

TRIO™ MPC-145 SERIES

**DUAL 3-AXIS MOTORIZED
MICROMANIPULATOR SYSTEM**

WITH SYNTHETIC FOURTH DIAGONAL AXIS

OPERATION MANUAL

REV. 2.62c (20191001) (FW v2.62)



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1.6 Overview



TRIO MPC-100 ROE/CONTROLLER

MP-845 SERIES ELECTROMECHANICAL MICROMANIPULATOR (E.G., A, RIGHT-HANDED)

Figure 1-1. The TRIO MPC-145 system



MP-845 SERIES ELECTROMECHANICAL MICROMANIPULATOR (E.G., B, LEFT-HANDED)

TRIO MPC-100 ROE/CONTROLLER

MP-845 SERIES ELECTROMECHANICAL MICROMANIPULATOR (E.G., A, RIGHT-HANDED)

Figure 1-2. The TRIO MPC-145-2 system

1.6.3.1 Stainless-Steel MP-845 (MP-845S)

The MP-845 manipulator is also available in stainless steel. The standard version of the **MP-845** has virtually no drift in its motor and bearing assemblies. The last remaining hurdle is that of thermal drift caused by the expansion and contraction of the aluminum body of the manipulator. By utilizing a stainless steel with very low coefficient of expansion, the **MP-845S** is simply the lowest drift manipulator available on the market. The added mass of the stainless-steel body has the additional benefit of dampening out vibration, giving the stainless **MP-845S** the silkiest movement of any manipulator.

Because low expansion stainless steels do have some ferric content, the stainless **MP-845S** is PVD coated in titanium nitride, giving it its distinctive gold color. This coating will ensure that the stainless trio will resist corrosion caused by exposure to salt solutions in a lab environment.



2. INSTALLATION

When installing the TRIO MPC-100 system for the first time, it is recommended that the components of the system be installed in the following order: MP-845 electromechanical micromanipulator first, followed by the TRIO MPC-100/E ROE/Controller.

IMPORTANT

Once the TRIO MPC-145 series system has been unpacked, remove the shipping tape from the various locations on each MP-845 series electromechanical micromanipulator. The shipping tape must be removed before operating the TRIO MPC-100 system. If you need to transport the MP-845 series in the future, reapply 2 to 3-inch pieces of masking tape to the same locations. Once the tape has been removed, handle the MP-845 with care. The mechanisms can be damaged if any of the axes are inadvertently moved without the tape in place.

2.1 Mounting Instructions

The following sections describe how to mount the MP-845 manipulator to a stand using the mounting adapter plate, how to adjust the pipette angle and how to mount different headstages.

2.1.1 Mounting the MP-845 Series to the Stand or Platform

The MP-845 attaches to the mounting adapter plate using four M3.5x6 hex head locking screws.

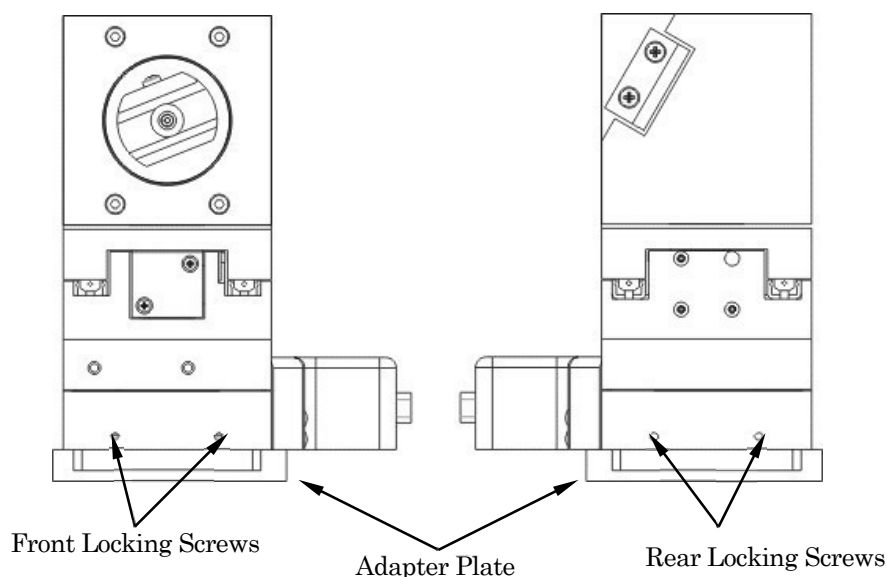


Figure 2-1. Side view of MP-845 showing mounting adapter plate and lock screws.

