NewView 100
Operation Manual
OMP-0348K

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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.

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original	October 1993	F	January 1995
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C	March 1994	H	June 1995
D	July 1994	J	March 1996
E	September 1994	K	April 1996

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 CUSTOMER SUPPORT

For help within North America, 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 Monday - Friday, 8 a.m. - 5 p.m. (Eastern Standard Time)
(800) ZYGO NOW (800) 994-6669
or (860) 704-5191

FAX (860) 346-4188

INTERNET www.zygo.com
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Attn: Customer Support

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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 100 System
  - How the NewView Works
- System Processor Components
- Microscope Components
- Specifications
- Safety

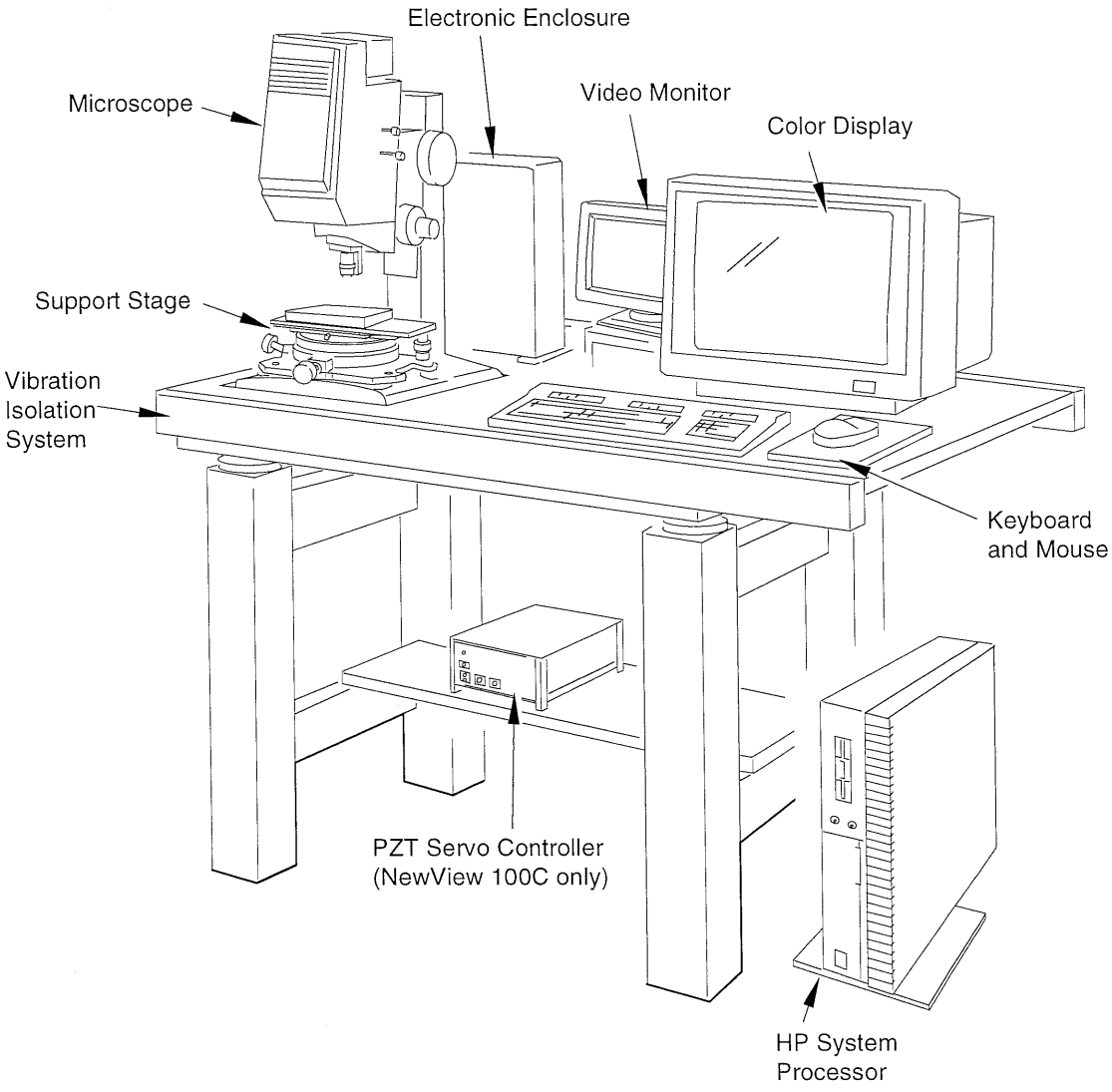
THE NEWVIEW 100 SYSTEM

The Zygo NewView 100[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.

NewView Configurations

Version/Option	*Description*	*Reference*
NewView 100	Standard model with 320 x 240 pixel resolution over the full aperture, and high resolution over one-quarter aperture.	-
NewView 100C	High precision model with capacitive feedback PZT (Pifoc); provides greater measurement accuracy, linearity, and stability.	-
High Resolution *option*	Provides a high resolution 640 x 480 pixel resolution over the measurement area.	pages: 3-15, B-4
Image Zoom *option*	Variable zoom 0.5 to 2.0 times the objective magnification.	App. C
Extended Scan *option*	Extends the vertical scan range from 100 micrometers to 5 millimeters.	App. D
Phase Option *option*	Adds the measurement capability of the Maxim•GP to the NewView.	App. F

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



NewView System
Figure 1-1

There are two major parts to the NewView system: the Microscope and the System Processor. The Microscope combines optical microscopy and interferometry to provide the raw data needed for imaging and for surface structure analysis. It includes the NewView 100 Microscope, objectives, Support Stage, Video Monitor, Electronic Enclosure, and a vibration isolation system. The System Processor 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.

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.

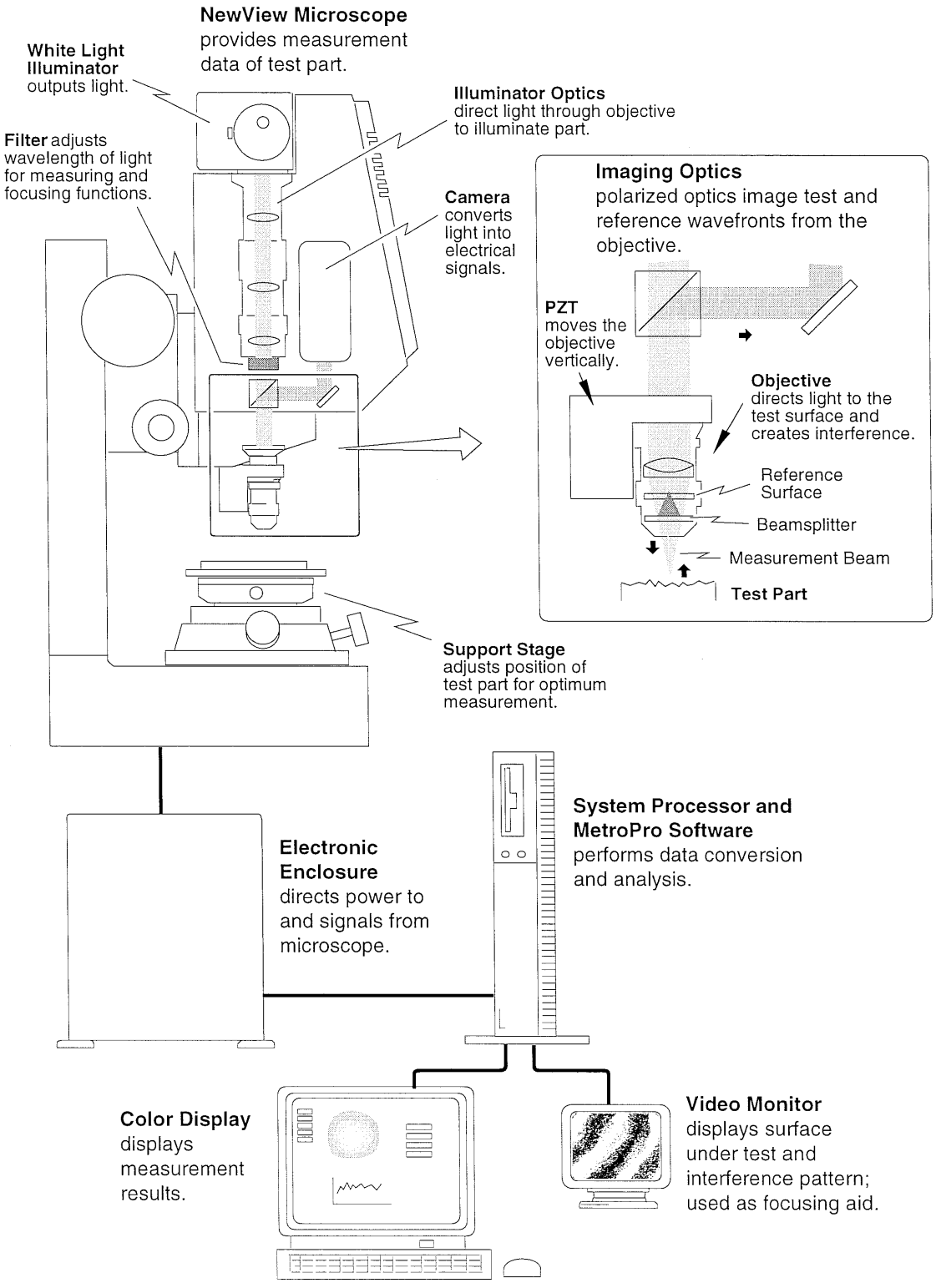
The real power to analyze the NewView system data lies in its MetroPro™ analysis and control software. MetroPro runs in a window environment and has a graphical user interface. MetroPro performs image reconstruction and analyzes entire areas as well as profiles, and provides numerous surface structure 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 objective image 20 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 0.3 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.



How the NewView Works

Figure 1-2

SYSTEM PROCESSOR COMPONENTS

The System Processor, an HP Computer, controls the Microscope, runs the Zygo MetroPro software program, performs calculations, and displays the measurement results on a color display. Figure 1-3 shows the System Processor components and their function.

Note:

For more information on any of the Hewlett-Packard components, refer to the HP documentation.

MICROSCOPE COMPONENTS

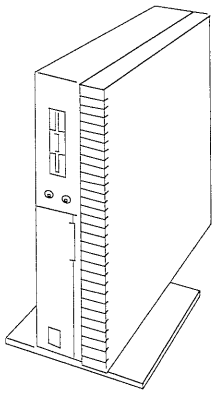
See Figures 1-4 and 1-5 for a breakdown of the Microscope components and their function. For more detailed information on individual Microscope components, refer to the specification sheets, later in this chapter.

SPECIFICATIONS

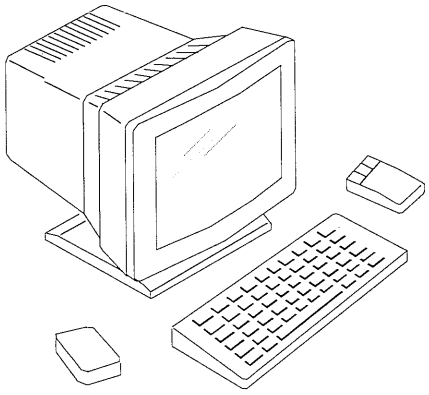
The pages following figure 1-5 provide greater details on the microscope components.

Specifications appear in the order listed below.

Documentation for all components on this page is provided by HP.



System Processor
HP Computer
For system control and data storage; houses the Matrox Board. Includes: an internal SCSI hard drive, 3.5-inch floppy drive, and 32 MB of RAM.
Extra RAM and ThinLAN Ethernet Transceiver optional.

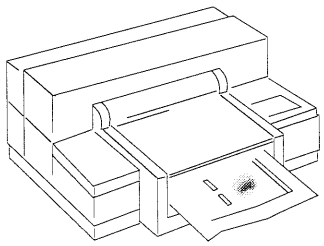


HP Color Display
Displays graphics and data. Two versions: 15-inch with 1024 x 768 pixel resolution and 19-inch with 1280 x 1024 resolution.

HP Mouse
Used for program control and selecting menus.

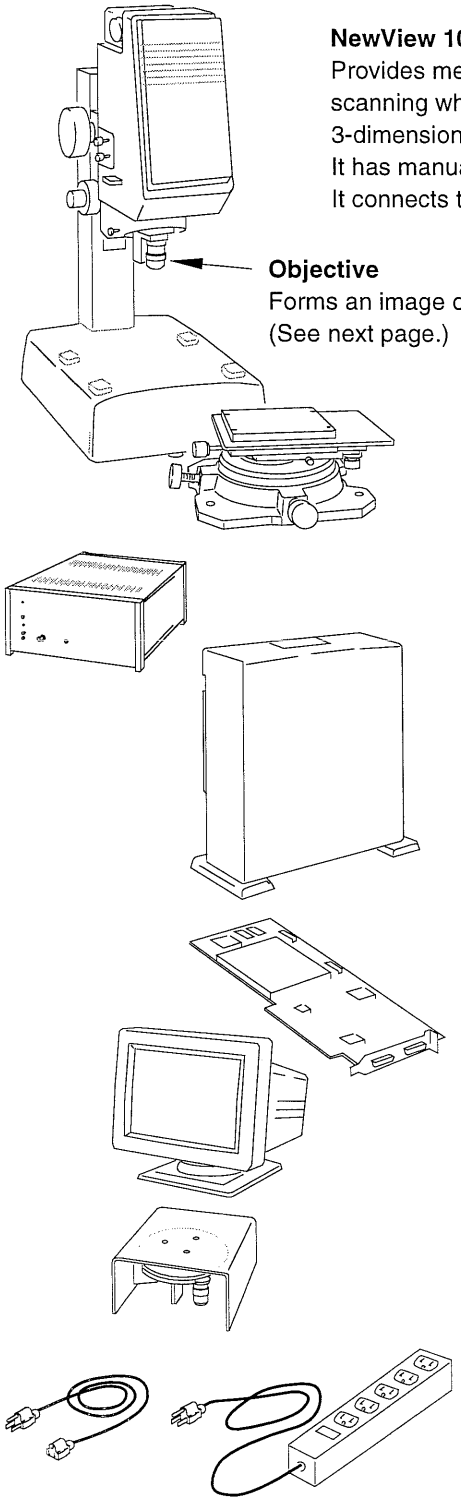
HP Keyboard
Used for data entry.

HP ID Module
Hardware key necessary to enable MetroPro and software options.



Option
HP DeskJet Printer
Outputs color copies of MetroPro screens. Connects directly to the computer.

System Processor Components
Figure 1-3



NewView 100 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.)

See Appendix C for information on the image zoom option.

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.

PZT Servo Controller
(NewView 100C only) Drives the capactive feedback system for the PZT.

Electronic Enclosure
Houses the main instrument board and power supply. Provides power to the Microscope and interfaces to the HP System Processor.

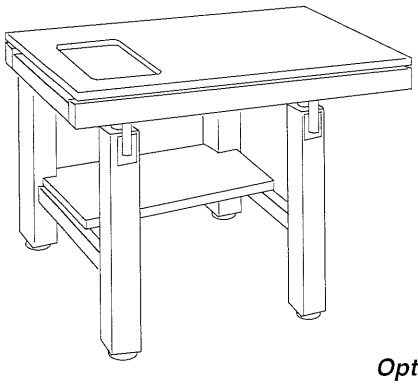
Matrox Board
Controls data acquisition. It is installed in the HP System Processor and connects to the Electronic Enclosure and Video Monitor.

Video Monitor
The 9-inch diagonal monochrome screen displays a live image of the part under view 20 times larger than the viewing area of the objective. It 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.

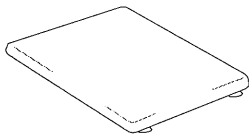
Microscope Components (page 1 of 2)
Figure 1-4

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



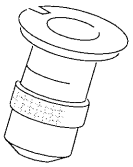
Vibration Isolation Table
The Microscope sits on a rigid laminated table top floating on self-leveling air pistons. Some components sit on a large upper shelf, which is separate from the table. The table requires a 60 psi source of compressed air or bottled nitrogen. It is 35 x 45 x 34 in. (HWD).

The table is manufactured by Technical Manufacturing Corporation (TMC). Operating instructions are provided by TMC.



Option
Table-top Vibration Isolator
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).

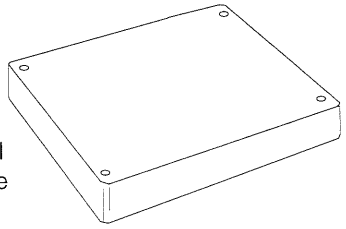
Option
Interferometric Objectives
Gathers light from the test object and forms a real image of it. The objective creates interference by dividing the light into two paths; directing one to an internal reference surface and the other to the test surface. Due to test surface irregularities, the test or measurement wavefront travels different distances. When the reference and measurement wavefronts are recombined, the waves are out of phase and form an interference pattern.



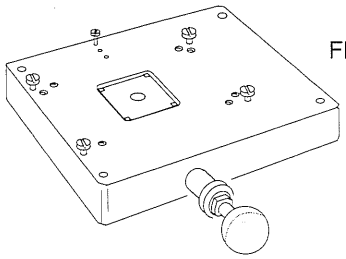
Objective	Type	System Magnification
2.5x	Michelson	50x
5x	Michelson	100x
10x	Mirau	200x
20x	Mirau	400x
40x	Mirau	800x
100x	Mirau	2000x

Additional specifications are provided on page 1-10.

Option
Top Plates
Attach to the top of the Support Stage to locate parts or fixtures under the objective. General purpose top plates are also available.



General Purpose



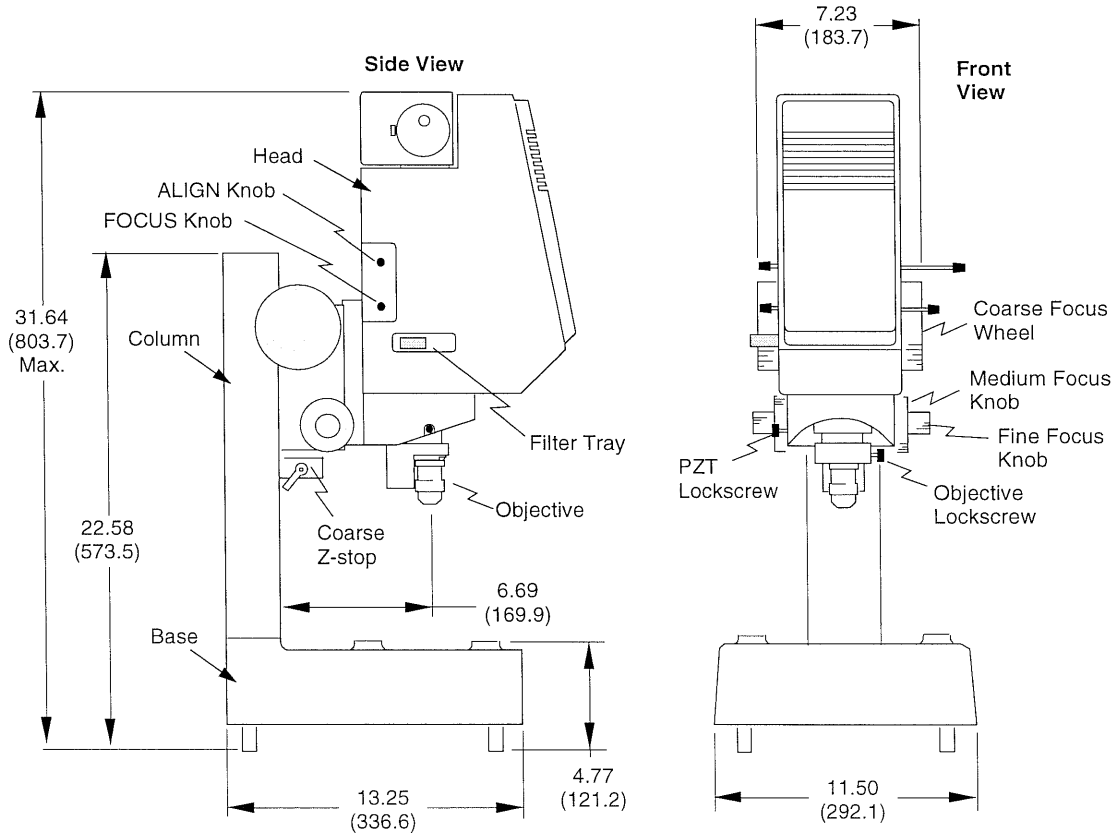
Fluoroware™ Tray Top Plate

Microscope Components (page 2 of 2)
Figure 1-5

NewView 100 Microscope

Physical Characteristics:
Dimensions: See Figure.
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, with lockscrew
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 minutes
Humidity: 5 to 95% relative, noncondensing
Vibration: Frequency Isolation - 1Hz < freq < 120Hz
Performance:
Vertical Resolution: 0.1 nm
Lateral Resolution: 0.46 to 4.87 µm (objective dependent)
Maximum Vertical Step Height: 100 µm



Dimensions are shown in inches and (millimeters)

Interferometric Objectives

For image zoom specifications, see Appendix C.

