APPENDIX B
PART 572, SUBPART O (5th Female) DUMMY PERFORMANCE CALIBRATION TEST PROCEDURE
# APPENDIX B
PART 572, SUBPART O DUMMY PERFORMANCE CALIBRATION TEST PROCEDURE

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1. PURPOSE AND APPLICATION

The purpose of this laboratory procedure is to provide dummy users (independent testing laboratories under contract with the Office of Vehicle Safety Compliance) with standard test procedures for performing receiving-inspection and performance calibration tests on the Part 572, Subpart O dummy so that repetitive and correlative test results can be obtained. The following tests have been developed to establish a uniform calibration procedure for all users as the means of verifying the performance of the dummy.

A. EXTERNAL DIMENSIONS (drawing 880105-000-XH pg. 5 of 6, & PADI)
B. HEAD DROP TEST (572.132)
C. NECK FLEXION TEST (572.133(b)(1))
D. NECK EXTENSION TEST 572.133(b)(2)
E. THORAX IMPACT TEST ((572.134)
F. TORSO FLEXION (572.135)
G. KNEE IMPACT TESTS (572.136)

This laboratory procedure for the calibration of Part 572, Subpart O dummies must be used by National Highway Traffic Safety Administration (NHTSA) contract laboratories performing FMVSS 208 testing for the Office of Vehicle Safety Compliance (OVSC).

2. GENERAL REQUIREMENTS

The Code of Federal Regulations (49CFR), Parts 571 and 572, was amended to adopt the Hybrid III, 5th Percentile Female Dummy as the means of determining a vehicle’s conformance to the performance requirements of FMVSS 208. Each Part 572, Subpart O dummy used in a compliance test must meet the specifications and performance criteria of Part 572 before and after each vehicle crash test or low risk deployment test in order to be an acceptable compliance test tool.

The Part 572, Subpart O Hybrid III 5th Percentile Female Dummy consists of components and assemblies specified in the drawing and specifications package which is available from Reprographics Technologies, 9000 Virginia Manor, Beltsville, MD 20705, telephone - (301) 419-5070.

3. SECURITY

All NHTSA Part 572, Subpart O test dummies delivered to the contract laboratory as Government Furnished Property (GFP) will be stored in a safe and secure area such as the dummy calibration laboratory. The contractor is financially responsible for any acts of theft and/or vandalism which occur during the storage of GFP. Any security problems shall be reported by telephone to the Industrial Property Manager (IPM), Office of Acquisition Management, within two working
days after the incident. A letter containing specific details of the security problem will be sent to the IPM (with copy to the COTR) within 48 hours.

The contractor is responsible for maintaining the NHTSA test dummies in good working order, and shall protect and segregate the data that evolves from conducting Part 572, Subpart O dummy calibration tests before and after each vehicle crash usage. No Information concerning the Part 572, Subpart O dummy calibration data shall be released to anyone except the COTR, unless specifically authorized by the COTR or the COTR's Division Chief.

**NOTE:** No Individuals, other than contractor personnel directly involved in the dummy calibration test program, shall be allowed to witness dummy calibration tests unless specifically authorized by the COTR.

4. **GOOD HOUSEKEEPING**

   Contractors shall maintain the entire dummy calibration laboratory, test fixtures, and instrumentation in a neat, clean, and painted condition with test instruments arranged in an orderly manner consistent with good test laboratory housekeeping practices.

5. **TEST SCHEDULING AND MONITORING**

   The Part 572, Subpart O dummies are being calibrated as test tools to be used in a vehicle test to determine compliance with the requirements of FMVSS 208. The schedule for these performance calibration tests must be correlated with that of the vehicle tests. All testing shall be coordinated to allow monitoring by the COTR.

6. **TEST DATA DISPOSITION**

   The contractor shall make all dummy calibration data available to the COTR for review and analysis as required. All calibration test data for each particular Part 572, Subpart O dummy will be sent to the COTR with each test report.

   All backup data sheets, strip charts, recordings, plots, technicians notes, etc. shall be either sent to the COTR or destroyed at the conclusion of each delivery order, purchase order, etc.
7. GOVERNMENT FURNISHED PROPERTY (GFP)

Part 572, Subpart O test dummies will be furnished to the contract laboratory by the OVSC. The dummies shall be stored in an upright sitting position with the weight supported by the internal structure of the pelvis. The dummies head shall be held upright by using a strap around the chest or the base of the neck so that the neck is not supporting the weight of the dummy. These dummies shall be stored in a secured room that is kept between 55ºF and 85ºF. The contractor will check dummy components for damage after each crash test and complete a dummy damage checklist that will be included with the posttest dummy calibration. The COTR will be kept informed of the dummies condition in order that replacement parts can be provided. The contractor shall calibrate the dummies before and verify the calibration after every crash or low risk deployment test. If the posttest verification is within the calibration specifications, it may be used as the pretest calibration for the next crash test or low risk deployment test.

8. CALIBRATION AND TEST INSTRUMENTATION

Before the contractor initiates the dummy performance calibration test program, a test instrumentation calibration system must be implemented and maintained in accordance with established calibration practices. The calibration system shall be set up and maintained as follows:

A. Standards for calibrating the measuring and test equipment shall be stored and used under appropriate environmental conditions to assure their accuracy and stability.

B. All measuring instruments and standards shall be calibrated by the contractor, or a commercial facility, against a higher order standard at periodic intervals not exceeding 12 months for instruments and 12 months for calibration standards. Records, showing the calibration traceability to the National Institute of Standards and Technology (NIST), shall be maintained for all measuring and test equipment.

C. All measuring and test equipment and measuring standards shall be labeled with the following information:

(1) Date of calibration

(2) Date of next scheduled calibration

(3) Name of the technician who calibrated the equipment
D. The contractor shall provide a written calibration procedure that includes, as a minimum, the following information for all measurement and test equipment:

1. Type of equipment, manufacturer, model number, etc.
2. Measurement range
3. Accuracy
4. Calibration interval
5. Type of standard used to calibrate the equipment (calibration traceability of the standard must be evident)
6. The actual procedures and forms used to perform calibrations.

E. The contractor shall keep records of calibrations for all test instrumentation in a manner that assures the maintenance of established calibration schedules. All such records shall be readily available for inspection when requested by the COTR. The calibration system shall need the written acceptance of the COTR before testing begins.

F. Test equipment shall receive a calibration check immediately prior to and after each test. This check shall be recorded by the test technician(s) and submitted with the final report.

G. Anthropomorphic test devices shall be calibrated before and verify the calibration after each crash or low risk deployment test. These calibrations shall be submitted with the final report.

9. PHOTOGRAPHIC DOCUMENTATION

Provide still digital photographs (8 x 10 inch glossy color prints properly focused for clear images) of post test damage resulting from the vehicle crash or low risk deployment test.

A tag, label or placard identifying the item and date shall appear in each photograph and must be legible. Each photograph shall be labeled as to the subject matter. The required resolution for digital photographs is a minimum of 1,600 x 1,200 pixels. Digital photographs are required to be in color and in a JPG format.

10. DEFINITIONS

PADI: Procedures for Assembly, Disassembly, and Inspection


11. PRETEST REQUIREMENTS

11.1 TRANSUDUCER REQUIREMENTS

The contractor shall provide and install the following instrumentation to the GFP dummies (excluding the chest deflection transducer).

A. HEAD – The head accelerometers shall have dimensions, response characteristics and sensitive mass locations specified in drawing SA572-S4 and be mounted in the head as shown in drawing 880105-000 sheet 3 of 6. (572.137(c))

Three accelerometers shall be mounted in the head cavity to measure orthogonal accelerations (Ax, Ay, Az) at the center of gravity (CG) of the head assembly.

