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USA

NewView 7200 & 7300 Operating Manual

OMP-0536E

Warnings and Notes

Warning!
Denotes a hazard that could cause injury to personnel, and can also cause damage to the equipment.

Note, provides helpful information.

CE Marking

If equipment has CE Marking it indicates compliance to safety requirements established by the European Union. The directives and standards in compliance are listed in a Declaration of Conformity, which is on file at Zygo Corporation, Middlefield, Connecticut, USA.

OMP-0536 Rev. E June 2011

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Introduction

Chapter 1

Get familiar with safety concerns and your metrology instrument, plus learn about the technology beneath the cover.

Safety Precautions

Failure to follow safety precautions could result in damage to personnel and the instrument, and may void the warranty.

WARNINGS!

- **Disconnect Power During Installation.** Ensure that all power is off during installation, when connecting cables, or when servicing equipment.
- **Ground the Instrument.** To minimize shock hazard, the equipment must be properly connected to an electrical ground through the power outlet.
- **Use Care When Moving Equipment.** It is recommended that several helpers work together when lifting or moving the instrument. Contact the appropriate agencies in your country for proper lifting recommendations.
- **Handle Objectives and Field Zoom Lenses With Care.** The objectives and field zoom lenses are delicate optical components and should not be mishandled or dropped. Store objectives and field zoom lenses in supplied storage containers.
- **Do Not Crash Objectives.** Do not crash the objective or optical profiler into the test part or part stage. Use caution when focusing and driving the z-axis.
- **Keep Fingers and Objects Away from Moving Turrets.** Both the motorized objective turret and the field zoom turret, if so equipped, are software controlled. Keep hands, fingers, and other objects away from moving components.
- **Keep Fingers and Objects Away from Moving Stages.** Motorized stages move during alignment and measurement operations. Keep hands, fingers, and other objects away from the part stage area. For emergencies press the Joystick's Emergency Stop button to stop all stage motion.
- **Do Not Touch Optical Surfaces.** Do not touch exposed glass surfaces on the instrument or on the objectives or field zoom lenses. Touching optical components will degrade the optical quality of the imaging system.
- **Clean Optics Only When Necessary.** Do not clean optical surfaces unless necessary. Improper and unnecessary cleaning may damage optical coatings.

- **Do Not Modify Equipment.** Do not install substitute parts or perform any unauthorized modification of the equipment.

Safety Labels

Failure to follow the safety labels on the equipment and the recommendations in this manual could result in damage to personnel and the instrument, and may void the warranty.

Label	Meaning
	General Hazard. Proceed with caution. Refer to the manual for instructions.
	Electrical Shock. Proceed with caution; there is a risk of electrical shock.
	Do not crash the objective or optical profiler into the test part or stage. Use caution when focusing and driving the z-axis.
	Disconnect power before performing the specified procedure.
	Refer to the manual for complete instructions on performing a specified procedure.

The NewView(1) Optical Profiler

The ZYGO NewView(1) optical profiler is a general purpose, three dimensional, surface structure analyzer. It provides graphic images and high resolution numerical analysis to accurately characterize the surface structure of test parts. The NewView uses scanning white light interferometry to image and measure the micro structure and topography of surfaces in three dimensions. A wide variety of surfaces can be measured.

All NewView profilers come with a granite base, a stable gantry column, and motorized focus control. Options include single or motorized three field zoom lens turret, manual or motorized 6-position objective turret, and manual or motorized part stages.

(1) U.S. patent numbers 4,948,253, 5,398,113, 5,402,234, 5,784,164, 5,953,124, 6,028,670, 6,597,460, 6,714,307, 6,775,006, and 6,882,745; U.S. and foreign patents pending.

Model Descriptions

Model	Description
7200	Base optical profiler with a high resolution camera, manually interchangeable single field zoom lens, filter tray, aperture stop, and a turret compatible closed loop transducer.
7300	All the features of Model 7200 plus- an aperture stop, an enhanced illuminator, a higher speed camera, and an automatic three-position field zoom lens turret.

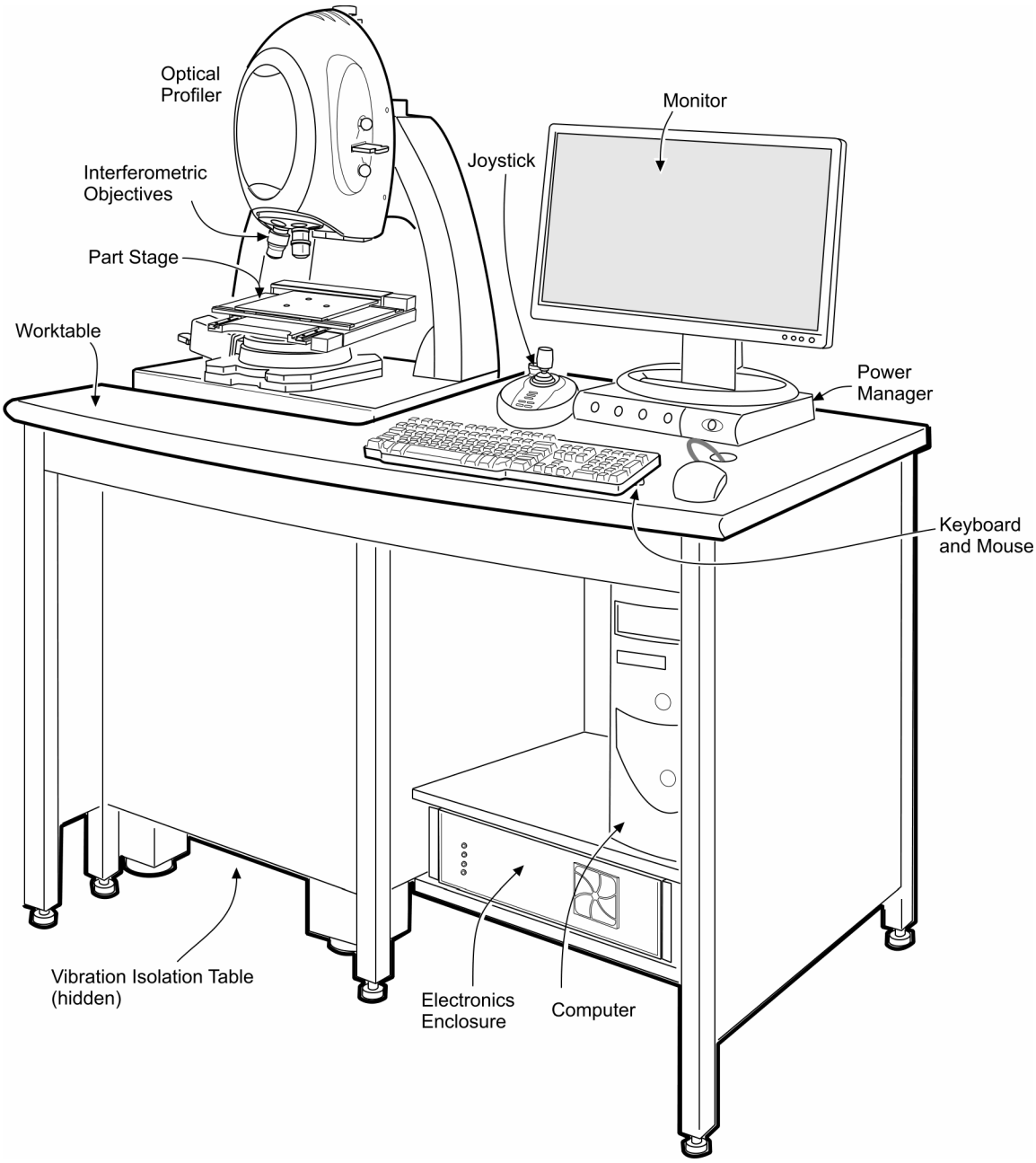
NewView Options

Option	Description
Field Zoom Lens	High-quality discrete field zoom lenses provide superior image magnification and are available in the following powers: 0.5X, 0.75X, 1.0X, 1.5X, and 2.0X.  NewView 7200 accepts a single field zoom lens; the lens can be manually interchanged. NewView 7300 accepts up to three field zoom lenses automatically selected via software.
Objective	Interferometric infinite conjugate objectives provide sharp images of the part under test. ZYGO offers standard and long working distance objectives in magnifications ranging from 1X to 100X.
Objective Mounting	● Single objective dovetail. ● Manual 6-position turret. ● Motorized 6-position turret.
Camera	● 640 x 480 (VGA) high-resolution camera (standard). ● 992 x 992 (1K) ultra-high resolution camera (option for NewView 7300).
Stages	● 1-axis stage; Motorized Z (focus), Manual Tip/Tilt and X/Y. ● 3-axis stage; Motorized Z (focus) and X/Y, Manual Tip/Tilt. ● 5-axis stage; Motorized Z (focus), Tip/Tilt, and X/Y. ● 5-axis stage; Motorized Z (focus), Tip/Tilt, and X/Theta. ● 5-axis stage; Motorized Z (focus), Tip/Tilt, and Y/Theta.  The number of stage axes indicates the total number of motorized axes in the configuration. The motorized Z stage and motorized X/Y stages are also available in a closed loop configuration.

 Accessories are described in the *NewView 7000 Accessory Guide*, OMP-0543.

NewView Components

Typical NewView System



NewView Components (shown on previous page)

Component	Description
Optical Profiler (Sensor)	Provides three dimensional measurement data of the surface under test. It is a scanning white light interferometric optical profiler or sensor. Focus is performed by driving the sensor up or down with the Z-axis motorized stage.
Interferometric Objectives	Objectives gather light from the test part and form a real image of it. The objective creates interference by dividing the light into two paths; directing one to an internal reference surface and the other to the test surface. Due to surface irregularities the measurement wavefront travels different distances than the reference wavefront. When the two wavefronts are recombined, the waves are out of phase and form an interference pattern. This interference pattern of light and dark bands is called “fringes”.
Part Stage	Holds the part under test and provides for positioning under the objective.
Electronics Enclosure	Houses system electronics; it provides power to the NewView and stages and interfaces to the computer.
Computer	For system control, data storage, and running MetroPro software.
Worktable	Nests against the vibration isolation table and holds the various system components.
Vibration Isolation Table	Isolates the optical profiler from environmental vibrations that degrade measurements.
Monitor	Displays MetroPro graphics and data. An on-screen live display is used to display a live image of the part under test. It serves as visual feedback when adjusting the interferometer focus and part positioning.
Joystick	Controls the motorized stages (including focus), z-stop settings, and provides an emergency stop.
Keyboard and Mouse	For data entry and software operation.
Power Manager	Distributes power to the system components, provides surge protection, and serves as the system disconnecting device.

Computer Components

For descriptions and specifications, refer to the manuals from the original equipment manufacturer.

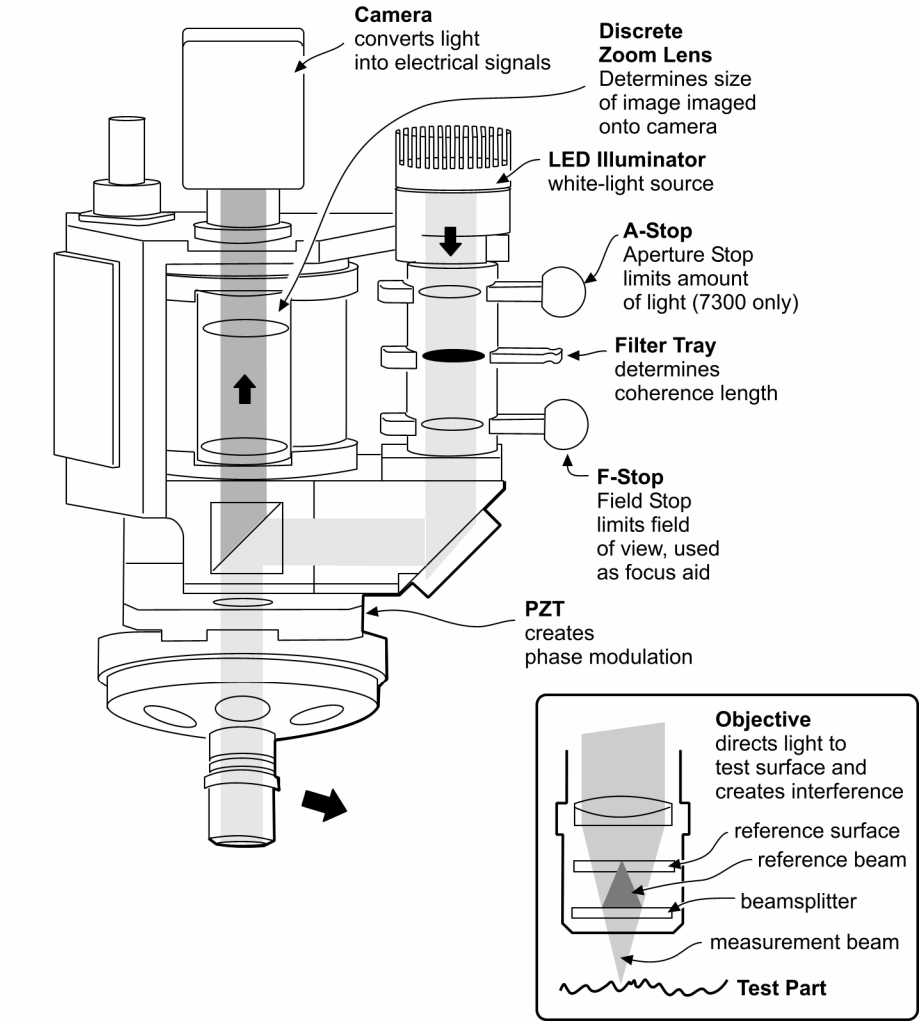
Principle of Operation

The NewView system uses scanning white light interferometry to image and measure test part surfaces and provide surface structure analysis without contacting the surface. Light from the optical profiler divides within the interferometric objective; one portion reflects from the test surface and another portion reflects from an internal, high quality reference surface in the objective. Both portions are then directed onto a solid-state camera.

Interference between the two light wavefronts results in an image of light and dark bands (called fringes) that indicate the surface structure of the part being tested. The test part is scanned by vertically moving the objective with a piezoelectric transducer (PZT). As the objective scans, a video system captures intensities at each camera pixel. These intensities are converted into height maps by MetroPro software. In addition, surface images are displayed on an on-screen live display.

Measurements are three dimensional. Vertical measurements, normal to the surface, are performed interferometrically. Lateral measurements, in the plane of the surface, are performed by calculating the pixel size from the field of view of the objective in use. Using these techniques the NewView analyzes and quantifies the surface topography of parts. Results are displayed on a color monitor as solid images, plots, and numeric representations of the surface.

Optical Diagram



Installation

Chapter 2

Make sure your working conditions are conducive to good metrology. Then position and connect components, and install options.

A Note About Installation

This chapter describes the site and utility requirements, which should be considered before the system is set up. It also provides installation instructions for equipment manufactured by ZYGO. Installation instructions for other components are covered in documentation provided by the original manufacturers.

Warning!
Installation must be performed by ZYGO trained personnel or the warranty may be void.

Site Requirements

Consideration	Comment
Vibration	The site should meet vibration criterion curve VC-C or better for best instrument performance.
Floor	The floor should be as stable as possible to avoid transmission of vibrations into the system. A ground level, poured concrete slab is recommended. The optional vibration isolation system effectively minimizes most vibration effects.
Acoustic Noise	Acoustic (sound) of sufficient amplitude can cause vibration of the instrument, items under test, and even of the vibration isolation table. This is especially true of low-frequency vibrations, which may not be audible even at relatively high amplitude. Uninsulated walls are prone to retransmitting acoustic vibration from adjoining areas and suspended ceilings can couple roof mounted air conditioning noise.

