UNIVERSAL VERTICAL ILLUMINATOR

MODEL: BH2-UMA

INSTRUCTION MANUAL

OLYMPUS CORPORATION

As this instruction manual describes the operation of the BH2-UMA Universal Vertical Illuminator attachment only, it is recommended that the user read the instruction manuals for the microscope being used as well, in order to obtain optimum performance from the integrated use of these instruments.

Observe the Following Points Carefully

* For Operation

1. Always handle this attachment with as much care as you would a microscope. Handle it carefully and avoid subjecting it to sudden or severe impact.

2. For protection of observers eyes from UV radiation, never look at excitation light directly. Even when handling the specimen slides, be sure to look through the UV protective shade, which blocks harmful UV radiation emitted from the mercury burner.

3. When replacing the light source lamp or the fuse, be sure to unplug the power cord first.

4. Do not open the lamp housing when the mercury burner is operating or, for about 10 minutes after the burner is switched off.

* For Maintenance

1. Do not use organic solvents such as xylene, ether, or alcohol to clean the microscope components. If components are heavily soiled, wipe with a cloth moistened with neutral detergent.

2. To clean the half-mirror units (e.g. reflecting surfaces of the mirrors), blow with a hand blower. If the dust cannot be removed by blowing, contact Olympus repair service or your authorized local agent.

3. Make sure that no dirt, fingerprints, etc. are left on the bulb surface. If it is stained, wipe the bulb surface clean with a small amount of an alcohol-ether mixture or benzine.

4. Always switch off the power supply unit prior to mercury burner replacement. Replace the burner after about 200 operating hours.

5. Prior to fuse replacement in the power supply unit, disconnect the power cord from the AC outlet.

6. While the BH2-UMA or microscope is out of use, be sure to store it under a dust cover, and keep it away from a moist environment.

BH2-UMA

UNIVERSAL VERTICAL ILLUMINATOR

INSTRUCTION MANUAL

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UNIVERSAL VERTICAL ILLUMINATOR

I. Standard Configurations

A. Universal (BF/DF/POL/FLUOR/DIC) Version

Unit

Universal vertical illuminator	BH2-UMA
Brightfield half-mirror unit	BH2-UBF
Brightfield half-mirror unit with NDO5 filter	BH2-UBFL
Darkfield half-mirror unit	BH2-UDF
Blue fluorescence half-mirror unit	BH2-UDMB
Green fluorescence half-mirror unit	BH2-UDMG
Violet fluorescence half-mirror unit	BH2-UDMV
ND filter slider, including ND 12 filter	BH2-UND
Tint plate, including ND 12 filter	BH2-UTP 530
Polarizer	BH2-UPO
Analyzer	BH2-UAN
Light balancing filter	20LBD3-W
Halogen lamp housing (with halogen collector lens)*	BH2-ULSH45
Halogen bulb	12V 50W HAL
Transformer **	
Fluorescence supplementary unit:	BH2-URF
Supplementary exciter slider	BH2-UFF
Extension tube adapter (with collector lens)	BH2-ULA
Supporting block	BH2-UA
UV protective shield	BH2-UCCV
Extension tube ***	BH2-UET
Mercury lamp housing	BH2-LSRF
Mercury lamp	USH 1OZD
Power supply	BH2-RFL
Centering screen	BH2-SGRF
Nomarski prism attachments:	
" 5X	U-NIC5-N
" 10X	U-NIC10-N
" 20X	U-NIC20-N
" 50X	U-NIC50-N
" 100X	U-NIC100-N

A. Universal (BF/DF/POL/FLUOR/DIC) Version, cont.

Universal objectives:

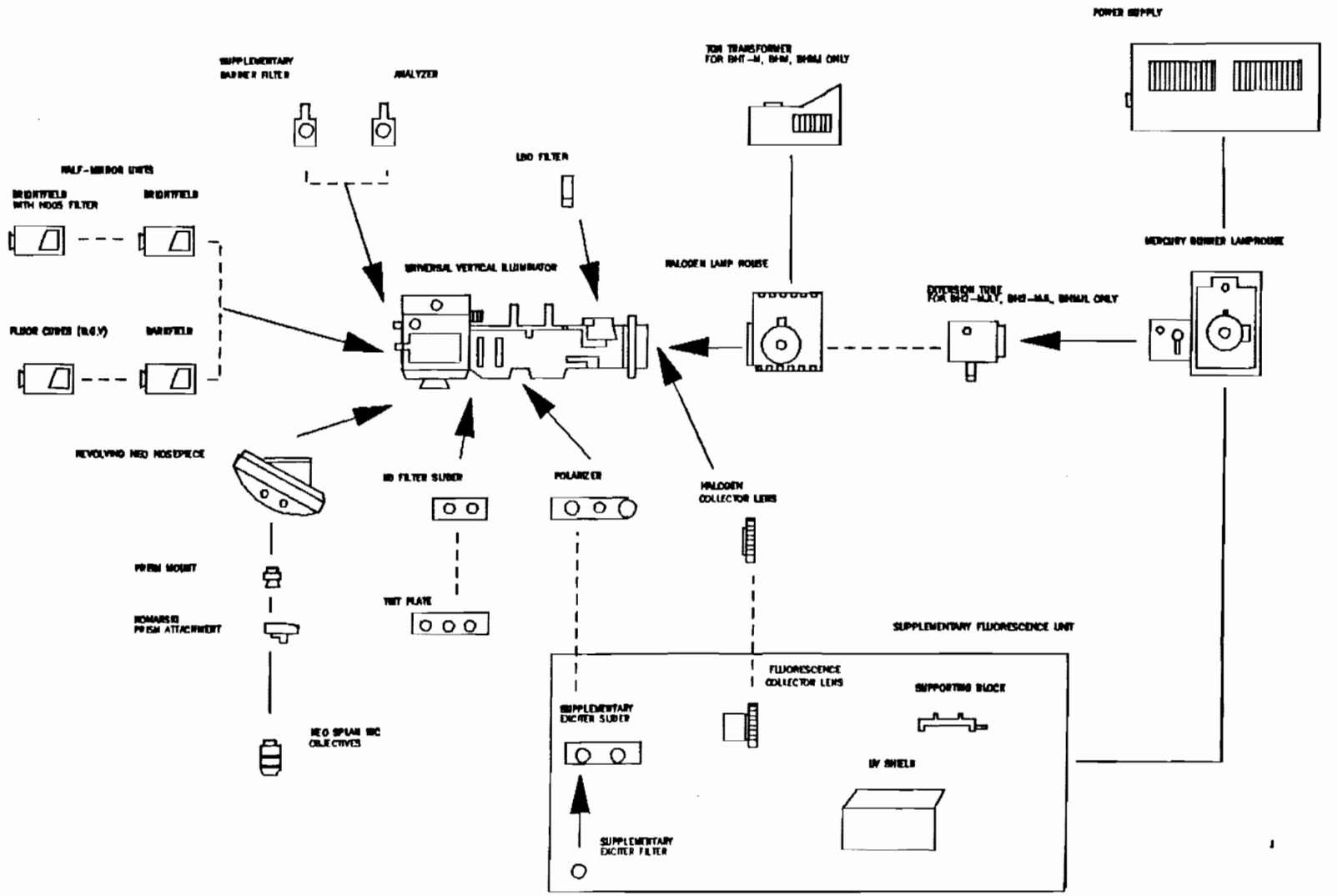
Neo S Plan 5X NIC	NEOSPL5X-NIC
" 10X "	NEOSPL10X-NIC
" 20X "	NEOSPL20X-NIC
" 50X "	NEOSPL50X-NIC
" 100X "	NEOSPL100X-NIC

