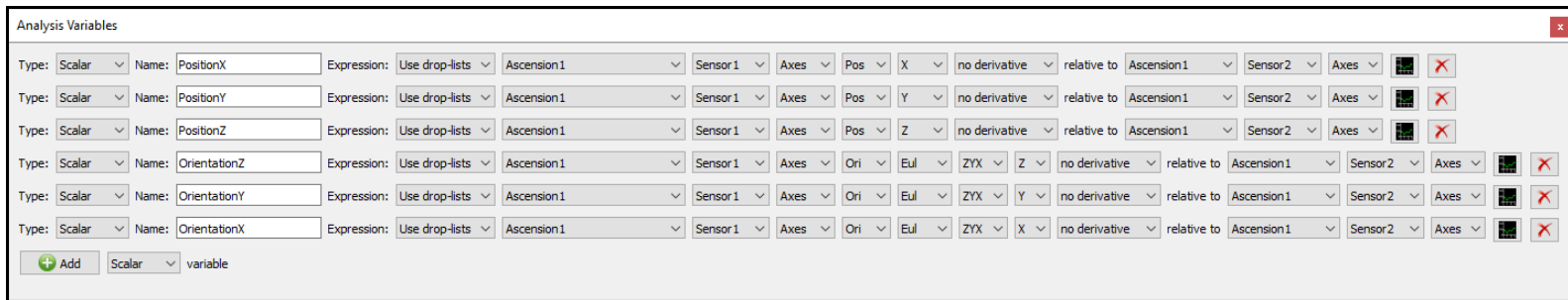


The MotionMonitor xGen Software Guide: Metal Mapping and Distortion Correction

This document reviews the configuration of mapping functions to correct readings from magnetic trackers (Ascension & Polhemus systems) that may have been be distorted by environmental conditions. Typically, standard range transmitters do not require mapping as they can often be moved away from sources of distortion.

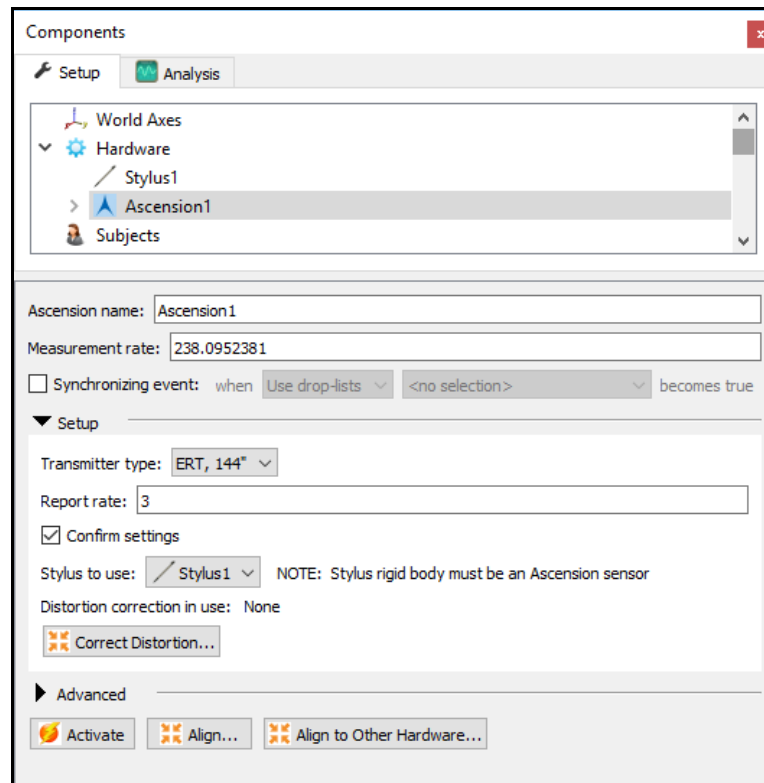
Prior to performing any type of metal mapping, testing should be performed to determine if environmental distortion exists and the extent that the data capture volume would need to be mapped. To confirm or test for environmental distortion, two sensors can be affixed to a rigid, non-ferrous, rod and then moved through the measurement space. It is recommended to have the sensors directed in the same general orientation as each other, as this will make the relative orientation data easier to evaluate. Since the sensors on the rod are stationary to each other, the reported values will remain stable in the absence of distortion or noise. As the rod is moved through the space, the user can determine the amount of variation from one part of the space to another. If the variation is excessive, it may indicate the need for a metal mapping to recalibrate the space. Please note that the noise is expected to increase as the sensors move farther from the transmitter and that this would not be reason for performing a mapping.

The Analysis Variables displayed in the image below demonstrate how the position and orientation of one sensor can be easily examined relative to another sensor.

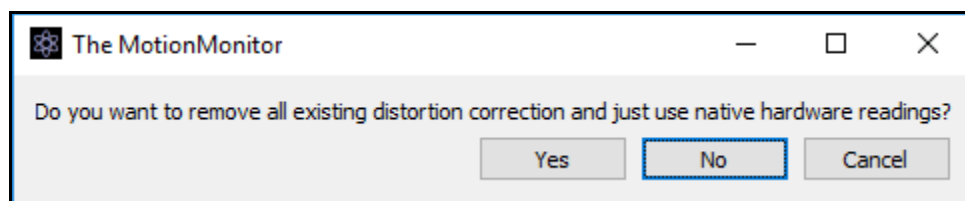


Performing a Metal Map using the “Grid” method

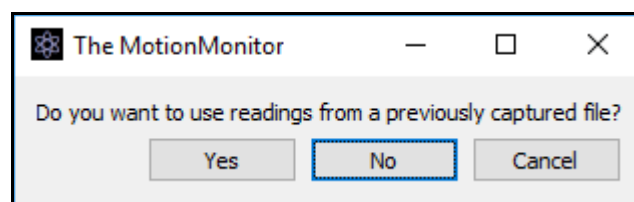
1. Start The MotionMonitor xGen and go to the Hardware node in the Setup Components window. From the Ascension or Polhemus node, click on the “Correct Distortion” button.