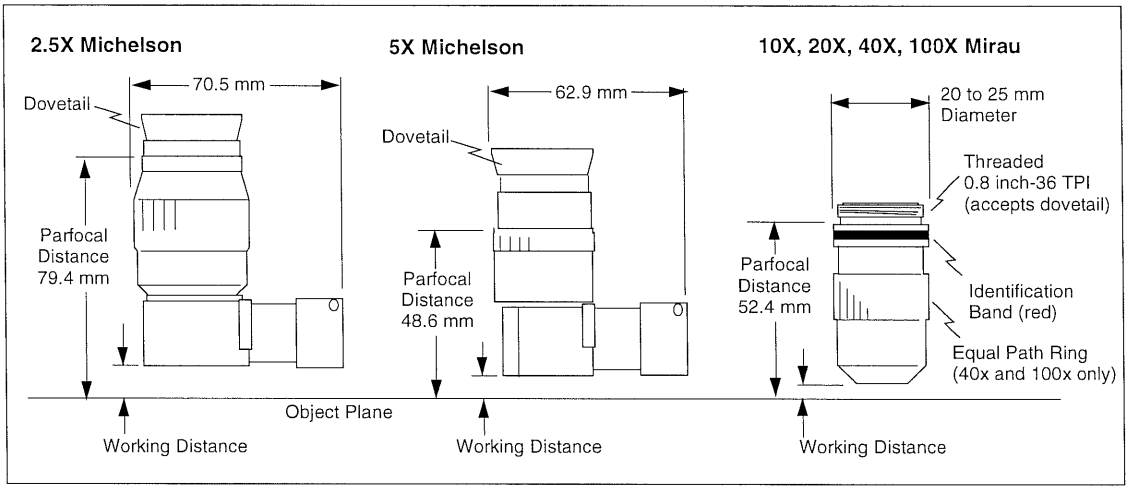
Physical Characteristics:
Typical Dimensions: See Figures in Box.

Type: 2.5X and 5X are Michelson objectives; 10X, 20X, 40X, and 100X are Mirau objectives. Coherence bandwidth centered within depth of focus. Useful for measuring the top surfaces of transparent and partially transparent materials, as well as curved and angled opaque surfaces with 4 to 100% reflectivity.

Magnification Range: 2.5X, 5X, 10X, 20X, 40X, 100X

Parfocal: 10X, 20X, 40X and 100X are parfocal.

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



Power	Sys Mag	NA	Working Distance	Focus Depth	Inter Depth	Lateral Res (µm)	Field of View H x V (mm)	Spatial Samp (µm) StdRes	Spatial Samp (µm) HiRes	Slope (deg) StdRes	Slope (deg) HiRes
2.5X	50X	0.075	11.1 mm	185 µm	4 µm	4.87	2.82 x 2.11	8.80	4.40	1.0	2.0
5X	100X	0.1	9.0 mm	70 µm	4 µm	3.65	1.41 x 1.06	4.40	2.20	2.0	4.1
10X	200X	0.25	4.0 mm	10 µm	4 µm	1.46	0.70 x 0.53	2.20	1.10	4.1	8.1
20X	400X	0.4	2.5 mm	3.5 µm	4 µm	0.91	0.35 x 0.26	1.10	0.55	8.1	15.9
40X	800X	0.5	4.5 mm	1.8 µm	3.6 µm	0.73	0.18 x 0.13	0.55	0.28	15.9	22.3
100X	2000X	0.8	0.6 mm	0.6 µm	1.2 µm	0.46	0.070 x 0.053	0.22	0.11	33.3	33.3

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.
Slope	Maximum angle of surface feature from one pixel to the next that can be measured.
StdRes HiRes	Maximum camera size in pixels. StdRes = 320 x 240, HiRes = 640 x 480

Support Stage

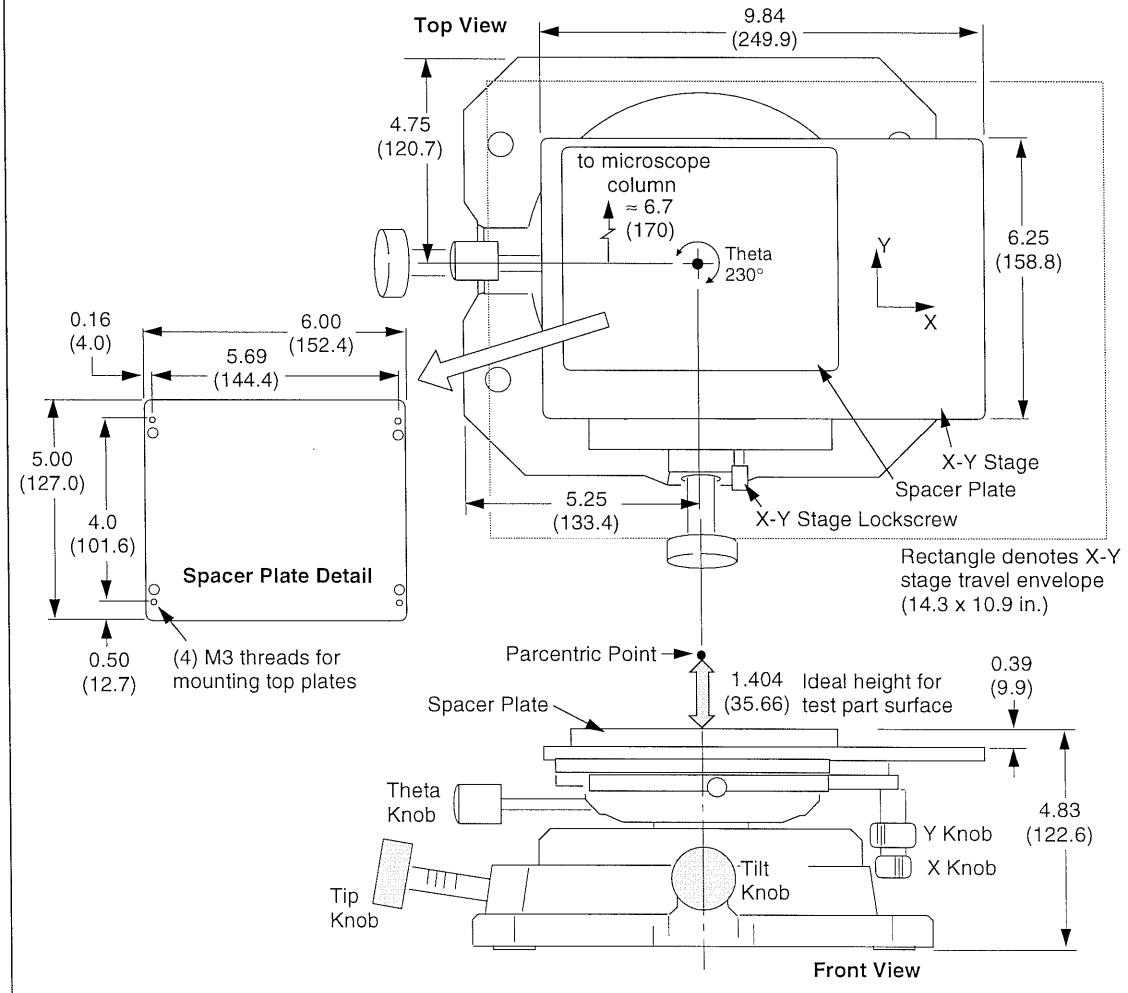
Physical Characteristics
Dimensions: See below.
Weight: 19 lb (8.6 kg) without top plate

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: ±6 degrees
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:
0.012 in. to parcentric point (P/N 6300-0130-01)
0.372 in. to parcentric point (P/N 6300-0130-02)
0.722 in. to parcentric point (P/N 6300-0130-03)
Fluoroware™ Top Plates:
2 x 2 trays (P/N 6300-0151-01)
3 x 3-3/4 and 4 x 4 trays (P/N 6300-0151-02)



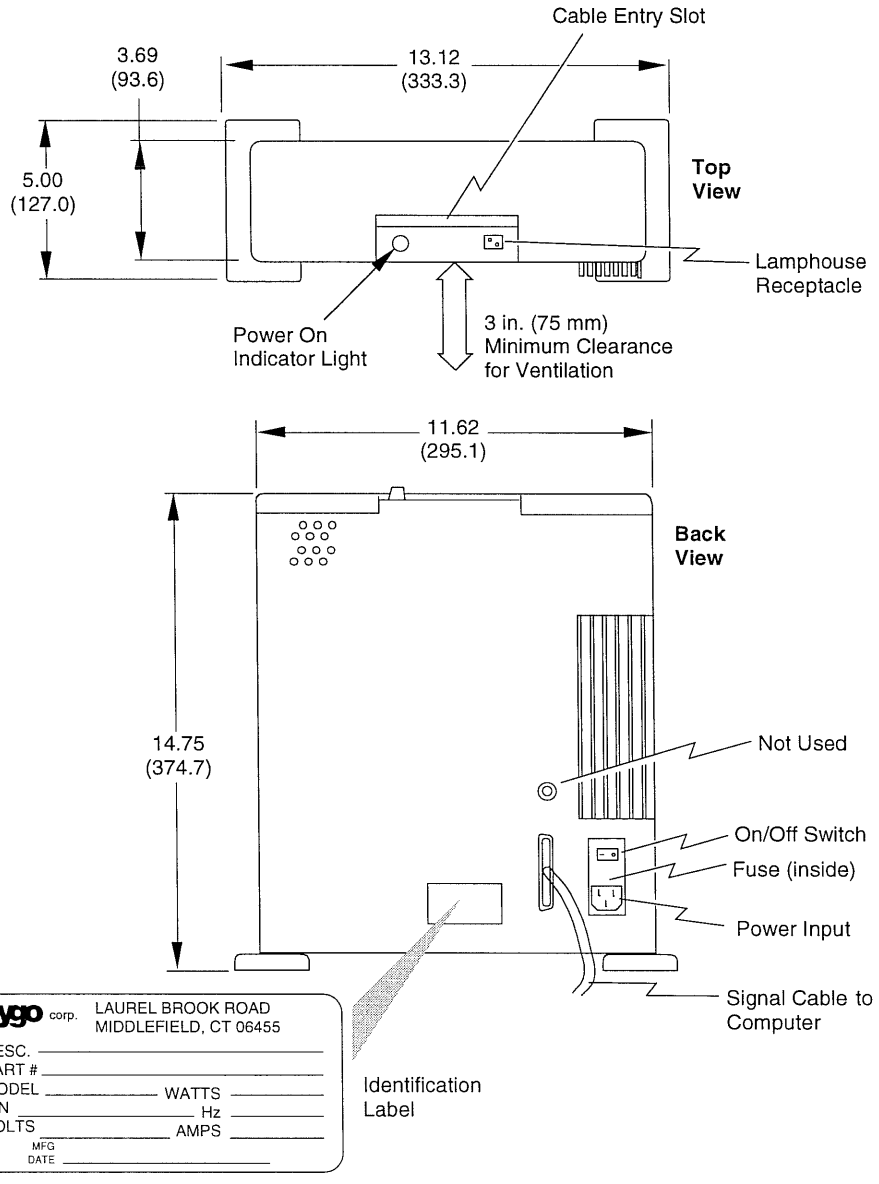
Dimensions are shown in inches and (millimeters)

Electronic Enclosure

Physical Characteristics:
Dimensions: See Figure.
Weight: 3.9 lb (1.8 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



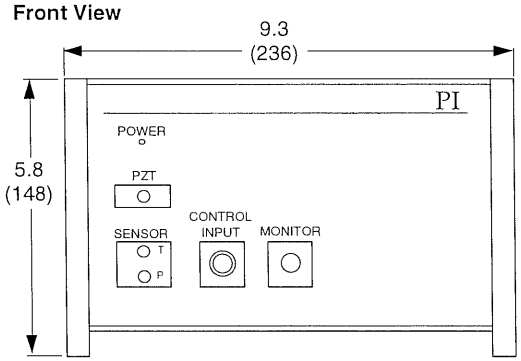
Dimensions are shown in inches and (millimeters)

PZT Servo Controller

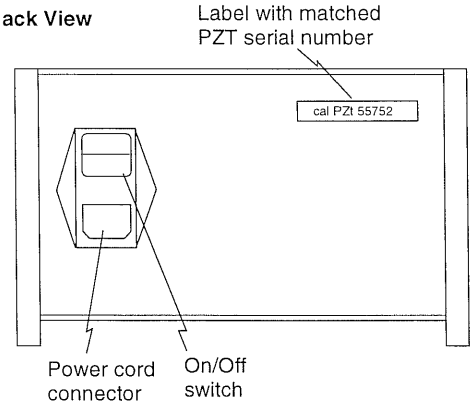
Physical Characteristics:
Dimensions: See Below.
Weight: 9.0 lb (4.1 kg)
Power Requirements:
Voltage: universal 90 - 240 VAC
Line Frequency: 50/60 Hz

NewView 100C only

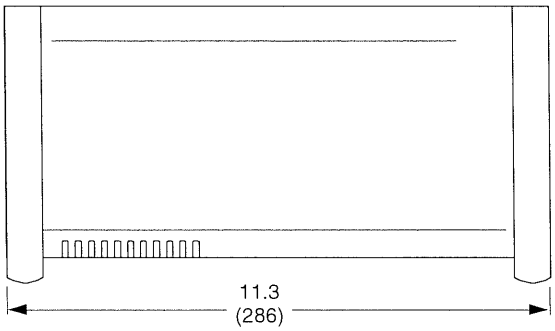
Front View



Back View



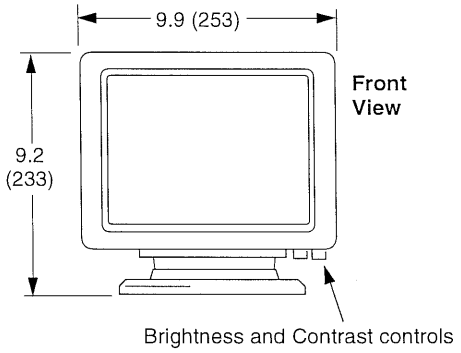
Side View

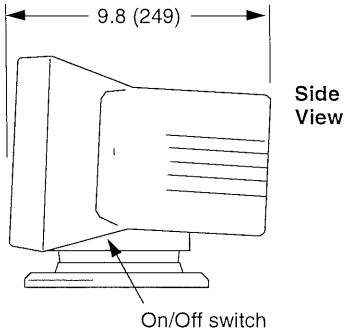


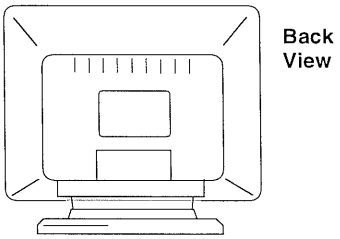
Dimensions are shown in inches and (millimeters)

Video Monitor

Physical Characteristics:
Dimensions: 9.2 x 9.9 x 9.8 in. (HWD)
Picture Tube: Monochrome 9-inch (23 cm) diagonal
Weight: 7.7 lb (3.5 kg)
Power Requirements:
Voltage: universal 100 - 240 VAC
Line Frequency: 50/60 Hz
Power Consumption: 20 watts typical
Video:
Input Signal: RGB Analog
Connector: 15 pin D-sub cable
Resolution: 640 x 480 pixels

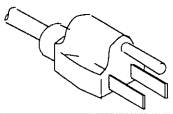
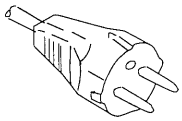
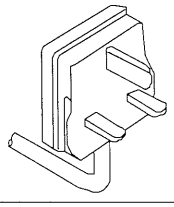






Dimensions are shown in inches and (millimeters)

Power Kit

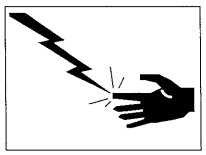
Plug Type	AC Voltage	Country	Zygo Part No.
	100V (1)	Japan	6300-0227-03
	120V	United States Canada	6300-0227-01
	220V	France Germany	6300-0227-02
	240V	United Kingdom	6300-0227-04

(1) Includes 3-prong to 2-prong plug adapters.

SAFETY

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

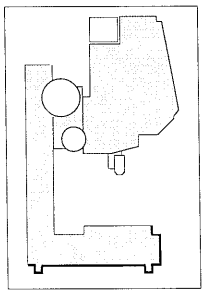
Electrical



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 the Matrox Board. 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, bend your knees when lifting, and get help if you need it.**
- ❑ **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.**
- ❑ **Handle the objectives and PZT 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.**

Chapter 2

INSTALLATION

In This Chapter

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.

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.

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.

> Note:
>
> The steps covered in HP documentation, included with the HP components, are indicated by HP. Other steps are covered in later sections of this chapter.

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.

System Processor Installation ⚡ *Follow ESD precautions*

- HP If necessary, install the EISA Adapter Board, Matrox Board, floppy drive, and extra RAM in the HP System Processor. (Most systems come with these items factory installed.)
- HP Mount the floor stand to the System Processor and stand the unit vertically.

(continued)

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 Chapter 3 of *Getting Started With MetroPro, OMP-0346.* Then start MetroPro and login.
- ☐ Align the lamp bulb.
- ☐ Install the objective. *Handle with care.*
- ☐ Align the Support Stage.

You are now ready to begin using your metrology system.

INSTALLATION PROCEDURES

Procedures to install your NewView system are listed in numerical order.

1. Install System Processor

Most of the HP System Processor components are simply unpacked, set in position, and then interconnected with cables. A cable interconnection diagram is located later in this chapter.

Most systems come with the Matrox Board and additional RAM factory installed. If it is necessary to install these items, refer to the procedures below. In all cases, you should install the Processor floor stand.

Note:

For more information, refer to the HP documentation:
HP Hardware Installation Guide Model 715, and
HP Model 715 Owner's Guide (Appendix B).

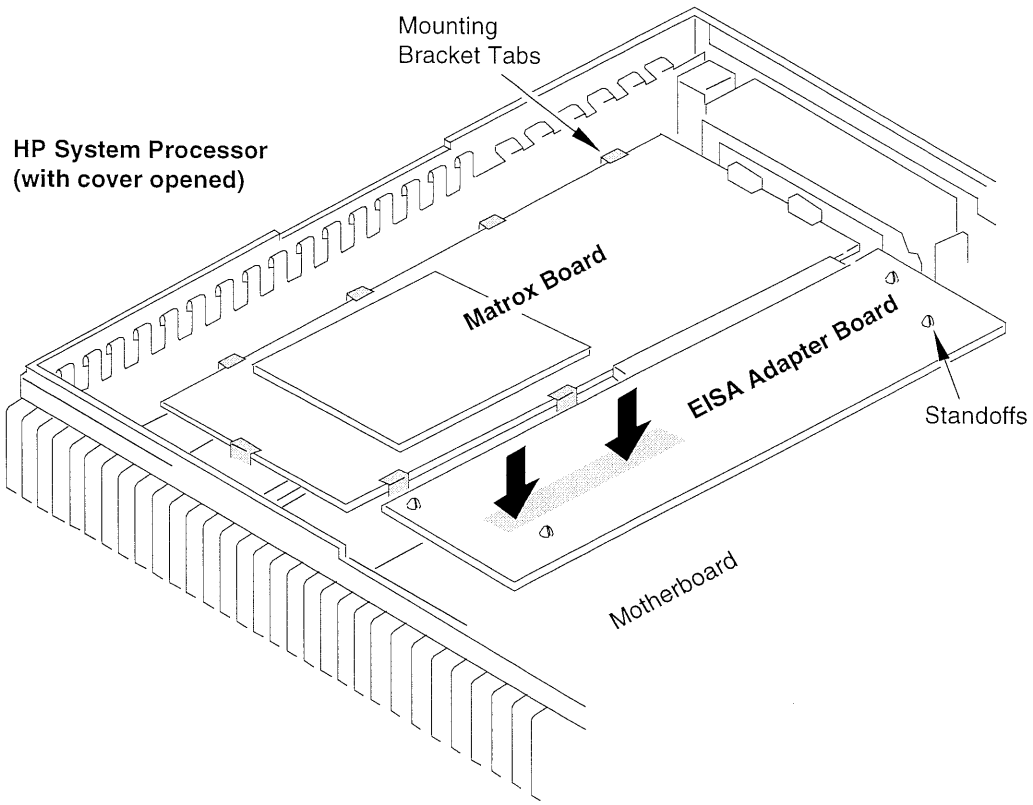
Install the Matrox Board

Most systems come with the Matrox Board factory installed. If it is necessary to install the board, follow the instructions below and refer to Figure 2-1.

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 that held 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.

Install the Additional RAM

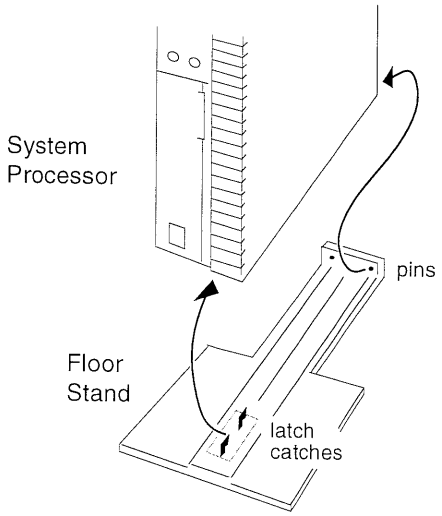
Most systems come with additional RAM factory installed. If it is necessary to install RAM follow the instructions provided in the HP documentation.



