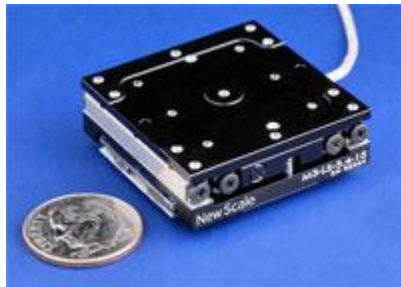


Integration Guide: M3-LS-3.4-15 Linear Smart Stage, Kits and Accessories



The M3-LS-3.4-15 Linear Smart Stage is an embedded motion system that moves and positions small payloads. The controller is built right into the stage, allowing a much more compact system and very simple integration. The patented piezoelectric SQUIGGLE® micro motor moves the carriage with 0.5 μm closed loop resolution over a 15-mm range, for precise, repeatable positioning. Absolute encoding removes the need to home the stage on power-up, eliminating errors and disruptions in processes and experiments. Precision crossed roller way bearings

provide smooth, repeatable motion with excellent lateral stability. The device operates on 6V DC, communicating through an SPI or I2C serial interface.

This **Electrical and Mechanical Integration Guide** for the M3-LS-3.4-15 Linear Smart Stage explains how to connect it electrically, to mount it, to attach a payload to the carriage, and to obtain precise positioning in two or three dimensions, by mounting two or three M3-LS-3.4-15 stages together. Refer to www.newscaletech.com for detailed CAD files, user guides and data sheets.



DK-M3-LS-3.4-15
Developer's Kit



DK-M3-LS-3.4-15-XY
(stages only)



DK-M3-LS-3.4-15-XYZ
(stages only)

Product Model Number	Description
M3-LS-3.4-15	Linear Smart Stage with 15 mm of travel
DK-M3-LS-3.4-15	Developer's Kit, including: M3-LS-3.4-15; Developer's Board, MicroHDMI, M3-LS-3.4; 6V Power Supply; M3, USB Adapter; cables; hardware and Pathway™ software.
DK-M3-LS-3.4-15-XY	Developer's Kit, 2-Axis (XY), including: two M3-LS-3.4-15, M3-USB-3:1-6V, 6V power supply, cables, hardware and Pathway™ software.
DK-M3-LS-3.4-15-XZ	Developer's Kit, 2-Axis (XZ), including: two M3-LS-3.4-15, Z-Bracket-3.4, M3-USB-3:1-6V, 6V power supply, cables, hardware and Pathway™ software.
DK-M3-LS-3.4-15-XYZ	Developer's Kit, 3-Axis (XYZ), including: three M3-LS-3.4-15, Z-Bracket-3.4, M3-USB-3:1-6V, 6V power supply, cables, hardware and Pathway™ software.
Accessories Model Number	Description
M3-USB-3:1-6V	3 Axis M3 to USB Adapter, 6 Volt
M3-PoE-3:1-6V	3 Axis M3 to Power over Ethernet Adapter, 6 Volt
Developer's Board, MicroHDMI, M3-LS-3.4	Developer's board, M3-LS-3.4-15 to M3-USB adapter, with breakout connections
PCB, Flex, Ext Cable, 0.5mm Ptch, 250mm Lg	250 mm long 10-trace flex cable to connect the M3 USB Adapter to the Developer's Board, MicroHDMI, M3-LS-3.4.
Z-Bracket-3.4	Z-Axis bracket with hardware kit for M3-LS-3.4.
M3 USB Adapter	SPI to USB adapter.
Kit, Mounting Hardware, M3-LS-3.4-15	Screws and alignment pins used to mount the stage to a surface and mount something to the stage.

