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ShapeWrap II & ShapeRecorder
Human Motion Capture System Documentation

Section 15: ShapeRecorder Output

Table of Contents

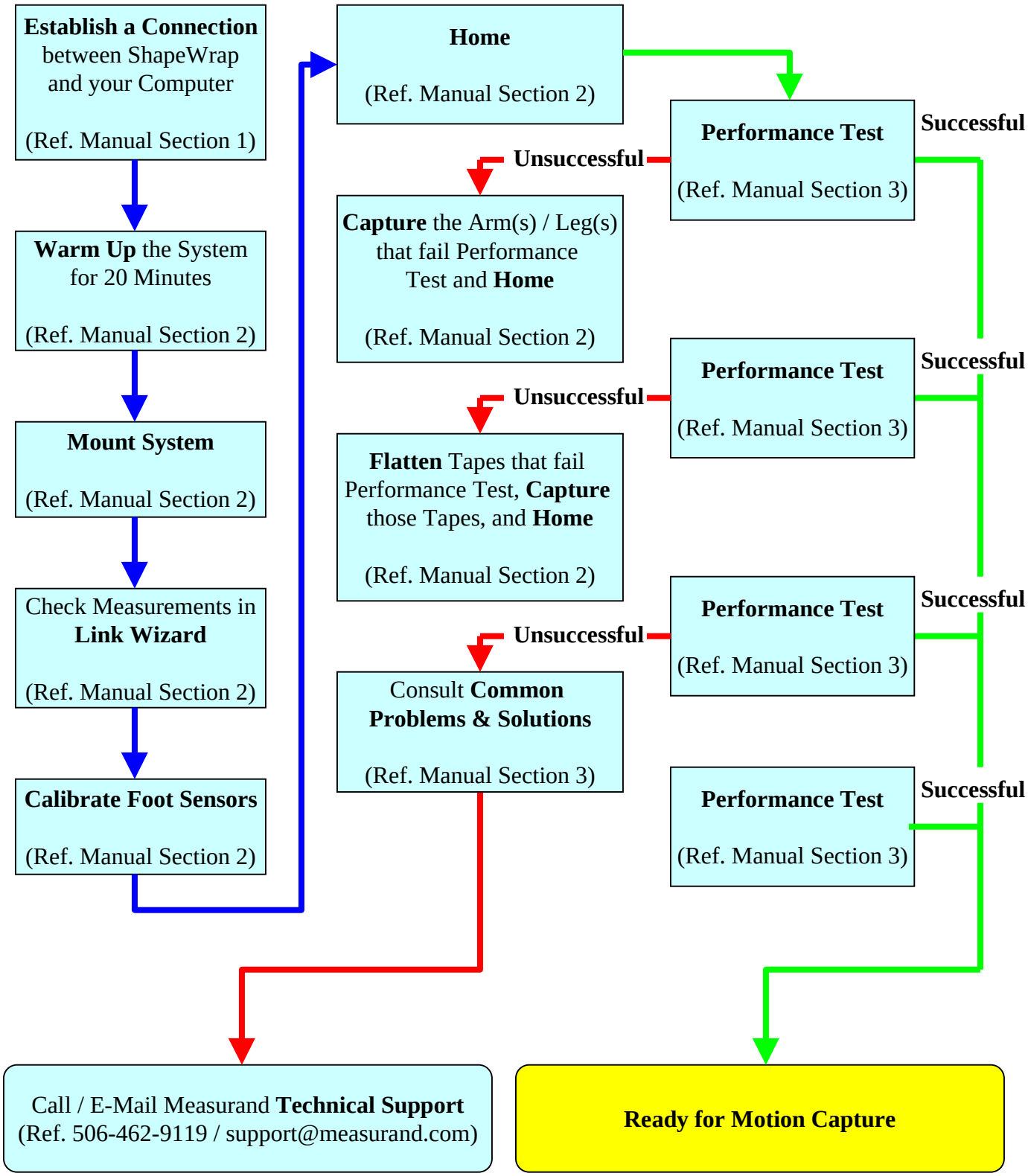
Introduction

- The ShapeWrap II Motion Capture System has many applications. Because of this, the ShapeRecorder software can format ShapeRecorder's raw data into many different data types.

- These data types include:
  - **BVH**
  - **C3D**
  - **Global position and orientation**
  - **MotionBuilder / Quest3D / Virtools (Quaternion) Format**

- This Section will discuss how to set ShapeRecorder's output settings in order to get the data type that you desire. First the Output interface will be described, then the above data types will be described in detail.

Steps to Motion Capture



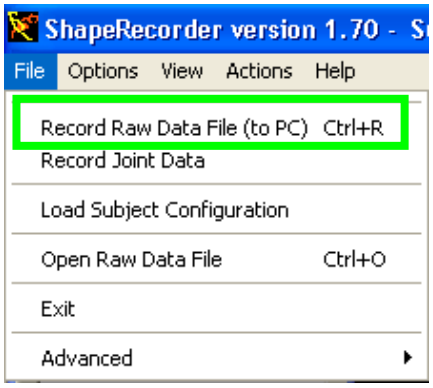
Output Setup

- **Output Setup**
- BVH
- C3D
- Global Position and Orientation
- MotionBuilder, etc. Format

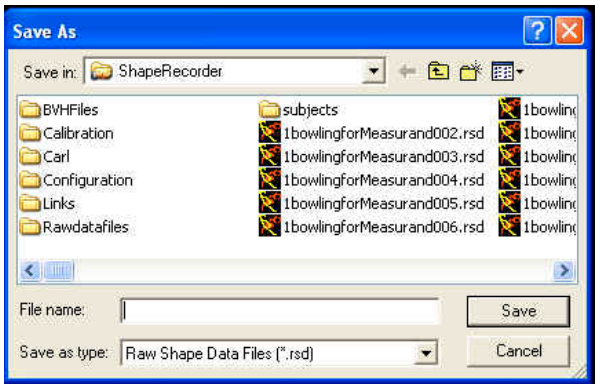
- Before Output Setup and Output Settings are discussed, a description of Recording Data is necessary.

