VAN GUARD®

VAN GUARD
Microscopes

Operation Manual

1400i Series

Covering Models:

1421BRi, 1431BRi, 1423PHi & 1433PHi

Printed in the USA

No. VGMNL120916-NS-1400BRi/PHi

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. We recommend you read this entire manual carefully before setting up and using the instrument.

1400i Series Compound Microscopes

The 1400i Series infinity corrected compound microscopes are the flagship of the VanGuard microscope line. Combining top performance with highly-advanced features and optics, the 1400i Series models produce images of the utmost in clarity. Choose from brightfield or phase contrast.

Viewing Head. Binocular or trinocular Seidentopf heads rotate 360° and are inclined at 30°. All models feature interpupillary and dioptric adjustment. The trinocular heads feature a sliding main prism (70/30 split) to provide full-time imaging when the vertical tube is in use. (70% of the image to the vertical tube and 30% to the viewing eyetubes).

Eyepieces. 10X high eyepoint, super-widefield (DIN) with a field number of 20.

Nosepiece. Quintuple, reversed, ball-bearing nosepiece with high-grade lubricant and positive stops. The nosepiece is reversed (inward-facing) to allow for easier manipulation of slides and to aid in keeping the objectives clean.

Objectives. Plan achromatic objective come standard on all models. All objectives are made to DIN standards and are anti-reflective coated.

Stage. Delivering a high level of fluid motion control and longevity, the stage measures 160mm x 140mm. Features a removable spring-clip slide holder and a chemical-resistant finish. Motion 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 tension adjustment and safety autostop.

Condenser. Brightfield models come with a 1.25 N.A. Abbe Condenser. Phase contrast models come with a 1.25 N.A. Zernike condenser with phase annulus rings for 10X, 20X, 40X and 100X; also has brightfield and darkfield stops. All condensers are mounted on a rack and pinion focusing mechanism and feature spring-loaded centering knobs and an iris diaphragm.

Illumination. 20W variable quartz halogen light source with Köhler field diaphragm. Comes with blue, green (phase contrast models only), and dispersion filters.

Base. Stable 225mm x 160mm base fitted with anti-skid rubber feet.

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

Dimensions. 225mm (L) x 160mm (W) x 400mm (H); 8.3kg.

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Warranty information and registration form can be found at:
www.veegee.com/service_support

Specifications

1400BRi and 1400PHi Microscopes

Viewing Head:	Binocular or Trinocular	
Viewing Head Type:	Seidentopf	
Head Rotation:	360°	
Head Inclination:	30°	
Sliding Prism:	70/30 Split [Models 1431BRi & 1433PHi]	
Interpupillary Adjustment:	55-75mm	
Dioptric Adjustment:	-5 to +5	
Eyepiece Magnification:	10X Super-Widefield, High Eyepoint	
Eyepiece Field Diameter:	20mm	
Nosepiece:	Quintuple/Reversed	
Brightfield Objectives:	4X	[0.10 N.A., 17.0mm W.D., 4.5mm F.O.V., Plan]
(Models 1421BRi/1431BRi)	10X	[0.25 N.A., 8.0mm W.D., 1.8mm F.O.V. Plan]
	40X	[0.65 N.A., 0.40mm W.D., 0.45mm F.O.V. Plan]
	100X	[1.25 N.A., 0.25mm W.D., 0.18mm F.O.V. Plan]
Phase Contrast Objectives:	10X	[0.25 N.A., 8.0mm W.D., 1.8mm F.O.V. Plan]
(Models 1423PHi/1433PHi)	20X	[0.40 N.A., 0.50mm W.D., 0.9mm F.O.V. Plan]
	40X	[0.65 N.A., 0.40mm W.D., 0.45mm F.O.V. Plan]
	100X	[1.25 N.A., 0.25mm W.D., 0.18mm F.O.V. Plan]
Stage Dimensions:	160mm x 140mm	
Stage Motion:	Right-Hand Coaxial Control/Rack & Pinion Drive	
Stage Movement Range:	50 x 75mm	
Focusing Movement:	Coaxial Coarse & Fine Controls/Safety Autostop	
Focusing Range:	40mm	
Focusing Graduation:	2 Microns/Division	
Brightfield Condenser:		
(Models 1421BRi/1431BRi)	1.25 N.A. Abbe Condenser with Iris Diaphragm	
Phase Contrast Condenser:		
(Models 1423PHi/1433PHi)	1.25 N.A. Zernike Condenser with Iris Diaphragm including Brightfield & Darkfield Stops	
Phase Centering Tool:		
(Models 1423PHi/1433PHi)	Telescoping Eyepiece	
Illumination:	20W/6V Variable Quartz Halogen with Köhler Field Diaphragm	
Fuses:	0.25A, 250V [2 each]	
Voltage:	110V [Standard]; 220V [Optional]	
Base Dimensions:	225mm x 160mm	
Overall Dimensions:	225mm (L) x 160mm (W) x 400mm (H) [Binocular Models]	
Weight:	8.3kg [Binocular Models]	

