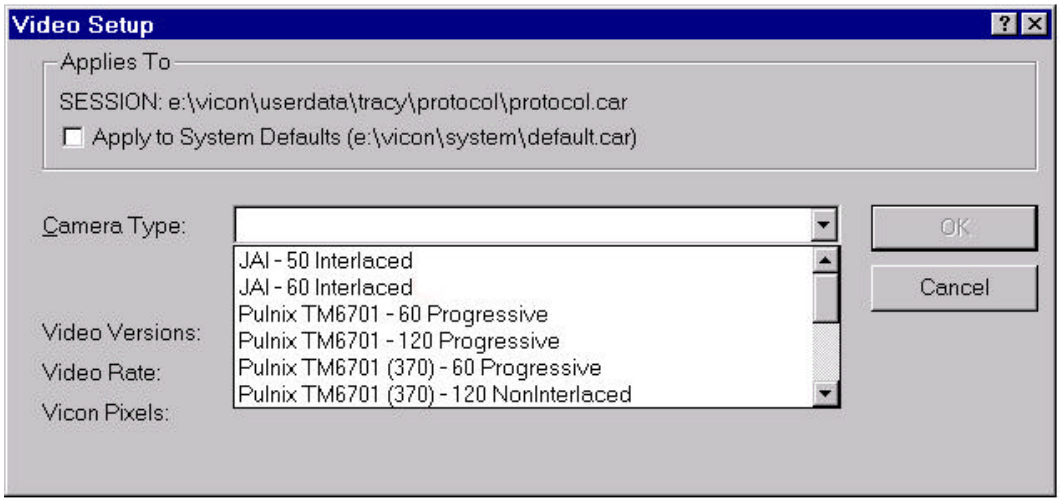
Setup and Collection of Data Using the Vicon 370 System

(Using Static Calibration)

This is a procedure that calibrates the Vicon 370 system using a static calibration method with the current workstation software (edits will be made as software upgrades are made).

Getting Started

1. Click on the Workstation software on your desktop or go to **Start|Programs|Vicon|370 Software.**
2. **Log in** with your Vicon Login (A password is not necessary). If you do not have a login you can create one now by entering a new username.
3. **Select camera type**. Go to System|Video Setup. Under camera type select the proper cameras (If you are using the 60 Hz Cameras select the Standard 60 or JAI – 60 interlaced drivers for 370 software (If you are using the 60/120 Hz visible strobe cameras select the Pulnix TM6701 (370) with the corresponding frequency.)



4. **Start a new file session**. File|New Session. Select a filename, for the particular protocol you are using.
5. **Select the system parameters**. Go to System|Set Parameters. Under E:/Vicon/System select the .car file for the protocol (for example default_2fp.car). It will ask *"Are you sure you want to set the parameters for session protocol"* Answer this question "*Yes*". This file should have the coordinates of the template targets located in the force plate information section of the .car file. The z-coordinate has the most noticeable change and is much higher than the actual marker location. (See Image below for location of the z coordinates in the .car file, shown in red). Also check that the number of force plates being used in the test is the same as the count value (seen in blue).

