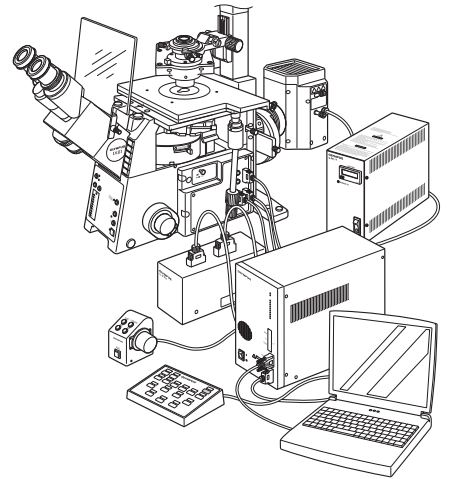


OLYMPUS®



Modules Described in This Manual

IX2-RFACA

IX2-RFAC

IX2-RFA

IX2-RFAL

U-LH100HGAPO

U-LH100HG

U-RFL-T

IX2-SHA

INSTRUCTIONS

MANUAL/MOTORIZED REFLECTED FLUORESCENCE SYSTEM

This instruction manual is for the Olympus Manual/Motorized Reflected Fluorescence System. To ensure the safety, obtain optimum performance and to familiarize yourself fully with the use of this microscope, we recommend that you study this manual thoroughly before operating the microscope. Retain this instruction manual in an easily accessible place near the work desk for future reference.



AX7371

CONTENTS

Correct assembly and adjustments are critical for a reflected fluorescence system to manifest its full performance. If you are going to assemble the microscope yourself, please read chapter 9, "ASSEMBLY" (pages 29 to 34) carefully.

IMPORTANT – Be sure to read this section for safe use of the equipment. – 1,2

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IMPORTANT

Motorized operations can be controlled by using the IX2-RFACA motorized fluorescence mirror unit cassette, IX2-SHA motorized shutter (for exclusive use with the IX2 series) and the IX2-BSW IX2 software for PC.

The descriptions of the IX2-UCB and U-HSTR2 are given in a separate instruction manual. Please also refer to these manuals.

SAFETY PRECAUTIONS

1. A microscope with motorized parts is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.
2. For the ultrahigh-pressure mercury burner, use the Olympus-provided USH-103OL (manufactured by OLYMPUS) or HBO103W/2 (manufactured by OSRAM) DC burner.
3. Make sure that the mercury burner is attached and cords are connected.
4. The internal parts become very hot during and within 10 minutes after completion of operation. Do not attempt to open the light housing in these periods (see page 13).
5. The stoppers provided for some functions may be damaged if excessive force is applied.
6. Do not disassemble the power supply unit because it contains high voltage parts inside.
7. Always use the power cord provided by Olympus. If no power cord is provided, please select the proper power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, product safety performance cannot be warranted.
8. Always ensure that the **grounding terminal** of the microscope and that of the wall outlet are properly connected. If the equipment is not grounded, Olympus can no longer warrant the electrical safety performance of the equipment.
9. Before opening the lamp housing for replacing the burner, etc., be sure to set the main switch to "○" (OFF), unplug the power supply unit's output connector from the power supply unit to the lamp housing and wait for more than 10 minutes until the burner has cooled down.
10. The top panel of the lamp housing becomes very hot during operation. To prevent fire hazard, do not block the ventilation through the top panel or tilt the lamp housing during use.
11. The standard service life of the lamp housing is eight (8) years of use or 20,000 hours of total power ON period, whichever is the shorter period.
For details, see Inspection Sheet on page 37.

Safety Symbols

The following symbols are found on the microscope system equipment. Study the meaning of the symbols and always use the equipment in the safest possible manner.

Symbol	Explanation
	High voltage warning indicating presence of high voltage (1 kV or more).
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper use could result in personal injury to the user and/or damage to the equipment.
	Indicates that the main switch is ON.
	Indicates that the main switch is OFF.

Warnings

Warning engraving is placed at parts where special precaution is required when handling and using the microscope. Always heed the warnings.

Warning engraving positions	• Lamp housing (U-LH100HG, U-LH100HGAPO) • Motorized shutter (IX2-SHA) • Power supply unit (U-RFL-T)	[HOT SURFACE warning]  [HIGH VOLTAGE warning] 
-----------------------------	--	--

1 Getting Ready

1. This manual pertains only to the operations of the reflected fluorescence system. Also read the instruction manuals of the IX2 microscope and associated options to obtain general understanding on the system.
2. Do not attempt to operate the motorized parts manually. They may be destroyed by excessive force.
3. The reflected fluorescence system is composed of precision instruments. Handle them with care and avoid subjecting them to sudden or severe impact.
4. Do not use the system where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations.
5. To enable ventilation for the lamp housing and power supply unit, reserve spaces of more than 10 centimeters around them.
6. The power cord can be used to shut off power supply in case of emergency. To enable this function, install the power supply unit so that its power cord connector (on the rear panel) or power outlet can easily be accessed and unplugged in case of emergency.

2 Maintenance and Storage

1. To clean the lenses and other glass components, simply blow dirty away using a commercially available blower and wipe gently using a piece of cleaning paper (or clean gauze).
If a lens is stained with fingerprints or oil smudges, wipe it gauze slightly moistened with commercially available absolute alcohol.
▲ Since the absolute alcohol is highly flammable, it must be handled carefully.
Be sure to keep it away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off.
Also remember to always use it only in a well-ventilated room.
2. Do not attempt to use organic solvents to clean the microscope components other than the glass components. To clean them, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.
3. Never attempt to disassemble any part of the microscope as this could result in malfunction or reduced performance.
4. When the microscope is not in use, be sure to set the main switch to “○” (OFF). After checking that the lamp housing has been cooled down, place the dust-prevention cover on the microscope for storage.
5. When the hour counter on the power supply unit indicates 300 hours (USH-103OL, HBO103W/2), set the main switch to “○” (OFF), wait for more than 10 minutes for safety, then replace the mercury burner (see page 33). Unlike fluorescent lamps, the mercury burner incorporates high-pressure gas sealer inside it. If the burner is used far beyond the service life, the distortion will accumulate in the glass tube, which may explode in worst case.

3 Caution

If the system is used in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the equipment may also be damaged. Always use the equipment as outlined in this instruction manual.

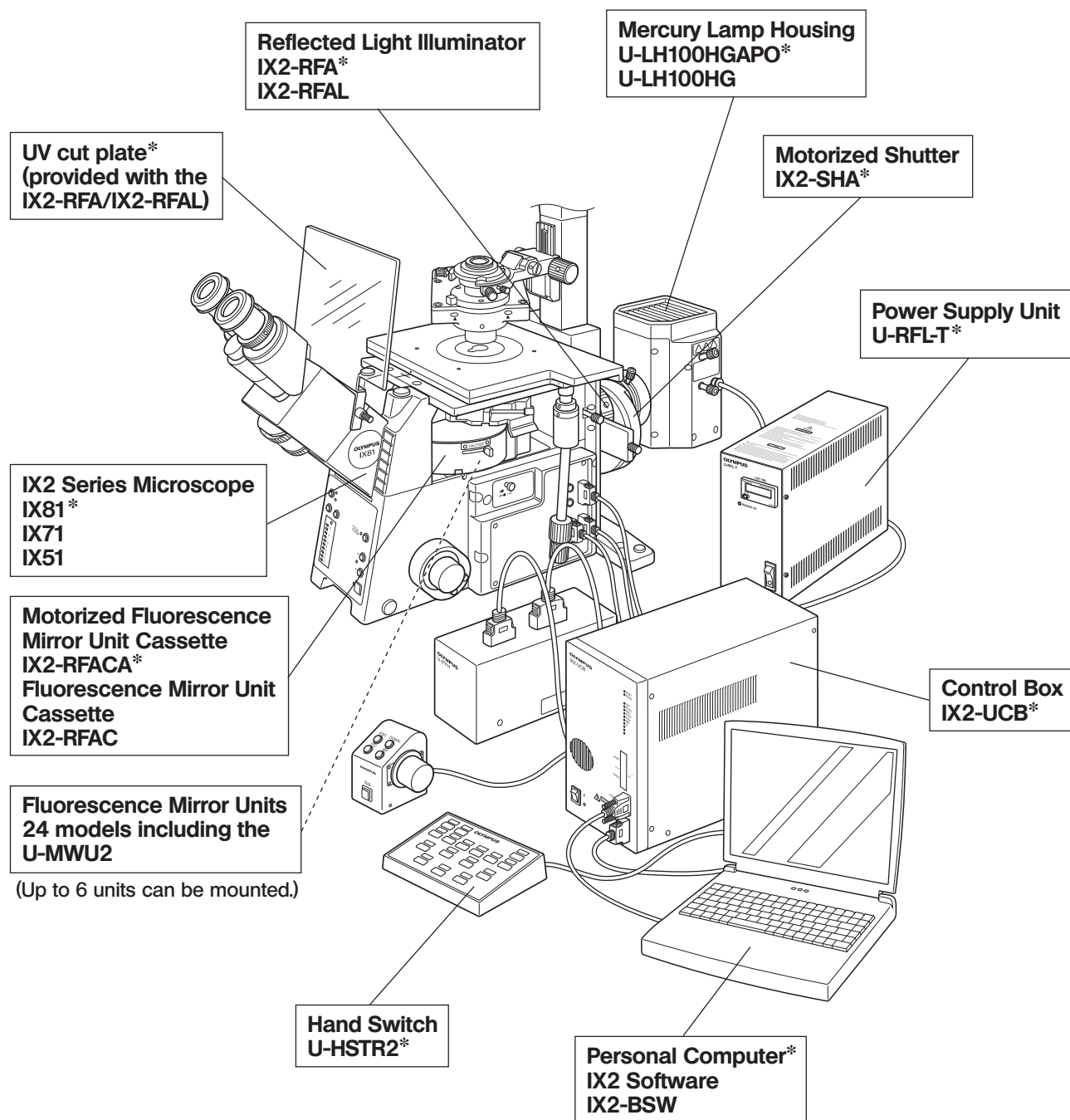
The following symbols are used to set off text in this instruction manual.

- ▲ : Indicates that failure to follow the instructions in the warning could result in bodily harm to the user and/or damage to equipment (including objects in the vicinity of the equipment).
- ★ : Indicates that failure to follow the instructions could result in damage to equipment.
- ◎ : Indicates commentary (for ease of operation and maintenance).

1 MODULE NOMENCLATURE

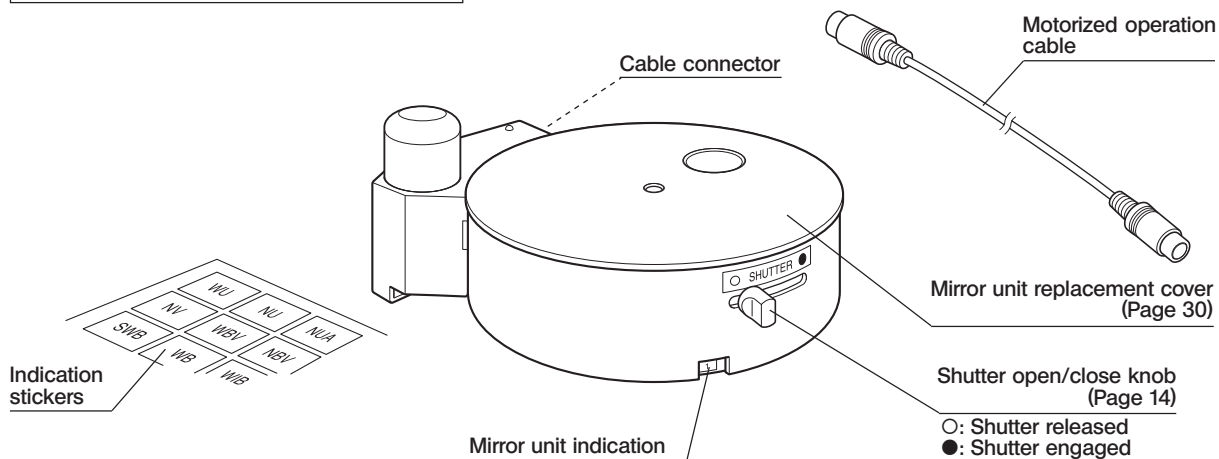
©When using the IX2-RFACA motorized fluorescence mirror unit cassette, it is required to use the IX2-UCB control box, U-HSTR2 hand switch, a PC and the IX2-BSW software is required to switch the mirror unit electrically. Also, the mercury lamp housing can be replaced by the U-LH75XEAP0 xenon lamp housing. For details on the available systems, consult Olympus or its latest catalogues.

The illustration shows the system composed of modules marked*.

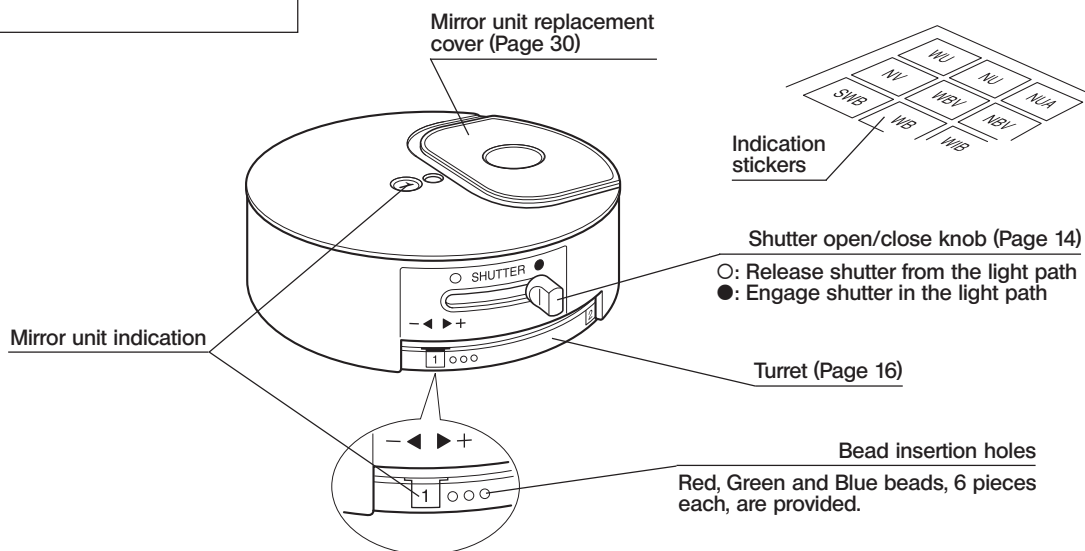


2 CONTROL NOMENCLATURE

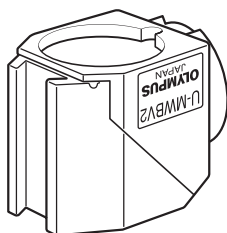
Fluorescence Mirror Unit Cassette IX2-RFACA



Fluorescence Mirror Unit Cassette IX2-RFAC



Fluorescence Mirror Unit 24 models including the U-MWU2



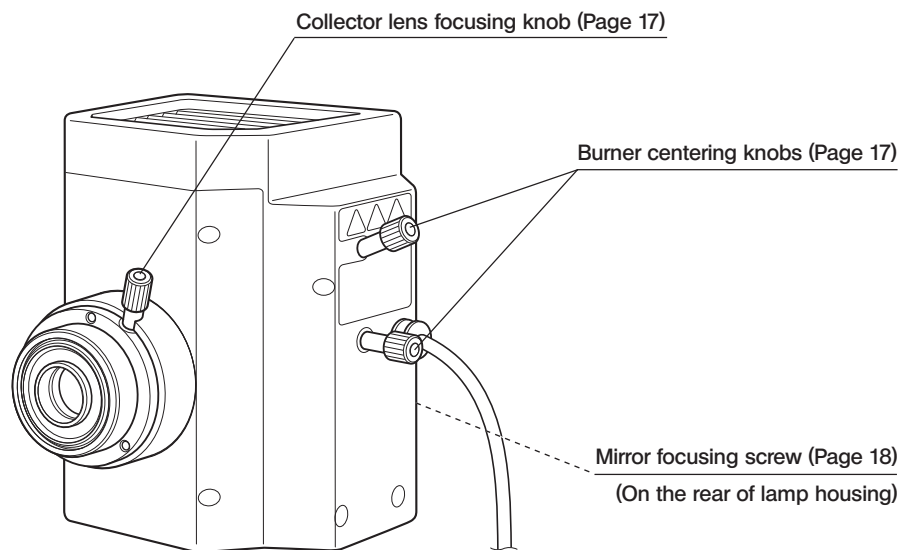
◎The IX2-RFACA/IX2-RFAC can accept up to six fluorescence mirror units.

