Design Instruments

Siskiyou

encoded device   user's manual

Encoded Device
User's Manual

Service Information

Please call, email, or fax in your questions to Siskiyou Design Instruments at:

Telephone (toll free): 1-877-313-6418

E-Mail: service@sd-instruments.com

Facsimile: 1-541-479-3314

For a mailing address, refer to page 23.

Product Warranty

Siskiyou Design Instruments products carry the following warranty, effective for a period of one year from the original invoice date unless otherwise stated in the product literature:

- Siskiyou Design Instruments products will be free of defects in material and workmanship.
- Siskiyou Design Instruments products will meet the specifications stated in this catalog.

If you find any defects in material or workmanship, or a failure to meet specifications within the warranty period, return the product to us clearly marked with a Return Authorization (RA) number and we will either repair or replace it at our discretion. Call our toll free telephone number and ask for the service department to request RA numbers.

Our warranty excludes products that have been improperly installed or maintained, modified or misused. Notification of claim must occur within the warranty period. Siskiyou Design Instruments' liabilities are limited as set forth in our STANDARD TERMS AND CONDITIONS, copies of which are available upon request.

Siskiyou Design Instruments products unused and undamaged may be returned to Siskiyou Design Instruments within 30 days of the initial invoice date (60 days outside of the US), but are subject to a 25% restocking fee.

Warranty Repairs

Before shipping a part to Siskiyou Design Instruments, a Return Authorization (RA) number must be obtained by calling our service department at our toll free telephone number. The product must be shipped prepaid in the original or equivalent packing with the RA number clearly marked on the outside of the box. Pack carefully to prevent damage. Place actuators, stages, manipulators, and controllers in a clean plastic bag to prevent contamination from packing materials. Siskiyou Design Instruments cannot be responsible for any damage occurring in transit to us. Products are not accepted without a Return Authorization number on the outside of the shipping carton.

Non-Warranty Repairs

If a product needs repairing after the one year warranty period expires, we will first provide an estimate of repair charges and then repair the product upon receiving authorization from you. Repairs are warranted for 90 days. Refer to the above Warranty Repairs information for return procedures.

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All dimensions in this manual are given in inches unless specified otherwise.

1.0 Introduction

This manual describes the operation of SD Instruments' 840 Series Linear Actuators, 100cri, 200cri, 7000, and 830 Series Stages, MXMS-cri Series Microscope Stages, MX7000 Series Micromanipulators, and MX831 Micromanipulators, as well as their related controllers.

MXMS-cri Series Microscope Stages, MX7000 Series Micromanipulators, and MX831 Micromanipulators are made up of 7000 Series Stages, and 830 Series Stages. Therefore the descriptions and operating features of the respective stages correspond to the related microscope stage, and micromanipulator systems as well.

1.1 Inspection

SD Instruments products are shipped in sturdy, cushioned boxes. Please inspect the instrument and/or controllers immediately and notify the carrier if damage is obvious.

2.0 Description

SD Instruments' 840 Series Actuators, 100cri, 200cri, 7000, and 830 Series Stages, MXMS-cri Series Microscope Stages, MX7000 Series Micromanipulators, and MX831 Series Micromanipulators incorporate mechanical limit switches that cut motor power preventing accidental over-travel.

The 840 Series Actuators can be configured with travel limits from approximately 1/32 inch to 2 inches (0.8 mm to 50 mm), enabling them to be used on a wide variety of SD Instruments translation stages.

To provide accurate motion, the 840 Series Actuator's 3/16-inch diameter plunger is non-rotating. A non-rotating low friction composite nut engages the leadscrew and pushes the actuator plunger or stage platform. In the 840 Series Actuators a composite half-nut is used to trigger a travel limit in the extended position while the lead screw nut trips the limit at full retraction.

☞ **Caution**

If an actuator or stage encounters a hard stop within its range of travel (a translation stage's or mirror mount's end of travel, for example), STOP THE DEVICE AS SOON AS POSSIBLE! CONTINUED OPERATION WILL DAMAGE THE INSTRUMENT!

These actuators and stages are powered by low inertia DC servomotors to provide smooth movement with low acoustic and mechanical noise. Submicron resolution is obtained with a precision stainless steel leadscrew driven through an anti-backlash reduction gearbox.

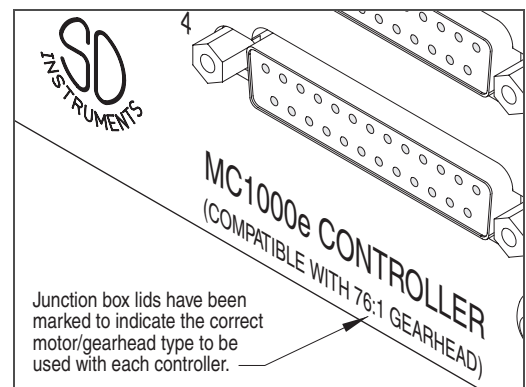The motor has an ironless-rotor to permit fast response due to its low inertia. The brushes are precious-metal plated for long life. The factory lubrication has a vapor pressure of 10^{-6} Torr at 25°C.

Motion Controllers

Digital Readout

Junction box lids have been marked to indicate the correct motor/gearhead type to be used with each controller.
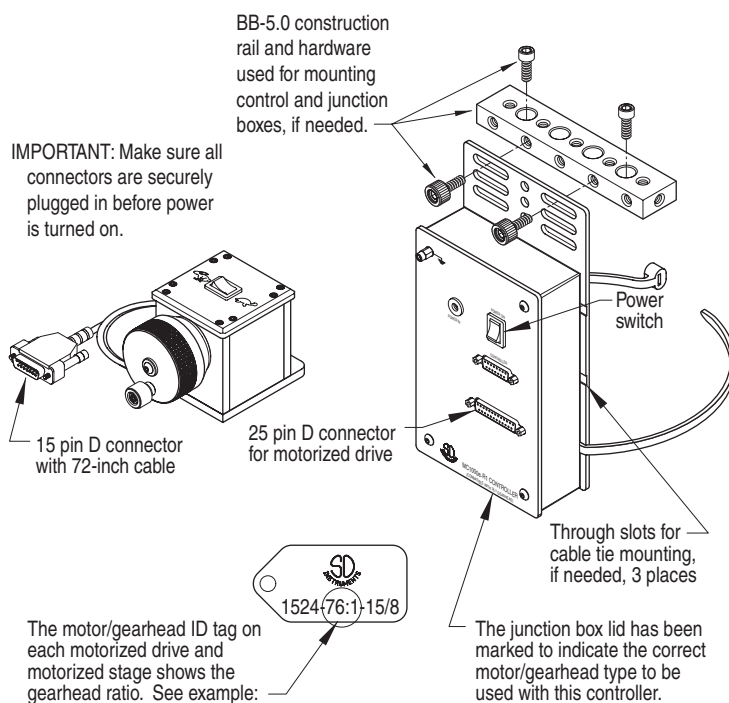
MC1000e CONTROLLER (COMPATIBLE WITH 76:1 GEARHEAD)

Encoded Device

User's Manual

MC1000e-R1

MC1000e-R1 Setup Instructions

BB-5.0 construction rail and hardware used for mounting control and junction boxes, if needed.

IMPORTANT: Make sure all connectors are securely plugged in before power is turned on.

Power switch

15 pin D connector with 72-inch cable

25 pin D connector for motorized drive

Through slots for cable tie mounting, if needed, 3 places

1524-76:1-15/8

The motor/gearhead ID tag on each motorized drive and motorized stage shows the gearhead ratio. See example:

The junction box lid has been marked to indicate the correct motor/gearhead type to be used with this controller.

CE CERTIFIED DEVICE

Performance Specifications

|	
Minimum controllable motion	0.2 µm
Maximum speed	1.7 mm/sec
Power requirements	110 VAC, 50/60 Hz
Output	15VDC/400mA, via supplied wall mounted power supply

2.1 Controller Interfaces

The 840 Series actuators, 7000 Series and 830 Series stages incorporate travel limit switches. Additionally, since these instruments use high torque motors and anti-backlash gearboxes, their comparability with non-SD Instruments controllers may be limited. The following sub-sections describe the comparability and features of SD Instruments controllers.