Consideration	Comment
Air Turbulence	The site should be free of air movement. Air turbulence causes uneven air density within small areas, which can refract portions of the measurement beam and alter the measurement. Fans, heaters, and air conditioners should not blow air onto the instrument.
Temperature	The temperature should be in the range of 15 to 30°C (59 to 86°F) and remain relatively constant. Rapid temperature changes degrade performance by causing uneven expansion and contraction of the instrument and parts under test. Air conditioning, heating devices, or vents, in the nearby area, can cause temperature differences.
Cleanliness	Keep the work environment clean. Over time, dust, smoke, and oil can accumulate on the optics and degrade performance. Keeping the site clean and periodically cleaning the instrument will minimize this concern.

Utility Requirements

Requirement	Comment
Electrical	100/120/220/240 VAC at 50/60 Hz User to provide an isolated 15 amp circuit with an earth ground.
Compressed Air	For optional vibration isolation table. 80 PSI (5.5 bar) dry and filtered source. The vibration isolation table accepts a 1/4 in. diameter input hose. For metric hoses the user must supply the appropriate adapter, such as available from SMC Pneumatics.

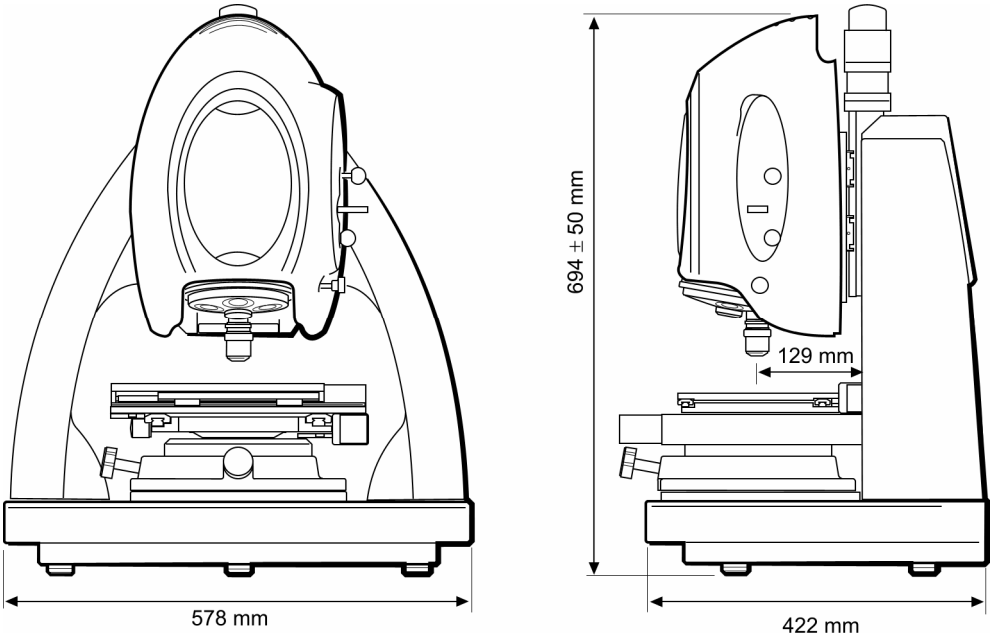
Warning!

The equipment must be electrically grounded through the supply outlet. Any interruption in the ground circuit can cause a shock hazard and could result in personal injury.

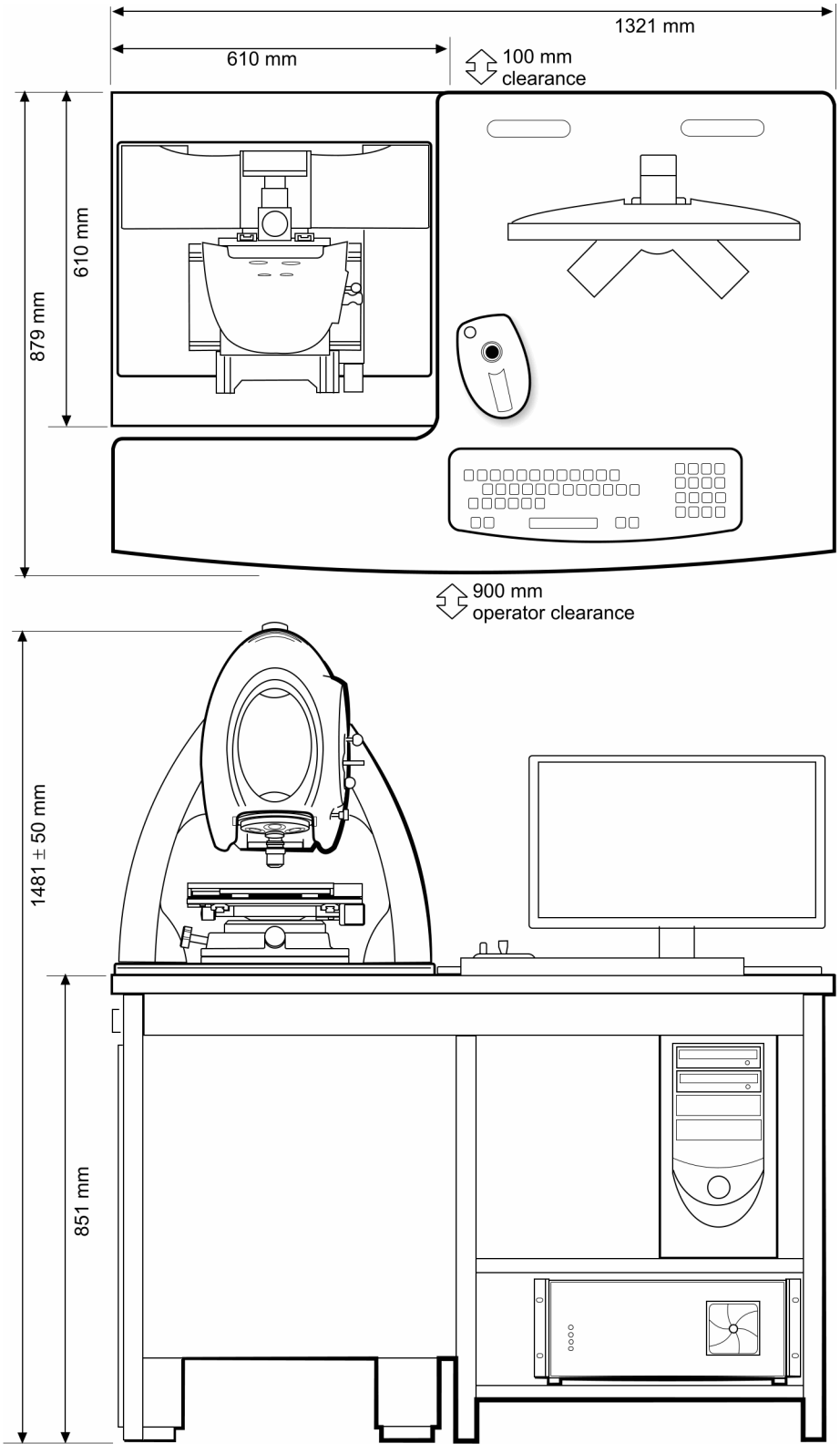
The power strip or power manger plug is used as the “master” disconnecting device. Ensure that the outlet is accessible.

System Layout

NewView Only Footprint

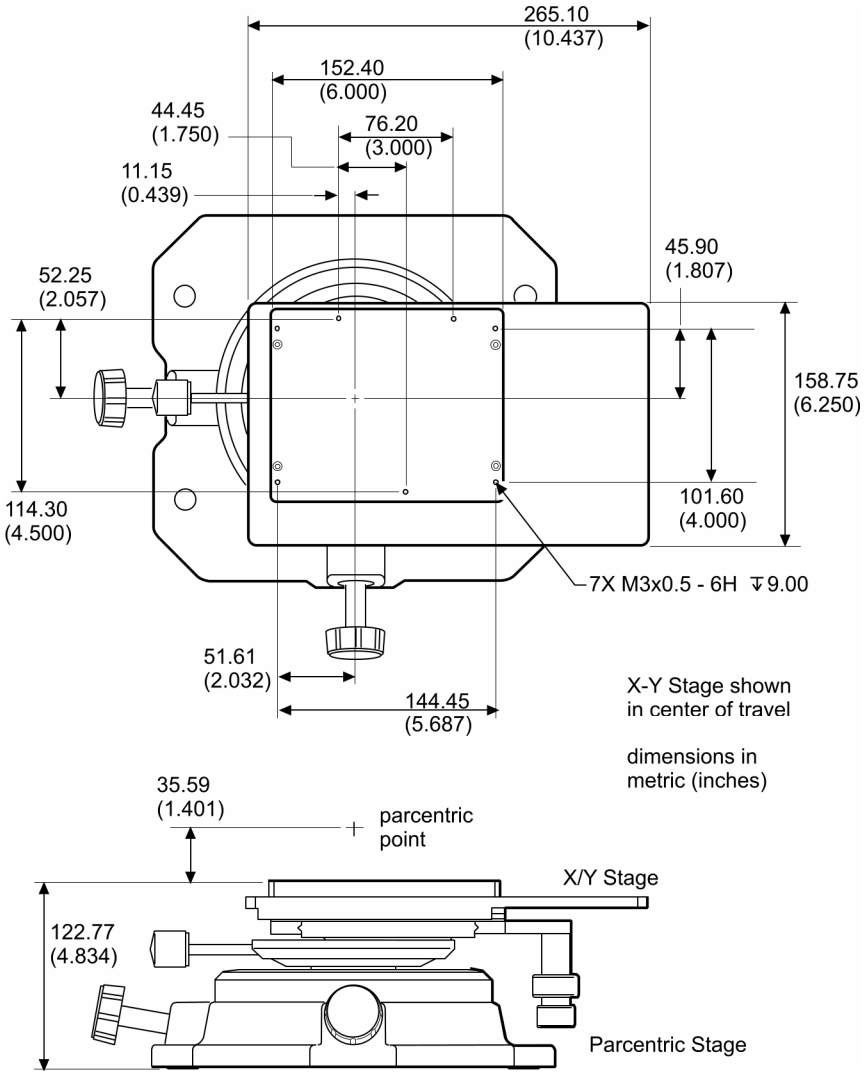


System Footprint

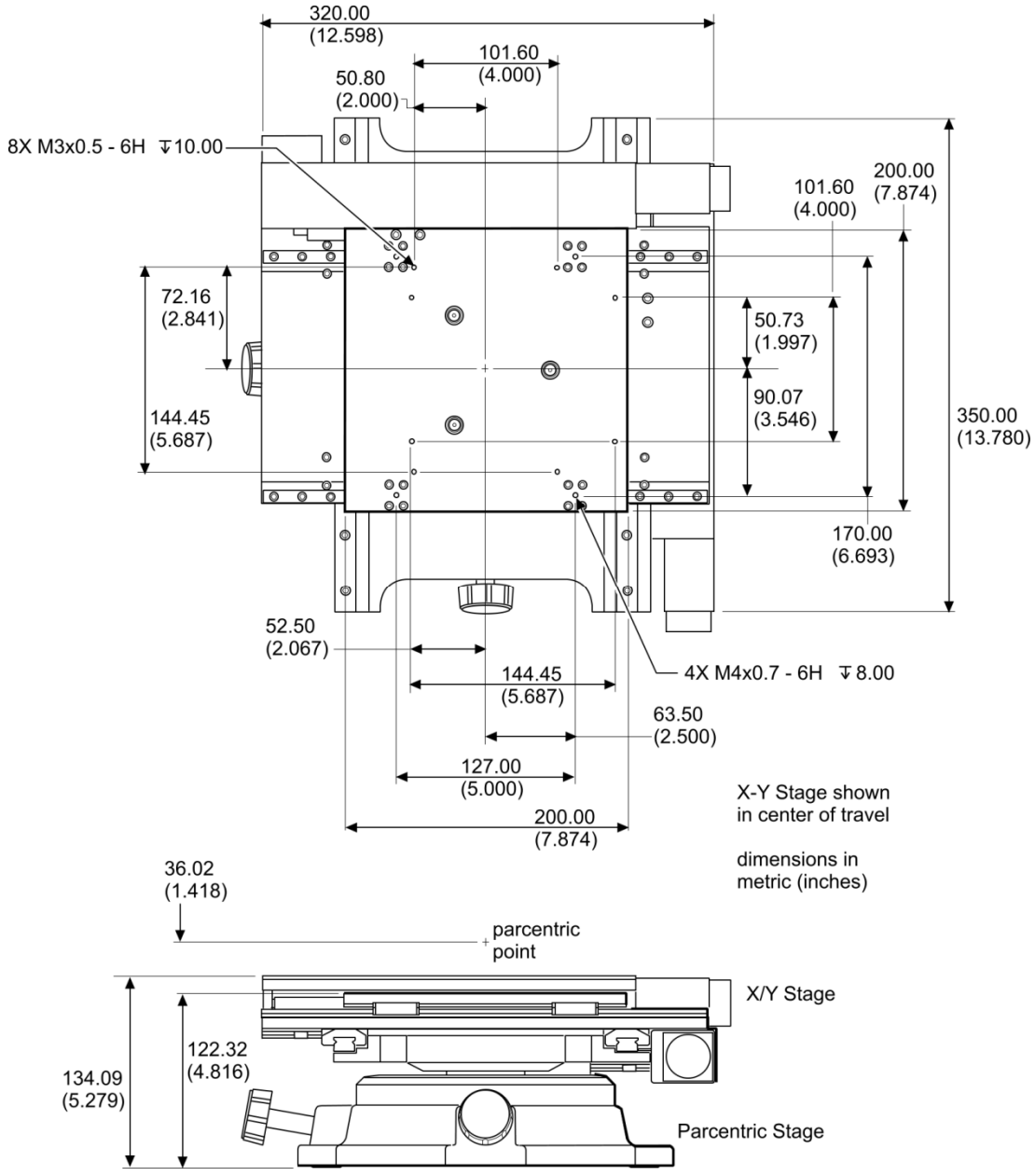


Part Stage Dimensions

Manual X/Y Stage Dimensions



Motorized X/Y Stage Dimensions



Preinstallation Checklist

- ☑ Inspect all packages for signs of shipping damage. Report any damage to the carrier.
- ☑ Check that the shipment is complete.
- ☑ Ensure that the worksite has the required operating environment and utilities.
- ☑ Contact your ZYGO representative to make arrangements for installation and training.
- ☑ Move all shipping containers to the worksite. Allow the equipment to acclimate for at least 24 hours. ZYGO recommends that you save the shipping containers for future transport of the equipment.

Warning!
When lifting or moving equipment or pallets, contact the appropriate local and national agencies for proper lifting recommendations.

Installation Summary

1. Open the box containing the vibration isolation table. Move and lift the system in pieces as described in the next step to prevent injury.

   Warning!
   When moving and installing the vibration isolation table have several helpers and use a forklift or hoist with lifting straps. Contact the appropriate agencies in your country for proper lifting recommendations.

2. Move the isolator legs (weight 200 lb, 90 kg) into position at the installation location.

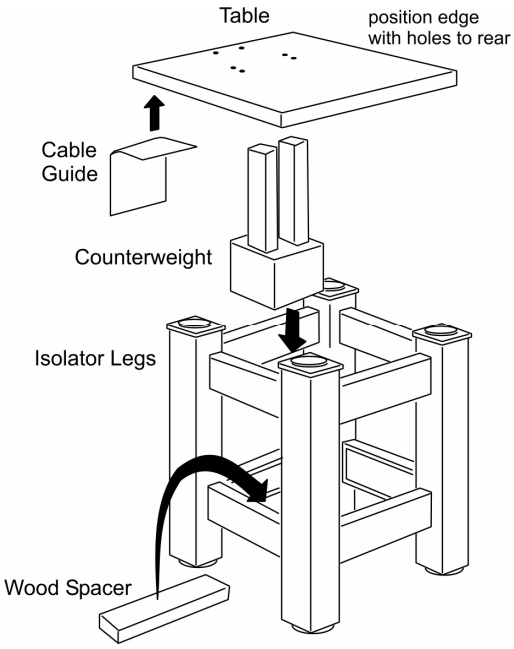
   Position the wood spacer inside the legs.