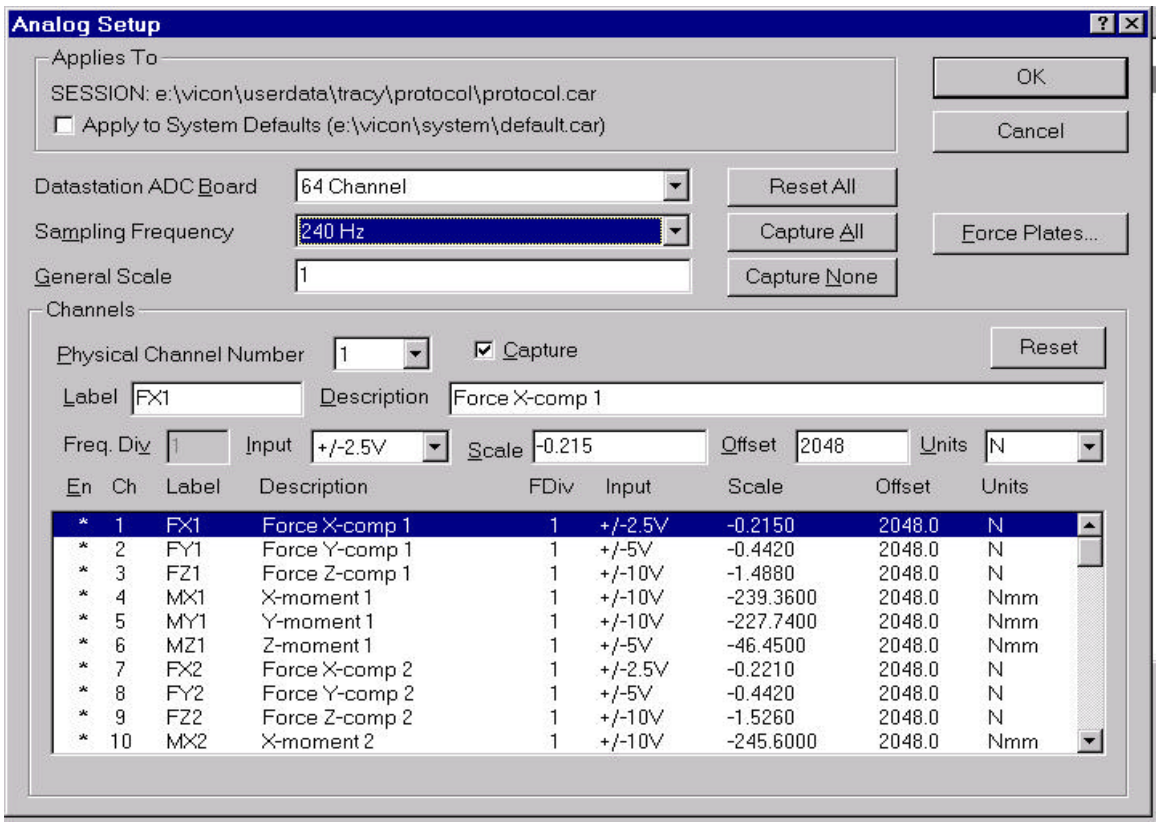
```
[ForcePlates]
Zero=1,10
Count=2

[Pipeline]
OML:Reconstruct=-3000.000000, -3500.000000, -100.000000,  3500.000000,
3500.000000, 2000.000000,  30.000000, 50.000000, 7.000000, 3.000000,
2.000000, 0
OML:Autolabel=3.000000, 50
OML:FillGaps=
OML:RemovePrefixes=
OML:SaveTrial=
OML:CaptureNextTrial=
Processes=OML:Reconstruct.

[ForcePlate1]
Corners=208.000,230.000,-45.0000,-208.000,230.000,-96.0000,-208.000,-
230.000,-96.0000,208.000,-230.000,-96.0000
Type=2
Origin=-4.400000,1.900000,-21.600000
Channels=1,2,3,4,5,6

[ForcePlate2]
Corners=208.000,230.000,-69.0000,-208.000,230.000,-96.0000,-208.000,-
230.000,-96.0000,208.000,-230.000,-96.0000
Type=2
Origin=-4.060000,3.810000,-20.066000
Channels=7,8,9,10,11,12
```

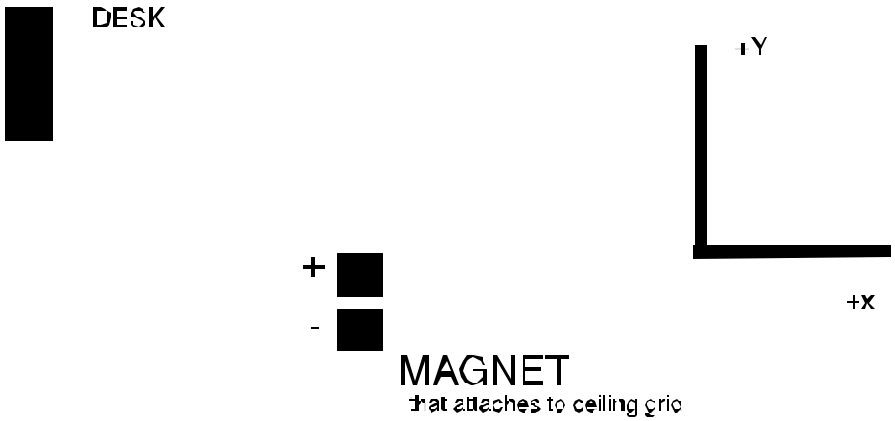
6. **Select the proper Analog Channels.** The analog setup is used to determine which devices such as the force plates, EMG, and footswitches will be used with the Vicon system. Select the proper components for the devices you are using. If you are just using two force plates, the first twelve channels should be selected. To turn on/off a channel, double click on the channel. A channel is considered active if there is a '*' to the left of the channel.