Maintenance

Replacing the Lamp

All Models

1. Before attempting to replace or remove the lamp, UNPLUG THE MICROSCOPE FROM ANY POWER SOURCE AND ALLOW SUFFICIENT TIME FOR THE LAMP TO COOL.
2. Lamp replacement is done by laying the microscope on its back and opening the trap door located on the bottom of the base by pulling on the release knob (see figure 16).

   Note: Be careful not to touch the glass lamp when replacing -- use a tissue or other medium to grasp the lamp. This will prevent the oils from your hand from reducing lamp life. If contact is made with the lamp, clean lamp with rubbing alcohol and allow a brief drying period.
3. Once the door is open, the lamp can easily be removed simply by grasping the lamp and pulling it from the fixture (see figure 17).
4. When replacing, insert the new lamp into the same fixture. Make sure that the pins on the lamp slide easily into the slots. You should not have to force the lamp.

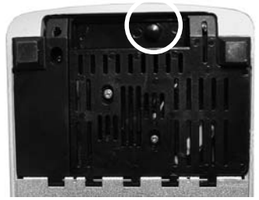


Figure 16

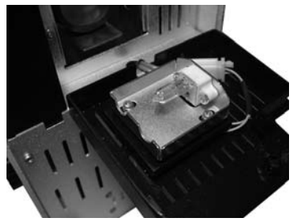


Figure 17

Replacing the Fuse

All Models

1. If the microscope is plugged in but the lamp is not turning on, the fuses could be blown. To check the fuses, UNPLUG THE MICROSCOPE FROM YOUR POWER SOURCE and remove the 5 screws securing the back panel (see figure 18).
2. Once the screws are removed, carefully pull the rear cover away from the microscope. There is a small circuit board connected to the rear cover that houses the two fuses (see figure 19 - note: connecting wires removed for clarity). Avoid pulling on the rear cover hard enough to loosen any of the wires that connect the circuit board to the microscope.
3. To replace the blown fuse(s) (the wire inside is broken, or the glass is blackened) pull the fuse out of it's holder and snap a new fuse in. You might need to use a screwdriver to lever the fuse out, but be careful not to scratch the circuit board.
4. Replace the rear cover and the five screws.

Figure 18

Replacement Lamp -- 20W Halogen (Part No. 1400-20WHL)
Replacement Fuse -- 0.25A, 250V (Part No. 1400-FS1) [2 required]

Maintenance

All Models

The eyepieces and objectives on VanGuard Microscopes are coated. They should never be wiped while dry as any dirt or dust will scratch the coating. The surfaces should either be blown off with an air canister, or blown and cleaned with an air-bulb and camel-hair brush. It is recommended to then use a lens cleaner. Apply with a cotton swab for a minimum of wetting, then wipe the surface clean with a quality lens tissue. 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.

Figure 19

For information about parts, accessories, or service -- contact your dealer directly or contact VanGuard Microscopes at 1-800-423-8842.

Parts & Accessories

Included Parts:

Model 1421BRi
Binocular Head (1 ea.)
Stand (1 ea.)
Brightfield Condenser (1 ea.)
10X High Eyepoint Eyepieces (2 ea.)
4X Infinity Corrected, Plan Achromat Objective (1 ea.)
10X Infinity Corrected, Plan Achromat Objective (1 ea.)
40X Infinity Corrected, Plan Achromat Objective (1 ea.)
100X Infinity Corrected, Plan Achromat Objective (1 ea.)
Dispersion Filter (1 ea.)
Blue Filter (1 ea.)
Power Cord (1 ea.)
Instruction Manual (1 ea.)
Dust Cover (1 ea.)
Spare 20W Halogen Lamp (1 ea.)
Spare 0.25A, 250V Fuses (2 ea.)
Focus Tension Wrench (1 ea.)

