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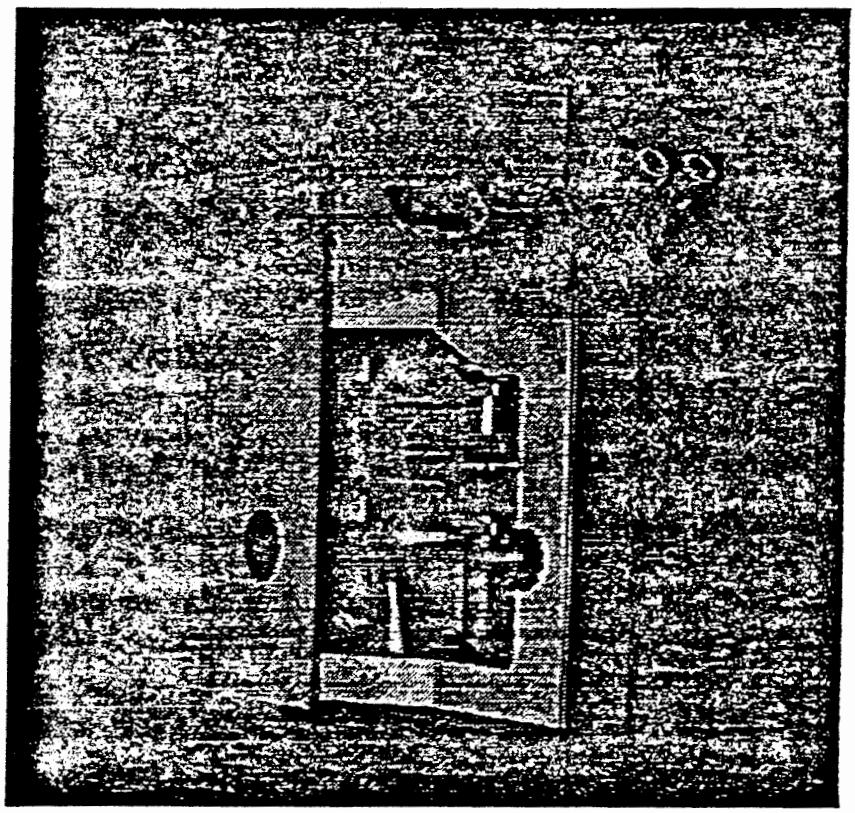
Find the *Spectra-Tech Reflachromat* at our website: ***Click HERE***

IR-Plan® *Advantage*

User's Manual

PN 0047-XXX

VERSION 1.0

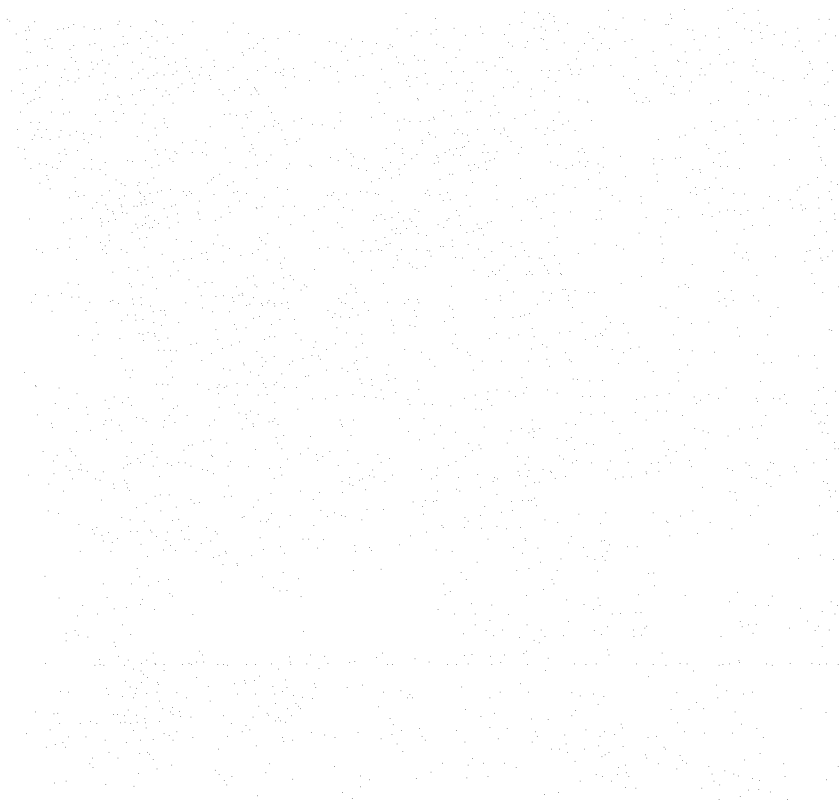


SPECTRA-TECH INC.

PN/700-0060

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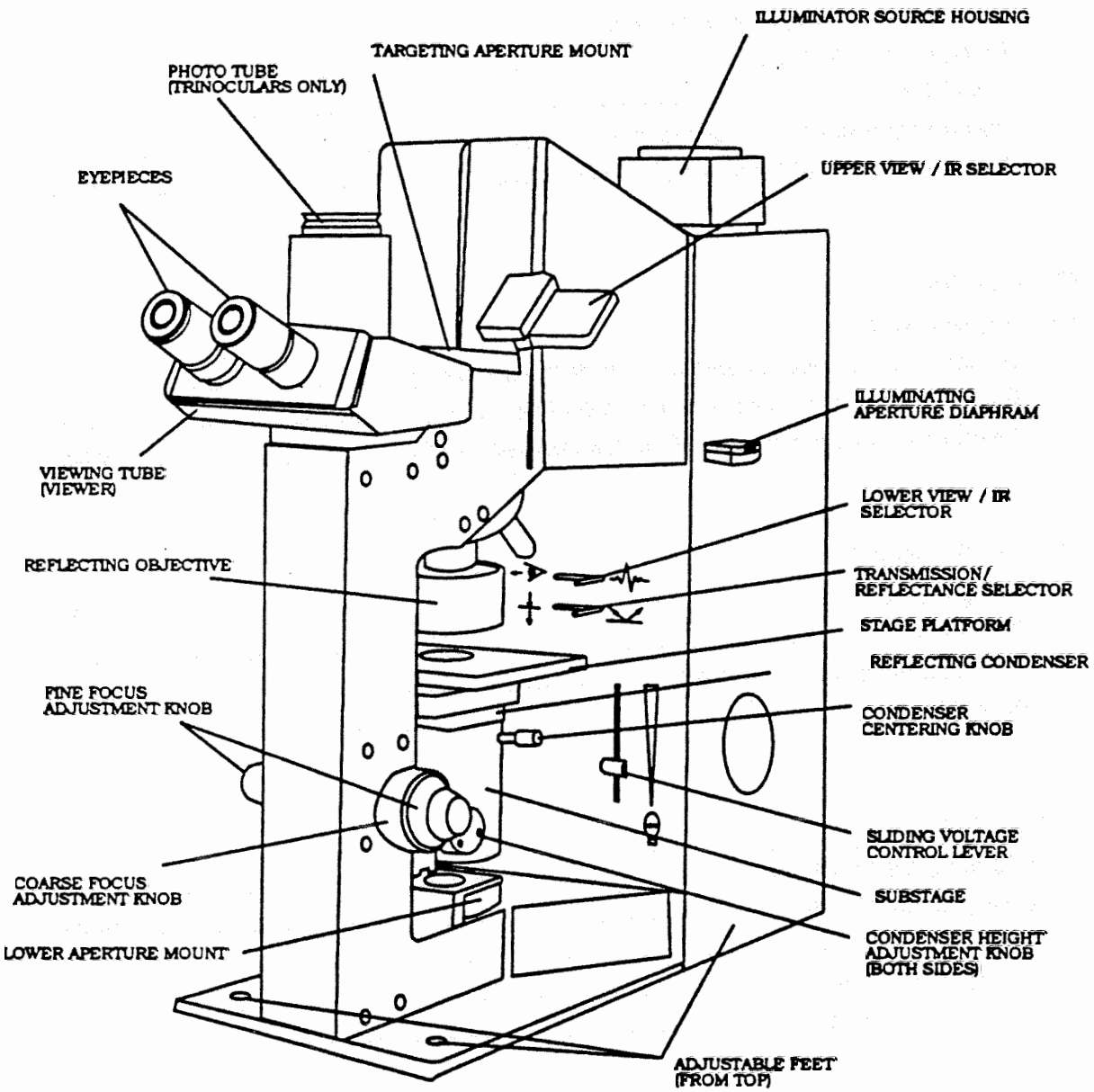
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NOMENCLATURE

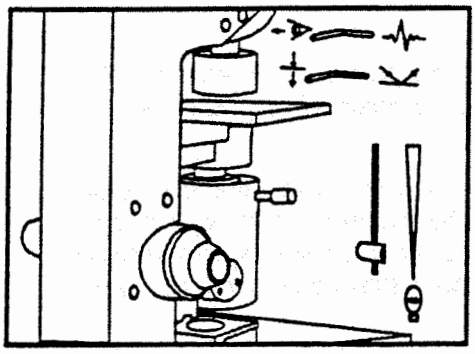
CAUTION: The IR-Plan® Advantage is to be unpacked, assembled and installed by a qualified service engineer. Damage can result if untrained personnel unpack and assemble the microscope.

