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## THORACIC INSTRUMENTATION FOR KINEMATIC STUDIES

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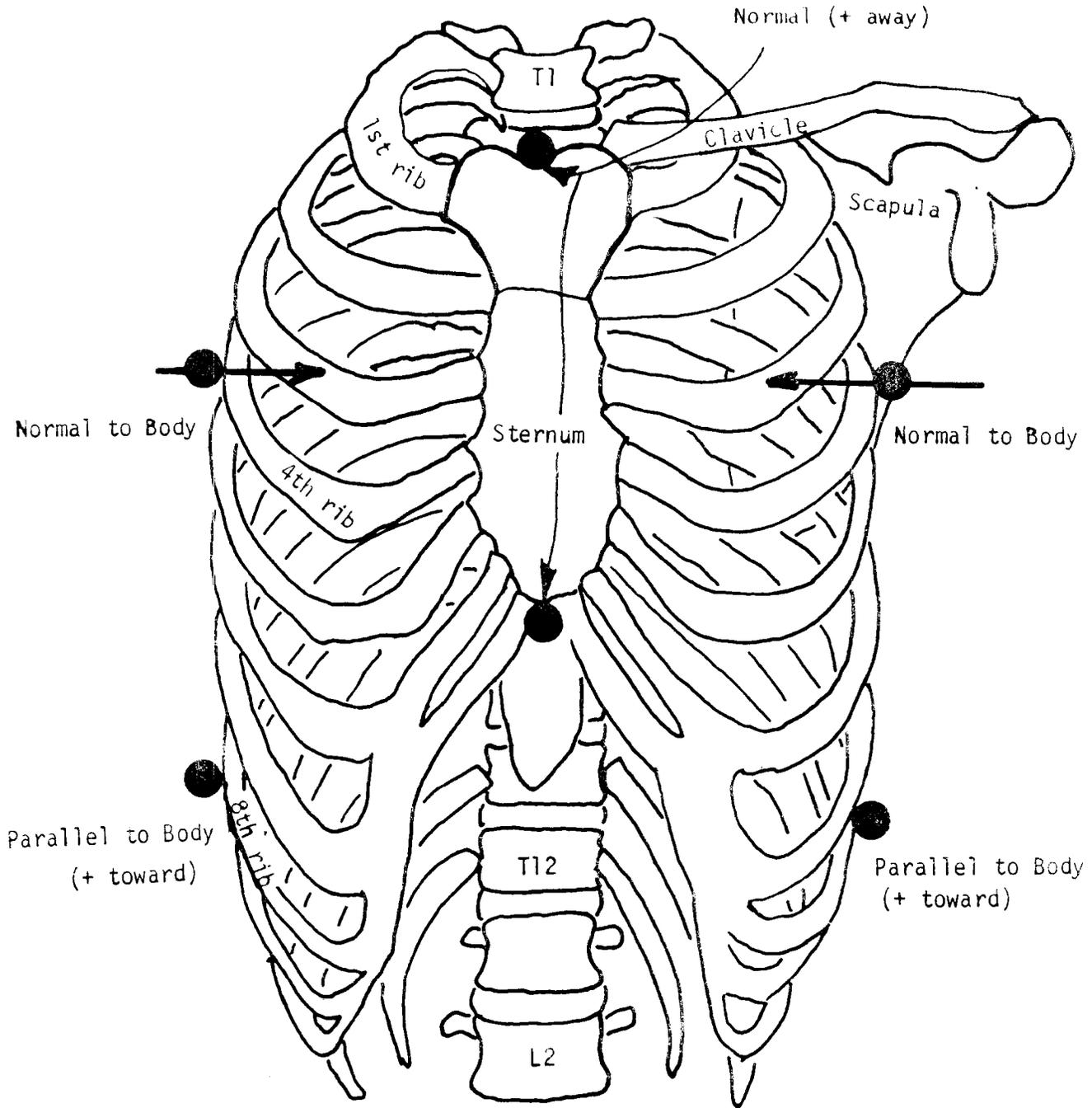
In order to measure kinematic response of a cadaver thorax to blunt impact from any direction, a 10 accelerometer system has been developed and is in use at HSRI. The idea behind this system visualizes the thorax as a structure of approximately ellipsoidal shape. The attempt has been to locate accelerometers around the periphery to register different acceleration signatures for different directions, levels, and durations of impact. The resulting data are being used in an attempt to correlate acceleration signatures with the actual injuries occurring in the impact test. This information is intended for use in the development of improved performance criteria for dummy thorax response.

