



SURFACE VEHICLE INFORMATION REPORT

J2854™

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Superseding EA-28 JUN1995

User's Guide for the Six Month Old Infant Dummy (CRABI)

RATIONALE

SAE J2854 replaced EA-28 in 2011. In addition to the format change and the correction of typographical and grammatical errors, the following corrections were made to this document.

INTRODUCTION – moved accelerometer mount note to Section 3.6 and revised

ACKNOWLEDGMENT – deleted due to redundancy

References to SAE J211 were changed to J211-1 throughout the report

Section 1 SCOPE – added

TABLE OF CONTENTS – added title to APPENDIX A

TABLE OF CONTENTS – added APPENDIX B, APPENDIX C, and APPENDIX D

Section 2 REFERENCES – added “SAE J211-1 – Instrumentation for Impact Test – Part 1 – Electronic Instrumentation.”

Section 2 REFERENCES – added “SAE J2517 – Hybrid III Family Chest Potentiometer Calibration.”

Section 2 REFERENCES – added “University of Michigan Transportation Research Institute Report 85-23”

Section 1 – Scope – replaced "cervical-1, cervical-7 and lumbar-5" with "C1, C7 and L5"

Section 3 – replaced all drawing numbers with part numbers

Section 3 – replaced all 1 to 2 G joint friction references with 1 G suspended setting

Section 3.1.4 – defined the Neck/Lumbar assembly as identical and removed the second reference to the old lumbar assembly and its associated hardware.

Section 3.1.4 – deleted obsolete part number 910420-006 and added part number 921022-051

Section 3.1.4 – deleted obsolete Figure 16 and inserted new Figure 16 and added a new list of parts for the current neck assembly

Section 3.2.1 – deleted obsolete part number 910420-006 and added part number 921022-051

Section 3.2.1 – deleted neck cable installation procedure for obsolete neck design and added neck cable installation procedure for the current neck assembly

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Section 3.5 – deleted “a solution of mild soap and water” from skin maintenance procedure

Section 3.6 – Added note to define locations for the upper neck, lower neck, and lumbar spine load cells and their respective load cell part numbers.

Section 4 and TABLE OF CONTENTS - changed calibration procedures to certification procedures

Section 4.1 – Moved External Dimensions and Mass Measurements to newly created Section 5, INSPECTION PROCEDURES. Created Section 6, and moved Notes and Marginal Indicia to this new section

Section 4.1 and 4.2 – changed Channel Class to Channel Frequency Class in multiple locations

Section 4.1.3 – changed the Head Drop Unimodal Oscillation spec from 10% to 17%

Section 4.2 – deleted obsolete Neck Test (Flexion and Extension) procedures and added new Neck Test (Flexion and Extension) procedures for current neck design including neck test components, test methods, and performance criteria

Section 4.2.1 Items 4 and 5 – changed Figure 10 to Figure 16

Section 4.2.1 Items 8 and 12 – changed Figures 15 and 16 to Figures 46 and 47

Section 4.2.2 and 4.2.3 – added table captions to the pendulum impulses and added the tables to the table of contents

Section 6 – added Notes and Marginal Indicia

TABLE 5 – revised head mass description to state “without upper neck load cell or structural replacement”

APPENDIX A – moved drawing list to Appendix D and added Accelerometer Handling Guidelines

APPENDIX B – added

APPENDIX C – added

APPENDIX D – deleted obsolete drawings: B-2897, TE-3200-002, TE-3200-003, TE-207-307, B-2554 and added drawings: TE-3200-100, TE-3200-110, TE-3200-111, TE-3200-120, TE-3200-130, TE-3200-140, TE-3200-152 TE-3200-153, TE-3200-155, TE-3200-160, TE-3200-161, 921022-004, 2554AJ, 6840J

INTRODUCTION

The six month old infant dummy, Figure 1, (CRABI) was designed specifically for the evaluation of the interaction of the dummy and child restraint with the inflatable restraint system. As such, it should be used in a rearward facing or lateral car-bed restraint.

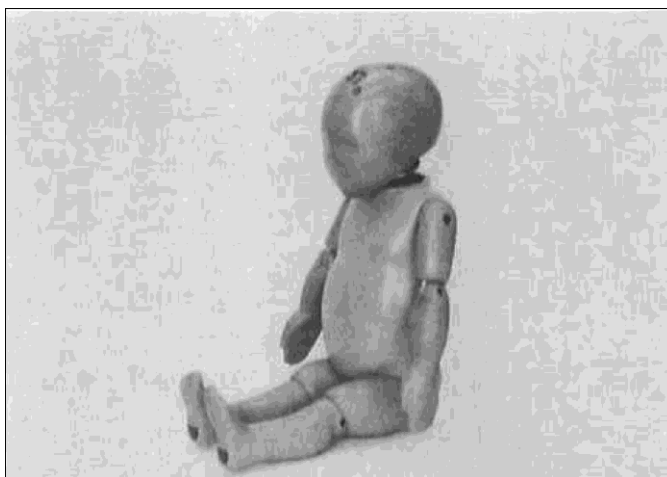


Figure 1 - Six month old infant dummy (CRABI)

Several of the dummy's components are interchangeable and can also be installed upside down and/or backwards. Extreme care should be taken when assembling and/or replacing components to ensure they are installed correctly.

