

MLS203P9 - October 1, 2015

Item # MLS203P9 was discontinued on October 1, 2015. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

HIGH-SPEED MOTORIZED XY SCANNING STAGES

- ▶ Ultra Fast XY Scanning Up to 250 mm/s
- ▶ Low-Profile, Compact Footprint
- ▶ Compatible with Nikon, Olympus, and Zeiss Microscopes

MLS203 Stage Shown Mounted to a Nikon Eclipse Ti-U Microscope Equipped with a Confocal Imaging Module



MLS203-1

Shown with MLS203P2

Slide Holder. Stage Dimensions:

260 mm x 230 mm x 31 mm (10.24" x 9.06" x 1.22")



OVERVIEW

Features

- Integrates with Nikon, Olympus, and Zeiss Upright and Inverted Microscopes
- Range of Sample Holders Available
- Integrated Brushless DC Linear Servo Motor Actuators
- Linear Optical Encoders
- High-Quality, Precision-Engineered Linear Bearings
- High Repeatability (0.25 μm) and Position Accuracy (<3.0 μm)
- Compatible with Thorlabs' APT, Molecular Devices' MetaMorph, and μManager Software

Thorlabs' MLS203 stages have been designed as drop-in replacements for the manual stages found on select Nikon, Olympus, and Zeiss microscopes to provide motorized XY positioning of microscopy samples. A complete stage package consists of the stage itself, a controller, mounting brackets, and optional accessories; all of these items need to be purchased separately (typical XY stage setup is shown to the right). The table below outlines the items that should be purchased to form a stage package compatible with a particular microscope. Alternatively, optional mounting brackets (MLSA01) enable the MLS203-1 stage to be bolted to an optical table or breadboard as part of a custom-built microscope setup or for use in typical photonics applications.



A typical XY stage setup is comprised of an MLS203 stage, BBD202 XY Stage controller, MJC001 2-Axis Joystick, and inverted Olympus microscope.

Characterized by high-speed scanning capabilities and high positional accuracy, these stages are ideal for manually or automatically positioning a wide range of specimens and samples in many types of microscopy or imaging techniques and applications. Very precise manual fine positioning and control at the cellular level is easily achieved through the combination of a stable closed-loop control system and an associated joystick option. In addition, the stages can be combined with our Z-Axis Piezo Stage to form an XYZ stage ideally suited for laser scanning microscopy.

Controller Option

The recommended controller for the MLS203 stage is the BBD202 dual-axis Brushless DC Motor Controller. See below for a brief overview, or click here to view the full presentation for these Brushless DC Motor Controllers. The APT GUI interface ships with each controller. The stage is compatible with μManager, which is open source software for controlling microscopes and peripherals, and Molecular Devices' MetaMorph, which is software that provides automated acquisition, control, and image analysis. For more details on using MetaMorph with the MLS203 stage and BBD202 controller, please see the *MetaMorph* tab above.

Specimen Holders and Accessories

We offer a range of adapters to allow the positioning of standard microscope slides, multiwell plates, Petri dishes, and mounted metalurgical specimens. Please see the details below.

Complete Microscope Stage Assemblies

Microscope ^a	Stage	Mounting Bracket	Controller	Optional Specimen Holders and Accessories
Nikon 50i, 80i, 90i and Ci-L	MLS203-1	MLSA06	BBD202	1) Multiwell Plate Adapter (Item # MLS203P1) 2) Slide / Petri Dish Holder for Inverted Microscopes (Item # MLS203P2) 3) Multi Slide Holder for Inverted Microscopes (Item # C4SH01) 4) Blank Adapter Plate (Item # MLS203P3) 5) 1/4"-20 Tapped Breadboard Plate (Item # MLS203P5) 6) M6-Tapped Breadboard Plate (Item # MLS203P4) 7) Multiple Slide Holder for Upright and Inverted Microscopes (Item # MLS203P9) 8) Recessed Slide Holder for Upright Microscopes (Item # MLS203P11) 9) 2-Axis Joystick Controller (Item # MJC001)
Nikon TE2000 and Eclipse Ti	MLS203-1	MLSA03		
Nikon Eclipse FN1	MLS203-1	MLSA07		
Olympus BX41, BX43, BX51, BX53 and BX61	MLS203-1	MLSA08		
Olympus IX51, IX71, IX73, IX81, and IX83	MLS203-1	MLSA02		
Zeiss Axio Observer and Axiovert 40	MLS203-2	None Needed		
Optical Breadboard / Custom Configuration	MLS203-1	MLSA01		

- If your microscope is not listed, please contact Technical Support to inquire about custom mounting adapters. We can support microscopes from Olympus, Nikon, Zeiss, and Leica.

