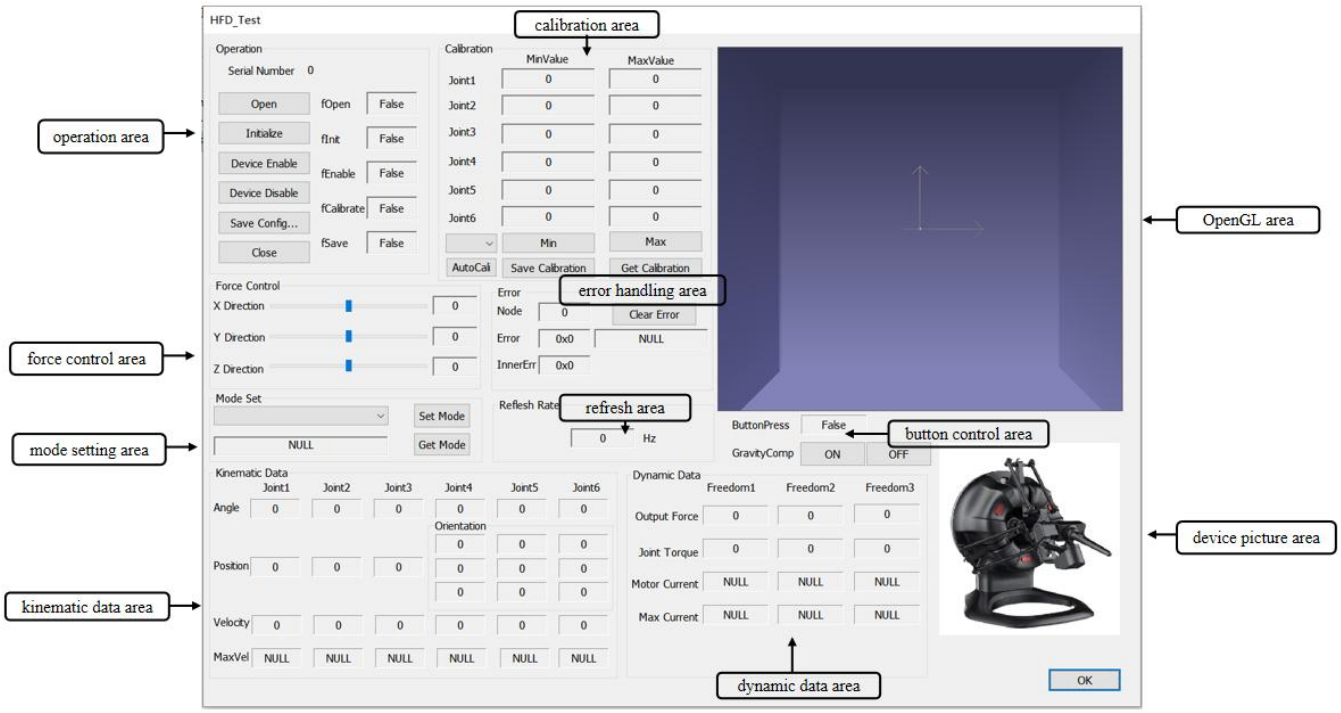
HFD_Test Software User Manual

Version 1.2

2023.11

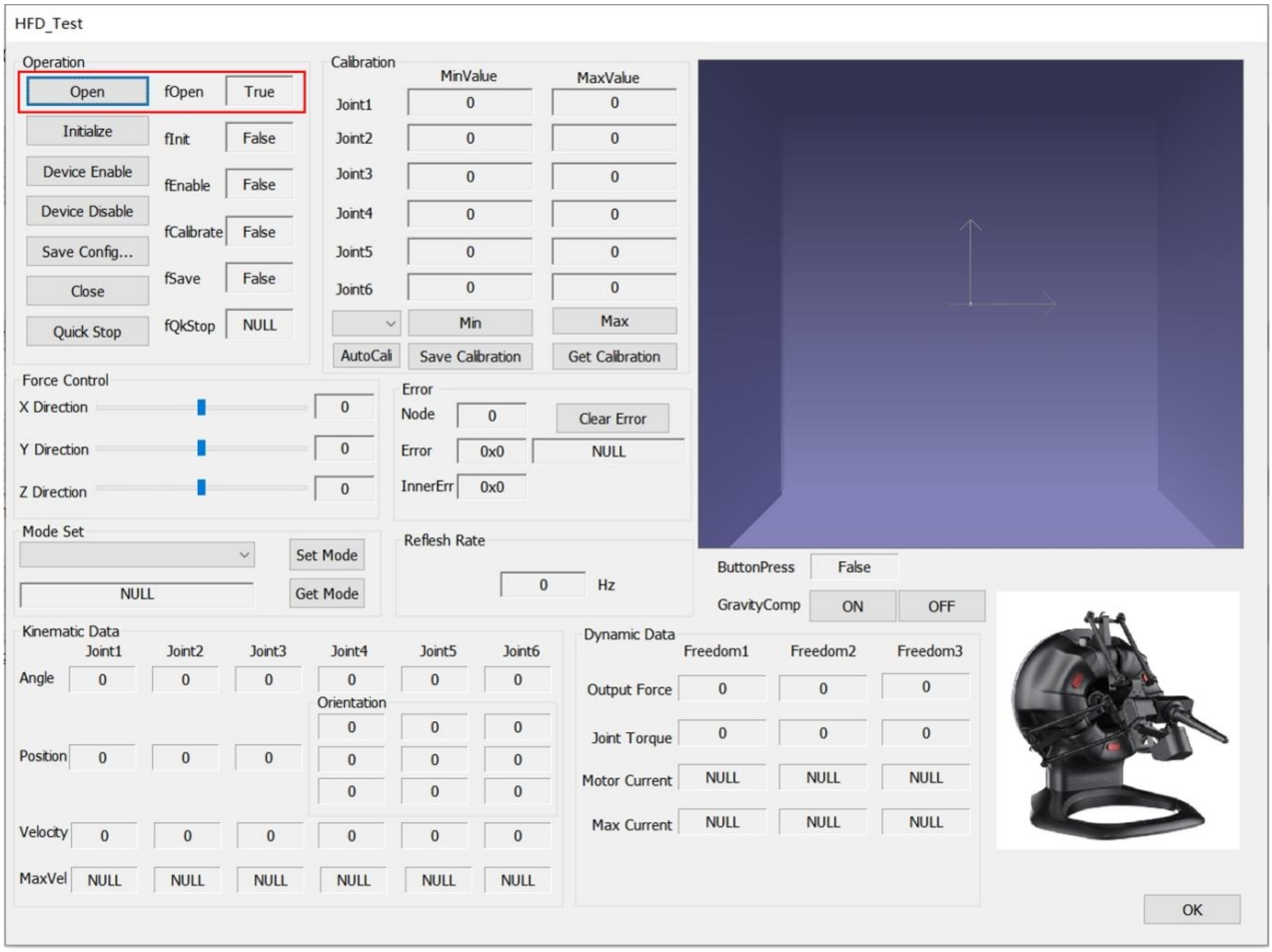


HFD_Test Software Interface

The HFD_Test software interface is divided into 10 sections：

1. **Operation Area(Operation)**
2. **Calibration Area（Calibration）**
3. **Force Control Area（Force Control）**
4. **Mode Setting Area（Mode Set）**
5. **Error Display Area（Error）**
6. **Refresh Rate Display Area（Refresh Rate）**
7. **Kinematic Data Display Area（Kinematic Data）**
8. **Dynamic Data Display Area（Dynamic Data）**
9. **OpenGL Scene Area**
10. **Device Image Area**