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1. SCOPE

The CRABI dummy was developed to evaluate small child restraint systems in automotive crash environments, in all directions of impact, with or without air bag interaction

Basic anthropometry for this test device was taken from the University of Michigan Transportation Research Institute Report 85-23. Weight distribution and scaling methods for the infant were approved by the Society of Automotive (SAE) Infant Dummy Task Group. The dummy weighs 17.2 pounds and has a 26.4 inches standing or 17.3 inches sitting height. The Hybrid III-like neck and lumbar spine are laterally notched to reduce lateral stiffness

The shoulders have flesh support for durability and human-like performance in areas where seatbelt webbing may be placed. In addition, rubber elements are used in each joint to improve biofidelity and to give the CRABI infant-like range of motion. The CRABI Six-Month-Old design meets all the SAE Infant Dummy Task Group anthropometry, biomechanical and instrumentation requirements. The instrumentation design incorporates three 6-channel load cells to provide load measurements at the C1, C7 and L5 vertebrae locations. Accelerometers are used to measure head, chest and pelvic acceleration and head angular acceleration. All instrumentation is easily accessed

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J211-1 Instrumentation for Impact Test – Part 1 – Electronic Instrumentation

SAE J1733 Sign Convention for Vehicle Crash Testing

2.1.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

University of Michigan Transportation Research Institute Report 85-23 – Weight Distribution and Scaling Methods for the Infant

3. ASSEMBLY AND DISASSEMBLY

3.1 Disassembly Instructions

3.1.1 Head

The head assembly consists of the head (910420-001), accelerometer triaxial mounting block (910420-004), and a transducer structural replacement (910420-003) or a transducer (Model 6840J).

Remove the four (4) 10-32 x 7/8 inch long socket head cap screws which attach the head to the upper neck transducer structural replacement or the upper neck transducer, Figure 2. After removing the screws, lift the head vertically until the base of the skull clears the accelerometer mounting block.

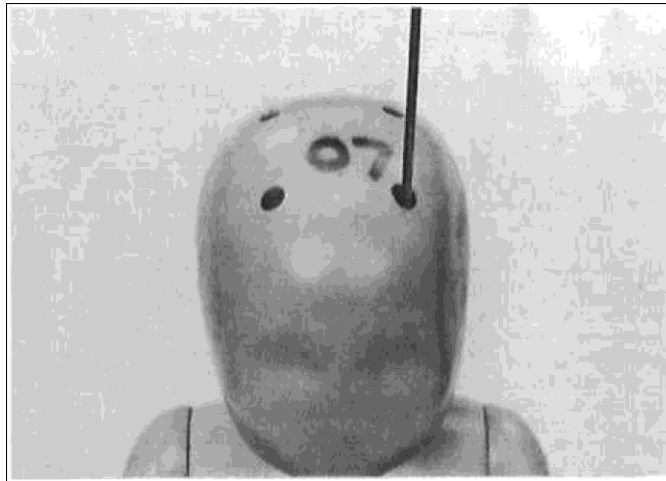


Figure 2 - Head assembly removal

Remove the accelerometer mounting block by removing the two (2) 10-32 x 1 inch long socket head cap screws, Figure 3.

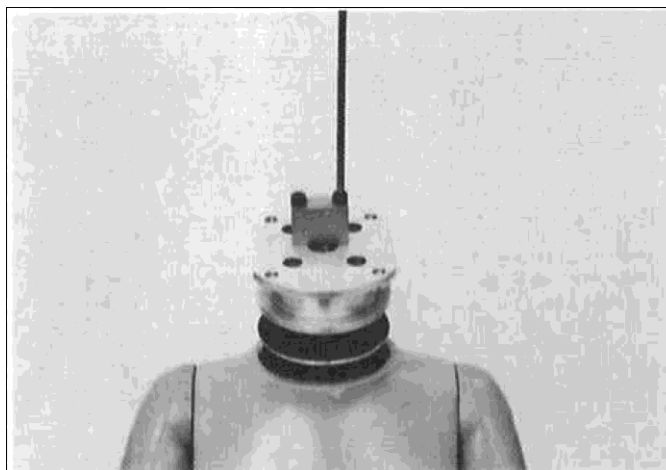


Figure 3 - Head accelerometer mount removal

Remove the upper transducer structural replacement or the transducer from the neck by removing the four (4) 10-32 x 1/2 inch long socket head cap screws, Figure 4.

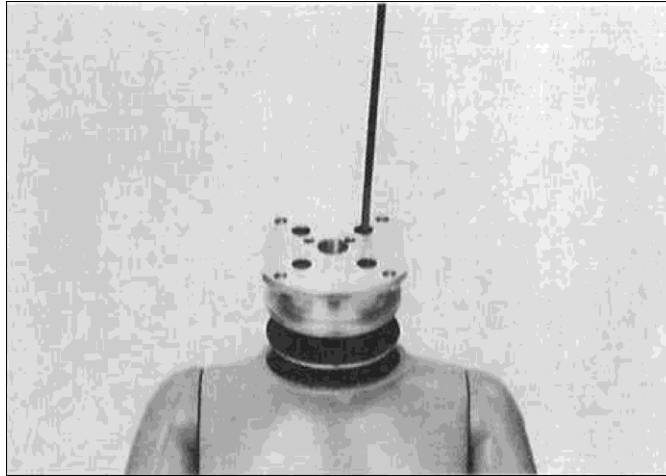


Figure 4 - Upper neck transducer structural replacement removal

3.1.2 Limbs

The limbs consist of the upper arms (910420-022-1 Left and 910420-022-2 Right), lower arms (910420-025-1 Left and 910420-025-2 Right), upper legs (910420-027-1 Left and 9103420- 027-2 Right), and the lower legs (910420-024-1 Left and 910420-024-2 Right).

3.1.2.1 Arms

Remove each arm assembly by removing the 5/16 x 1/2 inch long socket head shoulder screw from each shoulder, Figure 5. Separate the upper and lower arms by removing the 1/4 x 1/2 inch long socket head shoulder screw, Figure 6.