2.1.1 MC1000e-R1 Single-Axis Dial

The MC1000e-R1 uses encoder feedback from our closed loop devices to create an electronic link between the controller dial and the device being driven. This direct coupling to the encoder ensures smooth and coordinated motion between the controller and the drive. The encoder coupling enables the use of the DR1000 digital readout for repeated positioning requirements.

A two-position rocker switch is located on the top of the controller. The rapid 🐇 setting is set to maximize speed (1.7 mm/second) when the dial is turned at 180 RPM. The slow 🐢 setting is set to maximize resolution (0.2 µm) but still allow coarse positioning (45 µm/second).

MC1000e-R Setup Instructions

IMPORTANT: Make sure all connectors are securely plugged in before power is turned on.

BB-5.0 construction rail and hardware used for mounting control and junction boxes, if needed.

Drive axis 4 (not shown)

Drive axis 3

Drive axis 2

Drive axis 1

Connection to controller

Power switch

25 pin D connector for motorized drive

15 pin D connector with 72-inch cable

Through slots for cable tie mounting, if needed, 3 places

1524-76:1-15/8

The motor/gearhead ID tag on each motorized drive and motorized stage shows the gearhead ratio. See example:

The junction box lid has been marked to indicate the correct motor/gearhead type to be used with this controller.

MC1000e-R

CE CERTIFIED DEVICE

Performance Specifications

Minimum controllable motion	0.2 μm
Maximum speed	1.7 mm/sec
Power requirements	110 VAC, 50/60 Hz
Output	15VDC/400mA, via supplied wall mounted power supply

2.1.2 MC1000e-R 4-Axis Dial

The MC1000e-R uses encoder feedback from our closed loop devices to create an electronic link between the controller dial and the device being driven. This direct coupling to the encoder ensures smooth and coordinated motion between the controller and the drive. The encoder coupling enables the use of the DR1000 digital readout for repeated positioning requirements.
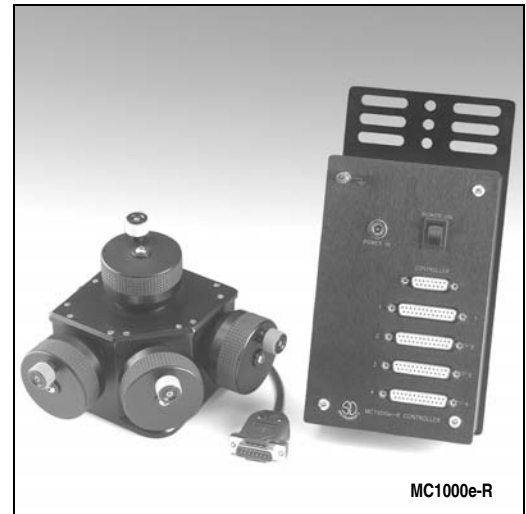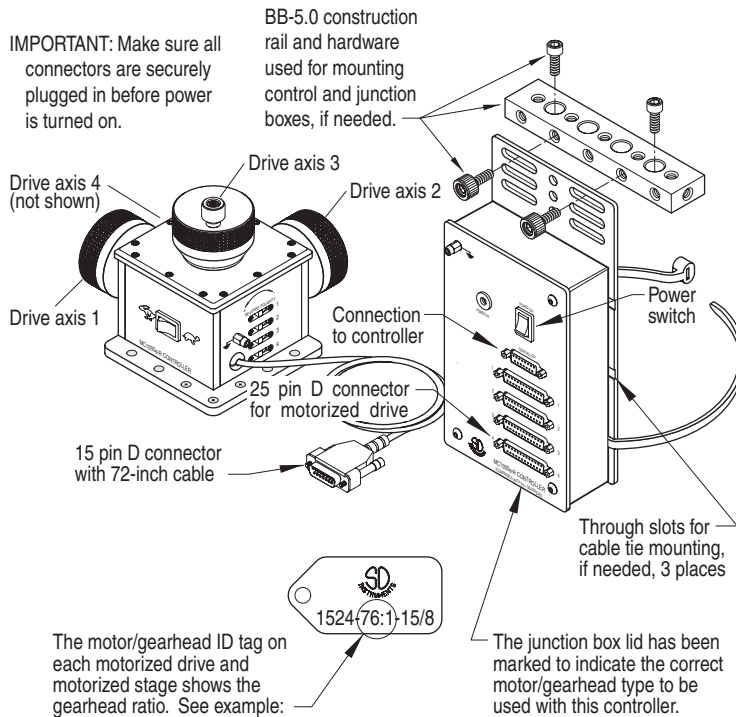
A two-position rocker switch is located on the side of the controller. The rapid 🐇 setting is set to maximize speed (1.7 mm/second) when the dial is turned at 180 RPM. The slow 🐢 setting is set to maximize resolution (0.2 μm) but still allow coarse positioning (45 μm/second).

Reverse polarity switches are included for each motion direction of the MC1000e-R. By switching the polarity, the direction of motion relative to the dial is reversed.
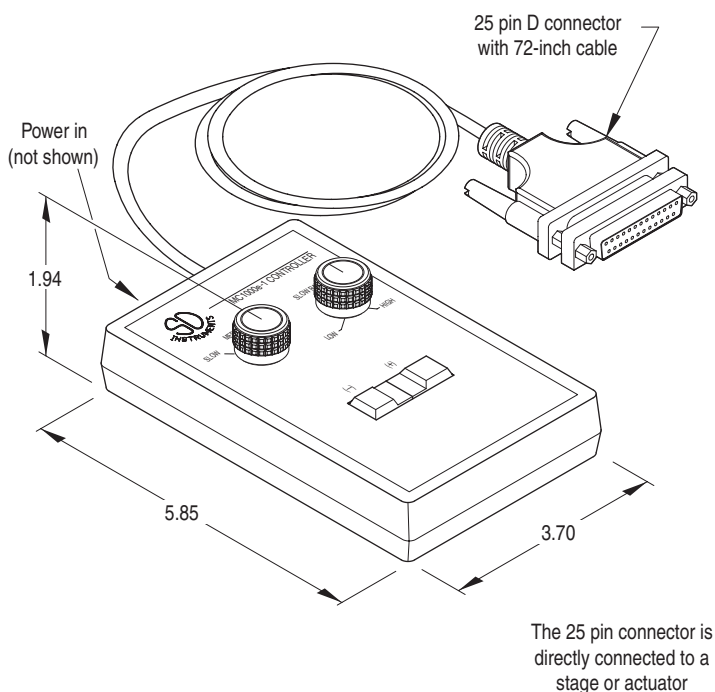
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MC1000e-1

⟨CE⟩ CERTIFIED DEVICE

Performance Specifications

Minimum controllable motion	0.2 µm
Power requirements	110 VAC, 50/60 Hz
Output	15VDC/400mA,
	via supplied wall mounted power supply

MC1000e-1 Setup Instructions

25 pin D connector with 72-inch cable

Power in (not shown)

1.94

5.85

3.70

The 25 pin connector is directly connected to a stage or actuator

2.1.3 MC1000e-1 Single-Axis Push Button

SD Instruments' MC1000e-1 hand held single axis controller is compatible with all of our 840 Series Actuators, 7000 Series Stages, 830 Series Stages, 7000 Series Micromanipulators, and 831 Series Micromanipulators.