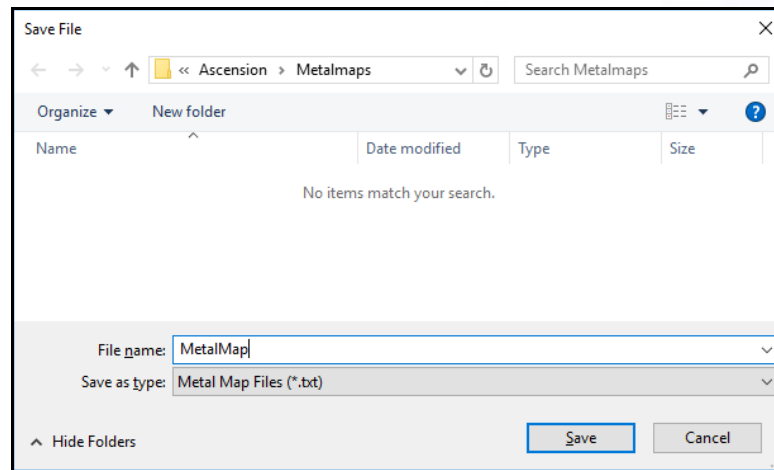


2. Select “No” when asked to remove all existing distortion correction and just use native hardware readings. Selecting “Yes” will clear the current mapping and result in the software going back to using uncorrected sensor position and orientation data.

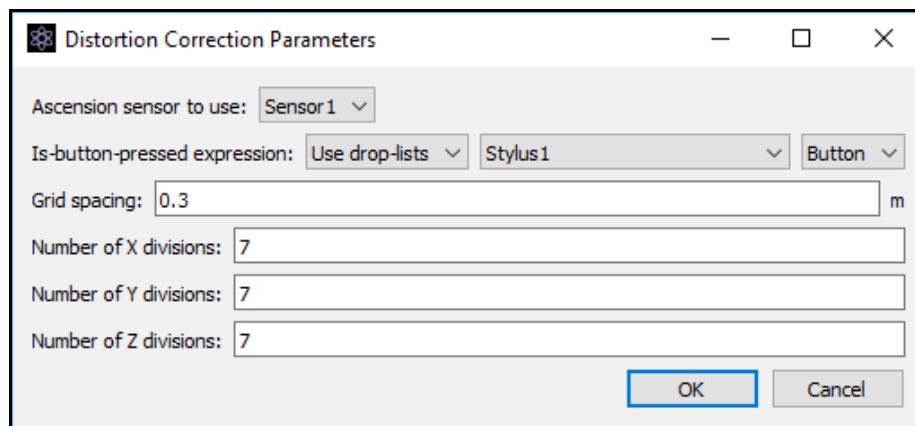


3. Select “No” when prompted to use a previously captured mapping file and select a name for the metal map file. Each metal map is unique to the transmitter position/orientation and environmental sources of distortion.

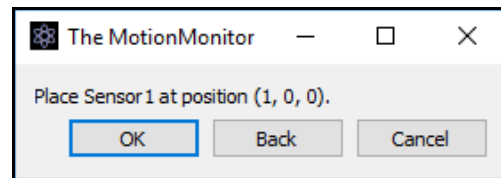
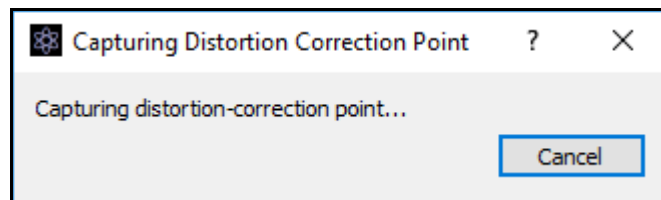
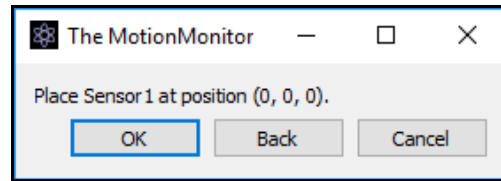




- Specify the distortion correction parameters for the metal map. Select the sensor to be used and Is-button-pressed expression if using a handheld event marker as a remote OK button to advance through the software dialogs. The number of X, Y and Z divisions represent the number of points to take in in the mapping, in the transmitters default coordinate system, and the Grid spacing indicates the spacing between each point. Click "OK" to begin the process of capturing points for the metal map.

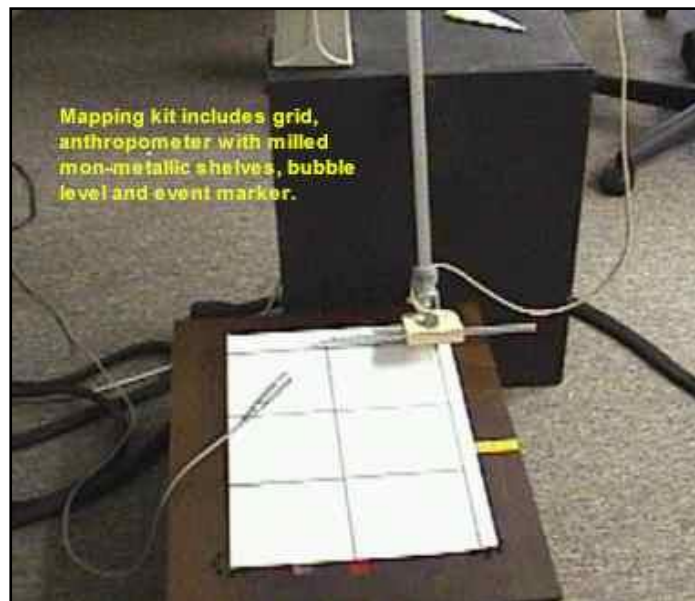


5. The software will then proceed through capturing the points for the metal map as defined in the Distortion Correction Parameters dialog. The readings are taken in order, first on x, then y then z axes, consistent with that of the transmitter's axes layout.