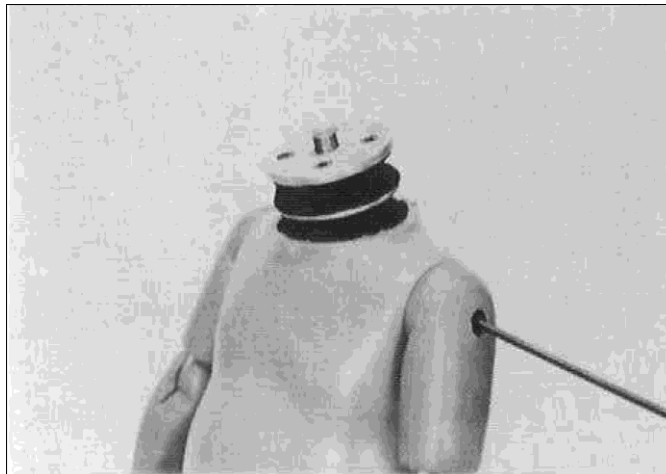


Figure 5 - Arm assembly removal

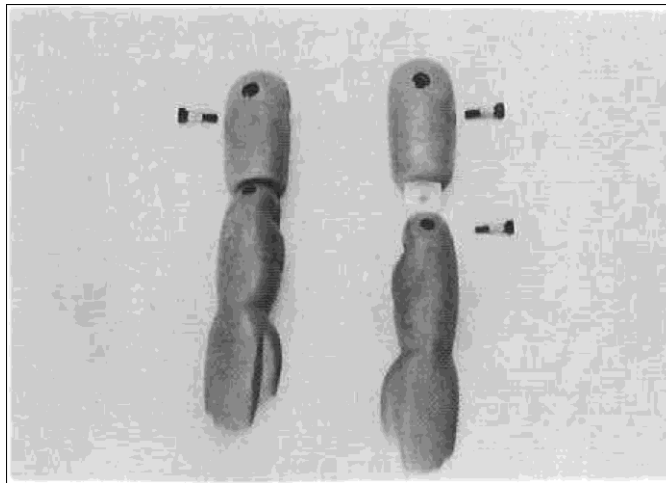


Figure 6 - Upper and lower arm separation

3.1.2.2 Legs

Remove each leg assembly by removing the 5/16 x 5/8 socket head shoulder screw from the upper thigh, Figure 7. Separate the upper and lower legs by removing the 1/4 x 3/4 inch long socket head shoulder screw from each knee, Figure 8.

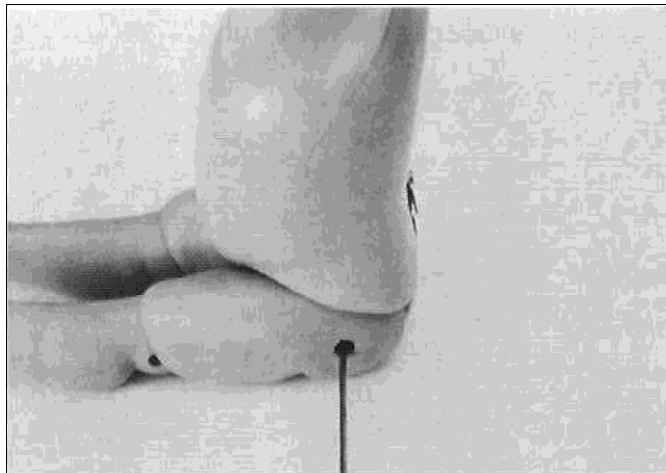


Figure 7 - Leg assembly removal

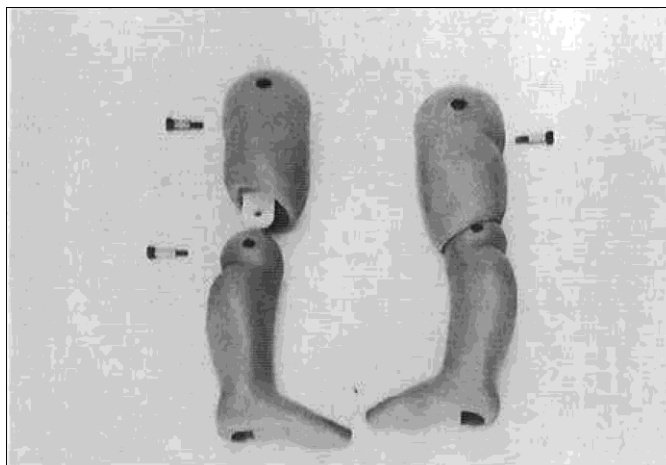


Figure 8 - Upper and lower leg separation

3.1.3 Isolation Dampers

There are four (4) isolation dampers (910420-019). The dampers are the same for each location. One (1) damper is located at each arm/shoulder joint and one (1) at each upper leg/pelvis joint.

3.1.3.1 Shoulders

Unfasten the zipper on the rear of the torso. Hold the urethane skin at the top of each shoulder to gain access to the 10-32 x 1/4 inch long, nylon tip, socket head set screws located on the top of each shoulder, Figure 9. The set screws retain the isolation damper. Loosen the set screws. It is not necessary to remove them completely. Remove the isolation damper from each shoulder joint by unscrewing it, Figure 10.

