



Wireless Motion Capture Tracker User Manual



Version	Author	Date
1.3	Rocky	2024/12/03
1.4	Justin	2025/04/29
1.5	Justin	2025/11/06

Motion Tracker Suites



Picture Just for Reference

Motion Tracker Suites is a full-body motion capture system with 13 or 15 (shoulder sensor optional) wireless sensors fixed to the body's activity nodes, equipped with a set of close-fitting, comfortable Tracker fixed straps, and each strap is affixed with a hint sticker fixed to the body part, making it easy for users to quickly identify the fixed position of each strap. Support fast, simple and reliable motion data capture, which is ideal for film and television animation and motion data acquisition practitioners. It has a data transmission range of up to 50 meters in an open, magnetic-free indoor environment and can be used for a variety of applications, including workplace ergonomics, rehabilitation and injury prevention, animation, recreation, biomechanical sciences, and ergonomics research. Alternatively, it can be worn on the outside of the garment. Inertial motion capture requires sensors attached to the body to capture motion data. The complete Zero Lab F-1 Motion Capture System includes hardware and software parts for full-body motion capture.

1、Wireless Motion Capture Tracker



Picture Just for Reference

The Wireless Motion Capture Tracker sensor is a 9-axis wireless motion sensor. The gyroscope measures triaxial angular velocity, the accelerometer measures triaxial acceleration, and the magnetometer measures triaxial earth magnetic field. Motion Tracker sensor fusion algorithm provides manual calibration, automatic calibration, magnetometer abnormality automatic elimination and other functions, which can provide absolute three-dimensional attitude and linear acceleration based on geodetic coordinate system Euler angle, quaternion format. There are two LEDs inside the sensor to indicate the sensor status. The front of the sensor is the power switch and calibration button for no software calibration. The Type-C interface on the side charges the sensor, and the internal high-capacity lithium battery can support the Motion Tracker for 8-10 hours. Longer standby times and better wireless signaling with the latest Zero Lab 2.4G proprietary protocol communication technology. Data packets from different protocol layers can be parsed in real time so that header and payload data can be checked. It provides detailed information about data packets, received signal strength indicator (RSSI), link quality indicator (LQI), channels, etc. The collected data can be configured to the output frequency 10/25/50/100Hz according to user needs to meet the needs of different applications.

Motion Capture Tracker Parameter	Value
Dimensions	42 x 31 x 16 mm
Weight	17g
Gyroscope Range	±2000 dps
Accelerometer Range	±16 g
Static attitude accuracy	roll / pitch / yaw: 0.5°
Dynamic attitude accuracy	roll / pitch / yaw: 1.0°

Output Data	Eulerian, quaternion
Working Voltage	3.3 v
Battery Capacity	180 mAh
Working Hours	8~10 h
Working Temperature	-40°C ~ 85°C
Communication	Zero Lab 2.4G Proprietary Protocol
Internal Fusion Frequency	500 Hz
Wireless Data Output Data Rate	50 Hz
Latency	< 20 ms
Charging Time	0.5 h

2、Wireless Motion Capture Tracker Charger



Picture Just for Reference

Motion Tracker charger parameter	Value
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Dimensions	119 x 178 x 19mm
Power Connector	DC 12V
Supports simultaneous charging of the Motion Tracker	16
Charge Connector	TypeC
Power Consumption	36 w

Plug the Wireless Motion Capture Tracker into the Wireless Motion Capture Tracker Charger to charge. Using the standard Type-C interface, each charging case can charge 16 sensors, and it takes about 0.5 hours from empty charging to full charging.

H-1 Data Gloves



Picture Just for Reference

H-1 Data Gloves is a truly "cost-effective, high-precision, lightweight data glove" with a high-precision bend sensor with more than 1000 resolutions per finger combined with an inertial attitude module that integrates low-latency communication to capture fine hand movements in real time, convert them into digital signals, and transmit data to a computer or other device. Whether in the areas of artistic creation, scientific research, medical rehabilitation, or virtual reality, this data glove gives you an efficient and convenient operation experience, so that your imagination and creativity can be perfectly displayed!

H-1 Data Gloves 参数	参数值
Dimensions	200 x 110 x 50 mm
Weight	58g
Gyroscope Range	±2000 dps
Accelerometer Range	±16 g
Static attitude accuracy	roll / pitch / yaw: 0.5°
Dynamic attitude accuracy	roll / pitch / yaw: 1.0°
Output Data	Eulerian, quaternion, 10bit bending value
Working Voltage	3.3 v
Battery Capacity	200 mAh
Working Hours	8~10 h
Working Temperature	-40°C ~ 85°C
Communication	Zero Lab 2.4G Proprietary Protocol
Wireless Data Output Data Rate	50 Hz
Latency	< 20 ms
Charging Time	0.5 h

Wireless Motion Capture Dongle



Picture Just for Reference

Wireless Motion Capture Dongle is mainly used to send commands to the computer terminal to collect data from Motion Tracker and H1 Data Gloves. The connection method is a universal USB interface, and the data transmission protocol is a 2.4G private protocol developed by Zero Lab, which supports dynamic frequency hopping (an industry first) to achieve efficient and stable data transmission without interference from other signals.

