

The MotionMonitor xGen Hardware Guide:

The MotionMonitor xGen Interface to Polhemus Liberty Hardware

Overview

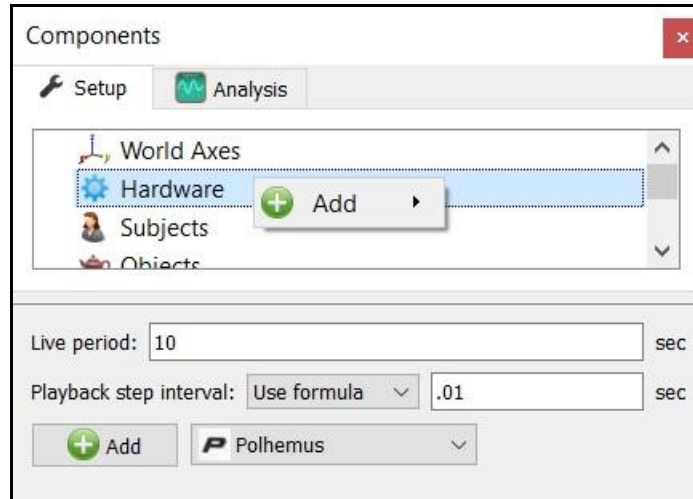
- This guide outlines the steps required to configure and collect from Polhemus **Liberty** devices connected to The MotionMonitor xGen. If using other Polhemus devices such as the Patriot, G4, Viper, or Fastrak, please see their respective guides.
- This document is divided into 3 sections:
 1. Configuring Polhemus Liberty Hardware
 2. Calibrating a Stylus
 3. Defining Biomechanical Model within The MotionMonitor xGen

Assumptions

- The Polhemus Liberty device is connected to The MotionMonitor xGen computer via USB.
- The Polhemus drivers and Polhemus PiMgr software are installed using the installation CD and instructions provided by Polhemus.
- The MotionMonitor xGen software is opened.

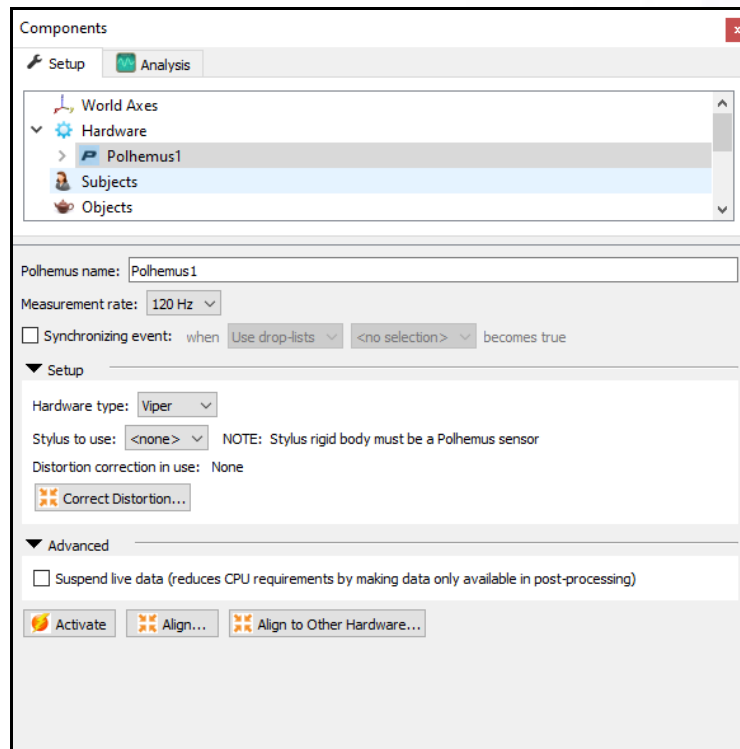
Section 1: Configure Polhemus Liberty Hardware

1. Add Polhemus Device in The MotionMonitor xGen:
 - Go to Components window > Setup Tab > **Hardware**.
 - In the hardware node, add the Polhemus device from the Add button in the parameters panel at the bottom of the Components window **or** by right-clicking the Hardware node and adding the device through the cascading drop list.



