VAN GUARD
Microscopes

Operation Manual

1400INi Series

Covering Models: 1491INi & 1493INi

VGMNL121915-1490INi
Printed in the USA

VAN GUARD®

VanGuard® Introduction

Thank you for purchasing this VanGuard microscope. With the user in mind, VanGuard microscopes are built from modern designs and should provide a lifetime of reliable performance. Before using this microscope it must be properly setup, which requires some familiarity with the microscope. For this reason we recommend you read this entire manual carefully before setting up and using the instrument.

1400INi Series Inverted Microscopes

Vanguard 1400INi Series inverted microscopes are suited for observation of biological cultures or specimens within well plates, petri dishes, slides and vials.

Viewing Head. Rotatable trinocular (Seidentopf) head is inclined at 30°. All models feature interpupillary and dioptric adjustment. The trinocular head features a sliding main prism (80/20 split) to provide full-time imaging when the vertical tube is in use (80% of the image to the vertical tube and 20% to the eyetubes).

Eyepieces. 10X ultra-widefield (DIN) with a field diameter of 22mm.

Nosepiece. Quintuple, ball-bearing nosepiece with high-grade lubricant and positive stops.

Objectives. Plan achromatic, infinity corrected objectives come standard on both models. Objectives are made to DIN standards and are optically coated.

Stage. The fixed stage measures 160 x 250mm and 300 x 250mm with stage extensions/mechanical stage attached. Mechanical stage accepts 96 well microplate and included stage inserts: Terasaki/65mm petri dish, 1 x 3" slide/54mm petri dish, 35mm petri dish. Motion of mechanical stage is controlled by a right-hand, low-position coaxial control and is driven by a rack and pinion system.

Focusing movement. Coaxial, ultra-low position coarse and fine focus controls feature a 40mm focusing range and are graduated to 2 microns per division. Fitted with a tension adjustment.

Condenser. Brightfield models come with a 0.30 N.A. condenser. Phase contrast models come with a 0.30 N.A. condenser with phase annulus slider for 10X/20X, and 40X; also has a open setting for brightfield work. All condensers are factory centered and aligned for ease of setup and include an iris diaphragm, and a slide-in filter holder.

Illumination. 30W variable quartz halogen light source. Comes with blue, green (model 1493INi only), and dispersion filters. 1A, 250V fuses.

Body. Cast-metal, ergonomic body with stain-resistant enamel finish.

Table of Contents

Warranty information and a registration card can be found at the following web address:

VanGuard® Specifications

Viewing Head:	Trinocular
Viewing Head Type:	Seidentopf
Head Rotation:	360°
Head Inclination:	30°
Sliding Prism:	100% or 80/20% Split
Interpupillary Adjustment:	48-75mm
Dioptric Adjustment:	-6 to +6
Eyepiece Magnification:	10X High Eyepoint, Ultra-Widefield
Eyepiece Field Diameter:	22mm
Nosepiece:	Quintuple
Brightfield Objectives:	4X [0.10 N.A., 25.2mm W.D.]
(Plan Achromatic, Infinity Corrected)	10X [0.25 N.A., 11mm W.D.]
	20X [0.25 N.A., 6mm W.D.]
	40X [0.60 N.A., 3.2mm W.D.]
Phase Contrast Objectives:	10X [0.25 N.A., 11mm W.D.]
(Plan Achromatic, Infinity Corrected)	20X [0.25 N.A., 6mm W.D.]
	40X [0.60 N.A., 3.2mm W.D.]
Stage Dimensions:	160mm x 250mm
Stage Motion:	Right-hand Coaxial Control/Rack & Pinion Drive
Stage Movement Range:	78 x 120mm
Sample Clearance (Brightfield):	75mm [Standard]
	150mm [With condenser lens removed]
Focusing Movement:	Coaxial Coarse & Fine Controls
Focusing Graduation:	2 microns Per Division
Brightfield Condenser (1491INi):	0.30 N.A. Condenser with Iris Diaphragm
Phase Contrast Condenser (1493INi):	0.30 N.A. Condenser with Iris Diaphragm & Annulus Slider
Phase Centering Tool:	Telescoping Eyepiece [1493INi only]
Illumination:	30W, 6V Variable Quartz Halogen
Fuse:	1A, 250V (2 ea)
Voltage:	110V [Standard], 220V [Optional]
Base Dimensions:	320mm x 245mm
Overall Dimensions:	515mm (L) x 300mm (W) x 475mm (H)
Weight:	11kg

VanGuard® Troubleshooting

his chart may help resolve some of the more common problems associated ith using a compound microscope. Simply follow the steps until your problem resolved. As always, you can contact your dealer or VanGuard Microscopes you ever need help.