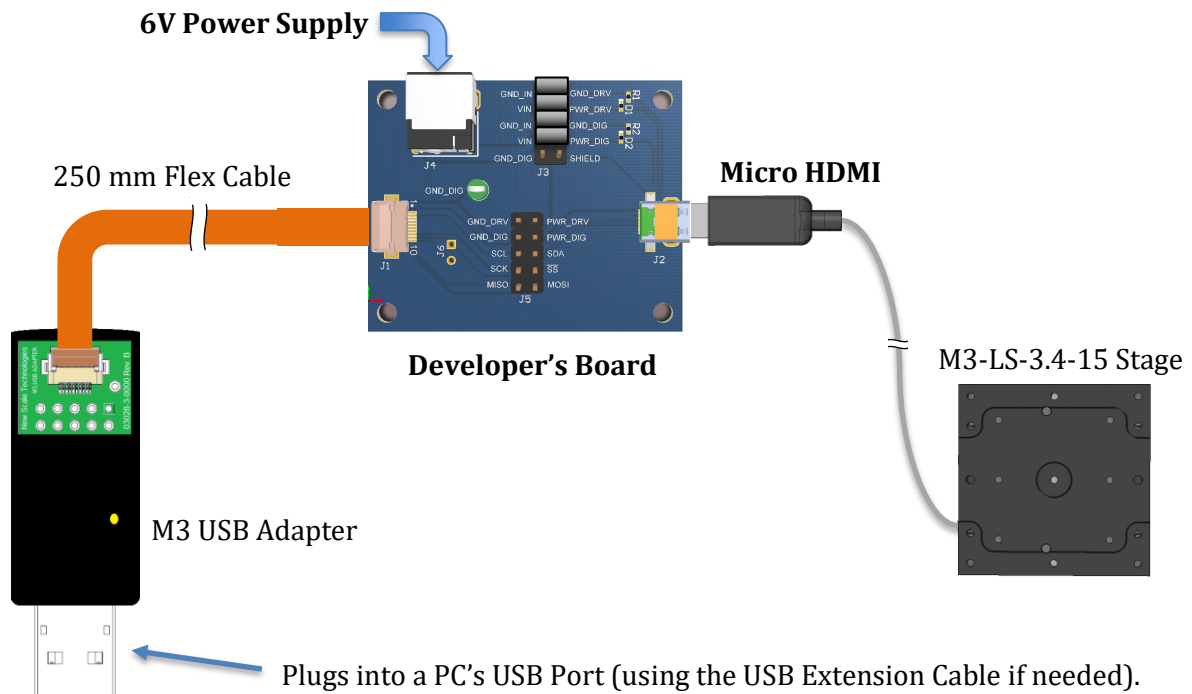
1 Electrical Integration

The following explains how to electrically connect M3-LS-3.4-15 Linear Smart Stages and Developer Kits.

1.1 Connecting the DK-M3-LS-3.4-15 Linear Smart Stage, Developer's Kit

1.1.1 To the M3 USB Adapter

The M3-LS-3.4-15 stage may be connected to a PC via the M3 USB Adapter via the developer's board that comes with the developer's kit as shown below.

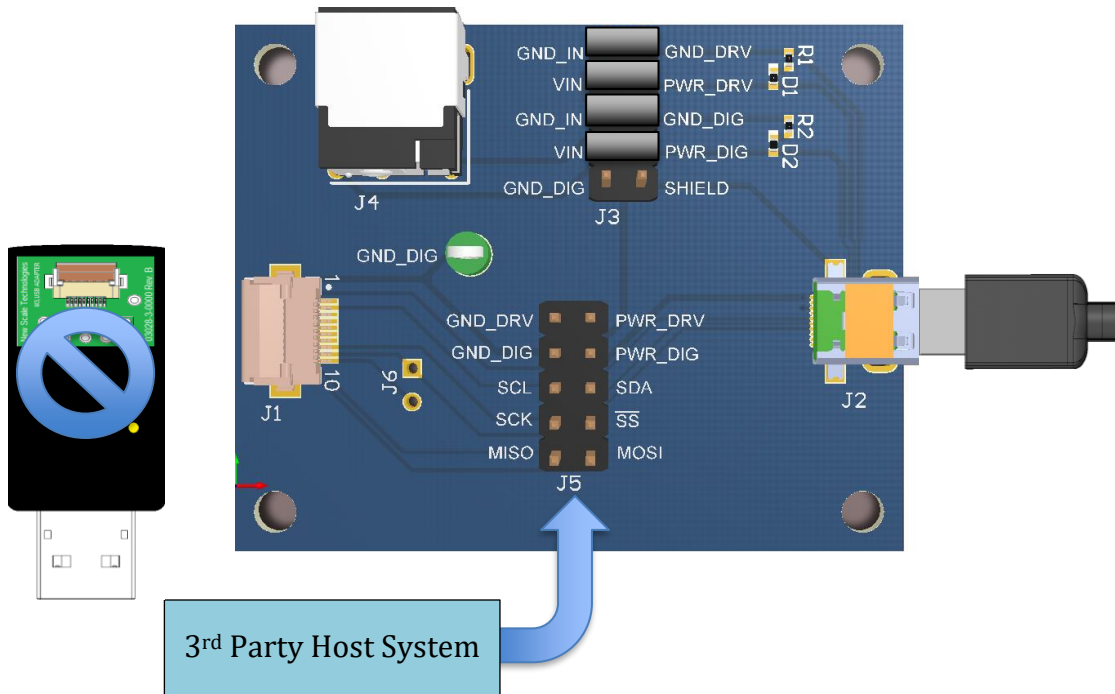


1.1.2 To a 3rd Party Host System

On the Developer's Board, the 10-pin 0.1" header at J5 may be used to connect to a 3rd party host system via I2C or SPI bus. The M3 USB Adapter should not be connected in this case.

