

# **OLYMPUS<sup>®</sup>**

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## Service Manual

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# FLUOVIEW FVMPE-RS

Multi Photon Laser Scanning Microscope

**Notice**

Thank you for your purchase of Olympus microscope at this time.  
Retain this manual in an easily accessible place near a system for future reference.

**- Research use only -**

AX8343



## Important

This is a Service Manual for Multi Photon Laser Scanning Microscope FVMPE-RS in FLUOVIEW Series.

This manual is intended to be used by Olympus service personnel or technical personnel who are provided the service training from Olympus.

## Caution

This system is a CLASS 4 laser product.

The procedures for using this system are classified as follows:

- Operation

"Operation" means the operations of observation functions using the microscope described in the FVMPE-RS user's manual provided by Olympus.

CLASS 4 laser light is only emitted from the objective lens during the actual execution.

- Maintenance

"Maintenance" means the adjustment or other procedures performed by customers to maintain the proper operations of this system described in the FVMPE-RS User's Manual provided by Olympus.

- Service

"Service" means any adjustment or repair performed by Olympus service personnel or technical personnel who are provided the service training according to the service manual provided by Olympus.

The performance has influence on the feature of this system, and there is a risk that unintended CLASS 4 laser light is emitted.

In order to maintain the full performance of this system and ensure your safety, be sure to read this service manual, the FVMPE-RS user's manual, and the operating instructions for the laser unit and light source unit before use.

For this unit, other than the manuals and instructions above, there is also an on-screen manual ("Online Help") embedded in the software. For details of FV30S-SW and the touch panel controller, refer to Online Help.

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### 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 system may also be damaged. Always use the system as outlined in this instruction manual.

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

**CAUTION** : Indicates a potentially hazardous situation which, if not avoided, may result in minor or serious injuries such as blindness, etc., or damage to the equipment or other property. It may also be used to alert against unsafe practices.

© : Indicates commentary (for ease of operation and maintenance).

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# 1 Before starting service work

This system is a Class 4 laser product. These products may expose the human body to dangerous laser beams. Please be thoroughly informed about laser safety and observe the following precautions when working with these products. During the service work, be sure to avoid those other than service workers entering around the device. Before conducting the service work, be sure to perform the works described in "1-5 Confirmation when working with FVMPE-RS" and "3-3 Completing the observation with this system (Operation)" in [Operation/Maintenance] in FVMPE-RS User's Manual.

## 1-1 Laser classes and danger levels

Class	Description of danger level
Class 1	Lasers are safe when any kind of optical system is used.
Class 1M	Degree of danger is equal to that in Class 1 for naked-eye observation. However, observation through an optical device is dangerous.
Class 2	This class applies to visible-light lasers with wavelengths of 400 to 700 nm, and safety is ensured by the aversive reaction of eyes.
Class 2M	Degree of danger is equal to that in Class 2, but use of an optical device is dangerous.
Class 3R	Direct beam observation is potentially dangerous.
Class 3B	Direct beam observation is dangerous.
Class 4	The lights of lasers of this class, being able to cause diffused reflection that is deemed dangerous, pose the danger of causing fire as well as of damaging skin. All laser products that can cause an amount of laser light radiation exceeding the accessible emission limit for class 3B upon human bodies.

**CAUTION** This system is a Class 4 laser device. Not only direct and specular reflection laser beams but also diffuse reflection beams are dangerous.

- Only Olympus technical personnel are allowed to assemble and set up this system. When people who are not Olympus technical personnel did a change (disassembly and modification) of a device which is not mentioned in this service manual, problems such as system malfunction, breakage or an accident may occur. We will provide disassembly, relocation and other services for a fee.
- Keep the objectives away from anything that has a mirror surface.
- Keep the device away from any combustible gas or liquid to prevent fire.
- It is dangerous to remove the objectives, the nosepiece caps and/or nosepiece, as this causes irradiation of laser beams that are parallel, not diffused.
- This system uses an IR pulse laser, which has an element of danger to cause blindness if it enters the eye.
- This system generates laser beams with a near-infrared wavelength, which are invisible and dangerous.
- Total laser radiation emitted from this system are as follows:
  - MPE (Maximum Permissible Exposure) : 0.016 J/m<sup>2</sup> (for a single pulse)
  - 0.00005 J/m<sup>2</sup> (for a single pulse in the pulse train)
  - NOHD (Nominal Ocular Hazard Distance) : 50 cm in the vicinity of objective lens \*
  - Exposure duration : 3 X 10<sup>4</sup> sec

\* Hereafter, this area is called "Laser Hazard Area".