The internal optics are not user serviceable - any adjustments made by the user can invalidate warranty conditions.



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CONTROLS

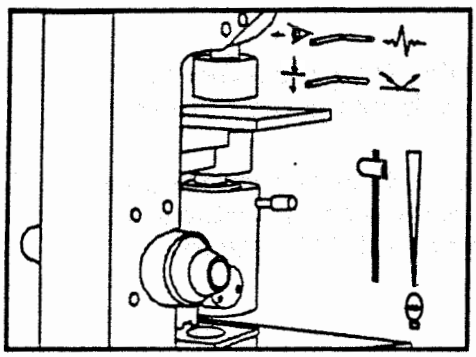


Sliding Illumination Voltage Control Lever

The Sliding Illumination Voltage Control Lever controls the illumination intensity or brightness of the image.

The lever should be in the low (dim) position when the microscope is plugged in and switched on. This will extend the bulb's life.

To the left, the lever is illustrated in the low or dim position.

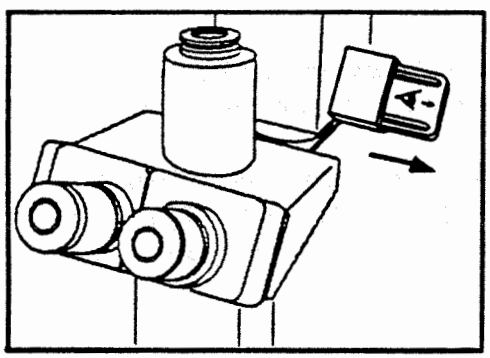


Sliding Illumination Voltage Control Lever

Here the lever is illustrated in the high or bright position.

CAUTION: The illuminator should not be left in this position when the microscope is not in use.

When doing photomicrography work, the illuminator should be at maximum intensity (slide is up all the way).

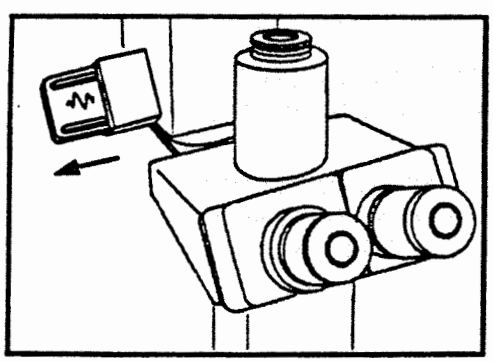


Upper View/IR Selector

The Upper View/IR Selector slides from view to IR (infrared) mode. This switches the optics from a beam splitter (view mode) to a mirror (IR mode).

It is used in conjunction with the Lower View/IR Selector to switch the microscope from View to IR and back.

In this diagram the selector has been positioned into the view mode.



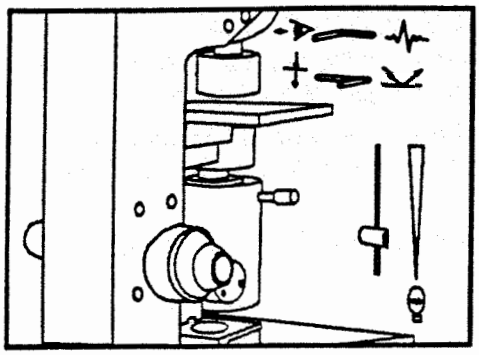
Upper View/IR Selector

In this diagram the selector is illustrated in the IR mode.

It is recommended that the microscope be left in the view mode when not collecting data. This is especially important when using a MCT detector without liquid nitrogen, i.e.: leaving it overnight.

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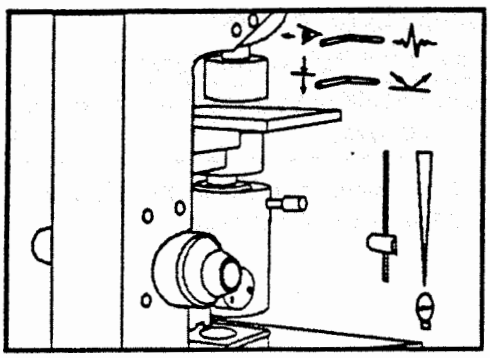
Summary of View and IR Data Collection Modes
Examples of Operating Modes



Example 1

The View/IR Selector is in the *view* position and the IR Transmission/Reflectance Selector is in the *reflectance* position.

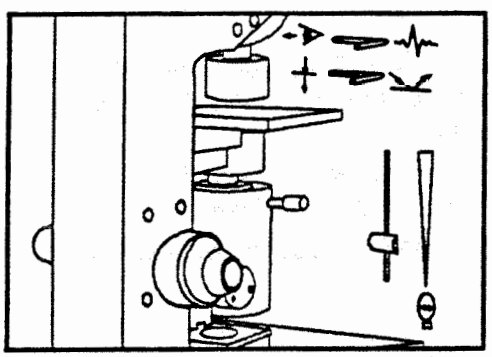
When these two levers are in this position and the Upper View/IR Selector (above the targeting aperture) is in the view position, the microscope is ready for viewing with reflected light illumination (this is sometimes called vertical or EPI illumination).



Example 2

The View/IR Selector is in the *view* position and the IR Transmission/Reflectance Selector is in the *transmission* position.

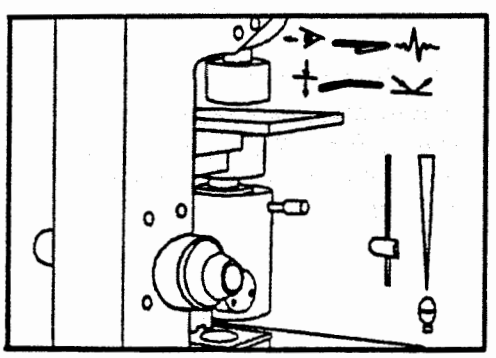
When these two levers are in this position and the Upper View/IR Selector is in the view position, the microscope is ready for viewing with transmitted light illumination.



Example 3

The View/IR Selector is in the *IR* position and the IR Transmission/Reflectance Selector is in the *reflectance* position.

When these two levers are in this position and the Upper View/IR Selector is in the IR position, the microscope is ready to sample or collect data in the IR reflectance mode.



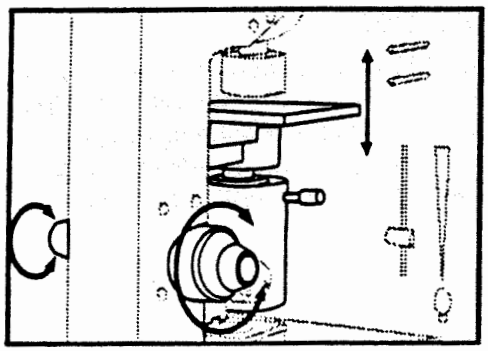
Example 4

The View/IR Selector is in the *IR* position and the IR Transmission/Reflectance Selector is in the *transmission* position.

When these two levers are in this position and the Upper View/IR Selector is in the IR position, the microscope is ready to sample or collect data in the IR transmission mode.

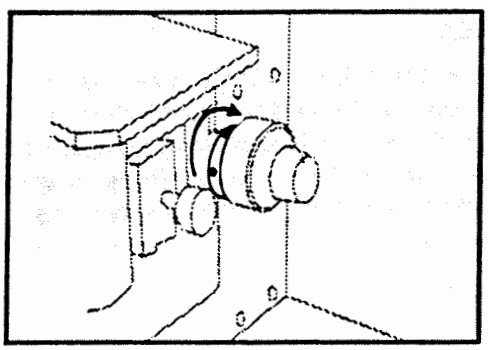
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CONTROLS



Focus Adjustment Knobs

Turning the focus adjustment knob moves the stage and condenser substage up and down in unison.