   Place the counterweight (weight 90 lb, 41 kg) on the wood spacer

   Place the table top (weight 300 lb, 136 kg) on the isolators legs. Position the top so the edge with holes is toward the back.

   Attach the counterweight to the bottom of the table with 4 bolts.

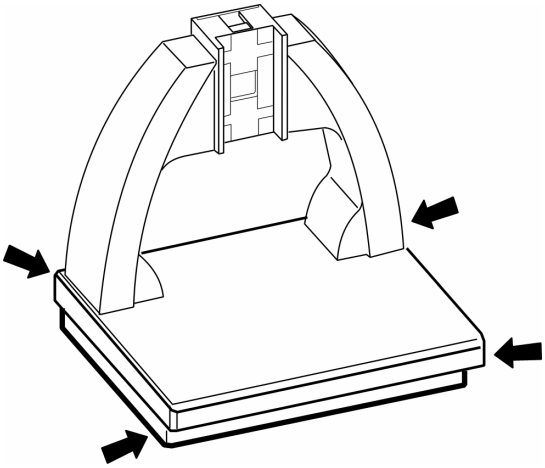
   Attach the cable guide to the underside of the table top. See “Routing Cables” later in this chapter.



3. Unpack the worktable and move it into position around the vibration isolation table.
4. Position the Electronics Enclosure on the bottom shelf and the computer on the upper shelf under the worktable.
5. Connect the power cords through the power manager.

   The power manager is for power distribution for the system. Other equipment should not be connected to the power manager.
6. Position the power manager, monitor, keyboard, mouse, and Joystick on top of the worktable.
7. Unpack the base and column and place it on the vibration isolation table.

   Warning!
   The granite base and column weigh about 170 lb (77 kg). Four people should lift the base and column, one at each corner, using the built-in lift edge on the granite, as shown here.



8. Unpack the sensor head and mount it to the column as described in greater detail in this chapter.

   Warning!
   Handle the sensor head, zoom lenses, objectives, and turrets with care; they are precision devices. Do not touch any glass surfaces.
9. Install the stage as described in greater detail later in this chapter.
10. Install the turret (if applicable) and mount an objective as described in greater detail in this chapter.
11. Connect cables to all components routing cables so they don't interfere with the optical profiler motion or the part stage motion and so they don't transmit vibrations. Cables from the optical profiler are clamped to the back of the vibration isolation table.

    Refer to the cable connection diagram later in this chapter.
12. Connect the vibration isolation table to the compressed air supply.

    Warning!
    The power manager plug is used as the disconnecting device for the NewView system. Ensure that the outlet is accessible.

13. Connect the power manager to incoming power.

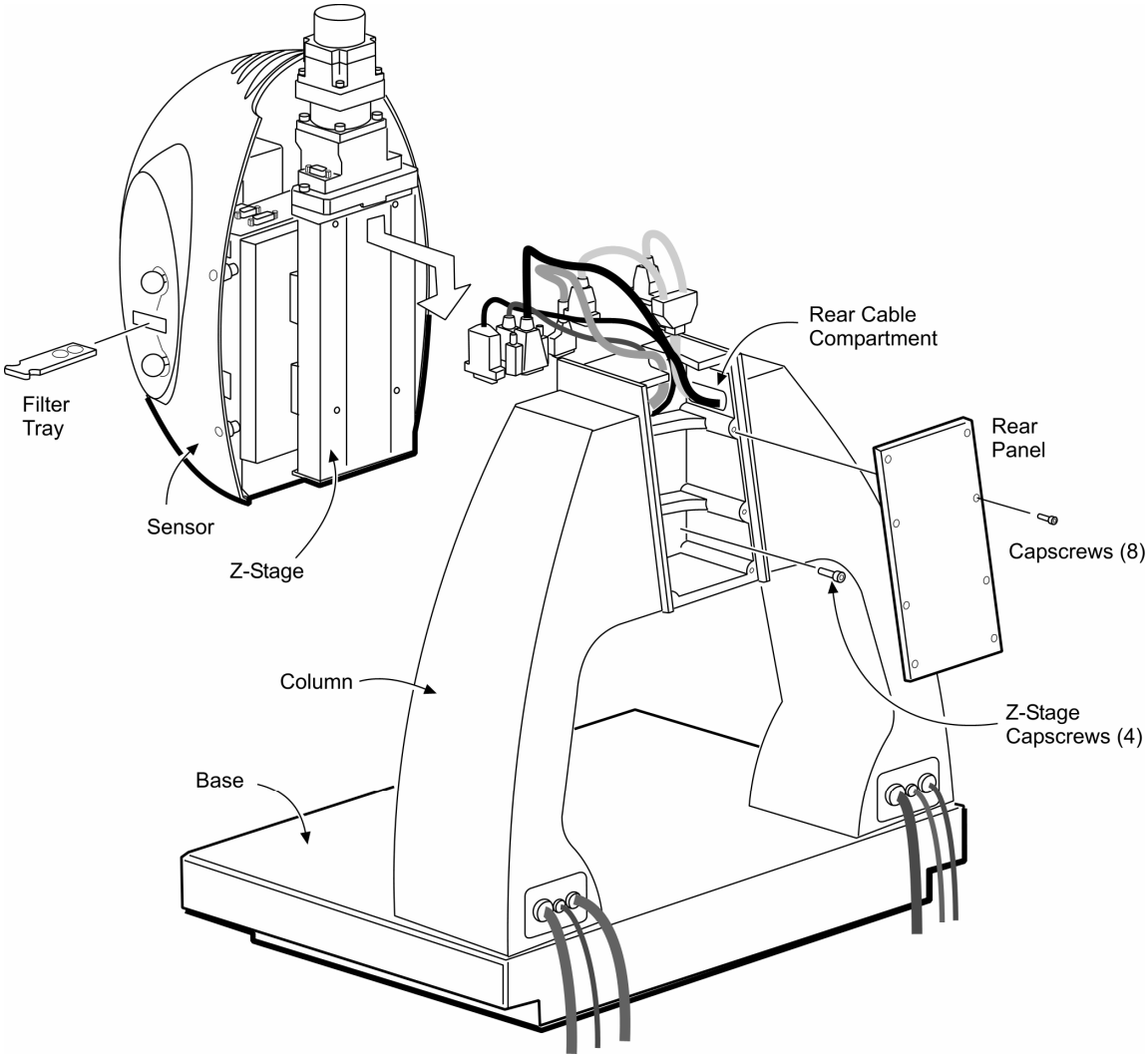
The power manager is for power distribution for the NewView system and its components. Other equipment should not be connected to the power manager.

Assembling the Optical Profiler

1. Remove the 8 socket head capscrews from the column rear panel and remove the panel.
2. Place the sensor and z-stage assembly onto the column; a bracket will hold it in position. Thread 4 Allen head capscrews into the z-stage and tighten the screws. Remove the z-stage shipping stop.
3. Connect the cables from the rear cable compartment to the connectors on the sensor.
4. Attach the rear panel to the column with 8 socket head capscrews.
5. Remove the shipping tape from the sensor's filter tray slot. Slide the Filter Tray into the slot in the sensor cover.
6. Remove any shipping plugs in the optical path. Remove the Field Zoom Lens access door and check the path. Replace the door when done.

Follow the procedures for installing the turret, objectives, and field zoom lenses as provided later in this chapter.

Optical Profiler Assembly



Changing the Sensor Height

The sensor height relative to the column and z-stage is set at the factory to match typical measurement conditions. Under some conditions, such as: measuring tall parts, using tall part fixtures, and using SLWD objectives, it may be necessary to raise the sensor height. The upper mounting position is 75 mm higher than the standard setting.

1. Remove installed objectives. Then remove the dovetail lockscrew and remove the turret (if installed). For the motorized turret also disconnect the cable.
2. Remove the filter tray and unscrew the F-Stop knob and the A-Stop knob (model 7300 only). Push all knob rods in as far as they go.
3. Loosen the 4 captive cover screws, and remove the cover.

   To remove the cover, shift it to the right to clear the F-Stop and A-Stop rods before pulling it off the sensor.
4. Remove field zoom lenses.

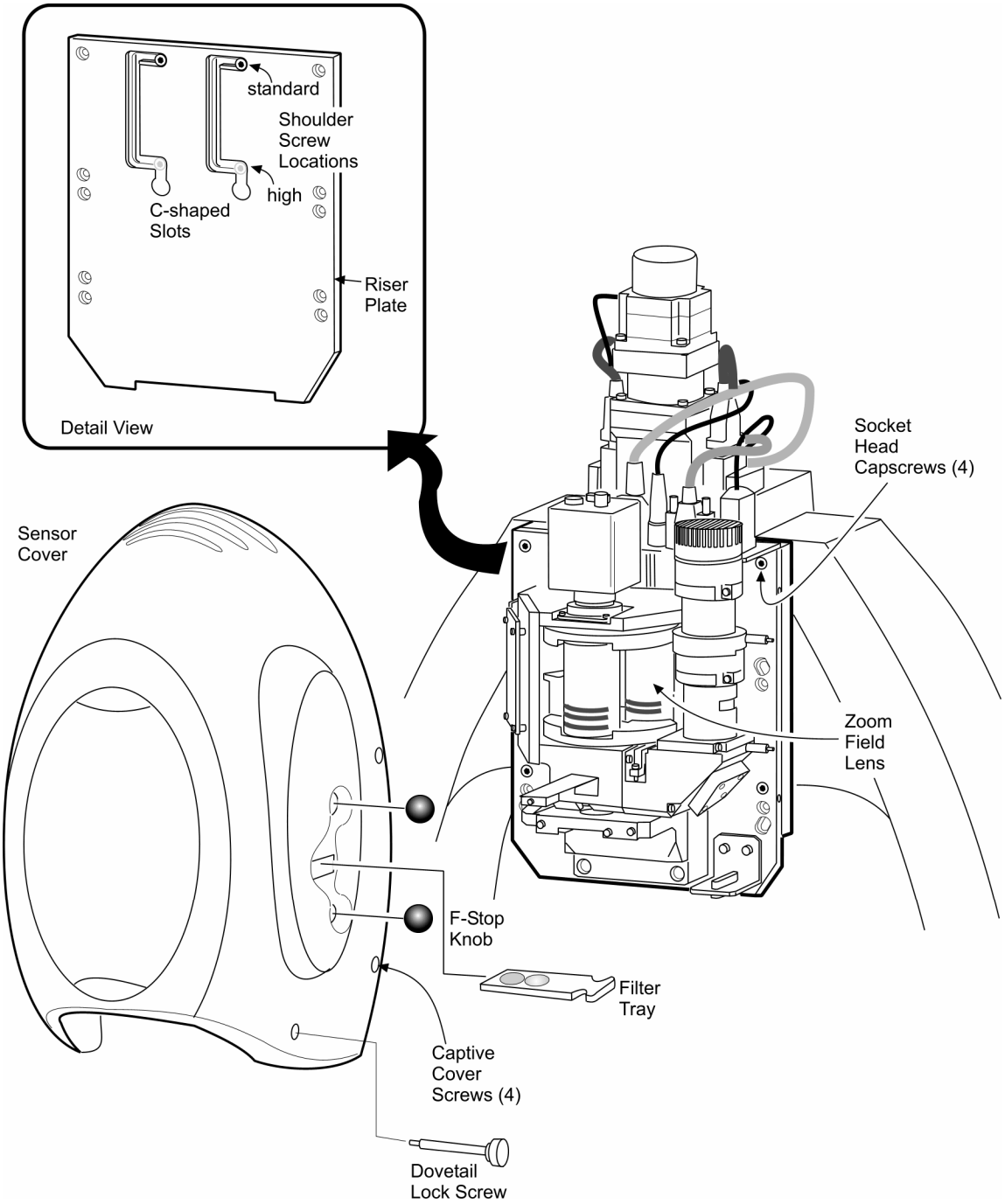
   Ensure that two captive shoulder screws are present in the two c-shaped slots on the sensor riser panel. These screws prevent the sensor from falling when the riser plate screws are removed.
5. Using an Allen wrench, remove four socket head capscrews in the corners of the riser plate.
6. Lift the sensor along the C-shaped slots until the captive screws are in the lower portion of the C-shaped slot.

   Warning!
   At this point the sensor can be completely removed from the z-stage when the captive screws are at the lowest position on the riser plate. Do not let the sensor fall off the z-stage or the sensor can be damaged.
7. Secure the riser plate in position using the four socket head capscrews.

   The holes used to secure the riser plate change when moved to the upper position. Use holes that align to threaded holes behind the plate.
8. Reinstall zoom field lenses, the cover, knobs, filter tray, dovetail lockscrew, turret, and objectives.

   Follow the procedures for installing the turret, objectives, and field zoom lenses as provided later in this chapter.

Adjusting the Riser Plate to the Upper Position (Optional)



Assembling the Part Stage

Achieving Optimum Part Stage Performance

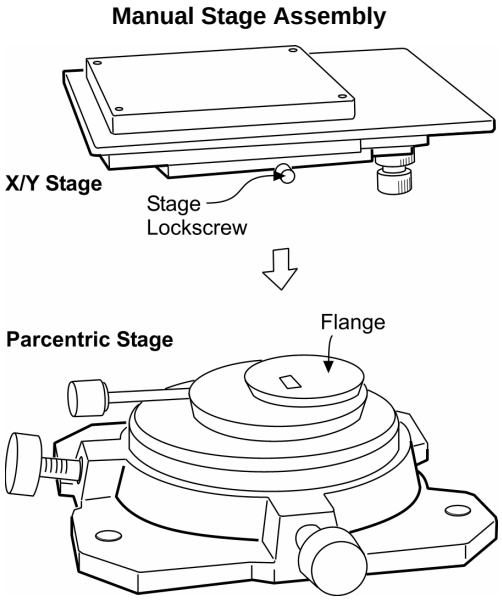
When the parcentric stage is aligned to the optical center and the part height is at the center of rotation of the tip/tilt stage, it is easier it is to align and focus the optical profiler on test parts. The higher the objective magnification the greater the need to meet these two conditions.

Lateral Alignment	The center of the Tip/Tilt stage should be laterally aligned under the objective to keep the part in focus as tip and tilt are adjusted.
Part Height	The part surface being measured should coincide with the parcentric point of the stage to minimize lateral movement of the part in the field of view as tip and tilt are adjusted. The ideal vertical location for the test part surface, also known as the parcentric point, is shown in the section “Part Stage Dimensions” in this chapter. Typically a vertical tolerance of 1 mm (0.04 in.) is acceptable. The user can adjust the stage height with optional top plates or by using custom fixturing to locate the surface at the parcentric point.

Manual Stage Assembly

The parcentric stage is factory installed on the granite base and comes laterally aligned to the optical system.

1. Align the flange in the X/Y Stage to the flange in the parcentric stage and place the X/Y stage on top of the parcentric stage flange.
2. Visually align the sides of the X/Y stage parallel to the edges of the parcentric stage.
3. Secure the X/Y stage in position by tightening the stage lockscrew.

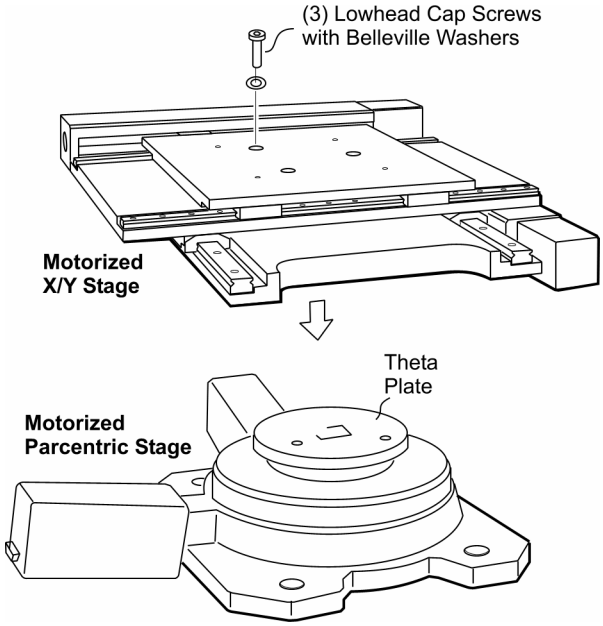


Motorized Stage Assembly

The parcentric stage is factory installed on the granite base and comes laterally aligned to the optical system.

