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Find the *Zygo NewView 200* at our website: *Click HERE*

NewView 200
Operating Manual
OMP-0407C

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MANUAL REVISION INFORMATION

The document (OMP) number and latest publication date for this manual appear on the title page. Any revision letter following the document number indicates that the manual has been revised. Revision letters also appear at the bottom of each revised page.

Revision	*Publication Date*
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B	April 1997
C	August 1997

MANUAL NOTATIONS

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

Note: Provides helpful information.

ZYGO TECHNICAL SUPPORT

For help within the United States, Canada, and Mexico, please use the contacts listed below. For help in other countries, please contact your local Zygo representative.

Be sure to supply the instrument model and serial number, and the software version.

PHONE (860) 704-5191 Customer Support Center, 8 a.m. - 8 p.m. (EST)
(860) 347-8506 Zygo Corporation

FAX (860) 347-3968, 24 hours per day

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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 Corporation. 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.

In addition, being committed to providing our customers with superior service, Zygo will support all standard products for a period of five years after the sale of the last newly-manufactured unit. Beyond this five-year period, we will continue to support these products on a "best-effort" basis.

WARRANTY SERVICE

Zygo's responsibility under this warranty shall be limited to the repair or replacement (at Zygo's option) of defective equipment at no cost to the buyer, except for transportation, cleaning, and recalibration charges.

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. This number 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.

RETURNS

Unused and undamaged products, in their original shipping containers, may be returned for credit within 30 days of receipt. All such products will be subject to a restocking fee equal to 20 percent of the purchase price. Custom products are not returnable.

EXCLUSIONS

The above warranty and product support statement applies only to equipment that is an integral part of a Zygo manufactured product. It does not apply to peripheral equipment manufactured by others, such as: computers, printers, vibration isolation tables, etc. In such cases, the warranty and the support that the original manufacturer supplies will apply.

In addition, warranty service does not include or apply to any product or part which, in Zygo's judgment:

a. Has been repaired by others, improperly installed, altered, modified, or damaged in any way.
b. Malfunctions because the customer has failed to perform maintenance, calibration checks or good operating procedures.
c. Is expendable or consumable (such as panel lights, fuses, batteries, windows, and filters) if such items were operable at the time of initial use.
d. Requires replacement because of decomposition due to chemical action.
e. 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 or accident; or repaired or altered by other than service representatives qualified by Zygo.

01/96

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Chapter 1

THE NEWVIEW SYSTEM

In This Chapter

- The NewView System
  - How the NewView Works
- Computer Components
- Microscope Components
- Specifications
- Safety

THE NEWVIEW SYSTEM

The Zygo NewView[1] is a general purpose, three dimensional, imaging surface structure analyzer; it provides both imaged surface details of test parts and accurate measurements to characterize these details. 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 with the NewView.

Configurations

Version/Option	*Description*	*Reference*
NewView 200	Standard model with 320 x 240 pixel resolution over the full aperture, and high resolution over one-quarter aperture.	covered herein
NewView 200 CHR	High precision model with capacitive feedback PZT (Pifoc) and high resolution 640 x 480 pixel camera; provides greater measurement accuracy, linearity, and stability.	covered herein
Image Zoom *option*	Variable zoom 0.5 to 2.0 times the objective magnification.	Appendix B
Extended Scan *option*	Extends the vertical scan range from 100 micrometers to 5 millimeters.	Appendix C
Phase Option *option*	Adds the phase measurement capability of the Maxim to the NewView.	Appendix D
Rough Surface Filter Set *option*	Three position filter set to improve measurements of rough surfaces.	Appendix E

[1] U.S. patent numbers 5,402,234, 5,398,113, and 5,558,003; U.S. and foreign patents pending.

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There are two major parts to the NewView system: the Microscope and the Computer. The Microscope combines optical microscopy and interferometry to provide the raw data needed for imaging and for surface structure analysis. It includes the NewView Microscope, objectives, Support Stage, Video Monitor, Electronic Enclosure, and a vibration isolation system. The Computer controls the measurement process, performs calculations, and displays measurement results on a color monitor. It includes a computer, color display, mouse, keyboard, and a hardware key. Figure 1-1 shows the NewView system.

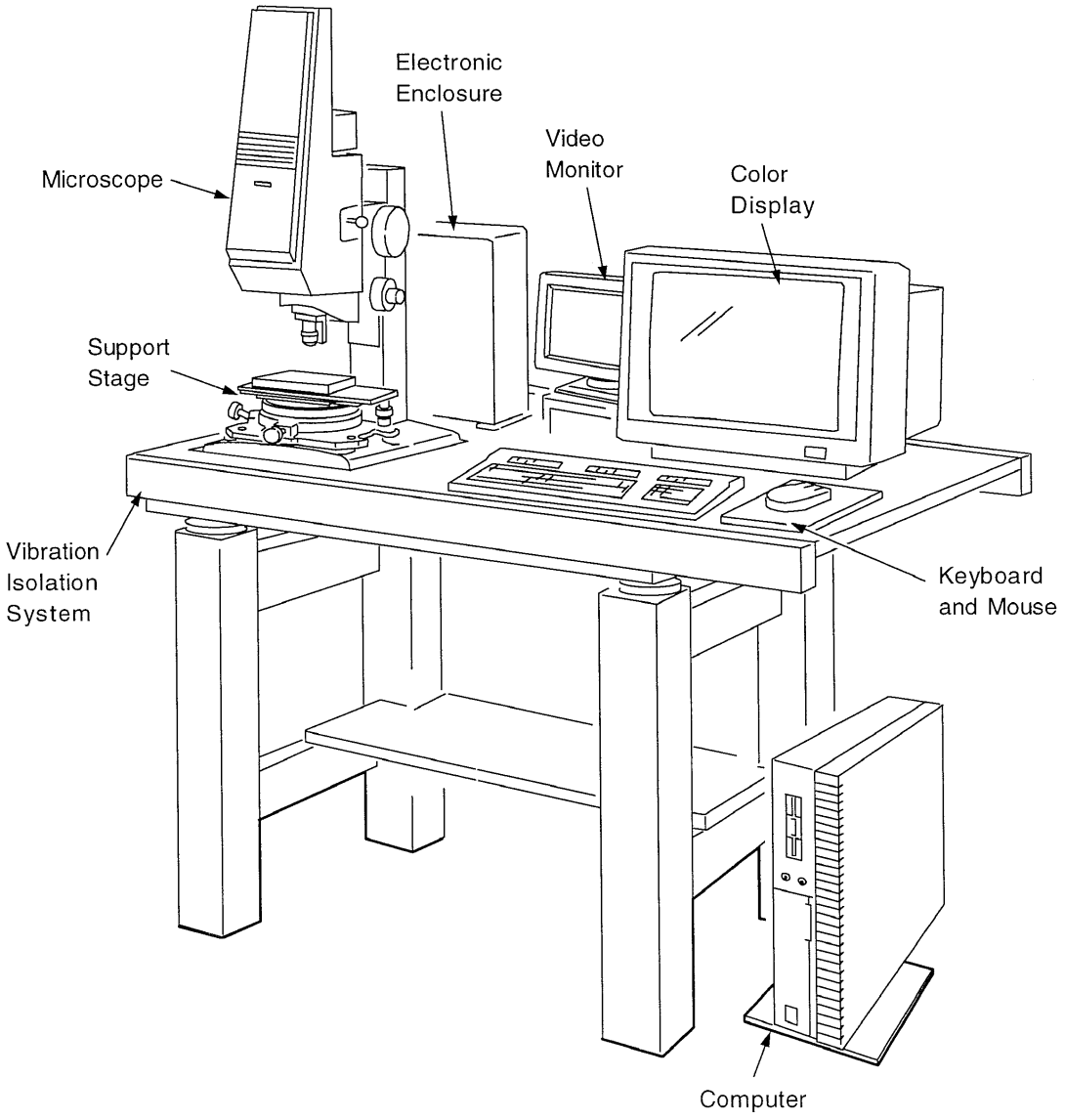


Figure 1-1 NewView System

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The NewView is designed to be easy to use, even by an operator without computer and microscope experience. Focusing on a test part is guided by a real-time display of the surface and optical focus aids. An adjustable Support Stage simplifies aligning the test part. Making a measurement is a single button operation.

The real power to analyze the NewView system data lies in its MetroPro™ analysis and control software. MetroPro runs in a window environment and has a graphical user interface. MetroPro performs image reconstruction and analyzes entire areas as well as profiles, and provides numerous surface structure results. Additional software options provide specialized testing capabilities.

How the NewView Works

The NewView system uses scanning white light interferometry to image and measure test part surfaces and provide surface structure analysis without contacting the surface. Refer to Figure 1-2. Light from the Microscope divides; one portion reflects from the test surface and another portion reflects from an internal, high quality reference surface. 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) (or Pifoc). As the objective scans, a video system captures intensities at each camera pixel. These intensities are converted into images by MetroPro software. In addition, surface images are displayed on a Video Monitor, which magnifies the camera image 26 times.

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. The NewView analyzes and quantifies the surface topography of parts. Depths up to 100 micrometers, with 0.1 nanometer resolution and 0.4 nanometer RMS repeatability, are imaged independent of objective magnification. Results are displayed on a color display as solid images, plots, and numeric representations of the surface.

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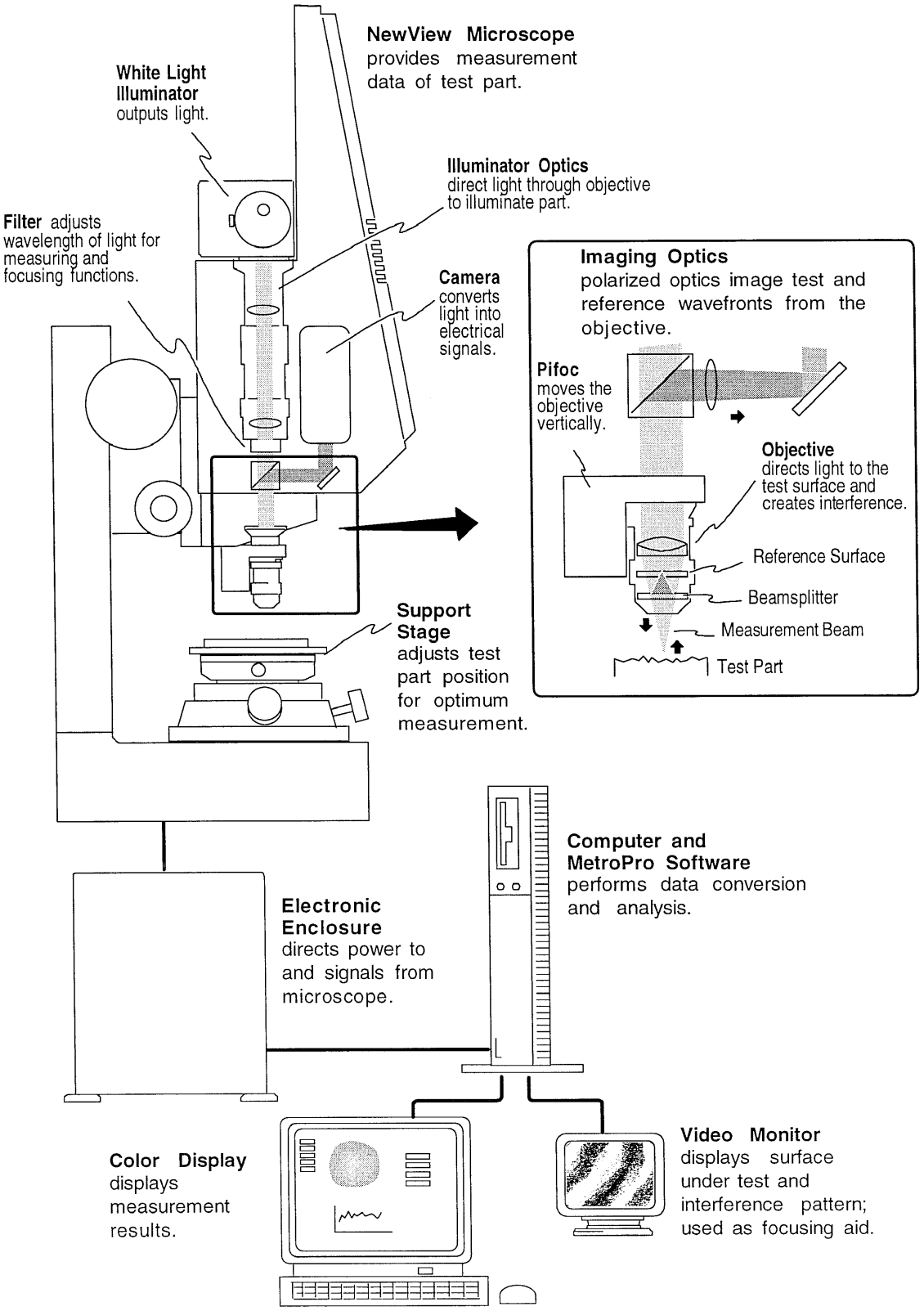


Figure 1-2 How the NewView Works

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COMPUTER COMPONENTS

The Computer controls the Microscope, runs the Zygo MetroPro software program, performs calculations, and displays the measurement results on a color display. Typical computer components are shown in Figure 1-3. For descriptions and specifications refer to the manuals from the original equipment manufacturer.

MICROSCOPE COMPONENTS

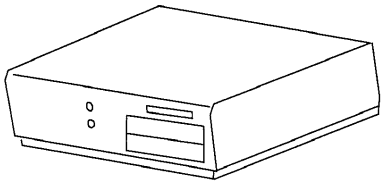
See Figure 1-4 for a breakdown of the Microscope components and their function. For more detailed information on individual Microscope components, refer to the specification sheets, later in this chapter.

SPECIFICATIONS

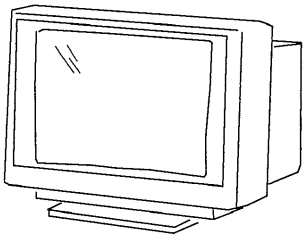
- NewView Microscope ..... *page 1-9*
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- Electronic Enclosure ..... *page 1-12*
- Video Monitor/Power Kit ..... *page 1-13*

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Typical components shown actual equipment may vary.

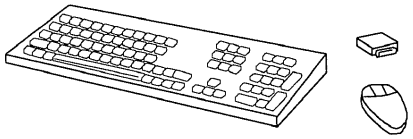


Computer
For system control and data storage. Versions for UNIX (X Windows) and PC are available.



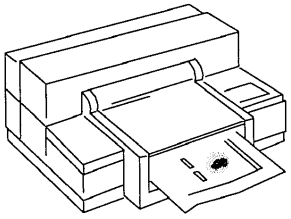
Color Display
Displays graphics and data.

Mouse
Used for program control and selecting menus.



Keyboard
Used for data entry.

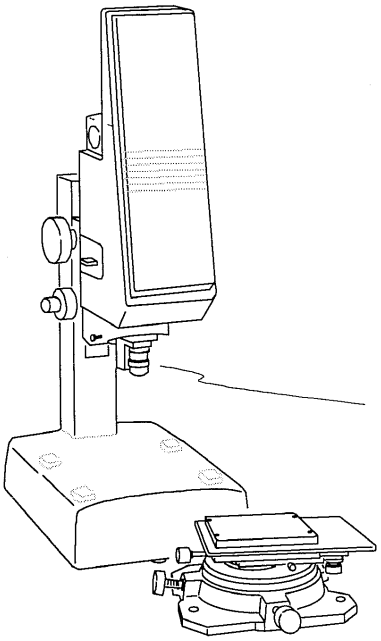
Hardware Key
Enables MetroPro and software options for PC versions.



Printer (Optional)
Outputs color copies of MetroPro screens. Connects directly to the computer.

Figure 1-3 Computer Components

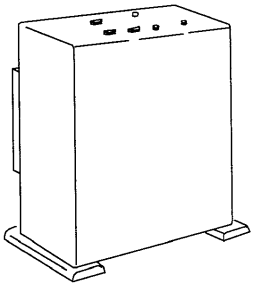
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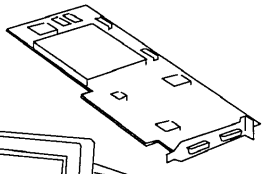
NewView Microscope
Provides measurement data of surface under test. It is a scanning white light interferometric microscope that supplies 3-dimensional images and analysis of the test part surface. It has manual coarse, medium, and fine focusing knobs.
It connects to the Electronic Enclosure.

Objective
Forms an image of the test surface.
(See next page.)

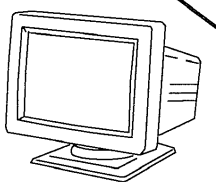
Support Stage
Holds the part under test and provides for tip, tilt, and X and Y positioning. It attaches to the Microscope base and accepts top plates.



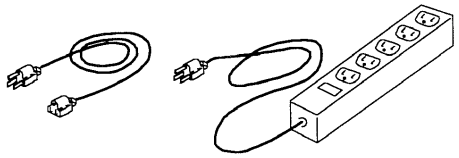
Electronic Enclosure
Houses the main instrument board and power supply. Provides power to the Microscope and interfaces to the computer. Also contains the capacitive feedback electronics for the NewView 200 CHR.



Frame Grabber Board
Controls data acquisition. It is installed in the computer and connects to the Electronic Enclosure and Video Monitor.



Video Monitor
The 9-inch diagonal monochrome screen displays a live image of the part under view 26 times larger than the image at the camera. The monitor is used for part focusing and displaying results. A monitor stand with an objective holder is included.

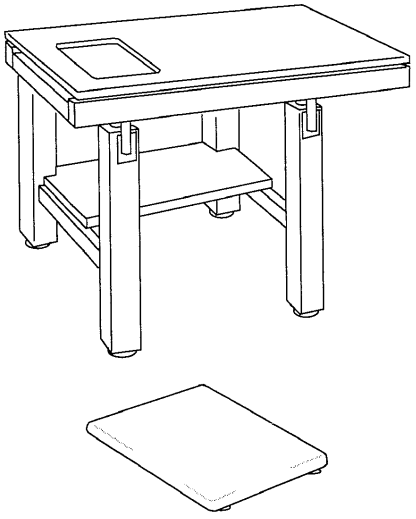


Power Kit
Includes an outlet strip and power cords to connect the system to incoming power. Versions available for 100, 120, 220, and 240 VAC.

Figure 1-4A Microscope Components (page 1 of 2)

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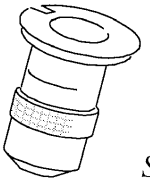
Vibration Isolation Systems
Isolate the Microscope from environmental vibrations that degrade measurements.



Vibration Isolation Table
The Microscope sits on a rigid laminated table top floating on self-leveling air pistons. Some components sit on a large upper shelf, which is separate from the table. The table requires a 60 psi source of compressed air or bottled nitrogen. It is 35 x 45 x 34 in. (HWD).
The table is manufactured by Technical Manufacturing Corporation (TMC). Operating instructions are provided by TMC.

Table-top Vibration Isolator (option)
Holds the Microscope and provides vibration protection in lieu of the table. It should sit on a rigid platform and not on the same surface as the other components. It is 3.5 x 18 x 24 in. (HWD).

Interferometric Objectives (option)
Gathers light from the test object and forms 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 test surface irregularities, the test or measurement wavefront travels different distances. When the reference and measurement wavefronts are recombined, the waves are out of phase and form an interference pattern.



See Page 1-10.

Objective	Type	Sys Magnification
2.5X	Michelson	50X
5X	Michelson	100X
10X	Mirau	200X
20X	Mirau	400X
50X	Mirau	1000X

Top Plates (option)
Attach to the top of the Support Stage to locate parts or fixtures under the objective. Both specialized and general purpose top plates are available.

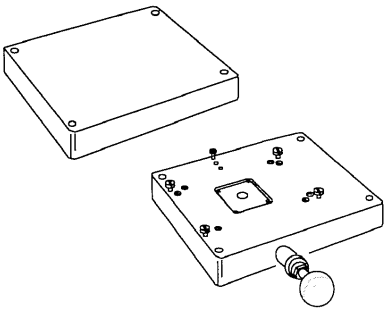


Figure 1-4B Microscope Components (continued)

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NewView 200 Microscope

Physical Characteristics:
Dimensions: See drawing below.
Weight: 80.5 lb (36.5 kg)

Measurement Technique:
Scanning white light interferometry.

Light Source: Filtered white light

Part Viewing: Real-time video monitor

Focus Control:
Coarse Wheel - 22 mm/turn, with tension adjust
Medium Knob - 4.7 mm/turn, with tension adjust
Fine Knob - 0.2 mm/turn

Vertical Travel: 5.1 in. (130 mm)

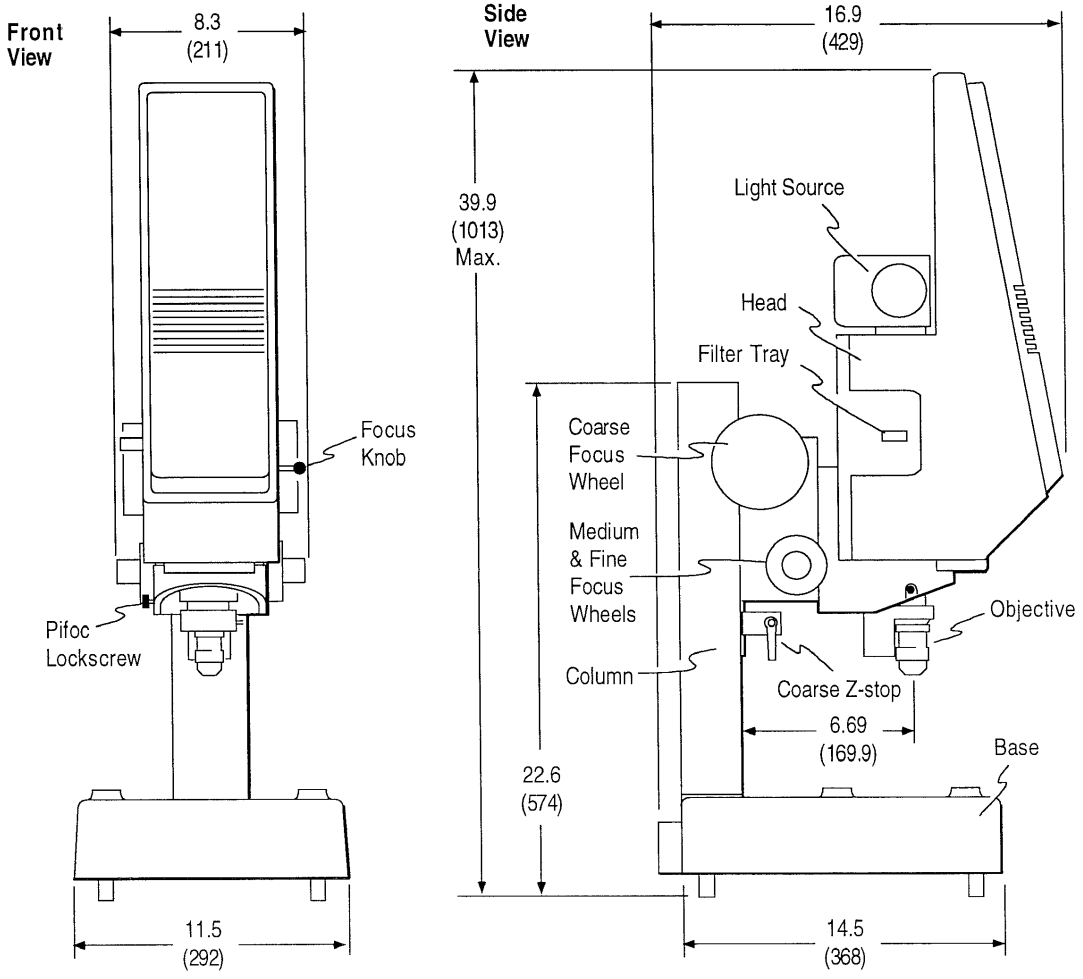
Objective Mounting: Single dovetail mount

Camera Size: up to 640 x 480 pixels.

