AMTI MODEL OR6-5 BIOMECHANICS PLATFORM
INSTRUCTION MANUAL

GENERAL

The AMTI Biomechanics Platform simultaneously measures three force components along the XYZ axes and three moment components about the XYZ axes. The forces and moments are measured by strain gauges attached to proprietary load cells near the four corners of the platform. The gauges form six Wheatstone bridges having four active arms each with eight or more gauges per bridge. Three of the output signals are proportional to the forces parallel to the three axes and the other three outputs are proportional to the moments about the three axes.

Figure 1 shows the sign convention for the force and moment components (any sign convention can be used by altering the polarity of the bridge outputs). The positive Y-axis points away from the cable connector, the positive X-axis points to the left when facing in the positive-Y direction, and the positive-Z axis points down.

The true origin of the XYZ axes is located a distance (Z_o) below the surface of the top plate. The location of the origin (relative to the top surface) is determined as part of the calibration procedure and is given in the calibration report supplied with the platform.

For most purposes we want to know the force and moment components relative to a set of XYZ axes located at the top surface of the platform (at a location Z_o above the true origin).

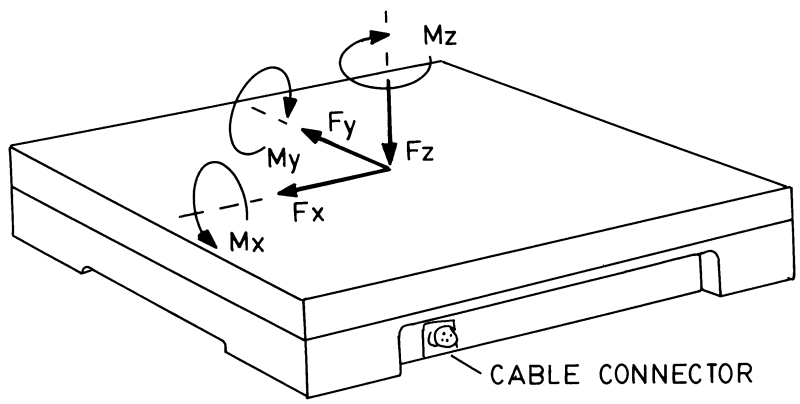

Figure 1 **Measured force and moment components: the true origin is a distance Z_0 below the top plate surface**

Although the three force components of the resultant applied force (Fx, Fy, Fz) are independent of the true XYZ location of the resultant, the moment outputs (Mx, My, Mz) are not. If a force is applied to the top surface at location X, Y (and Z_o, a negative number), the moment outputs are:

$$Mx = Fx*0 - Fy*Z_o + Fz*Y + Tx$$
$$My = Fx*Z_o + Fy*0 - Fz*X + Ty$$
$$Mz = - Fx*Y + Fy*X + Fz*0 + Tz$$

where Tx, Ty and Tz are the moments applied to the top of the plate.

Under normal conditions there is no physical way to apply Tx or Ty, so Tx = Ty = 0. Then, knowing Z_o (from the calibration procedure) and the three outputs (Mx, My, Mz), we can determine X, Y and Tz (the location of the resultant force vector and the moment applied about the Z-axis). In many applications the equations for the Mx and My can be replaced by a good approximate set:

$$Mx = Fz*Y$$
$$My = - Fz*X$$
$$Mz = - Fx*Y + Fy*X + Tz$$

thus: $Y = Mx/Fz$
$X = - My/Fz$