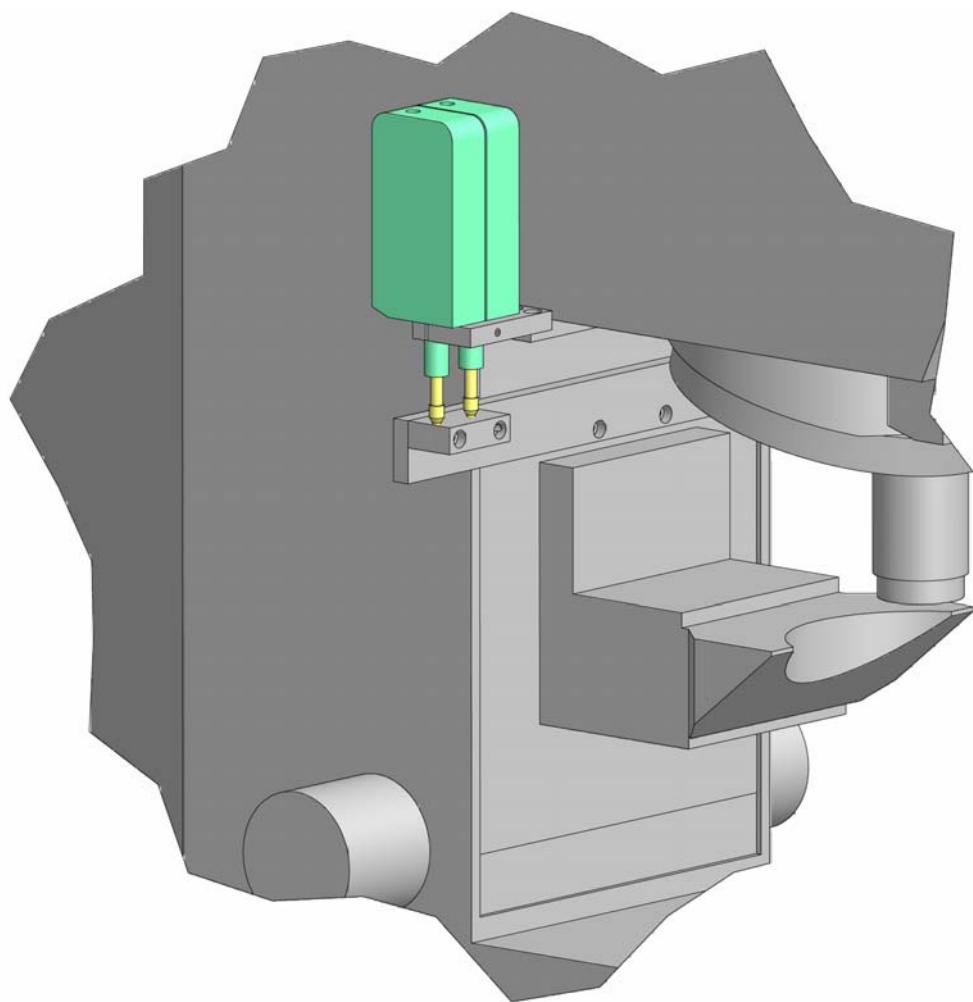


Limit Switch/Linear Encoder Installation Manual



Ludl Electronic Products, Ltd.
p/n: 90M032

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Introduction

In a typical microscope system, the z-axis movement is driven by a mechanical gearing system internal to the microscope. Mechanical gearing has two inherent problems, gear slop and wear. Automation of the z-axis can be added to the system, but this does not improve the mechanical aspects of the microscope gearing. LEP offers a linear encoder upgrade as a focus option to enhance the microscope z-axis. The linear encoder will improve the overall resolution, repeatability and accuracy of the microscope z-axis.

The LEP linear encoder option allows the z-axis position to be read from the actual stage carrier, bypassing the mechanical gearing inside the scope. The linear encoder works in conjunction with the focus motor. The MAC control system reads the linear encoder position and moves according to that input. The system can also be programmed to servo the z-position to the encoder input to compensate for drift or vibration.

The LEP limit switch option provides another level of robustness to the LEP z systems. Adjustable limit switches will help prevent over travel in the z-axis, saving the samples and objectives.

This manual explains and shows how to install the limit/encoder brackets onto a wide variety of microscope makes and models. See the table of contents to find the correct bracket for your specific microscope.

Components

All LEP limit/encoder brackets will come with the following components:

- Limit Switch/Linear Encoder Mounting Bracket
- Actuator Mounting Bracket
- Mounting Hardware

Required Tools

In order to install the wide variety of limit/encoder brackets the following tools are required:

- 1.27mm, 1.5mm, 2.0mm, 2.5mm, and 4mm Hex Wrenches

1. 99A450

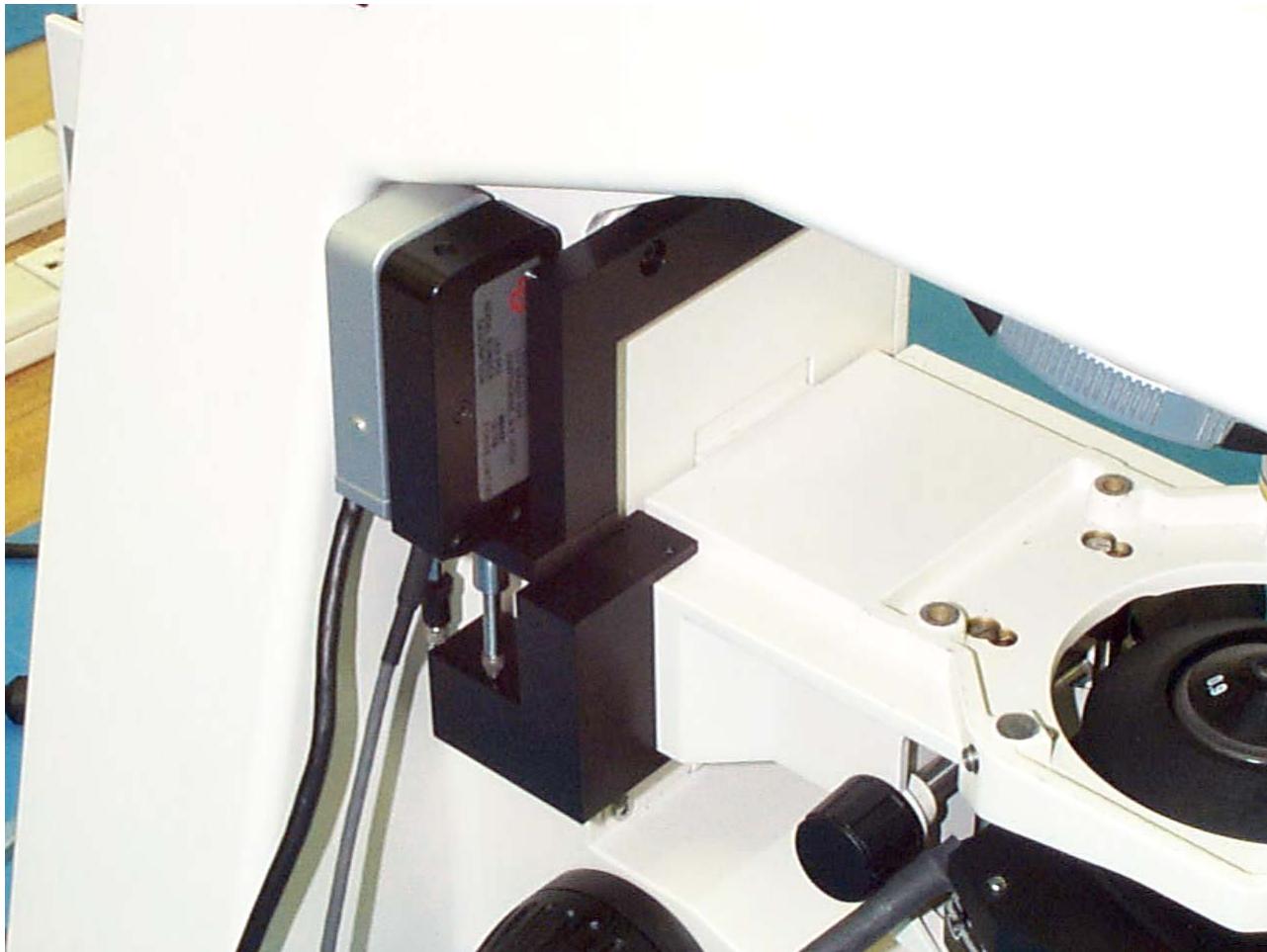
Zeiss Axioskop 2

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X12 Socket Head Screw	2
	M4X12 Socket Head Screw	2
Actuator Bracket	M3X4 Socket Cup Point Set Screw	2

Note: Depending upon the version of the microscope different hardware may be needed to mount the encoder/limit bracket.

- Remove the two screws on the throat of the microscope. Install the encoder/limit bracket with the appropriate hardware.
- Install the actuator bracket to the stage carrier. Tighten down with the pre-installed set screws.

For further installation information on the 99A409 Focus Drive Motor, refer to Manual 90M025.



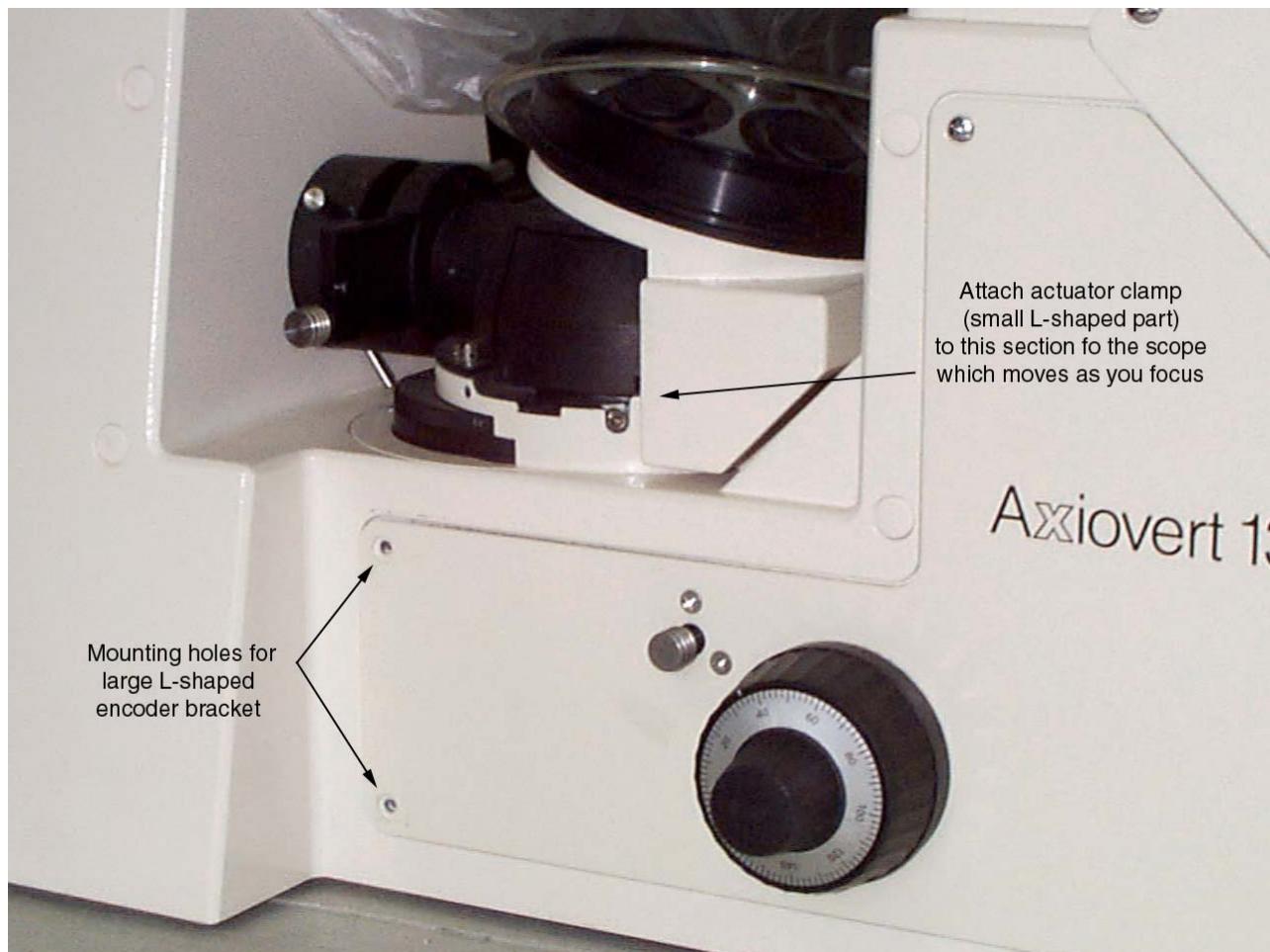
2. 99A451

Zeiss Axiovert 100/135

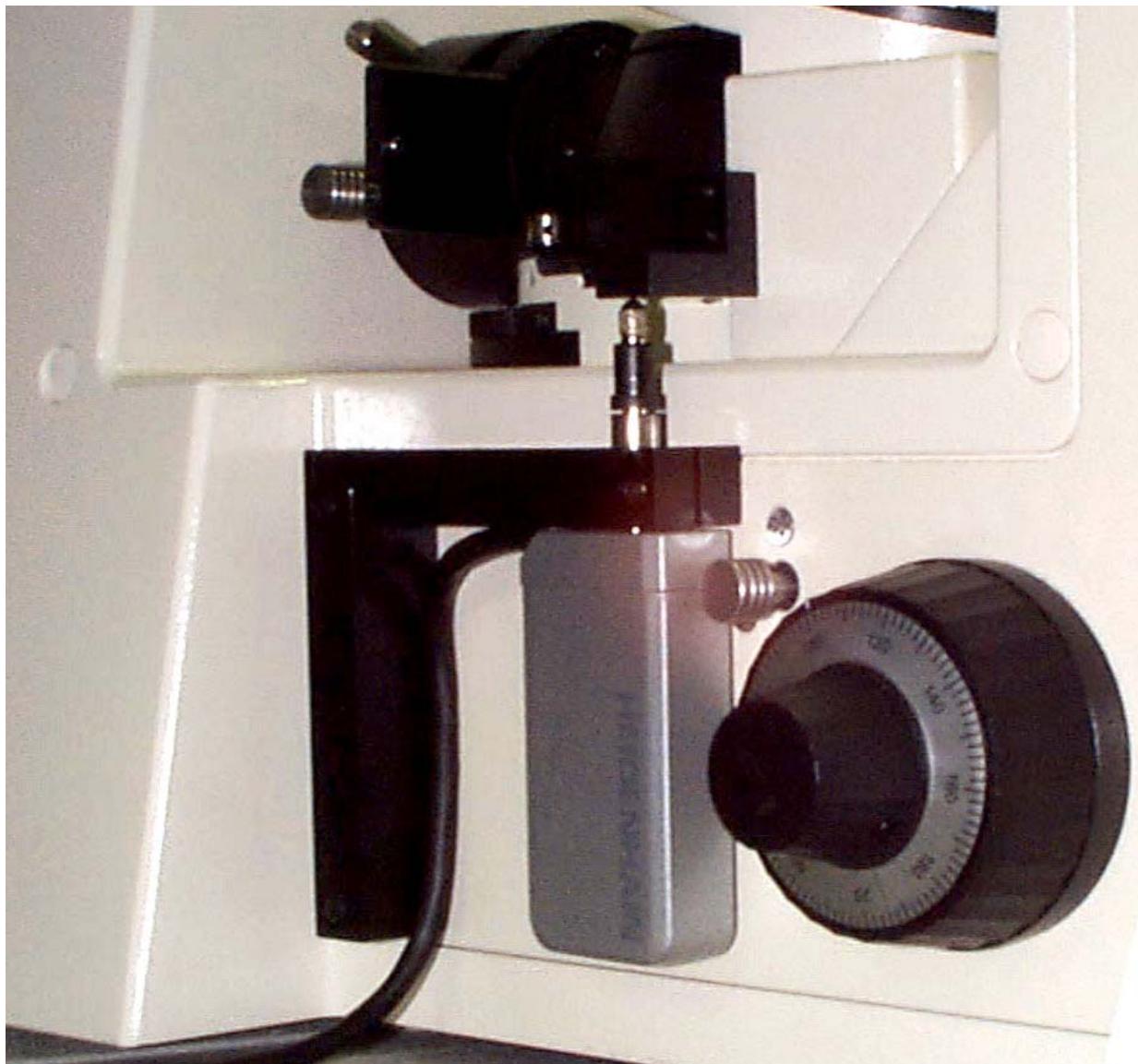
Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X22 Socket Head Screw	2
Actuator Bracket	M3X6 Socket Cup Point Set Screw	2

- Remove the two screws, as in the picture below. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the objective carrier. Tighten down with the pre-installed set screws.

