# MPC200 in μ−Manager
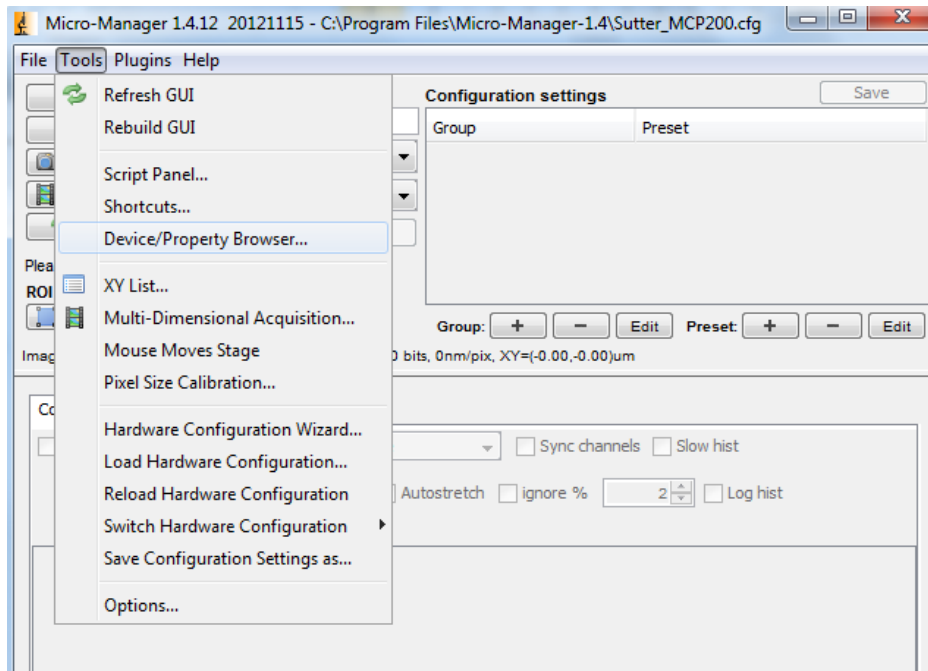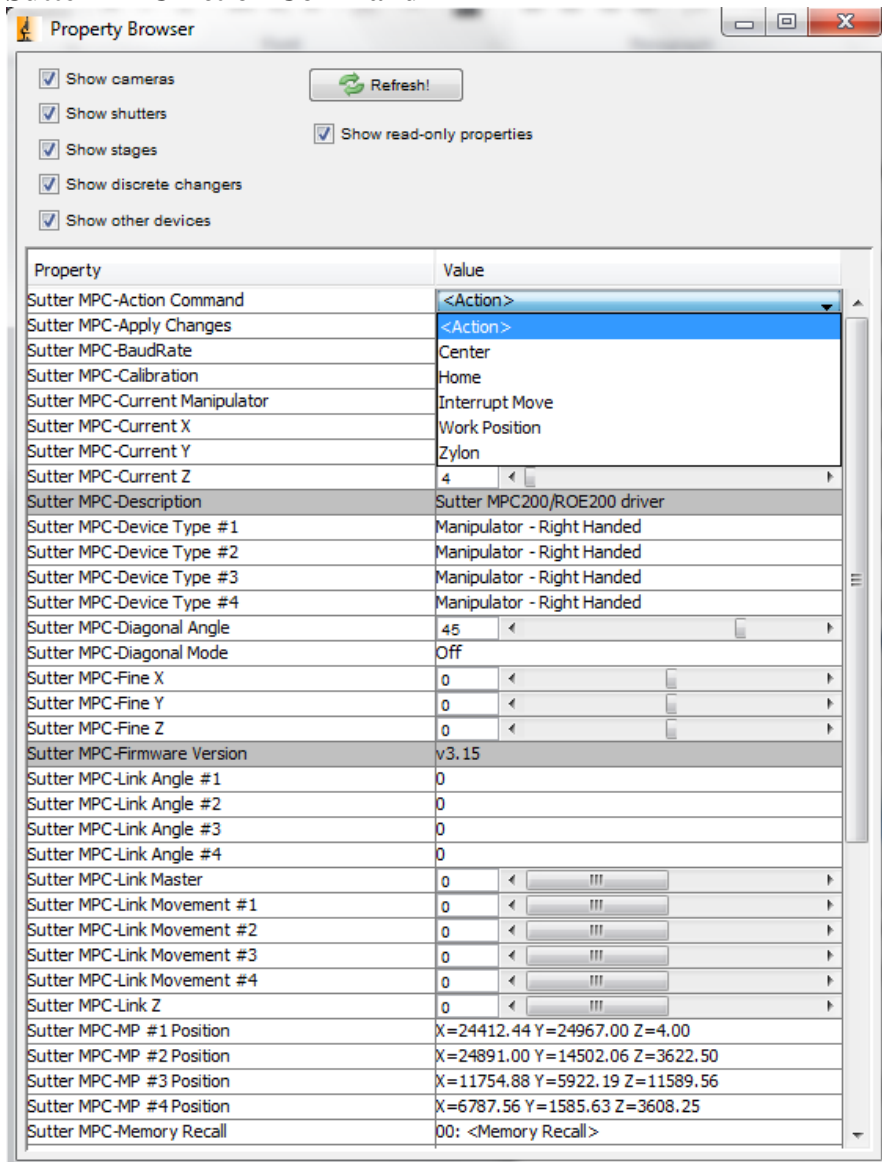# A Quick Reference