Matrox Board Installation
Figure 2-1

Install the Floor Stand

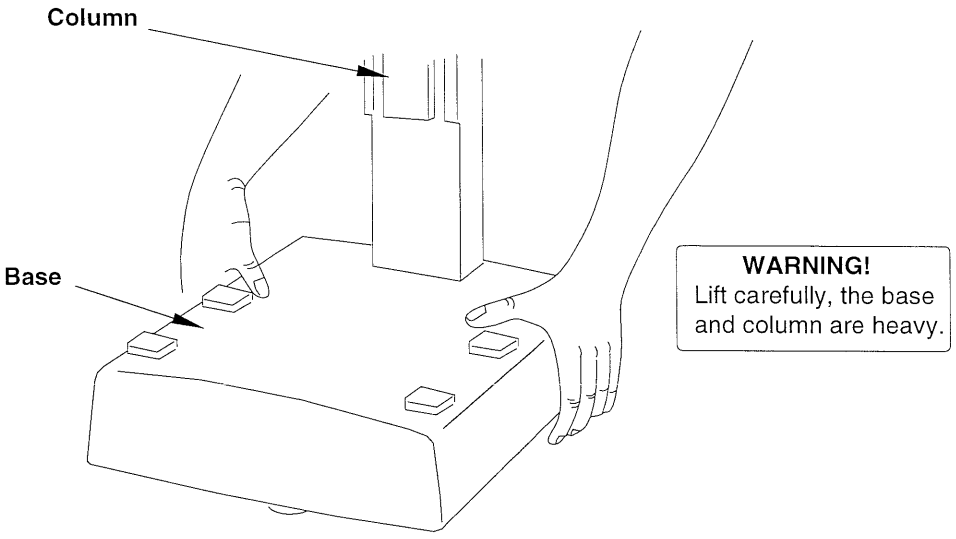
1. Insert the floor stand into the end of the unit as shown. Slide the latch on the bottom of the stand to lock it in place. For greater detail refer to the HP Hardware Installation Guide.
2. Stand the System Processor in a vertical position.



Installing the Floor Stand
Figure 2-2

2. Mount Microscope Head

Refer to Figure 2-3 for lifting the column. Refer to Figure 2-4 for mounting the Microscope head on the column.



Lifting the Column and Base
Figure 2-3

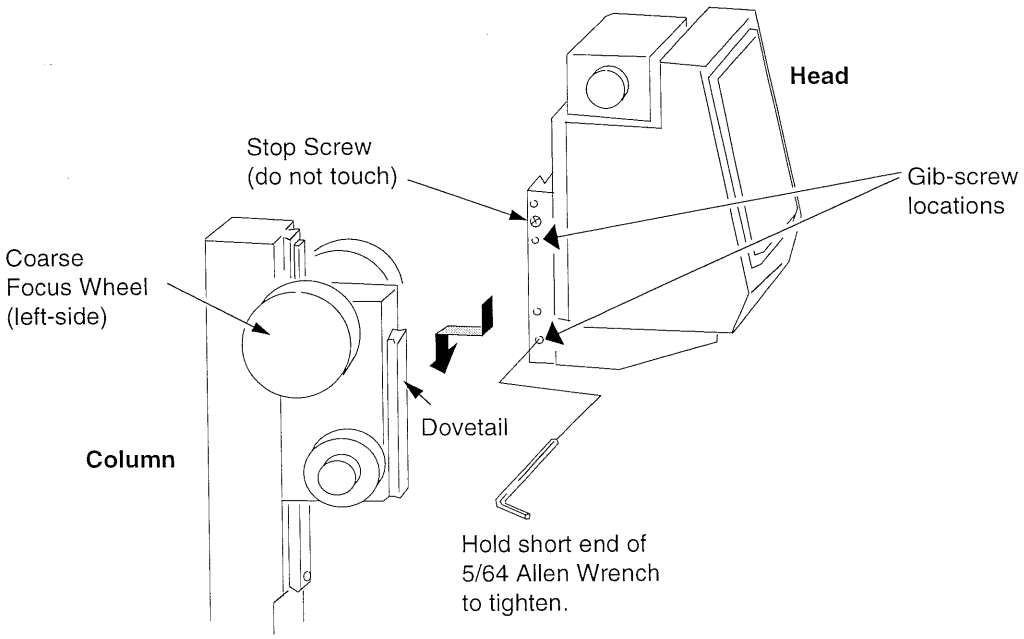
1. Remove the microscope column and base assembly from the shipping box. Lift the assembly as shown in Figure 2-3. Lift carefully; the column and base weigh about 65 pounds (30 kg). Stand it upright.
2. Remove the Microscope head from the shipping box, being careful not to touch it near the objective 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.

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.*



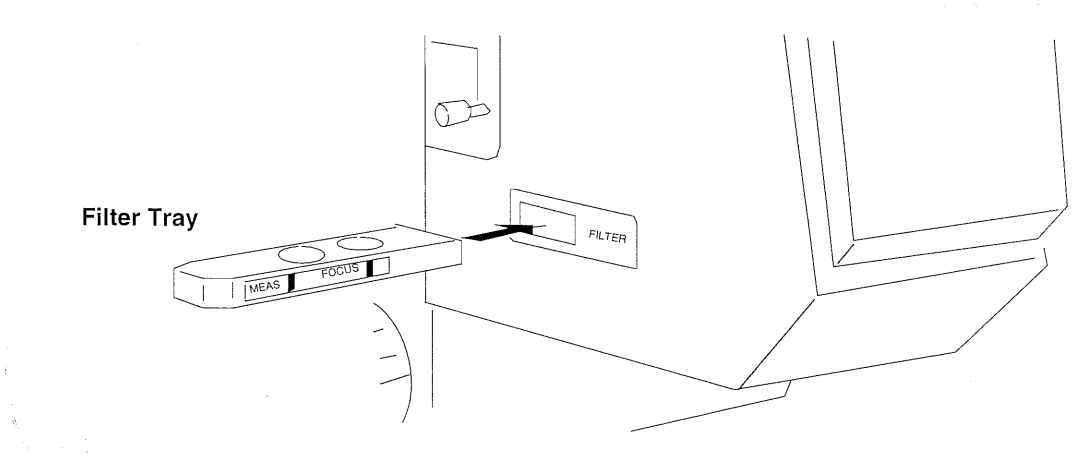
Mounting the Head on the Column

Figure 2-4

3. Install Filter Tray

The Filter Tray slides into the slot in the Microscope head; refer to Figure 2-5. 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.



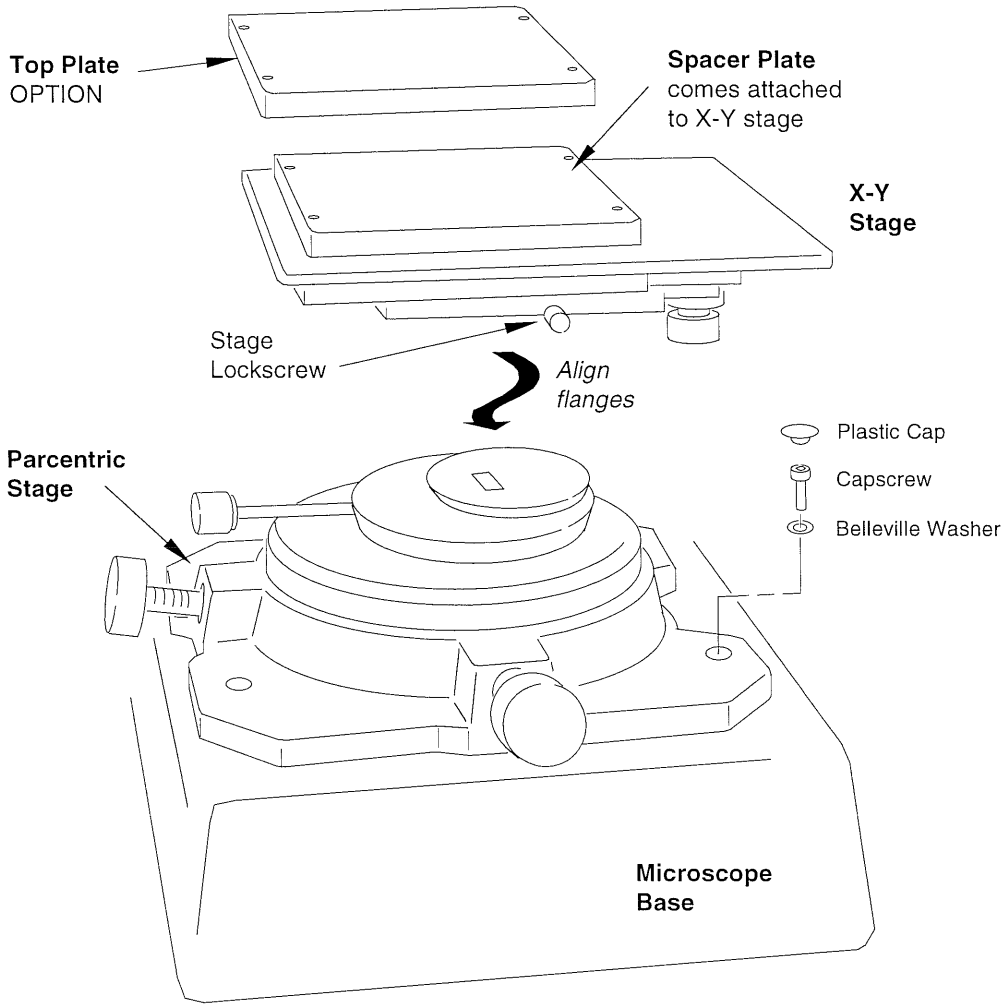
Installing the Filter Tray
Figure 2-5

4. Assemble 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 2-6.

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.

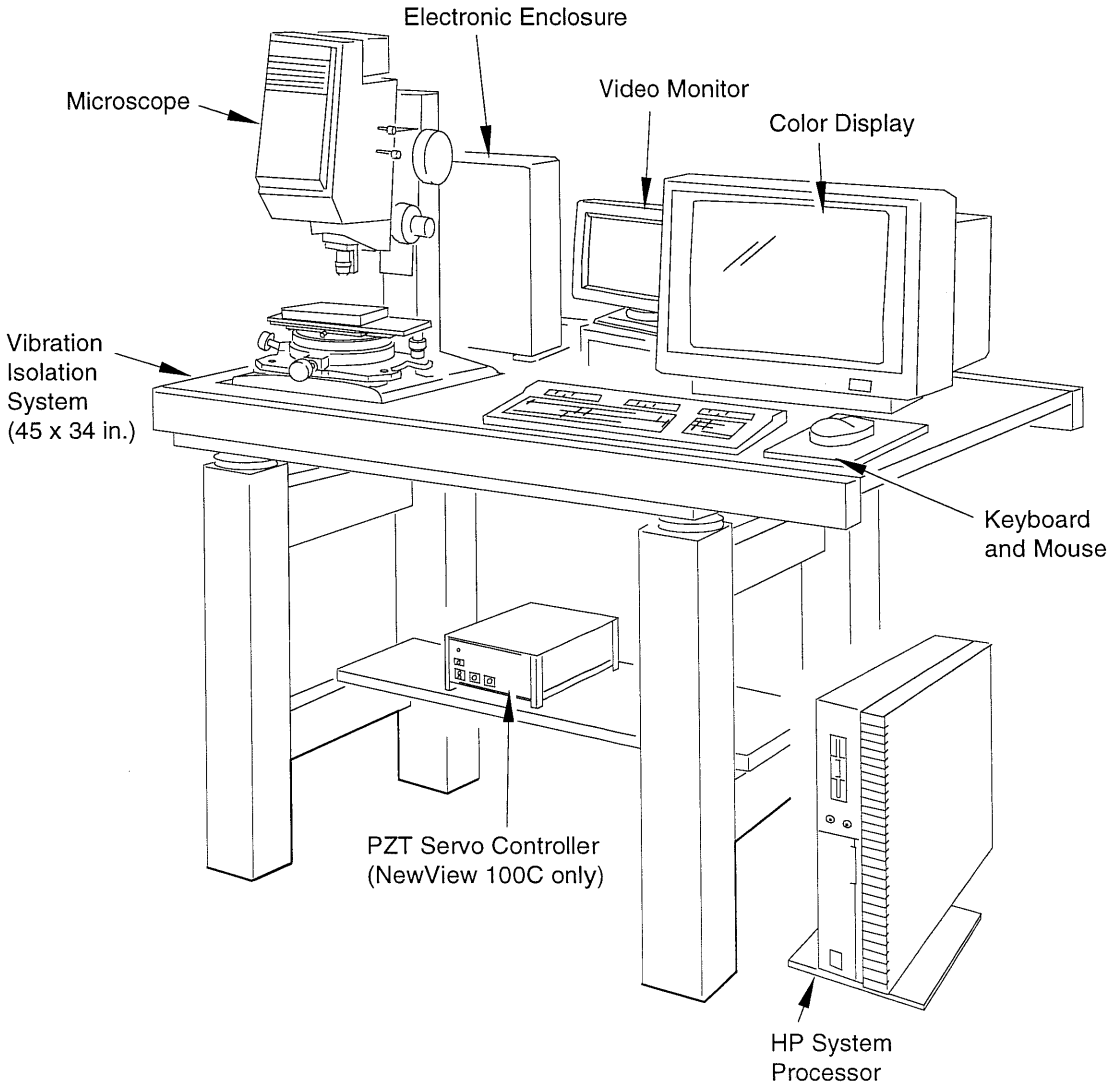
4. Align the flange in the X-Y Stage to the flange in the parcentric stage. Visually align the sides of the X-Y Stage parallel to the edges of the Microscope base. Secure the X-Y Stage in position by tightening the Stage Lockscrew.



Installing the Support Stage
Figure 2-6

5. Position Components

The minimum recommended size and space requirements are shown in Figure 2-7. Be sure to isolate the Microscope from the working surface by the vibration isolation system. Position the Electronic Enclosure six 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.



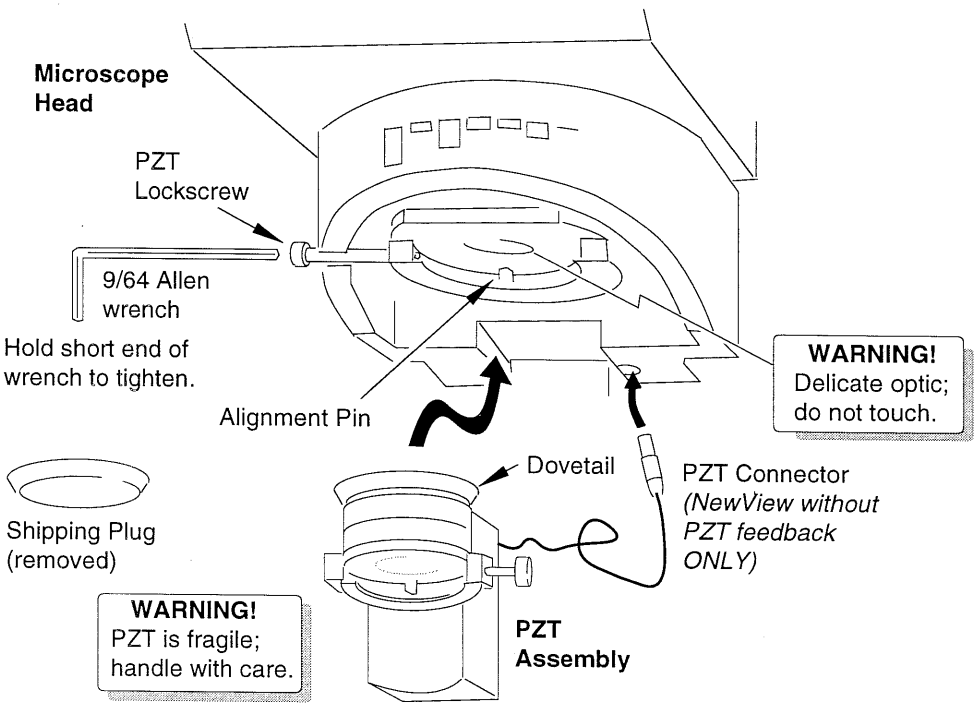
Recommended Component Layout

Figure 2-7

6. Install PZT Assembly

Install the PZT assembly as shown in Figure 2-8.

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.
3. *For NewView without PZT Feedback.* Feed the PZT connector up through the hole in the Microscope head; it exits near the top of the column and plugs into a connector on the back of the head.
4. *For NewView 100C with Capacitive Feedback.* Remove the self adhesive strips on the cable clamps and attach them to the Microscope column as shown in Figure 2-10. Route the PZT cable through the clamps, so they clear the up and down movement of the Microscope head and do not introduce vibrations. Continue to route the PZT cable under the Electronic Enclosure to the PZT Servo Controller on the shelf under the table.



Installing the PZT Assembly

Figure 2-8

7. Connect Cables

The next two major steps are to connect the Microscope to the Electronic Enclosure, and connect the Microscope and System Processor components.

Connect Microscope Cables

To connect the cables from the Microscope head to the Electronic Enclosure perform the following procedure.

For the NewView without PZT feedback refer to Figure 2-9.

For the NewView with PZT feedback refer to Figure 2-10.

WARNING!

You must wear the disposable ESD wrist strap when connecting the Microscope cable assembly; otherwise, you may damage sensitive electronic components. The Enclosure power cord must be connected to earth ground through a grounded outlet for proper ESD grounding. Ensure that the power switch is off.

1. Adhere the copper foil end of the disposable wrist strap to the Enclosure on an unpainted metal surface and place the strap around your wrist. Plug the Electronic Enclosure power cord into a grounded outlet.

2. Remove the two cover screws (one on each side of the cover). Remove the cover by pulling it up from the bottom and then away.

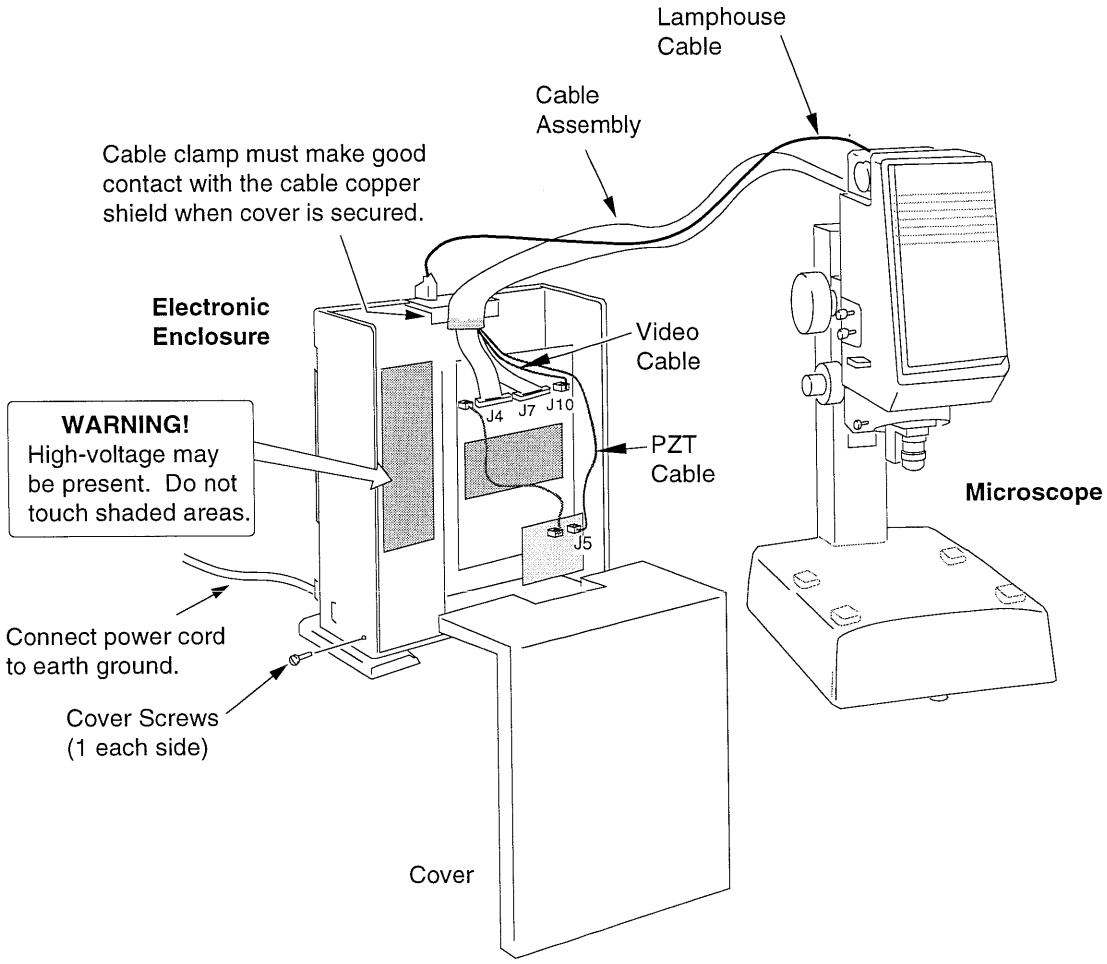
WARNING!