**CAUTION**

Main duties of the laser safety officer to manage lasers are as follows.

Planning and implementing measures for preventing damages due to laser light

Setting and managing laser controlled area

Managing key and so on which starts laser equipment

Inspecting and maintaining laser equipment, and preserving record of them

Inspecting and maintaining protection tool, and observing if it is being used properly

Conducting labor hygiene education and preserving record of it

Other items necessary for preventing damages due to laser light

- Service work is work that can affect the performance of the device and such work is described in this service manual.  
Only Olympus service personnel or technical personnel who are provided the service training by Olympus are allowed to do the service works according to the procedures described in this service manual.
- Doing service work by any other procedures than those given in this manual will result in exposure to dangerous laser radiation.
- During performing service work, do not allow others to enter the periphery of this system except service workers.



## 2 Service work

### 2-1 Work related to the microscope

**CAUTION** Confirm that the laser is not emitted, and then do the following work.

#### 1 Work related to the nosepiece

##### 1 Removing and mounting the nosepiece

###### I Removing the nosepiece

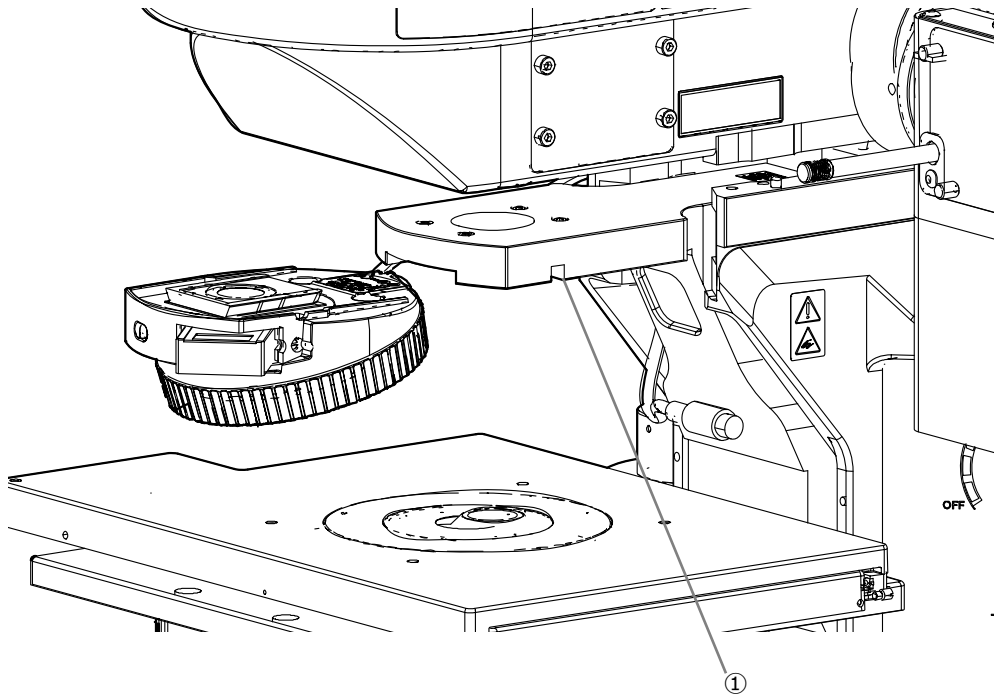
- 1) Remove the connector attached to the cable of the nosepiece from the connector secured to the left side of FV30-RFABXL with the binder.
- 2) With the motorized focusing knob of the controller (U-MCZ), move the stage apart from the objectives without hiding the nosepiece mounting screw ①.
- 3) Fully loosen the nosepiece mounting screw ① using the Allen screwdriver provided with the system.
- 4) Gently remove the nosepiece from the front side along the nosepiece mount dovetail.