The MP-845 series is shipped with the adapter plate in place. It is attached using four tapered pegs, along with four locking screws.

To remove it, first loosen the four hex screws that secure the manipulator to the pegs in the adapter plate. The rear pair is in a similar location in the back of the manipulator. Once the locking screws are sufficiently loosened, lift the MP-845 upwards from the adapter plate.

Before attaching the adapter plate to the MP-845, you need to decide where to position the manipulator on your stand/platform. The stand can be any flat surface carrying $\frac{1}{4}$ -20, 10-32, or M6 holes on one-inch centers (such as a Sutter Instrument MT-series stand or MD series platform).

Examine the space of the platform onto which installation is to take place. Attach the control cable to MP-845 and move the entire unit around on the platform until the precise desired position is determined. A small bag containing the necessary hardware to attach the MP-845 to the stand is included.

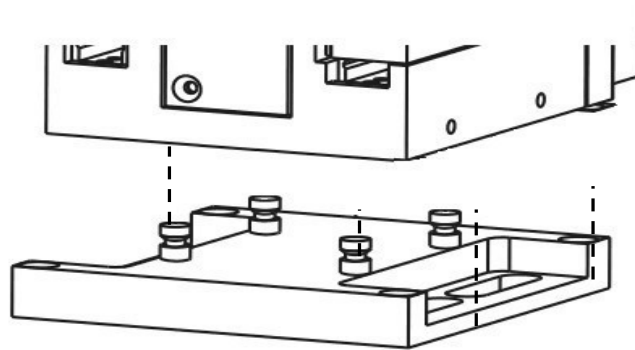


Figure 2-2. Mounting the MP-845 on the Adapter Plate

Once the plate is mounted, align the pegs on top of the plate with the holes in the manipulator, push the X-axis firmly onto the plate, and re-tighten the locking hex set screws.

2.2 Headstage Mounting

Sutter IPA headstage, Axon headstages 203B or CV-7, and the Heka EPC-10 headstage have an integral dovetail that fits directly into the rotary dovetail slide bracket on the MP-845. The dovetail slide bracket on the MP-845 also supports older Axon and Heka headstages when using the 4" dovetail extension.

Rod-mounted headstages and micro tools are accommodated by the use of a rod clamp that fits into the dovetail (not shown). All the headstage adapters and mounting hardware are included with the manipulator and are shipped in a zip lock plastic bag.

2.3 Other Accessories

One or more accessories may have been ordered and received for mounting the MP-845 and/or modifying the headstage mount to the manipulator (i.e., rotating base, microscope stage mount, gantry, dovetail extension, etc.). Setup of these accessories is normally covered in documentation accompanying the accessory.

2.5 ROE/Controller Rear Panel Controls and Configuration

2.5.1 Power Switch

The power switch for the TRIO MPC-100 system is located on the rear panel of the ROE/controller. At power up, the microprocessor in the ROE/controller scans the attached equipment and configures the system accordingly.

CAUTION: *When changing the configuration switches described in the following paragraphs, make sure that controller's power switch is turned off.*

2.5.2 Configuration Switches

Each manipulator channel (A and B) has its own bank of configuration switches. Switch bank A affects only MANIPULATOR A, and switch bank B likewise for MANIPULATOR B.