MoCap Data Receiver Parameter	Value
Dimension	50 x 75 x 9 mm
Weight	8.7g
Connector	USB

Software section (MotionCaptureMaster)



1、Installation

We provide the Setup.exe installation package, which is a green installation. After installation, the desktop will generate the Zero Lab Motion Capture Master icon. (Please contact ZeroLab staff to obtain the software)

Start Install:

1) Double-click the installation file ~



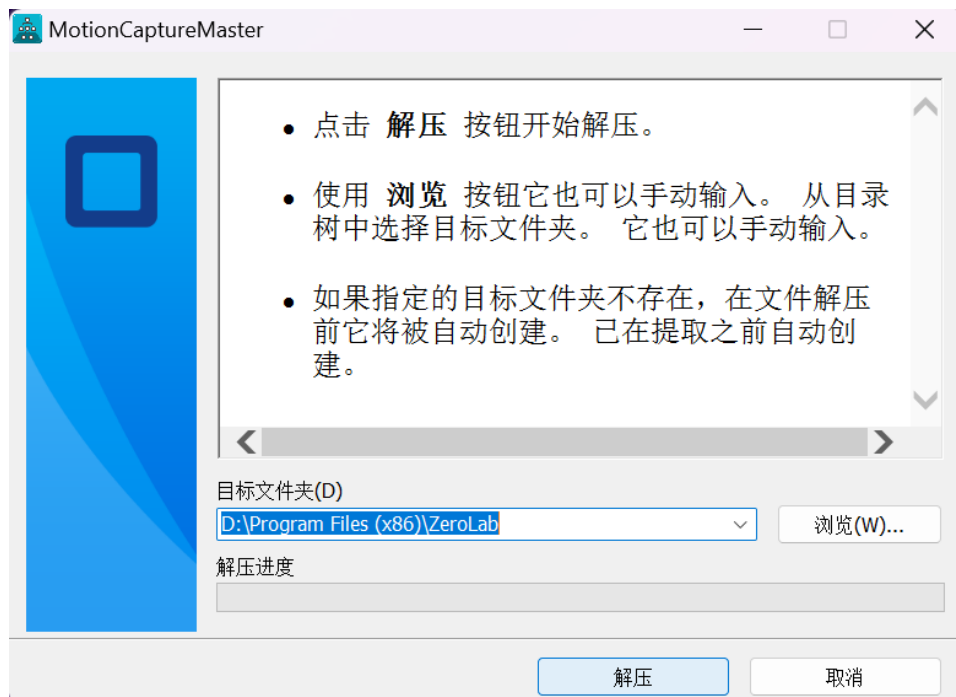
2) The installation interface appears, click Run ~



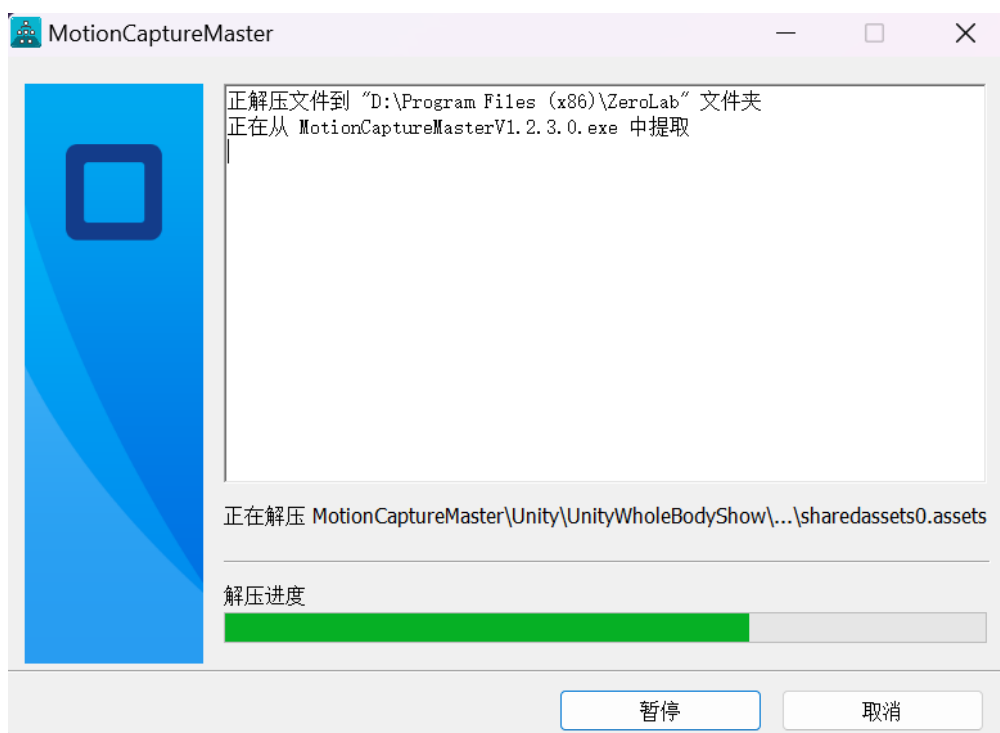
3) Allow network access to this app ~



4) Select the installation location and click Unzip~



5) Start unpacking ~



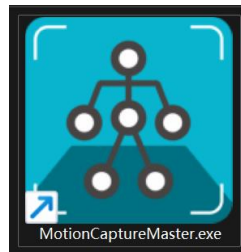
6) After the decompression is completed, it will automatically exit, and the application icon will be generated on the desktop~