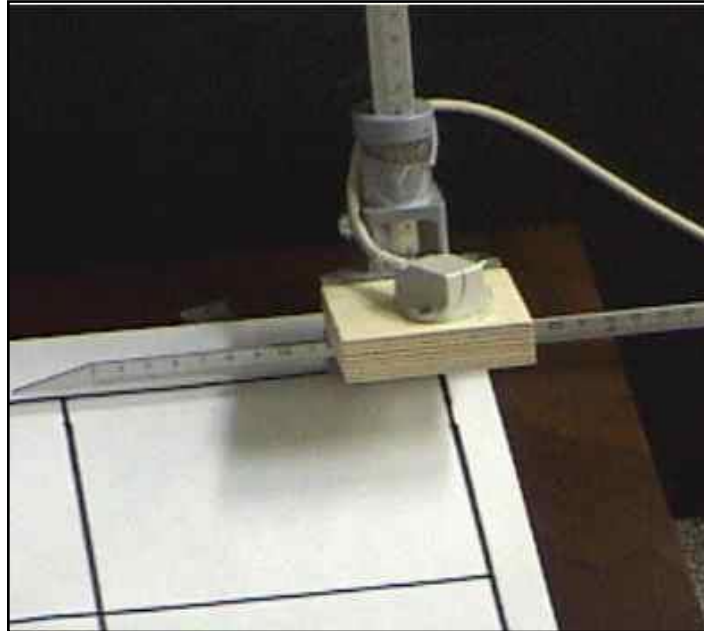


Positioning of the grid should be aligned as best possible with the transmitter's axes system, as seen in the following sample images.

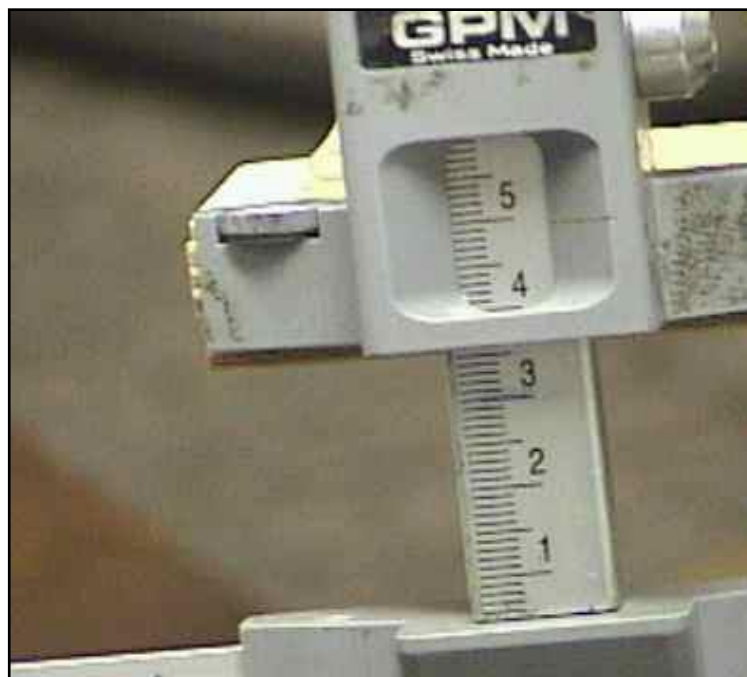
The following images provide a visual representation for how the "grid" method can be performed. This example uses a modified anthropometer, bubble level and grid, as shown here.