Electrical:
Incoming Power from Electronic Enclosure.

Operating Environment:
Temperature: 15° to 30°C (59° to 86° F)
Rate of Temperature Change: <1.0°C/15 min.
Humidity: 5 to 95% relative, noncondensing
Vibration:
Frequency Isolation 1Hz < freq < 120Hz

Performance:
Vertical Resolution: 0.1 nm
Lateral Resolution: see objective table
Maximum Vertical Step Height: 100 µm



Dimensions are shown in inches and (millimeters)

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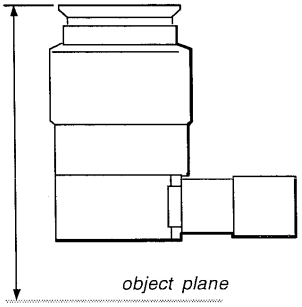
Interferometric Objectives

Physical Characteristics: See drawing below.

Description: 2.5X and 5X are Michelson objectives; 10X, 20X, and 50X are Mirau objectives. The coherence bandwidth is centered within the depth of focus. Objectives can measure the top surfaces of transparent and partially transparent materials, as well as curved and angled opaque surfaces with 4-100% reflectivity. 10X, 20X, and 50X objectives are parfocal.

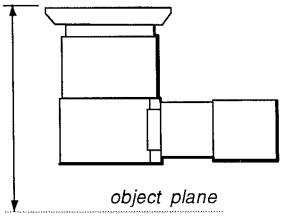
Viewing Magnification on Video Monitor: 20 times the objective magnification.

2.5X Michelson



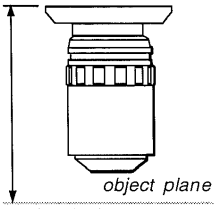
Parfocal Distance
91.2 mm

5X Michelson



Parfocal Distance
62.0 mm

10X/20X/50X Mirau



Parfocal Distance
58.1 mm

NewView 200

Power	Sys Mag	NA	Working Distance (mm)	Focus Depth (µm)	Inter Depth (µm)	Lateral Res (µm)	Field of View H x V (mm)	Spatial Samp (µm) StdRes	Spatial Samp (µm) HiRes	Slope (deg)
2.5X	50X	0.075	10.3	± 51.6	4.0	4.72	2.82 x 2.11	8.80	4.40	1.89
5X	100X	0.130	9.3	± 17.2	4.0	2.72	1.41 x 1.06	4.40	2.20	3.77
10X	200X	0.300	7.4	± 3.2	4.0	1.18	0.70 x 0.53	2.20	1.10	7.51
20X	400X	0.400	4.7	± 1.8	3.6	0.88	0.35 x 0.26	1.10	0.55	14.77
50X	1000X	0.550	3.4	± 1.0	2.0	0.64	0.14 x 0.11	0.44	0.22	33.39
NewView 200 CHR (with high resolution camera and capacitive feedback)										
2.5X	50X	0.075	10.3	± 51.6	4.0	4.72	2.53 x 1.90	7.92	3.96	2.10
5X	100X	0.130	9.3	± 17.2	4.0	2.72	1.27 x 0.95	3.96	1.98	4.19
10X	200X	0.300	7.4	± 3.2	4.0	1.18	0.63 x 0.48	1.98	0.99	8.33
20X	400X	0.400	4.7	± 1.8	3.6	0.88	0.32 x 0.24	0.99	0.50	16.33
50X	1000X	0.550	3.4	± 1.0	2.0	0.64	0.13 x 0.10	0.40	0.20	36.22

Objective Table Notes:

Power	Magnifying power of the objective.
Sys Mag	System magnification, the enlargement of the surface as viewed on the video monitor.
NA	Numerical aperture, a number representing the resolving power of the objective.
Working Distance	The distance from the end of the objective to the test surface when focused.
Focus Depth	Vertical distance within which any specimen detail will simultaneously be in focus.
Inter Depth	Interference depth, vertical distance over which interference can occur.
Lateral Res	Lateral resolution, optical resolution of the imaging system.
Field of View	The size of area imaged and measured.
Spatial Samp	Spatial sampling, the apparent pixel size at each magnification. StdRes = 320 x 240 and HiRes = 640 x 480; both refer to the maximum camera size in pixels.
Slope	Maximum angle of surface feature from one pixel to the next that can be measured.

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Support Stage

Physical Characteristics:
Dimensions: See drawing below.
Weight: 19.0 lb (8.6 kg) without top plate

Controls:
Parcentric Tip and Tilt knobs - rotate the top of the stage about a point 1.8 in. above the stage.
X knob - linear motion side-to-side, coaxial with Y.
Y knob - linear motion front-to-back, coaxial with X.
Theta knob - rotate the top of the stage around its center (z-axis).

Adjustment Range:
Tip/Tilt: ±4.2 degrees (sides)
Tip/Tilt: ±6 degrees (corners)
X and Y: ±2 in. (50 mm)
Theta: 230°

Sample Size:
Max. Thickness: 3.5 in. (89 mm)
Throat Depth: 6.7 in. (170 mm)

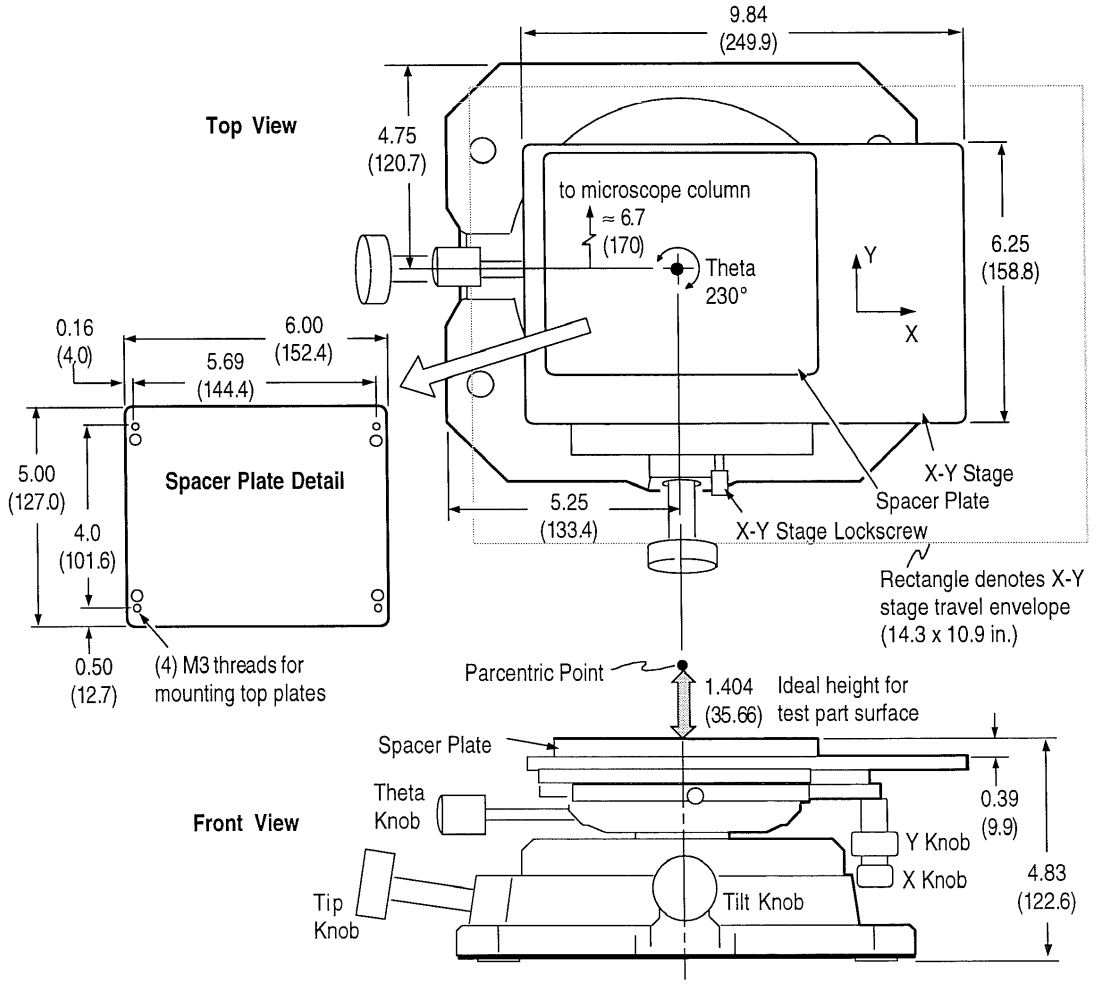
Top Plates (Optional):
Optimize the sample surface locations to the parcentric point.

General Purpose Top Plates:

P/N	Thickness	To Parcentricity
6300-0130-01	1.490 in.	0.012 in.
6300-0130-02	1.030 in.	0.372 in.
6300-0130-03	0.680 in.	0.722 in.

Fluoroware Top Plates:

P/N	Description
6300-0151-01	Holds 2 x 2 trays
6300-0151-02	Holds 3 x 3-3/4 trays



Dimensions are shown in inches and (millimeters)

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Electronic Enclosure

Physical Characteristics:

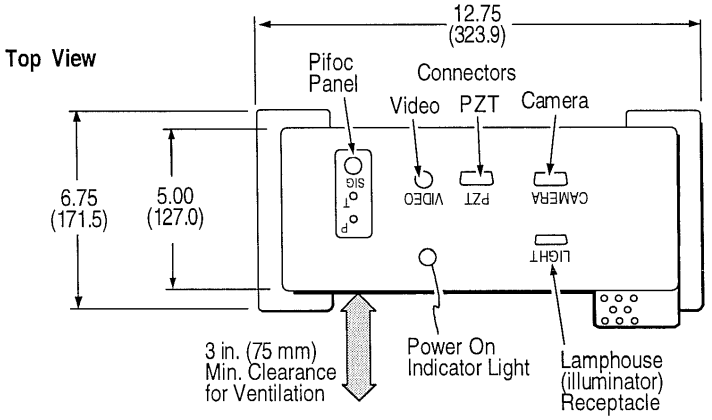
Dimensions: See drawing below.
Weight: ~ 5.0 lb (2.3 kg)

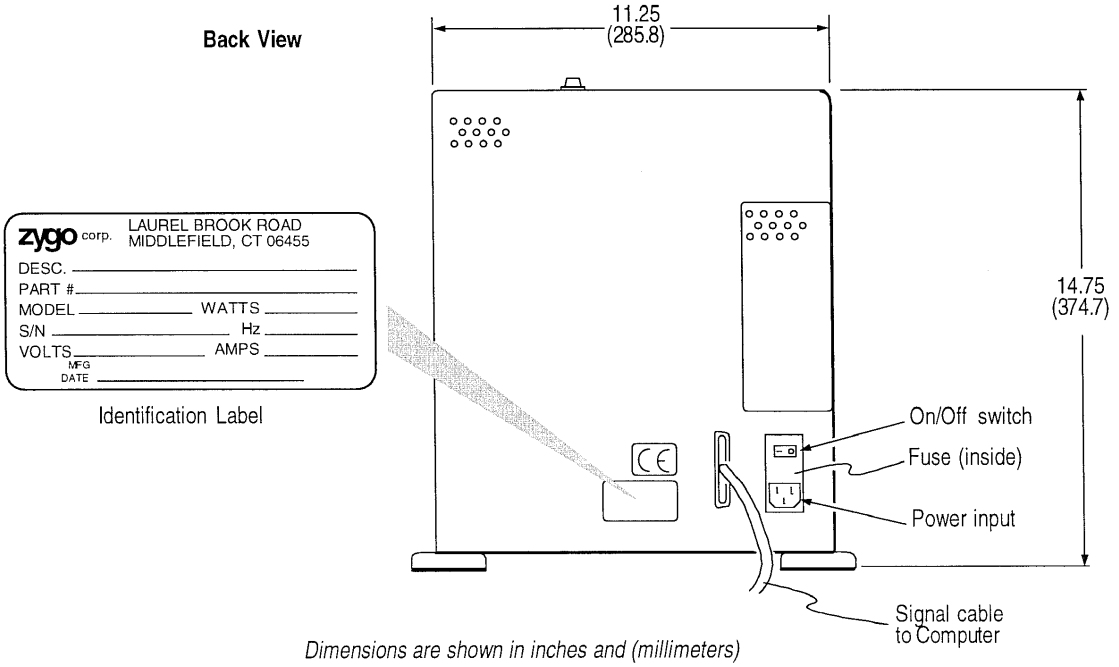
Electrical:

Incoming Power: 90 to 250 VAC, 50/60 Hz
Power Dissipation: 35 watts maximum
Fuse Rating (supply module): 250V 2A

Operating Environment:

Temperature: 15° to 30°C (59° to 86° F)
Humidity: 5 to 95% relative, noncondensing





Dimensions are shown in inches and (millimeters)

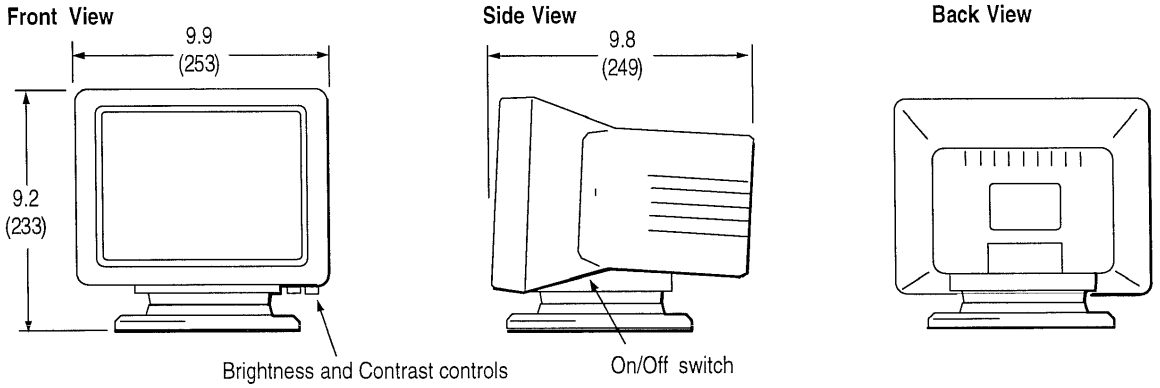
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Video Monitor

Physical Characteristics:
Dimensions: See drawing below.
Weight: 7.7 lb (3.5 kg)

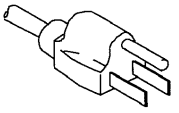
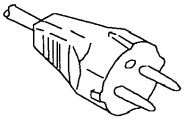
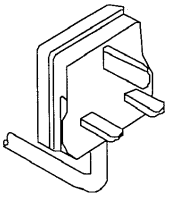
Power Requirements:
Voltage: 100 to 240 VAC
Line Frequency: 50/60 Hz
Power Consumption: 20 watts typical

Video:
Picture Tube: Monochrome 9-inch (23 cm) diagonal
Resolution: 640 x 480 pixels
Input Signal: RGB Analog
Connector: 15 pin D-sub cable



Dimensions are shown in inches and (millimeters)

Power Kit

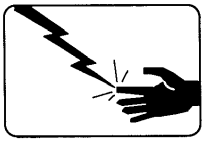
Zygo P/N	AC Voltage	Country	Plug Type
6300-0227-01	120V	United States Canada	
6300-0227-02	220V	France Germany	
6300-0227-03	100V	Japan	Same as 6300-0227-01, but with 3-prong to 2-prong plug adapters.
6300-0227-04	240V	United Kingdom	

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SAFETY

Failure to follow the safety recommendations in this manual could result in damage to the NewView System and may void the warranty.

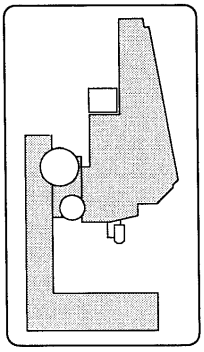
Electrical



Warning!

- Ensure that all power is off during installation and when connecting and disconnecting cables.
- The equipment must be electrically grounded through the outlet. The grounding lug for each component's plug should connect to ground.
- Be careful of electrostatic discharge (ESD) when handling and installing electronic components. A static control grounding wrist strap should be used when installing or handling circuit boards. Circuit boards should be stored in a static shield bag.

Microscope



Warning!

- The microscope weighs about 80 pounds (36 kilograms). Exercise care when moving or lifting the Microscope to prevent back injury.
- Be careful when adjusting the Coarse Focus Wheel tension. If the tension is too loose the microscope head can fall under its own weight.
- Be careful when focusing the microscope; do not allow the objective to contact the test part or Support Stage. Use the Coarse Z-stop to prevent crashes.
- Handle the objectives and PZT (Pifoc) with care; they are precision devices. Do not touch any glass surfaces.
- Do not touch the lamp housing; during use the housing may be extremely hot and cause burns.
- When replacing the bulb, turn off power, wait for the bulb to cool, and do not touch the replacement bulb with bare hands.

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Chapter 2

INSTALLATION

In This Chapter

- A Note About Installation
- Preinstallation Considerations
- Installation Checklist
- Installation Procedures
  - Installing the Computer
  - Mounting the Microscope Head
  - Installing the Filter Tray
  - Assembling the Support Stage
  - Positioning Components
  - Installing the PZT Assembly
  - Cable Interconnection
  - Power Distribution
  - Installing MetroPro
  - Aligning the Lamp Bulb
  - Mounting an Objective
  - Aligning the Support Stage

A NOTE ABOUT INSTALLATION

This chapter describes important things that should be done before you set up your system and provides detailed installation instructions.

If you are performing your own installation, please first read over the entire chapter to get an overview of the process. Do *not* attempt to use the system until you are familiar with its operation.

Installation instructions for computer equipment and vibration isolation equipment are covered separately in documentation provided by the original manufacturers.

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PREINSTALLATION CONSIDERATIONS

Before installing your metrology system, you should carefully consider the following aspects of the installation:

- Operating Environment
- Utility Availability

Operating Environment

Because the NewView system is capable of measuring to the sub-Angstrom level, the environment in which it is installed is significant and will have an affect on its overall performance. There are several aspects of the operating environment to be considered:

Vibration - The most significant environmental concern for the system, and the most difficult to control. Vibration can be introduced by any of several sources: floors with insufficient support or rigidity, acoustic noise, other equipment (fans, etc.), human activity, and so on.

Ideally, the floor of the installation site should be a poured concrete slab at ground level. This greatly reduces large-amplitude vibrations. Small amplitude vibrations transmitted through the ground, such as those caused by human activity, can be eliminated by using a vibration isolation system.

Acoustic vibration (sound) of sufficient amplitude can cause vibration of the Microscope, items under test, and even of the top of a vibration isolation table. This is especially true of low-frequency vibrations, which may not be audible even at relatively high amplitude. Uninsulated walls made with plasterboard are prone to retransmitting acoustic vibration from adjoining areas and suspended ceilings can couple roof mounted air conditioning noise.

Vibration can also be transmitted to the Microscope and support table through connecting cables. Be careful not to run cables where they would be touching sources of vibration or are likely to be jarred or kicked. Don't place the keyboard, mouse, or anything that has moving parts, on the vibration isolation table. Even equipment operating on a vibration isolation system's shelves may transmit vibration.

Zygo offers two different vibration isolation systems. Properly installed, they should minimize vibration effects.

Temperature - Rapid temperature changes will degrade system performance because different materials absorb and release heat at different rates, resulting in uneven expansion and contraction of the Microscope and components under test. The maximum acceptable rate of temperature change is approximately 1°C (1.8°F) per 15-minute interval.

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Wide concurrent temperature differences in the operating environment can also degrade performance because they create air turbulence which can disturb the measurement beam. Such temperature differences can be caused by air conditioning and/or heating devices or vents.

Air Turbulence - Fans or blowers help to even out temperature differences in the operating area. However, if these are positioned improperly, they can cause air turbulence and vibration problems. Air turbulence causes uneven air density within small areas, thus refracting parts of the measurement beam and altering the wavefront.

Airborne Impurities - Smoke, dust, and grease or oil globules can accumulate on optical components, degrading their performance, and eventually ruining sensitive optical coatings.

Utility Availability

Electrical - Incoming voltage can be 100, 120, 220, or 240. The NewView system requires an isolated 15 amp (100/120 V) or 10 amp (220/240 V) power circuit with at least two separate outlets and an earth ground.

Air Supply - If used, the Vibration Isolation Table requires a compressed air supply or bottled nitrogen. Operation at maximum load requires a supply line pressure of approximately 75 PSI (5.3 kg/cm^2), although typical operation pressure is less. The flow rate is negligible once the isolator has been pressurized. The air supply should be filtered and oil and water free. Bottled nitrogen normally does not require filtering.

INSTALLATION CHECKLIST

A series of checklists are provided to assist you in installing your metrology system. Use the checklists as a summary of the installation procedure.

Preinstallation

- ☐ 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 necessary utilities and environmental control. *[pages 2-2 and 2-3]*
- ☐ If installation and training are included in your purchase, contact your Zygo representative to make arrangements.
- ☐ Move all shipping containers to the worksite. Allow the equipment to acclimate for at least 24 hours.
- ☐ Unpack the equipment from the shipping boxes and place it near its working location. *Do not unpack the Microscope yet.*

Note: Save the shipping containers for future transport of the equipment.