Record Raw Data File

- Records raw binary data file for each ShapeTape of the ShapeWrap II system
- Raw data file can be replayed or used as input for recording Joint Data file, which will be explained shortly.



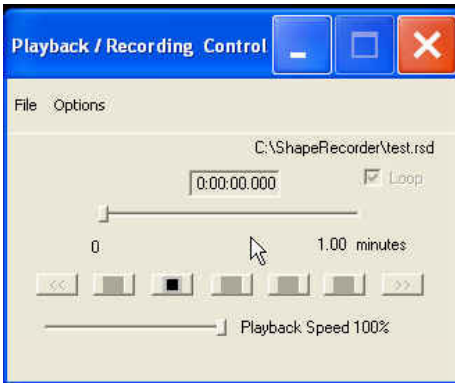
- After selecting 'Record Raw Data File' the 'Save As' window shown below will appear.
- Begin by entering the name of the file you will record.
- Raw data files are stored in an .rsd file format.
- Recorded files should be stored in a separate directory.



Output Setup

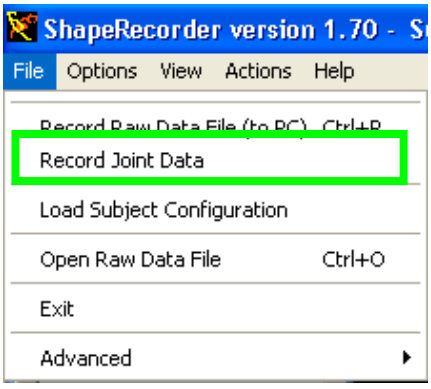
Record Raw Data File Continued

- Selecting Save after you enter a filename displays the VCR-like interface like that shown below.
- Recording begins immediately.
- While recording, only the stop button is enabled.
- After pressing the stop button, the recording stops and the other buttons (rewind, rewind single-frame, record, fast forward single-frame, play, and fast forward become enabled.



Record Joint Data

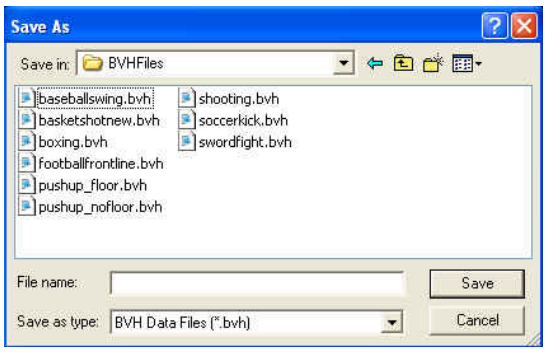
- Records a text file, BVH or C3D file.
- The text file records one line of text for each frame of arm, leg, back and head data received.
- The numbers recorded on each line are separated by either spaces or commas and have a format depending upon the file output settings selected in the ‘Output Settings’ dialog window.
- For a description of the various types of joint output data see the ‘Options | Output’ menu item found later in this section.
- It is recommended that a raw data file be recorded first, prior to recording joint data. This allows the raw data file to be used as input to record the joint data file. This ensures that quality BVH, C3D or text data is achieved regardless of the speed of the computer running the ShapeRecorder software.



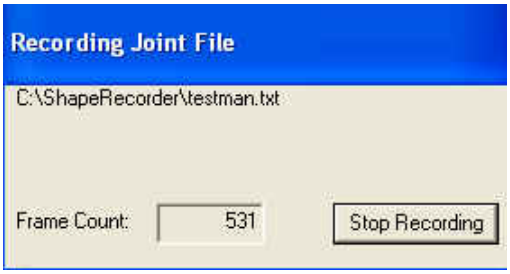
Output Setup

Record Joint Data Continued

- A raw data file will be open if a .rsd file has been recorded during this session of using ShapeRecorder.
- To select a different raw data file for creating the Joint Data, select Open Raw Data File.
- Select the raw data file you wish to use to record the Joint Data File.
- When a raw data file is open, selecting 'File | Record Joint Data' displays the window shown below.
- This window allows you to enter the name of the text, C3D or BVH file that you wish to create.

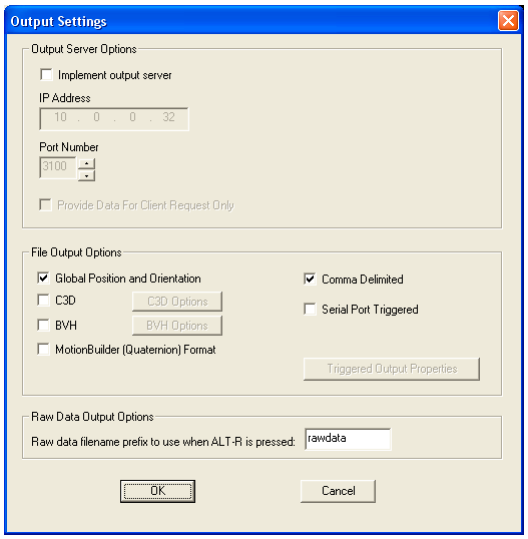


- Enter the file name you wish to use and select Save.
- Once Save is selected, the raw data file becomes the input for the BVH, C3D or text file you are trying to create and the window to the right will be displayed.
- If the raw data input file contains more data than you wish to output to a BVH, C3D or text file, select Stop Recording at any time to not output this data.
- Pressing Stop Recording displays the window shown below on the right.
- You have now created a joint data file. The Playback/Recording Control window will remain active and continue to replay the raw data until you select the stop button in the Playback/Recording Control window.