B. NECK – The upper neck force transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S11 and shall be mounted in the head neck assembly as shown in drawing 880105-000, sheet 3 of 6. (572.137(d))

C. CHEST – The chest accelerometers shall have the dimensions, response characteristics, and sensitive mass locations specified in drawing SA572-S4 and be mounted in the torso assembly in traxial configuration within the spine box instrumentation cavity as shown drawing 880105-000 sheet 3 of 6. The chest accelerometers are not required for dummy calibration testing but are required for FMVSS 208 testing. (572.137(e))

The chest deflection transducer shall have the dimensions and response characteristics specified in drawing SA572-S51 and be mounted to the upper torso assembly as shown in drawings 880105-300 and 880105-000 sheet 3 of 6. (572.137(j))

D. LEGS -- The single axis femur force transducer shall have the dimensions, response characteristics, and sensitive axis locations specified in drawing SA572-S14 and be mounted in assemblies 880105-560-1 and 880105-560-2. The femur transducers are not required for calibration of the dummy but are required for FMVSS 208 testing. (572.137(i))

E. TEST FIXTURE – The neck pendulum, thorax and knee probe accelerometers shall have the dimensions and characteristics of drawing SA572-S4.
11.2 OTHER TRANSDUCER CONDITIONS

A. TRANSDUCER MOUNTS – The mountings for sensing devices shall have no resonance frequency less than 3 times the frequency range of the applicable channel class. (572.137(o))

B. TRANSDUCER SIGN CONVENTION - The sign convention for outputs of transducers mounted within the dummy that measure head and chest accelerations, chest deflection and femur loads are located in Figure 1B. For other transducers see SAE J1733DEC94. (572.137(n))

C. TRANSDUCER OUTPUT FILTERING - The outputs of acceleration and force-sensing devices installed in the dummy and in the test apparatus specified by this part are recorded with individual data channels. Each data channel will be comprised of a sensor, signal conditioner, data acquisition device, and all interconnecting cables, and must conform to the requirements of SAE Recommended Practice J211/1 MAR95, "Instrumentation for Impact Test," with channel classes as follows: (572.137(m))

(1) Head acceleration Class 1000 (572.137(m)(1))
(2) Neck force Class 1000 (572.137(m)(2)(i))
   except use Class 600 for calculation of neck moment about the occipital condyle
(3) Neck moment Class 600 (572.137(m)(2)(iii))
(4) Neck pendulum acceleration Class 180 (572.137(m)(2)(iii))
(5) Neck rotation transducers Class 60 (572.137(m)(2)(iv))
(6) Thorax and thorax pendulum acceleration Class 180 (572.137(m)(3)(iii))
(7) Thorax deflection Class 600 (572.137(m)(3)(iii))
(8) Knee pendulum acceleration Class 600 (572.137(m)(6))
(9) Femur force Class 600 (572.137(m)(6))

All filter classes should be of the "phaseless" type to be compatible with the "time" dependent test parameters.

11.3 THORAX IMPACTOR PROBE (572.137(a))

A. The test probe for thoracic impacts shall be of rigid metallic construction, concentric about its longitudinal axis.

B. It shall have a mass of 13.97 ± 0.023 kg (30.8 ± 0.05 lbs). 1/3 of the weight of the suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.
C. It shall have a minimum mass moment of inertia of 3646 kg-cm$^2$ (3.22 lbs-in-sec$^2$) in yaw and pitch about the center of gravity.

D. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It must have a flat, continuous, and non-deformable face with diameter of 152.4 ± 0.25 mm (6.00 ± 0.01 in) and a maximum edge radius of 7.6-12.7 mm (0.3-0.5 in).

E. The impactor is a cylinder with a diameter of 152.4-152.6 mm (6.0-6.1 in) and it is at least 25 mm (1.0 in) long.

F. The probe’s end opposite to the impact face must have provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe.

G. The impact probe shall have a free air resonant frequency of not less than 1000 Hz.

11.4 KNEE IMPACTOR PROBE (572.137(b))

A. The test probe for knee impacts shall be of rigid metallic construction, concentric about its longitudinal axis.

B. It shall have a mass of 2.99 ± 0.01 kg (6.6 ± 0.022 lbs). 1/3 of the weight of the suspension cables and any attachments to the impact probe must be included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.

C. It shall have a minimum mass moment of inertia of 209 kg-cm$^2$ (0.177 lbs-in-sec$^2$) in yaw and pitch about the center of gravity.

D. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It must have a flat, continuous, and non-deformable face with diameter of 76.2 ± 0.2mm (3.00 ± 0.01 in) and a maximum edge radius of 7.6-12.7 mm (0.3-0.5 in).

E. The impactor is a cylinder with a diameter of 76.2 –76.4 mm (3.00 –3.1 in) and it is at least 12.5 mm (1.0 in) long.

F. The probe’s end opposite to the impact face must have provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe.

G. The impact probe shall have a free air resonant frequency of not less than 1000 Hz.
SIGN CONVENTIONS FOR
PART 572 SUBPART E TEST DUMMIES

POSSIBLE $A_R$

$A_R = \sqrt{A_X^2 + A_Y^2 + A_Z^2} \ Gs$

3 UNIAXIAL ACCELEROMETERS
LOCATED AT THE C.G. OF THE
HEAD ASSEMBLY

3 UNIAXIAL ACCELEROMETERS
LOCATED AT THE C.G. OF THE
CHEST ASSEMBLY

RIGHT FEMUR
LOAD CELL
($F_R$)

LEFT FEMUR
LOAD CELL
($F_L$)

$+F_R$

$+F_L$ (Tension)

$+F_R$

$+F_L$ (Tension)

FIGURE 1B
<table>
<thead>
<tr>
<th>BODY SEGMENT — MEASURED FORCE</th>
<th>POSITIVE OUTPUT DIRECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>NECK FX SHEAR</td>
<td>HEAD REARWARD OR CHEST FORWARD</td>
</tr>
<tr>
<td>NECK FY SHEAR</td>
<td>HEAD LEFTWARD, CHEST RIGHTWARD</td>
</tr>
<tr>
<td>NECK FZ AXIAL</td>
<td>HEAD UPWARD, CHEST DOWNWARD</td>
</tr>
<tr>
<td>NECK MX MOMENT (ROLL)</td>
<td>LEFT EAR TOWARD LEFT SHOULDER</td>
</tr>
<tr>
<td>NECK MY MOMENT (PITCH)</td>
<td>CHIN TOWARD STERNUM</td>
</tr>
<tr>
<td>NECK MZ MOMENT (YAW)</td>
<td>CHIN TOWARD LEFT SHOULDER</td>
</tr>
<tr>
<td>FEMUR FX SHEAR</td>
<td>KNEE UPWARD, UPPER FEMUR DOWNWARD</td>
</tr>
<tr>
<td>FEMUR FY SHEAR</td>
<td>KNEE RIGHTWARD, UPPER FEMUR LEFTWARD</td>
</tr>
<tr>
<td>FEMUR FZ AXIAL</td>
<td>KNEE FORWARD (TENSION), PELVIS REARWARD</td>
</tr>
<tr>
<td>FEMUR MX MOMENT (ROLL)</td>
<td>KNEE LEFTWARD, HOLD UPPER FEMUR IN PLACE</td>
</tr>
<tr>
<td>FEMUR MY MOMENT (PITCH)</td>
<td>KNEE UPWARD, HOLD UPPER FEMUR IN PLACE</td>
</tr>
<tr>
<td>FEMUR MZ MOMENT (YAW)</td>
<td>KNEE ROTATED CCW WHEN FACING FRONT OF DUMMY</td>
</tr>
<tr>
<td>KNEE CLEVIS - FZ AXIAL</td>
<td>TIBIA DOWNWARD (TENSION), FEMUR UPWARD</td>
</tr>
<tr>
<td>UPPER TIBIA MX MOMENT</td>
<td>ANKLE LEFTWARD, HOLD KNEE IN PLACE</td>
</tr>
<tr>
<td>UPPER TIBIA MY MOMENT</td>
<td>ANKLE FORWARD, BOTTOM OF KNEE CLEVIS REARWARD</td>
</tr>
<tr>
<td>LOWER TIBIA MX MOMENT</td>
<td>ANKLE FORWARD, KNEE REARWARD</td>
</tr>
<tr>
<td>LOWER TIBIA MY MOMENT</td>
<td>ANKLE RIGHTWARD, KNEE LEFTWARD</td>
</tr>
<tr>
<td>LOWER TIBIA ANKLE DOWNWARD (TENSION), KNEE UPWARD</td>
<td>ANKLE DOWNWARD (TENSION), KNEE UPWARD</td>
</tr>
<tr>
<td>CHEST DISPLACEMENT</td>
<td>CHEST COMPRESSED - NEGATIVE</td>
</tr>
<tr>
<td>KNEE SHEAR DISPLACEMENT</td>
<td>PUSH ON FRONT OF TIBIA - NEGATIVE</td>
</tr>
</tbody>
</table>