**Using μ-Manager to Operate MPC200**

To use Sutter MPC-200 in μ-Manager navigate to Tools→ Device/Property Browser

**Sutter MPC Action Command**



**All options correspond to the buttons on the ROE200**
The following options are seen in this drop down menu:

Center = Calibrate each manipulator using the ROE. Not to be confused w/ MPC Calibration drop down menu in µ–Manager. See below for µ–Manager Calibration menu.

Home= Coordinates X=0, Y=0, Z=0. If the manipulators are setup correctly, right handed manipulator on the right of the microscope, left handed manipulator on the left, Home is the point most away from the preparation to allow room to change pipettes. ***Note:*** *You must go Home first to go to Work Position.*

Interrupt Move = Corresponds to the Stop button on the ROE. This allows stopping of a robotic action such as going Home or to Work Position.
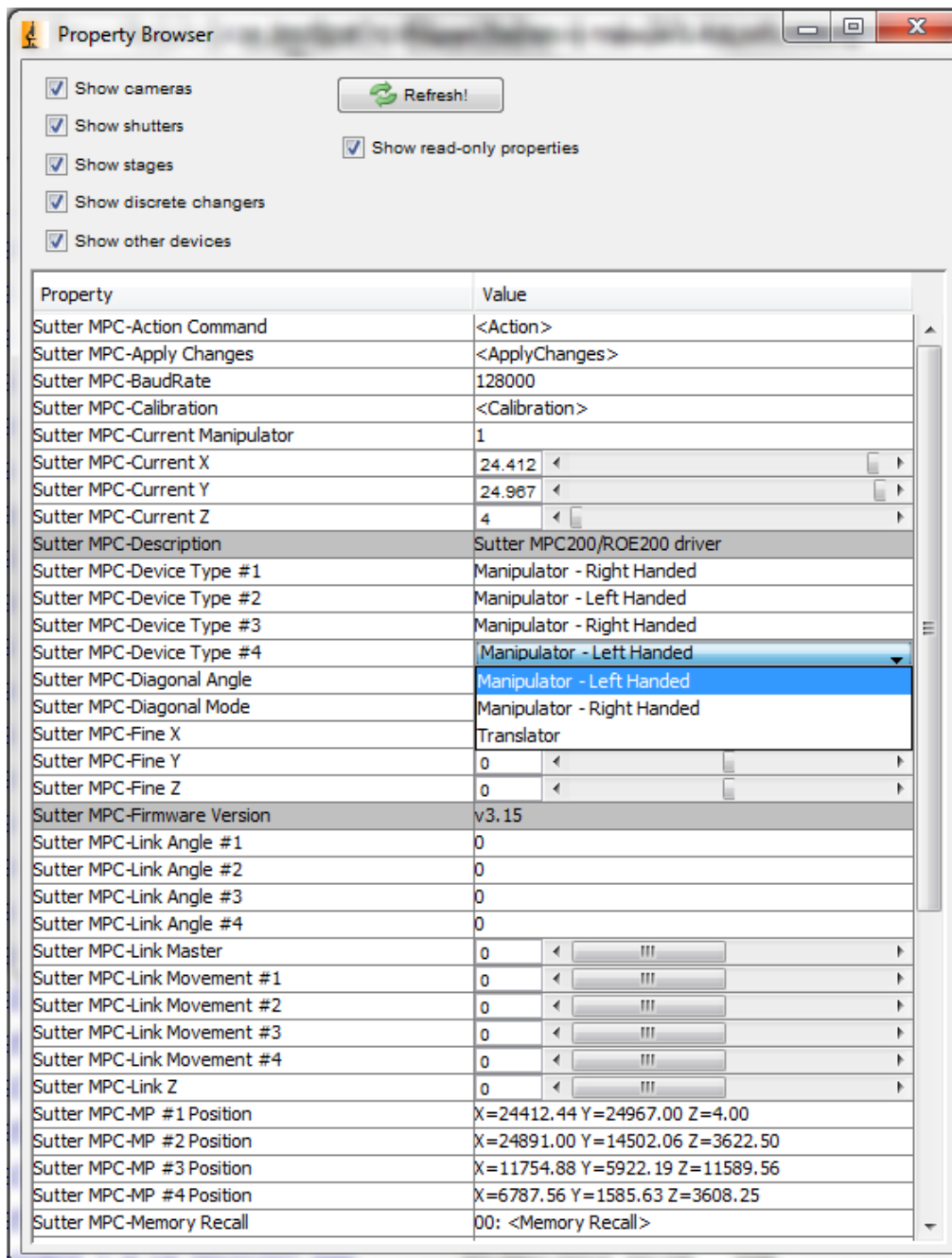
Work Position= A user defined set of coordinates X,Y, Z. *Note: You must go Home first to go to Work Position.*