###### II Mounting the nosepiece

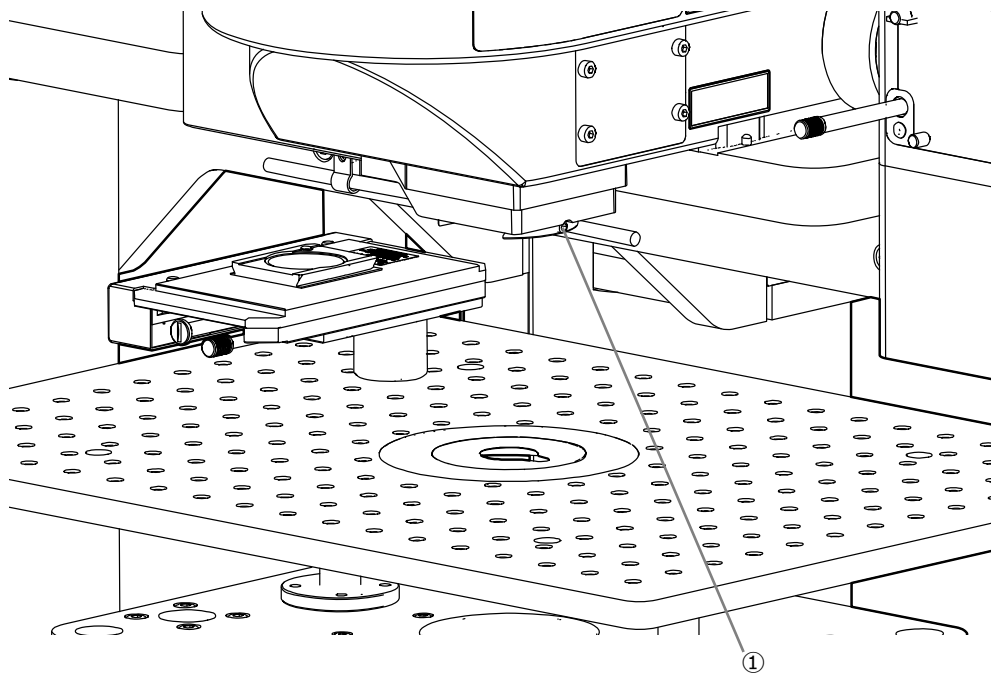
- 1) With the motorized focusing knob of the controller (U-MCZ), move the stage apart from the objectives without hiding the nosepiece mounting screw ①.
- 2) Fully loosen the nosepiece mounting screw ① using the Allen screwdriver provided with the system.
- 3) Gently insert the nosepiece from the front side along the nosepiece mount dovetail, and push the nosepiece until it stops.
- 4) Tighten the nosepiece mounting screw ①.
- 5) Connect the connector attached to the cable of the nosepiece to the connector secured to the left side of FV30-RFABXL with the binder.

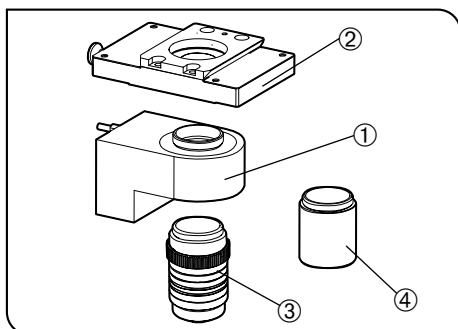
◎ When a nosepiece of a different type from the removed nosepiece is mounted, it is necessary to change the nosepiece information settings for the touch panel controller. For details, refer to Online Help of the touch panel controller.

BX63LF



FV30GF



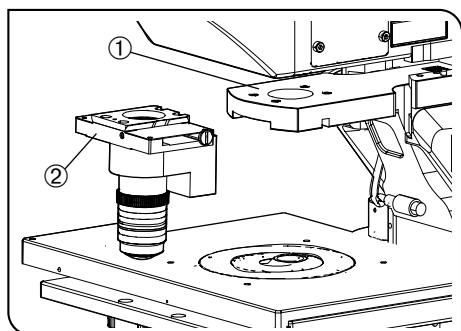


## 2 Attaching the piezo nosepiece

- 1** Attach the piezo nosepiece ① into the piezo nosepiece adapter ②. For details of attaching procedures, refer to the instruction manual provided with the piezo nosepiece (PIFOC(r) P-725K085) of PI co.
- 2** Screw the objective lens ③ into the piezo nosepiece ①.