For further installation information on the 99A408 Focus Drive Motor, refer to Manual 90M025.



99A451 - Continued
Zeiss Axiovert 100/135



3. 99A452

Zeiss Axioskop

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X8 Socket Head Screw	2
Actuator Bracket	M2X25 Slot'd Cheese Head Screw	2

- Attach the encoder/limit bracket to the 99A408 focus drive motor with the provided hardware.
- Remove the two pre-installed slot'd cheese head screws on the stage carrier. Install the actuator bracket with the provided hardware.

For further installation information on the 99A408 Focus Drive Motor, refer to Manual 90M025.

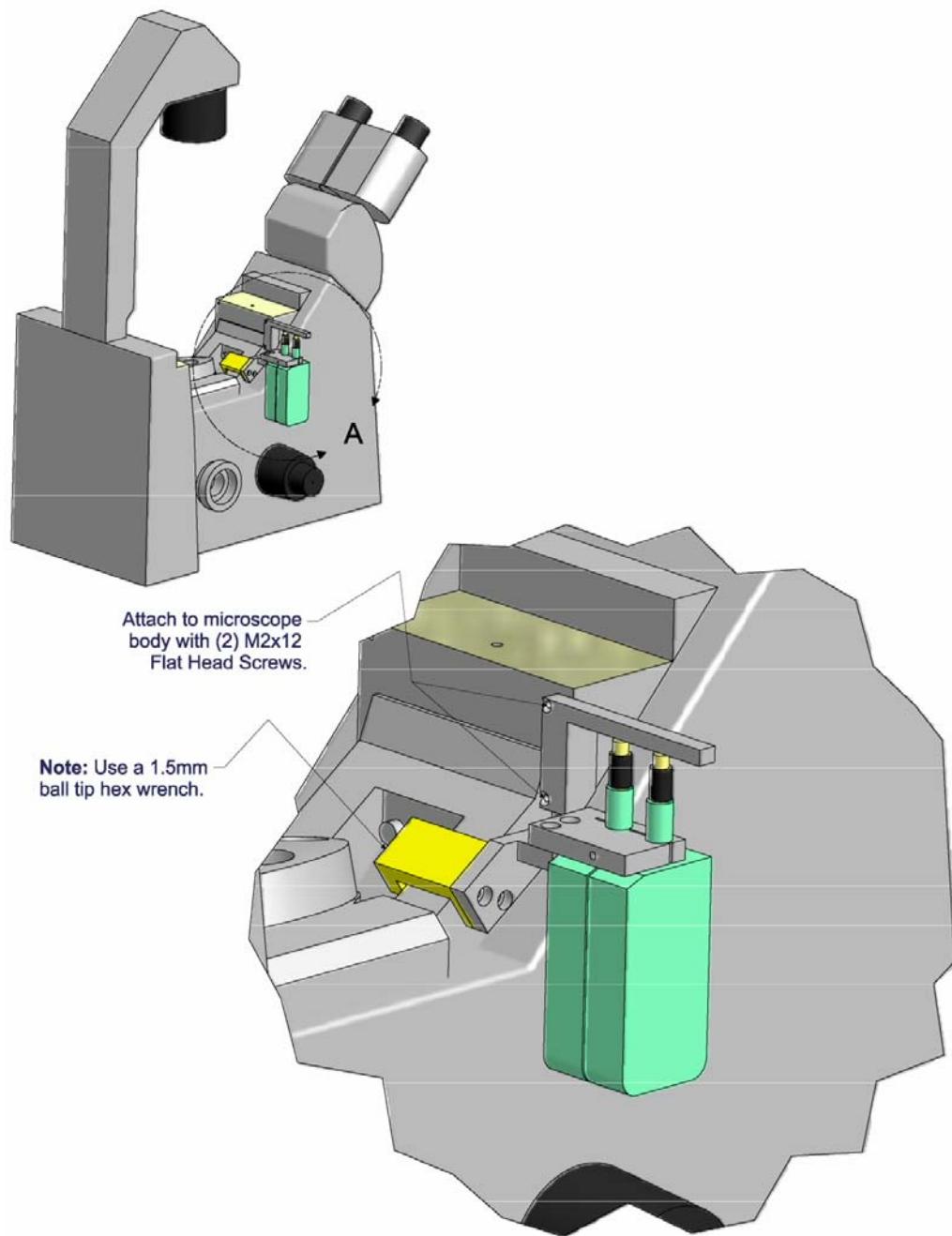


4. 99A453

Leica DMIRB (HC Stand)

Focus Drive Location	Either Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M2X12 Flat Head Screw	2
Actuator Bracket	Pressure Plate	1

- Attach the encoder/limit bracket with the pressure plate to the microscope turret.
- Remove the two screws in the cover plate and install the actuator bracket with the provided hardware.



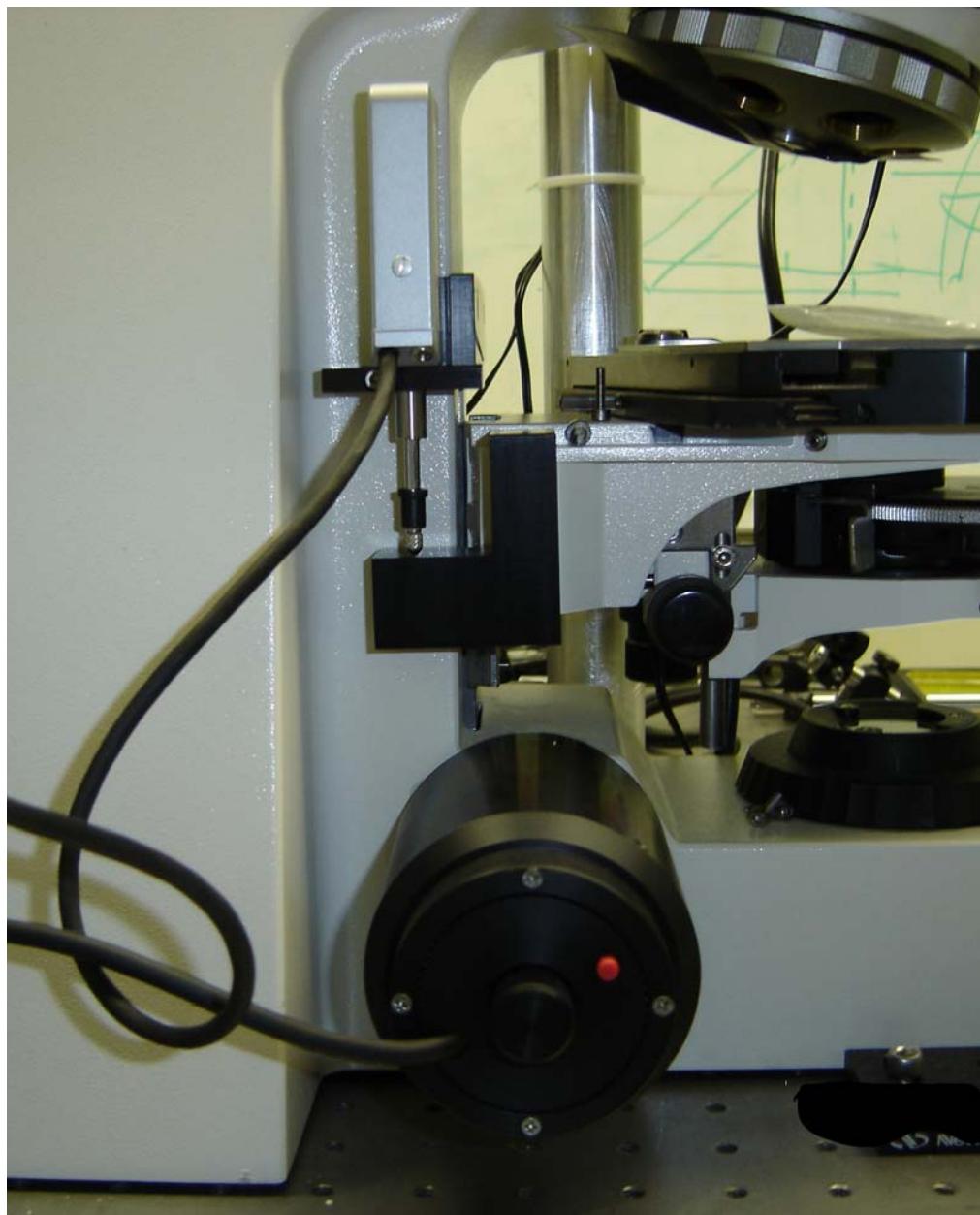
5. 99A454

Zeiss Axioplan 1/Axiophot 1

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M4X14 Socket Head Screw	2
Actuator Bracket	M3X4 Socket Cup Point Set Screw	2

- Remove the two screws on the throat of the microscope. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the stage carrier. Tighten down with the pre-installed set screws.

For further installation information on the 99A408 Focus Drive Motor, refer to Manual 90M025.