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Computer Installation *Follow ESD precautions*

- ☐ If the system is configured with an HP computer, it may be necessary to install the EISA Adapter Board, frame grabber Board, floppy drive, and extra RAM. (Most systems come with these items factory installed.)
- ☐ Mount the floor stand to the Computer and stand the unit vertically.

Microscope Installation

- ☐ Carefully unpack and mount the Microscope head to the column.
- ☐ Install the Microscope filter tray.
- ☐ Assemble the Support Stage.
- ☐ Position the Microscope on the vibration isolation system. Other components must be isolated from the Microscope.
- ☐ Position the remainder of the system components.
- ☐ Install the PZT Assembly.
- ☐ Connect the signal cables to the components.
- ☐ Locate the power strip near the work table. Connect the components to incoming power.
- ☐ Install MetroPro software following the instructions in the *Getting Started With MetroPro* manual. Then open MetroPro.
- ☐ Align the lamp bulb.
- ☐ Install the objective. *Handle with care.*
- ☐ Align the Support Stage.

INSTALLATION PROCEDURES

Procedures to install your NewView system are listed in the order in which they are typically performed.

Installing the Computer

Most of the computer components are simply unpacked, set in position, and then interconnected with cables. For reference purposes, a cable interconnection diagram is included later in this chapter. For specific information refer to the documentation supplied by the original equipment manufacturer.

If you want to install the floor stand, follow the instructions provided in the documentation supplied with the computer.

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Supplement for Installing the HP System Processor

Note: This section applies only to an HP System Processor (computer) running under UNIX (X Windows). If you have a NewView with a PC running under Windows NT, then skip this page.

Install the Matrox Board

Most systems come with the Matrox Board, or frame grabber board, factory installed. If it is necessary to install the board, follow the instructions below.

1. Turn off power. Open the HP System Processor. Wear an ESD wrist strap to protect the electronics from electrostatic discharge. (If retrofitting an existing system, remove the Matrox Board, EISA Adapter Board, and the related hardware holding the Matrox Board. Slide the new Mounting Bracket in place.)
2. Attach the Matrox Board to the EISA Adapter Board.
3. Align the outside edge of the Matrox Board against the four outside bracket tabs. Align the EISA Adapter Board with the EISA socket on the Processor motherboard.
4. Position the assembly into place. The Matrox Board is secured by seven bracket tabs. The EISA Adapter Board is secured by four standoffs. Press firmly on the EISA Adapter Board at the arrows to ensure the board is fully seated.

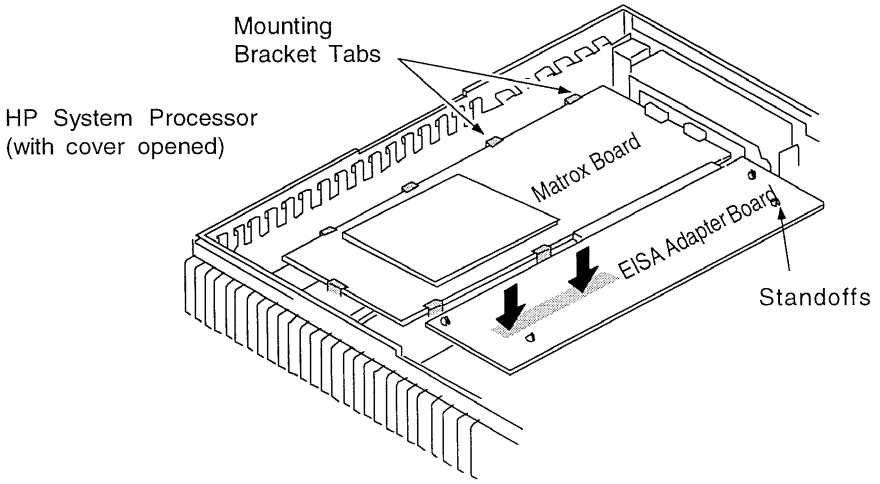


Figure 2-1 Matrox Board Installation

Install the Additional RAM

Most systems come with RAM factory installed. If it is necessary to install additional RAM follow the instructions provided in the HP documentation.

Install the Floor Stand

If you want to save floor space you may want to mount the computer vertically on its floor stand. Refer to the HP documentation for instructions.

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Mounting the Microscope Head

Refer to Figure 2-2 for lifting the column. Refer to Figure 2-3 for mounting the Microscope head on the column.

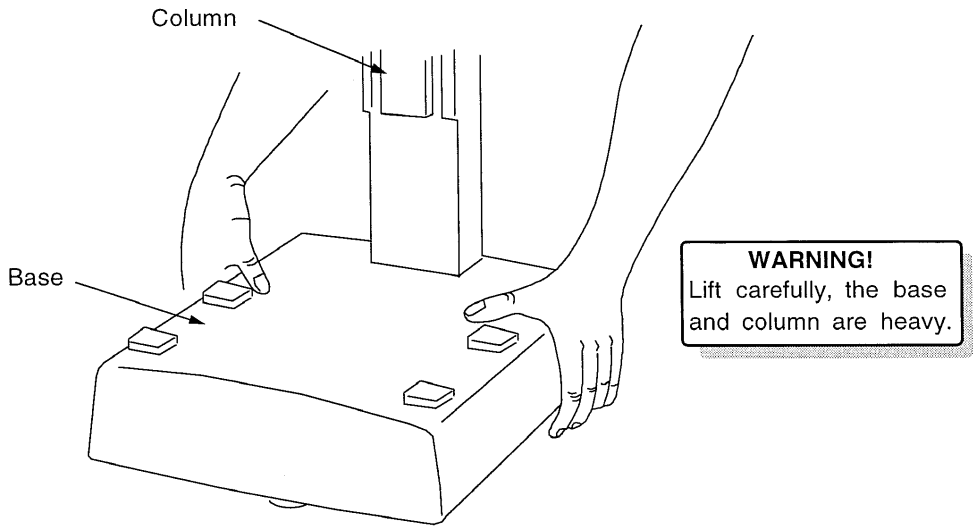


Figure 2-2 Lifting the Column and Base

1. Remove the microscope column and base assembly from the shipping box. Lift the assembly as shown in Figure 2-2. Lift carefully; the column and base weigh about 65 pounds (30 kg). Stand it upright.
2. Remove the Microscope head from the shipping box, being careful not to touch it near the objective mount area.
3. Lift the head above the column and align the dovetail of the head with the dovetail on the column.
4. Lower the head completely on to the column until it stops.
5. Holding the short end of a 5/64-inch Allen wrench, hand-tighten the two gib-screws located on the head.

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⚠ **Warning!** The Microscope head can drop under its own weight if the tension on the coarse focus wheel is not properly set.

6. If necessary, adjust the tension on the coarse focus wheel so the head doesn't drop under its own weight. To increase the tension, turn the right-hand wheel in the direction of the arrow on the wheel *while holding the left-hand wheel.*

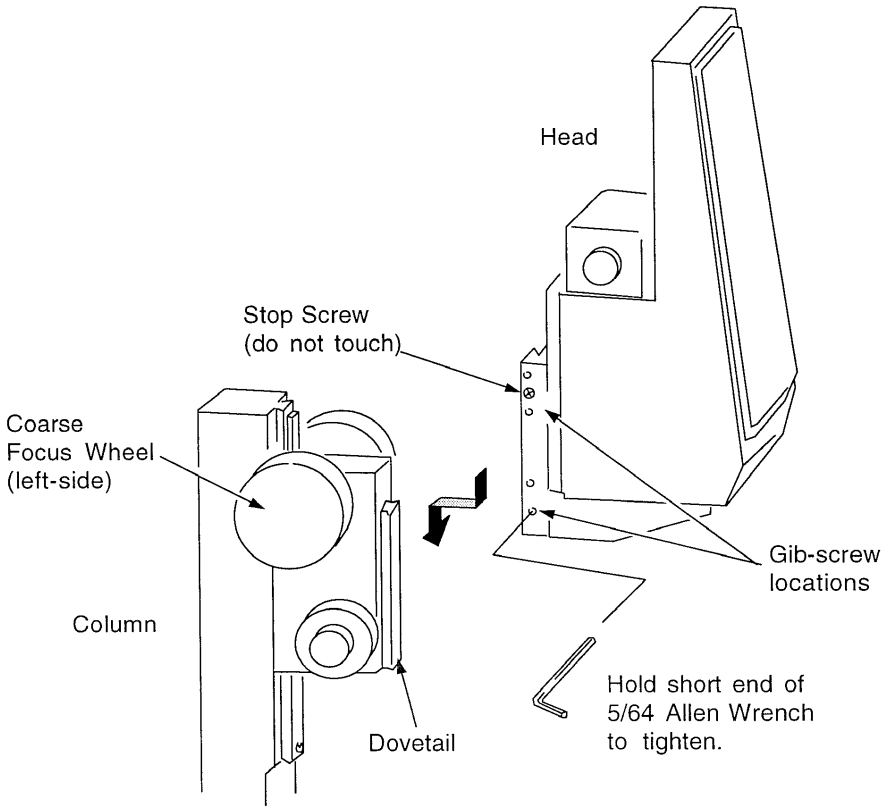


Figure 2-3 Mounting the Head on the Column

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Installing the Filter Tray

The Filter Tray slides into the slot in the Microscope head; refer to Figure 2-4. The stop locations for the focus and measure filters are indicated by detents and label on the side of the tray.

1. Unwrap the filter tray. Remove the protective tape from the side of the Microscope head covering the filter slot.
2. Slide the filter tray into the slot.

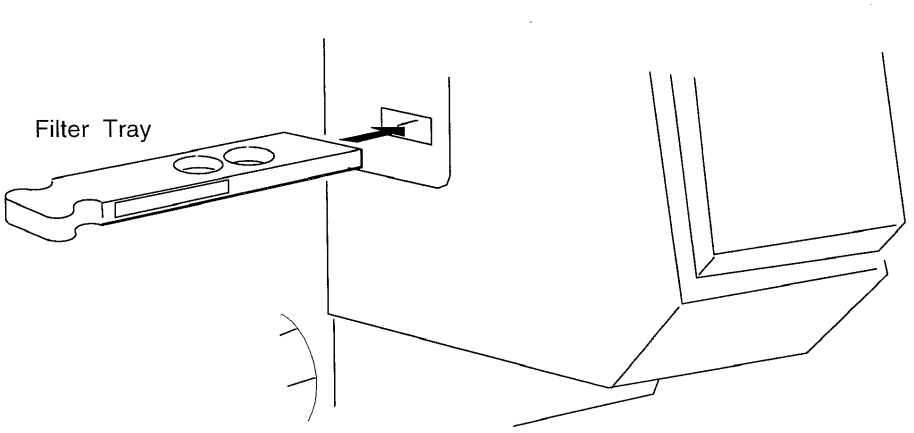


Figure 2-4 Installing the Filter Tray

Assembling the Support Stage

The parcentric stage is mounted to the Microscope base and then the X-Y stage is secured to its top; refer to Figure 2-5.

1. Place the parcentric stage on the Microscope base. Align the holes in the stage to the holes in base.
2. Place a capscrew and Belleville washer in each corner of the parcentric stage. Use a 5/32-inch Allen wrench to loosely secure each Stage mounting capscrew.
3. If you have an optional Top Plate, mount it to the X-Y stage with three M3 capscrews.
4. Align the flange in the X-Y Stage to the flange in the parcentric stage. Visually align the sides of the X-Y Stage parallel to the edges of the Microscope base. Secure the X-Y Stage in position by tightening the Stage Lockscrew.

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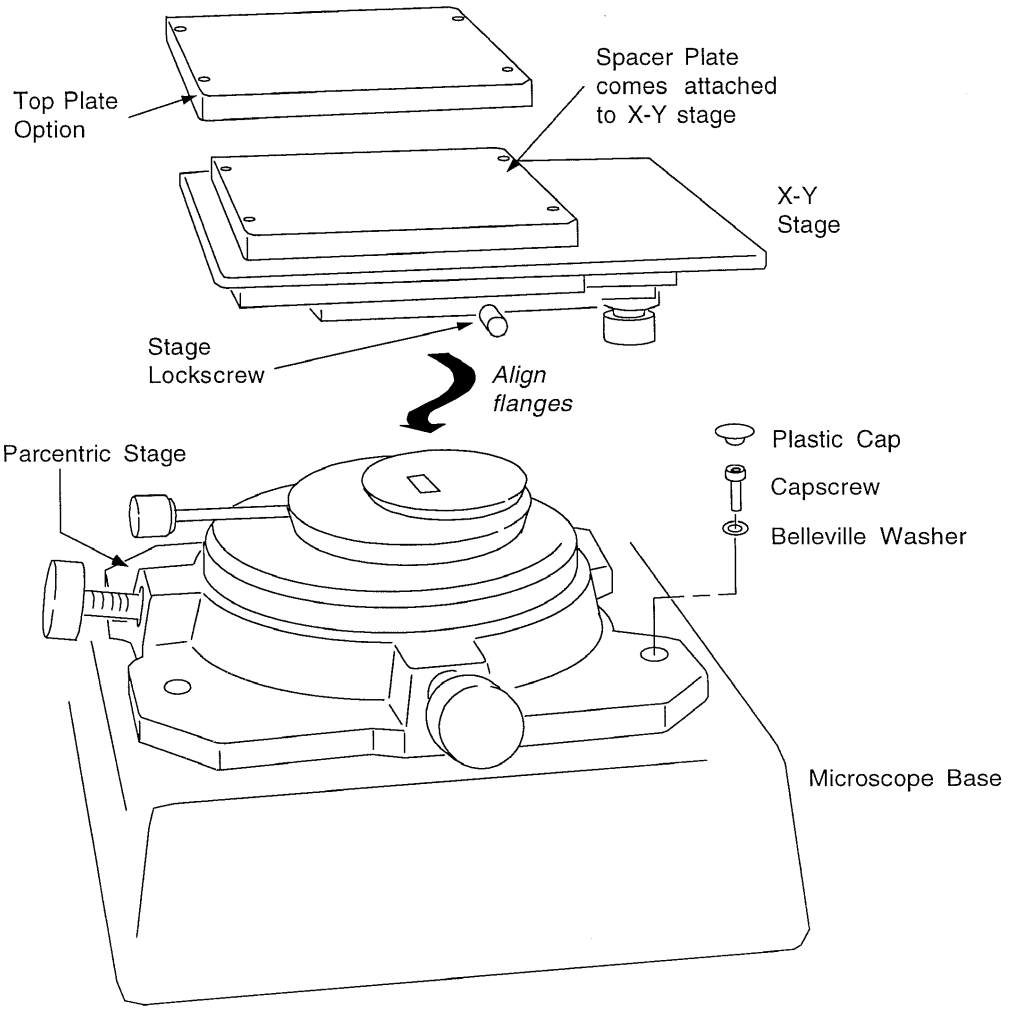


Figure 2-5 Installing the Support Stage

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Positioning Components

The recommended locations for components are shown in the following figure. The Microscope is isolated from vibrations from the working surface by the vibration isolation system. Position the Electronic Enclosure 6 inches behind the Microscope. The Video Monitor is placed on the Plexiglas monitor stand and positioned next to the Microscope, so you can see the screen and the test parts at the same time.

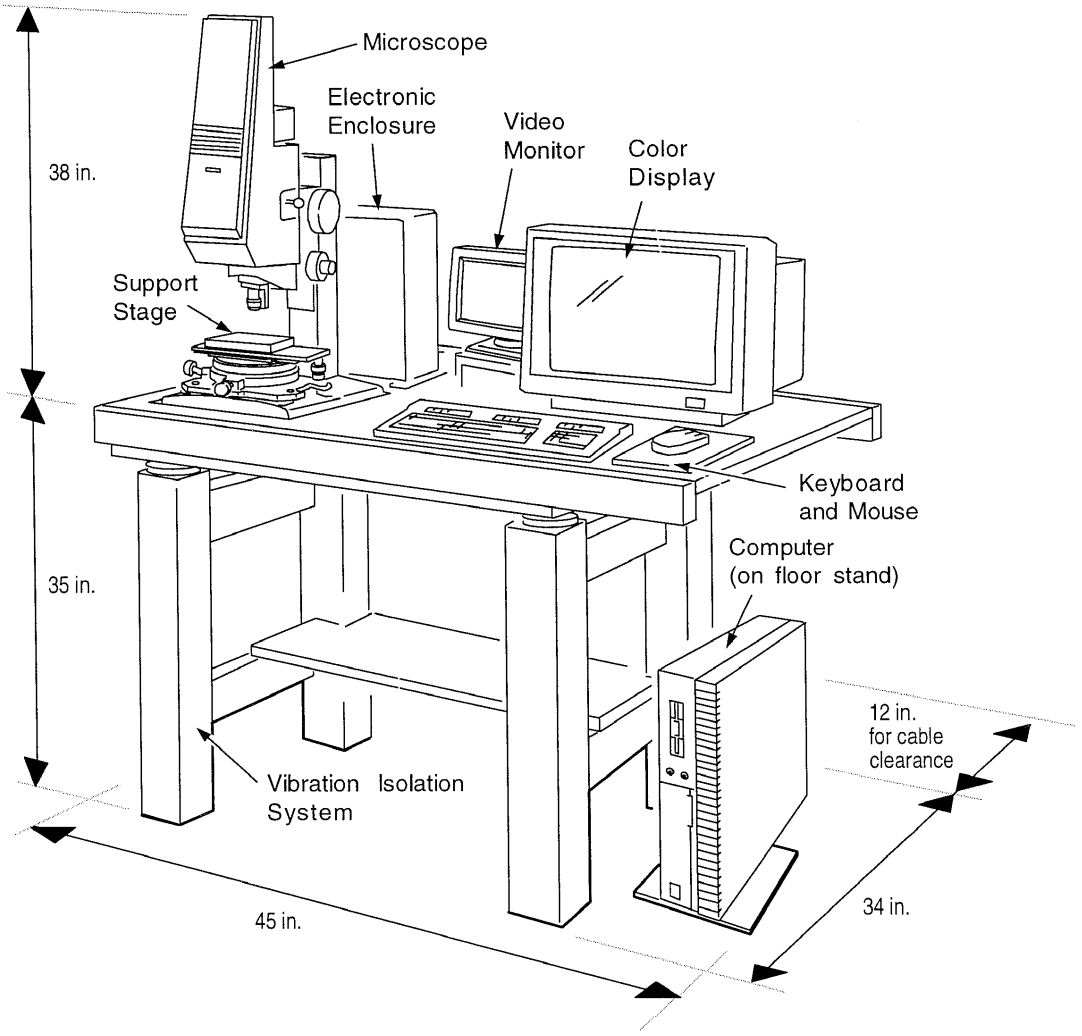


Figure 2-6 Recommended Component Layout

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Installing the PZT Assembly

1. Loosen the PZT lockscrew with a 9/64 inch Allen wrench and remove the shipping plug from the Microscope. Save the plug.
2. Align the slot in the PZT dovetail to the alignment pin on the head and slide the PZT into place. Holding the short end of a 9/64 inch Allen wrench, lightly finger tighten the PZT lockscrew.

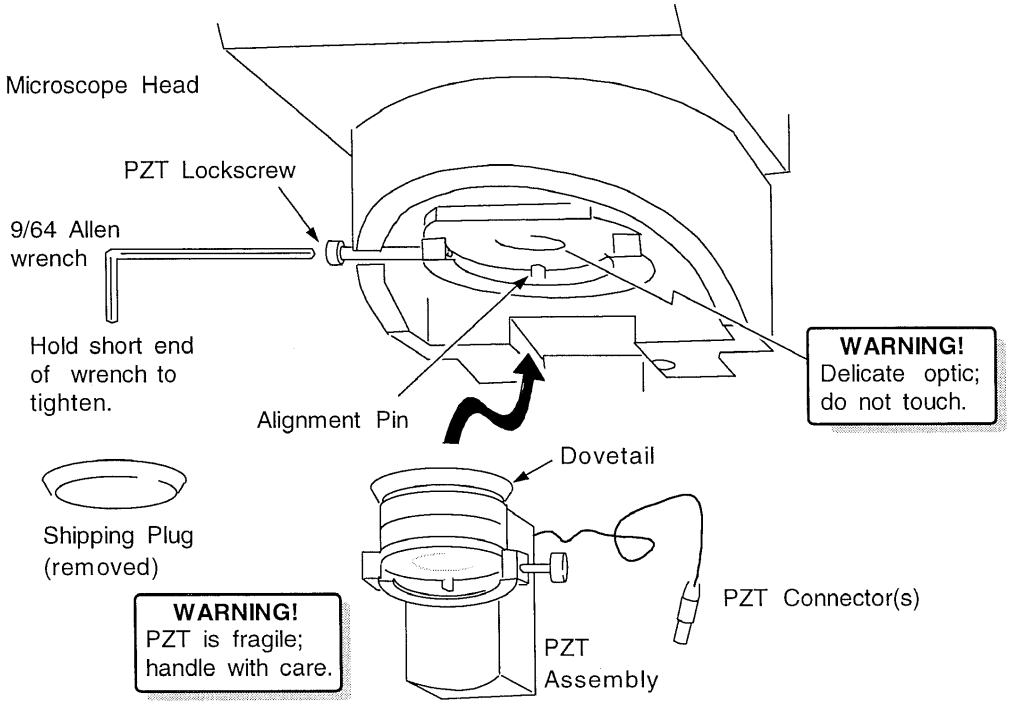


Figure 2-7 Installing the PZT Assembly

Cable Interconnection

For an HP computer running under X Windows, refer to Figure 2-8.
For a PC compatible computer running under Windows NT, refer to Figure 2-9.

⚠ **Warning!** Ensure all power is off when connecting cables.

1. Connect the cables from the Microscope head to the Electronic Enclosure matching the labels on the connectors to the labels on the Enclosure.
2. Route the cable from the PZT (Pifoc) to the Microscope column, and then to the connector(s) on the Electronic Enclosure.

   Note: Improper positioning of cables may degrade measurements. *Do not* cut the cable ties holding the cables together and *do not* remove the mesh cover around the cables.