The MC1000e-1 single-axis controller has two preset speed settings: rapid (1.7 mm/sec) and medium (300 µm/sec). The third speed selector (slow) has a variable 330° potentiometer that enables settings from high speed (50 µm/sec) to low speed (2 µm/sec). With the speed selector set at the slowest settings, consistent 0.2 µm moves are made by a bump of the axis button.
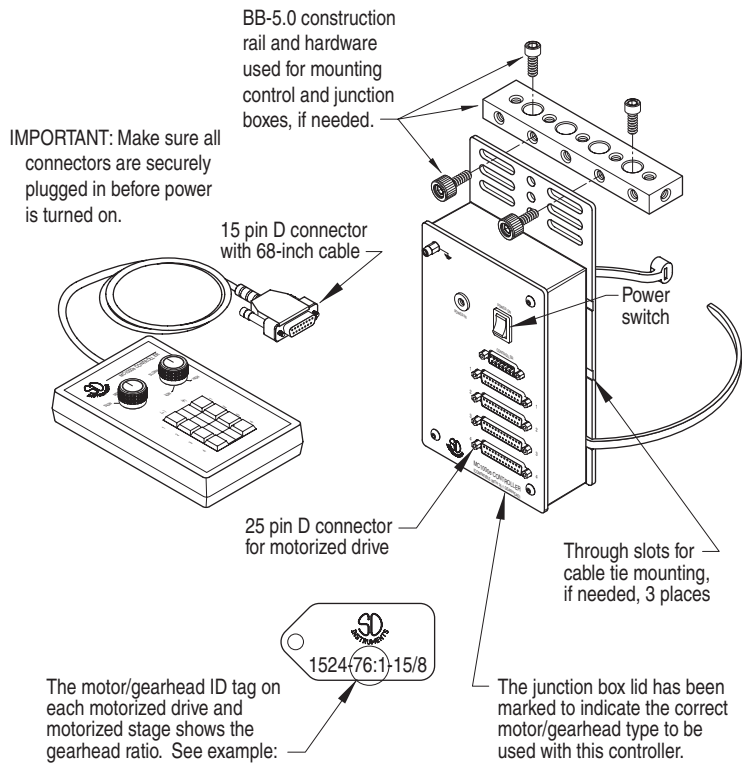
The MC1000e-1 controller does not have a junction box. The stage or actuator is connected directly to the 25 pin connector shown. The wall transformer power supply cord plugs into a power jack socket on the end of the case where the cable is shown, right above the logo.

MC1000e Setup Instructions

BB-5.0 construction rail and hardware used for mounting control and junction boxes, if needed.

IMPORTANT: Make sure all connectors are securely plugged in before power is turned on.

15 pin D connector with 68-inch cable

Power switch

25 pin D connector for motorized drive

Through slots for cable tie mounting, if needed, 3 places

1524-76:1-15/8

The motor/gearhead ID tag on each motorized drive and motorized stage shows the gearhead ratio. See example:

The junction box lid has been marked to indicate the correct motor/gearhead type to be used with this controller.

MC1000e

CE **CERTIFIED DEVICE**

Performance Specifications

Minimum controllable motion   0.2 µm

Power requirements   110 VAC, 50/60 Hz

Output   15VDC/400mA,
via supplied wall mounted power supply

2.1.4 MC1000e 4-Axis Push Button

SD Instruments' MC1000e hand held 4-axis controller is compatible with all of our 840 Series Actuators, 7000 Series Stages, 830 Series Stages, 7000 Series Micromanipulators, and 831 Series Micromanipulators. The MC1000e Controller is a closed loop controller that enable the user to consistently perform single step moves as small as 0.2 µm.

The MC1000e 4-axis controller has two preset speed settings: rapid (1.7 mm/sec) and medium (300 µm/sec). The third speed selector (slow) has a variable 330° potentiometer that enables settings from high speed (50 µm/sec) to low speed (2 µm/sec). With the speed selector set at the slowest settings, consistent 0.2 µm moves are made by a bump of the axis button.
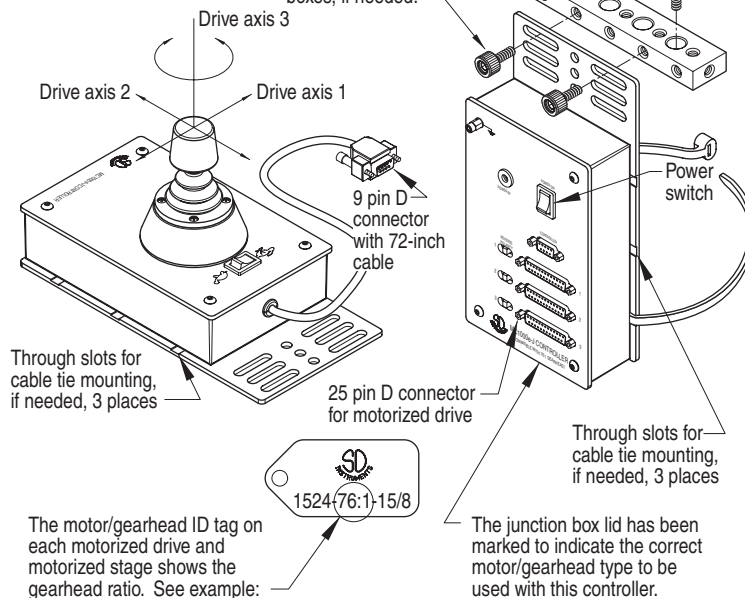
MC1000e-J

CE CERTIFIED DEVICE

Performance Specifications

Minimum controllable motion	1 µm
Power requirements	110 VAC, 50/60 Hz
Output	15VDC/400mA,
	via supplied wall mounted power supply

MC1000e-J Setup Instructions

IMPORTANT: Make sure all connectors are securely plugged in before power is turned on.

BB-5.0 construction rail and hardware used for mounting control and junction boxes, if needed.

Drive axis 3

Drive axis 2   Drive axis 1

9 pin D connector with 72-inch cable

Power switch

Through slots for cable tie mounting, if needed, 3 places

25 pin D connector for motorized drive

Through slots for cable tie mounting, if needed, 3 places

1524-76:1-15/8

The motor/gearhead ID tag on each motorized drive and motorized stage shows the gearhead ratio. See example:

The junction box lid has been marked to indicate the correct motor/gearhead type to be used with this controller.

2.1.5 MC1000e-J 3-Axis Joystick

SD Instruments' MC1000e-J 3-axis joy-stick controller is compatible with all of our 840 Series Actuators, 7000 Series Stages, 830 Series Stages, 7000 Series Micromanipulators, and 831 Series Micromanipulators. The MC1000e-J controller is a closed loop controller that enables the user to consistently perform smooth joy-stick motion as small as 1 µm.

A two-position rocker switch is located on the top of the controller. The rapid 🐇 setting is set to maximize speed (1.7 mm/second) when the joystick is moved to its farthest position from center. The slow 🐢 setting is set to maximize resolution (0.2 µm) but still allow coarse positioning (20 µm/second).
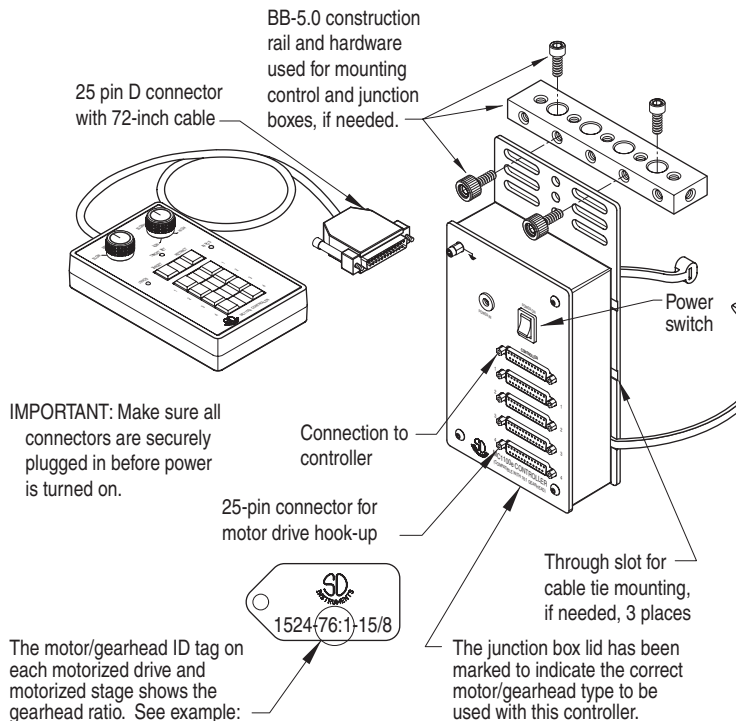
Reverse polarity switches are included for each motion direction of the MC1000e-J. By switching the polarity, the direction of motion relative to the joystick is reversed.

MC1100e Setup Instructions

BB-5.0 construction rail and hardware used for mounting control and junction boxes, if needed.

25 pin D connector with 72-inch cable

Power switch

IMPORTANT: Make sure all connectors are securely plugged in before power is turned on.