S P E C S

MLS203 Stage	
Travel Range	110 mm x 75 mm (4.3" x 2.95")
Speed (Max)	250 mm/s
Acceleration (Max)	2000 mm/s ²
Bidirectional Repeatability	0.25 μ m
Unidirectional Repeatability	0.25 μ m
Backlash ^a	N/A
Load Capacity (Max)	1 kg (2.2 lb)
Incremental Movement (Min)	0.1 μ m
Absolute On-Axis Accuracy	< 3 μ m
Percentage Accuracy (Max)	X-Axis: 0.0027% Y-Axis: 0.004%
Flatness in X Axis	$\pm 3 \mu$ m over full travel , $\pm 1 \mu$ m over 10 mm
Flatness in Y Axis	$\pm 2 \mu$ m over full travel , $\pm 1 \mu$ m over 10 mm
Home Location Accuracy	0.25 μ m
Settling Time within 1 μ m (600 g Load)	0.1 s
Settling Time within 0.1 μ m (600 g Load)	0.6 s
Weight (Including Cables)	3.2 kg (7.0 lbs)
Limit Switches	X and Y as Standard
Bearing Type	Precision Linear Bearing
Motor Type	Brushless DC Linear Motor
Dimensions (Mid Travel, Excluding Guards)	260.0 mm x 230.0 mm x 31.3 mm (10.24" x 9.06" x 1.23")
Recommended Controller	BBD202

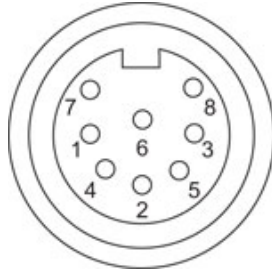
- The stage does not suffer from backlash because there is no leadscrew.

BBD202 Controller	
Drive Connector	8-Pin DIN, Round, Female
Feedback Connector	15-Pin D-Type
Continuous Drive Output	5 A
PWM Frequency	40 kHz
Operating Modes	Position and Velocity
Control Algorithm	16-Bit Digital PID Servo Loop with Velocity and Acceleration Feedforward
Velocity Profile	Trapezoidal/S-Curve
Position Count	32 Bit
Position Feedback	Incremental Encoder
Encoder Bandwidth	2.5 MHz 10 M Counts/s
Encoder Supply	5 V
AUX Control Connector	15-Pin D-Type
Input Power Requirements	250 VA Volt: 100 to 240 VAC Freq: 47 to 63 Hz Fuse: 3.15 A
Dimensions	240 mm x 337.9 mm x 124.8 mm (9.5" x 13.3" x 4.9")
Weight	6.1 kg (13.42 lb)

PIN DIAGRAMS

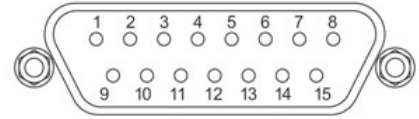
MLS203 XY Scanning Stage Pin Out Descriptions

**Motor Drive
Male**



Pin	Description	Pin	Description
1	Motor Phase V	5	Stage ID
2	GND	6	GND
3	Thermistor (Not Used)	7	Motor Phase W
4	Motor Phase U	8	Enable

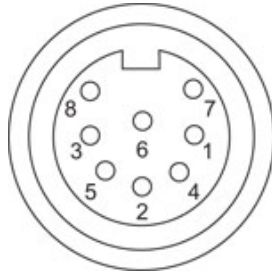
**Encoder Feedback
D-Type Male**



Pin	Description	Pin	Description
1	Not Connected	9	GND
2	GND	10	Limit Switch +
3	Not Connected	11	Limit Switch -
4	Enc Index -	12	Enc Index +
5	QB -	13	QB +
6	QA -	14	QA +
7	5 V	15	Not Connected
8	5 V		

MLS203 Coltroller (BBD202) Pin Out Descriptions

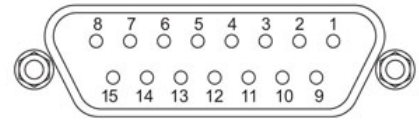
**Motor Drive
Female**



Pin	Description	Pin	Description
1	Motor Phase V	5	Stage ID
2	GND	6	GND
3	Temp Sensor (Not Used)	7	Motor Phase W
4	Motor Phase U	8	Enable