Model 1431BRi
Trinocular Head (1 ea.)
Stand (1 ea.)
Brightfield Condenser (1 ea.)
10X High Eyepoint Eyepieces (2 ea.)
4X Infinity Corrected, Plan Achromat Objective (1 ea.)
10X Infinity Corrected, Plan Achromat Objective (1 ea.)
40X Infinity Corrected, Plan Achromat Objective (1 ea.)
100X Infinity Corrected, Plan Achromat Objective (1 ea.)
Dispersion Filter (1 ea.)
Blue Filter (1 ea.)
Power Cord (1 ea.)
Instruction Manual (1 ea.)
Dust Cover (1 ea.)
Spare 20W Halogen Lamp (1 ea.)
Spare 0.25A, 250V Fuses (2 ea.)
Focus Tension Wrench (1 ea.)

Model 1423PHi
Binocular Head (1 ea.)
Stand (1 ea.)
Phase Contrast/Brightfield/Darkfield Condenser (1 ea.)
Phase Contrast Centering Telescope (1 ea.)
10X High Eyepoint Eyepieces (2 ea.)
10X Infinity Corrected, Plan Phase Objective (1 ea.)
20X Infinity Corrected, Plan Phase Objective (1 ea.)
40X Infinity Corrected, Plan Phase Objective (1 ea.)
100X Infinity Corrected, Plan Phase Objective (1 ea.)
Dispersion Filter (1 ea.)
Blue Filter (1 ea.)
Green Filter (1 ea.)
Power Cord (1 ea.)
Instruction Manual (1 ea.)
Dust Cover (1 ea.)
Spare 20W Halogen Lamp (1 ea.)
Spare 0.25A, 250V Fuses (2 ea.)
Focus Tension Wrench (1 ea.)

Model 1433PHi
Trinocular Head (1 ea.)
Stand (1 ea.)
Phase Contrast/Brightfield/Darkfield Condenser (1 ea.)
Phase Contrast Centering Telescope (1 ea.)
10X High Eyepoint Eyepieces (2 ea.)
10X Infinity Corrected, Plan Phase Objective (1 ea.)
20X Infinity Corrected, Plan Phase Objective (1 ea.)
40X Infinity Corrected, Plan Phase Objective (1 ea.)
100X Infinity Corrected, Plan Phase Objective (1 ea.)
Dispersion Filter (1 ea.)
Blue Filter (1 ea.)
Green Filter (1 ea.)
Power Cord (1 ea.)
Instruction Manual (1 ea.)
Dust Cover (1 ea.)
Spare 20W Halogen Lamp (1 ea.)
Spare 0.25A, 250V Fuses (2 ea.)
Focus Tension Wrench (1 ea.)

Parts & Accessories

Optional Accessories:

Video and Digital Camera Systems:

Part Number:	**Description:**
1400-CDPC-3	USB Digital Camera, 3 MP
1400-CDPC-5	USB Digital Camera, 5 MP
1400-CDPC-10	USB Digital Camera, 10 MP

Other Accessories:

Part Number:			
Call for Part Numbers	Eyepieces (15X, 20X)		
Call for Part Numbers	Objectives:	Plan Achromatic, Brightfield:	4X, 10X, 20X, 40X, 50X, 60X, 100X (oil)
		Plan Achromatic, Phase:	10X, 20X, 40X, 100X (oil)
1200-IOG	Immersion Oil, Low Viscosity (1/4 oz. Bottle)		

For information about parts, accessories, or service -- contact your dealer directly or contact VanGuard Microscopes at 1-800-423-8842.

Using Your 1400i Series Microscope

Using the Camera Port

1431BRi/1433PHi Models

1. Make sure that you have installed the camera port tube as described on page 7 and shown in figure 13.
2. Assemble the adapters and connect to the camera using the instructions provided with the camera/adapter kit.

   Note: Camera kit is not included with this microscope. Please see page 4 for available camera kits.