Output Setup

- The ‘Output Settings’ window, shown below, is used to set options for real-time streaming output and file saving. It is available through ‘Options | Output.’



Output Settings

- To use real-time streaming output over a network connection, choose the ‘Implement output server’ option

- Choose an IP address and port number for the server

- You may choose whether or not you want the receiving client to make a request for each sample of data.

- If the client is not required to request each sample of data, the client will only have to make a single request, and then data will be continuously streamed to that client until the server is shut down or ShapeRecorder is closed.

Output Setup

Output Settings Continued

- Each client request must consist of six bytes of data with the following format:
    - Bytes 1 to 4: IP address bytes, that are typically equal to the network IP address of the machine making the request for data (this can be the same machine that is running ShapeRecorder). For example byte 1 = 127, byte 2 = 0, byte 3 = 0, byte 4 = 1.
    - Bytes 5 and 6: Represent the port number used for the client making the request for data.
    - The port number = 256*byte 5 + byte 6, so that it can range from 0 to 65,535.
    - Any available port number on the requesting computer can be used.

- At present, the output server can only be implemented in Global Position and Orientation format, or in the MotionBuilder format.

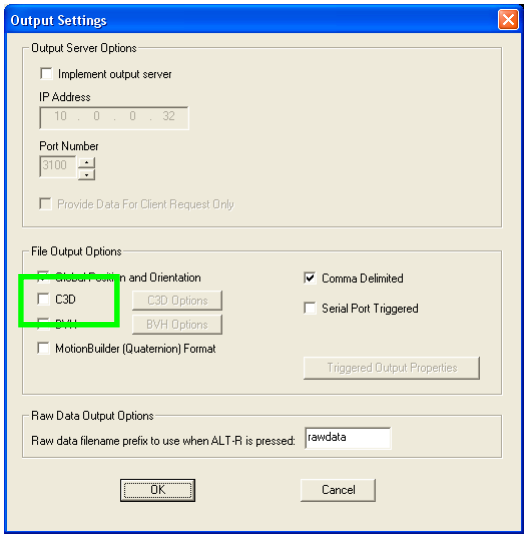
- Using the Output Settings, the user can specify the data format that they wish to use when capturing data using the 'Record Joint Data File' option under the 'File Menu'.

Global Position and Orientation:

- When recording a Joint Data file, if the text file type is selected, and this Global Position and Orientation box is checked, a text file is created that contains data on the positions of all major joints including the wrist, elbow, shoulder, hip, knee and back, and orientation of the bones between these joints.

C3D:

- Selecting the C3D output box ensures that C3D data is captured when a Joint Data File is recorded.



Output Setup

BVH:

- Selecting the BVH output box ensures that BVH data is captured when a Joint Data File is recorded. When selecting the BVH option, you may choose if you want data on toes included. Some graphic software packages support toes in the BVH data, and some do not.

MotionBuilder Format:

- Selecting the MotionBuilder output box ensures that Alias formatted data is captured when a Joint Data File is recorded and an output server is selected.

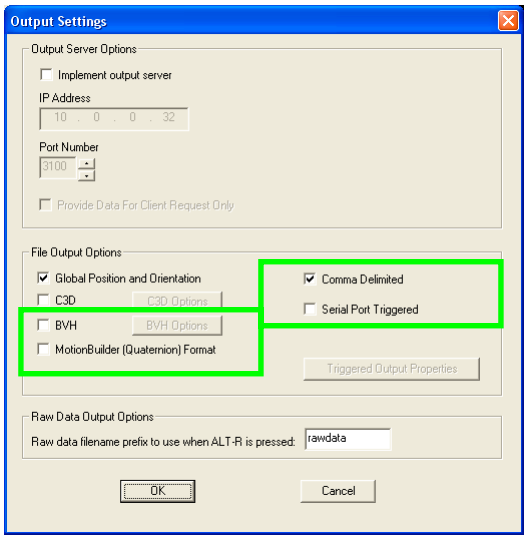
Comma Delimited:

- If this box is checked, the numbers recorded on each line of the Global Position and Orientation and Position / Bend / Twist files text files have commas separating them.

Serial Port Triggered:

- Check the 'Serial Port Triggered' box if you wish to have raw data files saved whenever a trigger signal is received at the PC's serial port. The serial port trigger signal is the same as a serial port "break" signal. That is, the serial port receive data line must go low for at least 10 bit times in order to initiate a valid trigger.

- ShapeRecorder configures the triggered serial port to receive data at 115,200 bps, so the 10 bit times corresponds to an actual "minimum-low" time of 87 μs.



