FT700 Power Cage, BMS and 400 Series Force Plate FAQ

Fitness Technology
21 Bishop St.
Skye SA 5072
Australia
+61 8 8331 9229
Mob: 0418 815 400
www.fittech.com.au

Q1: The force plate does not maintain the correct body mass measurement during use following calibration. At times, it seems to be quite extreme. How do we fix this?

A1: System should read body mass to within 0.1kg or roughly 1N of force consistently. Check that the plate is correctly zeroed prior to measurement. Check the plate is level and on a firm surface such as concrete rather than carpet or sprung wood floor. Refer to the 400S Manual page 5 & page 7 item 5 + the instructions on the FT700 Instructional Footage here is the direct link. http://www.fittech.com.au/video/ft700_pos_cal.mp4

Q2: The braking system seems to have a baseline level of operation that is constantly there. How do we eliminate it?

A2: The brake has tension due to the spring return system which is around 100N of force. It is fairly constant across the range of movement due to the spring and cam arrangement but the force does decrease slightly from full extension to retraction. It is advised to only use the braking system for training and use free weight only for testing. If the research involves examining the effect of the brake then this is OK as force is measured directly at the ground so upward brake force is included.

Q3: If the braking cannot be reduced to zero, how do we quantify this baseline? If using the force plate, would it be correct to say that we will have the correct mass information when the weight is un-racked? If we are not using the force plate, how do we quantify the contribution of the braking force?

A3: I would advise to not use the brake during testing and only attach for training when the load is too high to tolerate without eccentric assistance. However, even when using the brake, the force plate will reflect the ground reaction force and this will include the body weight, brake force and acceleration force components. To get an actual load with the brake attached we just "weigh" the person plus bar using the force plate.

Q4: Even more important than just how do we quantify it while in use, is how do we control it? Our initial experience with the braking system was that the control, especially the external manual one, had a much smaller range and resolution than we had anticipated. Our expectation had been that the percentage control of the braking force would be a percentage of a total load value that we would enter. It now seems to us that the settings may instead be percentages of the braking force that the system can provide. Is this the case?

A4: The brake should provide infinite adjustment from 10 to 150kg whether on manual or computer control.
(also see next Question).

Q5: Therefore, if we are dealing with the same absolute force from the breaking system at a particular setting regardless of the load on the bar, we need to know from you what are those absolute values...what is the lowest one and what is the highest one, and what is the smallest change in braking that can truly be controlled within that range?

A5: We hang various loads from the brake to determine this. In our experience this is in the range 10 -150kg corresponding to brake OFF and FULL ON. Video Explanation: How to Determine the Maximum Braking Load of your FT700 Power Cage Magnetic Braking Unit

Q6: What guidelines/advice can you provide on cutoff frequency for filtering each of the three variables to produce a smooth representative signal?

A6: Initially go with the default settings of 0, 16 and 10 Hz for displacement, velocity and acceleration. If the signals are too noisy then consider lowering the velocity and/or acceleration cutoffs. Filter cutoff will impact measured variables such as peak velocity and power so it is important not to change the settings between repeat tests.

Q7: Can the 30-ms default epoch be changed when calculating maximum RFD (N/s)?

A7: No it can't be changed but it is a good suggestion and we will add this to the software in the next week or so.

Q8: Does the Time to Peak Force calculation begin only at the start of the period enclosed by the two cursors on the graph or does it always use the same initiation time point? I will check to see if the cursor position affects it but thought you might have a quick answer for me.

A8: Yes – time to peak force is from cursor line 1 to the highest peak between the two cursors.

Q9: In the information you provide, it is stated: "For a squat or bench press, set the zero at the bottom of the movement. The zero point is not as crucial for movements that do not involve a flight phase."...Do you have to use a lighter weight ahead of the set to make sure the athlete can fully pause at the bottom without fatigue and assume the same "zero" depth will be used for other heavier barbell loads?

A9: The zero point is not that critical except for measuring maximum and minimum height which are not commonly used variables anyway. The zero is just relative so for example, you might find it easier to set the zero for squat or bench press at the top of the ROM.

Q10: When saving a training set, is there no automated process within the program to save time once the training begins (prompts based on pre-selected number of sets, athletes involved in session, date, etc.)?

A10: No, not as yet but could be added in future. We will add to the list of client suggestions.

Q11: How can we use the software to set up Bosco-type jump testing (e.g., total contact time versus total air time of repeat jumps)?

A11: At present you would have to analyze each jump and then add the times together. We will add this to the data analysis though.

Q12: According to the user guide, it indicates that power in training mode is calculated (mass x 9.81 x displacement) only from the displacement transducer. How do we make sure that data from the force plate is used during training mode?

A12: At present data from the force transducer is not used in the training mode as there are issues around processing the calculations fast enough in real time. We will investigate this and see what variables e.g. peak force could be added.

Q13: In training mode, the table heading is "Max Power", "Data to Plot" states only "Power", but the definition in user guide indicates "average power output". Please clarify.