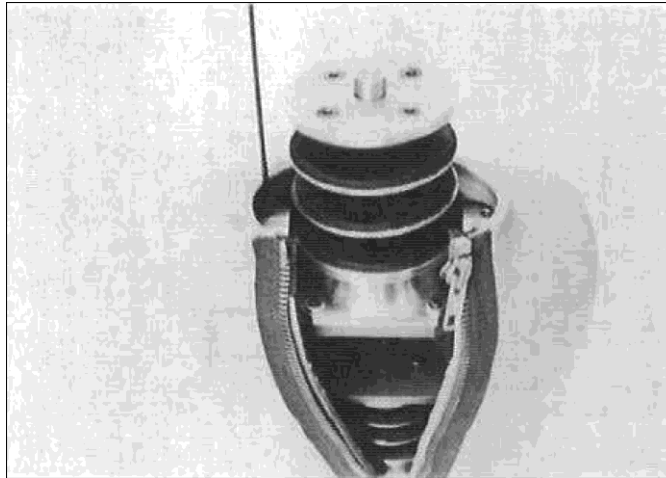


Figure 9 - Shoulder isolation damper set screw

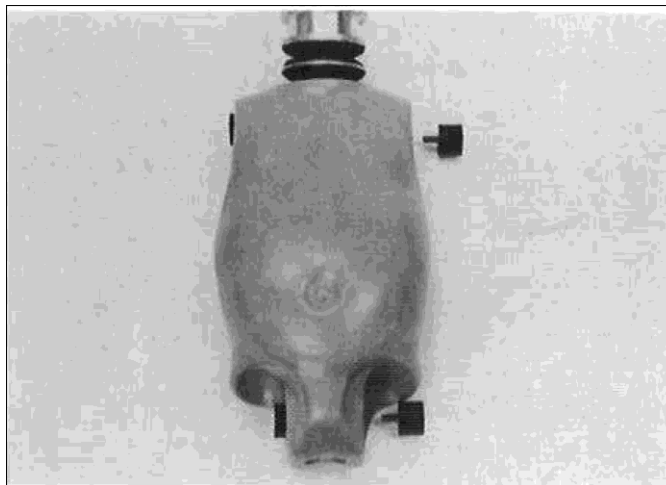


Figure 10 - Shoulder and upper leg isolation damper removal

3.1.3.2 Upper Legs

Access holes are provided in the urethane skin at the bottom of the torso for access to the two (2) 10-32 x 1/4 inch long, nylon tip, socket head set screws for the isolation dampers located at the leg/pelvis junction, Figure 11. Loosen the set screws and remove the isolation damper from each leg joint, reference Figure 10.

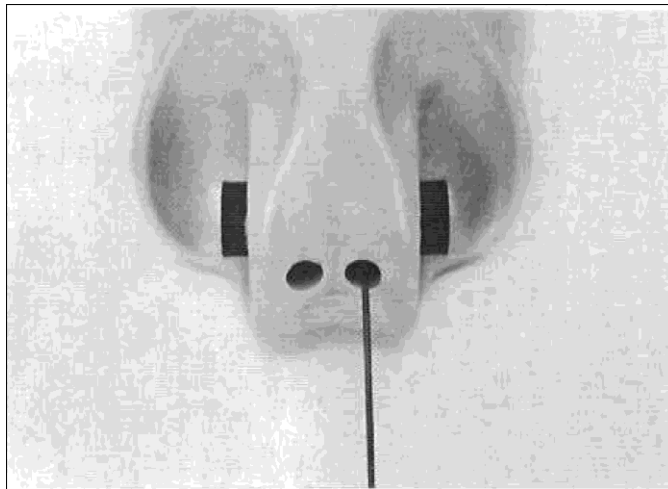


Figure 11 - Leg/pelvis isolation damper set screw

3.1.4 Torso

The torso assembly consists of two (2) neck/lumbar molded assemblies (921022-051), two (2) cable-neck/lumbar (ATD-6206), two (2) compression washers, two (2) nylon washers, two (2) mounting plate inserts and four (4) hex nuts; two (2) transducer structural replacements (910420-003), shoulder and thorax assembly (910420-014), chest accelerometer mounting block (910420-004), pelvic assembly (910420-018), pelvic accelerometer mounting block (910420-005).

Remove the urethane torso skin (910420-007) from the torso structure, Figure 12. Use caution so as not to damage the skin.

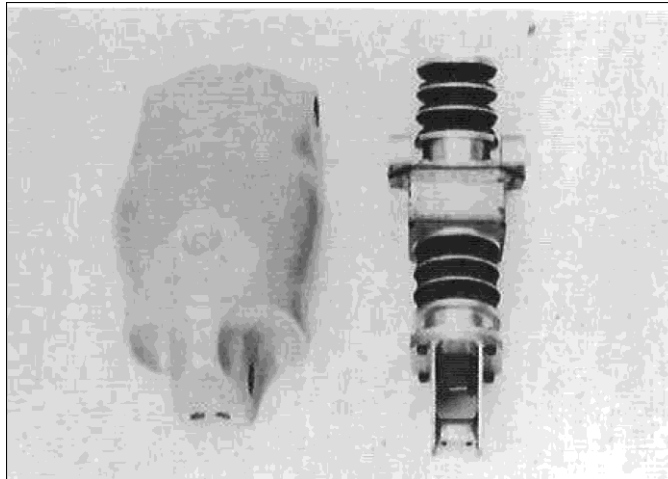


Figure 12 - Torso skin removal

Remove the four (4) 10-32 x 5/8 inch long socket head cap screws to remove the neck/lower neck transducer structural replacement assembly, Figure 13.