Figure 13

3. Remove the camera port dust cap, then slide the adapter into the camera port (see figure 14).
4. Pull the prism slider completely out to divert the image to the camera port. The prism slider is the silver knob on the right side of the head assembly (see figure 14).

   Note: The 1400i Series Microscopes utilize a 70/30 split sliding prism. This split prism diverts 70% of the light to the camera port and the remaining 30% to the eyepieces. This allows the eyepieces to be used while the prism slider is pulled out, although the image seen through the eyepieces will be dim when compared to normal use.

5. When the camera port is not in use, be sure to cover with the camera port dust cap.

Figure 14

Using Filters

All Models

Your VanGuard Microscope was supplied with either two or three colored filters depending on model. Brightfield models come with a dispersion filter and a blue filter. Phase contrast models add a green filter.

1. **Procedure for Using Filters:**
   Locate the drop-in filter holder (see figure 15a) located on the top of the substage illuminator. Place the desired filter into the filter holder.
2. **Dispersion filters** can be used to soften harsh illumination for both viewing and photomicroscopy.

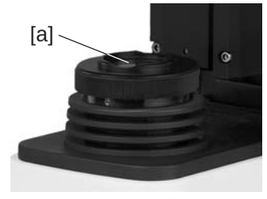


Figure 15

The **green filter** is used mainly for added contrast and photograph color correction during phase contrast work.
The **blue filter** is used to approximate natural light and photograph color correction.

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

Using Your 1400i Series Microscope

Interpupillary and Diopter Adjustments

All Models

1. 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 (see figure 11).
2. 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.
3. Using the 40X *objective* and a sample slide (i.e. one which produces an easily focused image), close your right eye and bring the image into focus in your left eye with the *coarse/fine focus control*. Once the image is well-focused using only your left eye, close your left eye and check the focus with your right. If the image is not perfectly focused, make fine adjustments with the *diopter adjustment mechanism* located on the right eyetube (see figure 12). Once complete, the microscope is now corrected for your vision.

Figure 11

Figure 12

Oil Immersion Objectives

All Models

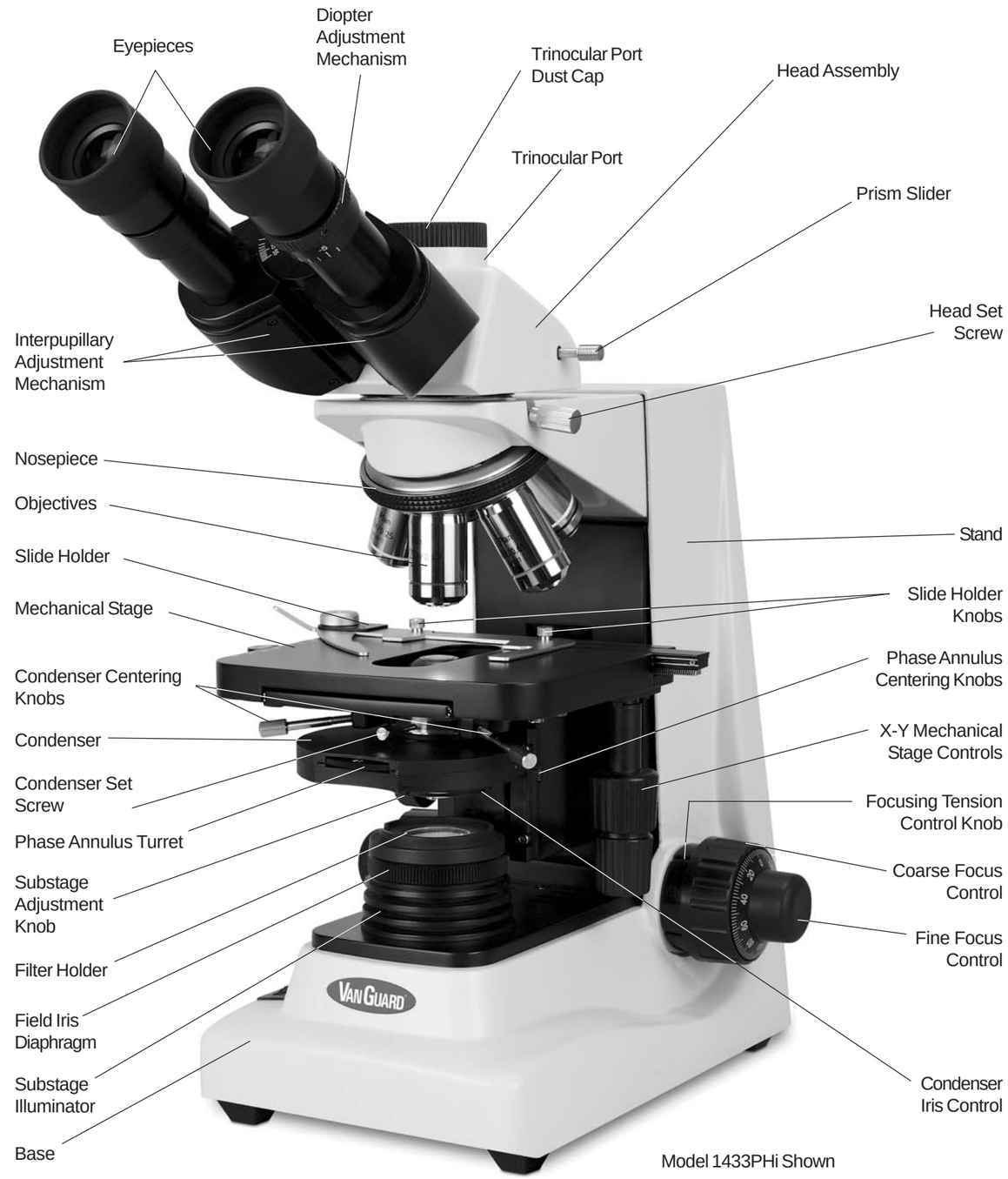
The 100X *objective* which comes with this microscope should be used with immersion oil in order to maintain image quality. After use, the objective tip must to be wiped clean so that no oil residue remains. This is especially true of any other objectives that may have intermittently come in contact with immersion oil.