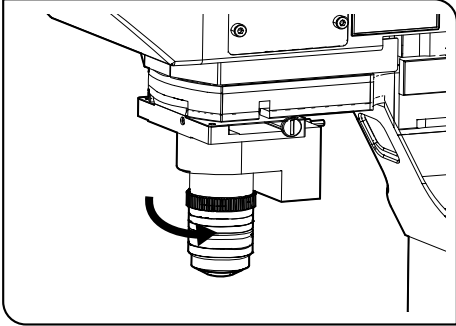
Recommended objective lens
LUMPLFLN60XW*
LUMPLFLN40XW*
XLPLN25XWMP2
XLPLN25XSMP2
XLPLN25XSMP2

When using the objective lens marked with \*, use the RMS adapter ④ (provided with the piezo nosepiece adapter) between the objective lens and the piezo nosepiece.



- 3** Secure the piezo nosepiece adapter ② to the arm ①. Attach the piezo nosepiece adapter to the microscope in the direction as shown in the picture (The IN/OUT knob of the DIC slider comes to the right side).

☉ For attaching procedures, refer to p.3.



**4** Rotating the piezo nosepiece secured to the illuminator will move it to the direction you desire. (It is recommended to place the piezo nosepiece at the back of the objective lens as shown in the picture.)

Ⓞ For rotation procedures of the piezo nosepiece, refer to the instruction manual of the piezo nosepiece.

**5** Connect the connector of the piezo nosepiece to the piezo nosepiece exclusive controller.

Ⓞ For connection procedures, refer to the instruction manual of the piezo nosepiece.

**6** Connect the piezo nosepiece exclusive controller to FV30-ANALOG with the commercially available BNC cable.

Ⓞ Connect the control signal input connector (CONTROL IN) of the piezo nosepiece exclusive controller to the analog output connector (ANALOG OUT) of FV30-ANALOG.

Ⓞ When connecting, refer to the instruction manual of the piezo nosepiece and [7-3 Setting Procedures] in the FVMPE-RS users manual [Operation/Maintenance].

Ⓞ Be sure to use the piezo nosepiece exclusive controller with settings described below.

- SERVO ON/OFF toggle switch = ON side
- ANALOG/DIGITAL toggle switch = ANALOG side
- DC-OFFSET knob = Minimum (Position at the end of the counterclockwise rotation)

## 2-2 Work related to the illumination

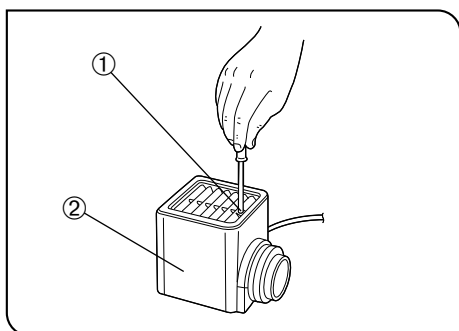
### 1 Changing the halogen bulb

#### 1 Changing the lamp

**CAUTION** The bulb, lamp housing and areas near these will be extremely hot during and right after use. Before replacing the bulb, exit the system and wait until the bulb and the lamp housing are fully cooled down. Then, replace to the appropriate bulb.

#### I Changing the halogen bulb

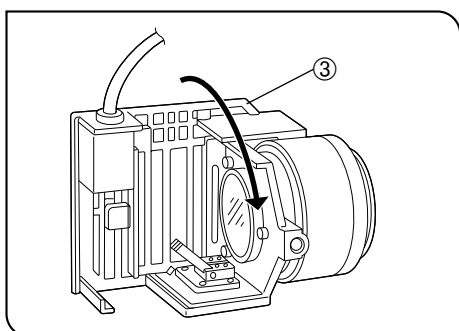
Ⓞ The designated bulb model is the 12V100WHAL-L (PHILIPS 7724) or 12V50WHAL-L (LIFE JC) halogen bulb.



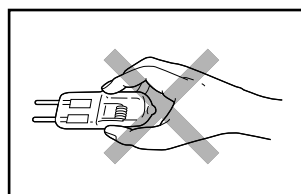
**1** Fully loosen the clamping screw ① at the top of the halogen lamp housing using the Allen screwdriver provided with the system.

**2** Lift up the halogen lamp housing ② to remove it.

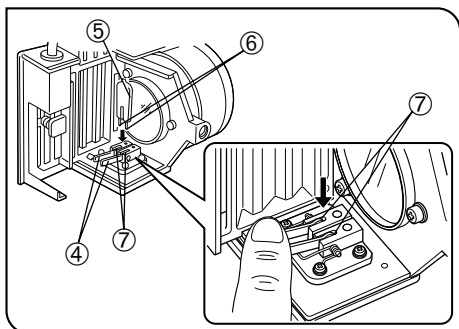
**3** Tilt the bulb socket ③ by 90° in the direction of the arrow.



