

When defining the functional knee joint, the calculation defines the axis of rotation, but not the location on the axis.

Two additional landmarks (RKneMed & LKneMed) must be created off the position of the mediolateral knee targets.

Sample files for this tutorial may be downloaded.

- 1) This tutorial will use the **Static.c3d** and **Functional Knee.c3d** files.
- 2) The Functional Hip.c3d file is used for the [Functional Hip Tutorial](#).
- 3) FunctionalJoints_Hip_Knee.cmo contains a static trial with both the functional hip and knee defined.

The calculation of functional joints is described [here](#).

Load Static Trial

1. From the **Model** menu, select **Create → Hybrid Model from C3D file**.

2. A dialog titled **Select the calibration file for the new model** will appear;

Select *Static.c3d* Click **Open**.

Create Functional Joint

1. On the **Landmarks** tab:

1. Select the **Functional** tab

Create Right Functional Joint

1. On the **Landmarks** tab:

1. Select the **Functional** tab

2. From the **Functional Joint Name** box, select *F_RKNEE*.

3. Click **Create**.

2. Select tracking targets for the F_RKNEE:	Tracking Segment/Targets Select Use Tracking Targets (ctrl-click to multi select) <i>RTH11, RTH12, RTH13, RTH14</i> Other Segment/Targets: Select Use Other Targets (ctrl-click to multi select) <i>RTIB1, RTIB2, RTIB3, RTIB4</i>	Click on Close Tab before proceeding.
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Create Left Functional Joint

1. On the Landmarks tab: 1. Select the Functional tab 2. From the Functional Joint Name box, select <i>F_LKNEE</i> . 3. Click Create .			
2. Select tracking targets for the F_LKNEE:	Tracking Segment/Targets Select Use Tracking Targets (ctrl-click to multi select) <i>LTHI1, LTHI2, LTHI3, LTHI4</i> Other Segment/Targets: Select Use Other Targets (ctrl-click to multi select) <i>LTIB1, LTIB2, LTIB3, LTIB4</i>	Click on Close Tab before proceeding.	

Model Builder Advanced Post Processing

1. Select the Post Processing button from the menu (image below) 			
2. Select the Functional Joints tab from the dialog box (image on right)			
3. Open functional movement file: 1. Select the Add Motion File From Disk 2. Browse to functional movement file, select <i>Functional Knee.c3d</i> 3. Click Open 4. Select the motion file by clicking on the trial, this will highlight the trial in blue .			

NOTE: Once the trial has been selected, the name of the trial will be highlighted and the movement file will appear in 3D viewer.

Define F_RKNEE Start and End of motion

1. Select the **START** frame of the right functional movement

1. **Select F_RKNEE**, this will highlight the joint in **blue**

2. Using the **slider** (seen below), select the START frame of the right functional movement. *Set the Start Frame to 241*



3. Click **Set START Event to Current Frame**



2. Select the **END** frame of the right functional movement

1. **Select F_RKNEE**, this will highlight the joint in **blue**

2. Using the **slider** (seen below), select the END frame of the right functional movement. *Set the End Frame to 631*



3. Click **Set END Event to Current Frame**



Define F_LKNEE Start and End of motion

1. Select the **START** frame of the left functional movement

1. **Select F_LKNEE**, this will highlight the joint in **blue**

2. Using the **slider**, select the START frame of the left functional movement. *Set the Start Frame to 733*

3. Click **Set START Event to Current Frame**



2. Select the **END** frame of the left functional movement

1. **Select F_LKNEE**, this will highlight the joint in **blue**

2. Using the **slider**, select the END frame of the left functional movement. *Set the End Frame to 1149*

3. Click **Set END Event to Current Frame**



Compute Landmarks

1. Select **Compute ALL Landmarks**
2. **Close** the Model Builder Advanced Post Processing dialog box
3. Four landmarks (**F_RKNEE**, **F_RKNEE_X**, **F_LKNEE** and **F_LKNEE_X**) should appear in purple in the 3D viewer

If the landmarks do NOT appear in the 3D viewer, check:

- That the landmarks are turned on (3D View Options)
- Check that all steps in this tutorial were completed

Compute Right Mediolateral Borders of the Knee Joint Center

The RKneLat and RKneMed landmarks created below will be used to define the mediolateral borders of the knee joint.

These landmarks will project the mediolateral targets (RLATKNE,RMEDKNE) onto the axis of rotation created by the functional joint (F_RKNEE,F_RKNEE_X).

1. Create Lateral Border of the Right Knee Joint Center (RKneLat): - Click Landmarks button - Click Add New Landmark button - Create Landmark: <i>RKneLat</i>	Landmark Name: <i>RKneLat</i> Define Orientation Using: Starting Point: <i>F_RKNEE</i> Ending Point: <i>F_RKNEE_X</i> Project From: <i>RLATKNE</i>	Do NOT Check: <i>Offset by Percent (1.0 = 100%)</i> Do NOT Check: <i>Calibration Only Landmark</i>
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2. Create Medial Border of the Right Knee Joint Center (RKneMed): - Click Landmarks button - Click Add New Landmark button - Create Landmark: <i>RKneMed</i>	Landmark Name: <i>RKneMed</i> Define Orientation Using: Starting Point: <i>F_RKNEE</i> Ending Point: <i>F_RKNEE_X</i> Project From: <i>RMEDKNE</i>	Do NOT Check: <i>Offset by Percent (1.0 = 100%)</i> Do NOT Check: <i>Calibration Only Landmark</i>
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Compute Left Mediolateral Borders of the Knee Joint Center

The LKneLat and LKneMed landmarks created below will be used to define the mediolateral borders of the knee joint.

These landmarks will project the mediolateral targets (LLATKNE,LMEDKNE) onto the axis of rotation created by the functional joint (F_LKNEE,F_LKNEE_X).

1. Create Lateral Border of the Left Knee Joint Center (LKneLat): - Click Landmarks button - Click Add New Landmark button - Create Landmark: <i>LKneLat</i>	Landmark Name: <i>LKneLat</i> Define Orientation Using: Starting Point: <i>F_LKNEE</i> Ending Point: <i>F_LKNEE_X</i> Project From: <i>LLATKNE</i>	Do NOT Check: <i>Offset by Percent (1.0 = 100%)</i> Do NOT Check: <i>Calibration Only Landmark</i>	
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2. Create Medial Border of the Left Knee Joint Center (LKneMed): - Click Landmarks button - Click Add New Landmark button - Create Landmark: <i>LKneMed</i>	Landmark Name: <i>LKneMed</i> Define Orientation Using: Starting Point: <i>F_LKNEE</i> Ending Point: <i>F_LKNEE_X</i> Project From: <i>LMEDKNE</i>	Do NOT Check: <i>Offset by Percent (1.0 = 100%)</i> Do NOT Check: <i>Calibration Only Landmark</i>	
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