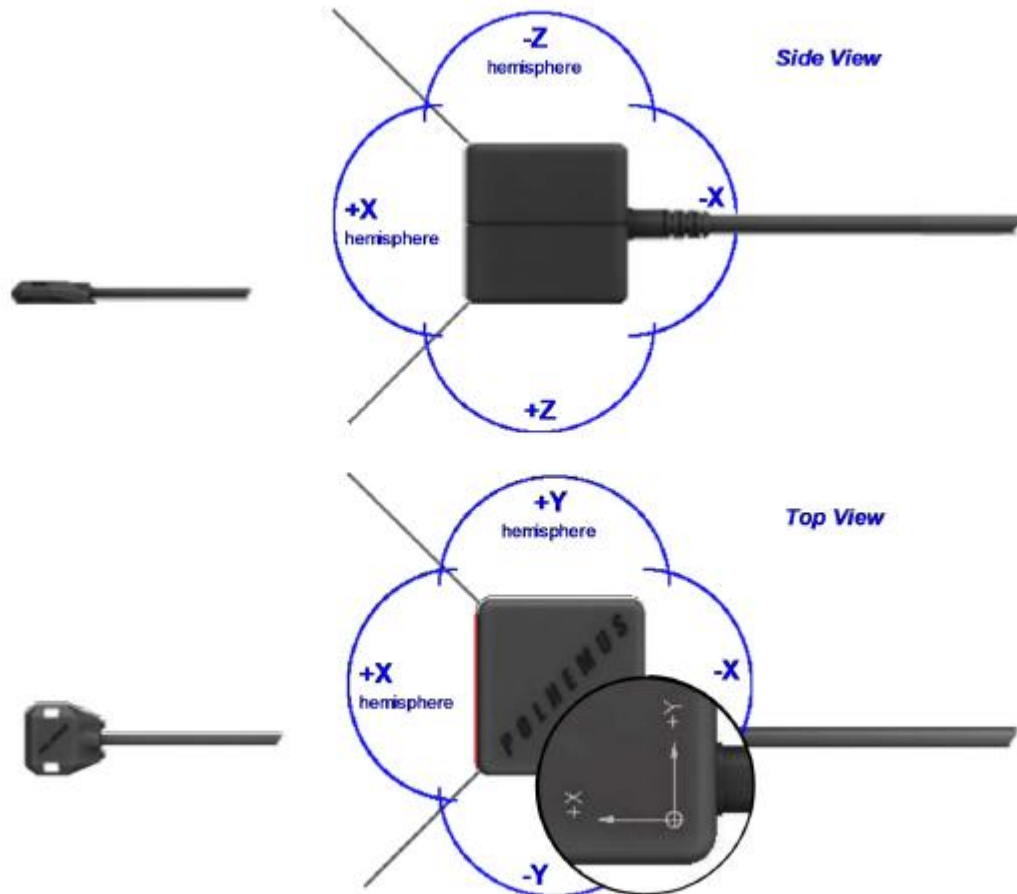
2. Configure Polhemus Device Parameters:

- Click on the Polhemus device in the Hardware list to bring up the Polhemus parameters panel.
- Specify:
 - **Name** (optional)
 - **Measurement rate** (choose from supported measurement rates for the device)
 - **Synchronizing event** (Optional)
 - A Boolean event can be specified for performing an active alignment of the Polhemus data stream with synchronous events from other hardware data streams. The Synchronizing event here must be defined from the Polhemus data (i.e. the stylus pen button or event marker, which could be defined as Polhemus1.Sensor1.Event==1, for instance, if the synchronizing event were connected to the first sensor).
 - **Hardware type** (Liberty)
 - **Stylus to use** (This stylus will be used for aligning this hardware device i.e. digitizing new world axes unique from the default transmitter coordinate system.)
 - **Suspend live data** (Optional)
 - The processing and display of data in a live mode uses computer resources, so this option allows the user to optimize computer resources and free up more processing power for data collection. This setting is independent for each hardware device and once an activity has been recorded data from the full measurement rate will be accessible for analysis.



