

Upper body modeling with Plug-in Gait

This section describes Plug-in Gait upper body modeling, so you can determine if an upper body model will provide the data you require for your clinical analysis.

The following topics are covered:

- [Outputs from Plug-in Gait upper body model](#)
- [Marker sets for Plug-in Gait upper body modeling](#)
- [Marker placement for Plug-in Gait upper body model](#)

For details about the labeling skeleton templates to be used with Plug-in Gait upper body models, see [Plug-in Gait labeling skeleton templates \(VSTs\) in Vicon Nexus](#).

Outputs from Plug-in Gait upper body model

Use a Plug-in Gait upper body model if you require the kinematic and kinetic calculation outputs listed in the following table. The output variables are prefixed by the appropriate context (**L** for left or **R** for right).

Output	Description
Kinematics: Angles	
ElbowAngles	Relative. The angles between the upper arm and forearm.
HeadAngles	Absolute. The angles between the head and the laboratory coordinate system.
NeckAngles	The angles between head relative to thorax.
ShoulderAngles	Relative. The angles between the upper arm and thorax.
SpineAngles	The angles between the thorax relative to the pelvis.
ThoraxAngles	Absolute. The angles between the thorax and the laboratory coordinate system.
WristAngles	Relative. The angles between the forearm and hand.
Kinetics: Forces	
ElbowForce	The force between the upper arm and forearm.
NeckForce	The force between the head relative to thorax.
ShoulderForce	The force between the upper arm and thorax.
WristForce	The force between the forearm and hand.
Kinetics: Moments	
ElbowMoment	The moment between the upper arm and forearm.
NeckMoment	The moment between the head relative to thorax.
ShoulderMoment	The moment between the upper arm and thorax.
WristMoment	The moment between the forearm and hand.
Kinetics: Powers	
ElbowPower	The power between the upper arm and forearm.
NeckPower	The power between the head relative to thorax.
ShoulderPower	The power between the upper arm and thorax.
WristPower	The power between the forearm and hand.

Marker sets for Plug-in Gait upper body modeling

The marker set for Plug-in Gait upper body modeling includes markers for the head, torso, and upper limbs. There are two variations of the standard marker set for the upper body model:

- Additional upper arm (UPA) and forearm (FRM) markers
- No UPA and FRM markers

The UPA and FRM markers are optional; however, using them improves marker tracking during dynamic trials.

Marker placement for Plug-in Gait upper body model

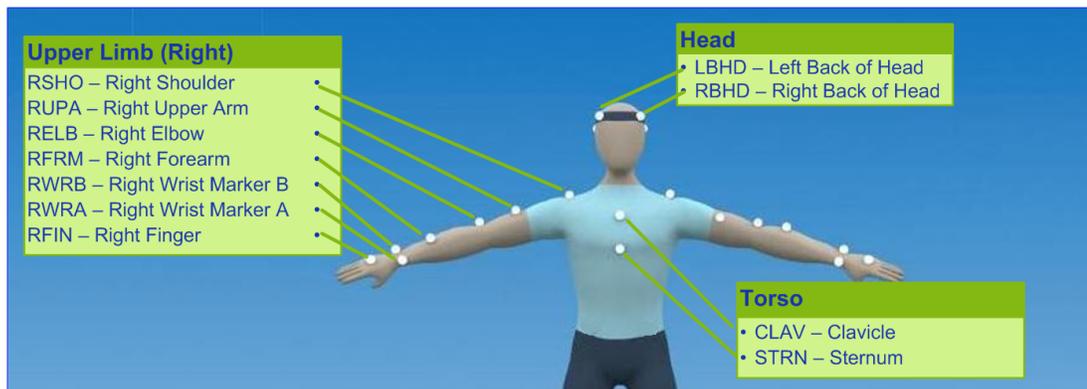
The following images show front, back, and side views to demonstrate where to attach the upper body markers to your patient. You do this before capturing a static trial as described in the *Vicon Nexus User Guide*. Some markers are shown from two views to help you better determine their position on your patient.



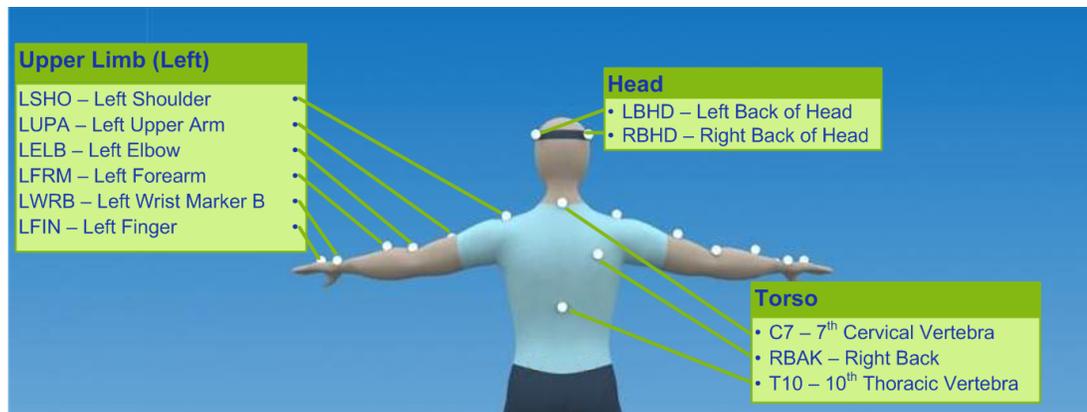
Important

As shown in the following images, some asymmetry is desirable as it helps the auto labeling routine distinguish right from left. For upper body modeling, you can place the UPA and FRM markers asymmetrically. Similarly, avoid symmetrical placement of marker clusters or groups of markers and also ensure markers are asymmetrical within each cluster/group.