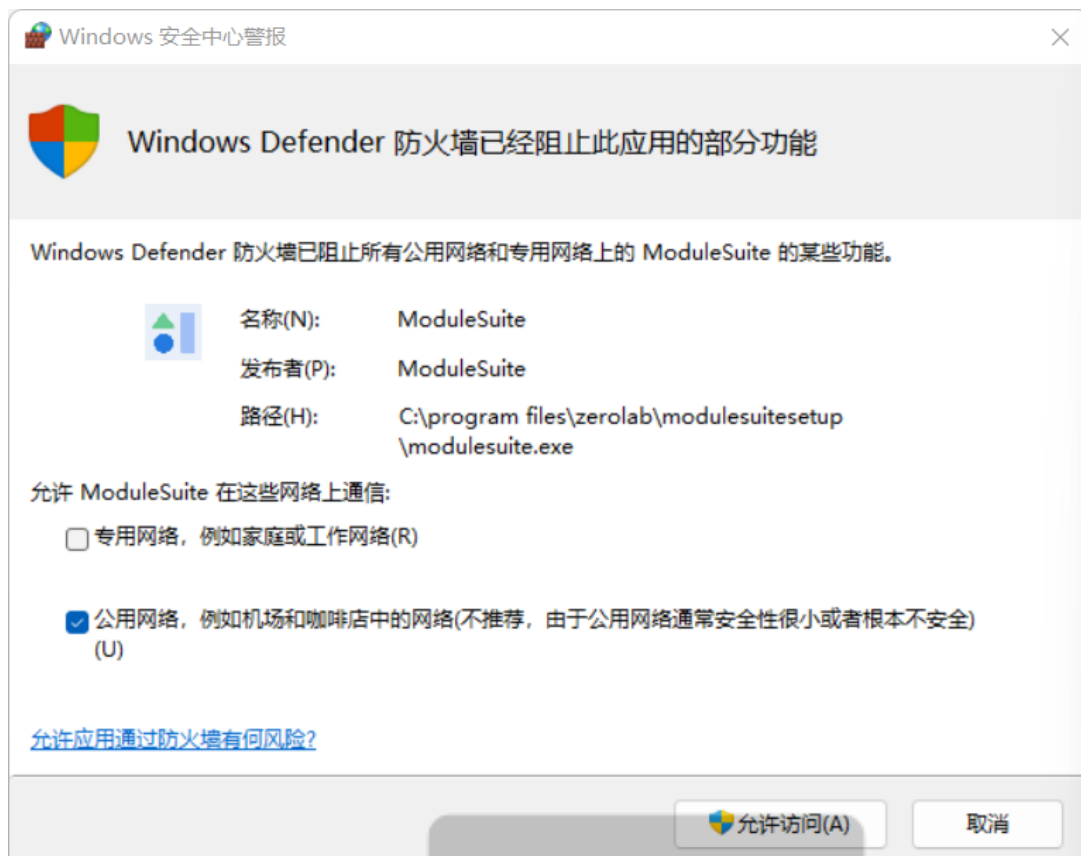
2、Uninstall

Please remove the uninstaller manually, because it is a green installation and nothing is written to the registry.

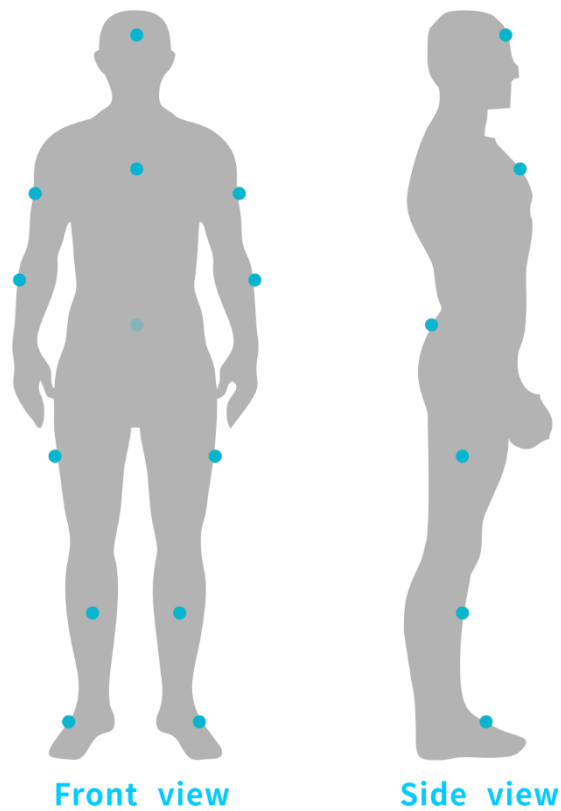
3、Run the program



Double-click the Zero Lab Motion Capture Master shortcut to open it. If prompted below, click [Allow Access].



Wearing Guideline



Wearing position and orientation

A total of 13-15 trackers and a pair of gloves are worn throughout the body, and the gloves are worn on the left and right hands normally.

According to the schematic diagram above, the Tracker ties the strap with the corresponding location label in the corresponding position, and the Tracker can be taped directly to the position of the schematic diagram. In addition to the Tracker USB port on the chest facing down, other Tracker directions can be taped arbitrarily. (In addition, if you need to ensure the accuracy of the action data, you can try to fix the Tracker in the corresponding position to avoid the Tracker from shaking)

Getting Start

1、Turn on the device

Press and hold the Tracker Middle Area light to release it when it turns green to start the Tracker.

2、Dongle Connection

Select the serial port corresponding to the Dongle (Dongle is generally displayed as a USB serial device).

Click the [Open Serial Port] button.

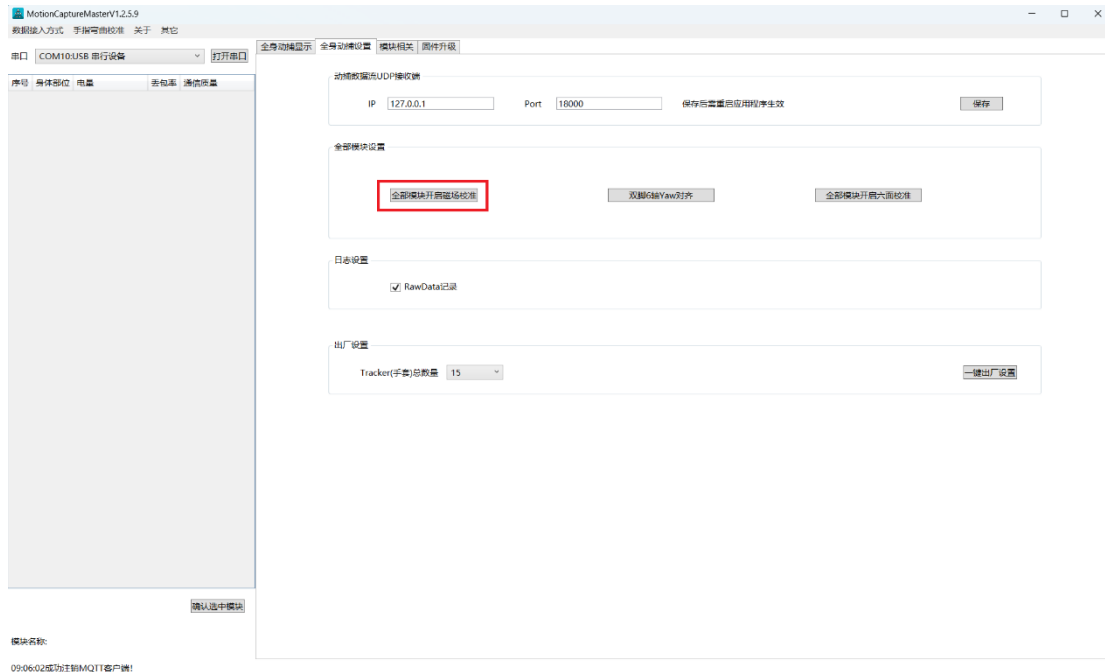
When the Tracker and gloves are all activated, they will automatically communicate with Dongle, and the robot limb of the software's full-body capture display interface already corresponds to the Tracker tied to the body.