**NOTE:** DIRECTIONS ARE DEFINED IN RELATION TO A SEATED DUMMY
11.5 GENERAL TEST CONDITIONS

A. Surfaces of dummy components are not painted unless otherwise specified. (572.137(r))

B. Dummy performance tests of the same component, segment, assembly, or fully assembled dummy are separated in time by a period of not less than 30 minutes unless otherwise specified. (572.137(q))

C. Except for neck assembly and thorax assembly testing, the dummy performance tests are conducted at any temperature from 18.9°C (66ºF) to 25.6°C (78ºF) and at any relative humidity from 10% to 70% after exposure of the dummy to these conditions for a period of not less than 4 hours. For the neck assembly and thorax assembly, the temperature range is 20.6°C (69ºF) to 22.2°C (72ºF)

D. Dummy limb joints are set at 1G, barely restraining the weight of the limb when it is extended horizontally. The force required to move a limb segment does not exceed 2 Gs throughout the range of limb motion. (572.137(p)) Also see Appendix B of the PADI for guidelines for setting the joints to 1G.

E. Dummies will be clothed for the thorax calibration tests with a form fitting cotton stretch above-the-elbow sleeved shirt and above-the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg (0.30 lb) each. (572.134(c)(1))

12. CALIBRATION TEST EXECUTION

Complete the Data Sheets in section 15.

13. POST TEST REQUIREMENTS

The contractor shall verify all instrumentation and check data sheets and photographs. Make sure data is recorded in all data blocks on every performance calibration test data sheet.

14. REPORTS

14.1 APPARENT NONCONFORMANCE

During the post test calibration verification, any indication of apparent nonconformance to the requirements of Regulation P572 shall be communicated by telephone to the COTR within 24 hours with written notification mailed within 48 hours (Saturdays and Sundays excluded). Written notification shall be
submitted with a copy of the particular test data sheet(s) and preliminary data plot(s).
In the event of an apparent nonconformance, a post test calibration check of some critically sensitive test equipment and instrumentation may be required for verification of accuracy. The necessity for the calibration shall be at the COTR's discretion and shall be performed without additional costs to the OVSC.

14.2 FINAL PERFORMANCE CALIBRATION REPORTS

14.2.1 COPIES

A report containing the pre-test calibration and post test calibration verification data for each Part 572, Subpart O dummy used in the vehicle compliance test shall be submitted with FMVSS 208 final test report for the vehicle tested.

Contractors are required to PROOF READ all Final Test Reports before submittal to the COTR. The OVSC will not act as a report quality control office for contractors. Reports containing a significant number of errors will be returned to the contractor for correction, and a "hold" will be placed on invoice payment for the particular test.

14.2.2 REQUIREMENTS

Performance calibration report Table of Contents shall include the following:

A. Section 1 — Purpose of Calibration Test
B. Section 2 — Calibration Data Summary
C. Section 3 — Test Data
D. Section 4 — Test Equipment List and Calibration Information
E. Section 5 — Photographs (if applicable)

The test data for each dummy will be presented in separate sections. Each section shall contain a title page, test results summary and the test data. The title page shall include the dummy's serial number and the manufacturer's name. It will also indicate whether the calibration data is pre or post test. The test results sheets will provide a summary of each test and describe any damage, failures and/or corrective action taken. The test data shall include the pass/fail data sheets, the time histories for each data channel used to determine the pass or fail status, and instrumentation calibration data sheets.
14.2.3 FIRST PAGE

FRONT COVER

A heavy paperback cover (or transparency) shall be provided for the protection of the final report. The information required on the cover is as follows:

A. Final Report Title And Subtitle such as

DUMMY PERFORMANCE CALIBRATION  
IN SUPPORT OF  
VEHICLE SAFETY COMPLIANCE TESTING  
FOR OCCUPANT CRASH PROTECTION

H. Contractor's Name and Address such as

ABC TESTING LABORATORIES, INC.  
405 Main Street  
Detroit, Michigan 48070

NOTE: DOT SYMBOL WILL BE PLACED BETWEEN ITEMS B AND C

C. Date of Final Performance Calibration Report completion

D. The sponsoring agency's name and address as follows

U. S. DEPARTMENT OF TRANSPORTATION  
National Highway Traffic Safety Administration  
Enforcement  
Office of Vehicle Safety Compliance  
Mail Code: NVS-220  
1200 New Jersey Ave., SE  
Washington, DC 20590
15. Data Sheets

DATA SHEET B1
DUMMY DAMAGE CHECKLIST

Dummy Serial Number _______________ Test Date _______________

Technician ___________________________

This check sheet is completed as part of the post test calibration verification.

__ Perform general cleaning.

<table>
<thead>
<tr>
<th>Dummy Item</th>
<th>Inspect for</th>
<th>Comments</th>
<th>Damaged</th>
<th>OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer skin</td>
<td>Gashes, rips, cracks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>Ballast secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General appearance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck</td>
<td>Broken or cracked rubber</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper neck bracket firmly attached to the lower neck bracket</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Looseness at the condyle joint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nodding blocks cracked or out of position</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td>Broken or cracks in rubber.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribs</td>
<td>Broken or bent ribs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Broken or bent rib supports</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Damping material separated or cracked</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rubber bumpers in place</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest Displacement Assembly</td>
<td>Bent shaft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Slider arm riding in track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transducer leads</td>
<td>Torn cables</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dummy Item</td>
<td>Inspect for</td>
<td>Comments</td>
<td>Damaged</td>
<td>OK</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------------------------------</td>
<td>----------</td>
<td>---------</td>
<td>----</td>
</tr>
<tr>
<td>Accelerometer</td>
<td>Head mounting secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountings</td>
<td>Chest mounting secure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knees</td>
<td>Skin condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insert (do not remove)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Casting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limbs</td>
<td>Normal movement and adjustment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee Sliders</td>
<td>Wires intact</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rubber returned to “at rest” position</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pelvis</td>
<td>Broken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

If upon visual examination, damage is apparent in any of these areas, the appropriate engineer or engineering technician is to be consulted for a decision on repair or replacement of parts.