Do not touch the high voltage section on the circuit board or the power supply.

3. Route the cable assembly so it is not twisted. Connect the ribbon connectors to J4 and J7 on the upper circuit board; then connect the video cable (square SMB connector) to J10 on the upper board. All connectors are marked.

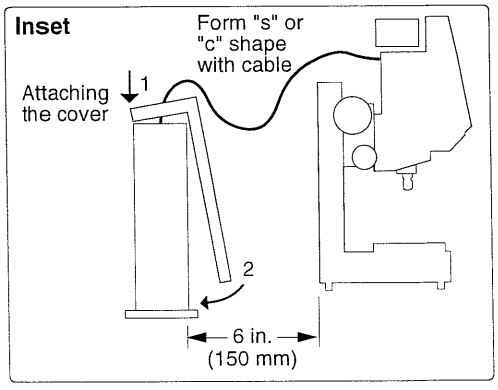
4. *For NewView without PZT Feedback.* Connect the PZT cable (square SMB connector) to J5 on the small, lower board mounted inside the Enclosure. See Figure 2-9.

5. *For NewView 100C with Capacitive Feedback.* Place the PZT Servo Controller on the shelf of the vibration isolation system.
   a. The PZT is installed as shown on page 2-13. Route the cable from the PZT through the two cable clamps on the microscope column, under the Electronic Enclosure to the PZT Servo Controller below. Match the cables to the PZT Controller connectors, ensuring that "T" and "P" are correct.
   b. Route the cable from the PZT Controller "Control Input" connector up to the Enclosure, through the cable clamp on the back of the Enclosure, and through a slot in the Enclosure to connector J8 on the board inside. The grommet on the cable should rest in the slot.
6. Position the cable assembly so its braided mesh contacts the unpainted metal surface and the foam cable clamp on the Electronic Enclosure. Install the Enclosure cover by hooking the top and then swinging the cover into place. (See inset of Figure 2-9 or 2-10.) Secure the cover with two cover screws.
7. Plug the lamp house cable into the connector on top of the Electronic Enclosure. Position the Electronic Enclosure about 6 inches behind the Microscope so the cable forms an "s" or "c" shaped loop and is not strained.



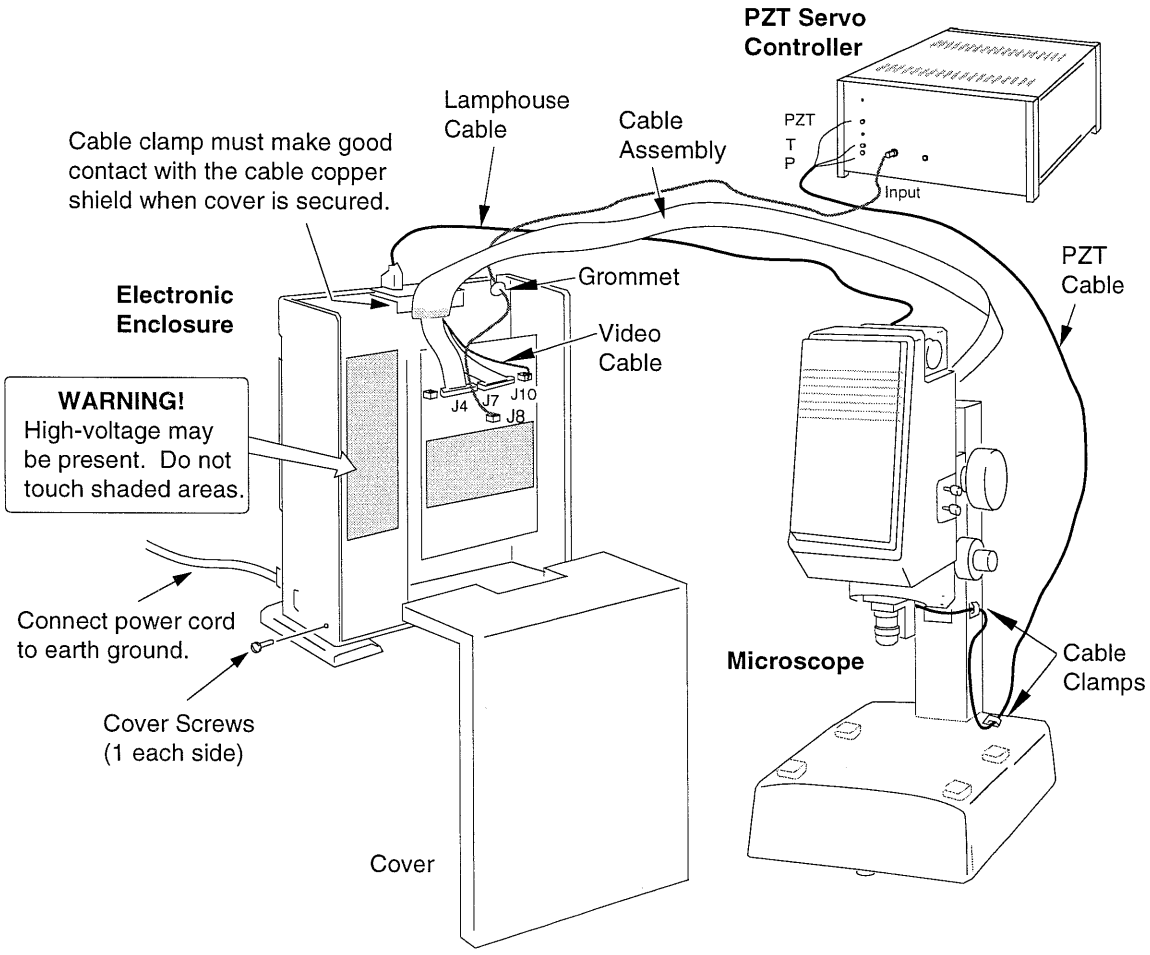
For NewView without PZT feedback ONLY

REMINDERS:
- *Ensure Enclosure power switch off.*
- *Ground Enclosure through power cord.*
- *Adhere ESD Wrist Strap to Enclosure.*



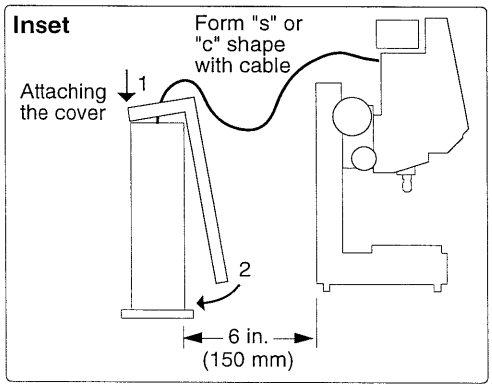
Connecting the Microscope Cable
(NewView without PZT Feedback)

Figure 2-9



For NewView with capacitive feedback ONLY

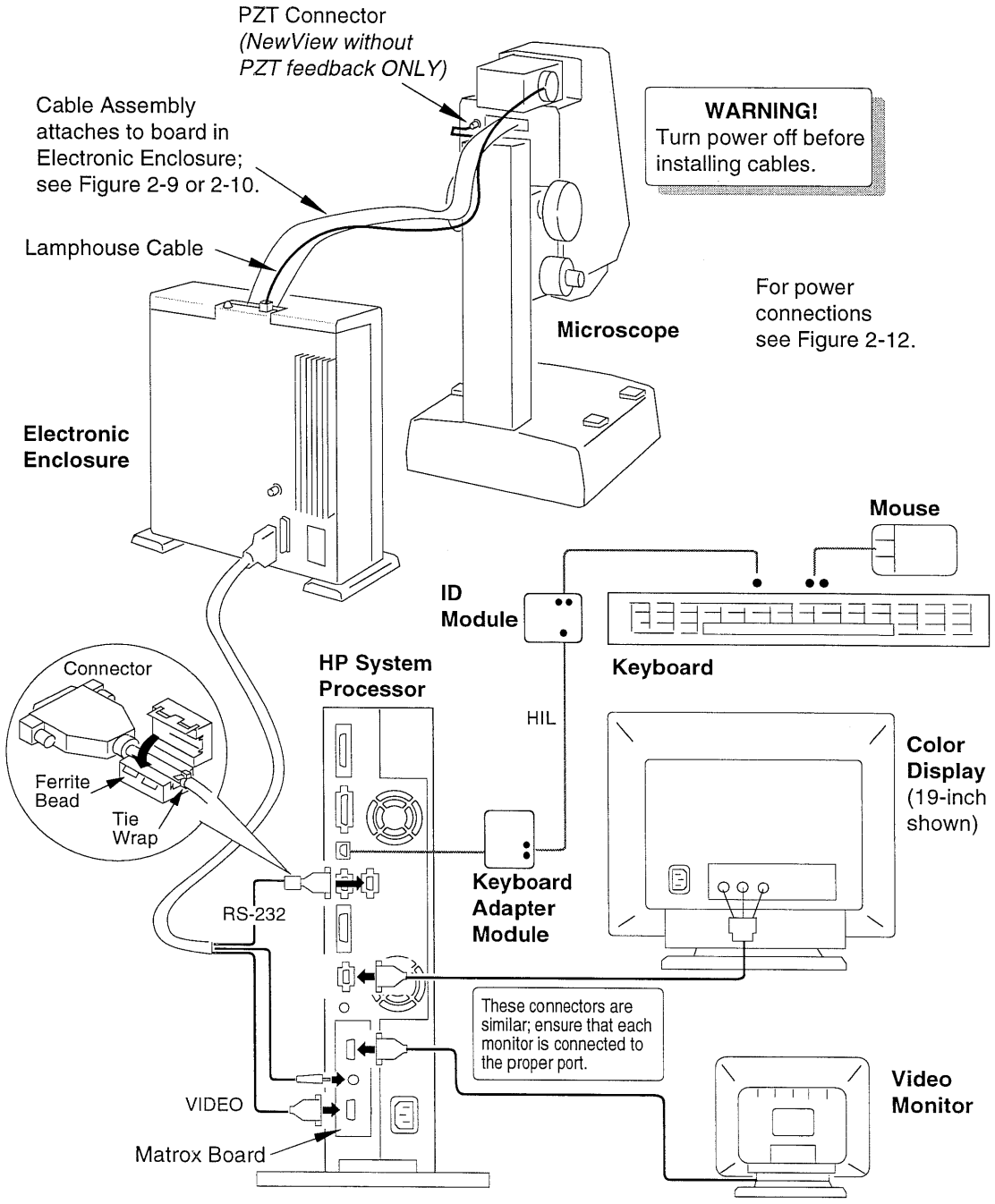
REMINDERS:
- *Ensure Enclosure power switch off.*
- *Ground Enclosure through power cord.*
- *Adhere ESD Wrist Strap to Enclosure.*



Connecting the Microscope Cable
(NewView with Capacitive Feedback)
Figure 2-10

Connect Component Cables

Cable connections are shown in Figure 2-11. Cables shown for the System Processor are for reference only; connect these cables following the suggestions in the HP documentation.



Cable Interconnection

Figure 2-11

8. Connect Power

Figure 2-12 shows power distribution for the system. Observe the following warnings.

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 HP computer components.

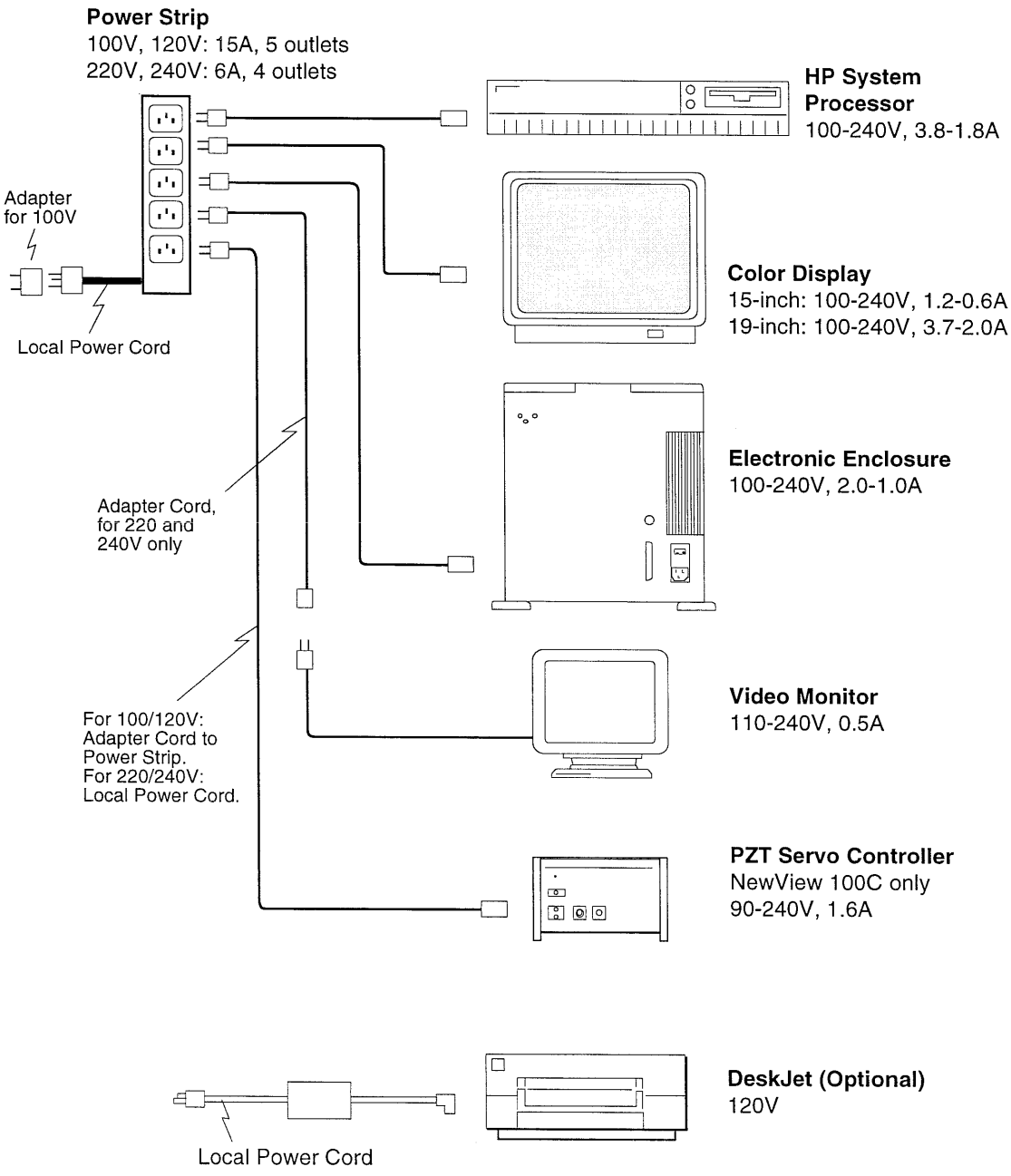
220V or 240V Power Distribution

The Zygo Electronic Enclosure, Video Monitor, PZT Servo Controller, and HP system controller 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 HP 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.

WARNING!

Ensure that all 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.



Power Distribution

Figure 2-12

9. Install 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 HP System Processor, Electronic Enclosure, Color Display, Video Monitor, and the PZT Servo Controller (optional).
2. To install MetroPro, follow the instructions titled "Installing and Updating MetroPro" located in Chapter 3 of *Getting Started with MetroPro, OMP-0346.*
3. After MetroPro is installed, complete the licensing requirements as explained in Chapter 4 of OMP-0346.
4. Open or login into MetroPro as explained in Chapter 5 of OMP-0346.

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

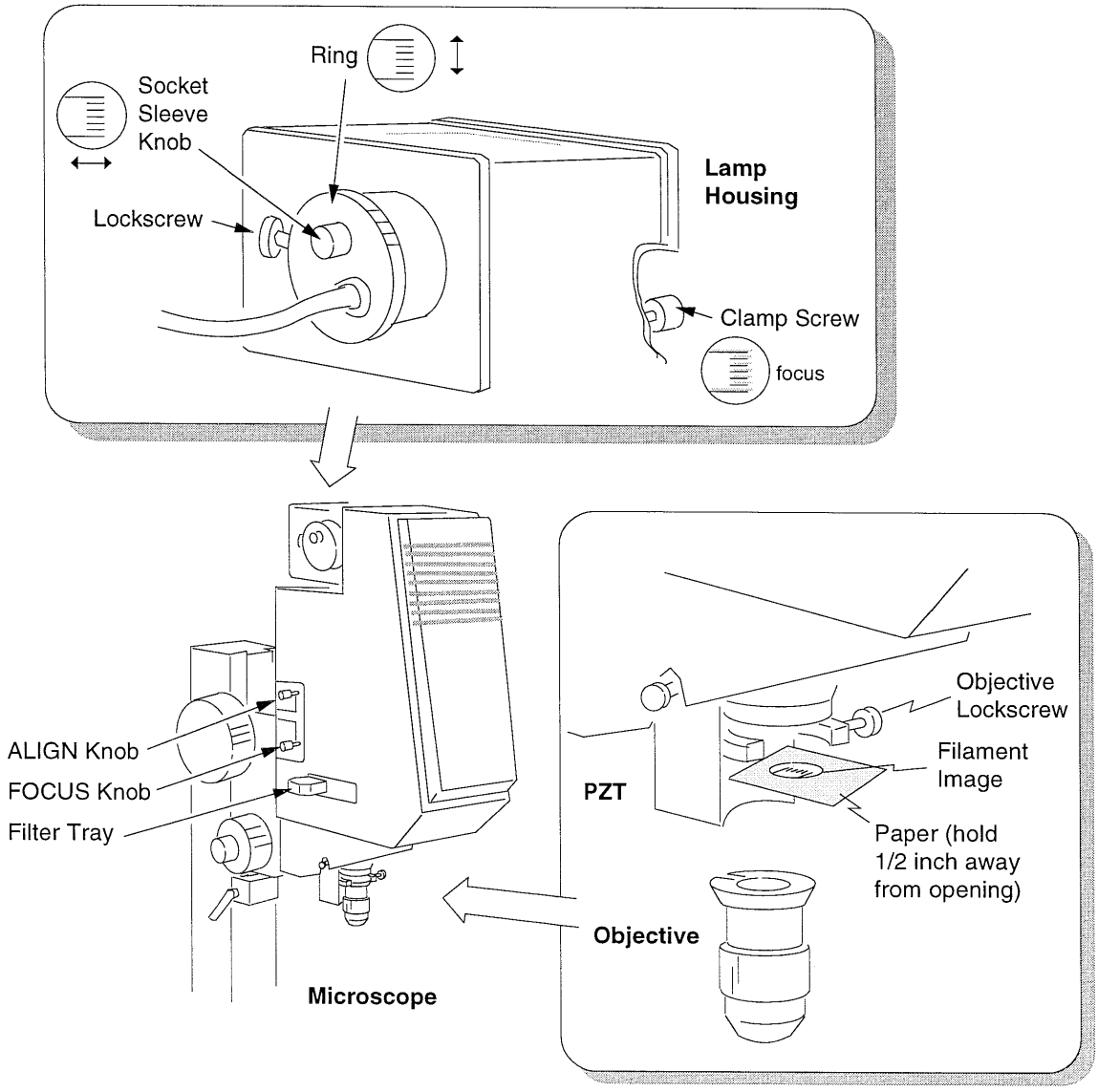
10. Align Lamb Bulb

The lamb bulb is factory aligned. To check and to align the lamp bulb, complete the following procedure and refer to Figure 2-13.

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

1. Position the FOCUS and ALIGN knobs in the measure position, and the filter tray at 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.



Aligning the Lamp Bulb
Figure 2-13

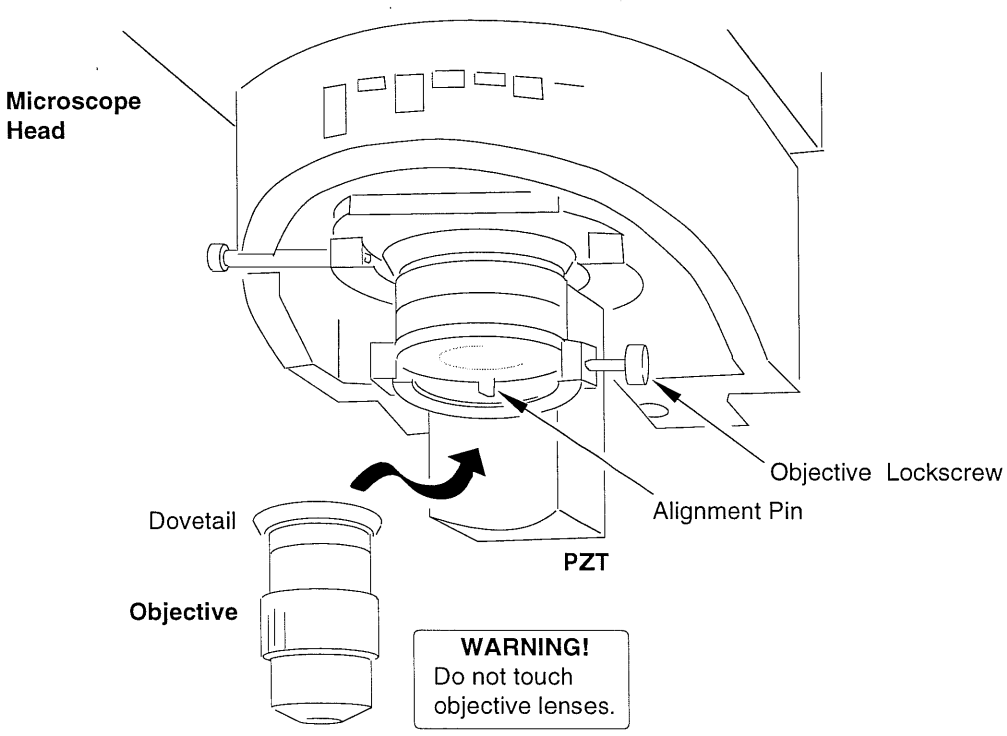
11. Mount Objective

To install objectives on the NewView, refer to Figure 2-14. 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.