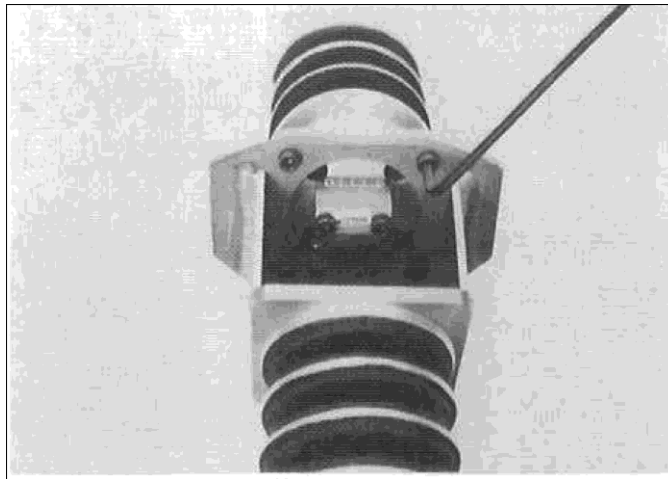


Figure 13 - Neck removal

Remove the two (2) 10-32 x 1 inch long cap screws to remove the chest accelerometer mount, Figure 14.

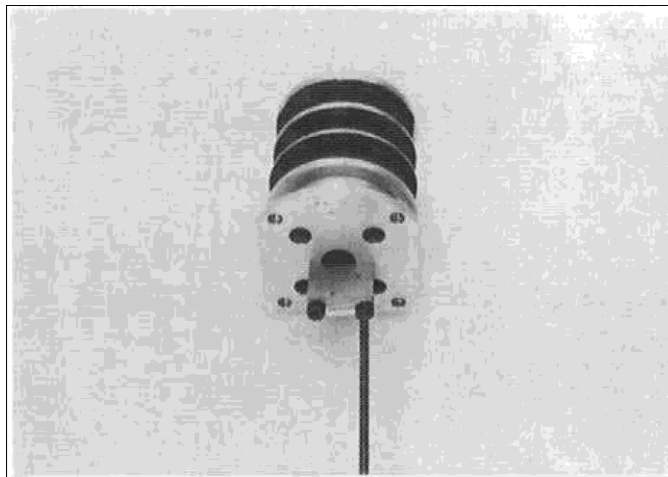


Figure 14 - Chest accelerometer mount removal

Remove the four (4) 10-32 x 1/2 inch long socket head cap screws separate the transducer structural replacement or transducer from the neck, Figure 15.

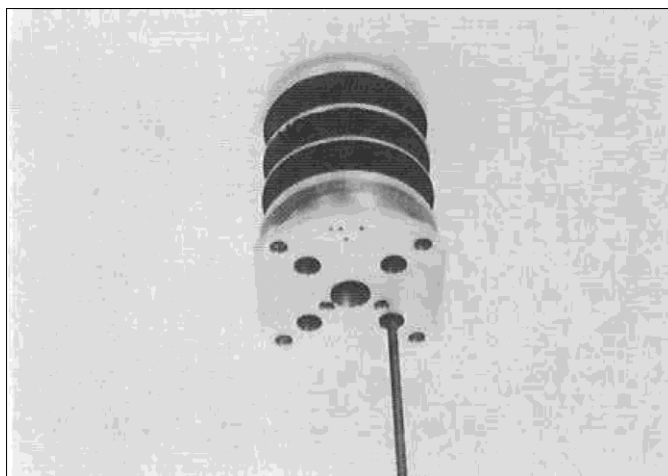


Figure 15 - Lower neck transducer structural replacement removal



Remove the two 5/16-24 hex nuts and remove the cable from the neck, Figure 16.

The Neck/Lumbar assembly consists of:

Cable-Neck/Lumbar	(ATD-6206)	Item 1, Figure 16
Mounting Plate – Insert	(910420-048)	Item 2, Figure 16
Neck/Lumbar Molded Assembly	(921022-051)	Item 3, Figure 16
Washer – Compression.....	(910420-049)	Item 4, Figure 16
Nylon Washer.....	(9001358).....	Item 5, Figure 16
Jam Nut.....	(9001336).....	Item 6, Figure 16

