AMTI General Force Platform Mounting Instructions

INTRODUCTION

AMTI Biomechanics Force Platforms are instruments designed to detect forces and moments applied to their top surface. In order to obtain the highest quality data, the force platform should be mounted in a manner appropriate for the type of testing to be performed. This may be obtained in some cases by simply placing the force platform on any surface which does not produce noticeable rocking. Use of the platform in this unmounted condition may be quite satisfactory for stability and gait testing with low frequency content signals and low side load. However, for test conditions that produce dynamic loading such as running or jumping it is preferable to mount the force platform.

The platform should be mounted in a manner that minimizes vibration of the entire force platform including the base structure. One of the best methods is to bolt the force platform to a flat plate that is bonded to a solid foundation. AMTI mounting plates for each specific model of force platform are recommended for this procedure. This manual discusses methods for mounting the platform using AMTI mounting fixtures or by designing your own.

GENERAL INSTRUCTIONS

AMTI force platforms consist of a top plate connected to a base plate separated by four sensing elements. All loads applied to the top plate must go through these sensing elements in order to be measured correctly. If there is twisting of the base plate (as with an unmounted force platform on a uneven floor) the loads in each of the four sensors may be non-linear with load. The force platform may not fully compensate for the non-linearity and there could be corresponding errors in the final outputs. There can be added errors in dynamic testing due to base plate structure mounting vibrations which can be much lower in frequency that the characteristic force platform natural frequencies. Any vibrations of the force plate base or top will produce errors in the outputs. These twisting and vibration induced errors can be minimized by firmly bolting the platform base to a rigid mounting surface. The platform base itself is only moderately rigid; it is stiffened by the bolted connection to the mounting surface. Please note that “rigid” is a relative term. The rigidity of the base structure should be high compared to the rigidity of the sensors and top plate. The standard mounting rails provided by AMTI are not, in themselves rigid compared to the platform base plate. The force platform and mounting rail structure becomes very rigid when the mounting rails are bonded to a concrete base or floor.

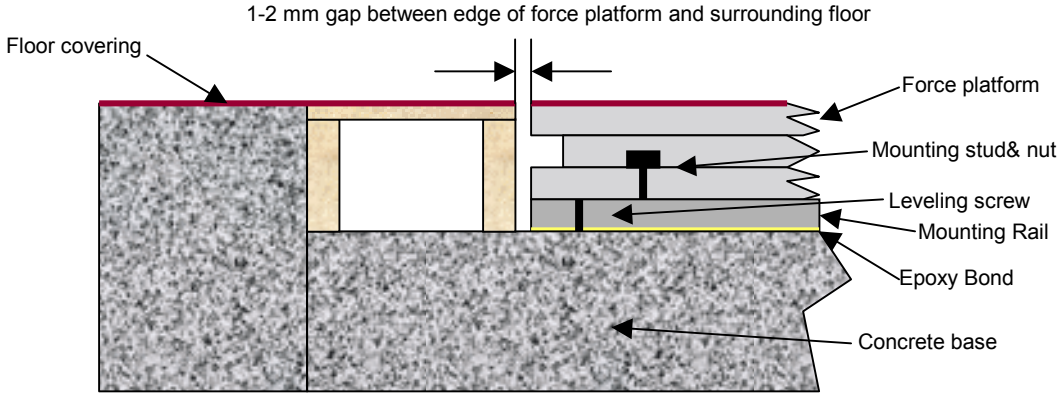
“Rigidity” and “strength” may be related but are not the same. There are many possible methods of mounting a force platform that are strong enough but are not sufficiently rigid. The use of metal plates and structural steel weldments is often thought to be rigid but does not necessarily produce an optimal installation due to flexing and bending of the structure. All interfaces should be solid or linearly elastic in order to prevent non-linear effects.

In addition to the rigidity aspects, the flatness of the mounting surface is important. Bolting the force platform directly to a non-flat surface will produce stresses in the sensing elements. The force platform should not rock when placed on the mounting surface. Metal or other types of non-compressible shims can be used to eliminate rocking if necessary, but the initial mounting installation should be made as flat as possible. A flat machined surface should contact the force platform; unmachined cold rolled or hot rolled steel or aluminum surface are almost never flat enough to be used a mounting surface. (Flat and level over the area of the force platform to better than .05 mm (.002”).

Vibrations of the mounting surface are important due to the fact that the force platforms behave like accelerometers and produce outputs from the floor vibrations. This may be more or less difficult to control upon your particular installation site. Ground floor locations are best in regard to vibrations. When mounting on an upper floor it is best to locate the force platforms over support beams, near support columns or near walls whenever possible. Each installation site is

different and no single solution or suggestion will be applicable to all situations. Since the acceleration caused outputs for a given capacity force platform are directly related to the mass of the top plate, they can be minimized by going to a platform with a composite top which will have higher resonant frequencies (AMTI Models OR6-6 and BP400600HF).

A typical mounting installation takes the form of a heavy rigid mass under the force platform. This mass is usually a metal reinforced concrete structure. There is considerable latitude in the design of an installation. A permanent ground floor (slab on grade) installation should have depth of 15 to 45 cm of concrete (6 to 18") beneath the force platform and mounting plate. Moveable force platform mounts are also possible; please refer to AMTI Air-Bearing Mounting System.