Repair or Replacement approved by:

_____________________________  ______________
Signature      Date

Describe the repair or replacement of parts:

Checked by

_____________________________  ______________
Signature      Date
DATA SHEET B2
EXTERNAL MEASUREMENTS (5th Female)
(See the PADI, pages 82-85)

Dummy Serial Number ________________ Test Date ________________

Technician ______________________________

_ Pretest calibration
_ Post test calibration verification

_ 1. Remove the dummy’s chest jacket and the abdominal insert.
_ 2. Seat the dummy on a flat, rigid, smooth, clean, dry, horizontal surface as shown in Figure 3B and 4B. The seating surface is at least 406 mm (16 in) wide and 406 mm (16 in) in depth with a vertical section at least 406 mm (16 in) wide and 914 mm (36 in) high attached to the rear of the seating fixture. The dummy’s midsagittal plane is vertical and centered on the test surface.
_ 3. Remove the four ¼-20 x 5/8 SHCS that attach the lumbar spine to the thoracic spine. Lift the upper torso off of the lower torso. Check the torque on the 2-20 jam nut that attaches to the end of the lumbar spine cable. The torque should be 1.13 – 1.35 NM (10 – 12 in-lbs).

NOTE: At this point the thorax is to be inspected for damage. The thorax displacement transducer may be removed for calibration if required (pretest calibration only). Extreme caution to be used so as not to damage the instrumentation cables.

_ 4. Reassemble the upper torso to the lower torso.
_ 5. Secure the dummy to the test fixture so that the button head screws (that attach the top rib to the spine box) and the adapter plate (that connects the upper torso to the lower torso) are against the vertical surface of the fixture. The rear surface of the buttocks now contacts the fixture.
_ 6. Position the dummy’s H-point so it is 83.8 ± 2.5 mm (3.3 ± 0.1 in) above the horizontal seating surface and 147.3 ± 2.5 mm (5.8 ± 0.1 in) forward of the rear vertical surface of the fixture. (Note: the H-point is located 68.6 mm (2.7 in) forward and 58.4 mm (2.3 in) downward from the center of the square hole in the pelvis.)
_ 7. Extend the dummy’s neck so that the base of the skull is level both fore-and-aft and side-to-side, within 0.5 degrees. The rear surface of the skull cap should be 45.7 ± 2.5 mm (1.8 ± 0.1 in) from the vertical surface of the test fixture. A strap or bungee cord may be placed around the forehead of the dummy to stabilize the head in this position.
_ 8. Position the upper and lower legs parallel to the midsagittal plane so the centerline between the knee pivot and the screw attaching the ankle to the lower tibia is vertical.
__9. Position the feet parallel to the dummy’s midsagittal plane with the bottoms horizontal and parallel to the seating surface.
__10. Position the upper arms downward vertically so the centerline between the shoulders and elbow pivots is parallel to the rear vertical surface of the fixture.
__11. Position the lower arms horizontally so the centerline between the elbow and wrist pivots is parallel to the seat surface.
__12. Record the dimensions listed in following table, except for dimension Y and Z (reference figure 2B).
__13. Install the abdominal insert and chest jacket. Reposition the dummy on the test fixture. The head need not be level as previously specified.
__14. Mark the locations AA, and BB, and record the dimensions Y, Z, as specified in following table and figure 2B.

________________________________________  ______________________
Signature                                      Date
## EXTERNAL DIMENSIONS

HYBRID III, PART 572, SUBPART O EXTERNAL DIMENSIONS

<table>
<thead>
<tr>
<th>DIMENSION</th>
<th>DESCRIPTION</th>
<th>DETAILS</th>
<th>ASSEMBLY DIMENSION (mm)</th>
<th>ACTUAL MEASUREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TOTAL SITTING HEIGHT</td>
<td>Seat surface to highest point on top of the head.</td>
<td>774.7-800.1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SHOULDER PIVOT HEIGHT</td>
<td>Centerline of shoulder pivot bolt to the seat surface.</td>
<td>431.8-457.2</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>H-POINT HEIGHT</td>
<td>Reference</td>
<td>81.3-86.3</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>H-POINT LOCATION FROM BACKLINE</td>
<td>Reference</td>
<td>144.8-149.8</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>SHOULDER PIVOT FROM BACKLINE</td>
<td>Center of the shoulder clevis to the rear vertical surface of the fixture.</td>
<td>68.6-83.8</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>THIGH CLEARANCE</td>
<td>Measured at the highest point on the upper femur segment.</td>
<td>119.4-134.6</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>BACK OF ELBOW TO WRIST PIVOT</td>
<td>back of the elbow flesh to the wrist pivot in line with the elbow and wrist pivots</td>
<td>243.9-259.1</td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>HEAD BACK TO BACKLINE</td>
<td>Back of Skull cap skin to seat rear vertical surface (Reference)</td>
<td>43.2-48.2</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>SHOULDER TO- ELBOW LENGTH</td>
<td>Measure from the highest point on top of the shoulder clevis to the lowest part of the flesh on the elbow in line with the elbow pivot bolt.</td>
<td>276.8-297.2</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>ELBOW REST HEIGHT</td>
<td>Measure from the flesh below the elbow pivot bolt to the seat surface.</td>
<td>182.8-203.2</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>BUTTOCK TO KNEE LENGTH</td>
<td>The forward most part of the knee flesh to the rear vertical surface of the fixture.</td>
<td>520.7-546.1</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>POPLITEAL HEIGHT</td>
<td>Seat surface to the plane of the horizontal plane of the bottom of the feet.</td>
<td>355.6-376</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>KNEE PIVOT HEIGHT</td>
<td>Centerline of knee pivot bolt to the horizontal plane of the bottom of the feet.</td>
<td>393.7-419.1</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>BUTTOCK POPLITEAL LENGTH</td>
<td>The rearmost surface of the lower leg to the same point on the rear surface of the buttocks used for dim. “K”.</td>
<td>414-439.4</td>
<td></td>
</tr>
<tr>
<td>DIMENSION</td>
<td>DESCRIPTION</td>
<td>DETAILS</td>
<td>ASSEMBLY DIMENSION (mm)</td>
<td>ACTUAL MEASUREMENT</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>O</td>
<td>CHEST DEPTH WITHOUT JACKET</td>
<td>Measured 304.8 ± 5.1 mm above seat surface</td>
<td>175.3-190.5</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>FOOT LENGTH</td>
<td>Tip of toe to rear of heal</td>
<td>218.5-233.7</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>STANDING HEIGHT (THEORETICAL)</td>
<td></td>
<td>1501.1</td>
<td>N/A</td>
</tr>
<tr>
<td>R</td>
<td>BUTTOCK TO KNEE PIVOT LENGTH</td>
<td>The rear surface of the buttocks to the knee pivot bolt</td>
<td>457.2-482.6</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>HEAD BREADTH</td>
<td>The widest part of the head</td>
<td>137.1-147.3</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>HEAD DEPTH</td>
<td>Back of the head to the forehead</td>
<td>177.8-188</td>
<td></td>
</tr>
<tr>
<td>U</td>
<td>HIP BREADTH</td>
<td>The widest part of the hip</td>
<td>299.7-314.9</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>SHOULDER BREADTH</td>
<td>Outside edges of right and left shoulder cleises</td>
<td>350.5-365.7</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>FOOT BREADTH</td>
<td>The widest part of the foot</td>
<td>78.8-94</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>HEAD CIRCUMFERENCE</td>
<td>Measured at the point as in dim. “T”</td>
<td>528.3-548.7</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>CHEST CIRCUMFERENCE (WITH CHEST JACKET)</td>
<td>Measured 345.4 ± 12.7 mm above seat surface</td>
<td>850.9-881.3</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>WAIST CIRCUMFERENCE</td>
<td>Measured 165.1 ± 5.1 mm above seat surface</td>
<td>759.5-789.9</td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>REFERENCE LOCATION FOR MEASUREMENT OF CHEST CIRCUMFERENCE</td>
<td>Reference</td>
<td>332.7-358.1</td>
<td></td>
</tr>
<tr>
<td>BB</td>
<td>REFERENCE LOCATION FOR MEASUREMENT OF WAIST CIRCUMFERENCE</td>
<td>Reference</td>
<td>160.1-170.2</td>
<td></td>
</tr>
</tbody>
</table>
FIGURE 2B
EXTERNAL DIMENSIONS TEST SETUP