3. Form the cables into a 'U' shaped loop between the Enclosure and Microscope.

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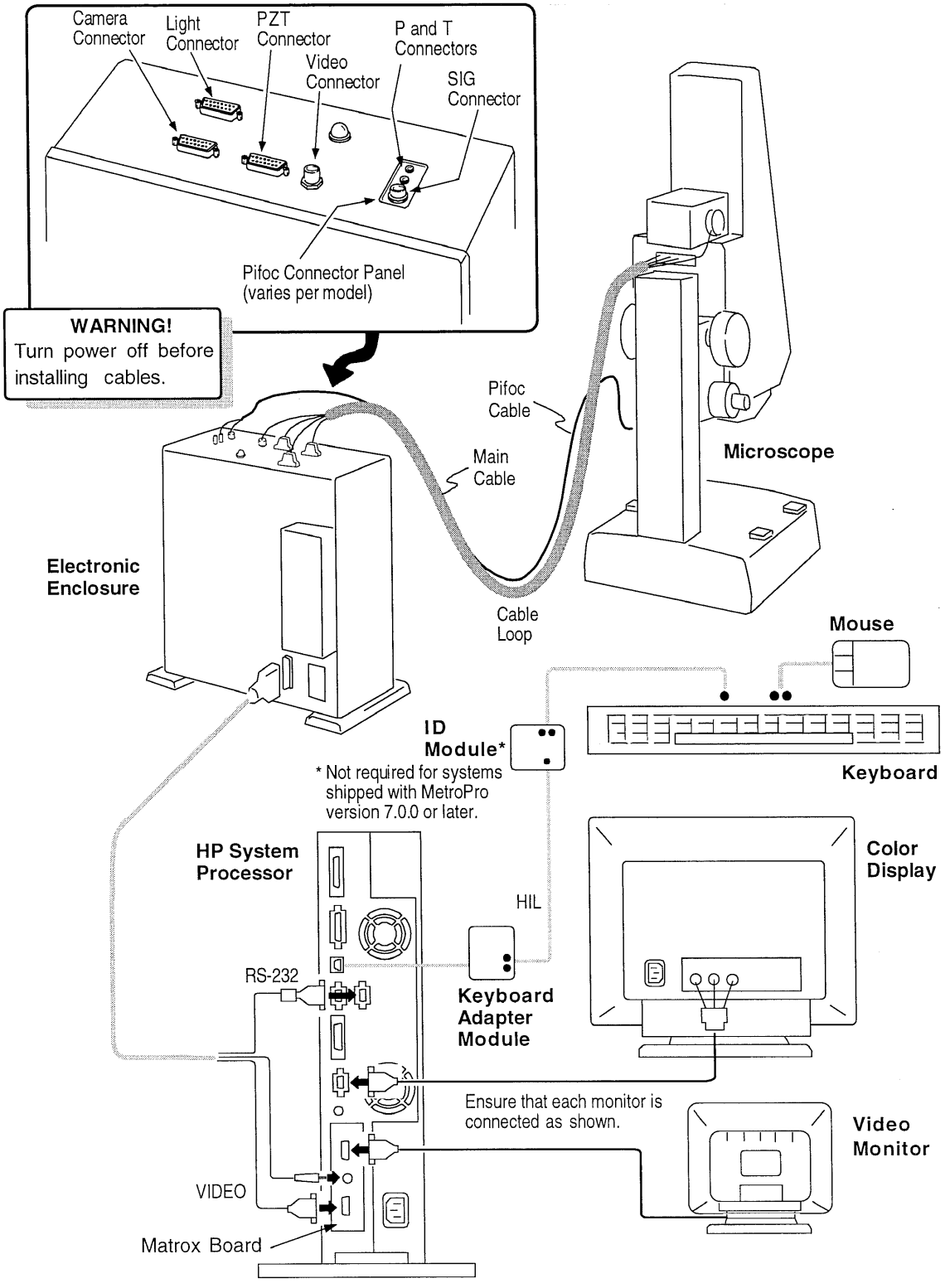


Figure 2-8 Component Connections (HP computer)

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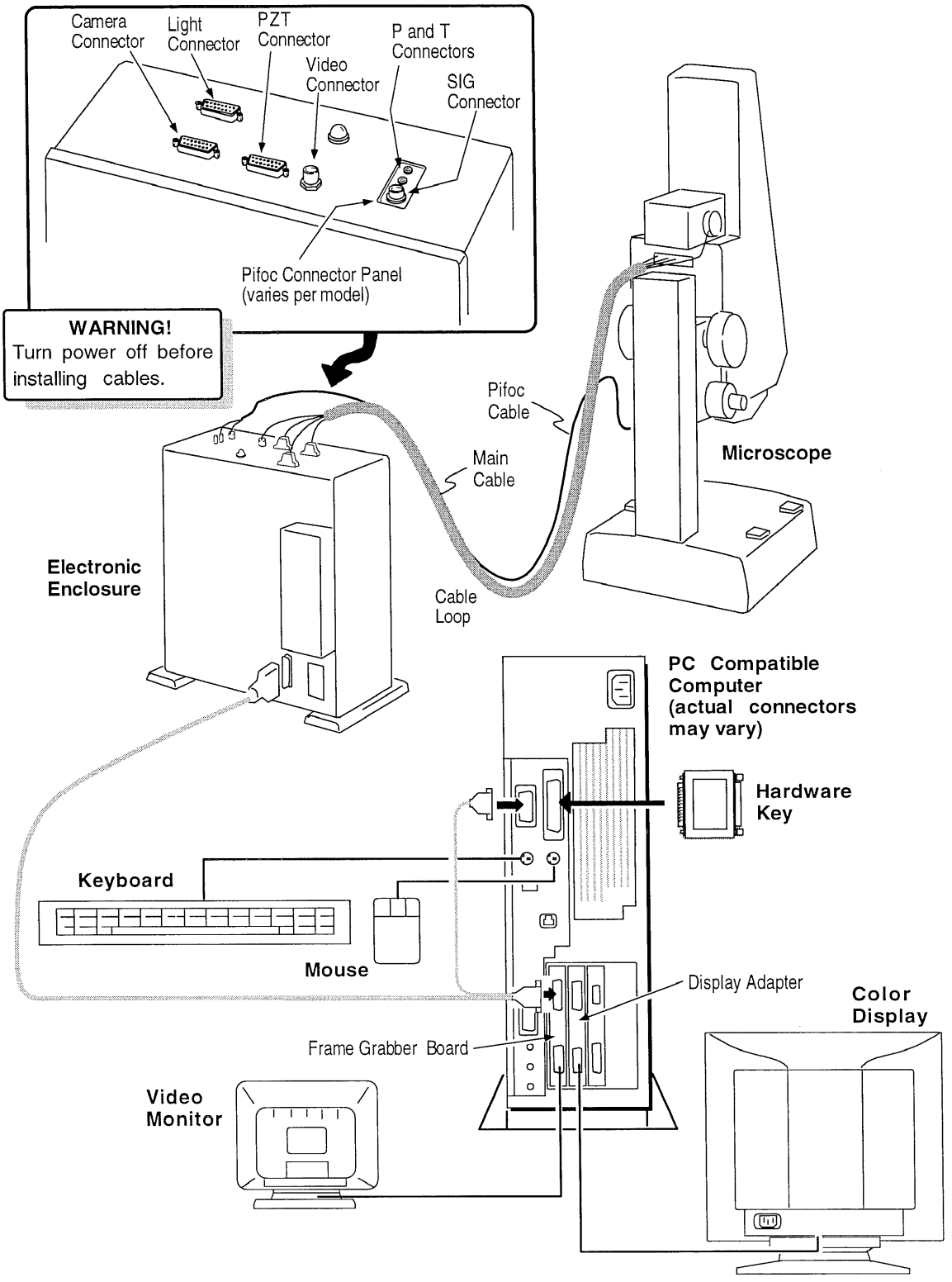


Figure 2-9 Component Connections (PC computer)

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Power Distribution

Warning! Ensure that power is off when connecting cables. The equipment is intended to be electrically grounded. It is equipped with a grounding plug to fit a grounding-type AC outlet. Ensure that the components are properly grounded through the outlet.

100V or 120V Power Distribution

A 120V, 15 amp, 5 outlet, power strip is used for power distribution. Use the power jumper cords that come with the computer components.

220V or 240V Power Distribution

All Zygo components and the computer components automatically adjust for multiple line voltages; no configuration is required. A universal, 6 amp, 4 outlet, power strip is used for power distribution; it accepts 100, 120, 220, or 240 VAC. The cords that come with the computer components are not used, as Zygo supplies the required jumper cords for use with the universal power strip. A local power cord is supplied for the universal power strip to match the plug requirement for your area.

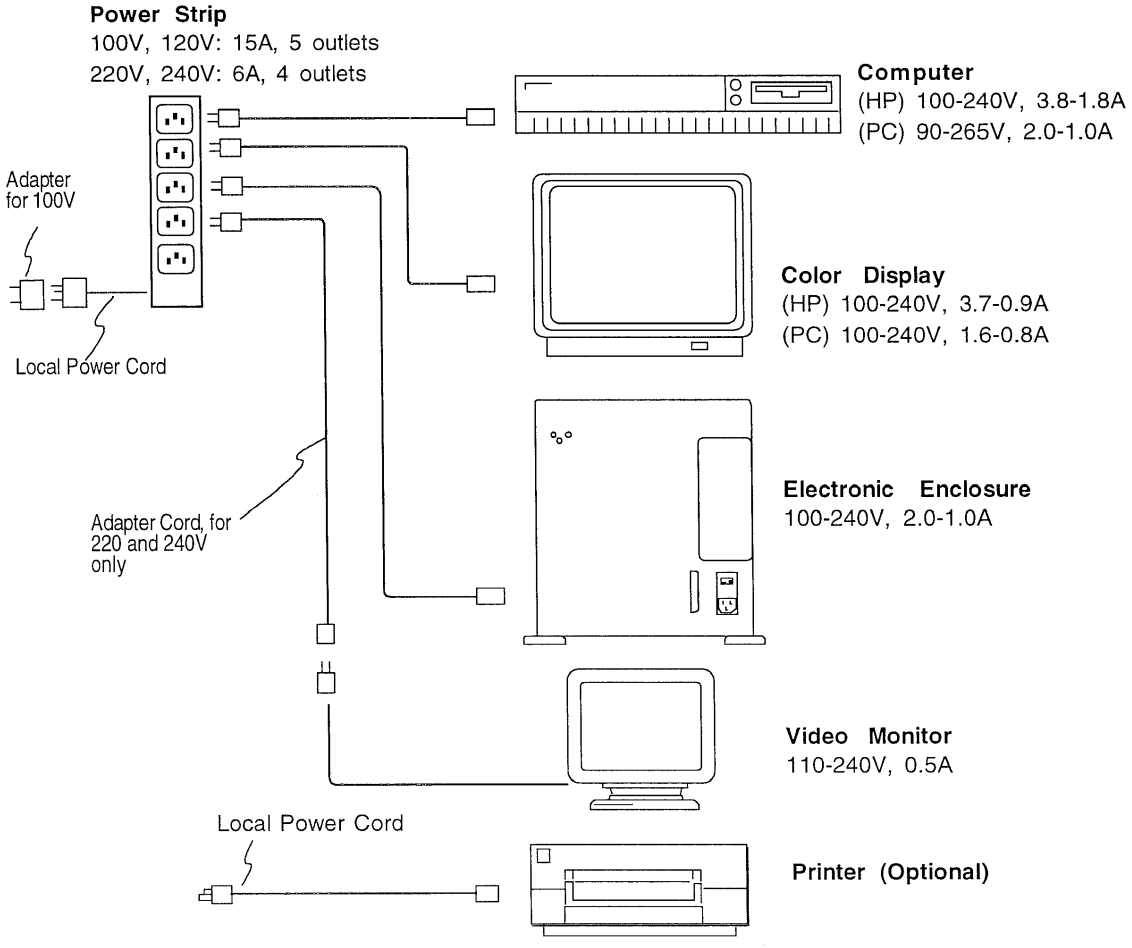


Figure 2-10 Power Distribution

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Installing MetroPro

The next step is to install the software; it is required before you can complete your installation.

1. Turn on power switches to the Computer, Electronic Enclosure, Color Display, and Video Monitor.
2. To install MetroPro, refer to the *Getting Started with MetroPro* manual. After MetroPro is installed, complete the licensing requirements as explained in the same manual.
3. Start MetroPro as explained in the *Getting Started with MetroPro* manual.

Later, after installation is complete, take some time to learn how to use the software and make the instrument do what *your* application requires.

Aligning the Lamp Bulb

The lamp bulb is factory aligned. To check and to align the lamp bulb, complete the following procedure and refer to following figure.

Note: The objective must not be in place to align the lamp bulb.

1. Position the Field Stop so the aperture is full open, and the filter tray is set to the MEAS detent.
2. Hold a small piece of paper under the Microscope head, locate it about 1/2-inch from the head.
3. Adjust the light intensity of the Microscope until a filament image is observed on the paper.
4. Adjust the filament image for best focus by loosening the clamp screw and moving the lamp housing up and down. When best focus is achieved, tighten the clamp screw.
5. Center the filament image from front to back by loosening the lockscrew and rotating the ring. When centered, tighten the lockscrew.
6. Center the filament image from side to side by turning the socket sleeve knob.

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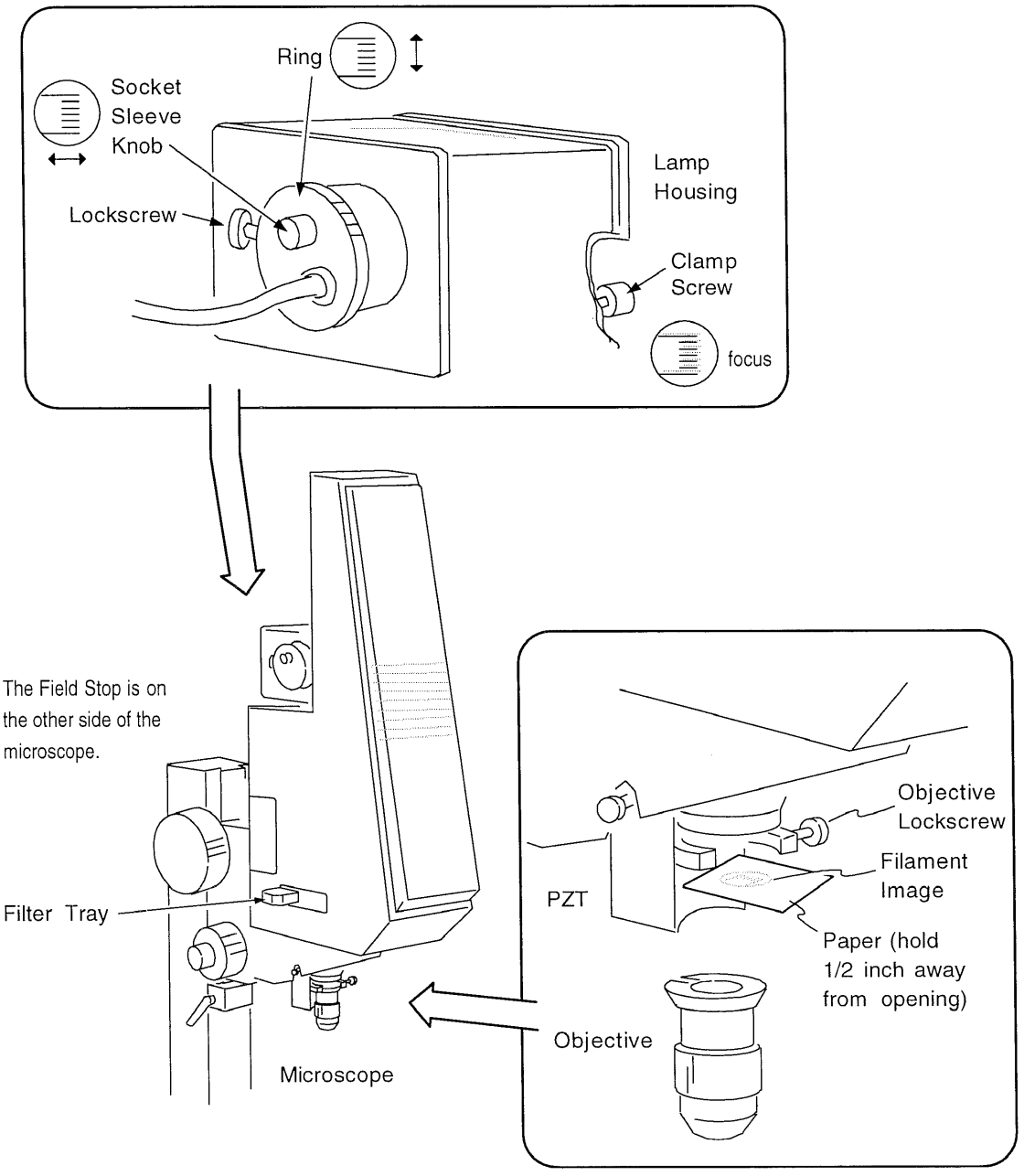


Figure 2-11 Aligning the Lamp Bulb

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Mounting an Objective

To install objectives follow the procedure below. Unused objectives should be stored in their protective cases.

> ⚠ **Warning!** Do not touch the objective lenses. Dust, dirt, and finger prints can impair the system's optical imaging and harm delicate lens coatings.

1. Remove the objective from its protective case.
2. Align the slot in the objective dovetail to the alignment pin.
3. Insert the objective and finger tighten the lockscrew.

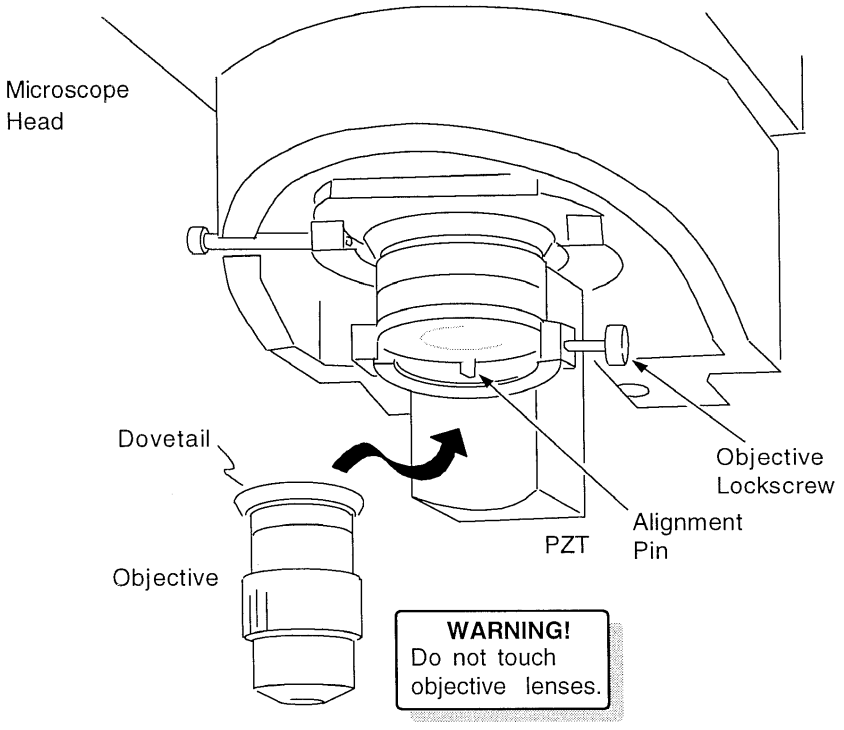


Figure 2-12 Mounting an Objective

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Aligning the Support Stage

For the Support Stage to provide parcentric tip/tilt adjustments, two alignment conditions should be met. The closer these two conditions are achieved, the easier it is to align and focus the Microscope on test parts.

- *Stage Lateral Alignment* The Stage should be laterally aligned under the objective in use to keep the part in focus as stage tip and tilt is adjusted. Two methods are provided for lateral alignment.
- *Part Height* The part surface being measured should be located 1.404 inches (35.66 mm) above the Spacer Plate mounted on the X-Y Stage to minimize the part from moving laterally in the field of view as tip and tilt is adjusted. See the following figure.

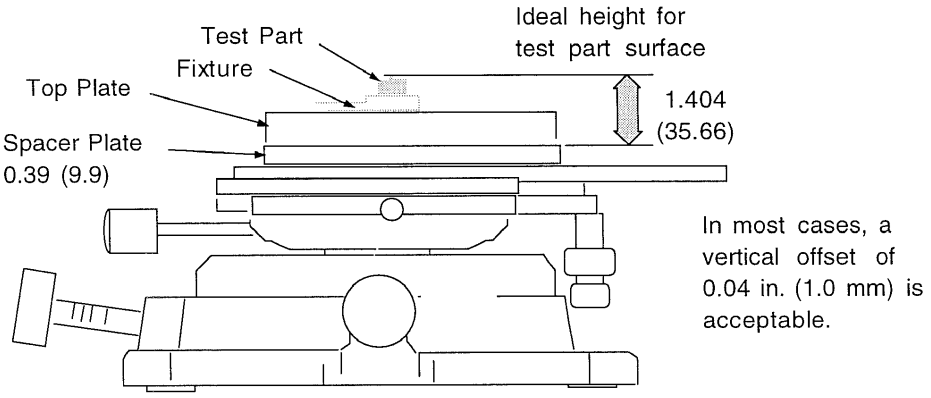
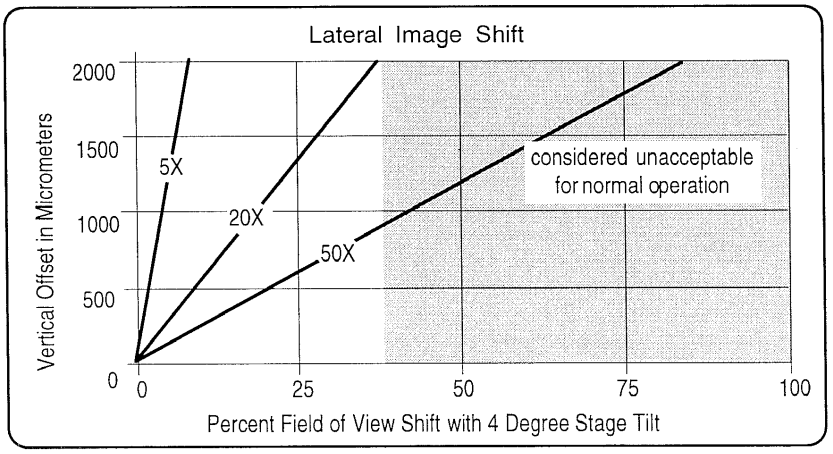


Figure 2-13 Part Height

The higher the objective magnification, the greater the impact of vertical offset in the part and stage misalignment. The impact of vertical offset is represented in the following graph.



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Stage Lateral Alignment

Two different procedures are provided; select one. The first procedure requires an alignment aid from Zygo. The second procedure is more of a trial and error process.

> **Note:** Before performing the stage alignment procedure, the instrument has to be operational and MetroPro running. You may like to review Chapter 3 before proceeding.

Method 1 - Stage Alignment using an Alignment Aid

The alignment aid is placed on the stage and the Video Monitor is observed as adjustments are made. Refer to following figure.

