INSCYE — Interscye Distance 57

2.8 Occupant Injury Information 58
1. INJNO — Injury Number 58
2. BODYRG — Body Region 58
3. ASPECT — Body Aspect 58
4. LESION — Injury 59
5. SYSORG — Injured Organ 59
6. AIS — Abbreviated Injury Scale 59
7. AIS90 — AIS90 Injury Code 59
8. INJCOM — Injury Commentary 59

2.9 Occupant Restraints Information 60
1. RSTNO — Restraint Number 60
2. RSTTYP — Restraint Type 60
3. RSTMNT — Restraint Mount 60
4. DEPLOY — Inflator/Belt Pre-tensioner Deployment 61
5. RSTCOM — Restraint Commentary 61

2.10 Instrumentation Information 62
1. CURNO — Curve Number 62
2. SENTYP — Sensor Type 62
3. SENLOC — Sensor Location 62
4. SENATT — Sensor Attachment 62
5. AXIS — Axis Direction of the Sensor 63
6. XUNITS - Time Units or 'Independent Axis' Units 63
7. YUNITS - Data Measurement Units 63
8. PREFIL — Pre-filter Frequency 63
9. INSMAN — Manufacturer of the Instrument 64
10. CALDAT — Calibration Date 64
11. INSRAT — Instrument Rating 64
12. CHLMAX — Channel Maximum Rating 64
13. INIVEL — Initial Velocity 64

14. NFP — Number of First Point 64
15. NLP — Number of Last Point 65
16. DELT — Time Increment (Time Step) 65
17. DASTAT — Data Status 65
18. CHSTAT — Channel Status 65
19. INSCOM — Instrumentation Commentary 65

2.11 Chest Band Occupant Information 67
1. BANDNO — Chest Band Number 67
2. CHSDPT — Chest Depth 67
3. CHSBRD — Chest Breadth 68
4. BANLEN — Chest Band Length 68
5. ANTLOC — Anterior Vertical Location 69
6. POSLOC — Posterior Vertical Location 70
7. GAGSTR — Curve Number of the Gauge Relative to the Sternum 71
8. DISSTR — Distance Referenced to the Sternum 72
9. GAGSPN — Curve Number of the Gauge Relative to the Spine 72
10. DISSPN — Distance Referenced to the Spine 72
11. TOTGAG — Total Number of Gauges 73
12. CHBCOM — Chest Band Commentary 73

2.12 Chest Band Gauge Information 74
1. BANDNO — Chest Band Number 76
2. GAGENO — Gauge Number 76
3. GAGDIS — Gauge Distance 77
4. BANLEN — Chest Band Length 77
5. CURNO — Curve Number of a Specific Gauge 78
6. GAGCOM — Gage Commentary 79

2.13 High-Speed Video Information 80
1. CAMNO — Camera Number 80
2. TSTREF — Test Reference Number 80
3. VSCFACTOR — Video Frame Number Scale Factor 80
4. VIEWDESC — View Description 80
5. COMMENT — Camera Commentary 81

Chapter 3 : Test Report Format 82

Chapter 4 : Pre- and Post-Event Images 84

4.1 Digital Images 84

4.2 Processed Film Images 84

Chapter 5 : Event Images, Film, and Video 85

5.1 High-Speed Film 85

5.2 High-Speed Digital Video 85
5.2.1 The High-Speed Digital Video Specification File 85
5.2.2 The Sequential Image and Movie Submission Format 86
5.2.3 The Media Format 86

5.3 Other Event Images ____ **88**

Appendix A: Data Coordinate System ____ ***89***

A-1. Using the Coordinate System Correctly ____ **89**

A-2. Vehicle Global Coordinate System ____ **89**

A-3. Occupant Global Coordinate System ____ **90**

Appendix B: Technical Support Information ____ ***93***

B-1. Reference Guide Updates and Software Updates ____ **93**

B-2. Requesting Assistance ____ **93**

B-3. Reporting a Problem ____ **94**

List of Figures

Figure 0-1 Database selection 2
Figure 2-1 A flowchart for determining biomechanics information record sets in an EV5 file 13
Figure 2-2 Impact angle measurement 27
Figure 2-3 RBFRCT - Number of Rib Fractures 35
Figure 2-4 SPLEN – Rib Length of Span 40
Figure 2-5 STATUR – Stature 42
Figure 2-6 SHLDHT – Shoulder Height (Acromial) 42
Figure 2-7 VRTSYM – Vertex to Symphysion Length 43
Figure 2-8 WASTHT - Test Occupant's Waist Height 43
Figure 2-9 SHLDBD - Shoulder Breadth 43
Figure 2-10 CHSTBD - Chest Breadth 44
Figure 2-11 WASTBD - Waist Breadth 44
Figure 2-12 HIPBD - Hip Breadth 44
Figure 2-13 SHLDEL - Shoulder to Elbow Length 45
Figure 2-14 FARMHD - Forearm-Hand Length 45
Figure 2-15 TIBLHT - Tibiale Height 46
Figure 2-16 ANKLHT - Ankle Height 46
Figure 2-17 FOOTBD - Foot Breadth 47
Figure 2-18 FOOTLN - Foot Length 47
Figure 2-19 HDTROC - Head to Trochanterion Distance 48
Figure 2-20 SEATHT - Seated Height 48
Figure 2-21 KNEEHT - Knee Height, Seated 49
Figure 2-22 HEADLN - Head Length 49
Figure 2-23 HEADBD - Head Breadth 50
Figure 2-24 HEADCH - Head Height (Vertex – Mentum) 50
Figure 2-25 BICPCR - Bicep Circumference 50
Figure 2-26 ELBWCR - Elbow Circumference 51
Figure 2-27 FARMCR - Forearm Circumference 51
Figure 2-28 WRSTCR - Wrist Circumference 51
Figure 2-29 THGHCR - Thigh Circumference 52
Figure 2-30 LTGHCR - Lower Thigh Circumference 52
Figure 2-31 KNEECR - Knee Circumference 53
Figure 2-32 CALCR - Calf Circumference 53
Figure 2-33 ANKLCR - Ankle Circumference 54
Figure 2-34 NECKCR - Neck Circumference 54
Figure 2-35 SCYECR - Scye (Armpit to Shoulder) Circumference 54
Figure 2-36 CHSTCR - Chest Circumference 55
Figure 2-37 WASTCR - Waist Circumference 55
Figure 2-38 BUTTCR - Buttock Circumference 55
Figure 2-39 CHSTDP - Chest (Bust) Depth 56
Figure 2-40 WASTDP - Waist Depth 56
Figure 2-41 BUTTDP - Buttock Depth 56
Figure 2-42 INSCYE – Interscye Distance 57
Figure 2-43 CHSDPT – Chest Depth 67

Figure 2-44 CHSBRD – Chest Breadth 68
Figure 2-45 BANLEN - Chest Band Length 68
Figure 2-46 ANTLOC - Anterior Location - A 69
Figure 2-47 ANTLOC - Anterior Location - B 70
Figure 2-48 POSLOC - Posterior Location 71
Figure 2-49 GAGSTR – Curve Number of Gauge Relative to Sternum 71
Figure 2-50 DISSPN - Distance Referenced to the Spine 72
Figure 2-51 Chest Cross Section - Top View 74
Figure 2-52 Chest Band Lying Flat 75
Figure 2-53 BANDNO – Chest Band Number 76
Figure 2-54 GAGENO – Chest Band Lying Flat 76
Figure 2-55 GAGDIS – Gauge Distance 77
Figure 2-56 BANLEN - Chest Band Length 77
Figure 2-57 CURNO - Curve Number 78
Figure A-1 Vehicle Global Coordinate System 89
Figure A-2 Occupant Global Coordinate System 90
Figure A-3 Nine-Accelerometer Coordinate System 91

List of Tables

Table 2-1 EV5 information record sets and their keys 14
Table 2-2 Signal Filename Examples 24

Preface

This guide and its companion guides are to be used to create formatted submissions of data collected from automotive crash tests.

There are four guides:

Volume I: NHTSA Vehicle Test Reference Guide
Volume II: NHTSA Biomechanics Test Reference Guide
Volume III: NHTSA Component Test Reference Guide
Volume IV: NHTSA Signal Waveform Generator Test Reference Guide (Suspended)

You are reading Volume II, the NHTSA Biomechanics Test Reference Guide.

The first step in creating a data submission is to determine which database to use for your test data. The design and partitioning of each database is centered upon the focus of the testing. Test programs focused on the evaluation of the **occupant** should be submitted to the Biomechanics Database; tests focused on the evaluation of **vehicles** belong in either the Vehicle Database or the Component Database; and tests focused on the evaluation of the **data acquisition system** belong in the Signal Waveform Generator Database. Refer to the flow chart in ***Figure 0-1 Database selection***, on the next page, to determine which database is appropriate for your test.

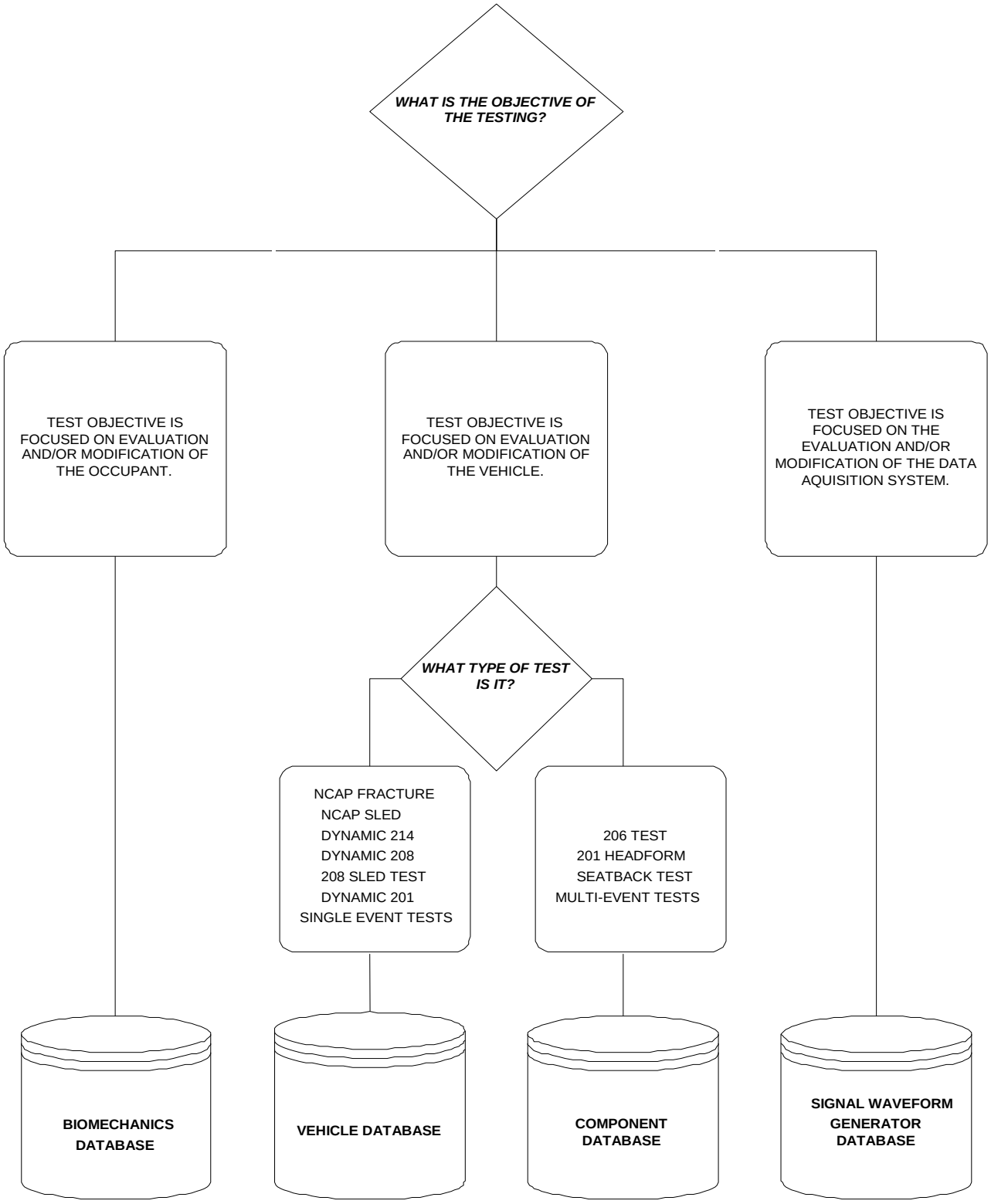


Figure 0-1 Database selection

In Figure 0-1, test types can be found from the NHTSA_TSTTYP table in the NHTSA code library named NCodes.mdb (*see Section 1.3 A Database for NHTSA Codes*). Several examples may help to illustrate where certain types of tests fit into the databases:

- All regulatory tests shall be submitted to the Vehicle Database or Component Database.
- Tests that are performed as part of the new car assessment program shall be submitted to the Vehicle Database.
- Forward Collision Warning (FCW), Lane Departure Warning (LDW) and Dynamic Rollover (DRO) Test Data shall be submitted to the Vehicle Database.
- Pendulum tests to cadavers shall be submitted to the Biomechanics Database.
- Lateral vehicle-to-vehicle impacts shall be submitted to the Vehicle Database.
- Sled tests with new dummy designs shall be submitted to the Biomechanics Database.
- Tests featuring a car body on a sled designed to evaluate occupant response should be submitted to the Biomechanics Database, except the 206-sled test.
- Tests featuring a car body on a sled designed to evaluate vehicle response should be submitted to the Vehicle Database.
- Tests to record a standard waveform using new car assessment conditioning amplifiers shall be submitted to the Signal Waveform Generator Database.

In many research cases, it will be difficult to determine whether testing is focused on evaluation of the vehicle or evaluation of the occupant. Always check with the COTR in determining which database tests should be submitted. In all cases where the COTR's advice is contrary to this guide, send email to nrd.softdev@nhtsa.dot.gov.

Release Notes

This section details changes between the current version of this guide, dated as of March 6, 2001, and the most recent version preceding this guide.

Content

- The four Test Reference Guides have been substantially merged to consolidate common information into a more easily maintained format. However, they are still distributed separately at this time.
- All guides updated to represent the version 5 schema and its corresponding coding.
- Sections added to address video, photos, and contractor reports.
- X-Y measurement / channel data is now permitted when the independent coordinate of a measurement is non-uniformly incremental (non-constant delta between adjacent X values).
- Data coordinate systems information moved to a common appendix in ***Appendix A: Data Coordinate System*** for easier reading and maintenance.
- Technical support appendix added in ***Appendix B: Technical Support Information***.
- Updated information on Version 5 Entrée for Windows.
- The OCCTYP variable replaces DOCCTYP and BOCCTYP and has been moved to the TEST record section in order to support business rules controlling content of the specification data file.
- Rib bending information has been extracted into its own record section.
- New specification data have been added to the Biological Occupant portion of the specification to capture information on the bone mineral content of occupants.
- Added high-speed video information to Chapter 2.
- Simplified definitions and corrected errors.
- The index of a specification data is consistent with the order number of this data in an information record.
- All code tables have been removed since they can be checked out from Entrée V5 for Windows.

Code Library

- Code library, Ncodes.mdb, explaining codes used in the NHTSA Test Reference Guides are now available through the NHTSA Research and Development web site: Entree for Windows | National Highway Traffic Safety Administration (NHTSA). It is also a database employed for validating codes by the Entrée for windows (see Section 1.3 A Database for NHTSA Codes).

Return to Table of Contents

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. For each test conducted for the agency, data is recorded from various transducers mounted to the test dummies or vehicles, high-speed films or videos are recorded to document the event, still pictures of the test setup are taken, and a written report is generated. Since 1978, these data have been loaded into a single data repository, where NHTSA staff and the public can access the data and conduct analysis.

This reference guide has been written for two reasons. The first is to document the format and content requirements for submission of data, films, videos and reports to the NHTSA database. 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.

Data Organization

Four types of crash test data can be submitted to the NHTSA Biomechanics database:

- **Electronic Data** (Chapter 2) - General quantitative information about the test setup and results as well as transducer output time-history data.

- **Written Report** (Chapter 3) - A report containing information about the test, such as test setup diagrams and test anomalies. The written report should be submitted in digital form using the Adobe PDF format. Alternatively, a paper copy of the report is acceptable.

- **Pre/Post-Event Images** (Chapter 4) - Pre- or post- event images of the test environment. These may be in the form of film or digital video, time sequenced or still images.

- **Event Images** (Chapter 5) - Film, video, or still images captured during the impact event. The images may be submitted on processed prints from photo-reactive film or on CCD cameras.

Chapters 2 through 5 of this guide provide instructions for formatting of each the above data types.

Digital Media Formats and Software Tools

The digital crash test information should be submitted to NHTSA via CD/DVD ROMs or downloadable web sites. ***Chapter 1 : Media Formats and Software Tools*** describes details on acceptable media, the layout of directories and files on the media, and software tools for generating quality formatted specification files.

Other Media Formats

Other media, including high-speed films, VHS or BETA videotapes, paper reports, or X-Rays should be submitted along with the digital media. If you have data that you wish to submit but which is not specified in this guide, please send email to

nrd.softdev@nhtsa.dot.gov

or contact the NHTSA COTR responsible for your submission.

Return Policy

Submissions that cannot be processed, or which have too many errors found by the validation system of the software, ***Entrée V5 for windows***, will be returned to the contractor to be corrected and resubmitted.

Return to Table of Contents

Chapter 1 : Media Formats and Software Tools

Each submission consists of multiple types of data: descriptive test information defined later in this guide, measurement data digitized from the test instrumentation signal traces, a written report of the testing, and still images and video before, during, and after the test event. Several pieces of physical media may be necessary to record all of this information for submission.

1.1 Media Types and Layout

All submissions should be submitted by CD/DVD ROMs, or posted in a downloadable web site, where there should be a directory structure in accordance with the following:

1) **Parent directory name -** All data for each submitted test should be in a directory created in

   \<TSTREF>\

   <TSTREF> is the value from the TSTREF in Chapter 2 of this guide. So, if TSTREF = 'IMPACT123', then the directory for all data for this test shall be stored in the directory, \IMPACT123\. Users should avoid illegal filename characters ('\', '*', '?') when choosing a value for TSTREF, so as not to interfere with the directory naming convention. Each piece of media should have a printout listing each TSTREF on the media.