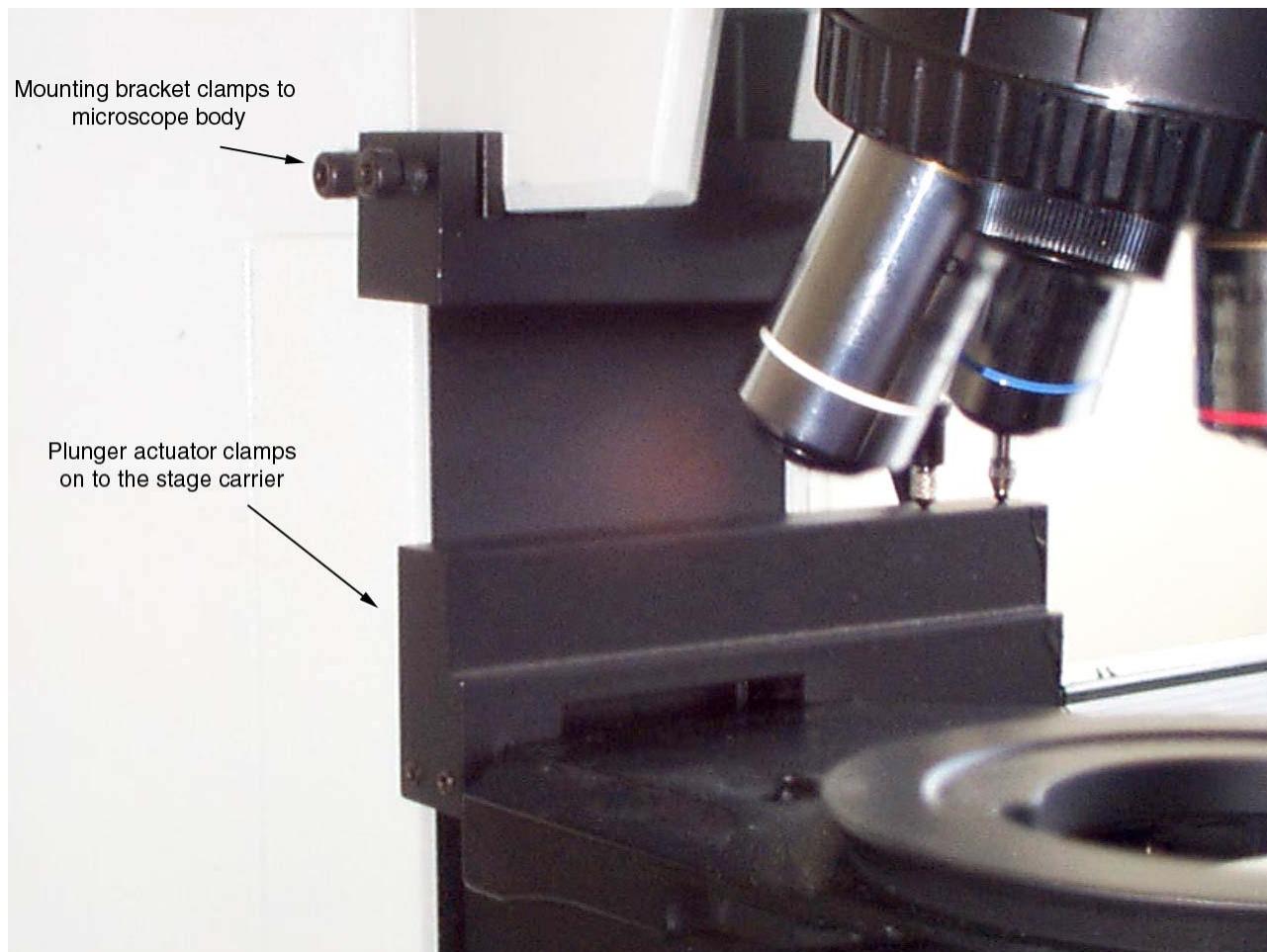


6. 99A455

Olympus BX 40/50

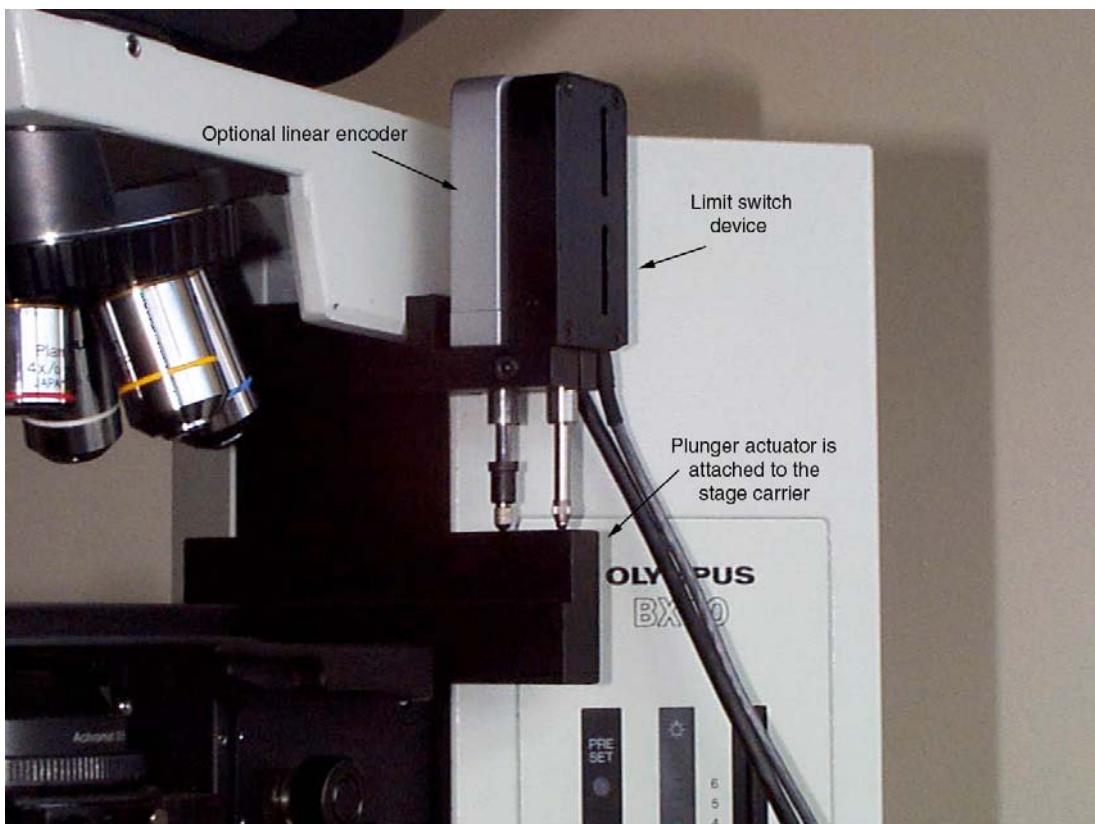
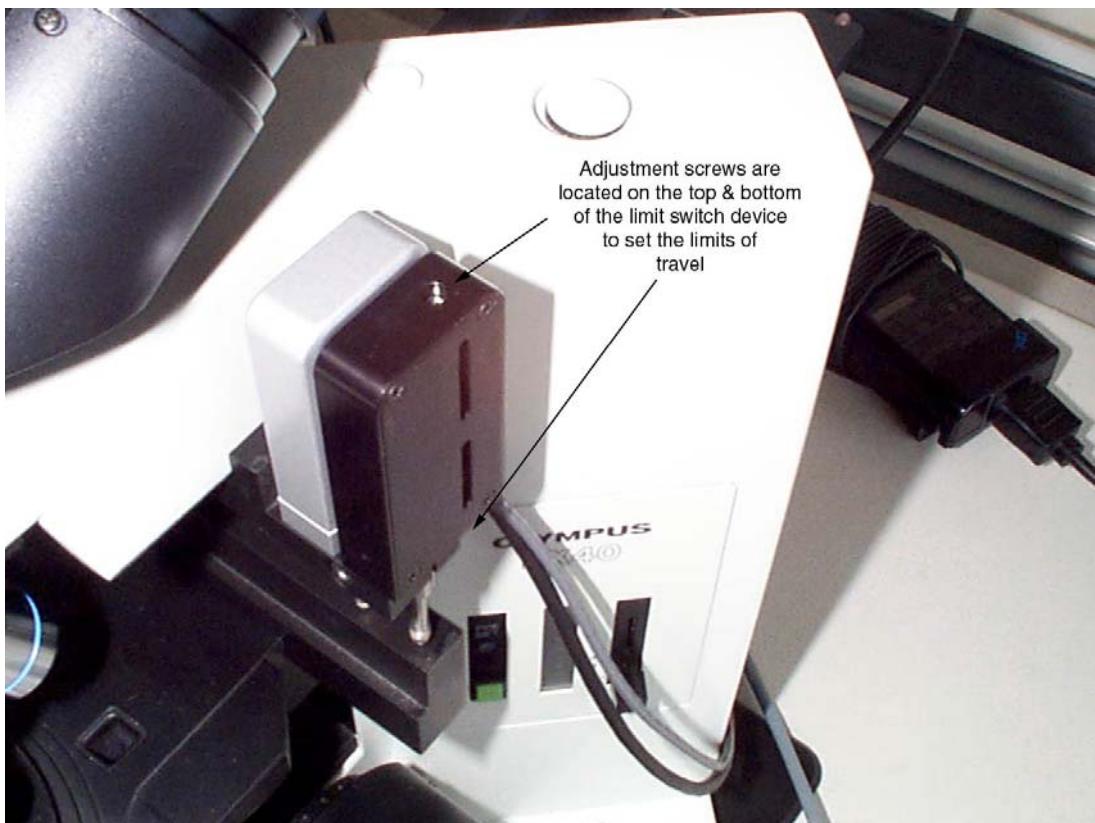
Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	BX 40 Pressure Plate (9.25mm thick) BX 50 Pressure Plate (3.00mm thick)	1 1
Actuator Bracket	M3X4 Socket Cup Point Set Screw	2

- Install the appropriate pressure plate into the encoder/limit bracket. Insert the encoder/limit bracket to the throat of the microscope. Tighten the two pressure plate set screws to secure the encoder/limit bracket.
- Install the actuator bracket to the stage carrier. Tighten down with the pre-installed set screws.



99A455 - Continued

Olympus BX 40/50

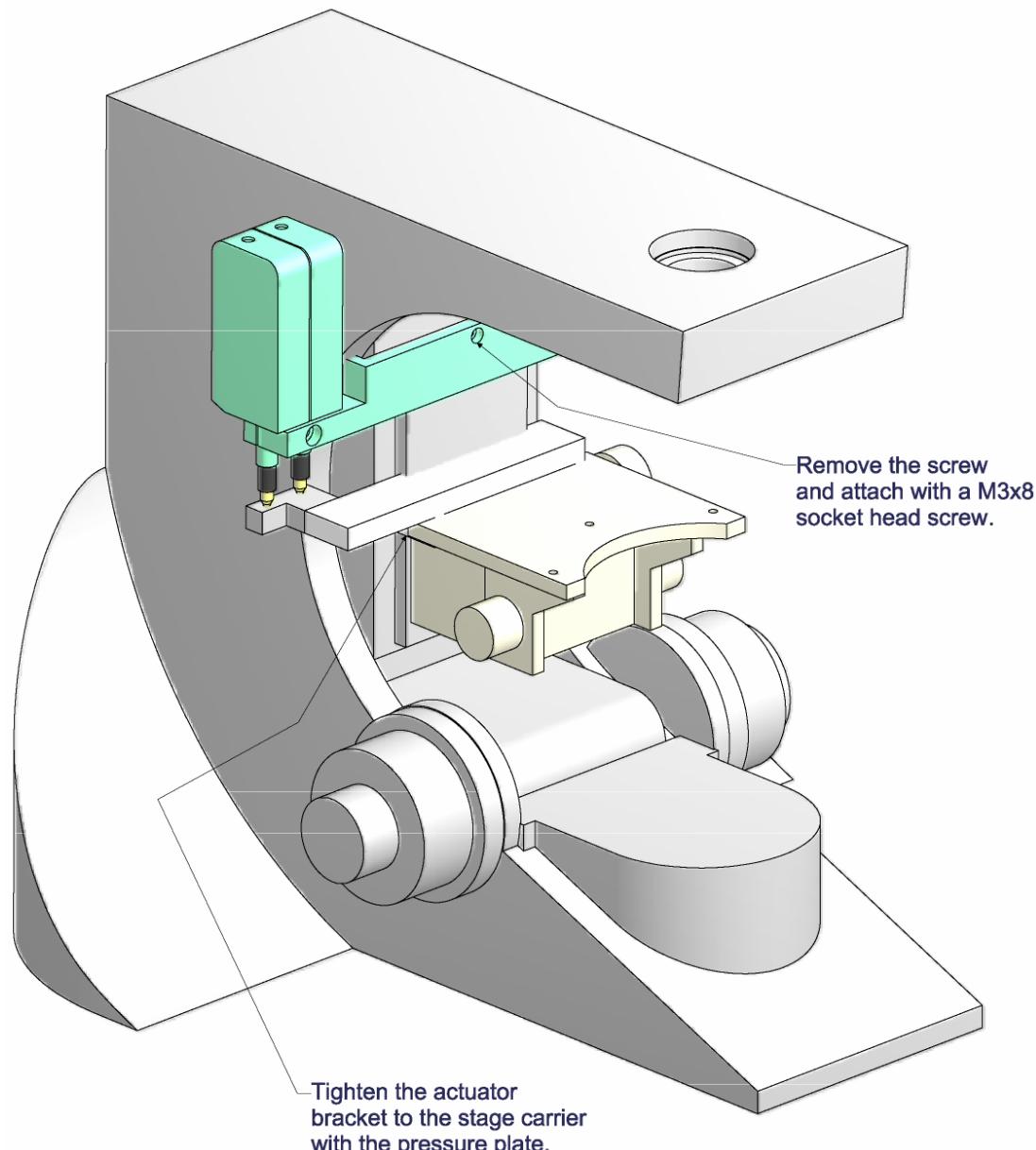


7. 99A456

Leica DMLB

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X8 Socket Head Screw	1
	M4X8 Socket Flat Point Set Screw	2
Actuator Bracket	Pressure Plate	1

- Remove the single screw on the throat of the microscope. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the stage carrier. Tighten the two pressure plate set screws.

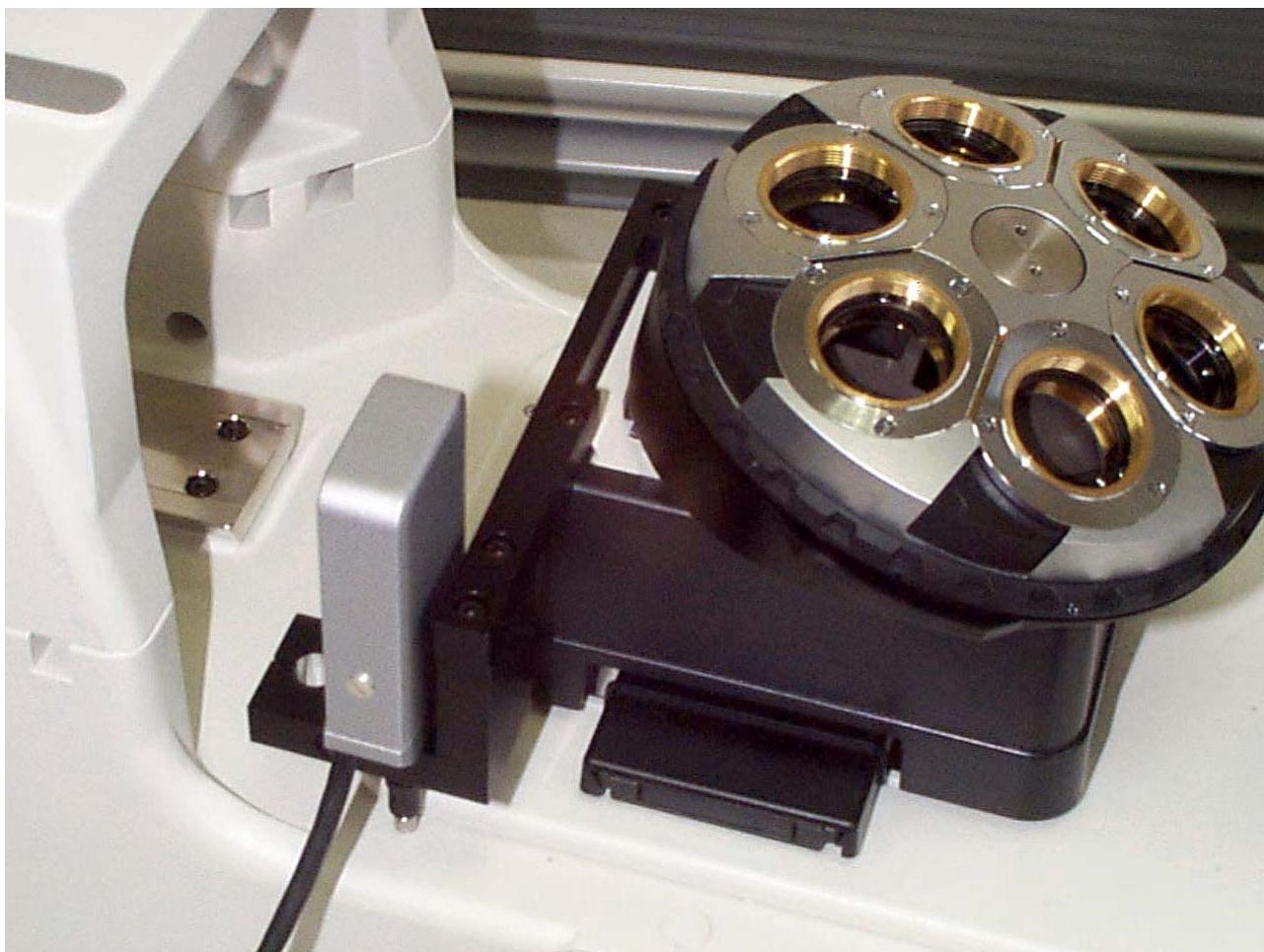


8. 99A457

Nikon TE200/300

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X12 Socket Head Screws	2
Actuator Bracket	None – (The microscope base will be used as the actuator.)	

- Install the encoder/limit bracket to the objective turret with the supplied hardware.



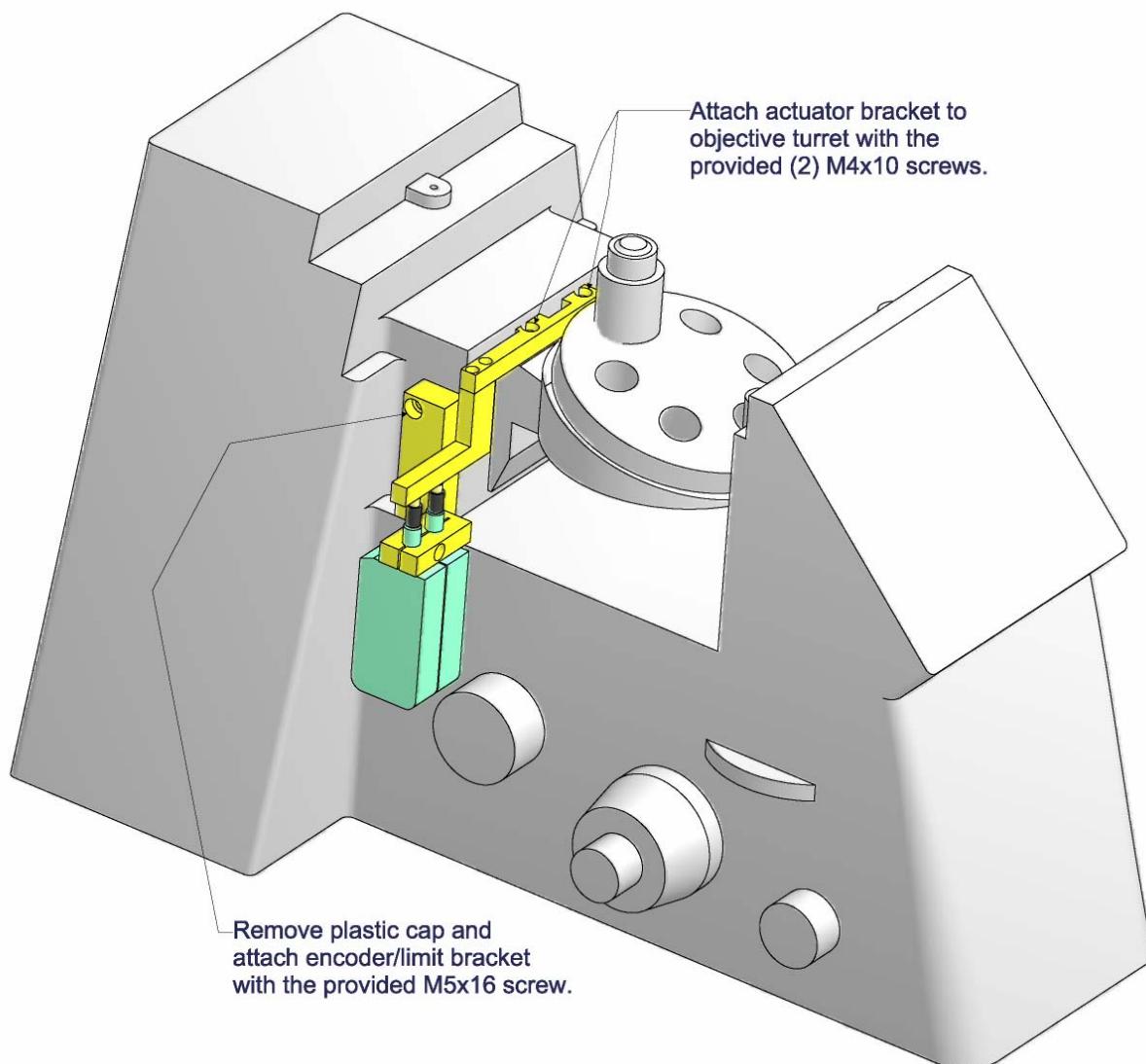
9. 99A458

Zeiss Axiovert 200/AxioObserver

Focus Drive Location	Right Side	
Bracket Location	Either Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M5X16 Socket Head Screw	1
Actuator Bracket	M4X10 Socket Head Screw	2

- Remove the single screw on the left side of the microscope base. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the objective carrier. Tighten down with the provided hardware.

For further installation information on the 99A409 Focus Drive Motor, refer to Manual 90M025.