1. Loosen the stage lockscrew and remove the X-Y stage if it is attached to the parcentric stage.
2. Use a 5/32-inch Allen wrench to tighten the four stage mounting capscrews until they just start to compress the Belleville washers, and the parcentric stage is still movable.
3. Adjust the tip and tilt so the parcentric stage is visually level.
4. 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.
5. Slightly loosen the X-Y stage theta knob. Rotate the theta plate and observe the Video Monitor. The dot will rotate about some axis. Adjust the position of the alignment aid half the way to the center of the rotation seen on the monitor. You are done when the dot rotates about itself as the theta plate is rotated.
6. Move the stage in x and y to center the dot on the Video Monitor.
7. If the best possible stage alignment is desired, recheck the alignment following steps 5 and 6 above, but use a 20X objective.
8. Secure the Stage in position by tightening the four stage mounting capscrews and place the plastic caps over the holes.
9. Rotate the theta plate until the Theta knob is aligned parallel to the x-axis of the stage. Tighten the theta knob.
10. Reattach the X-Y stage to the parcentric stage.

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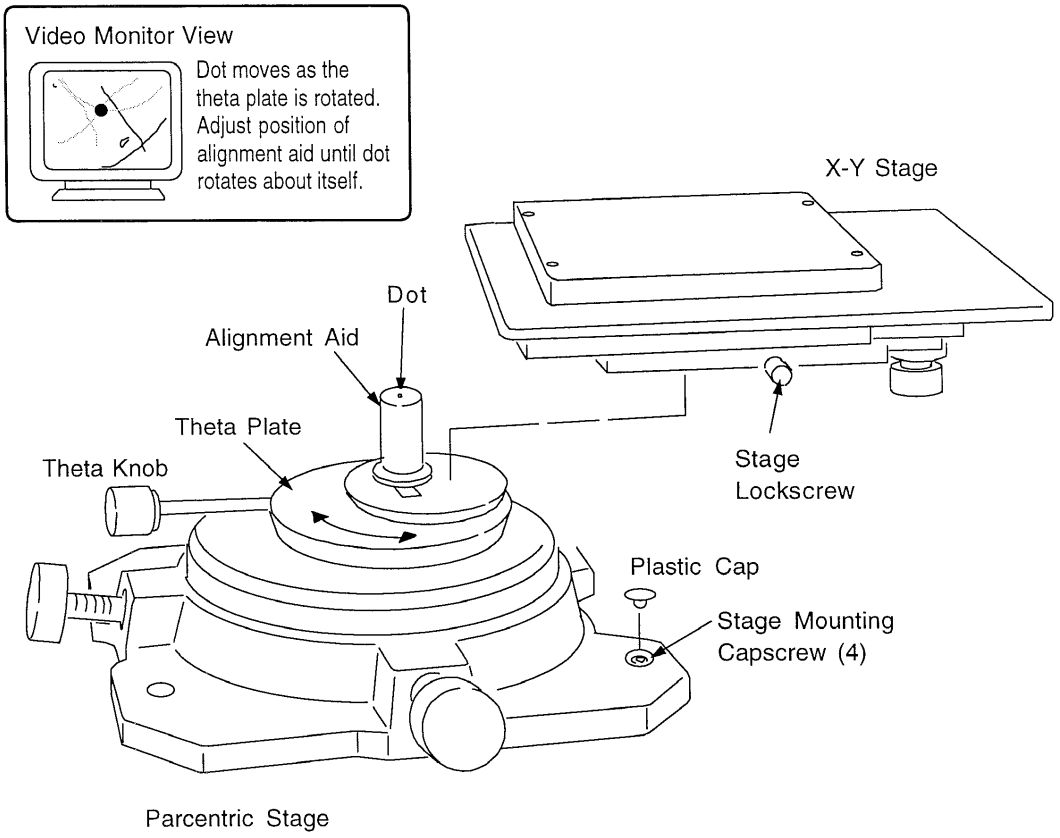


Figure 2-14 Using the Stage Alignment Aid

Alternate Method - Stage Alignment by Trial and Error

The Stage is laterally aligned by viewing a reflective part, watching the effects of the tip and tilt adjustments, and then adjusting the location of the Stage. Refer to the accompanying figure.

1. Install the highest magnification objective you plan to use. Start with a 20X objective if possible.
2. Use a 5/32-inch Allen wrench to tighten the four stage mounting capscrews until they just start to compress the Belleville washers, and the stage is still movable.
3. Adjust the tip and tilt so the X-Y Stage is visually level.
4. Place a test part under the objective, at the proper height (± 1 millimeter) as described previously. Focus on the part, achieving the best possible fringe contrast.

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5. Adjust the tip one way until the fringes become denser and then begin to fade off the Video Monitor.
6. Move the stage in the x-axis so the fringes come back onto the Video Monitor.
7. Adjust the tip in the opposite direction and repeat the procedure outlined in steps 5 and 6. Try to reach a balance between both positions. The high contrast fringes should remain after adjusting tip in either direction.
8. Repeat the techniques outlined in steps 5 through 7 to adjust tilt and move the stage in the y-axis.
9. This process is complete when the darkest fringe stays within a few fringe widths of the center of the Video Monitor when the X-Y stage is tilted.
10. Secure the Stage in position by tightening the four stage mounting capscrews and place the plastic caps over the holes.

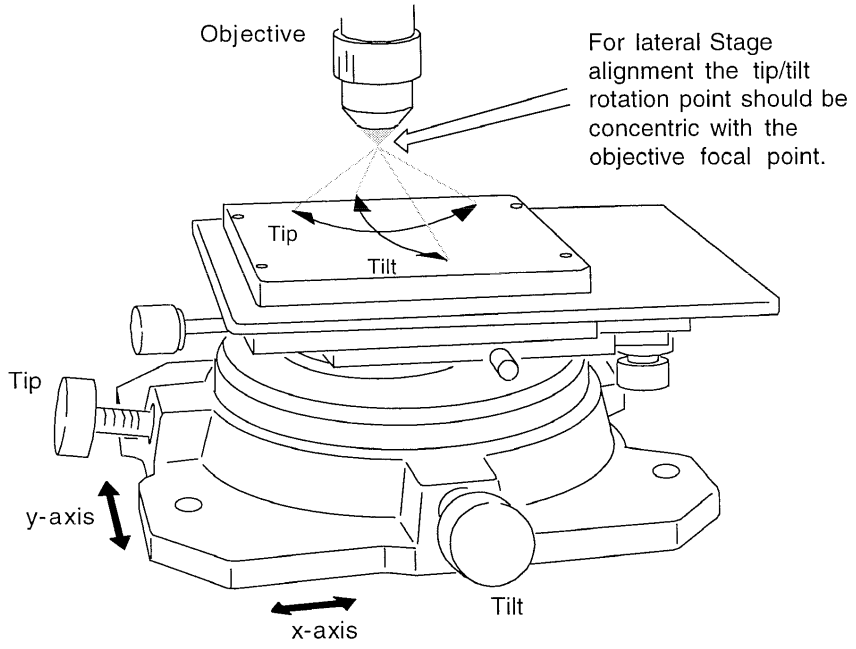


Figure 2-15 Lateral Alignment of the Motorized Stage

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Chapter 3

OPERATION

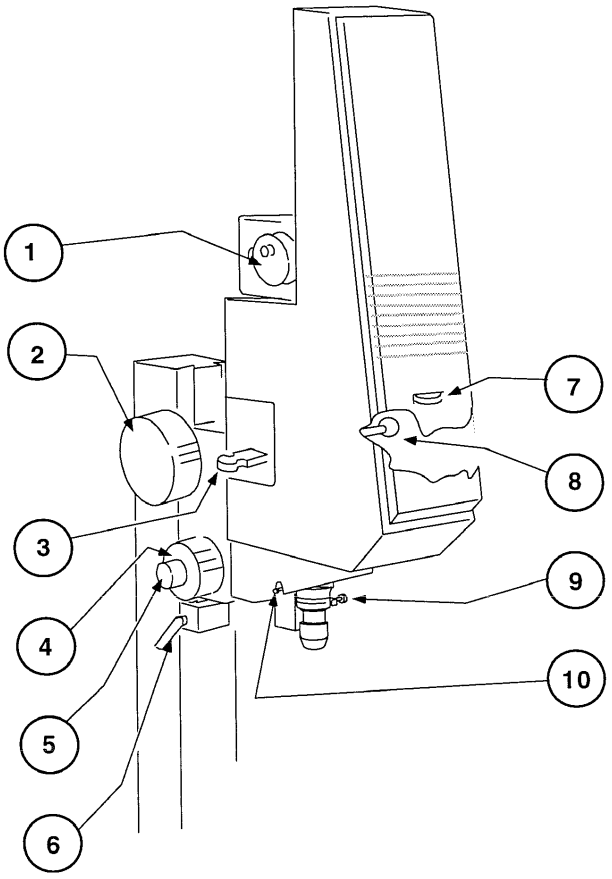
In This Chapter

- Controls
  - Microscope Controls
  - Support Stage Controls
  - Electronic Enclosure Controls
  - Video Monitor Controls
  - Light Level Controls
- Start-up
- Shutdown
- Measurement Overview
  - 1. Setup
  - 2. Focus
  - 3. Null
- Measurement Flowchart
- Operation Hints
  - Michelson Objectives
  - Use System Error Files
  - Selecting the Right Objective
  - MetroPro Controls Used Most Often
  - Technical Details: FDA Res, Scan Length, and Camera Mode

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Microscope Controls

Warning! Be careful when adjusting the Coarse Focus Wheel tension; if the tension is too loose the head can fall under its own weight. Use caution when focusing the Microscope so the objective does not contact the test part or Support Stage.



1 Light Centering Controls
Use to adjust for proper illumination and when replacing the bulb.

2 Coarse Focus Wheel
Use to move the head large distances, such as when replacing objectives or the test part; it moves the head 22 mm per turn. The wheel torque is increased by turning the right-side wheel in the direction of the arrow (→Tension) while holding the left-side wheel.

3 Filter Tray
Two position: MEAS for taking measurements, FOCUS to aid focusing.

4 Medium Focus Knob
Use for rough focusing; it moves the head 4.7 mm per turn. The knob torque is increased by turning an inner ring counterclockwise.

5 Fine Focus Knob
Use for fine focusing; it moves the head 0.2 mm per turn.

6 Coarse Z-stop
Position to prevent objective from contacting the stage or test part. It must not touch the microscope head when measuring.

7 Zoom Thumbwheel (Zoom option only)
Changes magnification, detents at 0.5, 0.75, 1.0, 1.5, and 2.0X.

8 Field Stop
Use as focus aid. Pull out to for field aperture, in to measure.

9 Objective Lockscrew
Secures objective in position. Finger tight only.

10 PZT Lockscrew
Secures PZT in position. Requires 9/64 Allen wrench.

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Support Stage Controls

1 Tip Knob
Rotates the X-Y stage about the x-axis.

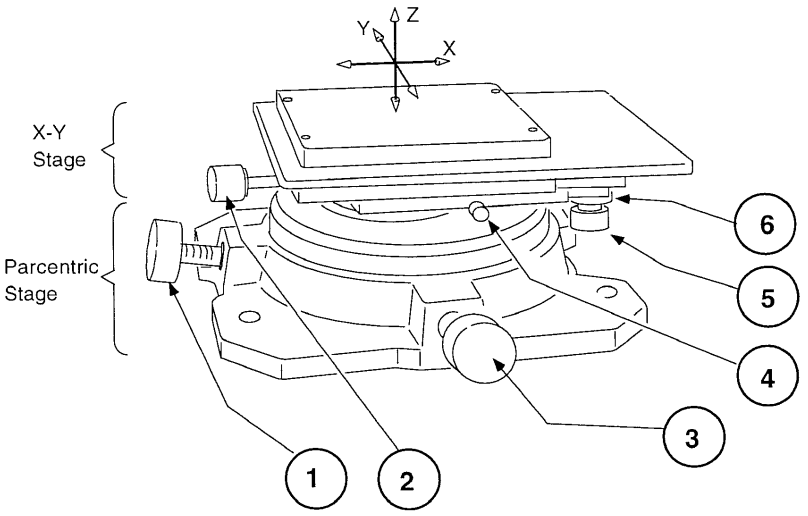
2 Theta Knob
Rotates the X-Y stage around the z-axis.

3 Tilt Knob
Rotates the X-Y stage about the y-axis.

4 X-Y Stage Lockscrew
Secures the X-Y stage to the parcentric stage.

5 X Knob
Moves the stage in the x-axis; it moves 16 mm per turn.

6 Y Knob
Moves the stage in the y-axis; it moves 30 mm per turn.

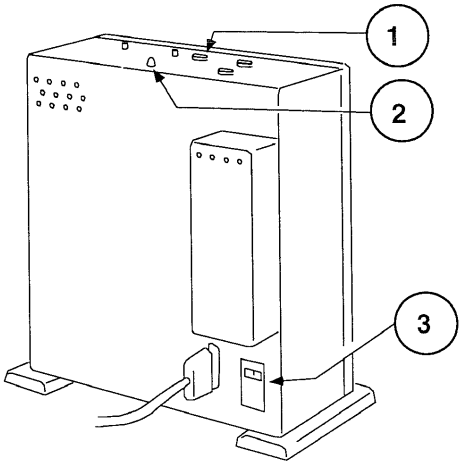


Electronic Enclosure Controls

1 Connector Panel
Provides for connection to the microscope.

2 Power On Indicator
When lit, the enclosure is receiving power.

3 Power Switch
Turns on power for the enclosure and the microscope.



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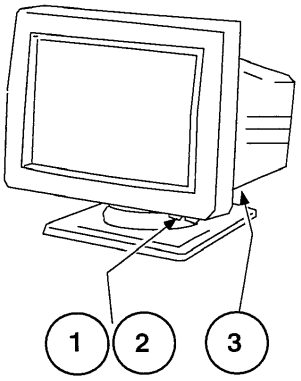
Video Monitor Controls

1 Brightness Control
Changes the intensity of the displayed image.

2 Contrast Control
Changes the tonal gradations in the displayed image.

3 Power Switch
Turns on power for the monitor.

Note: Picture will not appear if the Contrast and/or Brightness controls are turned too far in one direction.



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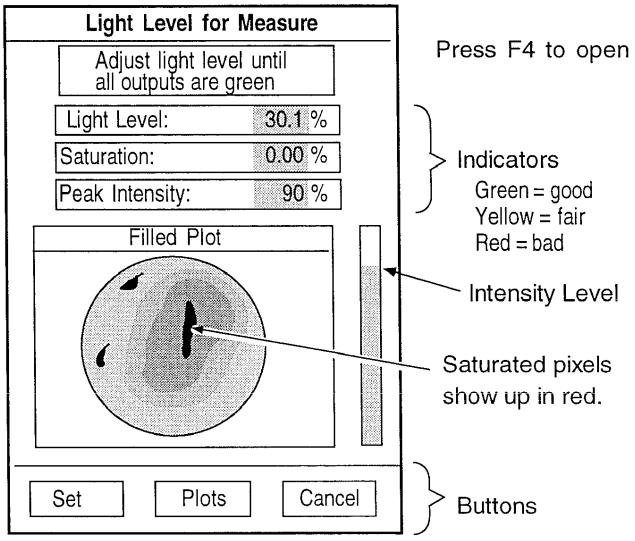
Light Level Controls

The light level for viewing the part on the video monitor and the light level for measuring are independent of one another.

Key	*Function*
F4	Open Light Level Window to manually set light level for measure.
F5	Automatically set light level for viewing.
Ctrl-F5	Automatically set light level for measure.

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.
4. Click the Set button or press [Return] to change the light level for measure. To cancel light level adjustment, click the Cancel button or press the [Esc] key.



Light Level Keys

These keys adjust the viewing light level for the instrument. To set the light level for measure, use the Light Level window, press Ctrl-F5 for automatic control, or enter a value in the Light Level Pct control.

Key	*Function*
* /	Coarse up and down.
+ -	Fine up and down.
1 2 3 ...	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.

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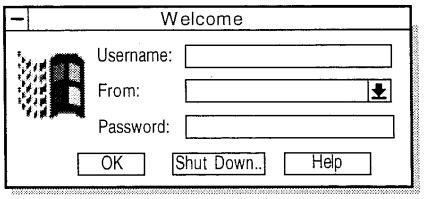
Start-up

1. Turn on the Electronic Enclosure, and Video Monitor. Wait about 15 seconds.
2. Turn on the computer and color display.
3. *Running on a PC (Windows NT):*
   After the welcome message appears, press Ctrl-Alt-Del to log on. In the Welcome dialog box type a username and password. If you do not have a username, enter "zygo" and press [return].
   Locate the MetroPro program icon and double-click it.

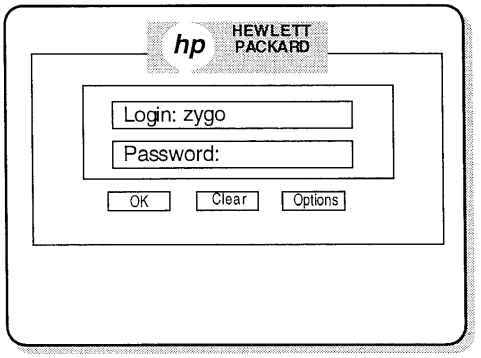
OR

4. *Running under UNIX (X Windows):*
   After the Login Screen appears, type "zygo" after the Login and press [return].

Windows NT Log on



UNIX (X-Windows) Login



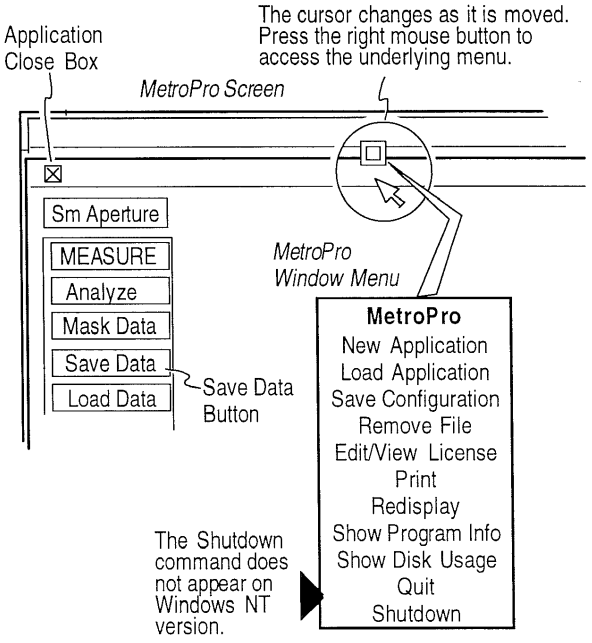
Shutdown

1. Save data and other files.
2. *Running on a PC (Windows NT):*
   Close open applications by clicking the close box in the upper left corner. Press and hold the right mouse button; choose Quit from the MetroPro Window menu. Select the Window's Shutdown command.

OR

3. *Running under UNIX (X Windows):*
   Select the Shutdown command from the MetroPro Window menu. Wait for the "halted message.."
4. Turn off all components.

Sample MetroPro Screen

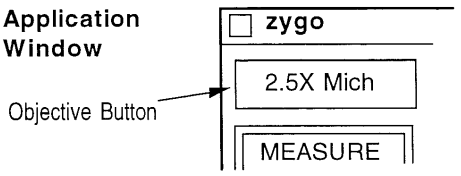


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Measurement Overview

Details on microscope setup, focusing, and nulling are provided over the next few pages.

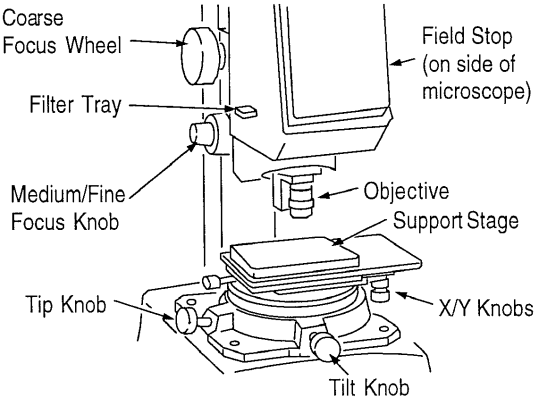
1. Power-up the instrument, start MetroPro, and click the application icon to open it.
2. Click the Objective button until it displays the objective in use.
3. Place the test part on the support stage under the objective. Position the objective at its working distance from the part. *Don't crash the objective into the part or the stage.*
4. Position the Field Stop so the aperture is in place, and put the filter tray to FOCUS. Press the **F5** key to adjust the viewing light level. Focus the microscope for a sharp aperture image; there should be visible fringes.
5. If there are not visible fringes, adjust for tilt in the part. To do this, press the F4 key to open the Light Level View window, adjust the stage tip and tilt until the intensity readout is maximized, and press [Return] to close the window.
6. Adjust the stage to center the area of interest in view. Place the filter tray to MEAS, press **Ctrl-F5** to adjust the measure light level. Refocus for high contrast fringes and sharp aperture.
7. Position the Field Stop to just larger than the field of view. Fine-tune focus and stage tip and tilt for surface detail, to null or minimize the number of fringes, and to center the darkest fringe.
8. Press the **F1** key or click the MEASURE button to measure.



Objective Working Distance (in mm)

2.5X	5X	10X	20X	50X
10.3	9.3	7.4	4.7	3.4

Microscope Controls



Typical microscope shown, actual controls may vary.

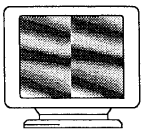
Sample Video Monitor Images



Flat Surface - minimize number of fringes, center darkest fringes.



Spherical Surface - center the fringe pattern.



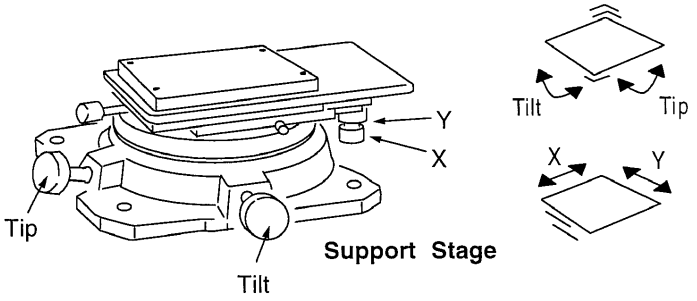
Stepped Surface - position fringes at right angle to step.

Note: Part must be in focus with fringes to measure.