2) **Electronic Data -** In accordance with the format in Chapters 1 and 2, the EV5 specification file and associated transducer signal files shall be stored in the subdirectory

   \<TSTREF>\DATA

3) **Written Report -** In accordance with Chapter 3, digital reports in PDF format shall be stored in the subdirectory

   \<TSTREF>\REPORT

4) **Pre/Post-Event Images** – In accordance with Chapter 4, still images and video captured before and after the impact event shall be stored in the subdirectory

   \<TSTREF>\PREPOST

5) **Event Images -** In accordance with Chapter 5, still images and video of the impact event, including high speed video files, shall be stored in the subdirectory

   \<TSTREF>\EVENT

1.2 A Data Entry Software – Entrée V5 for Windows

NHTSA has developed a data entry software tool, Entrée V5 for Windows, to facilitate preparation of the specification data defined in ***Chapter 2 : File Formats and Information records***. Because EntreeV5 contains a built-in data validation system, it is highly recommended that specification data be generated using this tool.

In addition to producing new specification files, Entrée V5 for Windows can import ASCII data files generated by previous versions of Entrée, typically of type EV4, EV5, or GR* (EV3). Once one of these files has been imported, it can be written to a new EV5 specification file (an ASCII file in the EV5 format).

1.2.1 System Requirements

The software is a Windows-based application for the Microsoft Windows XP environment with the following operating requirements:

- Hardware (CPU, memory, and disk space) according to Microsoft recommendations.
- 24 MB of disk space to install, and 12 MB of disk space during normal use.
- SVGA display adapter with resolution 1024x768, preferably using font size "small."
- A CD/DVD ROM driver.
- Database Ncodes.mdb that can be downloaded from the NHTSA Research and Development web site.

It may work in Windows NT Workstation 4.0 with Service Pack 6a or later. While the software may run under Microsoft Windows Millennium or Windows 2000, it has not been tested in those environments.

1.2.2 A Customer Developed Software

NHTSA provides access to the source code for the Entrée for Windows program as a separately downloadable package on the Entrée web pages (See ***Appendix B-1 : Reference Guide Updates and Software Updates***). This source code package may be used as an educational resource in understanding how the Entrée application works, and the logic used in generating an EV5 file. However, the source code is not suitable for direct inclusion in customer-developed software.

NHTSA does not provide source code for customers to develop their own software to write data compatible with the EV5 specification. This guide and files produced by Entrée V5 for Windows may be conditionally compatible with the engineering specification.

1.3 A Database for NHTSA Codes

The build-in code-validation system of Entrée V5 for Windows is based on the database Ncodes.mdb, defined by NHTSA Research and Development. This database includes more than 80 tables related to all "Search" buttons in Entrée V5 for Windows. For example, the table related to the test type is named NHTSADB_TSTTYP that lists test types for all acceptable tests. A comprehensive reference for currently acceptable codes can be checked out through "Search" buttons of Entrée V5 for Windows.

This database is mainly employed for instant code validations and valid code selections. If an existing data file is loaded into Entrée V5 for Windows, unacceptable codes will be detected and highlighted by the validation system. Neither a page including an unacceptable code can be switched to another one, nor a new data file can be generated, until the invalid code is replaced by one checked out through the related "Search" button.

The user can find a required code from a table in the database directly if the Microsoft Excel is ready. However, it is not a good way to search, especially when the code is indirectly related to multiple tables.

The Entrée for Windows is a friendly code searcher. For example, to determine which test type should be used, open the General Test Information page for an arbitrary database in Entrée V5 for Windows, and click on the search button for test type. Then a pop-up box appears, listing all codes of test types for this database only. If no listed code is acceptable, then switch to another database. If an appropriate code is found, the test type is determined and the data format can be determined.

The database might be updated in accordance with new requirements. The latest version can be downloaded from the NHTSA Research and Development web site: Entree for Windows | National Highway Traffic Safety Administration (NHTSA).

Return to Table of Contents

Chapter 2 : File Formats and Information Records

As a primer to understanding the following sections please review specification data types. We have categorized specification data so as to make it easier to model specification data and engineering requirements.

A specification data includes its name, type, unit, range, and order number in an information record. For convenience, it is called a field also. The field name is usually a short name of a test parameter, and it is used as the column name in the database of NHTSA. The unit is optional and predefined. The type and range are validated automatically in editing an EV5 file through EntréeV5 for windows. All fields are described from ***Section 2.3 General Test Information*** to ***Section 2.13 High-Speed Video Information***.

2.1 Field Types

- **Text –** A textual string whose content is not strictly governed by a rule, white-space, and a limited set of special characters including [ ] ( ) , : - + and _. This data type usually has a maximum length.

- **Code –** A textual string whose content is limited to a predefined set of coded data that can be found through a "Search" button in a page of EntréeV5 for windows. A code has a set length. Codes used in EntréeV5 for windows are defined by the R & D of NHTSA.

- **Integer –** An integer is expressed as one optional sign character (- or +) and one or more numeric characters, or digits, in the range from 0 – 9. The absence of a sign character implies a positive value. An integer in an EV5 file has its limits usually.

- **Real –** A real (floating point or decimal number) is expressed as one sign character (- or +), one or more numeric characters, or digits, in the range from 0 – 9, a decimal point '.', and one or more numeric characters in the range from 0 – 9. The absence of a sign character implies a positive value. A real in an EV5 file has its limits usually.

  The representation of a real as a textual string may be governed by a rule that specifies a total text length for placement of the sign and decimal number, and relative sizes and format of the mantissa and exponent.

- **Date –** A textual string whose content represents a calendar date of the format 'DD/MMM/YYYY'. The maximum length of a Date is limited to 11 characters.

The 'DD' portion is the numeric day of the month, padded to a width of two (2) characters with a leading zero, in the range from 1 – 31.

The 'MMM' portion is the three-character uppercase alphabetic abbreviation of the month (e.g. 'JAN', 'FEB', 'MAR', 'APR', 'MAY', 'JUN', 'JUL', 'AUG', 'SEP', 'OCT', 'NOV', 'DEC').

The 'YYYY' portion is a four-digit year (e.g. '2006').

2.2 Specification Files and Signal Files

A file system for a biomechanics test consists of two parts:

(1) Two specification files whose extensions are .EV5 and .HS5
(2) A set of signal (curve or channel data) files

An HS5 file records the high-speed video information. Note that the EV5 and HS5 files for the same test must have the same test reference number (see TSTREF in ***Section 2.3 General Test Information***). Software Entrée V5 for windows edits and validates specification files only. Signal files can be edited and generated by any available text editors.

2.2.1 Structures of Specification Files

An EV5 file consists of a subset of eleven (information) record sets named "General Test", "Dummy Occupant", "Biological Specimen Occupant", "Occupant Restraint", "Anthropometric", "Rib Bending Test", "Occupant Injury", "Instrumentation", "Chest Band Occupant", "Chest Band Gauge", and "High Speed Video", respectively. For example, an EV5 file for a biomechanics test might consist of information record sets: "General Test", "Biological Specimen Occupant", "Occupant Restraint", "Anthropometry", "Rib Bending Test", "Occupant Injury", "Instrumentation", "Chest Band Occupant", and "Chest Band Gauge". An HS5 file consists of a "High Speed Video" record set only.

Record sets for biomechanics tests can be further categorized as

(1) Independent record sets: "General Test", "Dummy Occupant", "Biological Specimen Occupant", "Occupant Restraint", "Instrumentation", "Chest Band Occupant", and "High Speed Video".
(2) Dependent record sets: "Anthropometry", "Rib Bending Test", "Occupant Injury", and "Chest Band Gauge", where record sets "Anthropometry", "Rib Bending Testing" and "Occupant Injury" are dependent on record set "Biological Specimen Occupant", and "Chest Band Gauge" is dependent on "Chest Band Occupant".

The existence of a dependent record set is accompanied by its independent record set.

A record set consists of one or more information records with the same name of the record set. For example, Record set, "General Test", always includes only one record while record set "Instrumentation" always include more than one record.

An information record consists of a sequence of fields (specification data) separated by pipes ('|'s); and it is listed in the same line of a specification file. An unavailable specification data is replaced with an empty space or a blank character. For example, a record with a data sequence, $d_1, d_2, ,\ldots d_{n-1}, d_n$, is expressed as "$d_1| d_2| \ldots| d_n$" delimited by a line feed. If d_1 and d_n are unavailable, this record is expressed as " $| d_2| \ldots, |d_{n-1}|$ " or "$|d_2| \ldots, |d_{n-1}|$".

The flowchart in **Figure 2-1** indicates the logical relation of the information record sets for a biomechanics test. It can be used to determine what record sets should be included in an EV5 file.

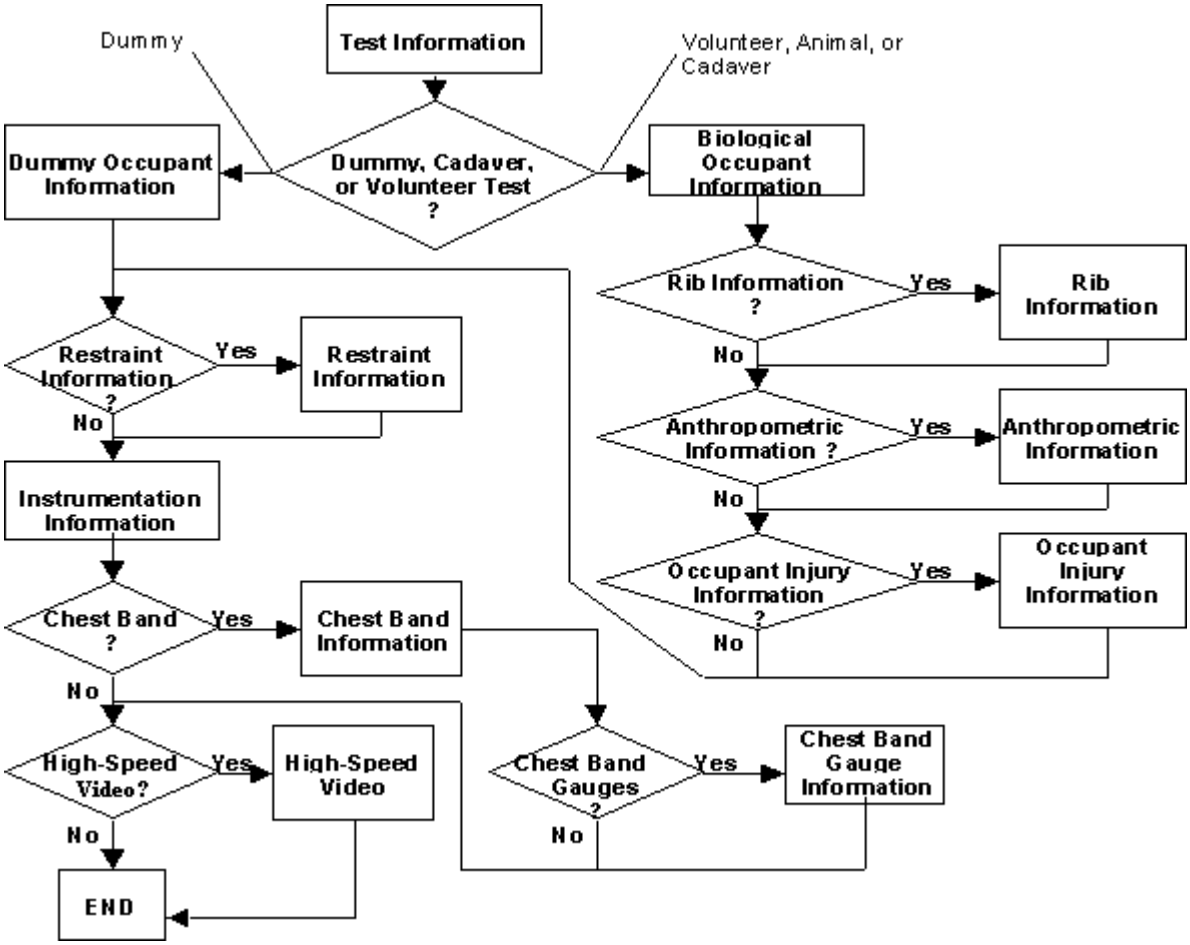


Figure 2-1 A flowchart for determining biomechanics information record sets in an EV5 file

If there are no comment lines on the beginning of a specification file, the first line of the file should be the string

"----- *extension* -----"

or

"-----"+space+ "*extension*"+space+"-----"

where *extension* = EV5, or HS5 for EV5, and HS5 files respectively. A specification file should terminate with the line

"----- END -----"

Record-set keys shown in Table 2-1 are used as identifiers in an EV5 file and its correlated HS5 file.

RECORD SET NAME	RECORD SET KEY	NOTE
General Test	TEST	Must be included
Dummy Occupant	DUMMY OCCUPANT	Optional
Biological Specimen Occupant	BIO OCCUPANT	Optional
Occupant Restraint	RESTRAINT	Optional
Anthropometry	ANTHROPOMETRY	Dependent on BIO OCCUPANT
Rib Bending Testing	RIB	Dependent on BIO OCCUPANT
Occupant Injury	OCCUPANT INJURY	Dependent on BIO OCCUPANT
Instrumentation	INSTRUMENTATION	Must be included
Chest Band Occupant	CHEST BAND	Optional
Chest Band Gauge	CHEST BAND GAUGE	Dependent on CHEST BAND
High Speed Video	HSVD	Optional

Table 2-1 EV5 information record sets and their keys

Within the body of a specification file, each section should begin with a record set key line to indicate the beginning of a record set. A record set key line is expressed as

"----- RECORD SET KEY -----"

or

"-----"+space+ RECORD SET KEY+space+ "-----".

Comments within a specification file are allowable anywhere in the file, but must start on a new line with the # (pound) sign and end with a line feed.

2.2.2 Specification File Examples

File examples (not for the same test) are given in the following. Please note that while the records in the EV5 file example appear to span lines, in actuality, they are continuous and have been wrapped to fit this page.

- **An Example for an EV5 file:**

```
# Source: Entree for Windows v5
# Date: <3/5/2005>
----- EV5 -----
----- TEST -----
B5|BIOMECHANICS INVESTIGATIONS USING HUMAN SURROGATES|SIDE IMPACT CADAVER|25/AUG/99|MCW|DTNH22-93-Y-
17028|SC125|SLN|23|DIG|UMB|26|270|144|CD|4.25 INCHES ABDOMEN OFFSET LOADWALL
----- BIO OCCUPANT -----
NA|M|NO|68|81| |7|10|HS544|1|17/AUG/99|CONJESTIVE HEART FAILURE|UNREMARKABLE| |UNREMARKABLE| | | | |
| | | |
----- RESTRAINT -----
1|RIG|OT|NA|LOADWALL MOUNTED ON A HEIDELBERG CONFIGURATION TYPE SLED
----- ANTHROPOMETRY -----
1700|1495|890|1070|455|305|320|330|390|495|490|100|85|255|825|865|530|190|155|230|265|265|260|180|505
|405|405|355|230|410|385|930|945|1040|215|220|230|310
----- OCCUPANT INJURY -----
1|C|L|F|S|3| |LEFT RIB2(1) - 1 CM DOWN, 11.5 CM LEFT
2|C|L|F|S|3| |LEFT RIB3(1) - 1.5 CM DOWN, 14.5 CM LEFT; FRACTURED AT ACC MOUNT
3|C|L|F|S|3| |LEFT RIB4(1) - 6 CM DOWN, 15 CM LEFT; MEDIALLY
4|C|L|F|S|3| |LEFT RIB5(1) - 2 CM DOWN, 18.5 CM LEFT; PARTIAL FRACTURE
5|C|L|F|S|3| |LEFT RIB7(1) - 11.5 CM DOWN, 22 CM LEFT; FRACTURED AT ACC MOUNT
6|C|L|F|S|3| |LEFT RIB7(2) - COSTAL-CRONDRIAL JUNCTION
7|C|L|F|S|3| |LEFT RIB8(1) - 9 CM DOWN, 24 CM LEFT
8|C|L|F|S|3| |LEFT RIB8(2) - 19 CM DOWN, 22 CM LEFT
9|C|L|F|S|3| |LEFT RIB9(1) - 9 CM DOWN, 28 CM LEFT
10|C|L|F|S|3| |LEFT RIB9(2) - COSTAL-CRONDRIAL JUNCTION
11|M|L|L|K|3| |2.6 CM LONG AND 1 CM DEEP; ABOVE RENAL VEIN
----- INSTRUMENTATION -----
1|VL|NA|SLED|YG|SEC|VOL|4000|MICROSWITCH|01/SEP/90|10|80|0|-975|6825|80|AM|P|NO COMMENTS
2|AC|NA|SLED|YG|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BME0-750F;SN:96D96D13-B08|23/JUL/99|750|14|26|-
975|6825|80|AM|R|NO COMMENTS
3|AC|NA|SLED|YG|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BME0-100DF;SN:96D96D13-B01|07/NOV/96|100|34|26|-
975|6825|80|AM|P|NO COMMENTS
4|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 01;ARTIFACT FROM DAS PRIOR TO TIME ZERO
5|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|85|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 04;ARTIFACT FROM DAS PRIOR TO TIME ZERO
6|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|84|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 05
7|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 07
8|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|MN|P|CHESTBAND S/N : C114 GAUGE # 08;BAD GAUGE
9|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 09
10|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 10
11|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|85|0|-
975|6825|80|MN|P|CHESTBAND S/N : C114 GAUGE # 12;BAD GAUGE
12|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|84|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 13
```

```
13|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 14
14|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 15
15|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|85|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 17
16|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|86|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 18
17|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 19
18|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|83|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 20
19|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|86|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 22
20|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|169|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 24
21|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|85|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 25
22|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|79|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 26
23|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 27
24|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|84|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 29;ARTIFACT FROM DAS PRIOR TO TIME ZERO
25|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|77|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 30;ARTIFACT FROM DAS PRIOR TO TIME ZERO
26|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 31;ARTIFACT FROM DAS PRIOR TO TIME ZERO
27|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|82|0|-
975|6825|80|QD|P|CHESTBAND S/N : C114 GAUGE # 32;ARTIFACT FROM DAS PRIOR TO TIME ZERO
28|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 34
29|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|79|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 35
30|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|83|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 36
31|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 38
32|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:114|08/APR/97|0|83|0|-
975|6825|80|AM|P|CHESTBAND S/N : C114 GAUGE # 39
33|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|79|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 01
34|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 02
35|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|173|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 03
36|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 04
37|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 05
38|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 06
39|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|76|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 07
40|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|169|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 09
```

```
41|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 10

42|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|84|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 11

43|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|81|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 12

44|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|80|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 13

45|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 14

46|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|81|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 15

47|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 16

48|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|85|0|-
975|6825|80|QD|P|CHESTBAND S/N : C107 GAUGE # 17;SPIKE IN DATA PRIOR TO TIME ZERO

49|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 18

50|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 19

51|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|81|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 20

52|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|89|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 21

53|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|274|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 22

54|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|85|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 23

55|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 24

56|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 25

57|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 26

58|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|89|0|-
975|6825|80|MN|P|CHESTBAND S/N : C107 GAUGE # 27;BAD GAUGE

59|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|137|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 28

60|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|85|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 29

61|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|82|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 30

62|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|78|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 31

63|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 32

64|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|93|0|-
975|6825|80|QD|P|CHESTBAND S/N : C107 GAUGE # 33;SPIKE IN DATA

65|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|131|0|-
975|6825|80|MN|P|CHESTBAND S/N : C107 GAUGE # 34;BAD GAUGE

66|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|87|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 35

67|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|77|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 36

68|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|76|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 37
```

```
69|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|79|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 39

70|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:107|11/NOV/98|0|152|0|-
975|6825|80|AM|P|CHESTBAND S/N : C107 GAUGE # 40

71|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|MN|P|CHESTBAND S/N : C132 GAUGE # 01;BAD GAUGE

72|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 02

73|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 03

74|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 04

75|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|MN|P|CHESTBAND S/N : C132 GAUGE # 05;BAD GAUGE

76|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|139|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 06

77|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|140|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 07

78|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 08

79|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 09

80|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 10

81|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 11

82|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 12

83|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 13

84|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 14

85|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|144|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 15

86|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 16

87|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 17

88|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 18

89|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 19

90|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 20

91|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 21

92|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 22

93|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 23

94|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|71|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 24

95|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 25

96|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|77|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 26
```