The locations for the ten accelerometers are shown in Figures 1 and 2. Figure 3 details the spinal mounts. For these, a small screw is first placed in the end of, and parallel to, the spinous process. A metal tube is then inserted over the process and filled with dental acrylic. The front of the mount is then inserted and clamped while the acrylic sets.

Figures 4 and 5 detail the rib mounts. Ribs are exposed. Small wires are placed around the ribs to clamp the mount down. Sternal mounts are attached using small screws (See Figure 6).

The final step is location of these mounts in space. The thorax is not a rigid body so selection of a final coordinate

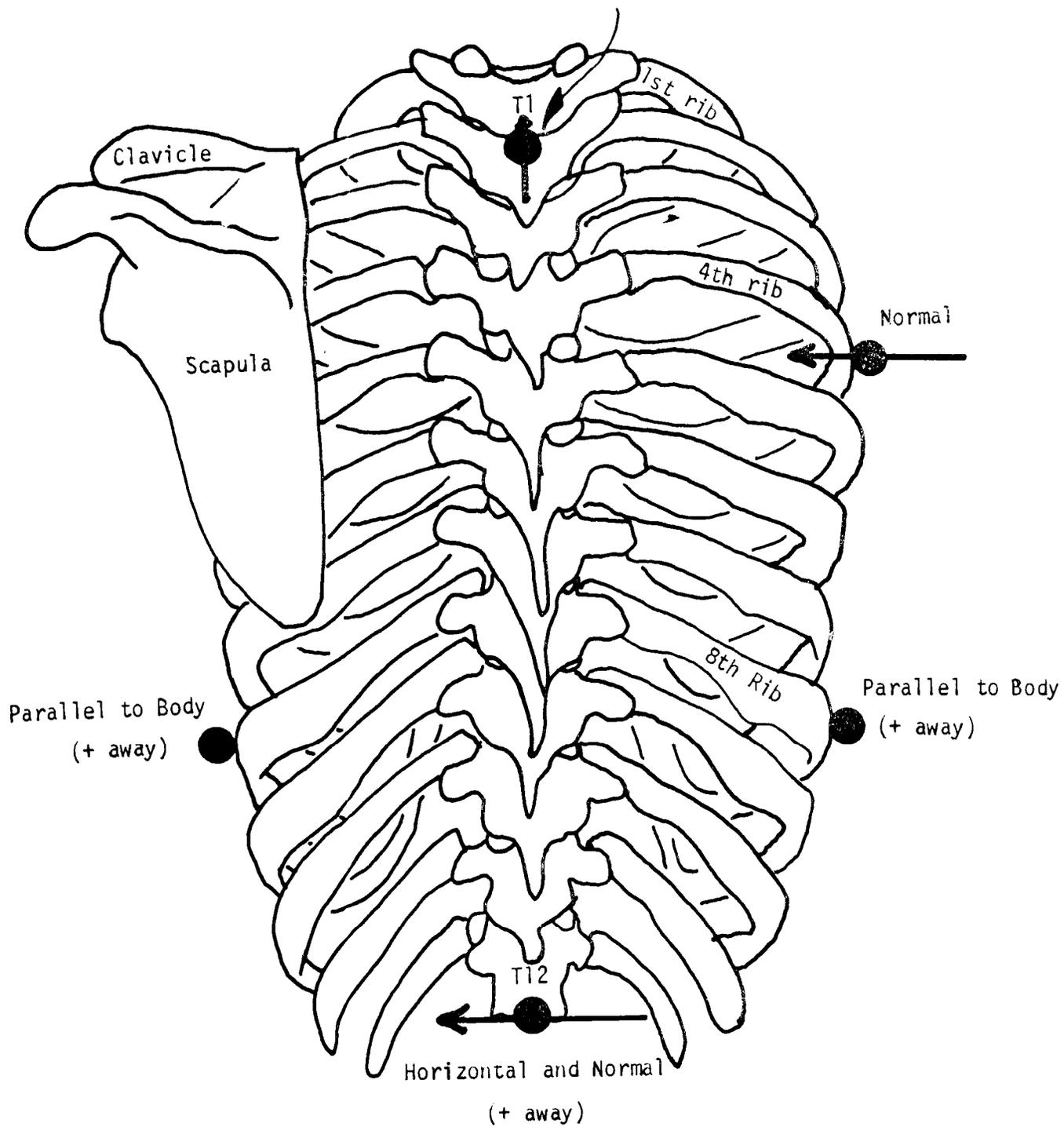
system someplace in the center of the thorax based on anatomical landmarks is out of the question. One possible candidate for a coordinate system is the T1 system proposed by Ewing and Thomas. Each of the mounts can be located relative to this at present using a cumbersome mechanical procedure with the subject prone or supine on a surgery table. A stereo x-ray system for measurement of instrumentation locations while the subject is in the sled-seated position is in the planning stage.