3、Tracker Magnetometer Calibration

4、 When the user uses the Zero Lab F-1 Motion Capture System for the first time in a brand new environment, magnetometer calibration is required for each module. The user can choose to calibrate all tracker data gloves at the same time or select a single module for magnetometer calibration.

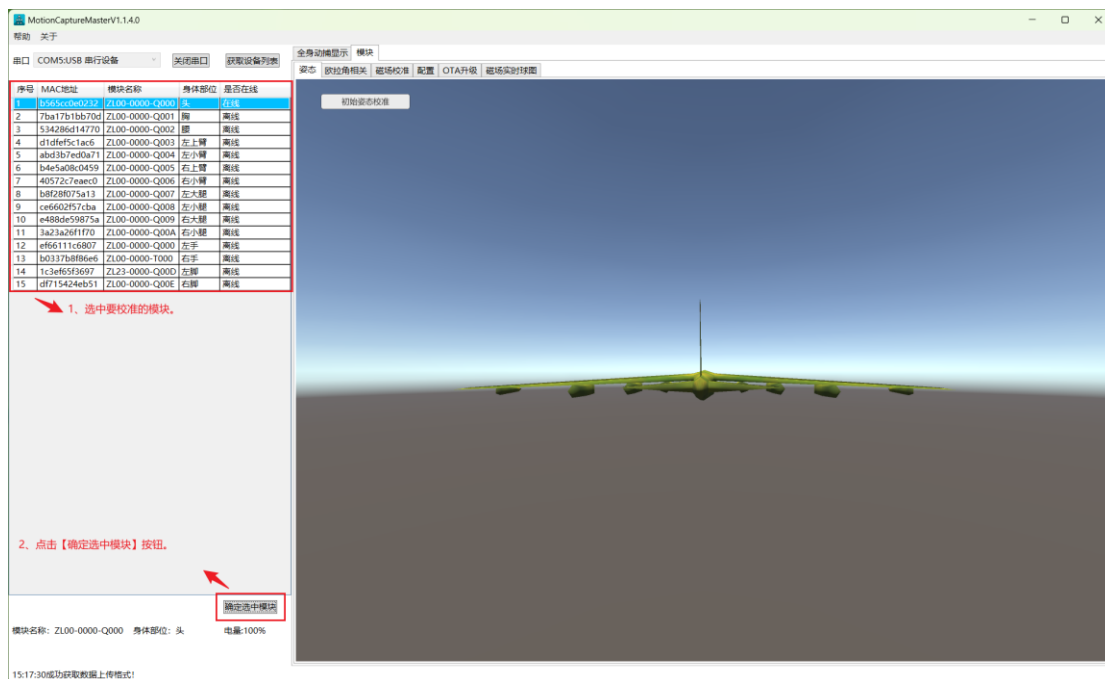
5、 In order to ensure a more accurate posture, it is recommended that the user calibrate the magnetometer on a module-by-module basis before first use.



Select a single tracker or glove to calibrate or configure, as shown in the following figure:

Select the module to configure or calibrate in the list of devices.

Click the [OK Select Module] button.