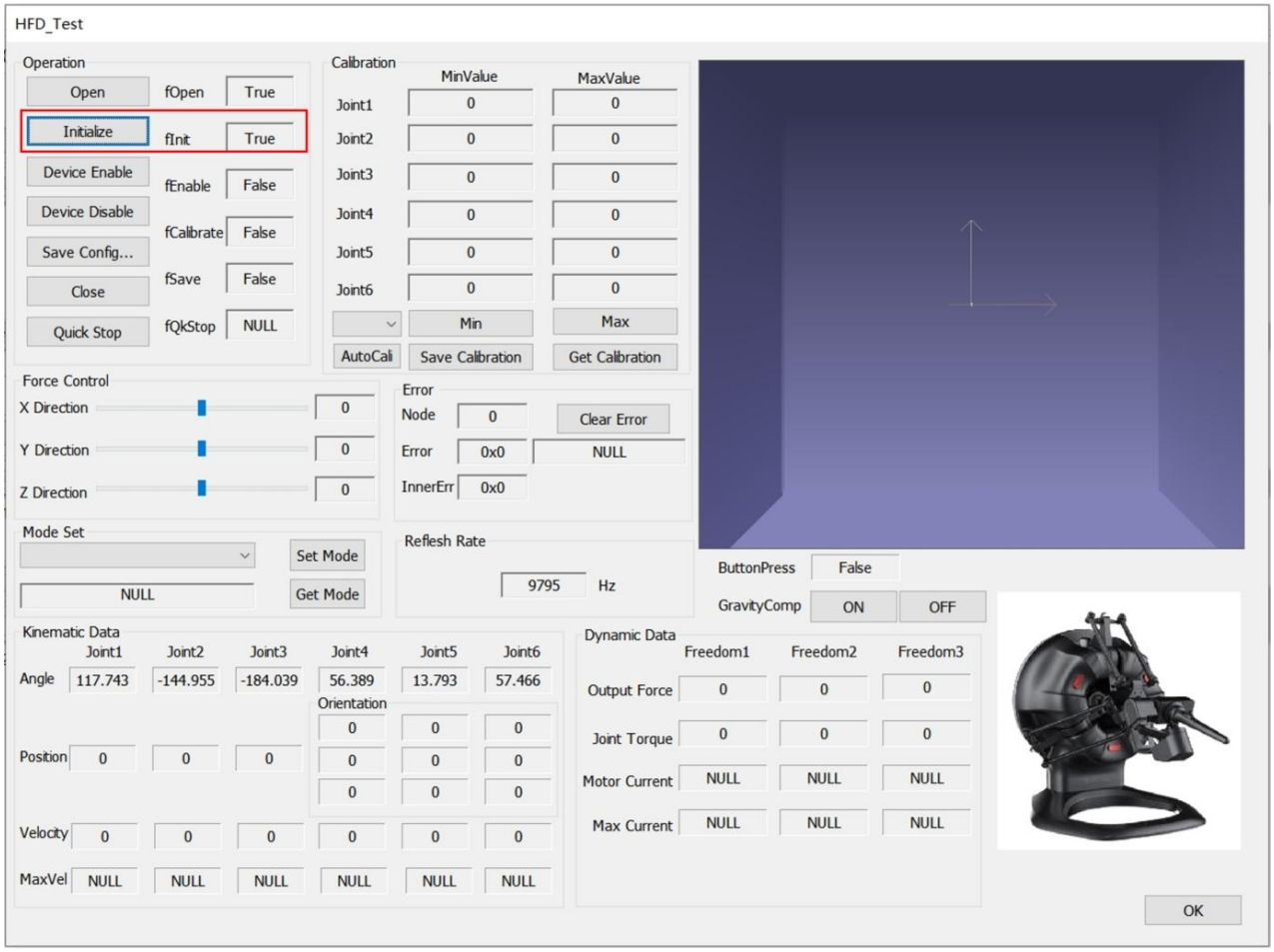
Step 1：Open the Device



Click the 【**Open**】 button in the **Operation Area**. If successful, the **fOpen** indicator on the right will change to **True**.

Function: Establishes USB communication between the computer and the HFD-6 device for data transmission.

Step 2：Initialize the Device

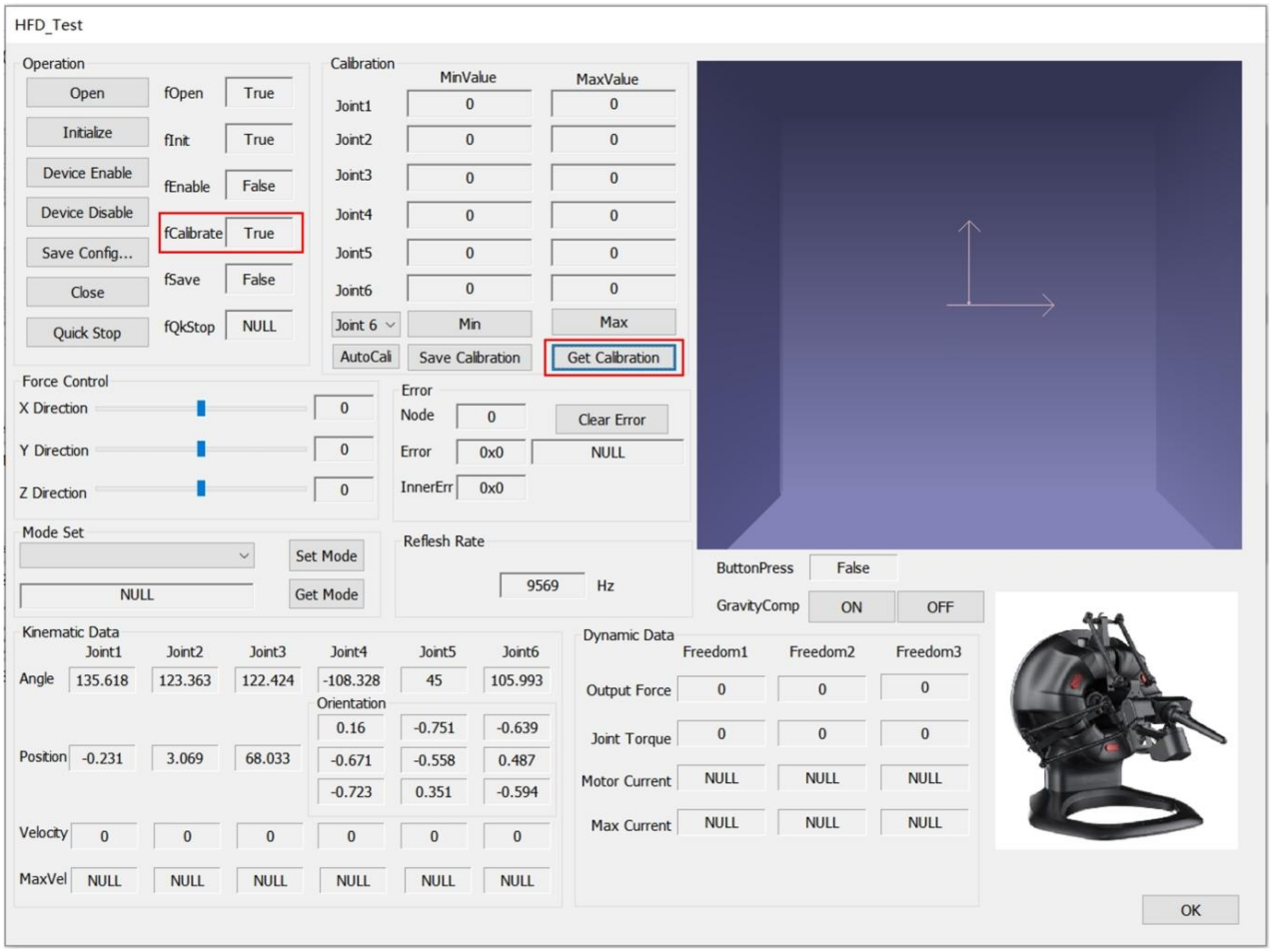


Click the【**Initialize**】button in the **Operation Area**. If successful, the **fInit** indicator will change to **True**.

Function: Configures device parameters, starts refresh threads, and sets initial values.

Step 3：Device Calibration

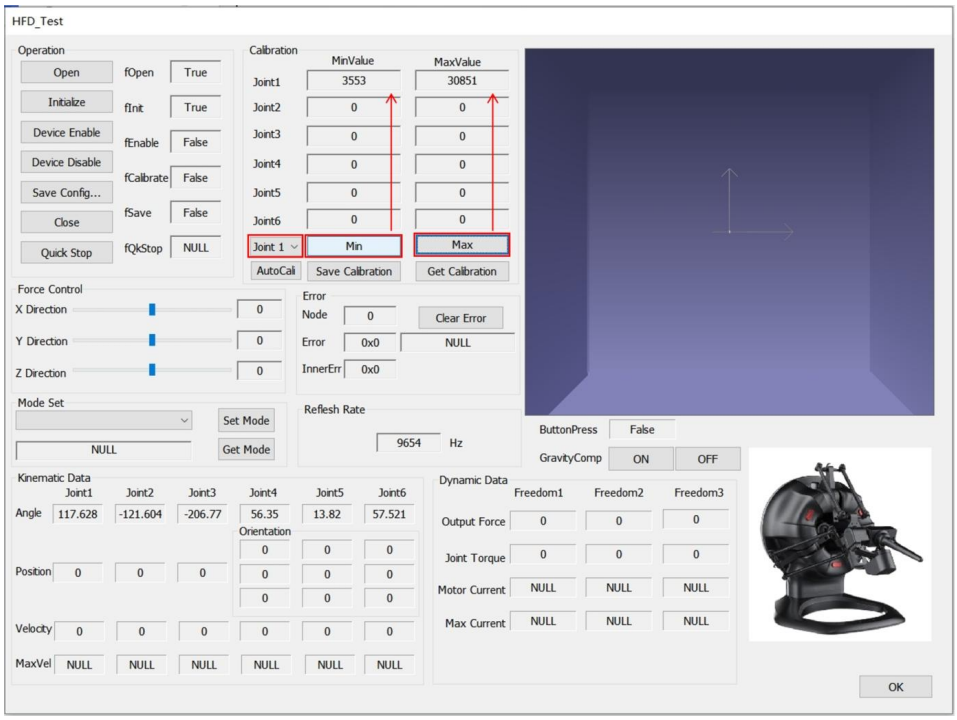
The device is pre-calibrated at the factory. For routine use, click 【**Get Calibration**】 in the **Calibration Area**.