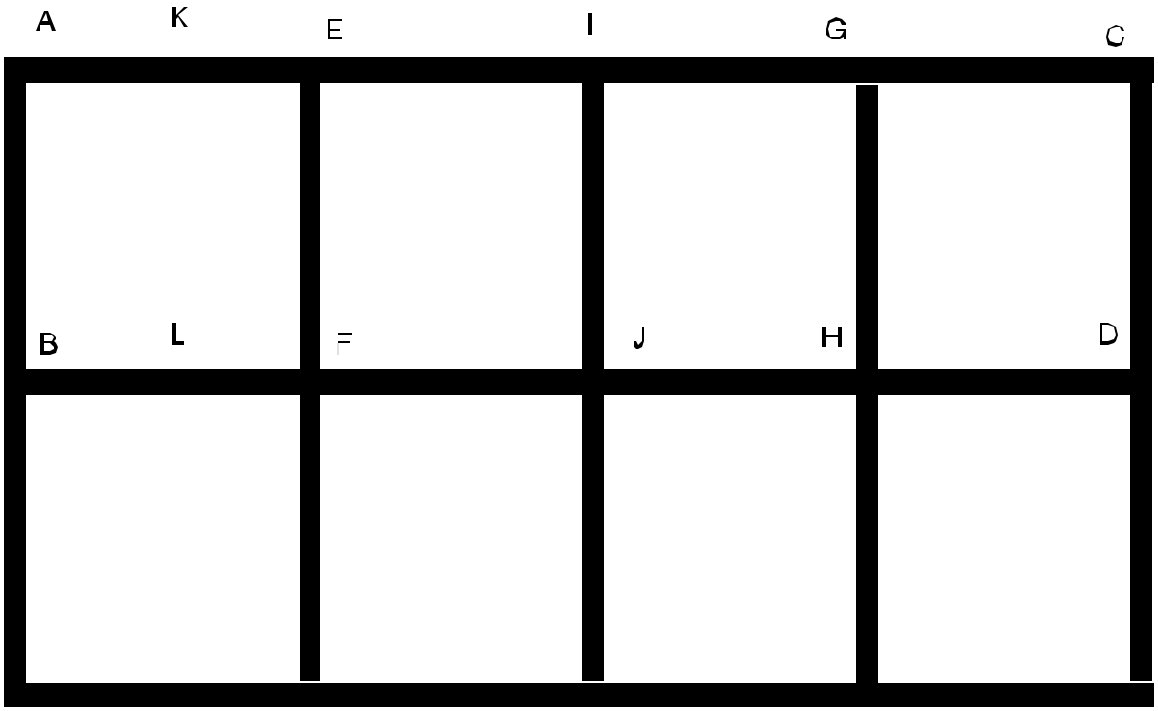
Calibration

The next step in this process is calibration. Sometimes it is best to hang the strings before doing the above computer setups so the strings will stabilize. To calibrate the system:

1. **Hang the strings** with the positive side of the magnet facing in the positive y direction (see figure below)