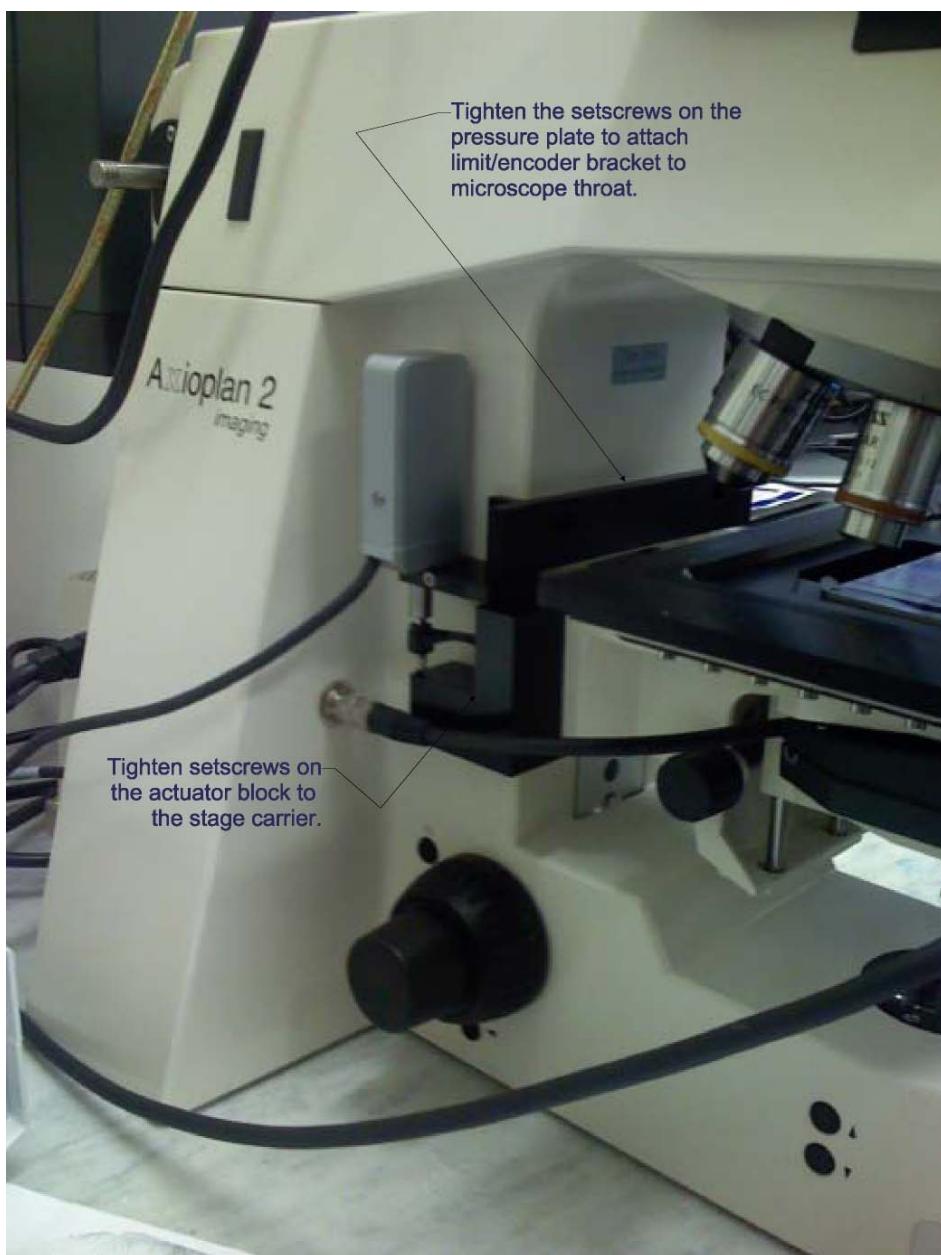
10. 99A459

Zeiss Axioplan 2

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	1
Actuator Bracket	M3X4 Socket Cup Point Set Screw	2

- Install the encoder/limit bracket to the throat of the microscope. Tighten down the two set screws on the pressure plate.
- Install the actuator bracket to the stage carrier. Tighten down with the pre-installed set screws.

For further installation information on the 99A408 Focus Drive Motor, refer to Manual 90M025.

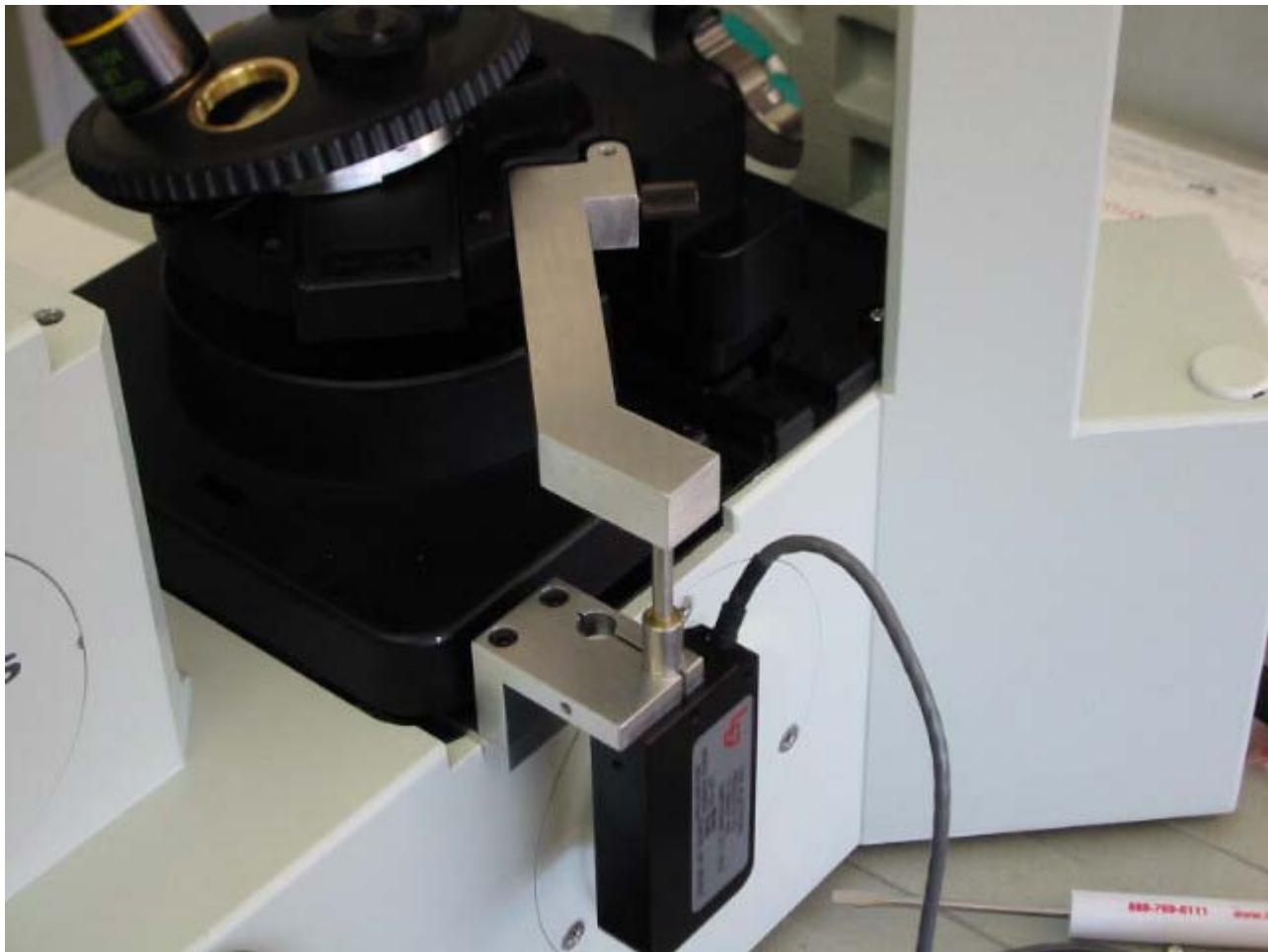


11. 99A460

Olympus IX 70

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X8 Socket Low Head Screw	1
Actuator Bracket	M4X12 Socket Flat Head Screw	1

- Remove the two screws on the right side of the microscope base. Attach the encoder/limit bracket with the provided hardware.
- Remove the filter slide locking screw. Insert the actuator bracket in the objective turret cutout. Tighten down with the provided flat head screw. Re-install the filter slide locking screw thru the clearance hole.

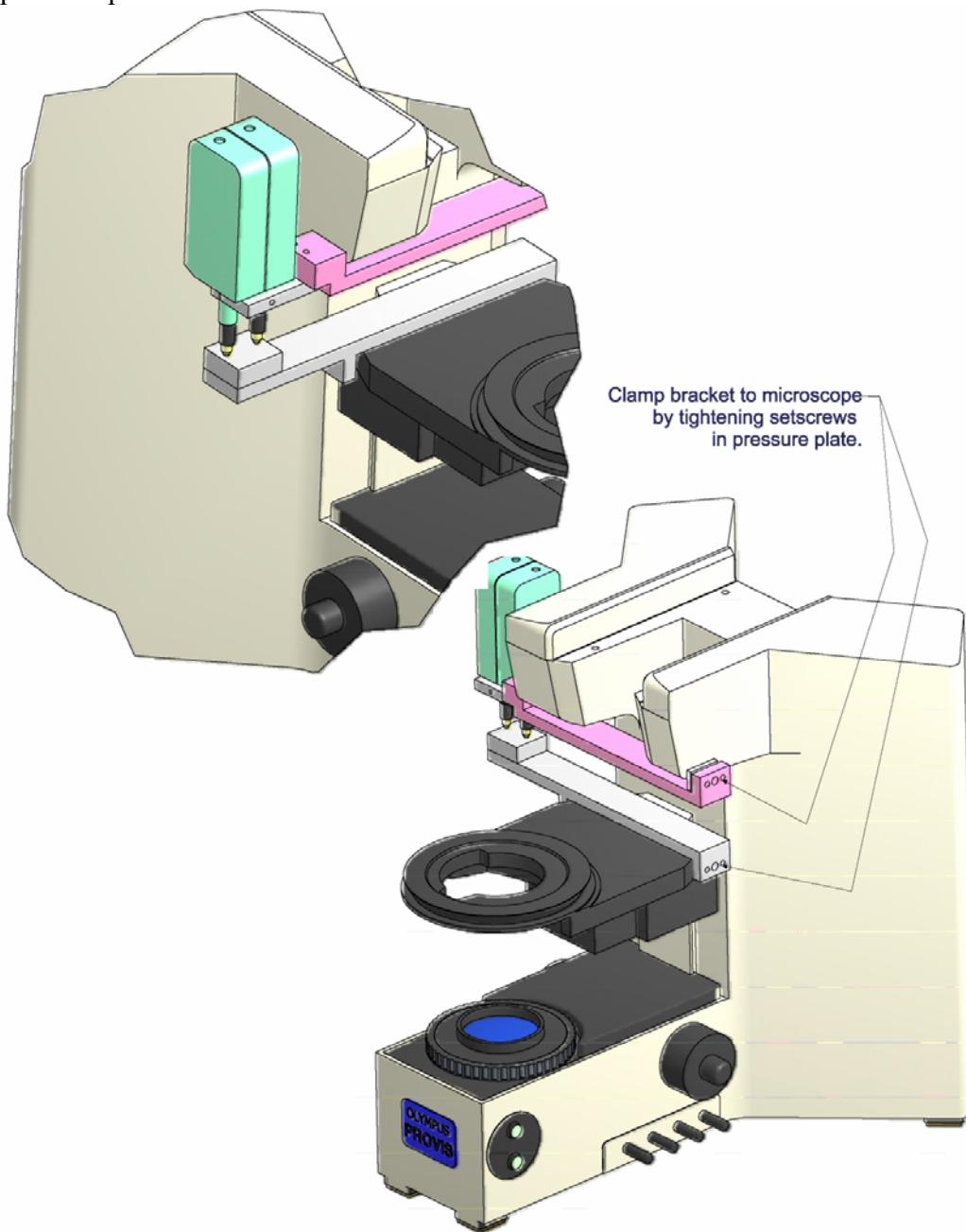


12. 99A461

Olympus AX 70

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	1
Actuator Bracket	Pressure Plate	1

- Install the encoder/limit bracket to the throat of the microscope. Tighten the two set screws on the pressure plate.
- Install the actuator bracket to the stage carrier. Tighten the two set screws on the pressure plate.



13. 99A462

Nikon TE2000

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M5X12 Socket Head Screw	1
Actuator Bracket	Pressure Plate	

- Remove the single screw on the right side of the microscope base. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the objective turret. Tighten the two set screws on the pressure plate.

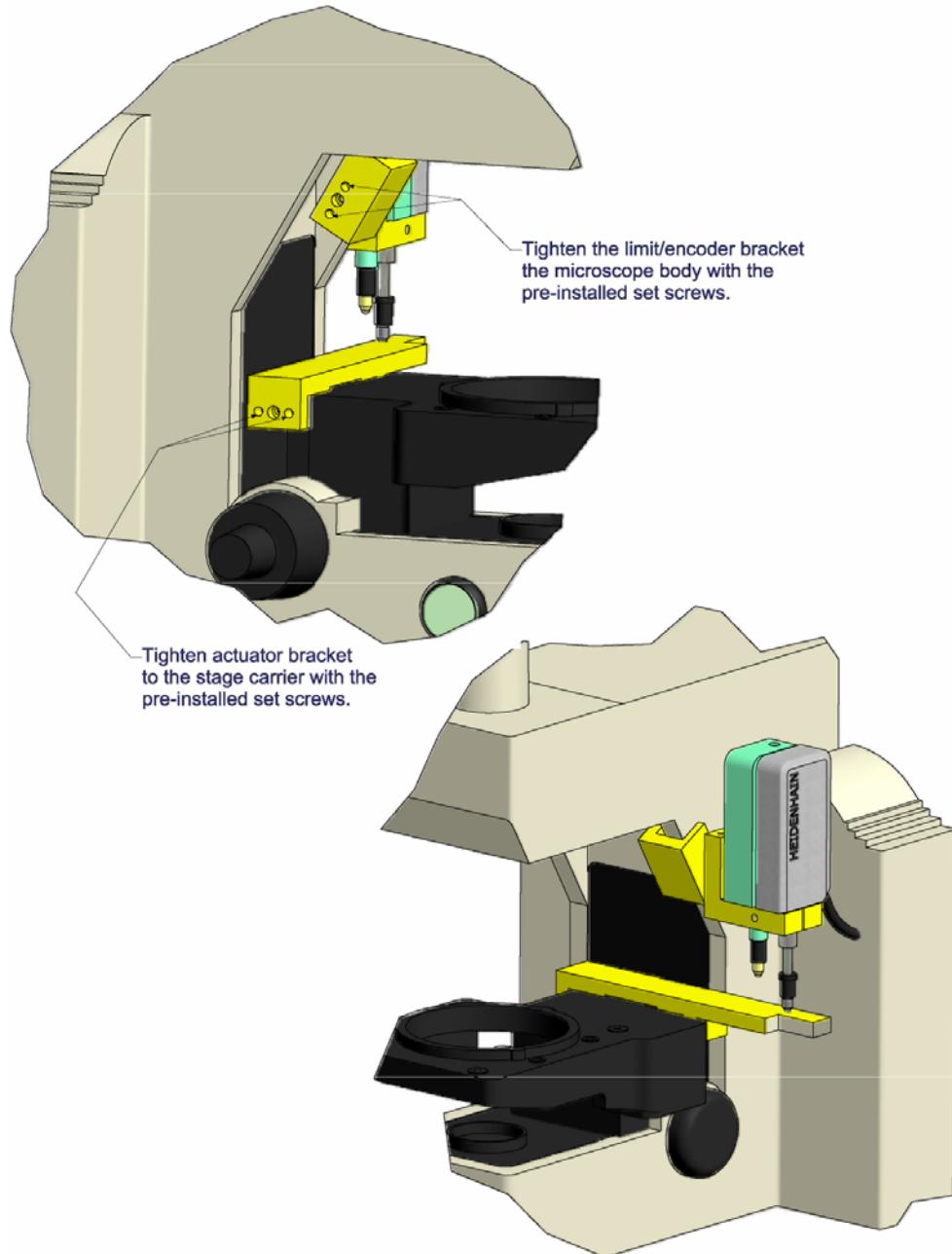


14. 99A463

Nikon E600

Focus Drive Location	99A400 – Left Side	
	99A405 – Right Side w/o manual stage	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	
Actuator Bracket	Pressure Plate	

- Install the encoder/limit bracket to the microscope. Tighten the two set screws on the pressure plate.
- Install the actuator bracket to the stage carrier. Tighten the two set screws on the pressure plate.