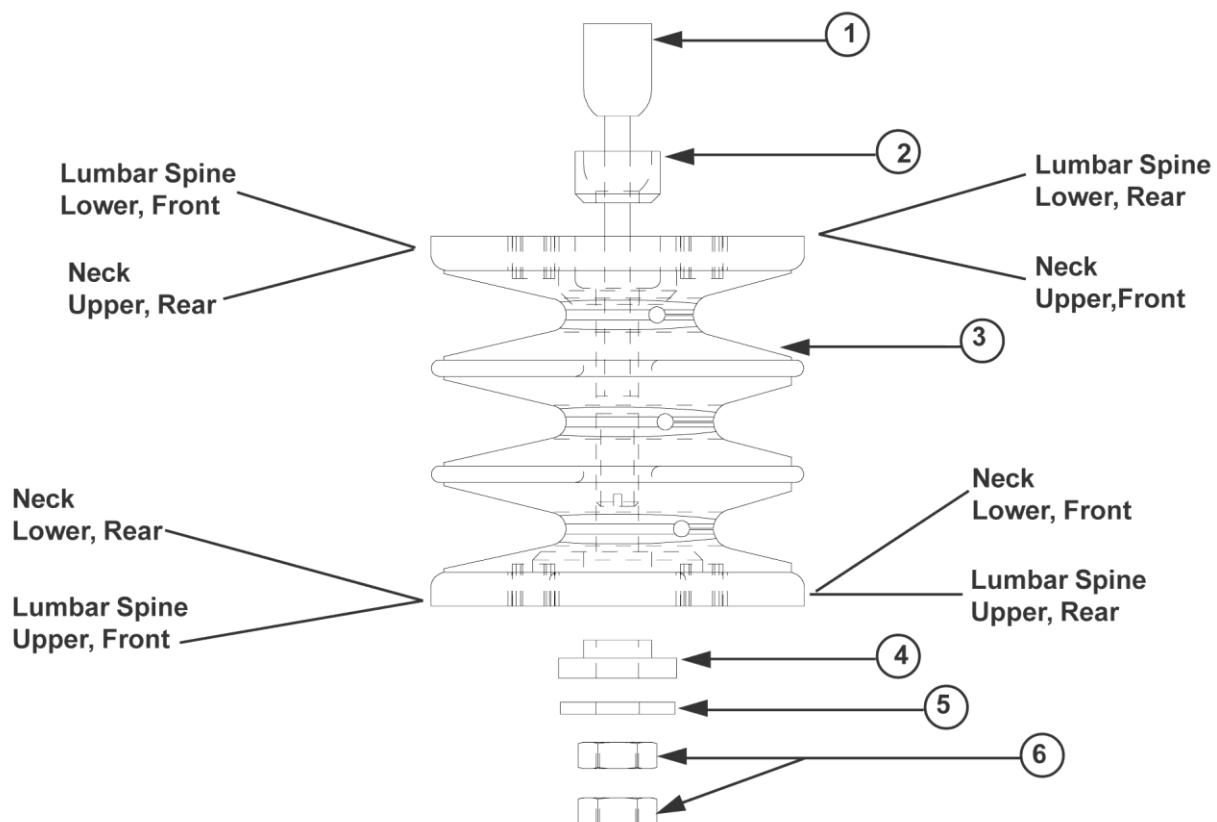


Figure 16 - Neck/lumbar exploded view

Remove the four (4) 10-32 x 1/2 inch long socket head cap screws attaching the shoulder/thorax structure to the lumbar spine, Figure 17.

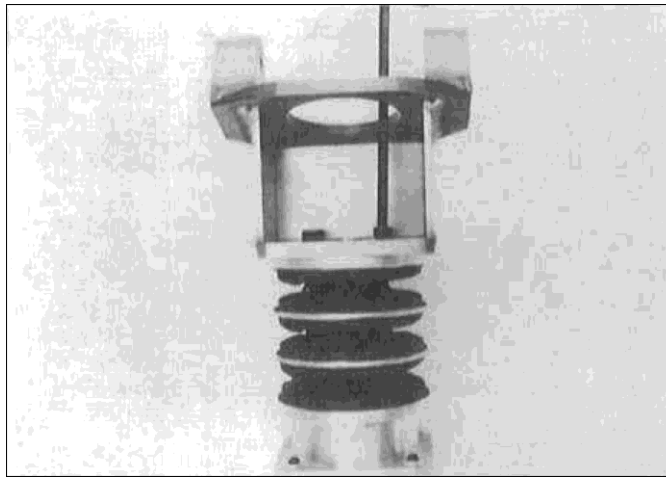


Figure 17 - Shoulder thorax structure removal

Remove the four (4) 10-32 x 5/8 inch long socket head cap screws attaching the lumbar spine transducer structural replacement to the pelvic structure assembly, Figure 18.

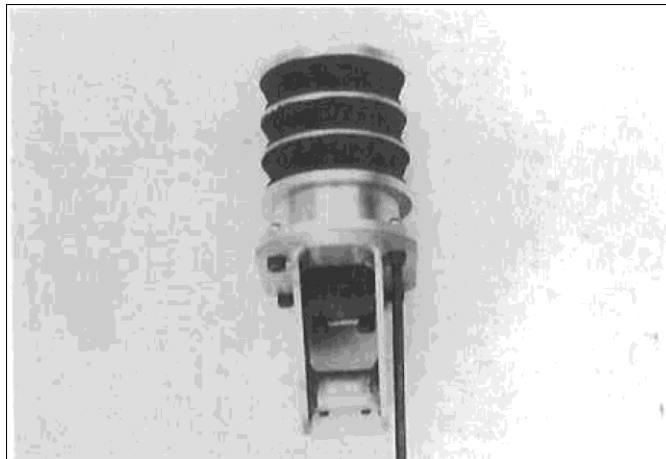


Figure 18 - Lumbar spine/transducer structural replacement removal

Remove the two (2) 10-32 x 1 1/4 inch long socket head cap screws to remove the pelvis accelerometer mount, Figure 19.

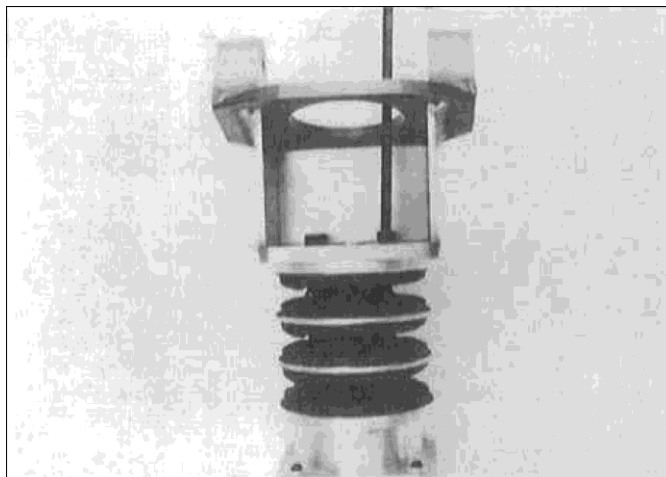


Figure 19 - Pelvis accelerometer mount removal

Remove the four (4) 10-32 x 1/2 inch long socket head cap screws to remove the transducer and/or the transducer structural replacement from the lumbar spine, Figure 20.

