



M-LSM Product  
User's Manual  
Firmware 5.00 and up

Last Update: December 10 2015  
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# Disclaimer

Zaber's devices are not intended for use in any critical medical, aviation, or military applications or situations where a product's use or failure could cause personal injury, death, or damage to property. Zaber disclaims any and all liability for injury or other damages resulting from the use of our products.

# General Description

Zaber's M-LSM series of Micromanipulators are used to position probes under a microscope with a joystick or computer. They can be mounted to either metric or imperial optical breadboards. An adjustable probe holder allows mounting of probe diameters between 2 and 13 mm. The controller connects to the RS-232 or USB port of any computer.

# Installation

## Mounting

The M-LSM micromanipulator is specified either with a flat base or an adaptor plate to mount to an optical post.

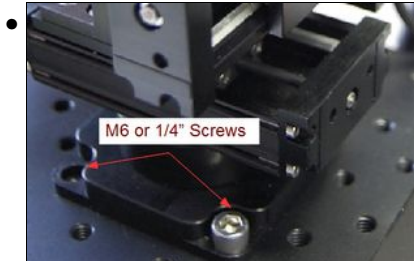
### Installing a M-LSM with a flat base



Right hand M-LSM that mounts to a flat base. Ships assembled as shown above.



Bracket to mount to flat base shown for clarity, but remains assembled during installation.

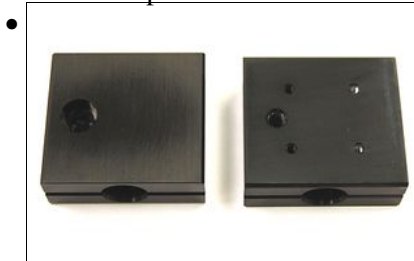


Using either four M6 screws on a 50mm grid or 1/2" screws on a 2" grid attach M-LSM micromanipulator to a flat base.

### Installing a M-LSM to an Optical Post



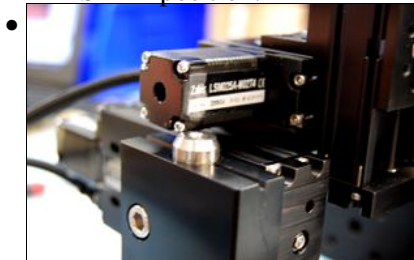
Left hand post mounted M-LSM. Ships assembled as shown above, excluding the optical post.



Bracket to mount to an optical post for either a 1/2" or 12.7mm optical post.



Slide bracket over optical post into desired position and tighten M6 screw with 5 mm allen key to lock M-LSM in position.

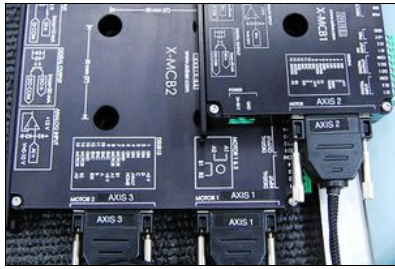


Ensure that the optical post doesn't extend too far, or it will interfere. The above image shows incorrect installation where the optical post will obstruct the movement.

## Powering up an M-LSM



Main components of M-LSM



Cables required to connect the devices are labelled. **Note:** there are extra cables that are not required during normal operation.



The X-MCB1 is connected to the X-MCB2 with a X-DC02 cable. **Note:** Power is only required to the X-MCB1 or X-MCB2 since power is daisy chained to both the other controller and the joystick.



The X-JOY3 is connected to the X-MCB2 through the X-DC06 cable

Once the system has been installed, verify that each axis is working correctly by moving the joystick. Please note that each stage needs to be homed before it is able to move the full length of travel. Homing the devices is done by using the joystick to move each axis to the end of travel on the side of the motor.

Should you wish to mount alternative probes to the M-LSM custom adaptor plates are available upon request. Please contact Zaber technical support at 1-888-276-8033 or [contact@zaber.com](mailto:contact@zaber.com) for more information.

# Operation

The joystick is pre-programmed with the following settings.