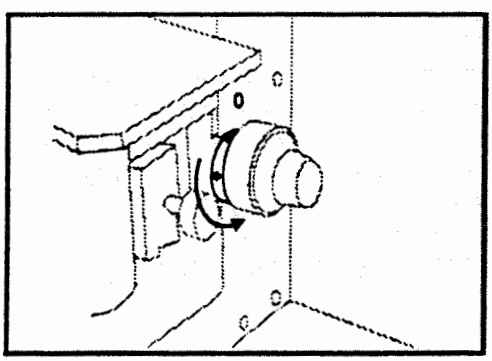


Tension Adjustment Ring

The tension adjustment ring adjusts the resistance of the coarse focusing knobs and the stage mechanism. If the tension is too great the coarse knobs will be too dificult to use. If it is too loose then the stage will slip out of focus.

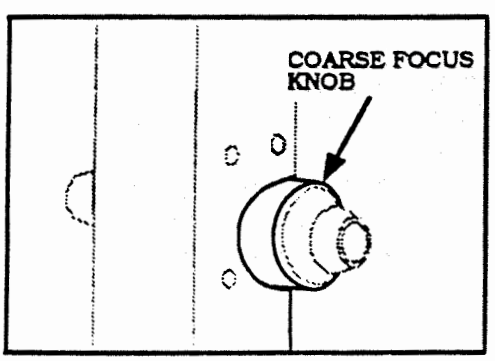
A hex key (allen wrench) is commonly used to adjust the tension by inserting it into one of the accessible holes in the ring and turning the ring.

The direction shown to the left tightens the mechanism.



Tension Adjustment Ring

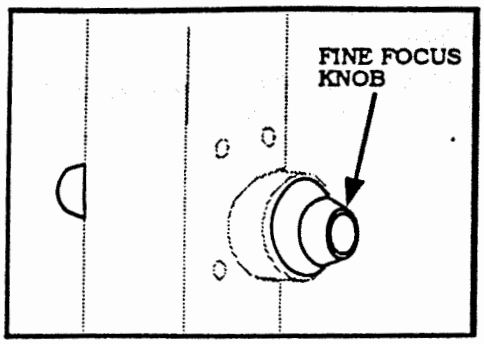
The direction shown to the left loosens the mechanism.



Coarse Focus Adjustment Knobs

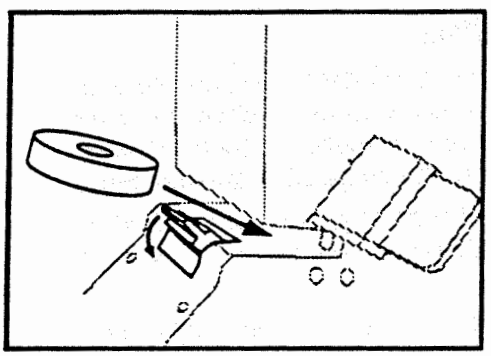
The Coarse Focus Adjustment Knobs are located on either side of the microscope frame. Turning this knob will rapidly move the stage and condenser substage up or down.

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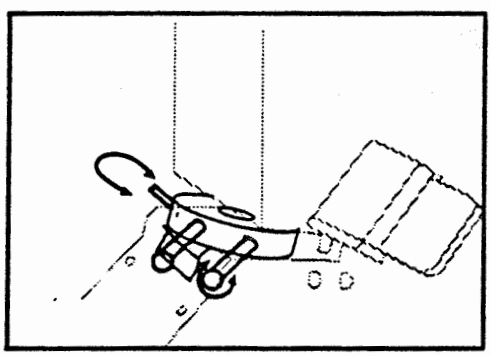
Fine Focus Adjustment Knobs

The Fine Focus Adjustment Knobs are located on either side of the microscope frame. They are used while viewing. They raise and lower the stage and condenser substage in fine increments. The knob to the left (from the user's front side) has graduated marks. Each mark represents 2 microns of stage/substage travel.



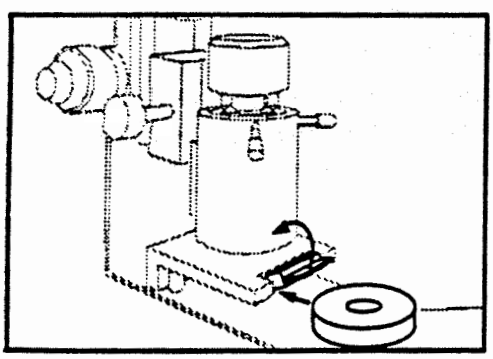
Targeting Aperture Mount

The Targeting® Aperture Mount holds the upper aperture in place. This aperture is located in the infrared path between the infrared source and the sample. It is located in an optically conjugate position to the sample and the source. Because the location is conjugate to the sample, the aperture is viewed as being in focus with the sample.



Targeting Aperture Mount

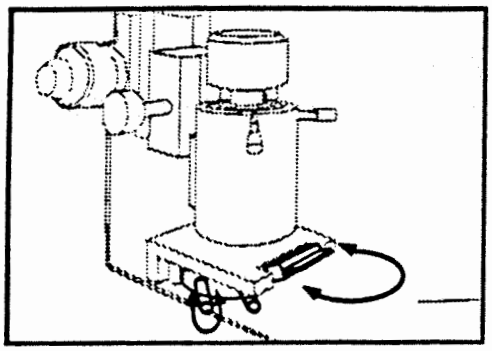
The aperture shown here is the standard variable rectangular aperture. The control rods of the aperture are turned to move the blades in and out to define areas of a sample or matrix for analysis. The aperture can also be rotated to accommodate different sample shapes and orientations. By being between the source and the sample, the aperture can limit the infrared energy striking the sample to the area defined. This enhances the spatial resolution.



Lower Aperture Mount

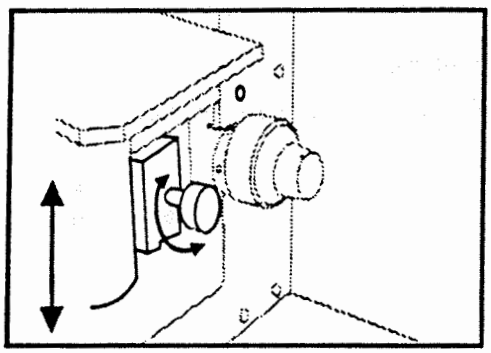
The Lower Aperture Mount holds the lower aperture in place. This aperture is located in the infrared path between the sample and the infrared detector. It is located in an optically conjugate position to the sample, the upper aperture, and the source. Because the location is conjugate to the sample, the aperture is viewed as being in focus with the sample.

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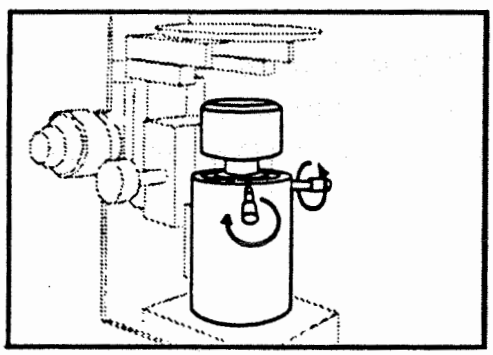
Lower Aperture Mount

The aperture shown here is the standard variable rectangular aperture. The blades of the aperture are rotated and it's blades can move in and out to mask out, separate, or define areas of a sample or matrix. The aperture can also be rotated to accommodate different sample shapes. When used in conjunction with the upper aperture, it yields Redundant Aperturing® for the maximum spatial resolution.



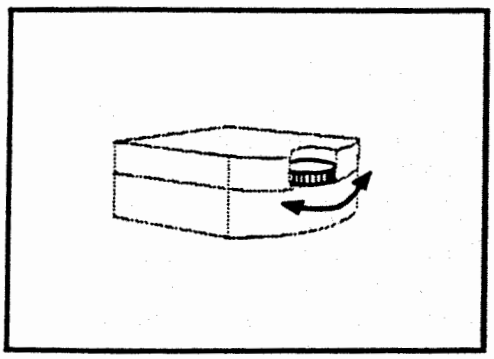
Condenser Height Adjustment Knobs

The Condenser Height Adjustment Knobs are locted on both sides of the microscope. These adjust the height (focus) of the condenser substage independent of the stage and the coarse and fine focus adjustment knobs. These controls enable the lower aperture to be focused without affecting the focus of the sample.