A13: In training mode the power for any given rep is the average concentric power. Please elaborate when "Max Power" is displayed on the training window.

Q14: "Eccentric Strength Test" - Need additional explanation than what is in the use guide within the options and settings table under "Configuration-Ballistic Measurement System".

A14: Eccentric Strength Test is a test specifically developed for the US Ski and Snowboard Association. It involves determining the maximum weight that the athlete can lower in a controlled manner over a 4 second period. This test is no longer available on the BMS software as it is so specific to USSA. We will remove from user guide.

Q15: "Test Serial Interface" - What kind of commands are there that one can send to test the communication with the serial transducer?

A15: This option only applies to the older XPV6 and RS232 transducer. This does not apply to the USB based units.

Q16: Do you have any recommendations/guidelines for setting up a bench press on the force plate, when it is obviously larger than the area of the force plate?

A16: Several labs have built custom benches which sit isolated on the force plate. This is the best option. However, depending on design some off the shelf benches can be isolated on the plate.

Q17: Why not attach the position transducer to the athlete's waist for barbell jump squats instead of attaching to barbell?

A17: Many labs and teams do attach the transducer to the belt rather than bar. There are no strict methodologies at this time and it depends on movement, setting, athlete experience, personal preference. I would test each and see which provides more representative data. Caution re attaching to waist belt – that belt position must be secure so it can't slip. Belt slippage causes inaccuracy data recorded re squat jumps Counter Movement Jumps etc.

Q18: Please confirm if the minimum velocity occurs at the highest eccentric value?

A18: The minimum velocity is the fastest velocity in the negative direction so will occur somewhere in the middle of the eccentric phase.

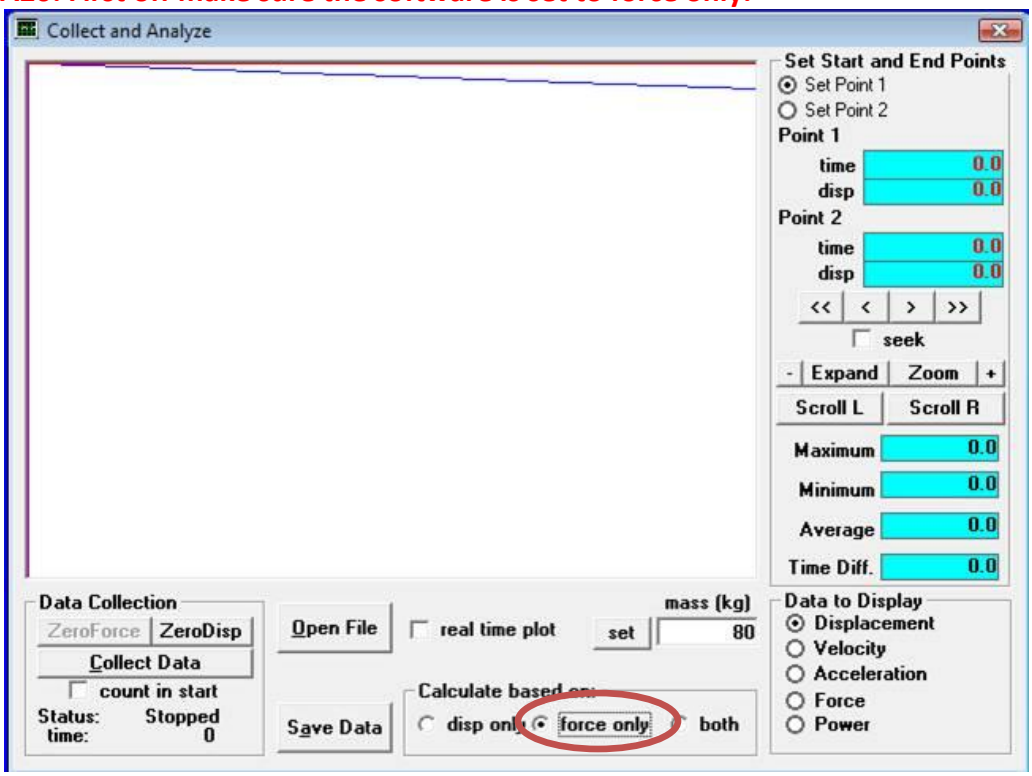
Q19: What is "count in start" selection in "Collect and Analyze" window?

A19: This provides a three second countdown to the start of data collection. This is useful when the athlete is operating the computer as well as testing or training. Or can be used to count the person being tested down to the start of the test.

Q20: We seem to be having some problems as the results, particularly the power and displacement when using the force only are wrong. So to simplify things to understand where our problems are stemming from we have been having someone standing stationary or place a weight on the force plate and measuring the force. Again the results appear to be incorrect – a minimum displacement is recorded which is significant (-90 in some instances) and the graph appears to be very noisy. I'm not sure where the error is stemming from but when we zero force we get a

peak force of around 20KN in the result window. Is this right? I would have imagined that if we zero force everything should be zero in the results window before we start the collection.

A20: First off make sure the software is set to force only.