97|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 27

98|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 28

99|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|143|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 29

100|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|277|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 30

101|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 31

102|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|73|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 32

103|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 33

104|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|139|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 34

105|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|70|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 35

106|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 36

107|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|72|0|-
975|6825|80|AM|P|CHESTBAND S/N : C132 GAUGE # 37

108|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|80|0|-
975|6825|80|QD|P|CHESTBAND S/N : C132 GAUGE # 38;ARTIFACT FROM DAS PRIOR TO TIME ZERO

109|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|80|0|-
975|6825|80|QD|P|CHESTBAND S/N : C132 GAUGE # 39;ARTIFACT FROM DAS PRIOR TO TIME ZERO

110|CC|NA|CHBD|OT|SEC|RMM|4000|R.A. DENTON;MODEL:CHESTBAND;SN:132|08/APR/97|0|77|0|-
975|6825|80|QD|P|CHESTBAND S/N : C132 GAUGE # 40;SPIKE IN DATA

111|AC|NA|RBLU|YL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z19|25/AUG/98|2000|26|0|-
975|6825|80|AM|P|ACCELEROMETER ATTACHED TO 3RD RIB

112|AC|NA|RBLL|YL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98F18-Z08|07/MAY/99|2000|24|0|-
975|6825|80|AM|P|ACCELEROMETER ATTAHED TO 7TH RIB

113|AC|NA|SNMU|XL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z17|25/AUG/98|2000|12|0|-
975|6825|80|NO|P|BAD GAUGE

114|AC|NA|HDOT|YL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98F18-Z09|07/MAY/99|2000|12|0|-
975|6825|80|AM|P|NO COMMENTS

115|AC|NA|HDOT|XL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98D22-Z03|06/MAY/99|2000|13|0|-
975|6825|80|AM|P|NO COMMENTS

116|AC|NA|HDOT|ZL|SEC|G'S|4000|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98D22-Z04|06/MAY/99|2000|22|0|-
975|6825|80|AM|P|NO COMMENTS

117|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74720|07/APR/99|22241|58|0|-
1679|8388|80|AM|P|THORAX LOAD WALL

118|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74726|07/APR/99|22241|58|0|-
1679|8388|80|AM|P|ABDOMEN LOAD WALL

119|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:71100|07/APR/99|22241|58|0|-
1679|8388|80|AM|P|ABDOMEN LOAD WALL

120|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74764|07/APR/99|22241|58|0|-
1679|8388|80|AM|P|THORAX LOAD WALL

121|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:71103|07/APR/99|22241|80|0|-
1679|8388|80|AM|P|PELVIS LOAD WALL

122|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74753|07/APR/99|22241|80|0|-
1679|8388|80|AM|P|PELVIS LOAD WALL

123|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74756|07/APR/99|22241|80|0|-
1679|8388|80|AM|P|PELVIS LOAD WALL

124|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B;SN:74738|07/APR/99|22241|80|0|-
1679|8388|80|AM|P|PELVIS LOAD WALL

```
125|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-2K;SN:74583|08/MAR/94|8896|98|0|-
1679|8388|80|AM|P|LEG LOAD WALL

126|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-2K;SN:75041|08/MAR/94|8896|98|0|-
1679|8388|80|AM|P|LEG LOAD WALL

127|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-2K;SN:75045|08/MAR/94|8896|98|0|-
1679|8388|80|AM|P|LEG LOAD WALL

128|AC|NA|SPNU|XL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z15|07/MAY/99|2000|10|0|-
1679|8388|80|AM|P|SPINE UPPER X-ACCEL, ACCELEROMETER ATTACHED TO T4

129|AC|NA|SPNU|YL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z07|06/MAY/99|2000|10|0|-
1679|8388|80|AM|P|SPINE UPPER Y-ACCEL, ACCELEROMETER ATTACHED TO T4

130|AC|NA|SPNU|ZL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z09|06/MAY/99|2000|10|0|-
1679|8388|80|AM|P|SPINE UPPER Z-ACCEL, ACCELEROMETER ATTACHED TO T4

131|AC|NA|PVSA|XL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000B:SN:98B98A26-D07|25/FEB/98|2000|15|0|-
1679|8388|80|AM|P|PELVIS-X ACC

132|AC|NA|PVSA|YL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000B:SN:98B98A26-D06|25/FEB/98|2000|15|0|-
1679|8388|80|AM|P|PELVIS-Y ACC

133|AC|NA|PVSA|ZL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000B:SN:98B98A26-D12|25/FEB/98|2000|15|0|-
1679|8388|80|AM|P|PELVIS-Z ACC

134|AC|NA|OTHR|YG|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BQ-2000F;SN:98G98E07-Z20|07/MAY/99|2000|15|0|-
1679|8388|80|AM|P|LOADWALL ACC

135|AC|NA|SPNL|YL|SEC|G'S|3125|ENTRAN;MODEL:EGE-72B1Q*-2000;SN:93B93B18-V08|03/OCT/97|2000|15|0|-
1679|8388|80|AM|P|LOWER SPINE Y-ACCLE, ACCELEROMETER ATTACHED TO T-11

136|AC|NA|SPNL|XL|SEC|G'S|3125|ENTRAN;MODEL:EGE-72B1Q*-2000;SN:93B93B18-V12|03/OCT/97|2000|15|0|-
1679|8388|80|AM|P|LOWER SPNE X-ACCEL, ACCELEROMETER ATTACHED TO T-11

137|AC|NA|SPNL|ZL|SEC|G'S|3125|ENTRAN;MODEL:EGE-73BE0-2000F;SN:95L95L09-B01|03/OCT/97|2000|15|0|-
1679|8388|80|AM|P|LOWER SPNE Z-ACCEL, ACCELEROMETER ATTACHED TO T-11

138|VL|NA|SLED|YL|SEC|KPH|4000|MICROSWITCH|01/SEP/90|10|80|0|-975|4380|80|CM|P|COMPUTED VELOCITY OF
CURVE 1

139|AC|NA|SLED|YL|SEC|KPH|4000|ENTRAN;MODEL:EGE-73BME0-750F;SN:96D96D13-B08|23/JUL/99|750|14|0|-
975|6825|80|CM|R|COMPUTED VELOCITY AS INTEGRATION OF CURVE 2

140|AC|NA|SLED|YL|SEC|KPH|4000|ENTRAN;MODEL:EGE-73BME0-100DF;SN:96D96D13-B01|07/NOV/96|100|34|0|-
975|6825|80|CM|P|COMPUTED VELOCITY AS INTEGRATION OF CURVE 3

141|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B|07/APR/99|22241|58|0|-
1679|8388|80|CM|P|SUMMATION OF CURVE NUMBERS :  117 120;THORAX LOADWALL

142|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B|07/APR/99|22241|58|0|-
1679|8388|80|CM|P|SUMMATION OF CURVE NUMBERS :  118 119;ABDOMEN LOADWALL

143|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-5K-B|07/APR/99|22241|80|0|-
1679|8388|80|CM|P|SUMMATION OF CURVE NUMBERS :  121 122 123 124;PELVIC LOADWALL

144|LC|NA|OTHR|YG|SEC|NWT|3125|INTERFACE INC;MODEL:1210AO-2K|08/MAR/94|8896|98|0|-
1679|8388|80|CM|P|SUMMATION OF CURVE NUMBERS :  125 126 127;LEG LOADWALL

----- CHEST BAND -----

1|251|375|1054|8|8|4|0|19|6|29|RIB 4 CHESTBAND (UPPER BAND)

2|305|356|1041|3|3|33|13|52|0|38|ABDOMEN CHESTBAND (LOWER BAND)

3|289|384|1010|6|6|72|0|92|3|40|RIB 8 CHESTBAND  (MIDDLE BAND)

----- CHEST BAND GAUGE -----

1|1|76|4|CHESTBAND S/N : C114 GAUGE # 01;ARTIFACT FROM DAS PRIOR TO TIME ZERO

1|2|152|5|CHESTBAND S/N : C114 GAUGE # 04;ARTIFACT FROM DAS PRIOR TO TIME ZERO

1|3|178|6|CHESTBAND S/N : C114 GAUGE # 05

1|4|229|7|CHESTBAND S/N : C114 GAUGE # 07

1|5|254|8|CHESTBAND S/N : C114 GAUGE # 08;BAD GAUGE

1|6|279|9|CHESTBAND S/N : C114 GAUGE # 09

1|7|305|10|CHESTBAND S/N : C114 GAUGE # 10

1|8|356|11|CHESTBAND S/N : C114 GAUGE # 12;BAD GAUGE

1|9|381|12|CHESTBAND S/N : C114 GAUGE # 13
```

```
1|10|406|13|CHESTBAND S/N : C114 GAUGE # 14
1|11|432|14|CHESTBAND S/N : C114 GAUGE # 15
1|12|483|15|CHESTBAND S/N : C114 GAUGE # 17
1|13|508|16|CHESTBAND S/N : C114 GAUGE # 18
1|14|533|17|CHESTBAND S/N : C114 GAUGE # 19
1|15|559|18|CHESTBAND S/N : C114 GAUGE # 20
1|16|610|19|CHESTBAND S/N : C114 GAUGE # 22
1|17|660|20|CHESTBAND S/N : C114 GAUGE # 24
1|18|686|21|CHESTBAND S/N : C114 GAUGE # 25
1|19|711|22|CHESTBAND S/N : C114 GAUGE # 26
1|20|737|23|CHESTBAND S/N : C114 GAUGE # 27
1|21|787|24|CHESTBAND S/N : C114 GAUGE # 29;ARTIFACT FROM DAS PRIOR TO TIME ZERO
1|22|813|25|CHESTBAND S/N : C114 GAUGE # 30;ARTIFACT FROM DAS PRIOR TO TIME ZERO
1|23|838|26|CHESTBAND S/N : C114 GAUGE # 31;ARTIFACT FROM DAS PRIOR TO TIME ZERO
1|24|864|27|CHESTBAND S/N : C114 GAUGE # 32;ARTIFACT FROM DAS PRIOR TO TIME ZERO
1|25|914|28|CHESTBAND S/N : C114 GAUGE # 34
1|26|940|29|CHESTBAND S/N : C114 GAUGE # 35
1|27|965|30|CHESTBAND S/N : C114 GAUGE # 36
1|28|1016|31|CHESTBAND S/N : C114 GAUGE # 38
1|29|1041|32|CHESTBAND S/N : C114 GAUGE # 39
2|1|76|33|CHESTBAND S/N : C107 GAUGE # 01
2|2|102|34|CHESTBAND S/N : C107 GAUGE # 02
2|3|127|35|CHESTBAND S/N : C107 GAUGE # 03
2|4|152|36|CHESTBAND S/N : C107 GAUGE # 04
2|5|178|37|CHESTBAND S/N : C107 GAUGE # 05
2|6|203|38|CHESTBAND S/N : C107 GAUGE # 06
2|7|229|39|CHESTBAND S/N : C107 GAUGE # 07
2|8|279|40|CHESTBAND S/N : C107 GAUGE # 09
2|9|305|41|CHESTBAND S/N : C107 GAUGE # 10
2|10|330|42|CHESTBAND S/N : C107 GAUGE # 11
2|11|356|43|CHESTBAND S/N : C107 GAUGE # 12
2|12|381|44|CHESTBAND S/N : C107 GAUGE # 13
2|13|406|45|CHESTBAND S/N : C107 GAUGE # 14
2|14|432|46|CHESTBAND S/N : C107 GAUGE # 15
2|15|457|47|CHESTBAND S/N : C107 GAUGE # 16
2|16|483|48|CHESTBAND S/N : C107 GAUGE # 17;SPIKE IN DATA PRIOR TO TIME ZERO
2|17|508|49|CHESTBAND S/N : C107 GAUGE # 18
2|18|533|50|CHESTBAND S/N : C107 GAUGE # 19
2|19|559|51|CHESTBAND S/N : C107 GAUGE # 20
2|20|584|52|CHESTBAND S/N : C107 GAUGE # 21
2|21|610|53|CHESTBAND S/N : C107 GAUGE # 22
2|22|635|54|CHESTBAND S/N : C107 GAUGE # 23
2|23|660|55|CHESTBAND S/N : C107 GAUGE # 24
2|24|686|56|CHESTBAND S/N : C107 GAUGE # 25
2|25|711|57|CHESTBAND S/N : C107 GAUGE # 26
2|26|737|58|CHESTBAND S/N : C107 GAUGE # 27;BAD GAUGE
2|27|762|59|CHESTBAND S/N : C107 GAUGE # 28
2|28|787|60|CHESTBAND S/N : C107 GAUGE # 29
```

```
2|29|813|61|CHESTBAND S/N : C107 GAUGE # 30
2|30|838|62|CHESTBAND S/N : C107 GAUGE # 31
2|31|864|63|CHESTBAND S/N : C107 GAUGE # 32
2|32|889|64|CHESTBAND S/N : C107 GAUGE # 33;SPIKE IN DATA
2|33|914|65|CHESTBAND S/N : C107 GAUGE # 34;BAD GAUGE
2|34|940|66|CHESTBAND S/N : C107 GAUGE # 35
2|35|965|67|CHESTBAND S/N : C107 GAUGE # 36
2|36|991|68|CHESTBAND S/N : C107 GAUGE # 37
2|37|1041|69|CHESTBAND S/N : C107 GAUGE # 39
2|38|1067|70|CHESTBAND S/N : C107 GAUGE # 40
3|1|76|71|CHESTBAND S/N : C132 GAUGE # 01;BAD GAUGE
3|2|102|72|CHESTBAND S/N : C132 GAUGE # 02
3|3|127|73|CHESTBAND S/N : C132 GAUGE # 03
3|4|152|74|CHESTBAND S/N : C132 GAUGE # 04
3|5|178|75|CHESTBAND S/N : C132 GAUGE # 05;BAD GAUGE
3|6|203|76|CHESTBAND S/N : C132 GAUGE # 06
3|7|229|77|CHESTBAND S/N : C132 GAUGE # 07
3|8|254|78|CHESTBAND S/N : C132 GAUGE # 08
3|9|279|79|CHESTBAND S/N : C132 GAUGE # 09
3|10|305|80|CHESTBAND S/N : C132 GAUGE # 10
3|11|330|81|CHESTBAND S/N : C132 GAUGE # 11
3|12|356|82|CHESTBAND S/N : C132 GAUGE # 12
3|13|381|83|CHESTBAND S/N : C132 GAUGE # 13
3|14|406|84|CHESTBAND S/N : C132 GAUGE # 14
3|15|432|85|CHESTBAND S/N : C132 GAUGE # 15
3|16|457|86|CHESTBAND S/N : C132 GAUGE # 16
3|17|483|87|CHESTBAND S/N : C132 GAUGE # 17
3|18|508|88|CHESTBAND S/N : C132 GAUGE # 18
3|19|533|89|CHESTBAND S/N : C132 GAUGE # 19
3|20|559|90|CHESTBAND S/N : C132 GAUGE # 20
3|21|584|91|CHESTBAND S/N : C132 GAUGE # 21
3|22|610|92|CHESTBAND S/N : C132 GAUGE # 22
3|23|635|93|CHESTBAND S/N : C132 GAUGE # 23
3|24|660|94|CHESTBAND S/N : C132 GAUGE # 24
3|25|686|95|CHESTBAND S/N : C132 GAUGE # 25
3|26|711|96|CHESTBAND S/N : C132 GAUGE # 26
3|27|737|97|CHESTBAND S/N : C132 GAUGE # 27
3|28|762|98|CHESTBAND S/N : C132 GAUGE # 28
3|29|787|99|CHESTBAND S/N : C132 GAUGE # 29
3|30|813|100|CHESTBAND S/N : C132 GAUGE # 30
3|31|838|101|CHESTBAND S/N : C132 GAUGE # 31
3|32|864|102|CHESTBAND S/N : C132 GAUGE # 32
3|33|889|103|CHESTBAND S/N : C132 GAUGE # 33
3|34|914|104|CHESTBAND S/N : C132 GAUGE # 34
3|35|940|105|CHESTBAND S/N : C132 GAUGE # 35
3|36|965|106|CHESTBAND S/N : C132 GAUGE # 36
3|37|991|107|CHESTBAND S/N : C132 GAUGE # 37
3|38|1016|108|CHESTBAND S/N : C132 GAUGE # 38;ARTIFACT FROM DAS PRIOR TO TIME ZERO
```

```
3|39|1041|109|CHESTBAND S/N : C132 GAUGE # 39;ARTIFACT FROM DAS PRIOR TO TIME ZERO
3|40|1067|110|CHESTBAND S/N : C132 GAUGE # 40;SPIKE IN DATA
----- END -----
```

- **An Example for an HS5 File:**

```
# Source: High Speed Video Data
# Date: <11/29/2005>
----- HSVD -----
1|V4537C|0.001|DRIVER FRONT VIEW|NO COMMENTS
2|V4537C|0.001|DRIVER VIEW|NO COMMENTS
3|V4537C|0.001|PASSENGER VIEW|NO COMMENTS
4|V4537C|0.001|REAR SIDE VIEW|NO COMMENTS
5|V4537C|0|MOVIE TC01-202|
----- END -----
```

2.2.3 Signal Data

Each subsequent file after an EV5 file contains unfiltered, digitized signal data collected from the sensors used in the tests. The order of signal files corresponds to the order of the instrumentation information records in the record set. A signal file is made up of ASCII records of 1 data point each, delimited by a line feed character (ASCII decimal 10, hexadecimal \x0a, octal \012). If a X-Y signal in which the independent X coordinate is non-uniformly incremental - is supplied, then each signal data consists of 1 data point each with the X coordinate listed first, followed by a single tab character, followed by the associated Y coordinate, and ending with a line feed character. The following two examples express two types of signal data in signal files.