FIGURE 3B
EXTERNAL DIMENSIONS TEST SETUP

FIGURE 4B
DATA SHEET B3
HEAD DROP TEST (572.132) (5th Female)

Dummy Serial Number _______________ Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive head drops are necessary)

__1. It has been at least 2 hours since the last head drop. (572.132(c)(5))
   __ N/A, ONLY one head drop performed
__2. The head assembly consists of the complete head (880105-100X), the six-axis
    neck transducer (SA572-S11) or neck transducer structural replacement
    (78051-383X), and three (3) accelerometers (SA572-S4). (572.132(a))
__3. The head accelerometer mounting plate screws ((10-24 x 3/8 SHCS) are torqued
    to 9.0 Nm.
__4. Accelerometers and their respective mounts are smooth and clean.
__5. Torque the skull cap screws (10-24 x 1/2 SHCS) to 9.0 Nm.
__6. The data acquisition system, including transducers, conforms to the requirements
    of SAE Recommended Practice J211/1 MAR95. (572.136(m))
__7. The head assembly soaked at a temperature between 18.9oC (66ºF) and 25.6oC
    (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4)
    hours prior to a test. (572.132(c)(1))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__8. Visually inspect the head skin for cracks, cuts, abrasions, etc. Repair or replace
    the head skin if the damaged area is more than superficial. Note: If the damage
    resulted from the vehicle crash test in which the dummy was an occupant, the
    damaged area is to be documented with photography and the post test
    calibration verification testing completed before any replacement or repairs are
    made.
   Record findings and actions: _________________________________________
   __________________________________________
   __________________________________________
   __________________________________________
__9. Clean the impact surface of the skin and the impact surface of the fixture with
    isopropyl alcohol, trichloroethane or equivalent prior to the test. (572.132(c)(2))
10. Suspend and orient the head assembly as shown in Figure 5B. The lowest point on the forehead is 376.0 ± 1.0 mm (14.8±0.04 inch) from the impact surface. (572.132(c)(3))
Record the actual distance

NOTE: The masses of the suspension device and the accelerometer cables are to be kept as lightweight as possible to minimize their effect on the test results.

11. The 1.57 mm (0.062 inch) diameter holes located on either side of the dummy's head are equidistance within 2 mm from the impact surface. A typical test setup is shown in Figure 6B. (572.132(c)(3))
Record the right side distance
Record the left side distance

12. The impact surface is clean and dry and has a micro finish in the range of 203.2x10^-6 mm (8 micro inches) to 2032.0x10^-6 mm (80 micro inches) (RMS). (572.132(c)(4))
Record actual micro finish

13. The impact surface is rigidly supported. (572.132(c)(4))

14. The impact surface is a flat horizontal steel plate 50.8 mm (2 inches) thick and 610 mm (24 inches) square. (572.132(c)(4))
Record thickness
Record width
Record length

15. Drop the head assembly from a height of 376.0 ± 1.0 mm (14.8 inches ± 0.04 inches) by a means that ensures a smooth, instant release onto the impact surface. (572.132(b) & (572.132(c)(4))

16. Complete the following table using channel class 1000 data. (572.132(b)):

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak resultant acceleration</td>
<td>250 g ≤ x ≤ 300 g</td>
<td></td>
</tr>
<tr>
<td>Resultant versus time history curve</td>
<td>Unimodal</td>
<td></td>
</tr>
<tr>
<td>Oscillations after the main pulse</td>
<td>Less than 10% of the peak resultant acceleration</td>
<td></td>
</tr>
<tr>
<td>Lateral acceleration</td>
<td>y-axis acceleration ≤ 15 g</td>
<td></td>
</tr>
</tbody>
</table>

17. Plots of the x, y, z, and resultant acceleration data follow this sheet.

_____________________________  ______________
Signature      Date
HEAD DROP TEST SETUP SPECIFICATIONS

RIGID SUPPORTED FIXTURE
QUICK RELEASE MECHANISM

ADJUSTMENT TURNBUCKLE
HEAD SUPPORT CABLES
ACCELEROMETER CABLES ROUTE
CABLES SUCH THAT THEY DO NOT
INFLUENCE HEAD MOTION DURING
THE DROP
NECK TRANSDUCER OR
STRUCTURAL REPLACEMENT

LIGHT-WEIGHT
THREADED
INSERT
(Plastic,
Nylon,
etc.)

DROP HEAD
14.8" ± 0.04"

FLAT HORIZONTAL STEEL PLATE
2" x 24" x 24" WITH SURFACE FINISH WITHIN THE
RANGE OF 8 TO 80 MICROINCHES. IMPACT
SURFACE TO BE CLEAN AND DRY.

CENTERLINE OF 0.062"
DIAMETER HOLES IN SKULL

DISTANCE A = DISTANCE B

FIGURE 5B
HEAD DROP TEST SETUP

FIGURE 6B
DATA SHEET B4
NECK FLEXION TEST (572.133) (5th Female)

Dummy Serial Number _______________ Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive flexion tests are necessary)

__1. It has been at least 30 minutes since the last flexion test. (572.137(q))
   __ N/A, ONLY one neck test performed
__2. The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
__3. The assembly soaked at a temperature between 20.6°C (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
   Record the maximum temperature ______
   Record the minimum temperature ______
   Record the maximum humidity ______
   Record the minimum humidity ______
__4. Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
   Record findings and actions: _________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
__5. Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
   Record findings and actions: _________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
__6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))
__7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))
__8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))
__9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 8B for the flexion test. (572.133(c)(3))
__10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.
__11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.
__12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 6.89 m/s to 7.13 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))
__13. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendulum impact speed</td>
<td>6.89 m/s ≤ speed ≤ 7.13 m/s</td>
<td></td>
</tr>
<tr>
<td>Pendulum ΔV with respect to impact speed</td>
<td>@ 10ms 2.1 m/s ≤ ΔV ≤ 2.5 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@ 20 ms 4.0 m/s ≤ ΔV ≤ 5.0 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@30ms 5.8 m/s ≤ ΔV ≤ 7.0 m/s</td>
<td></td>
</tr>
<tr>
<td>Plane D Rotation</td>
<td>Peak moment*</td>
<td>____Nm @ ____degrees</td>
</tr>
<tr>
<td></td>
<td>69 Nm ≤ moment ≤ 83 Nm during the following rotation range 77° ≤ angle ≤ 91°</td>
<td></td>
</tr>
<tr>
<td>Positive Moment Decay**</td>
<td>Time to decay to 10 Nm</td>
<td></td>
</tr>
<tr>
<td>(Flexion)</td>
<td>80 ms ≤ time ≤ 100ms</td>
<td></td>
</tr>
</tbody>
</table>

*Moment about the occipital condyle = M_y – (0.01778 m x F_x) (572.133(b)(1)(ii))

My = Moment in Nm measured by the transducer
Fx = Force, in N measured by the transducer

**Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

__14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follows this sheet.

_____________________________  ______________
Signature      Date
DATA SHEET B5
NECK EXTENSION TEST (572.133) (5th Female)