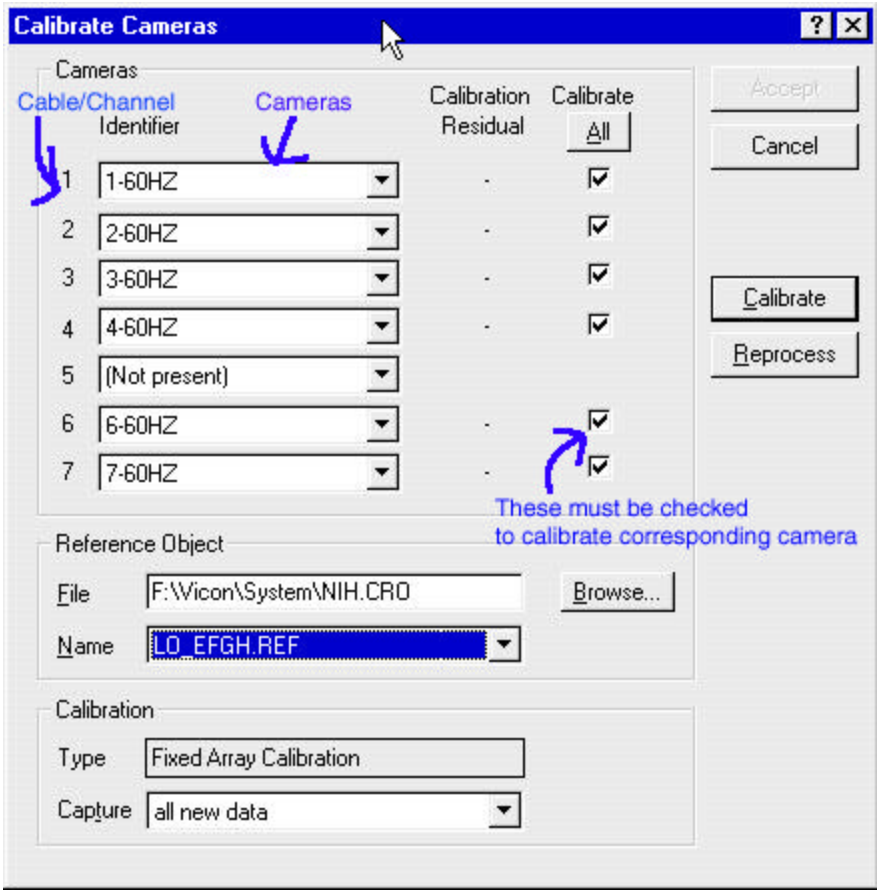


The Strings are placed in the proper holes in the grid. The most common setup, which is used, is called LO_EFGH. This means you use the string set with the markers, lower on the string, and you place string A in hole E, String B in hole F, String C in hole G, String D in hole H.



The exact hole to place the strings are marked on the ceiling

2. **Position Cameras**. In the 370 Workstation Software go to System|Live Monitors. A screen will pop up giving you the option of which camera view to see. You need to make sure each marker is located within the linearization box (white box in camera view) of each camera. (Note: If no linearization box appears go to System|Calibrate and calibrate and save the calibration, then go back and check the live monitors to see if the linearization box appears).
3. **Calibrate the system**. To do this go to System|Calibrate. You are then given the option to select which cameras and channels you will use for this data collection. In the Cameras Section the camera's linearization file must be matched up with the appropriate channel number. The channel number is the fixed number in the section (1,2,3,…) and the linearization file can be changed to match the camera to the apprioate channel (1-60Hz, 2-60Hz,3-60Hz,…) Then check for the appropriate reference file (NIH.cro is the correct static calibration file). Next, select the name of the string configuration that you are using (normally LO_EFGH.REF).



In the Calibration box (shown above) click on the calibrate button. Then press, "start" when the box appears on your screen. The system will automatically calibrate from this point. MAKE SURE THE STRINGS ARE MOVING AS LITTLE AS POSSIBLE BEFORE YOU CALIBRATE. Calibration Residual values will now appear. These values should be less than 2.0 and somewhat similar for a good calibration to occur. If any of the cameras failed, the residual will say failed and the calibrate box will be checked. There are several ways to determine why the camera failed. The best way is to look at the Live Monitor for that camera (System|Live monitor). Before you do this 'Accept' the current calibration. Normally the reason a particular camera does not calibrate is that it is viewing the strobe of another camera. The live monitor view will show that. To correct this problem, have someone stand in front of the strobe that is seen on live monitor and recalibrate that camera only. You can do this by only having the uncalibrated camera's calibration box checked. Continue to do this for all cameras that are not calibrated. If this does not solve the problem, look for other reflections in the lab.

Another possible error, which would cause calibration not to occur, is the cameras are not viewing all of the makers clearly. Use System|Live monitor and make sure every camera has each marker within the linearization frame and the makers are distinct and can be separated easily from other markers. This may require you to move cameras

and recalibrate ALL of the cameras. Make sure the blinds are pulled on the windows and office doors are closed which lead into the lab. Also check to make sure the strings are configured properly and you are using the correct linearization files. (NOTE: To see calibration marker pairs go to View|Calibration Marker Pairs)

4. **Accept the calibration** and now you are ready to locate the force plates in the laboratory if needed.

