



HZ Motion Capture Products

MotionStudio
Inertial Motion Capture Software

USER MANNUAL

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一、Hardware Configuration

1.1 Device Overview

1.1.1 Main Hardware Components

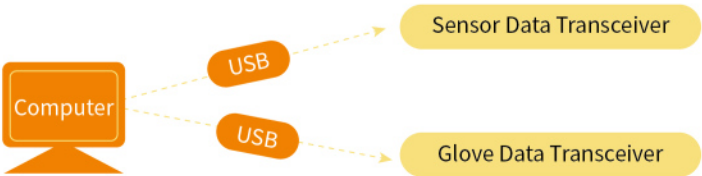
- HZ-Z1Pro Inertial Sensors ×17
- HZ-Z1Pro Backup Sensor ×1
- HZ-G1 Pro Motion Capture Gloves ×1 pair
- Data Transceiver with Omnidirectional Antenna ×1 set
- Charging Case (for sensor storage and calibration) ×1
- Power Adapter and USB Data Cable × 1 set
- Full-body Straps ×1 set
- Shockproof Carrying Case ×1
- User Manual×1

1.1.2 Recommended Computer Specifications

- OS: Windows 11
- Direct X9
- OpenGL 4.4
- CPU:3.0 GHz i5 processor
- RAM: 4GB of Memory
- Display Resolution: 1920×1080
- Refresh Rate: 60HZ
- Display Scaling: 100%

1.1.3 System Topology

The data transceiver is connected to the computer via a USB interface. A Type-C adapter cable is also provided for flexible connectivity and ease of use.



1.2 Device Details

1.2.1 HZ Wireless Sensors

The HZ wireless sensor is a high-precision sensing unit integrating a gyroscope, accelerometer, and magnetometer, enabling accurate motion capture and orientation tracking.

Indicator Light Description

LED Status	Sensor Status
Frequency indicator slow flashing	Frequency indicator slow flashing
Frequency indicator fast flashing	Frequency indicator fast flashing
Red light slow flashing continuously	Red light slow flashing continuously
Frequency indicator slow flashing	Frequency indicator slow flashing
Frequency indicator slow flashing	Frequency indicator slow flashing
Frequency indicators flashing alternately	Frequency band switching

Powering on the Sensor

Insert and remove the Type-C cable from the charging case. When the indicator lights on the sensors start flashing, it indicates that the sensors have been successfully activated.



1.2.2 Data Transceiver

The data transceiver is used to receive and transmit data signals from the sensors to the computer in real time.



1.2.3 HZ-G1 Pro Motion Capture Gloves



1.2.4 Charging Case

The charging case is used to charge and store the HZ wireless sensors. It also serves as a calibration platform for the sensors when required.



1.2.5 Shockproof Carrying Case

The shockproof carrying case is designed to protect the HZ sensors and accessories during transportation and storage.



1.3 Preparation of the Motion Capture Environment

HZ sensors are equipped with magnetometers, which are sensitive to strong magnetic fields. The sensors must be used in an environment with minimal magnetic interference to ensure accurate motion capture performance.



Permanent Magnet



Loudspeaker



Generator/
Electric Motor



Power Supply



Refrigerator



Low Power Consumption,
Long Battery Life

1.4 Wearing Instructions

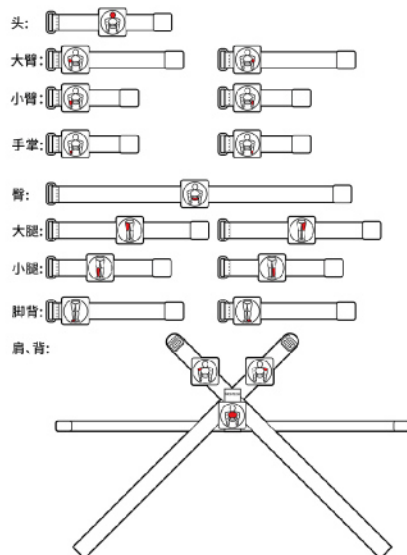
1.4.1 Motion Capture Suit

- **Sensor Attachment Method:** Sensors are secured to the straps using hook-and-loop fasteners.



• Strap-Type Motion Capture Suit

Each strap is designed with a specific length according to different body segments. Please follow the markings on the straps and attach them to the corresponding body parts accordingly.



1.4.2 Sensor Placement

• Upper Body

Head Sensor: Attach to the center of the back of the head.

Shoulder Sensors: Attach to the top of the shoulders, positioned slightly toward the outer side.

Hip Sensor: Attach to the center of the lower back, as close as possible to the tailbone. When wearing this sensor, ensure that the charging port faces upward and that the sensor fits tightly against the body.

Upper Arm Sensors: Attach to the outer side of the mid upper arm.

Forearm Sensors: Attach to the outer side of the mid forearm.

Hand Sensors: Attach to the back of the hand.

• Lower Body

Thigh Sensors: Attach to the middle of the thighs on the outer side, approximately 2–3 cm (0.8-1.2in) above the knee.

Shank Sensors: Attach to the middle of the calves on the outer side, approximately 2-3 cm (0.8-1.2in) below the knee.

Foot Sensors: Attach to the top of the feet. Ensure that the straps wrap securely around the instep to prevent accidental detachment during walking or movement.

• Precautions:

- Ensure all straps are securely fastened and closely fitted to the body to prevent excessive sensor movement during large or rapid motions.
- Before operation, the performer must ensure that no electronic devices (such as mobile phones or smartwatches) or magnetic objects (such as keys or coins) are present on the body, as they may cause significant magnetic interference.
- The HZ sensors are equipped with magnetometers, which are sensitive to strong magnetic fields. Always operate the system in an environment with minimal magnetic interference.
- The hip sensor must be positioned at the center of the lower back, as close as possible to the tailbone. When wearing this sensor, ensure that the charging port faces upward and that the sensor fits tightly against the body.

二、Quick Start

2.1 Hardware Connection and Activation

- Connect the data transceiver to the computer using a USB cable (a Type-C adapter may be used if needed).
- Insert and remove the Type-C cable from the charging case.
- When the indicator lights on the sensors inside the case start flashing, the sensors have been successfully activated.