1. Place the motorized stage on the parcentric stage and align the mounting holes to the threaded holes in the parcentric stage theta plate.
2. Use a 1/8-inch Allen wrench to attach the upper stage to the parcentric stage with three 10-32 x 1/2 inch lowhead capscrews and Belleville washers.
3. Remove any shipping blocks used to secure the stages.

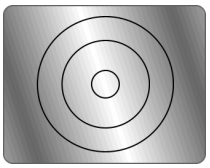
Motorized Stage Assembly



X/Theta (or Y/Theta) Stage Alignment

1. Open the Mask Editor and create a few circular masks. These masks must be centered in the view, with a small circular mask in the center. When complete, close the Mask Editor. These masks are displayed on the Live Display.

Circular Masks used as Alignment Aid



2. Click the Home Stage button. Open the Pattern Editor; click the Rect button to change it to Circ; click the Set Origin button; then set the following parameters:

Number of Circles:	1
Number of Radials:	1
Radius 1:	0.000
Radius 2:	0.000
Order:	Radial
Operation:	None
Prompt:	None

3. Place a test part on the stage; it should be the same height as the parcentric point. Focus the optical profiler on the part.
4. Push the Joystick θ button to select the theta stage. Pull the Joystick down for approximately two minutes.

5. Click on the Run Pattern button and observe the center of the axis of rotation. While the pattern is running, adjust the stage position to centralize it. Use the circular masks on the Live Display as a guide. Once it is aligned, tighten the three stage mounting screws.

Parcentric Stage Alignment

The parcentric stage is factory aligned. This procedure is provided in case it becomes necessary to realign the parcentric stage.

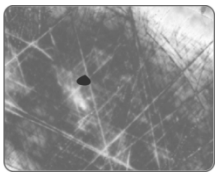
Prerequisites

- 2.5X Michelson objective.
- The optical profiler has to be operational and MetroPro running.
- An alignment aid that corresponds to the parcentric height. (Available from ZYGO.)

1. Adjust the pitch and roll so the parcentric stage is visually level. If necessary, remove the X/Y stage.
2. Remove the caps from the four parcentric stage mounting holes. Using a 5/32 inch Allen wrench, slightly loosen the four capscrews so the parcentric stage is movable on the bottom plate.
3. Using a marker, put a small dot on the alignment aid. Place the alignment aid on the parcentric stage under the objective. Focus on the dot; fringes are not necessary. Move the aid if necessary to see the dot.
4. *Manual Stage* - Loosen the Theta knob.

   Motorized Stage - Use a 1/8-inch Allen wrench to slightly loosen the theta setscrew. Remove two locking capscrews that secure the theta plate in position.
5. Rotate the theta plate and observe the Live Display. The dot will rotate about some axis. Move the alignment aid half way to the center of the rotation as seen on the monitor. The goal is to have the dot rotate about itself as the theta plate is turned.

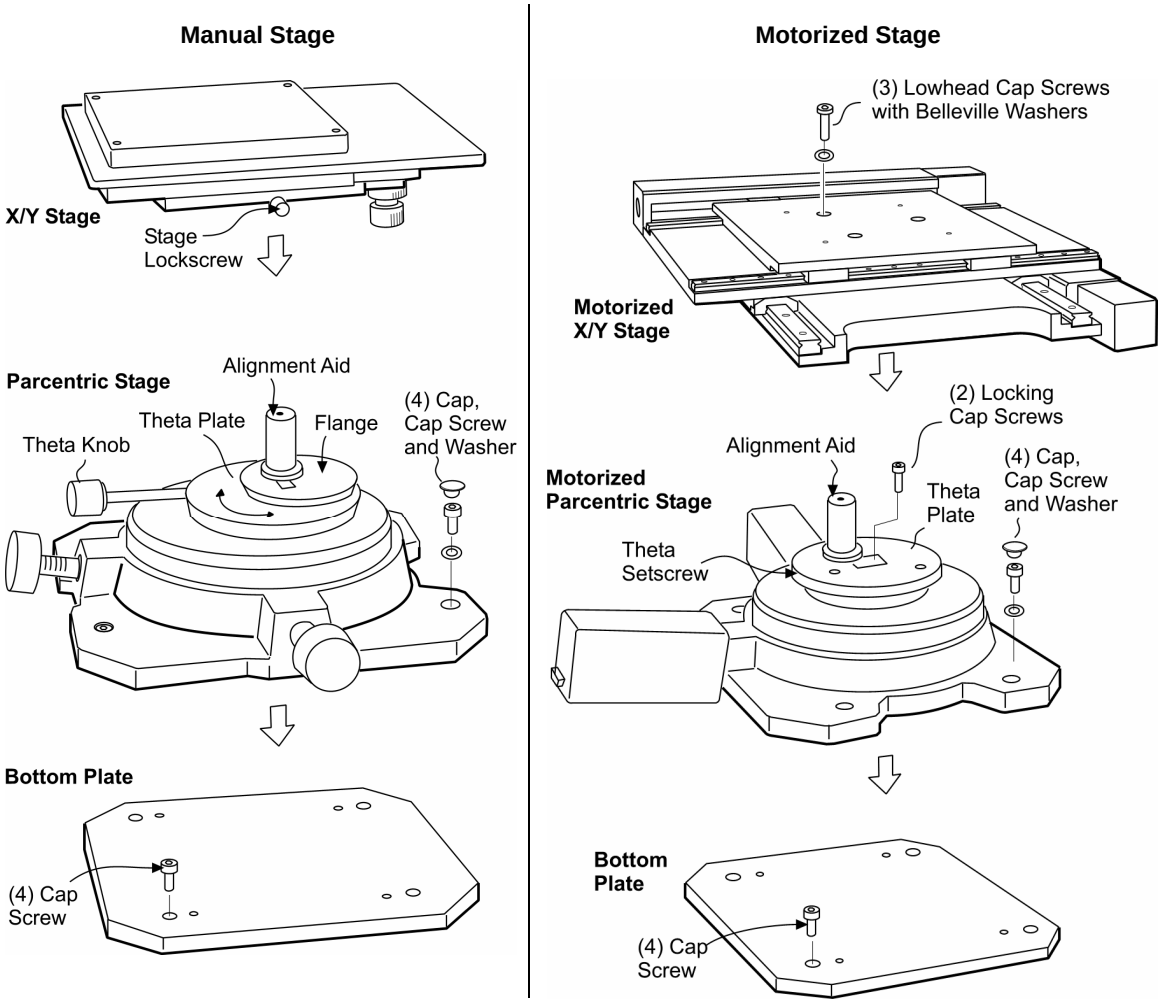
Dot on Alignment Aid Shown on Live Display



6. Move the parcentric stage in x and y to center the dot on the Live Display.
7. If the best possible stage alignment is desired, recheck the alignment following steps 5 and 6 above, but use a 20X objective. Secure the parcentric stage in position by tightening the four capscrews, and then place the plastic caps over the holes.
8. *Manual Stage* - Align the theta plate to its original location. Tighten the Theta knob.

   Motorized Stage - Align the theta stage to its original location and install the two locking capscrews removed in step 4. Tighten the theta setscrew.
9. Remove the alignment aid and reinstall the X/Y stage.

Parcentric Stage Alignment



Custom Part Stage Fixturing

User-designed fixturing may be attached to top of X/Y Stage or mounted on the breadboard option, which is attached to the base in place of the part stage.

Considerations for user-designed fixtures:

- Locate the height of the part surface so it is at the center of the Tip/Tilt Stage rotation (parcentric point).
- Use registration pins or guides to assist in aligning similar parts.
- Some parts may need to be held firmly in place so they don't move during the measurement.

For x/y stage interface dimensions refer to "Part Stage Dimensions", shown previously in this chapter.

Connecting Cables

General Cable Guidelines

- Remove protective caps from connectors before attaching cables.
- Ensure that cables are located so they do not introduce vibration into the system.

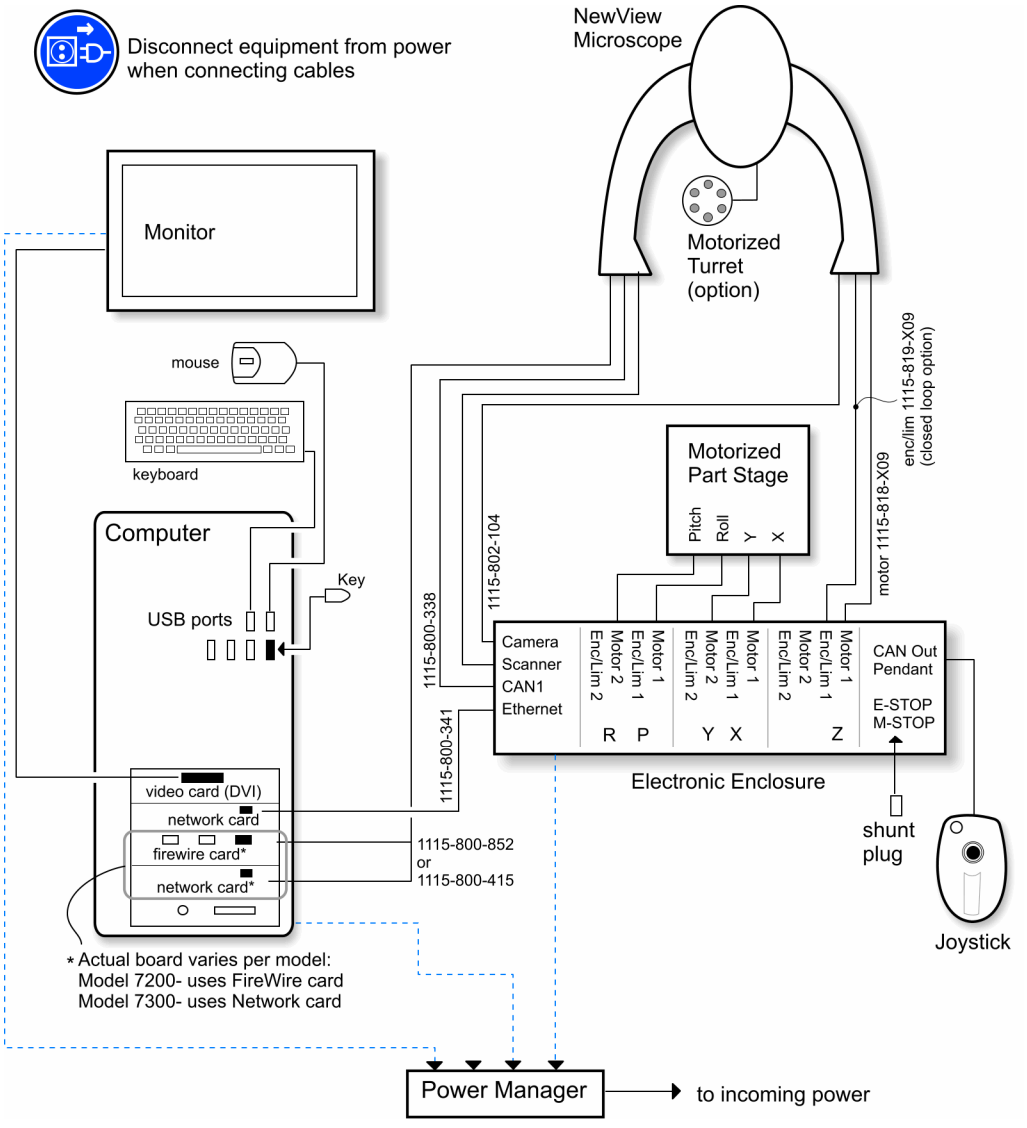
Warnings!

Disconnect equipment from power before connecting cables. Failure to do so may cause damage to the equipment.

The equipment must be electrically grounded through the supply outlet.

The Power Manager is for power distribution for the system. Do not plug other non-system equipment into the Power Manager.

Typical Cable Connections



Routing Cables

Route cables from the keyboard and mouse on the worktable through holes in the table. Secure the cables from the optical profiler to the cable clamps at the rear of the vibration isolation table. Ensure that cables from the optical profiler head do not get caught on the z-axis motor.

Installing Field Zoom Lenses

Warning!
Do not touch the exposed glass lens of the field zoom lens. Dust, dirt, and fingerprints can impair the imaging capability and harm optical coatings.

1. Remove the access door by lightly pulling the door out and away from the cover.
2. Remove the zoom lens from the storage box.
3. Remove the two protective end caps from the zoom lens.
4. Hold the zoom lens by the center of the tube. The serial number marks the top of the tube.

   Store unused zoom lens with their end caps on, in their storage box.
5. Slide the zoom lens into the recessed area until it seats into the detent.

NewView 7200 perform step 9
NewView 7300 perform steps 6-9

Removing the Access Door

Installing a Field Zoom Lens

Position the field zoom lens end with lines at the bottom

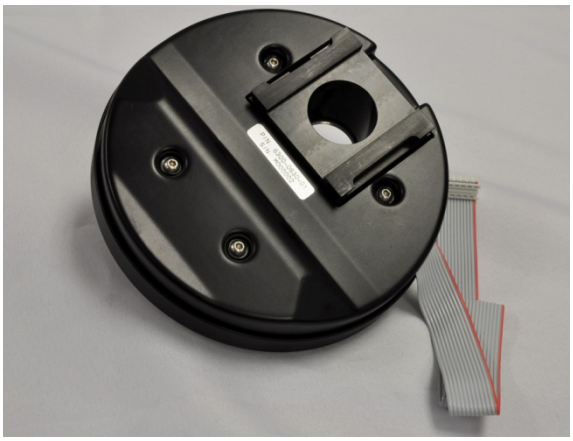
6. Rotate the zoom turret by hand to the next empty slot.
7. Install the second zoom lens as described above.
8. Repeat for the third zoom lens.
9. Install the access door.

Installing the Objective Turret

Warning!
Handle the turret with care. Do not force the turret onto the sensor. Do not drop the turret.

Disconnect equipment from power before connecting the turret cable.

The Top of the Turret



Note the square dovetail and turret cable.

1. Place the turret in your hand.
2. Align the square dovetail to the rear of the opening at the bottom of the sensor.
3. Push the turret upwards. The dovetail should go upward inside the dovetail receiver.
4. Pull the turret toward the front of the sensor as far as possible.

If the turret is properly positioned in the dovetail receiver, it will stay in place if you relax your grip.