**Sutter MPC Baud Rate** must always equal 128000.  See Installing μ–Manager and MPC200 document.

**Sutter MPC Calibration Menu / MPC Device Type**
The most powerful feature of this software is the link mode.  In order to properly link the movements of the pipettes (manipulators) w/ the microscope (translator), the program needs to learn the angle between the manipulators and the objective/camera.

To teach this software the angle of each pipette with respect to microscope (objective/camera), first we need to define what type of device is attached to the primary and secondary MPC200. The primary MPC200 is defined as the controller to which the ROE is connected.  The devices attached to this controller will show as Device Type#1(connected to Port A of primary controller) and Device Type #2 (Port B).   The secondary MPC200 is defined as the controller daisy chained to primary controller.  The devices attached to the secondary controller will appear as Device Type #3(Port A of secondary controller) and #4(Port B).  For each device type the user has to select Manipulator Right Handed, Manipulator Left Handed, or Translator.

**Property Browser**

- ☑ Show cameras
- ☑ Show shutters
- ☑ Show stages
- ☑ Show discrete changers
- ☑ Show other devices

🔄 Refresh!

☑ Show read-only properties

| Property | Value |
|---|---|
| Sutter MPC-Action Command | <Action> |
| Sutter MPC-Apply Changes | <ApplyChanges> |
| Sutter MPC-BaudRate | 128000 |
| Sutter MPC-Calibration | <Calibration> |
| Sutter MPC-Current Manipulator | 1 |
| Sutter MPC-Current X | 24.412 |
| Sutter MPC-Current Y | 24.967 |
| Sutter MPC-Current Z | 4 |
| Sutter MPC-Description | Sutter MPC200/ROE200 driver |
| Sutter MPC-Device Type #1 | Manipulator - Right Handed |
| Sutter MPC-Device Type #2 | Manipulator - Left Handed |
| Sutter MPC-Device Type #3 | Manipulator - Right Handed |
| Sutter MPC-Device Type #4 | Manipulator - Left Handed |
| Sutter MPC-Diagonal Angle | Manipulator - Left Handed |
| Sutter MPC-Diagonal Mode | Manipulator - Right Handed |
| Sutter MPC-Fine X | Translator |
| Sutter MPC-Fine Y | 0 |
| Sutter MPC-Fine Z | 0 |
| Sutter MPC-Firmware Version | v3.15 |
| Sutter MPC-Link Angle #1 | 0 |
| Sutter MPC-Link Angle #2 | 0 |
| Sutter MPC-Link Angle #3 | 0 |
| Sutter MPC-Link Angle #4 | 0 |
| Sutter MPC-Link Master | 0 |
| Sutter MPC-Link Movement #1 | 0 |
| Sutter MPC-Link Movement #2 | 0 |
| Sutter MPC-Link Movement #3 | 0 |
| Sutter MPC-Link Movement #4 | 0 |
| Sutter MPC-Link Z | 0 |
| Sutter MPC-MP #1 Position | X=24412.44 Y=24967.00 Z=4.00 |
| Sutter MPC-MP #2 Position | X=24891.00 Y=14502.06 Z=3622.50 |
| Sutter MPC-MP #3 Position | X=11754.88 Y=5922.19 Z=11589.56 |
| Sutter MPC-MP #4 Position | X=6787.56 Y=1585.63 Z=3608.25 |
| Sutter MPC-Memory Recall | 00: <Memory Recall> |