Procedure for Cleaning the Oil Immersion Objective:

1. Lightly moisten a cotton swab with lens cleaner.
2. Wipe the objective with a twisting motion in order to remove all traces of the immersion oil.
3. Check that all the immersion oil has been removed before storing the objective.

Under no circumstances should an objective be left sitting in oil for an extended period of time. Exceptionally long immersion periods can cause oil to penetrate the objective’s sealant and obscure the optics, which is not covered under warranty.

1400i Series Parts



Model 1433PHi Shown

1400i Series Parts

1400i Series Lower Left View

1400i Series Rear View

Using Your 1400i Series Microscope

Focusing and Mechanical Stage Mechanisms

All Models

1. Focusing adjustment is achieved by turning the *coarse/fine focus control*s (see figures 9 and 10). The large knob is used for coarse adjustment, the smaller knob for fine adjustment. The coaxial arrangement allows for easy, precise adjustment without stage drift.
2. Turning the *coarse/fine focus control* raises and lowers the stage vertically. One complete turn of the fine focusing knob raises or lowers the stage 0.3mm; the smallest graduation refers to 2 microns of vertical movement. One complete turn of the coarse focusing knob raises or lowers the stage 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 figure 9). For tighter tension, turn the control knob in a clockwise motion. For looser tension, turn the control knob in a counterclockwise motion.
4. **Vertical Focusing**: The *condenser* can be raised and lowered with the *substage adjustment* knob to focus the light for optimal illumination.
5. **Aperture Adjustment**: The light path can be adjusted with the *iris diaphragm adjustment* lever located underneath the condenser. Aperture adjustments are made to induce contrast into a specimen, not to adjust light intensity.

Figure 9

Figure 10

6. The *mechanical stage X-Y controls,* located underneath the right-hand side of the stage (see figure 9), provide easy and accurate positioning of the sample. One complete turn of the longitudinal (Y) control (lower half of the stage controls) will move the specimen 34mm left or right. One complete turn of the transverse (X) control (upper half of the stage controls) will move the specimen 20mm front or back.
7. The spring-loaded slide holder can be removed for users who prefer to not use a *mechanical stage*. Simply loosen the knurled *slide holder knobs* which lock the *slide holder* on the stage, and slip out the *slide holder*.