Feedback

D-Type Female

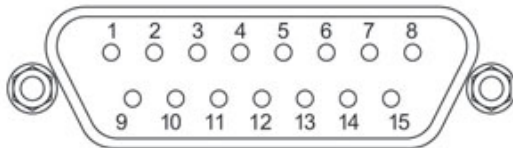


Pin	Description	Pin	Description
1	Not Connected	9	GND
2	GND	10	Limit Switch +
3	Not Connected	11	Limit Switch -
4	Index -	12	Index +
5	QB -	13	QB +
6	QA -	14	QA +
7 ^a	5 V	15	Not Connected
8 ^a	5 V		

- Pins 7 and 8 are Short Circuit Internally

User I/O

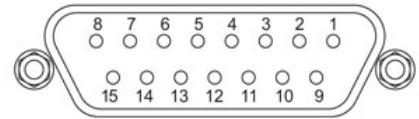
D-Type Male



Pin	Description	Pin	Description
1	5 V	9	QA +
2	Trigger IN	10	QA -
3	Trigger OUT	11	QB+
4	Ground	12	QB -
5	Ground	13	Index/Ref +

Aux I/O

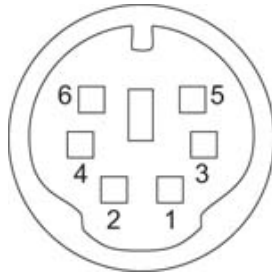
D-Type Female



Pin	Description	Pin	Description
1	Digital O/P 1	9	Digital Ground
2	Digital O/P 2	10	Digital Ground
3	Digital O/P 3	11	For Future Use
4	Digital O/P 4	12	For Future Use

6	For Future Use	14	Index/Ref -
7	For Future Use	15	Ground
8	For Future Use		

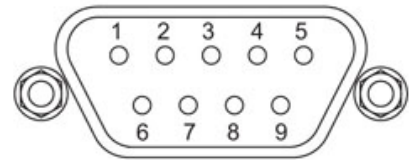
**Handset
Mini DIN Female**



Pin	Description	Pin	Description
1	RX (controller input)/RS232	4	Supply Voltage for Handset 5V
2	Ground	5	TX (controller output)/RS232
3	Ground	6	Ground

5	Digital Ground	13	Digital I/P 4
6	Digital I/P 1	14	5 V Supply O/P
7	Digital I/P 2	15	5 V Supply O/P
8	Digital I/P 3		

**Interconnect
D-Type Male**

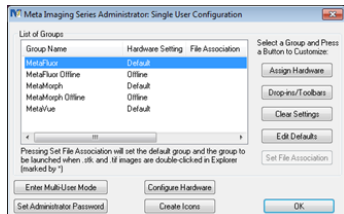


Pin	Description	Pin	Description
1	Not Connected	6	Not Connected
2	RX (controller input)	7	Not Connected
3	TX (controller output)	8	Not Connected
4	Not Connected	9	Not Connected
5	Ground		

METAMORPH

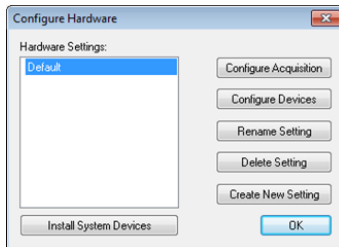
Using the MLS203 XY Statge with the Meta Imaging Series

The BBD202 controller for our MLS203 XY stage is compatible with the Meta Imaging Series software from Molecular Devices. The Meta Series includes MetaMorph NX, MetaMorph, MetaFluor, and MetaVue. The following images (taken from Meta Imaging Series version 7.8) show how to configure the software to control the XY stage.



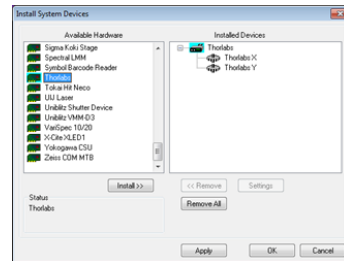
Click to Enlarge

Step 1: From one of the Meta Imaging Series programs, open the Meta Imaging Series Administrator. To configure the stage, click "Configure Hardware."