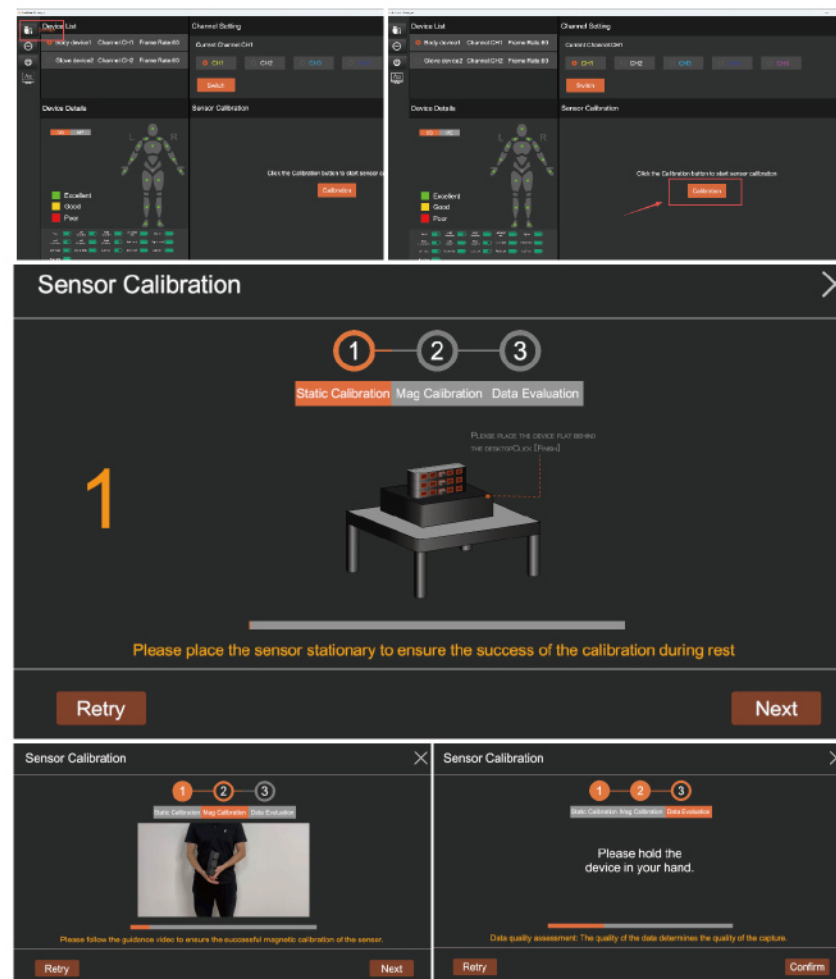
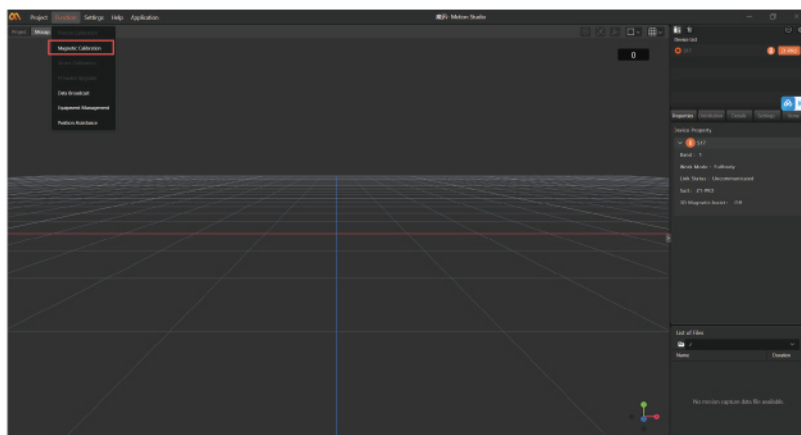


2.2 Sensor Calibration

- Launch the magnetic calibration software HardwareManager.
- Click the [Connect] button to connect the device.
- Click the [Calibrate] button to perform the magnetic calibration process.

Note: Please remove all metal accessories from your hands before calibration.

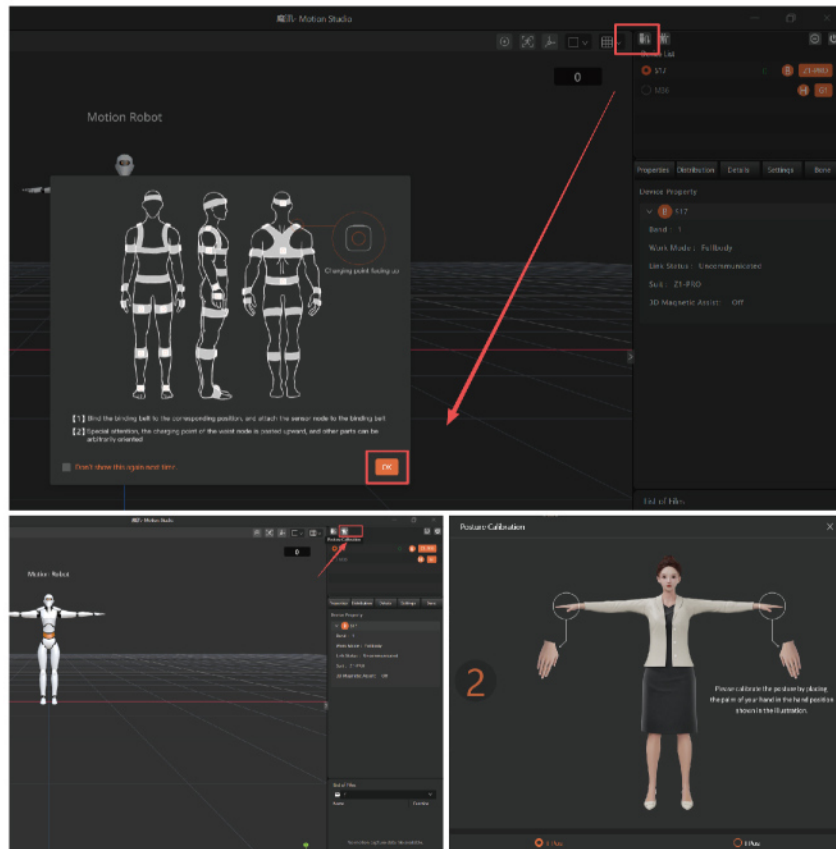
- After the calibration is completed, close the software.



2.3 Device Connection and Pose Calibration

- Open Motion Studio and create a new project or load an existing one.
- Insert the data transceiver into the computer. The device name will appear in the Device List.
- Click the **[Connect]** button to connect the sensors. During the connection process, keep all sensors stationary.
- Check the **Sensor Distribution** panel. When all sensor indicators are illuminated, the sensors have been successfully connected.
- After wearing all devices correctly, follow the on-screen instructions to complete the T-Pose, I-Pose, and OK-Pose calibrations.

***Note:** Keep both feet together and aligned during pose calibration.



2.4 Start Motion Capture

- After completing pose calibration, click the **[Record]** button to start motion capture. Recorded files will be automatically displayed in the file list.
- Right-click a file to play back or export the data.
- To stream data to third-party software, click **[BVH Data Broadcasting]** at the upper left corner of the interface. Offline data broadcasting is also supported when no hardware device is connected.

三、Operation Instructions

Before using the system for the first time, ensure the following items are ready: Sensors (fully charged); Data Receiver; Motion Studio; Magnetic calibration software.