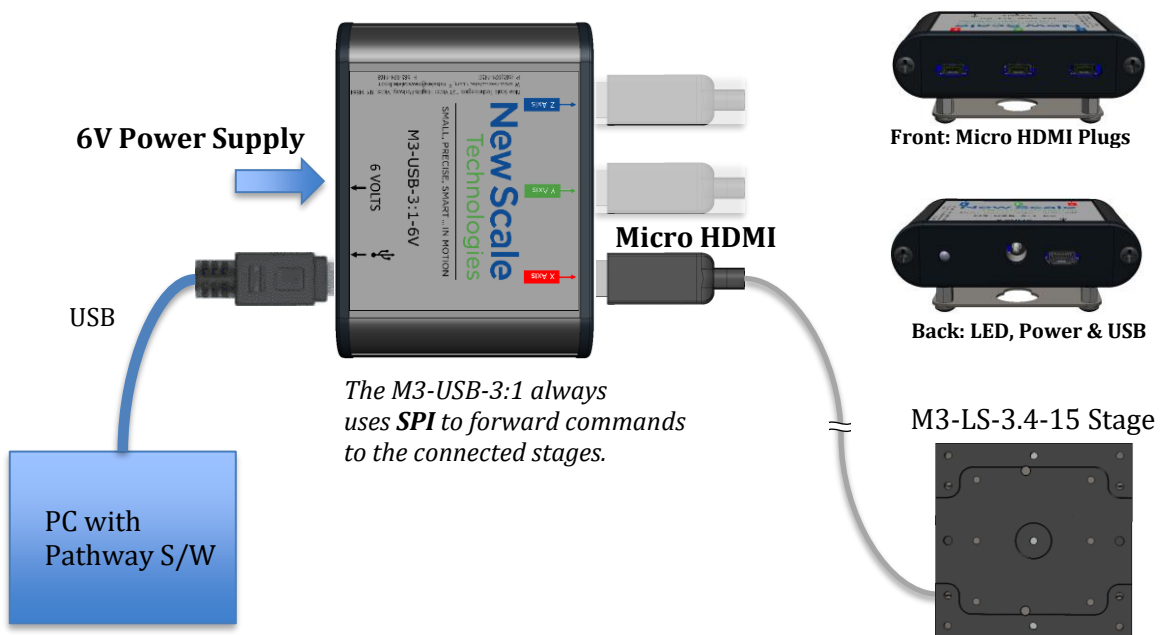
Even if I2C is not being used, the host system should tie pull-up resistors to the SCL and SDA lines (recommend 1.6 kOhm resistors though up to 4.7 kOhms will work).

If the separate power supply is used, via J4, then the jumpers at J3 should be left in place. Otherwise, if desired, the host may provide separate supplies (i.e. power & ground) for the motor and the digital electronics on the M3-LS-3.4 controller board. Note that at full power, the motor may draw up to 1.2 Amps. The motor supply voltage should be 6V. The digital supply voltage may range from 3.3V to 6V. See the Command and Control Reference Guide for more information.



1.2 Via the M3-USB-3:1 Multiplexer

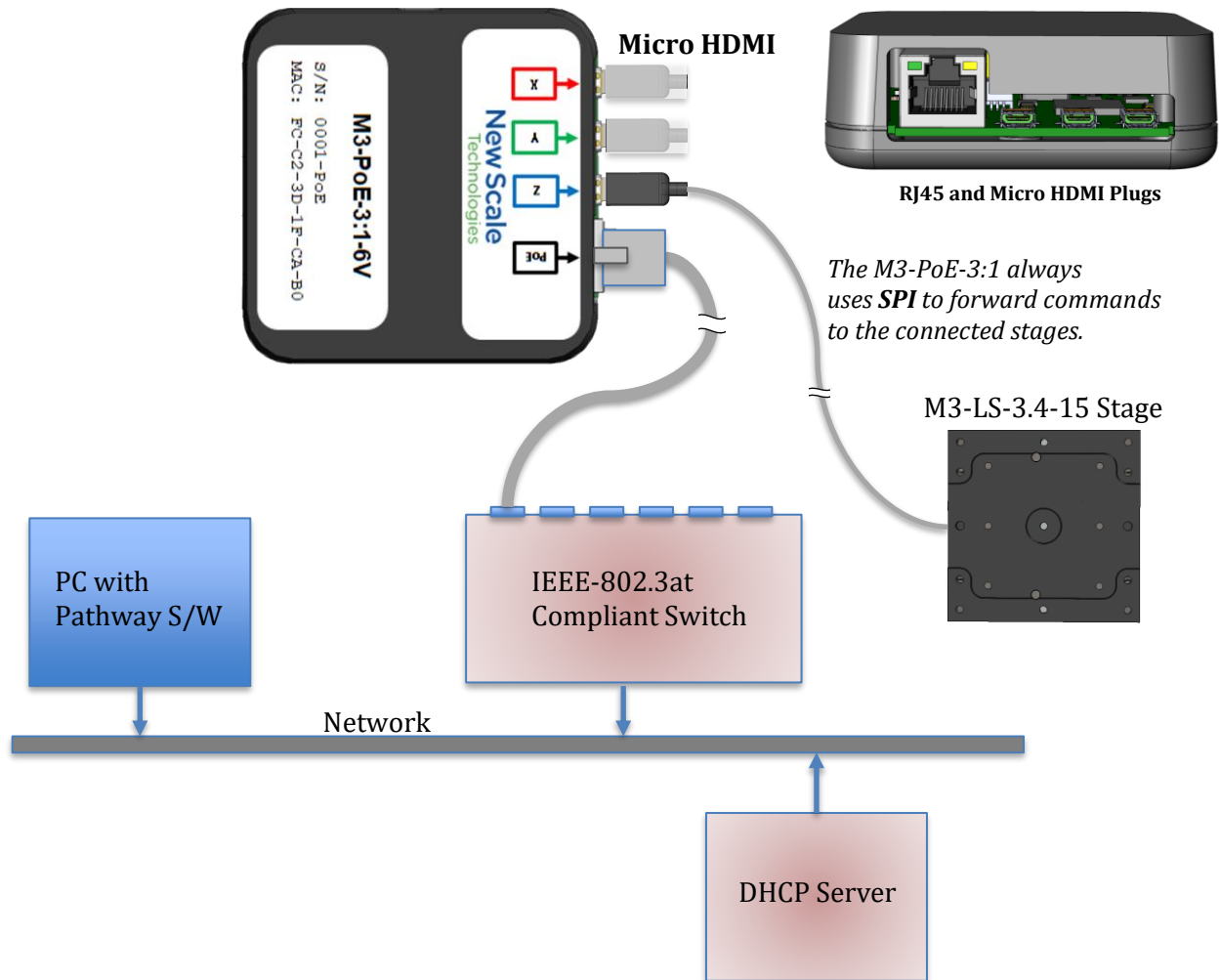
Up to three M3-LS-3.4-15 stages may be operated via a single PC USB port using the M3-USB-3:1 multiplexer box. The power supply input is plug compatible with the break out PCB.