* BH2-ULSH 45 for BHM, BHT-M, BHSM
BH2-ULSH 80 for BH2-MJL, BH2-MJLT

** Required for BHT-M, BHM, BHMJ, only.

*** For use with the BH2-MJLT, BH2-MJL, BHMJL.

BH2-UMA UNIVERSAL VERTICAL ILLUMINATOR
BF/DF/POL/FLUOR/DIC VERSION



B. Brightfield/Darkfield/DIC/POL Version

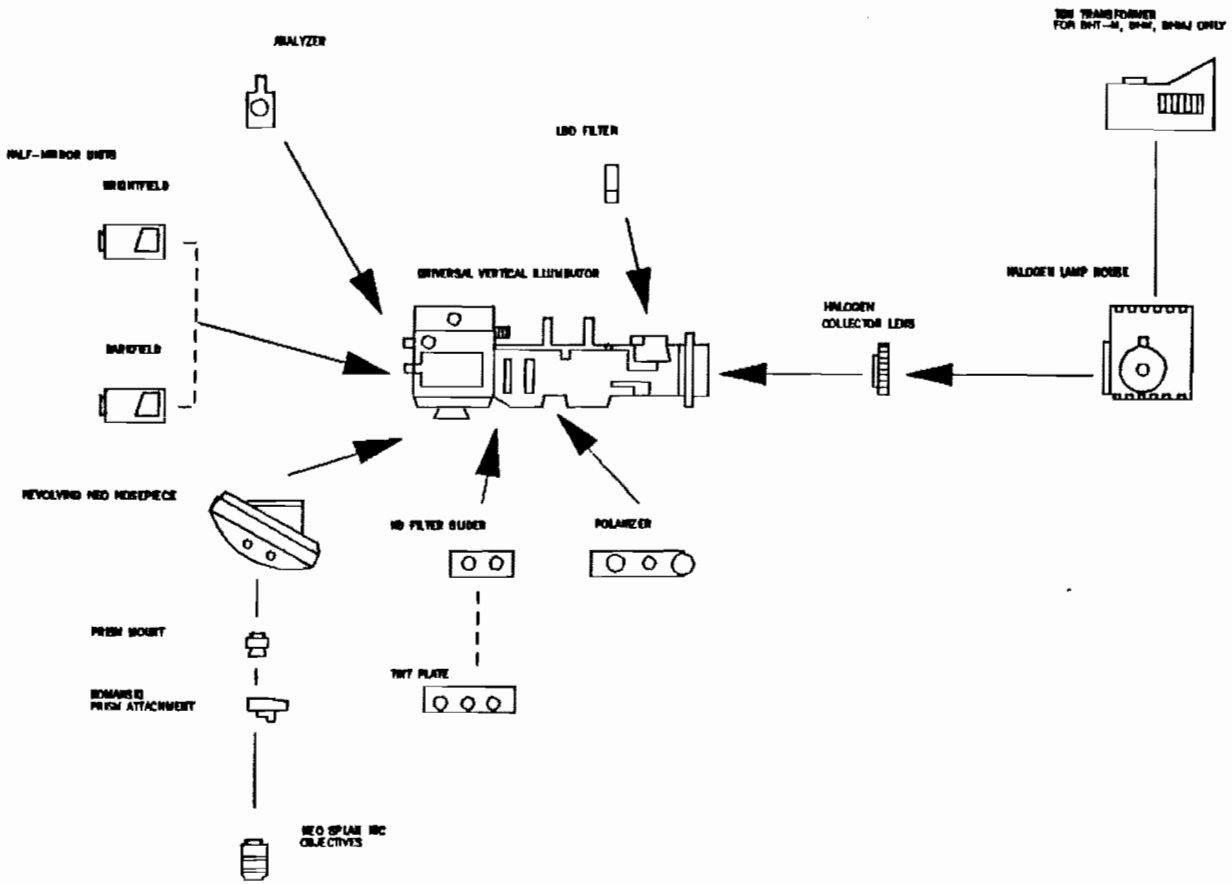
Unit

Universal vertical illuminator	BH2-UMA
Brightfield half-mirror unit	BH2-UBF
Darkfield half-mirror unit	BH2-UDF
ND filter slider, including ND 12 filter	BH2-UND
Tint plate, including ND 12 filter	BH2-UTP530
Polarizer	BH2-UPO
Analyzer	BH2-UAN
Light balancing filter	20LBD3-W
Halogen lamp housing (with halogen collector lens)*	BH2-ULSH45
Halogen bulb	12V 50W HAL
Transformer **	
Nomarski prism attachments:	
" 5X	U-NIC5-N
" 10X	U-NIC10-N
" 20X	U-NIC20-N
" 50X	U-NIC50-N
" 100X	U-NIC100-N
Universal objectives:	
Neo S Plan 5X NIC	NEOSPL5X-NIC
Neo S Plan 10X NIC	NEOSPL10X-NIC
Neo S Plan 20X NIC	NEOSPL20X-NIC
Neo S Plan 50X NIC	NEOSPL50X-NIC
Neo S Plan 100X NIC	NEOSPL100X-NIC