**4** While pushing down the bulb clamping lever ④, hold the halogen bulb ⑤ with gloves or a piece of gauze, insert the bulb pins ⑥ straight and fully into the pin position ⑦ on the lamp socket. Then return the lamp clamping lever gently back to the original position to clamp the bulb.

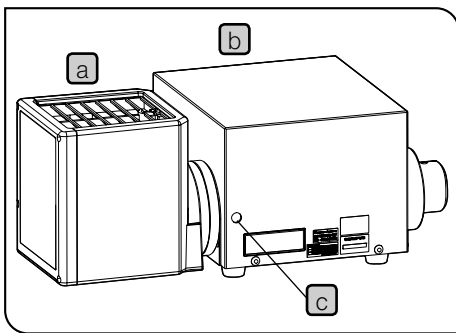


**CAUTION** Do not touch the lamp directly. If fingerprints, etc. are attached, wipe them off completely with the soft cloth, etc. to prevent the lamp from life reduction or burst.



**5** Fit the halogen lamp housing from up and tighten the clamping screw ① by applying downward pressure.

## 2 Attaching the lamp housing

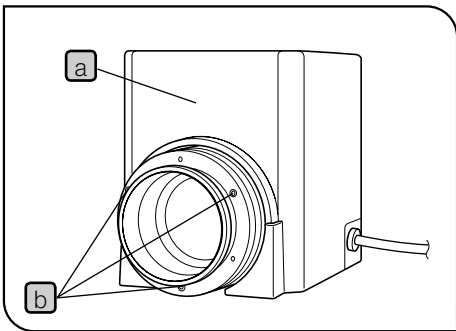


## I Attaching the halogen bulb and lamp housing

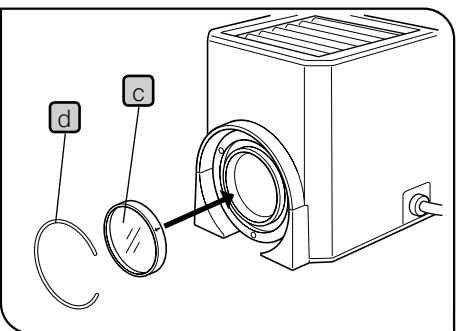
⊙ In this chapter, attaching method of the halogen lamp housing (U-LH100L-3, U-LH100-3) is explained as an example.

- 1 Attach the lamp housing (a) to the FV30-TD (b).
- 2 Tighten the clamping screw (c) of FV30-TD using the Allen screwdriver provided with the system.

## 3 Attaching the thermal reflection filter 45SCF



- 1 Remove the collector lens of the U-LH100IR lamp housing (a) by loosening the three clamping screws (b) with an Allen wrench (width across flats of 2.5 mm).



- 2 While positioning the 45SCF filter (c) so that the arrow on its frame points in the opposite direction of the lamp housing, insert the filter in the lamp housing, and clamp by tightening the ring spring (d) provided with the filter.
- 3 Attach the collector lens to the original position.

## 2 Changing the mercury lamp

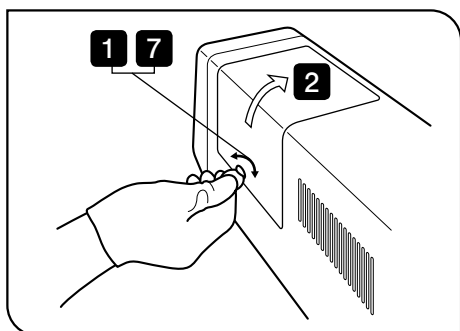
### 1 Replacement of the lamp

« Applicable lamp »

DC130W SHI Lamp (USHIO INC. SHI-130 OL)

**CAUTION** Before replacing the lamp, be sure to turn **○** (OFF) the power switch and unplug the power cord from the outlet, and wait (more than 40 minutes as a guide) until the lamp replacement cover and the lamp are cooled down sufficiently. If you replace the lamp keeping the power switch “**I**” (ON), the lamp may be damaged.