1.3 Via the M3-PoE-3:1 Multiplexer

Up to three M3-LS-3.4-15 stages may be operated via a wired ethernet connection using the M3-PoE-3:1 multiplexer box. This ethernet connection must be to an IEEE 802.3at (AKA PoE+) compliant switch. That is, the switch must be able to supply up to 25W to each connected M3-PoE-3:1.

Multiple M3-PoE-3:1 multiplexers may be connected to the network via the same switch or via other switches. In addition, the standard firmware in the M3-PoE-3:1 requires that there be a **DHCP** server on the network to which it is connected.



1.3.1 The M3-PoE-3:1 IP Address

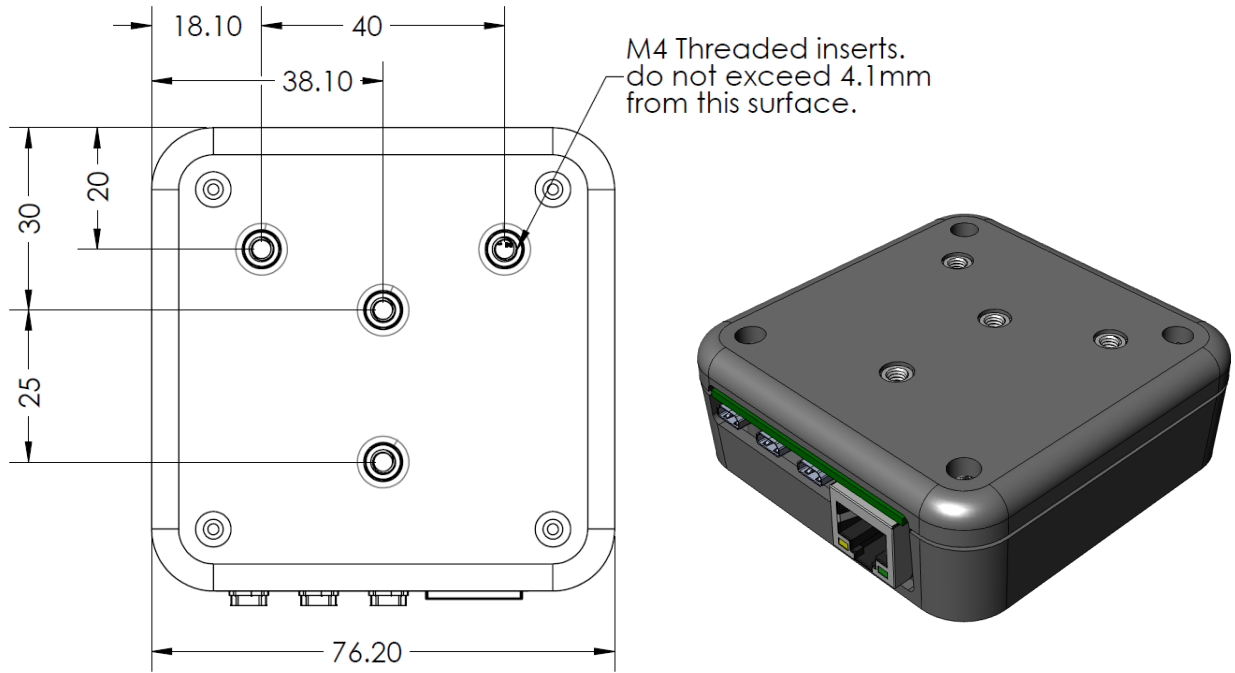
Each M3-PoE-3:1 has a unique MAC address and serial number which are printed on the label. On power up, it obtains its IP address from the local DHCP server.

The Standard and MPM Pathway Software user manuals describe how to detect and connect each of the M3-PoE-3:1 multiplexers that are on the same network.

Please contact New Scale Technologies if your application requires a static IP address for each M3-PoE-3:1 unit.