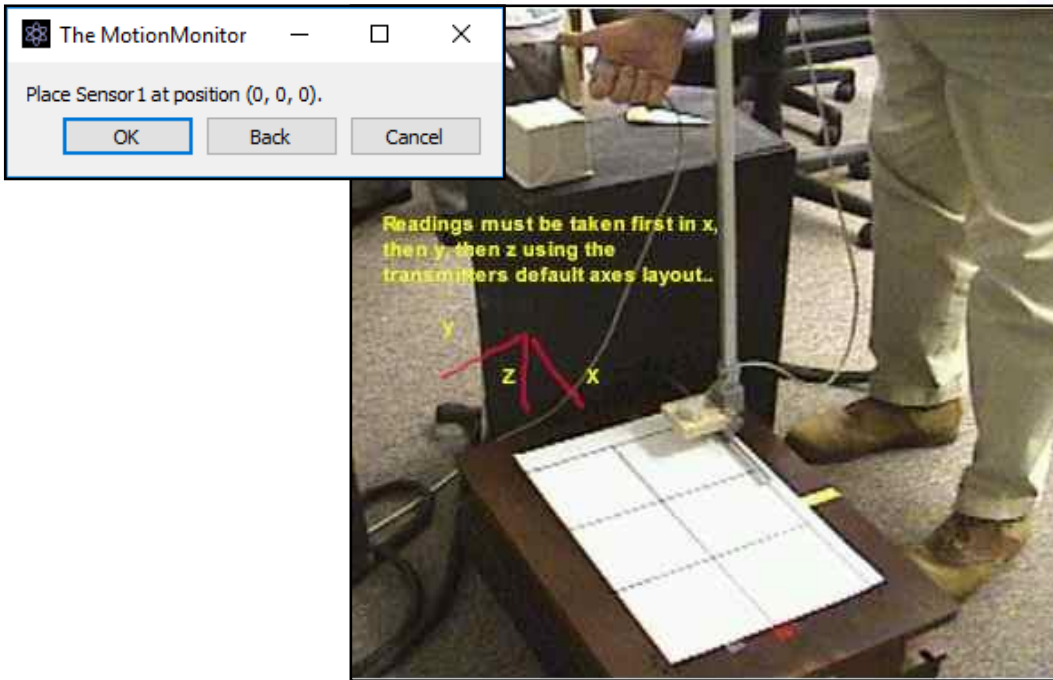


The sensor designated in Distortion Correction Parameters dialog is firmly attached to the milled "slider" shelf. Its orientation does not matter. The grid is then laid out in the measurement space that is to be mapped.

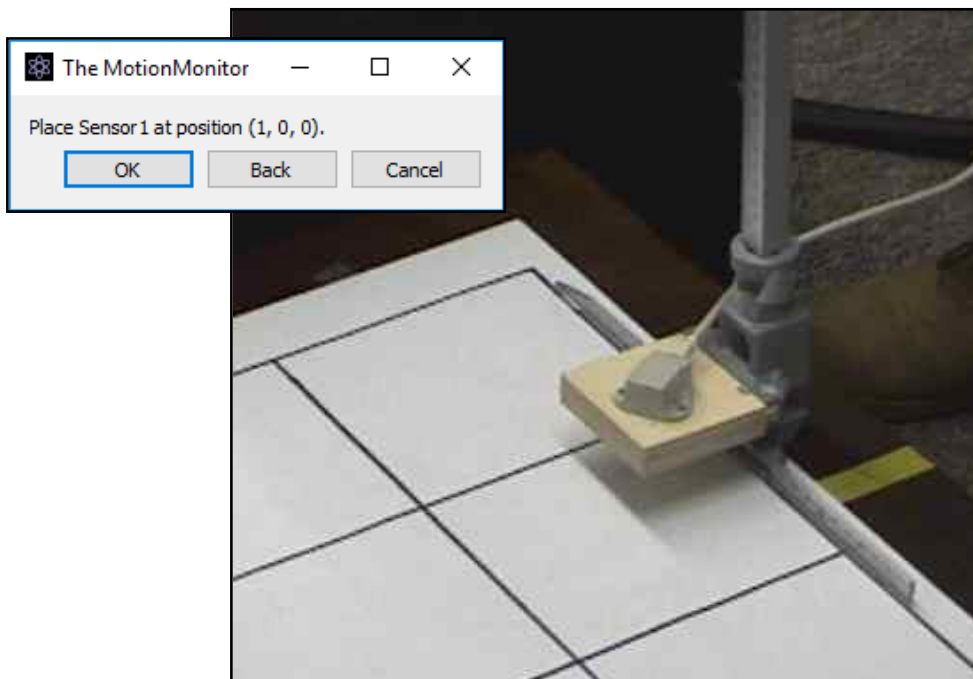


The user should take note of the initial position of the slider. As readings are taken in the upper layers of the grid, it will be necessary to move the slider by the grid spacing previously specified in the dialog.