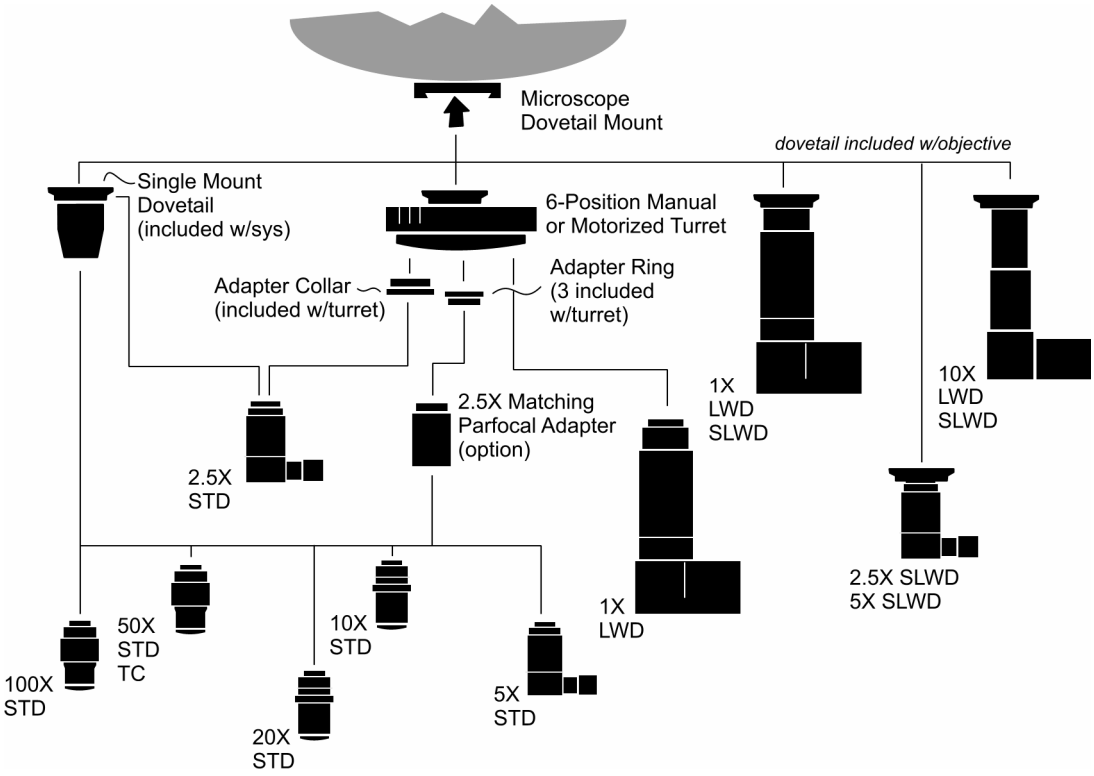
Installing the Turret onto the Sensor

Hold the turret while moving it back and up into the dovetail receiver, and then move the turret forward.

5. While slightly pulling the turret toward the front the sensor, tighten the dovetail lockscrew.
6. Connect the turret cable.

Objective Mounting

Objective Mounting and Adapters



Installing Objectives into a Turret

Warnings!
Do not touch the objective lenses. Dust, dirt, and fingerprints can impair the imaging capability and harm optical coatings.

Make sure the joysticks are not activated and software controls are not clicked to move motorized stages or the turret. To stop instrument motion in an emergency, press the Joystick's Emergency Stop.

Store unused objectives in their protective cases.

1. Remove the objective from the storage box.

   Some long working distance (LWD and SLWD) objectives cannot be mounted on the turret.

2. Screw the applicable adapter into the turret as shown in the Objective Adapter Guide table.

   Locate objectives on the turret to ensure balanced weight distribution.

3. Thread the objective clockwise into the turret.

   Do not over-tighten objectives; finger tight only.

Installing an Objective into the Turret

Objective Adapter Guide

Objective	Adapter
1X	none
2.5X	Adapter Collar (27 mm to 25 mm)
5X, 10X, 20X, 50X, 100X	Adapter Ring (0.800-36 to 25 mm)

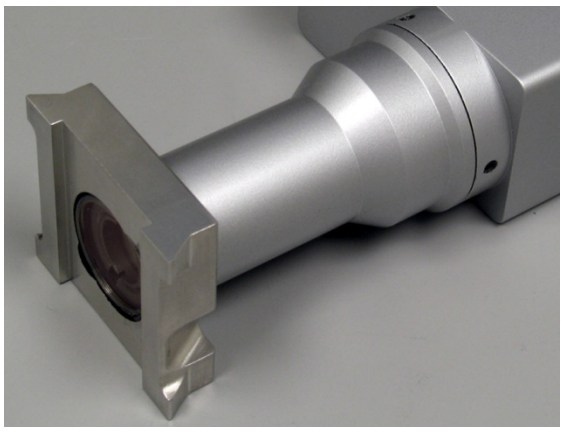
Installing a Single Objective

Warning!
Do not touch the objective lenses. Dust, dirt, and fingerprints can impair the imaging capability and harm optical coatings.

1. Remove the objective from the storage box.
2. If necessary, screw the objective into the Single Mount Dovetail (option).

   When mounting a 2.5X objective use only the upper portion of the Single Mount Dovetail. Standard 5X through 100X objectives use the entire dovetail adapter.
3. Hold the objective from the midsection.
4. Align the square dovetail to the rear of the opening at the bottom of the sensor.
5. Push the objective upwards. The dovetail should go upward inside the dovetail receiver.
6. Pull the objective toward the front of the sensor as far as possible.

A View of the Square Dovetail



Store unused objectives in their protective cases.

Installing a Single Objective

Hold the objective while moving it back, up, and then forward

If the objective is properly positioned in the dovetail it will stay in place if you relax your grip.

7. While slightly pulling the objective toward the front the sensor, tighten the dovetail lockscrew.

Operation

Chapter 3

Learn how to operate your interferometer and gain insight into important operational procedures.

Operating the NewView

Warning!
The operator must be trained before operating the system. Read all operation instructions before starting the equipment. The equipment should only be used in the manner for which it is intended.

Start-up

Warning!
The operator is responsible to make sure the joystick is not activated when the system is first started. People and objects must be clear from the part stage and sensor. To stop instrument motion in an emergency, press the Emergency Stop button.

1. Turn on all components.

   Some system include a power strip, which can be used to turn on all components with one switch.

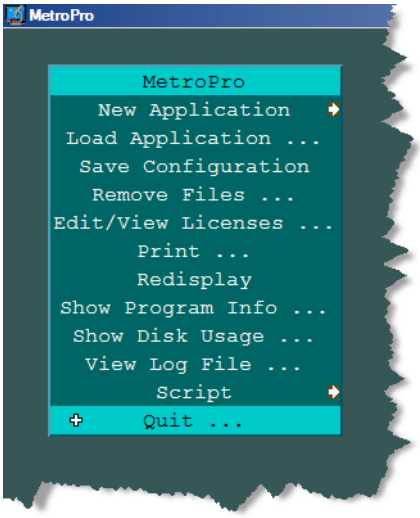
2. After the welcome message appears, press Ctrl-Alt-Del to log on.
3. In the dialog box type a user name and password. If you do not have a user name, enter “zygo” and press the Enter key.
4. Then locate the MetroPro program icon and double-click it to open MetroPro.

Log On to Windows

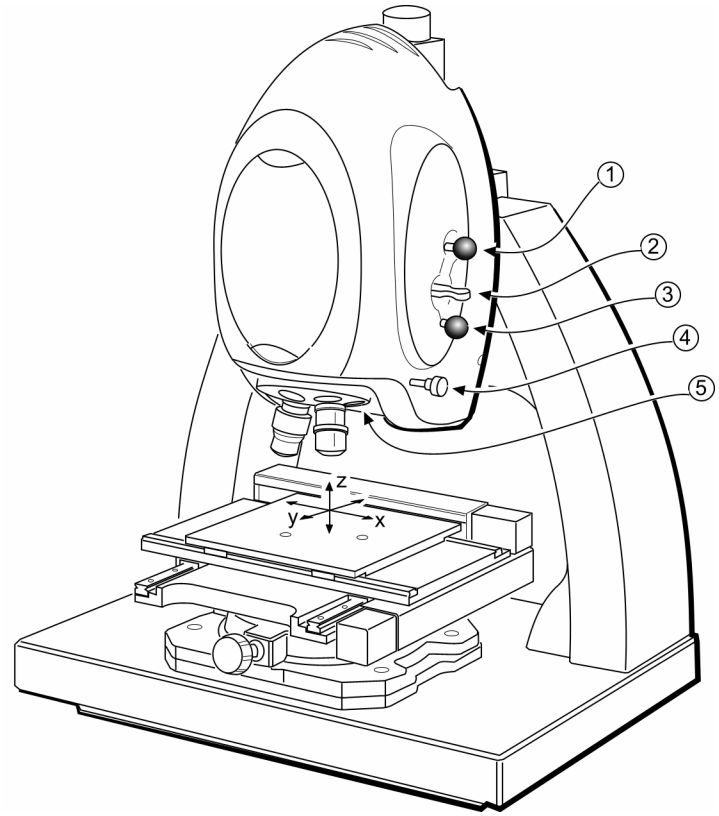
Shutdown

1. Save data and other files.
2. Close open applications by clicking each close box in the upper left corner of the application window.
3. Press and hold the right mouse button; choose Quit from the MetroPro Window menu.
4. From Windows, use the Start menu and select the Shutdown command.
5. Turn off all components.

Quitting MetroPro



NewView Controls and Guidelines



Ref	Control	Description
1	A-Stop (model 7300)	Aperture Stop. Use to control the amount of light entering the optical system. Pull out until the diaphragm image just covers the area of interest.
2	Filter Tray	Two position filter set used to change the coherence length of the light to optimize data capture under varying conditions.
3	F-Stop	Field Stop. Use as focus aid, particularly for smooth featureless surfaces. Pull out for field aperture, push in when making a measurement.
4	Dovetail Lockscrew	Secures the turret or objective dovetail in position on the sensor in the square dovetail receiver.
5	Turret (optional)	Holds up to six objectives for quick change of magnification.

Operating Precautions

Pinch Hazard
Keep hands, fingers, and items away from the sensor when adjusting focus or stages.

Crash Warning
Do not crash the NewView onto the part stage or test part. Keep an eye on the distance between the objective and the test part when adjusting focus or the sensor height.

Objective →	2.5X	5X	10X	20X	50X	100X
Working Distance (mm)	10.3	9.3	7.4	4.7	3.4	0.55

For the working distances of all ZYGO objectives refer to the *NewView 7000 Accessory Guide*, OMP-0543.

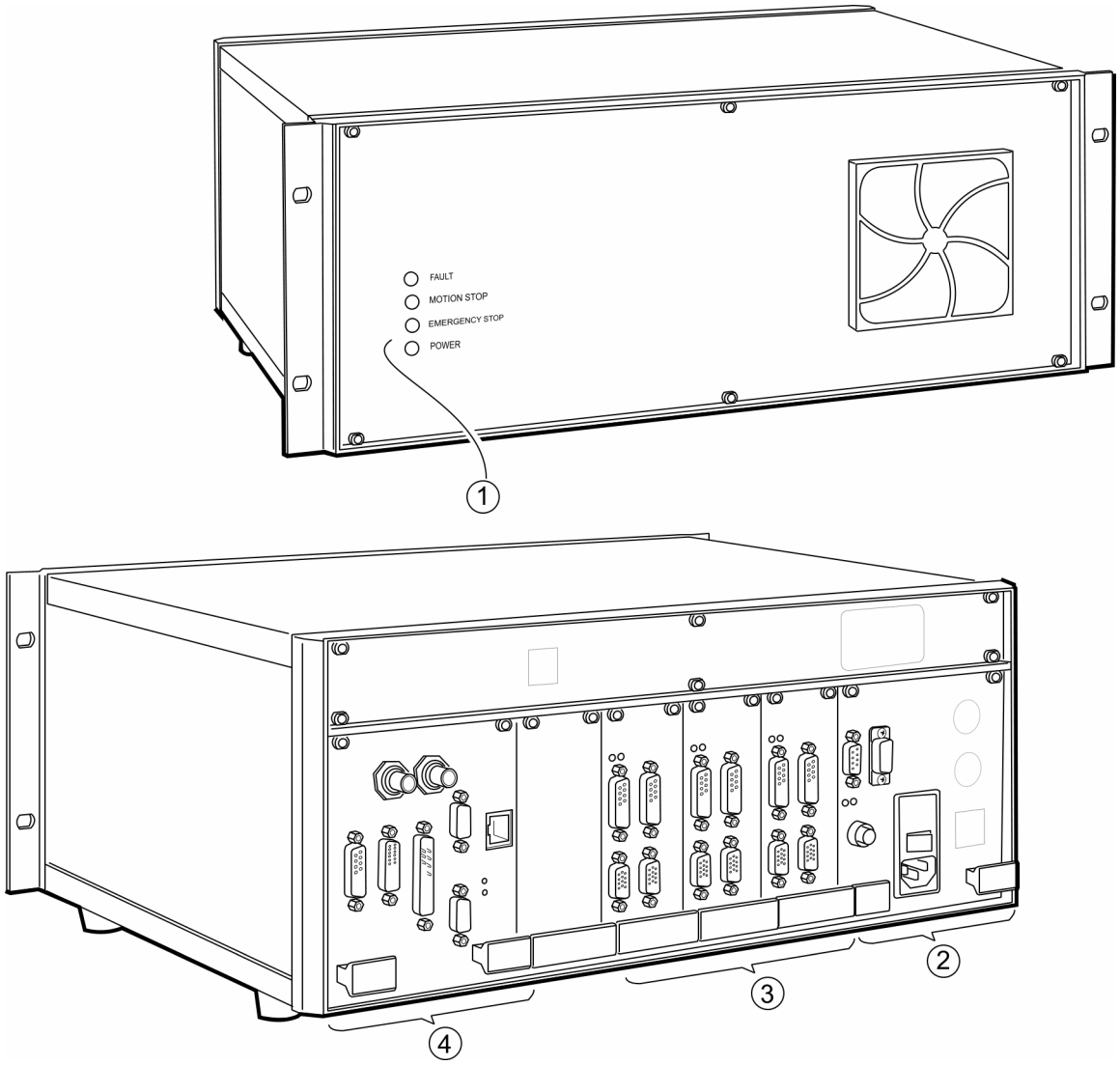
Filter Tray Settings

Filter	Setting (detent)	Bandwidth	Center Wavelength	Description
Standard	F1	125 nm	475 nm	Standard (MEAS) setting for most surfaces.
	F2	40 nm	550 nm	Setting for rougher surfaces or when there is data dropout. Dropout may occur when measuring low contrast surfaces or surfaces with high slopes.
Attenuating (MEAS+ND) (option)	F1	125 nm	475 nm	Same as standard F1 plus a neutral density (ND) filter. Use with large field of view objectives for highly reflective parts. Improves light level adjustability under these conditions.
	F2	40 nm	550 nm	Same as standard F2.

Working With Square Dovetails

Installing	Hold item, lift into the center of the receiver, pull to the front until it stops, and secure by tightening the dovetail lockscrew.  Make sure the dovetail lockscrew is tight before operating. Remake system error files whenever an objective is installed.
Removing	Loosen dovetail lockscrew, slide item back, down, and out of the receiver.

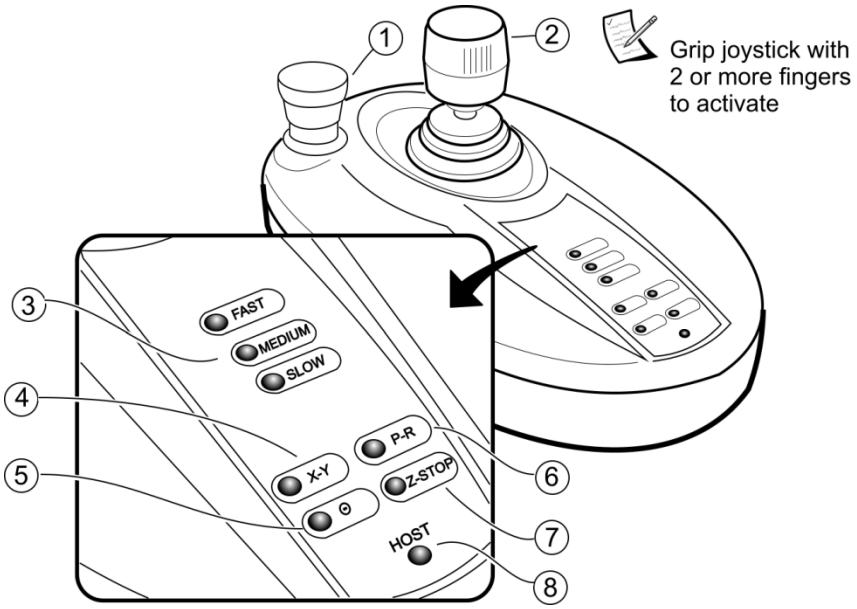
Electronics Enclosure Details



Ref	Item	Description
1	Indicators (front)	FAULT indicator: (Red) On when fault condition exists or the emergency stop is active. If a specific axis is at fault the corresponding indicators are lit on the stage driver module. MOTION STOP indicator: (Red) On when a motion stop is active. EMERGENCY STOP indicator: (Red) On when an emergency stop is active. POWER indicator: (Green) On when AC power is applied.