3.1 Connecting to the Receiver



3.2 Sensor Power-on and Activation

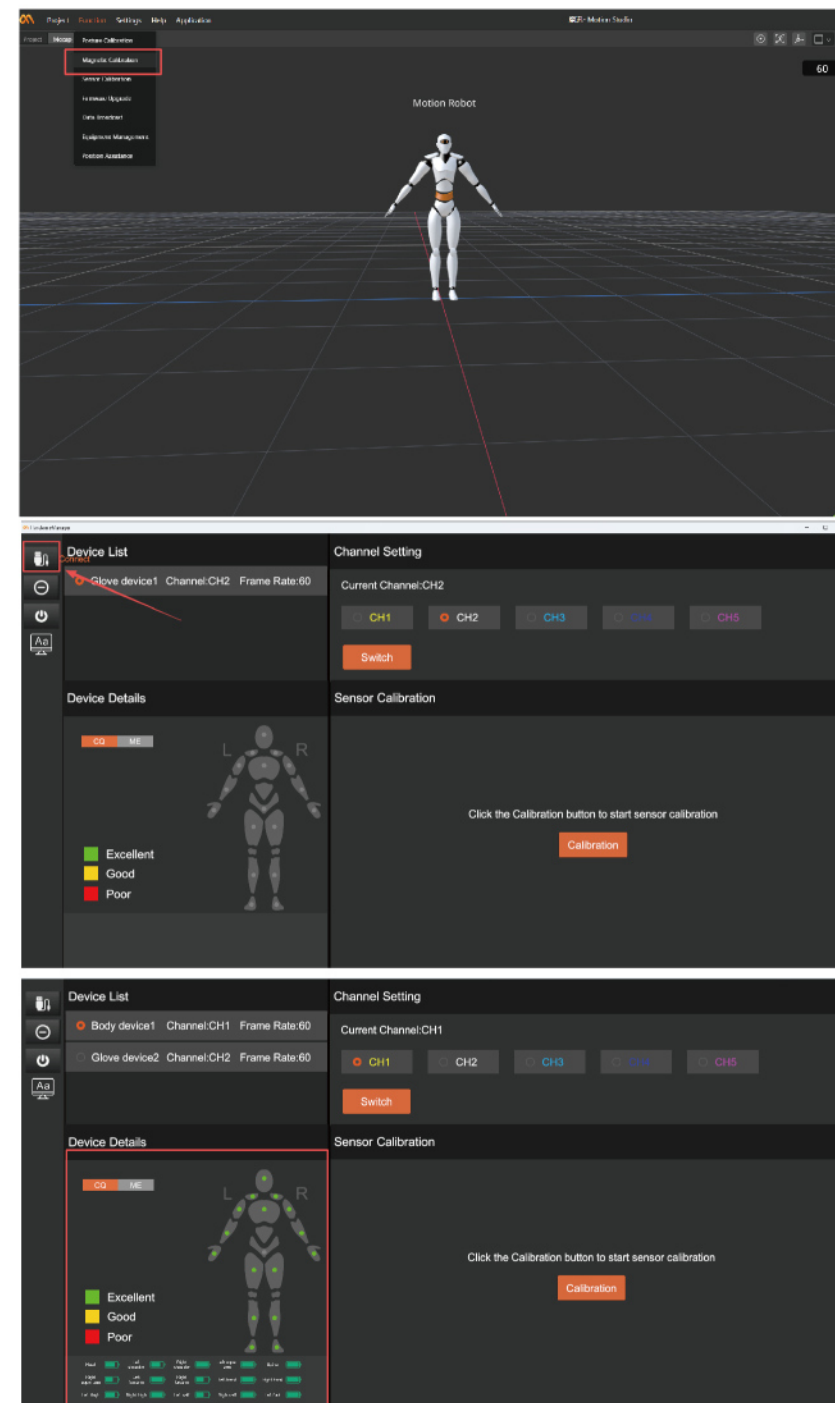
Insert and remove the Type-C cable from the charging case. When the indicator lights on the sensors begin flashing, the sensors have been successfully activated.

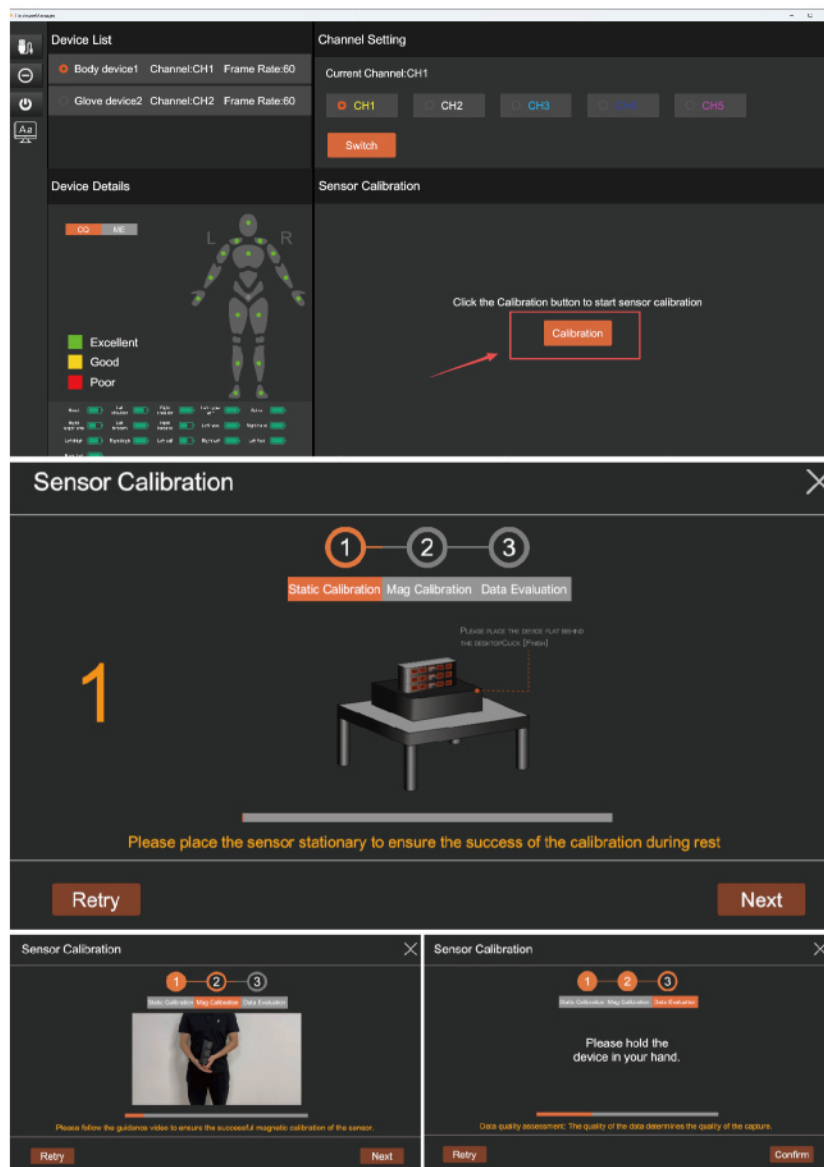


3.3 Sensor Calibration

- Open Motion Studio and select **Magnetic Calibration** to enter the calibration interface from function menu.
- Click the **[Connect]** button to connect the device.
- After the connection is completed, click the **[Calibrate]** button to perform the magnetic calibration procedure.