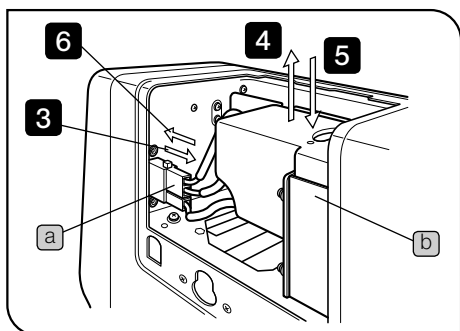
· Wear protective gloves and protective glasses when replacing the lamp.



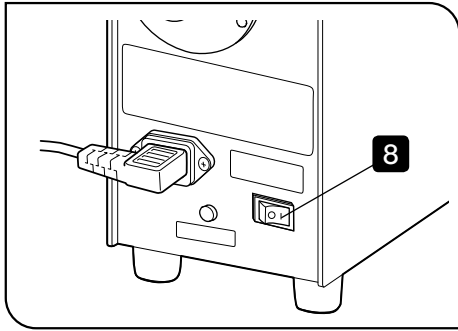
- 1 Use a coin or similar to unlock the lamp replacement cover.
- 2 Lift the lamp replacement cover to remove the cover.
- 3 Unplug the lamp connector **a**.
- 4 Hold the black frame and raise the lamp slowly upward.

**CAUTION** If the lamp is dropped, the glass will break and you may be injured. Pay careful attention when you replace the lamp.

Ⓞ Do not touch the glass area of the lamp (front glass or reflector) directly with bare hands. The lamp may not be used due to the attached dirt or fingerprints.

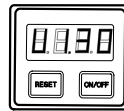


- 5 Insert a new lamp to the light source unit along the slide rail **b**.
- 6 Connect the lamp connector **a**.
- 7 Mount the lamp replacement cover and lock the lamp replacement cover with a coin or similar.
- 8 Set the power switch to “**I**” (ON). The version of the software is

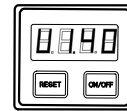


displayed on the counter (for three seconds). Please remember this version number.

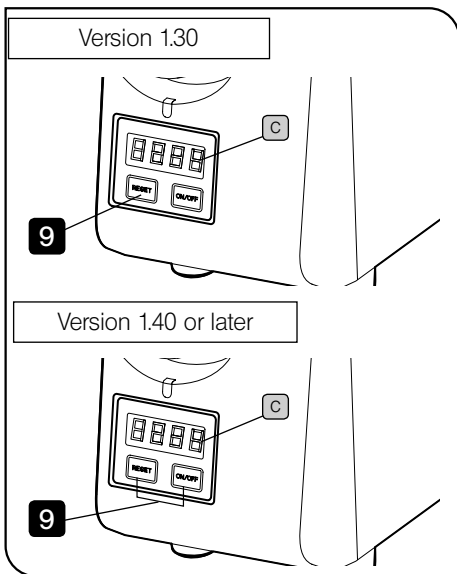
Example: The version is displayed as follows:



When the version is 1.30



When the version is 1.40



- 9** Reset the accumulated lighting time of the lamp. The reset method differs depending on the version of the software displayed in the previous step.

Version	Reset method
1.30	Press the reset switch for two seconds or more.
1.40 or later	Press the reset switch and the lamp switch at the same time for five seconds or more.

**CAUTION** Never subject cords and light guides to excessive bending or twisting because they can easily be damaged.

- Do not turn on the lamp when the light guide is not attached to the light source. The UV light is included in the lights from this lamp. Looking directly into the light may damage your eyes. Also, it could cause fire.



## 2-3 Work related to optical unit

Optical unit variation and unit on which the created optical unit is mounted

	Optical unit variation	Unit on which the created optical unit is mounted
Fluorescent mirror unit	IX3-FCFPXL IX3-FGFPXL IX3-FYFPXL-1-2 IX3-FMCHEXL-1-2 IX3-FUWXL IX3-FGWXL IX3-FBWWXL IX3-FFXL	FV30-RFABXL
Transmitted DIC filter unit	U-FDICTIR IX3-FDICT	FV30-RFABXL
DM unit for SIM scanner	FV30-ADM800 FV30-ADMOPT	FV30-HSUMP
DM unit for External NDD (Non-Descanned Detector)	FV30-NDM690 FV30-NDM760 FV30-NDMVCOIR	FV30-RFABXL

© When replacing the optical units with the different types, the nosepiece information set to the touch panel controller must be changed as well. For details, refer to Online Help of the touch panel controller.