Accelerometer Locations (Front View)

FIGURE 1.

Vertical and Normal (+ away)



Accelerometer Locations (Back View)

FIGURE 2.

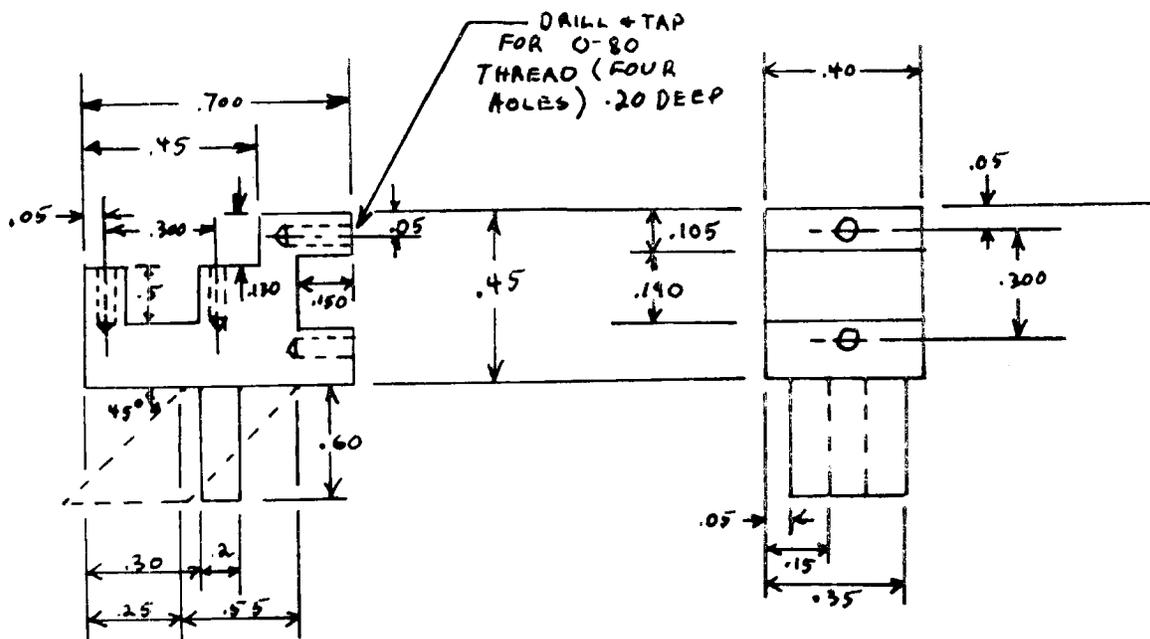
VERTEBRAL MOUNTS  
(UM-HSRI)

Two mounts are shown.

T12 mount has base shown in solid lines.

T1 mount has base shown dotted.