* BH2-ULSH45 for BHM, BHT-M, BHSM
BH2-ULSH80 for BH2-MJL, BH2-MJLT

** Required for BHT-M, BHM, BHMJ only.

BH2-UMA UNIVERSAL VERTICAL ILLUMINATOR
BF/DF/DIC/POL VERSION



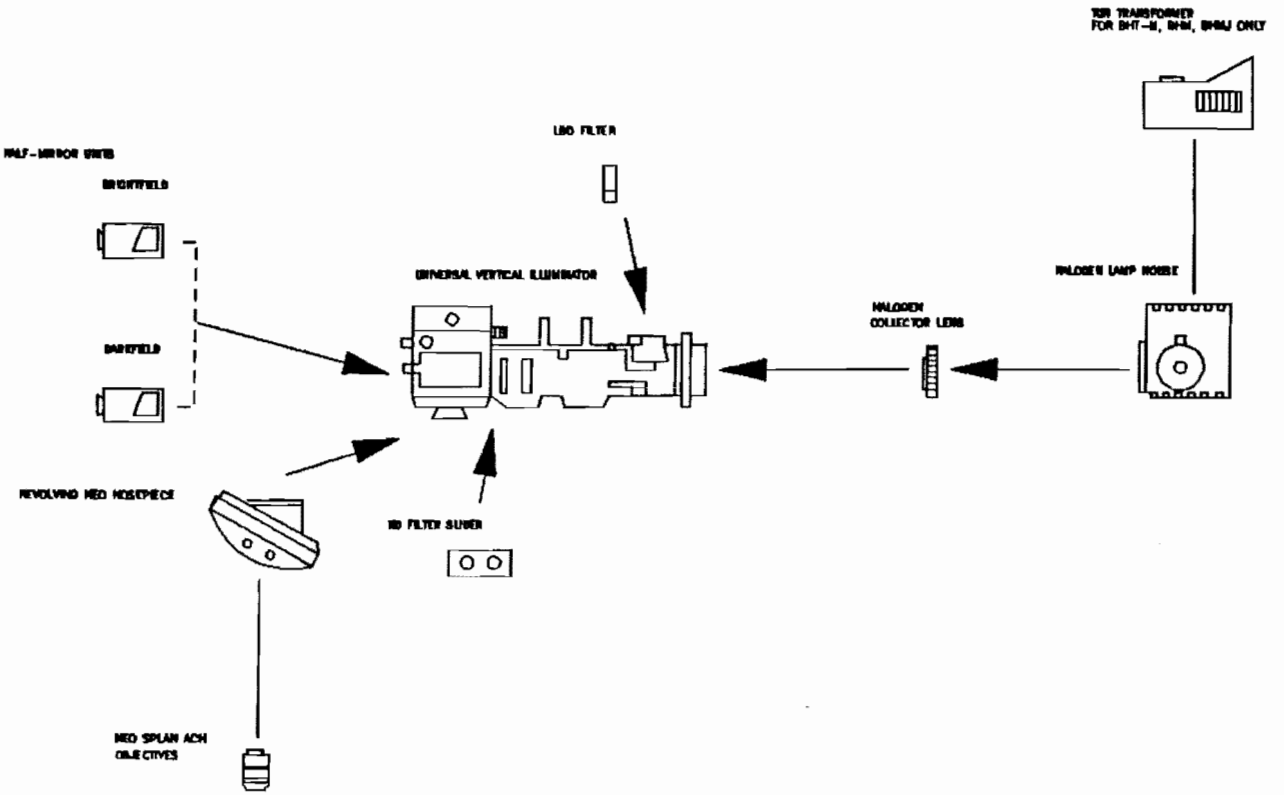
C. Brightfield/Darkfield Version

Unit	
Universal vertical illuminator	BH2-UMA
Brightfield half-mirror unit	BH2-UBF
Darkfield half-mirror unit	BH2-UDF
ND filter slider, including ND 12 filter	BH2-UND
Light balancing filter	20LBD3-W
Halogen lamp housing (with halogen collector lens)*	BH2-ULSH45
Halogen bulb	12V 50W HAL
Transformer **	TGH
Objectives:	
Neo S Plan Ach 5X	NEOSPL5X
Neo S Plan Ach 10X - T	NEOSPL10X-T
Neo S Plan Ach 20X - T	NEOSPL20X-T
Neo S Plan Ach 50X	NEOSPL50X