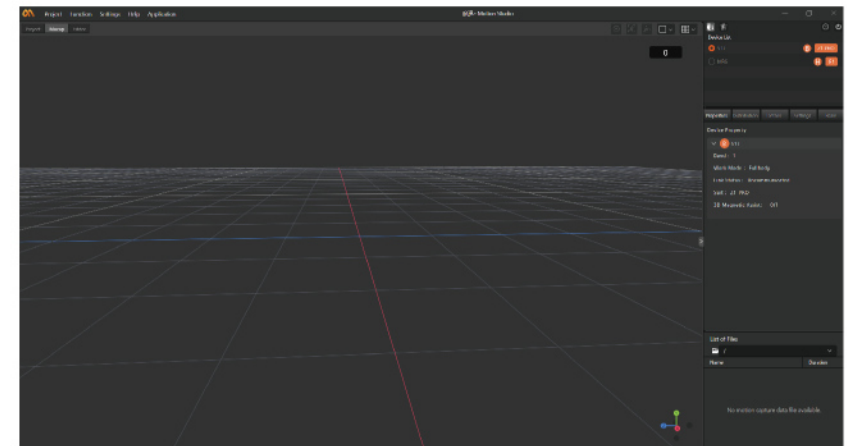
***Note:** Do not wear any metal accessories (e.g., rings, bracelets) during calibration, as they may interfere with the magnetic field and affect calibration accuracy.



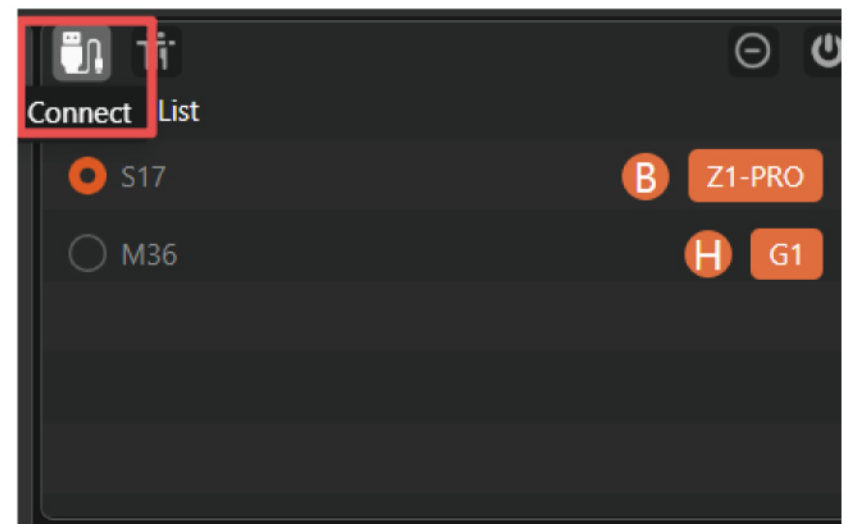


3.4 Device Connection

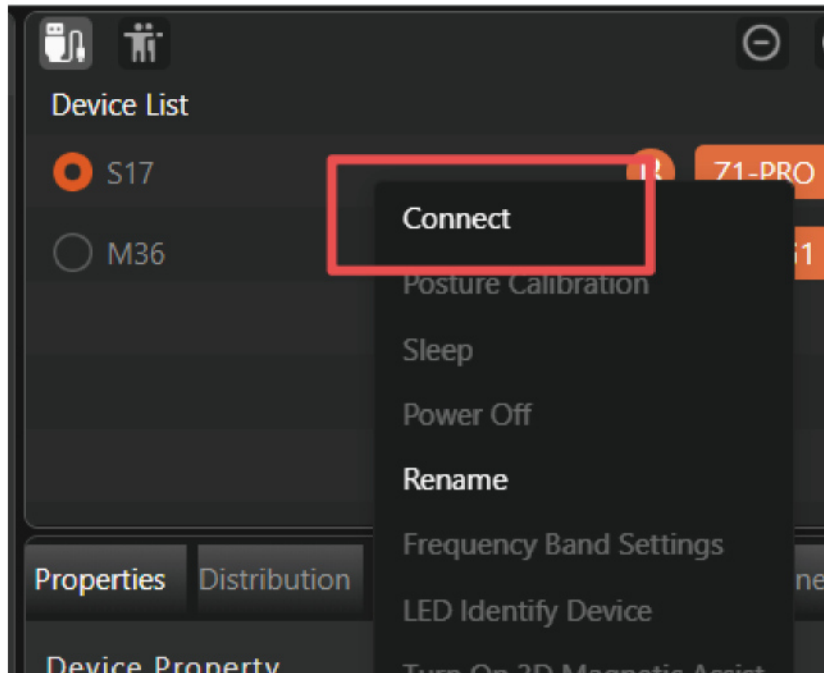
- After calibration is completed, close the calibration interface.
- Open Motion Studio (create a new project if this is the first use).
- Click the [Device List → Connect] button in the upper-right corner of the interface.



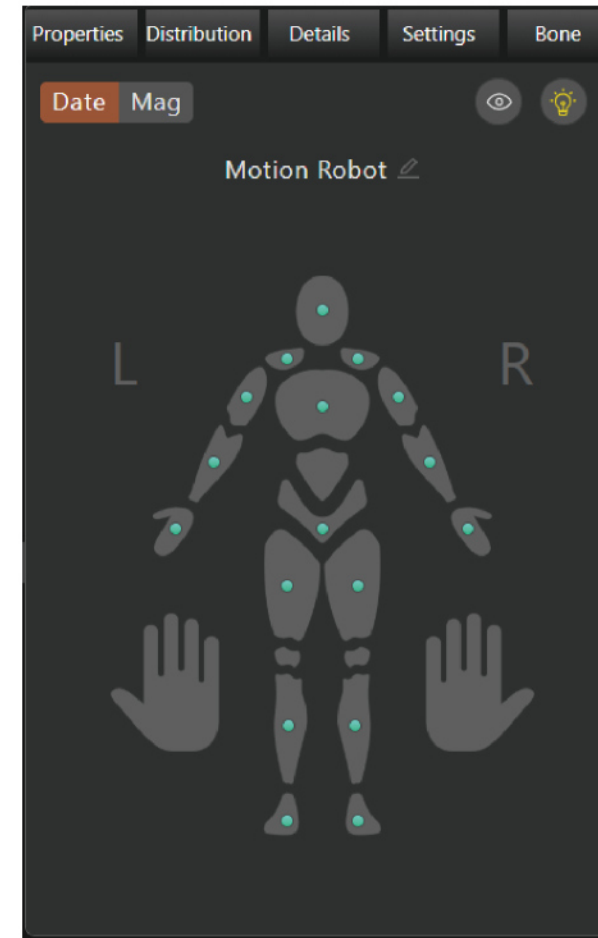
*Note: To connect all devices in the device list, click the [Connect] button in the upper-right corner.



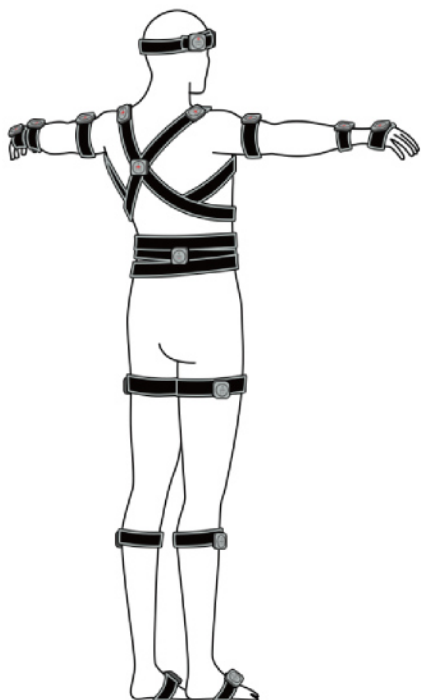
*Note: To connect a single device only, select the desired device, right-click, and choose the [Connect] button.