3. Position Transmitter and Sensors:

- Readings from the sensors can only be accurately taken from the front (positive X) hemisphere of the transmitter. Ensure that the sensors are placed in the transmitter's positive X hemisphere. (See the default transmitter reference frame depicted below)

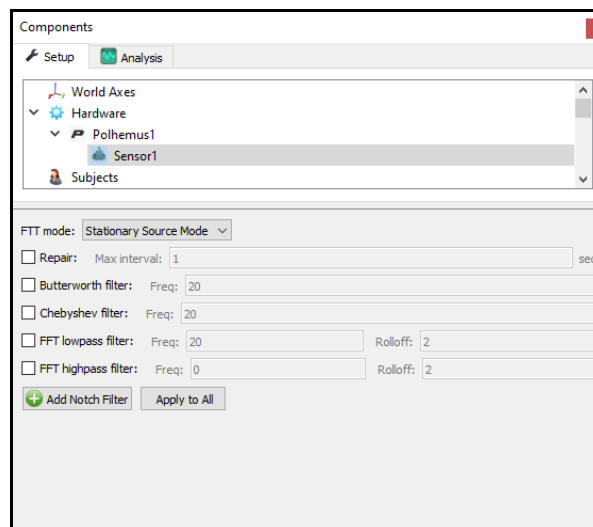


4. Activate the Device:

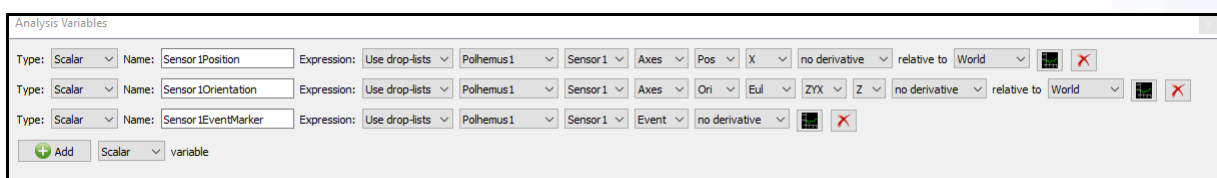
- Click **Activate** to initialize communication between The MotionMonitor xGen and Polhemus hardware.
- Optional Advanced Features:
 - Click **Align** to digitize a new world axes layout according to selections for the World Axes layout in the World Axes Setup Component. Align is used for hybrid configurations.
 - Click **Correct Distortion** to perform metal mappings.
 - Please contact your [Client Support Engineer](#) for more information regarding these advanced processes.

5. Verify Device Activation and Apply Filters

- After successfully activating the Polhemus Device, the activated sensors will populate under the Polhemus Hardware node
 - Expand the Polhemus Hardware node to show the activated sensors.
- Select a Sensor to bring up the Sensor parameters panel.
- Apply Data Repair and Filter settings (Optional)
 - These settings can be enabled or disabled here, pre or post data collection.

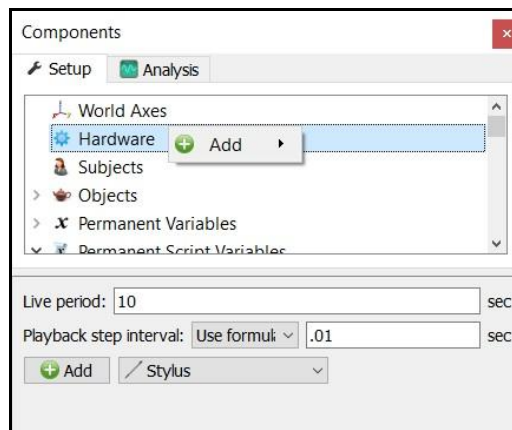


6. At this point, data available directly from the Polhemus hardware can be displayed in graphs or used in custom equations, as depicted below.



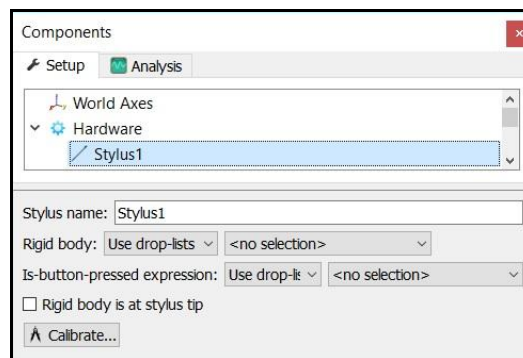
Section 2: Configure Stylus

1. Add a Stylus:
 - A Stylus will need to be configured for digitizing the alignment of the Polhemus hardware device, force plates, and defining joint centers or other landmarks of interest for your subject.
 - Go to Components Window > Setup Tab > **Hardware**
 - Add the Stylus device from the Add button in the parameters panel at the bottom of the Components window or by right-clicking the Hardware node and adding the device through the cascading drop list.



