U.S. DEPARTMENT OF TRANSPORTATION

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

LABORATORY TEST PROCEDURE

FOR

FMVSS No. 201U
Occupant Protection in Interior Impact
-Upper Interior Head Impact Protection-

APPENDIX B
FREE MOTION HEADFORM USER's MANUAL

ENFORCEMENT
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Background

The National Highway Traffic Safety Administration (NHTSA) has issued a Final Rule to upgrade Federal Motor Vehicle Safety Standard Number 201 (FMVSS No. 201). The intent of this regulation is to increase the level of occupant protection in head impacts with vehicle upper interior structures. The test procedure requires that a Part 572 Subpart L, Free-motion Headform (FMH) be propelled into the various upper interior structures at a speed of 24.1km/h (15 mph). The performance of a vehicle structure is evaluated based on the HIC responses of the FMH.

In developing the test procedure, the NHTSA selected a free-motion type impactor, as opposed to a more traditional guided impactor. The FMH specified in the final rule is based on the head of a Part 572 E Hybrid III dummy and was used throughout the agency's research program. It has four main components, excluding accelerometers; an aluminum skull, a steel skull cap plate, a 6-axis upper neck load cell simulator, and a head skin. The drawing package for the FMH consists of 19 drawings and/or part numbers which are specific to the Part 572L headform (numbered 92041-001 through -018, plus SA572- S4). All these drawings are dated November 30, 1992. This package also includes five drawings from the Part 572E dummy drawing package. All applicable Part 572L and Part 572E drawings and part numbers for this package are listed on the Bill of Materials (92041-018).

For illustrative purposes only, this user' s manual describes the FMH configured with three Endevco model 7264- 2000 accelerometers, and associated mounting hardware, positioned to measure the acceleration of the center of gravity of the headform. Instrumentation options allow for the use of any accelerometers which meet the specifications described in drawing SA572-S4.

It is recommended that the user inform the headform manufacturer of the type of accelerometer to be used. This will insure obtaining a correctly ballasted headform and the correct mounting blocks, if these blocks are purchased from the headform manufacturer.

Disassembly and Inspection

Completely disassemble and check every newly purchased FMH against the engineering drawing package. Pay particular attention to parts that are critical to the performance of the FMH. Use the following procedure for this effort.

Loosen two #10- 32 x l/4 inch socket head set screws which secure the head to neck pivot pin (78051- 339), then remove the pin (see Figure 1). Unscrew four FHCS 1/4-20 x 3/4 inch long screws from the skull cap plate (92041-004) and remove the plate (see Figure 2). Next, remove the four l/4- 28 x 3/4 inch long cap screws and washers which attach the 6-axis upper neck load cell simulator (92041-009) to the base of the headform (see Figure 3). Extract the load cell simulator through the back of the skull. Then, unscrew the four #10-24 x3/8 inch long screws from the accelerometer cube adaptor plate (e.g. Denton B-1780) and remove the plate and cube from the load cell simulator (see Figure 4). Finally, remove the #4-40 x3/8 screw which holds the accelerometer mounting cube (e.g. Denton B- 1778) to the adaptor plate, and lift off the cube.

Remove the skin from the skull and check for tears and general quality. Check the thickness of the head skin in the locations shown in drawing number 92041-008. The thickness must be 11.20±0.79 mm (0.441±0.031inches).

Inspect the skull for smoothness and freedom from flat spots and pits. Inspect the bond of the head ballast weight. If it is necessary to reinstall or change the ballast, see drawing number 92041-001 for information on headform weight, moment of inertia, and bonding.