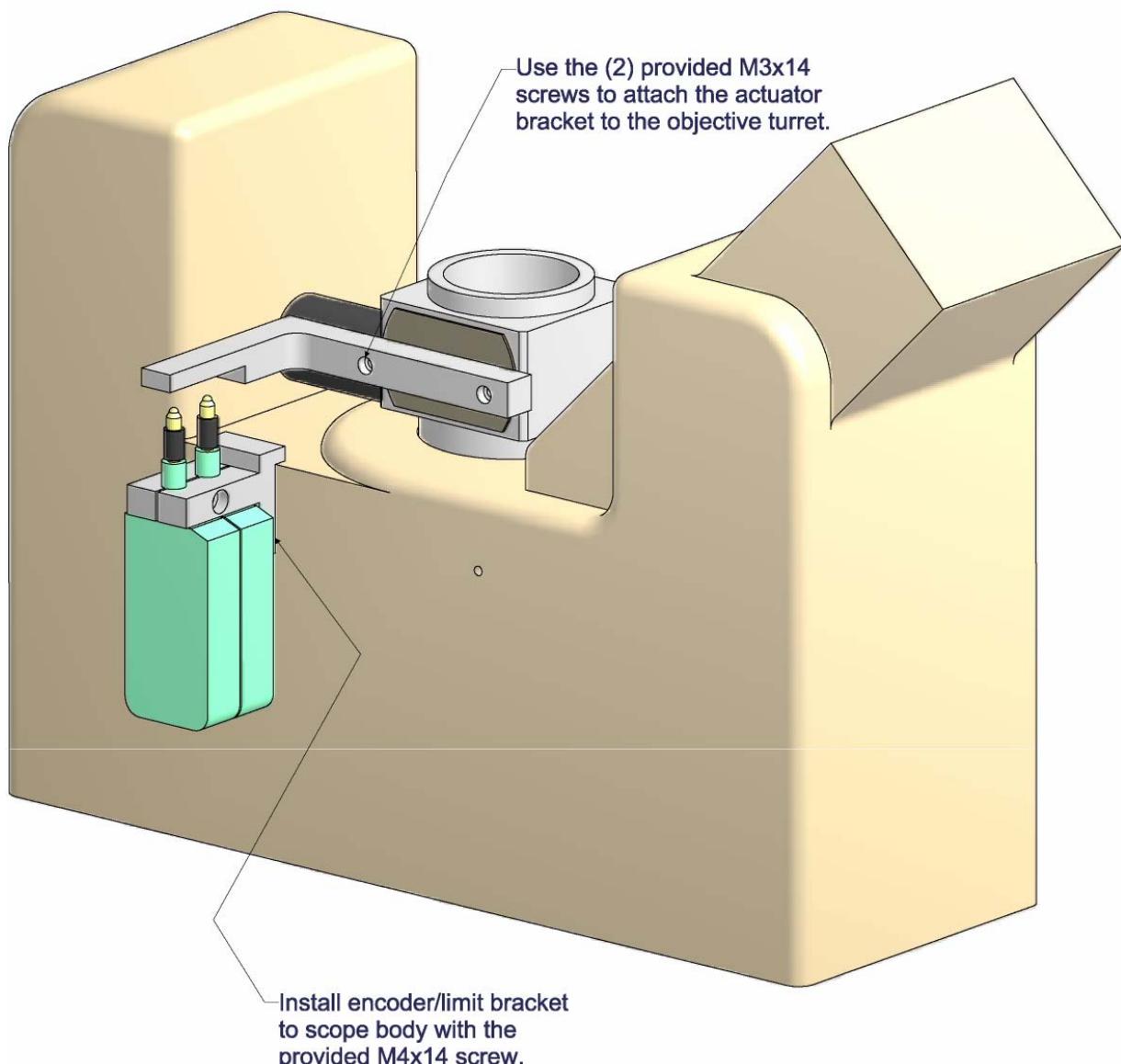


15. 99A464

Nikon Diaphot TMD

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M4X14 Socket Head Screw	1
Actuator Bracket	M3X14 Socket Head Screw	2

- Remove the single screw on the left side of the microscope base. Install the encoder/limit bracket with the provided hardware.
- Remove the two screws on the objective turret. Install the actuator bracket with the provided hardware.



16. 99A465

Olympus BX 51

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	
Actuator Bracket	M4X35 Socket Head Screw M4 Lock Washer	1 1

- Install the encoder/limit bracket to the throat of the microscope. Tighten the two set screws on the pressure plate.
- Remove the single screw on the right side of the microscope base. Install the actuator bracket with the pre-installed screw.

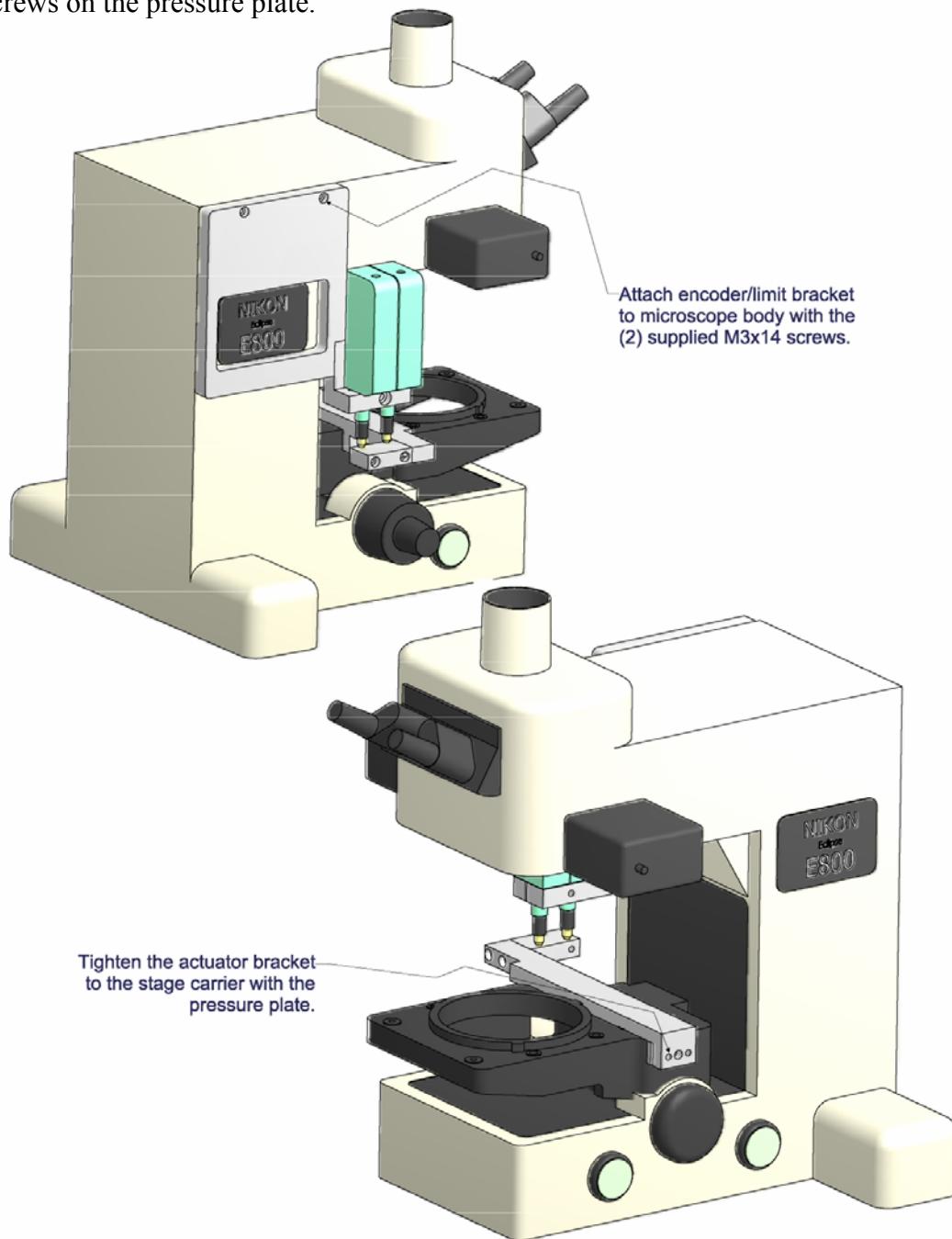
See Olympus BX 41 (99A67) Picture

17. 99A466

Nikon E800

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X14 Socket Head Screw	2
Actuator Bracket	Pressure Plate	1

- Remove the two screws on the left side of the microscope frame, just above the Nikon logo plate. Install the encoder/limit bracket with the provided hardware.
- Install the actuator bracket to the stage carrier of the microscope. Tighten the two set screws on the pressure plate.



18. 99A467

Olympus BX 41

Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	
Actuator Bracket	M4X35 Socket Head Screw M4 Lock Washer	1 1

- Install the encoder/limit bracket to the throat of the microscope. Tighten the two set screws on the pressure plate.
- Remove the single screw on the right side of the microscope base. Install the actuator bracket with the pre-installed screw.

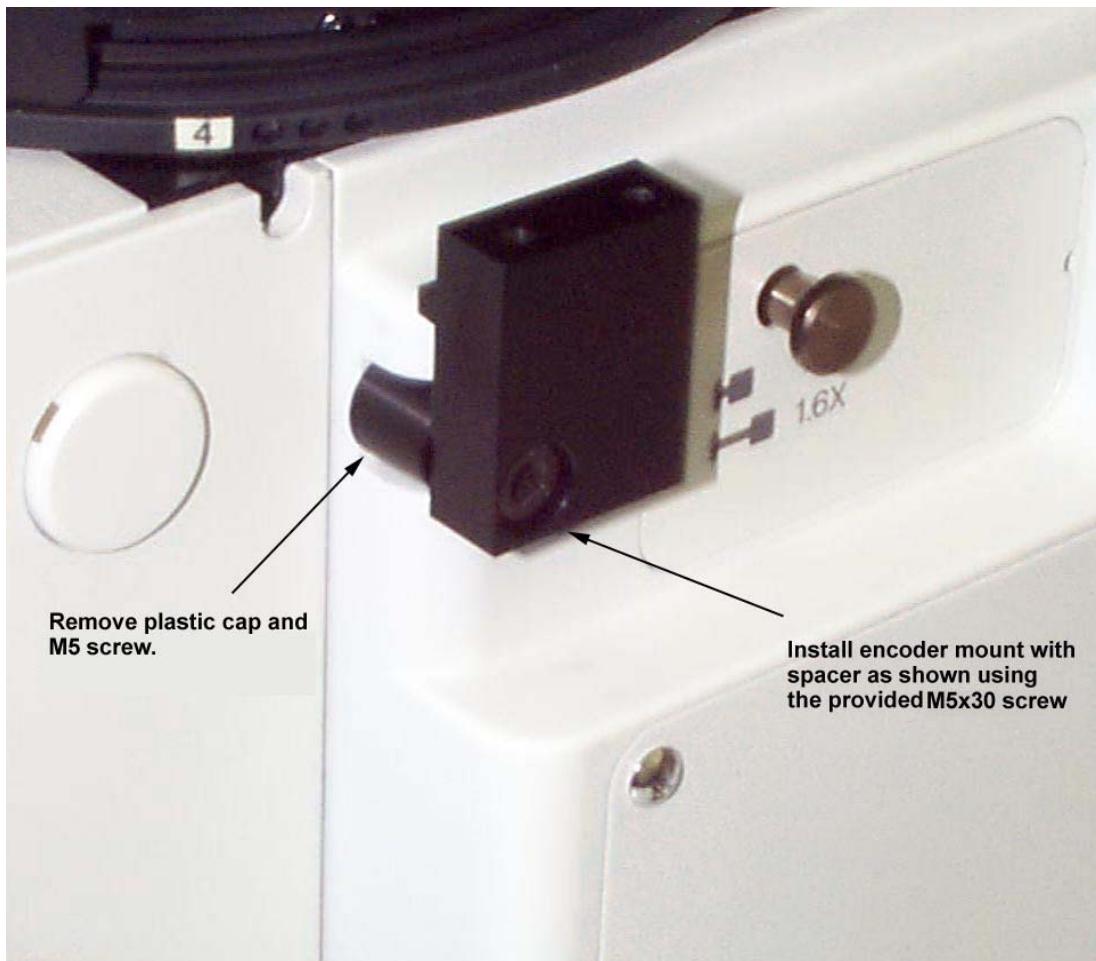


19. 99A468

Olympus IX 71

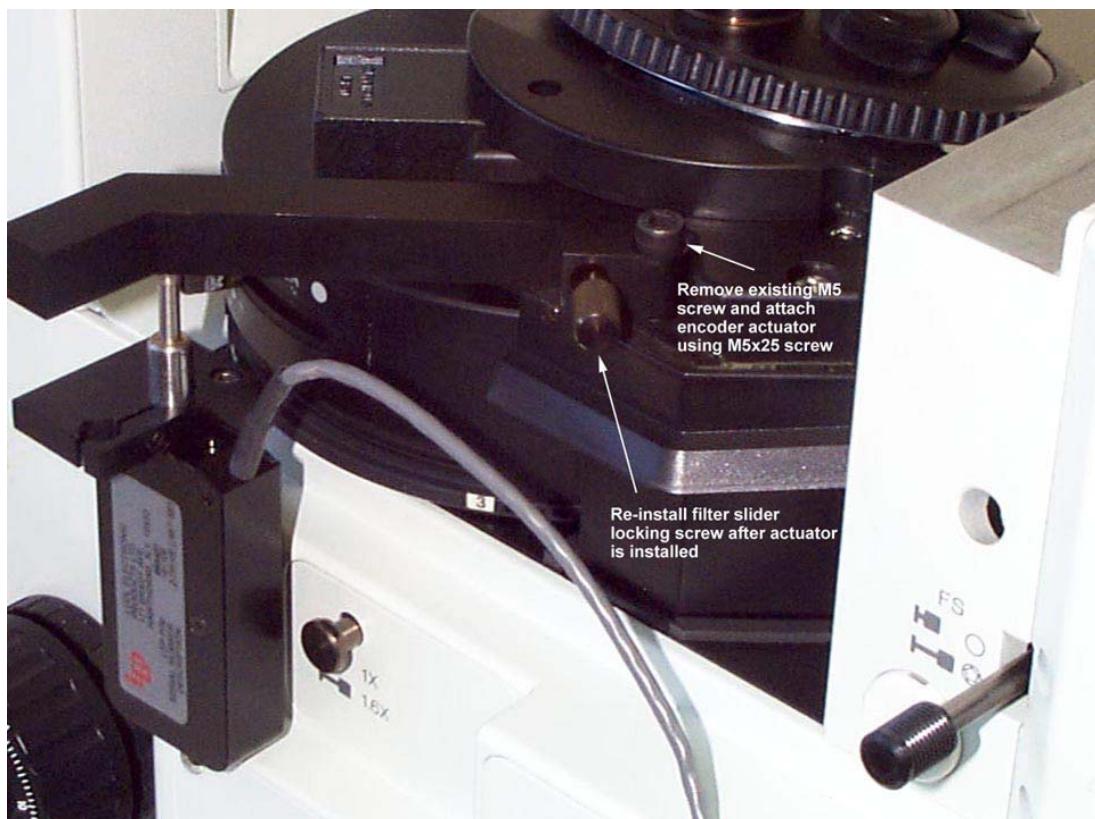
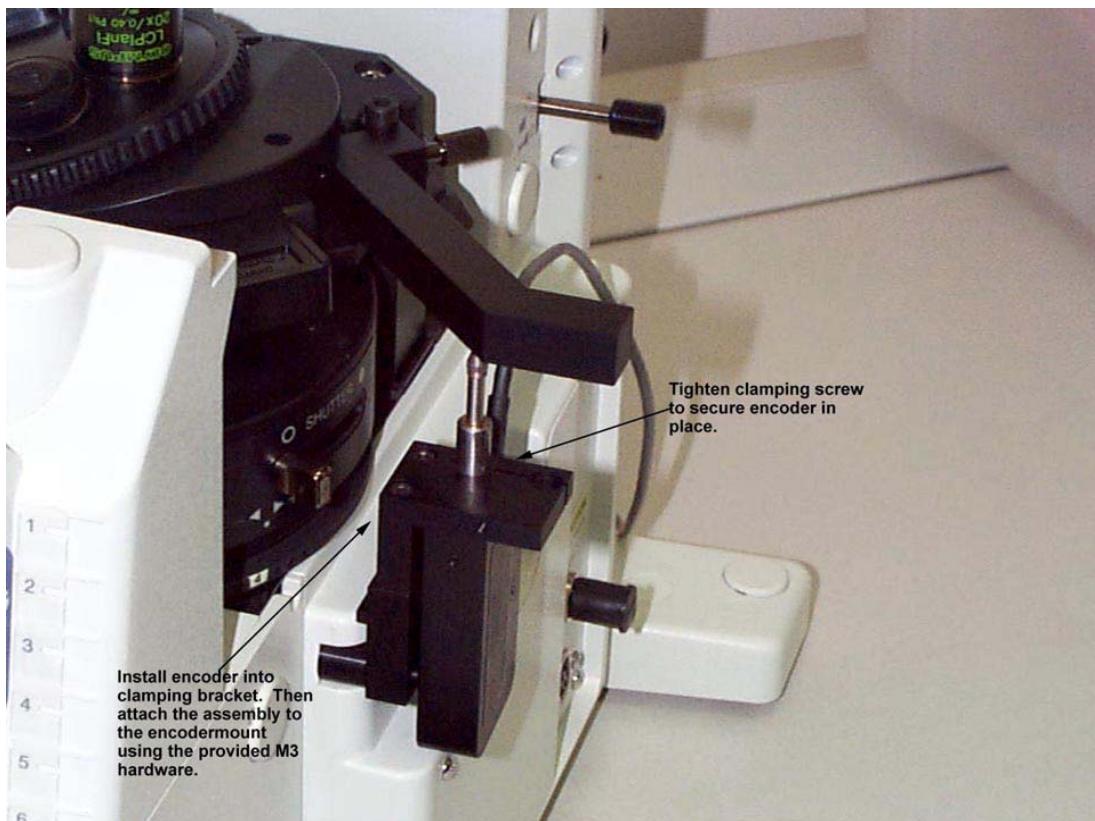
Focus Drive Location	Either Side (Left side is recommended to avoid any interference problems with a manual stage.)	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M5X30 Socket Head Screw	1
Actuator Bracket	M5X25 Socket Head Screw	1