After successful connection, all nodes in the Sensor Distribution panel will light up.



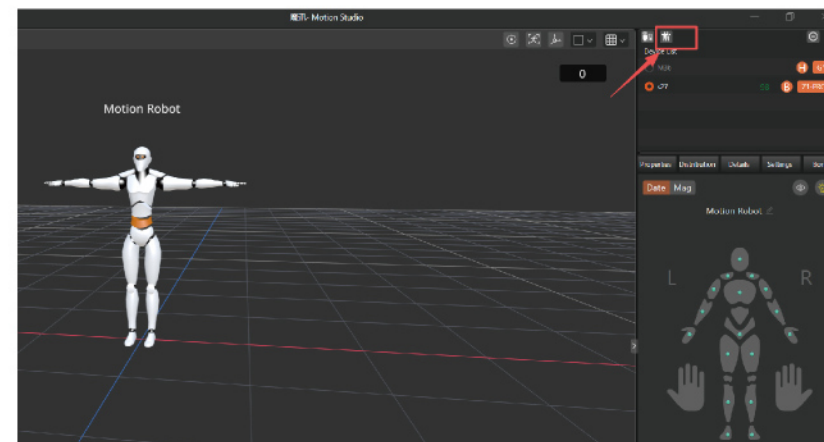
3.5 Wearing the Equipment (17 Sensors Total)



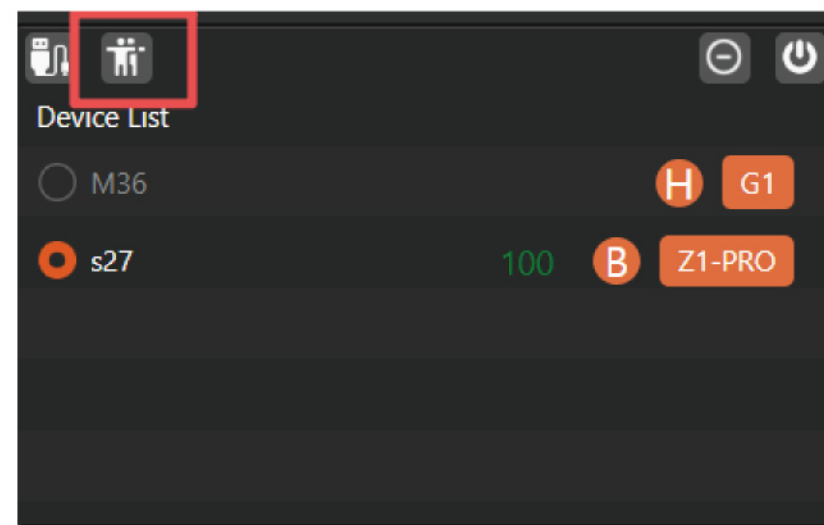
- Each sensor is equipped with hook-and-loop fasteners for attachment to the straps.
- Attach all sensors to the designated positions according to the sensor labels and placement guidelines.

3.6 Pose Calibration

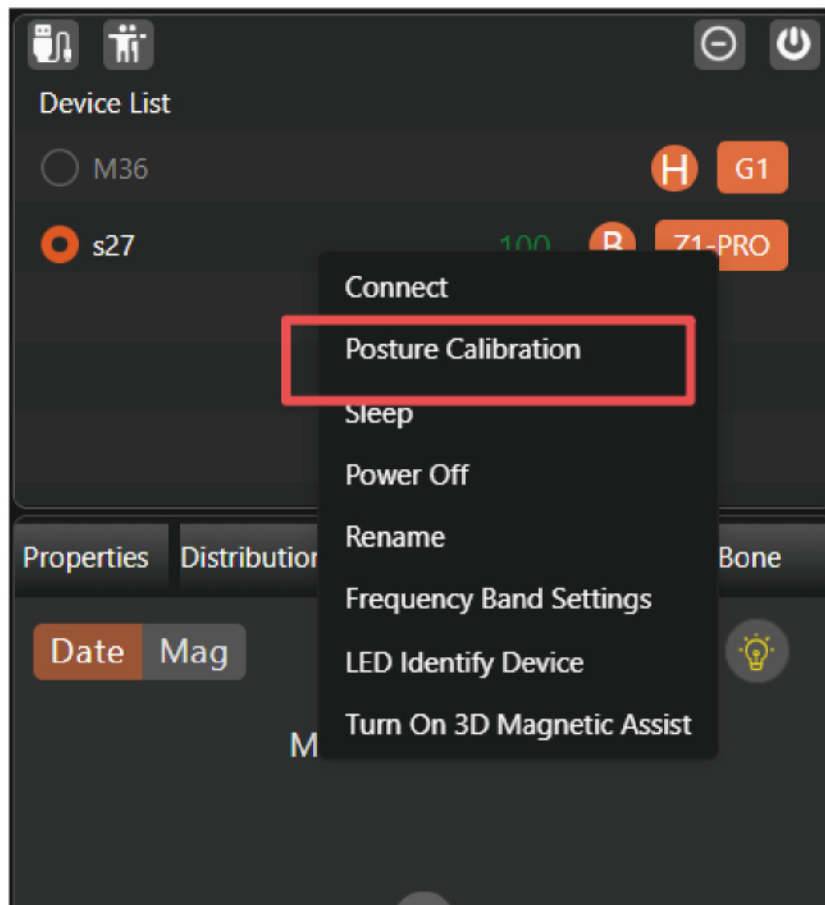
- After wearing the equipment, click the **[Pose Calibration]** button.
- Follow the on-screen instructions to complete the calibration process.
- Once completed, the system is ready for use.



*Note: To perform pose calibration for all devices, click the **[Pose Calibration]** button in the upper-right corner.



*Note: To perform pose calibration for a single device, select the desired device, right-click, and choose Pose Calibration.



四、Software Operation Instructions

4.1 Software Installation

The official download source for Motion Studio is provided by **Moretion Technology Download Service**.

Motion Studio is designed to operate on the **Windows** operating system and does not currently support **macOS**.

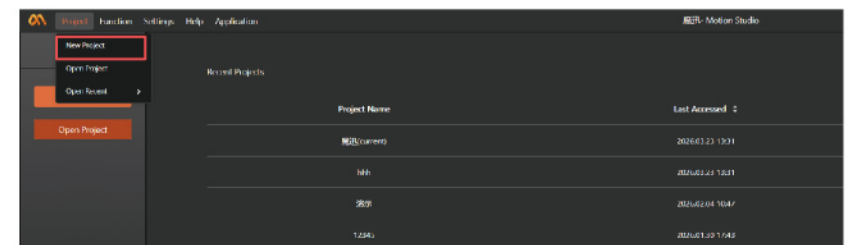
Run the installer and follow the on-screen instructions. If sufficient disk space is available, installation in the default directory (C drive) is recommended.