Output Setup

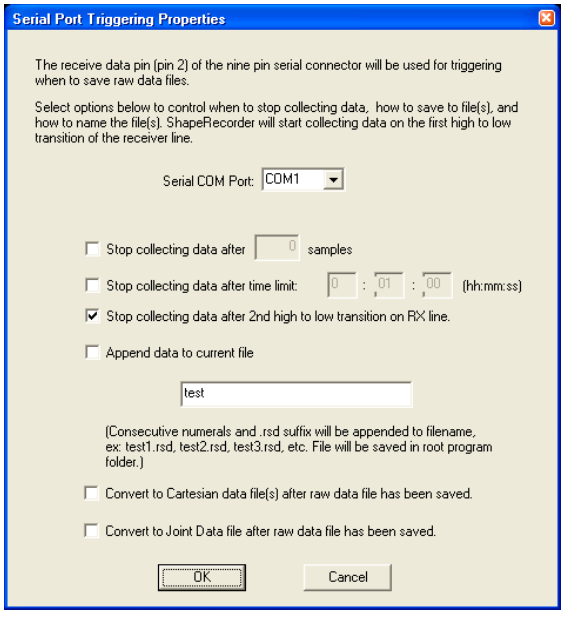
Serial Port Triggered Continued:

- Pressing the 'Triggered Output Properties' button presents the window shown below. It is necessary to make sure that proper RS-232 levels appear at the serial port receiver pin (pin 2) in order for triggering to work properly.

- Any available COM port on the PC can be used as a trigger input to start saving a raw data file. The required trigger signal is a low input pulse on the serial port receive data line that lasts at least 87 µs. The raw data file is closed after a specified number of samples (if the 'Stop collecting data after *xxxx* samples' box is checked), after a specified time limit (if the 'Stop collecting data after time limit' box is checked) or after a second low input pulse on the receive data line (if the 'Stop Collecting data after 2nd high to low transition on RX line' box is checked.

- A new raw data file will be created each time, unless the 'Append data to current file' box is checked, in which case all data will be appended to the current raw data file. If the 'Append data to current file' box is not checked, then the file created will have a base filename as specified in the filename entry field, followed by a number, and an ".rsd" extension. The numbers of all files created are consecutive (i.e. 1, 2, 3, 4, etc.)

- Cartesian or Joint Data files can be saved after the raw data file has been closed, by clicking the corresponding check boxes at the bottom of the window.



BVH / C3D

- Output Setup
- **BVH**
- **C3D**
- Global Position and Orientation
- MotionBuilder, etc. Format

BVH

- This file output option uses the standard Biovision Hierarchical Format (BVH). The axes for this file format are different from the axes that Measurand normally uses for its ShapeWrapII system. For BVH, the X-axis points to the person's left, the Y-axis points up (same as Measurand) and the Z-axis points in the direction that the person is facing. Rotations for this format are performed in roll, pitch, yaw order, firstly CCW about the +Z-axis, then CCW about the rotated +X axis, and finally CC W about the doubly rotated +Y-axis.

C3D

- This file output option uses a form of the C3D file output.. Each joint on the human body is modeled as a group of 3 points that allows you to infer the global position and orientation of that joint.

Global Position and Orientation

- For this file format, all limb data is stored with reference to the world coordinate system. All positional data is measured in mm and all orientation data is measured in roll, pitch, yaw orientation angles in degrees. The X-axis extends outwards in the direction that the person is facing during the homing calibration, the Y-axis extends upwards, and the Z-axis extends to the person's right during homing. The order of rotation angles is yaw first about the +Y axis, followed by pitch about the rotated +Z axis, and then roll about the doubly rotated +X axis. The default limb position (all rotation angles set to zero) is for a limb extending outwards along the X-axis.

- The file output uses one line of space or comma separated text per data sample, with the text aligned in the order shown on the next pages.

- If a tape is not available for a particular body part, the data related to that part does not appear in the output file.

Global Position and Orientation

- 1. Center of hips X-position
- 2. Center of hips Y-position
- 3. Center of hips Z-position
- 4. Hips roll angle
- 5. Hips pitch angle
- 6. Hips yaw angle
- 7. Left collarbone roll angle
- 8. Left collarbone pitch angle
- 9. Left collarbone yaw angle
- 10. Left shoulder X-position
- 11. Left shoulder Y-position
- 12. Left shoulder Z-position
- 13. Left upper-arm roll angle
- 14. Left upper-arm pitch angle
- 15. Left upper-arm yaw angle
- 16. Left elbow X-position
- 17. Left elbow Y-position
- 18. Left elbow Z-position
- 19. Left forearm roll angle
- 20. Left forearm pitch angle
- 21. Left forearm yaw angle
- 22. Left wrist X-position
- 23. Left wrist Y-position
- 24. Left wrist Z-position
- 25. Left hand roll angle
- 26. Left hand pitch angle
- 27. Left hand yaw angle
- 28. Left hand knuckle X-position[1]
- 29. Left hand knuckle Y-position[1]
- 30. Left hand knuckle Z-position[1]
- 31. Left finger roll angle[1]
- 32. Left finger pitch angle[1]
- 33. Left finger yaw angle[1]
- 34. Right collarbone roll angle
- 35. Right collarbone pitch angle
- 36. Right collarbone yaw angle
- 37. Right shoulder X-position
- 38. Right shoulder Y-position
- 39. Right shoulder Z-position
- 40. Right upper-arm roll angle
- 41. Right upper-arm pitch angle
- 42. Right upper-arm yaw angle
- 43. Right elbow X-position
- 44. Right elbow Y-position
- 45. Right elbow Z-position
- 46. Right forearm roll angle
- 47. Right forearm pitch angle
- 48. Right forearm yaw angle
- 49. Right wrist X-position
- 50. Right wrist Y-position
- 51. Right wrist Z-position
- 52. Right hand roll angle
- 53. Right hand pitch angle
- 54. Right hand yaw angle
- 55. Right hand knuckle X-position[2]
- 56. Right hand knuckle Y-position[2]
- 57. Right hand knuckle Z-position[2]
- 58. Right finger roll angle[2]
- 59. Right finger pitch angle[2]
- 60. Right finger yaw angle[2]
- 61. Left hip center X-position
- 62. Left hip center Y-position
- 63. Left hip center Z-position
- 64. Left thigh roll angle