* BH2-ULSH45 for BHM, BHT-M, BHSM
BH2-ULSH80 for BH2-MJL, BH2-MJLT

** Required for BHT-M, BHM, BHMJ only.

BH2-UMA UNIVERSAL VERTICAL ILLUMINATOR
BF/DF VERSION



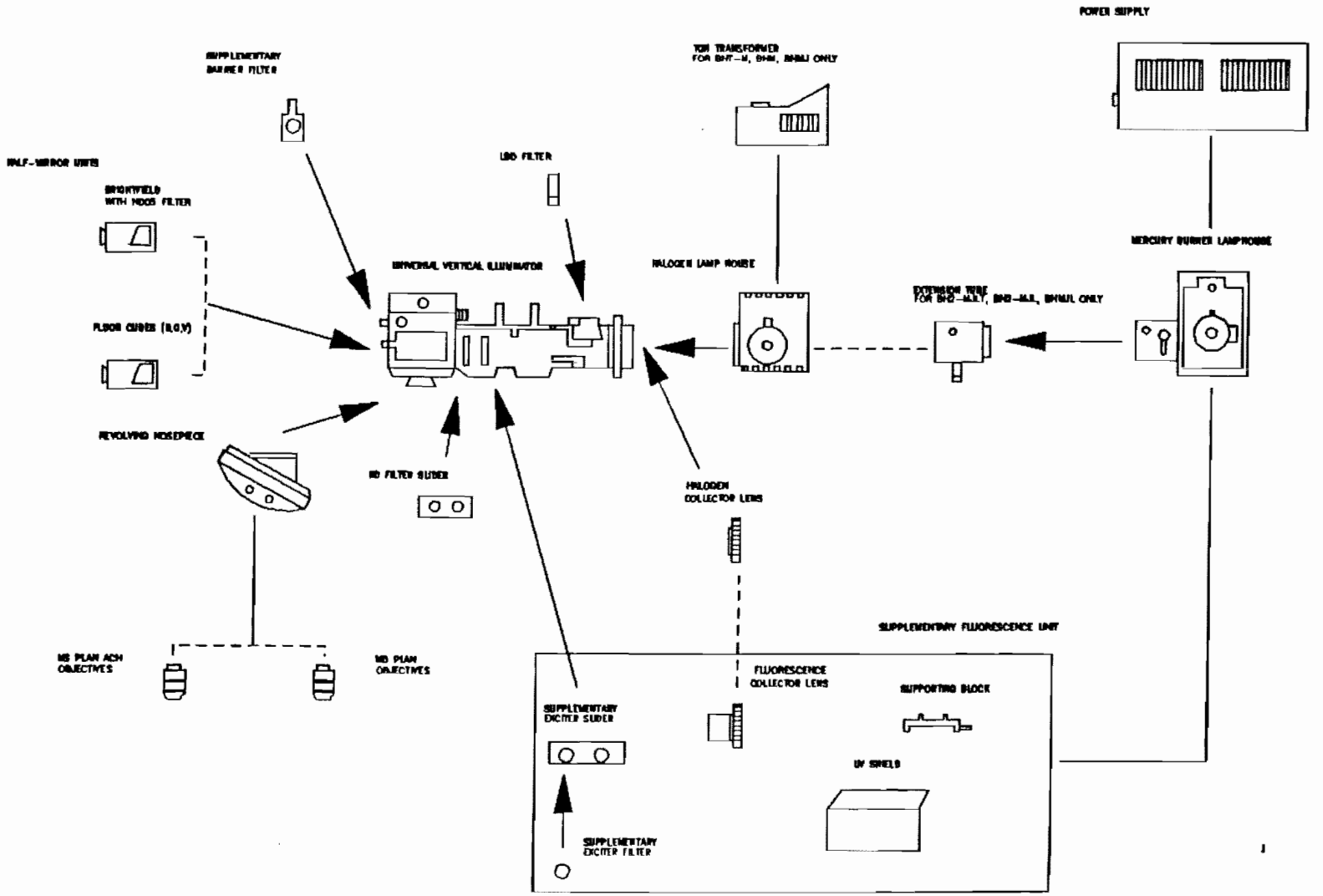
D. Brightfield/Fluorescence Version

Unit

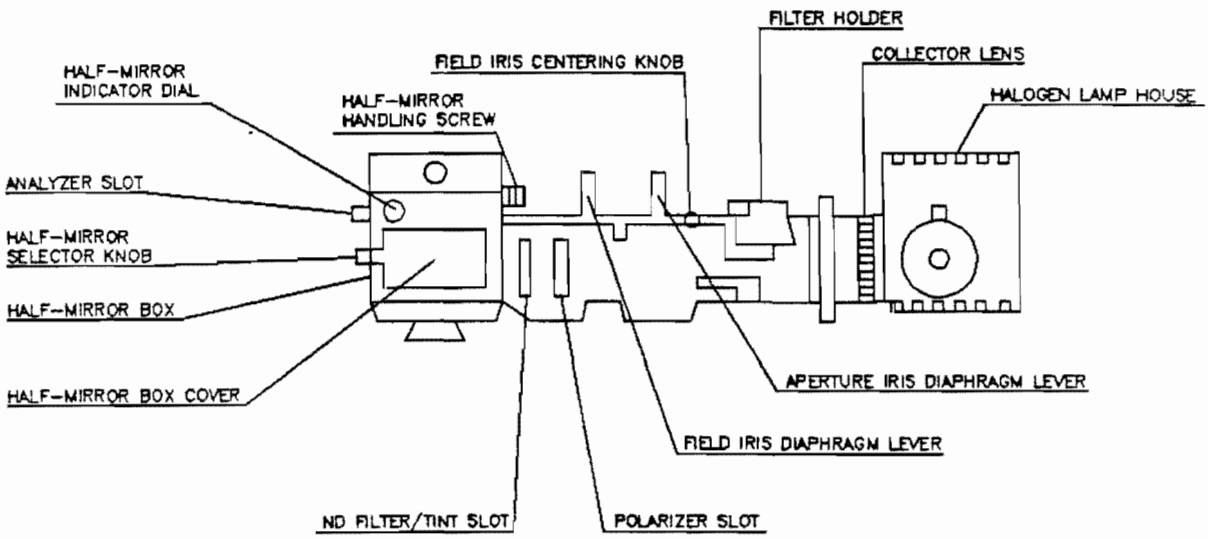
Universal vertical illuminator	BH2-UMA
Brightfield half-mirror unit with ND05 filter	BH2-UBFL
Blue fluorescence half-mirror unit	BH2-UDMB
Green fluorescence half-mirror unit	BH2-UDMG
Violet fluorescence half-mirror unit	BH2-UDMV
ND filter slider, including ND 12 filter	BH2-UND
Light balancing filter	20LBD3-W
Fluorescence supplementary unit:	BH2-URF
Supplementary exciter slider	BH2-UFF
Extension tube adapter (with collector lens)	B2-ULA
Supporting block	B2-UA
UV protective shield	B2-UCCV
Extension tube *	BH2-UET
Mercury lamp housing	BH2-LSRF
Mercury lamp	USH10ZD
Power supply	BH2-RFL
Centering screen	BH2-SGRF
Objectives:	
MS Plan Ach 5X	MSPL5X
MS Plan Ach 10X-T	MSPL10X-T
MS Plan Ach 20X-T	MSPL20X-T
MS Plan Ach 50X	MSPL50X
MS Plan Ach 100X	MSPL100X
or,	
MD Plan Ach 5X	MDPL5X
MD Plan Ach 10X	MDPL10X
MD Plan Ach 20X	MDPL20X
MD Plan Ach 50X	MDPL50X
MD Plan Ach 80X	MDPL80X