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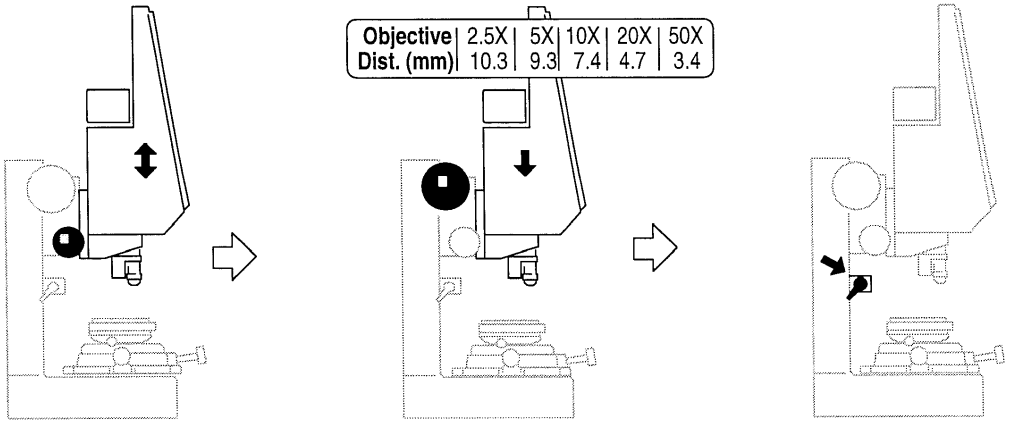
1 Setup

Part Setup



1. Adjust tip and tip to level stage.
2. Adjust X and Y position to locate part under objective.

Microscope Setup

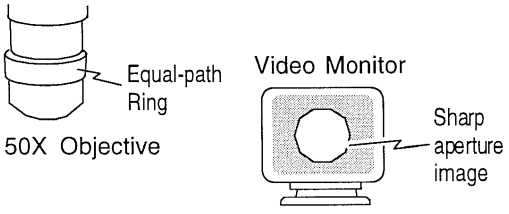


1. Turn Medium Focus knob to position microscope head in the center of its travel.
2. Turn Coarse Focus wheel to position objective at its working distance from the test part.
3. Position Coarse Z-stop to stop objective from crashing into the test part or stage. The Z-stop must not contact the microscope head.

50X Objective Setup

The 50X objective is sensitive to temperature changes. For maximum performance the equal-path ring must be adjusted under the actual operating conditions.

1. Close the Field Stop.
2. Adjust light level for even lighting.
3. Turn equal-path ring for sharp aperture.



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2 Focus

1. **Set software controls.**
   Set the *Scan Length* control to a length slightly greater than the peak to valley height in the test part. Click the *Objective button* until it displays the objective in use.

2. **Set the controls to starting point.**
   - Close the Field Stop.
   - Place the filter tray to MEAS.
   - Turn focus controls to position the objective at its working distance from the test part.
   - Press F5 to adjust viewing light level.

3. **Adjust coarse focus**.
   - Turn the Medium and Fine Focus knobs to bring the brightness into the center of the aperture.
   - Press F5 again.
   - Adjust focus for sharp aperture, surface detail, and fringes.

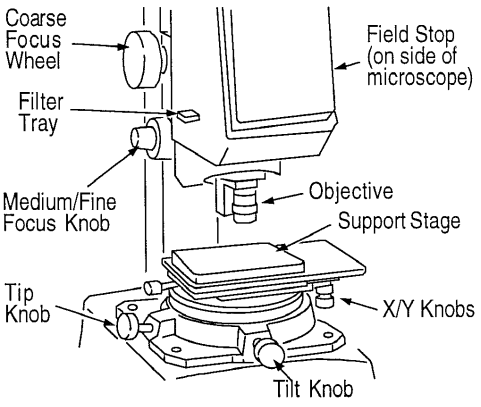
   Note: For 2.5X and 5X objectives only. If you can't see fringes, try setting the filter to FILTER.

4. **If no fringes, adjust stage tip/tilt**.
   - Press F4 to open the Light Level View window.
   - Adjust stage tip and tilt to maximize the intensity readout.
   - Click Done to close the window.

5. **Adjust fine focus**.
   - Position Field Stop to just larger than the field of view to minimize scatter.
   - Place the filter to MEAS.
   - Press Ctrl-F5 to adjust measure light level.
   - If necessary, adjust the stage X and Y position to locate the area of interest under the objective.
   - Adjust fine focus for visible fringes.

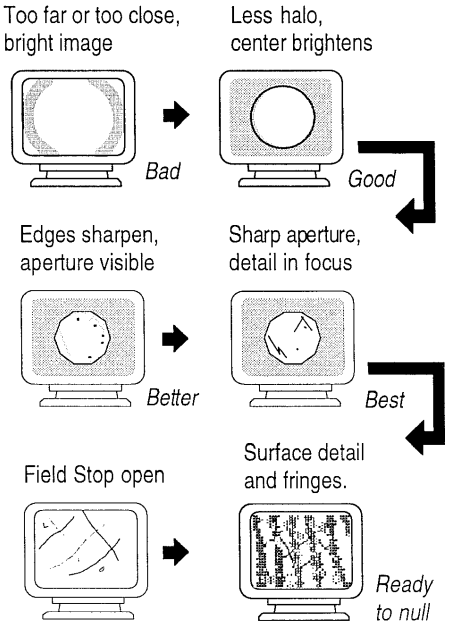
Important - Null Fringes !! *See next page.*

Microscope Controls



Typical microscope shown, actual controls may vary.

Video Monitor Images



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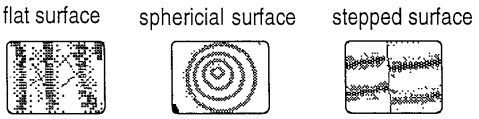
3 Null

Nulling means to minimize the number of fringes; it varies depending on the shape and roughness of the test surface. *Fringes* are the various light and dark bands produced by the interference of light.

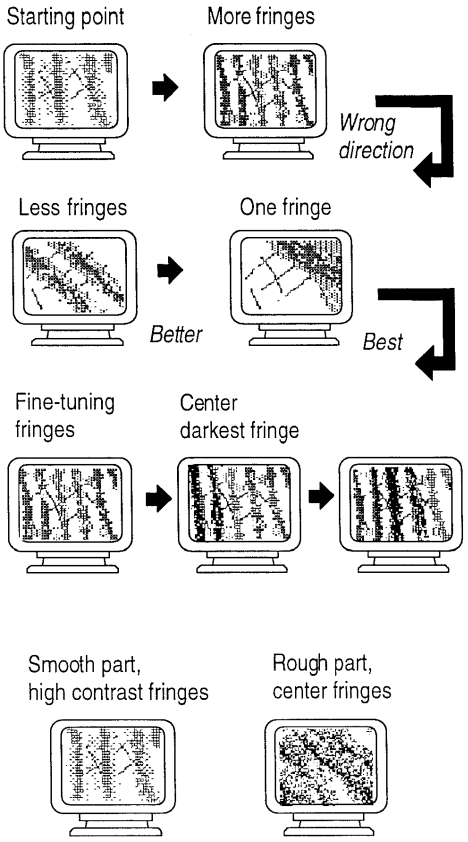
Note: The fringes vary depending on the part surface being measured.

For flat surfaces, reduce the number of fringes to as few as possible.
For spherical surfaces, center the fringe pattern.
For stepped surfaces, fringes should be positioned at right angles to the step.

Fringe Patterns of Different Surfaces



Video Monitor Images



1. **Adjust coarse null**.
   - Adjust state tip and tilt to minimize the number of fringes.
   - Readjust focus and part positioning if needed.

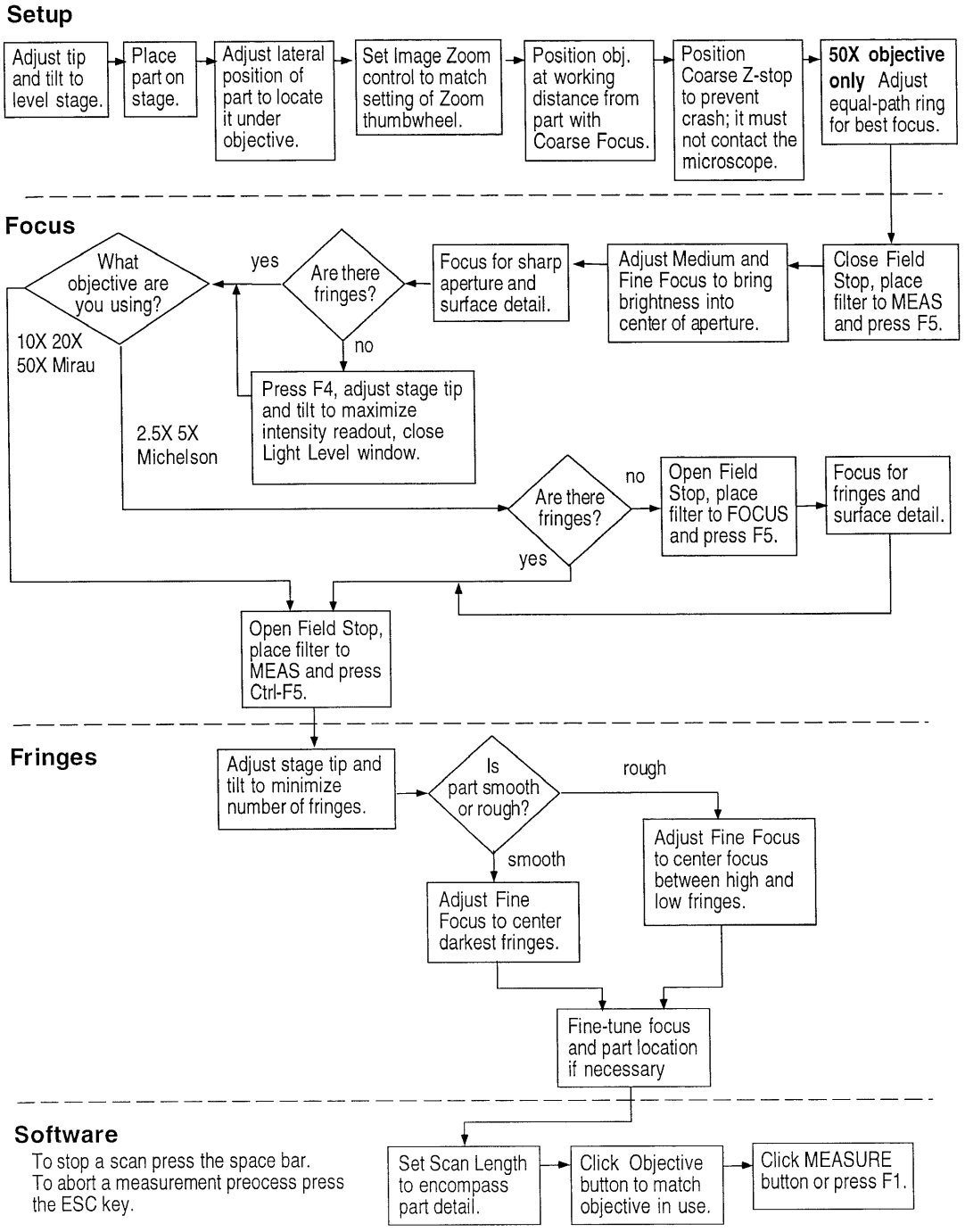
2. **Adjust fine null**.
   - Continue to fine-tine stage tip and tilt to center the darkest fringe.
   - For smooth parts, adjust the focus for high contrast fringes.
   - For rough parts or parts with steps, center the focus between the high and low fringes.

Measure - Press F1

Note: During the measurement cycle, the video monitor displays an image of the test part. The image may be displayed full screen or smaller (in which case, it is the capture size). This is normal.

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MEASUREMENT FLOWCHART



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OPERATION HINTS

This following pages provide useful hints for using the NewView efficiently. This section includes:

- Using System Error Files
- Selecting the Right Objective
- Using Michelson Objectives
- MetroPro Controls Used Most Often
- Technical Details: FDA, Scan Length, and Camera Mode

Using System Error Files

To eliminate optical artifacts and obtain optimum performance, create a system reference file for each objective and subtract this file from each measurement. Note that if the objective is taken out and put back in, or if the reference leg of Michelson objective is rotated, that the error file must be remade. Refer to the Zygo *Microscope System Error Application* booklet, OMP-0361.

Selecting the Right Objective

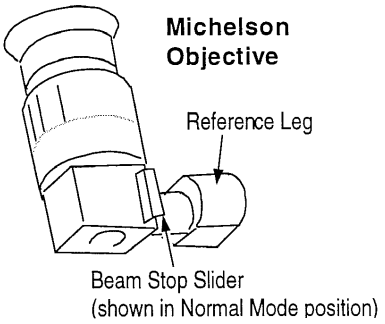
Its up to you to determine what parameters of the test sample you want to measure and then select the best objective for that task. Here are some considerations:

- *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 measure 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 a part that may be difficult to focus with a low power objective.
- *See page 1-10 for Objective Specifications.*

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Using Michelson Objectives

The Michelson objectives have a right-angle reference leg with a beam stop slider. For normal focusing and measuring, the beam stop slider *must* be all the way in. Pulling the beam stop slider out to the detent blocks a reference beam. The beam stop slider provides for two modes of operation - Normal or Focus Aid.

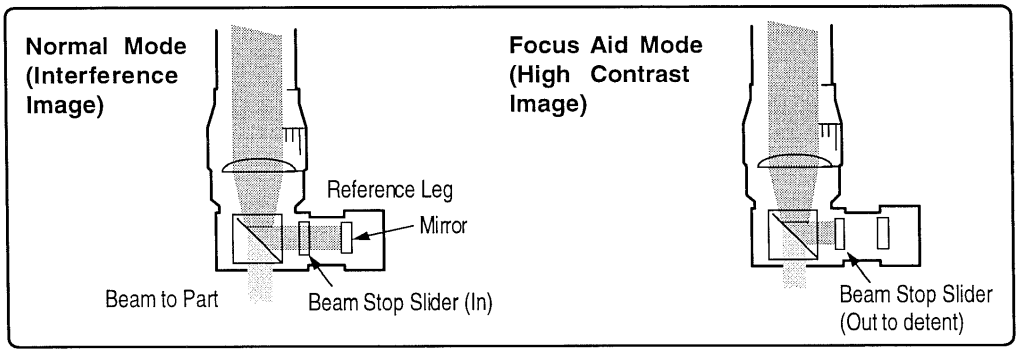


Note: If the beam stop slider is removed, dust may enter into the objective and impair its performance.

Normal Mode Beam stop slider IN. This permits a reference beam to reflect off an internal reference surface and provide an interference image with fringes. Fringes are required in order to measure.

Focus Aid Mode Beam stop slider OUT to detent. The reference beam is blocked from reaching the reference surface. This makes the instrument act like a standard microscope and enhances surface detail imaging. This serves as an advantage when focusing on a low reflective part or a part with little surface detail. After the part is in focus, push the beam stop slider back in before measuring.

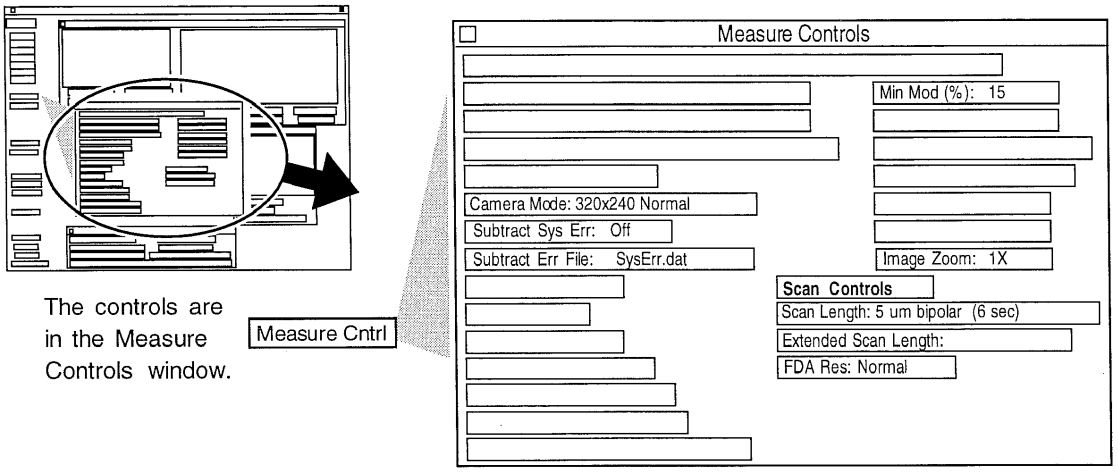
Note: If fringes can not be obtained, check that the beam stop slider is in.



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MetroPro Controls Used Most Often

MetroPro Microscope Application Screen



The controls are in the Measure Controls window.

Measure Cntrl

Camera Mode

Camera Mode selects the effective camera size in pixels. More pixels resolve smaller details, but increase processing time. The choices vary per microscope configuration. Click to change.

Subtract Sys Err

Subtract Sys Err activates the a error correction function. Subtracting system errors is useful for all measurements to subtract instrument aberrations during the analysis cycle.

Sys Err File

Specifies the name of a data file to subtract. System error files should be made for each objective and each time the objective is installed.

Min Mod (%)

Min Mod (%) specifies the minimal percentage of full modulation for each camera pixel to be accepted as a valid data point. Lower the setting when there are data dropouts and the roughness looks okay. Click to enter a numeric value.

Image Zoom

Microscopes with image zoom option. Image Zoom should be set to match the setting of the microscope's zoom thumbwheel. This ensures proper lateral resolution.

Scan Length

Scan Length selects the length of the scan. The choices are: 5, 10, 20, 40, and 100 µm. Select the shortest length that encompasses the details you are measuring. Click to change.

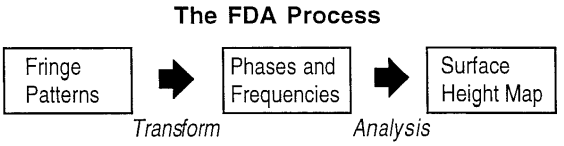
FDA Res

FDA Res selects the resolution used during analysis. Use the Normal setting when measuring rough surfaces. Use the High setting when measuring smooth surfaces and steps. Click to change.

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Technical Details: FDA Res, Scan Length, and Camera Mode

Frequency Domain Analysis (FDA)



The NewView is a scanning white-light interferometer that uses frequency domain analysis (FDA) to generate quantitative 3D images of surfaces. FDA is a mathematical method for processing complex interferograms in terms of phases and spatial frequencies. FDA transforms data to the frequency domain, where it is analyzed to calculate surface height.

The objective is mechanically scanned to generate a sequence of interferograms, which are transformed to get phase information. Fourier Analysis is used to extract a range of phases for each color or wavelength in the spectrum of the white-light source. The source spectrum together with the corresponding phases is a frequency domain representation of an interferogram. The particular combination of phases found by FDA uniquely defines the surface height map.

In traditional, single-wavelength, phase shift interferometry, the interference pattern is transformed into a matrix of phase values with an algorithm, such as the "five-bucket" method. With FDA, it is as if the five-bucket algorithm is applied for every one of the wavelengths in the source spectrum. The resulting phase measurements would be different for each wavelength. Having this type of data resolves the slope 2π ambiguity problem common to single-wavelength, phase shift interferometry.

The essential idea behind FDA is that it examines interference phase, not the original intensity data measured by the detector. To change intensity data to the frequency domain, the data is transformed using a Fast Fourier Transform. Distance is calculated by determining the slope of the line showing the rate of change of interferometric phase with spatial frequency. The NewView uses a simple linear least-squares fit to several phase values having high signal-to-noise ratio. The final distance calculation is done in either one of two ways, depending on whether or not a phase offset is included.

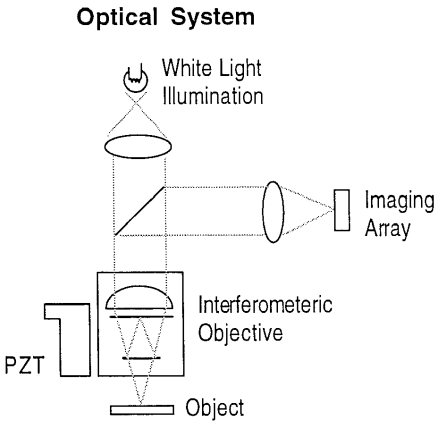
The FDA Res control determines the resolution of the analysis. The Normal mode uses only the least-squares slope result and is recommended for rough surfaces (greater than 75 nm R_a). The High resolution mode makes use of all of the available information for maximum precision.

Scan Length

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.

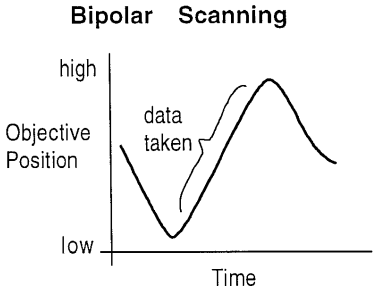
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The data acquired in this way consists of an array of interferograms, representing the variation in intensity as a function of scan position. The interferograms stored in the computer are individually processed by FDA, and the final step is the creation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



The 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.

The NewView uses a bipolar scan; it starts in the center of the scan envelope and moves the objective down and then up. During the upward scanning of the objective data is collected. Because data is collected in this manner, the microscope 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.



Camera Mode

The Camera Mode control selects the resolution of the measurement. The selections vary depending on the NewView model. The Camera Mode 640 x 480 Normal selection is only available with the NewView "CHR" model. Details on the Camera Mode control are shown in the following table.

Camera Mode Setting	Max. Pixels	Aperture	Pixel Spacing µm	Scan Speed µm/sec
320 x 240 Normal	76,800	full	22	2
160 x 120 Normal	19,200	full	44	2
320 x 240 Fast	76,800	limited*	22	4
160 x 120 Fast	19,200	full	44	4
320 x 240 Zoom	76,800	limited*	11	2
640 x 480 Normal	307,200	full	11	0.5

* If the "Cannot keep up with frame grabber" error message appears, try limiting the measurement area by creating an Acquisition mask with the Mask Editor in MetroPro.

Table 3-2 Camera Mode Details

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Chapter 4

MAINTENANCE AND TROUBLESHOOTING

In This Chapter

- General Care
- Maintenance and Service for Computer Components
- Maintenance and Service for the NewView
  - Cleaning of External Surfaces
  - Changing and Aligning the Lamp Bulb
  - Cleaning Optics
  - Oiling the Microscope Column
  - Replacing the Fuse in the Electronic Enclosure
- Returning Equipment to Zygo
- Packing and Shipping Suggestions
- Troubleshooting Guide

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 cleaning solution.
- *Handle Objectives Carefully*
  Objectives are precision optics. Handle objectives only when necessary. Keep unused objectives stored in their protective containers. Do not clean objectives unless you have experience cleaning optics.
- *Handle the PZT (Pifoc) Carefully*
  The PZT is a precision translation stage. Handle only when necessary. Remove the PZT if shipping the Microscope.
- *Don't Take Things Apart*
  Do not attempt to dismantle optical parts or repair circuit boards since system performance may be impaired. Do not remove the Microscope head cover, there are no user-serviceable internal parts.
- *Contact Zygo Customer Support Center or Your Zygo Representative*
  Call Zygo or your zygo representative if you have questions or problems.