1. Quantity is present only if left arm tape is available and left ShapeHand is not available.

2. Quantity is present only if right arm tape is available and right ShapeHand is not available.

Global Position and Orientation

- 65. Left thigh pitch angle
- 66. Left thigh yaw angle
- 67. Left knee X-position
- 68. Left knee Y-position
- 69. Left knee Z-position
- 70. Left shin roll angle
- 71. Left shin pitch angle
- 72. Left shin yaw angle
- 73. Left ankle X-position
- 74. Left ankle Y-position
- 75. Left ankle Z-position
- 76. Left foot roll angle
- 77. Left foot pitch angle
- 78. Left foot yaw angle
- 79. Left foot knuckle X-position
- 80. Left foot knuckle Y-position
- 81. Left foot knuckle Z-position
- 82. Left toe roll angle
- 83. Left toe pitch angle
- 84. Left toe yaw angle
- 85. Right hip center X-position
- 86. Right hip center Y-position
- 87. Right hip center Z-position
- 88. Right thigh roll angle
- 89. Right thigh pitch angle
- 90. Right thigh yaw angle
- 91. Right knee X-position
- 92. Right knee Y-position
- 93. Right knee Z-position
- 94. Right shin roll angle
- 95. Right shin pitch angle
- 96. Right shin yaw angle
- 97. Right ankle X-position
- 98. Right ankle Y-position
- 99. Right ankle Z-position
- 100. Right foot roll angle
- 101. Right foot pitch angle
- 102. Right foot yaw angle
- 103. Right foot knuckle X-position
- 104. Right foot knuckle Y-position
- 105. Right foot knuckle Z-position
- 106. Right toe roll angle
- 107. Right toe pitch angle
- 108. Right toe yaw angle
- 109. Center of head X-position
- 110. Center of head Y-position
- 111. Center of head Z-position
- 112. Head roll angle
- 113. Head pitch angle
- 114. Head yaw angle
- 115. Thoracic X-position
- 116. Thoracic Y-position
- 117. Thoracic Z-position
- 118. Thoracic roll angle
- 119. Thoracic pitch angle
- 120. Thoracic yaw angle
- 121. Left thumb metacarpophalangeal joint X-position[3]
- 122. Left thumb metacarpophalangeal joint Y-position[3]
- 123. Left thumb metacarpophalangeal joint Z-position[3]
- 124. Left thumb interphalangeal joint X-position[3]
- 125. Left thumb interphalangeal joint Y-position[3]
- 126. Left thumb interphalangeal joint Z-position[3]
- 127. Left thumb endpoint X-position[3]
- 128. Left thumb endpoint Y-position[3]

3. Quantity is present only if left ShapeHand is available.

Global Position and Orientation

- 129. Left thumb endpoint Z-position[3]
- 130. Left index knuckle (index metacarpophalangeal joint) X-position[3]
- 131. Left index knuckle (index metacarpophalangeal joint) Y-position[3]
- 132. Left index knuckle (index metacarpophalangeal joint) Z-position[3]
- 133. Left index proximal interphalangeal joint X-position[3]
- 134. Left index proximal interphalangeal joint Y-position[3]
- 135. Left index proximal interphalangeal joint Z-position[3]
- 136. Left index distal interphalangeal joint X-position[3]
- 137. Left index distal interphalangeal joint Y-position[3]
- 138. Left index distal interphalangeal joint Z-position[3]
- 139. Left index endpoint X-position[3]
- 140. Left index endpoint Y-position[3]
- 141. Left index endpoint Z-position[3]
- 142. Left middle finger knuckle (middle metacarpophalangeal joint) X-position[3]
- 143. Left middle finger knuckle (middle metacarpophalangeal joint) Y-position[3]
- 144. Left middle finger knuckle (middle metacarpophalangeal joint) Z-position[3]
- 145. Left middle proximal interphalangeal joint X-position[3]
- 146. Left middle proximal interphalangeal joint Y-position[3]
- 147. Left middle proximal interphalangeal joint Z-position[3]
- 148. Left middle distal interphalangeal joint X-position[3]
- 149. Left middle distal interphalangeal joint Y-position[3]
- 150. Left middle distal interphalangeal joint Z-position[3]
- 151. Left middle endpoint X-position[3]
- 152. Left middle endpoint Y-position[3]
- 153. Left middle endpoint Z-position[3]
- 154. Left ring finger knuckle (ring metacarpophalangeal joint) X-position[3]
- 155. Left ring finger knuckle (ring metacarpophalangeal joint) Y-position[3]
- 156. Left ring finger knuckle (ring metacarpophalangeal joint) Z-position[3]
- 157. Left ring proximal interphalangeal joint X-position[3]
- 158. Left ring proximal interphalangeal joint Y-position[3]
- 159. Left ring proximal interphalangeal joint Z-position[3]
- 160. Left ring distal interphalangeal joint X-position[3]