2. Configure Stylus:

- Click on the Stylus device to bring up the Stylus parameters panel.
- Specify:
 - **Name** (Optional)
 - **Rigid body** sensor attached to the stylus
 - **An Is-button-pressed expression** (Optional)
 - Boolean value that allows for an external trigger to be used in the OK messages where the stylus is being used in the setup, such as when performing the alignment of a hardware device, aligning force plates or when digitizing a subject.
 - Check **Rigid body is at stylus tip** (If applicable)
 - Can be enabled when the origin of the Rigid body specified for the stylus is already located at the tip for the stylus being used, as in the example of Polhemus Stylus Pens.
- Click **Calibrate** to set Stylus tip position and orientation.
 - The Calibrate button walks through the procedure of calculating the vector offset from the Rigid body origin to the stylus tip or captures the orientation of the stylus if the “Rigid Body is at stylus tip” is selected.
 - A tutorial video for configuring and calibrating a stylus can be found at <https://themotionmonitor.com/support/>.



Section 3: Define Biomechanical Model within The MotionMonitor xGen

1. Set Up Subject:

- Right-click on the **Subjects** header within the Components Setup tab and add a new subject.
- Assign a name (Optional) and enter basic anthropometric data.
- Confirm subject orientation for **Neutral Stance** and **Stylus to use** for digitizing.

The screenshot shows the 'Components' window with the 'Setup' tab selected. The 'Subjects' folder is expanded, showing 'Subject1' with sub-items: Segments, Joints, Muscles, and Objects. Below the tree, the 'Subject1' configuration is displayed. The 'Subject name' is 'Subject1'. The 'Neutral stance' is set to 'Arms down, thumbs forward'. There are checkboxes for 'Assume neutral stance while supine' (unchecked), 'Assume rigid bodies to be orientation-only' (checked), and 'Enable muscle modeling' (unchecked). The 'Body mass' is 75 kg and 'Body height' is 1.75 m, both using the 'Use formula' dropdown. The 'Static fixation joint' is 'T12/L1'. The 'Stylus to use' is '<none>'. The 'Maximum foot-to-GRF distance' is 50 cm. The 'Spline interval' is 10 msec. At the bottom, there are buttons for 'Calibrate...', 'Anthropometrics...', 'Import Muscle Model...', 'Export Muscle Model...', 'Map Muscles...', and 'Track'.

Components

Setup Analysis

Subjects

- Subject1
 - Segments
 - Joints
 - Muscles
 - Objects
- Permanent Variables
 - SacrumSensor
 - RThighSensor
 - LThighSensor

Subject name: Subject1

Neutral stance: Arms down, thumbs forward

☐ Assume neutral stance while supine

Body mass: Use formula 75 kg

Body height: Use formula 1.75 m

☒ Assume rigid bodies to be orientation-only

Static fixation joint: T12/L1

Stylus to use: <none>

☐ Enable muscle modeling

Maximum foot-to-GRF distance: 50 cm

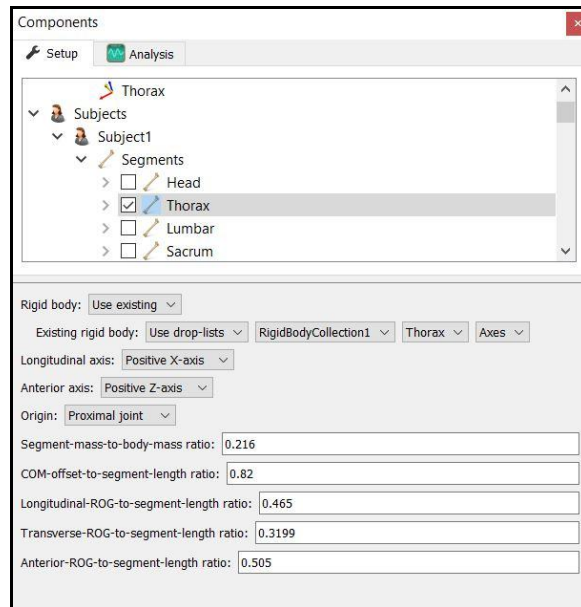
☐ Use spline fit to forces and moments

Spline interval: 10 msec

Calibrate... Anthropometrics... Import Muscle Model... Export Muscle Model... Map Muscles... Track