To calibrate the angles of the pipettes with respect to the translator:
1) Choose the right handed manipulator, left handed manipualtor, translator for each device first.
2) Get both pipettes in field of view. Mark the location of each pipette tip on the screen with a marker.

HINT: Memorize a Work Position for each device using the ROE. This would help retrieve the manipulator quicker in case of an error.
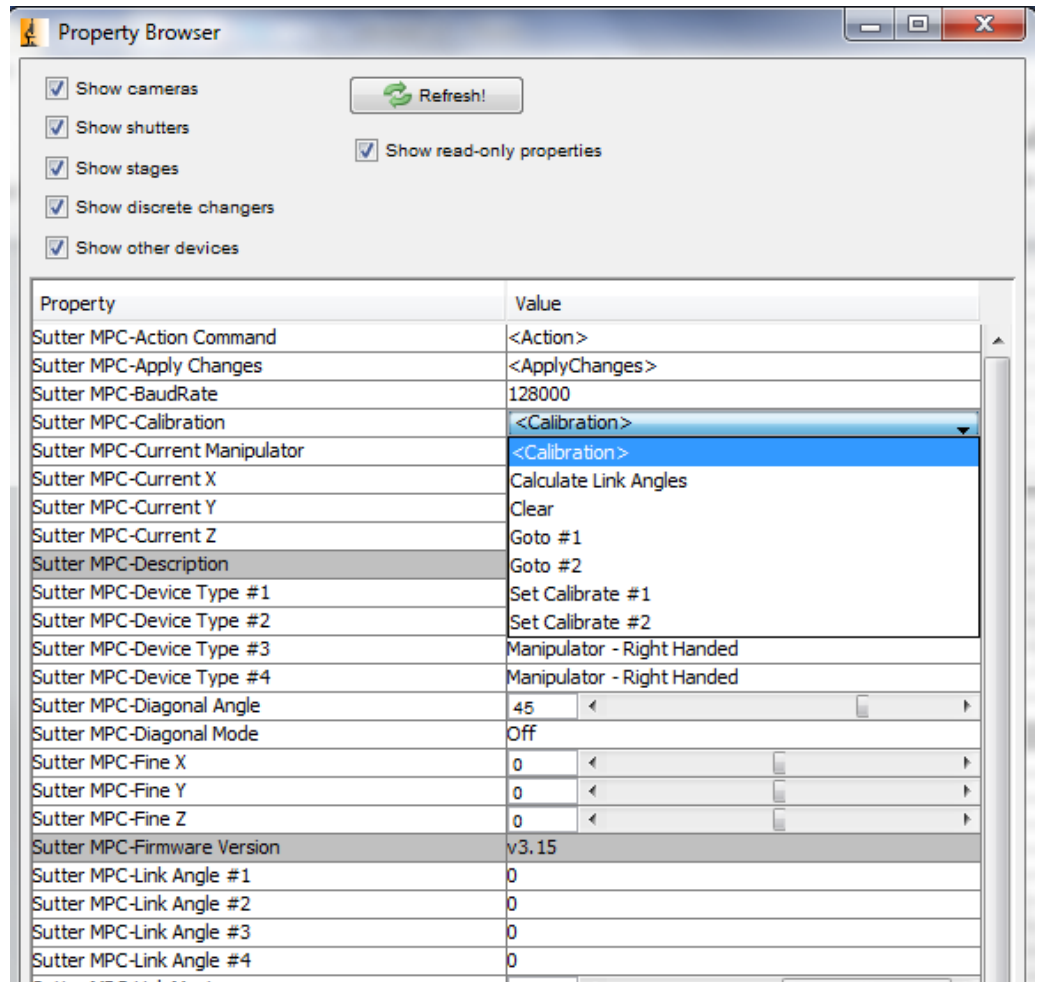
3) Under the Calibration menu select Calibration Set#1.