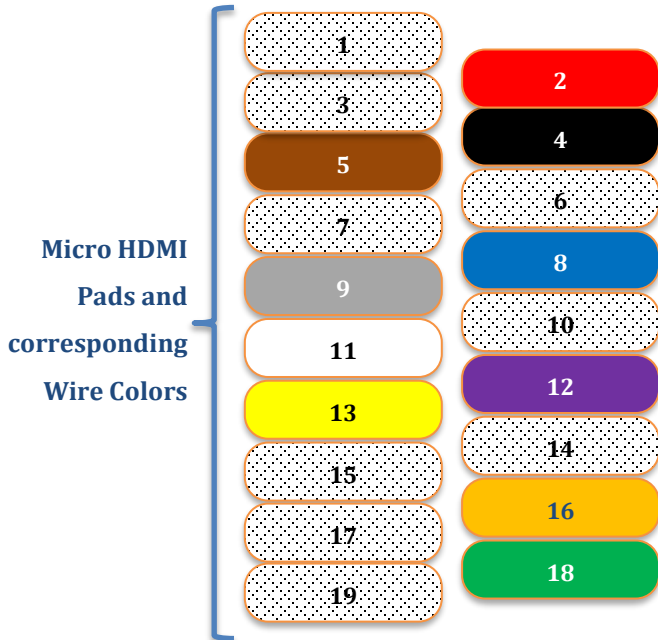
1.3.2 The M3-PoE-3:1 Footprint

The M3-PoE-3:1 enclosure measures 76.2mm x 76.2mm x 25.4mm and can accept up to four **M4** screws on its underside in the pattern depicted below. **Note the screw depth, from the surface must not exceed 4.1mm.**



1.4 Micro HDMI Cable Conductor Assignments

The Micro HDMI cable is 2-foot (61-cm) in length. Internally, the cable contains multiple colored wires. The wires are connected to the plug pads in the following manner. Note that pads in the illustration below are colored to match that of the wires.

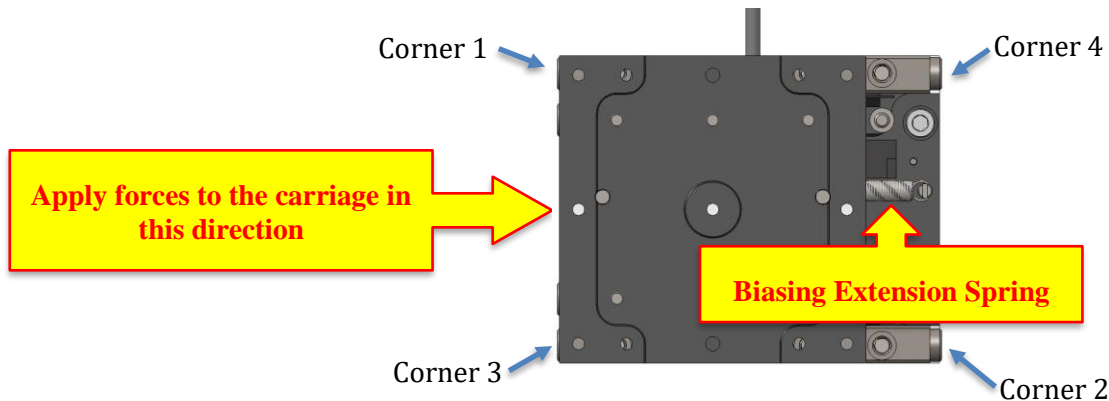


Pin	Description
2	VIN Digital (3.3V to 6V)
4	Ground Digital
5	SPI: MOSI (Host to M3-LS-3.4)
8	SPI: MISO (M3-LS-3.4 to Host)
9	I2C: SDA
11	SPI: SCK
12	I2C: SCL
13	SPI:/SS
16	VIN Motor Driver (6V)
18	Ground Motor Driver

2 Mechanical Integration

2.1 General Integration Considerations

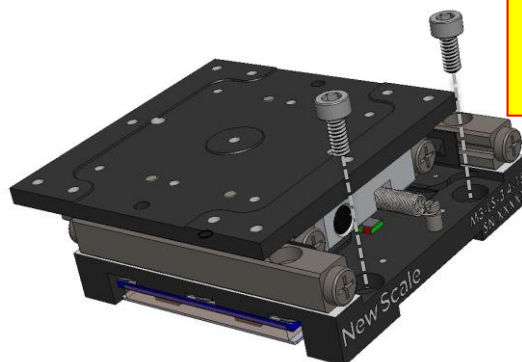
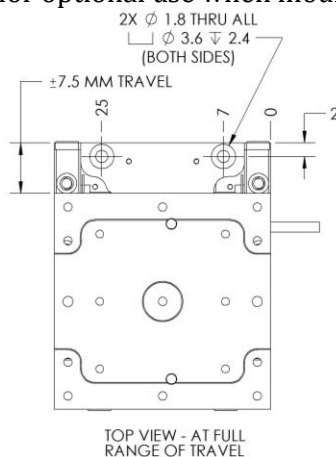
The M3-LS-3.4-15 may be mounted to create motion in any direction. When integrating the smart stage into a system it is essential that the biasing extension spring is not counter-acted by system forces (gravitational or otherwise). The biasing extension spring can be seen from the top of the stage as shown below.