Dummy Serial Number ________________  Test Date ________________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive extension tests are necessary)

__1.  It has been at least 30 minutes since the last extension test. (572.137(q))
    __ N/A, ONLY one neck test performed
__2.  The components required for the neck tests include the head assembly (880105-100X), neck (880105-250), bib simulator (880105-371), upper neck adjusting bracket (880105-207), lower neck adjusting bracket (880105-208), six axis neck transducer (SA572-S11) and either three accelerometers (SA572-S4) or their mass equivalent installed in the head assembly as specified in drawing 880105-100X. Data from the accelerometers are not required. (572.133(b))
__3.  The assembly soaked at a temperature between 20.6°C (69ºF) and 22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to a test. (572.133(c)(1))
Record the maximum temperature ______
Record the minimum temperature ______
Record the maximum humidity ______
Record the minimum humidity ______
__4.  Visually inspect neck assembly for cracks, cuts and separation of the rubber from the metal segments. Note: If the damage resulted from the vehicle crash test in which the dummy was an occupant, the damaged area is to be documented with photography and the post test calibration verification testing completed before any replacement or repairs are made.
Record findings and actions: _________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
__5.  Inspect the nodding blocks (78051-351) for any deterioration, but when replacement is necessary, ONLY replace during pre-test calibration. Using a Shore “A” type Durometer, verify the hardness of the nodding blocks is between 80 and 90. Ensure the nodding blocks are installed correctly. (880105-250 and PADI page17).
Record findings and actions: _________________________________________
_________________________________________________________________
6. Torque the jam nut (9000018) on the neck cable (880105-206) to 1.4 ± 0.2 Nm (12.0 ± 2.0 in-lb). (572.133(c)(2))

7. The data acquisition system, including transducers, conforms to the requirements of SAE Recommended Practice J211/1 MAR95. (572.137(m))

8. The test fixture pendulum conforms to the specifications in Figure 7B. (572.133(c)(3))

9. The head-neck assembly is mounted on the pendulum so the midsagittal plane of the head is vertical and coincides with the plane of motion of the pendulum longitudinal centerline as shown in Figure 9B for the extension test. (572.133(c)(3))

10. Install the transducers or other devices for measuring the "D" plane rotation with respect to the pendulum longitudinal centerline. Note: Plane "D" is the bottom horizontal surface of the skull. These measurement devices should be designed to minimize their influence upon the performance of the head-neck assembly. An example of a measurement device is shown in Figure 10B.

11. With the pendulum resting against the honeycomb material, the neck bracket was adjusted until the longitudinal centerline of the pendulum was perpendicular ± 1 degree to plane "D" on the dummy's head.

12. Release the pendulum and allow it to fall freely from a height to achieve an impact speed of 5.95 m/s to 6.19 m/s as measured at the center of the pendulum accelerometer. (572.133(c)(4)(i))

13. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pendulum impact speed</td>
<td>5.95 m/s ≤ speed ≤ 6.19 m/s</td>
<td></td>
</tr>
<tr>
<td>Pendulum ΔV with respect to impact speed</td>
<td>@ 10ms 1.5 m/s ≤ ΔV ≤ 1.9 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@ 20 ms 3.1 m/s ≤ ΔV ≤ 3.9 m/s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>@30ms 4.6 m/s ≤ ΔV ≤ 5.6 m/s</td>
<td></td>
</tr>
<tr>
<td>Plane D Rotation</td>
<td>Peak moment*</td>
<td>___ Nm @ ___ degrees</td>
</tr>
<tr>
<td></td>
<td>-65 Nm ≤ moment ≤ -53 Nm during the following rotation range 99° ≤ angle ≤ 114°</td>
<td></td>
</tr>
<tr>
<td>Negative Moment Decay**</td>
<td>Time to decay to -10 Nm</td>
<td></td>
</tr>
<tr>
<td>(Extension)</td>
<td>94 ms ≤ time ≤ 114 ms</td>
<td></td>
</tr>
</tbody>
</table>

* Moment about the occipital condyle = My – (0.01778 m x Fx) (572.133(b)(1)(ii))
  My = Moment in Nm measured by the transducer
  Fx = Force, in N measured by the transducer

** Time zero is defined as the time of initial contact between the pendulum striker plate and the honeycomb material. (572.133(b)(3))

14. Plots of acceleration, velocity, y-axis moment, and x-axis force and y-axis moment about the occipital condyle follow this sheet.

_________________________________________  ______________
Signature      Date
PENDULUM SPECIFICATIONS

INERTIAL PROPERTIES OF PENDULUM, MOUNTING PLATE AND MOUNTING HARDWARE WITHOUT TEST SPECIMEN.
WEIGHT 29.57 kg (65.21 lbs)
MOMENT OF INERTIA 33.2 kg-m^2
(294 in.-lb-sec^2) ABOUT PIVOT AXIS

FIGURE 7B
NECK FLEXION TEST SETUP SPECIFICATIONS

DIRECTION OF PENDULUM FLIGHT

3.2 ± 0.5 mm
(0.125 ± 0.02 in)

PENDULUM CENTERLINE

PENDULUM STRIKER PLATE

ACCELEROMETER

BRACKET - NECK ADJUSTING - UPPER
(P/N 880105-207)
BIB SIMULATOR
(P/N 880105-210)

NECK ASS'Y
(P/N 880105-250)

BRACKET - NECK ADJUSTING - LOWER
(P/N 880105-208)
MOUNTING SCREW CENTERLINE

6-AXIS UPPER NECK LOAD CELL
(SA572-S1)

D-PLANE * — PERPENDICULAR TO PENDULUM CENTERLINE â°

OCCIPITAL CONDYLE

HEAD ASSY
(P/N 880105-100X)

* D-PLANE IS DEFINED AS AN IMAGINARY PLANE PERPENDICULAR TO THE SKULL CAP/SKULL INTERFACE.

FIGURE 8B
NECK EXTENSION TEST SETUP SPECIFICATIONS

FIGURE 9B

* D-PLANE IS DEFINED AS AN IMAGINARY PLANE PERPENDICULAR TO THE SKULL CAP/SKULL INTERFACE.
DATA SHEET B6
THORAX IMPACT TEST (572.134) (5th Female)

Dummy Serial Number _____________  Test Date _____________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive thorax impact tests are necessary)

__1. It has been at least 30 minutes since the last thorax impact test. (572.137(q))
   __ N/A, ONLY one thorax impact test performed
__2. The test fixture conforms to the specifications in Figure 11B.
__3. The complete assembled dummy (880105-000) is used (572.134(b)) and is
   dressed in a form fitting cotton stretch above-the-elbow sleeved shirt and above-
   the-knee pants. The weight of the shirt and pants shall not exceed 0.14 kg.
   (572.134(c)(1))
__4. The dummy assembly soaked at a temperature between 20.6°C (69ºF) and
   22.2°C (72ºF) and at a relative humidity from 10% to 70% for a period of at least
   four (4) hours prior to this test. (572.134(c)(2))
   Record the maximum temperature ______
   Record the minimum temperature  ______
   Record the maximum humidity  ______
   Record the minimum humidity  ______
__5. Remove the chest skin and visually inspect the thorax assembly for cracks, cuts,
   abrasions, etc. Particular attention should be given to the rib damping material,
   chest displacement transducer assembly and the rear rib supports. Inspect for
   rib deformation using the chest depth gage. If any damage is noted repair and/or
   replace the damaged components unless the damage resulted from the vehicle
   crash test in which the dummy was an occupant in which case the damage must
   be documented and post test calibration verification testing completed before any
   repairs or replacements are made.
   __ - No damage
   __ - Damage from crash test, no repairs or replacement because this is a post
   test calibration verification. Record damage _____________________________
   __ - The following repairs or replacement was performed. Record
   ______________________________________________________________________
__6. Seat the dummy, (chest skin still removed) without back and arm supports on the
   test fixture surface as shown in Figure 11B. The surface must be long enough to
   support the pelvis and outstretched legs. (572.134(c)(3))
__7. Level the ribs both longitudinally and laterally ± 0.5º and adjust the pelvis angle to
   7º ± 2º. The angle may be measured using the special H-point tool (TE-2504)
that inserts into the pelvic structure and extends outward beyond the pelvic skin surface or by using the surface of the pelvic adaptor block.