★Every mirror unit is composed of a dichroic mirror, barrier filter and excitation filter, which are suitable for each excitation method. Basically, do not disassemble the mirror unit.

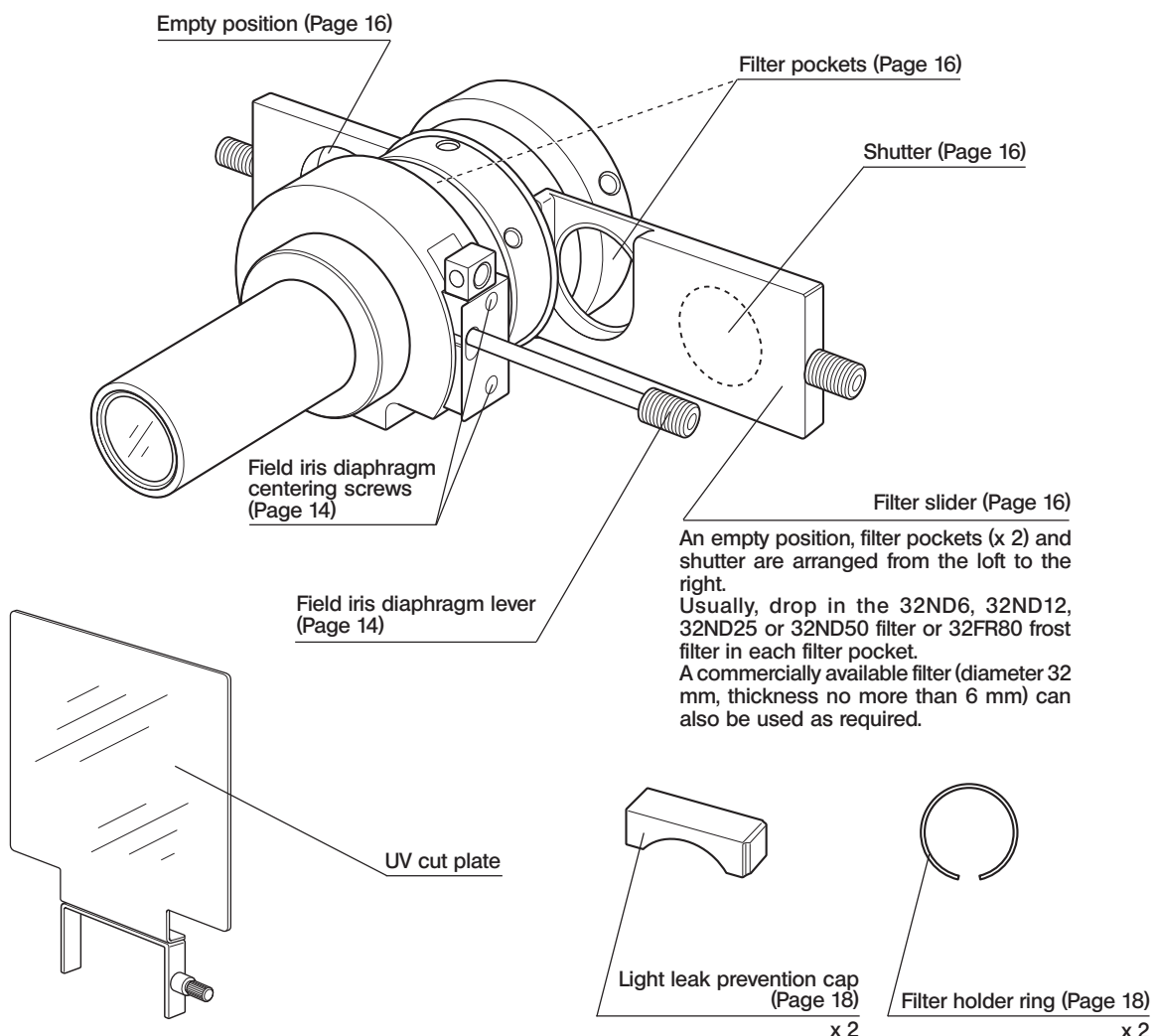
◎If you want to fabricate an original fluorescence mirror unit, it is recommended to use the U-MF2 empty mirror unit (which does not include filter) (see page 31).

A sheet of blank indication stickers is provided with the reflected light illuminator. Use the stickers for writing the original mirror unit names.

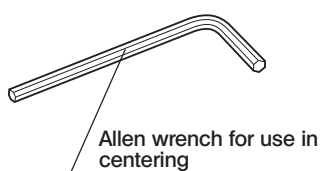
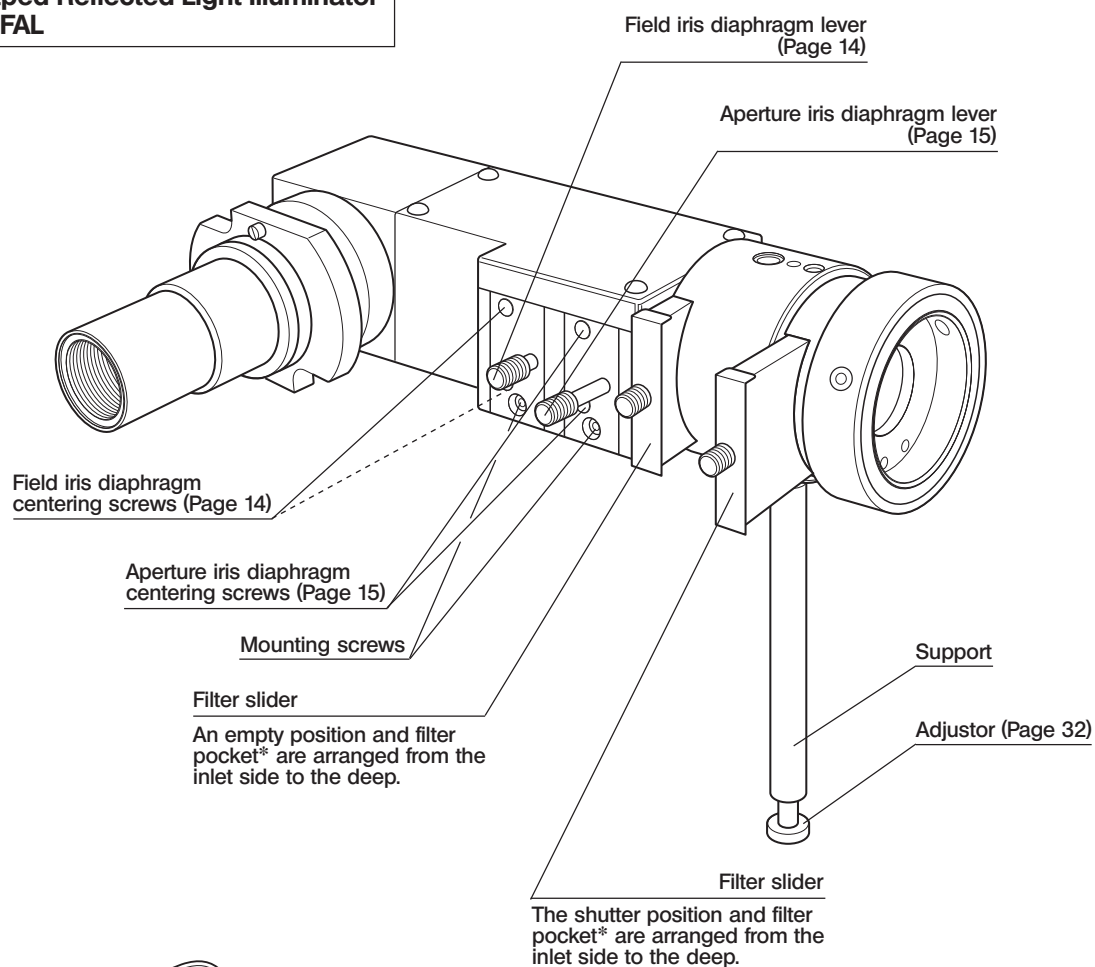
Mercury Lamp Housing
U-LH100HGAPO
U-LH100HG



Reflected Light Illuminator
IX2-RFA

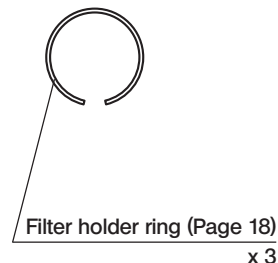
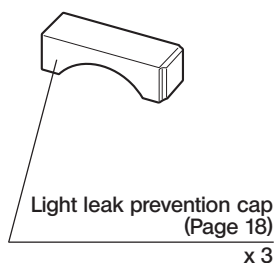
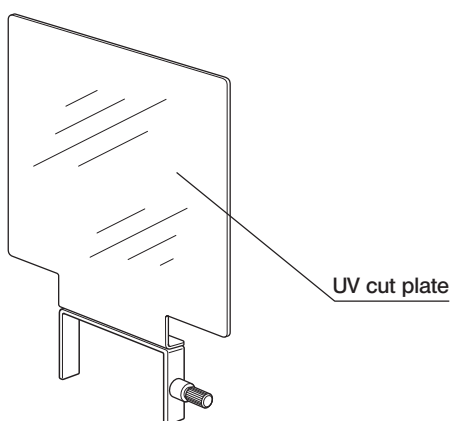


L-Shaped Reflected Light Illuminator IX2-RFAL



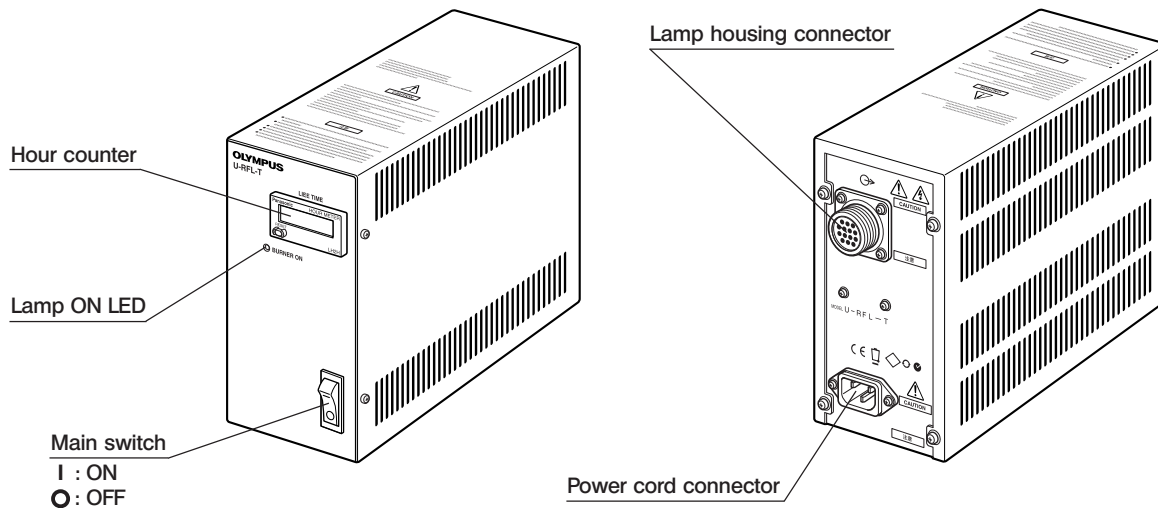
* Usually, drop in the 32ND6, 32ND12, 32ND25 or 32ND50 filter or 32FR80 frost filter in each filter pocket.

A commercially available filter (diameter 32 mm, thickness no more than 6 mm) can also be used as required.



Power Supply Unit U-RFL-T

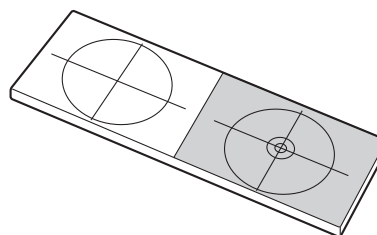
© For details, see the instruction manual provided with the U-RFL-T.