Default axes are setup with X as 1, Y as 2 and Z as 3

Joystick Settings				
Key	Event 1	Event 2	Event 3	Event 4
1		Stop	Set active axis 3 (Z)	Set axis velocity scale 0 (Deactivate Z)
2		Set Reference Position	Go to Reference Position	
3		Set Reference Position	Go to Reference Position	
4		Set Reference Position	Go to Reference Position	
5		Set Reference Position	Go to Reference Position	
6	Set active axis 1 (X)	Set axis velocity scale 3000	Set axis velocity scale 80000	
7	Set active axis 2 (Y)	Set axis velocity scale 3000	Set axis velocity scale 80000	
8	Set active axis 3 (Z)	Set axis velocity scale 3000	Set axis velocity scale 80000	

Button 8 reactivates the Z-axis.

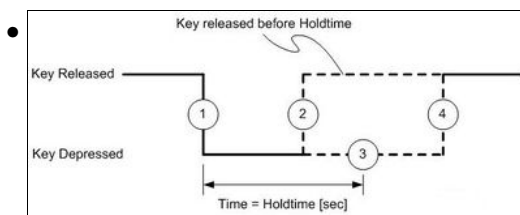


Diagram of the event path for each key. The events are numbered from 1-4. This diagram shows what events are issued depending on how long you hold the key.

Accessing key events			
Event 1	Event 2	Event 3	Event 4
Press button	Quick release of button, less than 2 seconds	Hold button longer than 2 seconds	Release button after holding longer than 2 seconds



The orange led will flash after about 2 seconds to signify that event 3 has been triggered.

If you would like to change the settings of the joystick refer to the [X-JOY3 user manual](#).

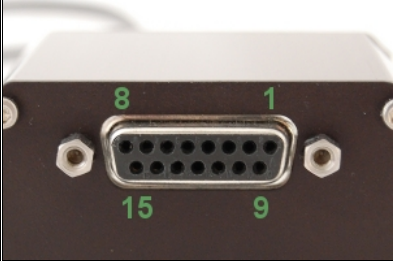
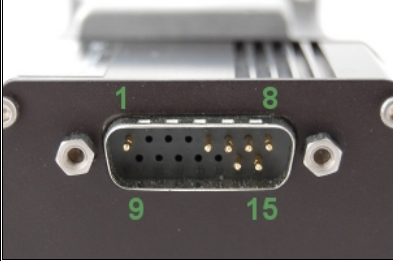
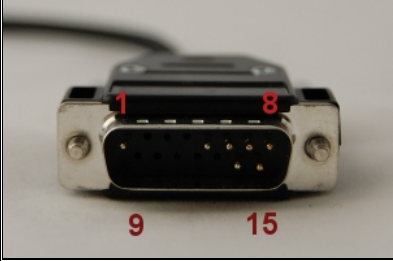
Most of the information you will need to operate the stage using the X-MCB1 and X-MCB2 controller can be found in the [X-MCB1 user manual](#) and here [X-MCB2 user manual](#).

## Controller Connection

The stages of the M-LSM series micromanipulators are controlled with X-MCB1 and X-MCB2 chopper drive controllers. The stages used are LSM025A-M02T4 which have a peripheral ID of 43111 for each axis. If you ever need to restore the correct settings for your M-LSM micromanipulator, verify that the [peripheralid](#) settings for each axis are correct and send the `/system restore` command to the X-MCB2 controller.

For reference, the pinout for the motor cable connectors is shown below:

## Pinout for D-sub 15 Connectors (A-series and X-Series controllers and peripherals)

A- or X-series controller (female)		
T3 Peripheral (male)		
T4 Peripheral (male)		
Pin #	Function	
1	+5V	
2	Encoder Error ****	

3	<i>reserved</i>
4	Away Sensor ***
5	Home Sensor
6	Ground
7	Motor B1
8	Motor A1
9	+5V *
10	Encoder A *
11	Encoder B *
12	Encoder Index **
13	Ground *
14	Motor B2
15	Motor A2

*\* encoder embedded peripherals only*

*\*\* devices with encoders with index only*

*\*\*\* devices with away sensors only*

*\*\*\*\* devices with linear or direct-reading encoders only*

## Alternate Controllers

The M-LSM may be controlled by any 2-phase stepper motor controller with limit sensor input. **We do not recommend using your own controller unless you are familiar with how to control a stepper motor with hall sensor limit switches.** Damage to the stage due to incorrect wiring is not covered by warranty.