Ref	Item	Description
2	Power Module	CAN IN: DB9 male plug, cable from instrument electronics. CAN OUT/ PENDANT: DB9 female receptacle, cable to Joystick or secondary CAN device. E-STOP M-STOP: M12 connector for optional E-Stop (emergency stop- removes power) or M-Stop (motion stop- halts movement) devices.  If an optional stop is not used, the shunt plug must be installed. Power Switch and Receptacle- On/Off (1/0) switch and plug for incoming power cord; also houses fuse (line and neutral). PWR indicator: (Green) On when AC power is applied. VBUS indicator: (Green) On when DC voltage bus power is applied to stage driver modules. (Off) E-Stop condition present.
3	Stage Driver Module(s)	 Each module is labeled with applicable stage axes: X x-axis, Y y-axis, R roll (tip) axis, P pitch (tilt) axis, T theta (rotary) axis, Z z-axis. The axis label on the handle corresponds to the axis number above the label. There can be from 1 to 4 modules. MOTOR 1: DB15 female receptacle, cable to corresponding motor. MOTOR 2: DB15 female receptacle, cable to corresponding motor. ENC/LIM 1: HD15 female receptacle, cable to corresponding encoder and limit switches. ENC/LIM 2: HD15 female receptacle, cable to corresponding encoder and limit switches. ENABLE/FAULT 2/1 indicators (correspond to module label): (Green) Stage driver enabled. (Amber) Stage driver disabled. (Red) Stage driver fault condition. (Off) Amplifier module is not installed.
4	Sensor Module	AUX IN / OUT: BNC connectors for optional equipment. SCANNER: DB15 female receptacle, connection to PZT scanner. CAMERA: DB15 female receptacle, connection to camera. TRIGGER: DB25 male plug, for PC frame grabber (option, based on camera). CAN1: DB9 male plug, CANbus connector to sensor. CAN2: DB9 male plug, spare CANbus connector. Network connector: RJ45 Ethernet connector, CANbus connection to computer. CAN STATUS indicator: (Green) Communication okay. (Red) Error. POWER indicator: (Green) Power okay. (Off) No power.

Joystick Details

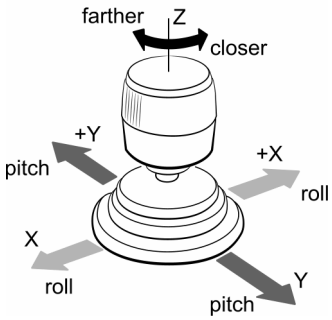


The Joystick is used for focusing and driving motorized part stages. The joystick has audible user feedback: dull click = ok, high pitched beep = warning.

Warnings!

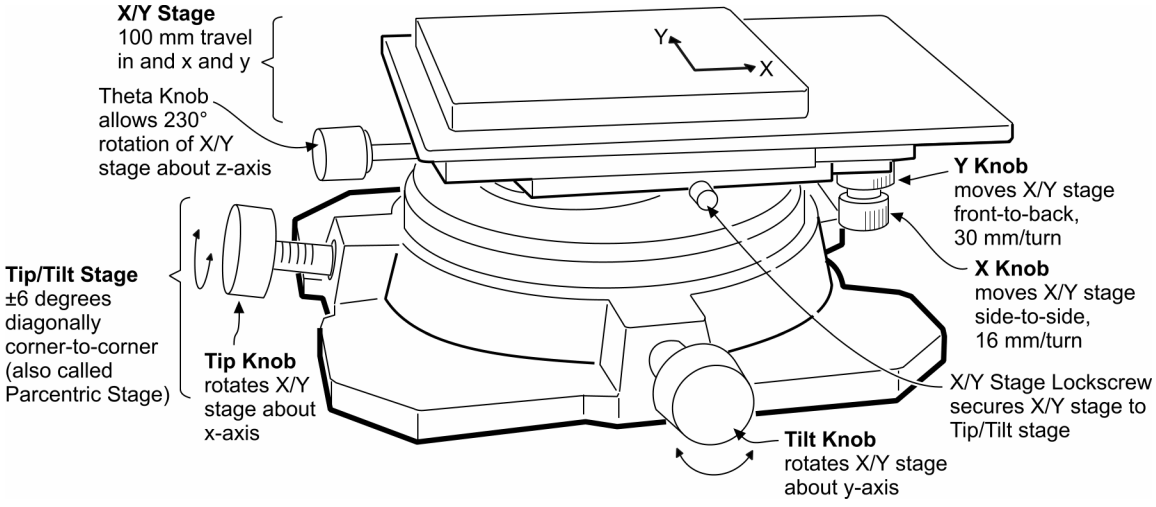
The operator is responsible for ensuring that the Joystick is not deflected when the system is first started. People and objects must be clear of the stage area. Press the Emergency Stop to stop all motion.

Do not drive the instrument into the part stage or test part. Use caution driving the z-axis (focus) stage. Use the Z-Stop function to prevent crashes.

Ref	Control	Description
1	Emergency Stop	Emergency Stop button. When pressed it stops all stage motion and removes voltage bus power to all stage driver modules. To reset the Emergency Stop turn it clockwise until it pops back up.
2	Joystick	 Turn Twist Knob to drive z-axis (focus) stage. Clockwise- away from part stage. Counterclockwise- towards the part stage. Push joystick to drive selected part stages. The greater the deflection the faster the motion. Up/Down for y-axis or pitch (tilt). Left/Right for x-axis or roll (tip). The joystick is equipped with a proximity sensor to insure safe operation. An operator's hand must be sensed for the joystick to be active. An accidental touch or a quick tap of one finger will not drive system stages.

Ref	Control	Description
3	Speed buttons	FAST, MEDIUM, SLOW Push button to choose the relative speed of the z-axis (focus) stage. Selected speed is indicated by corresponding green light.
4	X-Y	Push to activate the X-Y lateral part stages (if equipped). The selected stage is indicated by corresponding green light on button. Only one stage type (X-Y, P-R, or θ) can be selected.
5	P-R	Push to activate the Pitch/Roll (Tilt/Tip) part stages (if equipped).
6	θ	Push to activate the theta part stage (if equipped).
7	Z-STOP control	Controls Z-Stop functions for the z-axis. To set a stop, first home the z-axis in MetroPro, then lower the instrument until it is close to part stage or test part and press Z-STOP. To clear a set stop press Z-STOP again. The z-axis must be homed in MetroPro before the Z-Stop position can be set. Indicator: Red (Flashing)- stop not set. Green (On)- stage clear of set stop. Red (On, with audible alarm)- stage at set stop.
8	HOST	Indicator (Red) On when the motion system is controlled by software.

Manual Part Stage Details



Adjusting the Manual Stage

Lateral	To locate the test part under the objective turn the X and Y knobs.
Angular	To adjust the angle of the test part to the objective turn the Tip and Tilt knobs. For best possible results the part should be normal to the objective.

Light Level Controls (Software)

The proper light level is critical to obtaining an accurate measurement.

Light Level Function Keys

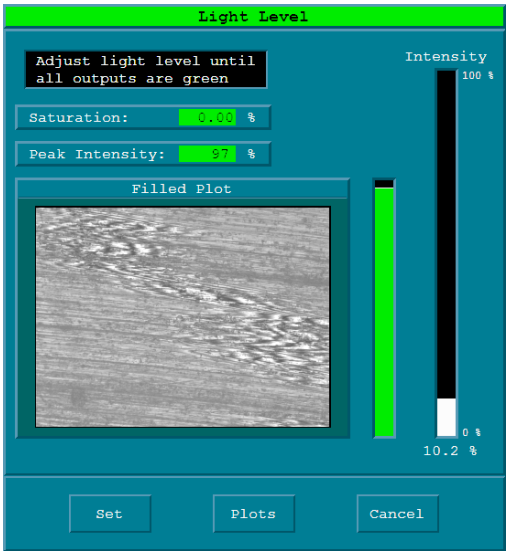
Key	Function
F4	Open Light Level window to manually set light level.
F5	Automatically set light level.

The Light Level Window

1. Adjust the instrument for proper focus.
2. Press the F4 key to open the Light Level window.
3. Use the numeric keypad to adjust levels until all indicators are green. Saturation causes data dropout. Saturated areas appear as red in the Filled Plot.
4. Click the Set button or press the Enter key to change the light level for measure.

   To cancel light level adjustment, click the Cancel button or press the Esc key.

Sample Light Level Window



Light Level Keys (Manual Light Level Adjustment)

Press F4 to open the Light Level window and then press the keys listed below.

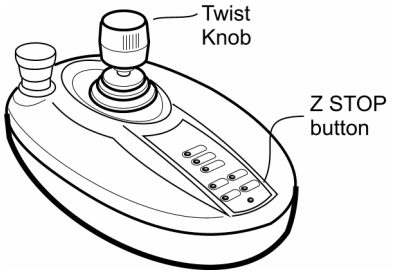
Key	Function
/ *	Coarse down (/) and up (*).
- +	Fine down (-) and up (+).
1 2 ... 9	Adjust level in 10% steps, 1 = 10%, 3 = 30%, 9 = 90%
Tab	Toggle between last two light settings.
Esc	Cancel current action and abort measurement.

For automatic light level adjustment press the F5 key. To set a specific light level for measuring, enter a value in the Light Level Pct control.

Measurement Overview

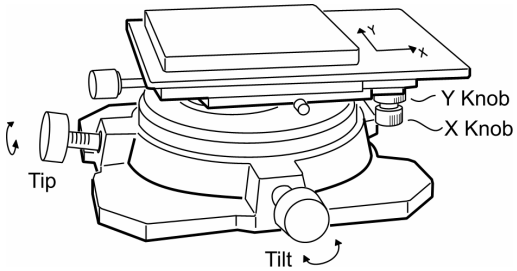
1 Setup

Z-Stop Setup - Joystick



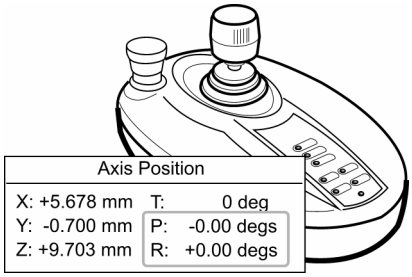
1. Home the z-axis in MetroPro.
2. Turn the Joystick twist knob to drive the objective to slightly closer to the part than its working distance.
3. Press the Joystick Z-STOP button; the indicator should turn green and stop blinking.

Part Setup - Manual Stage



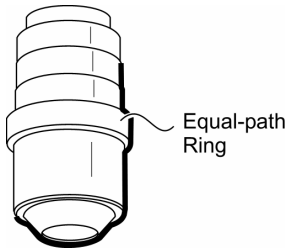
1. Turn the Tip and Tilt knobs to level stage.
2. Turn the X and Y knobs to locate the part laterally under the objective.

Part Setup- Motorized Stage



1. Press the Joystick P-R button and use the joystick to drive the part stage in tip and tilt to level the stage. The P (pitch) and R (roll) readouts in the Axis Position dialog box should be 0.
2. Press the Joystick X-Y button and use the joystick to drive the part stage in x and y axes to locate the part under the objective.

Objective Setup - 50X and 100X Only



The 50X and 100X objectives are sensitive to temperature changes. Adjust the equal-path ring so focus is synchronous with fringes.

1. Install objective.
2. Focus on the test part.
2. Turn the ring to obtain fringes at focus. If the part is rough, adjust the ring to center the fringes halfway between the highest and lowest points.

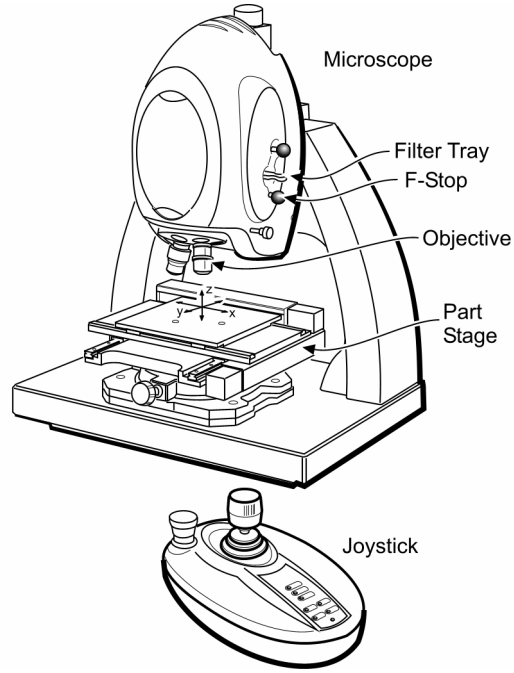
Warning!
The 100X Objective has a very short (0.55 mm) working distance. Do not crash it into the part or stage.

2 Focus

1. Set software controls.
   Click the *Objective button* until it displays the objective in use. Set the *Scan Length* control to a length slightly greater than the peak to valley height in the test part.
2. Set the optical profiler to starting point.
   - Align the filter tray to F1.
   - Drive z-axis to position the objective near its working distance from the test part.
   - Press the F5 key to adjust the light level.

Warning!
Do not crash the objective or optical profiler into the test part or stage. Use caution when focusing and moving the z-axis.

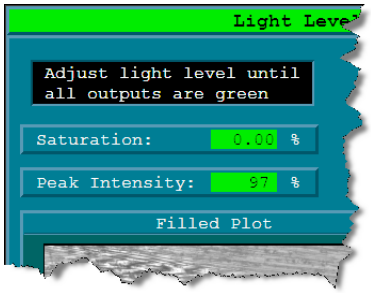
Optical profiler Controls



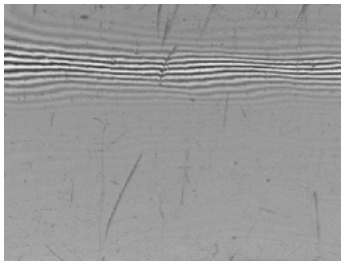
Objective	2.5X	5X	10X	20X	50X	100X
Work Dist. (mm)	10.3	9.3	7.4	4.7	3.4	0.8

3. Adjust coarse focus.
   - Focus for part detail and fringes. If you can't find focus, look for a flash of light as you focus, this flash is the part surface going into and out of focus.
   - Press the F5 key again.
4. If no fringes, adjust stage tip/tilt.
   - Press F4 to open the Light Level window.
   - Adjust stage tip and tilt to maximize the Peak Intensity readout.
   - Click Set to close the window.

Light Level Window
use to help find fringes



Sample Video Image
focus for surface details and fringes



5. Adjust fine focus.
   - Press the F5 key to adjust the light level again.
   - If necessary, adjust the stage X and Y position to locate the area of interest under the objective.
   - Adjust fine focus knob for high contrast visible fringes.

   The F-Stop is used as focus aid when measuring smooth featureless surfaces with high magnification objectives. See “Using the F-Stop.”

3 Null

Nulling means to minimize the number of fringes. *Fringes* are the light and dark bands produced by the interference of light. Obtaining properly nulled fringes is critical to good metrology.

The fringes vary depending on the part surface being measured.

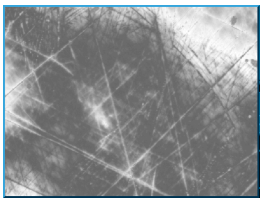
Nulling is an iterative process. It is performed by adjusting the tip and tilt of the part, adjusting the lateral positioning of the part, and fine-tuning focus during the process.

After Nulling Press F1 – Measure

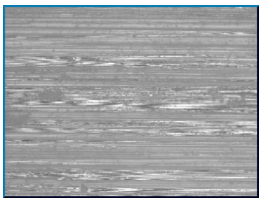
Nulling is Part Dependent

- Flat surface- reduce the number of fringes to as few as possible.
- Rough flat surface- center the fringes between the highest and lowest areas of the part.
- Spherical surface- center the fringe pattern.
- Stepped surface- position fringes at right angles to the step.