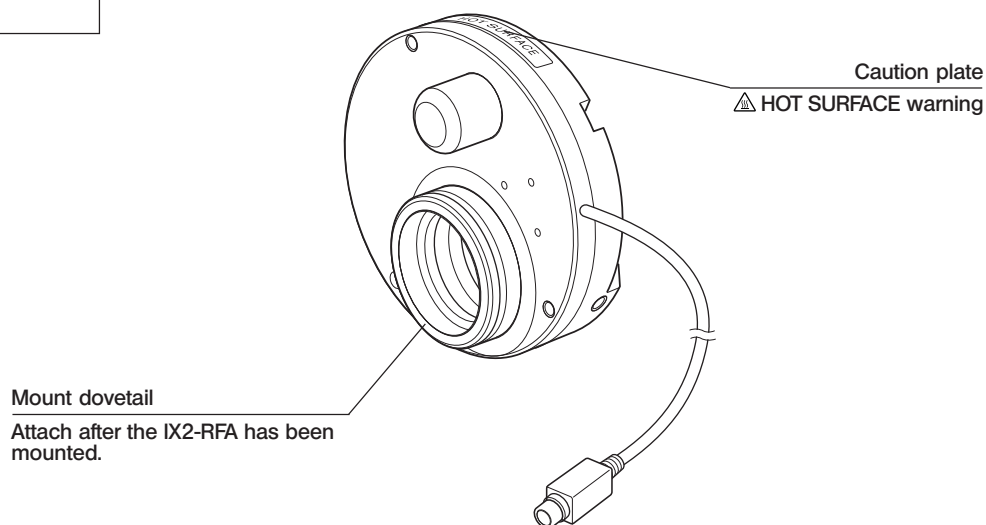
ND Filter
32ND6
32ND12
32ND25
32ND50



**Centering Target
U-CST**

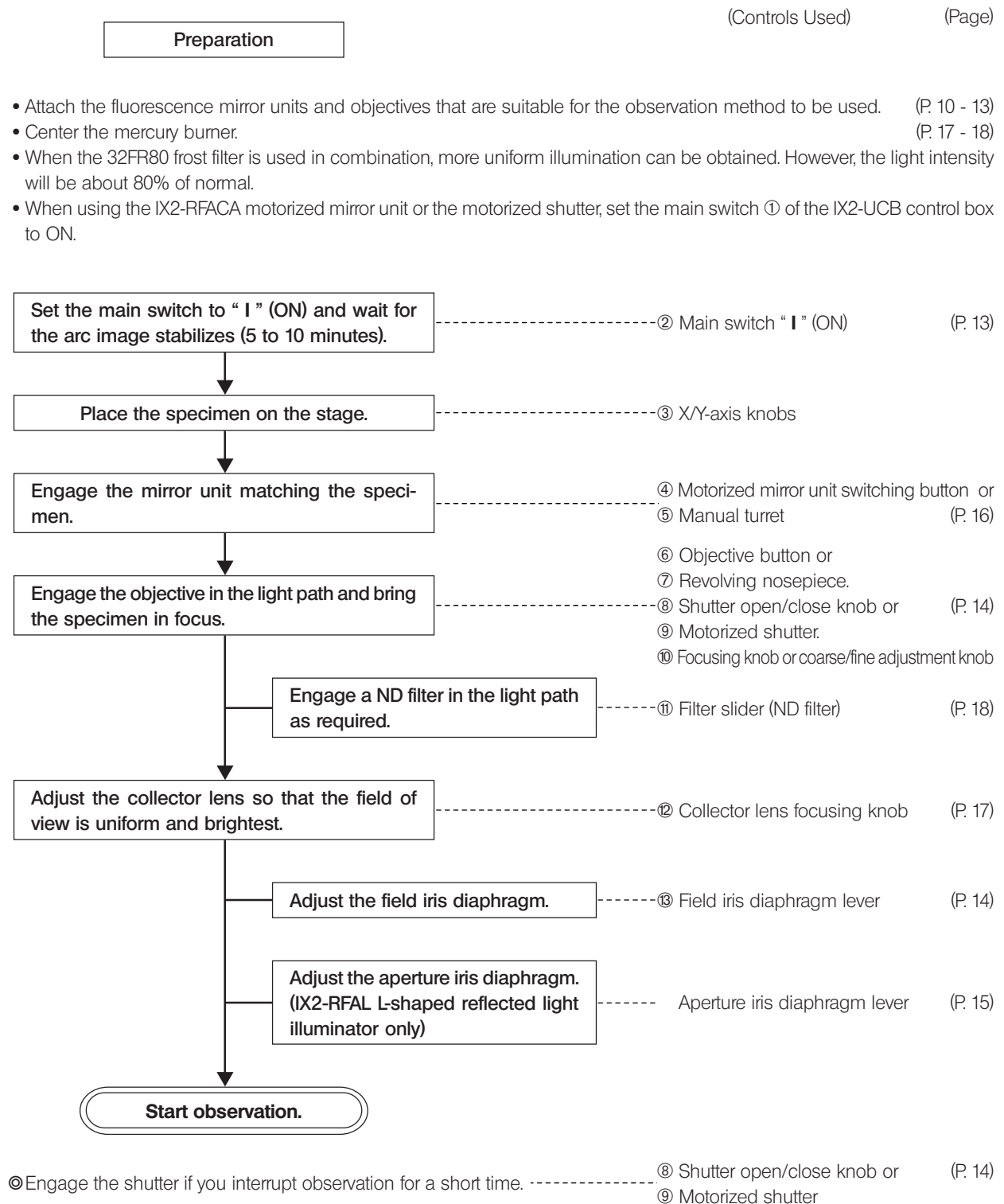


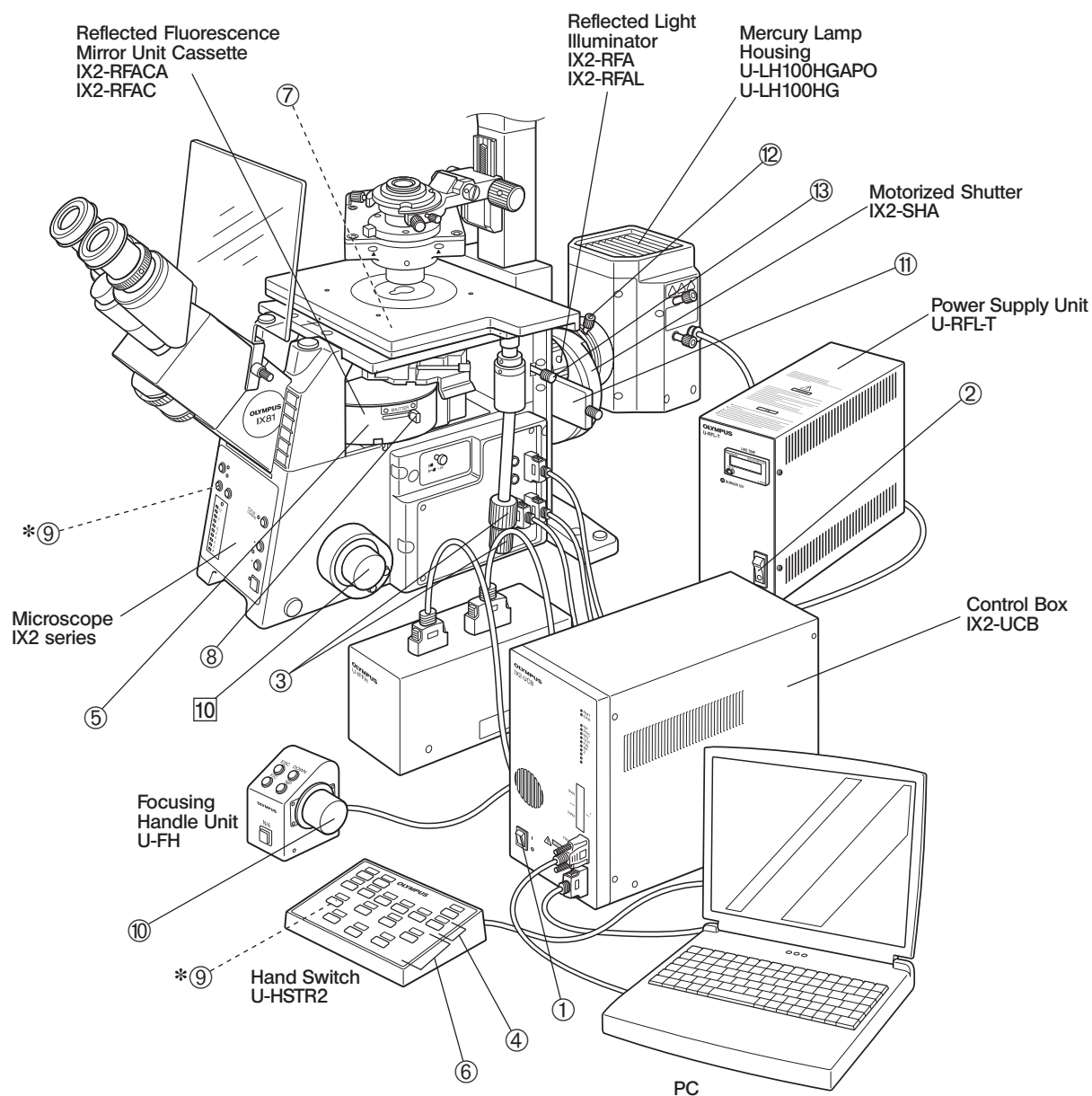
**Motorized Shutter
IX2-SHA**



(Note) The motorized shutter open/close button should be assigned to a button on the microscope frame or hand switch using the PC.

© For the operating procedures for simultaneous observations of phase contrast or transmitted Nomarski DIC observation with fluorescence observation, see chapter 5, "SIMULTANEOUS FLUORESCENCE OBSERVATION METHODS" (page 19).





* Assign the motorized shutter function to an operation button ⑨ on the microscope frame or the hand switch. Note that ⑩ does not work when the U-FH focusing handle unit is used.

© Make a photocopy of the observation procedure pages and post it near your microscope.

4 USING THE CONTROLS

1 General Precautions for Observation

1. Make sure that the power cord and connecting cables are plugged in securely.
2. If you perform only transmitted light phase contrast or transmitted light DIC observation, leave one position on the fluorescence mirror unit empty. This allows for transmission of original color reproduction.
3. Enlarge the field iris diaphragm so it just circumscribes the field of view. If decentered, center it using the Allen screwdriver (see page 14).
4. Always use immersion oil for immersion objectives.
5. When using a LCPlanFI series objective, attach a correction cap for compensating for the material and thickness of the container used in observation. For the types of available correction caps, refer to the instruction manual for the IX2 series microscope.
6. If you use an objective with correction collar, you can correct resolution deterioration due to variations in cover glass thickness by adjusting the correction collar.
 - UPlanSApo40X2, UPlanApo40X, PlanApo40X, UApo40XW3/340, UApo40X3/340, UPlanSApo60XW, UPlanApo60XW3, UPlanFLN60X, LUCPlanFLN20X/40X/60X, LCPlanFI40X/60X

Correction procedure

If the thickness of the vessel bottom is known, match the correction collar to the thickness of the vessel bottom using the collar scale provided. If the thickness is not clear, turn the collection collar while adjusting the fine adjustment knob to where the image is focused with the best resolution.

7. Engage the shutter if you interrupt observation for a short time (using the manual or motorized shutter).
(Turning the mercury burner ON and OFF repeatedly will significantly shorten the life span of the burner.)
8. Color fading of specimens:
This system features high excitation light intensity to ensure bright observation of dark fluorescence specimens. In consequence, after long period of observations using high-power objectives, the colors of specimens will fade quicker than usual, causing the view (contrast of fluorescence images) to deteriorate.
In such a case, slightly reduce the excitation light intensity to slow color fading down and improve the fluorescence image.
To reduce the excitation light intensity, use ND filters or aperture iris diaphragm as far as the observation is not affected or use the shutter to limit the exposure of specimen to more than necessary light.
Commercially marketed color fading protection agent (DABCO, etc.) can also delay fading of specimen colors. The use of fading protection agent is recommended especially when you perform high-magnification observations frequently.

★ Remember that fading protection agents cannot be used with certain kinds of specimens.

2 Selecting the Fluorescence Mirror Units

Select the fluorescence mirror unit providing excitation that matches the fluorochrome in use.

★ **Never mount or use the U-MBF3 brightfield mirror unit with a fluorescence mirror unit. The U-MBF3 is excessively bright and injury to the eyes could occur. If this type of mirror unit is to be used together with a fluorescence mirror unit, use the U-MBFL3 mirror unit equipped with a built-in ND filter or add a 3% ND filter to the U-MBF3.**

◎ Use of fluorescence mirror units according to the excitation wavelength

Olympus has prepared some sets of fluorescence mirror unit combined with appropriate filters, which are variable depending on wavelengths.

The wide-band (W) set is normally used. There may be cases, however, where superwide-band (SW) or narrow-band (N) sets are recommendable.

- | | | |
|--|---|---|
| ① Extremely weak fluorescence brightness
(B- and G-excitation only) | → | Use the superwide-band (SW) set.
◎ With the SWB2, strong autofluorescence may reduce image contrast. |
| ② Specimens emitting strong autofluorescence | → | Use the narrow band (N) set.
◎ The fluorescence brightness is somewhat reduced. |

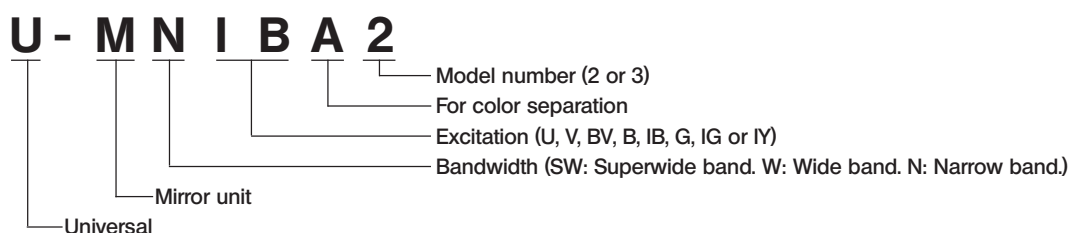
Dichroic Mirror and Filter Configurations of Fluorescence Mirror Units

Excitation Method	Mirror Unit	Dichroic Mirror	Excitation Filter	Barrier Filter	Fluorochromes
U	U-MWU2	DM400	BP330-385	BA420	• Autofluorescence observation • DAPI: DNA staining • Hoechst 33258, 33342: Chromosome
	U-MNU2		BP360-370		
V	U-MNV2	DM455	BP400-410	BA455	• Catecholamine • Serotonin • Tetracycline: Bones, teeth
BV	U-MWBV2	DM455	BP400-440	BA475	• Quinacrine, quinacrine mustard: Chromosome • Thioflavine S: Lymphocyte • Acriflavine: Nucleic acid • ECFP
	U-MNBV2		BP420-440		
B	U-MWB2	DM500	BP460-490	BA520IF	• FITC: Fluorescent antibody • Acridine orange: DNA, RNA • Auramine: Tubercle bacillus • EGFP, S65T, RSGFP
	U-MNB2		BP470-490		
	U-MSWB2		BP420-480		
IB	U-MWIB3	DM505	BP460-495	BA510IF	
	U-MNIB3		BP470-495		
G	U-MWG2	DM570	BP510-550	BA590	• Rhodamine, TRITC: Florescent antibody • Propidium iodide: DNA • RFP
	U-MNG2		BP530-550		
	U-MSWG2		BP480-550		
IG	U-MWIG3	DM570	BP530-550	BA575IF	
IY	U-MWIY2	DM600	BP545-580	BA610IF	Texas Red: Fluorescent antibody

Color Separation Filter Combinations

U	U-MNUA2	DM400	BP360-370	BA420-460	For observing only the U-excitation stain, when using U-excitation stain together with FITC.
IB	U-MWIBA3	DM505	BP460-495	BA510-550	For observing only the B-excitation stain, when using B-excitation stain with TRITC or Texas Red.
	U-MNIBA3		BP470-495		
G	U-MWIGA3	DM570	BP530-550	BA575-625	For observing only the G-excitation stain, when using G-excitation stain together with Cy5.
	U-MNIGA3		BP540-550		

Mirror Unit Name Meaning



Exclusively for Fluorescent Proteins

Excitation Method	Mirror Unit	Dichroic Mirror	Excitation Filter	Barrier Filter	Fluorochromes
CFP	U-MCFPHQ	DM450HQ	BP425-445HQ	BA460-510HQ	For ECFP
GFP	U-MGFPHQ	DM485HQ	BP460-480HQ	BA495-540HQ	For EGFP
YFP	U-MYFPHQ	DM505HQ	BP490-500HQ	BA515-560HQ	For EYFP
RFP	U-MRFPHQ	DM565HQ	BP535-555HQ	BA570-625HQ	For RFP

Mirror Unit Name Meaning



3 Objectives for Various Observation Methods

UIS2 Series

Objective	Reflected Fluorescence								Phase Contrast (Phase contrast ring)	DIC		
	340	U	V	BV	B	IB	G	IY		U-UCD8		IX2-LWUCDA2
										TLO	TLD	IX2-LWUCD
UPlanSApo 4X	△	○	○	○	○	○	○	○	—	—	—	—
10X2	△	○	○	○	○	○	○	○	—	—	○	○
20X	△	○	○	○	○	○	○	○	—	—	○	○
20XO	△	○	○	○	○	○	○	○	—	○	○	○
40X2	△	○	○	○	○	○	○	○	—	—	○	○
60XO	△	○	○	○	○	○	○	○	—	○	○	○
100XO	△	○	○	○	○	○	○	○	—	○	○	○
UPlanFLN 4X	△	○	○	○	○	○	○	○	○* (PhL)	—	—	—
10X2	△	○	○	○	○	○	○	○	○* (Ph1)	—	○	○
20X	△	○	○	○	○	○	○	○	○* (Ph1)	—	○	○
40X	△	○	○	○	○	○	○	○	○* (Ph2)	—	○	○
40XO	△	○	○	○	○	○	○	○	—	○	○	○
60X	△	○	○	○	○	○	○	○	—	—	○	○
60XOI	△	○	○	○	○	○	○	○	○* (Ph3)	○	○	○
100XO2	△	○	○	○	○	○	○	○	○* (Ph3)	○	○	○
100XOI2	△	○	○	○	○	○	○	○	—	○	○	○
PlanApoN 60XO	—	△	○	○	○	○	○	○	—	○	○	○
UPlanSApo 60XW	△	○	○	○	○	○	○	○	—	○	○	○
CPlanFLN 10XPh	△	△	△	△	△	△	△	△	○* (PhC)	—	—	○
LCAchN 20X	—	△	△	△	○	○	○	○	○* (PhC)	—	—	—
40X	—	—	—	—	○	○	○	○	○* (Ph2)	—	—	—
LUCPlanFLN20X	○	○	○	○	○	○	○	○	○* (Ph1)	○	○	○
40X	○	○	○	○	○	○	○	○	○* (Ph2)	○	○	○
60X	△	○	○	○	○	○	○	○	○* (Ph2)	○	○	○

○ : Recommended combination.