When using threaded fasteners for mechanical integration, it is recommended that removable Loctite such as Loctite 242 be applied to the fastener threads. This method will prevent any loosening of payloads or mounts that can be caused by vibration during operation. Use only a small amount of Loctite, and do not get it on any of the internal parts of the stage as this may interfere with normal stage operation and movement. Tighten screws to 5 – 10 oz-in of torque and use a cross/opposite corner pattern (for example, tighten corner 1, then corner 2, then corner 3, then corner 4).

2.2 Mounting the M3-LS-3.4-15 Linear Smart Stage from Above

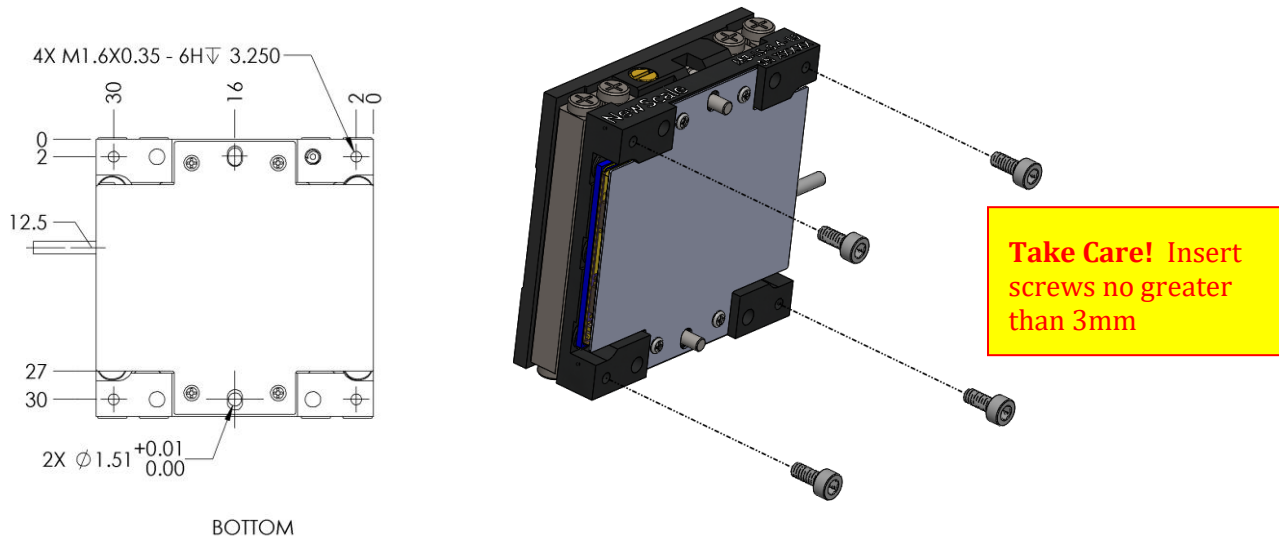
Insert the mounting screws through the two counter-bored clearance holes, visible when the carriage is forward or reverse of center, and screw them into tapped holes on a flat mounting plate. Mounting plate should be flat to within .007mm. Four M1.6 x 4 screws and a wrench are provided in the Developer's Kit. Tighten the screws to 5 - 10 oz-in of torque and use a cross/opposite corner pattern (see section 2.1 General Integration Considerations). Precision alignment pins are available for optional use when mounting the stage.



Take Care! Do not allow Loctite to get on any internal parts of the stage

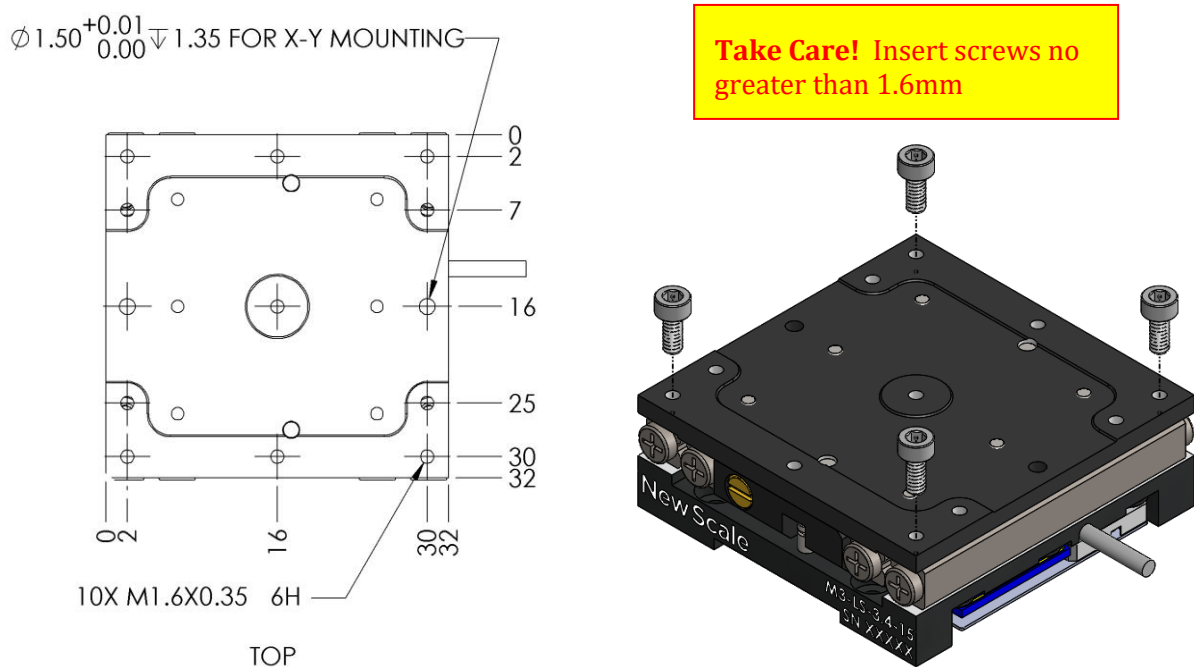
2.3 Mounting the M3-LS-3.4-15 Linear Smart Stage from Below