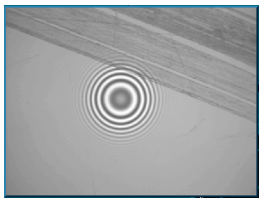
Example of Nulled Parts



Smooth Flat Part
Adjust for high contrast and the least number of fringes.

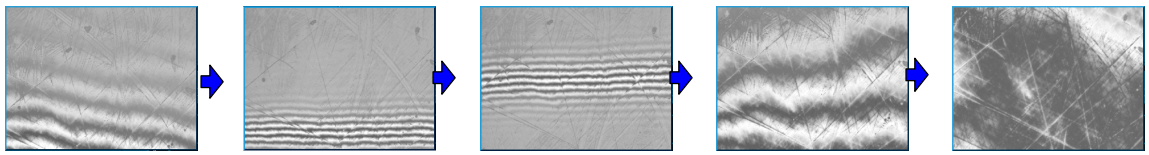


Rough Flat Part
The fringes are in smaller isolated areas. Center the fringes and adjust focus between the high and low fringes.



Spherical Part
Adjust the stage and focus to center the circular fringe pattern.

Example Sequence of Nulling a Flat Surface



After focusing for part detail, move z-axis upward until fringes just disappear. Then focus downward to find best high contrast fringes.

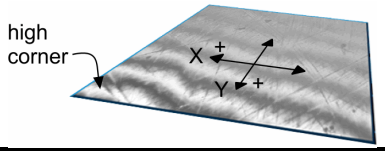
Adjust the part stage tip and tilt to make the fringes either straight across or up and down.

Adjust the fine-focus and lateral position as the part is tilted to keep the fringes in view.

Adjust the fine-focus to minimize the number of fringes.

Correctly nulled image of a smooth flat surface.

Observe where the first fringes appear; this gives an indication of the tilt in the part. In the above example, the lower left corner is the highest portion of the part. Adjust the part stage to lower the highest corner.

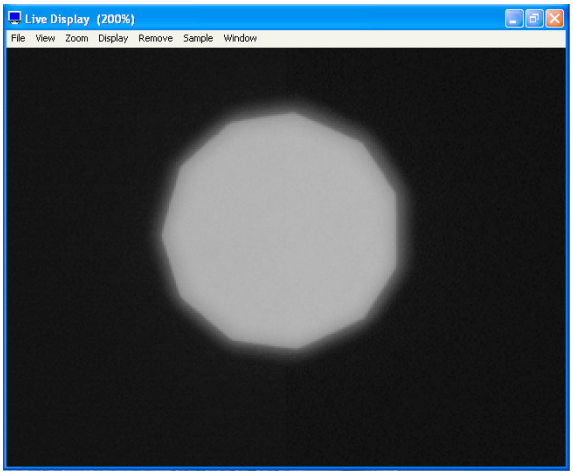


Using the F-Stop

The F-Stop (Field Stop) controls the diameter of the illuminated region on the part. Because it is conjugate to the optical profiler object and image planes, *the field stop can also be used as a focus aid.* It is especially useful for focusing on smooth, featureless parts.

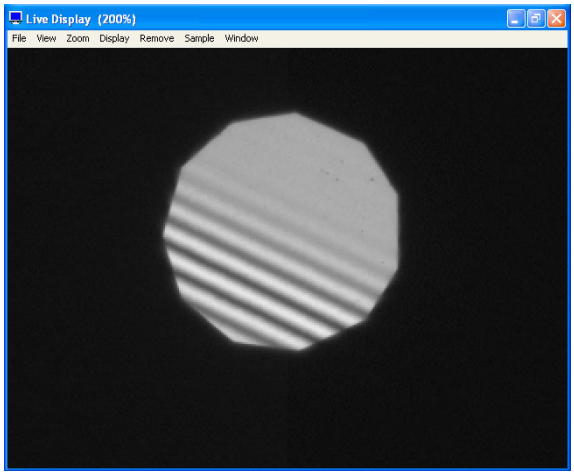
When the field stop is pulled closed and the system is near focus, there are two images of the iris on the Live Display. One image from the reference mirror of the interference objective is always in focus. The second, fainter image is from the part. This image will go in and out of focus as the z-stage is moved, but it will not be visible if the system is far from focus. When the two images of the field stop overlap exactly, the system is in focus and fringes should be visible. The sensitivity of this focusing technique increases with objective magnification.

F-Stop- System Out of Focus



When the F-Stop is pulled closed and the system is near focus, the two images of the field stop are both visible on the Live Display. The image from the reference mirror is always in-focus while the image from the part changes as the z-stage is moved.

F-Stop- System In Focus



When the F-Stop is pulled closed and the system is in-focus, the two images of the field stop exactly overlap on the Live Display. When this occurs, fringes should be visible. This sensitivity of this technique increases with objective magnification.

Using the A-Stop

The A-Stop (Aperture Stop) is used as an illumination aid for the NewView 7300 only. The A-Stop controls the size of the source image formed in the entrance pupil of the objective lens; this determines the maximum angle of incidence of the illumination at the part. The aperture stop is conjugate to the light source and the objective entrance pupil.

For general use, the aperture stop should be pushed in to the full open position. When measuring thin films or parts with deep, narrow features, the aperture stop may be pulled out (stopped down) to reduce the maximum angle of the illumination.

Do not use the A-Stop to adjust the light level on the part.

Operational Hints

Greater details for some of these hints can be found in the software documentation.

Perform Lateral Calibration

To specify the actual magnification of each objective, establish the accuracy of lateral measurements, to designate what objectives appear in MetroPro, and to create coordinates for turret mounted objectives, use the MetroPro Lateral Calibrator window. A ZYGO Lateral Calibration Standard is required.

Use System Error Files

To eliminate optical artifacts and obtain optimum performance, create a system reference file in MetroPro specific to each objective and zoom lens combination and then subtract this file from subsequent measurements. To use a system error file measure the ZYGO SiC Reference Flat and save the data file. Activate this function by setting the Subtract Sys Err control to On and entering the name of the data file in the Sys Err File control.

Error files should be remade when the objective is removed or replaced, if the reference leg of Michelson objective is rotated, when another zoom lens is used, when the Camera Mode control is changed, or when the environmental conditions change. Error files do not have to be remade when objectives are changed using the turret.

Select the Right Objective

It's up to you to determine what parameters of the test sample you want to measure and then select the best objective for that task. Here are some considerations:

Power	Match the objective field size to the area of interest you want to measure. Low magnification objectives measure widely spaced surface characteristics; high magnification measures finer detail.
Lateral Resolution	There is a tradeoff between objective power and lateral resolution. The higher the magnification, the greater the lateral resolution, but the smaller the field of view. Vertical resolution is constant, regardless of the objective.
Multiple Objectives	Multiple objectives provide maximum flexibility. Some objectives are parfocal allowing you to switch between objectives with minimal refocusing.
Work Smart	Use a low magnification objective to locate an area of interest before switching to a higher power. Use a high magnification objective to help you focus on a part that may be difficult to focus with a low power objective.

Using the 1X Michelson Objective

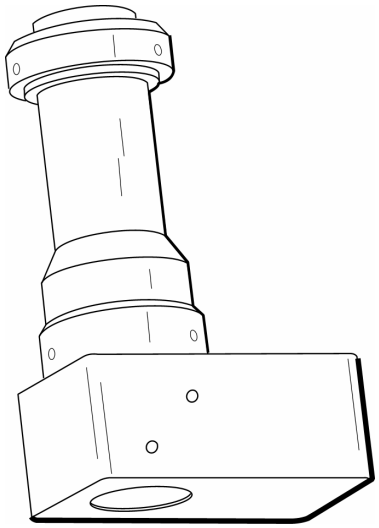
Warning!
Handle objectives with care; they are precision devices. Do not touch any glass surfaces.

The 1X Michelson objective provides a large field of view, allowing large areas to be measured. However, it can be difficult to obtain fringes on especially rough and low reflective parts because of its large focus depth compared to its fringe depth.

Depending upon the specific 1X Michelson objective, it either mounts directly to the optical profiler dovetail mount or mounts to a turret.

Be careful when using the 1X objective on a turret along with other objectives. The 1X objective is greater in length and subject to hitting or crashing into the stage or test part when the turret is rotated.

1X Michelson Objective



Focusing and Finding Fringes

1. Position the objective at its working distance from the part surface.
2. Adjust the tip and tilt of the part to maximize light return to the objective. To do this, press the F4 key to open the Light Level window, adjust the stage tip and tilt until the Peak Intensity readout is maximized, then press Enter to close the window.
3. Use the F2 filter to increase the coherence length and enhance the ability to find fringes.
4. Focus the objective on the part surface. Keeping the part in focus, position the objective as close to the part as the depth of field allows.
5. Slowly adjust the position of the objective by focusing upward. Set the Joystick focus speed to Fast, and intermittently drive the sensor upward in small increments. Watch for fringes to appear in the image.
6. When fringes appear, switch the filter to F1 and fine-tune focus and null the fringes as previously described in this chapter.

Using the Motorized Turret

Warning!

When the MetroPro Objective button is clicked the motorized turret will rotate; no warning is given. Make sure that nothing is in the way of the rotating turret and objectives. Examine carefully that the legs on the 1X, 2.5X, and 5X objectives are positioned such that they will not hit anything when the turret is rotated.

The motorized turret is typically used for automating measurements, or when using a low magnification objective to locate a feature in the part, then switching to a high magnification objective and making the measurement.

In order to maintain the same part positioning and focus between objectives, a coordinate file containing x, y, z, tip, and tilt position offsets should be created. This file, called “TRC”, for Turret Reference Coordinates, contains coordinate offset data for each objective. This information is used by the software to adjust for the fine variation between each objective's focus, center, and null position. This file is set and cleared using the software Lateral Calibrator window.

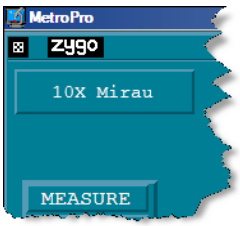
Setting Up a Motorized Turret

- If only two or three objectives are screwed into the turret, mount the objectives opposite each other so their weight is balanced on the turret.
- Make a note of the numbered turret position in which each objective is mounted. (This is needed this when using the Lateral Calibrator.)
- Examine carefully that the legs on the 1X, 2.5X, and 5X objectives are positioned such that they will not hit anything when the turret is rotated.
- Use the Parfocal Adapter for 5X-50X objectives to locate their object plane at the object plane of the 2.5X objective.

Moving the Motorized Turret

To select an objective or move the motorized turret, click the Objective button in MetroPro. For the Objective button to work, selections must be made beforehand in the Lateral Calibrator window.

Objective Button

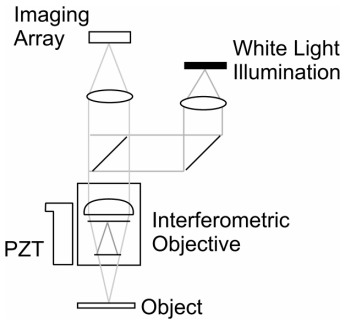


Setting the Scan Length Control

The NewView is a scanning white-light interferometer. The instrument includes optics for imaging an object surface and a reference surface together onto a solid-state imaging array, resulting in an interference intensity pattern that is read electronically into a digital computer. A series of interferograms are generated as the objective is scanned perpendicular to the illuminated surface, while recording detector data in digital memory.

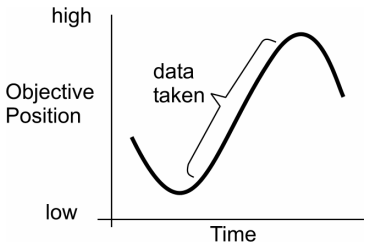
The data acquired in this way consists of an array of interferograms, representing the variation in intensity as a function of scan position. The interferograms stored in the computer are individually processed by FDA (frequency domain analysis), and the final step is the creation of a complete three-dimensional image constructed from the height data and corresponding image plane coordinates.

Optical System



The MetroPro Scan Length control determines the actual length of the scan. The longer the scan, the more time required for acquiring data. The time for scanning is displayed within the choices in the Scan Length control.

Bipolar Scanning



The NewView uses a bipolar scan; it starts in the center of the scan envelope and then moves the objective in the direction set in the Scan Direction control. During the scanning of the objective, data is collected. Because data is collected in this manner, the optical profiler should be focused in the midpoint between the high and low fringes before making your measurement. The Scan Length control should be set to the shortest length that includes this detail.

Maintenance and Service

Chapter 4

If you keep things clean and handle equipment with care you'll find that your ZYGO instrument requires very little maintenance.

Maintaining the NewView

The general maintenance procedures covered in this chapter include equipment cleaning and cleaning optical components. A regimen of good general care will prolong the life of the equipment.

For maintenance and service on the computer components refer to the original manufacturer's documentation. The computer components include the computer, monitors, mouse, keyboard, and accessories, such as a printer.

Replacement of any non-ZYGO components, such as a keyboard, monitor, or printer, must be done with CE compliant components.

General Care

The components used in the NewView system will provide many years of service with little maintenance if a few simple guidelines are followed:

- *Keep Things Clean*
  The working environment should be as clean, dry, and as dust-free as possible. Occasionally clean painted surfaces and covers by wiping with a cloth dampened with a mild soap solution.
- *Handle Equipment Carefully*
  The instrument is designed to provide precision measurements. Objectives are precision optics; handle them only when necessary. Keep unused objectives stored in their protective containers. Clean objectives only when necessary following the procedures in this chapter.

Maintenance Schedule

It is recommended that a ZYGO service representative perform the maintenance procedures in this chapter at least once a year to ensure optimum performance from your instrument.

Item	Interval	Comments
Clean exterior surfaces of equipment	Only when needed	The interval depends upon the cleanliness of work environment.
Clean Electronics Enclosure Fan Filter	Only when needed	The interval depends upon the cleanliness of work environment.
Clean Optical Components	Only when needed	Optical surfaces of the objectives should only be cleaned when dirt or dust is noticeable.
Lubricate motorized parcentric stage	Every 3 months	Use Magnalube-G Teflon grease.
Lubricate motorized Z stage	Every 12 months	Use supplied oil tube for the carriages and appropriate grease for the ballscrew.
Lubricate motorized X and Y stages	Every 12 months	Use supplied oil tube for the carriages and appropriate grease for the ballscrew.

Spare Parts List

Item	Description	ZYGO P/N
Fuse	Electrical Enclosure fuse: 2A 250V Fuse (for 100/120V) 2A 250V Fuse 5x20 mm (for 220/240V)	 1343-000-026 1343-000-205
Line Cord	Electronics Enclosure local power cord: 100/120V United States and Japan 220V German/French 240V United Kingdom	 1115-800-005 1115-800-042 1115-800-224
Parcentric Stage Grease	Magnalube-G Teflon grease for Motorized Parcentric Stage only.	1376-000-003
X, Y, Z Stage Oil	Schneeberger mineral oil based lubricant for carriages on X, Y, and Z stages. An oil tube is supplied with the instrument.	N/A
X, Y, Z Stage Grease	Kyodo Yushi Multemp PS No. 2 grease (or Lubriplate Aero grease) for ballscrews on X, Y, and Z stages.	N/A

Cleaning External Surfaces

Occasionally clean the painted surfaces of the equipment and covers by wiping with a cloth dampened, but not wet, with a mild soap solution.

Cleaning the Electronics Enclosure Fan Filter

Occasionally clean the fan filter on the front of the Electronics Enclosure using a vacuum cleaner to remove dust from the filter element.

Cleaning Optics

Cleaning a precision optical component can actually degrade the surface. Many of the optics used with the interferometer are coated. Coated optics are easily damaged by improper or unnecessary cleaning. The need for cleaning can be minimized by proper handling techniques; returning objectives to their protective boxes when not in use, and keep the environment clean.