There is a zero offset of around 20,000 but this is the summed Analogue to Digital count. This is normal; it has been put into the XPV7 to account for any instances when there is a tensile force on the load cells.

The graph would be noisy if the person is just standing on the plate because it is auto-scaling to the maximum and minimum readings. To solve this problem we recommend you have the person perform a CMJ and then stand still. This process is shown in the following link (3MB video file).

http://www.fittech.com.au/video/FT700_single_cmj.mp4

Q21: When "mean concentric only" box is ticked, at which point on the graph are the measurements taken from?

A21: All calculations are for the period selected between the two points (vertical lines inserted on the graph). For some measures e.g. power it may not be suitable to include eccentric (negative velocity) phases in the calculation of mean values so selecting this option causes the system to only average values between the selection points during concentric phases.

Q22: Is velocity calculated from the linear transducer only? (as results make no sense with the force only!). If so, why can't we use the force plate to get Vertical velocity at take-off (and hence jump height also calculated)? (as we know the mass)

A22: This depends on which option is selected to calculate data sets – displacement only (linear transducer), force only, or both. If both is selected then displacement and velocity are calculated from linear transducer data and force is measured from the force plate. If force only is selected then velocity data is calculated from force data using impulse-momentum relationship and displacement data including peak height are calculated by integrating the velocity time data.

Q23: With printing from excel, I couldn't just use selected part of graph for results (it only worked with all the data)? Any ideas? Would be good to have force by time scale on the graph, then be able to print selected part.

A23: Right click on the graph and the options to copy selected section of data are displayed. The displayed data set or all data sets between the two selections points can be copied and then pasted into Excel for graphing or other analysis.

Q24: Can the data be smoothed to remove noise (eg. just after take-off/landing etc.)?

A24: Fourth order Butterworth digital filter is provided for all data sets including force. Cutoffs are selected under options.

Q25: I am using the BMS to analyse bench throw power, based on the below evidence this would now be inaccurate. Luckily I have access to the force plate as well, my question is would there be enough impulse from/through a bench to record meaningful ground reaction force data that can be coupled with the BMS data to give an accurate power reading?

A25: Measurement of power during bench press using the BMS and linear transducer only is not as problematic as for a movement such as squat jump or power clean as you are measuring the power applied to the bar only. So depending on the level of validity that you require using the linear transducer should be sufficient. If you do have access to a force plate then measuring the force directly by placing the bench on the plate will work well. I did most

of my early power research using this setup. I have attached my PhD for your reference which details these studies.

Q26: What are the formulae used to calculate Jump Height from flight time and Peak Velocity?

A25: The formulae for calculating jump height from flight time versus peak velocity are as follows:

Flight time:

Jump Height = 9.81 * (flight time) ^{2} / 8

Peak Velocity:

Jump Height = peak velocity ^{2} / (2 * 9.81)

Q27:

1. **When calibrating for force is there an optimal load we should use for the "Higher Force" considering our population?**
   The key is to calibrate over the maximum range of forces that you expect to measure. So if it is possible for the athlete to produce three body weights of force then this would be 3 x 165 = 495 kg or more correctly 4,856 Newton.
   a. **We have athletes as heavy as 165kg**
   b. **What would this load be? The last time I tested the IMTP on dual force plates we used 500kg total to calibrate (250kg per force plate)** this is pretty close to the mark as with the example above you would be seeing approximately 250 kg per force plate.
   c. **How much difference in actual measured weight and weight measured during the calibration test is acceptable?** Yes this is acceptable. The force plate is designed to measure up to 10,000 N of force or the equivalent of around 1000 kg so a discrepancy of only 0.74 kg is well within its measurement accuracy.

   d. **I weighed myself at 91kg exactly but during the calibration test it reported 90.26kg**
   e. **I calibrated several times using different loads for "higher force" and it gave me a similar difference**

2. **Do we have to calibrate Position at all?** **It is only necessary to calibrate displacement/position if you have a linear position transducer. If you are using just the force plate it is not necessary to calibrate displacement.**

Q28: I cannot find a detailed explanation of smoothing the trace curves via the filter settings

a. **What is its purpose?** **All measurement systems have a certain amount of noise within them which can produce errors in measurement. These errors are amplified by a squared factor when the data is integrated or differentiated as is the case when calculating velocity and displacement from force or calculating velocity, acceleration of force using displacement data. For this reason the data has to be smoothed. The problem is not nearly as large when using direct measurement of force by the force plate. If you are not using a position transducer then I suggest filtering the force data at 50 Hz cut off and not worry about the cut-off frequencies for displacement and velocity as they do not affect your data.**
b. **Displacement, Velocity, Acceleration, and Force**
c. **One of the tutorial videos showed typing in 90 into Force and then 80 to smooth the trace even more but does not explain where that number came from** **- filter cut-offs really depend on the nature of your data in terms of the amount and frequency of any noise it may contain. For example, if the force plate is vibrating on the floor then this will introduce a high frequency noise into the measured for signal which needs to be filtered out. As stated above I would apply a 50 Hz cut off to the force by default.**