* For use with the BH2-MJLT, BH2-MJL, BHMJL

BH2-UMA UNIVERSAL VERTICAL ILLUMINATOR
BF/FLUOR VERSION



II. Identification of Components



BH2-UMA UNIVERSAL VERTICAL ILLUMINATOR

III. Assembly

A. General

1. Mounting the Universal Vertical Illuminator

   a. Loosen the illuminator clamping screw on the microscope frame and fit the universal vertical illuminator in place on the microscope stand, and clamp firmly with the illuminator clamping screw.

   b. Turn the revolving nosepiece by hand to make sure that it moves freely.

   c. Screw the collector lens supplied with the lamp housing into the universal vertical illuminator.

2. Mounting the Vertical Illuminator Lamp Housing

   a. Loosen the lamp housing clamping screw on the lamp housing.

   b. Insert the lamp housing all the way into the universal vertical illuminator, and firmly clamp with the lamp housing clamping screw.

3. Mounting the Bulb

   A. <u>For the Halogen Lamp</u>

   a. Be sure to turn off the ON-OFF switch of the transformer.

   b. Push the bulb clamping levers forward, against the body of the bulb socket, insert the terminals of the halogen bulb (12V 50W HAL) into the socket.

      * Do not hold the bulb with bare fingers.

   c. Release the clamping levers to clamp the bulb.

      * If the bulb is stained with dirt, fingerprints, etc., wipe the bulb surface with a small amount of alcohol-ether mixture or benzine.

   d. Insert the bulb and socket into the halogen lamp housing and tighten the locking screw.

B. For the Mercury Burner

a. Be sure to turn off the transformer switch. -

b. Insert the lower electrode (marked "+") into the bottom terminal and tighten the clamping screws securely.

* Ascertain that no dirt, fingerprints, etc. are left on the bulb surface, and when installing, be careful not to touch the bulb portion. If the bulb is stained, wipe the bulb surface clean with a small amount of alcohol-ether mixture or benzine.

c. Insert the bulb and socket into the mercury lamp housing and tighten with the locking screw.

4. Mounting the Bulb Socket

A. For the Halogen Lamp

a. Loosen the bulb socket clamping screw on the bulb socket in advance.

b. Insert the socket, with the locating groove in the lamp housing aligned with the clamping screw.

c. Tighten clamping screw to fix bulb socket in place.

B. For the Mercury Burner

a. Insert the socket into the lamp housing by first setting the hooks, which act as a hinge, at the base of the socket into the lamp house.

b. Tighten the clamping screw at the top of the socket into the side of the lamp house to fix the bulb socket in place.

5. Connecting the Universal Illuminator Bulb Socket Cord

A. For the Halogen Lamp

a. Plug in the halogen lamp bulb socket cord into the connector on the rear of the microscope stand.

* If a separate transformer is used, plug the lamp bulb socket cord into the 12V 50W transformer and plug the transformer cord plug into the mains.

B. For the Mercury Burner

a. Plug in the mercury burner socket cord into the connector on the rear of the mercury burner power supply unit.

b. Plug in the mercury burner power supply cord plug into the mains.

B. Universal Version (BF/DF/POL/FLUOR/DIC) or BF/DF/DIC/POL Version

1. Inserting the Half-Mirror Unit

a. Remove the half-mirror box covers on the right and left sides of the universal illuminator.

* The covers are kept in place by magnetic attraction. Take care not to lose them.

b. Unscrew the half-mirror unit handling screw from the universal illuminator housing, screw it into the desired half-mirror unit.

Cube	Observation Technique
Brightfield (BH2-UBF)	Brightfield, Polarized, DIC
Brightfield (BH2-UBFL)	Brightfield, (use with mercury burner)
Darkfield (BH2-UDF)	Darkfield
Blue (BH2-UDMB)	Blue Fluorescence
Green (BH2-UDMG)	Green Fluorescence
Violet (BH2-UDMV)	Violet Fluorescence

c. Holding the handling screw, carefully slide the half-mirror box into the universal illuminator until it clicks.

* The half-mirror unit can be inserted into either side of the universal illuminator.

* At the clicking position, the half-mirror unit is flush with the side of the half-mirror box.

d. If desired, insert a second half-mirror unit into the universal illuminator in the same manner described.

e. Unscrew the handling screw from the half-mirror, return it to the universal illuminator.

f. Remount the half-mirror box covers.

g. Set the half-mirror indicator dials to the code (BF, DF, B, G, or V) for the half-mirror units inserted on the respective opposite sides.

* When the brightfield half-mirror unit is inserted on the right side, set the left indicator dial to BF.

2. Inserting the Polarizer

A. <u>For Reflected Light Nomarski DIC Observation</u>

a. Insert the polarizer, with the NIC mark facing forward, into the polarizer slot of the universal illuminator.

* Set the polarizer in the light path.

B. <u>For Reflected Light Simple Polarizing Observation</u>

a. Insert the polarizer into the polarizer slot of the universal illuminator with PO mark facing forward.

* Set the polarizer in the light path.

3. Inserting the Analyzer

   a. Insert the analyzer, with the mark up, into the analyzer slot on the front of the universal illuminator.