All Models

Symptom: *No image visable in eyepiece(s) and/or trinocular port*

Step #	Possible Cause	How To Test	Test Result?	Solution	For More Info
1	Light is not switched on	Visually inspect	Switched on	Go to next step	
			Not switched on	Move power switch to on position	Page 12
2	Variable lighting control (VLC) is set too low	Visually inspect	Not set too low	Go to next step	
			Set too low	Increase VLC level	Page 12
3	Objectives not installed	Visually inspect	Objectives are installed	Go to next step	
			Objectives not installed	Install objectives	Page 7
4	Light path selection knob in wrong position	Visually inspect	In correct position	Go to next step	
			Not in correct position	Set to correct position	Page 11
5	Light path blocked	Visually inspect space between illuminator and objectives	Nothing blocking	Contact dealer or VanGuard Microscopes	Page 18
			Blockage present	Remove blockage	

Symptom: *Can't focus on specimen image*

Step #	Possible Cause	How To Test	Test Result?	Solution	For More Info
1	Dirty objective	Visually inspect	Objective is clean	Go to next step	
			Objective is not clean	Clean objective or replace with new objective	Pages 16 & 4
2	Specimen vessel is too thick	Test with different vessel	Vessel is correct	Contact dealer or VanGuard Microscopes	Page 18
			Vessel is too thick	Replace with 1.2mm max thickness vessel	

VanGuard® Parts & Accessories

Included Parts:

Model 1491INi	
Trinocular Head Assembly	1 ea
Stand	1 ea
Condenser	1 ea
Detachable Slide-Out Filter Holder	1 ea
Socket Assembly	1 ea
10X High Eyepoint Eyepiece	2 ea
4X Plan Infinity LWD Objective	1 ea
10X Plan Infinity LWD Objective	1 ea
20X Plan Infinity LWD Objective	1 ea
40X Plan Infinity LWD Objective	1 ea
Terasaki/65mm Petri Dish Stage Insert	1 ea
1 x 3" Slide/54mm Petri Dish Stage Insert	1 ea
35mm Petri Dish Stage Insert	1 ea
Glass Stage Insert	1 ea
Stage Extension	2 ea
Mechanical Stage Assembly	1 ea
Trinocular Port	2 ea
Camera Port	1 ea
Dispersion Filter	1 ea
Blue Filter	1 ea
Spare 30W, 6V Quartz Halogen Lamp	1 ea
Spare 1A Fuses	2 ea
Main Power Cord	1 ea
Focus Tension Wrench	1 ea
Condenser Setscrew Hex Wrench	1 ea
Operations Manual	1 ea
Dust Cover	1 ea

Model 1493INi	
Trinocular Head Assembly	1 ea
Stand	1 ea
Condenser	1 ea
Detachable Slide-Out Filter Holder	1 ea
Phase Contrast Annulus Slider	1 ea
Phase Contrast Centering Telescope	1 ea
Socket Assembly	1 ea
10X High Eyepoint Eyepiece	2 ea
4X Plan, Infinity, LWD Objective	1 ea
10X Plan, Infinity, Phase, LWD Objective	1 ea
20X Plan, Infinity, Phase, LWD Objective	1 ea
40X Plan, Infinity, Phase, LWD Objective	1 ea
Terasaki/65mm Petri Dish Stage Insert	1 ea
1 x 3" Slide/54mm Petri Dish Stage Insert	1 ea
35mm Petri Dish Stage Insert	1 ea
Glass Stage Insert	1 ea
Stage Extension	2 ea
Mechanical Stage Assembly	1 ea
Trinocular Port	2 ea
Camera Port	1 ea
Dispersion Filter	1 ea
Blue Filter	1 ea
Green Filter	1 ea
Spare 30W Halogen Lamp	1 ea
Spare 1A Fuses	2 ea
Main Power Cord	1 ea
Focus Tension Wrench	1 ea
Condenser Setscrew Hex Wrench	1 ea
Annulus Centering Hex Wrench	2 ea
Operations Manual	1 ea
Dust Cover	1 ea