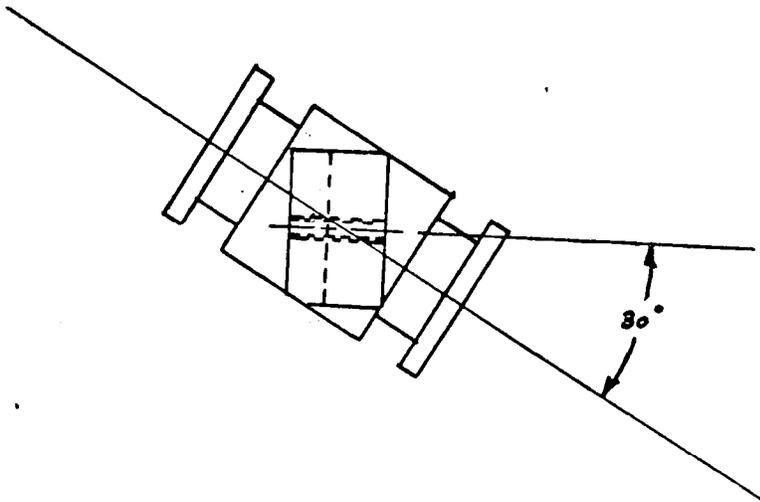
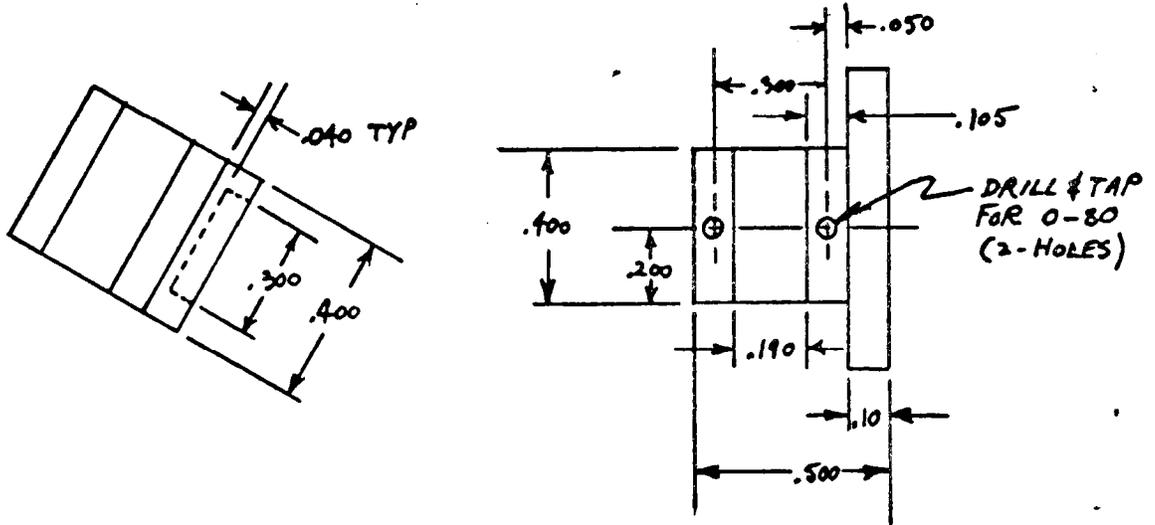
These mounts are designed for Endevco  
2264 accelerometers.