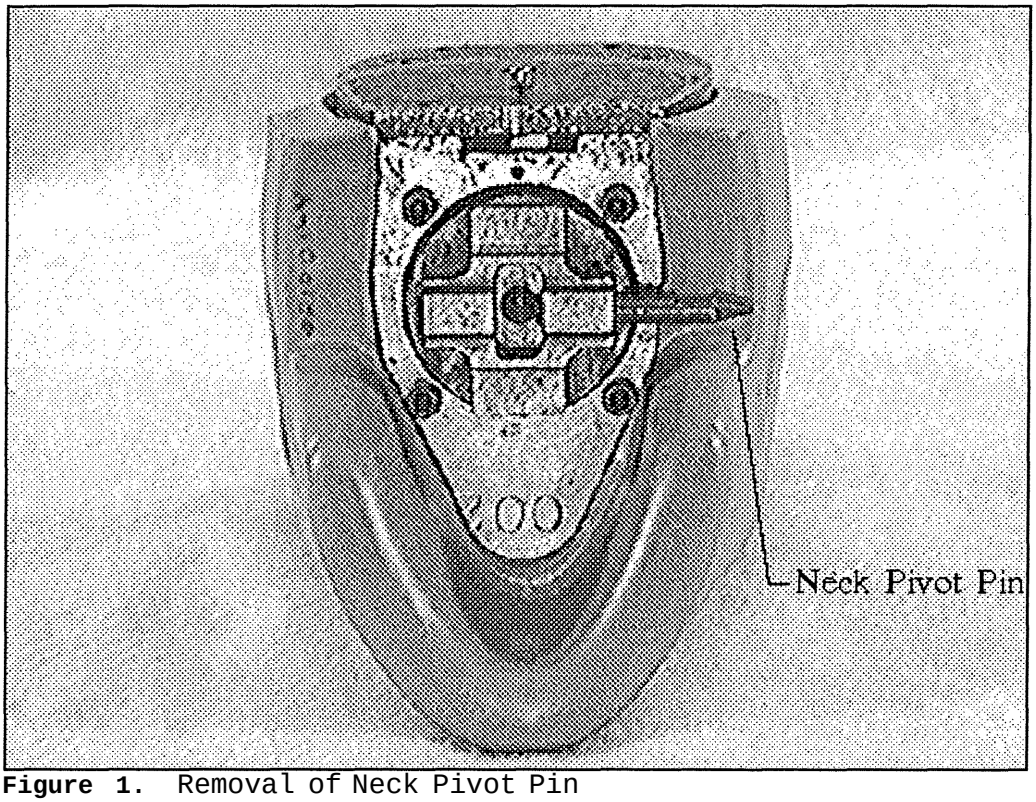

Figure 1. Removal of Neck Pivot Pin

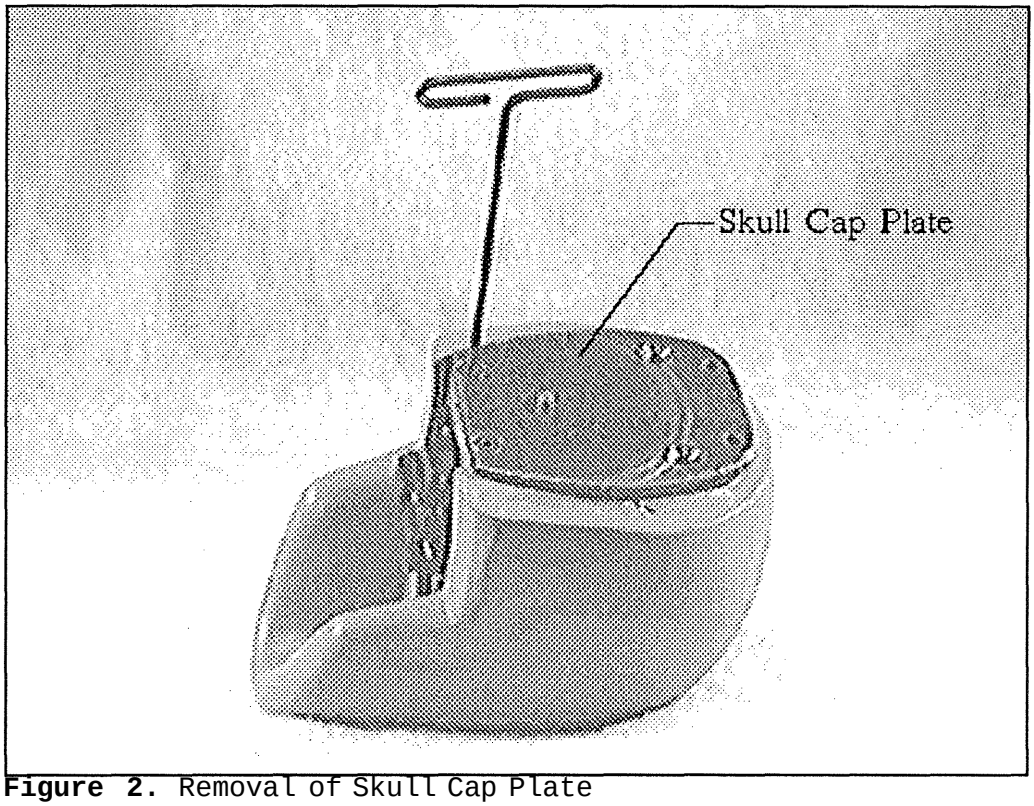

Figure 2. Removal of Skull Cap Plate

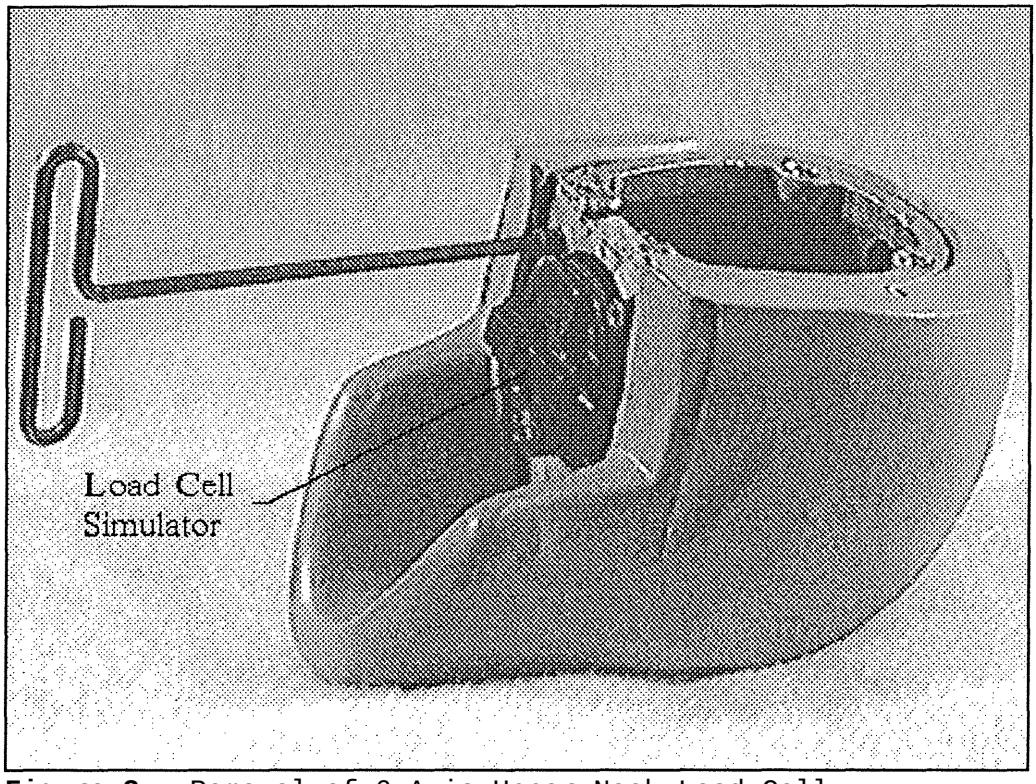

Figure 3. Removal of 6-Axis Upper Neck Load Cell

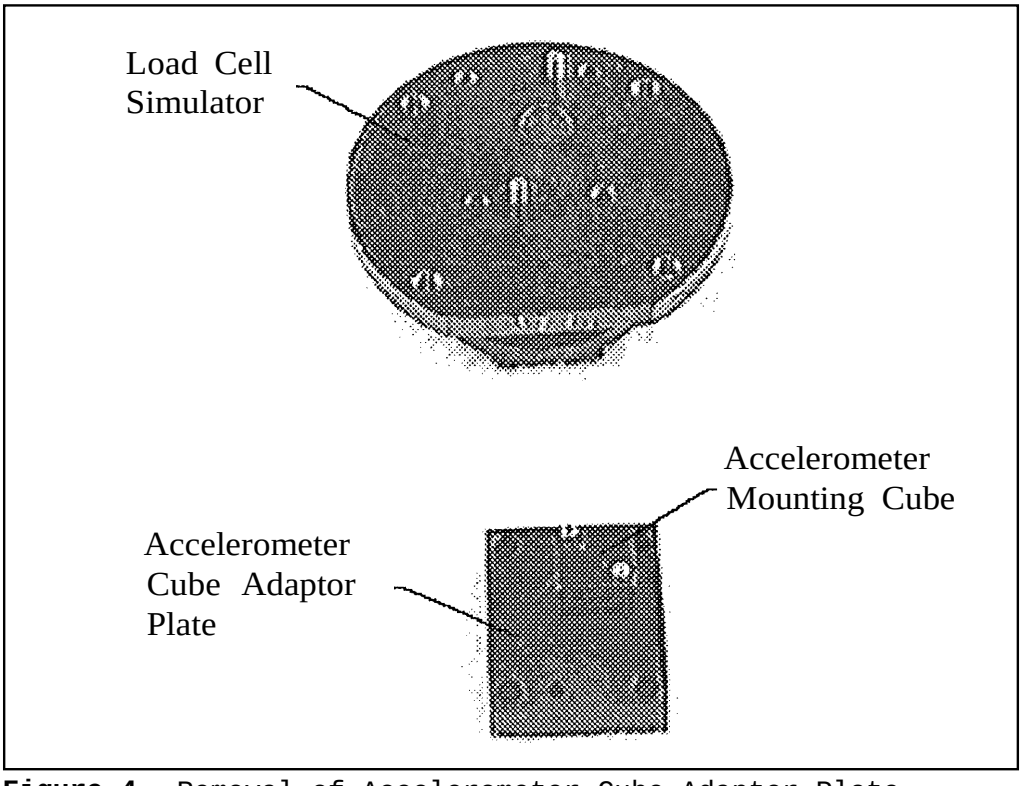

Figure 4. Removal of Accelerometer Cube Adaptor Plate

Assembly

Reversing the disassembly instructions, attach the center of gravity accelerometer mounting cube to the cube adaptor plate. Then mount the adaptor plate to the 6-axis upper neck load cell simulator. Also attach three accelerometers to the mounting cube. Again