VanGuard® Parts & Accessories

All Models

Optional Accessories:

igital & Video Camera Systems:

Part Number	Description
1400-CDPC-x	USB Digital Camera Kit with Adapters and Microscopy Software

pi-Fluorescence Upgrade Package

Part Number	Description
1490-FLP01	Fluorescence upgrade kit with blue/green broadband filter sets
1490-FUV001	Optional eGFP filter set for fluorescence upgrade kit
Contact us for Information	Optional filter sets for single & multiple dye applications

VanGuard® Troubleshooting

All Models

This chart may help resolve some of the more common problems associated with using a compound microscope. Simply follow the steps until your problem is resolved. As always, you can contact your dealer or VanGuard Microscopes if you ever need help.

Symptom: *No light visable from collector*

Step #	Possible Cause	How To Test	Test Result?	Solution	For More Info
1	Light is not switched on	Visually inspect	Switched on	Go to next step	
			Not switched on	Move power switch to on position	Page 12
2	Main power cord and/or illuminator plug not connected	Visually inspect	Plugged in	Go to next step	
			Not plugged in	Plug in power cord or illuminator plug	
3	Variable lighting control (VLC) turned all the way down	Visually inspect	VLC turned up	Go to next step	
			VLC turned down	Turn VLC up	Page 12
4	Microscope not getting power	Inspect outlet	Good outlet	Go to next step	
			Outlet not good	Plug power cord into working outlet	
5	Blown fuse	Visually inspect or try new fuse	Good fuse	Go to next step	
			Fuse is blown	Install new fuse	Page 15
6	Burnt out light bulb	Visually inspect or try new bulb	Good bulb	Contact dealer or VanGuard Microscopes	Page 18
			Bulb is burnt out	Install new bulb	Page 14

Symptom: *Image through eyepieces is too dim*

Step #	Possible Cause	How To Test	Test Result?	Solution	For More Info
1	Variable lighting control (VLC) is turned down too far	Visually inspect	VLC is turned up	Go to next step	
			VLC is turned down	Turn VLC up	Page 12
2	Light bulb not centered properly	Visually inspect	Bulb is centered	Go to next step	
			Bulb is not centered	Center the bulb	Page 14
3	Light path selection knob in wrong position (trinocular models only)	Visually inspect	In correct position	Go to next step	
			Not in correct position	Set to correct position	Page 11
4	Dirty condenser, eyepiece, or objective lenses	Visually inspect	Lenses are clean	Contact dealer or VanGuard Microscopes	Page 18
			Lenses are dirty	Clean lenses	Page 16

Symptom: *The objectives keep drifting downward*

Step #	Possible Cause	How To Test	Test Result?	Solution	For More Info
1	Focus tension is set too loose	Check focus tension control	Tension set correctly	Contact dealer or VanGuard Microscopes	Page 18
			Tension too loose	Increase tension	Page 13