Force Plate Location

1. **Place Templates over Force Plates**. There are two templates located on the windowsill the laboratory they are labeled Force Plate 1 and Force Plate 2. Place these templates over the force plates on the floor. Corner 1 of both templates is considered the corner in which the marker wand is shortest. Therefore you place plate cover 1, corner 1 over plate 1, corner 1. And do the same for Force Plate 2. (See lab map for plate names and corner locations.)
2. **Capture Template Data.** Go to Trial|Capture. Choose FPLOC as your trial type then select capture. Another box will appear where you will press start when you are ready to capture data. The data will automatically stop and process. A screen will appear which has the reconstruction of the template markers. You need to label the markers appropriately. To label the force plates beginning with corner one and move clockwise. Then on the side of the window you will see makers F1C1, F1C2, etc. Click on the labels in the same order as you clicked the force plate markers designating a label to each of those markers (If you choose auto identification mode while running FPLOC, this assignment can be arbitrary.) Delete unlabeled trajectories and fill all gaps. Save this trial. Make sure all target data is available for all frames, especially at the beginning and end of the trial. If it is not available then you can change the reconstruction parameters to decrease the intersection limit, then reprocess the data. To do this go to Trial|Reconstruction Parameters and change the Intersection limit. If this does not work it is possible to save a range of data within a file. You can save a range by going to Trial|Trajectory Save range and enter the range of frames in which you want to save. Go to Trial|Pipeline and make sure only the box that is checked is 'Trim C3d File Parameter Size'. CLICK ON 'PROCESS NOW', not 'OK'!
3. **Close the session and minimize the software window.**
   Using my computer go to e:/vicon/userdata/*username/session*
4. **Copy *fploc.exe* to the current session.** This can be done by going to o:/nih.exe and copying it to the current directory.
5. **Run the program FPLOC.**
6. **Open your Vicon software again**. Close the session and reopen it.
7. **Check force plate location**. Go to Trial|Capture. Select FPLOC as your capture type. Click Capture and Start. When the reconstruction appears on the screen the markers should be in the corners of the force plate location squares on the screen. If this is not the case, you need to reset your system parameters to an original .car

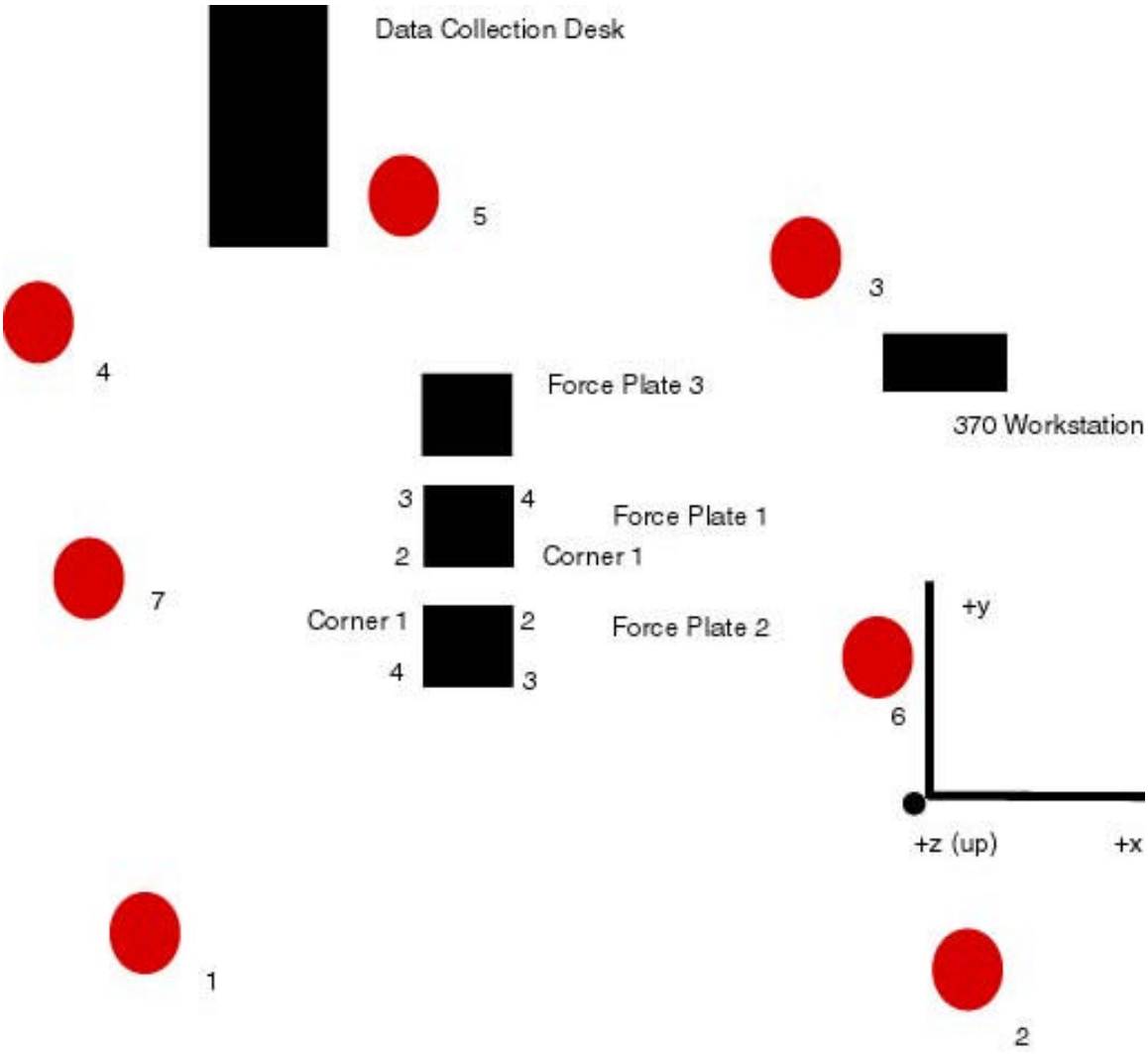
file then capture data again and rerun FPLOC. Make sure the files are trimmed (Trial|Pipeline|Trim C3D file) and there are no unlabeled trajectories in the file. To double check that FPLOC has run properly open the .car file that is located in the folder which was set up to save the data. The data is usually saved to a folder in your login directory (Vicon/Userdata/*username*/*session name*). Check to make sure the z locations are close to zero and they are not above 2.