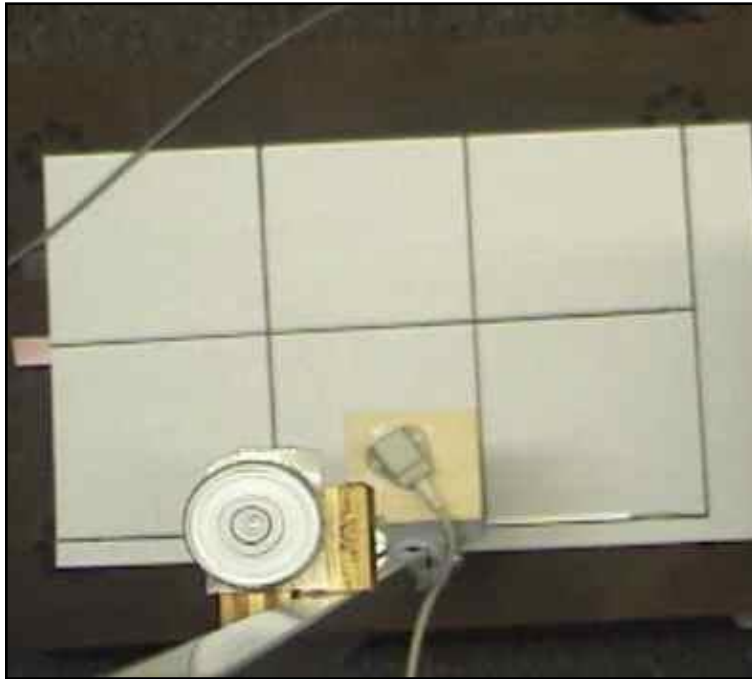




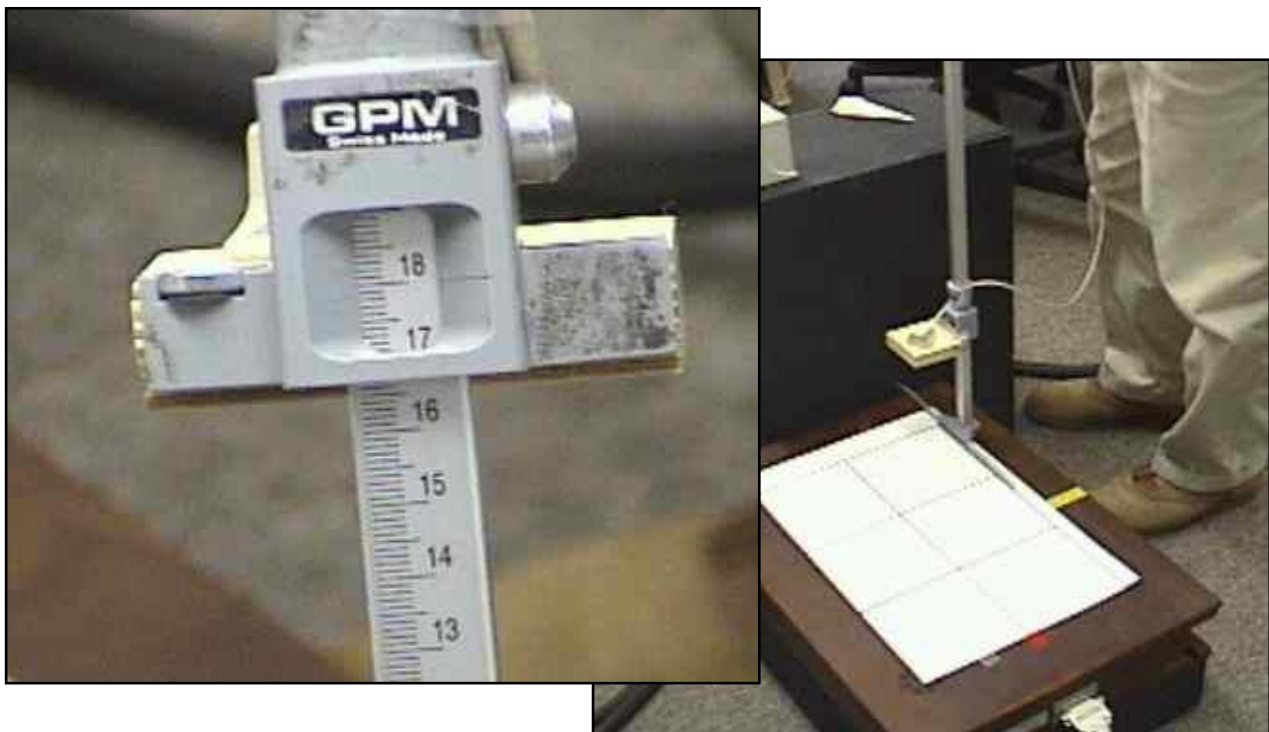
As the anthropometer is moved to successive points in the grid, care must be taken to ensure that the anthropometer is placed in the same relative position and orientation.



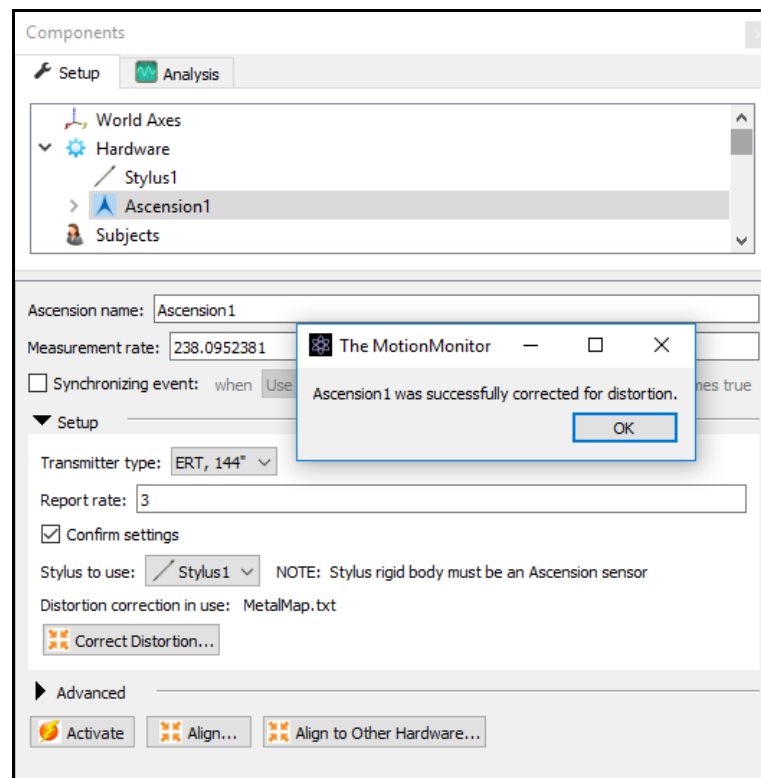
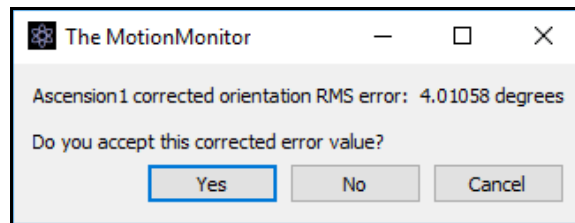
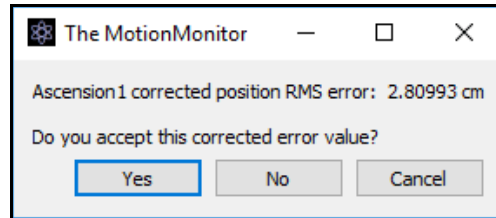
The cross member in the base of the anthropometer should be carefully aligned with the grid; the point on the grid should be accurately positioned at a common point on the anthropometer base. In addition, the bubble level should be observed to ensure that the anthropometer is perfectly vertical.