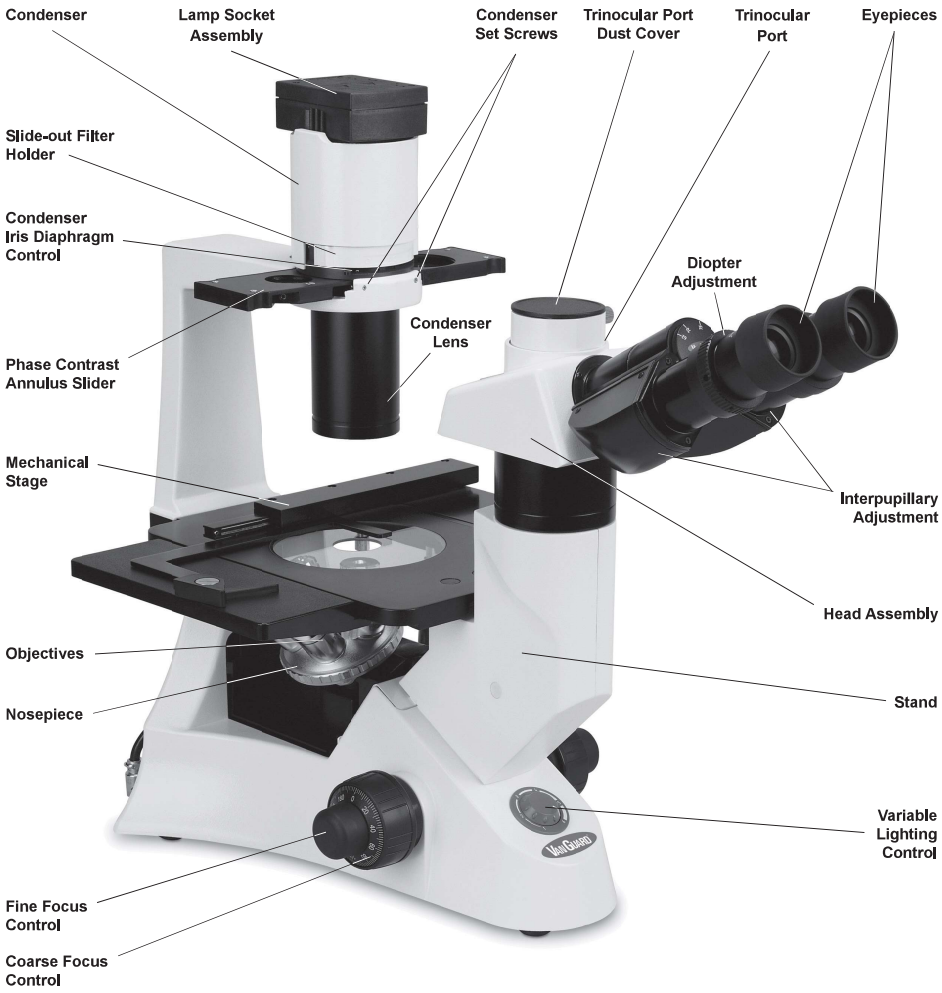
VanGuard® Maintenance

Caring for your 1400INi Microscope

All Models

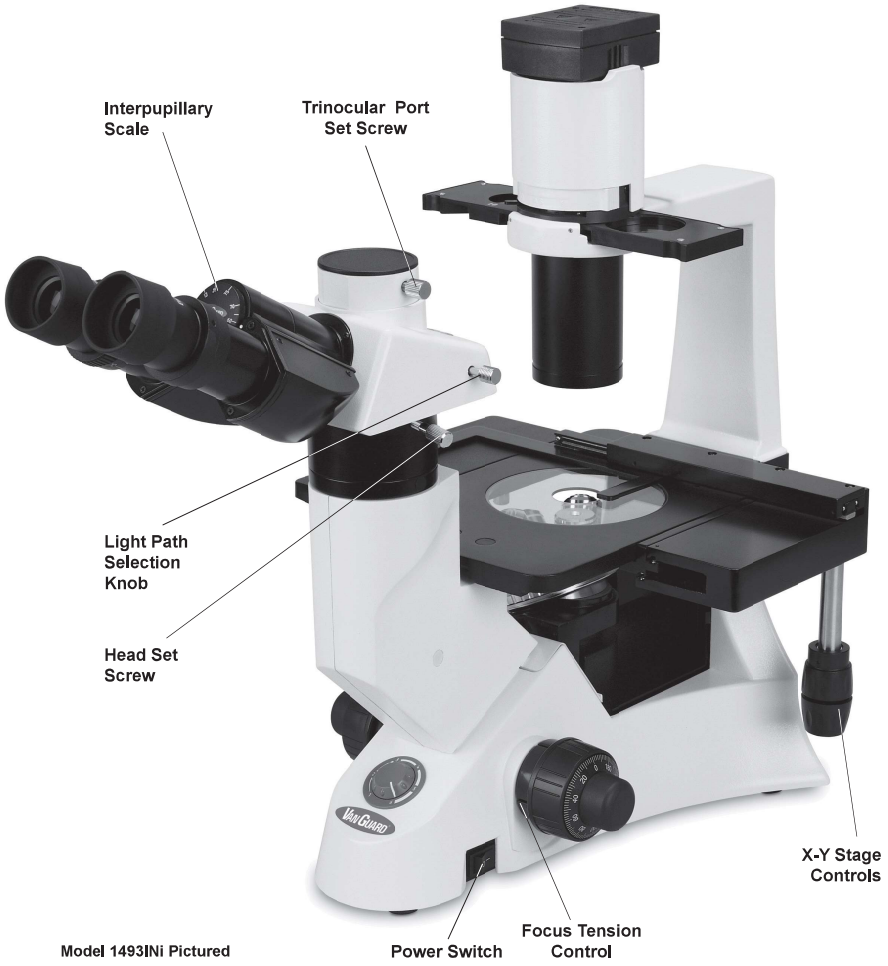
- The eyepieces and objective lenses on VanGuard Microscopes have delicate, optical coatings. Therefore they should ***never*** be wiped while dry because any dirt or dust will scratch the coating. Blow off the lens surface with an air-bulb and lens brush. Then use a lens cleaning solution. ***Never use anything other than lens cleaner on any optical component.*** Apply with a cotton swab for a minimum of wetting, then wipe the surface clean with a quality lens tissue.
- The same care instructions apply to all optical parts on this VanGuard Microscope, including the condenser lenses.
- All other parts can be cleaned with a paper towel and mild detergent. Be aware that rubbing alcohol can break down lubricants and damage the painted surfaces; it is therefore not recommended. If used, be careful when cleaning near the following parts:
  - Focus controls
  - Nosepiece
  - Mechanical controls
- Xylene, since it breaks down the bonding material holding the lenses, should never be used as a cleaner.
- Periodically, your VanGuard Microscope should be fully serviced by a qualified service technician.
- In order to keep dust and debris out of the optical pathways, always keep the camera port and eyetubes covered (with either eyepieces or dust caps), and always use the dust cover when the microscope is not in use.

VanGuard® Parts & Accessories



Model 1493INi Pictured

VAN GUARD® Parts & Accessories



Model 1493INi Pictured

VAN GUARD® Maintenance

Replacing the Fuses

All Models