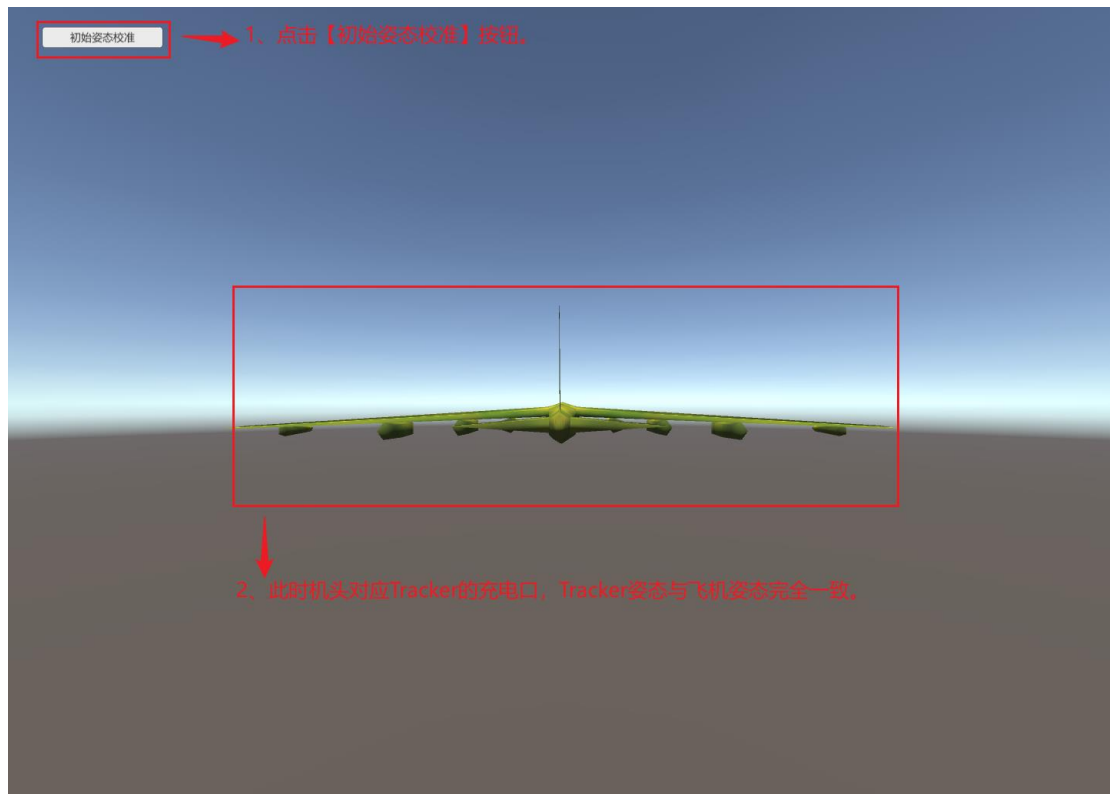


At this point, the aircraft attitude of the aircraft interface is displayed accordingly with the selected module.

If you want the display attitude of the aircraft to be consistent with the actual display attitude of the module, follow the steps below.

The module is placed horizontally on the table, facing upwards, and when the charging port is pointed in the direction of the screen, after clicking [Initial attitude calibration], the tail of the

aircraft is facing the person, at this time, the posture of the module and the posture of the aircraft fully correspond. As shown in the following figure.

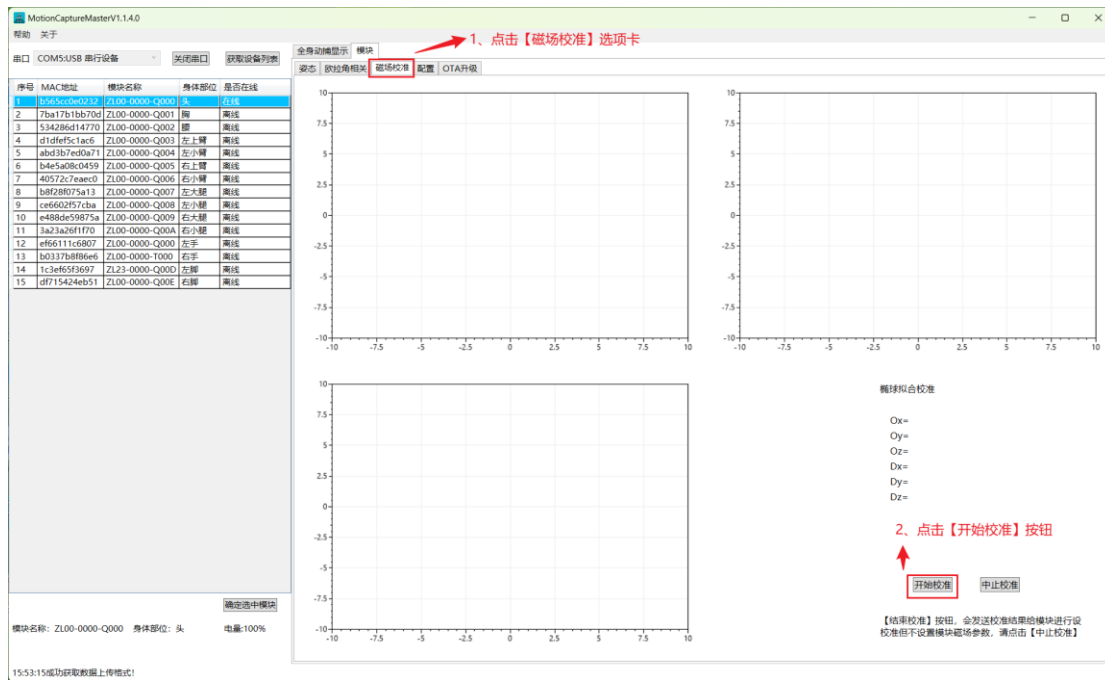


6、Magnetic Field Calibration

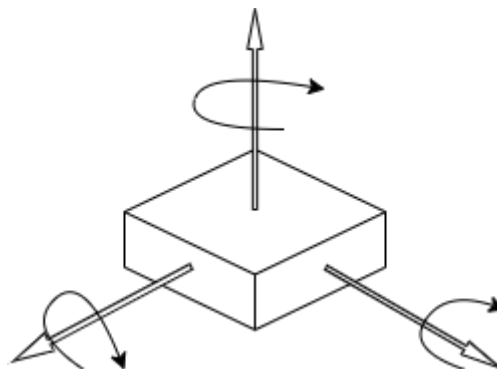
At this point, the aircraft attitude of the aircraft interface is displayed accordingly with the selected module.

If you want the display attitude of the aircraft to be consistent with the actual display attitude of the module, follow the steps below.