3. Quantity is present only if left ShapeHand is available.

Global Position and Orientation

- 161. Left ring distal interphalangeal joint Y-position[3]
- 162. Left ring distal interphalangeal joint Z-position[3]
- 163. Left ring endpoint X-position[3]
- 164. Left ring endpoint Y-position[3]
- 165. Left ring endpoint Z-position[3]
- 166. Left small finger knuckle (small metacarpophalangeal joint) X-position[3]
- 167. Left small finger knuckle (small metacarpophalangeal joint) Y-position[3]
- 168. Left small finger knuckle (small metacarpophalangeal joint) Z-position[3]
- 169. Left small proximal interphalangeal joint X-position[3]
- 170. Left small proximal interphalangeal joint Y-position[3]
- 171. Left small proximal interphalangeal joint Z-position[3]
- 172. Left small distal interphalangeal joint X-position[3]
- 173. Left small distal interphalangeal joint Y-position[3]
- 174. Left small distal interphalangeal joint Z-position[3]
- 175. Left small endpoint X-position[3]
- 176. Left small endpoint Y-position[3]
- 177. Left small endpoint Z-position[3]
- 178. Right thumb metacarpophalangeal joint X-position[4]
- 179. Right thumb metacarpophalangeal joint Y-position[4]
- 180. Right thumb metacarpophalangeal joint Z-position[4]
- 181. Right thumb interphalangeal joint X-position[4]
- 182. Right thumb interphalangeal joint Y-position[4]
- 183. Right thumb interphalangeal joint Z-position4[4]
- 184. Right thumb endpoint X-position[4]
- 185. Right thumb endpoint Y-position[4]
- 186. Right thumb endpoint Z-position[4]
- 187. Right index knuckle (index metacarpophalangeal joint) X-position[4]
- 188. Right index knuckle (index metacarpophalangeal joint) Y-position[4]
- 189. Right index knuckle (index metacarpophalangeal joint) Z-position[4]
- 190. Right index proximal interphalangeal joint X-position[4]
- 191. Right index proximal interphalangeal joint Y-position[4]
- 192. Right index proximal interphalangeal joint Z-position[4]

3. Quantity is present only if left ShapeHand is available.
4. Quantity is present only if right ShapeHand is available.

Global Position and Orientation

- 193. Right index distal interphalangeal joint X-position[4]
- 194. Right index distal interphalangeal joint Y-position[4]
- 195. Right index distal interphalangeal joint Z-position[4]
- 196. Right index endpoint X-position[4]
- 197. Right index endpoint Y-position[4]
- 198. Right index endpoint Z-position[4]
- 199. Right middle finger knuckle (middle metacarpophalangeal joint) X-position[4]
- 200. Right middle finger knuckle (middle metacarpophalangeal joint) Y-position[4]
- 201. Right middle finger knuckle (middle metacarpophalangeal joint) Z-position[4]
- 202. Right middle proximal interphalangeal joint X-position[4]
- 203. Right middle proximal interphalangeal joint Y-position[4]
- 204. Right middle proximal interphalangeal joint Z-position[4]
- 205. Right middle distal interphalangeal joint X-position[4]
- 206. Right middle distal interphalangeal joint Y-position[4]
- 207. Right middle distal interphalangeal joint Z-position[4]
- 208. Right middle endpoint X-position[4]
- 209. Right middle endpoint Y-position[4]
- 210. Right middle endpoint Z-position[4]
- 211. Right ring finger knuckle (ring metacarpophalangeal joint) X-position[4]
- 212. Right ring finger knuckle (ring metacarpophalangeal joint) Y-position[4]
- 213. Right ring finger knuckle (ring metacarpophalangeal joint) Z-position[4]
- 214. Right ring proximal interphalangeal joint X-position[4]
- 215. Right ring proximal interphalangeal joint Y-position[4]
- 216. Right ring proximal interphalangeal joint Z-position[4]
- 217. Right ring distal interphalangeal joint X-position[4]
- 218. Right ring distal interphalangeal joint Y-position[4]
- 219. Right ring distal interphalangeal joint Z-position[4]
- 220. Right ring endpoint X-position[4]
- 221. Right ring endpoint Y-position[4]
- 222. Right ring endpoint Z-position[4]
- 223. Right small finger knuckle (small metacarpophalangeal joint) X-position[4]
- 224. Right small finger knuckle (small metacarpophalangeal joint) Y-position[4]

4. Quantity is present only if right ShapeHand is available.

Global Position and Orientation

- 225. Right small finger knuckle (small metacarpophalangeal joint) Z-position[4]
- 226. Right small proximal interphalangeal joint X-position[4]
- 227. Right small proximal interphalangeal joint Y-position[4]
- 228. Right small proximal interphalangeal joint Z-position[4]
- 229. Right small distal interphalangeal joint X-position[4]
- 230. Right small distal interphalangeal joint Y-position[4]
- 231. Right small distal interphalangeal joint Z-position[4]
- 232. Right small endpoint X-position[4]
- 233. Right small endpoint Y-position[4]
- 234. Right small endpoint Z-position[4]
- 235. Time stamp (ms)

4. Quantity is present only if right ShapeHand is available.

MotionBuilder / Quest3D / Virtools (Quaternion) Format

- This format is available for use with Measurand's plug-ins to AutoDesk's MotionBuilder's software, Dassault Systems' Virtools software, and Act-3D's Quest3D software. The coordinate system has the X-axis pointing to the person's left, the Y-axis pointing upwards, and the Z-axis pointing forwards. The base position is defined for a person standing straight up with arms at sides, and head straight up. The data is organized as one line of text per sample in the following order:
    - All rotations are expressed in quaternions.
    - Quaternions are of the form: Q = w + xi + yj + zk
- The file output order is described on the following pages.