Collecting Data

1. Go to trial – capture (be sure that the trial type is appropriate) – click on capture – click on start and stop.
2. Close out the trial and repeat as needed.
3. During each trial or after they are complete go back and label the trials. You can auto label after you label the first trial but auto label requires that the user do an additional set up. See instructions on how to auto label.
4. After labeling each trial make sure you delete unlabeled trajectories and fill all gaps under the edit menu.

5. Continue Steps 1-4 for all data needed. At the end of the trial, select Trial|Pipeline and process now to trim the c3d files which were created. This enables some of the software, which does not work with the Vicon .c3d file format to now work with these files.

Data Collection Area



Quick Reference Guide for Setup and Collection of Data Using the Vicon 370 System.

(Static Calibration)

1. Hang Calibration Strings
    - Make sure positive side is in +y direction
2. Turn on collection computer, workstation, and cameras
3. Start 370 Software.
4. Login
5. Open New Session
    - Create a filename. Remember to keep a maximum of 8 plus 3 format. (Remember that Vicon adds two numbers to the end of each file.)
6. Set Parameters
    - Usually you choose the default_2fp.car file for two force plates
    - Check the z-coordinates and the number of force plates in the .car file
7. Set analog setup
    - If you are only using two force plates select the first 12 channels. For any other analog configuration, select only what you need.
8. Place cameras using live monitors
    - Make sure markers are within the white linearization box in the Live Monitors.
    - Make sure each camera can see all of the markers and that you are picking up minimal reflections from other cameras and the floor.
9. Calibrate System
    - Make sure strings are not moving
    - Check for correct reference file, linearization files, and reference object.
    - Press Calibrate
    - Values should be less than 2 and normally range around 1 to 1.5.
    - Accept the Calibration
10. Take down Strings
11. Locate Force Plates
    - Make sure corner 1 of the template is over corner 1 of the force plate.
    - Capture data using the FPLOC Marker set
    - Label Trajectories
    - Delete Unlabeled Trajectories
    - Fill all Gaps
    - Save range where all markers are present
    - Pipeline to trim C3D file
    - Close session
    - Run FPLOC
    - Collect data again to see if force plate locations match template markers
12. Collect Data

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