△ : Usable but image may be dark.

○* : A phase contrast objective (Ph) is required for phase contrast observation.

- : Not usable or the applicable objective is not available.

★ DIC observation is not available when a plastic container (petri dish, flask, etc.) is used.

UIS Series

Objective		Reflected Fluorescence								Phase Contrast (Phase contrast ring)	DIC		
											U-UCD8		IX2-LWUCDA2
		340	U	V	BV	B	IB	G	IY		TLO	TLD	
UPlanApo	4X	△	○	○	○	○	○	○	○	—	—	—	—
	10X	△	○	○	○	○	○	○	○	○* (Ph1)	—	○	○
	20X	△	○	○	○	○	○	○	○	○* (Ph2)	—	○	—
	40X	△	○	○	○	○	○	○	○	—	—	○	○
	40XOI3	△	○	○	○	○	○	○	○	○* (Ph3)	○	○	—
	100XOI3	△	○	○	○	○	○	○	○	○* (Ph3)	○	○	○
UPlanFI	4X	△	○	○	○	○	○	○	○	○* (PhL)	—	—	—
	10X	△	○	○	○	○	○	○	○	○* (Ph1)	—	○	○
	20X	△	○	○	○	○	○	○	○	○* (Ph1)	—	○	—
	40X	△	○	○	○	○	○	○	○	○* (Ph2)	—	○	—
	100XO3	△	○	○	○	○	○	○	○	○* (Ph3)	○	○	○
	100XOI3	△	○	○	○	○	○	○	○	—	○	○	○
CPlanFI	10XPh	△	△	△	△	△	△	△	△	○* (PhC)	—	—	○
UApo	20X3/340	○	○	○	○	○	○	○	○	—	—	—	—
	40X3/340	○	○	○	○	○	○	○	○	—	—	○	○
	40XOI3/340	○	○	○	○	○	○	○	○	—	○	○	—
UPlanApo	60XW3	△	○	○	○	○	○	○	○	—	○	○	○
LCPlanFI	20X	—	—	—	—	○	○	○	○	○* (Ph1)	—	○	○
	40X	—	△	△	△	○	○	○	○	○* (Ph2)	—	○	○
	60X	—	—	—	—	○	○	○	○	○* (Ph2)	—	○	○
LCAch	20X	—	△	△	△	○	○	○	○	○* (PhC)	—	—	—
	40X	—	—	—	—	○	○	○	○	○* (Ph2)	—	—	—

○ : Recommended combination.

△ : Usable but image may be dark.

○* : A phase contrast objective (Ph) is required for phase contrast observation.

— : Not usable or the applicable objective is not available.

★ DIC observation is not available when a plastic container (petri dish, flask, etc.) is used.

4 Turning the Power Supply Unit On

Set the main switch to “I” (ON). The arc image will stabilize in 5 to 10 minutes after ignition.

⊗ The discharge type mercury burner may not be ignited from the beginning on rare occasions due to its characteristics. In this case, set the main switch to “O” (OFF), wait for 5 to 10 seconds, then set it again to “I” (ON).

★ To extend the mercury burner life, do not turn the mercury burner off for 2 hours after ignition.

★ The mercury burner cannot be ignited until the mercury vapor has cooled down and liquefied. Before re-igniting a mercury burner, wait for about 10 minutes after the last time it was turned off.

⊗ For the sake of safety, the power supply to the lamp housing is shut down if the lamp housing is opened while the burner is on. If this happens, set the main switch to “O” (OFF), wait for more than 10 minutes, then set it again to “I” (ON). Do not open the lamp housing until it has cooled down enough.

★ To reset the hour counter, hold its reset button until “0.0” is displayed.

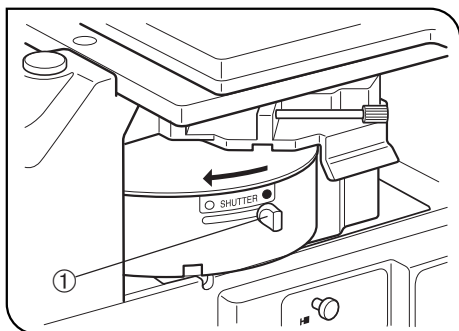


Fig. 1

5 Opening/Closing the Shutter of the Mirror Unit Cassette (Fig. 1)

1. Turn the shutter open/close knob ① in the direction of the arrow to the position marked ○ to release the shutter.
2. When the shutter open/close knob is turned in the opposite direction to the arrow, the shutter is engaged and the excitation light is blocked when the knob comes in the position marked ●.

▲The excitation light incident to the specimen can be blocked with the shutter open/close knob of the mirror unit cassette. However, when removing the mirror unit cassette from the IX2 microscope frame, be sure to insert the shutter in the filter slider of the reflected fluorescence illuminator in advance.

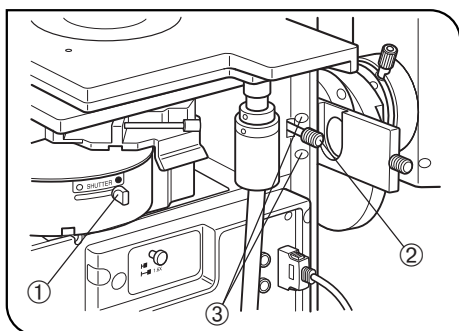


Fig. 2

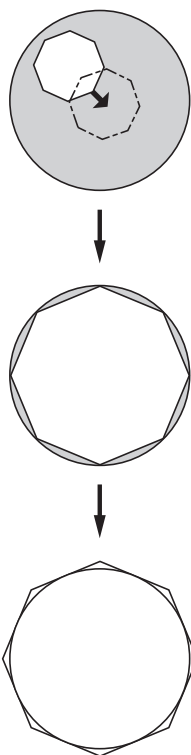
6 Centering the Field Iris Diaphragm (Fig. 2)

1. Turn the shutter open/close knob ① till the position marked ● to engage the shutter in the light path. (When using the motorized shutter, engage the shutter using the appropriate control button.)
2. Engage the B or IB mirror unit in the light path. (If these mirror units are not available, engage another fluorescence mirror unit in the light path.)
3. Turn the shutter open/close knob ① till the position marked ○ to release the shutter.
4. Engage the 10X objective in the light path, place the specimen on the stage and bring the specimen into approximate focus.
5. Pull out the field iris diaphragm lever ② of the illuminator and minimize the field iris diaphragm.
6. Fit the Allen screwdriver provided with the microscope frame alternately in the two field iris diaphragm centering screws ③ and adjust them so that the field iris image comes at the center of the field of view.
7. While pushing in the field iris diaphragm lever ②, enlarge the field iris diaphragm until it inscribes the field of view. If eccentricity is found after this, try centering again.
8. After completing the centering adjustment, enlarge the field iris diaphragm until the iris image becomes almost the same size as (i.e. circumscribes) the field of view.

Effects of Field Iris Diaphragm

The field iris diaphragm restricts the diameter of the beam of light entering the objective and thus excludes extraneous light, improving image contrast.

To exclude extra light, set the field iris diaphragm lever ② on the reflected fluorescence illuminator according to the objective power, so that the image of the field iris diaphragm just circumscribes the field of view.



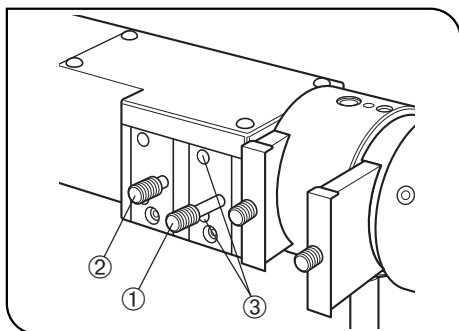


Fig. 3

7 Centering the Aperture Iris Diaphragm (IX2-RFAL) (Fig. 3)

★ To manipulate the centering screws, use the provided Allen wrench.

1. Turn the shutter open/close knob till the position marked ● to engage the shutter in the light path. (When using the motorized shutter, engage the shutter using the appropriate control button.)
2. Engage the B or IB mirror unit in the light path. (If these mirror units are not available, engage another fluorescence mirror unit in the light path.)
3. Engage the 10X objective in the light path and place the U-CST centering target on the stage.
4. Turn the shutter open/close knob till the position marked ○ to release the shutter.
5. Move the slide with crosslines inside a double circle of the U-CST until the crosslines are overlaid on the center of field.
6. Rotate the revolving nosepiece to engage the empty position (the objective cap should be removed) in the light path.
7. Pull out the aperture iris diaphragm lever ① to minimize the aperture iris diameter.
8. Pull out the field iris diaphragm lever ② to minimize the field iris diaphragm. Now the aperture iris image should be visible on the U-CST.
9. Fit the Allen wrench in the two aperture iris centering screws ③ and adjust so that the aperture iris image coincides with the crosslines.

Effects of Aperture Iris Diaphragm

The aperture iris diaphragm helps adjust the brightness of the observed image and improve the contrast.

To perform normal fluorescence observation, enlarge the aperture iris by pushing in the aperture iris diaphragm lever ①.

- ◎ If specimen colors tend to fade due to too high excitation light, first use ND filters to reduce the brightness, and decrease the aperture iris diaphragm if the ND filters are not enough.

Do not decrease the aperture iris diaphragm too much. Do not use it as a substitute to the shutter.

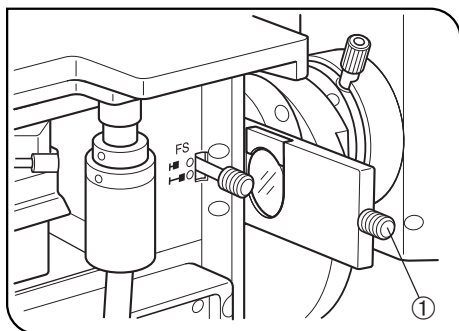


Fig. 4

8 Switching the Filter Slider

(Fig. 4)

⊙ Hold the knob ① on the filter slider of the reflected fluorescence illuminator and move it to the left or right to switch the engaged position in 4 steps including the shutter, two filter pockets and empty position.

When the knob is pushed in all the way to the left, the shutter is engaged. Pulling the knob to the subsequent three positions engages filter pocket 1, filter pocket 2 and the empty hole in the light path respectively.

To adjust the brightness, insert appropriate ND filter(s) (32ND6, 32ND12, 32ND25 and/or 32ND50) or frost filter (32FR80) and switch the filter slider to engage the ND filter(s) in the light path.

When no observation is performed or replacing the mirror unit, set the knob to engage the shutter in the light path to cut the excitation light and prevent color fading of the specimen due to fluorescence.

▲ **Note that the metallic filter frame and the filters will be very hot if you leave the filters inserted for a long time while the mercury burner is on. Be careful when switching the filter slider or inserting or removing the ND filters.**

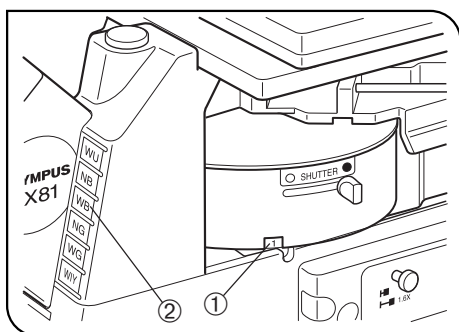


Fig. 5

9 Switching the Turret of the Mirror Unit Cassette

(Figs. 5 & 6)

IX2-RFACA Motorized Fluorescence Mirror Unit Cassette

1. Check the mirror unit indication ① to identify the number of the mirror unit being engaged in the light path.

⊙ If mirror unit indication plates are inserted in the indication plate pockets ② of the microscope frame, the mirror unit names can be confirmed by checking the pockets.

2. Manipulate the hand switch or PC to engage the required mirror unit in the light path.

IX2-RFAC Fluorescence Mirror Cassette

1. Look at the mirror unit indication ① from the direction indicated by the arrow or the indication on the side of the turret ② to identify the number of the mirror unit being engaged in the light path.

⊙ If mirror unit indication plates are inserted in the indication plate pockets ③ of the microscope frame, the mirror unit name can be confirmed by checking the pockets.

2. Rotate the turret ④ to a click position so that the number of the required mirror unit can be seen in indication ① or ②.

⊙ Rotating the turret in the "+" direction switches the mirror units in order of "1 → 2 → 3 → 4 → 5 → 6 → 1", and rotating it in the "-" direction switches them in order of "1 → 6 → 5 → 4 → 3 → 2 → 1".

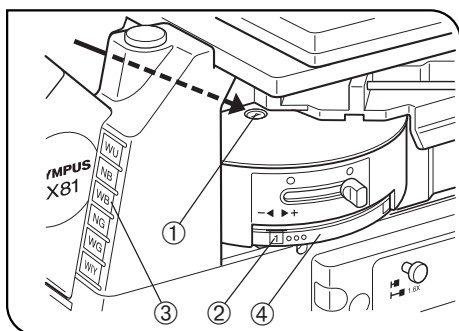


Fig. 6

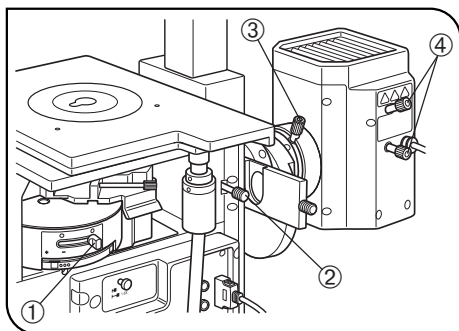
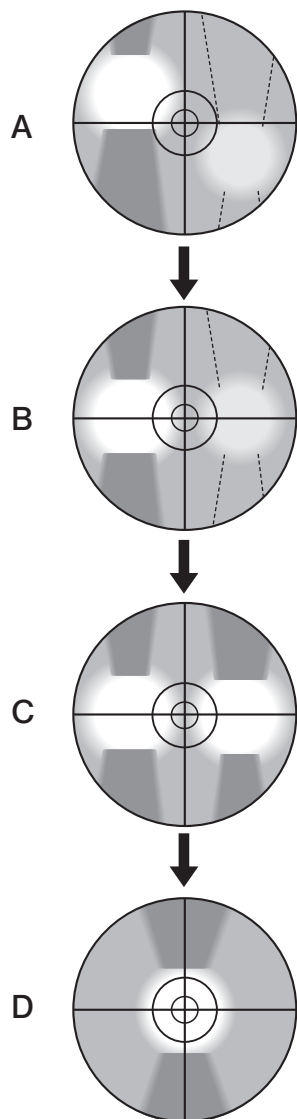


Fig. 7



10 Centering the Mercury Burner

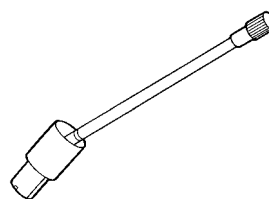
(Figs. 7 & 8)

⊙ Set the main switch to "I" (ON) and wait for 5 to 10 minutes until the arc image stabilizes before proceeding to the mercury burner centering. If the 32FR80 frost filter is used, disengage it from the light path.

1. Turn the shutter open/close knob ① till the position marked ● to engage the shutter in the light path.
2. Engage the B or IB excitation fluorescence mirror unit in the light path. (If these mirror units are not available, engage another fluorescence mirror unit in the light path. Also note that, when using a U-excitation fluorescence mirror unit, be always sure to observe the specimen image through a UV cut plate.)
3. Engage the 10X objective in the light path, place the U-CST centering target in the light path and adjust the centering of the center of crosslines and double circle of the U-CST with respect to the center of field of view.
4. Engage the empty position (the objective cap should be removed) in the light path.
5. Pull out the aperture iris diaphragm lever ② (to minimize the aperture).
6. Turn the open/close knob ① knob till the position marked ○ to release the shutter.
7. Turn the collector lens focusing knob ③ to project the arc image on the U-CST. (A)
If the arc image is not projected, adjust the burner centering knobs ④.
8. Turn the burner centering knobs ④ to bring the arc image on the center of the right (left) half of the field. (B)
9. Fit the Allen screwdriver in the mirror focusing screw (⑤ in Fig. 8) on the rear of the lamp housing and adjust it to bring the mirror arc image in focus. (C)
10. Turn the burner centering knobs ④ to overlay the arc image with the mirror arc image. (D)

⊙ During observation, adjust the collector lens focusing knob ③ so that the observed field is uniform.