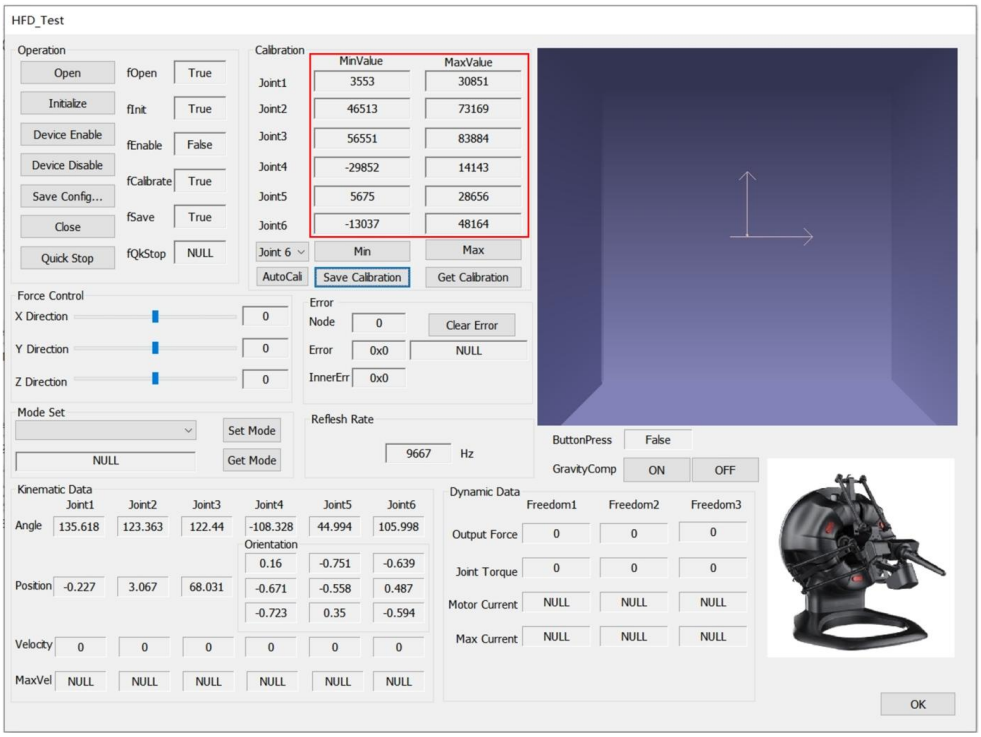
If the device has not been used for a long time or has been transported, it may cause the encoder to read data with offset. Therefore, it is necessary to calibrate the device again and save the calibration data to the chip.

Recalibration (if needed):

1. Select a joint (Joint1–Joint6).
2. Rotate the joint to its minimum or maximum position.
3. Click 【**Min**】 or 【**Max**】 to record encoder readings.
4. Repeat for all joints.



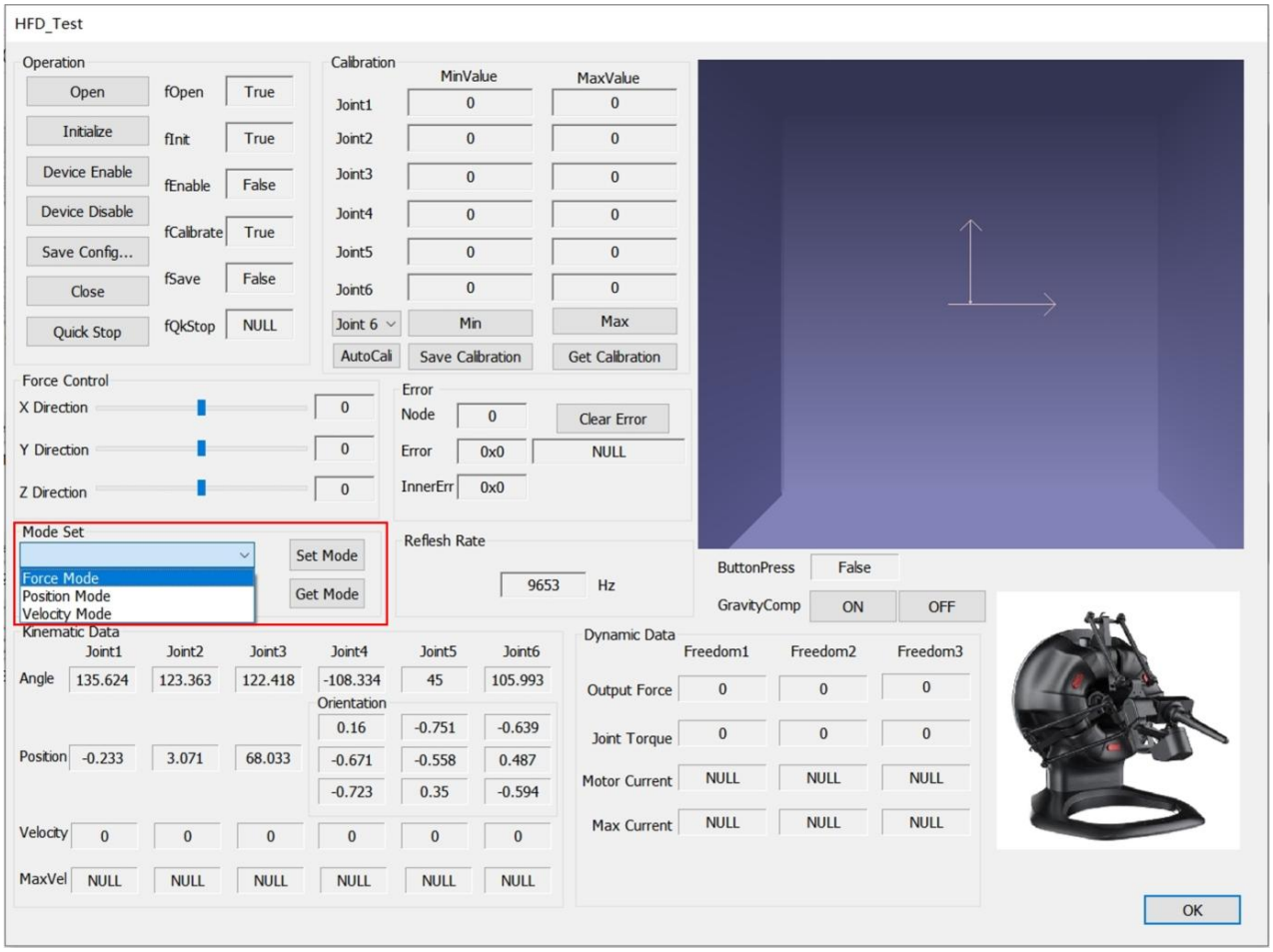
Complete the calibration data acquisition from Joint1 to Joint6 in sequence



Click 【**Save Calibration**】 to save data. The **fCalibrate** indicator will change to **True**.

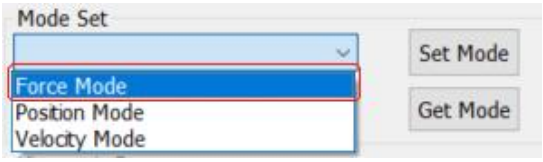
Note: After calibration, the OpenGL scene will display the end-effector movement.， At the same time, the kinematic data display area and the refresh rate display area will display some internal data of the device; Because the device has not yet been enabled at this time and damping has been set, moving the end of the device will feel quite awkward;