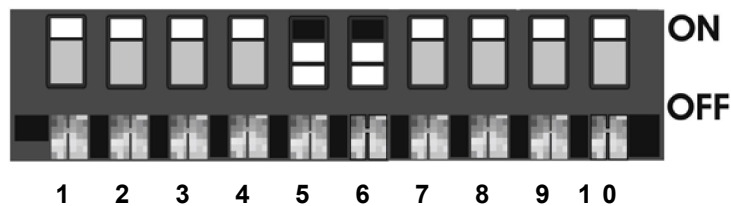


Figure 2-4. Configuration switches on rear of TRIO MPC-100 ROE/Controller unit (switch positions shown are factory defaults).

2.5.2.1 Switches 1, 2, 3 and 4

These switches set the directionality for each of the four axes.

Table 2-1. Configuration Switches 1 - 4: Configuring the direction of each axis.

Switch #	Definition	State	Setting	Position
1	X-Axis Knob Directionality for Forward (+) Movement	Clockwise	OFF*	UP*
		Counterclockwise	ON	DOWN
2	Y-Axis Knob Directionality for Forward (+) Movement	Clockwise	OFF*	UP*
		Counterclockwise	ON	DOWN
3	Z-Axis Knob Directionality for Forward (+) Movement	Clockwise	OFF*	UP*
		Counterclockwise	ON	DOWN
4	D-Axis Knob Directionality for Forward (+) Movement	Clockwise	OFF*	UP*
		Counterclockwise	ON	DOWN

* Factory default (typical setting for right-hand-mounted manipulator).

2.5.2.2 Switch 5: Y-Axis Lockout during Homing

Table 2-2. Configuration Switch 5: Configuring the Homing Y-Movement Lock Out.

Switch #	Definition	State	Setting	Position
5	Y-Movement lock out during homing (pressing HOME or WORK)	Enabled: Locked (no movement while X & Z are homing)	OFF	UP
		Disabled: Not locked (Y moves along with X & Z when homing)	ON*	DOWN*

* Factory default (recommended normal operation setting)

2.5.2.3 Switch 6: Calibration Homing on Power On

Table 2-3. Configuration Switch 6: Configuring the Sensor Test.

Switch #	Definition	State	Setting	Position
6	Calibration Homing on Power On	Disabled: No calibration occurs on power on. Power-off position is retained on power on	OFF	UP
		Enabled: Calibrates to 1,000 μm for all axes on power on. Power-off position is forgotten.	ON*	DOWN*

* Factory default (recommended normal operation setting)

2.5.2.4 Switches 7 & 8 Reserved

Switches 7 & 8 are reserved.

Table 2-4. Configuration Switches 7 & 8: Reserved.

Switch #	Definition	Setting	Position
7	Reserved	OFF*	UP*
8	Reserved	OFF*	UP*

* Factory default (recommended normal operation setting).

2.5.2.5 Switch 9 Electromechanical Device Compatibility

Table 2-5. Configuration Switch 9: Electromechanical device compatibility.

Switch #	Definition	State	Setting	Position
9	Electromechanical device compatibility	MP-845[S]/M, MP-245/M micromanipulators	OFF*	UP*
		MP-285/M micromanipulator; 3DMS & MT-78 stages; MOM & SOM objective movers	ON	DOWN

* Factory default (recommended normal operation setting).