If the collector lens focusing knob ③ is far from the hand and hard to be accessed, fit the U-CLA extension handle (optional) to the knob ③ and turn the knob by manipulating the handle.



⊙ Hereafter, the mercury burner centering need not be adjusted until the next time the mercury burner is replaced.

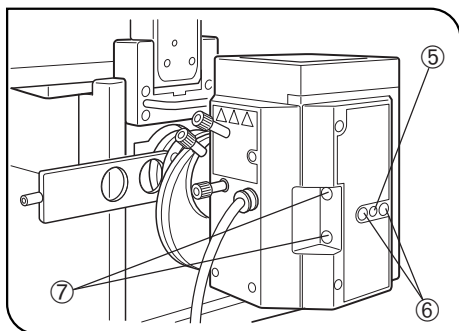


Fig. 8

Precise Centering of Mirror Arc Image

⊙ The mirror arc image position has been adjusted and fixed at the factory. Perform the centering of the mirror arc image after completing the centering of the mercury burner and only when you want to make your adjustments very strict and precise.

Note that, once this adjustment has been executed, the mirror can never be returned to the same status as the factory shipment status.

1. Using a pair of tweezers, etc., peel off the two blind seals ⑥ from the rear of the lamp housing.
2. Loosen the screws below the seals using the Allen screwdriver. The mirror is unclamped when these two screws are loosened.
3. Then peel off another couple of blind seals ⑦. This exposes the mirror arc image centering holes.
4. Fit the Allen screwdriver in these holes and adjust the centering of the mirror arc image.

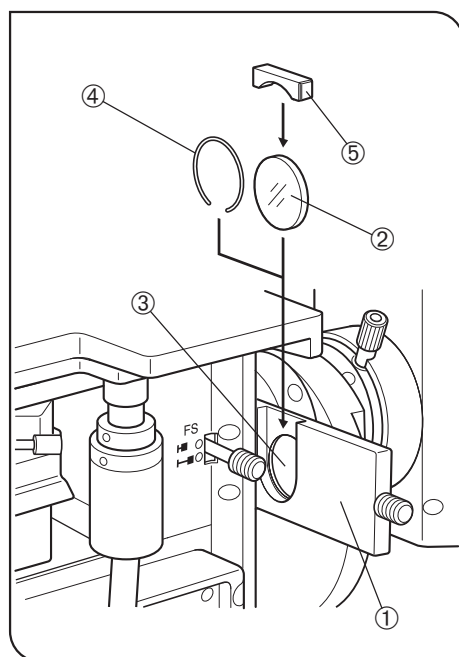


Fig. 9

11 Using the ND Filters

(Fig. 9)

⊙ Specimen color fading can be delayed by reducing the excitation light intensity with ND filters. Use the ND filters as far as they do not hinder observations.

1. Slide the filter slider ① of the reflected fluorescence illuminator into the direction of the arrow.

2. Put a filter ② in the filter pocket ③ and place the filter holder ring ④ above the filter so that the ring surface having a notch faces downwards.

⊙ If the filter is thick (5 mm or more), the ring ④ is not required because the filter will not be tilted.

3. Press the filter holder ring ④ toward the filter to prevent the filter from being tilted.

4. Fit the light leak prevention cap ⑤ into the top surface of the filter slider.

★ **Even when the filter is not set, insert the filter holder ring ④ and fit the light leak prevention cap ⑤ to prevent light leak.**

★ **Be sure to drop in the filters so that the surfaces with indications faces the observing side. Otherwise, the filters may be cracked.**

★ **Make sure that the filters are cool enough before proceeding to their replacement.**

⚠ **Note that the metallic filter frame will be very hot if you leave the filter(s) inserted for a long time while the mercury burner is on.**

Do not leave the filter insertion position in other position than the click positions for a long period of time.

⊙ Other filter than ND filters can also be inserted, provided that the filter has a diameter of 32 mm and thickness of no more than 6 mm.

★ **Use the reflectance ND filter (32ND6, 12, 25 or 50). Do not use a commercially available low-reflectance ND filter for it may be cracked or burned.**

- ◎ By properly combining equipment, this system can be used in transmitted light brightfield observation, transmitted light phase contrast observation and transmitted light DIC (Differential Interference Contrast) observation in addition to the reflected fluorescence observation. With specimens that fade rapidly, fading can be minimized by initially using transmitted light phase contrast or transmitted light DIC observation for positioning. Reflected fluorescence observation can also be executed simultaneously with phase contrast or DIC observation, making it easy to tell which portion of the specimen is fluorescing.
- ◎ The IX81 and IX71 have a lamp ON-OFF button. Use this button to switch combined observations to the fluorescence observation only.

1 Simultaneous Reflected Fluorescence and Phase Contrast Observations

- ◎ The phase contrast observation requires the IX2-LWUCDA2, IX2-LWUCD, IX-ULWCD, IX2-MLWCD or U-UCD8 condenser and a Ph objective.
 1. Engage a dummy mirror unit (an empty position) in the light path.
 2. Rotate the phase contrast turret to show the same number as the Ph number shown on the objective.
 3. Adjust the optical axis between the ring slit and phase plate by centering them.
 4. Engage the mirror unit corresponding to the desired excitation in the light path and release the shutter.
 5. Adjust the transmitted light for the best balance of fluorescence and phase contrast brightness.
- ◎ Use ND filters or green filter in combination to adjust the transmitted light intensity. This can also be adjusted with the light intensity control of the microscope frame.
Remember that the service life of a halogen bulb tends to decrease when the bulb is kept on continuously at a low voltage when it is to be turned off, so be careful.

2 Simultaneous Reflected Fluorescence and DIC (Transmitted Light) Observations

- ◎ The DIC observation requires the following modules.
 - Condenser (IX2-LWUCDA2, IX2-LWUCD, IX2-DICD, IX2-MLWCD or U-UCD8)
 - DIC slider (U-DICT, U-DICTS, U-DICTHC or U-DICTHR)
 - Analyzer (U-ANT or IX2-AN)
- ★ **In order for reflected fluorescence to be effective in the simultaneous observation, insert the IX2-AN analyzer into the analyzer insertion slot below the dichroic mirror.**
Do not insert the U-ANT analyzer in the DIC slider, for this will dim the fluorescence observation imaged and cause the analyzer to be burnt.
 1. Engage the dummy mirror unit (on an empty position) in the light path.
 2. Adjust the polarizer on the DIC condenser to the "Crossed Nicol" (complete extinction) position.
 3. Insert the DIC slider into the position provided on the revolving nosepiece.
 4. Rotate the turret on the condenser to select the Nomarski prism matching the objective to be used for observation.
 5. Engage the objective to be used in the light path.
 6. Place the specimen on the stage and focus on the specimen.
 7. Adjust the field iris diaphragm and aperture iris diaphragm.
 8. Turn the prism movement knob on the DIC slider to adjust contrast of the DIC image.
 9. Engage the mirror unit corresponding to the desired excitation and release the shutter.
 10. Adjust the transmitted light for optimum fluorescence and DIC image brightness.

3 Convenient Modules

DIC mirror unit IX2-MDICT

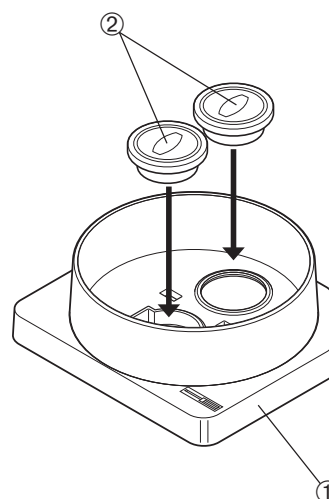
◎ If you are frequently switching between reflected fluorescence observation and DIC observation but you do not need to use both simultaneously, it will be more convenient for you to use the IX2-MDICT DIC mirror unit instead of the IX2-AN analyzer. This facilitates the switching operation because the analyzer simultaneously enters the light path when the fluorescence mirror unit is switched to the DIC mirror unit.

Reflected Fluorescence Dummy

◎ The reflected fluorescence dummy attached to the IX81/IX71/IX51 microscope can be used as the specimen cover for preventing glare in reflected light fluorescence observation.

How to Use the Dummy as Specimen Cover

- Insert the eyepiece caps ② into the through-holes on the reflected fluorescence dummy ① to stop the holes. One of the two holes actually does not play the role of light shielding, but it should also be filled in order not to lose the pair of eyepiece caps.
- Holding the reflected fluorescence dummy upside down, put the dummy on the specimen on the stage. (The dummy can be used as a specimen cover provided that the specimen and its container has a diameter of up to 100 mm and height of up to 25 mm.)



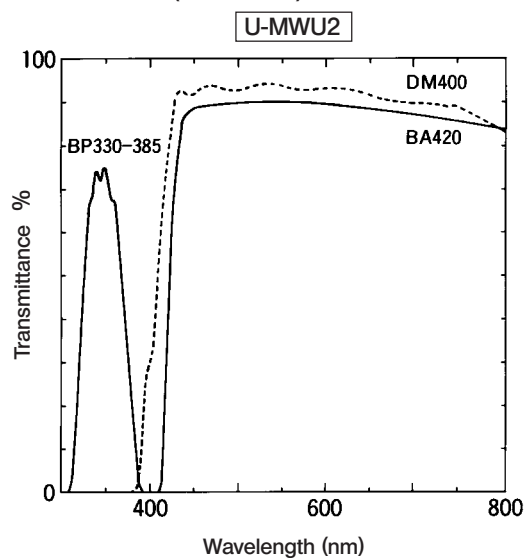
6 TROUBLESHOOTING GUIDE

Under certain conditions, performance of the system may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as needed. If you cannot solve the problem after checking the entire list, please contact your local Olympus representative for assistance.

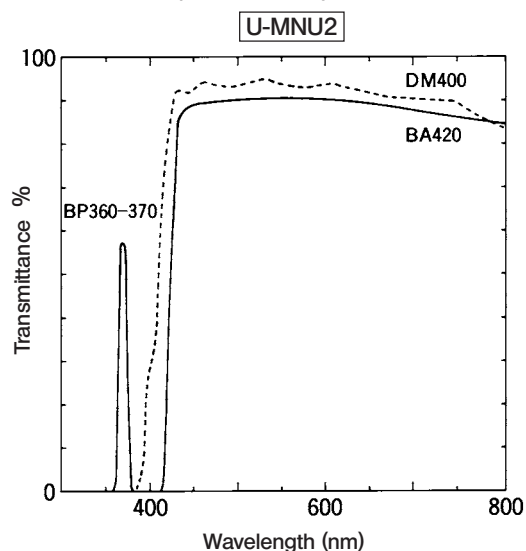
Problem	Cause	Remedy	Page
1. Optical System			
a) The burner lights, but field of view is not visible through the eyepieces or is dark.	The manual or motorized shutter or the shutter of the filter slider is engaged in the light path.	Release the shutter.	14/16
	ND filter is engaged in the light path.	Disengage the ND filter as required.	18
	Fluorescence mirror unit is not properly engaged in the light path.	Engage the fluorescence mirror unit correctly.	16
	Aperture iris diaphragm (IX2-RFAL only) and field iris diaphragm are not enlarged enough.	Fully open the aperture iris diaphragm and enlarge the iris field diaphragm until its image circumscribes the field of view.	14/15
	Fluorescence mirror unit in use does not match the specimen.	Use fluorescence mirror unit matching the specimen.	11/12
b) Observed image is low quality, not sharp or poor in contrast.	Dirt/dust on objective or filter.	Clean thoroughly.	2
	Aperture iris diaphragm (IX2-RFAL only) and field iris diaphragm are not enlarged optimally.	Fully open the aperture iris diaphragm and enlarge the iris field diaphragm until its image circumscribes the field of view.	14/15
	Fluorescence mirror unit in use does not match the specimen.	Use fluorescence mirror unit matching the specimen.	11/12
c) Field of view is obscured or not evenly illuminated.	Objective is not correctly engaged in the light path.	Make sure that the revolving nosepiece clicks correctly into place.	–
	Fluorescence mirror unit is not properly engaged in the light path.	Engage the fluorescence mirror unit correctly.	16
	Field iris diaphragm is set too small.	Enlarge field iris diaphragm enough.	14
	ND slider is not stopped at a click position.	Make sure that the ND slider clicks properly into place.	18
	Shutter is stopped at an intermediate position.	Make sure that the shutter is released completely.	14/16
	Mercury burner is not centered or focusing is defective.	Center the mercury burner or perform focusing adjustment.	17
d) Field contains dark, spot-like areas.	Dirt or dust on the burner or on the burner side of collector lens.	Clean them.	2
2. Electrical System			
a) Main switch cannot turn the system ON.	Power cord is not connected properly.	Connect firmly.	–
b) Even when the main switch is set to "I" (ON), the mercury burner does not light.	Connectors are not connected properly.	Connect firmly.	–
	Mercury burner is not attached.	Attach a mercury burner.	33
	Safety device in lamp housing is active.	Set up the lamp socket correctly.	13
	Auto ignition is malfunctioning.	Set the main switch of the power supply unit to "O" (OFF) and "I" (ON) again. (ON/OFF can be repeated.)	13

Problem	Cause	Remedy	Page
c) Mercury burner flickers or is dark.	It is soon after ignition.	Wait for 10 minutes or more after ignition.	13
	Burner life has expired.	If the hour counter indicates 300 hours (USH-103OL, HBO103W/2), replace the mercury burner.	33
	Burner is deviated from the optical axis.	Center the mercury burner.	17
d) Motorized controls do not work.	Connectors are not correctly connected.	Connect firmly.	–
e) Hand switch or PC indicates that the shutter is released, but light is not incident or image is dark.	Shutter is moved due to external vibrations.	Try perform shutter operation again.	34
f) Turret will not rotate (or stops in the middle of movement).	Fluorescence mirror unit is slipping out of the turret.	Remove the turret and place the fluorescence mirror unit in correct position securely.	30

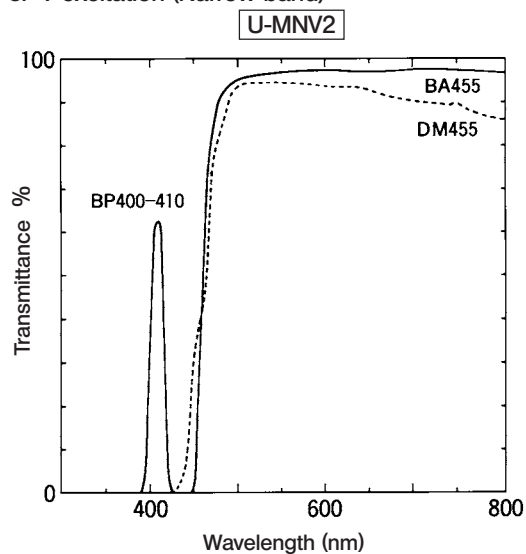
1. U-excitation (Wide band)



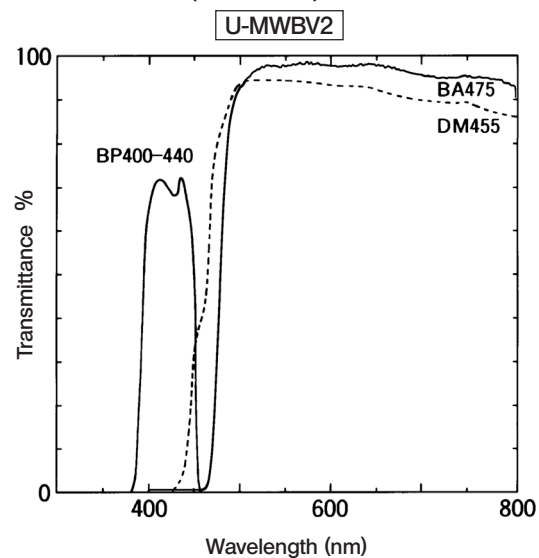
2. U-excitation (Narrow band)