- **Signal Data Example (Y value only)**

```
-.206786E-02
0.285321E-01
0.285321E-01
-.632679E-01
0.285321E-01
-.206786E-02
0.285321E-01
-.632679E-01
-.632679E-01
-.206786E-02
0.285321E-01
-.206786E-02
-.326679E-01
-.206786E-02
-.206786E-02
-.206786E-02
-.206786E-02
-.326679E-01
0.285321E-01
```

- **Signal Data Example (X and Y values)**

```
-0.025000000      0.0
-0.024875002      0.0
-0.024750002      -0.12266
-0.024625001      0.12266
-0.024500001      0.0
-0.024375001      -0.24532
-0.024250000      0.0
-0.024125000      0.0
-0.024000000      -0.12266
-0.023875002      0.0
-0.023750002      0.0
-0.023625001      0.0
-0.023500001      0.12266
-0.023375000      0.0
-0.023250000      0.0
-0.023125000      -0.12266
-0.023000002      0.0
-0.022875002      0.0
-0.022750001      0.24532
-0.022625001      0.0
-0.022500000      0.0
-0.022375000      -0.12266
-0.022250000      -0.12266
```

The point specification will allow for any floating-point format, but the preferred format is the C format %12.5E. Thus, each Y-only record will be 12 characters wide (e.g. +1.23456E-01) and each X-Y record will be a maximum of 25 characters wide (e.g. +1.23456E-01<tab>-9.87654E+02). 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 title of the ASCII signal files should be the same given to the specification (EV5) file described above followed by a numeric file extension. The file extension should be the curve number of the curve contained in the file, padded on the left with zeroes to three characters, and should correspond to the curve number in the instrumentation information record set.

If the specification file is named TSTABC.EV5, and there are 35 signal (curve) files, the signal files should be named TSTABC.001 through TSTABC.035.

Right	TSTABC.001	TSTABC.012	TSTABC.101
Wrong	TSTABC.T0	TSTABC.12	TSTABCDAT

Table 2-2 Signal Filename Examples

Return to Table of Contents

2.3 General Test Information

Fields defined below constitute the general test information record. A filed includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**VERNO** ", "**Version Number**", and "Pre-defined code, 2 characters" are its order index in the general test information record, its name, its brief description, and its type and range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

1. VERNO — Version Number

Pre-defined code, 2 characters

VERNO should be chosen for all biomechanics crash tests. The number of this version of the NHTSA Test Reference Guide is a special pre-assigned code (B5).

However, it can be another code for identifying the version of the reference guide used to prepare contents of specification files. Therefore, it does not refer to the format of the files within an EV5 file.

For example, it is possible to convert an existing specification file for a biomechanics test from the version 3 format, having GR files, into an EV5 format file. Since the original file was developed using the version 3, VERNO would then have a value of "B3" (see the table below).

CODE	DESCRIPTION
B5	Data prepared according to the version 5 guide.
B4	Data prepared according to the version 4 guide.
B3	Data prepared according to the version 3 guide.
B2	Data prepared according to the version 2 guide.

2. TITLE — Contract or Study Title

Text with or within 70 characters

TITLE is the title of the contract or study.

3. TSTOBJ — Test Objectives

Text with or within 70 characters

TSTOBJ is a description of the purpose of the test.

4. TSTDAT — Test Date

Date, format (DD/MMM/YYYY), 11 characters

TSTDAT is the date the test was performed. *This field must be filled with a valid date*. **Don't leave it blank, please.**

5. TSTPRF — Test Performer

Code, 3 characters

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

6. CONNO — Contract Number

Text with or within 17 characters

CONNO is the Department of Transportation contract number assigned by the sponsoring organization.

7. TSTREF — Test Reference Number

Text with or within 16 characters

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

8. TSTCFN — Test Configuration

Code, 3 characters

TSTCFN describes the test setup. If a vehicle body is used in a test, describe the make and model of the vehicle (without abbreviations) in TSTCOM.

9. TEMP — Ambient Temperature

Integer, degrees Celsius, -99 to 99

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

10. RECTYP — Type of Recorder

Code, 3 characters

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

11. LINK — Data Link to Recorder

Code, 3 characters

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

12. CLSSPD — Closing Speed

Real, kilometers per hour, 0 to 200.00

The test configuration determines CLSSPD. For a sled test, CLSSPD is the pre-impact speed of the sled; for a pendulum test, CLSSPD is the speed of the impactor; and so forth, from the occupant's frame of reference.

13. IMPANG — Impact Angle

Integer, degrees, 0 to 359

IMPANG is the angle of impact in the xy plane, measured clockwise from the x-axis. The angle is 0 degrees if the impact is from the front; 90 degrees if the impact is from the right side; 180 degrees if the impact is from the rear; and 270 degrees if the impact is from the left side. The figure below shows measurement direction in the x-y plane.

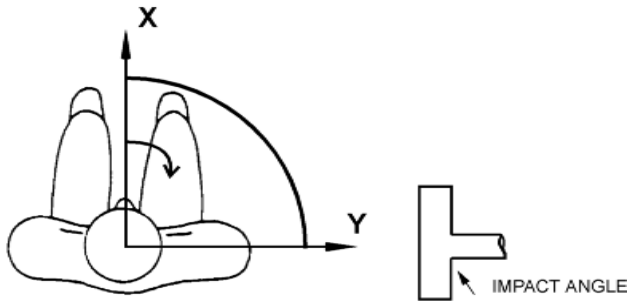


Figure 2-2 Impact angle measurement

14. TOTCRV — Total Number of Curves

Integer, 1 to 200

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

15. OCCTYP — Occupant Type

Code, 2 characters

OCCTYP is the type of a test occupant, such as the type of dummy, cadaver, animal or human volunteer.

16. TSTCOM — Test Commentary

Text with or within 70 characters

TSTCOM is used to describe other test information, for which a code does not exist, including anomalies or problems. The reason for using OTHER or NOT APPLICABLE to a code of this information record should record a commentary as well. If a vehicle body is used in a test, describe the make and model of the vehicle (without abbreviations) in this field. If TSTCFN is coded PEN (an impactor), enter the mass of the impactor in the appropriate units. If no comments are to be made, assign NO COMMENTS (left justified) to this field.

Return to Table of Contents

2.4 Dummy Occupant Information

Fields defined below constitute the general dummy occupant information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**DOCCLOC** ", "**Dummy Occupant Location**", and "Code, 2 *character*s" are its order index in the dummy occupant information record, its name, its brief description, its type, respectively. It has two characters, and its range is a set of valid codes defined for NHTSA R & D. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

1. DOCCLOC — Dummy Occupant Location

Code, 2 characters

DOCCLOC is coded OT for all pendulum, drop, pedestrian, and sled tests without a vehicle body. When the test occupant is seated in a vehicle body (such as when a vehicle body is mounted on a sled and the test occupant is sitting in the vehicle), OCCLOC indicates the location of the test occupant (for example, driver, front passenger, and so forth).

2. DOCCSEX — Dummy Occupant Sex

Code, 1 character

DOCCSEX is the sex of the test occupant, applicable to all test subjects except child dummies. Use N for child dummies.

3. DSEPOSN — Dummy Seat Position

Code, 2 characters

DSEPOSN is the position of the seat at the initiation of the test. For pendulum and sled tests without a vehicle body, use NO; for drop and pedestrian tests, use NA.

4. HIC — Head Injury Criterion

Integer, 0 to 9,999

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.

5. T1 — Lower Boundary of HIC Time Interval

Real, milliseconds, 0 or positive

T1 is the lower boundary of the time interval over which the HIC was computed.

6. T2 — Upper Boundary of HIC Time Interval

Real, milliseconds, 0 or positive

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

7. CLIP3M — Thorax Region Peak Acceleration Measurement

Real, G'S, 0 or positive

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.

8. LFEM — Left Femur Peak Load Measurement

Integer, Newtons, negative or 0

LFEM indicates the maximum compression load for the left femur. It is listed as a negative number.

9. RFEM — Right Femur Peak Load Measurement

Integer, Newtons, negative or 0

RFEM indicates the maximum compression load for the right femur. It is listed as a negative number.

10. CSI — Chest Severity Index

Integer, 0 to 9,999

CSI indicates the computed value of the chest severity index.

11. LBELT — Lap Belt Peak Load Measurement

Integer, Newtons, 0 or positive

LBELT indicates the maximum tension load on the lap belt.

12. SBELT — Shoulder Belt Peak Load Measurement

Integer, Newtons, 0 or positive

SBELT indicates the maximum tension load on the shoulder belt.

13. TTI — Thoracic Trauma Index

Real, 0 or positive

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.

14. PELVG — Pelvic G's

Real, 0 or positive

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.

15. CTI — Combined Thoracic Index

Real, 0 to or positive

CTI indicates the computed value of the Combined Thoracic Index.

16. VC — Viscous Criterion

Real, meters per second, 0.000 to 100.000

VC indicates the computed value of the Viscous Criterion.

17. CMAX — Maximum Chest Compression

Integer, 0 or positive

CMAX indicates the maximum Chest Compression.

18. NIJ — NHTSA Neck Injury Criterion

Real, 0 or positive

NIJ indicates the computed value of the NHTSA Neck Injury Criterion.

19. MTHCAL — Method of Calibration

Code, 2 characters

MTHCAL indicates which method was used to calibrate the test dummy. This data is used for dummy tests only; for other tests, use NA.

20. DUMSIZ — Dummy Size

Code, 2 characters

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

21. DUMMAN — Dummy Manufacturer and Serial Number

Text with or within 70 characters

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

22. DUMMOD — Dummy Modification Description 1

Text with or within 70 characters

DUMMOD is the description of any modifications to the design of the dummy used in the test. Indicate CONT'D at the end of this data if DUMDSC is to be used to continue this description.

23. DUMDSC — Dummy Description 2

Text with or within 70 characters

DUMDSC is a continuation of DUMMOD. DUMDSC should only be used if more space for recording information about the modifications to the test dummy is needed.

24. DCOMPWT — Dummy Component Weight

Integer, 0 to 999

DCOMPWT is the mass of the Dummy component tested. Use 0.00 if test is a full dummy test.

25. DOCCOM — Occupant Commentary

Text with or within 70 characters

DOCCOM should be used to describe any information that is important about the test occupant that does not appear in any other text in this information record. If no comments are to be made, use NO COMMENTS (left justified).

Return to Table of Contents

2.5 Biological Specimen Occupant Information

Fields defined below constitute the biological specimen occupant information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**BOCCLOC** ", "**Biological Occupant Location**", and "Code, 2 *character*s" are its order index in the biological specimen occupant information record, its name, its brief description, its type, respectively. It has two characters, and its range is a set of valid codes defined for NHTSA R & D. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

1. BOCCLOC - Biological Occupant Location

Code, 2 characters

BOCCLOC is coded OT for all pendulum, drop, pedestrian, and sled tests without a vehicle body. When the test subject is seated in a vehicle body (such as when a vehicle body is mounted on a sled and the test subject is sitting in the vehicle), BOCCLOC indicates the location of the test subject (for example, driver, front passenger, and so forth).

2. BOCCSEX — Biological Occupant Sex

Code, 1 character

BOCCSEX is the sex of the test occupant.

3. BSEPOSN — Biological Seat Position

Code, 2 characters

BSEPOSN is the position of the seat at the initiation of the test. For pendulum and sled tests without a vehicle body, use NO; for drop and pedestrian tests, use NA.

4. OCCAGE — Occupant Age

Integer, 0 to 99

OCCAGE is the age of a human cadaver or volunteer; for animal tests, use 99.

5. OCCWT — Occupant Weight

Integer, kilograms, 0 to 999

OCCWT is the weight of the test occupant.

6. BCOMPWT — Biological Component Mass

Integer, kilograms, 0 to 999

Mass in Kg of the biological component tested.

7. FRCTRB — Number of Fractured Ribs

Integer, 0 to 24

FRCTRB is the number of fractured ribs sustained by the subject. The maximum number of fractured ribs is 24. The following figure depicts four fractured ribs with six rib fractures. This data is used for animal and cadaver tests only; for human volunteer tests, use 99.

8. RBFRCT — Number of Rib Fractures

Integer, 0 to 99

RBFRCT is the number of rib fractures sustained by the subject. Rib fractures will always be greater than or equal to fractured ribs. This data is used for animal and cadaver tests only; for human volunteer tests, use 99.

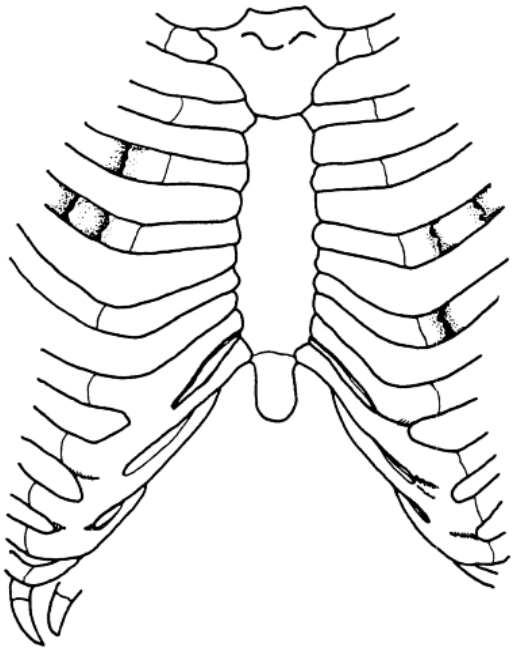


Figure 2-3 RBFRCT - Number of Rib Fractures

9. OCCREF — Occupant Reference Number

Text with or within 10 characters

OCCREF is the occupant reference number assigned by the test performer. If multiple tests are performed on an occupant, each test will have the same OCCREF, while each TSTREF will be different.

10 NOTEST — Number of Tests

Integer, 0 to 99

NOTEST indicates the total number of impact tests conducted on the occupant.

11. DTEDTH — Occupant Date of Death

Date, format (DD/MMM/YYYY), 11 characters

DTEDTH is the date of death of the occupant

12. CSEDTH — Occupant Cause of Death

Text with or within 70 characters

CSEDTH indicates the cause of death of the occupant.

13. CADAPP — Occupant Appearance

Text with or within 70 characters

CADAPP is the appearance of the occupant. Anything unusual about the appearance of the occupant should be noted in this field. If nothing is remarkable about the occupant, use UNREMARKABLE (left justified).

14. BEDCON — Length of Bed Confinement

Integer, days, 0 to 999

BEDCON is the length of bed confinement, in days, of the occupant immediately prior to death.

15. CADAN — Occupant Anomaly

Text with or within 70 characters

CADAN is used to note anything unusual about the occupant prior to the test, such as a pretest condition that may affect an injury. If, for example, an occupant had a broken arm before the test, that characteristic would be noted in this data.

Also included should be an anomalous injury such as one produced by instrumentation rather than the test, e.g. mounting screws for an accelerometer puncture of the pericardium.

16. AORPRE — Presence of Cardiovascular Pressurization

Code, 3 characters

AORPRE indicates whether the cardiovascular system of the thorax and/or abdomen of the test occupant was pressurized during testing. Use code YES or NO.

17. CERPRE — Presence of Head Pressurization

Code, 3 characters

CERPRE indicates whether the head vascular system of the test occupant was pressurized during testing. Use code YES or NO.

18. PULPRE — Presence of Pulmonary Pressurization

Code, 3 characters

PULPRE indicates whether the pulmonary system of the test occupant was pressurized during testing. Use code YES or NO.

19. BMC — Bone Mineral Content

Real greater than zero

BMC is the numeric value of the bone mineral content.

20. BMCLOC — BMC Measurement Location

Code, 3 characters

BMCLOC is the location where the bone mineral content was assessed.

21. BMCUNITS — BMC Measurement Units

Code, 3 characters

BMCUNITS are the units for bone mineral content.

22. BMCMETHOD — BMC Measurement Method

Code, 3 characters

BMCMETHOD is the method used to determine the bone mineral content.

23. BMCCOM — BMC Commentary

Text with or within 70 characters

BMCCOM should be used to provide comments on the calculation of BMC.

24. BOCCOM — Occupant Commentary

Text with or within 70 characters

BOCCOM should be used to describe any information that is important about the test occupant that does not appear in any other text in this information record. If no comments are to be made, use NO COMMENTS (left justified).

Return to Table of Contents

2.6 Rib Bending Test Information

Fields defined below constitute the rib bending test information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**RIBNO**", "**Rib Number**", and "*Integer, >= 0*" are its order index in the rib bending test information record, its name, its brief description, and its type and range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

This information record is applicable to cadavers and human volunteers only. If a dummy is the test occupant, it should be omitted.

1. RIBNO — Rib Number

Integer, >= 0

RIBNO is the sequential number assigned to each rib test performed.

2. RIBLOC — Rib Location

Code, 3 characters

RIBLOC indicates the position in the rib cage of the first rib undergoing the bending strength test.

3. RIBIN — Moment of Inertia for Rib

Integer, millimeters^4, 0 or positive

RIBIN is the moment of inertia for the cross-section of the rib being tested.

4. NADIS — Neutral Axis Distance of the Rib

Integer, millimeters, 0 or positive

NADIS is the distance from the neutral axis to the most remote point of the rib cross-section of the rib being tested.