- Remove the plastic cap and screw. Install the standoff and encoder/limit bracket to the right side of the microscope base.
- Remove the filter slide locking screw. Install the actuator bracket to the objective turret with the provided hardware. Re-install the filter slide locking screw.



99A468 - Continued

Olympus IX 71



20. 99A469

Zeiss Axioskop 40

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X12 Socket Head Screw	2
	M3X14 Socket Head Screw	2
	M4X14 Socket Head Screw	2
Actuator Bracket	M3X4 Socket Cup Point Set Screw	2

Note: Depending upon the version of the microscope different hardware may be needed to mount the encoder/limit bracket.

- Remove the two screws on the right side of the microscope base. Install the encoder/limit bracket with the appropriate hardware.
- Install the actuator bracket to the stage carrier. Tighten down with the pre-installed set screws.

For further installation information on the 99A408 Focus Drive Motor, refer to Manual 90M025.

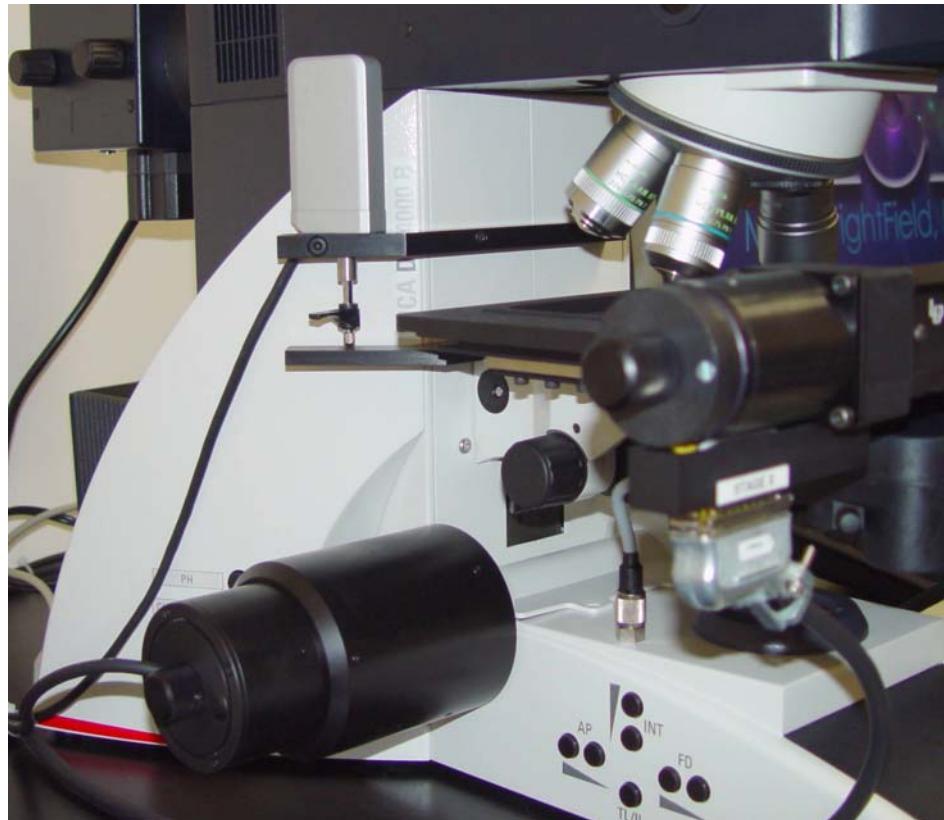
See Zeiss Axioskop 2 (99A450) Picture

21. 99A470

Leica DM 4000/5000

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X20 Socket Head Screw	2
Actuator Bracket	M4X6 Socket Nylon Tipped Set Screws	2

- Remove the two screws on the throat of the microscope. Install the encoder/limit bracket with the provided hardware.
- Install the actuator onto the stage carrier. Tighten down with the two pre-installed set screws.

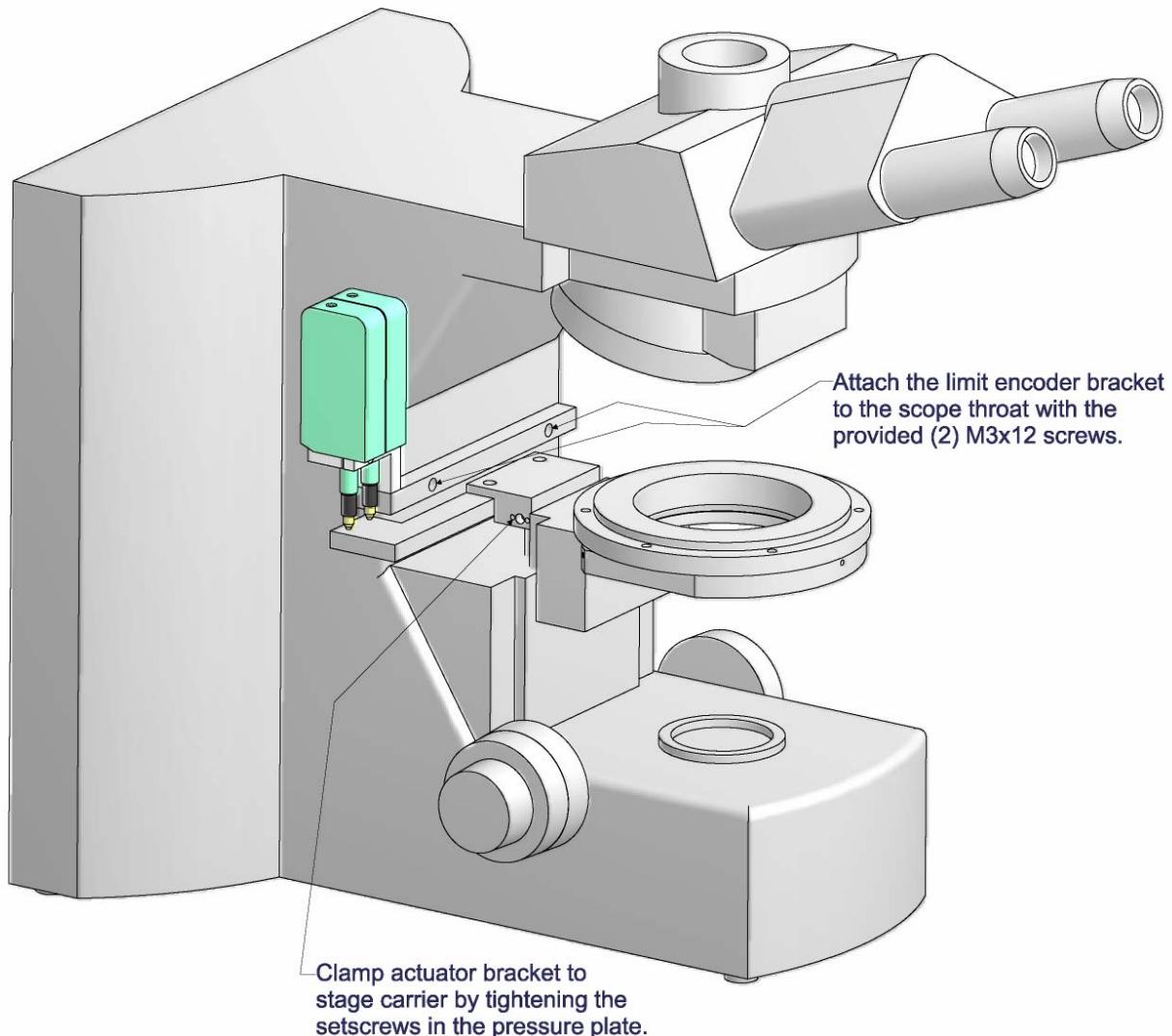


22. 99A471

Nikon E80i/E90i

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X12 Socket Head Screw	2
Actuator Bracket	Pressure Plate	1

- Remove the two screws on the throat of the microscope. Install the encoder/limit bracket with the provided hardware.
- Install the actuator onto the stage carrier. Tighten the two set screws on the pressure plate.



23. 99A472

Nikon E400

Focus Drive Location	99A400 – Either Side	
	99A407 – Right Side	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	1
Actuator Bracket	Nylon Tip Set Screws	2

- Install the encoder/limit bracket to the microscope. Tighten the two set screws on the pressure plate.
- Install the actuator bracket to the stage carrier. Tighten the two nylon tip set screws.

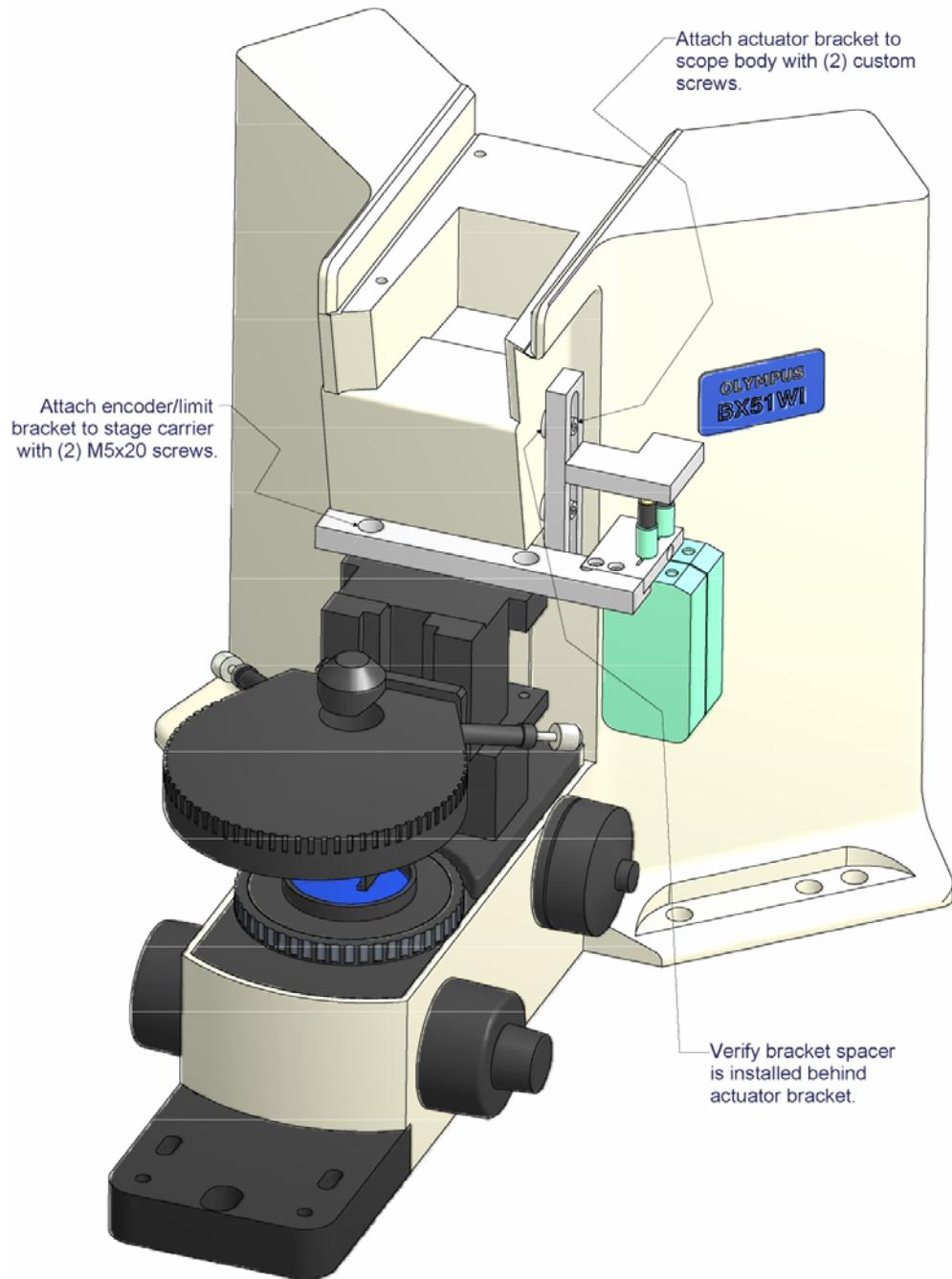
See Nikon E600 (99A463) Picture

24. 99A473

Olympus BX51WI

Focus Drive Location	Either Side	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M5X20 Socket Head Screw	2
Actuator Bracket	M4 Custom Screw	2

- Install the actuator bracket to the right side of the microscope body. Verify spacer is threaded onto each custom M4 screw.
- Install the encoder/limit bracket to the stage carrier with the supplied hardware.

