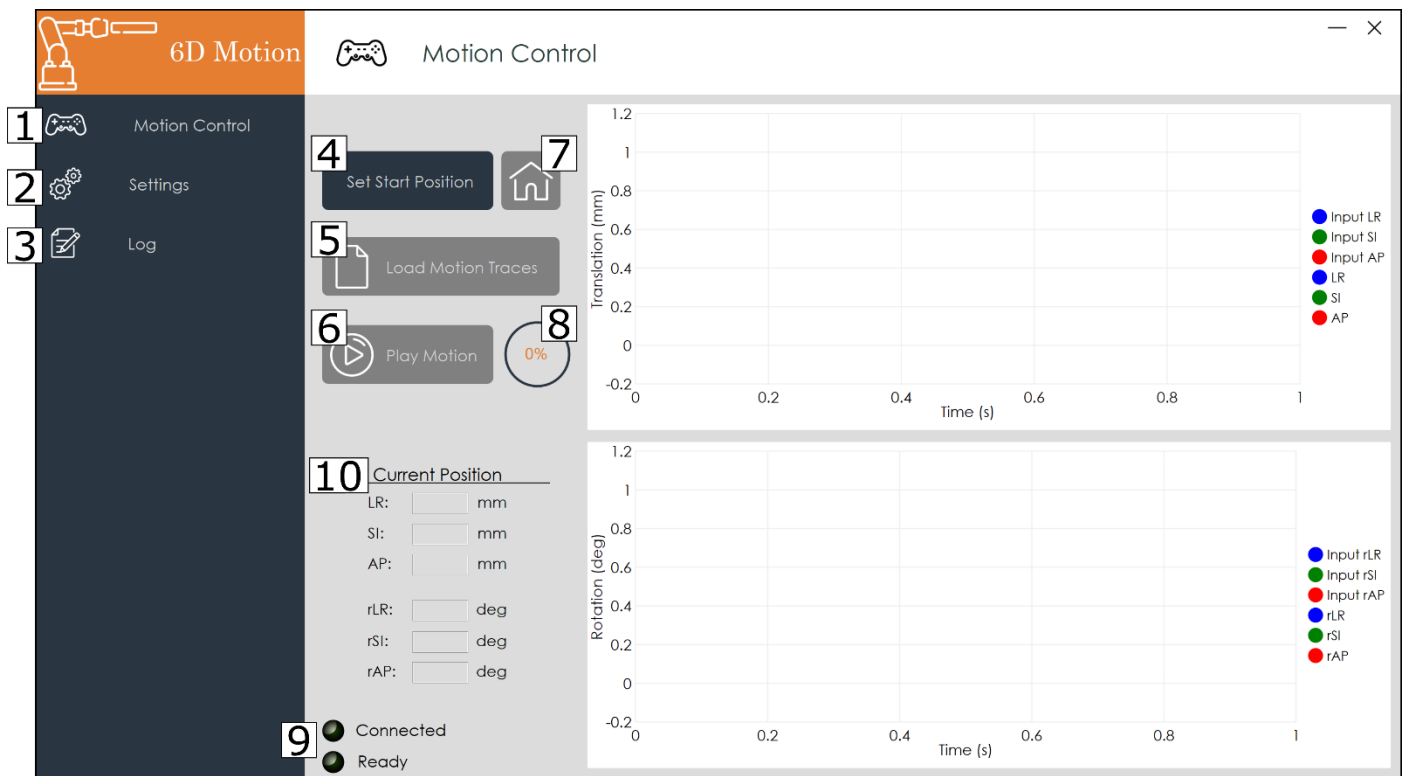


Robotic Motion Phantom Software GUI Guide





1. Motion Control tab

Opens controls to load traces and run motion.

2. Settings tab

Opens settings for robotic motion phantom.

3. Log tab

Opens log box to view status of robotic motion phantom.

4. Set Start Position

Once the phantom is setup and aligned, click the *Set Start Position* button. This will first establish a connection with the robot and get the current (aligned) position of the phantom.