5. SPLEN — Rib Length of Span

Integer, millimeters, 0 or positive

SPLEN is the length of the span between the two points where the rib is simply supported. The following figure depicts a rib bending strength test setup:

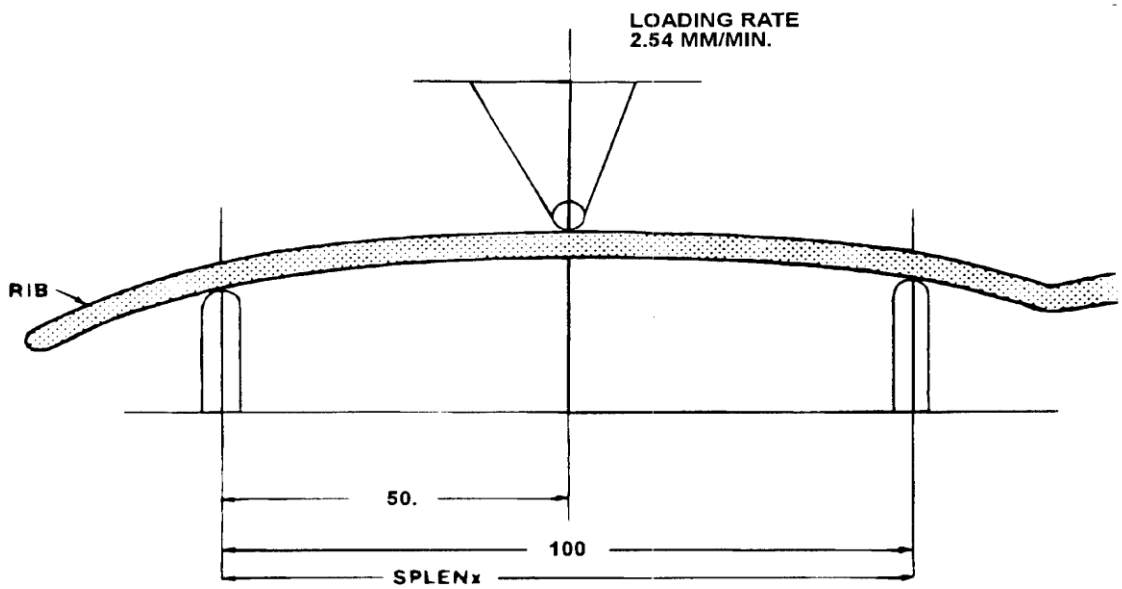


Figure 2-4 SPLEN – Rib Length of Span

6. DEFL — Deflection of the Rib

Integer, millimeters, 0 or positive

DEFL represents the deflection of the rib at the point of loading.

7. LOAD — Load on the Rib

Integer, Newtons, 0 or positive

LOAD represents the load on the rib at the time of DEFL where the relationship is linear at a loading rate of 2.54 mm per minute.

8. BRKLD — Breakload for the Rib

Integer, Newtons, 0 or positive

BRKLD is the load on the rib at the beginning of the plastic deformation region.

9. ARMAR — Area of Bone Marrow of Rib Segment

Integer, millimeters^2, 0 or positive

ARMAR is the area of the bone marrow, or core, of the rib segment being tested.

10. RAREA — Total Cross-sectional Area of the Rib

Integer, millimeters^2, 0 or positive

RAREA represents the total area of a cross-section of the rib being tested.

Return to Table of Contents

2.7 Anthropometric Information

Fields defined below constitute the anthropometric information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**STATUR**", "Stature", and "*Integer, millimeters, 0 to 9,999*" are its order index in the anthropometric information record, its name, brief description, and its type and range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

This information record is applicable to cadavers and human volunteers only. If a dummy is the test occupant, it should be omitted.

1. STATUR — Stature

Integer, millimeters, 0 to 9,999

STATUR is the stature of the test occupant, measured as the horizontal distance from the headboard of the measuring table to the most distal portion of the heel and taken as an average of the measurement from the left heel and the measurement from the right heel. The measurement is taken with an anthropometer, with the test occupant supine, head in the Frankfort plane and firmly touching the headboard.

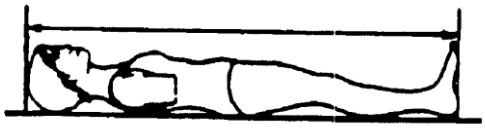


Figure 2-5 STATUR – Stature

2. SHLDHT — Acromial Shoulder Height

Integer, millimeters, 0 to 9,999

SHLDHT is the shoulder height of the test occupant measured as the horizontal distance from the most distal portion of the heel to the most lateral point of the acromial process of the scapula. The measurement may be obtained by measuring either the distance to both the right and left heels and averaging the two values; or by measuring the distance from the vertex of the head to the acromial process and subtracting the value from STATUR.

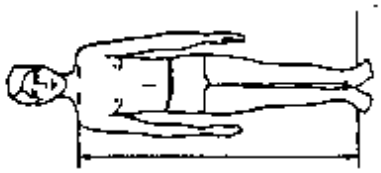


Figure 2-6 SHLDHT – Shoulder Height (Acromial)

3. VRTSYM — Vertex to Symphysion Length

Integer, millimeters, 0 to 9,999

VRTSYM is the test occupant's vertex-to-symphysion length, measured, using an anthropometer, from the headboard of the measuring table to the symphysion, with the test occupant in a supine position, head oriented in the Frankfort plane and firmly touching the headboard.

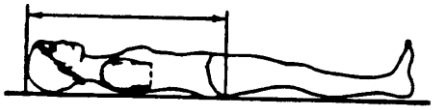


Figure 2-7 VRTSYM – Vertex to Symphysion Length

4. WASTHT — Waist Height

Integer, millimeters, 0 to 9,999

WASTHT is the test occupant's waist height, measured as the horizontal distance from the most distal portion of the heel to the anterior superior iliac spine. The measurement may be obtained by measuring either the distance to both the right and left heels and averaging the two values; or by measuring the distance from the vertex of the head to the anterior superior iliac spine and subtracting the value from STATUR.

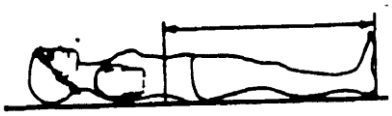


Figure 2-8 WASTHT - Test Occupant's Waist Height

5. SHLDBD — Biacromial Shoulder Breadth

Integer, millimeters, 0 to 9,999

SHLDBD is the breadth of the test occupant's shoulder measured as the distance across the body between the lateral edge of the left and right acromions.

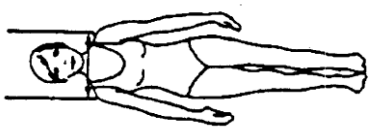


Figure 2-9 SHLDBD - Shoulder Breadth

6. CHSTBD — Chest Breadth

Integer, millimeters, 0 to 9,999

CHSTBD is the chest breadth of the test occupant, taken as the average of two measurements of the horizontal breadth of the chest — one taken at the axilla and the other at the substernale, using a beam caliper.

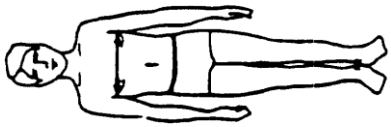


Figure 2-10 CHSTBD - Chest Breadth

7. WASTBD — Waist Breadth

Integer, millimeters, 0 to 9,999

WASTBD is the waist breadth of the test occupant, measured, using a beam caliper, as the horizontal breadth of the body at the level of the anterior superior iliac spine.

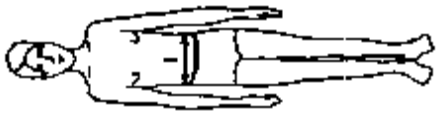


Figure 2-11 WASTBD - Waist Breadth

8. HIPBD — Hip Breadth

Integer, millimeters, 0 to 9,999

HIPBD is the hip breadth of the test occupant, measured, using an anthropometer, between the right and left illocristale landmarks perpendicular to the mid-sagital plane.

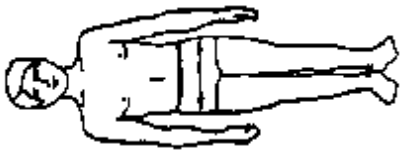


Figure 2-12 HIPBD - Hip Breadth

9. SHLDEL — Shoulder to Elbow (Acromion to Radiale) Length

Integer, millimeters, 0 to 9,999

SHLDEL is the length of the test occupant's arm from shoulder to elbow, measured, with a beam caliper, as the distance from the top of the acromion process to the bottom of the elbow, with the arm flexed 90 degrees.

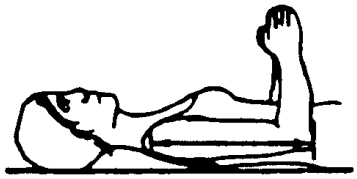


Figure 2-13 SHLDEL - Shoulder to Elbow Length

10. FARMHD— Forearm - Hand Length

Integer, millimeters, 0 to 9,999

FARMHD is the length of the test occupant's forearm, measured, with a beam caliper, from the tip of the elbow to the tip of the longest finger, with the arm flexed 90 degrees.

Figure 2-14 FARMHD - Forearm-Hand Length

11. TIBLHT — Tibiale Height

Integer, millimeters, 0 to 9,999

TIBLHT is the knee height of the test occupant, measured from the most distal portion of the heel to the proximal medial margin of the tibia. The measurement may be obtained by measuring either the distance to both the right and left heels and averaging the two values; or by measuring the distance from the vertex of the head to the proximal medial margin of the tibia and subtracting that value from STATUR.

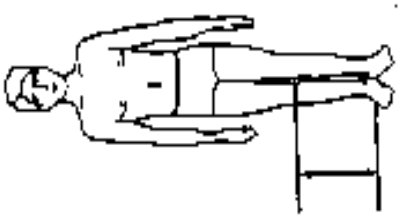


Figure 2-15 TIBLHT - Tibiale Height

12. ANKLHT — Ankle Height

Integer, millimeters, 0 to 9,999

ANKLHT is the height of the test occupant's ankle as measured, with sliding calipers, from the most distal portion of the heel to the level of the minimum circumference of the ankle (at the level proximal to the malleoli of the tibia and fibula perpendicular to the long axis of the lower leg).

Figure 2-16 ANKLHT - Ankle Height

13. FOOTBD — Foot Breadth

Integer, millimeters, 0 to 9,999

FOOTBD is the breadth of the test occupant's foot, measured with sliding calipers, at the level of the metatarsal-phalangeal joints along an axis perpendicular to the long axis of the foot. Measure the breadth of both feet and take the average to obtain FOOTBD.

Figure 2-17 FOOTBD - Foot Breadth

14. FOOTLN — Foot Length

Integer, millimeters, 0 to 9,999

FOOTLN is the length of the test occupant's foot, measured from the dorsal surface of the heel to the tip of the big toe by the use of a beam caliper. Measure the length of both feet and take the average to obtain FOOTLN.

Figure 2-18 FOOTLN - Foot Length

15. HDTROC — Head to Trochanterion Distance

Integer, millimeters, 0 to 9,999

HDTROC is the horizontal distance from the test occupant's head to the trochanterion measured, using an anthropometer, from the headboard of the measuring table to the trochanterion, with the test occupant supine, head in the Frankfort plane.

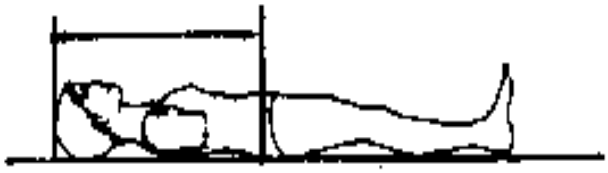


Figure 2-19 HDTROC - Head to Trochanterion Distance

16. SEATHT — Seated Height

Integer, millimeters, 0 to 9,999

SEATHT is the test occupant's seated height, measured as the vertical distance from the sitting surface to the top of the head. The measurement is taken with the test occupant sitting erect, looking straight ahead. This measurement must be made in all cases where the test occupant is seated during testing.

Figure 2-20 SEATHT - Seated Height

17. KNEEHT — Knee Height, Seated

Integer, millimeters, 0 to 9,999

KNEEHT is the knee height of the test occupant, taken as an average of the vertical distance from the floor to the uppermost point on the knee of both legs. The measurement is taken with the test occupant sitting erect, knees and ankles at right angles. This measurement must be made in all cases where the test occupant is seated during testing.

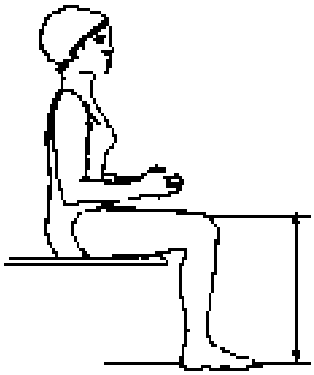


Figure 2-21 KNEEHT - Knee Height, Seated

18. HEADLN — Head Length

Integer, millimeters, 0 to 9,999

HEADLN is the head length of the test occupant, measured as the maximum length of the head between the glabella and the occiput in the mid-sagittal plane.

Figure 2-22 HEADLN - Head Length

19. HEADBD — Head Breadth

Integer, millimeters, 0 to 9,999

HEADBD is the test occupant's head breadth, measured, with spreading calipers, as the maximum horizontal breadth of the skull above the level of the ears, perpendicular to the mid-sagittal plane.

Figure 2-23 HEADBD - Head Breadth

20. HEADCH — Head Height (Vertex - Mentum)

Integer, millimeters, 0 to 9,999

HEADCH is the test occupant's head height, measured from the highest point on the head to the mentum landmark.

Figure 2-24 HEADCH - Head Height (Vertex – Mentum)

21. BICPCR — Bicep Circumference

Integer, millimeters, 0 to 9,999

BICPCR is the circumference of the test occupant's bicep, measured, with a tape, as the circumference of the upper arm at the level of the maximum anterior prominence of the biceps brachii, perpendicular to the long axis of the upper arm.

Figure 2-25 BICPCR - Bicep Circumference

22. ELBWCR — Elbow Circumference

Integer, millimeters, 0 to 9,999

ELBWCR is the circumference of the test occupant's elbow, measured with a tape passing over the olecranon process of the ulna and into the crease of the elbow, which is flexed at 125 degrees.

Figure 2-26 ELBWCR - Elbow Circumference

23. FARMCR — Forearm Circumference

Integer, millimeters, 0 to 9,999

FARMCR is the circumference of the test occupant's forearm, measured at the maximum circumference of the forearm, with a tape perpendicular to the long axis of the forearm.

Figure 2-27 FARMCR - Forearm Circumference

24. WRSTCR — Wrist Circumference

Integer, millimeters, 0 to 9,999

WRSTCR is the wrist circumference of the test occupant, measured at the minimum circumference of the wrist proximal to the radial and ulnar styloid processes, with a tape perpendicular to the long axis of the forearm.

Figure 2-28 WRSTCR - Wrist Circumference

25. THGHCR — Thigh Circumference

Integer, millimeters, 0 to 9,999

THGHCR is the circumference of the test occupant's thigh, measured, with a tape, perpendicular to the long axis of the leg and passing just below the lowest point of the gluteal furrow.

Figure 2-29 THGHCR - Thigh Circumference

26. LTGHCR — Lower Thigh Circumference

Integer, millimeters, 0 to 9,999

LTGHCR is the circumference of the test occupant's lower thigh, measured, just superior to the patella, with a tape perpendicular to the long axis of the thigh.

Figure 2-31 LTGHCR - Lower Thigh Circumference

27. KNEECR — Knee Circumference

Integer, millimeters, 0 to 9,999

KNEECR is the circumference of the test occupant's knee, measured either with the leg extended or with the knee flexed 90 degrees. Only one measurement is needed for the test.

For tests in which the test occupant is seated with the leg flexed 90 degrees, measure the circumference of the knee across the antecubital crease and the most anterior superior margin of the patella. Measure the circumference of both knees and take the average to obtain KNEECR.

For all other tests, the test occupant is supine with the leg extended. Measure the circumference of both knees at the level of the mid-patella landmark and take the average to obtain KNEECR.

Figure 2-31 KNEECR - Knee Circumference

28. CALFCR — Calf Circumference

Integer, millimeters, 0 to 9,999

CALFCR is the circumference of the test occupant's calf, taken as the average measurement of the calf circumferences of both legs. The maximum circumference of the calf for each leg is measured by the use of a tape perpendicular to the long axis of the lower leg.

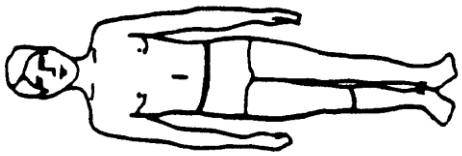


Figure 2-32 CALCR - Calf Circumference

29. ANKLCR — Ankle Circumference

Integer, millimeters, 0 to 9,999

ANKLCR is the circumference of the test occupant's ankle, measured as the average maximum circumference of the ankle perpendicular to the long axis of the lower leg at the level proximal to the malleoli of the tibia and fibula.

Figure 2-33 ANKLCR - Ankle Circumference

30. NECKCR — Neck Circumference

Integer, millimeter, 0 to 9,999

NECKCR is the circumference of the test occupant's neck, measured with a tape in a plane perpendicular to the axis of the neck and passing inferior, but tangent, to the laryngeal prominence.

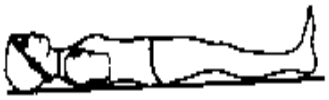


Figure 2-34 NECKCR - Neck Circumference

31. SCYECR — Scye (Armpit to Shoulder) Circumference

Integer, millimeters, 0 to 9,999

SCYECR is the test occupant's scye circumference, measured by passing through the axilla over the anterior and posterior vertical scye landmarks and over the acromial landmarks.

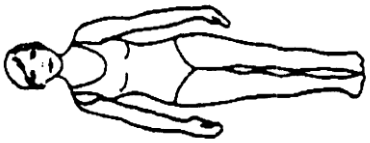


Figure 2-35 SCYECR - Scye (Armpit to Shoulder) Circumference

32. CHSTCR — Chest Circumference

Integer, millimeters, 0 to 9,999

CHSTCR is the test occupant's chest circumference, taken as the average of two measurements, made perpendicular to the long axis of the trunk: one taken as the axilla circumference and the other as the substernale circumference.

Figure 2-36 CHSTCR - Chest Circumference

33. WASTCR — Waist Circumference

Integer, millimeter, 0 to 9999

WASTCR is the waist circumference of the test occupant, measured with a tape passing over the anterior superior iliac spine and perpendicular to the long axis of the trunk.

Figure 2-37 WASTCR - Waist Circumference

34. BUTTCR — Buttock Circumference

Integer, millimeters, 0 to 9,999

BUTTCR is the horizontal circumference of the buttocks of the test occupant, measured at the level of the trochanterion surface landmarks.

Figure 2-38 BUTTCR - Buttock Circumference

35. CHSTDP — Chest (Bust) Depth

Integer, millimeters, 0 to 9,999

CHSTDP is the test occupant's chest depth, taken as the average of two measurements: with an anthropometer, one is taken from the measuring table to the anterior surface of the body at the axilla and the other at the substernale.