When the layer of x, y points has been recorded, the "slider" should be moved by the spacing specified in the dialog box....



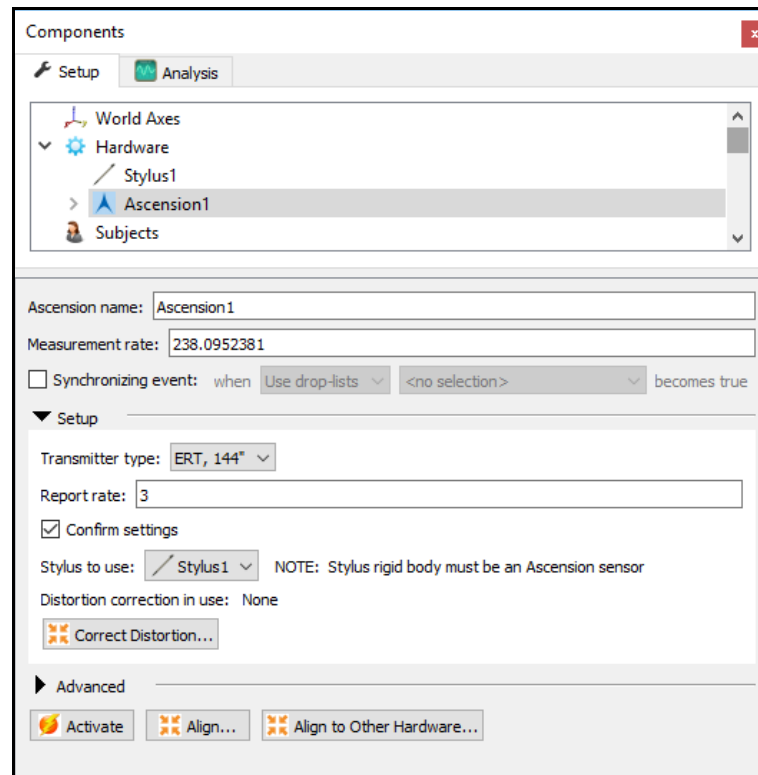
When all of the points have been recorded, the system will report the position RMS and orientation RMS.



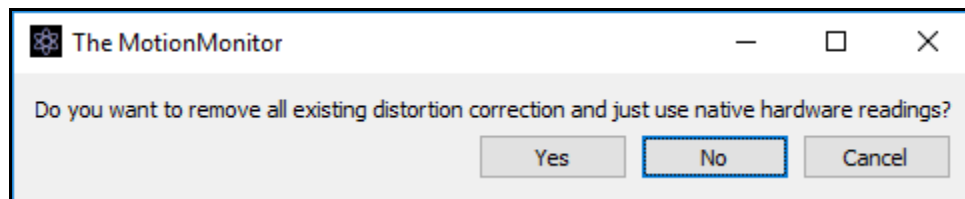
The Parameter panel for the hardware device now indicates which distortion correction file is in use.

Loading an existing metal map file

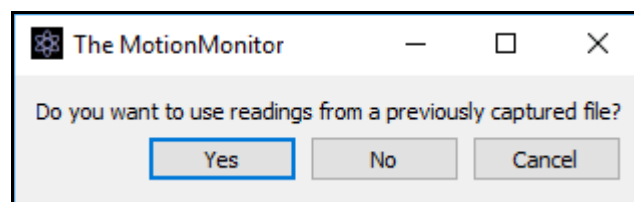
1. Start The MotionMonitor xGen and go to the Hardware node in the Setup Components window. From the Ascension or Polhemus node, click on the “Correct Distortion” button.

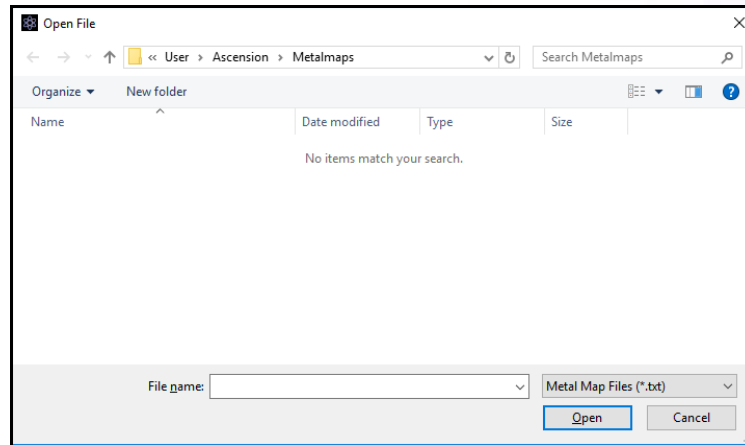


2. Select “No” when asked to remove all existing distortion correction and just use native hardware readings. Selecting “Yes” will clear the current mapping and result in the software going back to using uncorrected sensor position and orientation data.