If the microscope is plugged in but the bulb is not turning on, the fuses could be blown. The instructions below detail how to check for a blown fuse. You can tell a blown fuse by if the wire inside is broken, or the glass is blackened.

> ⚠ **Before attempting to replace or remove the fuse, UNPLUG THE MICROSCOPE FROM ANY POWER SOURCE.** ⚠

1. Remove the fuse holders from the rear of the microscope (figure 27) by using a slotted screwdriver to push inward while turning counter-clockwise.
2. Remove the fuse from the fuse holder.
3. If the fuse is blown replace by inserting a new fuse into the fuse holder (figure 28).
4. Thread the fuse holder back into the microscope by turning in a clockwise direction with the slotted screwdriver.

Figure 27

Figure 28

Replacement Fuse - 2 each 1A 250V (Cat. No. 1200-FS4)

VAN GUARD® Maintenance

Replacing the Lamp

All Models

⚠ Before attempting to replace or remove the lamp, UNPLUG THE MICROSCOPE FROM ANY POWER SOURCE and allow to cool. ⚠

Remove the socket assembly from the top of the condenser (figure 25).

Remove the lamp from the socket by gently pulling.

Figure 25

⚠ Be careful not to touch the glass bulb when replacing - use a tissue or other medium to grasp the lamp. This will prevent the oils in your hand from reducing lamp life. If contact is made with the bulb, clean with rubbing alcohol and allow a brief drying period. ⚠

When replacing, insert the new lamp into the socket assembly. Make sure that the pins on the lamp line up with the holes on the socket. The pins should slide freely into the holes with only slight resistance - do not force.

The lamp filament should be lined up with the screw head located underneath the lamp for proper centering (figure 26).