Insert screws through a flat mounting plate into the four M1.6 x 0.35 tapped holes on the bottom of the Smart Stage housing. Mounting plate should be flat within .007mm. Four M1.6 x 4mm threaded screws and a wrench are provided in the Developer's Kit. Tighten the screws to 5 - 10 oz-in of torque and use a cross/opposite corner pattern (see section 2.1 General Integration Considerations). Precision alignment pins are available for optional use when mounting the stage.



2.4 Attaching the Payload to the Carriage

The carriage of the Smart Stage accepts M1.6 x 0.35 screws to attach a payload. Payload mating surface should be flat within .007mm. Screws must not be allowed to thread in more than 1.6mm into the carriage, or risk damaging the stage. Prior to tightening the screws, align your moving payload to the tolerance required by your application. Tighten the screws to 5 - 10 oz-in of torque and use a cross/opposite corner pattern (see section 2.1 General Integration Considerations).

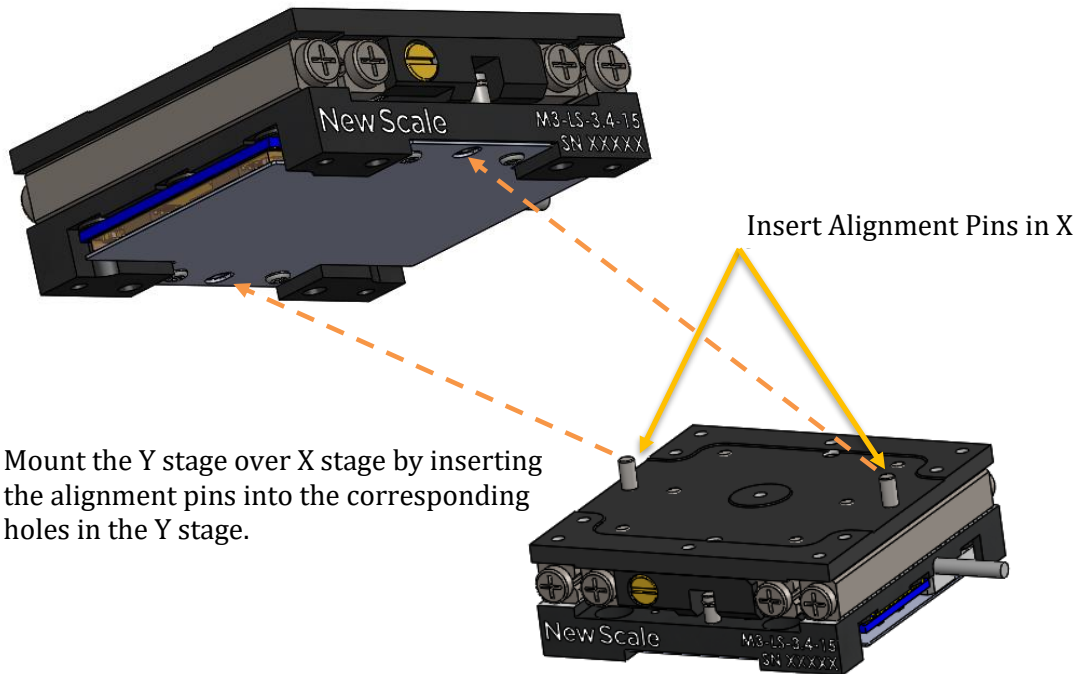


3 Assembling a Multi-Axis System with the M3-LS-3.4-15

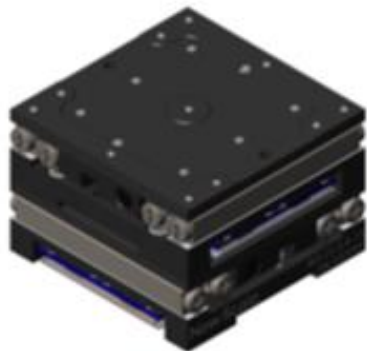
It is easy to obtain movement and precise positioning in two or three dimensions by mounting two or three M3-LS-3.4-15 stages together.