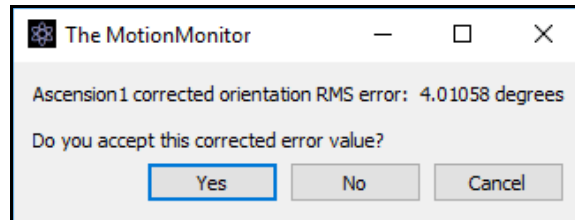
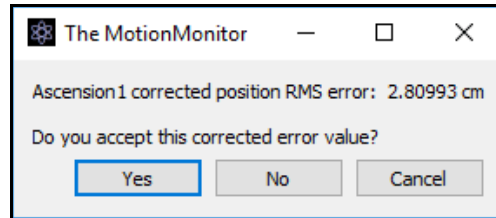


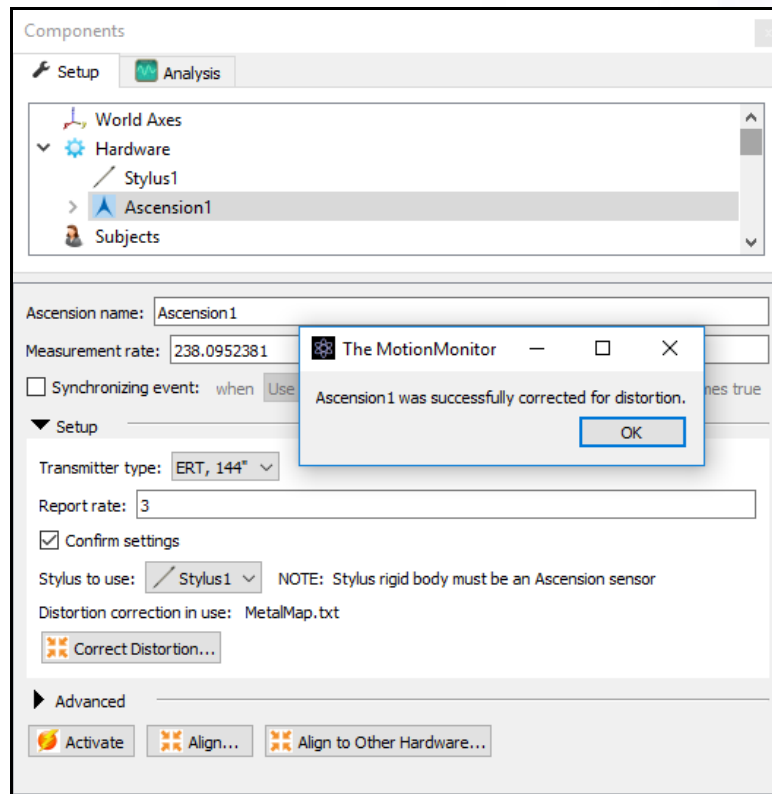
3. Select “Yes” when prompted to use a previously captured mapping file and select a name for the metal map file. Each metal map is unique to the transmitter position/orientation and environmental sources of distortion. Note: Mapping files generated using The MotionMonitor Classic can also be selected here.





4. The system will report the position RMS and orientation RMS from the selected metal map file.



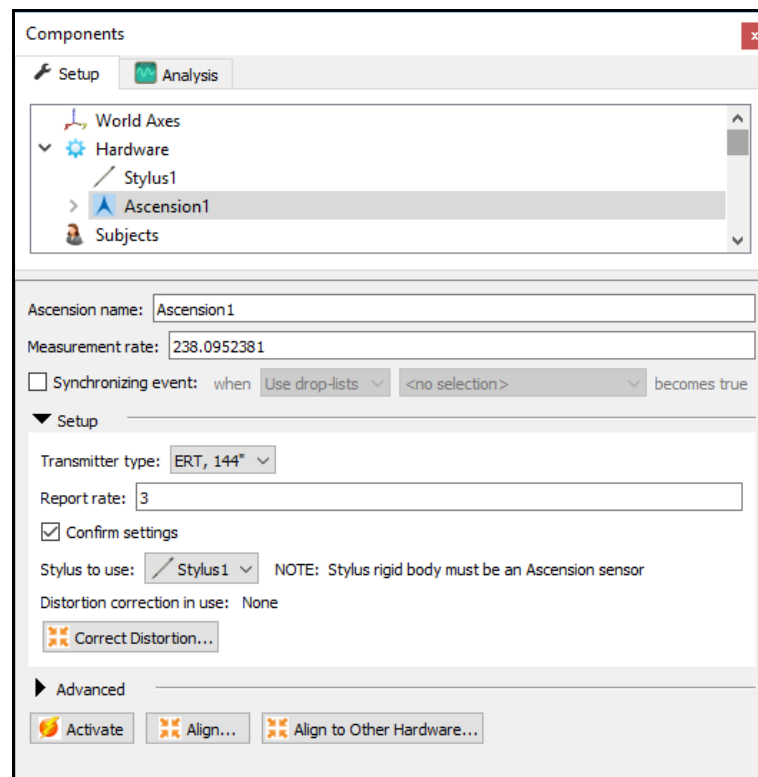


The Parameter panel for the hardware device now indicates which distortion correction file is in use.

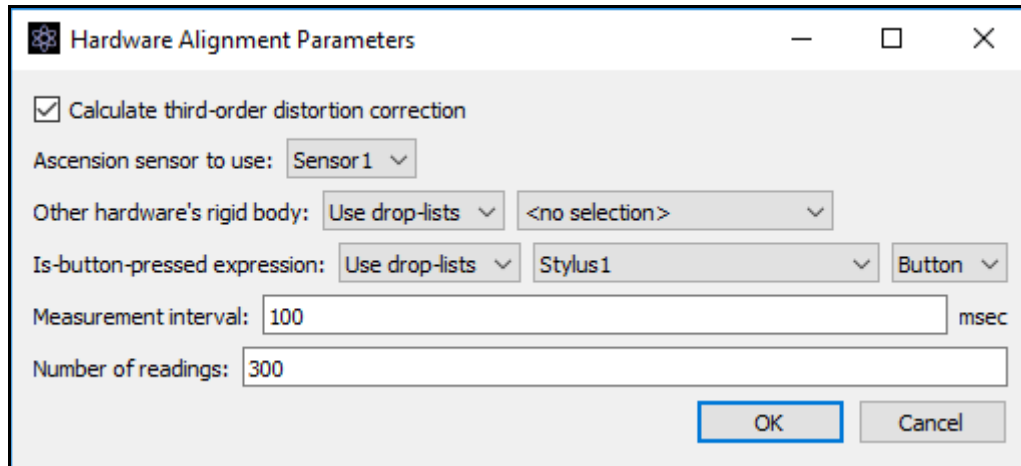
Distortion Correction with Hybrid Hardware Configuration

If capturing passive or active optical camera data with an electromagnetic system (Ascension or Polhemus) a dynamic distortion correction can be performed by taking simultaneous readings from a sensor or rigid body from each hardware device when the sensors are affixed to a rigid, non-ferrous, object and then moved through the measurement space.