Connection to controller

25-pin connector for motor drive hook-up

The motor/gearhead ID tag on each motorized drive and motorized stage shows the gearhead ratio. See example:

1524-76:1-15/8

Through slot for cable tie mounting, if needed, 3 places

The junction box lid has been marked to indicate the correct motor/gearhead type to be used with this controller.

MC1100e

$C\epsilon$ **CERTIFIED DEVICE**

Performance Specifications

Minimum controllable motion	0.2 µm
Power requirements	110 VAC, 50/60 Hz
Output	15VDC/400mA, via supplied wall mounted power supply

2.1.6 MC1100e 4-Axis Targeting

SD Instruments' MC1100e hand held 4-axis controller is compatible with all of our 840 Series Actuators, 7000 Series Stages, 830 Series Stages, 7000 Series Micromanipulators, and 831 Series Micromanipulators. The MC1100e Controller is a closed loop controller that enables the user to consistently perform single step moves as small as 0.2 µm. The MC1100e incorporates a "Targeting" feature for one axis. This feature enables the user to pre-set a target point on that axis, "Retract" to the negative limit of travel and return to that pre-set point simply by depressing the "Target" button on the controller.

The targeting axis is axis number 1. To set a point of reference when axis 1 is in a desired position, push the "Target Set" button. To retract the motorized axis 1, push the "Retract" button. Once this axis has reached its reverse limit switch the red LED will light up. To bring the axis back to the target position, push the "Target" button. When the green LED lights up, the motorizer is in the target position. For best results and to avoid backlash, the direction of travel when the "Target Set" button is pushed should be a forward move; that is, the same travel direction as the movement from the limit switch to the target.

☞ Note: For all axes to operate, the targeting axis 1 must be connected.

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MC2000

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Performance Specifications

Minimum controllable motion	0.1 μm
Maximum speed	1.7 mm/sec
Power requirements	110-240 VAC 50/60 Hz
	includes auto-switching

MC2000 Controller
Optimal Operation Settings and Limits

Baud rate	38400 bps
Com port	1-5
Incremental/decrimental move	1-8,388,600

where 1 = 0.005μm, 198472 = 1.0mm

Velocity	1-32,765

where velocity is in RPM of the motor.

2.1.7 MC2000 Closed Loop Motion Controller

SD Instruments' MC2000 closed loop controller is compatible with all of our 840 Series Actuators, 7000 Series Stages, 830 Series Stages, 7000 Series Micromanipulators, and 831 Series Micromanipulators. The MC2000 Controller is a closed loop four axis controller that enables the user to consistently perform single step moves as small as 0.1 μm via the encoder on the drive motor. The MC2000 Controller is designed to be operated from a customer supplied PC. The communication from the PC to the MC2000 is accomplished through one of the PC's com ports via the supplied RS-232 cable. The LabView based operation software is set-up with the following single/multiple axis features; absolute position set, go to absolute position, zero set, zero return, set all zero, zero return all, and emergency stop. Customer adjustable settings include; baud rate, com port, incremental/decrimental move, velocity, and acceleration/deceleration.

The following examples show specific velocity and acceleration/deceleration settings converted to μm/second. These speeds are approximations.

Velocity RPM	Acceleration / deceleration	Approx. Speed μm/sec
32,765	32,765	1,700
30,000	3,000	1,470
20,000	2,000	1,385
10,000	1,000	1,080
5,000	500	740
1,000	100	140
500	50	75
100	50	15.8
50	10	7.4
10	2	1.6

Acceleration / deceleration	1-32765

Acceleration/deceleration is a function of the velocity and should be set at an even divisor of the velocity for optimum performance.
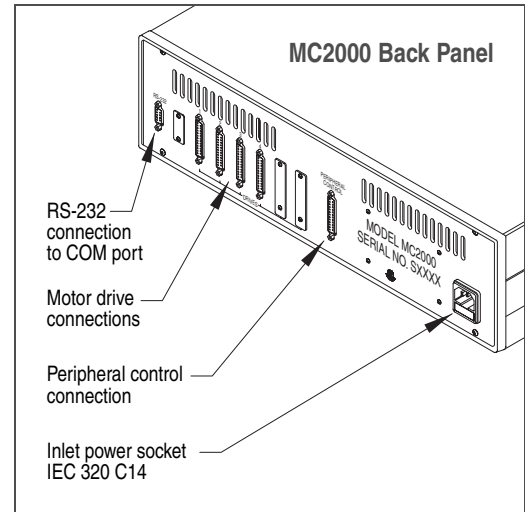
MC2000 Software Startup Instructions

The following procedures should be observed in sequence for start up after the software has been installed onto the computer.

☞ Install the software before beginning the following steps:

1 Connect all drives to the MC2000 controller and connect the RS-232 cable to an open com port on the computer.

2 Plug in AC power cord and switch the MC2000 to the ON position. The red LED switch will light up.

3 Wait 10 seconds, then execute the MC2000 program.

④ Confirm that the com port setting matches the com port that is actually used.

⑤ Confirm that the baud rate on the screen is set at 38400.

⑥ Click on the arrow symbol (RUN button) at the top left of the screen.

MC2000 Back Panel

RS-232 connection to COM port

Motor drive connections

Peripheral control connection

Inlet power socket IEC 320 C14

The vi (virtual instrument) is now active and ready to execute a motion command. The default jog size for an incremental move is 1 mm.
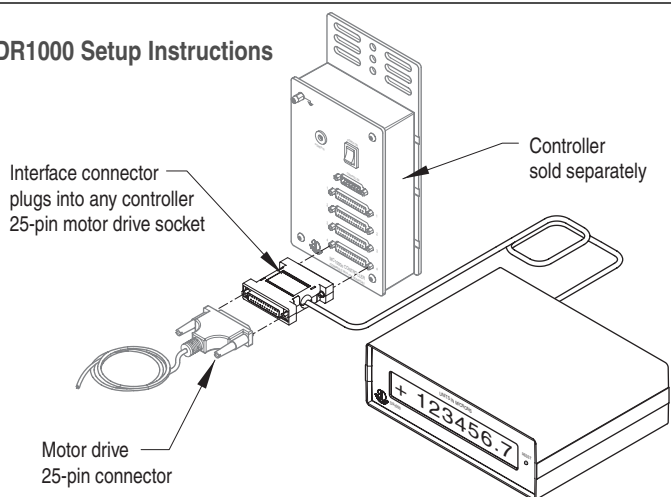
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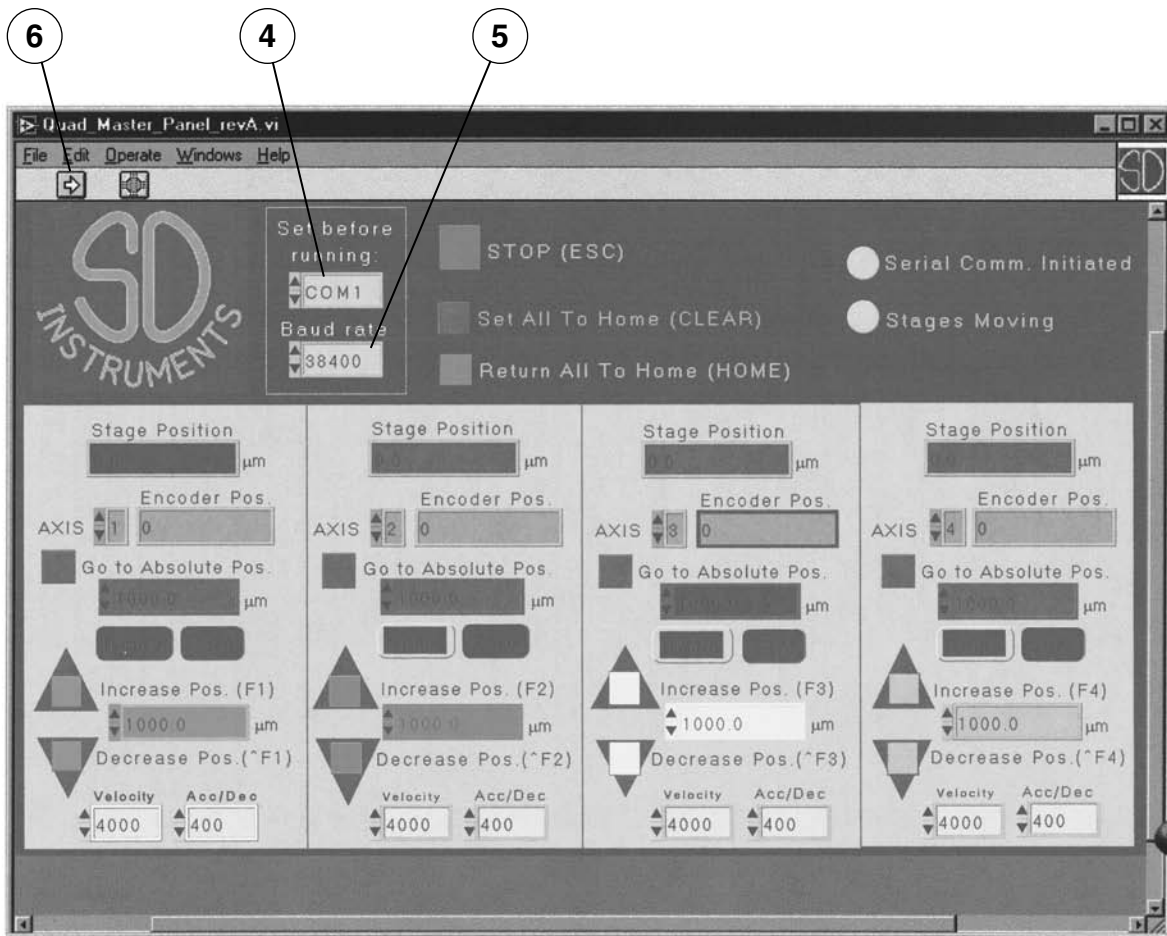
DR1000