Replace the socket assembly.

Figure 26

eplacement Lamp - 30W, 6V Halogen (Cat. No. 1400-30WHL)

VAN GUARD® Setup

Basic Assembly

All Models

1. Remove all components from the packaging. Use the parts list on page 3 to verify that all parts are present. Please retain all packaging in the unlikely event that the instrument should need servicing in the future.
2. Place the stand on a stable counter top.
3. Remove the plastic protective cover from the bottom of the head assembly.
4. Loosen the head set knob (figure 1).
5. Remove the protective cover from the head mount on the stand.

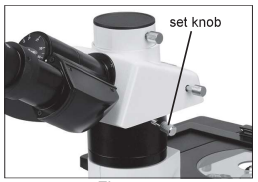


Figure 1

⚠ Do not release the head assembly until it is firmly secured to the microscope with the head set screw. ⚠

6. Place the head assembly on top of the stand so that the dovetail flange slides into place.
7. Secure by tightening the head set screw.

8. Remove the dust caps from the eyetubes.
9. Insert the eyepieces into the eyetubes (figure 2).

Figure 2

10. Remove the objectives from their storage containers.
11. Unthread four of the protective covers from the nosepiece.
12. Install the objectives onto the nosepiece by threading them clockwise into the holes until they are fully seated (figure 3). Be careful not to cross thread. It is common practice to install the objectives in order of increasing magnification, though not required.

Figure 3

VAN GUARD® Setup

Basic Assembly (continued)

All Models

3. Slightly loosen the two condenser set screws in the condenser mount with the included hex key and insert the condenser into the mount.

   Model 1491INi only: It will be necessary to remove the condenser plug while inserting the condenser into the condenser mount.

4. Rotate the condenser clockwise until the "AS" mark faces forward.

5. Secure in place by retightening the condenser set screws.

Figure 4

6. ***Model 1491INi only:*** Replace the condenser plug into the condenser.

7. ***Model 1493INi only:*** Slide the phase annulus slider into the condenser assembly, printed side up.

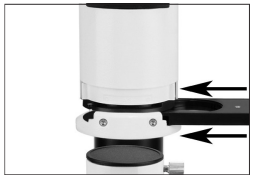


Figure 5

8. Slide the illuminator power plug onto the two prongs located on the socket assembly

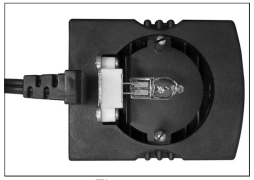


Figure 6

9. Place the socket assembly onto the condenser so that the large location pins slide into the pin slots and push down gently until housing is fully seated.

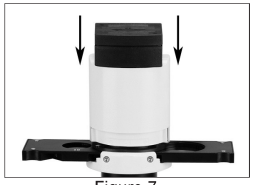


Figure 7

VAN GUARD® Microscope Use

Focusing and Mechanical Stage Mechanisms

All Models

1. Focusing adjustment is achieved by turning the coarse/fine focus controls located on both sides of the microscope (figures 21 and 22). The large knob is used for coarse adjustment, the smaller knob for fine adjustment. The coaxial arrangement allows for easy, precise adjustment without drift.
2. Turning the coarse/fine focus control raises and lowers the nosepiece vertically. One complete turn of the fine focusing knob raises or lowers the nosepiece 0.3mm; the smallest graduation refers to 2 microns of vertical movement. One complete turn of the coarse focusing knob raises or lowers the nosepiece 3.6mm. To ensure long life, turn the focusing knobs slowly and uniformly.
3. The focusing tension control knob is located just inside of the right-hand focus control knob (see arrow in figure 21). For tighter tension, use the included tension adjustment wrench and turn the control knob in a clockwise motion. For looser tension, turn the control knob in a counterclockwise motion.
4. The mechanical stage X-Y controls, located underneath the right-hand side of the stage (figure 23), provide easy and accurate positioning of the sample. One complete turn of the longitudinal (Y) control (lower half of the stage controls, bottom arrow) will move the specimen 34mm left or right. One complete turn of the transverse (X) control (upper half of the stage controls, top arrow) will move the specimen 20mm front or back.
5. This microscope comes with various stage inserts:

   Terasaki/65mm Petri Dish Stage Insert

   1 x 3" Slide/54mm Petri Dish Stage Insert

   35mm Petri Dish Stage Insert

   Glass Stage Insert

Figure 21

Figure 22

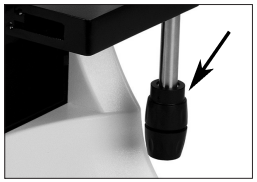


Figure 23

Brightfield and Phase Contrast Condensers

1. Aperture Adjustment: The light path can be adjusted with the iris diaphragm adjustment lever (see arrow in figure 24) located in the condenser. The aperture diaphragm acts as a control for resolution and contrast. Generally, if the iris diaphragm is open too far, you will have high contrast at the expense of resolution. If the iris is closed too far, you will not have enough contrast to properly view the specimen. The condenser iris diaphragm should not be used to adjust light intensity, which is best left to the variable lighting control.
2. Annulus Slider (phase contrast condenser only): When using phase contrast the number on the annulus slider must match the magnification of the objective in use. For example, if you are using the 10X objective, slide the annulus turret until it reads "10-20". For brightfield work set the annulus slider to the open position.

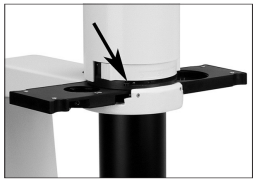


Figure 24

Optional Setup (cont.)

Removal of Condenser Lens

The condenser lens may be removed in order to gain additional sample clearance space when viewing specimens in large vessels. By unscrewing the lens (figure 19) the sample clearance is extended from 75mm to 150mm.

All Models

Figure 19

Power Switch/Variable Lighting Control

The rocker switch located on the right hand side of the microscope (see lower arrow in figure 20) turns the illuminator on or off. To turn the power on press the rocker on the end marked "|". To turn the power off press the rocker on the end marked "O".

All Models

Figure 20

⚠ The illuminator housing will get hot if left on for extended periods of time. Be careful when making adjustments to the illuminator housing or bulb fixture. ⚠

VanGuard 1490INi microscopes are equipped with a variable lighting control (VLC), which allows the user to set the lighting anywhere between off and full brightness. The variable lighting control is located on the front of the microscope (see upper arrow in figure 20). To increase the brightness rotate the wheel clockwise.

20. Place the glass stage plate into the opening in the stage. This plate allows the user to easily view the objectives.

Figure 8

21. Connect the main power cord to the power cord jack (figure 9) on the back of the microscope.

22. Connect the other end of the main power cord to a suitable power supply.

23. Power on the microscope using the power switch located on the right hand side of the microscope.

24. Set illuminator to desired intensity by adjusting the variable lighting control located at the front of the microscope.

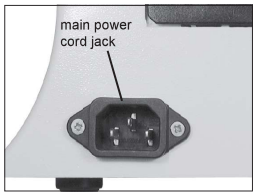


Figure 9

Interpupillary and Diopter Adjustment

All Models

Interpupillary adjustment (the distance between eyepieces) is made through a "folding" action. The Seidentopf design allows for a folding adjustment which is quickly and easily done for each user (figure 10).

Proper adjustment is done by looking through the eyepieces, then "folding" the eyepieces until they are comfortable to look through. At this point, if you are seeing two images continue to "fold" the eyepieces together until the images merge into one.

Figure 10

Diopter adjustment allows for proper optical correction based on each individual's eyesight. This adjustment is easily made and is recommended prior to each use by different users to prevent eyestrain. The procedure for dioptric adjustment is as follows:

1. Using the 40X objective and a sample slide (i.e. one which produces an easily focused image), close your left eye and bring the image into focus in your right eye with the coarse/fine focus control.
2. Once the image is well-focused using only your right eye, close your right eye and check the focus with your left.
3. If the image is not perfectly focused, make fine adjustments with the diopter adjustment mechanism located on the left eyetube (see arrow in figure 11).
4. Once complete, the microscope is corrected for your vision.

Figure 11

Phase Contrast Setup

Model 1493INi

This section pertains to model 1493INi only!