Step 4：Mode Setting



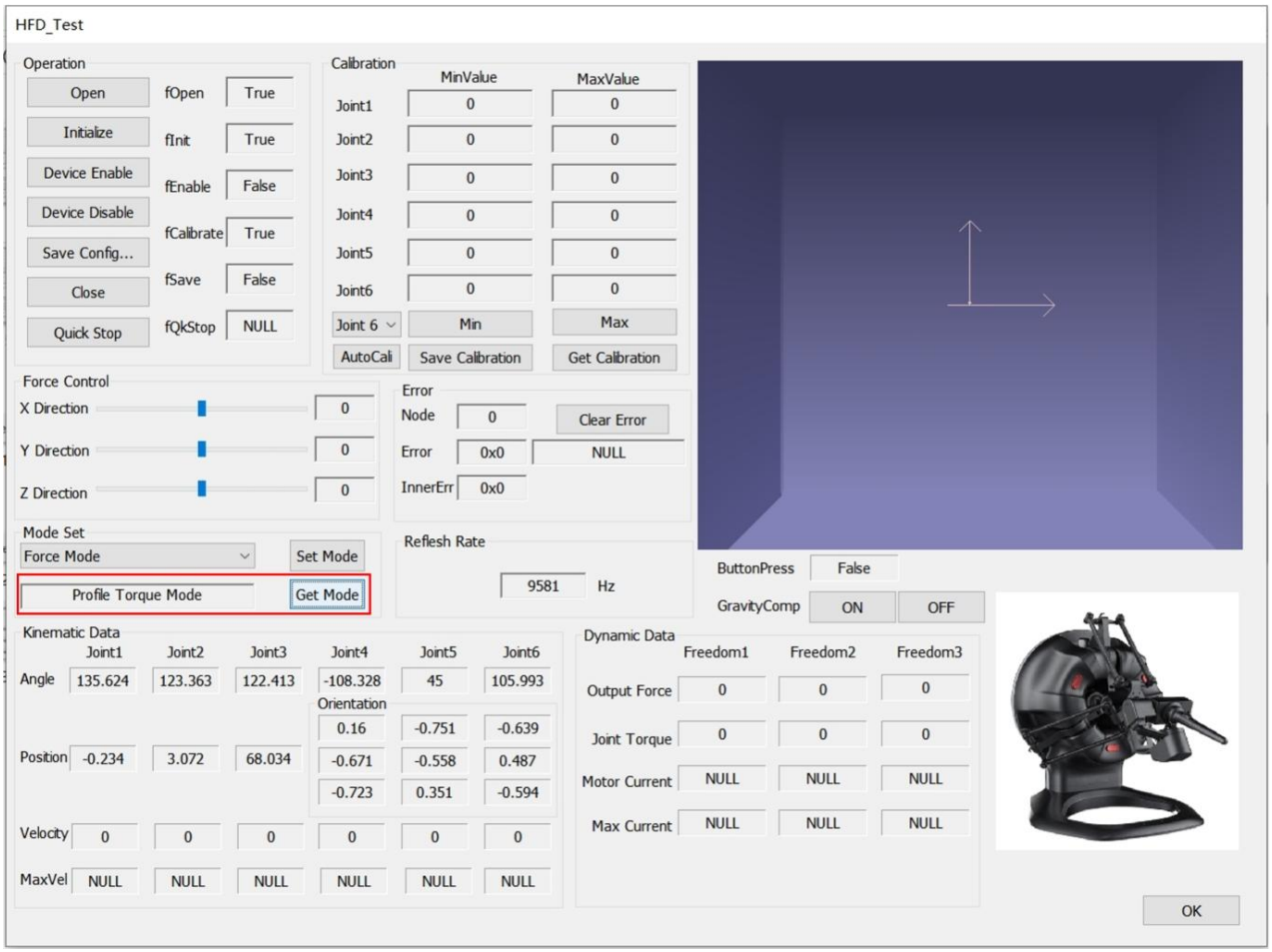
1.Select **Force Mode** from the dropdown in the **Mode Setting Area**.

2.Click 【**Set Mode**】 to activate.



Function: Configures the device for force feedback output.

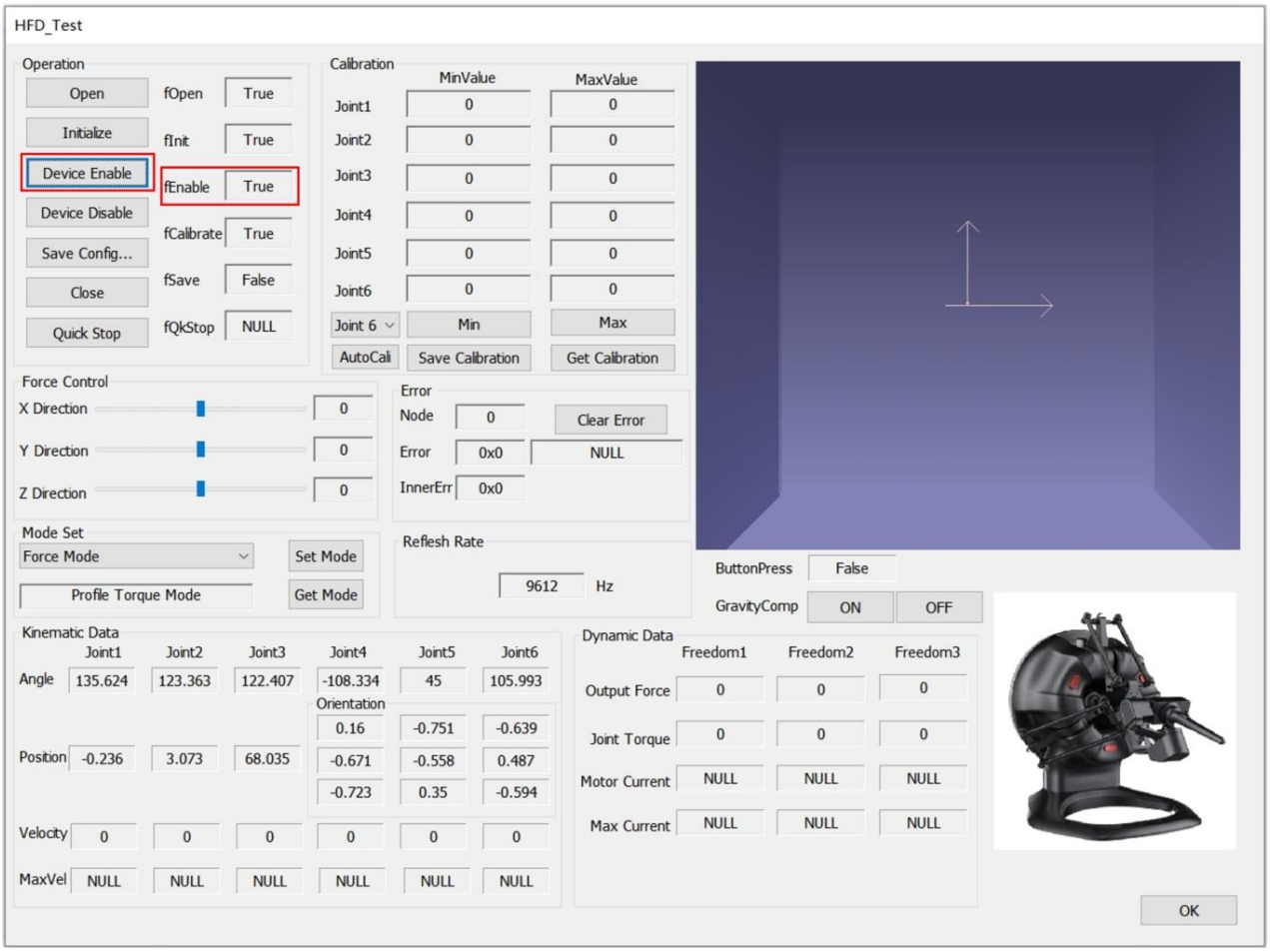
Step 5：Verify Mode



Click 【**Get Mode**】 to confirm **Profile Torque Mode** is displayed.