4. Inserting the Tint Plate

   a. Insert the tint plate into the ND filter/tint plate slot of the universal illuminator.

      * Insert the tint plate so as to engage the empty hole in the light path.

5. Mounting the Nomarski Prism Mounts

   a. Loosen the prism clamping screw of the Nomarski prism with an Allen wrench, and remove the Nomarski prism mounts from the Nomarski prism attachments.

   b. With the supplied screwdriver, firmly screw the Nomarski prism mounts into the revolving nosepiece.

6. Mounting the Nomarski Prism Attachments on the Detached Nosepiece

   a. Mount the Nomarski prisms by inserting them over the circular dovetail guides of the Nomarski prism mount, one by one in ascending order of magnification, in the clockwise direction, and tighten the prism clamping screws firmly with the Allen wrench.

      * To simplify the mounting of the Nomarski prisms, fully clamp the prisms only after all of them have been mounted.

7. Mounting the Objectives

   a. Screw the objectives firmly into the objective mounting holes of the Nomarski prisms for the corresponding magnification power.

8. Mounting the Revolving Nosepiece

a. Lower the stage by turning the coarse focus adjustment knob.

b. Carefully insert the revolving nosepiece into the dovetail guideway of the microscope stand.

c. Push the nosepiece all the way in, and tighten it firmly with the nosepiece clamping screw.

C. Bright/Darkfield/Fluorescence Versions (BF/DF or BF/FLUOR only)

1. Inserting the Half-Mirror Units

a. Remove the half-mirror box covers on the right and left sides of the universal illuminator.

* The covers are kept in place by magnetic attraction. Take care not to lose them.

b. Unscrew the half-mirror unit handling screw from the universal illuminator, screw it into the desired half-mirror unit.

Cube	Observation Technique
Brightfield (BH2-UBF)	Brightfield
Brightfield (BH2-UBFL)	Brightfield, (use with mercury burner)
Darkfield (BH2-UDF)	Darkfield
Blue (BH2-UDMB)	Blue Fluorescence
Green (BH2-UDMG)	Green Fluorescence
Violet (BH2-UDMV)	Violet Fluorescence

c. Holding the handling screw, carefully insert the half-mirror box in the universal illuminator until it clicks.

* The half-mirror unit may be inserted into either side of the universal illuminator.

* At the clicking position, the half-mirror unit is flush with the side of the half-mirror box.

d. If desired, insert a second half-mirror unit into the universal illuminator in the same manner described.

e. Unscrew the handling screw from the half-mirror, return it to the universal illuminator.

f. Remount the half-mirror box covers.

g. Set the half-mirror indicator dials to the code (BF, DF, B, G, or V) for the half-mirror units inserted on the respective opposite sides.

* When the brightfield half-mirror unit is inserted on the right side, set the left indicator dial to BF.

2. Inserting the ND Filter Slider

a. Insert the ND filter slider into the ND filter/tint plate slot in the universal illuminator, with the mark on the ND filter slider facing forward.

* Set the ND filter or the open position into the light path.

3. Mounting the Objectives

a. Fully lower the mechanical stage with the coarse focus adjustment knob.

b. Screw the objectives firmly into the lens openings on the revolving nosepiece one by one in ascending order of magnification in clockwise sequence.

IV. Operation

1. Switching the Light Source On

A. <u>For the Halogen Lamp</u>

a. Set the line voltage selector switch on the transformer to conform with the local mains voltage.

b. Set the voltage adjustment knob at the lowest voltage position, and turn on the ON-OFF switch.

c. Turning the voltage adjustment knob clockwise increases voltage and the voltmeter LED lights up, accordingly.

B. For the Mercury Burner

a. Make sure that the line voltage selector switch on the power supply is set to conform with the local mains voltage. (This switch can be turned with a screwdriver, and can be set to the following voltages: 100V - 110V - 120V or 220V - 240V).

b. Set the frequency selector switch to conform with the local mains frequency. (This switch can be adjusted with a screwdriver).

c. Ascertain that the power cord from the power supply to the lamp socket and the power supply power cord are correctly connected.

d. Turn on the main switch of the power supply unit. The switch lamp will then light up green.

* The burner sometimes may not ignite by turning on the main switch once, due to the electrode condition, etc. If your burner does not ignite, repeat turning on the main switch several times.

e. In 2 or 3 minutes after ignition, the arc will be stabilized.

f. Do not switch off the burner within 15 minutes after the ignition.

* Once the mercury burner is switched off, do not re-ignite it for 3 minutes or more in order to give it time to cool.

g. Turn off the main switch to switch off the power supply.

* At each bulb replacement, zero the life meter.

2. Centering the Light Source

* Burner centration should be performed each time a burner is replaced.

* Be careful never to open the lamp housing while the burner is on or immediately after switching off.

A. For the Halogen Lamp

a. Remove the analyzer, polarizer, and all filters from the light path.

b. Slide the brightfield half-mirror unit into the light path.

c. Rotate the field iris diaphragm "F.S." and the aperture iris diaphragm "A.S." counter-clockwise to the maximum open position.

d. Swing out the objectives from the light path, and remove the dust cap from the nosepiece aperture, so that the light passes through an empty aperture of the nosepiece.

e. Screw the centering screen into the nosepiece aperture so that the image of the filament can be projected onto the screen.

f. Looking at the filament image projected on the screen, focus it by means of the course and fine focusing knobs of the microscope.

g. Loosen the locking screw and, sliding the lamp socket in and out, and rotating in either direction, center the filament image.

h. Remount the desired analyzer, polarizer, and filters in the illuminator.