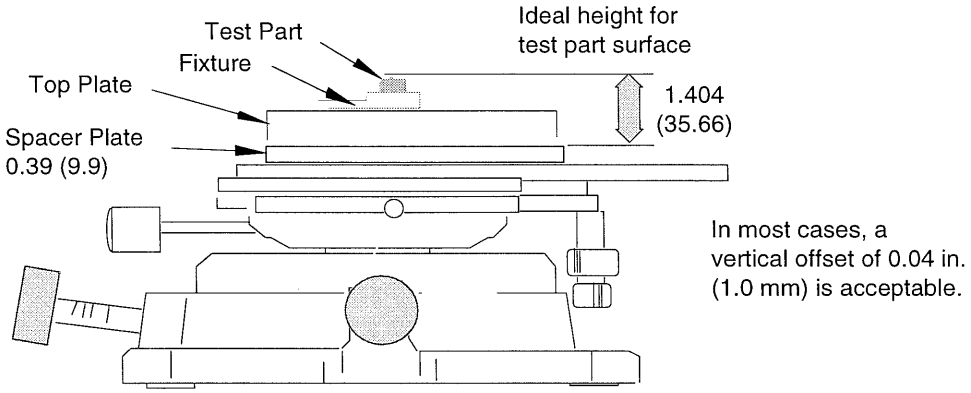
Mounting an Objective

Figure 2-14

12. Align 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.

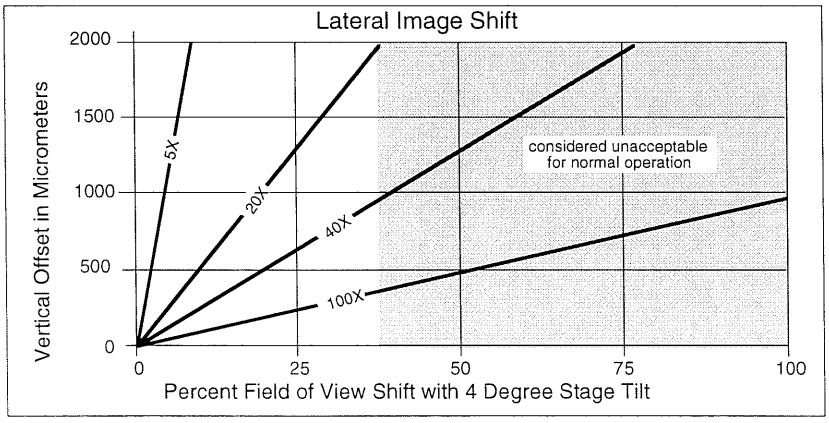
- *Stage Lateral Alignment* The Stage should be laterally aligned under the objective in use to keep the part in focus as stage tip and tilt is adjusted. Two methods are provided for lateral alignment.
- *Part Height* The part surface being measured should be located 1.404 inches (35.66 mm) above the 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 Figure 2-15.



Part Height

Figure 2-15

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.



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.

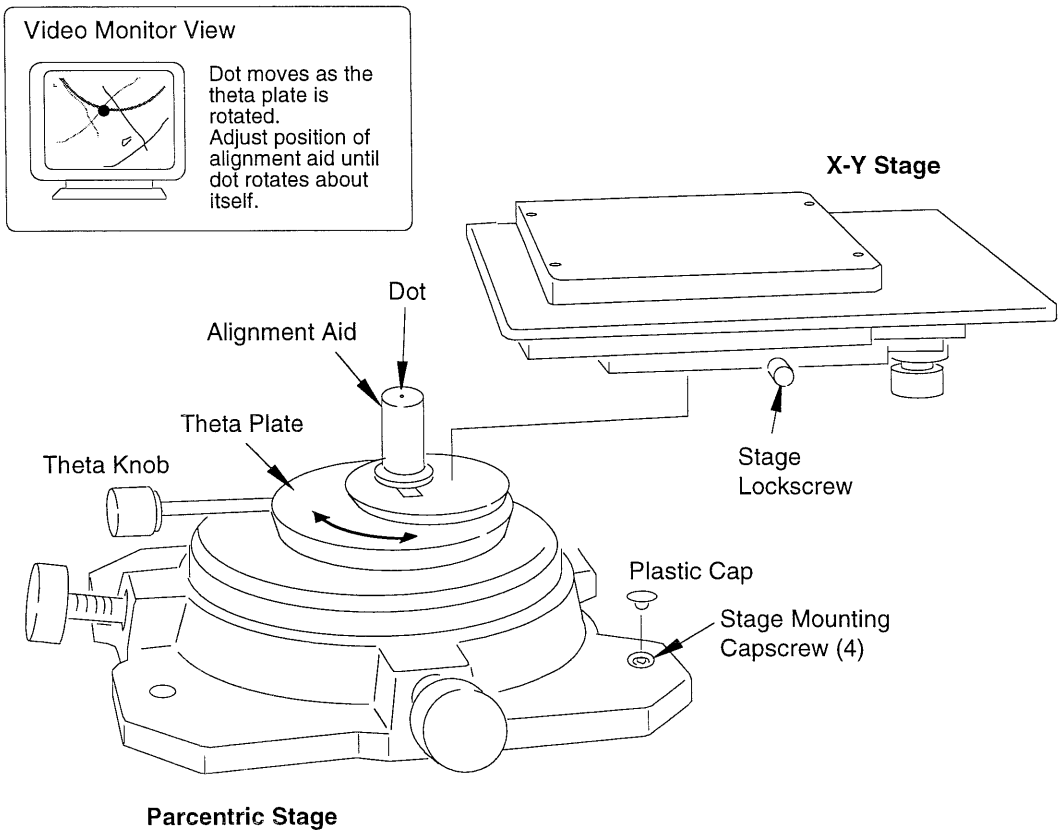
Note:

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 Figure 2-16.

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.



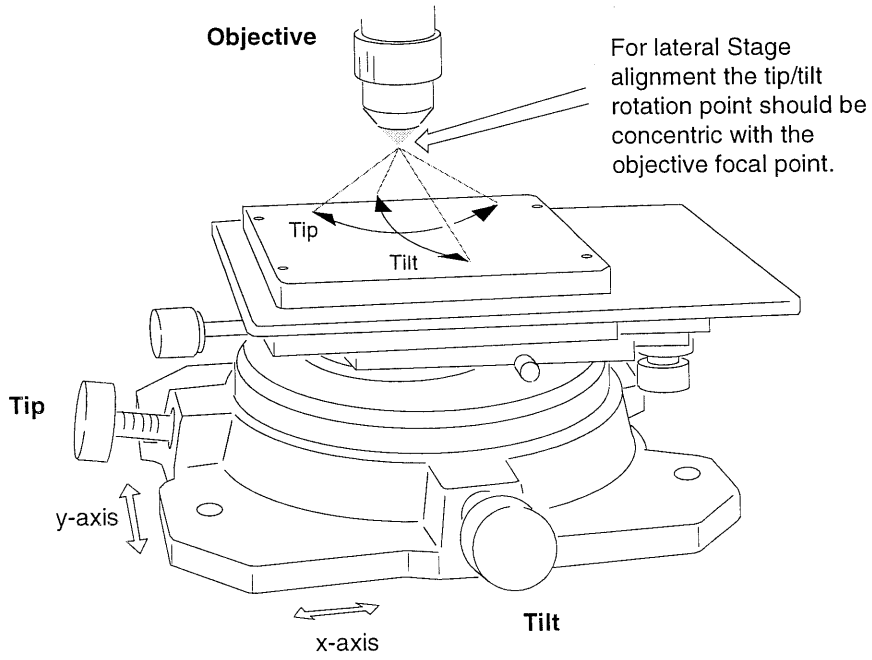
Using the Stage Alignment Aid
Figure 2-16

Method 2 - 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 Figure 2-17.

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.
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.



Lateral Alignment of the Motorized Stage
Figure 2-17

Chapter 3
OPERATION

In This Chapter

OPERATION OVERVIEW

This section provides an overview of NewView operation. It includes:

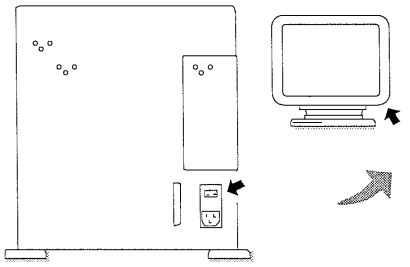
- Start Up
- Making a sample measurement
- Shutdown

Greater details on using the NewView are covered in later sections.

Start Up

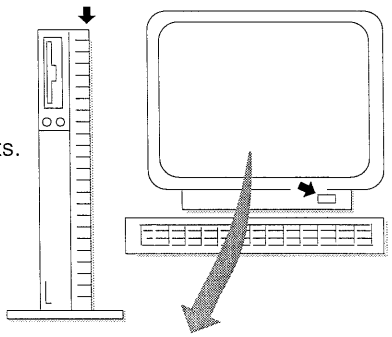
STEP 1

Turn on Microscope components. Wait 15 seconds.



STEP 2

Turn on computer components.



STEP 3

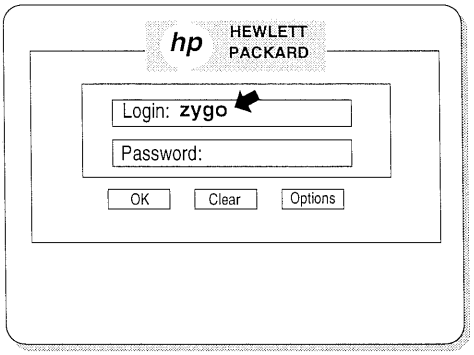
Wait until the HP Login screen appears. After Login type:

`zygo` [Return]

When asked a question about the date, press:

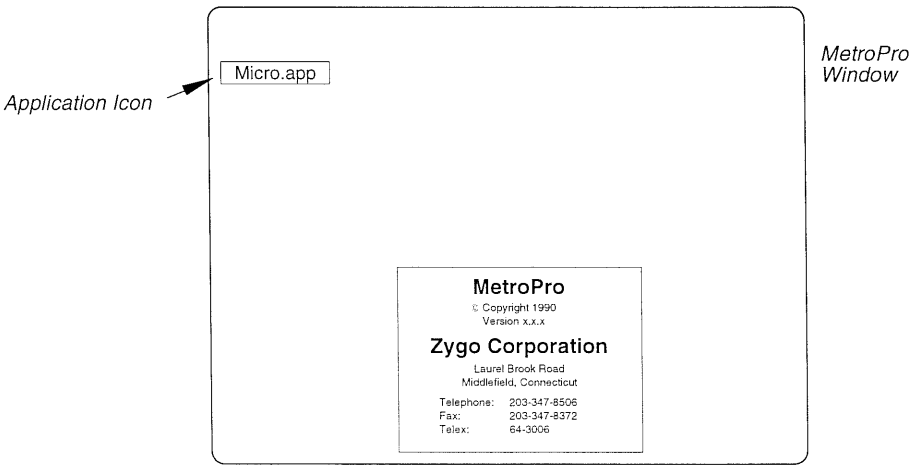
`Y` [Return]

MetroPro software automatically opens after login.



screen display

To open an application, click on the icon once with the left mouse button.

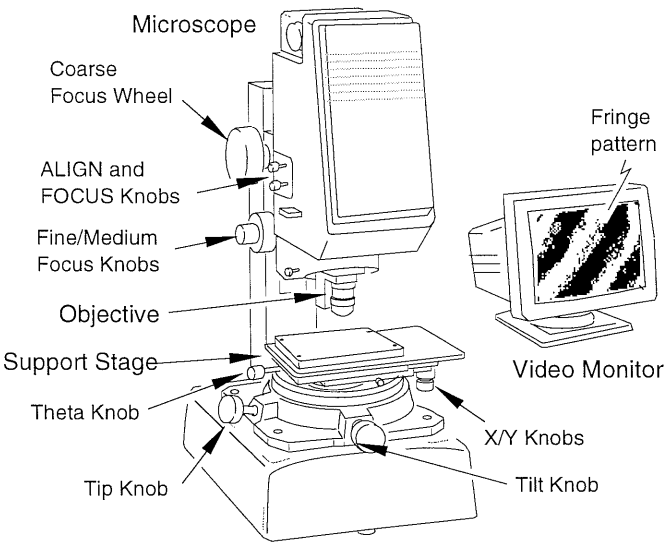


MetroPro Window

Sample Measurement

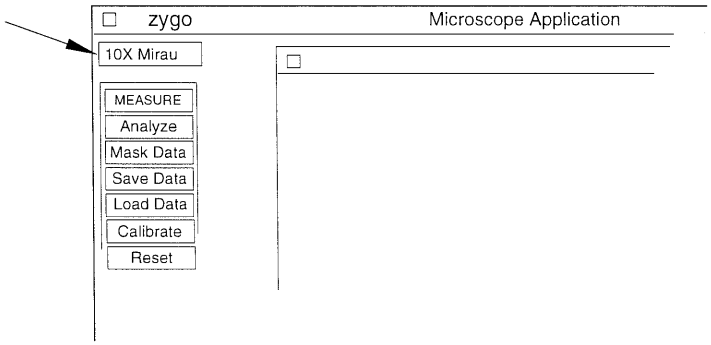
1. Place part on Support Stage under objective.
2. Turn coarse and medium focus controls to bring objective near to part surface. Bring the objective slightly closer than its working distance.
3. Locate the part under the objective by turning the Stage X and Y knobs.
4. Focus by turning the fine and medium focus knobs so the head moves slowly upward. Adjust focus for surface detail and fringes (contrasting bands).
5. Turn the Stage tip and tilt knobs to minimize the number of fringes. Readjust focus and part location if necessary.
6. Click the mouse on the **Objective** button until it displays the objective power in use.
7. Press **F5** to adjust the light level.
8. Press **F1** to measure. Results are calculated and then displayed.

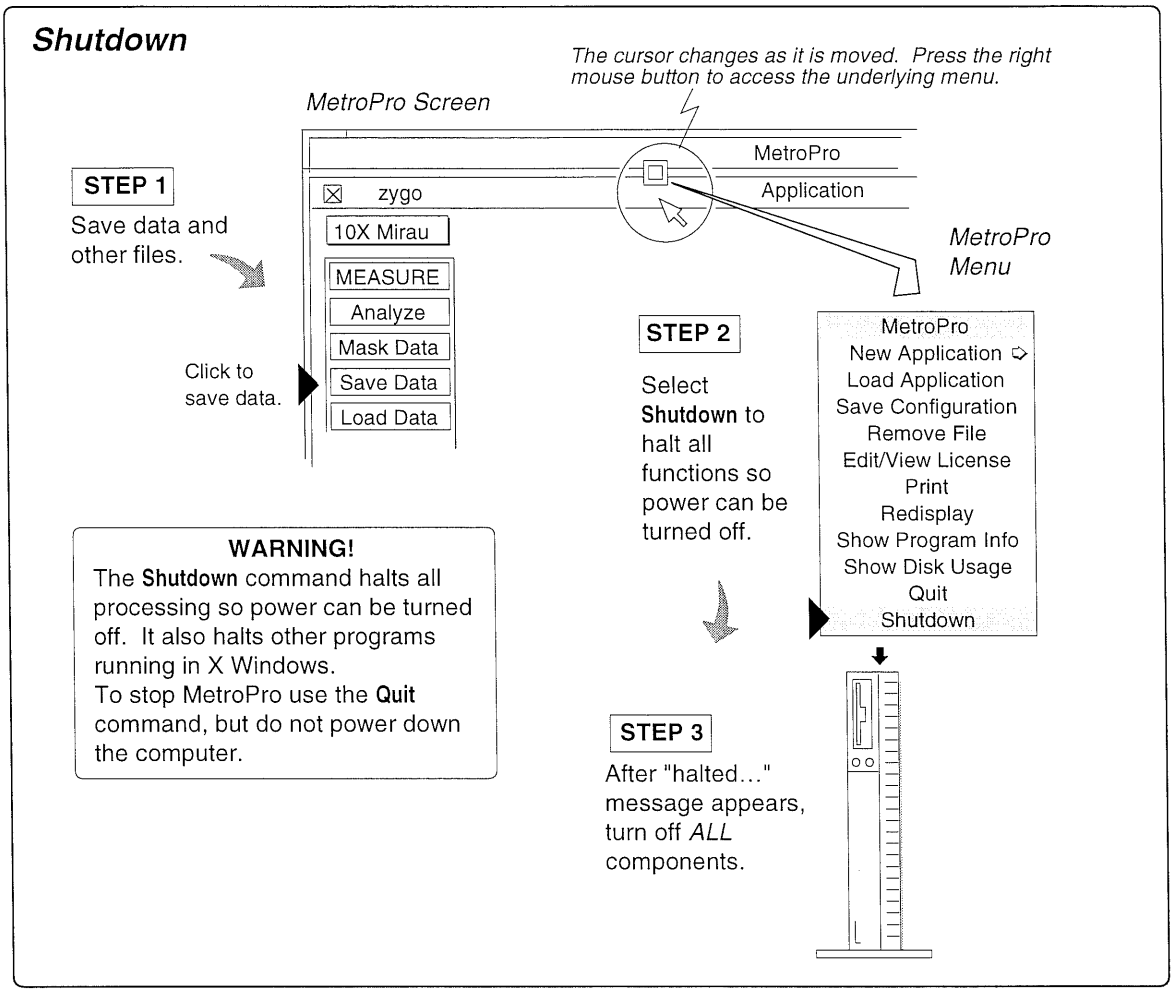
More details provided on pages 3-9 thru 3-12.



Part must be in focus with fringes to measure.

MetroPro Screen





THE NEWVIEW CONTROLS

The pages that follow provide a complete discussion of the NewView controls. It covers:

- Microscope Controls
- Support Stage Controls
- Electronic Enclosure Controls
- PZT Servo Controller
- Video Monitor Controls
- Light Level Controls

Microscope Controls

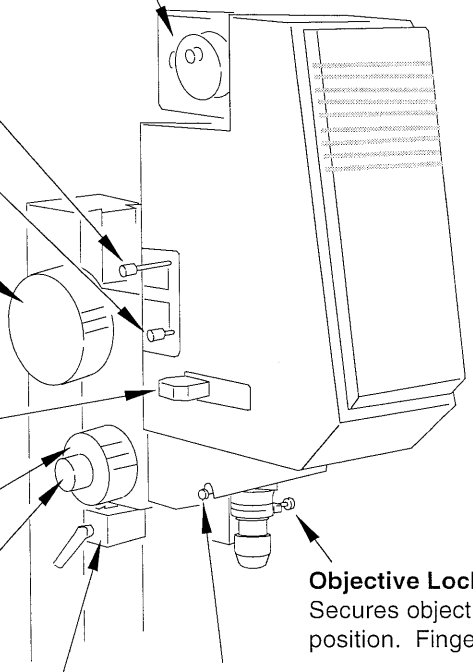
Light Centering Controls
Use to adjust for proper illumination when replacing the bulb.

Some controls are also accessible on the right side of the Microscope.

ALIGN Knob
Use with low power objectives as tip/tilt adjust aid. Pull out to align, in to measure.

FOCUS Knob
Use as focus aid. Pull out to focus, in to measure.

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.



Filter Tray
Two position: MEAS for taking measurements, FOCUS to aid focusing 2.5X and 5X objectives.

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.

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

Coarse Z-stop
Position to prevent objective from contacting the stage or test part. It must not contact the head.