8. The midsagittal plane of the dummy is vertical within ± 1º. (572.134(c)(3))

9. The longitudinal centerline of the test probe is centered within ±2.5 mm of the midsagittal plane of the dummy and is 12.7 mm ± 1mm below the horizontal peripheral centerline of the No. 3 rib and is within 0.5º of a horizontal line in the dummy's midsagittal plane. (572.134(c)(4))

10. Align the adjustable neck bracket index marks to the "zero" position.

11. Record locations such as the rear surfaces of the thoracic spine and the lower neck bracket reference with respect to the laboratory coordinate system. These reference measurements are necessary to ensure the dummy is in the same position after the chest skin is installed. The reference locations must be accessible after installation of the chest skin. It may be necessary to leave the chest skin zipper unfastened until the references are checked and fasten it just prior to the test.

12. Install the chest skin and reposition the dummy as described in the preceding paragraph using the reference measurements recorded.

13. Place the arm assemblies horizontal ± 2º and parallel to the midsagittal plane. The arms are held in place by tightening the adjustment nut that holds the arm yoke to the clavicle assembly.

14. The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 180.

15. Impact the anterior surface of the thorax with the test probe so the longitudinal centerline of the probe is within 2º of a horizontal line in the dummy's midsagittal plane at the moment of impact. (572.134(c)(5)) The velocity of the test probe at the time of impact is 6.71 m/s ± 0.12m/s. (572.134(b)) The probe is guided so there is no significant lateral, vertical or rotational movement during the impact. (572.134(c)(6)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.134(c)(7))
__16. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter*</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Probe Speed</td>
<td>6.59 m/s ≤ speed ≤ 6.83 m/s</td>
<td></td>
</tr>
<tr>
<td>Chest Compression</td>
<td>50.0 mm ≤ compression ≤ 58.0 mm</td>
<td></td>
</tr>
<tr>
<td>Peak force** between 50.0 and 58.0 mm chest compression</td>
<td>3900N ≤ peak force ≤ 4400N</td>
<td></td>
</tr>
<tr>
<td>Peak force** between 18.0 and 50.0 mm chest compression</td>
<td>Peak force ≤ 4600 N</td>
<td></td>
</tr>
<tr>
<td>Internal Hysteresis***</td>
<td>69% ≤ hysteresis ≤ 85%</td>
<td></td>
</tr>
</tbody>
</table>

*Time zero is defined as the time of initial contact between the test probe and the chest skin.

**Force = impactor mass x acceleration (572.134(b)(3))

***Area under loading curve minus the area under the unloading curve divided by the area under the loading curve. (Figure 12B)

__17. Plots of chest compression, acceleration, force, force versus deflection follow this sheet.

_____________________________  ______________  
Signature      Date
Probe specifications:
1. Rigid metallic construction, concentric about its longitudinal axis.
2. A mass of 13.97 ± 0.023 kg (30.8 ± 0.05 lbs). 1/3 of the weight of the suspension cables and their attachments to the impact probe are included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.
3. Minimum mass moment of inertia of 3646 kg-cm² (3.22 lbs-in-sec²) in yaw and pitch about the center of gravity.
4. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It has a flat, continuous, and non-deformable face with diameter of 152.4 ± 0.25 mm (6.00 ± 0.01 in) and a maximum edge radius of 7.6 to 12.7 mm (0.3 to 0.5 in).
5. The impactor is a cylinder with a diameter of 152.4-152.6 mm (6.0-6.1 in) and it is at least 25 mm (1.0 in) long.
6. The probe's end opposite to the impact face must have provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe.
7. The impact probe shall have a free air resonant frequency of not less than 1000 Hz.
PART 5720 HYBRID III-5F THORAX CALIBRATION - HYSTERESIS

Point A = Maximum Force in Deflection Corridor. Point B = Max. Force between 18.0 mm - 50.0 mm shall not exceed 4600 N.

FIGURE 12B
DATA SHEET B7
TORSO FLEXION TEST (572.135) (5th Female)

Dummy Serial Number ________________  Test Date ________________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive torso flexion tests are necessary)

1. It has been at least 30 minutes since the last torso flexion test. (572.137(q))
   __ N/A, ONLY one torso flexion test performed
2. The test fixture conforms to the specifications in Figure 13B.
3. The complete assembled dummy (880105-000) is used (572.135(c)(2)).
   __ with legs below the femurs.
   __ without legs below the femurs.
4. The dummy assembly soaked at a temperature between 18.9°C (66ºF) and
   25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least
   four (4) hours prior to this test. (572.135(c)(1))
   Record the maximum temperature
   Record the minimum temperature
   Record the maximum humidity
   Record the minimum humidity
5. Secure the pelvis to the fixture at the pelvis instrument cavity rear face by
   threading four ¼ cap screws into the available threaded attachment holes.
   Tighten the mountings so that the test material is rigidly affixed to the test fixture
   and the pelvic lumbar joining surface is horizontal. (572.135(c)(3))
6. Attach the loading adapter bracket to the spine of the dummy as shown in
   Figure 13B. (572.135(c)(4))
7. Inspect and adjust, if necessary, the seating of the abdominal insert within
   the pelvis cavity and with respect to the torso flesh, assuring that the torso flesh
   provides uniform fit and overlap with respect to the outside surface of the pelvis
   flesh. (572.135(c)(5))
8. Flex the dummy forward and back 3 times such that the angle reference plane
   moves between 0° and 30° with respect to the vertical transverse plane.
   (572.135(c)(6))
9. Support the dummy such that the angle reference plane is at or near 0° (vertical
   with respect to the vertical transverse plane). Wait at least 30 minutes before
   continuing. (572.135(c)(6))
10. Remove all external support that was implemented in 9 above. (572.135(c)(7))
11. Measure the initial orientation angle of the torso reference plane of the seated,
    unsupported dummy. (572.135(c)(7))
    Record reference plane angle (max. allowed 20°)
12. Attach the pull cable and the load cell. (572.135(c)(8))
__13. Apply a tension force in the midsagittal plane to the pull cable at any upper torso deflection rate between 0.5° and 1.5° per second, until the angle reference plane is at 45° ± 0.5° of flexion relative to the vertical transverse plane. (572.135(c)(9))

__14. Maintain angle reference plane at 45° ± 0.5° of flexion for 10 seconds. (572.135(c)(10))

__15. As quickly as possible release the force applied to the attachment bracket. (572.135(c)(11))

__16. 3 minutes after the release of the force, measure the reference plane angle. (572.135(c)(11))

__17. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial ref. plane angle</td>
<td>Angle ≤ 20°</td>
<td></td>
</tr>
<tr>
<td>Torso rotation rate</td>
<td>0.5°/s ≤ rate ≤ 1.5°/s</td>
<td></td>
</tr>
<tr>
<td>Force at 45° ±0.5°</td>
<td>320 N ≤ force ≤ 390 N</td>
<td></td>
</tr>
<tr>
<td>Final ref. plane angle</td>
<td>Initial ref. plane angle ±8°</td>
<td></td>
</tr>
</tbody>
</table>

Signature __________________________ Date __________________________
TORSO FLEXION TEST SET UP SPECIFICATIONS

- Vertical Transverse Plane
- Loading Adapter Bracket
  - Attach to Spine Box
  - With Four #10-32 Screws
- Pelvis-Lumbar Joining
  - Surface Horizontal ±1°
- Attach Pelvis Bone
  - (88105-431) to Fixture
  - With Four 14-20 x 1/2 Bolts
- Dummy Assembly
  - (88105-000)
- Pivot Pin
- Final Position
- Pull Cable
- Combined Weight of Load Cell, Loading Adapter Bracket, Pull Cable and Attachment Hardware ≤ 1.07 kg (2.35 lb.)