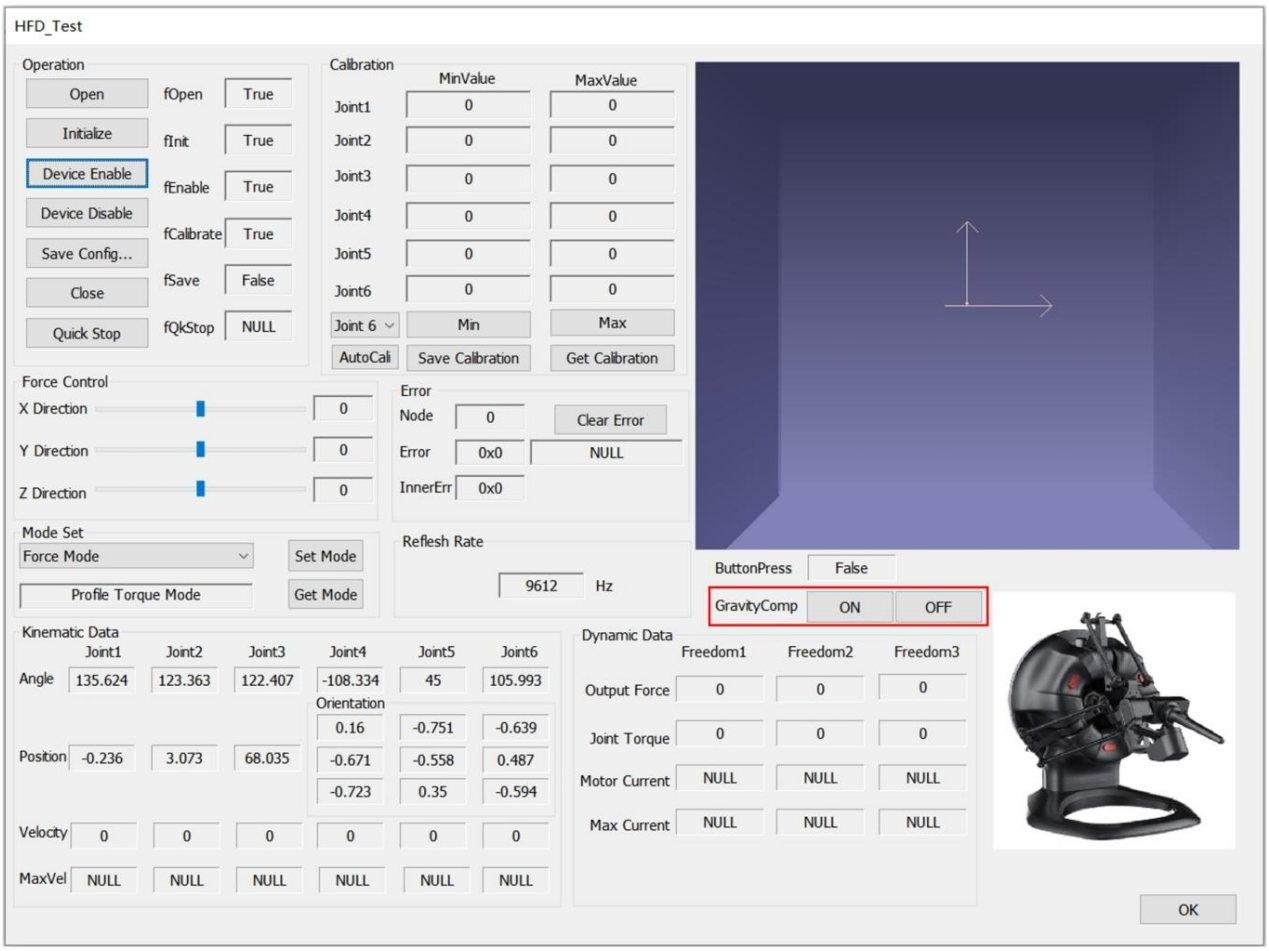
Step 6：Enable the Device

Click 【**Device Enable**】 in the **Operation Area**. If successful, the **fEnable** indicator changes to **True**.



Function: Switches the device from damping mode to force feedback output mode.At this point, it is possible to set the desired feedback force output and feel the corresponding magnitude and direction of the feedback force at the end of the handle. However, as the device has not yet activated gravity compensation, its own weight will influence the feedback force.

Step 7：Activate Gravity Compensation

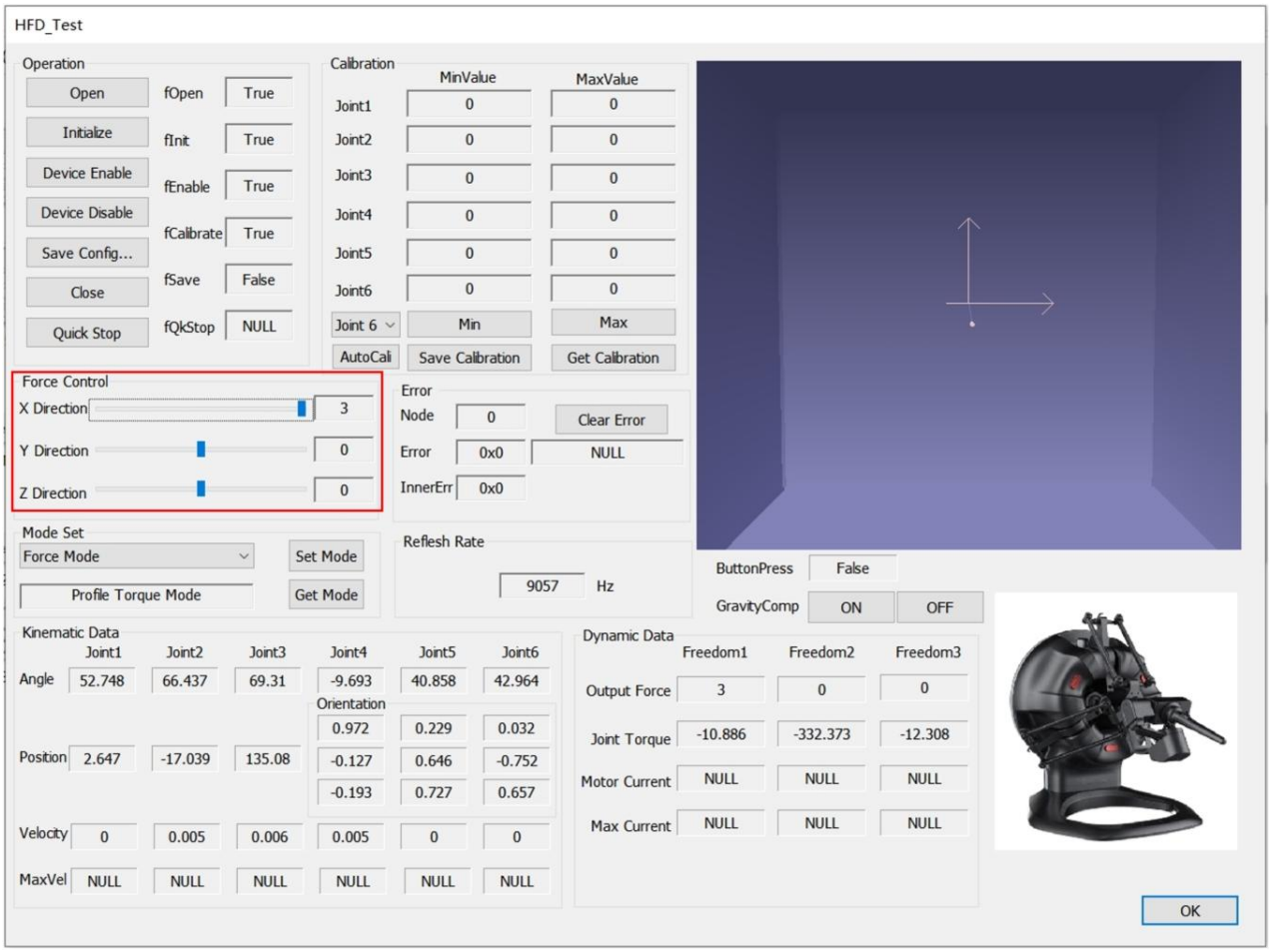


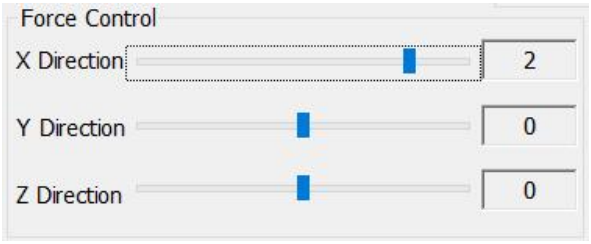
Click【**ON**】next to **GravityComp** to enable. The device will hover freely.Click【**OFF**】to disable the gravity compensation.

Function: Compensates for device weight to eliminate interference in force output.

Step 8：Force Output Control

WARNING:Hold the handle to prevent sudden movements during testing.





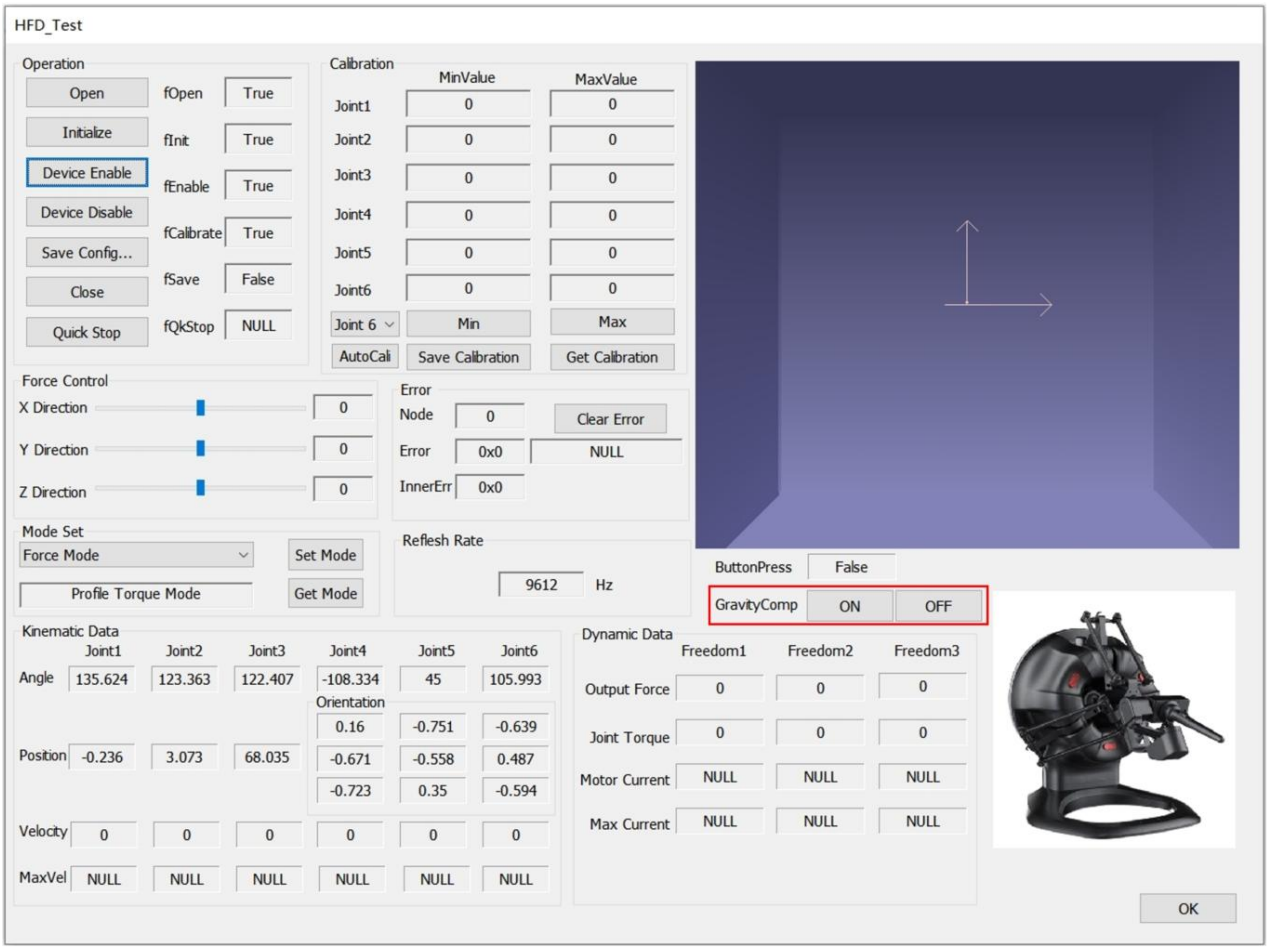
In the Force Control section, drag the sliding blocks in the **X Direction**, **Y Direction**, and **Z Direction** directions to output force in the X, Y, and Z directions on the device. Among them, dragging the slider to the left outputs feedback force in the negative direction of the corresponding axis;