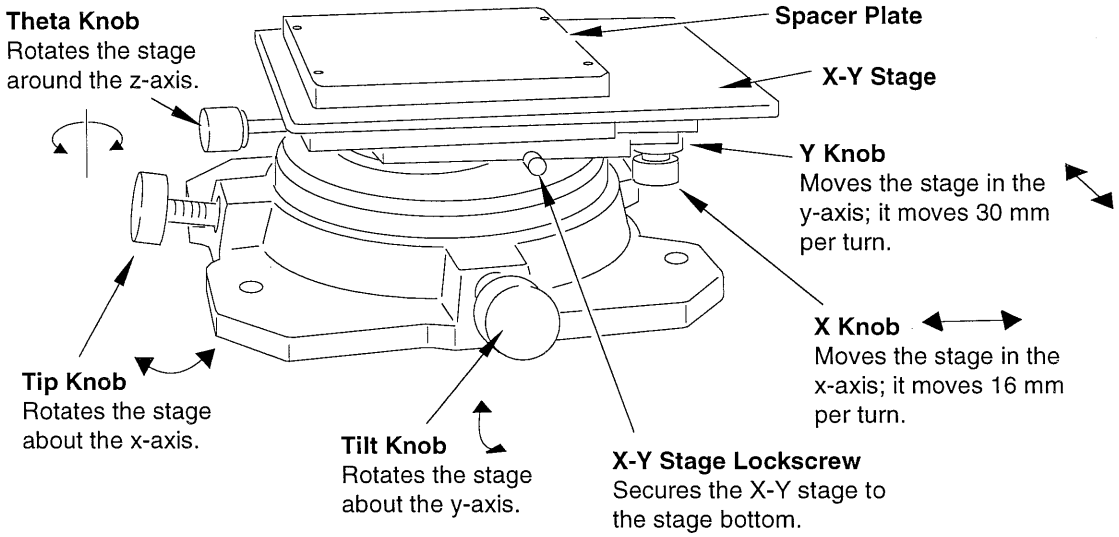
PZT Lockscrew
Secures PZT in position. Requires 9/64 Allen wrench.

Objective Lockscrew
Secures objective in position. Finger tight only.

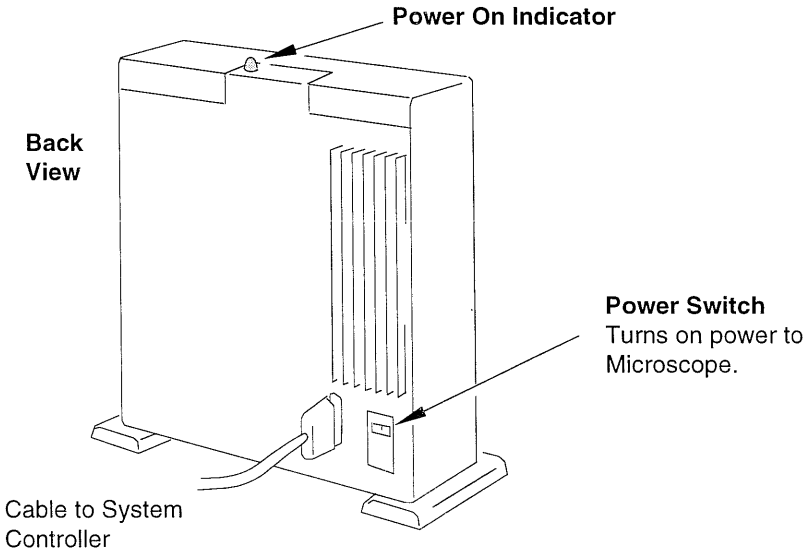
WARNING!
Be careful when adjusting the Coarse Focus Wheel tension. If the tension is too loose the head can fall under its own weight.

Be careful when focusing the Microscope so the objective does not contact the test part or Support Stage.

Support Stage Controls



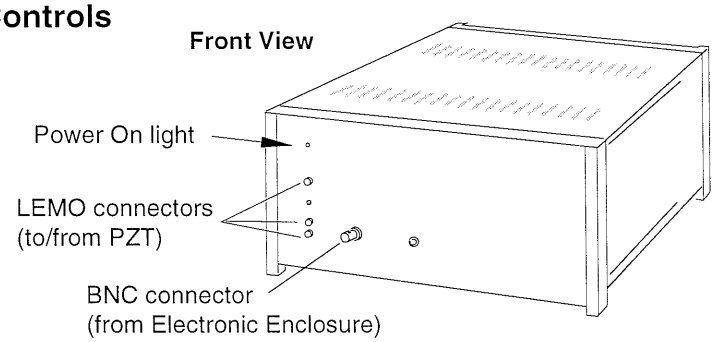
Electronic Enclosure Controls



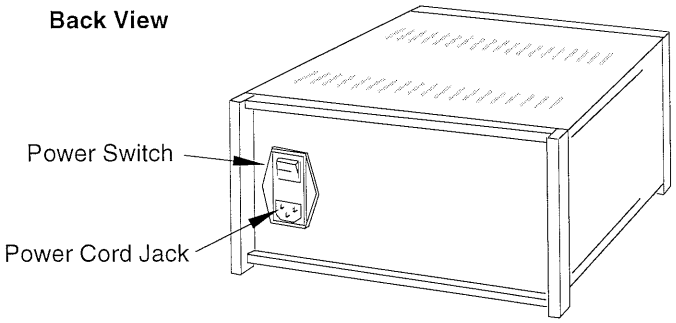
PZT Servo Controller Controls

NewView 100C only

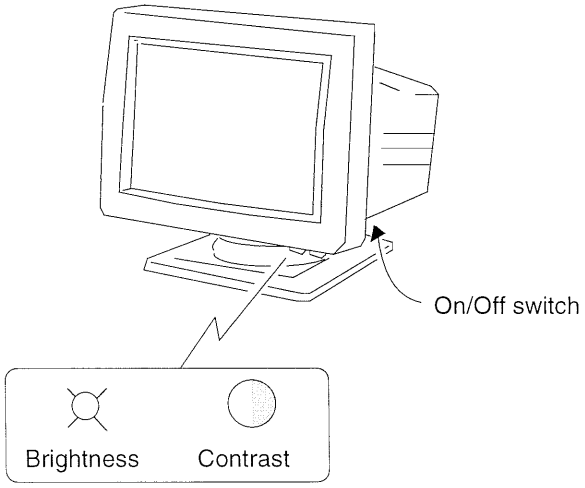
Front View



Back View



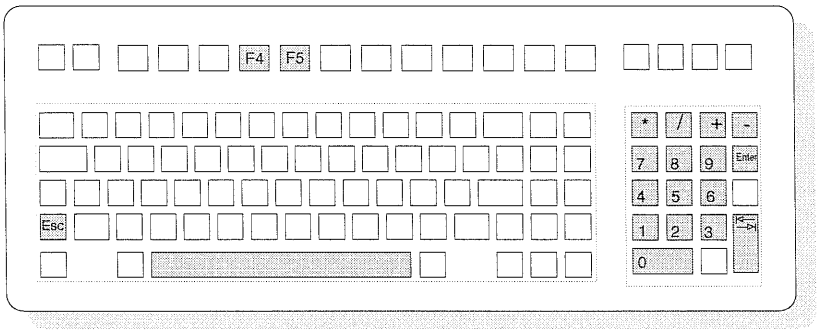
Video Monitor Controls



Operation Instructions
Pictures will not appear if the **Contrast** and **Brightness** controls are turned excessively in one direction. Adjust these controls for optimum picture quality.

Light Level Controls

Keyboard



F4	Open Light Level View window
F5	Auto adjust light level
Esc	Abort measurement
space bar	Stop scan, process any acquired data

Use the tab key to toggle between two light level settings - one for adjusting focus, the second for taking data.

Coarse up/down: * /

Fine up/down: + -

Number keys adjust light level in 10% steps:
1→10%
2→20%
↓
9→90%
0→100%

7 8 9
4 5 6
1 2 3
0

Enter — Close Light Level View window (or Return)

Toggle between last two settings

Adjusting Light Level

Automatic

Press **F5**

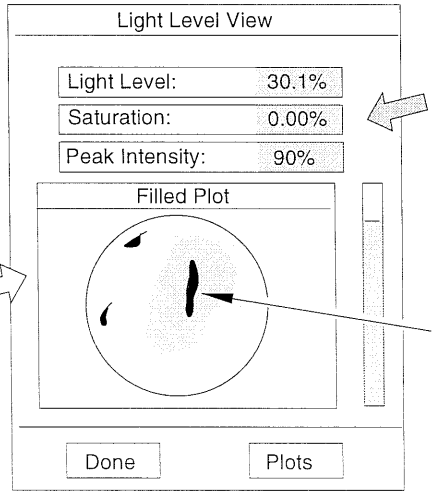
Press F5 when first finding focus, as a quick light adjust. Press F5 again before measuring, after you have adjusted focus for darkest fringes.

Manual

Press **F4** to open manual light level viewing aid.

Press **Enter** or click Done to close the window.

Window in MetroPro



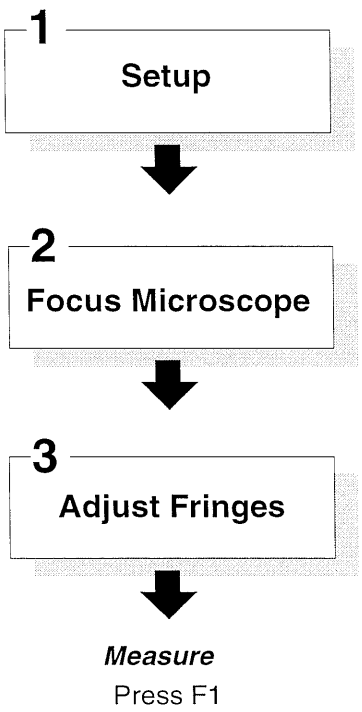
Adjust focus for the darkest fringes. Then, adjust light level with keyboard until all indicators are green.
Do not allow any saturation.

Saturated pixels show up in red.

USING THE MICROSCOPE

The following pages provide details on operating and adjusting the NewView.

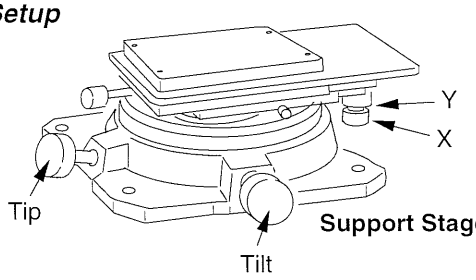
Simplified Measurement Overview

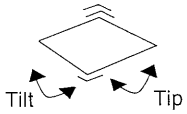


Each step is explained over the pages that follow…

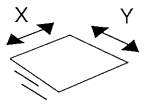
1 Setup

Part Setup





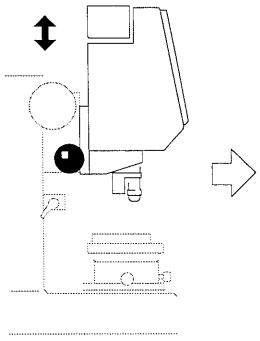
Level Stage



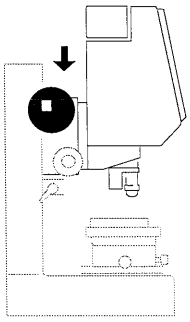
Locate part under objective

Microscope Setup

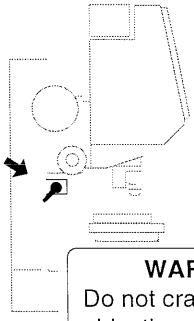
Objective	2.5X	5X	10X	20X	40X	100X
Dist. (mm)	11.1	9.0	4.0	2.5	4.5	0.6



Turn medium focus knob to position microscope head in the center of its travel.



Turn coarse focus wheel to position objective at its working distance from the test part.



Position Coarse Z-stop to stop objective from crashing into the test part or stage.

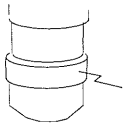
WARNING!
Do not crash the objective onto the test part or stage.
The z-stop should not contact the microscope head.

40X and 100X Objective Setup

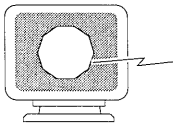
The 40X and 100X objectives are sensitive to temperature changes. For maximum performance the equal-path ring must be adjusted under the actual operating conditions.

1. Put Focus knob in focus position.
2. Adjust light level for even lighting.
3. Turn equal-path ring for sharp aperture.

Once the objective is adjusted under operating conditions it is not necessary to change the adjustment.



40X or 100X Objective



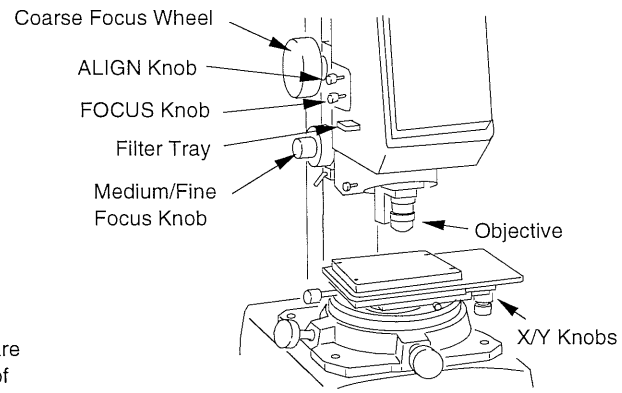
Video Monitor

2 Focus Microscope

Set Software Scan Length Control

Select a length slightly greater than the peak to valley height in the test part.

Scan Length: 5 um bipolar (6 sec)



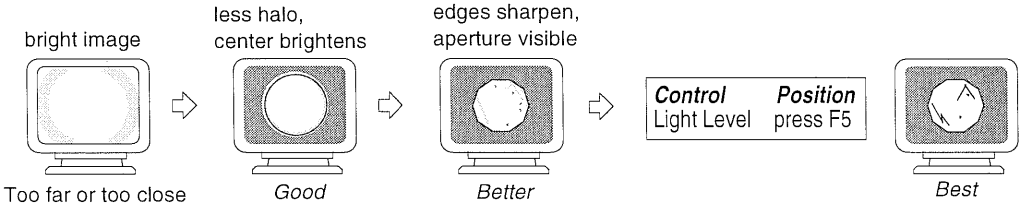
Set Controls to Starting Point

Control	*Position*	
ALIGN Knob	measure (in)	Start
FOCUS Knob	focus (out)	
FILTER	MEAS	
Light Level	6 to 9 (1)	
Focusing Controls	objective at working distance	

(1) Actual light level settings are dependent on the reflectivity of the part.

Objective	2.5X	5X	10X	20X	40X	100X
Distance (mm)	11.1	9.0	4.0	2.5	4.5	0.6

Coarse Focus



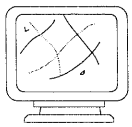
Control	*Position*
Light Level	press F5

Turn Medium and Fine Focus knobs to bring the brightness into the center of the aperture.

Fine-tune focus for surface detail, sharp aperture, and fringes.

Fine Focus

Control	*Position*
FOCUS Knob	measure (in)
Light Level	press F5
X + Y Knobs	turn to locate part



Fine-tune focus if necessary. Fringes must be visible.

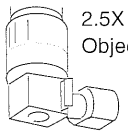
Adjust Fringes
next page

Important to null fringes before measuring.

2.5X and 5X Focus Aid

Filter - set to **FOCUS** to help find fringes; must be set to **MEAS** to measure.

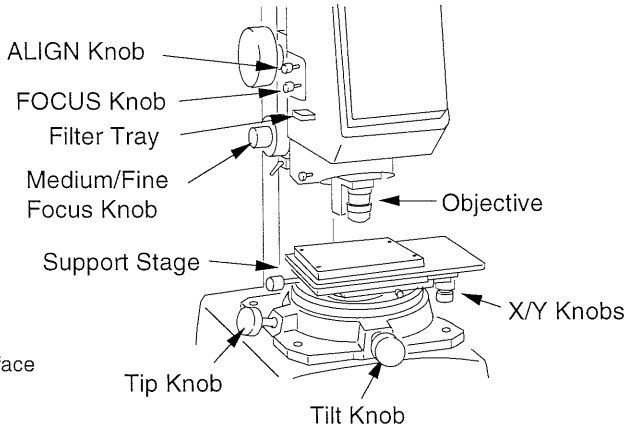
See also Appendix E.

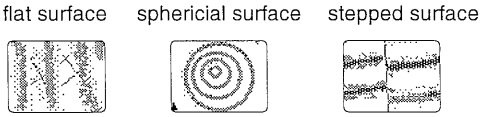


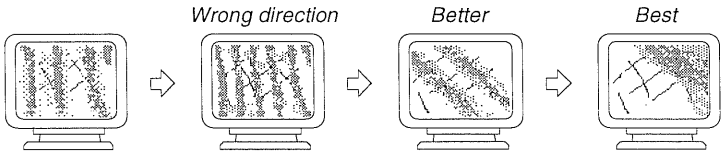
3 Adjust Fringes

Null Fringes

Nulling means to minimize the number of fringes; it varies depending on the shape of the test surface. 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.

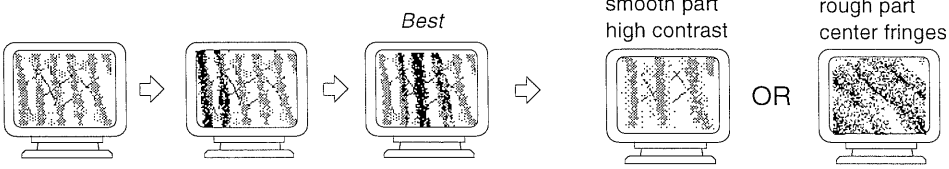






Turn the Tip and Tilt knobs to minimize the number of fringes. Readjust focus and part positioning as necessary.

Fine-tune Fringes



Adjust Tip/Tilt and focus to center the darkest fringe.

For smooth parts adjust focus for high contrast fringes. For rough or parts with steps center the focus between high and low fringes.

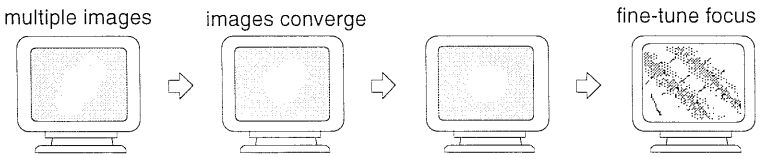
2.5X and 5X Nulling Aid

Control	*Position*
ALIGN Knob	align (out)
FOCUS Knob	focus (out)
FILTER	MEAS
Light Level	6 to 9 (1)

Start Settings

Control	*Position*
ALIGN Knob	measure (in)
FOCUS Knob	measure (in)
Light Level	press F5

End Settings



Adjust the Tip and Tilt knobs to centralize the multiple circular images.

(1) Actual light level settings are dependent on the reflectivity of the part.

Measure
press F1

OPERATION HINTS

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

- Use System Error Files
- Selecting the Right Objective
- MetroPro Controls Used Most Often
- Using the NewView High Resolution Version

Use 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 *Microscope System Error Application* booklet, OMP-0361.

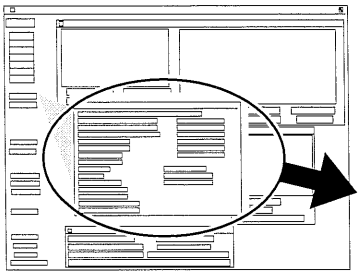
Selecting the Right Objective

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.*

MetroPro Controls Used Most Often

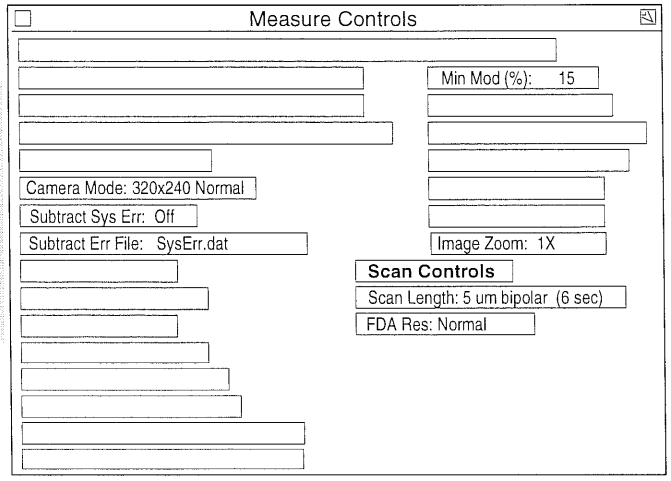
MetroPro NewView Application Screen



The controls are in the Measure Controls window.

Measure Cntrl

Software is described in the MetroPro Reference Guide, OMP-0347



Camera Mode

Camera Mode selects the effective camera size in pixels. More pixels resolve smaller details, but increase processing time. The choices are 320 x 240 Normal, plus 320 x 240 Zoom, and 640 x 480 Normal for high resolution microscopes. Click to change.

Subtract Sys Err

Sys Err File

Subtracting system errors is useful for all measurements to subtract instrument aberrations during the analysis cycle. Subtract Sys Err activates the function. Sys Err File specifies the name of a data file to subtract. Error files should be made for each objective.

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.

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.

More information on objective scanning, FDA, and Camera Mode is located in Appendix B.

Using the NewView High Resolution Version

Operation of the high resolution NewView is identical to the standard resolution version, except the high resolution option has switchable camera resolutions over the entire aperture. These resolutions are listed in the following table.