MATERIAL : ALUMINUM  
SCALE : 2X SIZE

Figure 3. Spinal Mounts

RIB MOUNT FOR ENDEVCO ACCELEROMETER  
TANGENT ORIENTATION

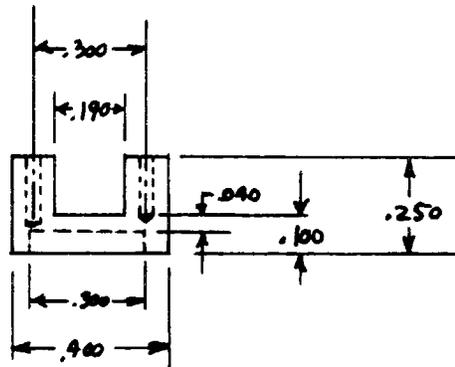
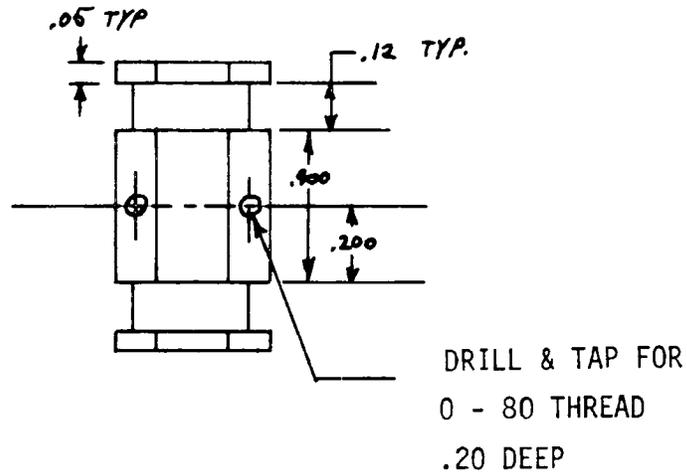


MATERIAL: ALUMINUM  
 QUANTITY: FOUR REQ'D.  
 SCALE: 2 x FULL SIZE  
 (One is mirror image  
 of the other)

FIGURE 4. 8th Rib Mounts

## RIB MOUNT FOR ENDEVCO ACCELEROMETER

NORMAL ORIENTATION



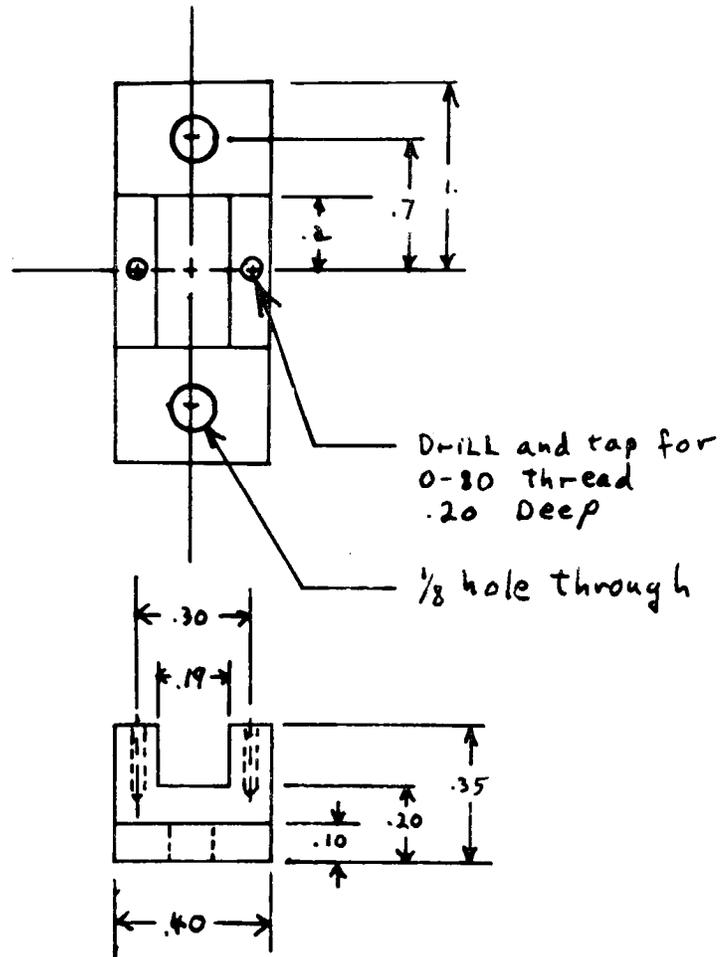
MATERIAL: ALUMINUM

QUANTITY: FOUR - REQ'D.

SCALE: 2 x FULL SIZE

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4-23-75

FIGURE 5. 4th Rib Mount



Material : Aluminum

Quantity : Two

Scale : 2x Full size

Figure 6. Sternal Mounts