# Warranty and Repair

For Zaber's policies on warranty and repair, please refer to the [Ordering Policies](#)

## Standard products

Standard products are any part numbers that do not contain the suffix ENG followed by a 4 digit number. Most, but not all, standard products are listed for sale on our website. All standard Zaber products are backed by a one-month satisfaction guarantee. If you are not satisfied with your purchase, we will refund your payment minus any shipping charges. Goods must be in brand new saleable condition with no marks. Zaber products are guaranteed for one year. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

## Custom products

Custom products are any part numbers containing the suffix ENG followed by a 4 digit number. Each of these products has been designed for a custom application for a particular customer. Custom products are guaranteed for one year, unless explicitly stated otherwise. During this period Zaber will repair any products with faults due to manufacturing defects, free of charge.

## How to return products

Customers with devices in need of return or repair should contact Zaber to obtain an RMA form which must be filled out and sent back to us to receive an RMA number. The RMA form contains instructions for packing and returning the device. The specified RMA number must be included on the shipment to ensure timely processing.

# Email Updates

If you would like to receive our periodic email newsletter including product updates and promotions, please sign up online at [www.zaber.com](http://www.zaber.com) ([news section](#)). Newsletters typically include a promotional offer worth at least \$100.

# Contact Information

Contact Zaber Technologies Inc by any of the following methods:

<b>Phone</b>	1-604-569-3780 (direct) 1-888-276-8033 (toll free in North America)
<b>Fax</b>	1-604-648-8033
<b>Mail</b>	#2 - 605 West Kent Ave. N., Vancouver, British Columbia, Canada, V6P 6T7
<b>Web</b>	<a href="http://www.zaber.com">www.zaber.com</a>
<b>Email</b>	Please visit our website for up to date email contact information.

The original instructions for this product are available at <http://www.zaber.com/wiki/Manuals/M-LSM>.

# Appendix A: Default Settings

see [our website](#)

## Appendix B: Device Specifications

For complete device specifications for the M-LSM micromanipulator, please see [our website](#).

## Appendix C: Device Drawings

For complete drawings and CAD models of the M-LSM micromanipulator, please see [our website](#)



<b>Specification</b>	<b>Value</b>	<b>Alternate Unit</b>
<u>Microstep Size (Default Resolution)</u>	0.047625 $\mu\text{m}$	
<u>Recommended Controller</u>	<u>X-MCB2</u> (24 V) and <u>X-MCB1</u> (24 V)	
<u>Travel Range</u>	25.4 mm	1.000 "
<u>Accuracy (unidirectional)</u>	8 $\mu\text{m}$	0.000315 "
<u>Repeatability</u>	< 1 $\mu\text{m}$	< 0.000039 "
<u>Backlash</u>	< 3 $\mu\text{m}$	< 0.000118 "
<u>Maximum Speed</u>	14 mm/s	0.551 "/s
<u>Minimum Speed</u>	0.00022 mm/s	0.00001 "/s
<u>Speed Resolution</u>	0.00022 mm/s	0.00001 "/s
<u>Encoder Type</u>	None	
<u>Communication Interface</u>	RS-232	
<u>Communication Protocol</u>	Zaber Binary or Zaber ASCII	
<u>Guide Type</u>	Needle roller bearing	
<u>Vertical Runout</u>	< 8 $\mu\text{m}$	< 0.000315 "
<u>Horizontal Runout</u>	< 12 $\mu\text{m}$	< 0.000472 "
<u>Pitch</u>	0.02 degrees	0.349 mrad
<u>Roll</u>	0.005 degrees	0.087 mrad
<u>Yaw</u>	0.02 degrees	0.349 mrad
<u>Probe Diameter Range</u>	2-13 mm	0.079 "
<u>Probe Angle Range</u>	360 degrees	6.283 rad
<u>Linear Motion Per Motor Rev</u>	0.6096 mm	0.024 "
<u>Motor Steps Per Rev</u>	200	
<u>Motor Type</u>	Stepper (2 phase)	
<u>Inductance</u>	1.7 mH/phase	
<u>Motor Connection</u>	D-sub 15	
<u>Default Resolution</u>	1/64 of a step	
<u>Mechanical Drive System</u>	Precision lead screw	
<u>Limit or Home Sensing</u>	Magnetic hall sensor	
<u>Axes of Motion</u>	3	

<u>Vacuum Compatible</u>	No	
<u>Operating Temperature Range</u>	0 to 50 degrees C	
<u>Stage Parallelism</u>	< 25 $\mu$ m	< 0.000984 "
<u>RoHS Compliant</u>	Yes	
<u>CE Compliant</u>	Yes	
<u>Weight</u>	0.952 kg	
<u>Joystick Control</u>	Velocity Mode	