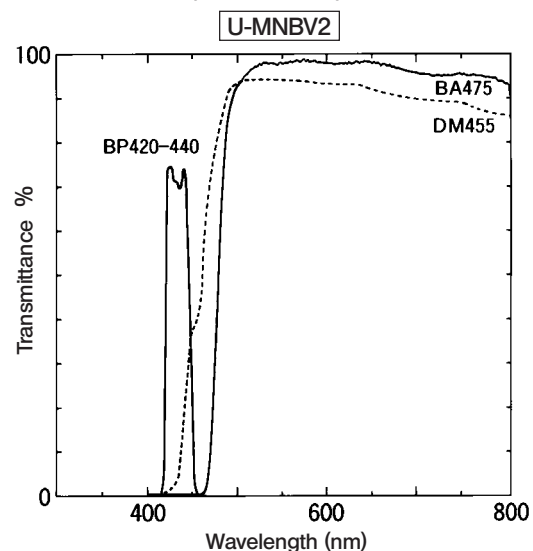
3. V-excitation (Narrow band)



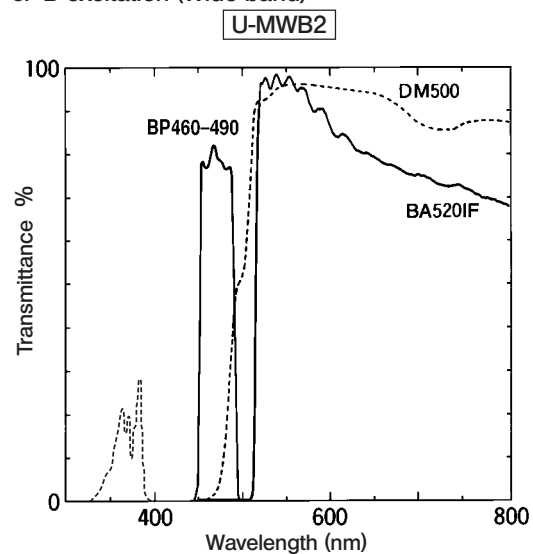
4. BV-excitation (Wide band)



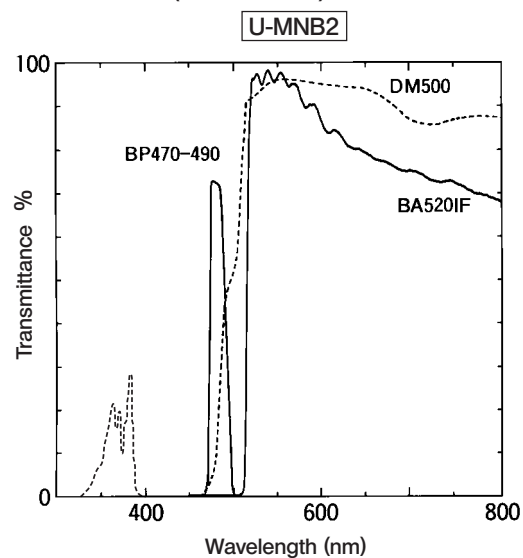
5. BV-excitation (Narrow band)



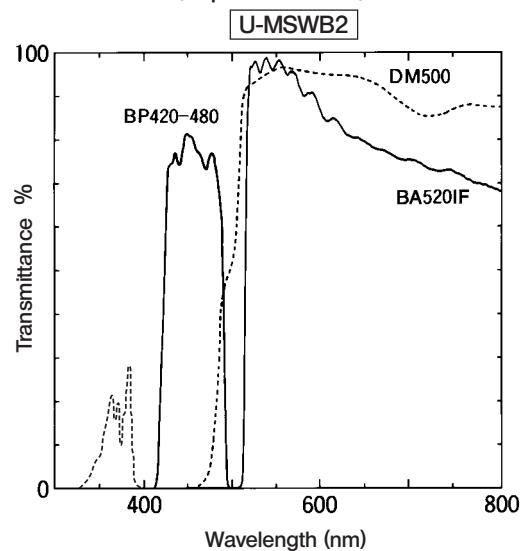
6. B-excitation (Wide band)



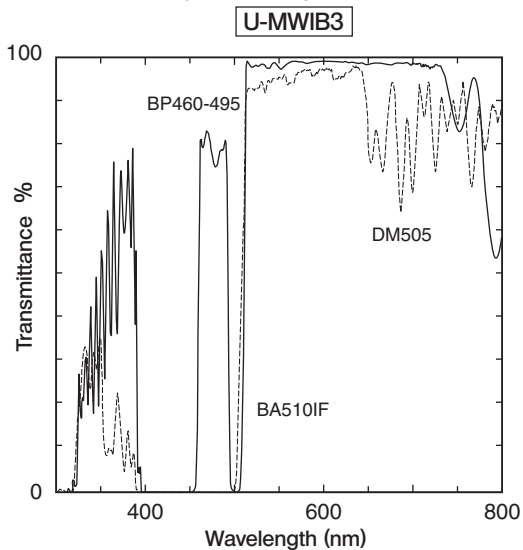
7. B-excitation (Narrow band)



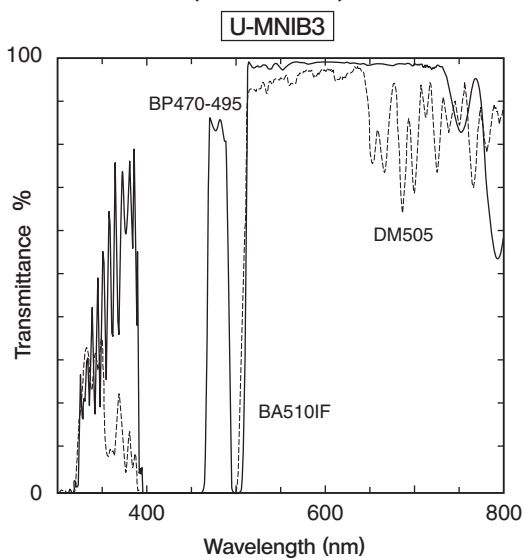
8. B-excitation (Superwide band)



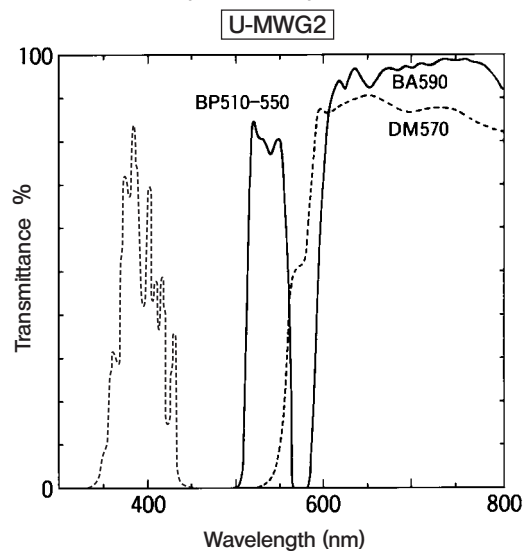
9. IB-excitation (Wide band)



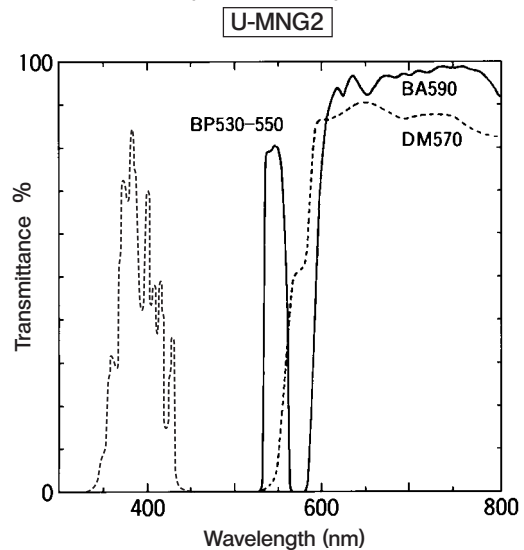
10. IB-excitation (Narrow band)



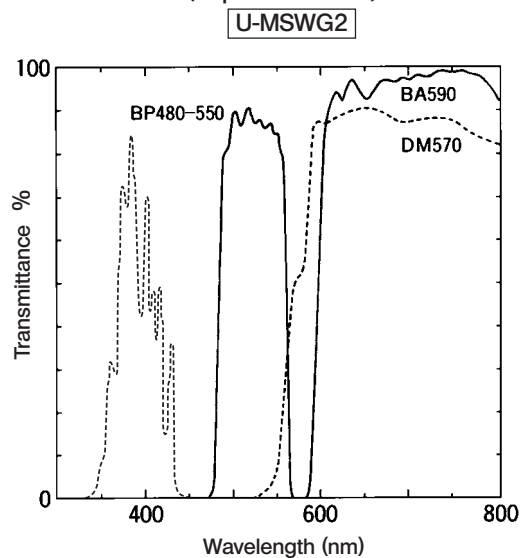
11. G-excitation (Wide band)



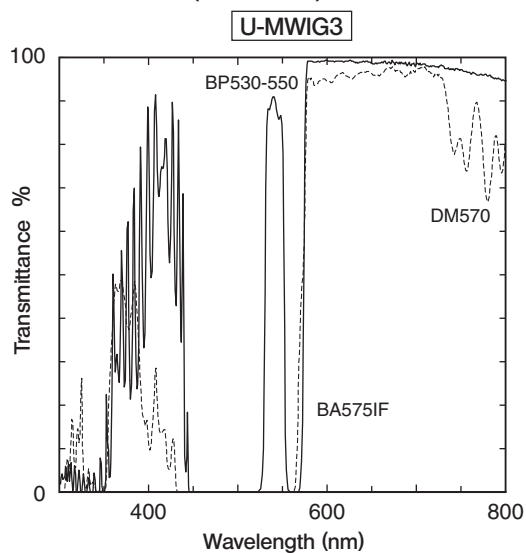
12. G-excitation (Narrow band)



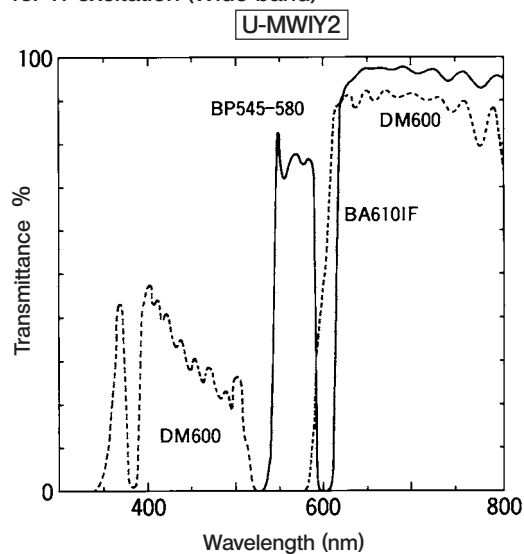
13. G-excitation (Superwide band)



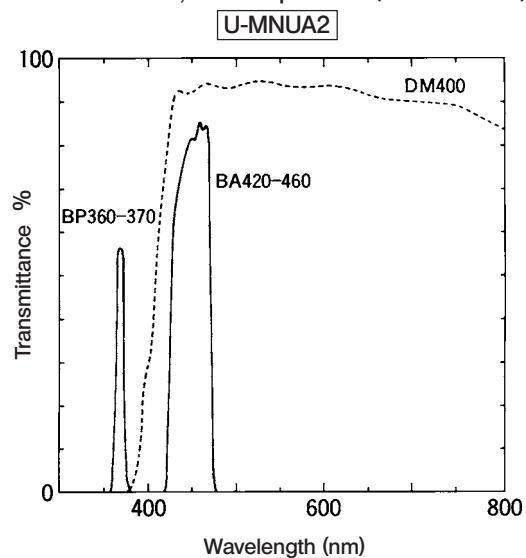
14. IG-excitation (Wide band)



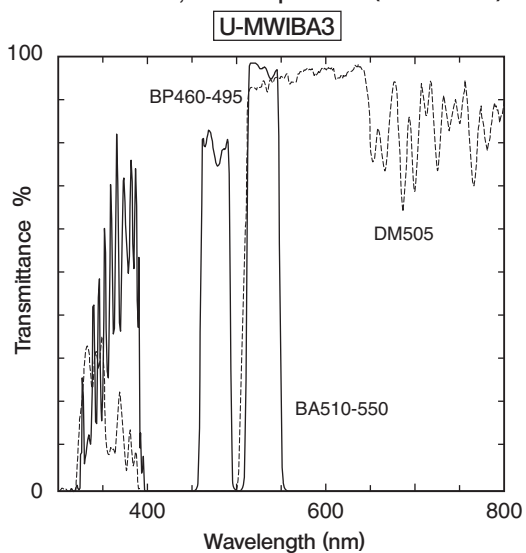
15. IY-excitation (Wide band)



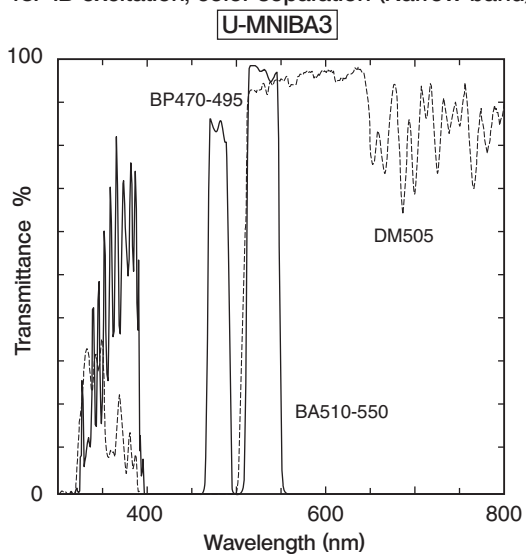
16. U-excitation, color separation (Narrow band)



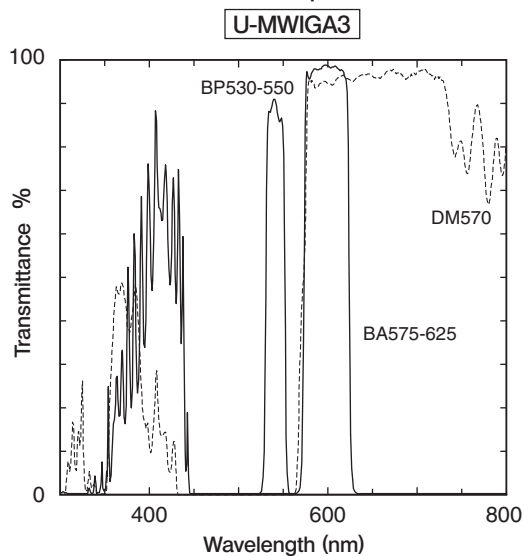
17. IB-excitation, color separation (Wide band)



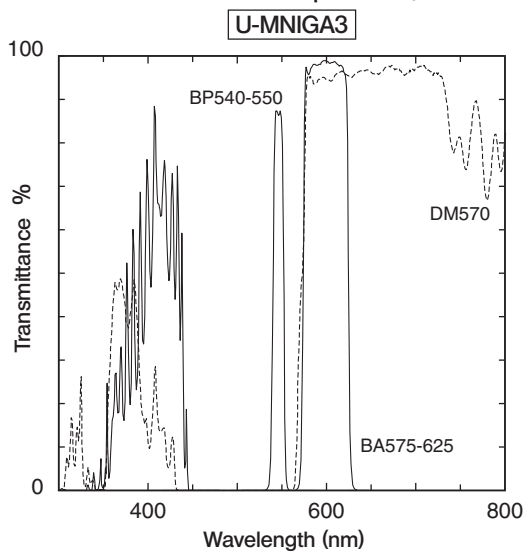
18. IB-excitation, color separation (Narrow band)