Performance Specifications

Minimum travel increment	0.1 µm
Maximum travel display	500,000 µm
Accuracy	99%
Power requirements	110 VAC, 50/60 Hz
Output	18VDC/500mA,
	via supplied wall mounted power supply

DR1000 Setup Instructions

Interface connector plugs into any controller 25-pin motor drive socket

Controller sold separately

Motor drive 25-pin connector

2.1.8 DR1000 Digital Readout

The digital readout may be installed on any of our **e** series controllers and is connected in series via a double-sided connector between the controller junction box and the device D connector. The DR1000 has a face mounted ZERO RESET button.

☞ Note: The DR1000 is not compatible with the MC2000 controller.

RPA

RPA Setup Instructions

RPA interface connector plugs into any controller 25-pin motor drive socket, except axis one on the MC1100e

Controller sold separately

Motor drive 25-pin connector
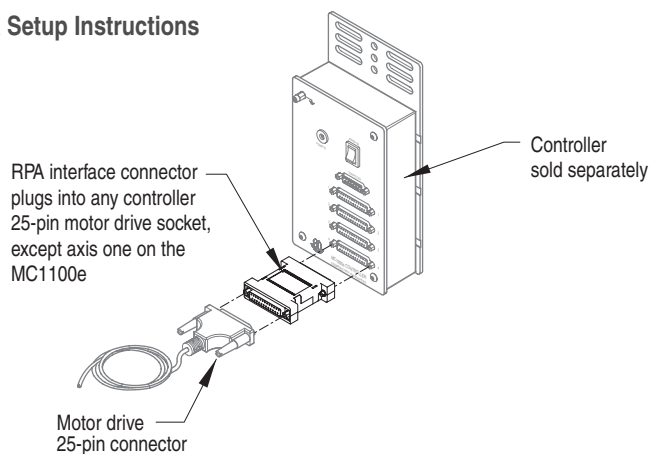
2.1.9 RPA Reverse Polarity Adapter

The RPA is an interface plug that reverses the motion direction of stages and actuators. Used to reverse axis direction relative to controller. Use on MC1000e-1, MC1000e, MC1000e-R1, and MC1100e.

☞ Note: Not for use on the targeting axis, axis number 1, on the MC1100e.

2.1.10 Motorized Translation Stages

The 100cri motorized crossed roller bearing translation stage has more bearing area than similar stages. The increased bearing surface ensures true bidirectional axial positioning even at submicron levels.

100cri stages are an integration of our 100cr crossed roller translation stage and our 841 actuators. Our *e* series and MC2000 controllers drive the stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements.

There is a man-readable scale on both the top and bottom of the drive housing. They are available in either right- or left-hand versions. Multiple 100cri units are stackable for XY positioning requirements and are compatible with our MX-AB angle block for Z axis applications.

• No maintenance is required under normal operating conditions.

The 200cri motorized crossed roller bearing translation stage has more bearing area than similar stages. The increased bearing surface ensures true bidirectional axial positioning even at submicron levels.

200cri stages are an integration of our 200cr crossed roller translation stage and our 842 actuators. Our *e* series and MC2000 controllers drive the stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements.

There is a man-readable scale on both the top and bottom of the drive housing. They are available in either right- or left-hand versions. Multiple 200cri units are stackable for XY positioning requirements and are compatible with our MX-AB2 angle block for Z axis applications.
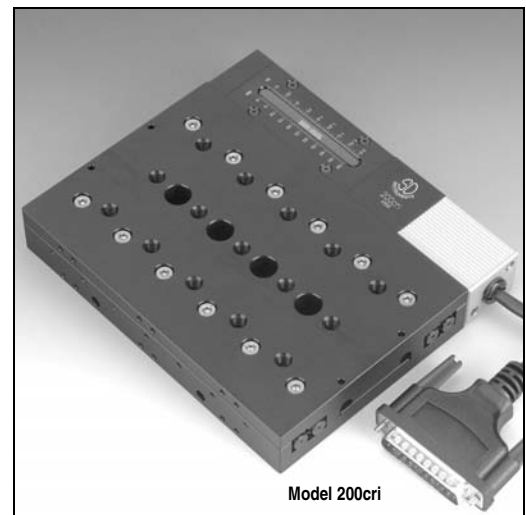
• No maintenance is required under normal operating conditions.

Model 100cri
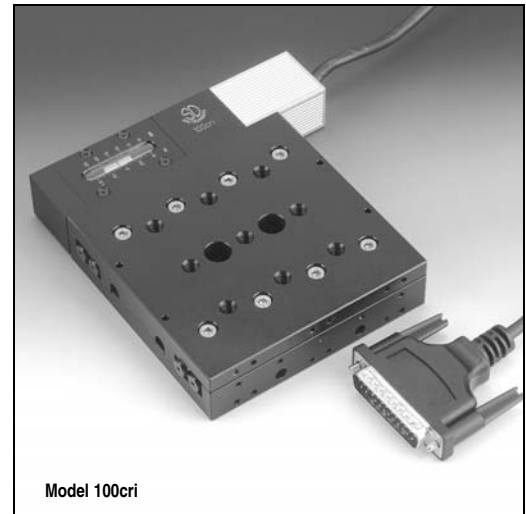
CE CERTIFIED DEVICE

Performance Specifications

Maximum horizontal axis load	30 lbs
Maximum vertical axis load	10 lbs
Travel	1.0 inch (25 mm)
Backlash	≤ 5 µm
Point-to-point accuracy	± 2 µm

Model 200cri

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Performance Specifications

Maximum horizontal axis load	30 lbs
Maximum vertical axis load	10 lbs
Travel	2.0 inch (50 mm)
Backlash	≤ 5 µm
Point-to-point accuracy	± 2 µm

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Model 831

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Performance Specifications

Maximum horizontal axis load	15 lbs
Maximum vertical axis load	3 lbs
Travel	1.0 inch (25 mm)
Backlash	≤ 5 µm
Point-to-point accuracy	± 2 µm
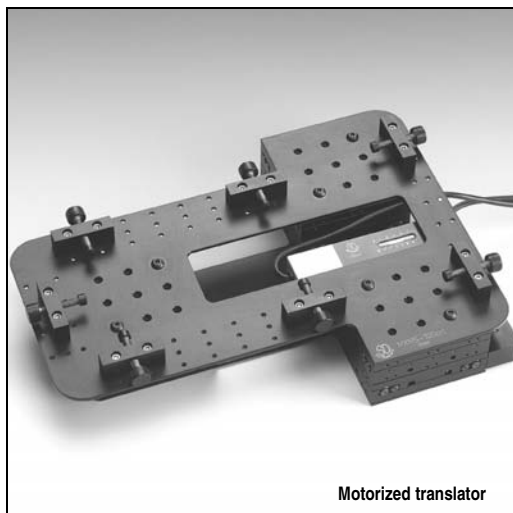
Motorized translator

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Performance Specifications

Maximum load	200 lbs, centered
Travel/axis	1.0 inch (25 mm)
Minimum controllable motion:	
Backlash	≤ 5 µm
Point to point accuracy	± 2 µm

The 831 motorized precision ball bearing translation stage has more bearing area than similar stages. The increased bearing surface ensures true bidirectional axial positioning even at submicron levels.