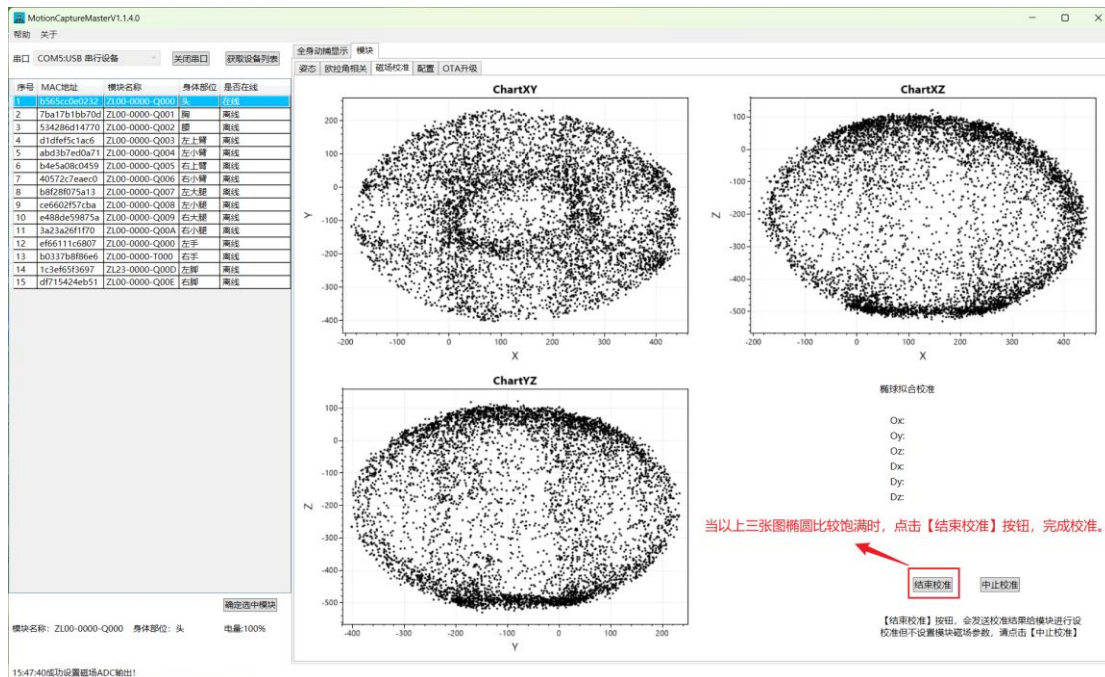
The module is placed horizontally on the table, facing upwards, and when the charging port is pointed in the direction of the screen, after clicking [Initial attitude calibration], the tail of the aircraft is facing the person, at this time, the posture of the module and the posture of the aircraft fully correspond. As shown in the following figure.



Hold the tracker in your hand and flip it in various directions in space, or rotate it clockwise and counterclockwise around the tracker's three axes.

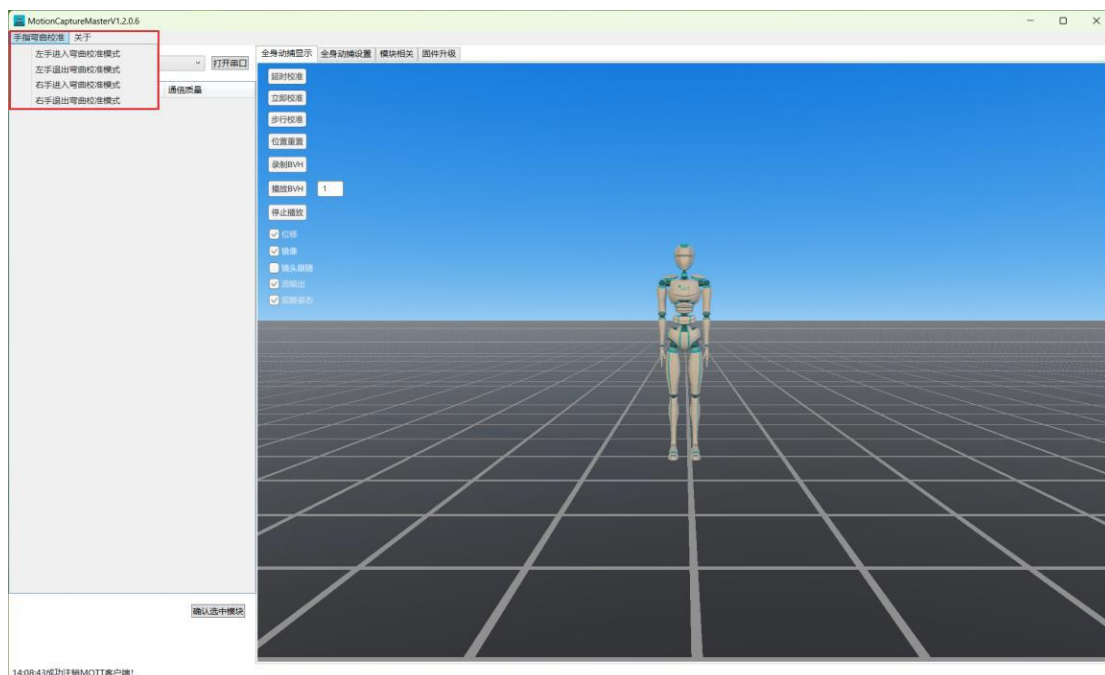


As shown in the figure below, when the contours of the three ellipses on the program are full and obvious, click the [End Calibration] button to complete the calibration.