Resolution (Camera Mode)	Maximum pixels in Measurement Area	Aperture	Pixel Spacing
320 x 240 Normal	76,800 (320 x 240)	full	22 µm
640 x 480 Normal	307,200 (640 x 480)	full	11 µm
320 x 240 Zoom	76,800 (320 x 240)	1/4	11 µm

High Resolution NewView

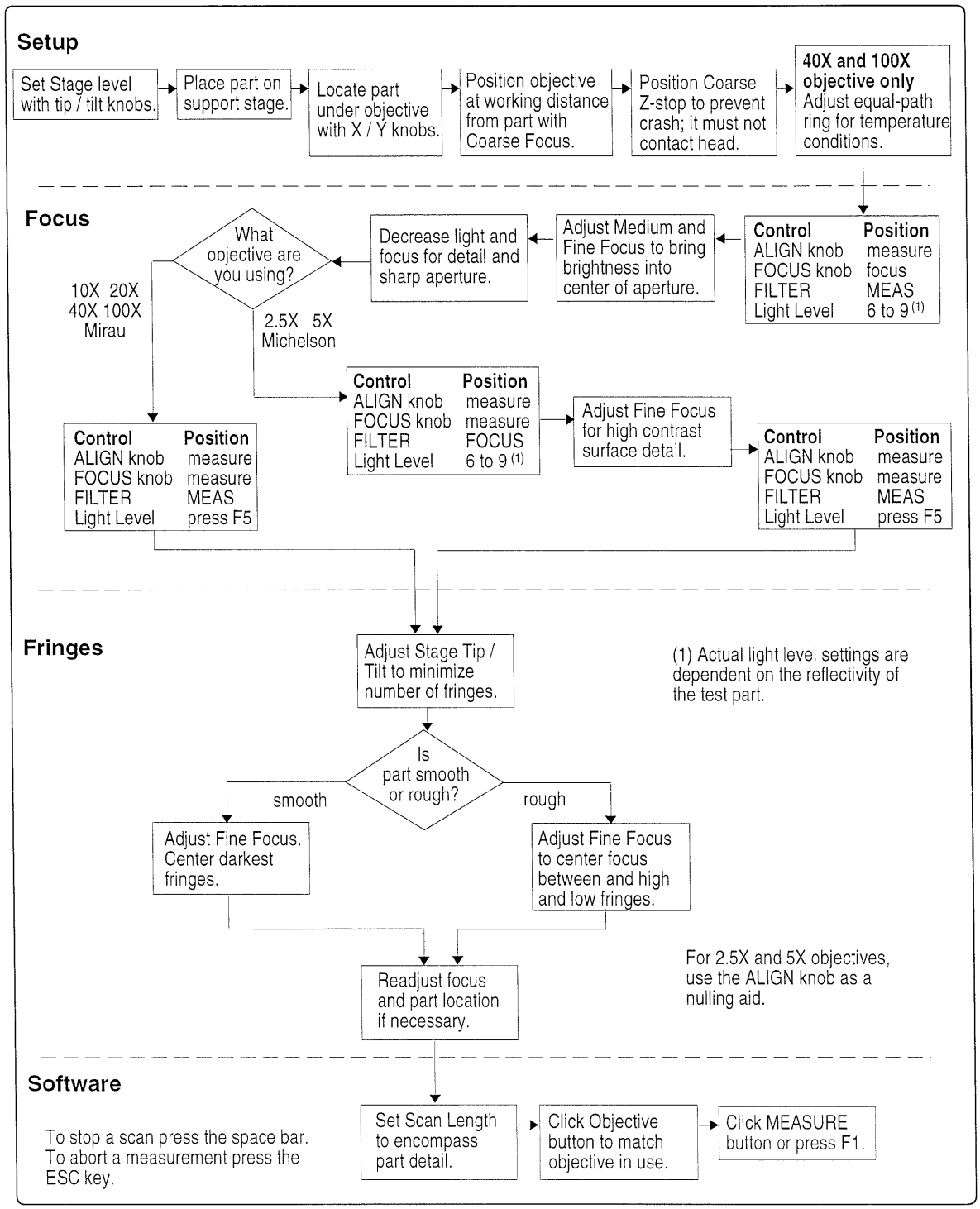
Table 3-1

NewView resolution is selected with the Camera Mode control. The Video Monitor displays vary during acquisition depending on the selected resolution. When resolution is 320 x 240, the Video Monitor displays a reduced view in the center of the screen. When the resolution is 640 x 480, the Video Monitor display goes blank for a few seconds before showing a full screen view.

Additional information on standard verses high resolution is located in Appendix B.

MEASUREMENT FLOWCHART

The complete measurement process is detailed below.



Chapter 4
MAINTENANCE AND TROUBLESHOOTING

In This Chapter

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 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*
  Call Zygo at (860) 347-8506 if you have questions or problems.

MAINTENANCE AND SERVICE FOR HP COMPONENTS

Refer to the HP documentation for maintenance information for the HP components, which include the System Processor, Color Display, Mouse, Keyboard, and any HP accessories, such as the PaintJet printer.

If you require service or assistance for the HP components contact Hewlett-Packard directly. In the United States, you can telephone HP toll free at (800) 835-4747. For other countries, refer to the directory sent with your product.

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.

Maintenance Schedule
Table 4-1

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

Recommended Spare Parts
Table 4-2

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.

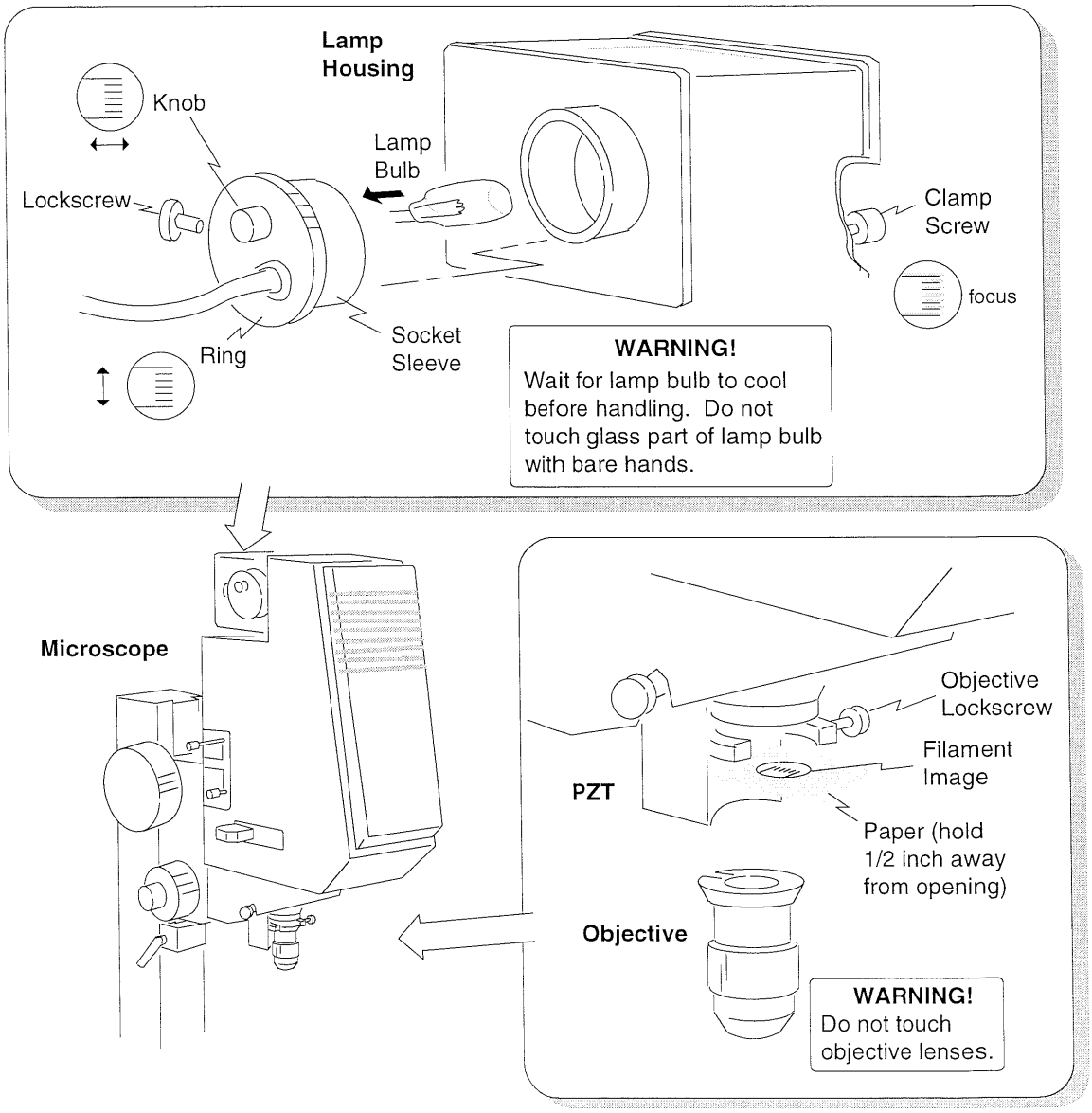
3. Remove the old lamp bulb from the socket sleeve.
4. Insert the new lamp bulb, aligning the pins to the holes on the socket.
5. Reinstall the socket sleeve and lockscrew. Connect the lamp housing cable to the Electronic Enclosure and turn on power.
6. Position the FOCUS and ALIGN knobs, and the filter tray, in the measure position.

   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.



Changing and Aligning the Lamp Bulb

Figure 4-1

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

Recommended 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.

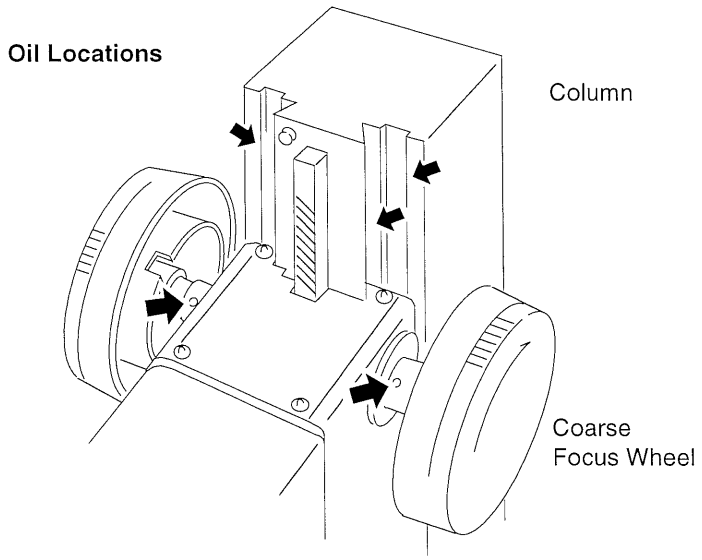
Contaminant	*Procedure*
Dust or light dirt	1. Blow off loose particles. 2. If any dust remains, twist two sheets of lens tissue around a swab or fold a lens tissue so it is just wider than the area you are cleaning. 3. Dampen the tissue with alcohol or methanol. 4. Wipe the lens straight across once. 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.

Optics Cleaning Procedures

Table 4-3

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.

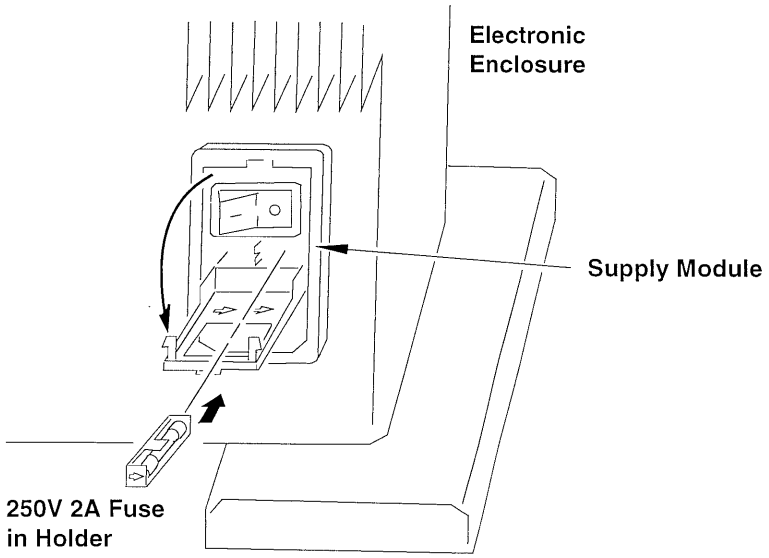


Lubricating the Microscope Column
Figure 4-2

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.



Replacing the Electronic Enclosure Fuse
Figure 4-3

GETTING HELP

If difficulties arise, please refer to the provided manuals. They are designed to help you through the most common questions. If you still have questions or need assistance, contact the Zygo Service Department directly.

Preparing for Technical Support

Before communicating with our Service Department, please have the following information *written down* so that we can provide you with the quickest possible solution to your problem.

- The equipment's model number and serial number. If it is software related, the software version number.
- A description of the problem and the sequence of events that led up to your discovering the problem. Note any software error messages.
- Your company name and complete shipping address.

Contacting Zygo

PHONE

(860) 347-8506, 8:00 a.m. to 8:00 p.m. (Eastern Time), Monday - Friday

Call from a telephone close to the system, in case the service engineer wants you to perform certain operations or requests additional information.

FAX

(860) 347-3968, 24 hours per day

WRITE

We welcome your letters. You can reach us at:

Zygo Corporation
Laurel Brook Road P.O. Box 448
Middlefield, Connecticut USA 06455-0448

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 at (860) 347-8506.
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 neccessary 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.
- System Processor - If the Matrox Board is held in place with a plastic mounting bracket, as shown in Chapter 2, it is *not* necessary to remove the board before shipping. Otherwise, remove the Matrox Board first to prevent damage.

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.	Call 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.	Call 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.

Problem	Possible Cause	Solution
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.
	Focus knob in light path.	Put focus knob in proper position.
	Dirty objective.	Clean objective or try another objective.
	Video Monitor controls set wrong.	Adjust Brightness and Contrast.
	Internal Microscope head optics are dirty.	Call 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 has low reflectivity. Part too rough.	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.
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).
Part hard to focus.	Part has low reflectivity.	Focus first with high power objective.
	Part is extremely smooth.	Focus first with high power objective.
	Part too rough.	Check system with known good part.

Problem	Possible Cause	Solution
Features on part appear to move when focusing.	Improperly aligned lamp bulb.	Align bulb (Chapter 2).
Microscope head does not move.	Head contacting Coarse Z-stop.	Move Coarse Z-stop.
	Head at end of travel.	Relocate head with Focus controls.
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".	Using high resolution camera mode with HP 715/33.	Make an acquisition mask smaller than the camera image area.
	Reconfiguring or building application fragments memory.	Press the Measure button again.
	System controller performing background functions, like printing.	Wait for the function to end.
	Window size too large for scan length and Camera Res 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 HP System Processor.	Check and replace cables.
	Improperly connected cables.	Ensure that the RS-232 cable is connected to the right port on the HP System Processor.
	Matrox Board not properly seated in the HP System Processor	Reseat Matrox Board (Chapter 2).

Appendix A
WHERE TO FIND THINGS

This manual, OMP-0348, covers installing, using, and maintaining the Zygo NewView 100.

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, troubleshooting, and technical support.

Zygo Manual References

OMP	*Manual*	*Description*
0337	Programmable Stage Options	Covers automated stage options.
0346	Getting Started With MetroPro	Introductory information for MetroPro version 4.0.0 and later.
0347	MetroPro Reference Guide	Reference material for MetroPro version 4.0.0 and later.
-	Application manuals	Various small, compact booklets dealing with one unique application. Contact Zygo for the latest listing.

Other Sources of Information

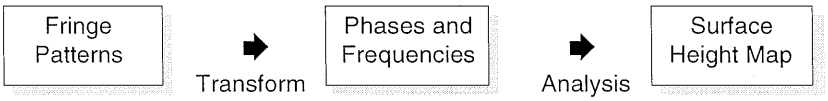
Item	*Where to Find Information*
HP components: System Processor, Color Display, keyboard, mouse, etc.	Documentation supplied by Hewlett-Packard.
HP-UX	See manuals supplied by HP: *Using HP-UX* *HP Visual User Environment User's Guide*
TMC Vibration Isolation Table	Documentation supplied by Technical Manufacturing Corporation.

Appendix B
TECHNICAL DETAILS

This appendix addresses some of the technical questions that may arise when using the NewView. Specifically, it describes Frequency Domain Analysis (FDA) and objective scanning.

Frequency Domain Analysis (FDA)

The NewView 100 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.



Frequency Domain Analysis
Figure B-1

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.

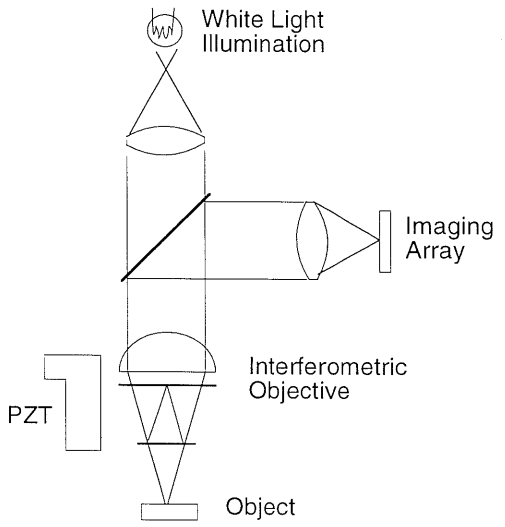
In traditional, single-wavelength, phase shift interferometry, the interference pattern is transformed into a matrix of phase values with an algorithm, such as the "five-bucket" method. With FDA, it is as if the five-bucket algorithm is applied for every one of the wavelengths in the source spectrum. 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 in the calculation.

The **FDA Res** control in MetroPro 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.

Objective Scanning

The NewView 100 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.



NewView Optical System

Figure B-2

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.

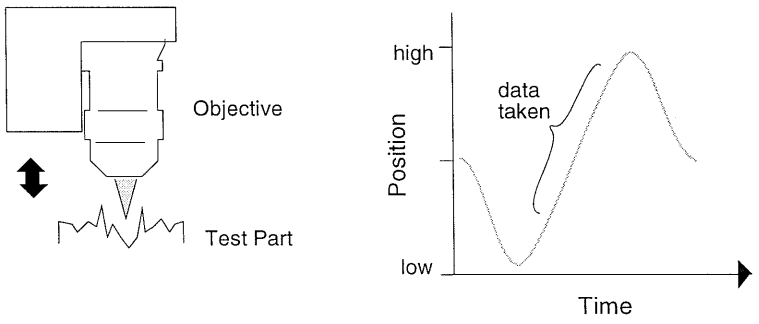
The **Scan Length** control determines the actual length of the scan. Scan selections and times are shown in the following table. Bipolar scan is illustrated below.

		Scan Time	
Scan Length	Type	320 x 240 Pixels	640 x 480 Pixels
5 µm	Bipolar	6 sec	22 sec
10 µm	Bipolar	9 sec	32 sec
20 µm	Bipolar	14 sec	53 sec
40 µm	Bipolar	25 sec	93 sec
100 µm	Bipolar	55 sec	207 sec

Scan Selections and Scan Time Required
Table B-1

Bipolar Scan
Starts in the center and moves the objective down, and then up.

Focus part between high and low fringes. Use the Scan Length control to select the length necessary to capture data.



Bipolar Scanning
Figure B-3

Standard Resolution versus High Resolution

The NewView is available in two resolutions; the capability of each is linked to the HP System Processor. Resolution is selected with the **Camera Mode** control. The differences are highlighted in Table B-2.

	Camera Mode	Scan Speed	Maximum Measurement Area (pixels) HP 715/33	HP 715/50[2]
High Res / Standard	320 x 240 Normal	2 µm/sec	57,600 (240 x 240)[1]	76,800 (320 x 240)
High Res / Standard	320 x 240 Zoom	2 µm/sec	14,400 (120 x 120)[1]	76,800 (320 x 240)[1]
High Res	640 x 480 Normal	0.5 µm/sec	not supported	307,200 (640 x 480)

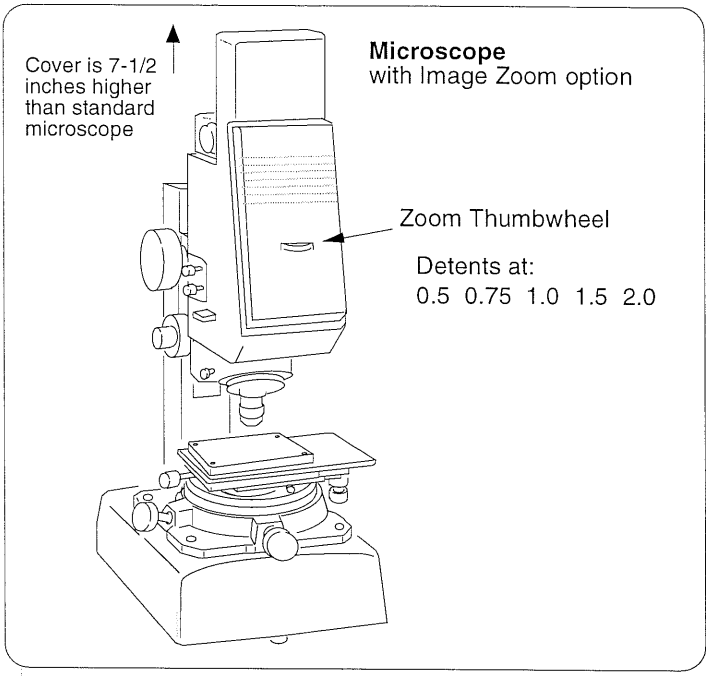
A standard resolution NewView supports 320 x 240 Normal.
A high resolution NewView supports all camera modes.
(1) The measurement area must be limited by an Acquisition mask.
(2) Model HP 715/50 or faster.