The phase system comes precentered from the factory but alignment should be checked from time to time especially if poor phase performance has been noted.

Power on the microscope and rotate the objective turret until the 10X objective is in the light path. Make sure the condenser iris is fully opened.

Place a specimen on the stage and focus the image using the coaxial focus controls.

Remove the right eyepiece and insert the centering telescope into the empty eyetube (figure 12).

Figure 12

Adjust the phase annulus slider to the "10-20" position.

While looking through the centering telescope, turn the uppermost portion of the telescope only to focus the annulus rings (figure 12).

Insert the annulus centering hex keys into the the adjustment holes on the phase annulus slider (figure 13). Turn the hex keys until the two phase rings visable in the centering telescope are centered over one another (figure 14A-14B). Repeat this step for the 40X objective and "40" annulus setting.

Figure 13

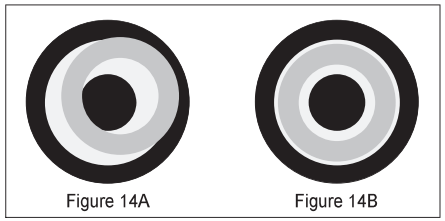


Figure 14A Figure 14B

Optional Setup

All Models

Stage extensions and mechanical stage assembly:

Either one or both of the included stage extensions can be attached at the same time on opposite sides of the stage to increase the stage size when using large specimen holders. In addition, the mechanical stage can be attached to either side of the stage in place of an extension.

Hold the extension or mechanical stage against the side of the stage and position the screws underneath the screw holes (figure 15). Thread the screws into the screw holes and tighten down until the attachment is secure.

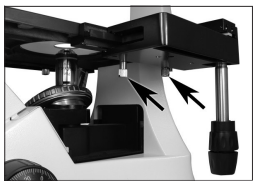


Figure 15

VAN GUARD® Setup

Optional Setup (cont.)

All Models

Colored Filters

Your Vanguard Microscope was supplied with either two or three filters. Brightfield models (1491INi) come with a dispersion (frosted) filter and a blue filter. Phase contrast models (1493INi) add a green filter.

1. Slide out the filter holder (see arrow in figure 16) and place the desired filter into the bottom of the holder making sure that it sits flat. Replace filter holder.
2. You may stack filters but the total thickness should not exceed 11mm.

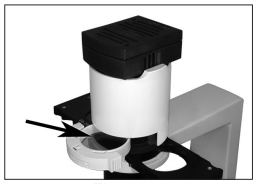


Figure 16

Dispersion filters can be used to soften harsh illumination for both viewing and photomicroscopy. Dispersion filters can control photograph exposure levels.

The **green filter** is used primarily for phase contrast and photograph color correction. Achromatic and plan achromatic objectives give their best image in green light.

The **blue filter** is used to approximate natural light. Because this is not a conversion filter, it should not be used for photomicroscopy.

Filtering is a user preference and application specific issue and therefore beyond the scope of this manual. There are many sources available that explain proper filtering technique and theory.

Trinocular Port

The trinocular port can be used as an additional viewing tube when a standard 23mm eyepiece is inserted (not included) as well as to attach a camera for documentation and group observation.

1. Loosen the trinocular port set screw (see upper arrow in figure 17) and remove the trinocular port dust cap.
2. Slide the trinocular tube assembly into the trinocular port (figure 18) and secure with the trinocular port set screw. Be sure the trinocular tube is inserted fully into the trinocular port.
3. For attaching an eyepiece simply remove the trinocular tube dust cap and insert a 23mm eyepiece. For attaching a camera follow the instructions provided with the camera package for assembly and use.

Note: When using the trinocular port it is necessary to pull the light path selection knob fully to the right (see lower arrow in figure 17). This diverts 80% of the available light to the trinocular tube while the remaining 20% is directed to the main eyepieces. When pushed inward fully, the selector directs 100% of the light to the main eyepieces for the brightest speciman viewing possible.

Figure 17

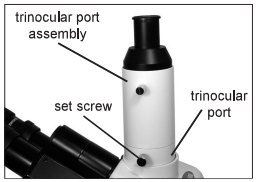


Figure 18