Condenser Centering Knobs

The Condenser Centering Knobs (2) are located on the condenser substage. These knobs will center the condenser to the optical axis.



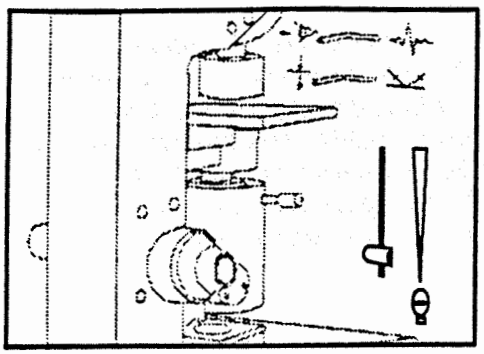
Illuminating Aperture Diaphragm

The Illuminating Aperture Diaphragm is located on the right hand side of the microscope and controls the diameter of the light beam (visible) which goes to the objective and condenser lenses. Over filling the lenses "washes out" the image and under filing leaves the image dark and unevenly illuminated. The user adjusts the knob as shown, to achieve the best image quality.

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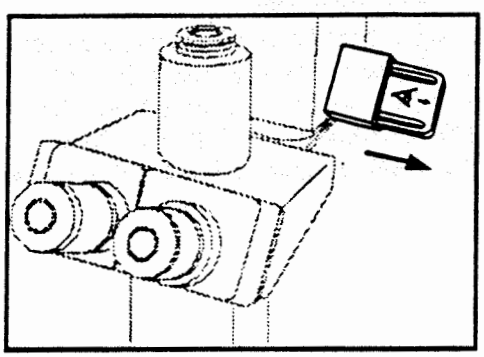
GETTING STARTED

Mounting and Focusing the 100 µm Pinhole



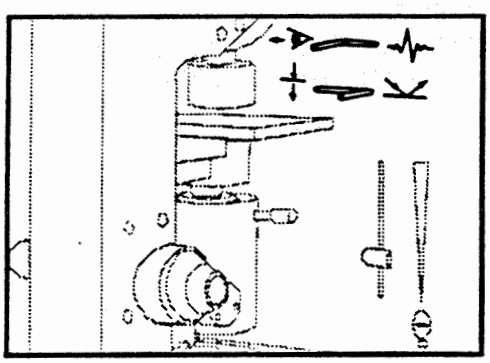
Adjust Voltage Control Lever

Place the Sliding Voltage Control Lever to the low position.



Put Microscope In View Mode

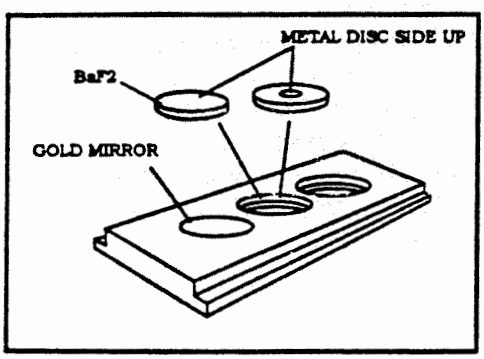
Slide the Upper View/IR Selector to the *view* position.



Put Microscope In View/Reflectance Mode

Put the Lower View/IR Selector in the *view* position

Put the Transmission/Reflectance Selector in the *reflectance* position.



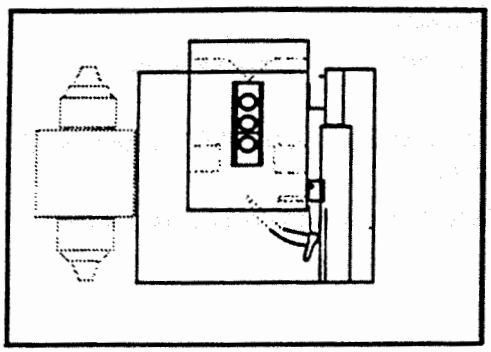
Place the Pinhole on the Sample Slide

Place the 100 µm pinhole on the sample slide. Be sure that the stainless steel disc (the one with the 100 µm pinhole) is facing upward, toward the objective.

Note: If the microscope is equipped with a condenser that is adjusted for a 2 mm thick BaF_2 window, the 100 µm pinhole will be mounted on a 2 mm thick BaF_2 window. If the condenser has been adjusted to correct for air only (between the sample and condenser) then the 100 µm pinhole will be mounted in a 1" x 3" Metal Mount.

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Mounting and Focusing the 100 µm Pinhole

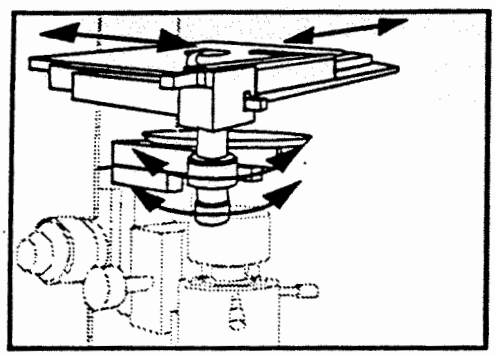


Place the Pinhole and Sample Slide on the Purge Plate

The sample slide can be mounted with the purge plate.

Place the 100 µm pinhole and sample slide on the purge plate.

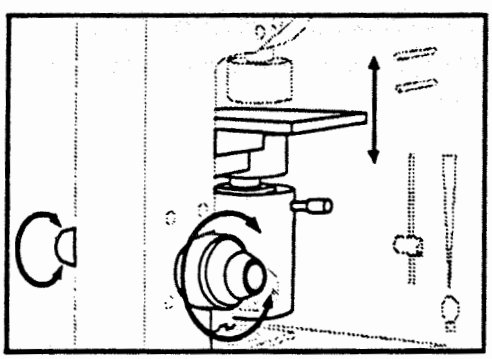
Gradually increase the illumination intensity (sliding voltage control lever).



Focus on the Pinhole

Note: When locating the pinhole, it is useful to not look through the viewer when beginning. Instead, look under the objective. Light will emanate from the objective and can be focused on to the surface. The pinhole can then be moved to the focused point of light before viewing.

Using the x,y movements of the mechanical stage and the focus adjustment knobs, bring the pinhole to the focal point of light.

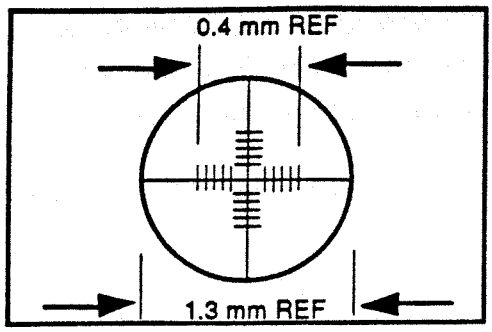


Focus on the Pinhole

At this point one can now look through the viewer and easily locate, focus and center the pinhole (to the cross hair reticle).

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Crosshair Reticle Scale Divisions

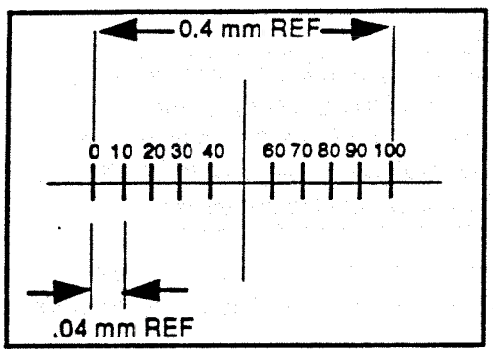


Reticle Divisions - Full Field

A cross hair reticle is mounted in one of the eyepieces. In most cases the right hand one.

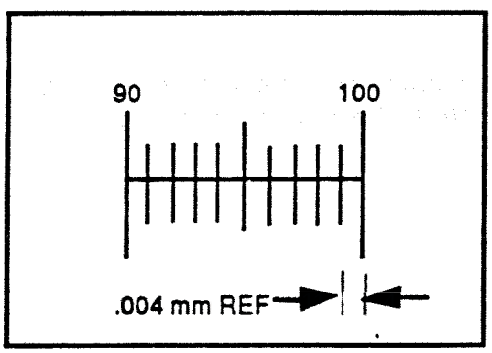
When viewing with a 15X objective, the full field of view is 1.3 mm (1300 µm) in diameter.