MotionBuilder / Quest3D / Virtools (Quaternion) Format

- 1. Hips X-position
- 2. Hips Y-position
- 3. Hips Z-position
- 4. Hips Q.w
- 5. Hips Q.x
- 6. Hips Q.y
- 7. Hips Q.z
- 8. Left shoulder X-position
- 9. Left shoulder Y-position
- 10. Left shoulder Z-position
- 11. Left collarbone Q.w
- 12. Left collarbone Q.x
- 13. Left collarbone Q.y
- 14. Left collarbone Q.z
- 15. Left elbow X-position
- 16. Left elbow Y-position
- 17. Left elbow Z-position
- 18. Left upperarm Q.w
- 19. Left upperarm Q.x
- 20. Left upperarm Q.y
- 21. Left upperarm Q.z
- 22. Left wrist X-position
- 23. Left wrist Y-position
- 24. Left wrist Z-position
- 25. Left forearm Q.w
- 26. Left forearm Q.x
- 27. Left forearm Q.y
- 28. Left forearm Q.z
- 29. Left knuckle X-position
- 30. Left knuckle Y-position
- 31. Left knuckle Z-position
- 32. Left hand Q.w
- 33. Left hand Q.x
- 34. Left hand Q.y
- 35. Left hand Q.z
- 36. Left fingers Q.w
- 37. Left fingers Q.x
- 38. Left fingers Q.y
- 39. Left fingers Q.z
- 40. Right shoulder X-position
- 41. Right shoulder Y-position
- 42. Right shoulder Z-position
- 43. Right collarbone Q.w
- 44. Right collarbone Q.x
- 45. Right collarbone Q.y
- 46. Right collarbone Q.z
- 47. Right elbow X-position
- 48. Right elbow Y-position
- 49. Right elbow Z-position
- 50. Right upperarm Q.w
- 51. Right upperarm Q.x
- 52. Right upperarm Q.y
- 53. Right upperarm Q.z
- 54. Right wrist X-position
- 55. Right wrist Y-position
- 56. Right wrist Z-position
- 57. Right forearm Q.w
- 58. Right forearm Q.x
- 59. Right forearm Q.y
- 60. Right forearm Q.z
- 61. Right knuckle X-position
- 62. Right knuckle Y-position
- 63. Right knuckle Z-position
- 64. Right hand Q.w

MotionBuilder / Quest3D / Virtools (Quaternion) Format

- 65. Right hand Q.x
- 66. Right hand Q.y
- 67. Right hand Q.z
- 68. Right fingers Q.w
- 69. Right fingers Q.x
- 70. Right fingers Q.y
- 71. Right fingers Q.z
- 72. Center of head X-position
- 73. Center of head Y-position
- 74. Center of head Z-position
- 75. Head Q.w
- 76. Head Q.x
- 77. Head Q.y
- 78. Head Q.z
- 79. Left knee X-position
- 80. Left knee Y-position
- 81. Left knee Z-position
- 82. Left shin Q.w
- 83. Left shin Q.x
- 84. Left shin Q.y
- 85. Left shin Q.z
- 86. Left ankle X-position
- 87. Left ankle Y-position
- 88. Left ankle Z-position
- 89. Left ankle Q.w
- 90. Left ankle Q.x
- 91. Left ankle Q.y
- 92. Left ankle Q.z
- 93. Left knuckle X-position
- 94. Left knuckle Y-position
- 95. Left knuckle Z-position
- 96. Left Toe Q.w
- 97. Left Toe Q.x
- 98. Left Toe Q.y
- 99. Left Toe Q.z
- 100. Right knee X-position
- 101. Right knee Y-position
- 102. Right knee Z-position
- 103. Right shin Q.w
- 104. Right shin Q.x
- 105. Right shin Q.y
- 106. Right shin Q.z
- 107. Right ankle X-position
- 108. Right ankle Y-position
- 109. Right ankle Z-position
- 110. Right ankle Q.w
- 111. Right ankle Q.x
- 112. Right ankle Q.y
- 113. Right ankle Q.z
- 114. Right knuckle X-position
- 115. Right knuckle Y-position
- 116. Right knuckle Z-position
- 117. Right Toe Q.w
- 118. Right Toe Q.x
- 119. Right Toe Q.y
- 120. Right Toe Q.z
- 121. Chest X-position
- 122. Chest Y-position
- 123. Chest Z-position
- 124. Chest Q.w
- 125. Chest Q.x
- 126. Chest Q.y
- 127. chest Q.z
- 128. Left Hand Q.w