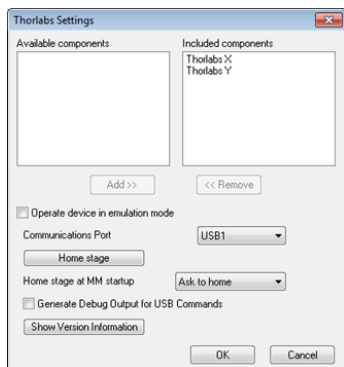
Click to Enlarge

Step 2: To set up the stage, click "Install System Devices."



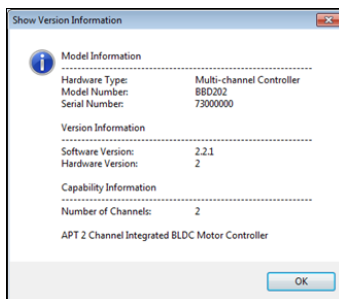
Click to Enlarge

Step 3: Browse through the list on the left and find and highlight Thorlabs; then click "Install." From the Installed Devices list on the right, select Thorlabs and then click "Settings".



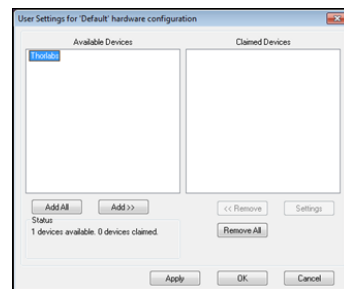
Click to Enlarge

Step 4: Ensure that "Thorlabs X" and "Thorlabs Y" are listed in the included components, then click "Show Version Information."



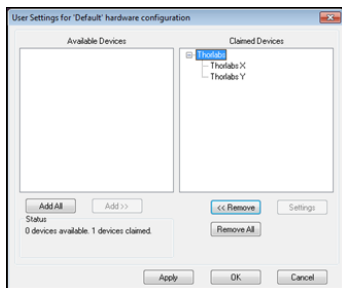
Click to Enlarge

Step 5: Confirm that the details are correct as shown above, and then click OK (if multiple windows appear, click OK on each one). You will return to the "Configure Hardware" window shown in step 2. Now Click "Configure Devices."



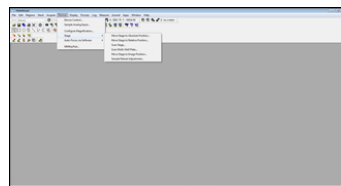
Click to Enlarge

Step 6: Select Thorlabs from the list of available devices and click add.



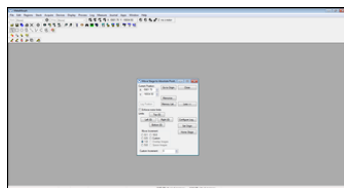
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Step 7: Check that both "Thorlabs X" and "Thorlabs Y" are listed in the "Claimed Devices" column, and then click OK until all the program windows are closed.



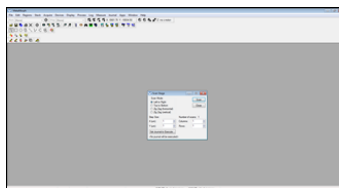
Click to Enlarge

Step 8: Open the Meta Imaging Series software program installed on your computer from All Programs under the Start Menu. In the "Devices" menu select "Stage," and different types of movements are possible. The screenshots below show, from left to right, absolute position movement settings, scanning movement settings, and relative position movement settings.



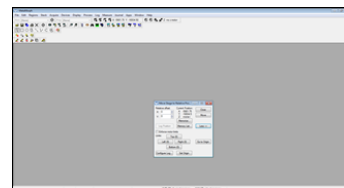
Click to Enlarge

Absolute Position Movement Settings



Click to Enlarge

Scanning Movement Settings



Click to Enlarge

Relative Position Movement Settings

APT SOFTWARE

The APT™ (Advanced Positioning Technology) family covers a wide range of motion controllers ranging from small, low-powered, single-channel drivers (such as the T-Cubes) to high-power, multi-channel, modular 19" rack nanopositioning systems (the APT Rack System).

All controllers in the APT family share a common software platform, the 'APT System Software', which is available on our APT software download page. A support package, containing a wealth of information on using and programming these Thorlabs products is also available.