831 stages are an integration of our 331 translation stage and our 841 actuators. Our *e* series and MC2000 controllers drive the stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements.

There is a man-readable scale on both the top and bottom of the drive housing. They are available in either right- or left-hand versions. 831s are stackable for XY positioning requirements and are compatible with our MX-AB for Z axis applications.

• No maintenance is required under normal operating conditions.

The MXMS-cri series microscope translators are designed to be stable XY translators for fixed stage experiments. MXMS-cri series translators have a full 25 mm of XY translation and have full crossed roller bearing stages in all three locations.

MXMS-cri series translators can be controlled with any *e* series and MC2000 controllers. Our controllers drive the stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements. All cables are shielded to ensure noise-free operation during sensitive electrophysiology experiments.

• No maintenance is required under normal operating conditions.

2.1.11 Motorized XYZ Stages

The 7000 series motorized crossed roller bearing translation stages are an integrated version of our 1600 series crossed roller translation stage. They use a precision pre-loaded lead screw to ensure drift-free operation.

Our *e* series and MC2000 controllers drive the stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements.

7000 series stages come standard with our ABP-R mounting plate. The design of this mounting plate enables coarse positioning between platform mounting holes as well as 360° of coarse rotational positioning. If rotation with a solid submicron level stop is required, the MX-RS rotation stage is designed to mount directly into the ABP-R and has mounting holes for all 1600 series stages.

• No maintenance is required under normal operating conditions.

The MX7600 uses a precision pre-loaded lead screw to ensure drift-free operation and has applications in patch recording experiments. The motorized 4-axis micromanipulator incorporates our MXC-45 pipette holder mounted to an adjustable clamp on the Ø axis. This clamp allows the MXC-45 and Ø axis to be adjusted to the desired angle of approach from 0° to 180° for true axial approach. The MXC-45's built in rotational stop allows easy pipette replacement.

The MX7600 can be used with our *e* series and MC2000 controllers to drive the 7600 stage through a closed loop interface between the controller and the motor encoder. The closed loop connection ensures 0.2 µm and 0.1 µm resolution, respectively. The encoder coupling also enables the use of the DR1000 digital readout for repeated or relative positioning requirements. All cables are shielded to ensure noise-free operation during sensitive electrophysiology experiments.

MX7600 series stages come standard with our ABP-R mounting plate. The design of this mounting plate enables coarse positioning between platform mounting holes as well as 360° of coarse rotational positioning. If rotation with a solid submicron level stop is required, the MX-RS rotation stage is designed to mount directly into the ABP-R and has mounting holes to attach to the base of the MX7600.
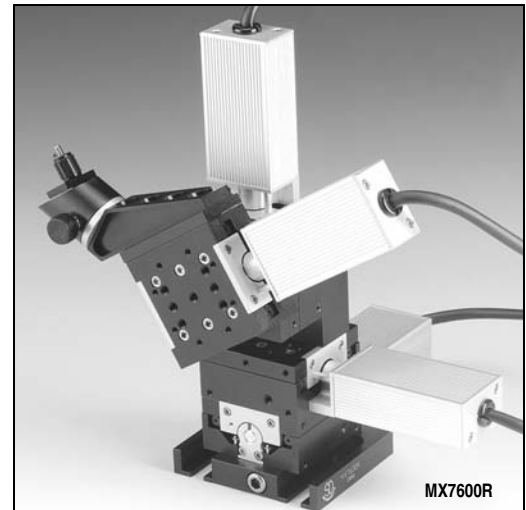
• No maintenance is required under normal operating conditions.

7600-XYZR
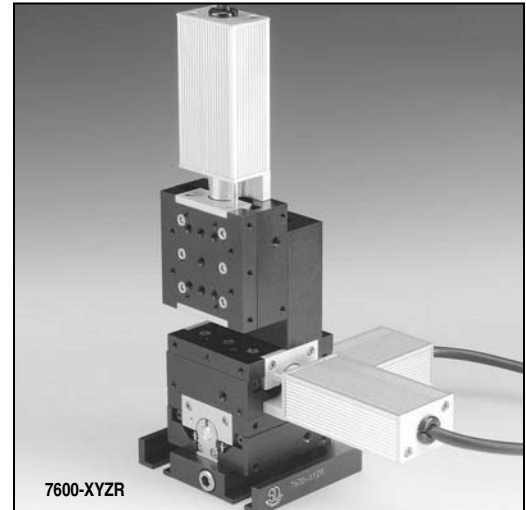
CE CERTIFIED DEVICE

Performance Specifications

Maximum horizontal axis load	5 lbs
Maximum vertical axis load	2 lbs
Travel	0.80 inch (20 mm)
Backlash	≤ 5 µm
Point to point accuracy	± 2 µm

MX7600R

CE CERTIFIED DEVICE

Performance Specifications

Maximum load	2 lbs
Travel/axis	0.80 inch (20 mm)
Minimum controllable motion	0.1 µm
Backlash	≤ 5 µm
Point to point accuracy	± 2 µm

Encoded Device

User's Manual

Model 841

CE CERTIFIED DEVICE
Performance Specifications

Maximum axial load	15 lbs (6.8 kg)
Backlash	≤ 5 µm
Point to point accuracy	± 2 µm

Components shipped with unit
    Spanner wrench for retaining ring
    Locknut / Retaining nut
    0.050-inch hex Allen wrench
    #2-56 flat head screws, quantity of 4

Tools required for travel limit adjustment

0.050-inch hex Allen wrench
    Note: Allen wrench and four extra #2-56 flat head
    screws shipped with unit.
Lubricant, light machine oil
    Note: Use sparingly ONLY on the non-rotating push
    rod, in the area that extends through the brass nose
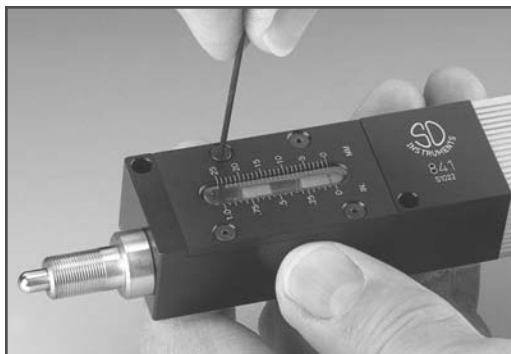   mount, and only if necessary.

2.1.12 Model 840 Series Actuator

The 840 Series Actuators can be configured with travel limits from approximately 1/32 inch to 2 inches (0.8 mm to 50 mm), enabling them to be used on a wide variety of SD Instruments translation stages.

To provide accurate motion, the 840 Series Actuator's 3/16-inch diameter plunger is non-rotating. The standard gearbox ratio actuator can produce a maximum thrust in excess of 25 pounds (11 kg); but, when operating continuously over many cycles, the maximum load is rated at 18 pounds (8 kg). A non-rotating low friction composite nut engages the leadscrew and pushes the actuator plunger or stage platform. In the 840 Series Actuators a composite half-nut is used to trigger a travel limit in the extended position while the lead screw nut trips the limit at full retraction. The limit switches are repeatable to approximately 40 µm.

3.0 Installation, Setup, and Operation

3.1 Setting the Travel Limits (840 Series Actuators only)

Before mounting the 840 Series Actuator, follow the directions below to adjust the travel limits such that the actuator will trigger one of its limit switches before encountering any external hard stop such as the end of travel of a translation stage. Failure to do this may result in damage to the actuator and/or the stage. Actuators are shipped with the travel limit set to less than 1/2 inch (12mm) to prevent accidental over-travel in most instances.