reversing the disassembly instructions, replace the 6-axis upper neck load cell simulator, the neck pivot pin, and the head skin. Replace the skull cap plate and weigh the headform. The headform weight, center of gravity location, and moment of inertia must conform to drawing number 92041-001. [NOTE: For other types of accelerometers, use mounting hardware appropriate for those devices rather than that described here. Maintain the correct headform weight, center of gravity location, and moment of inertia]. Tighten the various screws used in the headform to the following torque specifications:

Description of Screw	Screw Size	Torque N-m(in-lb)
skull cap plate screws	l/4-20 x3/4	18.1 (160)
neck load cell simulator screws	l/4- 28x3/4	13.6 (120)
head to neck pivot pin set screws	#10-32x1/4	5.7 (50)
accelerometer mounting block screws	#4-40	0.6 (5)
cube adaptor plate screws	#10-32 x 3/8	5.7 (50)

Free-Motion Headform Sign Convention

The instrumentation for the FMH consists of three accelerometers positioned to measure the acceleration of the headform' s center of gravity. The positive sign conventions for these transducers are as shown in Figure 5.

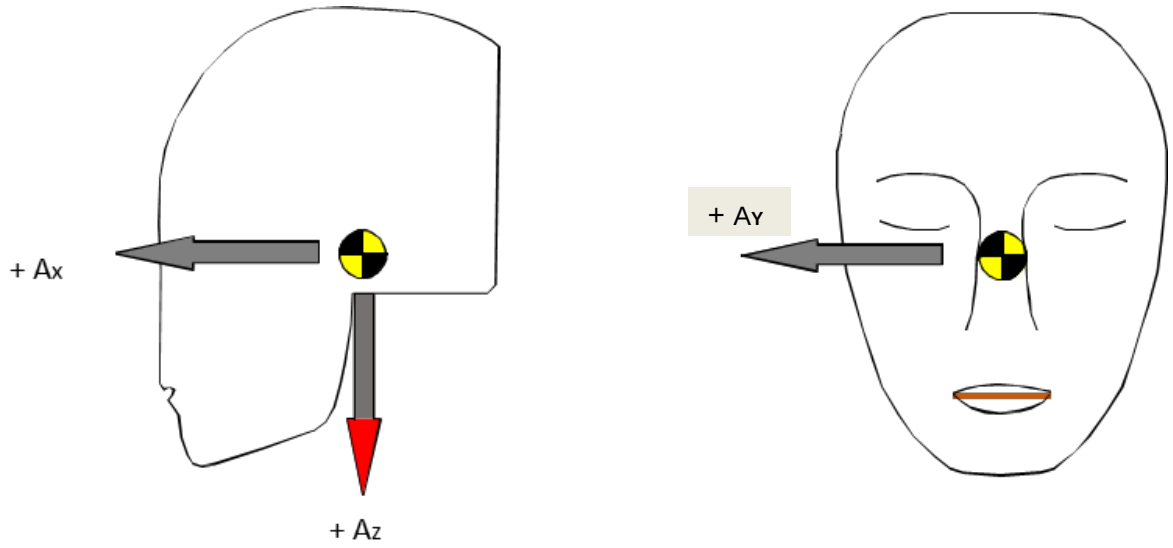

Figure 5. FMH Accelerometer Sign Convention