By providing this common software platform, Thorlabs has ensured that users can easily mix and match any of the APT controllers in a single application, while only having to learn a single set of software tools. In this way, it is perfectly feasible to combine any of the controllers from the low-powered, single-axis to the high-powered, multi-axis systems and control all from a single, PC-based unified software interface.

The APT System Software allows two methods of usage: graphical user interface (GUI) utilities for direct interaction and control of the controllers 'out of the box', and a set of programming interfaces that allow custom-integrated positioning and alignment solutions to be easily programmed in the development language of choice.

A range of video tutorials are available to help explain our APT system software. These tutorials provide an overview of the software and the APT Config utility. Additionally, a tutorial video is available to explain how to select simulator mode within the software, which allows the user to experiment with the software without a controller connected. Please select the *APT Tutorials* tab above to view these videos, which are also available on the software cd included with the controllers.

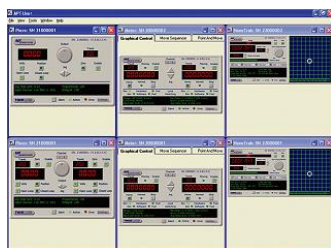
Software

APT Version 3.7.0

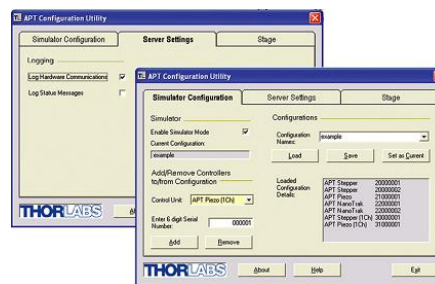
Includes a GUI for control of Thorlabs' APT™ system controllers, as well as a wealth of support information in the form of handbooks, help files, tutorial videos, and FAQs.

Also Available:

- Support Package
- Redistribution Module



Typical APT User GUI



Typical Configuration Screen

APT TUTORIALS

These videos illustrate some of the basics of using the APT System Software from both a non-programming and a programming point of view. There are videos that illustrate usage of the supplied APT utilities that allow immediate control of the APT controllers out of the box. There are also a number of videos that explain the basics of programming custom software applications using Visual Basic, LabView and Visual C++.



[Click here to view the video tutorial](#)



To further assist programmers, a guide to programming the APT software in LabView is also available.



[Click here to view the LabView guide](#)



High-Speed Motorized XY Scanning Stages



These XY scanning stages are drop-in replacements for the manual stages found on select microscopes, and provide motorized XY positioning of microscopy samples. The MLS203-1 is compatible with inverted and upright microscopes from Nikon and Olympus. Adapter brackets can be

purchased separately that enable the stage to be fitted to a particular microscope. Tabletop mounting brackets (MLSA01) are also available that enable the stage to be bolted to an optical table or breadboard as part of a custom built microscope setup or for use in typical photonics applications (see below for more details).

The MLS203-2 is directly compatible with Zeiss Axio Observer and Axiovert 40 microscopes. Mounting brackets are not required.

Key Specifications ^a	
Travel Range	110 mm x 75 mm (4.3" x 2.95")
Velocity (Max)	250 mm/s
Acceleration (Max)	2000 mm/s ²
Bidirectional Repeatability	0.25 μm
Unidirectional Repeatability	0.25 μm
Horizontal Load Capacity (Max)	1.0 kg (2.2 lb)
Min. Achievable Incremental Movement	0.1 μm
Home Location Accuracy	0.25 μm
Absolute On-Axis Accuracy	<3 μm

- Please see the Specs tab for complete specifications.

Part Number	Description	Price	Availability
MLS203-1	Fast XY Scanning Stage	\$6,799.00	Today
MLS203-2	Fast XY Scanning Stage for Zeiss Microscopes	\$6,799.00	Today

Compatible Controller for MLS203 Stages



The BBD202 two-channel controller features Thorlabs' standard apt™ control and programming interface, enabling easy integration into automated microscopy applications. It is ideal for applications demanding operation at high speeds (hundreds of mm/s) and high encoder resolution (<100 nm). For greater flexibility, communication with a PC is supported using either a USB or RS232 serial interface. The controller is supplied with a software development kit (SDK) in order to support automated PC control of the stage. This is useful to system integrators and other automation specialists who need to combine operation of the stage with other microscopy automation accessories. The fully documented SDK supports all major development languages running on Windows, such as LabView, C++, and Matlab, and comes in the form of ActiveX libraries or a conventional dynamic link library (DLL).