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MAINTENANCE AND SERVICE FOR COMPUTER COMPONENTS

Refer to the original manufacturer's documentation for maintenance information for the computer components, which includes the computer, color display, mouse, keyboard, and any accessories, such as a printer.

If you are experiencing problems, but are not sure what is at fault, contact Zygo.

MAINTENANCE AND SERVICE FOR THE NEWVIEW

NewView components require minimal upkeep. Maintenance items are listed in the following table. For details, refer to the sections that follow the table. Recommended spare parts are listed in Table 4-2.

Maintenance	*Frequency*
Clean exterior surfaces of equipment.	As needed, based on the operating environment.
Change and align lamp bulb.	As needed, when bulb expires.
Clean objectives or filters.	As needed; only when dirty.
Lubricate the Microscope column.	Every two months.
Replace Electronic Enclosure fuse.	As needed when fuse blows.

Table 4-1 Maintenance Schedule

Component	*Description*	*Zygo Part Number*
Lamp Bulb	BRL 12V - 50W Halogen Bulb	1445-400-042
Fuse	250V 2A Fuse for Electronic Enclosure	1343-000-026

Table 4-2 Recommended Spare Parts

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Cleaning of External Surfaces

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

Changing and Aligning the Lamp Bulb

Complete the following procedure and refer to Figure 4-1.

1. Turn off power and disconnect the lamp housing cable from the Electronic Enclosure.

   ⚠ **Warning!** Allow the lamp housing and the lamp bulb to cool before continuing.

2. Remove the lockscrew and pull the socket sleeve from the lamp housing.

   ⚠ **Warning!** Do not touch the glass part of the lamp bulb with bare hands. Touching the bulb may cause premature bulb failure.

3. Remove the old lamp bulb from the socket sleeve.
4. Insert the new lamp bulb, aligning the pins to the holes on the socket.
5. Reinstall the socket sleeve and lockscrew. Connect the lamp housing cable to the Electronic Enclosure and turn on power.
6. Position Field Stop for full aperture and set the filter tray to MEAS.

   ⚠ **Warning!** Do not touch the glass surfaces of the objective.

7. Loosen the objective lockscrew and remove the objective.
8. Position a small piece of paper under the opening in the PZT, and about 1/2-inch away.
9. Adjust the light intensity of the Microscope until a filament image is observed on the paper.
10. Adjust the filament image for best focus by loosening the clamp screw and moving the lamp housing up and down. When best focus is achieved, tighten the clamp screw.
11. Center the filament image from front to back by loosening the lockscrew and rotating the ring. When centered, tighten the lockscrew.
12. Center the filament image from side to side by turning the socket sleeve knob.
13. Reinstall the objective to the PZT; secure it with the objective lockscrew.

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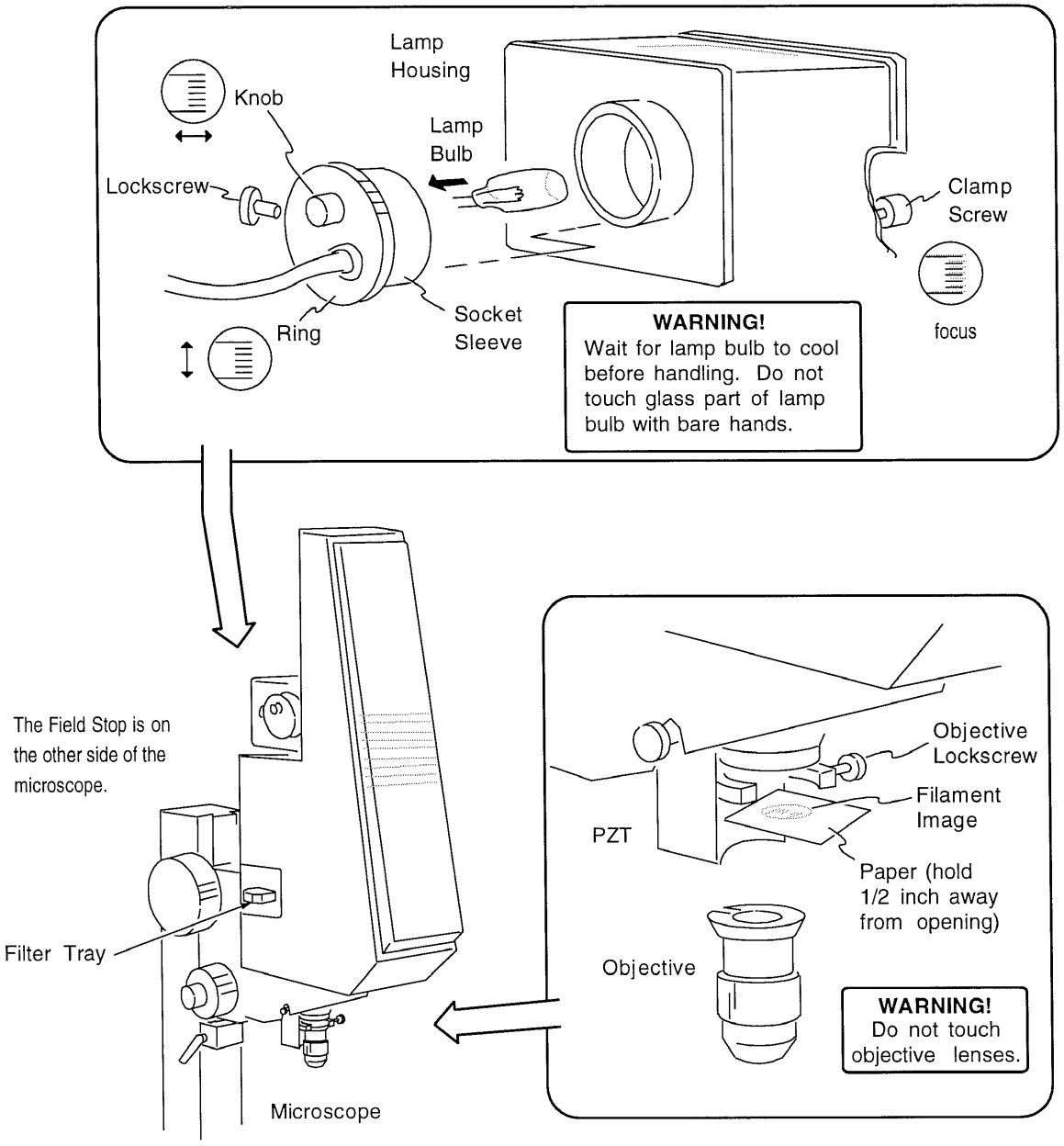


Figure 4-1 Changing and Aligning the Lamp Bulb

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Cleaning Optics

Cleaning of any precision optic risks degrading the surface. All the cleanable objective lens surfaces are coated. Coated optics are easily damaged by improper or unnecessary cleaning. The need for cleaning can be minimized by proper handling techniques, returning the objectives to their plastic case when not in use, and by keeping the environment clean.

Do not attempt to clean optics within the Microscope head since system performance may be impaired.

Recommended Cleaning Materials:

- *Polyethylene lab gloves*
  Wear to prevent contamination of surfaces and 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 should 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 contaminates fixed to the optical surface. Use a mild, neutral 1% soap solution or lens cleaner to remove oily contaminates.

Many of these materials are available from:

Edmund Scientific Co.
101 East Gloucester Pike
Barrington, New Jersey, USA 08007
Telephone: (609) 573-6250

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Recommended Optic Cleaning Procedures

Warning!

- 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 put on lab gloves.

Contaminant	*Procedure*
Dust or light dirt	1. Blow off loose particles. 2. 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. 3. Dampen the tissue with alcohol or methanol. 4. Wipe the lens straight across once. If it needs wiped again use a new swab or tissue.
Fingerprints, oil and water spots *Note: Clean surface immediately; skin acids attack lens coatings.*	1. Blow off loose particles. 2. 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. 3. Dampen it with 1% soap solution. 4. Wipe the lens straight across once. If it needs wiped again use a new swab or tissue. 5. Repeat steps 2 and 4 with tissue dampened with distilled water to remove soap residue. 6. Repeat steps 2 and 4 with tissue dampened with alcohol or methanol.

Table 4-3 Optics Cleaning Procedures

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Lubricating the Microscope Column

Every two months, apply a couple of drops of light-weight, non-migratory lubricating oil in the oil hole for each coarse focus wheel and to the column sliding surfaces. See Figure 4-2. A supply of oil is included with the column.

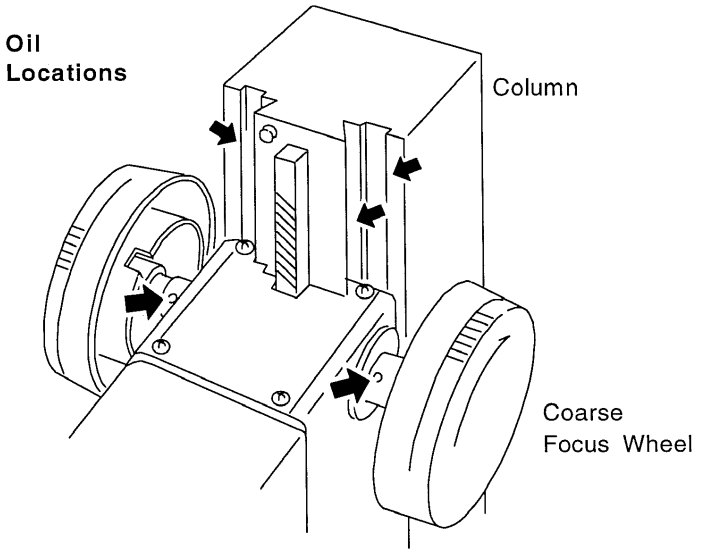


Figure 4-2 Lubricating the Microscope Column

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Replacing the Fuse in the Electronic Enclosure

If it is necessary to check or replace the fuse in the Electronic Enclosure, refer to the procedure below and to Figure 4-3.

1. Turn off power.
2. Remove the power cord.
3. Open the supply module door.
4. Pull out the fuse holder and remove the fuse.
5. Place a new 250V 2A fuse into the holder. Then insert the holder, with the arrows aligned, into the supply module.
6. Close the supply module door and connect the power cord.

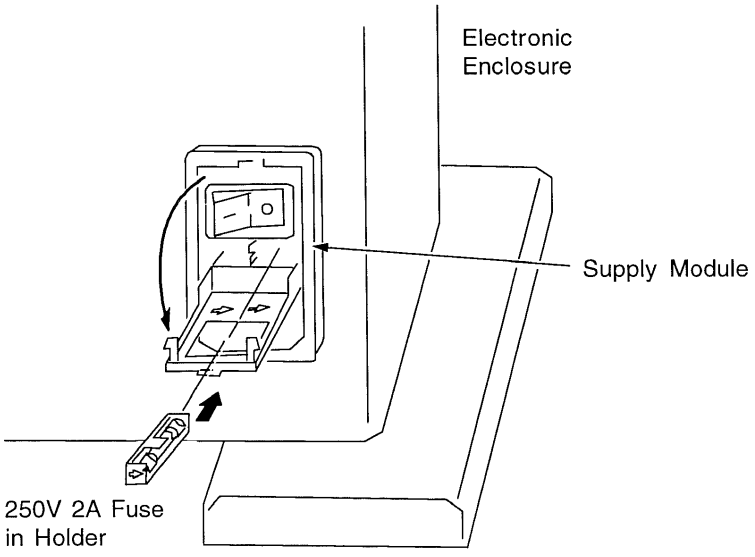


Figure 4-3 Replacing the Electronic Enclosure Fuse

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RETURNING EQUIPMENT TO ZYGO

If it is necessary to return equipment to Zygo for service, please follow the procedure outlined below. You must first contact Zygo to obtain a Return Authorization (RA) number; so that we can route your equipment properly when it arrives. Equipment returned without an RA number is not accepted.

Note: Do *not* return equipment to Zygo without an RA number.

1. Have the following information ready when requesting an RA number:
   - The name of the component and serial number if applicable.
   - Your company's name and complete shipping address.
   - A description of the problem and the sequence of events that led up to your discovering the problem.
2. Contact Zygo by telephone.
3. We will provide an RA number and advise you of the next steps to take.
4. Pack the equipment securely to prevent any damage in shipping. Use the original shipping container and packing material when possible. Include the RA number on the shipping container and on any correspondence.

PACKING AND SHIPPING SUGGESTIONS

If it is necessary to move or ship any component, adhere to the suggestions below. Contact Zygo if you need assistance or have questions.



Warning! To prevent damage, remove the PZT from the microscope when moving equipment.

- Padding - If original packing material is not available, wrap equipment with bubble-wrap or similar padding for protection.
- Microscope - Disassemble the microscope to prevent breakage. Remove the objective, the PZT, and the head from the column. Pack objectives, the PZT, and the microscope head separately. Reinstall the shipping plug in the objective mount to protect the internal optics.
- Objectives - Secure objectives in their protective containers.

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TROUBLESHOOTING GUIDE

The following table can be used to quickly determine the probable cause for your trouble; it also lists the corrective action.

Problem	*Possible Cause*	*Solution*
No power.	Equipment not plugged in.	Check power strip and cords.
	Enclosure switch off.	Turn switch on.
	Blown Enclosure fuse.	Replace fuse.
	Disconnected or loose cables.	Check cable connections.
	Defective incoming power.	Check power source.
	Defective Electronic Enclosure.	Contact Zygo.
Enclosure blows fuse.	Defective incoming power.	Check power source.
	Circuit overload.	Plug system into its own circuit.
No light.	Filter tray not set at detent.	Check filter position.
	Defective objective.	Try another objective.
	Loss of power.	See "No power".
	Defective lamp bulb.	Replace bulb (Chapter 4).
	Light level control adjusted low.	Adjust light level.
	Defective Electronic Enclosure.	Contact Zygo.
No video image.	Video Monitor disconnected.	Check Video Monitor connections.
	Video Monitor turned off.	Turn Video Monitor switch on.
	Video Monitor controls set wrong.	Adjust Brightness and Contrast.
	Part way out of focus.	Adjust focus.
	No light.	See "No light".
	Computer crash or hang-up.	Restart computer.
Image shifts when adjusting tip/tilt.	Part surface is vertically offset from ideal location.	Locate part surface at ideal height above the X-Y stage (Chapter 2).
Focus shifts when adjusting tip/tilt.	Support stage is not laterally aligned under objective.	Realign Support Stage (Chapter 2).

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Problem	***Possible Cause***	***Solution***
Features on part appear to move when focusing.	Improperly aligned lamp bulb.	Align bulb (Chapter 2).
Video image is spotty or partial.	Part way out of focus.	Adjust focus.
	Incorrect part tip/tilt.	Adjust Stage tip and tilt knobs.
	Filter tray not set at detent.	Check filter position.
	Part is too rough or irregular.	Check system with known good part.
	Field Stop is limiting aperture.	Put Field Stop to full aperture.
	Dirty objective.	Clean or replace objective.
	Video Monitor controls set wrong.	Adjust Brightness and Contrast.
	Internal Microscope head optics are dirty.	Contact Zygo.
Can't obtain an interference or fringe pattern.	Part out of focus.	Adjust focus.
	Incorrect part tip/tilt.	Adjust Stage tip tilt knobs.
	Part is too rough or has low reflectivity.	Check system with known good part.
	Support stage improperly aligned.	Align support stage.
	Focus filter not used.	Use focus filter to assist with focusing of 2.5X and 5X objectives.
	Beam block blocking reference path (2.5X and 5X objectives only).	Push the beam block in.
Part hard to focus.	Part has low reflectivity.	Focus first with high power objective or check system with known good part.
	Part is extremely smooth.	
	Part too rough.	
Microscope head does not move.	Head contacting Coarse Z-stop.	Move Coarse Z-stop.
	Head at end of travel.	Relocate head with Focus controls.

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Problem	Possible Cause	Solution
Inconsistent measurement results.	Part out of focus.	Adjust focus.
	Part not secure.	Use fixture to secure part.
	Incorrect part tip tilt.	Adjust Stage tip and tilt knobs.
	Dirty part.	Clean part.
	Dirty objective.	Clean objective or try another objective.
	Excessive vibration.	Check fringe stability. Check vibration isolation system.
	Objective switched after making system error file.	Make new error file. (Error files are objective specific.)
Software error message - "Cannot keep up with frame grabber".	Improper Camera Mode control setting for the computer.	Make an Acquisition mask smaller than the camera image area.
	Reconfiguring or building application fragments memory.	Press the Measure button again.
	Computer performing background functions, like printing.	Wait for the function to end.
	Window size too large for scan length and Camera Mode selected.	Make an Acquisition mask smaller than the camera image area.
Instrument cannot be initialized when MetroPro starts.	Instrument not turned on.	Turn on power switch on Electronic Enclosure.
	Defective cable or connector between instrument and computer.	Check and replace cables.
	Improperly connected cables.	Ensure that the RS-232 cable is connected to the right port on the computer.
	Frame grabber board not properly seated in the computer.	Reseat frame grabber board.

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Appendix A

WHERE TO FIND THINGS

This manual covers installing, using, and maintaining the Zygo NewView 200.

Manual Contents

Chapter 1..... A quick system overview and detailed specifications on the microscope components.

Chapter 2..... Putting the pieces together and connecting the wires.

Chapter 3..... Basic operation, instrument controls, focusing, and helpful hints. Using the MetroPro software.

Chapter 4..... Maintenance and troubleshooting.

Zygo Manual References

OMP	*Manual*	*Description*
0337	Programmable Stage Options	Covers automated stage options.
0346	Getting Started With MetroPro UNIX Version	Introductory information for MetroPro software.
0398	Getting Started With MetroPro PC Version	Introductory information for MetroPro software.
0347	MetroPro Reference Guide	Detailed reference material for MetroPro software.
-	Application manuals	Various booklets covering MetroPro applications. A complete package is provided with the original order.

Other Sources of Information

Item	*Where to Find Information*
Computer equipment and peripherals	Documentation supplied by the original equipment manufacturer.
Computer operating system.	For HP-UX, see information provided by Hewlett-Packard. For Windows NT, see information provided by Microsoft.
TMC Vibration Isolation Table	Documentation supplied by Technical Manufacturing Corporation.

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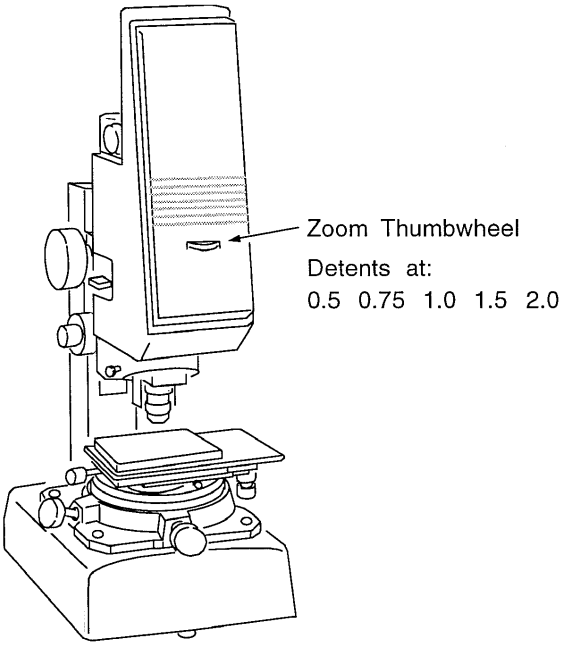
Appendix B

IMAGE ZOOM OPTION

Image Zoom Option

The Image Zoom Option provides continuous variable zoom from 0.5 to 2.0 times the magnification of the objective in use. The zoom option changes the field of view of all the objectives by adding specialized optics inside the Microscope head. The zoom setting is changed by turning a thumbwheel on the front of the instrument.

This option is factory installed, available with the original system order, or added later, if the system is returned to Zygo. An Image Zoom Option system operates similar to the standard Microscope.



Note: The functional performance of a "zoomed" objective will not be equal to a corresponding nonzoomed objective. For example, a 5X objective at 2X zoom is not the same as a 10X objective.

The 0.5 zoom setting may cause image artifacts. When using the 10X, 20X, and 50X objectives, the reference surface might be off center limiting the useful field of view.

Objective Specifications and Zoom Settings

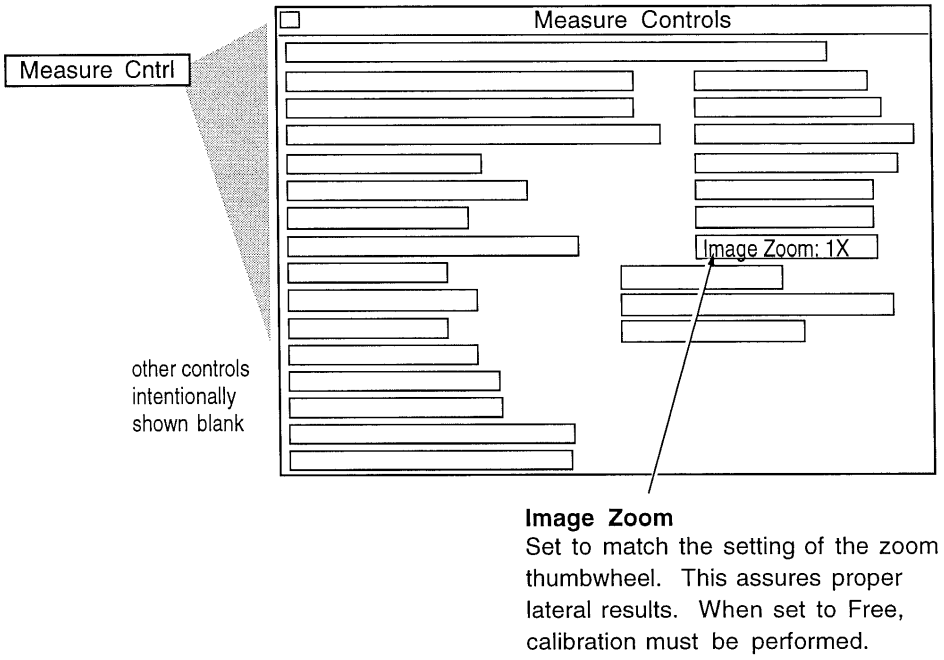
The specifications of the objectives at 1X zoom are identical to those shown on page 1-10. Specifications at other zoom settings are easily calculated. Use the multipliers in the table below for the listed specification; multiply times the value shown for a particular objective in the chart on page 1-10. The NA, Work Dist, Focus Depth, Inter Depth, and Lat Res specifications are the same for zoomed objectives.