The distance on the reticle (between 0 and 100) is 0.4 mm (400 µm).



Reticle Divisions - Distance Between Large Divisions

When using the 15X objective, the distance between the large divisions is 0.04 mm (40 µm).

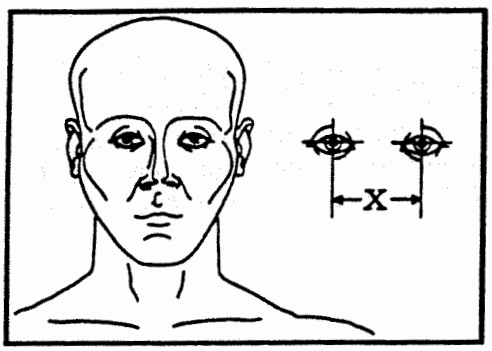


Reticle Divisions - Distance Between Small Divisions

When using the 15X objective, the distance between the small divisions is 0.004 mm (4 µm).

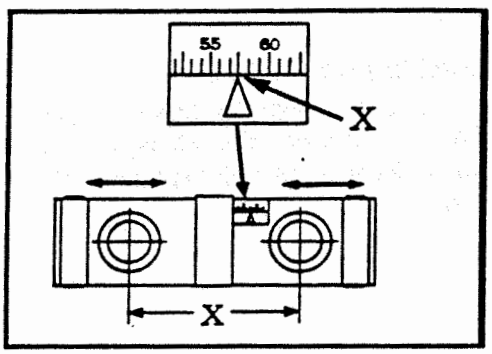
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Adjusting the Viewer to the Operator's Interpupilary Distance



Standard Binocular Viewer (PN 0047-40)7

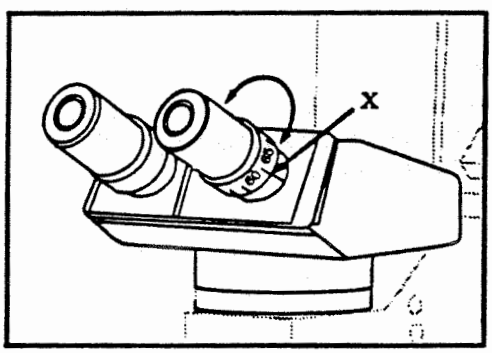
Humans, by nature are equiped with two eyes or visible light detectors. The distance between the entrance pupils of these detectors will vary with individuals and is referred to as the *interpupilary distance* (X).



Standard Binocular Viewer

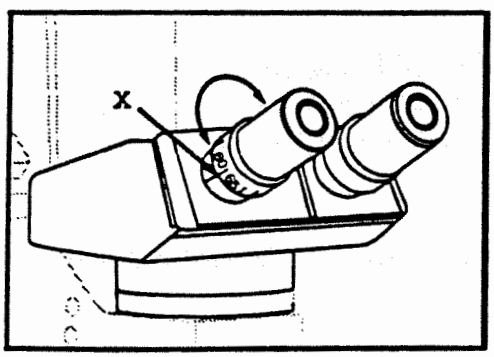
The operator should view a focused image (pinhole) through the eyepieces and set the interocular distance such that the two images presented by the individual eyepieces are perceived as one image by the operator. Additionally, viewing should be comfortable for the individual.

The binocular viewer is equipped with a scale and an indicator which will change in synchronization as the interpupilary distance is varied and the microscope "tube length" changes.



Standard Binocular Viewer

Set the diopter adjustment to match the scale reading. This will set the correct tube length to correct for the optical path difference created by the interocular adjustment.

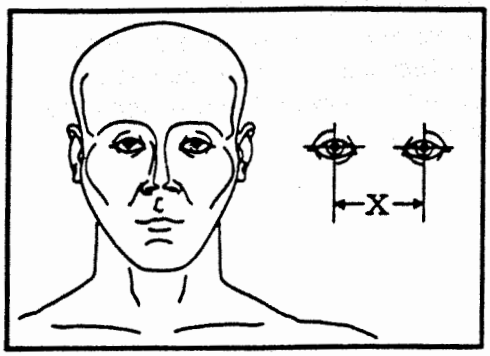


Standard Binocular Viewer

Repeat the procedure (to the adjustment) on the opposite side.

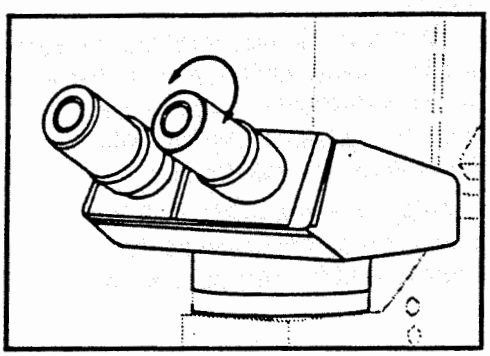
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Adjusting the Viewer to the Operator's Interpupilary Distance



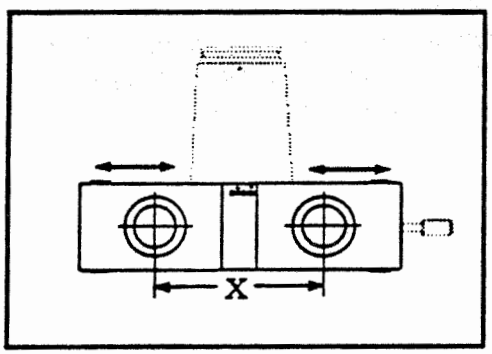
Optional **Binocular (PN4004-513), Trinocular (PN4004-514), & Tilting Trinocular (PN4004-515) Viewers.**

Humans by nature are equipped with two eyes or visible light detectors. The distance between the entrance pupils of these detectors will vary with individuals and is referred to as the interpupilary distance (X).



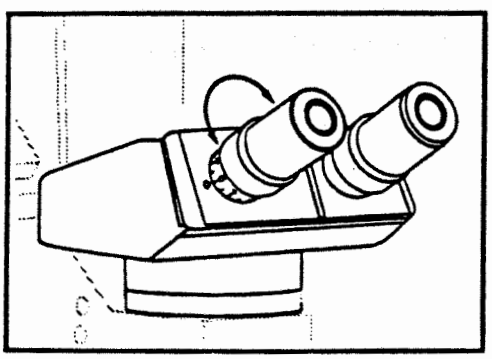
View an Image Through the Right Eyepiece

The operator should view a focused image (pinhole) through the right hand eyepiece only (the one with the reticle) and turn the outside of the eyepiece until the cross hair reticle and the image are both finely focused.



Set the Interocular Distance

Set the interocular distance such that viewing is comfortable and the two images presented by the individual eyepieces are perceived as one image by the operator.



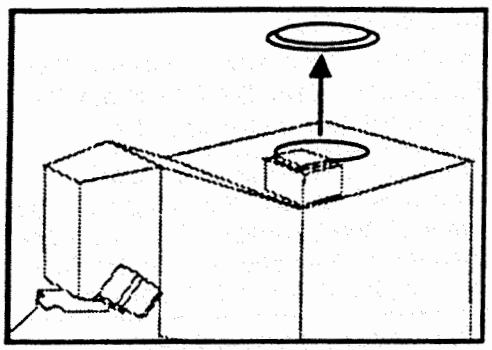
View an Image Through the Left Eyepiece

While viewing through only the left hand eyepiece, turn the diopter adjustment on the left hand eyepiece port until the image is finely focused.

DO NOT TURN THE FOCUS KNOBS WHILE SETTING THE DIOPTER ADJUSTMENT.

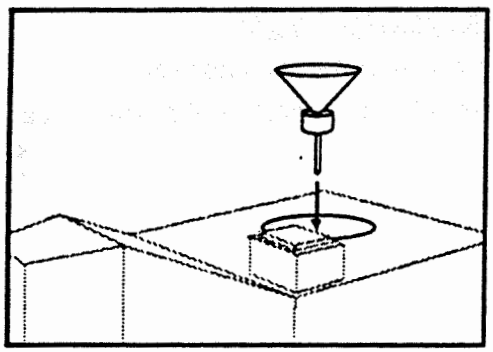
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Check List



Filling the Detector

Remove the protective plastic cap which covers the MCT detector area.