3.1.1 Remove the Coarse Travel Indicator Window

Find a clean, flat surface to disassemble the actuator. (Tapped hole optical tables are not recommended since many of the parts are small and may drop into the table.) Using your controller, adjust the actuator to the zero position as read on the coarse position scale as shown in Figure 1. Remove the four #2-56 flat head screws holding the indicator window lid, place them to the side and gently lift off the lid, Figure 2.
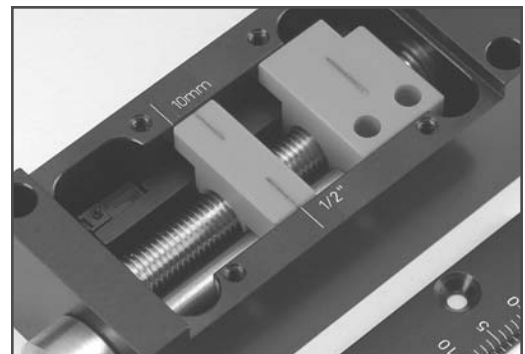

Figure 1
Remove the indicator window lid with the actuator in the zero position.

Figure 2
Approximate travel range markings assist in quick travel adjustment.

3.1.2 Reposition the Half-Nut to the Desired Travel

After removing the lid, laser marked lines indicating approximate travel ranges can be seen. Remove the half-nut by lifting it from the leadscrew. Note its orientation with respect to the leadscrew since it only fits one way (Figure 3). Approximate travel is set by replacing the half-nut onto the leadscrew with its center scribe mark aligned to one of the markings on the actuator body (Figure 4). These marks are only an aid to determining travel. The half nut may be placed anywhere along the lead screw. For full 840 Series Actuator travel, remove the half nut completely and store it in a safe place for future use in case shorter travel is desired.
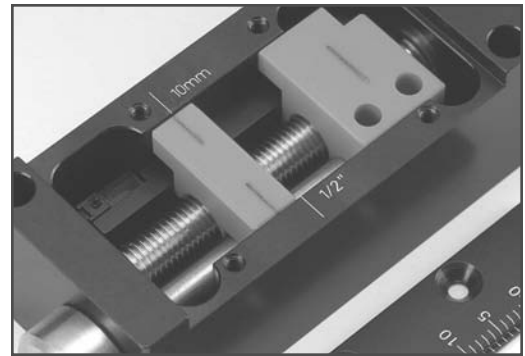
Ramped corner towards brass nose mount
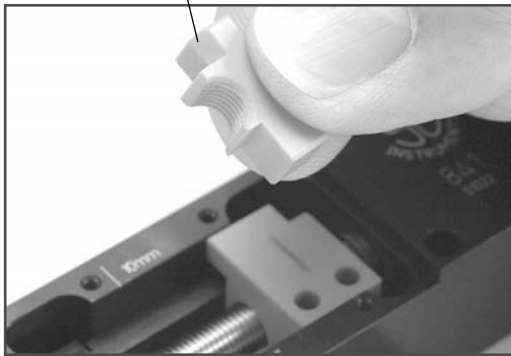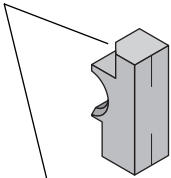
Figure 3
The half nut's ramped corner triggers the positive limit switch.

Figure 4
Place the half nut on the lead screw to set the approximate travel.

3.1.3 Replace the Coarse Travel Indicator Window

After inspecting the half-nut placement to ensure that it is fully seated on the lead screw, replace the lid and tighten the four #2-56 screws. Be sure to tighten the screws completely for proper operation (Figures 5 & 6). If the lid is loose, the half nut may ride up off the lead screw at the end of travel and defeat the purpose of the limit switch resulting possibly in damage to the actuator or the equipment it is moving.
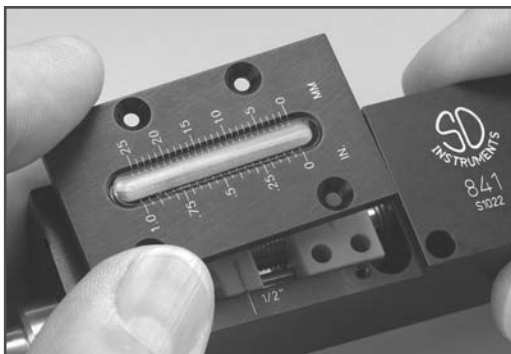

Figure 5
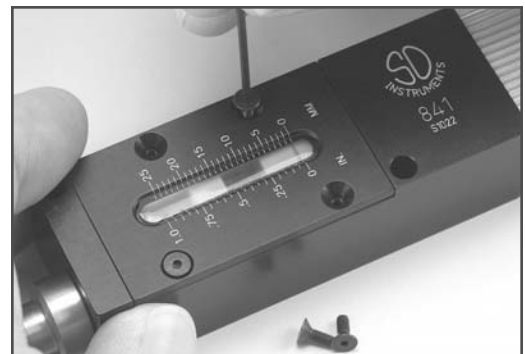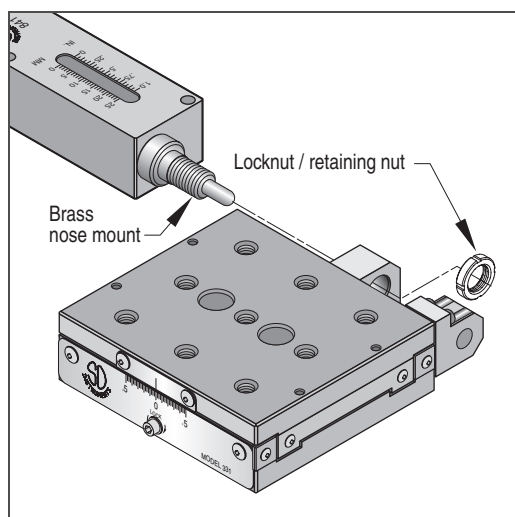**Replace the actuator lid, after seating the half nut on the lead screw.**

Figure 6
Tighten all four screws securely for proper operation.

Brass nose mount

Locknut / retaining nut

3.2 Actuator mounting

The 840 Series Actuators may be mounted using either the 3/8 inch brass nose mount or by attachment using the clearance holes in the actuator body. When using the brass mounting sleeve, the actuator may be mounted to a wide variety of SD Instruments' components in one of four ways:

1. Unscrew the locknut / retaining nut and insert the 840 Series Actuator into the mount. Either use a spanner wrench to tighten the nut, or if space permits, gently rotate the actuator body while holding the nut stationary with the fingers or a small screwdriver to tighten the whole assembly.

2. When the mount has a set screw, the retaining nut is not used. Insert the actuator and tighten the set screw.

3. In rare cases, when neither of the above two mounting methods can be used, it might be necessary to partially disassemble the device in which the actuator is being used. When access to the retaining nut side is reached, follow method #1 above.

4. For panel mounting in panels up to 1/2" thick, drill a 3/8" hole. Insert actuator and tighten retaining nut.
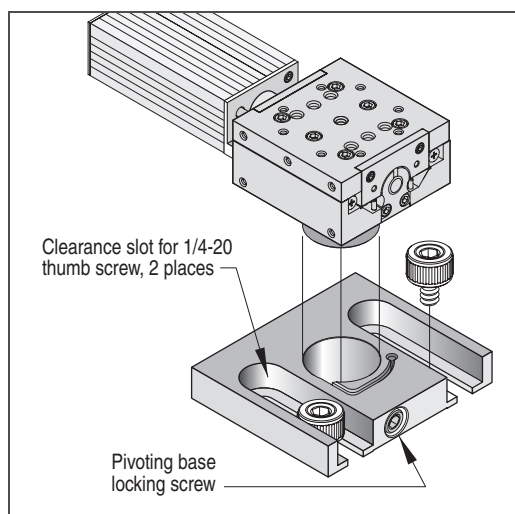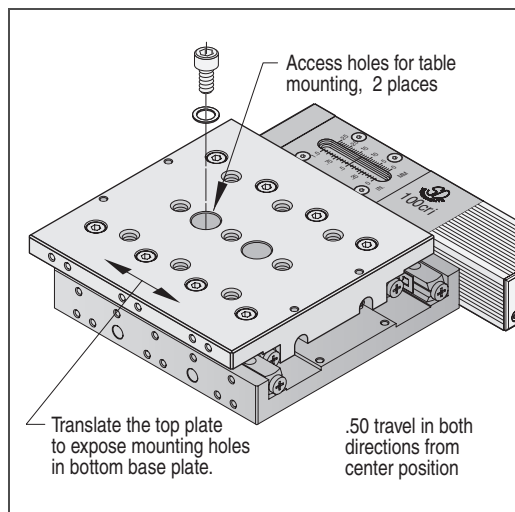
3.3 Stage mounting

The 7000 Series and 831 Series Stages have specific mounting procedures for the two styles of stage.