X direction: **Right:** horizontal force to the right; **Left:** horizontal force to the left;

Y direction: **Right:** vertical force upward; **Left:** vertical force downward;

Z-**direction**: **Right:** outward force ; **Left:** inward force ;

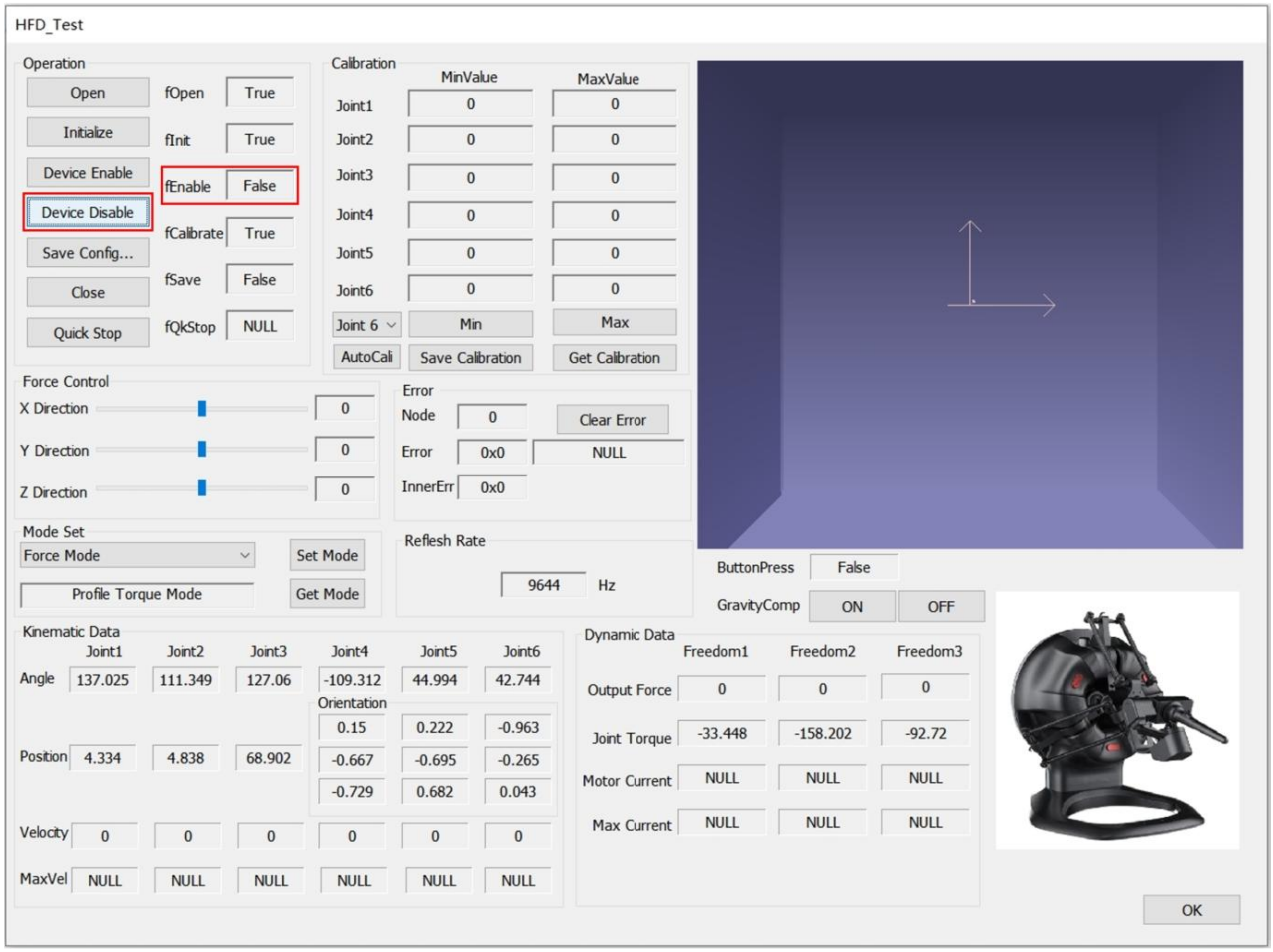
Step 9：Disable Gravity Compensation



Click 【**OFF**】 next to **GravityComp** to deactivate gravity compensation.

Funciton： turn off the gravity compensation of the device after use, so that the device is in a natural state.

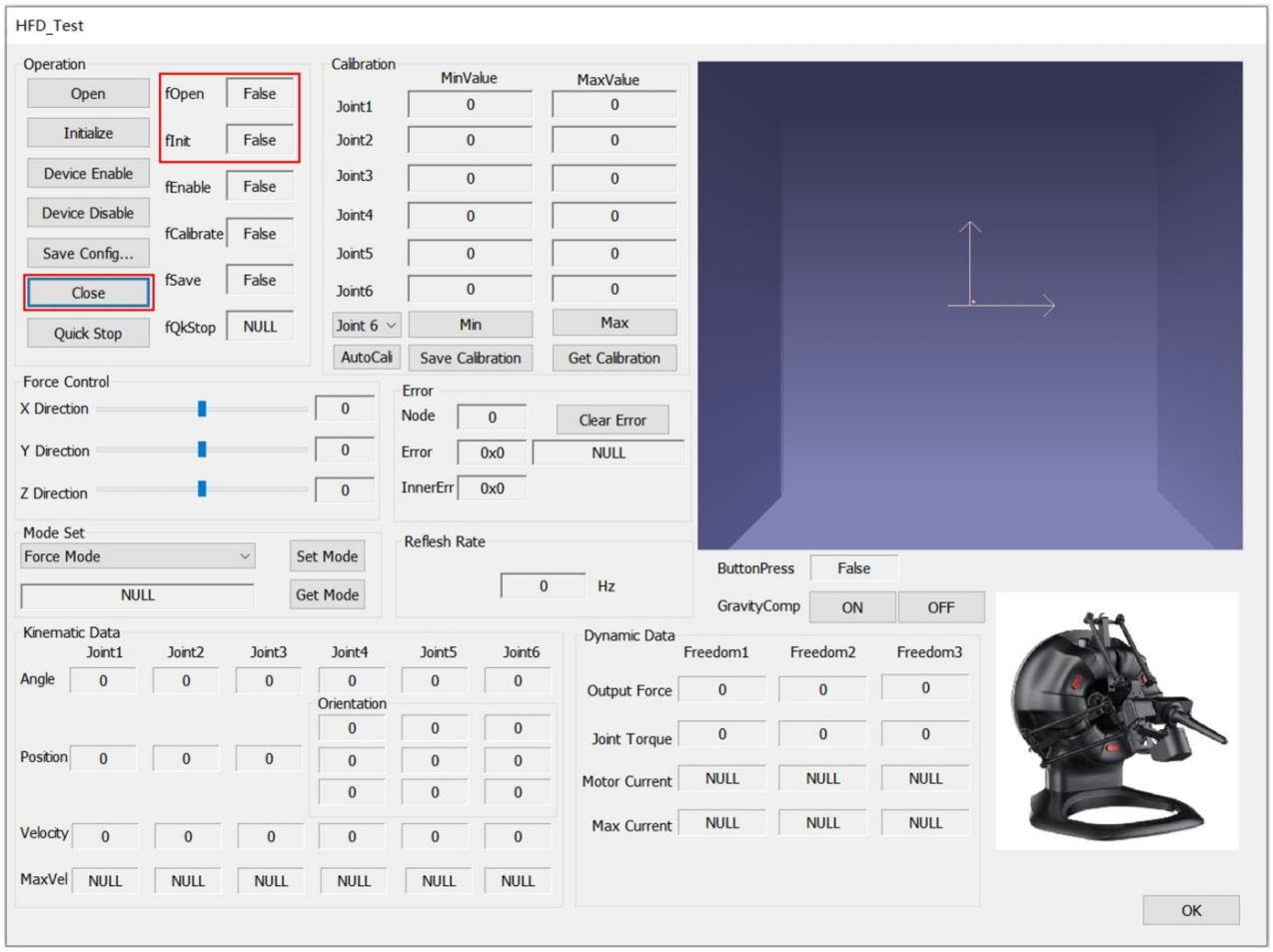
Step 10：Disable the Device



Click 【**Device Disable**】 in the **Operation Area**. The **fEnable** indicator changes to **False**.