Fill the Detector

Using a funnel, fill the MCT detector with liquid nitrogen.

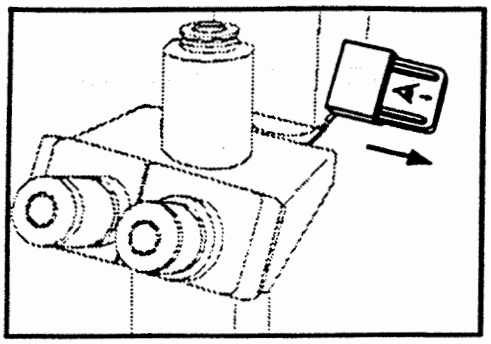
CAUTION:Do Not Overfill the Detector

CHECK LIST

- Is the spectrometer running according to it's manufacturer's specifications?
- Is the infrared beam directed to the microscope (flipper mirror) and has the microscope's detector been selected?
- Have the spectrometer's parameters been set for use with the microscope (i.e.: mirror velocity, gain, resolution, aperture size)?
- Is electrical power being supplied to the microscope?
- Is the illuminator source working?
- Is the illuminating aperture diaphragm open?
- Is purge, if it is to be used, on (flowing)?

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Performing a Signal to Noise Ratio Test in Transmission

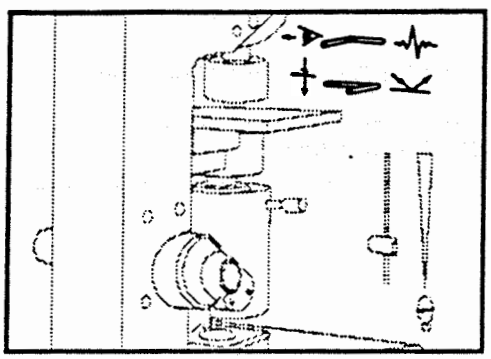


Place the Pinhole on the Sample Slide

Place the 100 µm pinhole on the sample slide (if not mounted already). Be sure that the stainless steel disc (which the 100 µm pinhole is in) is facing upward, toward the objective.

Note: If the microscope is equipped with the condenser corrected for a 2 mm thick infrared window, the 100 µm pinhole will be mounted on a 2 mm thick BaF2 window. If the condenser is corrected for air (between the sample and condenser) then the 100 µm pinhole will be mounted in a 1" x 3" metal slide.

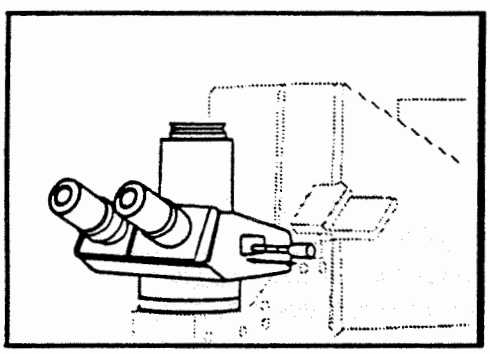
Slide the Upper View/IR Selector to the view position.



Put the Microscope in the View/Refl Mode

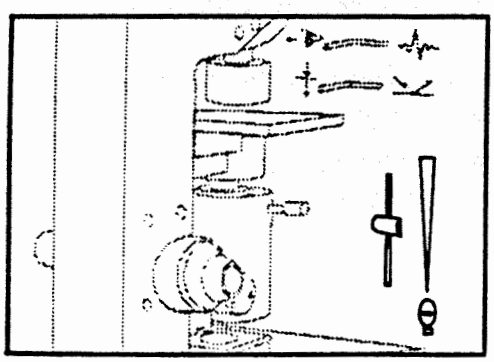
Slide the Lower View/IR Selector to the view position.

Slide the Transmission/Reflectance Selector to the reflectance (REFL) position.



Adjust the Viewer Mde

If the microscope is equipped with a trinocular viewer, ensure that the viewer is in either the view (v) or view/camera (v.c.) mode.

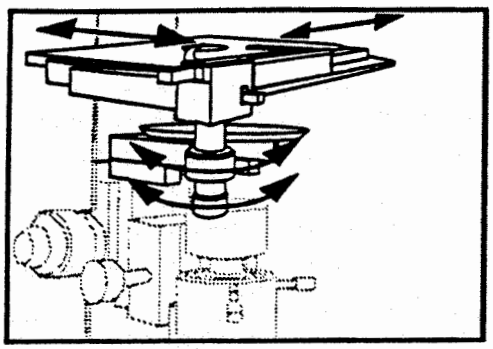


Adjust the Illumination Voltage

Raise the Sliding Illumination Voltage Control Lever halfway.

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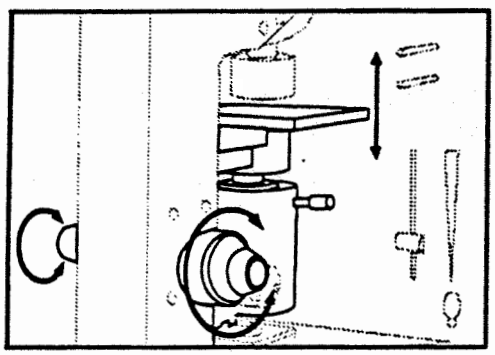
Performing a Signal to Noise Ratio Test in Transmission



Focus on the Pinhole

Using the stage x,y controls and the fine and coarse Focus Adjustment Knobs raise (and/or lower) the100 µm pinhole until the light emanating from the reflecting objective focuses on the pinhole surface.

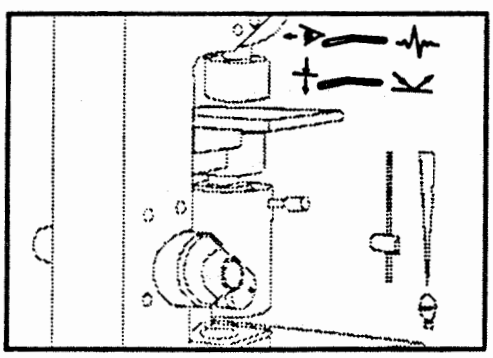
Look through the viewer and center the pinhole relative to the crosshair reticle using the x and y stage controls.



Focus on the Pinhole

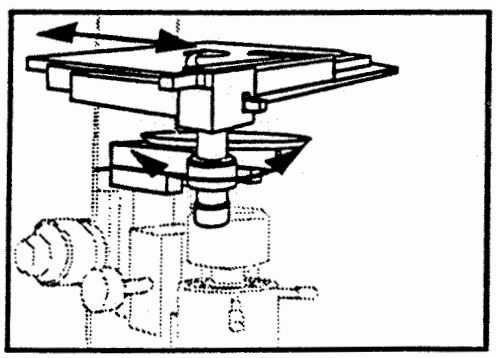
Adjust the focus so the centered pinhole image is in sharp focus.

Note: By adjusting it in and out of focus you will be able to tell the sharpest focus point more easily.



Put the Microscope in the Transmission Mode

Slide the Transmission/Reflectance Selector to the transmission (TRANS) position.



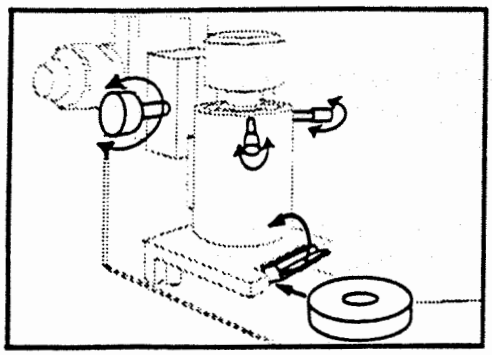
Move the Pinhole

Using only the y adjustment knob (stage control), move the pinhole to the side so that the beam is passing through the window only.

Note: If the microscope is equipped with a condenser that has been corrected for air, move the pinhole out of the field of view. Position the 1" x 3" mount so the middle unoccupied 13 mm opening is centered.

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Performing a Signal to Noise Ratio Test in Transmission

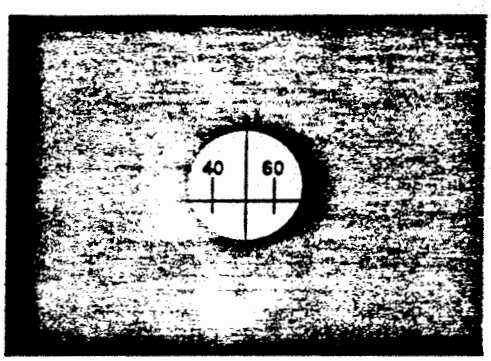


Install Lower Aperture

Install a 1.5 mm aperture into the lower aperture mount. Verify that the label is right side up and the aperture clamp is properly closed, holding the aperture securely in position.