4.2 Starting Motion Capture

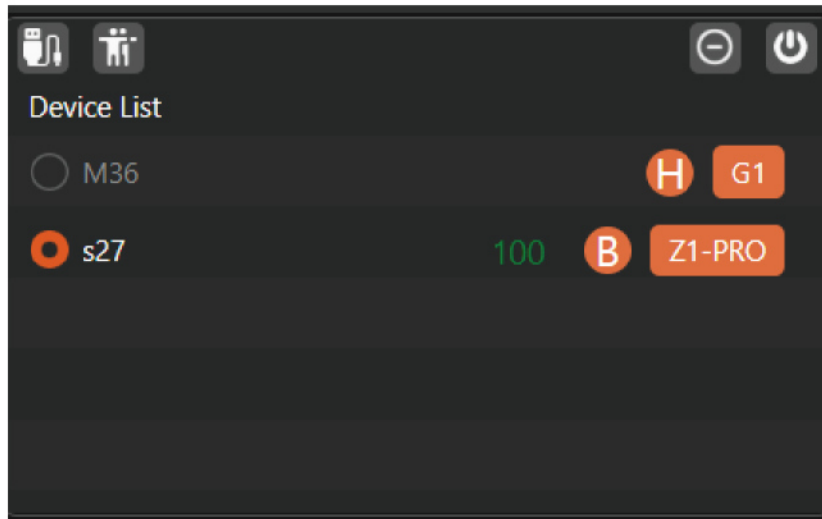
1.4.1 Motion Capture Suit

After launching Motion Studio, you must first create a new project or load an existing project before proceeding.



4.2.2 Connecting the Data Transceiver

After inserting the glove or sensor data transceiver into the computer, the device name will be displayed in the **Device List**.



4.2.3 Sensor Connection

- To activate the sensors:

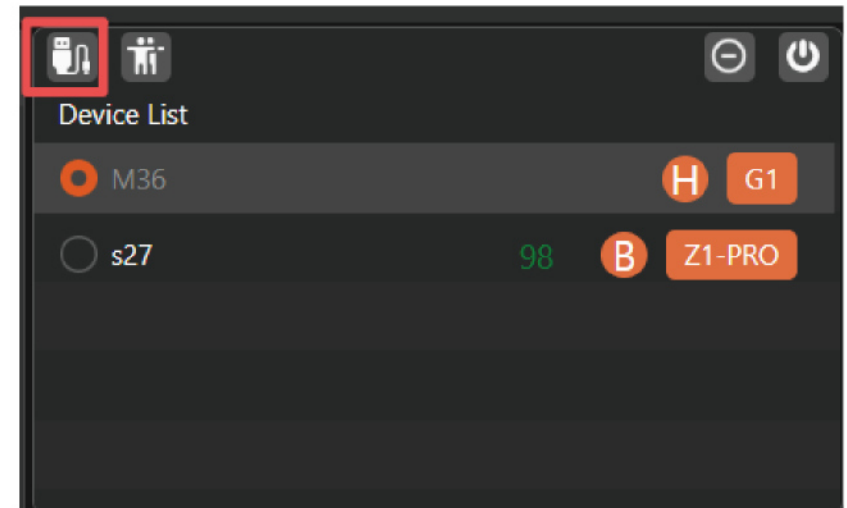
Insert and remove the Type-C cable from the charging case.

When the indicator lights on the sensors begin flashing, activation is successful.

- To connect the sensors:

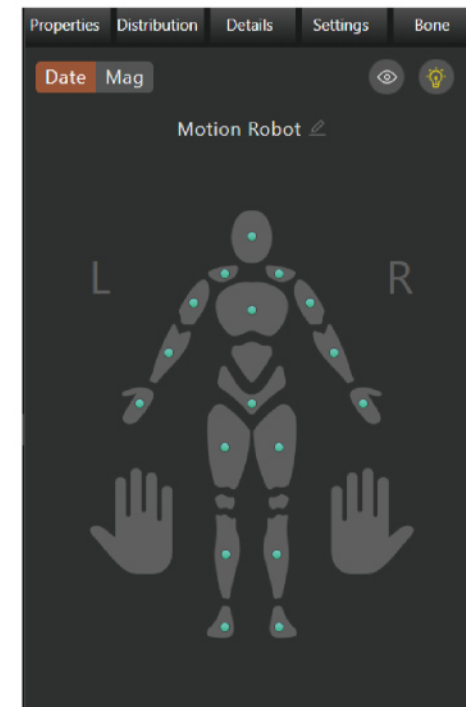
Click the **[Connect]** button in the software interface.

***Note:** During the connection process, all sensors must remain completely stationary, otherwise it may affect initialization accuracy.



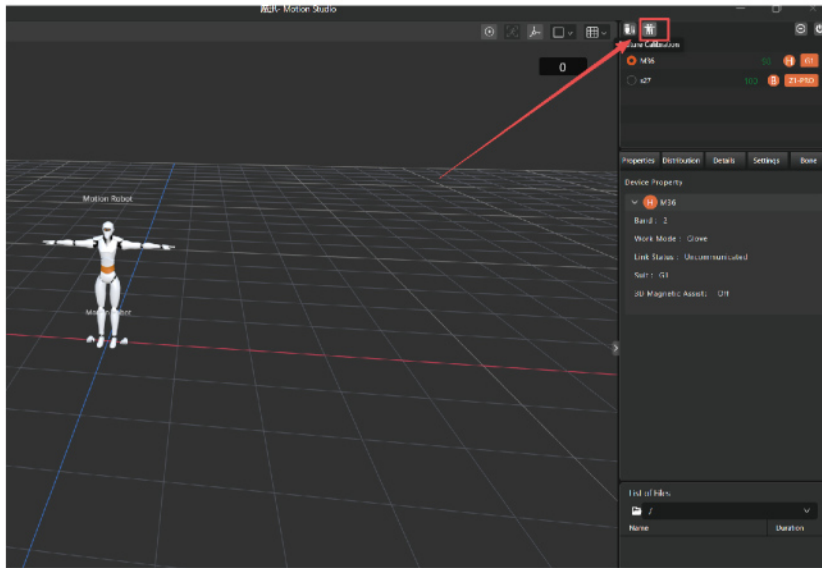
- After connection:

Check the Sensor Distribution panel: if all node indicators are lit, all sensors are successfully connected. When both full-body devices and gloves are connected simultaneously, the hand nodes on the body model will be disabled, while the glove nodes will be enabled.