Function: The main function of disabling the device is set the device to damping state from the enabled state, disable the feedback force output function of the device, and prepare for the subsequent shutdown of the device.

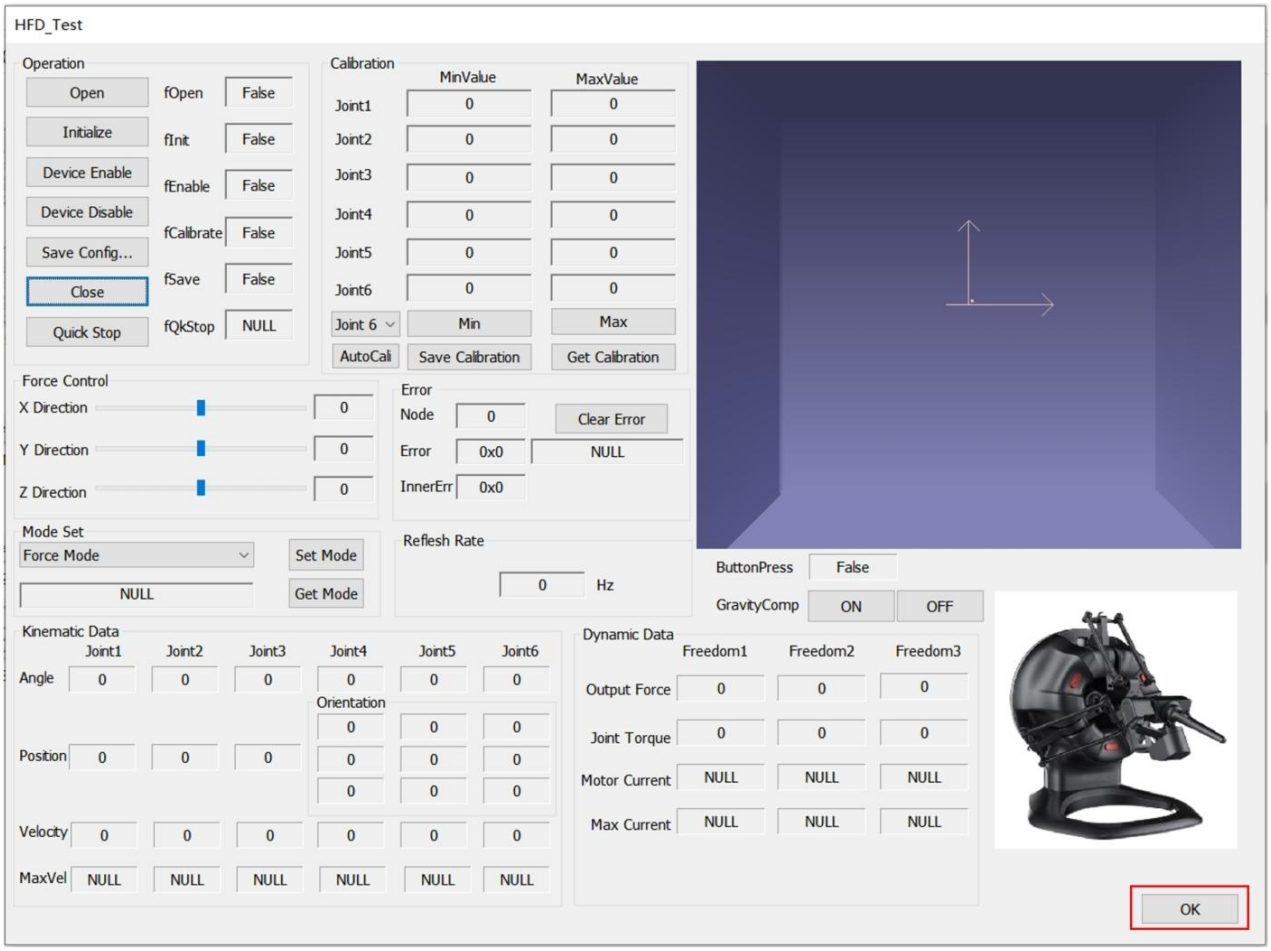
Step 11：Close the Device



Click 【**Close**】 in the **Operation Area** to terminate USB communication

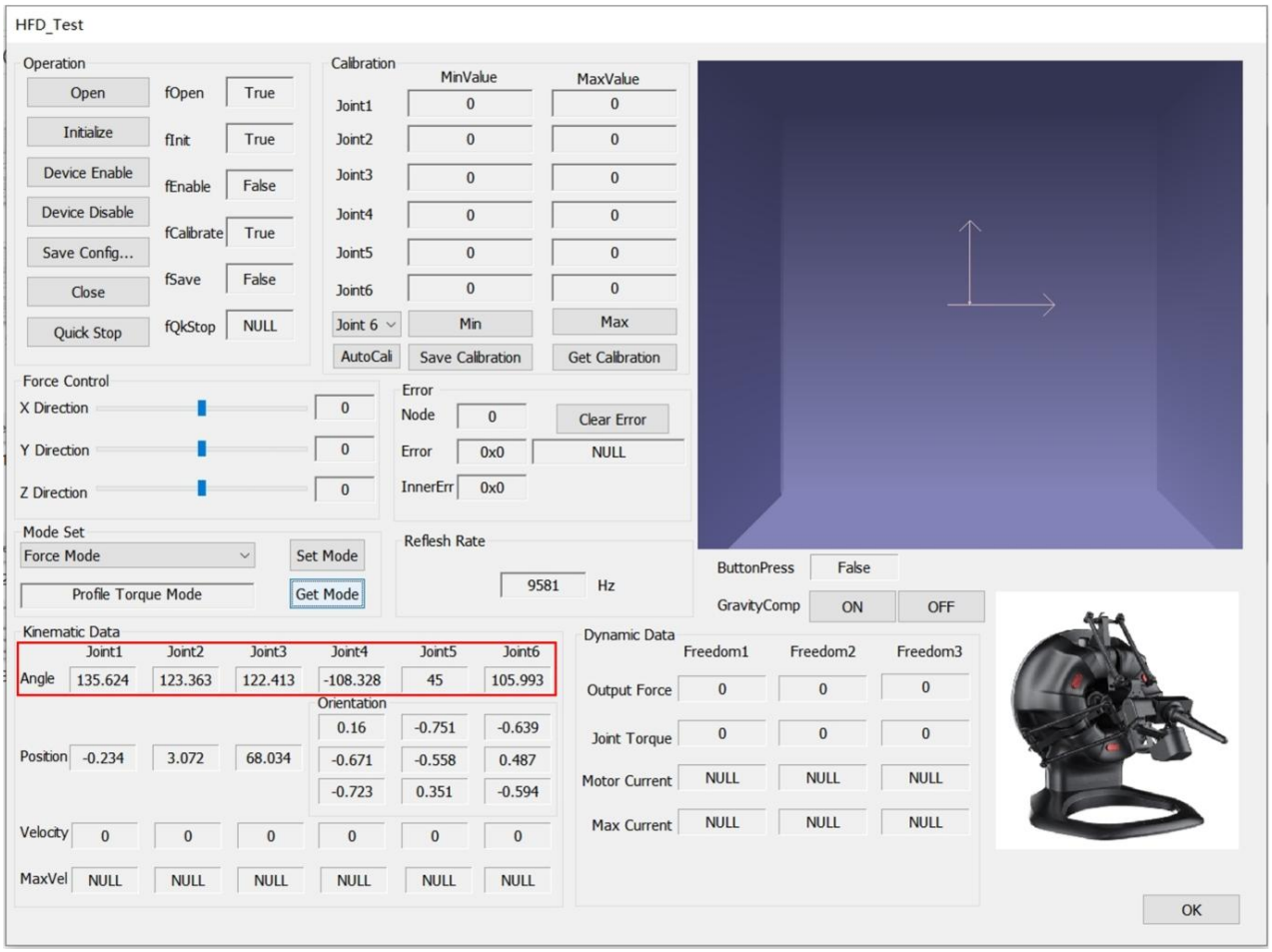
Function: The main function of close the device is to end threads in the software, clear relevant flag bits, and terminate USB communication between the device and the computer.