Never attempt to clean optics within the instrument since system performance may be impaired.

Precautions When Cleaning Optics

Warnings!

Be careful when using isopropyl alcohol and methanol; both are flammable and toxic.

Do not reuse any cleaning tissue or pads, reusing tissues can cause contamination and damage to the optic.

Before cleaning optics, remove all rings and jewelry from your hands and wrists; wash your hands thoroughly to remove excess skin oils; and wear lab gloves.

Consult the local agency in your area for requirements concerning proper disposal of cleaning waste.

Recommended Cleaning Materials

Item	Comments
Polyethylene lab gloves	Wear to prevent contamination of surfaces and to protect the skin against harsh chemicals.
Compressed gas with blower nozzle	Use to blow off dust and lint from the optic.
Lens tissue	Use when it is necessary to clean an optical surface. The lens tissue must be optics grade.
Cotton swabs	Use to clean difficult to reach surfaces. The swabs should have wood or paper stems; plastic stems can dissolve in acetone.
Solvents	Use spectroscopic grade isopropyl alcohol and methanol to remove contaminants fixed to the optical surface. Use a mild, neutral 1% soap solution or lens cleaner to remove oily contaminants.

Recommended Cleaning Procedures

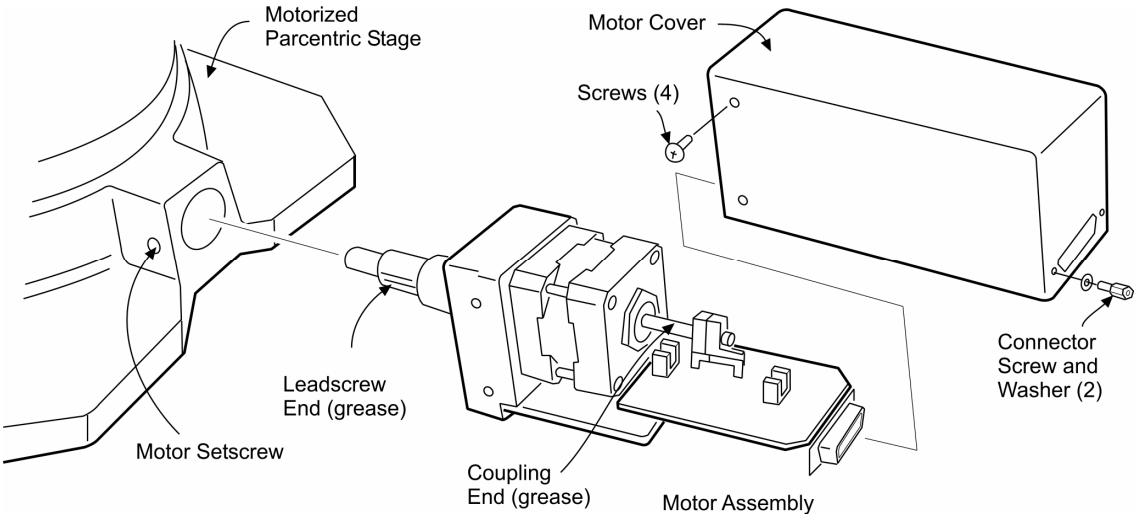
Contaminant	Procedure
Dust or light dirt.	Blow off loose particles. If any dust remains, twist two sheets of lens tissue around a swab or fold a lens tissue so it is just wider than the area you are cleaning. Dampen the tissue with alcohol or methanol. Wipe the lens straight across once. If it needs additional wiping, use a new swab or tissue.
Fingerprints, oil, and water spots. *Clean surface immediately; skin acids attack lens coatings.*	Blow off loose particles. Twist two sheets of lens tissue around a swab or fold a lens tissue so it is just wider than the area you are cleaning. Dampen it with 1% soap solution. Wipe the lens straight across once. If it needs additional wiping, use a new swab or tissue. Repeat steps 2 and 4 with tissue dampened with distilled water to remove soap residue. Repeat steps 2 and 4 with tissue dampened with alcohol or methanol.

Lubricating the Motorized Parcentric Stage

1. Using the Joystick, drive the right front corner of the stage down so you have clearance to reach the parcentric stage's pitch and roll motors.

   Disconnect the NewView from power before continuing.

Motorized Parcentric Stage Detail



2. Disconnect the cable going to one motor. Using an 1/8-inch Allen wrench, loosen the motor setscrew. Pull the motor assembly out of the parcentric stage.

   Do not interchange the parcentric stage motors; they are different. Lubricate one motor at a time to avoid confusion.

3. Remove four motor cover screws and two connector screws and washers. Remove the motor cover.
4. Put a 1/4-inch (6 mm) long bead of Magnalube-G grease on the leadscrew, as close as possible to the motor. Put a small amount of grease on the coupling end of the motor.
5. Install the motor cover and screws. Insert the motor assembly into the stage and secure the motor setscrew. Reconnect the cable.
6. Perform steps 2 through 5 for the other motor.

Lubricating the Motorized Z Stage

1. Remove any installed objectives (procedure in Chapter 2).
2. Use the Joystick to drive the Z stage as high as it can go for easiest access to the Z stage carriage end plates.
3. Use the supplied oil tube and apply a couple drops into both holes on two red carriage end plates.

It is only necessary to lubricate both carriage end plates on one side of the stage. It is not necessary to lubricate all four carriages end plates.

Lubricating the Z Stage Carriage End Plates
(as viewed looking down on the sensor cover)

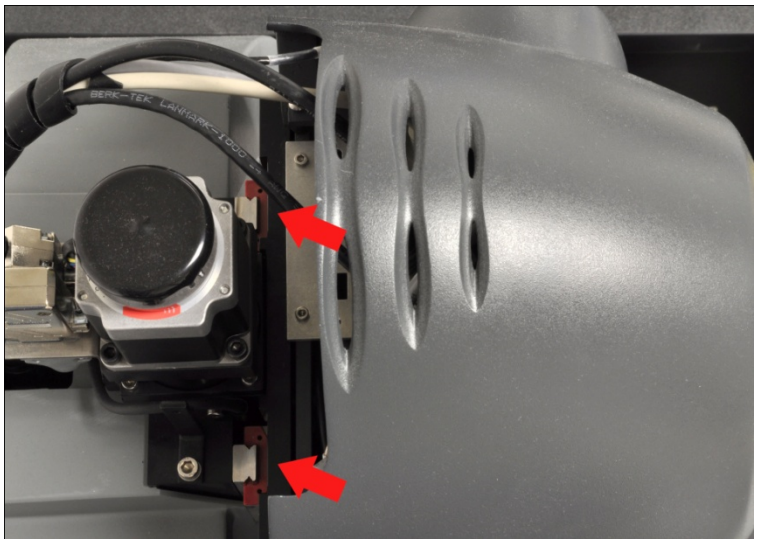
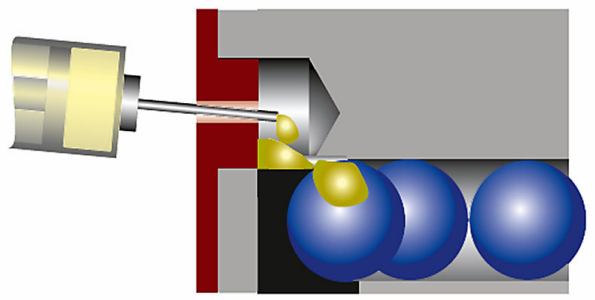


Illustration of Carriage Lubrication



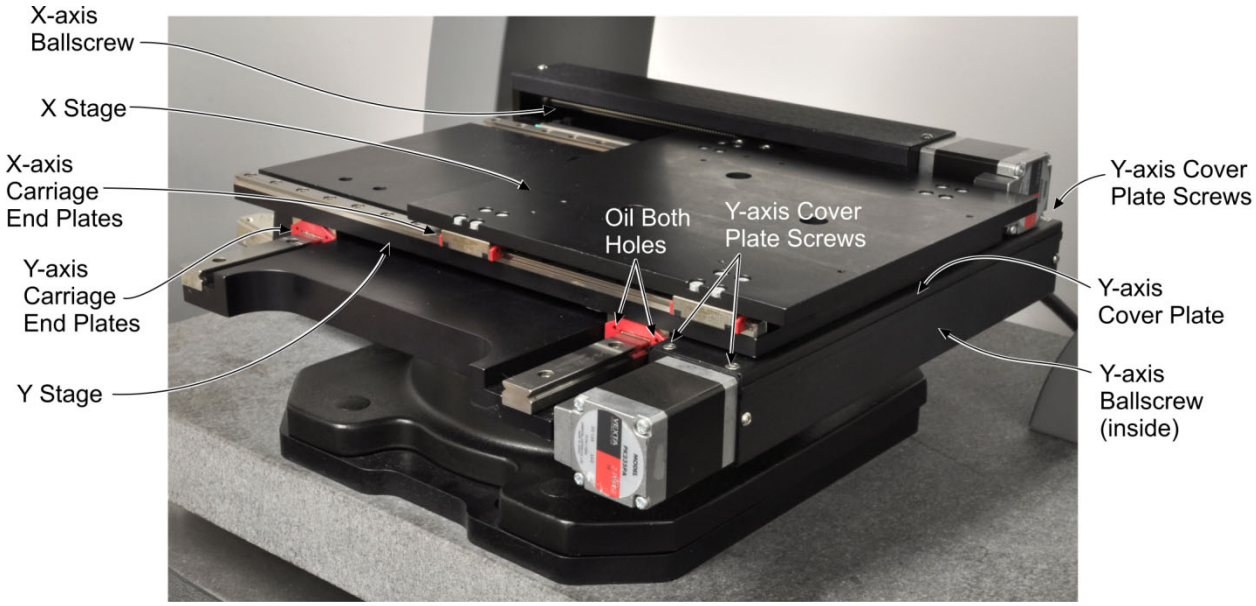
4. Drive the Z stage as low as it can go for easiest access to the ballscrew.
5. Put a small dab of grease onto a long swap. Using the swap, wipe the grease along a section of the stage ballscrew, being careful not to get the grease on other components.
6. Drive the Z stage up and down a few times to distribute the lubricant.

Lubricating the Z Stage Ballscrew

Lubricating the Motorized X/Y Stage

1. Use the Joystick to drive the part stage y-axis to gain access to the four y-axis cover plate screws.

X/Y Stage Details



2. Remove the four y-axis cover plate screws and then slide the cover out from under the stage and remove it.

   It may be necessary to drive the y-axis stage for enough clearance to remove and install the cover.

3. Use the supplied oil tube and apply a couple drops into both holes on two y-axis red carriage end plates.

   Apply oil in both holes on each red carriage end plate. It is only necessary to lubricate both carriage end plates on one side of each axis. It is not necessary to lubricate all carriage end plates. Refer to the carriage lubrication illustration in the previous procedure.

4. Put a small dab of grease onto a long swap. Using the swap, wipe the grease along a section of the Y stage ballscrew, being careful not to get the grease on other components.
5. Install the y-axis cover plate and screws.
6. Drive the X stage all the way to the right for best access.
7. Use the supplied oil tube and apply a couple drops into both holes on two x-axis red carriage end plates.
8. Put a small dab of grease onto a long swap. Using the swap, wipe the grease along a section of the X stage ballscrew, being careful not to get the grease on other components.
9. Drive the X/Y stage back and forth a few times to distribute the lubricant.

Getting Service

Warning!
The equipment does not have any user-serviceable components. Service must be performed by ZYGO trained service personnel. Any attempt to service or repair equipment may void the warranty. Please contact ZYGO Customer Support.

Returning Equipment for Service

To return equipment to ZYGO, it is necessary to have a RA (return authorization) number. Contact ZYGO Customer Support for an RA number and instructions on packing and shipping equipment.

Do not return equipment to ZYGO without a RA Number. Equipment returned without a RA number is not accepted.

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ZYGO Statement of Warranty and Product Support

ZYGO Corporation provides this warranty to protect its customers from defects in product workmanship or product materials. This warranty covers all products manufactured by ZYGO.

A. STANDARD PRODUCTS.

WARRANTY PERIOD ZYGO warrants that the equipment purchased will be free from any defects in material and/or workmanship under normal operating conditions for a period of one year from the date of shipment.

POST WARRANTY TO 5 YEARS ZYGO will support all standard products for a period of five years after the sale of the last newly manufactured unit. As vendor supplied material components become unavailable during this period, ZYGO will create upgrade paths to replace obsolete components with more current replacements. These upgrades can include internal components, computers, and software.

5 TO 10 YEARS ZYGO will continue to support older products. Service methods may include modifying units when parts become available, upgrading a unit to allow peripherals in a more supportable configuration, or providing a current product that meets or exceeds the original units functionality.

GREATER THAN 10 YEARS Product is obsolete. Service and support will be performed on a best-efforts basis.

B. NON-STANDARD / CUSTOM PRODUCTS.

WARRANTY PERIOD ZYGO warrants that the products purchased will be free from any defects in material and/or workmanship under normal operating conditions for a period of one year from the date of shipment. In cases of customer supplied materials, ZYGO warrants only the workmanship.

POST WARRANTY ZYGO will continue to support non-standard / custom products on a best effort basis after the new product warranty expires.

C. WARRANTY SERVICE.

ZYGO will provide service to return malfunctioning products to as shipped condition by repair or replacement (at ZYGO's option) of defective equipment at no cost to the Buyer. ZYGO will perform warranty service by: (1) sending replacement parts with appropriate installation instructions to the Buyer, the Buyer returning his defective part to ZYGO or: (2) repairing the product at a ZYGO repair facility after it has been returned freight prepaid, or: (3) at the Buyer's request, dispatching a service representative to the Buyer's facility. The Buyer shall pay ZYGO's travel and living expenses as well as travel time.

Defective products or parts will be repaired or replaced with new or like-new parts. These replacement parts will be warranted for a period of 90 days after they are shipped, or for the remainder of the original warranty period, whichever is longer. Warranty service will be performed only if the Buyer notifies ZYGO within 14 days of discovering any defects. Equipment or parts that are to be returned to ZYGO must be issued a Return Authorization number that can be obtained by contacting the ZYGO Service Department. Should ZYGO's subsequent inspection reveal that the parts were not defective, all expenses incurred by ZYGO shall be charged back to the Buyer. Defective equipment that is replaced shall become the property of ZYGO.

Warranty period begins when the product is shipped from ZYGO. Replacement parts, service workmanship, used equipment and refurbished equipment are warranted for a period of 90 days.

D. RETURNS.

Unused and undamaged products, in their original shipping containers, may be returned for credit within 30 days of receipt. All such returned products will be subject to a restocking fee equal to 35% of the purchase price. Custom products are not returnable.

E. EXCLUSIONS.

Warranty service does not include or apply to any product or part which, in ZYGO's judgment:

i. Has been repaired by others, improperly installed, altered, modified or damaged in any way.
ii. Malfunctions because the Buyer has failed to perform maintenance, calibration checks or use good operating procedures.
iii. Is expendable or consumable (such as panel lights, fuses, batteries, windows and filters) if such items were operable at the time of initial use.
iv. Requires replacement because of decomposition due to chemical action.
v. Fails because of poor facility, operating conditions or utilities.

OTHER THAN EXPRESSLY DESCRIBED ABOVE, ZYGO MAKES NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY REGARDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE RELATING TO THE USE OR PERFORMANCE OF THE EQUIPMENT. ZYGO WILL NOT BE LIABLE FOR PERSONAL INJURY OR PROPERTY DAMAGE (UNLESS CAUSED SOLELY BY ITS OWN NEGLIGENCE). LOSS OF PROFIT OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE EQUIPMENT, NOR DOES THIS WARRANTY APPLY TO ANY EQUIPMENT WHICH HAS BEEN SUBJECT TO MISUSE, NEGLECT, ACCIDENT, REPAIRED OR ALTERED BY OTHER THAN SERVICE REPRESENTATIVES QUALIFIED BY ZYGO.

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