Focus and center (with respect to the crosshair reticle) the image of the lower aperture using the controls on the Condenser Substage assembly only (Condenser Centering Knobs, Condenser Height Adjustment Knobs).

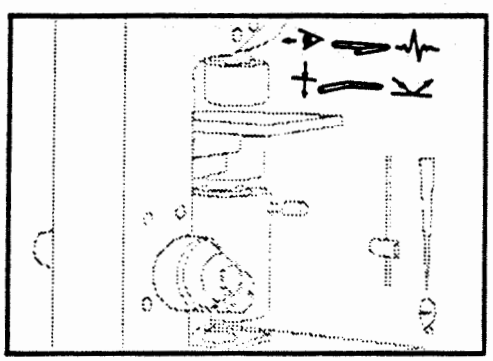
CAUTION: Do not use the coarse or fine adjustment Knobs. Use the Condenser height adjustment knob ONLY.



Recenter the Pinhole

Return the 100 µm pinhole to the centered position using the X adjustment knob (stage control) only.

Both the pinhole and the 1.5 mm aperture should be focused and centered on the crosshairs.

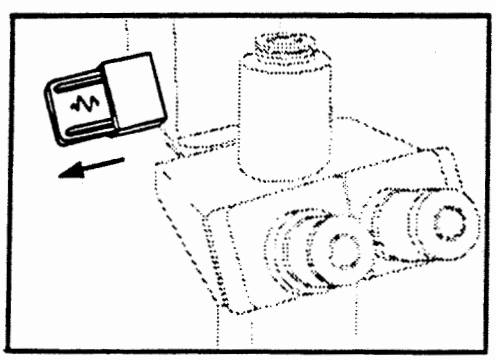


Install Upper Aperture

Install a 1.5 mm aperture into the Targeting (upper) Aperture Mount. Verify that the label is right side up and the aperture clamp is properly closed and holding the aperture securely in position. At this point, all apertures should be centered with respect to the crosshairs.

Slide the Lower View/IR Selector in the *IR* position.

Slide the Upper View/IR Selector in the *IR* position.



Summary

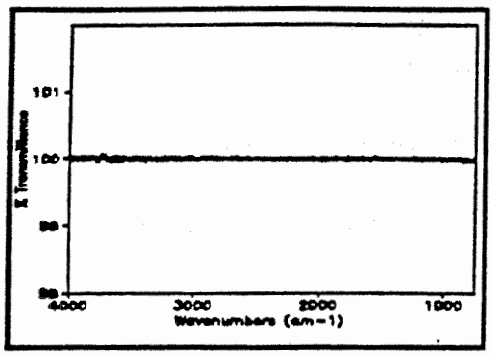
A signal to noise test is one measure of the overall performance of the microscope/spectrometer system.

The procedure outlined involves collection and analysis of a standard 100% line and calculation of the SNR (signal to noise ratio) value from that spectrum.

Background and sample data are to be acquired at a resolution of 4 wavenumbers (cm^{-1}) for 2 minutes (each file).

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Performing a Signal to Noise Ratio Test in Transmission

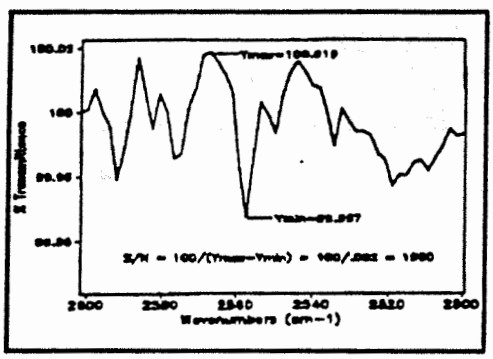


Acquire a 100% Line

At this point the pinhole is focused and in line with the two apertures. The microscope is in the *Transmission IR* mode. You should now scan under these conditions for two minutes into the sample file.

Next, without changing conditions, scan for two minutes into the background file.

Ratio the sample and background spectra to acquire the 100% line. The line should be flat and near 100%



Calculate the Signal-to-Noise

Change the display to expand the 2600-2500 wavenumber region. Record the values for the highest and lowest peak in the region. Calculate the difference.

100 divided by the above difference is the signal to noise ratio.

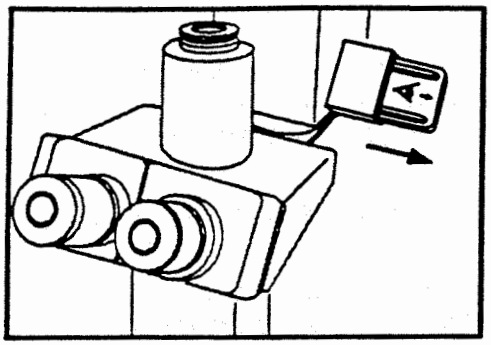
Enter Values In Logbook

At the initial installation, a logbook of alignment measurement information should be started for logging the following information:

- Signal to noise ratio
- Signal throughput (specify mode and gain)
- Single beam spectrum
- 100% line

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Performing a Signal to Noise Ratio Test in Reflectance

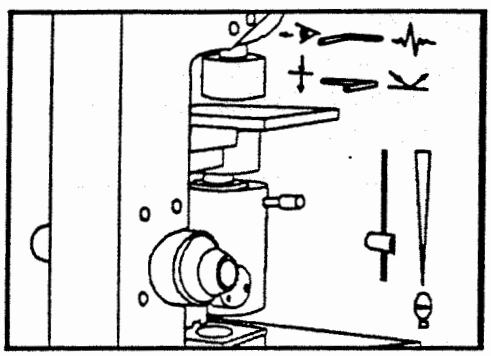


Position Gold Mirror on Sample Slide

Install the sample slide with the gold mirror onto the stage (if not installed already).

Position the gold mirror for viewing using the x,y stage controls.

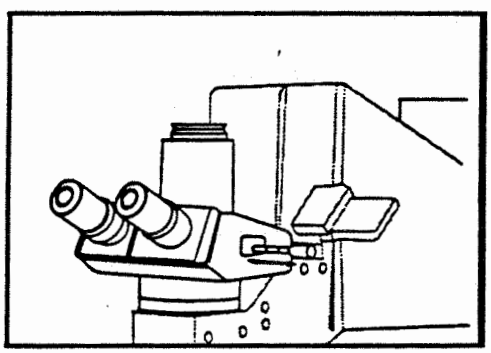
Slide the Upper View/IR Selector to the *view* position.



Put Microscope in View/Refl Mode

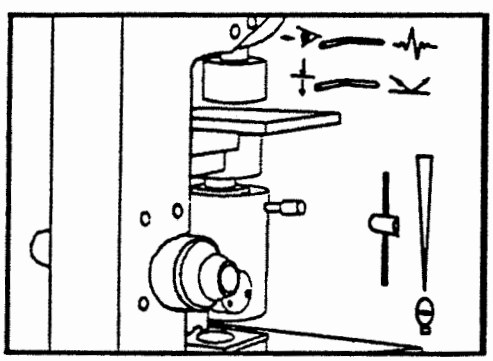
Slide the View/IR Selector to the *view* position.

Slide the Transmission/Reflectance Selector to the *reflectance* (REFL) position.



Adjust Viewer Mode

If the microscope is equipped with a trinocular viewer, ensure that the viewer is in either the view (v) or view/camera (v.c.) mode.

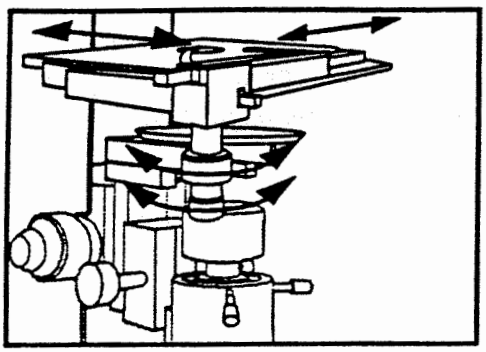


Adjust Illumination Voltage

Raise the Sliding Illumination Voltage Control Lever to halfway.