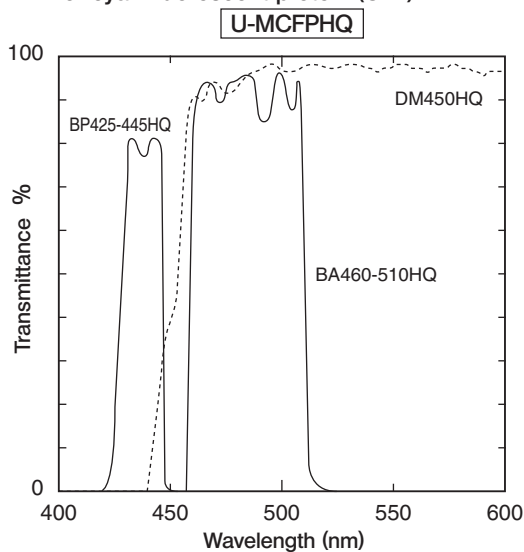
19. G-excitation for color separation (Wide band)



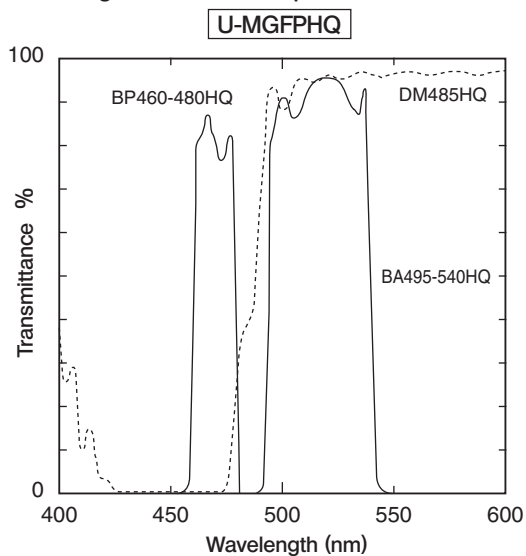
20. G-excitation for color separation (Narrow band)



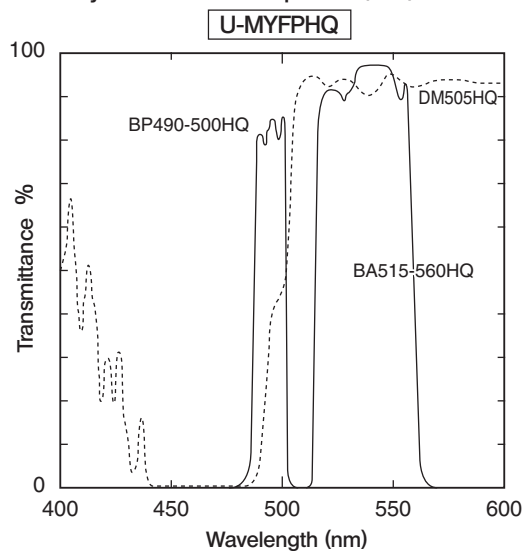
21. For cyan fluorescent protein (CFP)



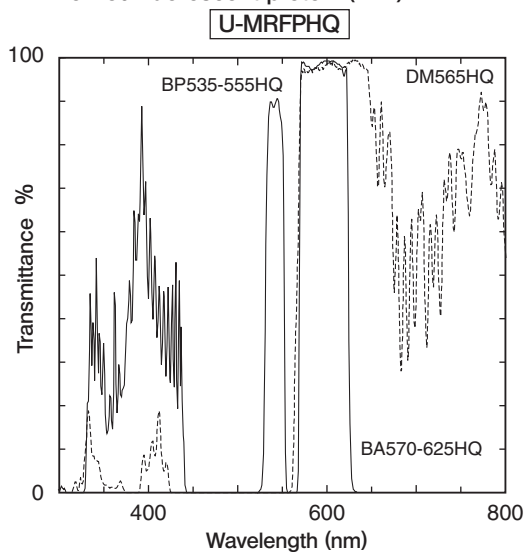
22. For green fluorescent protein (GFP)



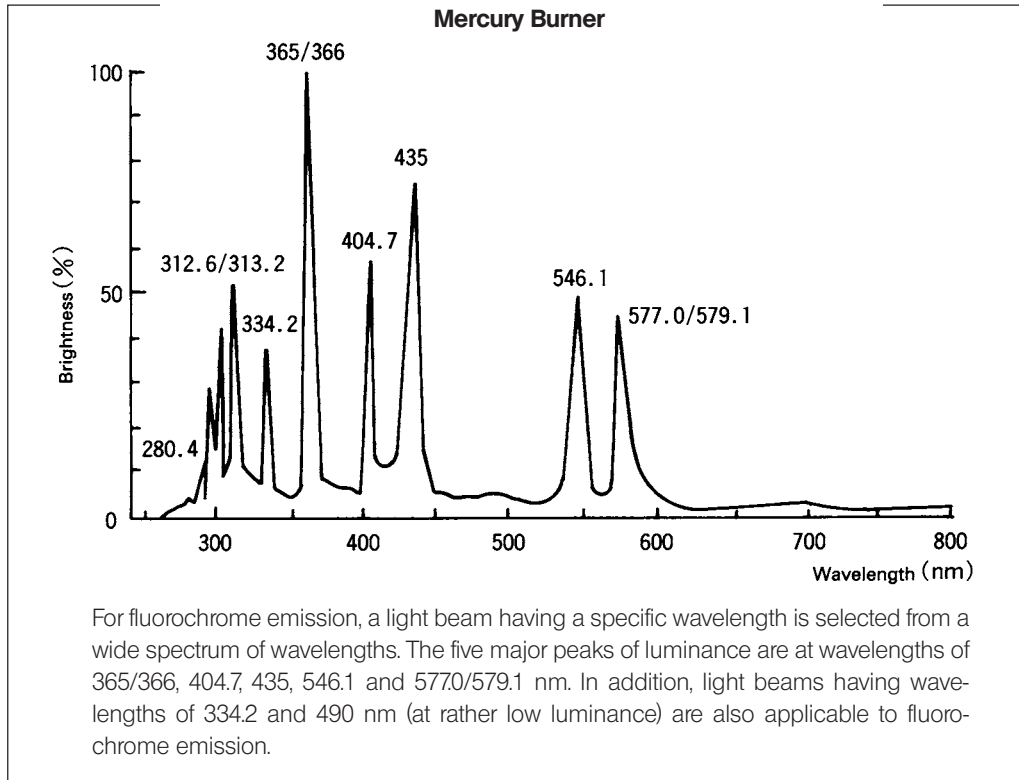
23. For yellow fluorescent protein (YFP)



24. For red fluorescent protein (RFP)



**Typical Example of Emission Spectrum of Ultrahigh-Vacuum
Mercury Burner**



8 SPECIFICATIONS

Item	Specification
Reflected Light Illuminator IX2-RFA L-Shaped Reflected Light Illuminator IX2-RFAL Motorized Fluorescence Mirror Unit IX2-RFACA Fluorescence Mirror Unit Cassette IX2-RFAC	- UIS2/UIS (Universal Infinity System) optics - Illuminator magnification: 1X (widefield compatible, FN 22) - IX2-RFA : With field iris diaphragm (centering possible) - IX2-RFAL : With field iris diaphragm and aperture iris diaphragm (centering possible), detachable - Mirror unit switching - IX2-RFACA : Mirror unit with motorized turret (Switching speed: Approx. 1 sec.) - IX2-RFAC : Mirror unit with manual turret - Manual shutter (on the right panel of the mirror unit) - Motorized shutter IX2-SHA (Switching speed: 0.4 sec.) - Available observations ①Reflected fluorescence ②Reflected fluorescence + Transmitted light DIC ③Reflected fluorescence + Phase contrast ④Transmitted light - Applicable microscope frames: IX2 series - Other convenient optional modules ①Extension handle U-CLA ②Transmitted light DIC module IX2-MDICT ③Reflected light motorized filter wheel U-FWR
Mercury Lamp Housing	100 W mercury lamp housing U-LH100HG 100 W mercury apo lamp housing U-LH100HGAP0 - Mercury burner: USH-103OL (OLYMPUS) or HBO103W/2 (OSRAM) - Power supply unit U-RFLT
Operating environment	- Indoor use. - Altitude: Max. 2000 m - Ambient temperature: 5° to 40°C (41° to 104° F) - Maximum relative humidity: 80% for temperatures up to 31°C (88°F), decreasing linearly through 70% at 34°C (93°F), 60% at 37°C (99°F), to 50% relative humidity at 40°C (104°F). - Supply voltage fluctuations; Not to exceed $\pm 10\%$ of the normal voltage. - Pollution degree: 2 (in accordance with IEC60664) - Installation/Overvoltage category: II (in accordance with IEC60664)

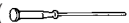
9 ASSEMBLY

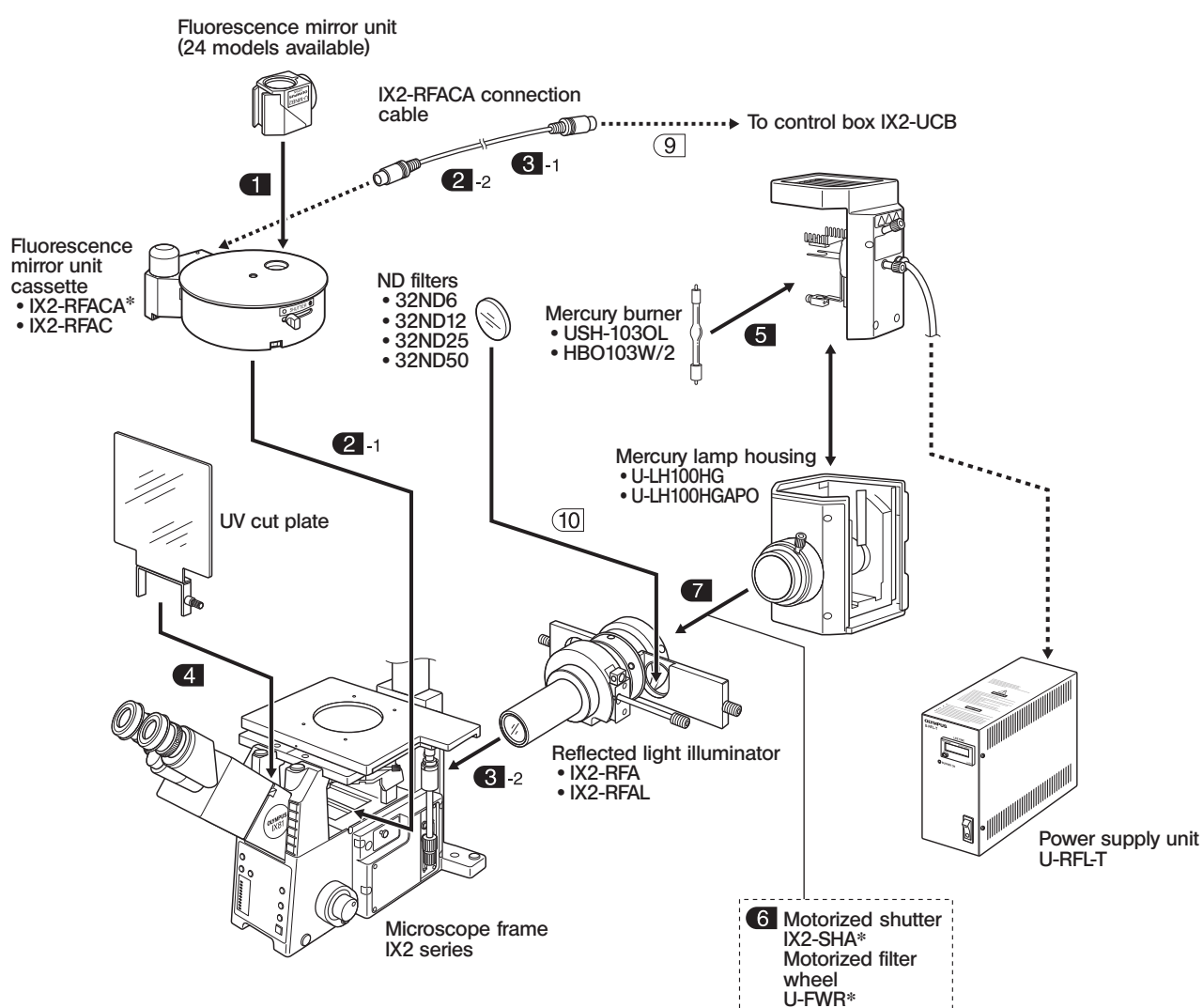
9-1 Assembly Diagram

The diagram below shows the sequence of assembly of the various modules. The numbers indicate the order of assembly. The module model numbers shown in the following diagram are merely the typical examples. For the modules with which the model numbers are not given, please consult your Olympus representative or the latest catalogues.

★ When assembling the microscope, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.

Assembly steps enclosed in ■ will be detailed on the subsequent pages.

◎ Assembly operations are possible by using the Allen screwdriver () provided with the microscope and the Allen wrench () provided with the reflected light illuminator.



Modules marked * requires the IX2-UCB control box, U-HSTR2 hand switch, a PC and IX2-BSW software for their motorized control.

9-2 Detailed Assembly Procedures

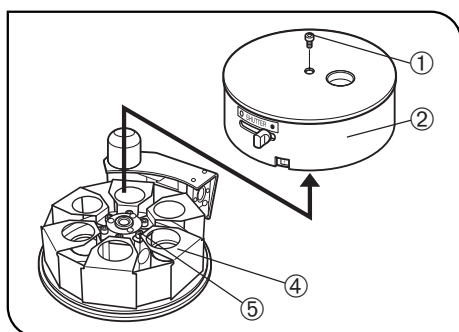


Fig. 10

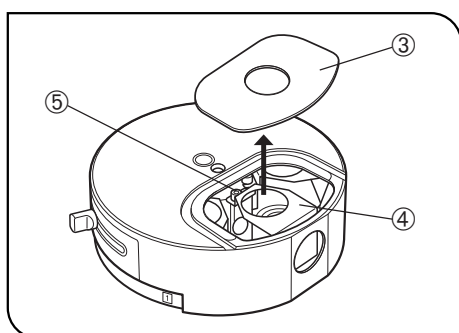


Fig. 11

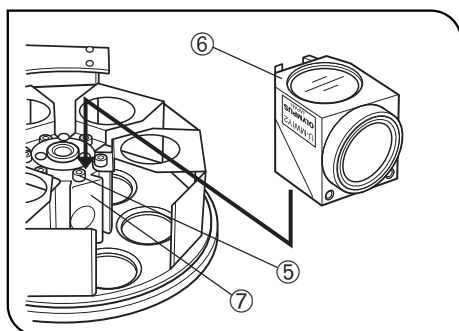


Fig. 12

1 Attaching the Fluorescence Mirror Units (Figs. 10 to 12)

Ⓒ Select a suitable fluorescence mirror unit for observation by reading item **2** on pages 11 and 12.

1. Remove the mirror unit replacement cover.

IX2-RFACA Fluorescence Mirror Unit Cassette

- Loosen and remove the clamping screw ① of the mirror unit cassette using the Allen screwdriver.
- Lift the cover ② to remove.