To mount the 7000 Series Stages, loosen the ¼-20 pivoting base locking screw located in the side of the supplied ABP-R mounting base. Once loosened, slide the stage and the mounting base apart. Next, mount the ABP-R mounting base in the desired location with the two ¼-20 thumb screws that are supplied. Once mounting base is in the desired position, slide the stage back into place and lock with the ¼-20 pivoting base locking screw. The 7000 Series Stages may also be mounted using any of the 8-32 or 4-40 holes in the base or side of the stage.

☞ Note: Care should be taken to not over tighten or use screws which are too long when using these mounting points.

Clearance slot for 1/4-20 thumb screw, 2 places

Pivoting base locking screw

Access holes for table mounting, 2 places

Translate the top plate to expose mounting holes in bottom base plate.

.50 travel in both directions from center position

To mount the 830 series Stages, you will need to translate the top of the stage so that the 1/2" diameter access hole lines up with one of the three mounting holes in the base. Once these holes are lined up, drop a ¼-20 cap screw through the top plate and screw into place with a 3/16 Allen wrench. Once tightened, be sure that the head of the screw does not protrude into the path of the top plate of the stage. If this happens the stage will be damaged upon operation. If two mounting screws are desired, translate the stage in the opposite direction to line up one of the other mounting holes. Once lined up, repeat the procedure performed on the previous hole. Another option for mounting the 831 Series stages is to use a MX-APC which bolts directly to the base of the 831 Series Stage and eliminates the need for the previous procedure.

3.4 Vacuum compatible versions

840 Series Actuators, 7000 Series, and 831 Series Stages can be ordered to operate cleanly within a vacuum environment as high as 10^{-6} Torr. The following describes the alterations that make the standard actuators vacuum compatible;

1. Six foot Teflon-coated cable from actuator/stage attached to six foot standard cable.

2. Unanodized aluminum body without label.

3. No fastener sealing compound.

4. The window material is removed.

5. Special lubricant with vapor pressure of 10^{-6} Torr at 39°C.

6. All blind holes and cavities are vented.

4.0 Maintenance and Service

No scheduled maintenance is required for these products. There are no maintenance procedures which may be performed by the user. The actuator should be cared for and handled as any fine instrument. Keep the unit clean and free of moisture, solvents, or other foreign matter.

Should it become necessary to service a product, read the instructions for repairs on page 2 of this manual and complete a copy of the Service Form to be returned with the unit, page 22 of this manual.

☞ **Caution**

Do not attempt to adjust the actuator/stages mechanical assembly in any way other than outlined above (see *Section 3.1, Setting the Travel Limits, page 16*). Any attempt to disassemble the actuator will cause a misalignment. Call the factory before you try to adjust, repair, or alter any of the 840 Series Actuators, or all series of Stages without factory-provided instructions. Any unauthorized attempts to adjust, repair, or alter the actuators or controllers will invalidate your warranty.

5.0 Connector Pin Assignments

Pins	Function
5 & 6	Motor +
7 & 8	Motor –
14	Shield ground (encoder channels)
17	Forward limit
18	Reverse limit
19	Channel A
20	Channel B
21	+5VDC (5ma @ 5V DC)
22	-VDC ground

25-Pin D Connector

Pin No. 1
Pin No. 14
Pin No. 13
Pin No. 25
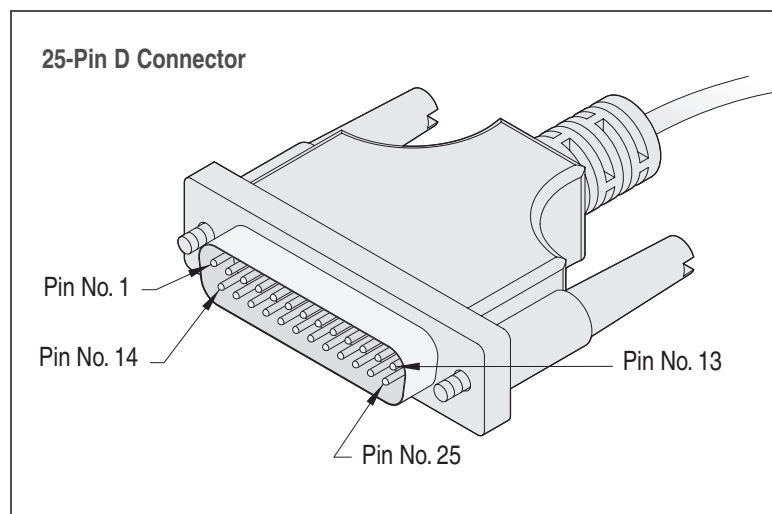
6.0 Drawings

For the most current drawings of SD Instruments' Actuators, Stages or Micromanipulators see our website at www.sd-instruments.com

7.0 Specifications

Encoder resolution	
840 Series Actuators, MXMS-cri,	0.005 µm
100cri, 200cri, 7000, and 831 Series Stages	

Nominal gearbox ratio and maximum speed

Backlash, typical with external load of 2 lbs (0.9 kg)	
841 and 842 Actuators	< 5 µm
100cri, 200cri, MXMS-cri, 7000 & 831 Series Stages	< 10 µm

Accuracy	< 0.1% of travel, cumulative

Encoder	Magnetic, open collector, quadrature output, +5V supply

Absolute cyclic pitch error	< 1 micron

Time to reach full speed	< 50 msec at maximum speed and acceleration settings

Maximum actuator side load	5 lbs (2.3 kg) at full shaft extension

Maximum actuator axial load	18 lbs (8.2 kg)

Maximum Stage side load	
7000 Series	1 lb (0.45 kg) at full extension
831 Series	5 lbs (2.3 kg) at full extension

Maximum Stage axial load	
7000 Series	2 lbs (0.9 kg)
831 Series	10 lbs (4.5 kg)

Cable	10-foot (3.05-m) cable integral to actuator / stage terminated with 25-pin male "D" sub connector

Temperature range	0°F to 120°F (-18°C to 49°C)

Actuator / Stage case	Black / clear anodized aluminum

Vacuum compatibility	Special order vacuum-compatible versions for operation to 10^{-6} Torr; temperature range restricted as stated above.

Service Form

Return a copy of this form
along with the product
to SD Instruments

CONTACT

Company _____

Address _____

City, St Zip _____

Country _____

Sales Order _____

PO Number _____

Purchase Date _____

Return Authorization No. _____
Note: Call the toll free number prior to returning the item.

Date _____

Technical Contact _____

Telephone _____

Fax _____

Email _____

PRODUCT

Model Number _____   Serial Number _____

Describe any modifications made to the unit _____

_____

_____

REASON FOR RETURN

List all control settings and describe problems _____

_____

_____

_____

_____

Diagram

RETURN TO

Email addresses:
   sales@sd-instruments.com
   service@sd-instruments.com
   tech@sd-instruments.com
Website: www.sd-instruments.com

Siskiyou Design Instruments
RA# _____
110 S.W. Booth Street
Grants Pass, OR 97526-2410
U.S.A.

RA Number must
be clearly written on
the outside of the
shipping carton

Toll free 1-877-313-6418   Siskiyou Corporation   Fax 1-541-479-3314

SF22

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International

Please call or visit our website for international contacts.

modular by design

- Laboratory Mechanicals
- Life Science
- Photonics

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