Zoom Setting	**0.5**	**0.75**	**1.0**	**1.5**	**2.0**
Multiplier for Sys Mag and Slope	0.5	0.75	1.0	1.5	2.0
Multiplier for Field of View and Spatial Samp	2.0	1.333	1.0	0.667	0.5

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Software Calibration for the Image Zoom Option

Calibration establishes the lateral measurement resolution of each camera pixel. The Image Zoom control *must* be set in the Measure Controls window to match the zoom setting selected on the thumbwheel. If the setting of the control and the thumbwheel do not match, results will be erroneous. Select Free with the Image Zoom control when the thumbwheel is set between detent positions.



Calibrating for "Free" Zoom

Each time the Image Zoom control is set to Free, you must perform calibration to provide absolute units of measure. Calibration *must* be performed before making measurements. A calibration standard, such as the Zygo Model 5690 Lateral Calibration Standard, makes calibration easier and more accurate.

An overview of the calibration procedure is provided on the following page.

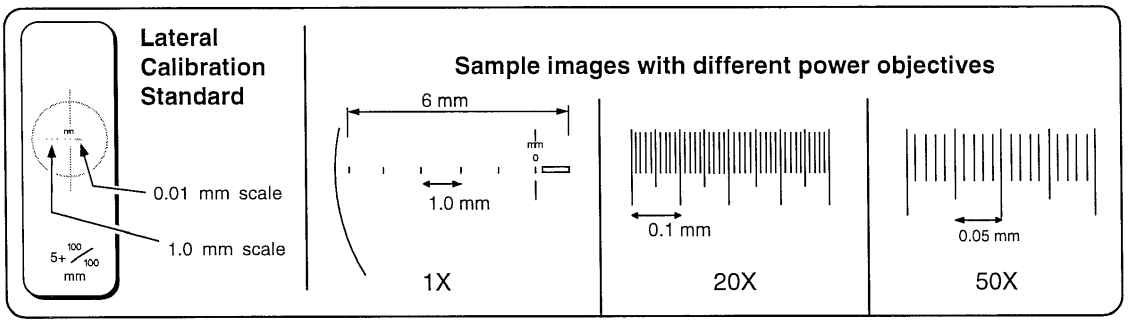
Calibration Procedure

Note: Calibration settings for Free are not saved. Calibration must be performed every time the instrument is restarted.

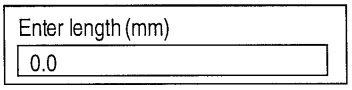
Calibration performed when the Microscope thumbwheel is not at a detent is only temporary. If the thumbwheel is moved to another free position, the Microscope must be recalibrated.

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1. Position the Lateral Calibration Standard under the objective. Focus the instrument on the standard's lines and null the fringe pattern.



2. Click the **Calibrate** button to open the Lateral Calibrator window.
3. Select the objective to calibrate by clicking on the little box to the left of its title.
4. Draw a line across the image. Position the crosshairs over the image and click and hold the left mouse button; move the mouse to draw a line parallel to the Standard's scale; and release the mouse button for the end point.
5. Using the keyboard, enter the length of the drawn line in millimeters, as determined by reading the Calibration Standard scale. Press Return when done.



6. Close the Lateral Calibrator window and make your measurement.

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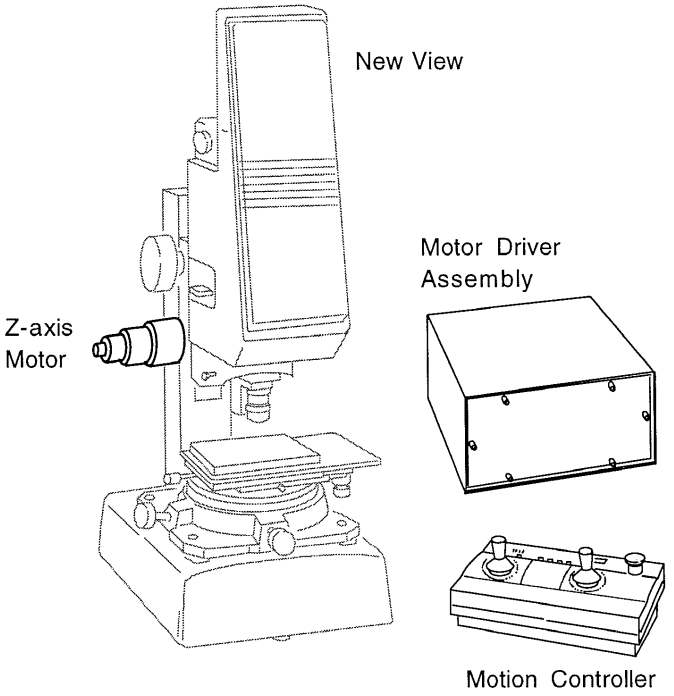
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Appendix C

EXTENDED SCAN OPTION

Extended Scan Option

The Extended Scan Option extends the standard 100 micrometer vertical scan range of the NewView microscope to 5000 micrometers (5 mm). This option provides increased range for all objectives, limited only by the objective working distance. This enables the NewView to measure a greater variety of parts and up to 5 millimeter steps. In addition to the equipment already described in this manual, the option includes a Z-axis Motor with limit stops, Motion Controller, and a Motor Driver Assembly.



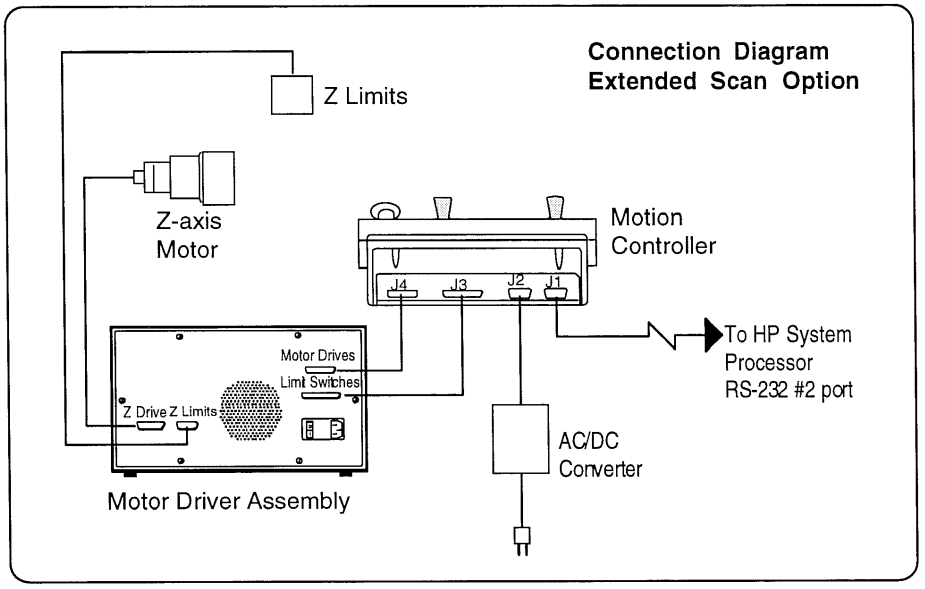
The Z-axis Motor precisely drives the objective through the vertical scan envelope as measurement data is collected. The Motion Controller provides joystick control of the z-axis. The Motor Driver Assembly houses the electronics that power and direct the motor.

The Extended Scan Option is available for the Zygo NewView microscope. It is a factory-installed option, available with the original order, or it may be added later. For information on upgrading your NewView, contact your Zygo representative.

MetroPro software version 6.0.20 or later is required for this option. This option requires licensing to activate and use. It is licensed as a separate line item in the Edit/View Licenses window. For information on licensing, see the *Getting Started With MetroPro* manual.

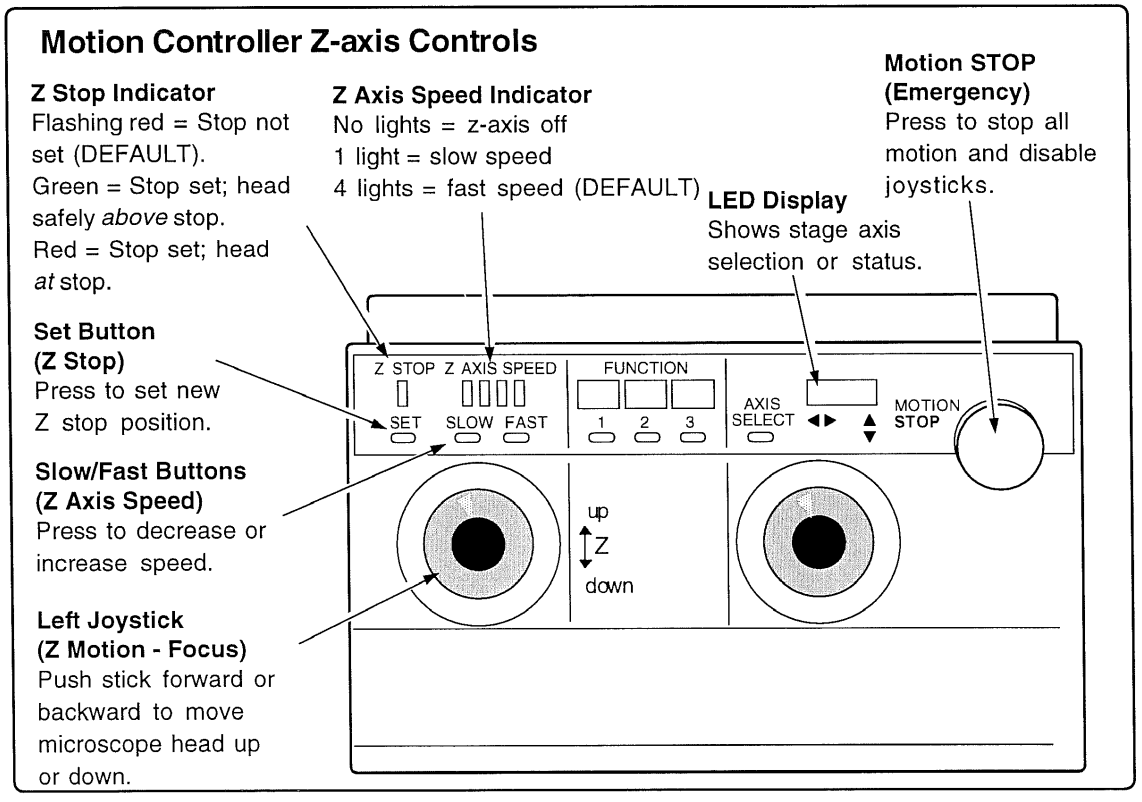
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Extended Scan Option Cable Connection



Using the Motion Controller

The illustration below describes the controls pertaining to the Extended Scan Option. The Motion Controller is also used for automated systems.



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Using the Motion Controller (continued)

Driving the Z-axis

1. Push or pull the left Joystick to raise or lower the microscope head.

   Note: Be careful when focusing or driving the z-axis. Do not allow the objective to crash into or touch the test part or microscope stage. Set the Z Stop on the Motion Controller to prevent crashes.

Controlling the Z-axis Speed

1. Press the SLOW or FAST buttons on the Motion Controller. The speed is indicated by the number of lights. These buttons control the speed of the z-axis when it is driven with the joystick.

Setting Z Stop

1. Use the left joystick to position microscope head at a position slightly less than the objective working distance.
2. Press SET.

Unsetting Z Stop

1. If the Z STOP indicator is green, press SET.
2. Otherwise, use left joystick to raise head until the Z STOP indicator is green.
3. Press SET.

Resetting the Motion Controller after MOTION STOP is pressed

1. Press and hold the AXIS SELECT button.
2. Turn the MOTION STOP knob clockwise until it pops back up.
3. Release the AXIS SELECT button.
4. Click the **Reset MC** button in MetroPro.

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Using the Extended Scan Option

1. Click on the **Meas Cntrl** icon to open the Measure Controls window.
2. Click on the Scan Length control until it displays "Extended." Note that when the Scan Length is set to Extended, that the FDA Res control is ignored.
3. Click on the Extended Scan Length control, and, using the keyboard, enter a value for the length of the scan; then press [Return].

   Note: The value should be the approximate range of detail or step height in the test part, plus 10%. Do a manual scan first to determine the length. (Explained in the "Manual Mode" section below.)

4. Focus the NewView on the bottom (lowest) detail of the test part. Adjust the stage orientation to null the fringes. (Focus and null are described in detail in Chapter 3.)

   Note: The higher the objective power, the shorter its working distance. Make sure you don't drive the objective into the upper portion of the part when trying to locate the lowest detail.

5. Adjust the focus (z-axis) to slightly lower the focus below the lowest fringes.

   Note: The NewView scans from the bottom up when the Scan Length control is set to Extended. The starting position should be the lowest fringes found in the test part. To lower the focus below the fringes, pull lightly down on the joystick, or turn the Fine Focus Knob counterclockwise a quarter turn.

6. Press **F1** or click the **MEASURE** button. Do not touch the instrument, test part, or the work area during the measurement. The measurement takes approximately 8 minutes per millimeter (Camera Mode 320x240).

Manual Mode

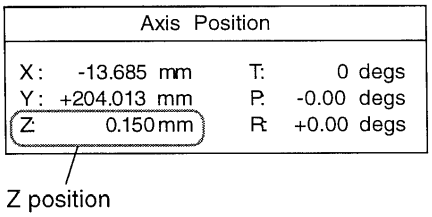
The NewView with the Extended Scan Option can also be used in a "manual mode", where the objective is driven from one location to the next and the step difference is read directly from a digital readout in the software.

Manual mode can be used to quickly determine an appropriate scan length before the actual measurement or to derive a simple step height measurement, without the other results in MetroPro.

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Manual Mode (continued)

1. Focus the NewView on the lowest point of interest in the test part.
2. Click the **Reset MC** button to zero the Z position readout. A Reset MC button can be created in a Control Window by selecting the New Button → Miscellaneous → command.
3. Drive the z-axis upward by pushing the joystick forward. Observe the fringes on video monitor as they move through the test part; stop the z-axis motion when you have scanned to or past the desired location.
4. Read the Z position off the on-screen digital readout. Hint: when using the readout to determine a scan length, increase the Z position length by 20 µm to ensure that the part detail is covered.



The Axis Position or digital readout displays when the microscope is moving.

Software Calibration of the Extended Scan Option

The MetroPro Step Height Application provides the ability to calibrate the vertical step measurement of the NewView to match a traceable standard. To calibrate the Extended Scan Option, follow the procedure supplied in the Zygo Step Height Application booklet, under "Step Calibration".

When performing calibration, be sure to use the same objective you'll use for measurements, that the Scan Length control is set to Extended and the applicable length is entered in the Extended Scan Length control. For the greatest accuracy, do not remove or even touch the objective after performing calibration.

During the process of calibration, a scalar value is modified in the system calibration file that adjusts the vertical scale specifically for the Extended Scan Option.

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Appendix D

PHASE OPTION

Phase Option

The NewView Phase Option adds the measurement capability of the Maxim to the NewView. This option is useful for testing smooth surfaces, which do not need the vertical measurement range provided by the NewView white light scanning technique. The Phase Option has the advantage of using turret mounted objectives, except for the 2.5X objective, and the acquiring of data in milliseconds. The NewView Phase Option gives you a full featured system capable of measuring surfaces with 100 micrometers to sub-Angstrom feature heights.

This option is available for the NewView microscope. It is a factory installed option, available with the original system order, or added later, if the system is returned to Zygo. The mode of operation is switched in minutes by changing the Acquisition Mode software control and by swapping the NewView Pifoc with the Maxim Turret, and exchanging the filter tray.

Switching from the NewView (scan) to the Maxim (phase)

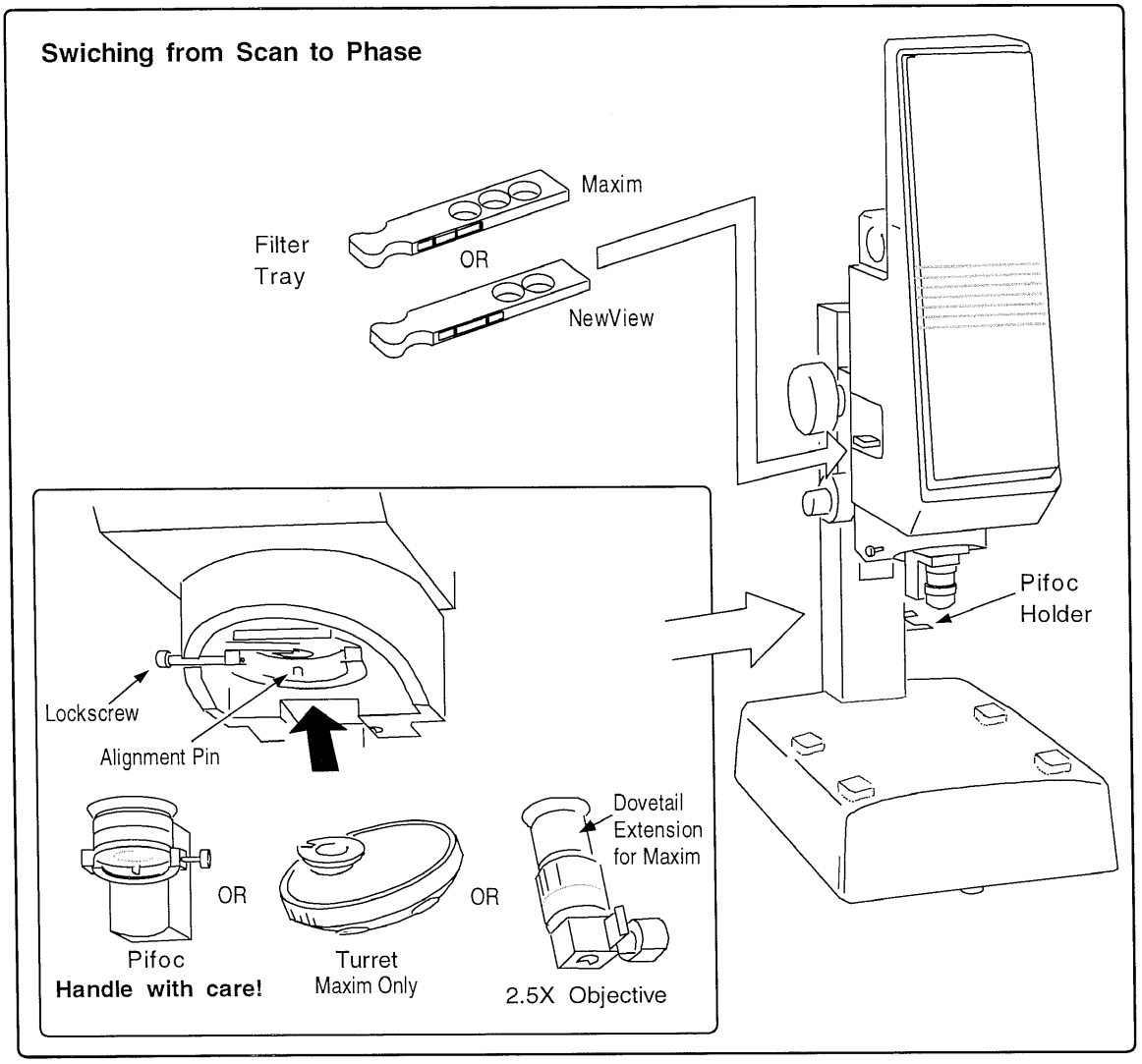
Follow the procedure below and refer to the illustration on next page.

1. Loosen the lockscrew and carefully remove the Pifoc from the instrument. Place the Pifoc in the Pifoc holder on the side of the microscope. Do not disconnect the Pifoc cable.
2. Pull the NewView filter tray out of the instrument. Store the filter tray in a clean and safe place. Insert the Maxim filter tray into the microscope.
3. If you are swapping a 2.5X objective for use in the phase mode, the existing dovetail extension must be removed and a longer dovetail extension must attached. Align the slot in the objective dovetail to the pin on the instrument, and install the objective. Firmly finger tighten the lockscrew.
4. If you are installing the Maxim turret, align the slot in the turret dovetail to the pin on the instrument, and install the turret. Firmly finger tighten the lockscrew. Depending on your objectives, it may be necessary to unscrew dovetails from the NewView objectives to screw them onto the Maxim turret.
5. Click once with the left mouse button on the **Meas Cntrl** icon to open the Measure Controls window. Click once with the left mouse button on the Acquisition Mode control to change it from Scan to Phase.

Switching from the Maxim (phase) back to the NewView (scan)

The procedure is similar to the one previously described. Replace the turret with the Pifoc, swap filter trays, and change the software Acquisition Mode control to Scan. Follow any software messages.

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Using the Phase Option with the NewView "CHR"

This section only applies to the high resolution model of the NewView. The NewView CHR has a capacitive feedback Pifoc and a high resolution camera. These notes apply only to this model when operating in the Phase mode.

Note: When operating the NewView with a high resolution option in Phase mode, and when the Camera Mode control is set to 640 x 480, the user must use an Acquisition mask that is smaller than 580 x 480 pixels. The mask can be any shape as long as the area is less than 278,000 pixels. Failure to apply this mask will result in bad data. Information on creating and using masks can be found in the *MetroPro Reference Guide*.

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Appendix E

ROUGH SURFACE FILTER SET

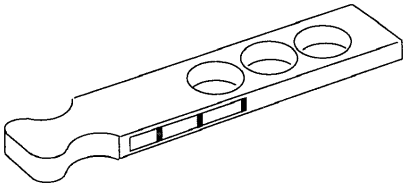
Background Information

The NewView is a scanning white light interferometer; measurements use a white light filter based on a center wavelength of 600 nanometers, with a bandwidth of 125 nanometers. This gives the NewView a coherence length of 2.9 micrometers. The coherence length of an optical source is the maximum path length distance of the interferometer over which interference is obtained.

For most applications, this coherence length is adequate to attain good data of the surface. However, there is data dropout where there is considerable height variation within one pixel. This may occur when measuring surfaces with low contrast, such as paper or ceramics; or when measuring surfaces with high slopes, such as ball bearings or bumped wafers.

The coherence length of the NewView is increased by decreasing the bandwidth of the filter. Using a narrow bandwidth filter improves the measurement capability for rough surfaces and decreases data dropout.

Rough Surface Filter Set



The Rough Surface Filter Set provides a three position filter tray with the standard filter and two narrow bandwidth filters. To use the Rough Surface Filter Set, simply replace the existing filter tray; no software modification is necessary.

The following filter selections are suggested.

Filter	*Bandwidth*	*Coherence Length*	*Ra of Surface*
F1 (standard)	125 nm	2.9 µm	< 3.0 µm
F2	80 nm	4.5 µm	3.0 to 6.0 µm
F3	40 nm	9.0 µm	> 6.0 µm

Note: For the majority of rough surfaces use the F2 filter; improper use of the F3 filter may cause erroneous results.

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