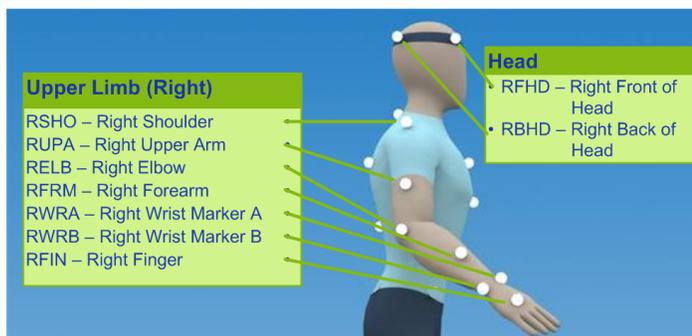
The following image shows the front view. The left upper body markers are not labeled; attach markers on that side in a similar way to those on the right (with some asymmetry as described above).



The following image shows the back view. The right upper body markers are not labeled; attach markers in a similar way to those on the left (with some asymmetry as described above).



The following image shows the right side view. The left side view is not shown; attach markers on that side in a similar way to those on the right (with some asymmetry as described above).



The following tables list the markers defined in Plug-in Gait templates for upper body modeling and describe where to place them on the patient.

Head markers

The following table describes the markers positioned on the patient's head. To save time, many users buy a headband and permanently attach markers to it.

Marker label	Definition	Position on patient
LFHD	Left front head	Left temple
RFHD	Right front head	Right temple
LBHD	Left back head	Left back of head (defines the transverse plane of the head, together with the frontal markers)
RBHD	Right back head	Right back of head (defines the transverse plane of the head, together with the frontal markers)



Important

If the back markers cannot be placed level with the front markers, you must configure Plug-in Gait to compensate for this during the subject calibration process. To do this, in the **Properties** for the **Process Static Plugin Gait Model** pipeline operation, under **Assume Horizontal**, select **Head**.

Torso markers

The following table describes the markers positioned on the patient's torso. The torso markers (C7, T10, CLAV, STRN) define the thorax sagittal plane; therefore, their lateral positioning is most important.

Marker label	Definition	Position on patient
C7	7th cervical vertebra	On the spinous process of the 7th cervical vertebra
T10	10th thoracic vertebra	On the spinous process of the 10th thoracic vertebra
CLAV	Clavicle	On the jugular notch where the clavicles meet the sternum
STRN	Sternum	On the xiphoid process of the sternum
RBAK	Right back	Anywhere over the right scapula (This marker has no equivalent marker on the left side. This asymmetry helps the autolabeling routine determine right from left on the subject. Placement is not critical as it is not included in the Plug-in Gait model calculations.)

Upper limb markers

The following table describes the markers positioned on the patient's upper body.

Marker labels shown with an asterisk * are optional; however, using them improves marker tracking during dynamic trials.

Marker label	Definition	Position on patient
Left upper limb markers		
LSHO	Left shoulder	On the acromio-clavicular joint
*LUPA	Left upper arm	On the upper lateral 1/3 surface of the left arm (Place asymmetrically with RUPA)
LELB	Left elbow	On the lateral epicondyle
*LFRM	Left forearm	On the lower lateral 1/3 surface of the left forearm (Place asymmetrically with RFRM)
LWRA	Left wrist marker A	At the thumb side of a bar attached to a wristband on the posterior of the left wrist, as close to the wrist joint center as possible. Loose markers can be used but for better tracking of the axial rotations, a bar is recommended.
LWRB	Left wrist marker B	At the little finger side of a bar attached to a wristband on the posterior of the left wrist, as close to the wrist joint center as possible. Loose markers can be used but for better tracking of the axial rotations, a bar is recommended.
LFIN	Left finger	Just proximal to the middle knuckle on the left hand

Right upper limb markers		
RSHO	Right shoulder	On the acromio-clavicular joint
*RUPA	Right upper arm	On the lower lateral 1/3 surface of the right arm (Place asymmetrically with LUPA)
RELB	Right elbow	On the lateral epicondyle approximating the elbow joint axis
*RFRM	Right forearm	On the lower lateral 1/3 surface of the right forearm (Place asymmetrically with LFRM)
RWRA	Right wrist marker A	At the thumb side of a bar attached symmetrically with a wristband on the posterior of the right wrist, as close to the wrist joint center as possible
RWRB	Right wrist marker B	At the little finger side of a bar attached symmetrically with a wristband on the posterior of the right wrist, as close to the wrist joint center as possible
RFIN	Right finger	Just below the middle knuckle on the right hand