4) On the ROE select the translator. Make an X-axis only move with the translator.

5) Switch to Right-handed manipulator and move X and Y axes to get the pipette back to the mark for pipette one in Step 2.

6) Switch to Left-handed manipulator and move its X and Y axes to the mark for pipette two in Step 2.

7) In the Calibration drop down menu select Calibration Set#2.

| Property | Value |
|---|---|
| Sutter MPC-Action Command | <Action> |
| Sutter MPC-Apply Changes | <ApplyChanges> |
| Sutter MPC-BaudRate | 128000 |
| Sutter MPC-Calibration | <Calibration> |
| Sutter MPC-Current Manipulator | <Calibration> |
| Sutter MPC-Current X | Calculate Link Angles |
| Sutter MPC-Current Y | Clear |
| Sutter MPC-Current Z | Goto #1 |
| Sutter MPC-Description | Goto #2 |
| Sutter MPC-Device Type #1 | Set Calibrate #1 |
| Sutter MPC-Device Type #2 | Set Calibrate #2 |
| Sutter MPC-Device Type #3 | Manipulator - Right Handed |
| Sutter MPC-Device Type #4 | Manipulator - Right Handed |
| Sutter MPC-Diagonal Angle | 45 |
| Sutter MPC-Diagonal Mode | Off |
| Sutter MPC-Fine X | 0 |
| Sutter MPC-Fine Y | 0 |
| Sutter MPC-Fine Z | 0 |
| Sutter MPC-Firmware Version | v3.15 |
| Sutter MPC-Link Angle #1 | 0 |
| Sutter MPC-Link Angle #2 | 0 |
| Sutter MPC-Link Angle #3 | 0 |
| Sutter MPC-Link Angle #4 | 0 |

Property Browser

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8) Select Calibration angle Calculation.

The three angles appear as Link Angles 1, 2, 3. Make sure the angles are reasonable. Using the above method of calculation, the translator's angle would be zero. Remember a negative number means a left handed manipulator's angle of deviation from orthogonal in a counter clockwise rotation from the negative X axis.
A positive number is the angle of deviation of the right handed manipulator from an orthogonal position in a clockwise rotation from the positive X axis.

The calculated angles can be edited.

**MPC Link Master**

The Link Master **must be off** during the above calibration calculations.

When the link master is turned on, all the Link Movement devices are turned on. Turn off the devices that are not part of the linked moves individually. Each experiment will require a different number of the manipulators/translators to be linked. To enable a link the scroll bar is moved left to right and the number to the left changes from a 0 to a 1, 0 corresponds to off and 1 indicates the link is active.

| | | |
|---|---|---|
| Sutter MPC-Link Master | 1 | ◄ ▬▬▬▬▬ III ▬ ► |
| Sutter MPC-Link Movement #1 | 1 | ◄ ▬▬▬▬▬ III ▬ ► |
| Sutter MPC-Link Movement #2 | 0 | ◄ ▬ III ▬ ► |
| Sutter MPC-Link Movement #3 | 1 | ◄ ▬▬▬▬▬ III ▬ ► |
| Sutter MPC-Link Movement #4 | 0 | ◄ ▬ III ▬ ► |
| Sutter MPC-Link Z | 0 | ◄ ▬ III ▬ ► |

**When the Link Master is turned on,
ANY move made with the ROE in one linked device will result the other linked device(s) making a move
(using the angular correction calculations).**

**In Linked Mode the ROE is the active device. Be careful when moving with link enabled.**

**MPC Link Z**

Unlike the X and Y axes, the Z-axis movement is a free of angular dependence.
For safety reasons, the link of the Z-axis can be turned on or off (Default is off).
*We recommend keeping the Z-Link off. Find a safe Z-height for the linked pipette(s) and then make linked moves without the Z-axis linked.*

**MPC Memory Set/ MPC Memory Recall**

μ-Manager allows for users to define up to 16 sets of X, Y, Z coordinates. Each set of coordinates will have the device number memorized as well. The Memory Set enables movement of the pipettes to different areas on the specimen without going Home first. As mentioned previously, to use the ROE's Work Position, the manipulator must go Home first**.**