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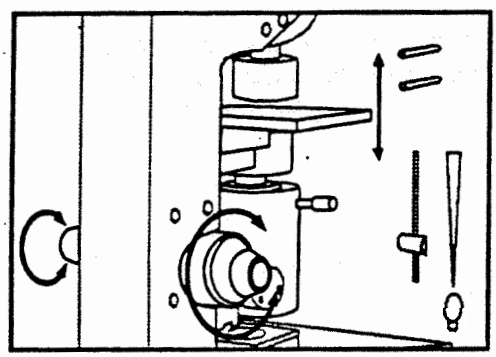
Performing a Signal to Noise Ratio Test in Reflectance



Focus on Gold Mirror

Using the stage x,y controls and the fine and coarse Focus Adjustment Knobs, raise (and/or lower) the gold mirror until the light emanating from the reflecting objective focuses on the mirror surface.

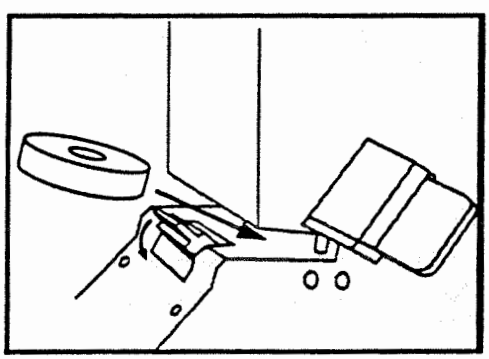
Look through the viewer and locate a relatively clean area of the mirror that is free of large scratches which fill the field of view (using the x and y stage controls).



Focus on Gold Mirror

Adjust the focus such that the mirror surface is in sharp focus.

Note: A small scratch can aid in focusing and not affect signal throughput.



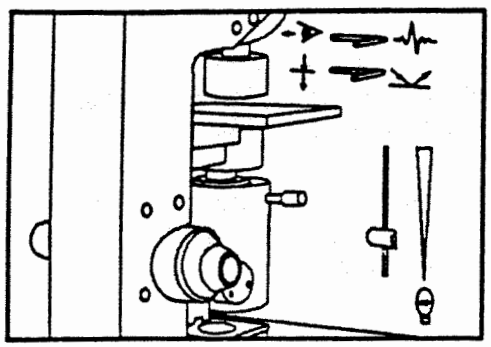
Install Upper Aperture

Install a 1.5 mm aperture into the Targeting (upper) Aperture Mount. Verify that the label is right side up and the aperture clamp is properly closed and holding the aperture securely in position. The aperture should be centered with respect to the crosshairs.

When the 1.5 mm aperture is in place you can focus on the mirror more accurately. Look for the least amount of shadow in the focused image.

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Performing a Signal to Noise Ratio Test in Reflectance

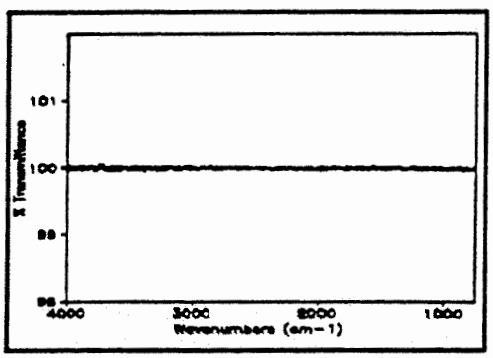


Put Microscope In IR Mode

Slide the View/IR Selector to the *IR* position

Slide the Upper View/IR Selector to the *IR* position.

A signal to noise test is one measure of the overall performance of the microscope/spectrometer system. The procedure outlined involves collection and analysis of a standard 100% line and calculation of the SNR (signal to noise ratio) value from that spectrum. Background and sample data are to be acquired at a resolution of 4 wavenumbers for 2 minutes (each file).



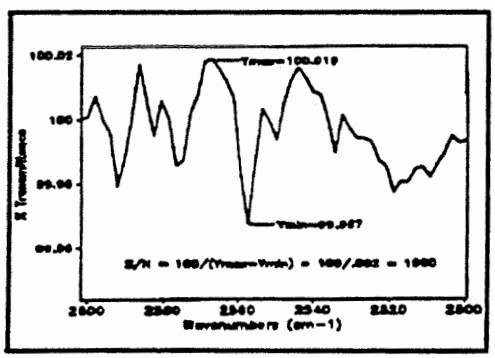
Acquire a 100% Line

With the mirror focused, the aperture in place, and the microscope in the *Transmission /IR* mode, scan for two minutes into the sample file.

Without changing conditions, scan for two minutes into a background file.

Ratio the sample and background spectra to acquire the 100% line. The line should be flat and near 100% transmission.

The spectrum should be free of periodic spikes.



Calculate the Signal-to-Noise

Change the display to expand the 2600-2500 wavenumber region. Record the values for the highest and lowest peak in the region. Calculate the difference.

100 divided by the above difference is the signal to noise ratio.

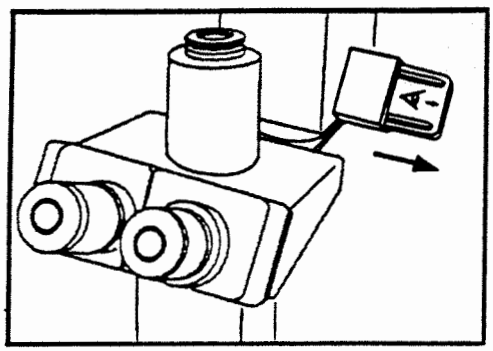
Enter Values In Logbook

At the initial installation, a logbook of alignment measurement information should be started for logging the following information:

- Signal to noise ratio
- Signal throughput
- Single beam spectrum
- 100% line

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Performing a Standard Reflectance Experiment

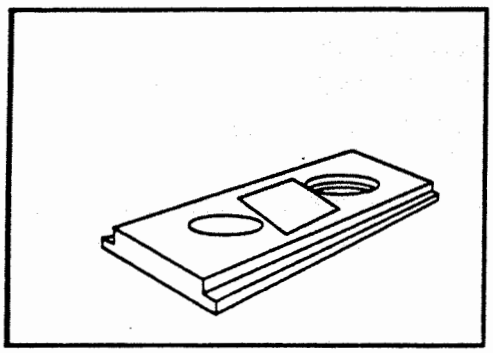


Select Reflectance View Mode

Slide the Upper View/IR Selector to the *view* position.

Slide the Lower View/IR Selector to the *view* position.

Slide the Transmission/Reflectance Selector to the Reflectance (REFL) position.



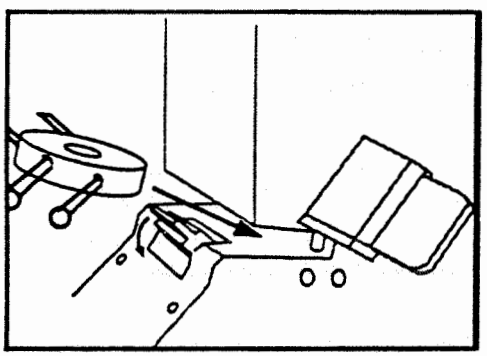
Focus on Sample

Cut and flatten a section from an aluminum soft drink can and place it printed side up next to the mirror on the sample slide.

Place the sample slide onto the stage clip.

Using the stage x,y controls and the fine and coarse Focus Adjustment Knobs raise (and/or lower) the soda can until the light emanating from the reflecting objective focuses on the can's surface.

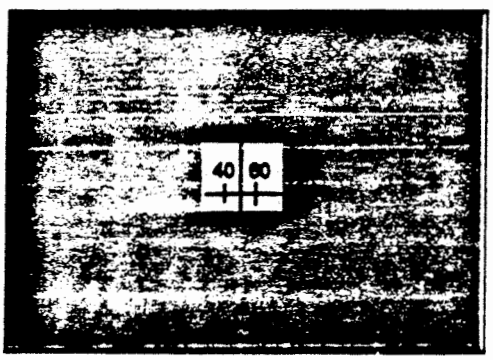
Adjust the focus so the can is in sharp focus.



Install Upper Aperture

Install a rectangular variable aperture into the Targeting (upper) aperture mount.

The aperture can be rotated and the blades are adjustable. This permits the user to adjust the aperture to conform to the sample's geometry, required aperture area and dimensions.



Adjust Aperture Blades

Adjust the aperture blades so that a 100 µm x 100 µm (25 divisions) area is defined and centered with respect to the crosshair reticle.

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