B. For the Mercury Burner

After the arc has stabilized, center the burner in the following steps:

a. Remove the analyzer, polarizer, and all filters from the light path.

b. Slide the brightfield half-mirror unit into the light path.

c. Open the shutter to maximum open position.

d. Rotate the field iris diaphragm "F.S." and the aperture iris diaphragm "A.S." counter-clockwise to the maximum open position.

e. Swing out the objectives from the light path, and remove the dust cap from the nosepiece aperture, so that the light passes through an empty aperture of the nosepiece.

f. Screw the centering screen into the nosepiece aperture so that the image of the burner can be projected onto the screen.

g. Bring the arc image into focus with the course and fine focusing knobs of the microcscope and center the brightest spot of the arc with the centering knobs.

h. Remount the desired analyzer, polarizer, and filters in the illuminator.

C. <u>If A Centering Screen Is Not Available</u>

The following process for centering the bulb applies to both the 12V 50W Halogen bulb (BF/DF/DIC/POL) and the 100W HBO Mercury bulb (FLUOR).

a. Remove the analyzer, polarizer, and all filters from the light path.

b. Slide the half-mirror selector knob to engage the brightfield half-mirror unit in the light path.

c. Swing the 10X objective into the light path.

d. Place a mirror or other high-reflectivity specimen on the stage, and roughly focus on it.

e. Remove one of the eyepieces, and while observing the bulb filament image in the observation tube, bring the image to the center of the objective pupil by turning the bulb centering knob and the socket clamping knob.

* A centering telescope is helpful since it enlarges the image of the filament for easy centering.

f. Remount the desired analyzer, polarizer, and filters in the illuminator.

3. Centering the Field Iris Diaphragm

a. Turn the revolving nosepiece to bring the 10X objective into the light path, and approximately focus on the specimen on the stage.

b. Turn the field iris diaphragm lever on the universal illuminator clockwise to the minimum iris diaphragm.

c. Turn the two diaphragm centering knobs on the universal illuminator and make the diaphragm image concentric with the field of view.

d. Turn the diaphragm lever counterclockwise until the image coincides with the field of view. If it is eccentric, adjust with the centering knobs again.

e. Open the field iris diaphragm until it just disappeares from the field of view.

4. Adjusting the Field Iris Diaphragm

To obtain images with improved contrast, the illumination area must be properly adjusted.

A. <u>Reflected Light Observation</u>

a. Close the iris diaphragm with the diaphragm lever of the universal illuminator to barely enclose the field of view, with the respective objective lenses, to shut off excess light.

B. Reflected Light Darkfield Observation

a. Be sure to turn the field iris lever on the universal illuminator counterclockwise to fully open the iris diaphragm.

5. Adjusting the Aperture Iris Diaphragm

Adjust the numerical aperture of the illumination system to the optimum image resolution, contrast and field depth.

A. Reflected Light Observation

a. Remove one of the eyepieces from the observation tube, and while looking at the exit pupil of the objective through the empty tube, adjust the opening of the aperture iris diaphragm with the diaphragm lever of the universal illuminator. Clockwise rotation of the diaphragm lever reduces the diaphragm opening.

* Generally, 70% to 80% of the aperture of the objective used gives the optimum image.

B. Reflected Light Darkfield Observation

a. Turn the aperture iris lever counterclockwise to fully open the aperture iris diaphragm.

* With some specimens, a slight closing gives good flarefree darkfield images. Since the objective lens iris cannot be seen even when the objective is removed, make this adjustment to minimize flare while observing the image.

6. Inserting the Filters

a. Open the filter cover, located in front of the lamp housing, on the universal illuminator.

b. Insert desired filters into the filter slot.

For specific purposes, use the following filters:

Filter	Effect
20 LBD3-W	Color temperature conversion to daylight quality.
20 IF550-W	Green illumination. Gives contrast to the image for observation and black and white photography.
20 ND6-W	Reduces illumination intensity (transmission 6%).
20 ND25-W	Reduces illumination intensity (transmission 25%).

* When the filter is not easily inserted or removed, remove the filter cover from the universal illuminator.

* When no filter is used, be sure to close the filter cover to prevent the entry of dust.

V. Observation

A. Reflected Light Brightfield/Darkfield Observation

Preparation

1. Setting the Half-Mirror Units

a. Make sure that the brightfield half-mirror unit and the darkfield half-mirror unit are in the half-mirror box, and set the desired half-mirror into the light path with the half-mirror selector slider-knob.

2. Selecting the ND Filter Slider

   a. Set the ND filter slider with the ND filter in the light path to minimize glare by reducing the brightness difference between the darkfield and the brightfield.

      * If the light intensity is insufficient in brightfield observation or when shortening the exposure time in photomicrography, set the slider with the empty opening in the light path.

Summary of Reflected Light Brightfield/Darkfield Observation Procedure

1. Move the required half-mirror into the light path with the half-mirror selector slider-knob.
2. Remove the universal analyzer, polarizer, tint plate, and Nomarski prism from the light path.
3. Turn on the power switch, and turn on the halogen bulb.
4. Place the specimen on the stage.
5. Bring the 10X objective into the light path and focus.
6. Adjust the interpupillary distance and diopter adjustment on the observation tube.
7. Make sure that the illumination is in order.
8. Insert the required filter into the universal illuminator.
9. Bring the objective of the required magnification into the optical path and focus.
10. Adjust the illumination intensity with the voltage adjustment knob.
11. Brightfield Observation: Adjust the field iris diaphragm and the aperture iris diaphragm.

    Darkfield Observation: Open the field iris diaphragm and the aperture iris diaphragm, fully.

B. Reflected Light Nomarski Differential Interference Contrast

Preparation

1. Setting the Half-Mirror

   a. Set the brightfield half-mirror unit in the light path by sliding the half-mirror selector slider-knob.

2. Checking the Analyzer and Polarizer

   a. Make sure that the analyzer and polarizer are properly set in the light path of the universal illuminator.

      * Make sure that the polarizer is set with the mark NIC facing forward.

3. Inserting the Nomarski Prism

   a. Set the Nomarski prism into the light path by turning the prism control knob to the IN position.

4. Setting the Background Color

   a. With the tint plate in the path, turn the polarizer ring of the polarizer to change the field of view background color until the optimum contrast for the specimen is obtained.