FIGURE 13B
DATA SHEET B8
LEFT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number _______________  Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive knee impact tests are necessary)

__1. It has been at least 30 minutes since the last knee impact test. (572.137(q))
   __ N/A, ONLY one knee impact test performed
__2. The test fixture conforms to the specifications in Figure 14B.
__3. The knee assembly (880105-528L), lower leg structural replacement (880105-
   603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly
   (880105-650), and femur load transducer (SA572-S14) (may use the load cell
   structural replacement (78051-319)) were used. (572.136(b)(1))
__4. The knee assembly soaked at a temperature between 18.9°C (66ºF) and 25.6°C
   (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4)
   hours prior to this test. (572.136(c)(1))
   Record the maximum temperature __________
   Record the minimum temperature __________
   Record the maximum humidity __________
   Record the minimum humidity __________
__5. Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
__6. No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
__7. Align the test probe so that throughout its stroke and at contact with the knee it is
   within 2 degrees of horizontal and collinear with the longitudinal centerline of the
   femur. (572.136(c)(3))
__8. The probe is guided so there is no significant lateral, vertical or rotational
   movement during the impact with the knee. (572.136(c)(4))
__9. The data acquisition system, including transducers, must conform to the
   requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class
   600.
__10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s.
    (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other
    attachments to the probe, including the velocity vane, make contact with the
    dummy. (572.136(c)(6))
11. Complete the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe speed</td>
<td>$2.07 \text{ m/s} \leq \text{speed} \leq 2.13 \text{ m/s}$</td>
<td></td>
</tr>
<tr>
<td>Peak resistance force*</td>
<td>$3450 \text{ N} \leq \text{force} \leq 4060 \text{ N}$</td>
<td></td>
</tr>
</tbody>
</table>

*Force = impactor mass x deceleration (572.136(b)(2))

12. Plots of acceleration versus time and force versus time follow this sheet.

_____________________________  ______________
Signature      Date
DATA SHEET B9
RIGHT KNEE IMPACT TEST (572.136) (5th Female)

Dummy Serial Number _______________  Test Date _______________

Technician ___________________________

__Pretest calibration
__Post test calibration verification

Test attempt no. ____ (when successive knee impact tests are necessary)

__1.  It has been at least 30 minutes since the last knee impact test. (572.137(q))
      __N/A, ONLY one knee impact test performed
__2.  The test fixture conforms to the specifications in Figure 14B.
__3.  The knee assembly (880105-528R), lower leg structural replacement (880105-603), lower leg flesh (880105-601), ankle assembly (880105-660), foot assembly (880105-651), and femur load transducer (SA572-S14) (may use the load cell structural replacement (78051-319)) were used. (572.136(b)(1))
__4.  The knee assembly soaked at a temperature between 18.9°C (66ºF) and 25.6°C (78ºF) and at a relative humidity from 10% to 70% for a period of at least four (4) hours prior to this test. (572.136(c)(1))
      Record the maximum temperature ______
      Record the minimum temperature  ______
      Record the maximum humidity  ______
      Record the minimum humidity  ______
__5.  Mount the test specimen and secure it to the rigid test fixture. (572.136(c)(2))
__6.  No parts of the foot or tibia contact any exterior surface. (572.136(c)(2))
__7.  Align the test probe so that throughout its stroke and at contact with the knee it is within 2 degrees of horizontal and collinear with the longitudinal centerline of the femur. (572.136(c)(3))
__8.  The probe is guided so there is no significant lateral, vertical or rotational movement during the impact with the knee. (572.136(c)(4))
__9.  The data acquisition system, including transducers, must conform to the requirements of SAE Recommended Practice J211/1 MAR95 (572.136(m)) Class 600.
__10. Contact the knee with the test probe at a speed between 2.07 m/s and 2.13 m/s. (572.136(c)(5)) Neither the suspension hardware, suspension cables, nor other attachments to the probe, including the velocity vane, make contact with the dummy. (572.136(c)(6))
11. Complete the following table:

Knee Impact Results (572.136(b)(1) and 572.136(c)(5))

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe speed</td>
<td>2.07 m/s ≤ speed ≤ 2.13 m/s</td>
<td></td>
</tr>
<tr>
<td>Peak resistance force*</td>
<td>3450 N ≤ force ≤ 4060 N</td>
<td></td>
</tr>
</tbody>
</table>

*Force = impactor mass x deceleration (572.136(b)(2))

12. Plots of acceleration versus time and force versus time follow this sheet.

Signature ___________________________ Date _______________
Probe specifications:
1. Rigid metallic construction, concentric about its longitudinal axis.
2. A mass of $2.99 \pm 0.23 \text{ kg (6.6 \pm 0.05 lbs)}$. 1/3 of the weight of the suspension cables and their attachments to the impact probe must be included in the calculation of mass, and such components may not exceed 5 percent of the total weight of the test probe.
3. Minimum mass moment of inertia of 209 kg-cm$^2$ (0.177 lbs-in-sec$^2$) in yaw and pitch about the center of gravity.
4. The impacting end of the probe is perpendicular to and concentric with the longitudinal axis. It must have a flat, continuous, and non-deformable face with diameter of $76.2 \pm 0.2 \text{ mm (3.0 \pm 0.01 in)}$ and a maximum edge radius of 7.6 to 12.7 mm (0.3 to 0.5 in).
5. The impactor is a cylinder with a diameter of 76.2-76.4 mm (3.0-3.1 in) and it is at least 12.5 mm (0.5 in) long.
6. The probe’s end opposite to the impact face must have provisions for mounting of an accelerometer with its sensitive axis collinear with the longitudinal axis of the probe.
7. The impact probe shall have a free air resonant frequency of not less than 1000 Hz.
<table>
<thead>
<tr>
<th>I.D. NO.</th>
<th>MANUFACTURER</th>
<th>MODEL NO.</th>
<th>SERIAL NO.</th>
<th>DATE OF LAST CALIBRATION</th>
<th>DATE OF NEXT CALIBRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DUMMY INSTRUMENTATION**

**HEAD ACCELEROMETERS**

(1) LONGITUDINAL
(2) LATERAL
(3) VERTICAL
NECK TRANSDUCER

**CHEST ACCELEROMETERS**

(1) LONGITUDINAL
(2) LATERAL
(3) VERTICAL
CHEST POTentiOMETER

**FEMUR LOAD CELLS**

(1) RIGHT FEMUR
(2) LEFT FEMUR

**LABORATORY INSTRUMENTATION**

NECK PENDULUM ACCELEROMETER
THORAX PENDULUM ACCELEROMETER
KNEE PENDULUM ACCELEROMETER
NECK ROTATION TRANSDUCER 1 (OPTIONAL)
NECK ROTATION TRANSDUCER 2 (OPTIONAL)

LABORATORY TECHNICIAN: ____________________________________________