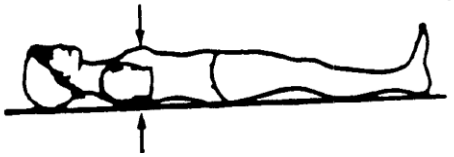


Figure 2-39 CHSTDP - Chest (Bust) Depth

36. WASTDP — Waist Depth

Integer, millimeters, 0 to 9,999

WASTDP is the waist depth of the test occupant, measured as the vertical distance between the measuring table and the anterior surface of the body at the level of the anterior superior iliac spine.

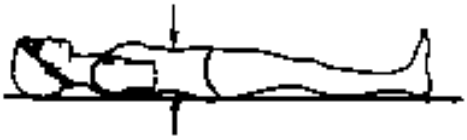


Figure 2-40 WASTDP - Waist Depth

37. BUTTDP — Buttock Depth

Integer, millimeters, 0 to 9,999

BUTTDP is the buttock depth of the test occupant, measured as the anterior-posterior distance on the medial plane projection at the level of the maximum posterior protrusion of the buttocks.

Figure 2-41 BUTTDP - Buttock Depth

38. INSCYE — Interscye Distance

Integer, millimeters, 0 to 9,999

INSCYE is the horizontal distance across the back of the test occupant, measured between the posterior scye point landmarks.

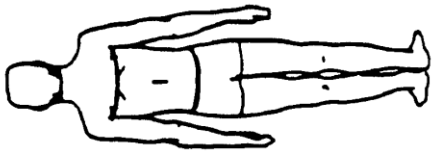


Figure 2-42 INSCYE – Interscye Distance

Return to Table of Contents

2.8 Occupant Injury Information

Fields defined below constitute the general test information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**INJNO**", "**Injury Number**", and "*Integer, 0 to 99*" are its order index in the occupant injury information record, its name, its brief description, and its type and range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

This information record is used only for animal and cadaver tests. The appropriate specification data should be recorded in this information record for each injury sustained by the test occupant. If no injuries occur, this information record should be omitted.

This information record is a concise report of the occupant injuries, following, in general, the practices of accident investigation teams. Record as many injuries as the test occupant received one injury per record, starting with the most severe injuries (highest AIS), and continuing to the least severe injury.

If an injury is solely the result of instrumentation mounts (e.g. mounting screws lacerating the brain), do not record the injury, but do note this fact in CADAN of the *Biological Specimen Occupant Information*. If the cause of the injury cannot be clearly attributed to the test or to instrumentation, note this problem in INJCOM (injury text below). For example, if a skull fracture propagates through an accelerometer mount, record the injury, but note in INJCOM that the fracture propagates through the mount.

1. INJNO — Injury Number

Integer, 1 to 99

INJNO is the sequential number (1, 2, 3…) assigned to each injury recorded.

2. BODYRG — Body Region

Code, 1 character

BODYRG is the region of the test occupant's body sustaining injury.

3. ASPECT — Body Aspect

Code, 1 character

ASPECT provides a refinement of BODYRG by indicating which portion was injured. If a lesion involves more than one aspect of a body region, determine the predominant aspect and code ASPECT as that aspect. Use W (whole) if ASPECT cannot be determined.

As an example, consider a laceration on the right side of the spleen. The aspect would not be coded right (R) referring to where the laceration is on the spleen. The aspect would be coded left (L), referring to the position of the injury in the body region, abdomen.

4. LESION — Injury

Code, 1 character

LESION is the type of injury sustained by the test occupant. Hemorrhages represent the result of injuries; indicate them as abrasion, contusion, laceration, or strain.

5. SYSORG — Injured Organ

Code, 1 character

SYSORG is the organ or physiological system of the test occupant sustaining injury.

6. AIS — Abbreviated Injury Scale

Code, 1 character

AIS is the abbreviated injury scale, a numerical ranking of the severity of the injury sustained by the test occupant. In AIS, injury is coded on a scale of one to six. The reference volume to be used to determine this injury classification is the **Abbreviated Injury Scale**, *the Association for the Advancement of Automotive Medicine* (AAAM).

7. AIS90 — AIS90 Injury Code

Real, 0 or positive

AIS90 is the 1990 version of the AIS Injury Code.

8. INJCOM — Injury Commentary

Text with or within 70 characters

INJCOM is used to describe the injury**.** Some examples are: FRACTURES OF RIBS R-7 AND R-8 or LACERATION OF THE LARYNX.

Return to Table of Contents

2.9 Occupant Restraints Information

Fields defined below constitute the occupant restraints information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first data, "**1**", "**RSTNO**", "**Restraint Number**", and "*Integer, 1 to 9*" are its order index in the occupant restraints information record, its name, its brief description, and its type and range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

Occupant 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.

1. RSTNO — Restraint Number

Integer, 1 to 9

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.

2. RSTTYP — Restraint Type

Code, 3 characters

RSTTYP describes the type of restraint or otherwise describes the test apparatus used. An unrestrained test in a vehicle body is NOT coded as NON; rather, dashboard, steering column, or other appropriate vehicle-related component should be coded. Likewise a pendulum test with a steel bar on the face of the impactor is coded as OTH. Use of OTH requires a description in RSTCOM such as '25 mm diameter steel bar on impactor face'.

3. RSTMNT — Restraint Mount

Code, 2 characters

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).

4. DEPLOY — Inflator/Belt Pre-tensioner Deployment

Code, 2 characters

DEPLOY describes the deployment performance of inflatable restraints or the firing of the belt pre-tensioner during the test.

5. RSTCOM — Restraint Commentary

Text with or within 70 characters

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

Return to Table of Contents

2.10 Instrumentation Information

Fields defined below constitute the instrumentation information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**CURNO** ", "**Curve Number**", "integer", and "1 to 200" are its order index in the instrumentation information record, its name, its brief description, its type and its range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

Approximately twenty milliseconds of data prior to time zero should come with all measurement signal data; the 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.

1. CURNO — Curve Number

Integer, 1 to 200

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

2. SENTYP — Sensor Type

Code, 2 characters

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

3. SENLOC — Sensor Location

Code, 2 characters

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.

4. SENATT — Sensor Attachment

Code, 4 characters

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

5. AXIS — Axis Direction of the Sensor

Code, 2 characters

AXIS is the axis direction for sensors measuring vector quantities as described in ***Appendix A : Data Coordinate System***. 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 such as acceleration, force, velocity, and so forth. 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. 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.

6. XUNITS - Time Units or 'Independent Axis' Units

Code, 3 characters

XUNITS indicates either the unit of time for time series sensor data (e.g. 'SEC'), or the units of the independent coordinate of a non-time series signal (e.g. if a load is applied in a controlled fashion to produce a deflection, the load is the independent coordinate, and the deflection is the dependent coordinate).

7. YUNITS - Data Measurement Units

Code, 3 characters

YUNITS indicates the units used to measure the signal of the sensor data.

8. PREFIL — Pre-filter Frequency

Integer, 0 to 99,999

PREFIL is the cutoff frequency in Hz of a low-pass filter (digital or analog) applied to the signal. This frequency is defined as where filter gain equals 70 percent (-3db).

9. INSMAN — Manufacturer of the Instrument

Text with or within 70 characters

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

10. CALDAT — Calibration Date

Date, format (DD/MMM/YYYY), 11 characters

CALDAT is the most recent calibration date of the instrument, prior to **TSTDAT** in the general test information. *This field must be filled with a valid date.* **Don't leave it blank, please.**

11. INSRAT — Instrument Rating

Unbounded integer

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 kilo-Newtons.

12. CHLMAX — Channel Maximum Rating

Integer, 0 to 999

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

13. INIVEL — Initial Velocity

Real, kilometers per hour, -200 to 200

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 data should be zero (0.0).

14. NFP — Number of First Point

Integer, -10,000 to 0

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.

15. NLP — Number of Last Point

Integer, 0 or positive

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.

16. DELT — Time Increment (Time Step)

Integer, microseconds, 0 or positive

DELT is the time increment in microseconds between each data point. DELT is assumed to be constant for all data points for a given sensor (uniform sampling frequency). It is not used in X-Y signal data, and therefore it is set to zero.

17. DASTAT — Data Status

Code, 2 characters

DASTAT indicates the status of the data as it appears in the data submission. This data 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.

18. CHSTAT — Channel Status

Code, 1 character

CHSTAT indicates whether the data channel is primary or redundant. If, for example, the dummy is instrumented with a backup tri-axial 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.

19. INSCOM — Instrumentation Commentary

Text with or within 70 characters

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 reason for using OTHER or NOT APPLICABLE to a code of this information record should record a commentary 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 (**See:** ***Figure A-3 Nine-Accelerometer Coordinate System*** and the definition of AXIS earlier in this section), 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.

Return to Table of Contents

2.11 Chest Band Occupant Information

Fields defined below constitute the chest band occupant information record. A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**BANDNO** ", "**Chest Band Number**", "integer", and "1 to 5" are its order index in the chest band occupant information record, its name, its brief description, its type and its range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

The chest band occupant information describes the relationship of a chest band and the occupant to which it is attached. It details the location of the band on the occupant and the attributes of both the band and the occupant at the point of attachment.

The appropriate specification data should be recorded in this record for each chest band used. For example, if three chest bands are used, data will be repeatedly recorded three times, once for each chest band. In this case, the chest band occupant information record set includes three records.

1. BANDNO — Chest Band Number

Integer, 1 to 5

BANDNO is the sequential number assigned to the chest band. Chest band numbering begins at the topmost band, progressing from the superior of the occupant to the inferior of the occupant. NOTE: BANDNO is NOT equal to INSMAN, the manufacturer's serial number, defined in the ***Instrumentation Information***.

2. CHSDPT — Chest Depth

Integer, millimeters, 0 to 999

CHSDPT is the chest depth of the seated test occupant at the location of the specific chest band, indicated by BANDNO. The measurement should be taken after the chest band is put on the occupant, when the occupant is in position for the test. NOTE: This measurement may differ from CHSTDP of the ***Anthropometric Information***, which is a measurement taken on a supine occupant.

Figure 2-43 CHSDPT – Chest Depth

3. CHSBRD — Chest Breadth

Integer, millimeters, 0 to 999

CHSBRD is the chest breadth of the seated test occupant at the location of the specific chest band, indicated by BANDNO. The measurement should be taken after the chest band is put on the occupant, when the occupant is in position for the test. Note that this measurement may differ from CHSTBD of the ***Anthropometric Information***, which is taken on a supine occupant.

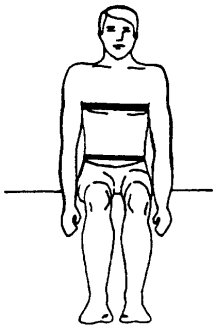


Figure 2-44 CHSBRD – Chest Breadth

4. BANLEN — Chest Band Length

Integer, millimeters, 1 to 1,800

BANLEN circumference of the chest measured at the location of the specific chest band, indicated by BANDNO.

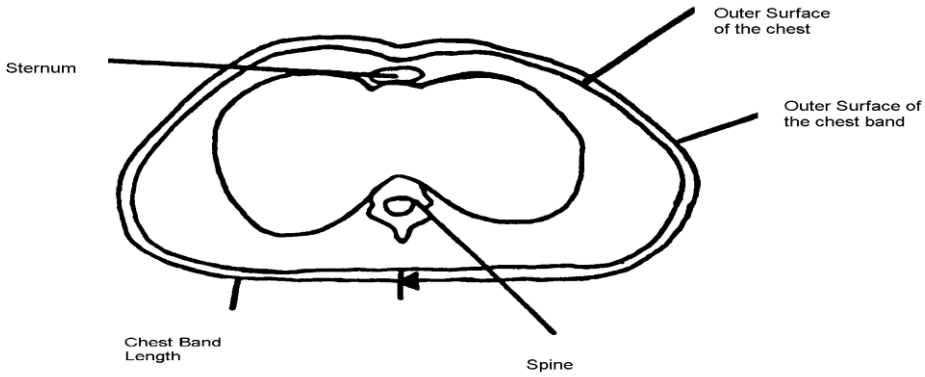


Figure 2-45 BANLEN - Chest Band Length

5. ANTLOC — Anterior Vertical Location

Code, integer, 1 to 10

ANTLOC is the vertical position of the top edge of the chest band specified in BANDNO on the anterior of the occupant. To determine the vertical location of the chest band, the torso has been divided into height levels, ranging from 1 to 10. Ten corresponds to the topmost measurement on the torso, and 1 corresponds to the lowest measurement on the torso. ***Figure 2-46 ANTLOC - Anterior Location - A*** illustrates these height levels for the cadaver. ***Figure 2-47 ANTLOC - Anterior Location – B*** shows the anterior height levels for the Hybrid III dummy.

For the cadaver, ANTLOC is equal to the height level shown in ***Figure 2-46 ANTLOC - Anterior Location***, which corresponds to the vertical position of the chest band. The upper limit of the range (ANTLOC = 10) is referenced to the suprasternal notch. The reference for the lower limit (ANTLOC = 1) of the range is the iliac crest. At the xiphisternal junction, ANTLOC = 6.

For the Hybrid III, ANTLOC is equal to the height level shown in Figure 2-47 ANTLOC - Anterior Location – B, which corresponds to the vertical position of the top edge of the chest band. The upper limit of the range (ANTLOC = 10) is referenced to the sterno-clavical link. The reference for the lower limit (ANTLOC = 1) is the upper edge of the pelvis. At the bottom of the fourth rib, ANTLOC = 5.

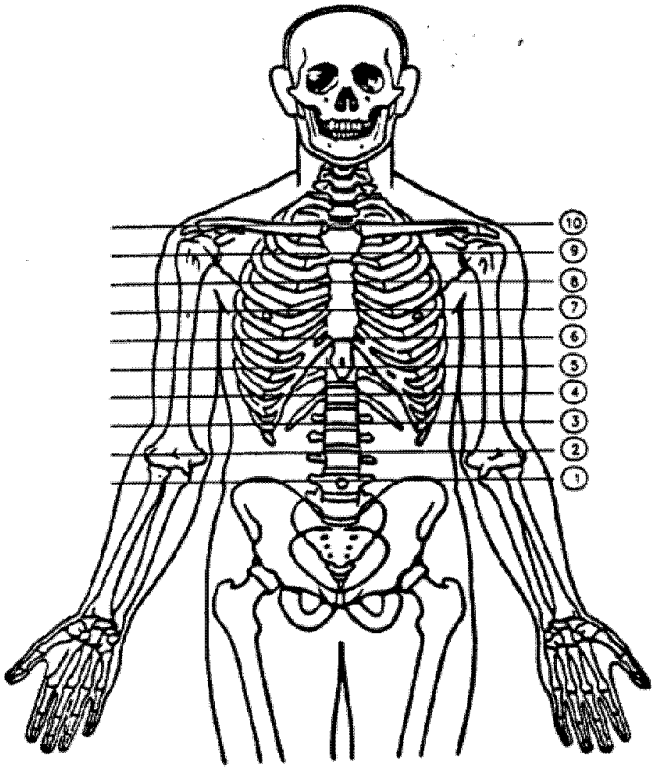


Figure 2-46 ANTLOC - Anterior Location - A

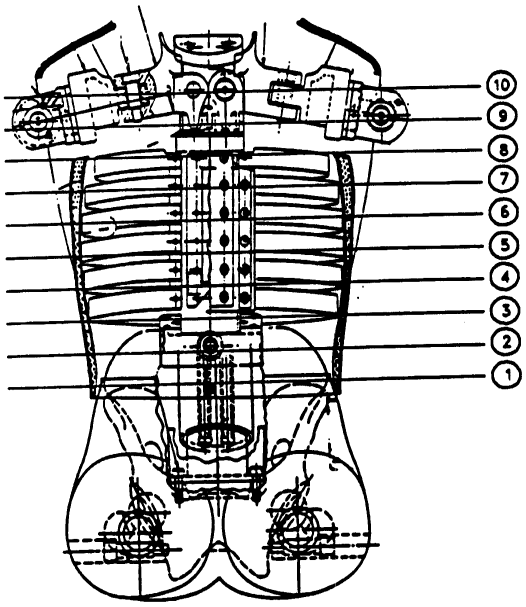


Figure 2-47 ANTLOC - Anterior Location – B

6. POSLOC — Posterior Vertical Location

Code, integer, 1 to 10

POSLOC is the vertical position of the top edge of the chest band specified in BANDNO on the posterior of the occupant. The same height level designations pertain to this measurement as pertain to ANTLOC. The included figure shows the posterior height levels.

For the cadaver, POSLOC is equal to the height level in the following figure corresponding to the vertical position of the chest band. The upper limit of the range (POSLOC = 10) is referenced to the spinous process of the T02. The reference for the lower limit of the range (POSLOC = 1) is the iliac crest. At the spinous process of T10, POSLOC = *5*.

For the Hybrid III, the value of POSLOC should be equal to the value of ANTLOC.

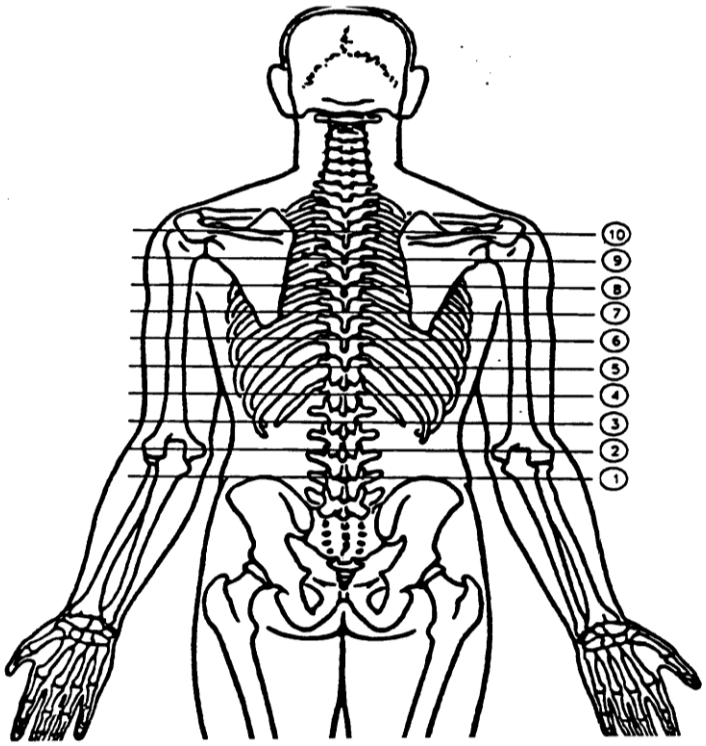


Figure 2-48 POSLOC - Posterior Location

7. GAGSTR — Curve Number of the Gauge Relative to the Sternum

Integer, 1 to 200

GAGSTR is equal to the curve number, CURNO, of the first active gauge encountered, clockwise, from the center of the sternum. This field defines the location of the sternum relative to the chest band. Note that CURNO of the ***Instrumentation Information*** is the sequential number (1, 2, 3 ...) assigned to a specific sensor and data curve.