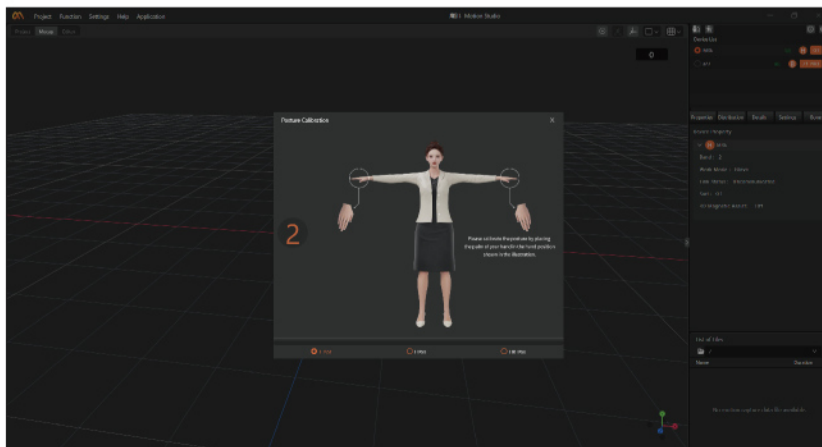
4.2.4 Pose Calibration

After wearing all sensors correctly, click the [Pose Calibration] button and follow the on-screen instructions to perform pose calibration. The specific requirements for each pose are as follows:



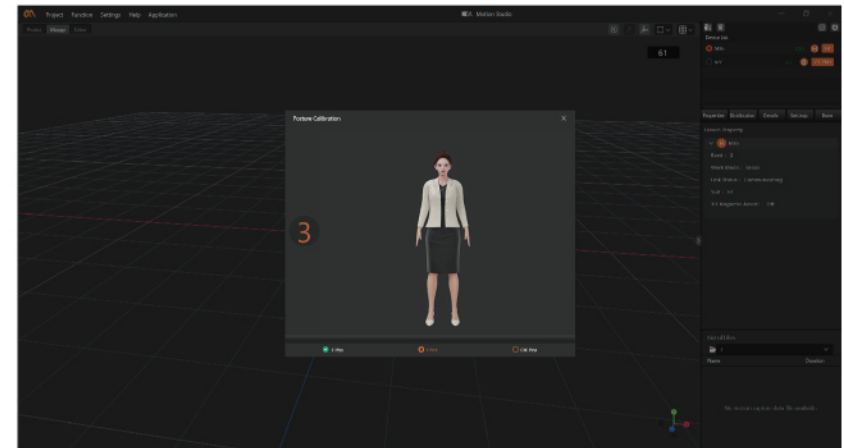
T-Pose

- Stand upright with both feet together. Extended both arms and horizontally to the sides, perpendicular to the body, with palms facing downward;
- Extended all fingers and keep together.



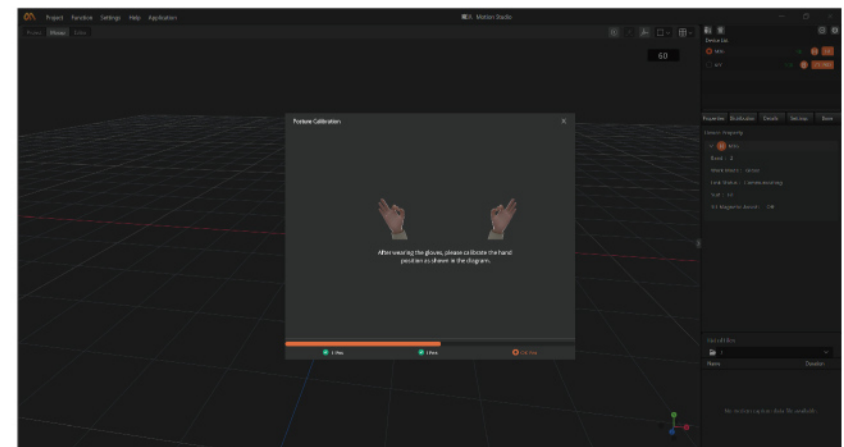
T-Pose

- Stand upright with both feet together;
- Let both arms hang naturally at the sides, palms facing inward. Keep fingers extended, with thumbs pointing toward the outside of the thighs;
- Look straight ahead, with the chin parallel to the ground;
- Keep shoulders relaxed and avoid shrugging.



OK-Pose

- Hold both hands approximately 30 cm (11.8in) in front of the chest;
- Form an “OK” gesture with both hands.

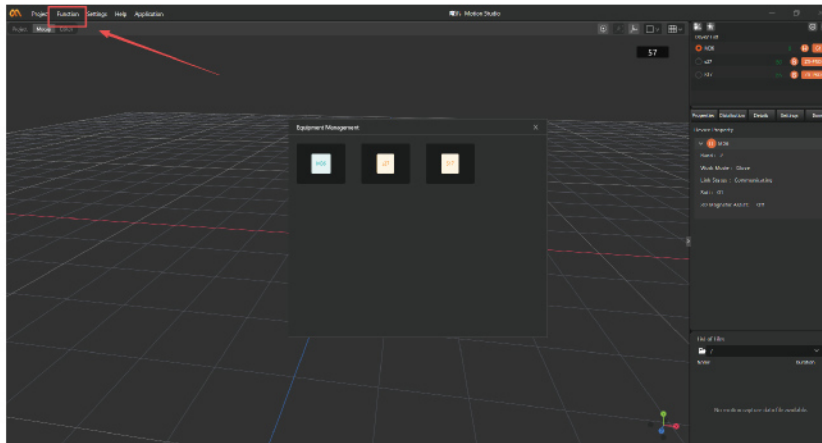


*Calibration Principle

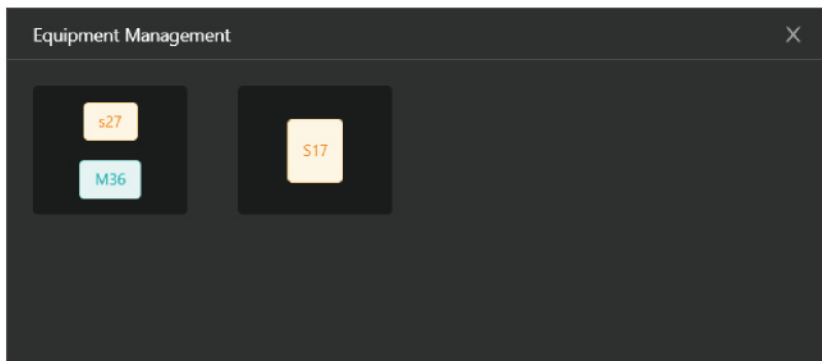
In inertial motion capture systems, pose calibration is used to establish the mapping relationship between sensor coordinates and the human body skeletal model. The accuracy and standardization of calibration poses directly affect motion tracking precision, stability of the skeletal model or overall motion capture quality. Users are strongly advised to follow both textual instructions and visual guides carefully.

4.2.5 Device Pairing

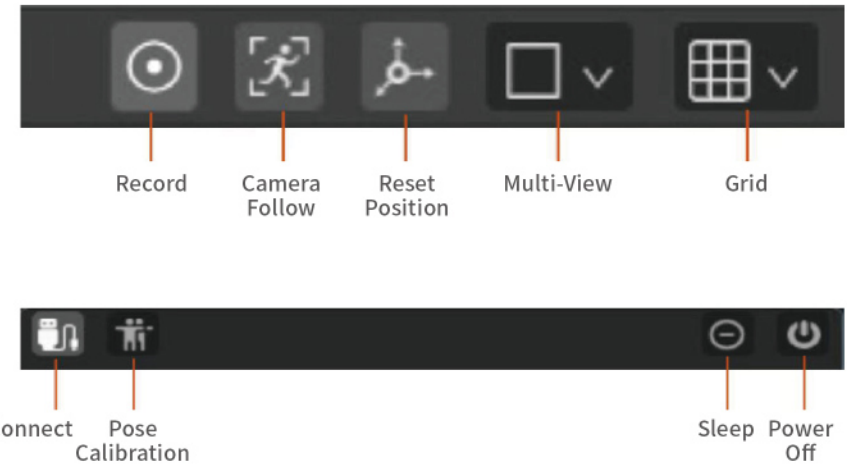
When multiple sets of glove devices and full-body devices are connected, users may select **Device Management** from the function menu to freely pair glove devices with full-body devices.