USB 1.1 connectivity provides easy, plug-and-play PC operation. Multiple units can be connected to a single PC via standard USB hub technology; for example, both the BBD202 controller for the MLS203 XY stage and the controller with our MZS500-E Z-axis piezo stage kit can be operated simultaneously with a single PC. Combining this feature with the user-friendly apt™ software allows the user to program and carry out complex move sequences quickly. For more details on the BBD202 controller, please see the Specs tab above or the full presentation for more details on our brushless DC controllers.

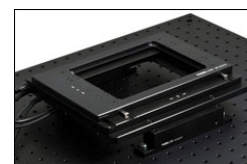
Part Number	Description	Price	Availability
BBD202	2-Channel Benchtop 3-Phase Brushless DC Servo Controller	\$2,959.28	Today

Mounting Brackets for MLS203 Series Stages

We offer a choice of brackets to facilitate mounting the MLS203-1 stage to a range of upright and inverted microscopes from Nikon and Olympus. Please see the table below for specific compatibility. We also offer brackets that allow the MLS203-1 stage to be attached to imperial or metric breadboards for home-built microscopes or general photonics applications.

Each bracket comes with instructions describing how to attach the stage to the microscope. Please note that the MLS203-2 stage can be bolted directly to a Zeiss Axiovert without the need for brackets.

Click Image for Details						
Bracket Item #	MLSA02	MLSA08	MLSA03	MLSA06	MLSA07	MLSA01
Microscope Brand	Olympus		Nikon			Optical Breadboard, Custom Configuration
Microscope Model	IX51, IX71, IX73, IX81, IX83	BX41, BX43, BX51, BX53, BX61	TE2000, Eclipse Ti	50i, 80i, 90i, Ci-L	Eclipse FN1	N/A
Microscope Type	Inverted	Upright	Inverted	Upright	Upright	N/A



Click to Enlarge
 MLS203-1 Stage Attached to a Breadboard with our MLSA01 Bracket Set

We support microscopes from Olympus, Nikon, Zeiss and Leica. Please contact Technical Support to inquire about bracket availability if your microscope model is not listed above.

Part Number	Description	Price	Availability
MLSA02	Olympus IX51, IX71, IX73, IX81, and IX83 Mounting Brackets, 2 Pieces	\$105.00	Today
MLSA08	Olympus BX41, BX43, BX51, BX53, and BX61 Adapter	\$350.00	3-5 Days
MLSA03	Nikon TE2000 and Eclipse Ti Mounting Brackets, 2 Pieces	\$129.00	Today
MLSA06	Nikon 50i, 80i, 90i, and Ci-L Adapter	\$350.00	Today
MLSA07	Customer Inspired! Nikon Eclipse FN1 Mounting Adapter	\$350.00	Today
MLSA01	MLS203 31.5 mm Riser Plates for Breadboard Mounting, 2 Pieces	\$155.00	Today

Slide Holders for MLS203 Stages

MLS203P2

Slide/Petri Dish Holder for Inverted Microscopes



[Click to Enlarge](#)

- Compatible with Slides Measuring 25 mm to 26.5 mm (0.98" to 1.04") in Width
- Compatible with Petri Dishes Measuring 30 mm to 60 mm (1.18" to 2.36") in Diameter



[Click to Enlarge](#)
MLS203 Stage with MLS203P2 Slide/Petri Dish Holder Fitted



[Click to Enlarge](#)
MLS203 Stage with MLS203P2 Mounted on Inverted Microscope

C4SH01

Multi Slide Holder for Inverted Microscopes



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- Plastic Holder is Compatible with Standard Microscope Slides (25 mm x 75 mm)
- Mount up to Four Slides for Automated Tissue and Tissue Microarray Analysis
- Same Footprint as Multiwell Plates (127.6 mm x 85.5 mm)
- Requires MLS203P1 Adapter Plate (Sold Below)



[Click to Enlarge](#)
MLS203 Stage with C4SH01 in a MLS203P1 Plate Adapter Mounted on Inverted Microscope (Requires the MLS203P1 Plate Adapter, Sold Below)



[Click to Enlarge](#)
MLS203 Stage with C4SH01 in a MLS203P1 Plate Adapter Mounted on Inverted Microscope

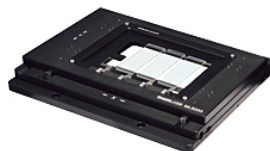
MLS203P9

Multi-Slide Holder for Upright or Inverted Microscopes



[Click to Enlarge](#)