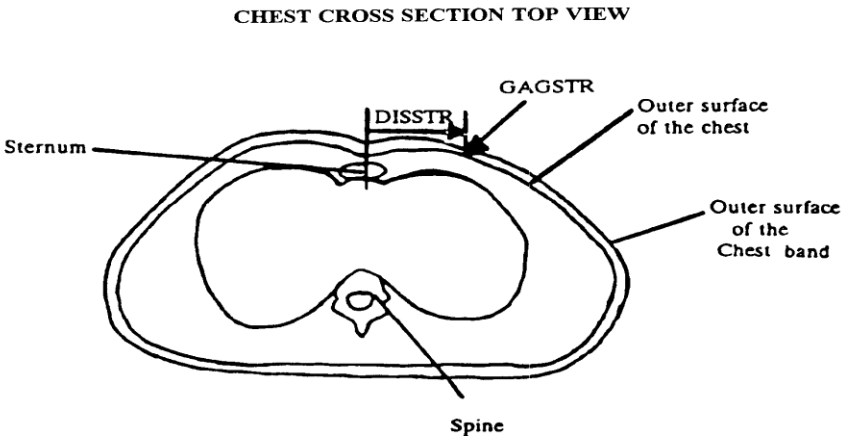


Figure 2-49 GAGSTR – Curve Number of Gauge Relative to Sternum

8. DISSTR — Distance Referenced to the Sternum

Integer, millimeters, 0 to 99

DISSTR is the curvilinear distance from the center of the sternum in a clockwise direction to the specified GAGSTR. This value, in conjunction with GAGSTR, locates the sternum relative to the chest band.

9. GAGSPN — Curve Number of the Gauge Relative to the Spine

Integer, 1 to 200

GAGSPN is equal to the curve number, CURNO, of the first active gauge encountered when proceeding in a clockwise direction from the center of the spine. This value defines the location of the spine relative to the chest band. Note that CURNO of the ***Instrumentation Information*** is the sequential number (1, 2, 3 ...) assigned to a specific sensor and data curve.

10. DISSPN — Distance Referenced to the Spine

Integer, millimeters, 0 to 99

DISSPN is the curvilinear distance from the spine to the gauge specified by GAGSPN. This value, with GAGSPN, locates the spine relative to the chest band.

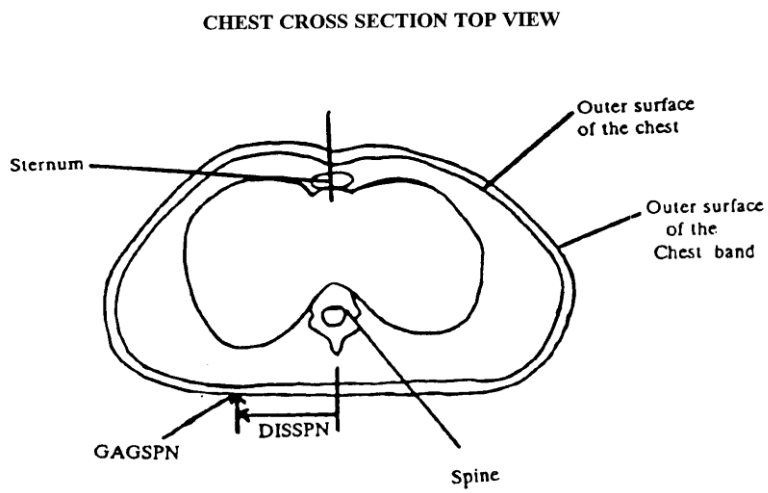


Figure 2-50 DISSPN - Distance Referenced to the Spine

11. TOTGAG — Total Number of Gauges

Integer, 1 to 40

TOTGAG is the total number of active curvature gauges on the chest band specified by the BANDNO.

12. CHBCOM — Chest Band Commentary

Text with or within 70 characters

CHBCOM should be used to describe any information that is important about the chest band that does not appear in any other text in this information record. If no comments are to be made, use NO COMMENTS (left justified).

Return to Table of Contents

2.12 Chest Band Gauge Information

Fields defined below constitute the chest band gauge information record. A field includes its order index in the record, name, brief description, type and valid range, respectively. For example, in the first field, "**1**", "**BANDNO** ", "**Chest Band Number**", "integer", and "1 to 5" are its order index in the chest band gauge information record, its name, brief description, its type and its range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field. If the value or content of the field is undetermined and filling the field is not enforced, leave it blank.

The chest band gauge information describes the relationships of the active gauges on the chest band and the relationships of those gauges and the curve number that identifies the signal generated by each gauge.

The chest band occupant information must first be entered for each chest band used prior to entering the chest band gauge information.

A 16-gauge chest band is shown below in two positions: lying flat and encircling the test occupant's torso. A cross section view of the torso is shown below, from the perspective of superior to inferior. As the drawings show, the gauges occur on the band in sequence beginning at the leading edge of the band.

The band should be positioned on the torso so that the gauge numbers are increasing in a clockwise direction. The location of the leading edge of the chest band in reference to the occupant is not restricted and can be placed anywhere along the circumference (surface) of the chest.

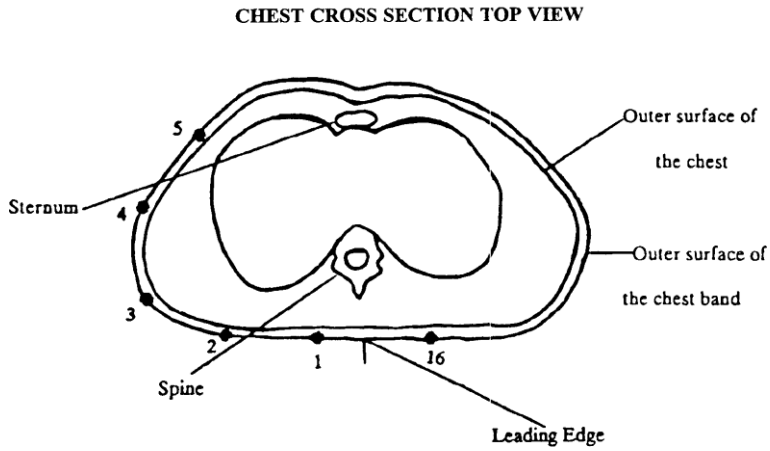


Figure 2-51 Chest Cross Section - Top View

CHEST BAND LYING FLAT

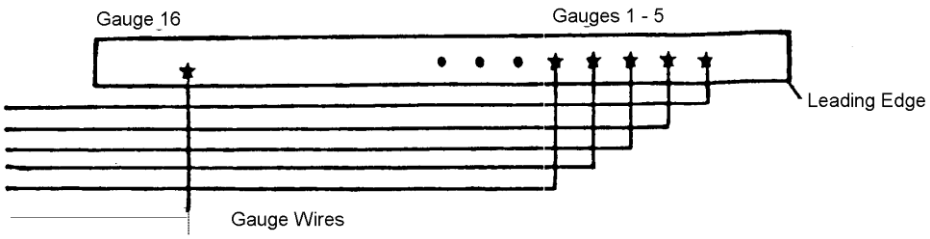


Figure 2-52 Chest Band Lying Flat

The chest band is described further in a technical article by Rolf H. Eppinger, entitled "The Development of a Measurement System and Its Application toward Developing Mechanically Based Injury Indices" and found in the 33rd Stapp Car Crash Conference Proceedings, October 1989. A detailed Chest Band User's Guide has been written for the experimentalist and can be obtained by contacting the NHTSA technical person working with you.

The data in the chest band gauge information apply to each active curvature gauge on a chest band. The appropriate information should be recorded in all specification data for each sensor (active chest band curvature gauge) associated with the test.

For example, if three chest bands are used, with 16 active gauges per band, the data TSTNO through GAGCOM will be repeated 48 times. This corresponds to the 48 instrumentation information records where SENATT = CHBD.

Chest Band gauge information includes three specification data in ***Section 2.10 Instrumentation Information*** that indicate

1) where the sensor is attached (SENATT),
2) the type of sensor used (SENTYP), and
3) unit used for the sensor (YUNITS).

For each active chest band sensor (strain gauge bridge), special codes are used for these three data:

1) SENATT, Sensor Attachment, indicates where the sensor is attached. For tests in which sensors are attached to a chest band, SENATT = CHBD.

2) SENTYP, Sensor Type, indicates the type of sensor used for collecting the measurements at the time of the test. For tests in which chest band gauges are used as sensors, SENTYP = CC.

3) YUNITS**,** Data Measurement Units, indicates the units used to measure the signal of the sensor data. For tests in which chest band gauges are used, the code RMM (for reciprocal millimeters) should be used to indicate the appropriate data measurement units.

1. BANDNO — Chest Band Number

Integer, 1 to 5

BANDNO is the sequential number (1, 2, 3 ...) assigned to the chest band defined in the Chest Band Occupant Information group. Chest band numbering begins at the superior of the occupant, progressing to the inferior of the occupant. NOTE: BANDNO is NOT equal to INSMAN, the manufacturer's serial number, defined in the ***instrumentation information***.

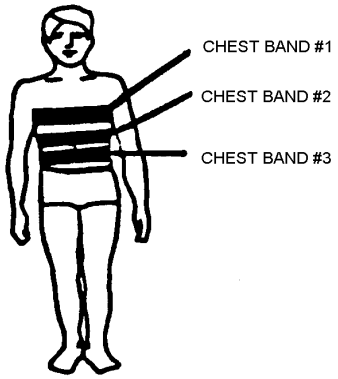


Figure 2-53 BANDNO – Chest Band Number

2. GAGENO — Gauge Number

Integer, 1 to 5

GAGENO is the number of the active chest band curvature gauge. Active gauges are numbered sequentially from the leading edge of the chest band. Gauges that are not active for the test are ignored. For example, if there are ten active gauges on the chest band, then the value of GAGENO would be 1, 2, 3, 4, 5, 6, 7, 8, 9 or 10, as shown below.

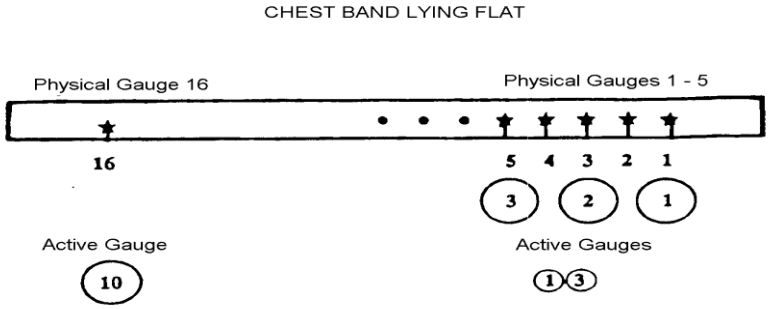


Figure 2-54 GAGENO – Chest Band Lying Flat

3. GAGDIS — Gauge Distance

Integer, millimeters, 1 to 1,800

GAGDIS is the curvilinear distance from the leading edge of the chest band in a clockwise direction to the GAGENO. There will be one value of GAGDIS that corresponds to each GAGENO (active gauge number). Recall that the leading edge may be positioned anywhere along the circumference of the torso surface.

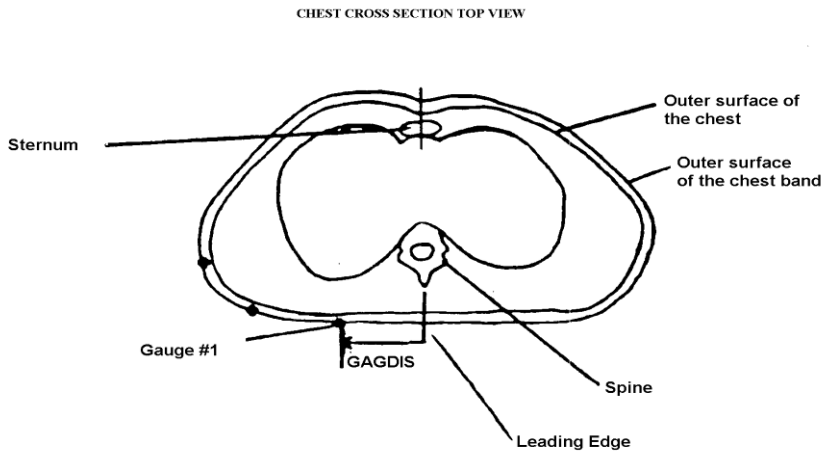


Figure 2-55 GAGDIS – Gauge Distance

4. BANLEN — Chest Band Length

Integer, millimeters, 1 to 1,800

BANLEN circumference of the chest measured at the location of the specific chest band, indicated by BANDNO.

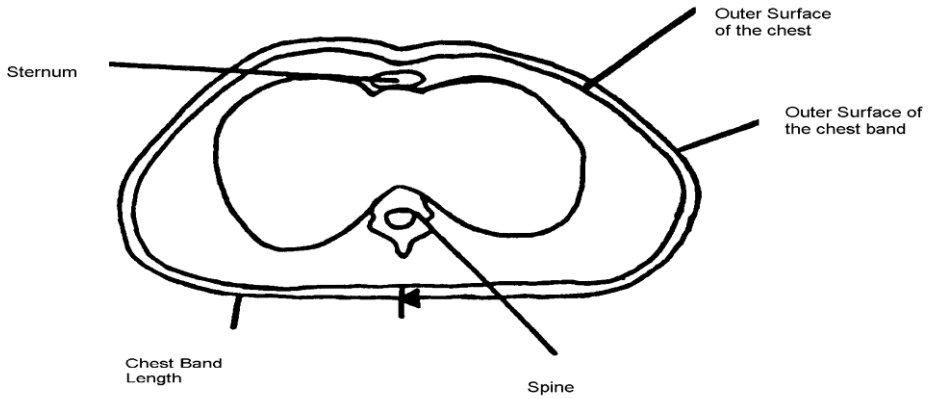


Figure 2-56 BANLEN - Chest Band Length

5. CURNO — Curve Number of a Specific Gauge

Integer 1 to 200

CURNO is the sequential number (1, 2, 3...) assigned to a specific sensor and data curve as defined in ***Section 2.10 Instrumentation Information***. CURNO must be equal to the curve number of the active gauge. The total number of CURNOs is equal to the total number of records where SENATT= CHBD in the instrumentation information.

When CURNOs for other instruments (accelerometers and load cells, for example) have been defined for the same test, CURNOs defined for the gauge numbers will follow in sequence, as the illustration shows.

Chest Band Number	Physical Gauge	Active Gauge (GAGENO)	Curve Number (CURNO)
1	1 - 16	1 - 10	22 - 31
2	1 - 16	1 - 8	32 - 39
3	1 - 16	1 - 7	40 - 46

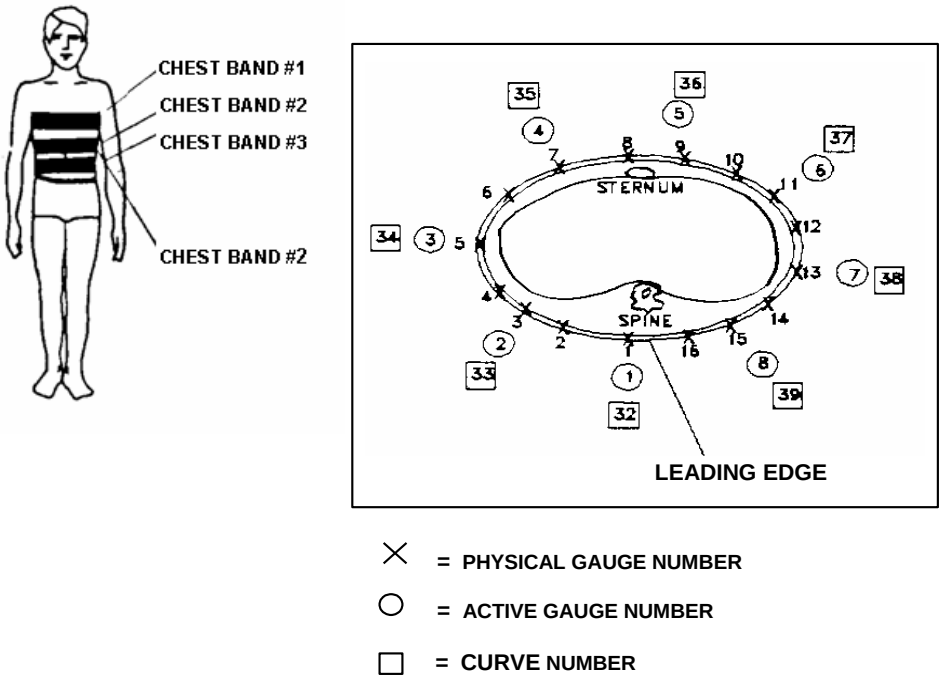


Figure 2-57 CURNO - Curve Number

6. GAGCOM — Gage Commentary

Text with or within 70 characters

GAGCOM should be used to describe any information that is important about the gauge that does not appear in any other text in this information record. If no comments are to be made, use NO COMMENTS (left justified).

Return to Table of Contents

2.13 High-Speed Video Information

Fields defined below constitute the high-speed video information record. This information record contains data from each camera used in the test.

A field includes its order index in the record, name, brief description, type and valid range. For example, in the first field, "**1**", "**CAMNO**", "**Camera Number**", "integer" and "0 to 99" are its order index in the high-speed video information record, its name, its brief description, its type and its range, respectively. Any use of the code for "OTHER" should be explained in an appropriate commentary field.

1. CAMNO — Camera Number

Integer, 0 to 99

CAMNO indicates the order number of cameras used in the test. For example, "1" indicates that the video was taken by camera 1.

2. TSTREF — Test Reference Number

Text with or within 10 characters

TSTREF is an alphanumeric code number assigned to the test by the test performer. It is the same data as TSTREF in the general test information record.