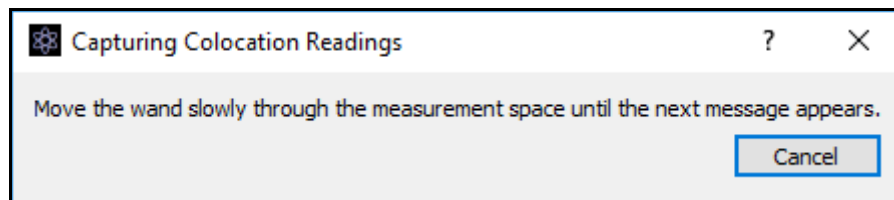
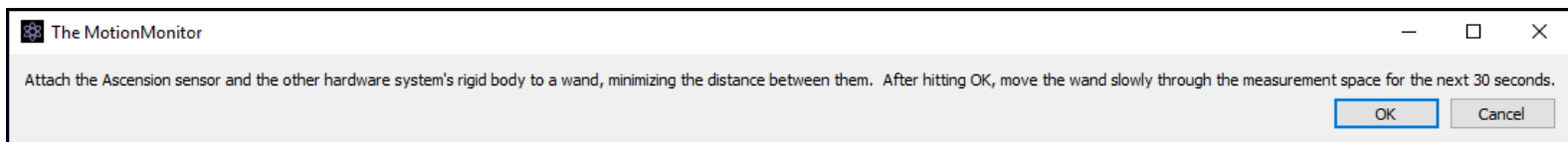
1. Start The MotionMonitor xGen and go to the Hardware node in the Setup Components window. From the Ascension or Polhemus node, click on the “Align to Other Hardware” button.



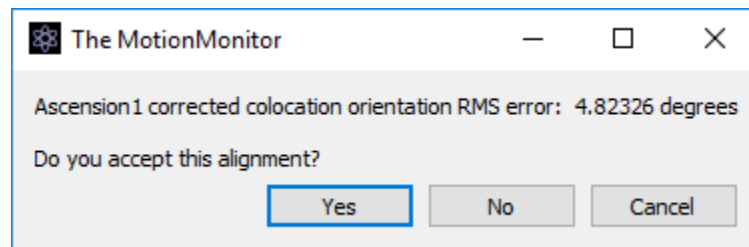
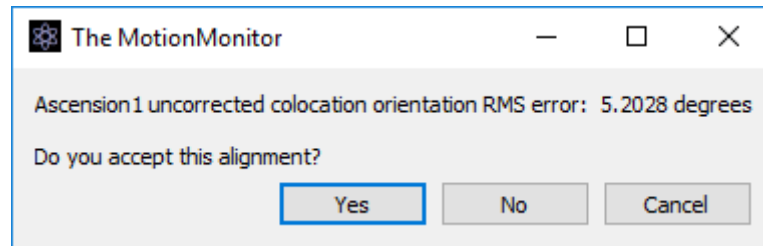
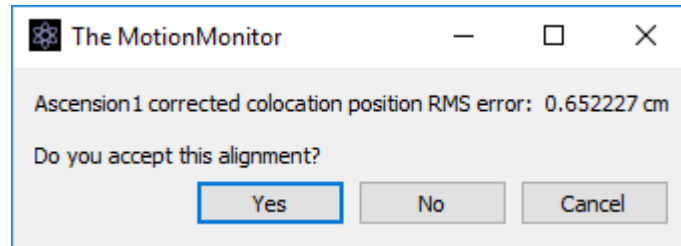
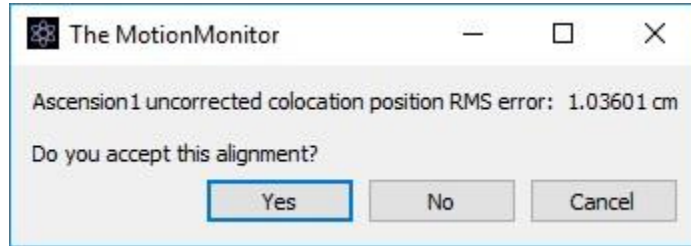
- Specify the parameters in the Hardware Alignment Parameters. For the distortion correction to be performed, enable the “Calculate third-order distortion correction” otherwise the hardware devices coordinate systems will only be aligned. Specify the electromagnetic sensor to use along with the other hardware’s sensor to be used and the Is-button-pressed expression if using a handheld event marker as a remote OK button to advance through the software dialogs. The Measurement interval and Number of readings edit fields will determine how often the readings are captured and the number of readings to include in the distortion correction, respectively. Click “OK” to proceed.



- After ensuring that the sensors from both hardware systems are attached to the same rigid object, click “OK” to proceed with the capturing of the distortion correction points.



4. After capturing the distortion correction readings, the software will report the pre and post position RMS errors followed by the pre and post and orientation RMS errors.



5. If accepted, this distortion correction will be applied to the electromagnetic hardware data.