Setting the Up-Stop Mechanism

All Models

The *up-stop mechanism* is located just inside of the left-hand *focus control* knob (see figure 10). It allows the user to set a maximum point to which the *stage* can be raised.

1. To set this point, turn the *up-stop mechanism* in a counterclockwise motion, so that its tab is facing up.
2. Raise or lower the *stage*, by turning the *focus control* knobs, to the desired height. **Be careful not to raise the stage high enough to crash into the objective.**
3. Once achieved, turn the *up-stop mechanism* in a clockwise motion, so that its tab is facing forward (see figure 10).
4. Once gently tightened, the u*p-stop mechanism* will not allow the *stage* to be raised higher than the set point.

Setup

Aligning the Phase Contrast Annulus Rings

1423PHi/1433PHi Models

Phase contrast is a system which utilizes a series of light baffling annulus rings. Proper alignment of these rings is absolutely necessary to achieve optimal phase contrast.

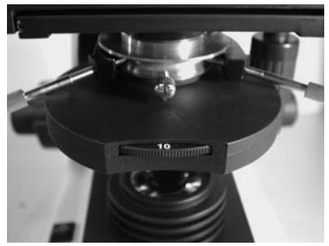


Figure 5

Figure 6

1. Begin by turning on the *substage illuminator* with the *power switch* located on the lower left side of the instrument. Set the *objectives* so they are in the approximate position for actual use. This is best achieved by placing a slide on the *stage*, rotating the 100X *objective* into position, then raising the stage (via the *coarse/fine focus control* knobs) until the tip of the 100X *objective* is just above the slide (almost touching).
2. Rotate the *nosepiece* until the 10X *objective* is in the light path, then rotate the *phase annulus turret* (the dial on the front of the condenser) in the *phase contrast condenser assembly* until the "10" is seen in the viewing window (see figure 5).
3. Remove an *eyepiece* from one of the *eyetubes* and replace with the *phase contrast centering telescope* (see figure 6).
4. After loosening the set screw on the *phase contrast centering telescope*, look through the *phase contrast centering telescope* and pull out the uppermost piece of the *phase contrast centering telescope* until the image is in focus. Tighten the set screw.
5. The image seen through the *phase contrast centering telescope* should resemble rings superimposed on one another (see Figure 7A). What is actually being viewed are the phase rings.
6. Turn the *condenser centering knobs*, which extend from the front of the condenser mount, until the two rings of light are centered upon one another (see Figure 7B).
7. Once the phase rings are centered, remove the *phase contrast centering telescope* and replace with the *eyepiece*.
8. The phase rings are now centered for the other remaining *objectives* unless one of the factory phase objectives has been replaced. In this instance you will need to align just that condenser setting for your new objective using the centering knobs located at the rear of the condenser (not the knobs at the front as used in step 6 above).

NOTE: Brightfield work can be achieved by setting the condenser at the "0" marking. Likewise, the "DF" setting is for Darkfield work.

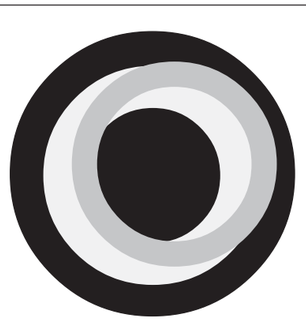


Figure 7A

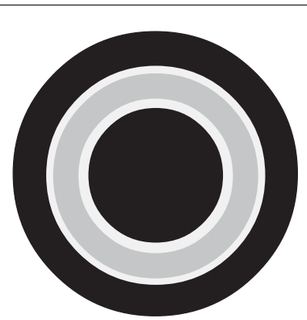


Figure 7B

Note: This completes the setup for the 1423PHi and the 1433PHi. The next 3 pages will explain how to use and make adjustments to the microscope.

Setup

Assembly

All Models

All part names in *italics* are illustrated on pages 5 or 6.

1. After removing the microscope parts from the protective foam packaging and checking it over for all components and accessories (a list is provided on page 3), you can begin assembly.
2. Place the *stand* on a stable counter top.
3. Place the *head assembly* on top of the *stand* so that the dovetail flange slides into place. Secure with the *head set screw* (circled in figure 1).

   NOTE: Do not release the *head* until it is firmly secured with the *head set screw*.

Figure 1

4. If you are setting up a trinocular microscope, remove the packing cap and carefully screw the *camera port* onto the *head assembly* in a clockwise direction until tight (see figure 2).