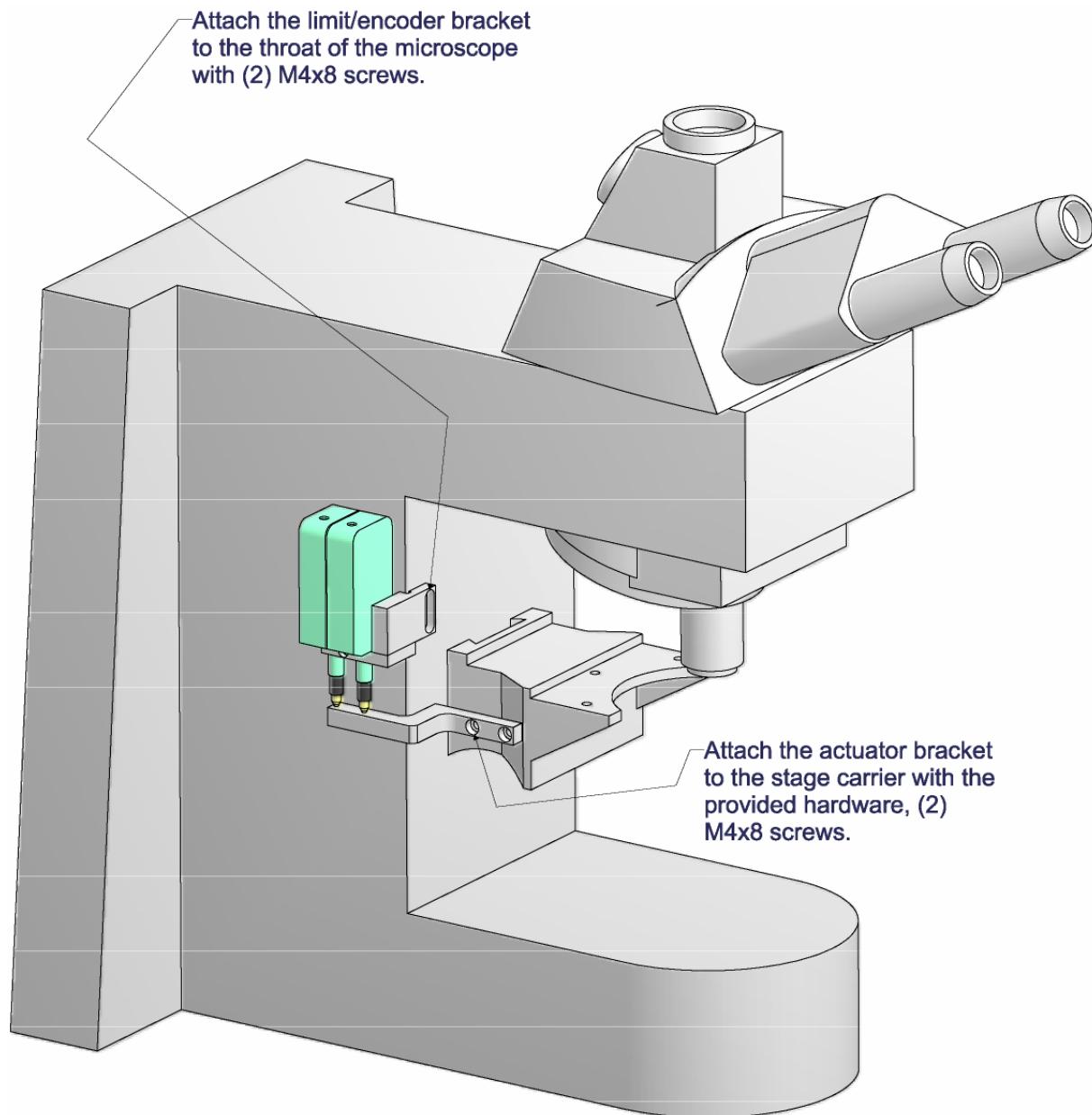


25. 99A474

Zeiss AxioImager

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M4X8 Socket Head Screw	2
Actuator Bracket	M4X8 Socket Head Screw	2

- Install the encoder/limit bracket to the microscope throat with the supplied hardware.
- Install the actuator bracket to the stage carrier with the supplied hardware.

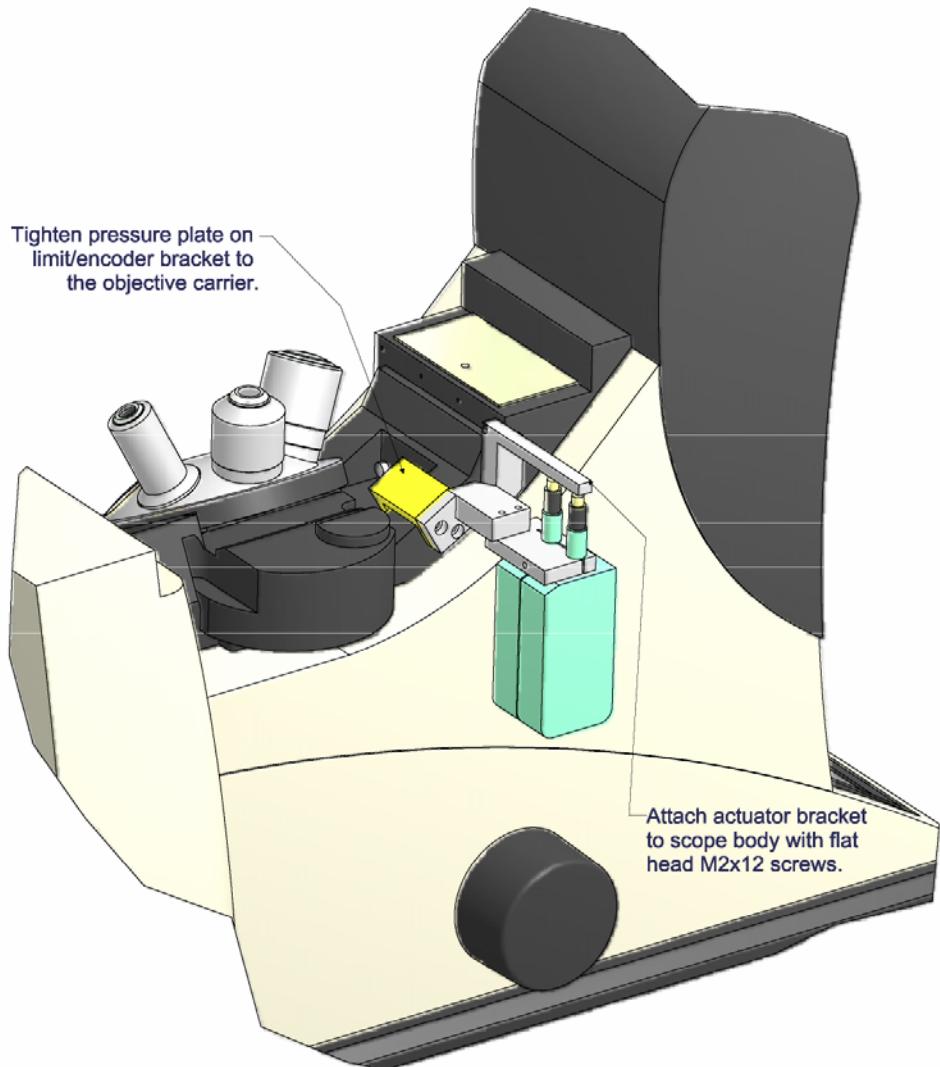


26. 99A475

Leica DMI 3K/4K/6K

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	1
Actuator Bracket	M2X12 Flat Head Screw	1

- Install the encoder/limit bracket to the object turret frame. Tighten the two set screws on the pressure plate.
- Install the actuator bracket to the microscope fame with the supplied hardware.

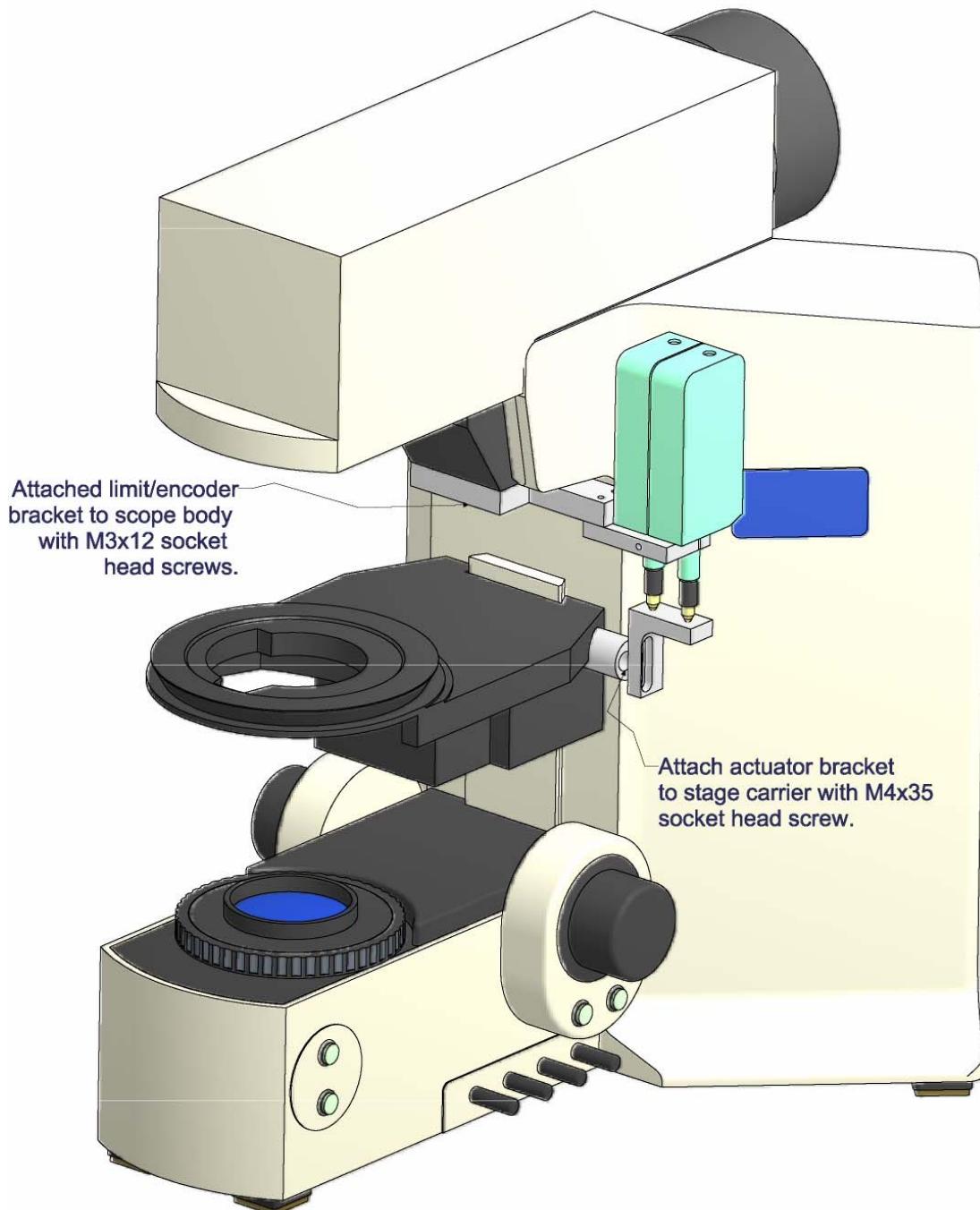


27. 99A476

Olympus BX61

Focus Drive Location	Left Side	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X12 Socket Head Screw	2
Actuator Bracket	M4X35 Socket Head Screw	1

- Install the encoder/limit bracket to the microscope throat with the supplied hardware.
- Install the actuator bracket to the stage carrier with a single M4x35 screw.

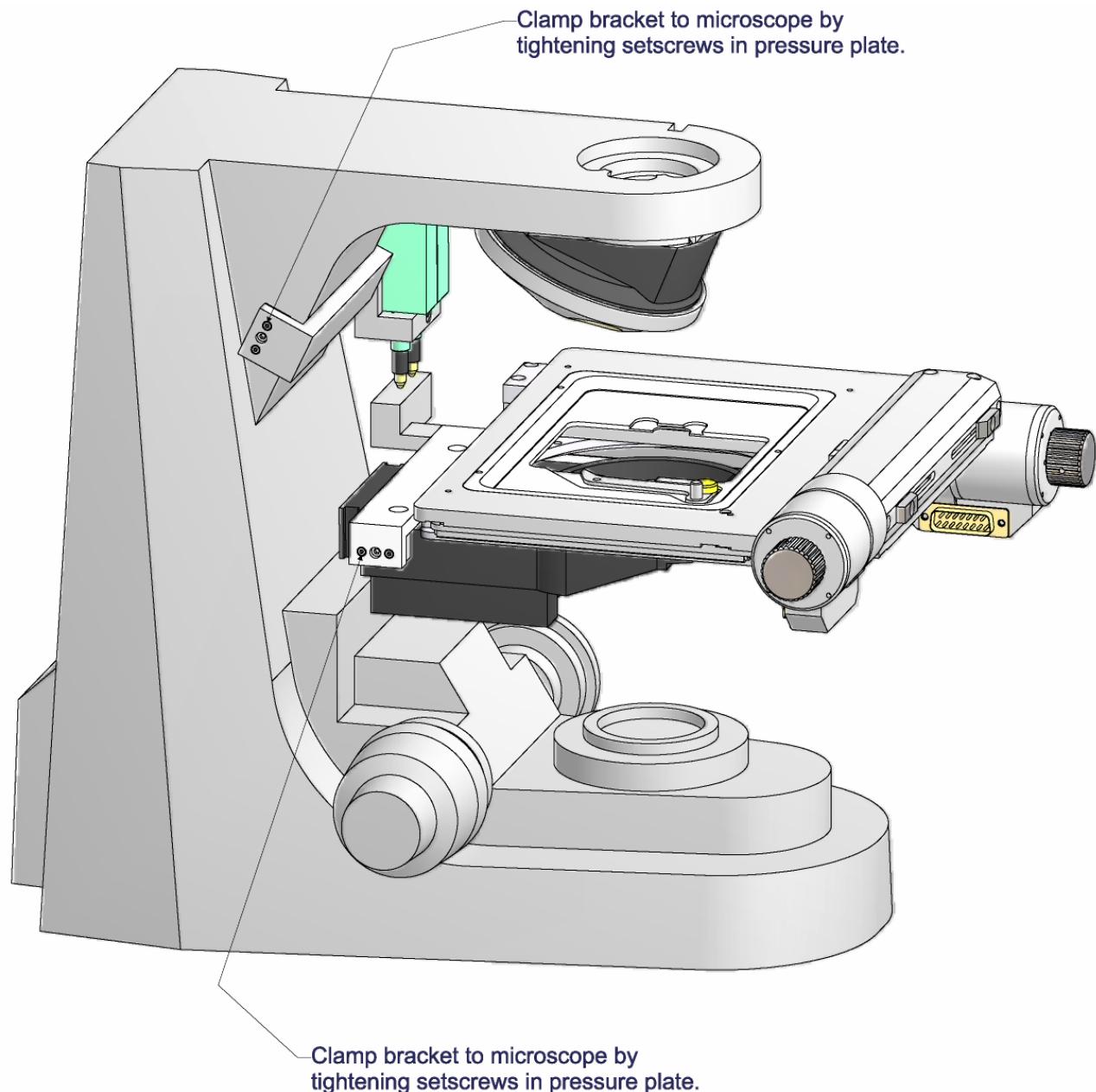


28. 99A477

Nikon E50i

Focus Drive Location	Left Side	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	Pressure Plate	1
Actuator Bracket	Pressure Plate	1

- Install the encoder/limit bracket to the microscope. Tighten the two set screws on the pressure plate.
- Install the actuator bracket to the stage carrier. Tighten the two set screws on the pressure plate.