5. Load Motion Traces

Once the *Set Start Position* button is clicked and a connection to the robot established the *Load Motion Trace* button will become active. This will allow the user to load a .txt file in the following format [t x y z rx ry rz] with units of [sec mm mm mm deg deg deg], note this is space delimited not tab. The loaded trace will be then displayed in the graph on the right. Note: If exporting the motion traces from MATLAB, using the *dlmwrite* function is recommended. e.g. `dlmwrite('output.txt',TraceArray,'');`

6. Play Motion

Once the loaded trace is complete and the transformed motion is checked for irregular motion (singularity check, large motion check) the *Play Motion* button will become active. Clicking this will send the data to the robot and run the motion. The play icon will change to a stop icon and renamed to *Stop Motion*, clicking *Stop Motion* will stop the robot from moving.

7. Home

The home button will send the robotic phantom back to the original start position which was set by the *Set Start Position* button. If the robot is repositioned and the *Set Start Position* is clicked again the new home position will be updated to that position.

8. Status Bar

Provides an estimated status of progress of the motion that is running.

9. Display LEDs

Provide information if the robot and connected and ready for motion. If there is an issue with the motion such as a singularity or very large motion the Ready LED will be red and the Play button will become inactive. If both LEDs are green motion can be run.

10. Current Position Value Box

Displays the current position of the robot when a motion trace is running.

The screenshot shows the '6D Motion' software interface. On the left is a dark sidebar with three icons: a game controller for 'Motion Control', a gear for 'Settings', and a notepad for 'Log'. The 'Settings' section is active. The main panel is titled 'Settings' and contains several numbered sections: 1. 'Connection' with an IP address field set to '192.168.94.11'. 2. 'Origin of Motion' with input fields for x, y, z (in mm) and rx, ry, rz (in rad). 3. 'Outputs' with toggle switches for 'Logfile' (On), 'UrScript' (Off), and 'Data' (On). 4. 'Payload' with a 'Mass' field set to '2.23 kg'. 5. 'Motion Type' with a dropdown menu currently showing 'movej'. 6. 'Kinematics' with a 'Sample rate' field set to '0.2 s'. 7. 'Aligned Position' with fields for x, y, z (in m) and rx, ry, rz (in rad), and a 'Move to Aligned Position' button. The current values for aligned position are x: 509.15 m, y: -6.25 m, z: 208.7 m, rx: 2.405 rad, ry: -2.409 rad, rz: 2.432 rad.

1. Connection

Input the IP address of the robotic controller for TCP/IP connection. IP address can be changed on the Teach Pendant under settings → network (See getting started document).

2. Origin of Motion

Sets the origin of motion for both translation and rotation for the input traces relative to the centre of the end-effector (See getting started document). This is also known as the Tool Centre Point (TCP), see URScript documentation.

3. Outputs

Output files can be turned on and off. Logfile outputs a .txt of the logging information during a motion run. UrScript outputs what is sent to robotic controller for executed motion, this is in the robot API language. Data outputs the motion recoded from the robot as a .txt file in the format [Time (s) x (mm) y (mm) z (mm) rx (deg) ry (deg) rz (deg)] (space delimited).

4. Payload

Input the weight of the phantom in kg including the tool attachment to the end-effector (important for safety of robot and accurate motion).

5. Motion Type

Two motion types can be run movej (default) and movel. Movej makes the robotic arm move from point a to b in the most efficient way when moving the joints on the arm. Movel makes the robotic arm move from point a to b linearly, i.e. the joints will move in a way that will force the phantom to move in a straight path.

6. Kinematics

The sample rate defines the velocity and acceleration of the robotic phantom. The input sample rate should be the same as the input data sampling frequency. This will allow the robot to move from point a to b at the set input sampling time.

7. Aligned Position

Once the robotic phantom is aligned to the treatment isocentre, the user may record the 6DoF position from the tablet of the robot in the *Base coordinate system*.