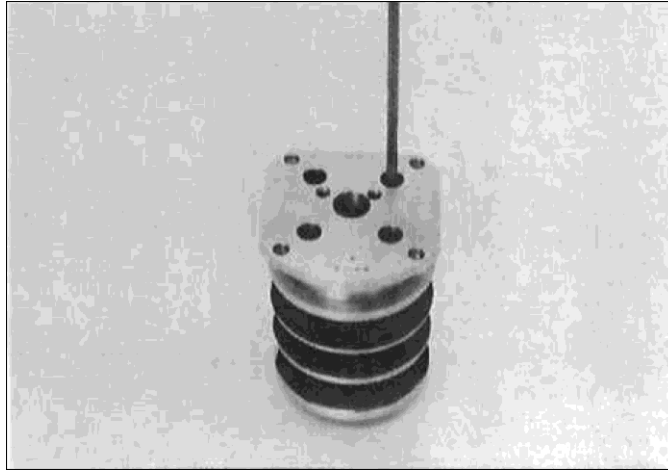


Figure 20 - Lumbar spine/transducer structural replacement assembly separation

Remove the two (2) 5/16-24 hex nuts from the cable in the lumbar spine and remove the cable, Figure 21.



Figure 21 - Lumbar spine cable removal

This concludes the disassembly instructions. Each component should be inspected to ensure there is not any visible damage which could affect the performance of the dummy.

3.2 Assembly Instructions

The assembly of the dummy is basically the reverse process of the disassembly instructions. Care should be taken to ensure the correct assembly due to the interchangeability of some of the components as well as some components can be installed with the incorrect orientation.

3.2.1 Torso/Neck

The torso assembly consists of two (2) neck/lumbar molded assemblies (921022-051), two (2) cable-neck/lumbar (ATD-6206), two (2) compression washers, two (2) nylon washers, two (2) mounting plate inserts and four (4) hex nuts; two (2) transducer structural replacements (910420-003), shoulder and thorax assembly (910420-014), chest accelerometer mounting block (910420-004), pelvic assembly (910420-018), pelvic accelerometer mounting block (910420-005).

Install the mounting plate insert in the lumbar spine. Insert the cable into the lumbar spine. Install the rubber and nylon washers with the nylon washer on top. Install the 5/16-24 hex nut and torque until the height of the spine is 69 mm (2.7 in) measured from the bottom surface of the lumbar spine to the top surface of the nylon washer. Flex the assembly back and forth a few times to help seat the cable in the socket. Recheck the height to ensure it is still correct and install the second

5/16-24 hex nut and tighten, Figure 22.

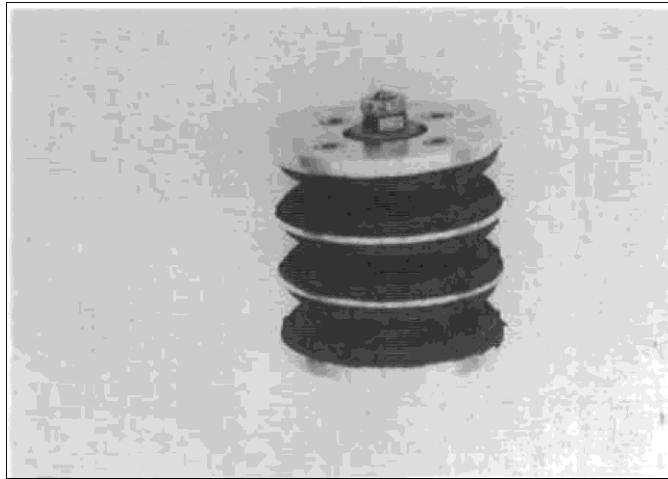


Figure 22 - Lumbar spine cable installation

Install the lumbar spine onto the transducer structural replacement or transducer assembly using the four 10-32 x 1/2 inch long socket head cap screws, Figure 23. Torque the screws to 6.8 N·m (60 in-lb). The orientation of the spine is with the slits between the rubber discs facing rearward and the hex nuts on the spine cable facing upward. The curved surface on the outer circumference of the top of the pelvic structure is facing the front of the dummy.

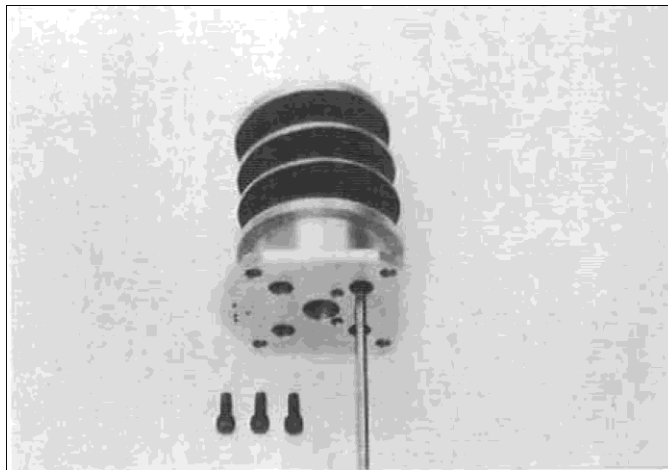


Figure 23 - Lumbar spine installation

Install the pelvis accelerometer mount on the bottom of the transducer structural replacement or the transducer using two (2) 10-32 x 1 1/4 inch long socket head cap screws, Figure 24. Torque the screws to 6.8 N·m (60 in-lb). The orientation of the mount is with the accelerometer mounting screws holes facing toward the front. The mount is stamped "pelvis" and the "bottom" labeled since it can also be installed in an upside down orientation.