3. OPERATIONS

3.1 Main Controls and Indicators on the ROE/Controller

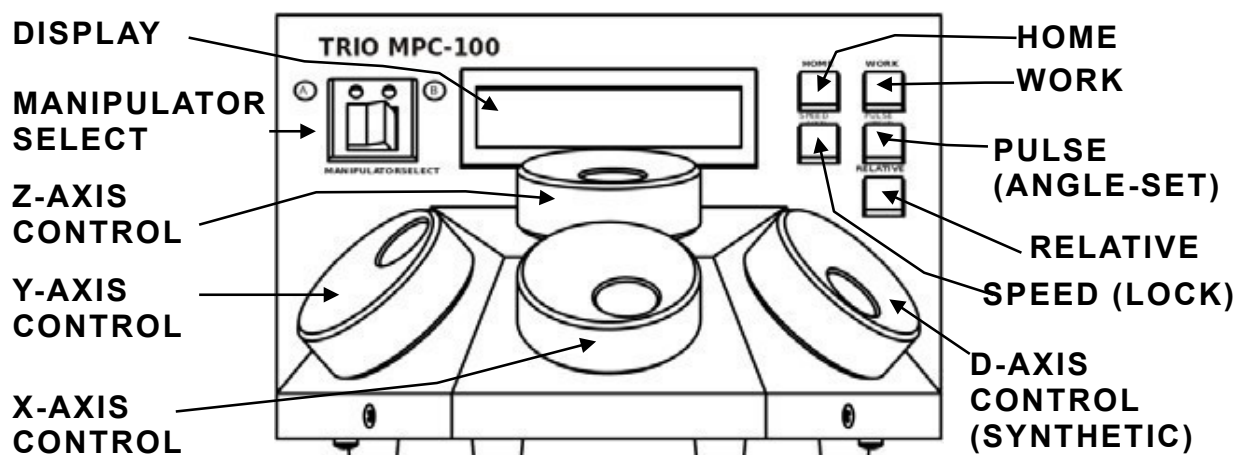


Figure 3-1. Front view of the TRIO MPC-100 ROE/Controller

3.2 Display

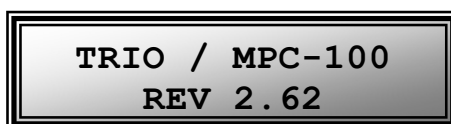
3.2.1 Initial Startup



(Text in Green)

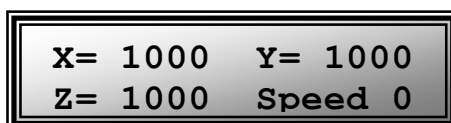
Figure 3-1. LCD Display showing startup screen.

When starting the TRIO MPC-100 system for the first time or if the HOME position has not yet been defined (saved), the values of all four axes will be 1,000 micrometers (microns).



(Text in Green)

Figure 3-2. Startup screen



(Text in Green)

Figure 3-3. Device A factory default startup (Home) position after calibration

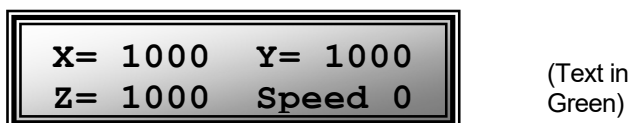


Figure 3-4. Device B factory default startup (Home) position after calibration

3.3 Control Operations

3.3.1 Manipulator Select

The MANIPULATOR select switch on the front of the TRIO MPC-100 ROE/controller is used to select which of two possible manipulators (or stages) is active for manual control using the axis control knobs and buttons or keys (HOME, WORK, etc.).

3.3.2 Maximum Positive Position Values:

Move the dial of an axis clockwise until its position value stops incrementing. The following table lists the maximum position value (in microns) for each axis.

Table 3-1. Maximum positive position value of each axis

Axis	Maximum Position Value (in microns)
X	25,000
Y	25,000
Z	25,000

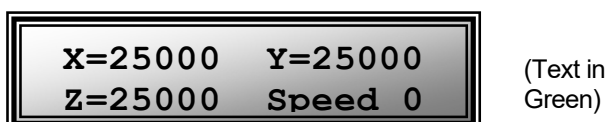


Figure 3-5. Maximum positive values

3.3.3 Setting Position for HOME or WORK

To set position, hold down HOME or WORK button for 3 seconds until beep sounds.

3.3.4 Setting the Angle of the Pipette/Headstage Holder

To change the angle of the holder, first loosen the set screw at the top of the rotary dovetail bracket, rotate the holder to the desired angle, and then retighten the set screw.

Measure the angle of the holder. (Tip: Many smart phones have an app with a level that can assist the user.)

3.3.5 Operating the Virtual D Axis

The TRIO MPC-100 consists of three physical axes, X, Y and Z. A tangent function utilizing X and Z axes and the angle of the holder has been implemented to create a virtual D axis. Use angles between 10° and 90° for best results.