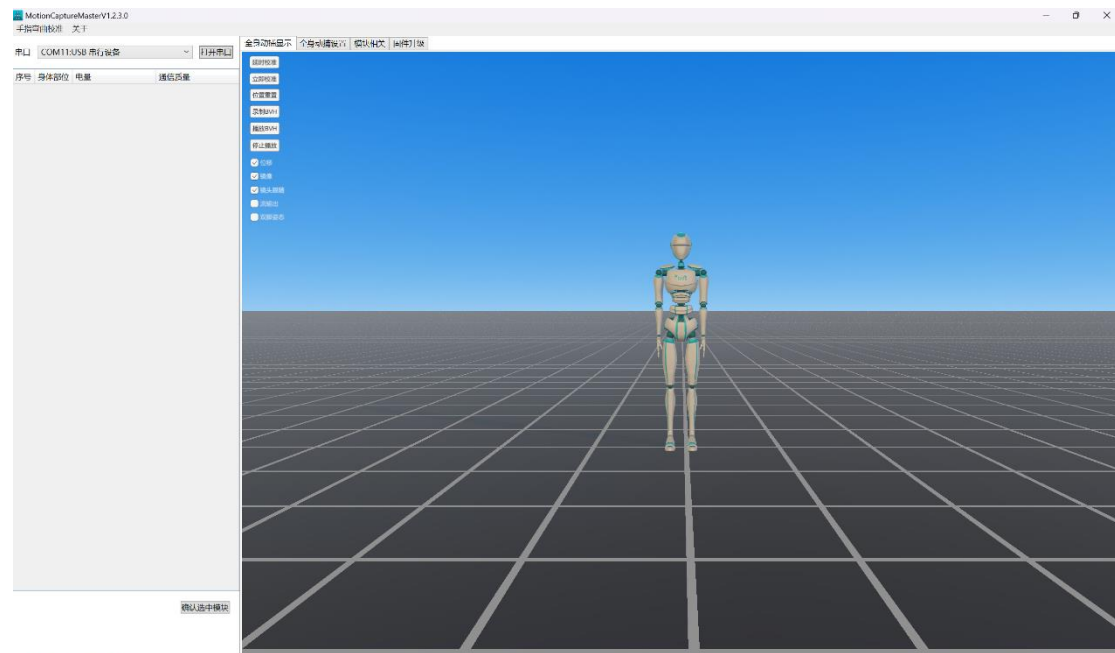


7、Date Glove Bend Calibration

When an abnormality in the display of finger bends in the program is found, a finger bend calibration is required. Click [Finger Calibration Mode] on the configuration interface. If calibration is required for the left hand, click [Left Hand Enter Bend Calibration Mode], then grip and release the glove 3 - 5 times, and then click [Exit Finger Calibration Mode] to complete the calibration. Just do the same with your right hand.



8、Segment to Pose Calibration

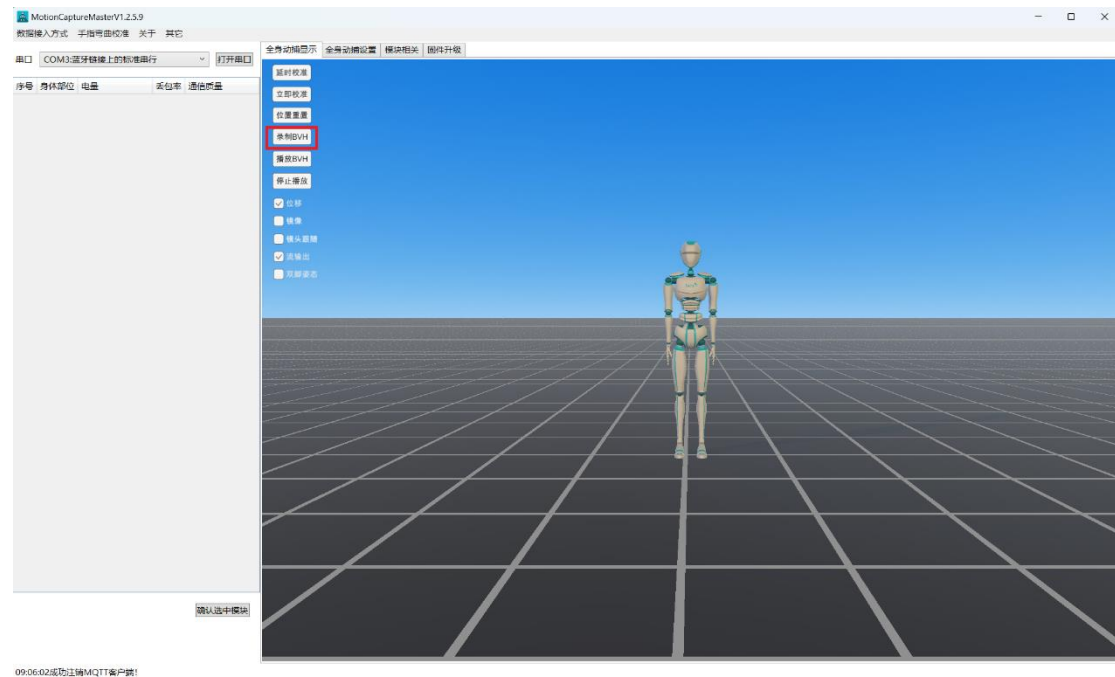


Wear the tracker and gloves as required, and complete the magnetic field calibration. After the glove bending calibration, the user can use the motion capture system. Since the user does not align the sensor with the human bone when wearing the tracker, the initial posture is random. The user needs to perform posture calibration. When a single user uses it, they can click the [Time Delay Calibration] button and position the N-pose posture. The arms naturally sag and stick to the outside of the thigh, the feet forward and keep the same width as the shoulders. The fingers naturally lie flat and the head remains flat in front of the user. (Specifically, refer to the figure model posture in the above figure interface and keep it as consistent as possible with the model posture). The program will count down 5 seconds and perform calibration. Good calibration is the key to the accuracy of the motion capture system.

If assisted by someone else, the person wearing the device poses in an N-pose and another person clicks the [Calibrate Now] button to calibrate immediately.