3.1 Assembling a Two-Axis (X-Y) System

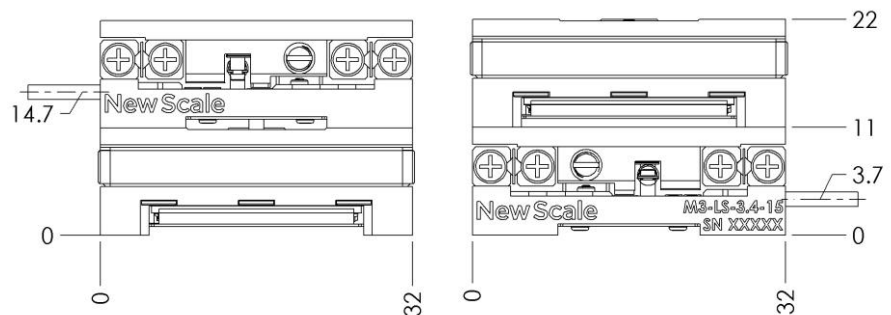
See Section 2.2 for a description of how to mount a stage to a base plate from above. The two alignment pins are required to be inserted into the X stage first before mating it with the Y stage.



After the Y stage has been placed on the X stage, command the Y stage to the forward travel limit and insert one of the four M1.6 screws (as illustrated in section 2.2). Tighten screws to 5 - 10 oz-in of torque and use a cross/opposite corner pattern (see section 2.1 General Integration Considerations). NOTE: Do not use screws longer than 4mm. Then command the Y stage to the reverse travel limit and insert another M1.6 screw. Repeat to insert the remaining screws.



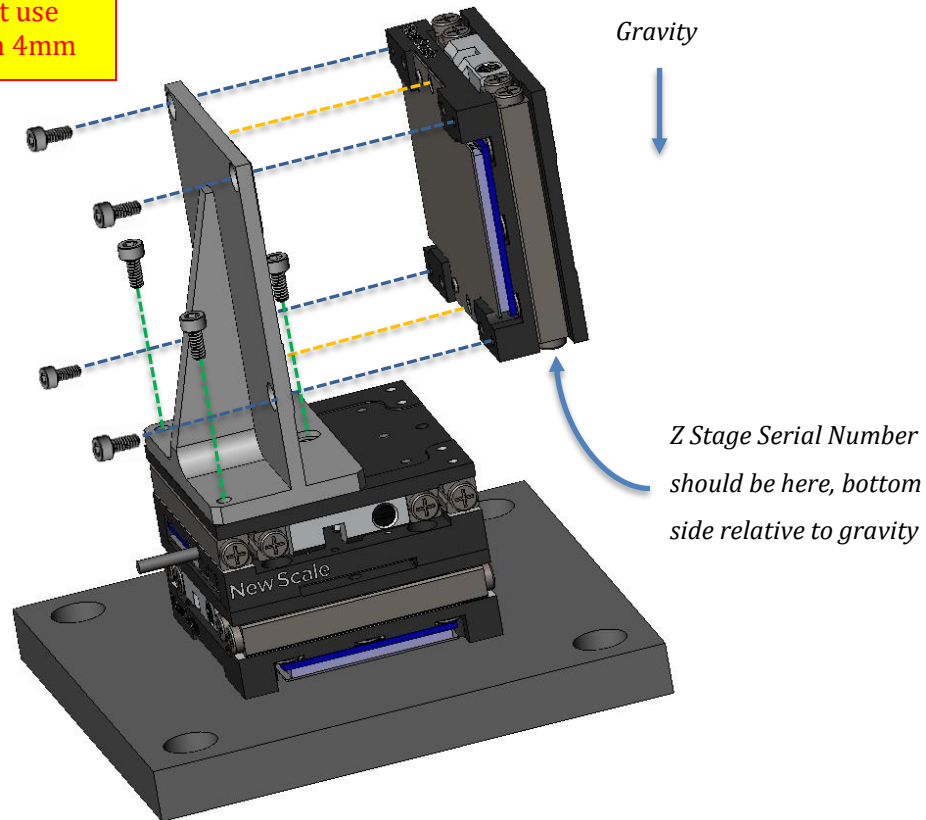
Assembled XY stage



3.2 Assembling a Z-Stage Adapter

The Z mounting bracket (included in Z-Bracket-3.4) mounts to a horizontal stage using three M1.6 x 4 mm screws (**green dashes**) and an alignment pin. A vertically oriented M3-LS-3.4-15 can be mounted to the bracket via four M1.6 x 4 mm screws (**blue dashes**) and two alignment pins (**yellow dashes**). Insert the alignment pins into the Z bracket before mating it to the Z stage. Tighten the screws to 5 - 10 oz-in of torque and use a cross/opposite corner pattern (see section 2.1 General Integration Considerations).

Take Care! Do not use screws longer than 4mm



Please note that the Z stage must be oriented with forward motion opposite gravity. As shown in the diagram, the serial number should be at the bottom side, relative to gravity.

Revision History			
Date	Rev.	Description	Author
6 Sep 2017	1	M3-LS-3.4-15 Integration Guide	TLG
28 Sep 2017	2	Label Corrections	SRF
17 Jan 2018	3	Added screw length/depth, flatness specs, mounting screw torque specs	JHH
04 Sep 2021	4	Added details about the M3-PoE-3:1 multiplexer	TLG

Subject to change without notice. Any new revision will supersede this guide. Squiggle® and New Scale Pathway™ are trademarks of New Scale Technologies, Inc.

© 2017-2021 New Scale Technologies, Inc., Victor, NY, USA

<http://www.newscaletech.com>

(585) 924-4450

NSTservice@newscaletech.com