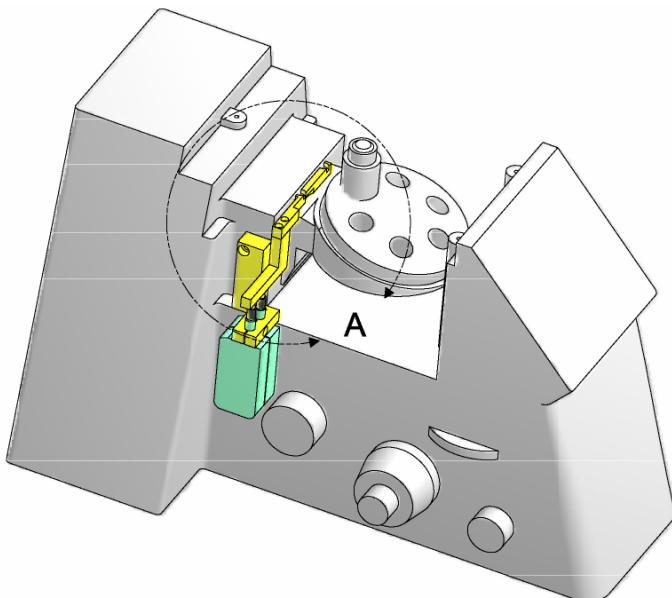


29. 99A478

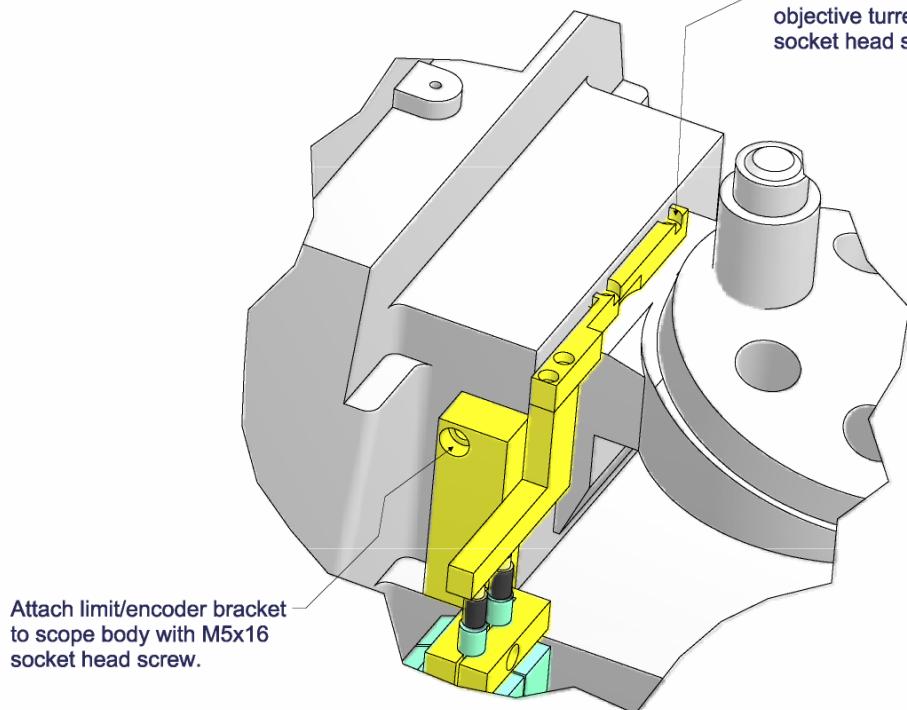
Zeiss AxioObserver Z1 Stand

Focus Drive Location	Left Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M5X16 Socket Head Screw	1
Actuator Bracket	M4X10 Socket Head Screw	2

- Install the encoder/limit bracket to the microscope frame with the supplied hardware.
- Install the actuator bracket to the objective turret with the supplied hardware.



Attach actuator bracket to objective turret with M4x10 socket head screws.



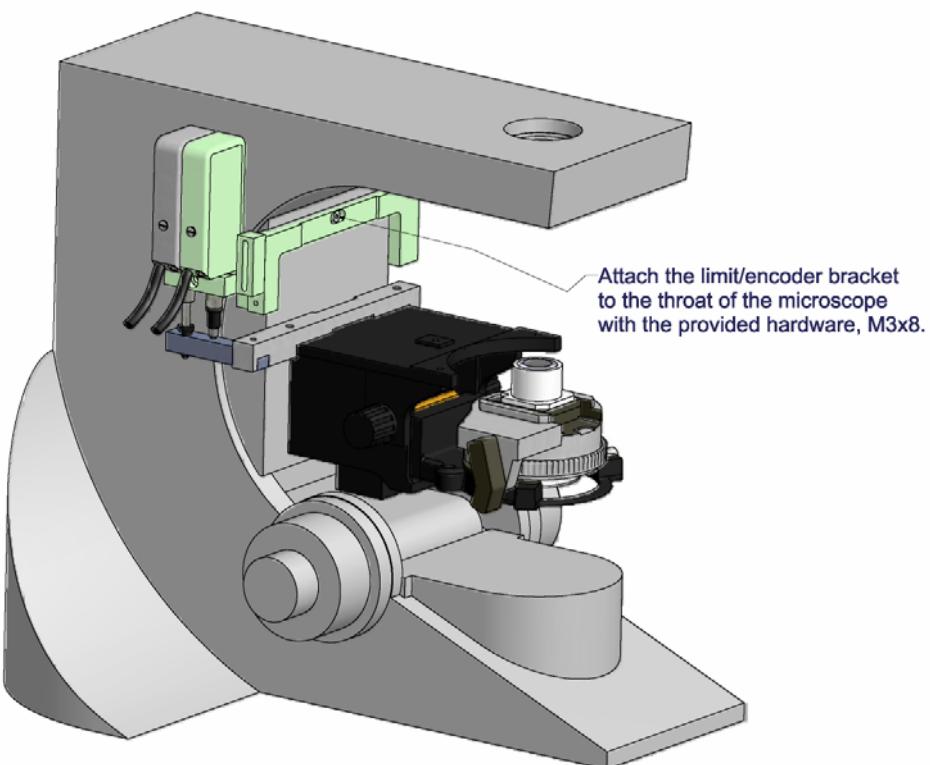
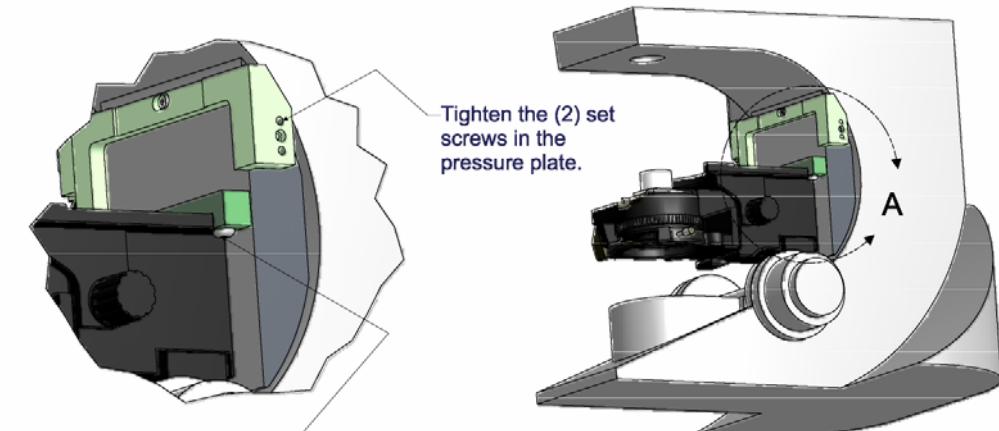
Attach limit/encoder bracket to scope body with M5x16 socket head screw.

30. 99A479

Leica DM2500

Focus Drive Location	Right Side	
Bracket Location	Left Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M3X8 Socket Head Screw/Pressure Plate	1
Actuator Bracket	M5X8 Button Head Screw	2

- Install the encoder/limit bracket to the microscope throat with the supplied hardware. For added support, tighten the pressure on the right side of the bracket.
- Install the actuator bracket to the stage carrier. Tighten the two socket head screws. The button heads will clamp to the stage carrier.

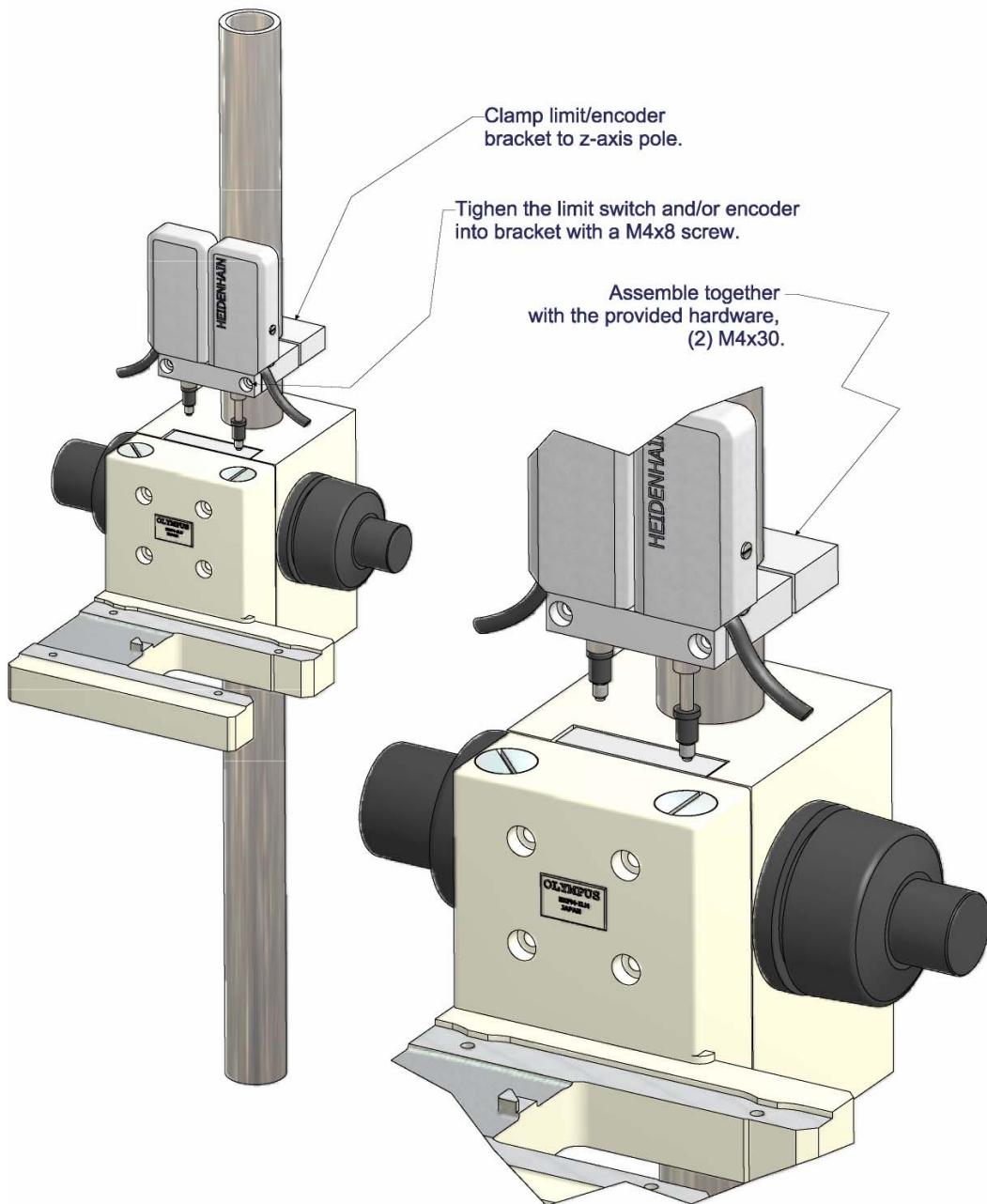


31. 99A480

Olympus BXFM

Focus Drive Location	Left Side	
Bracket Location	Above Focusing Unit	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M4X30 Socket Head Screw	2
Actuator Bracket	None – (The microscope base will be used as the actuator.)	

- Clamp the limit/encoder bracket to the z-axis pole.
- Insert limit switch/linear encoder into the bracket. Adjust bracket height so that the focus unit frame is driving the plungers.
- Once in place, tighten the (2) M4x30 socket head screws.

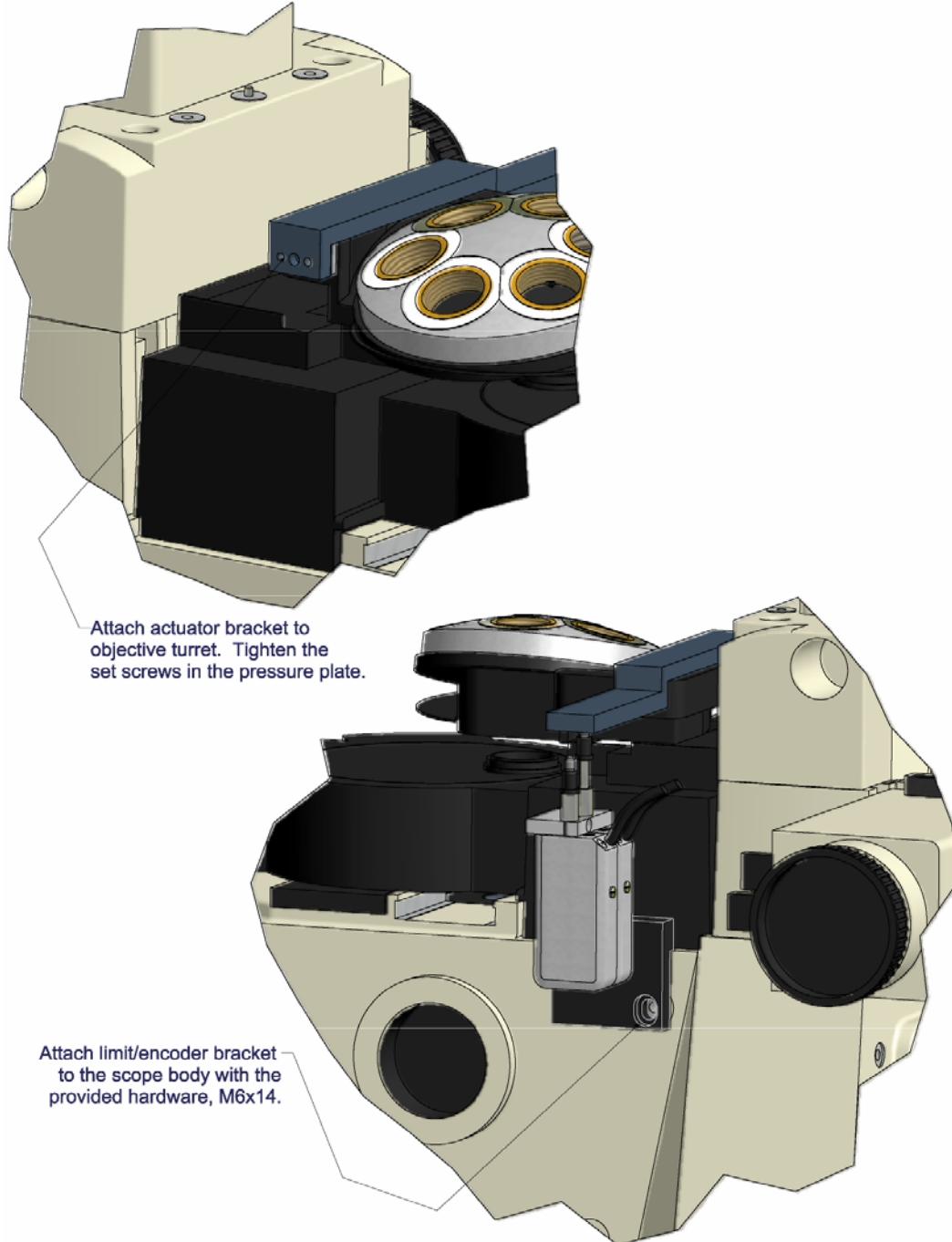


32. 99A481

Nikon Ti

Focus Drive Location	Left Side	
Bracket Location	Right Side	
	Mounting Hardware	Qty
Encoder/Limit Bracket	M6X14 Socket Head Screw	1
Actuator Bracket	Pressure Plate	

- Install the encoder/limit bracket to the microscope body with the supplied M6x14 screw.
- Install the actuator bracket to the objective turret. Tighten the two set screws on the pressure plate



Encoder/Motor Phase Relationship Settings for the MAC Controllers

MAC 5000

Motor Position	Encoder Position	Switch 9 Position
Right Side	Upright	Closed
	Inverted	Open
Left Side	Upright	Open
	Inverted	Closed

* Upright encoder denotes plunger facing down toward the table.

MAC 6000

The encoder/motor phase relationship is auto-detected with the MAC6000 controllers. The encoder needs to be mechanically attached to the microscope for the auto detection to perform properly.

Notes

Notes

Notes

Ludl Electronic Products designs and manufactures a wide range of automation accessories for microscopes and instrumentation.

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