Zero (0°) is set with the diagonal being parallel to the table and 90° is set with the diagonal being perpendicular to the table.

To set the angle measured above, on the ROE hold [PULSE]/ANGLE down for 3 seconds. The screen will be red until the display indicates in green: “Select the angle in use (0-90)”.

Use the D dial on the ROE to set the value of the angle. Once this value is dialed in, do not touch the ROE knob for 8-10 sec. The virtual D angle will now be set.

3.3.6 Moving to the Home Position

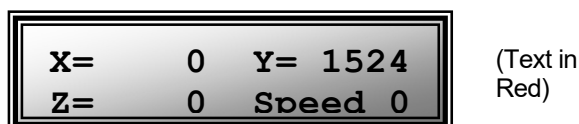


Figure 3-6. Moving to Home position (screen is amber while moving)

If the Home position has not yet been defined and saved, the Home position values for all axes will default to 1,000 microns, as shown in the following figure.



Figure 3-7. Factory default Home position

If the Home position has been previously defined (saved), pressing HOME will make a move to the defined home position (see example in the following figure).

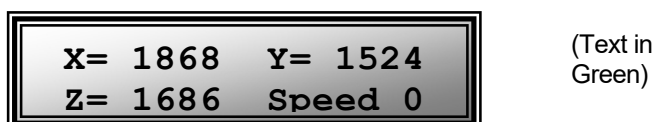


Figure 3-8. Example Home position defined and saved

To move to the Home position, press HOME. If the current position before pressing HOME is greater than the Home position, the movement will be as follows:

NOTE: Movement to the Home position works only if X coordinates of the HOME position are less than the WORK position. HOME and WORK positions cannot be the same.

1. Movement begins by retracting the Z and X axes (at the angle currently set) away from the sample.
2. Movement then continues along the Y axis toward the Home position (towards the operator and away from the microscope).

NOTE: Step 2 occurs only if “Y-Lockout” is disabled. Otherwise, no movement along the Y-axis occurs.

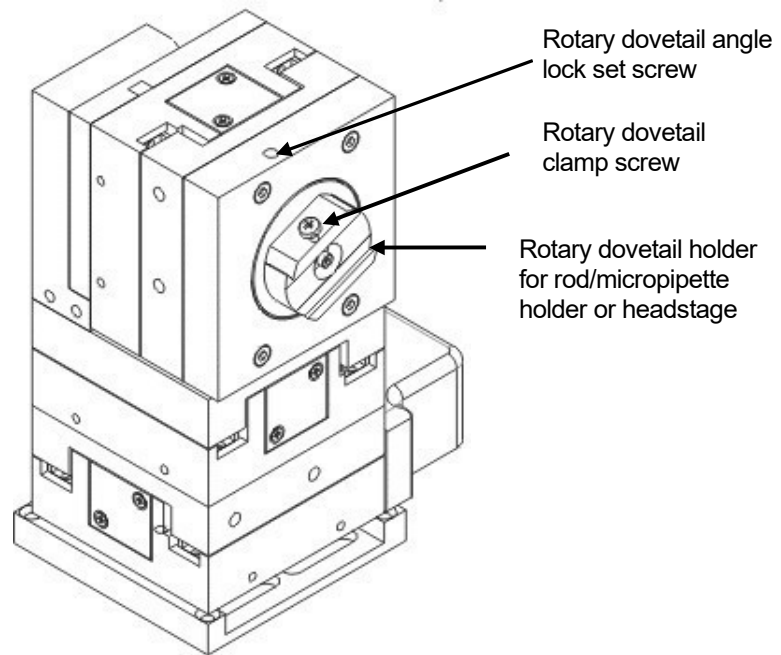


Figure 3-13. Angled side view of MP-845 to change headstage mount

To change the headstage/micropipette, loosen the screw in the center of the rotary dovetail clamp. Slide the headstage upward out of the dovetail groove. Make any adjustments needed of the headstage, and then tighten down (but do not over tighten) the lock screw in the center of the holding bracket.