Figure 2

5. Remove the protectors from the eyetubes and replace with the *eyepieces* (see figure 3).

Figure 3

Assembly (continued)

All Models

6. After removing the *objectives* from their storage containers, individually install each one into the *nosepiece* by twisting them clockwise into the threaded holes of the *nosepiece* (see figure 4).

Figure 4

The *condenser assembly* comes preinstalled, but should it be necessary to reinstall then use the following instructions:

7. Raise the *substage* and *stage* to their maximum height (see figure 5). Raise the *stage* via the *coarse/fine focus controls*, and the *substage* using the *substage adjustment knob*.
8. Loosen the condenser set screw enough to allow the neck of the condenser to slide through the silver condenser mounting ring. It will be necessary to unthread and remove the upper portion of the *base collector* first in order to gain sufficient clearance.

Figure 5

9. Gently slide the neck of the *condenser* through the *condenser mounting ring* until it will go no further (see figure 6). Make sure that the text “NA 1.25” is facing up as you install the *condenser*. If the *condenser* will not slide freely through the mounting ring (and you’ve checked that the *condenser set screw* is backed out far enough), **do not force**, simply wiggle the *condenser* while lightly pushing up. It may be necessary to loosen the *up-stop mechanism* in order to gain sufficient clearance (refer to page 11 for details).
10. Once the *condenser* assembly is in place, lower the *substage* via the *substage adjustment knob* and tighten the *condenser set screw* just enough to prevent the *condenser* from coming out.

    Note: The phase contrast condenser is pictured, but the assembly instructions are identical for the brightfield condenser.

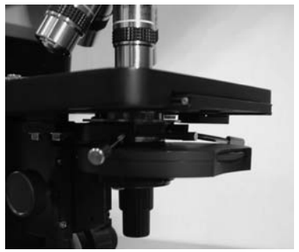


Figure 6

11. Connect the female end of the power cord to the microscope (the jack is on the rear of the stand) and the male end to a suitable power supply, then turn the *substage illuminator* on with the *power switch* located on the lower left side of the instrument. If the light does not come on, check to see that the *variable lighting control*, located next to the *power switch* is on the highest setting.

VAN GUARD® Setup

Aligning the Condenser

All Models

Adjustments to the substage condensing system are crucial for proper illumination and performance. There are three basic adjustments which need to be made: Centering, Vertical Focusing, and Aperture Adjustment.

1. **Centering**: The *condenser* must be centered in the light path to ensure proper light control. A simple method for centering is as follows:
   - Rotate the *nosepiece* until the 10X *objective* is in the light path.
   - Raise the substage assembly fully by turning the substage adjustment knob counter-clockwise.
   - Use the focus controls to focus on a specimen located on the stage.
   - Open the *aperature iris diaphragm* to the largest setting by using the *aperature iris diaphragm adjustment* lever which extends from the *condenser* assembly.
   - While looking into the microscope eyepieces, close the *field iris diaphragm* to the smallest setting by turning the uppermost section of the *substage illuminator* counter-clockwise.
   - Closing the iris in this manner will reduce the field so that a small white hexagon is visible within a black field (see figure 8A). Focusing of the hexagon is performed by turning the *substage adjustment knob*. This white hexagon is the light which is passing through the field iris and should be centered in the black field. If not, move it to the center (see figure 8B) by tightening and/or loosening the *condenser centering knobs*.
   - Fine tuning can be done by opening the *field iris diaphragm* until the white hexagon almost fills the entire field (see figure 8C), and then readjusting (see figure 8D). After centering the condenser open the field iris diaphragm slightly wider than the field of view.

Figure 8A **Figure 8B** **Figure 8C** **Figure 8D**

2. **Vertical Focusing**: The *condenser* can be raised and lowered with the *substage adjustment* knob to focus the light for optimal illumination.
3. **Aperture Adjustment**: The light path can be adjusted with the *aperature iris diaphragm adjustment* lever located just below the condenser. Aperture adjustments are made to induce contrast into a specimen, not to adjust light intensity.

If the iris isn’t centered in the field of view then use the condenser centering knobs to adjust. You may have to split the alignment difference between the field iris and the condenser iris to achieve a balance.