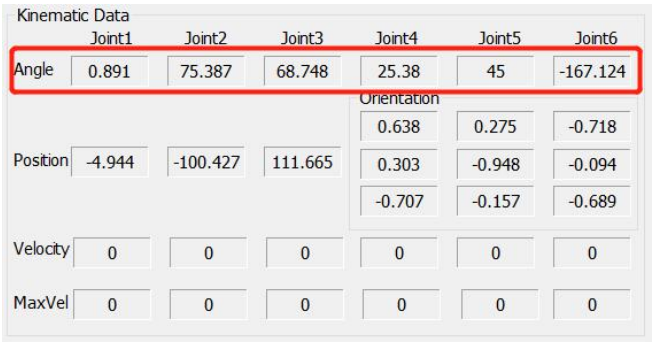
Step 12：Exit the Software

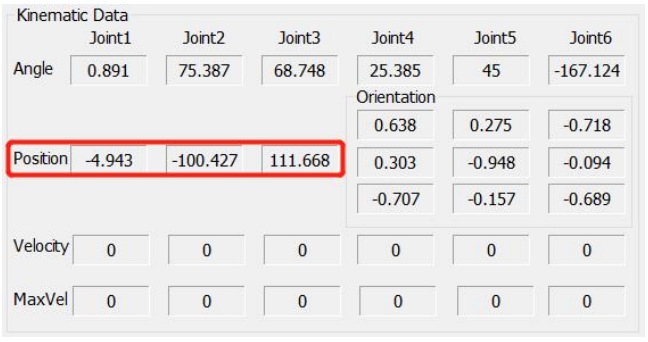


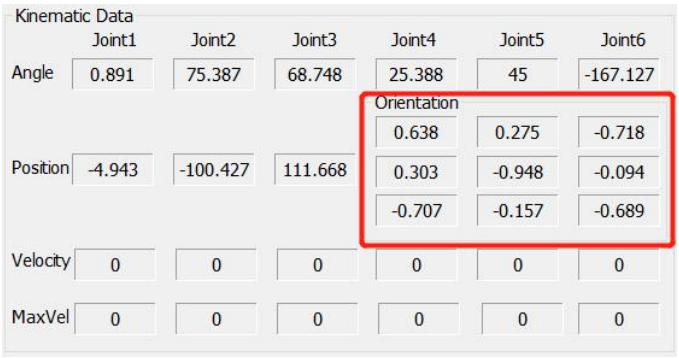
Click 【**OK**】 at the bottom-right to exit.

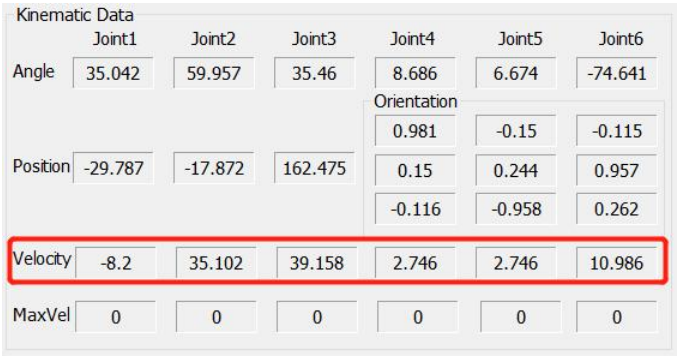
Kinematic Data Display Area











Kinematic Data display area, where each column represents information about each rotation axis Joint, consisting of six rotation axes: Joint1, Joint2, Joint3, Joint4, Joint5, and Joint6;

【Angle】: Joint rotation angle.

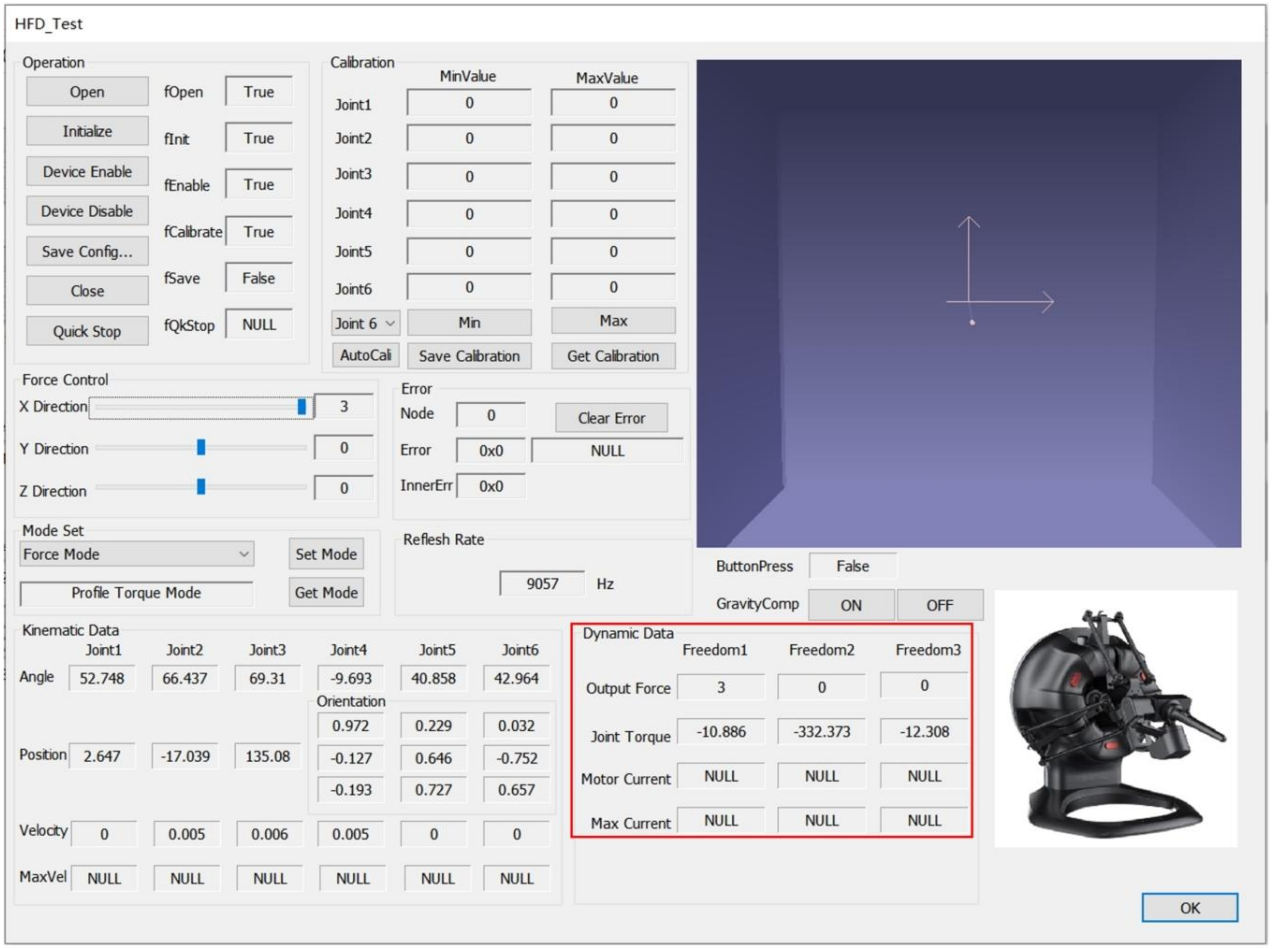
【Position】: End-effector coordinates (X, Y, Z).

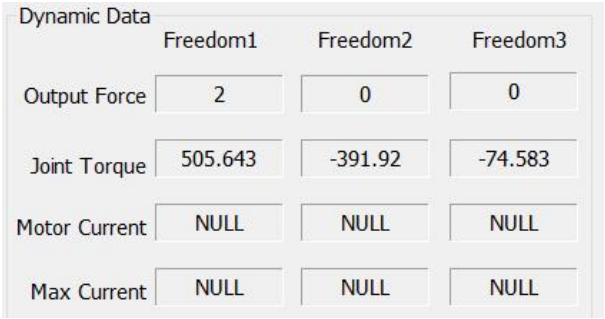
【Orientation】: 3×3 orientation matrix.

【Velocity】: Translational (Vx, Vy, Vz) and rotational speeds.

【MaxVel】: Maximum joint speed (currently inactive).

Dynamic Data Display Area





Displays data for Freedom1–Freedom3:

【Output Force】： X/Y/Z-axis force values；

【Joint Torque】： Torque on the first three axes；

【Motor Current】： Motor current values (inactive)；

【Max Current】： Peak motor current (inactive)；