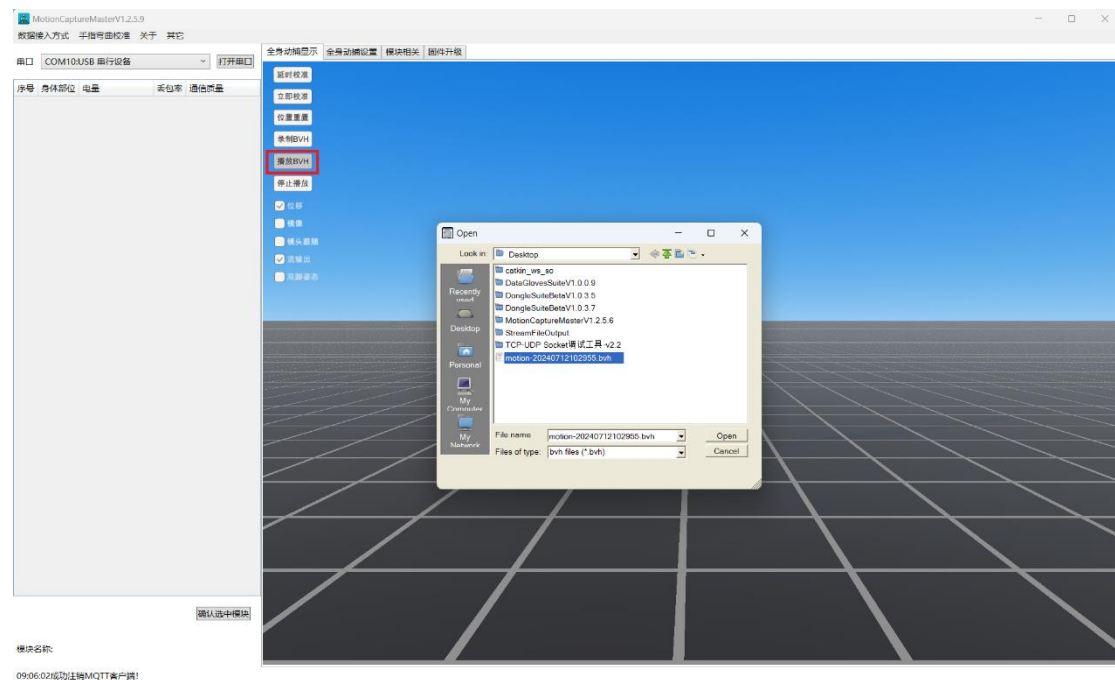
After the calibration is completed, the robot model in the software and the human body posture of the actual wearable device have been adapted. If the user finds that the action displayed by the model does not match the actual performer's action, repeat step 6 of step 4 according to the actual situation. During use, the user should ensure that the wear of the sensor is tightly attached to the body and there is no rotation or displacement. If there is a change in the wear position of the sensor due to muscle expansion or other reasons during use, the user needs to re-execute the process of user posture calibration.

9、 Save Action Data



When the user needs to save the action of the current performer as an action file, the user can click the [Record BVH] button, during which all the user's actions will be saved to the local hard disk, the file name is "motion_", and the recorded BVH will be changed to stop recording. When the user's complete action data is recorded, click [Stop Recording].

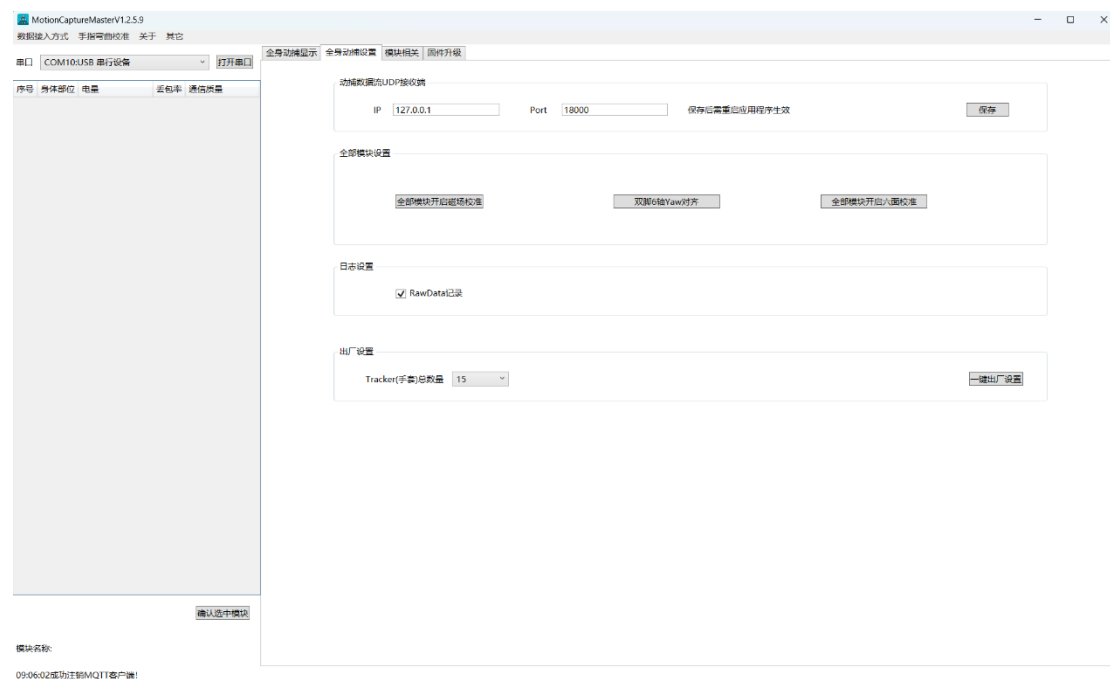
10、 Preview Action Data



The user can play by clicking the [Play BVH] button of the current performer and then selecting the recorded BVH file. This allows the user to preview previously recorded action files. At the same time, the button changes to [Stop Playing]. The user can click [Stop Playing] to switch back to real-time data. If the user does not click [Stop Playing], the current bvh file will be played in a loop.

11、 Real Time Data Streaming

The whole body motion capture system supports motion capture data to send real-time data to other applications through UDP mode in two ways: attitude data and finger bend values. Among them, the whole body motion capture software is UDP Client, and the user side is UDP Server. Note that after the user sets the IP address and port number of the UDP Server, click the [Save] button, and reopen the software to ensure that the user configuration is called normally by the software.



After completing the software restart, the user can check the [Stream Output] of the capture interface, and then the user can receive the posture and finger bend data of each part of the body on the UDP Server developed by the user. For the specific format definition, refer to the "Full-body capture UDP output data description".

Appendix 1: FCC Compliance

Wireless Motion Capture Tracker:

FCC ID:2BR4G-MT1

FCC Compliance:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) This device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause

undesired operation.

- **15.21 Information to user.**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- **15.105 Information to the user.**

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ✧ Reorient or relocate the receiving antenna.
- ✧ Increase the separation between the equipment and receiver.
- ✧ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- ✧ Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC RF Exposure Warning Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment can be used in portable exposure conditions.

Wireless Motion Capture Dongle:

2BR4G-DONGLE1

FCC Compliance:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 3) This device may not cause harmful interference, and
- 4) this device must accept any interference received, including interference that may cause undesired operation.

- **15.21 Information to user.**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- **15.105 Information to the user.**

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules.

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