Background Color	Observation Effect
Dark black	View similar to darkfield is obtained.
Grey	Observation by best gray sensitive color.
Red-purple sensitive color	Very slight optical difference (refractive index, thickness) can be observed as difference in color.

* When the tint plate is inserted in the ND filter/tint plate slot, and set in the light path, sensitive colors appear for observation.

* The background colors can be changed continuously from 0-order black to 2nd order blue (0 to 700 nm).

5. Changing to Brightfield/Darkfield Observation

   a. Take the Nomarski prism out of the light path by moving the prism control knob to the OUT position.

   b. Pull the universal analyzer, polarizer and the tint plate from the light path.

Summary of Reflected Light Nomarski DIC Procedure

1. Bring the brightfield half-mirror into the light path with the half-mirror selector knob.

2. Engage the analyzer, polarizer and Nomarski prism into the light path.

3. Turn on the power switch and light the halogen bulb.

4. Place the specimen on the stage.

5. Bring the 10X objective into the light path and focus.

6. Adjust the interpupillary distance and diopter.

7. Make sure that the illumination is in order.

8. Insert the required filters into the universal illuminator.

9. Bring the objective of the required magnification into the light path and focus.

10. Adjust the illumination intensity with the voltage adjustment knob.

11. Adjust the field iris diaphragm and the aperture iris diaphragm.

C. Reflected Light Simple Polarizing Observation

Preparation

1. Setting the Half-Mirror

    a. Set the brightfield half-mirror unit in the light path by sliding the half-mirror selector slider-knob.

2. Checking the Analyzer and Polarizer

    a. Make sure that the analyzer and the polarizer are properly set in the light path of the universal illuminator.

        * Make sure that the polarizer is set with the mark PO facing forward.

3. Taking the Nomarski Prism Out of the Light Path

    a. If the Nomarski prism has been mounted, take it out of the light path by moving the prism control knob to the OUT position.

4. Setting the Polarizer and Analyzer into Crossed Position

    a. Attain the crossed filter position by turning the polarizer ring of the polarizer. The field of view should appear black when there is no specimen in the light path.

Summary of Reflected Light Simple Polarizing Procedure

1. Bring the brightfield half-mirror into the light path with the half mirror selector knob.
2. Engage the analyzer and the polarizer in the light path.
3. Take the Nomarski prism out of the light path.
4. Turn on the power switch and light the halogen bulb.

5. Place the specimen on the stage.

6. Bring the 10X objective into the light path.

7. Adjust the interpupillary distance and the diopter adjustment ring on the observation tube.

8. Make sure that the illumination is in order

9. Insert the required filter into the universal illuminator.

10. Turn the polarizer ring to set it to the crossed position.

11. Bring the objective of the required magnification into the light path and focus.

12. Adjust the illumination intensity with the voltage adjustment knob.

13. Adjust the field iris diaphragm and the aperture iris diaphragm.

D. Reflected Light Fluorescence Observation

* Make it a practice to use the UV protective shade provided to protect your eyes from fluorescent light.

Preparation

1. Focus on the Specimen with Transmitted Light.

   a. Bring the area of the specimen to be observed into the field of view, and focus with transmitted light emitted from the microscopes.

      * Make sure that the brightfield with NDO5 filter (BH2-UBFL) half-mirror unit is in the light path.

* Make sure all filters, analyzer, polarizer and Nomarski prism are removed from the light path.

  The Nomarski prism is removed from the light path by moving the prism control knob to the OUT position.

* On microscopes without transmitted light capabilities, proceed to step 2.

2. Setting the Half-Mirror

   a. Set the desired fluorescent half-mirror unit into the light path by sliding the half-mirror selector knob.

      * The universal illuminator is capable of housing two half-mirror units. If two fluorescence half-mirror units are required, remove the brightfield half-mirror unit from the universal illuminator and insert the two desired fluorescence units.

3. Setting the Illumination

   a. Install the Fluorescence Supplementary Unit components on the universal illuminator: extension tube adapter, supporting block, UV protective shield, supplementary exciter slider.

      * Prior to installing the extension tube adapter, ascertain that the halogen collector has been removed.

   b. Install the 100W mercury lamp house on the universal illuminator.

      * An extension tube (BH2-UET) is required between the universal illuminator and the mercury lamp house for models BH2-MJLT, BH2-MJL, BHMJL.

   c. Switch on the mercury light source.

   d. Switch off the transmitted light source.

   e. Center the mercury burner.

Summary of Reflected Light Fluorescence Observation

1. Install the Fluorescence Supplementary Unit components.
2. Install the 100W mercury lamp house on the universal illuminator.
3. Remove all filters, analyzer, and polarizer from the light path.
4. Swing the 10X objective into the light path.
5. Remove the Nomarski prism from the light path.
6. Place the specimen on the stage.
7. Adjust the interpupillary distance and diopter adjustment ring.

* Steps 8, 9 and 12 are for microscopes with transmitted light only. For microscopes without transmitted light capabilities, proceed to step 10.

8. Bring the brightfield half-mirror into the light path with the half-mirror selector knob.
9. Focus on the specimen with transmitted light.
10. Bring the desired fluorescent half-mirror unit into the light path with the half-mirror selector knob.
11. Switch on the mercury light source.
12. Switch off the transmitted light source.
13. Adjust the field iris diaphragm and the aperture iris diaphragm.
14. Bring the objective of the required magnification into the light path and focus.
15. If desired, install a supplementary exciter filter into the polarizer slot of the universal illuminator.
16. If desired, install a supplementary barrier filter into the analyzer slot of the universal illuminator.

Note:

* When fluorescence observation is to be interrupted briefly, it is good practice to cut off the beam of light by means of the shutter slide rather than to turn off the mercury burner, since fluorescence is quick to fade and repeated on-off switching considerably shortens the useful life of the burner.

* Use the light-cut dark slide provided to avoid deterioration of the fluorescence image due to the reflection of the incident light from the top lens of the substage condenser.

To Install the Light-Cut Dark Slide:

Rack down the condenser and insert the slide into the horizontal slit in the front of the stage.