Standard and High Resolution Capabilities
Table B-2

Appendix C

MICROSCOPE IMAGE ZOOM OPTION

The Microscope 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 Microscope head cover is enlarged to house the specialized optics; the zoom setting is changed by turning a thumbwheel on the front of the instrument.



This option is available for the Zygo NewView 100 and the Maxim•GP microscopes. It is a factory installed option, 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. The information in this appendix applies only to systems with this option.

Notes: 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, 40X, and 100X objectives, the reference surface might be off center limiting the useful field of view.

Objective Specifications

(Nominal specifications at 1X zoom)

Power	Sys Mag	NA	Work Dist (mm)	Focus Depth (µm)	Inter Depth (µm)	Lat Res (µm)	Field of View H x V (mm)	Spatial Samp (µm) Lo	Spatial Samp (µm) Std	Slope (deg) Lo	Slope (deg) Std
2.5X	50X	0.075	11.1	185.0	4.0	4.87	2.82 x 2.11	8.80	4.40	1.0	2.0
5X	100X	0.1	9.0	70.0	4.0	3.65	1.41 x 1.06	4.40	2.10	2.0	4.1
10X	200X	0.25	4.0	10.0	4.0	1.46	0.70 x 0.53	2.20	1.10	4.1	8.1
20X	400X	0.4	2.5	3.5	4.0	0.91	0.35 x 0.26	1.10	0.55	8.1	15.9
40X	800X	0.5	4.5	1.8	3.6	0.73	0.18 x 0.13	0.55	0.28	15.9	22.3
100X	2000X	0.8	0.6	0.6	1.2	0.46	0.070 x 0.053	0.22	0.11	33.3	33.3

Objective Specifications at Other Zoom Settings

Specifications for the objectives at the various zoom settings are easily calculated. Use the multipliers in the table below for the listed specification; multiply times the value shown for that objective at 1X zoom. 2.5X objective specifications at different zoom settings are shown in the next chart as an example. NA, Work Dist, Focus Depth, Inter Depth, and Lat Res do not change.

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

2.5X Objective Specifications at Different Zoom Settings

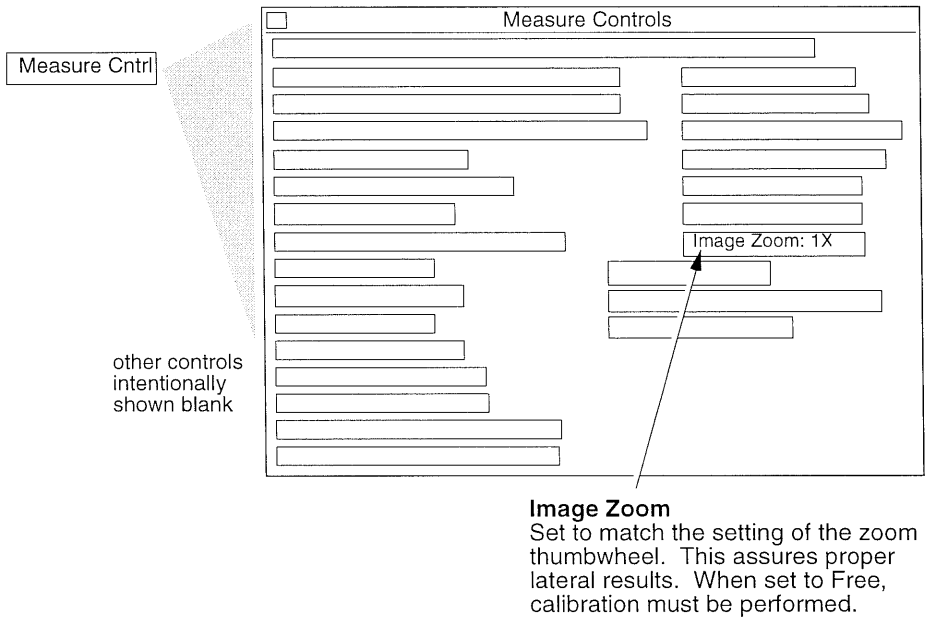
Zoom	Sys Mag	NA	Work Dist (mm)	Focus Depth (µm)	Inter Depth (µm)	Lat Res (µm)	Field of View H x V (mm)	Spatial Samp (µm) Lo	Spatial Samp (µm) Std	Slope (deg) Lo	Slope (deg) Std
0.5	25X	0.075	11.1	185.0	4.0	4.87	5.64 x 4.22	17.60	8.80	0.5	1.0
0.75	38X	0.075	11.1	185.0	4.0	4.87	3.76 x 2.81	11.73	5.87	0.8	1.5
1.0	50X	0.075	11.1	185.0	4.0	4.87	2.82 x 2.11	8.80	4.40	1.0	2.0
1.5	75X	0.075	11.1	185.0	4.0	4.87	1.88 x 1.41	5.87	2.93	1.5	3.0
2.0	100X	0.075	11.1	185.0	4.0	4.87	1.41 x 1.06	4.40	2.20	2.0	4.0

Objective Specification 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.
Work Dist.....The working 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.
Lat 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.
Slope.....Maximum angle of surface feature from one pixel to the next that can be measured.
Lo Std .....Camera size in pixels: Lo is 320 x 240 pixels, Std is 640 x 480 pixels.

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.

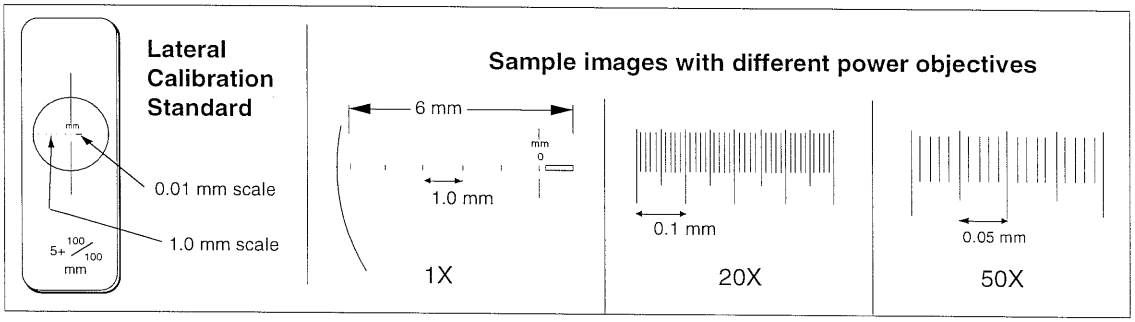
For more information on calibration, see "Calibration - Microscope" in the *MetroPro Reference Guide, OMP-0347*. An overview of the calibration procedure is provided on the following page.

Calibration Procedure

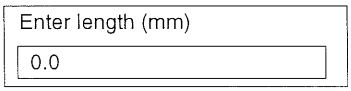
Note: Calibration settings for Free are not saved. Calibration must be performed every time the instrument is restarted.

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

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.



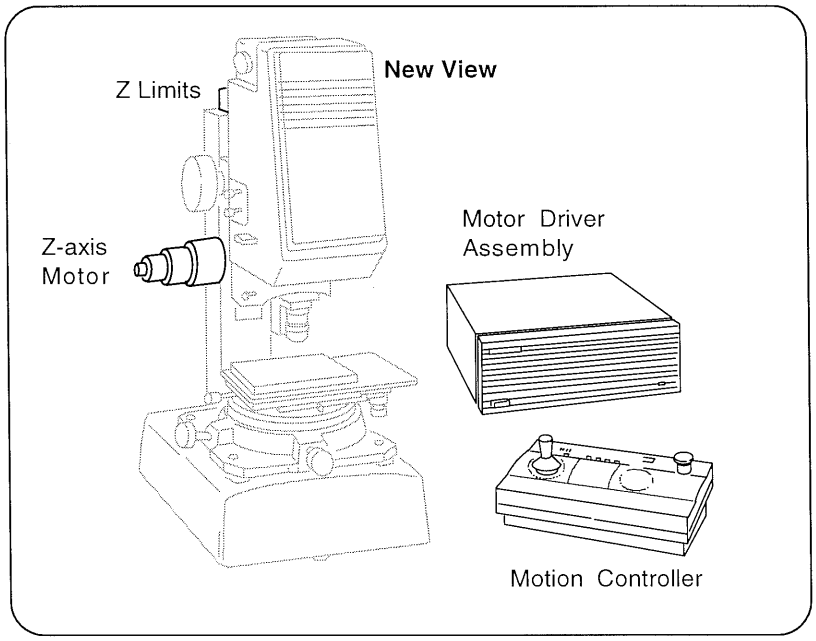
6. Close the Lateral Calibrator window and make your measurement.

Appendix D

EXTENDED SCAN OPTION

Overview

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. The option includes a Z-axis Motor with limit stops, Motion Controller, and a Motor Driver Assembly.

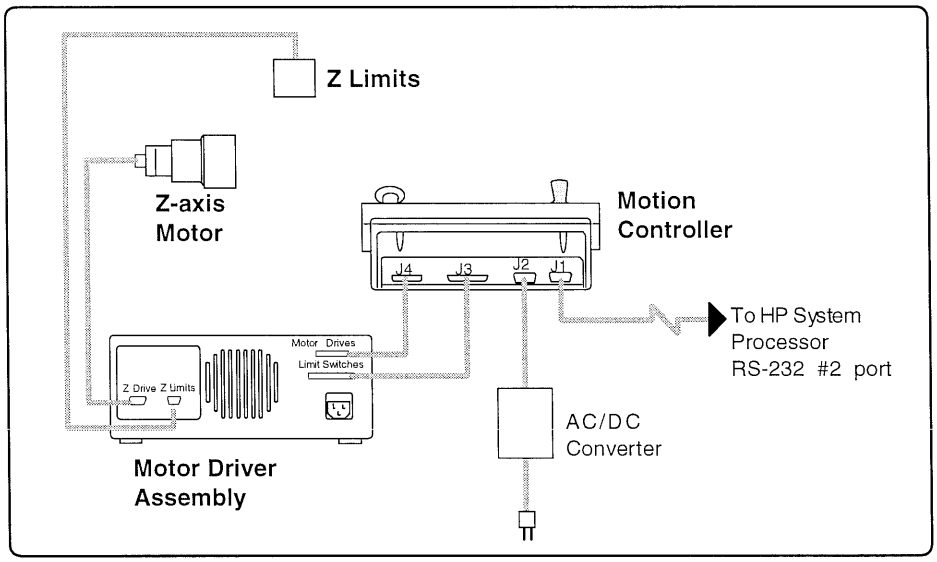


The Z-axis Motor precisely drives the objective through the vertical scan envelope as measurement data is collected. The Motion Controller provides joystick control of the z-axis. The Motor Driver Assembly houses the electronics that power and direct the motor.

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 Chapter 4 in *Getting Started With MetroPro*, OMP-0346.

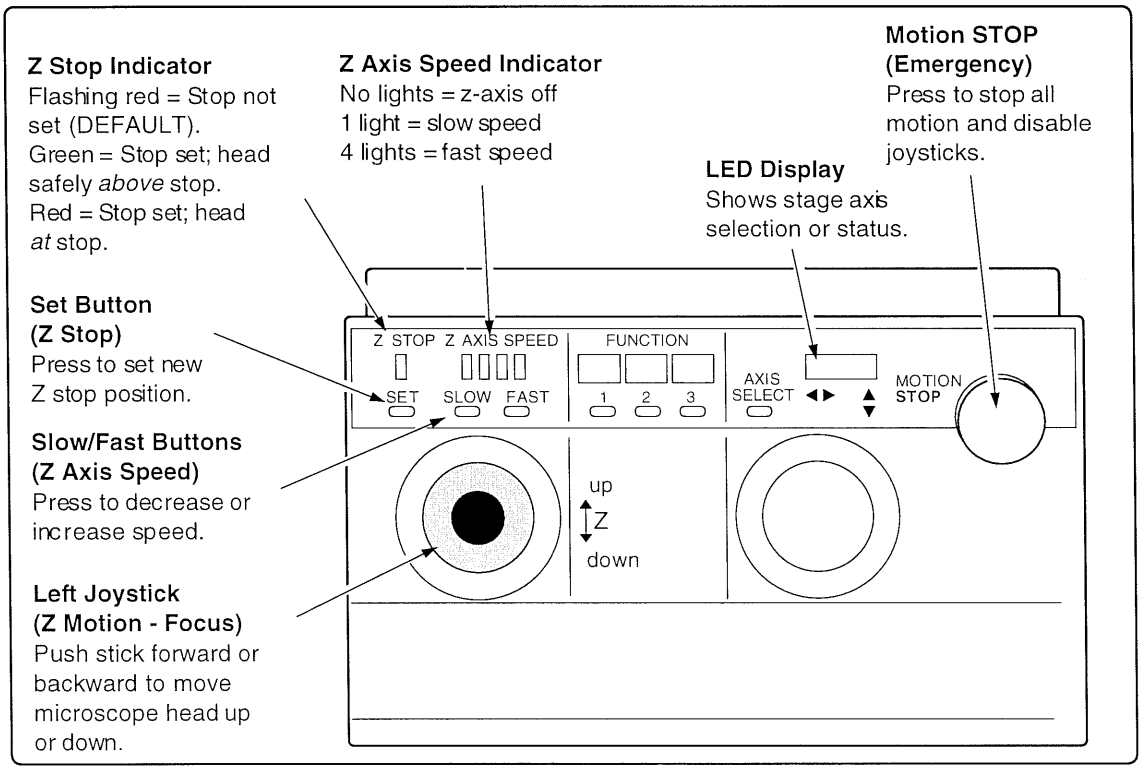
The Extended Scan Option is available for the Zygo NewView microscope. It is a factory-installed option, available with the original order, or it may be added later. For information on upgrading your NewView, contact your Zygo representative.

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.



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.

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).

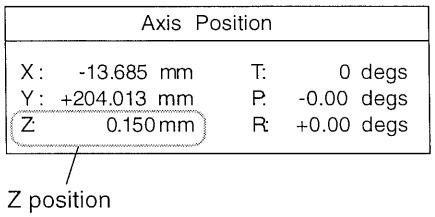
Manual Mode

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.

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 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.

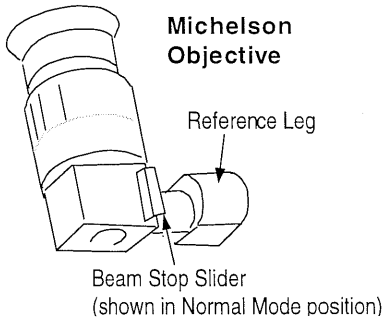
During the process of calibration, a scalar value is modified in the system calibration file that adjusts the vertical scale specifically for the Extended Scan Option.

Appendix E

2.5X AND 5X MICHELSON OBJECTIVE USER INSTRUCTIONS

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.

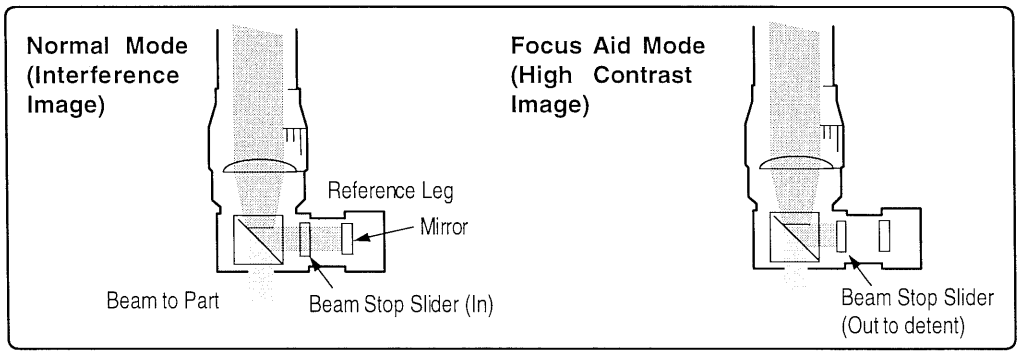


Note: If the beam stop slider is removed, dust may enter into the objective and impair its performance.

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.



Appendix F

PHASE OPTION

NewView 100 Phase Option

The NewView 100 Phase Option adds the measurement capability of the Maxim•GP 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 100 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 100 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 PZT with the Maxim•GP Turret, and exchanging the filter tray.

Instructions for switching the operation mode of the NewView instrument is provided with this addendum. The specifics of operation for each instrument are detailed in Chapter 3 of the NewView 100 and Maxim•GP manuals.

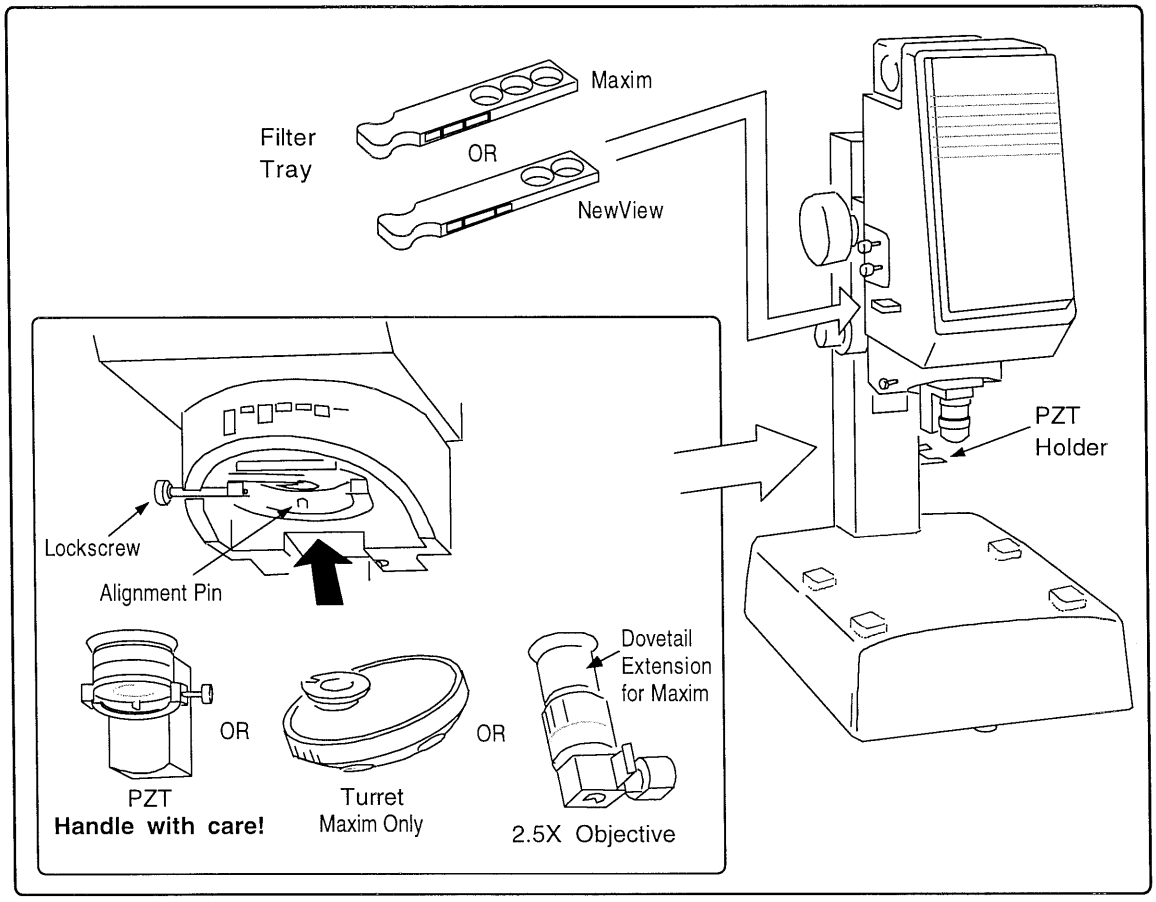
Switching from the NewView (scan) to the Maxim (phase)

1. Loosen the lockscrew and carefully remove the PZT from the instrument. Place the PZT in the PZT holder on the side of the microscope. Do not disconnect the PZT cable. If you are switching a NewView 100C, also turn off the PZT Servo Controller.
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.

Using the Phase Option with the NewView 100C

This section only applies to the NewView 100C. The NewView 100C has a capacitive feedback PZT, which adds PZT Servo Controller electronics to the system.

Note: The PZT Servo Controller electronics must be turned off when making phase measurements. If the driver electronics are not turned off, the PZT remains energized and causes acquisition errors.



Switching from the Maxim Back to the NewView

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

If you are using the NewView 100C, be sure to turn on the PZT Servo. The PZT Servo Controller is located on the shelf below the vibration isolation system.

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