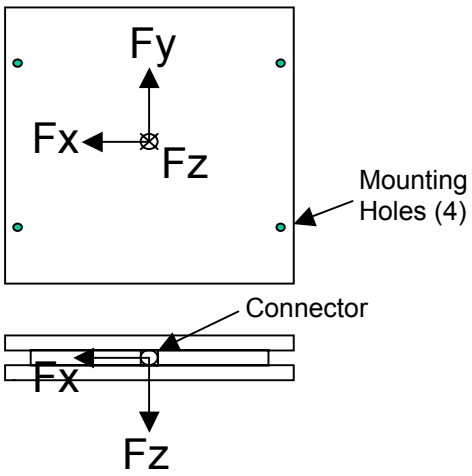


PLATFORM COORDINATE SYSTEM

Many different force platform models have different dimensions but the force coordinate system is the same for all force platforms. The reference for the coordinate system on AMTI force platforms is the location of the connector.

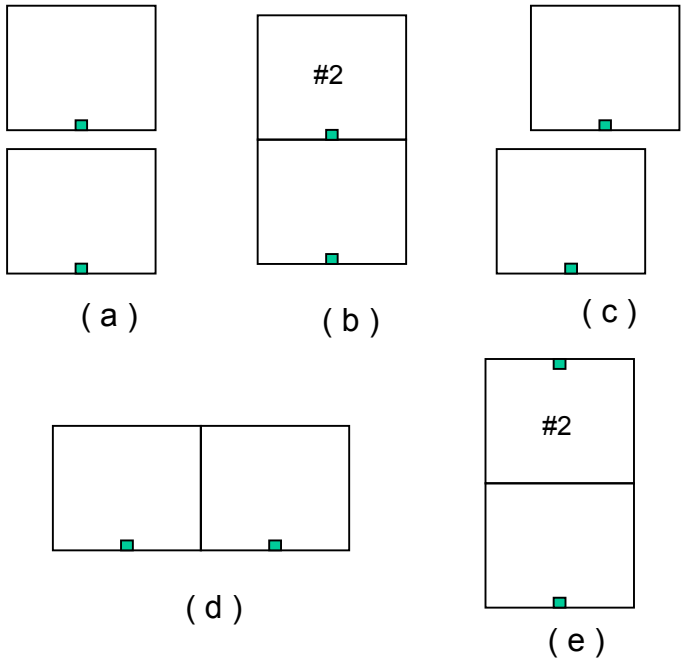
The precise location of the origin is supplied with each force platform calibration sheet. The origin's location is referenced to the geometric center of the top surface of the platform, but it lies at the given X, Y and Z offsets from the top surface geometric center. The positive Y-axis points away from the cable connector and the positive Z-axis points down. When standing facing the connector, with the platform in front of you, the positive X-axis points to your left.

AMTI sensors follow the right hand rule. If you point the thumb of your right hand in the positive direction for any of the axes, your fingers will curl in the positive direction for the moment of that axis.



MOUNTING CONFIGURATIONS

Many laboratories use two or more force platforms in a variety of models and sizes in the same installation. AMTI force platforms can be placed in many configurations including end-to-end, side-to-side and other combinations. End to end in line mounting with a space of at least 5 cm between force platforms (Figure **a**) can be accomplished using any of the standard AMTI mounting rails. End to end mounting shown in figure **b** can be accomplished with use of a model 7615R (right angle connector) cable for platform #2. Offset mounting (Figure **c**) with a space of at least 5 cm between force platforms can be accomplished using any of the standard AMTI mounting rails. Side-to-side mounting (Figure **d**) requires a special mounting plate to allow access to the mounting bolts located on the sides of the force platform. Back to back mounting (Figure **e**) requires that the cable for platform #2 have the polarity of the force platform axis reversed (AMTI Model 7615RP) so both platforms will have the same coordinate convention. AMTI mounting systems can be custom designed to accommodate a wide variety of gait laboratory activities ranging from pediatric gait to sports performance.



MOUNTING CONSIDERATIONS

The following is a brief checklist to use in planning your installation. AMTI technical support staff (support@amtimail.com, telephone 617-926-6700, fax 617-926-5045) is available for additional assistance in planning your installation:

- Make the pit deep enough to accommodate the force platform/mounting plate combination that you will be using (See table 1 below for dimensions).
- Make the pit long and wide enough to adequately configure the force platform(s) for their intended use.
- If the pit is for a single platform, it may be wise to make it large enough to add additional platforms in the future. This is especially important in new construction where the cost for constructing a larger pit during the initial construction is small compared to enlarging the pit in the future.
- Allow about 15 cm (6”) of free space between the connector end of the platform and the side of the pit to allow access to the connector.

- Allow for about 15 cm of space on the side of the force platform(s) to fit your hand and a wrench to tighten the mounting fasteners.
- Allow for electrical conduit to be run under the floor from the pit to the area where the computers will be located. This is for the force platform cable(s) The minimum recommended conduit diameter is 5+ cm (2") (inside diameter).

Force Platform Model Number	Force Platform size in mm (width X length X height)	Mounting Rail* Size in mm (width X length X height)
OR6-6	464 X 508 X 82.5	101 X 508 X 25.4 rails
OR6-7	464 X 508 X 82.5	101 X 508 X 25.4 rails
BP400600	400 X 600 X 82.5	101 X 600 X 25.4 rails
BP400800	400 X 800 X 82.5	101 X 800 X 25.4 rails
BP600900	600 X 900 X 82.5	101 X 900 X 25.4 rails
BP900900	900 X 900 X 82.5	101 X 900 X 25.4 rails
BP6001200	600 X 1200 X 102	101 X 1200 X 25.4 rails
BP12001200	1200 X 1200 X 102	101 X 1200 X 25.4 rails

*2 mounting rails per force platform, one on each side.