After combination, the Device Management interface will be displayed accordingly:

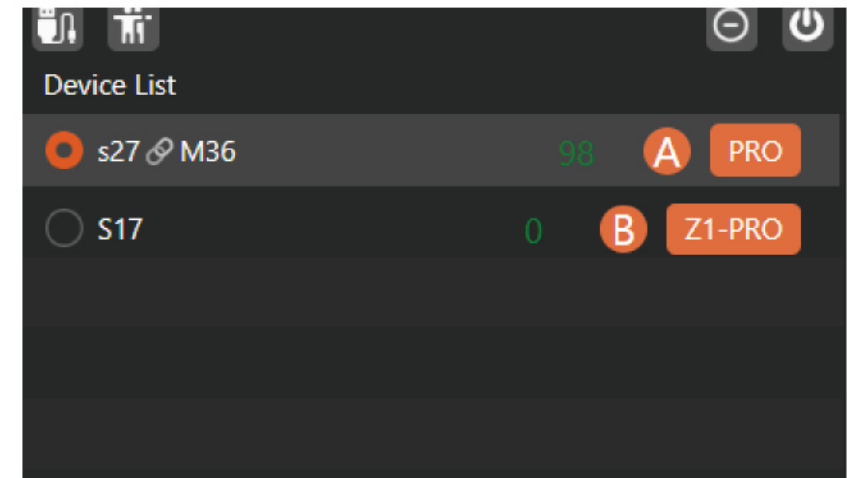


4.3 Function Description

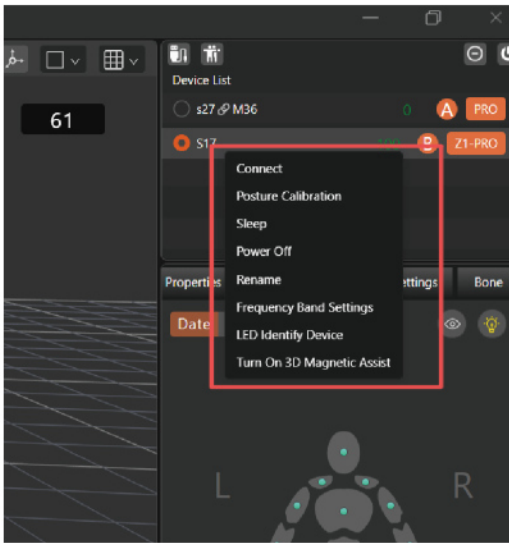


4.3.1 Device List

The **Device List** displays all devices currently connected to the system.

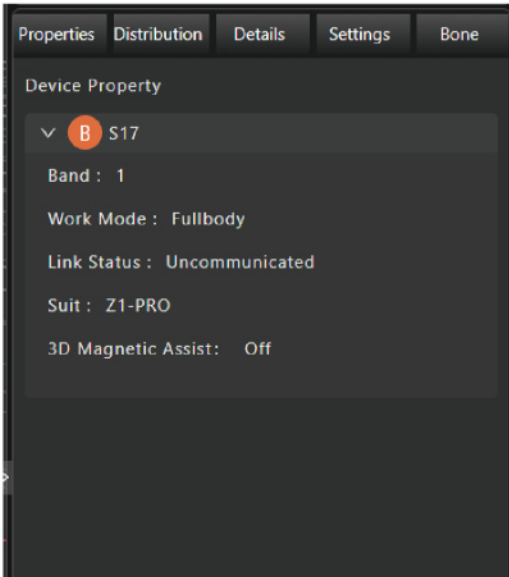


Select a device and right-click to perform individual operations such as **Connect**, **Pose Calibration**, and other device-specific actions.



4.3.2 Device Properties

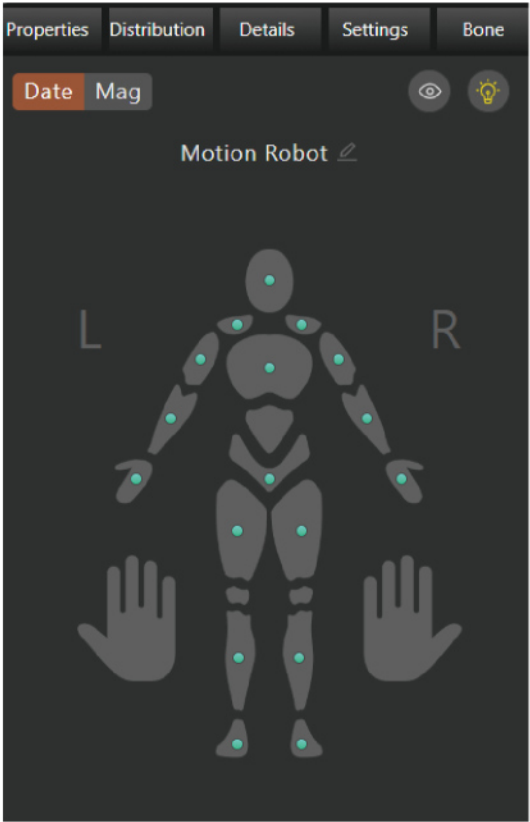
Detailed information for the selected device will be displayed, including frequency band, working mode, communication status and device type.



4.3.3 Sensor Distribution

Displays the packet reception rate and magnetic environment status of each sensor node.
Indicator Meanings:

- **Green**: Normal;
- **Orange**: Acceptable;
- **Red**: Poor;
- **Gray**: Not connected. Please check the connection between the sensor and the charging case.



4.3.4 Device Details

Displays detailed information for each sensor, including: packet reception rate, magnetic environment status and battery level.

Properties	Distribution	Details	Settings	Bone
Sensor	Number	Signal	Magnetic	Power
Head	01	100%	Poor	59
LeftShoulder	02	85%	Fair	79
RightShoulder	03	100%	Fair	87
LeftUpperArm	04	100%	Poor	100
Spine	05	100%	Good	90
RightUpperArm	06	100%	Good	59
LeftLowerArm	07	100%	Good	91
Crotch	08	100%	Fair	30
RightLowerArm	09	100%	Fair	80
LeftHand	10	100%	Fair	99
RightHand	11	100%	Fair	100
LeftUpperLeg	12	98%	Good	71
RightUpperLeg	13	100%	Fair	94
LeftLowerLeg	14	100%	Good	69
RightLowerLeg	15	98%	Fair	100
LeftFoot	16	100%	Fair	90
RightFoot	17	100%	Poor	99

4.3.5 Parameter Settings

Allows users to configure parameters according to different application scenarios.

PropertiesDistributionDetailsSettingsBone

Application Scenarios

Ground

Touchdown point

☒ Adaptive☐ Foot☐ Crotch☐ Hand

Constraint Mode

Normal

Joint Constraint

0.30

Yaw

0

Pitch

0

Model Initial Position

X0m

Y0m

Apply