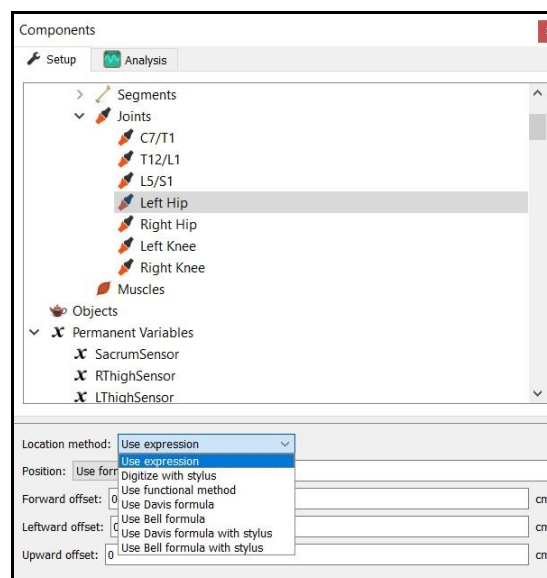
2. Set Up Subject Segments:

- Under the Subject > **Segments**, enable desired body segments to be tracked and assign rigid bodies to those segments. Additional basic anthropometric information can be defined here for each segment as well.



3. Define each segment's proximal and distal joint centers:

- The required joint centers will be automatically populated, under Subject > **Joints**, based on the selection of segments.
- Joint centers can be defined via digitizing, marker-based expressions, linear regression, or functional (rotational) methods.

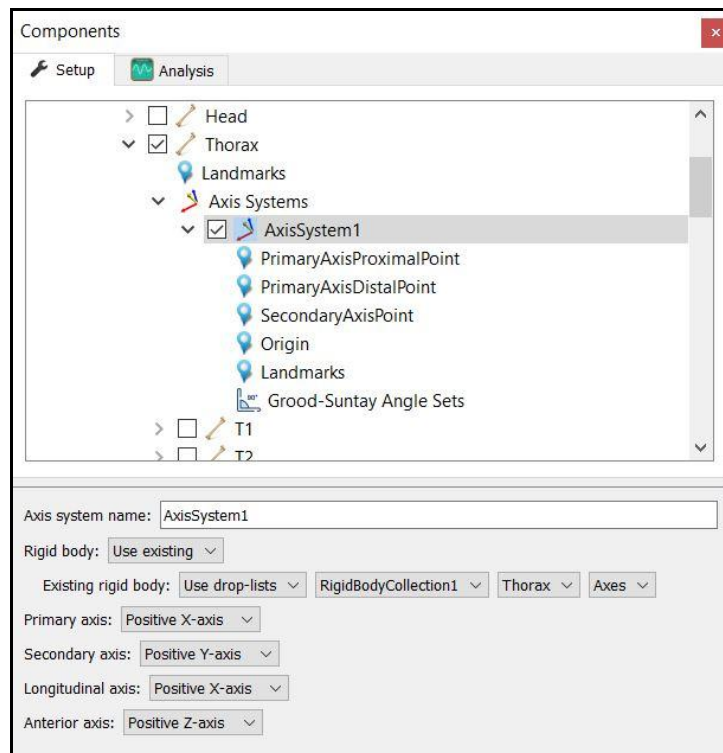


4. Calibrate Subject:

- Once the Subject Segments and Joints definitions are completed, click the Subject **Calibrate** button to complete the model setup following the on-screen prompts. A warning message will be displayed for any definitions that have not been appropriately defined.

5. Optionally, add anatomically based local coordinate systems to segments via adding an **Axis System**. Define axes based on sensor and landmark positions.

- Select the Rigid Body axes tracking the segment and general axes layout.
- Define points for the proximal and distal endpoints of the primary axis, a point along the secondary axis and a point for the Origin.
- The default local coordinate axes generated by **The MotionMonitor xGen** are defined as having a long axes through the joint centers and A/P and M/L axes being orthogonal to the long axes and parallel to the world when the subject was standing in the neutral position.



6. The subject model is now ready for data collection and computations.

7. Save your setup and subject definition as a workspace for easy reloading in the future:

- Go to File > **Save Workspace As**
- Load later with File > **Open Workspace**