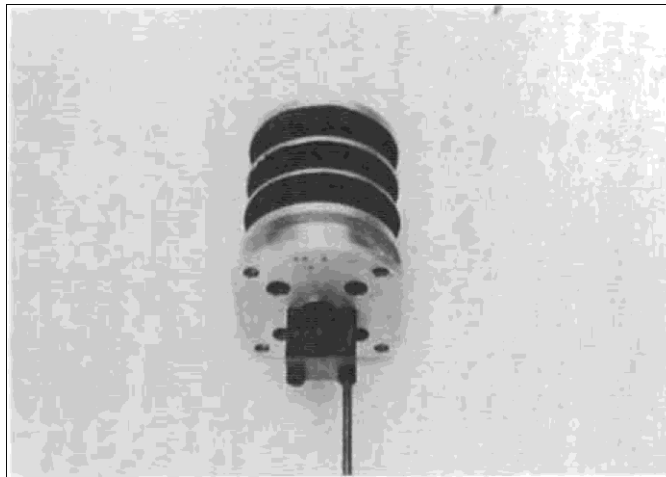


Figure 24 - Pelvis accelerometer mount installation

Install the lumbar spine/transducer structural replacement assembly onto the pelvic structure using four (4) 10-32 x 5/8 inch socket head cap screws, Figure 25. Torque the screws to 6.8 N·m (60 in-lb). The curved section on the outer circumference of the pelvis structure and transducer structural replacement should be adjacent and facing toward the front of the dummy.

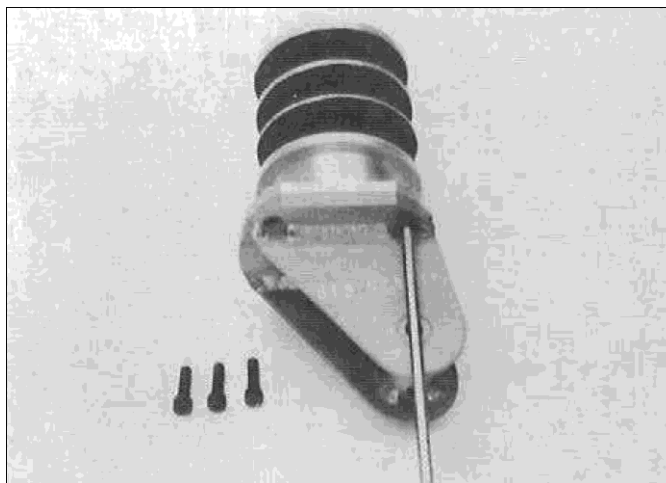


Figure 25 - Lumbar spine/transducer structural replacement assembly installation

Install the shoulder/thorax assembly onto the top of the spine/pelvic assembly using four (4) 10-32 x 1/2 inch long socket head cap screws, Figure 26. Torque the screws to 6.8 N·m (60 in-lb).

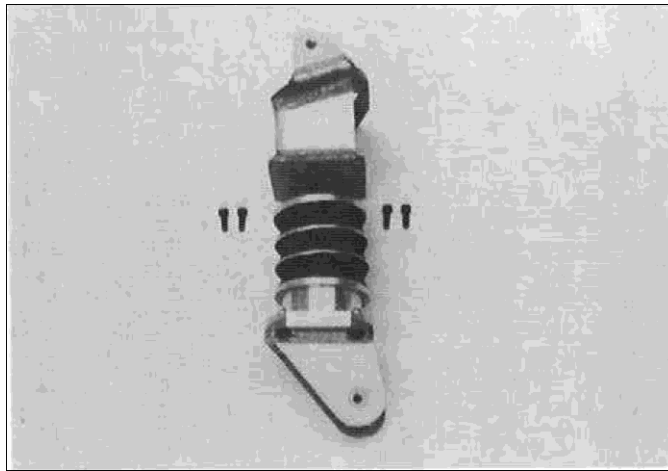


Figure 26 - Shoulder/thorax assembly installation

Make sure the top of the shoulder/thorax assembly is sloping toward the front.

Install the mounting plate insert into the neck or lumbar spine. Insert the cable, Figure 27. Install the rubber and nylon washers with the rubber washer installed first, making certain that the washers are fully seated in the recess. Install the 5/16-24 hex nut and torque to $0.23 \text{ N}\cdot\text{m} \pm 0.02 \text{ N}\cdot\text{m}$ ($2.0 \text{ in}\cdot\text{lb} \pm 0.2 \text{ in}\cdot\text{lb}$) using a screwdriver in the slot at the end of the cable. Flex the assembly back and forth a few times to help seat the cable in the socket. Recheck the torque to ensure it is still correct, install the second 5/16-24 hex nut, and tighten.

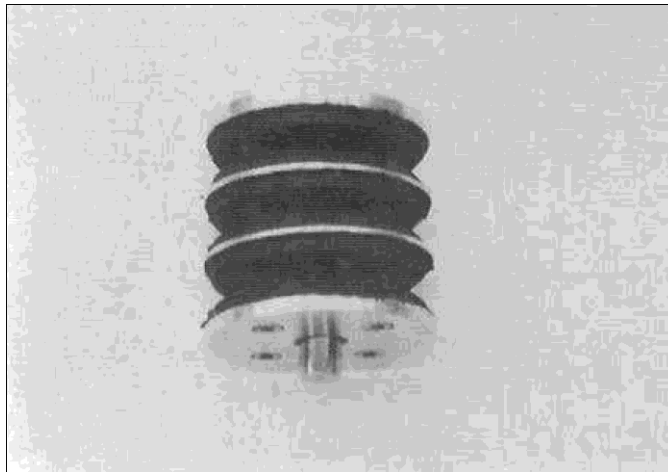


Figure 27 - Neck cable installation

Install the lower neck transducer structural replacement or the lower neck transducer to the base of the neck assembly using four (4) 10-32 x 1/2 inch long socket head cap screws, Figure 28. Torque the screws to $6.8 \text{ N}\cdot\text{m}$ (60 in-lb). The hex nuts on the neck cable should be facing downward. The slits between the rubber discs on the neck and the curved surface on the outer circumference of the transducer structural replacement or transducer should be facing forward.