3. VSCFACTOR — Video Frame Number Scale Factor

Positive Real

VSCFACTOR is the scale factor to be applied against the integer frame number of a sequential image file, as described below, in order to convert the integer frame sequence value into a time value in seconds. A value of zero (0) may be entered if sequential frames are not stored at constant intervals of time as with force-deflection data.

4. VIEWDESC — View Description

Text with or within 70 characters

VIEWDESC describes the view of this high-speed video camera (example 'front left view', or 'overhead view')

5. COMMENTS — Camera Commentary

Text with or within 70 characters

COMMENTS comments on this particular camera view.

Return to Table of Contents

Chapter 3 : Test Report Format

A written report should be generated for each test to be submitted. This report shall be saved on the submission physical media under the directory:

\REPORT\

with the filename

R<TSTREF>.pdf

where <TSTREF> has the same value as TSTREF in ***Section 2.3 General Test Information*** of this guide.

The report shall preferably be in the Adobe PDF document format (www.adobe.com). Alternatively, a report may be submitted in Microsoft Word 2000 or later format if the test site is unable to generate a PDF file.

At a minimum, each report shall contain the following information:

1) A cover page including,

   - Title of Study
   - Test Performer
   - Test Reference Number (EV5 specification file - TSTREF)
   - Contract Number
   - Test Date

2) In the main body of the test report, the following items shall be included:

   - A text description and diagram/pictures of the test setup.
   - A table of all injury criteria reported in the EV5 specification file.
   - A complete description of specimen necropsy (cadaver and animal tests only).
   - Description of camera views and type of media (film/video).
   - Information which could not be included in the EV5 specification file, and that the test engineer and/or COTR deem appropriate or important to mention.

3) In the report Appendix A, the following information shall be included:

   - A diagram describing the coordinate system.
   - A table describing load cell manipulations for positive values.

4) In the report Appendix B, a plot of each curve submitted exactly as it should appear in the database. The plots will be compared with the signal data loaded into the database to ensure that the signals the test laboratory intends to enter into the NHTSA database are not corrupted during the submission and loading process. Each plot should display the maximum and minimum values of the signal and their respective event times.

5) In the report Appendix C, a list of the instrumentation associated with each channel, including transducer, sampling rate, signal conditioning, units and axis.

The COTR or test engineer is encouraged to include any other information that they feel is necessary to make the report meaningful and the quality control process easier. However, the COTR or test engineer may not eliminate any of the five (5) minimum requirements outlined above.

Return to Table of Contents

Chapter 4 : Pre- and Post-Event Images

Images and video captured before and after the test may be submitted whether they are digital images or processed film images.

4.1 Digital Images

Digital images and videos of the test before and after the event shall be submitted on the submission media as noted in ***Section 1.1 Media Types and Layout***. Video files shall be submitted under the directory \PREPOST\VIDEOS. Still images shall be submitted under the directory \PREPOST \PHOTOS. File names should be descriptive. Naming convention is at the discretion of the COTR, with the exception that standard file extensions shall be applied to all files as appropriate to the content type of each file.

As an example, TIFF format image files should be named with a file extension of

.tif

while JPEG format image files should be named with a file extension of

.jpg

Digital images shall be submitted in one of the following formats: Windows bitmap (BMP), GIF, TIFF, or JPEG.

4.2 Processed Film Images

Hardcopy processed film images shall be included as an appendix in the report.

If you have data that you wish to submit but which is not specified in this guide, please send email to nrd.softdev@nhtsa.dot.gov.

Return to Table of Contents

Chapter 5 : Event Images, Film, and Video

The procedures for capturing and formatting images of the impact event are described below. Procedures for images captured by high-speed film and high-speed video are outlined below, as well as generic procedures for other event image types.

5.1 High-Speed Film

This section describes procedures for capturing and submitting high-speed film, not digital video. The only content requirements of the high-speed film camera image view specified in this guide are:

1) Somewhere in the image view there should be text denoting the TSTREF described in ***Section 2.3 General Test Information***.

2) Some type of visible time mark should be present to indicate time zero for the test. This time zero should correspond with the time zero on the data acquisition system.

3) Somewhere within the image, the time at which the image was captured shall also be displayed. Alternatively, the use of the LED timing mark available on most high-speed cameras is acceptable.

Processed film should be submitted to NHTSA with the test submission. Multiple camera angles may be submitted on a single reel, or multiple reels may be submitted.

5.2 High-Speed Digital Video

This section describes procedures for capturing and submitting high-speed digital video, not film. The only content requirements of the high-speed video camera image view specified in this guide are:

1) Somewhere in the image view there should be text denoting the TSTREF described in ***Section 2.3 General Test Information***.

2) Some type of visible time mark should be present to indicate time zero for the test. This time zero should correspond with the time zero on the data acquisition system.

3) Somewhere within the image, the time at which the image was captured shall also be displayed.

5.2.1 The High-Speed Digital Video Specification File

The High-Speed Video specification (HS5) File contains information about the data from each camera used in the test. The file is a delimited text file similar to the EV5 information file (see ***Section 2.2.1 Structures of Specification Files***) containing information record sets described in ***Section 2.13 High-***

Speed Video Information. Each high-speed video information record shall be written to an HS5 file on a single line. The line shall be terminated by a carriage return. The HS5 file shall be named <TSTREF>.HS5.

5.2.2 The Sequential Image and Movie Submission Format

High-speed video data should be submitted in two formats, sequential raster image files and AVI movies.

- **Sequential Bitmap Image Files**

Most high-speed video systems output sequential raster image files, with the frame number denoted within the filename of each file. Each file shall be numbered using the following file naming convention:

F<frame number>.<file format extension>

where

<frame number> is the integer sequential frame number of each image. A minus (-) should prefix the <frame number> for images captured before the start of the event.

<file format extension> is TIF for TIFF format image files, JPG for JPEG format image files, GIF for GIF format image files, and BMP for Windows bitmap files.

- **AVI Files**

For each camera view, AVI movie files shall be generated using a widely available codec agreed upon by the laboratory and the COTR. For help with codec selection, send email to nrd.softdev@nhtsa.dot.gov. Each AVI file shall use the following naming convention:

<TSTREF> C <CAMNO>.avi (no spaces in filename)

5.2.3 The Media Format

All high-speed video files shall be stored in the directory \EVENT as described in ***Chapter 1 : Media Formats and Software Tools*** of this guide.

An HS5 file, <TSTREF>.HS5, shall be stored in the directory \EVENT\HSVIDEO on the test submission media with the filename.

High-speed video sequential raster image files and AVI movies shall be placed on the test submission media under \EVENT \HSVIDEO\CAMERA<CAMNO>\, where <CAMNO> is a sequential number assigned to each camera, described in the ***High-Speed Video Information*** section.

Example:

Test lab ABC conducted test T1234 that had 3 high-speed video cameras collecting images, each having views of an impact event from the top, right side, and front. Each camera captured TIFF images from -40 to +500 milliseconds in increments of one millisecond. The digital test submission media would have the following directories:

\EVENT\HSVIDEO\CAMERA1\
\EVENT\HSVIDEO\CAMERA2\
\EVENT\HSVIDEO\CAMERA3\

The following files would be included (**example only**):

\EVENT\HSVIDEO\CAMERA1\T1234C1.AVI (AVI Movie File)
\EVENT\HSVIDEO\CAMERA1\F-40.TIF (Sequential Bitmap Image File)
…
\EVENT\HSVIDEO\CAMERA1\F0.TIF (Sequential Bitmap Image File)
…
\EVENT\HSVIDEO\CAMERA1\F500.TIF (Sequential Bitmap Image File)

\EVENT\HSVIDEO\CAMERA2\T1234C2.AVI
\EVENT\HSVIDEO\CAMERA2\F-40.TIF
…
\EVENT\HSVIDEO\CAMERA2\F0.TIF
…
\EVENT\HSVIDEO\CAMERA2\F500.TIF

\EVENT\HSVIDEO\CAMERA3\T1234C3.AVI
\EVENT\HSVIDEO\CAMERA3\F-40.TIF
…
\EVENT\HSVIDEO\CAMERA3\F0.TIF
…
\EVENT\HSVIDEO\CAMERA3\F500.TIF

The contents of the High Speed Video Specification file named T1234.HS5 would be:

```
# Source: High Speed Video Data
# Date: <11/29/2005>
----- HSVD -----
1|T1234|0.001|TOP VIEW|NO COMMENTS
2|T1234|0.001|RIGHT SIDE VIEW|NO COMMENTS
3|T1234|0.001|FRONT VIEW|NO COMMENTS
----- END -----
```

In this example, the frame number scale factor for each camera is 0.001 second.

5.3 Other Event Images

Other event images, such as BETA or VHS tapes, can be included in the test submission packet. Please send email to nrd.softdev@nhtsa.dot.gov if you have any questions about submitting event images not specified in this guide.

Return to Table of Contents

Appendix A: Data Coordinate System

Starting with Version 4 of the NHTSA Test Reference Guides, 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.

A-1. 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 A-1*** and ***Figure A-2***. The coordinate system for the nine-accelerometer head array is shown in ***Figure A-3***, along with the proper SENATT codes.

Table A- 1 lists the polarity of the sensor output from various dummy manipulations when using this coordinate system.

A-2. Vehicle Global Coordinate System

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

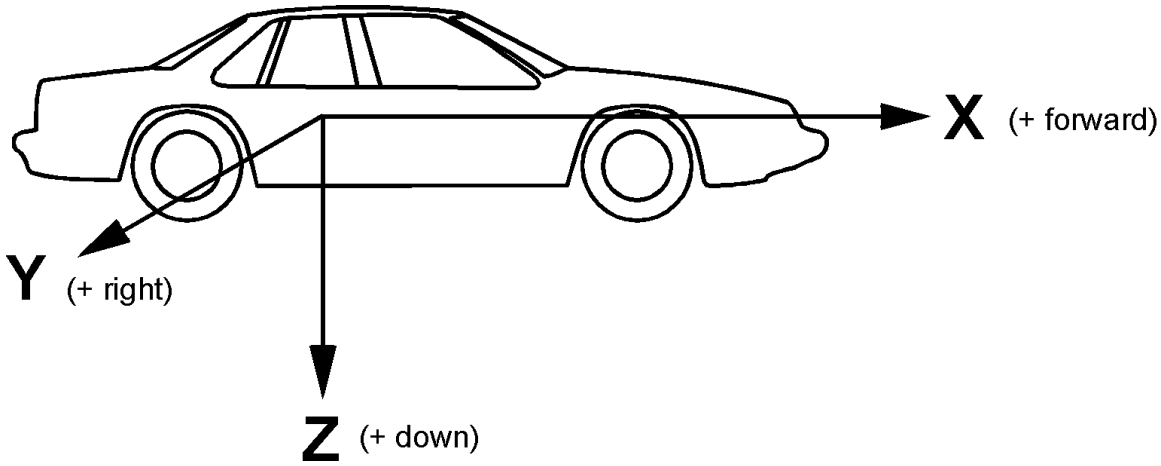


Figure A-1 Vehicle Global Coordinate System

A-3. Occupant Global Coordinate System

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

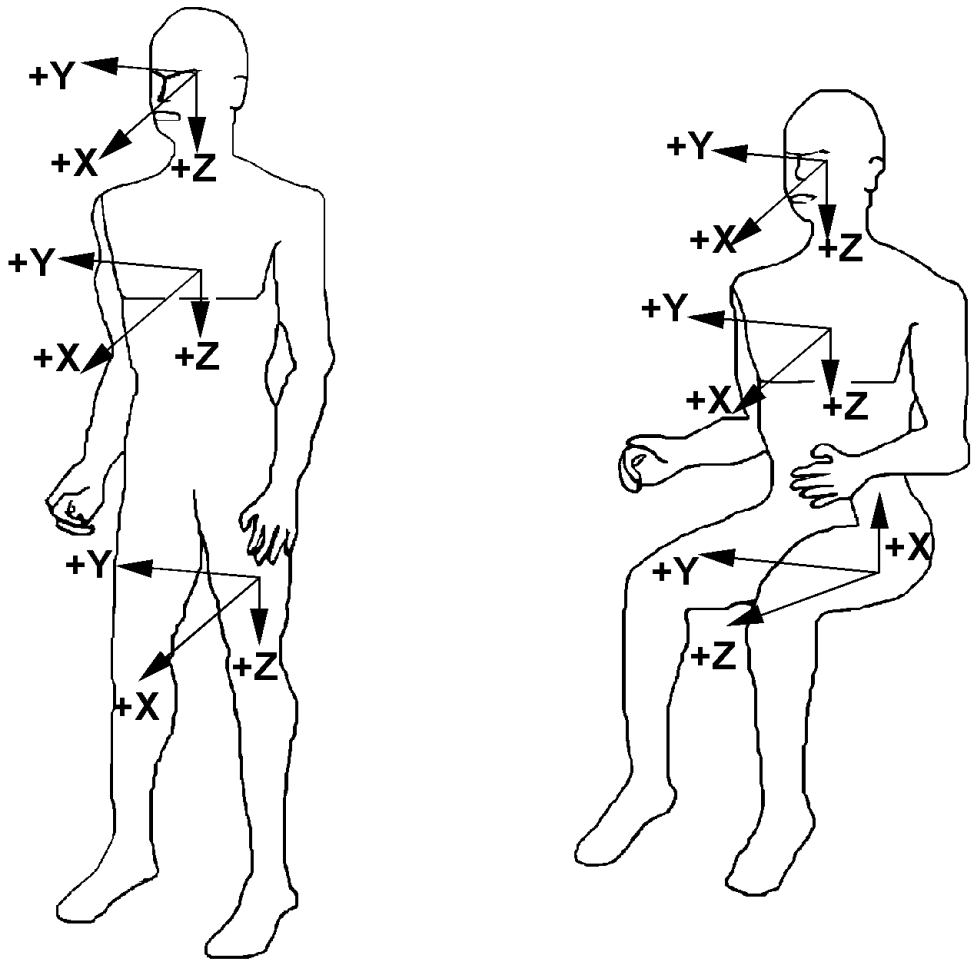


Figure A-2 Occupant Global Coordinate System

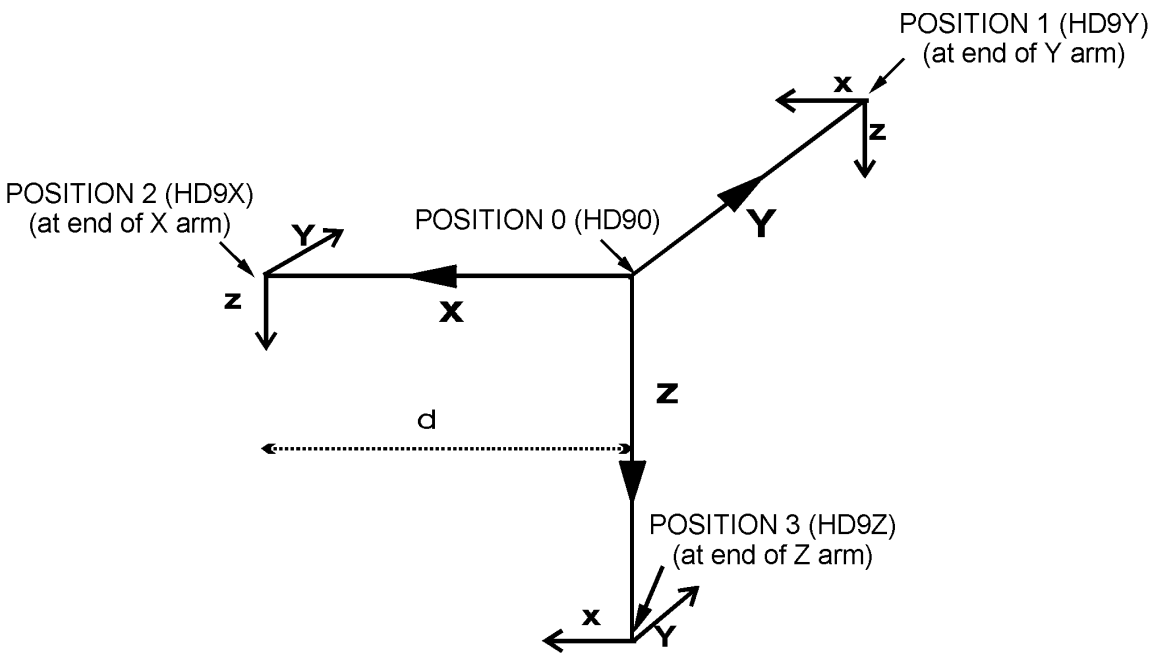


Figure A-3 Nine-Accelerometer Coordinate System

Table A- 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	Fx	Chest rearward, Pelvis forward	+
	Fy	Chest leftward, pelvis rightward	+
	Fz	Chest upward, pelvis downward	+

Load Cell	Measure	Dummy Manipulations	Polarity
lumbar spine	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	+
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	+
	Mz	Tibia leftward, hold pelvis in place	+
Knee clevis	Fz	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	+

Return to Table of Contents

Appendix B: Technical Support Information

B-1. Reference Guide Updates and Software Updates

NHTSA now maintains web sites for the NHTSA Test Reference Guides and the Entree for Windows software. The latest versions of the guides and the software are made available for download from the sites below:

NHTSA Test Reference Guides

NHTSA Test Reference Guides | National Highway Traffic Safety Administration (NHTSA)

Entree for Windows

Entree for Windows | National Highway Traffic Safety Administration (NHTSA)

Because the NHTSA Research and Development web site is a constantly evolving resource it may happen that the links noted above do not work correctly. In the event that this does occur please utilize the available ***SEARCH*** feature to search for "NHTSA Test Reference Guides" and "Entrée for Windows".

B-2. Requesting Assistance

In the event that a user of the Test Reference Guides requires technical support with using the guides, or has questions about the content of the guides, support is offered via Internet e-mail. Simply send a message to the address

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

ATTN: NHTSA Test Reference Guides

To request assistance with the Entree for Windows software send an e-mail to

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

ATTN: Entrée for Windows

A staff person will acknowledge the request, and we will endeavor to provide a complete response within two (2) business days on a first-come, first-served basis.

B-3. Reporting a Problem

To report a problem or potential bug in either the guides or the Entree for Windows software, please send an e-mail to

nrd.softdev@nhtsa.dot.gov

with a subject line including the text

BUG REPORT: NHTSA Test Reference Guides

or

BUG REPORT: Entrée for Windows

for the Test Reference Guides, or Entrée for Windows, respectively.

A staff person will acknowledge the problem report. For simple problems we will endeavor to provide a complete response within five (5) business days on a first-come, first-served basis. In the event that correction of a problem requires more than 5 business days we will notify the user in advance.

Return to Table of Contents