- Compatible with Standard Microscope Slides and 18 mm x 18 mm Calibration Targets
- Holds up to Three Slides and One Calibration Target
- Can be Used with 25 mm x 75 mm and 1" x 3" Slides



[Click to Enlarge](#)
MLS203 Stage with MLS203P9 Multi Slide Holder, Holding Three Slides



[Click to Enlarge](#)
MLS203 Stage with MLS203P9 Multi-Slide Holder Mounted on Inverted Microscope

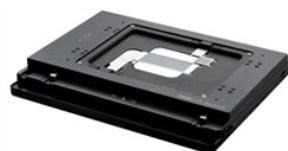
MLS203P11

Recessed Slide Holder for Upright Microscopes

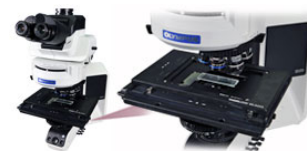


[Click to Enlarge](#)

- Compatible with Standard Microscope Slides and 18 mm x 18 mm Calibration Targets
- Allows the Microscope Condenser to be Positioned Within 1.5 mm (0.06") of the Slide Surface
- Can be Used with 25 mm x 75 mm and 1" x 3" Slides



[Click to Enlarge](#)
MLS203 Stage with MLS203P11 Slide Holder, Holding a Slide and 18 mm Square Test Target



[Click to Enlarge](#)
MLS203 Stage with MLS203P11 Recessed Slide Holder Mounted on Upright Microscope

Part Number	Description	Price	Availability
MLS203P2	Slide/Petri Dish Holder for Inverted Microscopes	\$450.00	3-5 Days
C4SH01	Four-Position Microscope Slide Holder	\$79.30	Today
MLS203P9	Multiple Slide Holder for Upright and Inverted Microscopes	\$460.00	Today
MLS203P11	Recessed Slide Holder for Upright Microscopes	\$395.00	Today

General Accessory Plates for MLS203 Stages

MLS203P1 Multiwell Plate Adapter



Click to Enlarge

- Compatible with C4SH01 and Standard Well Plates
- Clip Holder to Secure Samples in Place

MLS203P3 Blank Adapter Plate



Click to Enlarge

- Ideal for Custom or Non-Standard Applications
- Easily Drilled and Tapped

MLS203P4 and MLS203P5 Breadboard



Click to Enlarge

- 35 Imperial or Metric Taps
- MLS203P4: M6 Taps on 25 mm Centers
- MLS203P5: 1/4"-20 on 1" Centers

Application Example 1



Click to Enlarge

MLS203 Stage with MLS203P1 Multiwell Plate Adapter Fitted

Application Example 2



Click to Enlarge

MLS203 Stage with MLS203P3 Blank Adapter Plate Fitted

Application Example 3



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MLS203 Stage with MLS203P4 Breadboard Fitted

Part Number	Description	Price	Availability
MLS203P4	Metric M6 Breadboard Plate	\$200.00	Today
MLS203P1	Multiwell Plate Adapter	\$400.00	3-5 Days
MLS203P3	Blank Adapter Plate	\$150.00	Today
MLS203P5	Imperial 1/4"-20 Breadboard Plate	\$200.00	Today

2-Axis Joystick Console



- ▶ Speed Adjustment for Fast or High Precision Moves
- ▶ Speed Dial for Sensitivity Adjustment
- ▶ Ergonomic Design
- ▶ High-Quality Machined Anodized Aluminum Casing
- ▶ High-Reliability Hall Effect Joystick

The MJC001 Joystick Console has been designed for microscope users and provides intuitive, tactile, manual positioning of a stage. The console features a two-axis joystick for XY control. In most applications, the default parameter settings saved within the controller allow the joystick to be used out-of-the-box, with no need for further setup, thereby negating the requirement to be connected to a host PC and allowing true remote operation.

The joystick is shipped complete with cables for use with the BBD202 two-axis controller. If you intend to use the joystick with a legacy BBD10x series unit, please contact tech support for a compatible cable.

Part Number	Description	Price	Availability
MJC001	2-Axis Microscopy Joystick Console	\$995.00	Today
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Visit the *High-Speed Motorized XY Scanning Stages* page for pricing and availability information:
http://www.thorlabs.com/newgrouppage9.cfm?objectgroup_id=5360