MotionBuilder / Quest3D / Virtools (Quaternion) Format

- 129. Left Hand Q.x
- 130. Left Hand Q.y
- 131. Left Hand Q.z
- 132. Left Thumb Proximal Bone Q.w
- 133. Left Thumb Proximal Bone Q.x
- 134. Left Thumb Proximal Bone Q.y
- 135. Left Thumb Proximal Bone Q.z
- 136. Left Thumb Middle Bone Q.w
- 137. Left Thumb Middle Bone Q.x
- 138. Left Thumb Middle Bone Q.y
- 139. Left Thumb Middle Bone Q.z
- 140. Left Thumb Distal Bone Q.w
- 141. Left Thumb Distal Bone Q.x
- 142. Left Thumb Distal Bone Q.y
- 143. Left Thumb Distal Bone Q.z
- 144. Left Index Proximal Bone Q.w
- 145. Left Index Proximal Bone Q.x
- 146. Left Index Proximal Bone Q.y
- 147. Left Index Proximal Bone Q.z
- 148. Left Index Middle Bone Q.w
- 149. Left Index Middle Bone Q.x
- 150. Left Index Middle Bone Q.y
- 151. Left Index Middle Bone Q.z
- 152. Left Index Distal Bone Q.w
- 153. Left Index Distal Bone Q.x
- 154. Left Index Distal Bone Q.y
- 155. Left Index Distal Bone Q.z
- 156. Left Middle Proximal Bone Q.w
- 157. Left Middle Proximal Bone Q.x
- 158. Left Middle Proximal Bone Q.y
- 159. Left Middle Proximal Bone Q.z
- 160. Left Middle Middle Bone Q.w
- 161. Left Middle Middle Bone Q.x
- 162. Left Middle Middle Bone Q.y
- 163. Left Middle Middle Bone Q.z
- 164. Left Middle Distal Bone Q.w
- 165. Left Middle Distal Bone Q.x
- 166. Left Middle Distal Bone Q.y
- 167. Left Middle Distal Bone Q.z
- 168. Left Ring Proximal Bone Q.w
- 169. Left Ring Proximal Bone Q.x
- 170. Left Ring Proximal Bone Q.y
- 171. Left Ring Proximal Bone Q.z
- 172. Left Ring Middle Bone Q.w
- 173. Left Ring Middle Bone Q.x
- 174. Left Ring Middle Bone Q.y
- 175. Left Ring Middle Bone Q.z
- 176. Left Ring Distal Bone Q.w
- 177. Left Ring Distal Bone Q.x
- 178. Left Ring Distal Bone Q.y
- 179. Left Ring Distal Bone Q.z
- 180. Left Small Proximal Bone Q.w
- 181. Left Small Proximal Bone Q.x
- 182. Left Small Proximal Bone Q.y
- 183. Left Small Proximal Bone Q.z
- 184. Left Small Middle Bone Q.w
- 185. Left Small Middle Bone Q.x
- 186. Left Small Middle Bone Q.y
- 187. Left Small Middle Bone Q.z
- 188. Left Small Distal Bone Q.w
- 189. Left Small Distal Bone Q.x
- 190. Left Small Distal Bone Q.y
- 191. Left Small Distal Bone Q.z
- 192. Right Hand Q.w

MotionBuilder / Quest3D / Virtools (Quaternion) Format

- 193. Right Hand Q.x
- 194. Right Hand Q.y
- 195. Right Hand Q.z
- 196. Right Thumb Proximal Bone Q.w
- 197. Right Thumb Proximal Bone Q.x
- 198. Right Thumb Proximal Bone Q.y
- 199. Right Thumb Proximal Bone Q.z
- 200. Right Thumb Middle Bone Q.w
- 201. Right Thumb Middle Bone Q.x
- 202. Right Thumb Middle Bone Q.y
- 203. Right Thumb Middle Bone Q.z
- 204. Right Thumb Distal Bone Q.w
- 205. Right Thumb Distal Bone Q.x
- 206. Right Thumb Distal Bone Q.y
- 207. Right Thumb Distal Bone Q.z
- 208. Right Index Proximal Bone Q.w
- 209. Right Index Proximal Bone Q.x
- 210. Right Index Proximal Bone Q.y
- 211. Right Index Proximal Bone Q.z
- 212. Right Index Middle Bone Q.w
- 213. Right Index Middle Bone Q.x
- 214. Right Index Middle Bone Q.y
- 215. Right Index Middle Bone Q.z
- 216. Right Index Distal Bone Q.w
- 217. Right Index Distal Bone Q.x
- 218. Right Index Distal Bone Q.y
- 219. Right Index Distal Bone Q.z
- 220. Right Middle Proximal Bone Q.w
- 221. Right Middle Proximal Bone Q.x
- 222. Right Middle Proximal Bone Q.y
- 223. Right Middle Proximal Bone Q.z
- 224. Right Middle Middle Bone Q.w
- 225. Right Middle Middle Bone Q.x
- 226. Right Middle Middle Bone Q.y
- 227. Right Middle Middle Bone Q.z
- 228. Right Middle Distal Bone Q.w
- 229. Right Middle Distal Bone Q.x
- 230. Right Middle Distal Bone Q.y
- 231. Right Middle Distal Bone Q.z
- 232. Right Ring Proximal Bone Q.w
- 233. Right Ring Proximal Bone Q.x
- 234. Right Ring Proximal Bone Q.y
- 235. Right Ring Proximal Bone Q.z
- 236. Right Ring Middle Bone Q.w
- 237. Right Ring Middle Bone Q.x
- 238. Right Ring Middle Bone Q.y
- 239. Right Ring Middle Bone Q.z
- 240. Right Ring Distal Bone Q.w
- 241. Right Ring Distal Bone Q.x
- 242. Right Ring Distal Bone Q.y
- 243. Right Ring Distal Bone Q.z
- 244. Right Small Proximal Bone Q.w
- 245. Right Small Proximal Bone Q.x
- 246. Right Small Proximal Bone Q.y
- 247. Right Small Proximal Bone Q.z
- 248. Right Small Middle Bone Q.w
- 249. Right Small Middle Bone Q.x
- 250. Right Small Middle Bone Q.y
- 251. Right Small Middle Bone Q.z
- 252. Right Small Distal Bone Q.w
- 253. Right Small Distal Bone Q.x
- 254. Right Small Distal Bone Q.y
- 255. Right Small Distal Bone Q.z
- 256. Time Stamp (ms)