IX2-RFAC Fluorescence Mirror Unit Cassette

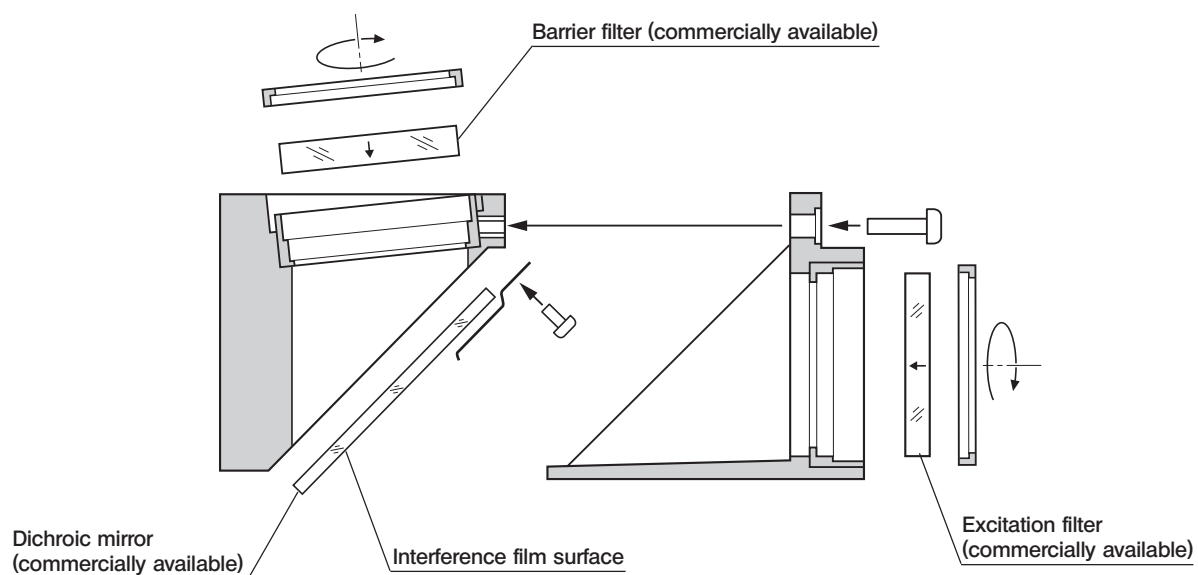
- Remove the magnet ③ that is attached by magnetic absorption.
- ★ If you plant to replace mirror units after attaching the fluorescence mirror unit, make sure not to touch the dichroic mirror and excitation filter with your hand.
2. Dummy mirror units ④ are attached to the mirror unit positions. Remove the dummy units from the positions you want to attach fluorescence mirror units by loosening the clamping screw ⑤ of each dummy mirror unit and moving it outward.
3. Insert a fluorescence mirror unit into the mount dovetail ⑦ so that the model indication of the mirror unit ⑥ is upside down, push it all the way in and tighten the clamping screw ⑤ firmly.
4. Insert all of the required fluorescence mirror units. Be sure to leave dummy mirror units in the positions where fluorescence mirror units are not attached.
- ★ If a clamping screw ⑤ is loose, the turret will be unable to be rotated due to interference of the screw with the turret cover. To prevent this, tighten all the clamping screws ⑤ firmly now.
5. Insert the mirror unit indication plates into the indication plates of the microscope frame so that each indication matches the turret position number with which the corresponding fluorescence mirror unit is engaged in the light path.
- Ⓒ This step is not required if you plant to insert other indication plates. As the IX2-RFAC is provided with beads in three colors, they can be attached according to the excitation colors to enable visual identification at a glance.
- 6 Attach the cover ② or ③ to the original position.

Fabricating an Optional Mirror Unit

© You can also fabricate optional mirror units by fitting a commercially available barrier filter, excitation filter or dichroic mirror to the U-MF2.

Dimensions of Optical Parts

- Barrier filter
 - Excitation filter
 - Dichroic mirror :
- Diameter $25^{+0.1/-0.2}$ mm, max. thickness 6 mm
- $26^{+0.1/-0.3}$ mm x $38^{+0.1/-0.2}$ mm, thickness 1 ± 0.05 mm



★ When replacing the dichroic mirror, take special care not to stain it by leaving fingerprints, etc.

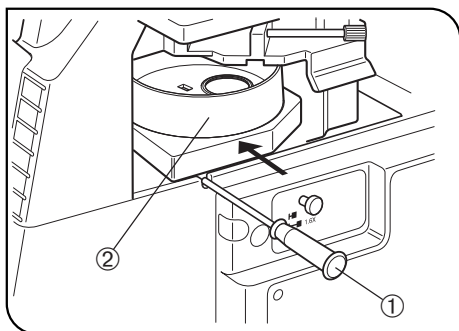


Fig. 13

2 Attaching the Fluorescence Mirror Unit Cassette (Fig. 13)

▲When you want to remove the cassette in the middle of operation, be sure to engage the shutter of the filter slider of the reflected light illuminator in advance.

If the cassette in use is the motorized fluorescence mirror unit cassette, also be sure to set the main switch of the IX2-UCB to “O” (OFF) and unplug the connection cable in advance.

1. Loosen the clamping screw of the cassette mount dovetail on the microscope frame using the Allen screwdriver ①, then push out the cassette dummy ② in the direction of the arrow.
2. Align the mount dovetail on the bottom of the cassette with the cassette mount dovetail on the microscope and push in the cassette all the way until it is stopped.
3. Tighten the clamping screw.
4. When the IX2-RFACA is used, plug the connector of the connection cable.

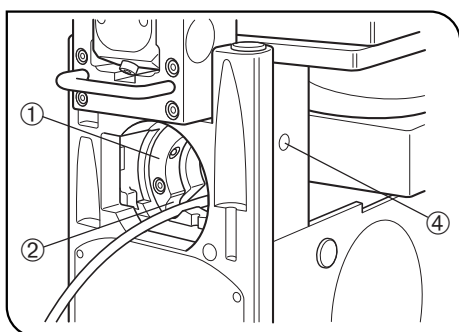


Fig. 14

3 Attaching the Reflected Light Illuminator (Figs. 14 & 15)

◎When using the IX2-RFACA, pass the connection cable through the cable groove ② on the reflected light illuminator mount hole ① before proceeding to the following.

◎When using the IX2-RFAL, following steps 1 and 5 are not required. Simply adjust the horizontality of the illuminator by turning the adjuster near the bottom of the support.

1. Push in the field iris diaphragm lever ③ then turn the lever counterclockwise to remove it.
2. Loosen the two illuminator clamping screws ④ using the Allen wrench provided with the illuminator.
3. Insert the illuminator ⑤ into the mount hole ① by aligning the pin at the bottom of the illuminator with the groove on the mount hole.
4. Tighten the two illuminator clamping screws ④.
5. Screw in the field iris diaphragm lever ③ into the illuminator by passing through the hole ⑥ on the microscope frame.

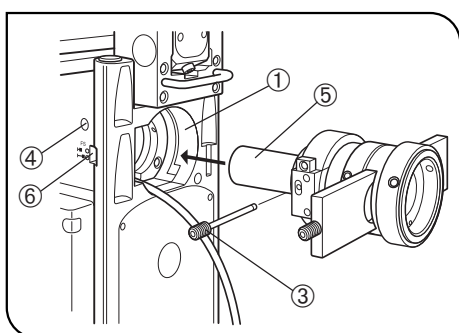


Fig. 15

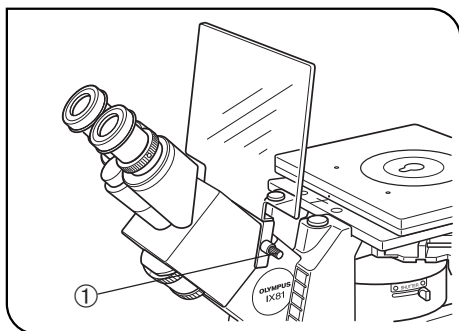


Fig. 16

4 Attaching the UV Cut Plate

(Fig. 16)

1. Turn and loosen the clamping knob ① of the UV cut plate.
2. Fit the UV cut plate into the observation tube support on the microscope frame as shown in the figure.
3. Turn and tighten the clamping knob.

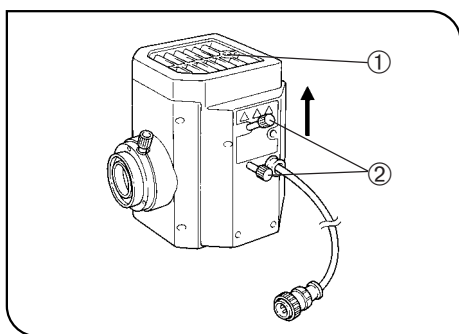


Fig. 17

5 Attaching the Mercury Burner

(Figs. 17 & 18)

1. Loosen the socket clamping screw ① using the Allen screwdriver.
2. Hold the upper section of lamp housing and pull it upward to remove the socket section.

★ **To prevent malfunction, do not hold the lamp housing by the centering knobs ②.**

3. Place the socket section upside down as shown in Fig. 18.

◎ The lamp housing is equipped with the holder for transportation in the factory shipment condition or with an old burner when the burner is replaced. Remove the holder or old burner by loosening the two burner holding screws ③.

4. Attach the + (positive) pole of a specified mercury burner ④ to the fixed mount on the upper side, then the – (negative) pole to the mount on the lower side.

★ **Be sure to use the USH-103OL (OLYMPUS) or HBO103W/2 (OSRAM) mercury burner.**

★ **Be careful and avoid leaving fingerprints or contaminants on the mercury burner. Otherwise, there is a danger of explosion due to distortion of glass caused by the stains. If the burner is contaminated, clean it by wiping gently with gauze slightly moistened with absolute alcohol.**

5. Attach the socket section with burner to the original position and tighten the socket clamping screw ①.

★ **Align the external edges of the lamp housing with those on the socket section, and push the lamp housing straight downward.**

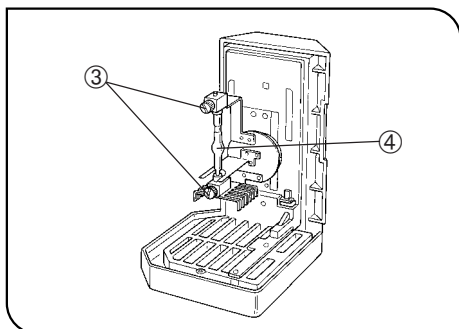


Fig. 18

Burner Service Life

USH-103OL: 300 hours

◎ This value assumes light cycles composed of 2 hours of lighting and 30 minutes of extinction. Do not turn it on and off at a shorter cycle than the above, for this will shorten the service life of the burner.

▲ **After replacing the burner, reset the hour counter to “0.0” as outlined above.**

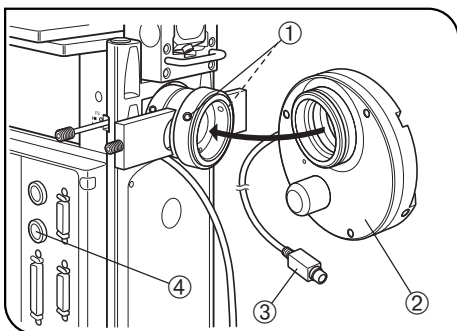


Fig. 19

6 Attaching the Motorized Shutter

(Fig. 19)

⊙ When also using the U-FWR filter wheel, attach modules in order from the reflected light illuminator — IX2-SHA motorized shutter — U-FWR filter wheel — lamp housing.

1. Loosen the two clamping screws of the lamp housing mount hole ① using the Allen screwdriver.
2. Insert the motorized shutter ② all the way as shown in the figure, and tighten the two clamping screws ①.
3. Plug the cable ③ into the lower connector ④ on the microscope frame.

⊙ When attaching the lamp housing after the motorized shutter, use the lower two clamping screws to clamp the lamp housing.

★ If the shutter position is deviated due to vibrations during transport, etc., simply setting the main switch to “O” (OFF) then “I” (ON) again corrects the shutter position.

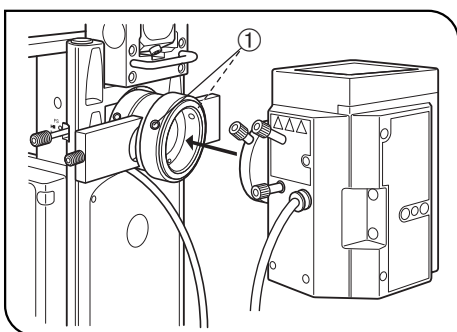


Fig. 20

7 Attaching the Lamp Housing

(Fig. 20)

1. Loosen the two setscrews of the lamp housing mount hole ① using the Allen screwdriver.
2. Insert the lamp housing all the way as shown in the figure.
3. Tighten the two setscrews ①.

★ The surroundings of the lamp housing will become very hot during operation. When installing the microscope system, reserve enough spaces around, particularly above the lamp housing. Also be careful not to attach the lamp housing in a tilted position.

■ PROPER SELECTION OF THE POWER SUPPLY CORD

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to “Specifications” and “Certified Cord” below:

CAUTION: In case you use a non-approved power supply cord for Olympus products, Olympus can no longer warrant the electrical safety of the equipment.

Specifications

Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60°C minimum
Length	3.05 m maximum
Fittings Configuration	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.

Table 1 Certified Cord

A power supply cord should be certified by one of the agencies listed in Table 1, or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1. In case you are unable to buy locally in your country the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.

Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET, JQA, TÜV, UL-APEX / MITI	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA BSI	
Germany	VDE		USA	UL	
Ireland	NSAI				

Table 2 HAR Flexible Cord

APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or Embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)		Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC	⟨HAR⟩	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	⟨VDE⟩	⟨HAR⟩	30	10	10
Union Technique de l'Electricite' (UTE)	USE	⟨HAR⟩	30	10	30
Instituto Italiano del Marchio di Qualita' (IMQ)	IEMMEQU	⟨HAR⟩	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	⟨HAR⟩	10	10	30
N.V. KEMA	KEMA-KEUR	⟨HAR⟩	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO	⟨HAR⟩	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	⟨ÖVE⟩	⟨HAR⟩	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	⟨DEMKO⟩	⟨HAR⟩	30	10	30
National Standards Authority of Ireland (NSAI)	⟨NSAI⟩	⟨HAR⟩	30	30	50
Norges Elektriske Materielkontroll (NEMKO)	NEMKO	⟨HAR⟩	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	⟨UNED⟩	⟨HAR⟩	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	⟨HAR⟩	30	30	70
Instituto Portages da Qualidade (IPQ)	np	⟨HAR⟩	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	⟨HAR⟩	10	30	90
Elektriska Inspektoratet	SETI	⟨HAR⟩	10	30	90

Underwriters Laboratories Inc. (UL)
Canadian Standards Association (CSA)

SV, SVT, SJ or SJT, 3 X 18AWG
SV, SVT, SJ or SJT, 3 X 18AWG

This device complies with the requirements of both directive 89/336/EEC concerning electromagnetic compatibility and directive 73/23/EEC concerning low voltage. The CE marking indicates compliance with the above directives.

10 LAMP HOUSING INSPECTION SHEET

- Study the instruction manual for the lamp housing before inspection.
- For safe use of the lamp housing, we recommend performing the following inspection periodically (every time you replace the lamp bulb and at least every 6 months).
- The table below identifies the check items to be observed. Put (X) if not applicable or (✓) if applicable.
- If there is any (X) mark noted, immediately stop use of the product, and contact Olympus for detailed inspections or replace the lamp housing.
- If you detect an abnormality other than that listed below or with other Olympus product, also stop the use of the product and contact Olympus for detailed inspections.
- Note that the service, replacement and detailed inspections are charged after expiration of the warranty period.

If you have any questions, please contact Olympus.

Check items	Check results (Date)			
	/	/	/	/
1. More than 8 years have passed since original purchase or the total power ON time has exceeded 20,000 hours.				
2. Illumination flickers when you move the lamp cable or lamp housing.				
3. Lamp cable is unusually hot to the touch.				
4. Scorching or burning odor is produced during use.				
5. Deformation, backlash, or looseness, etc. when you assemble the lamp housing. (Impossibility of removing the top section of lamp housing when you attempt to replace the lamp bulb, etc.)				
6. Discoloration, deformation or cracking of the lamp housing.				
7. Melting, crack, deformation or solidification of the lamp cable or a wiring part.				
8. Increased frequency of servicing compared to similar devices put into use at the same time as the lamp housing.				

* When the Check Result columns become insufficient, copy this sheet.

MEMO



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