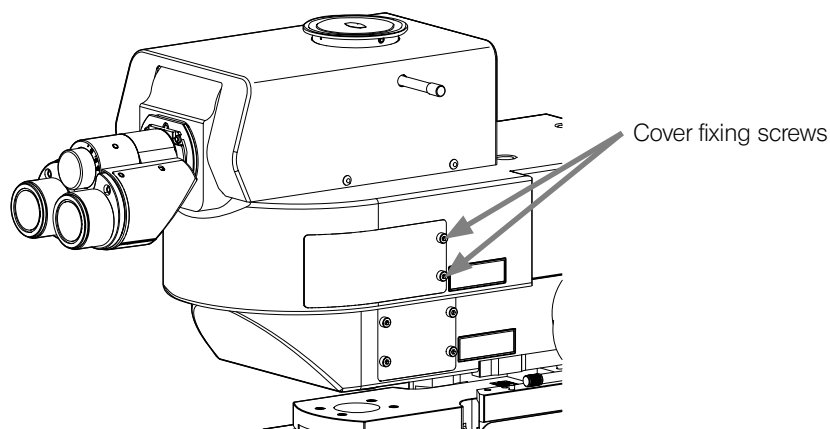
## 1 Fluorescence mirror unit

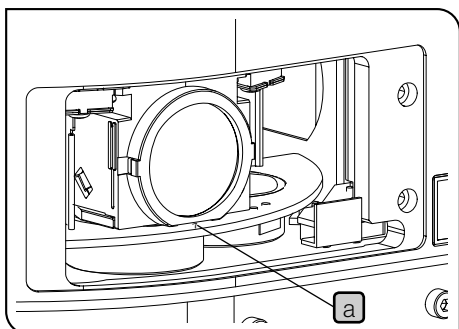
### 1 Attaching and removing to/from FV30-RFABXL

#### CAUTION

- Make sure not to remove the fluorescence mirror unit mounted on No. 1 in the turret. Do not apply excess force.  
If this fluorescence mirror unit is shifted, the protection for laser safety may be disabled and the optical performance of LSM could not be guaranteed.
- Before attaching or detaching the fluorescence mirror unit, be sure to engage the shutter in the light path.
- Be sure to exit the FV30S-SW software before attaching/removing the fluorescence mirror unit.

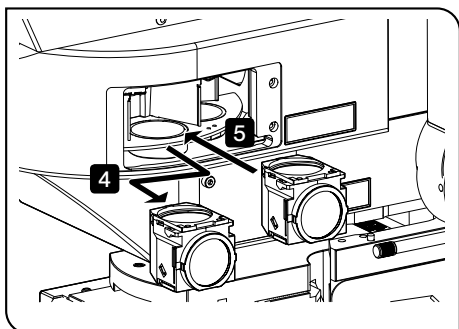
- 1 Remove the cover of FV30-RFABXL by loosening the cover fixing screws (two locations) of FV30-RFABXL using the Allen screwdriver provided with the system.



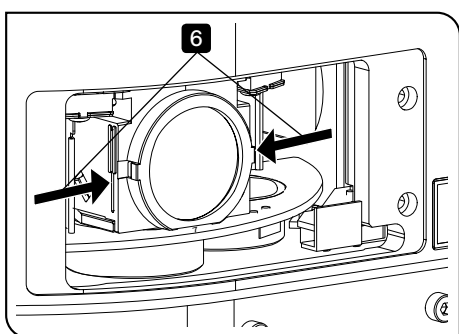


- 2 Rotate the turret by the touch panel controller or the U-MCZ while checking the display area **a** of the fluorescence mirror unit No. and move the fluorescence mirror unit to be replaced to the position on the front side of the cover.

**CAUTION** When rotating the turret, put your fingers away from the turret. Otherwise, your fingers may be caught.



- 3 Hold the sides of the fluorescence mirror unit to be replaced, and remove it by pulling toward the front side.
- 4 Push the fluorescence mirror unit to be used into the space where the fluorescence mirror unit was removed until it touches the end.



- 5 Hold the both right and left sides of the fluorescent mirror unit with your thumb and the index finger, and shake it gently to make sure that the fluorescent mirror unit is fixed securely. Without this process, the fluorescent mirror unit may be attached keeping tilted.

- 6 After attaching or removing the part, reposition the cover and secure it by tightening the cover fixing screws using the Allen screwdriver provided with the system.

⊙ Put the hook inside the cover into the groove of the microscope frame.

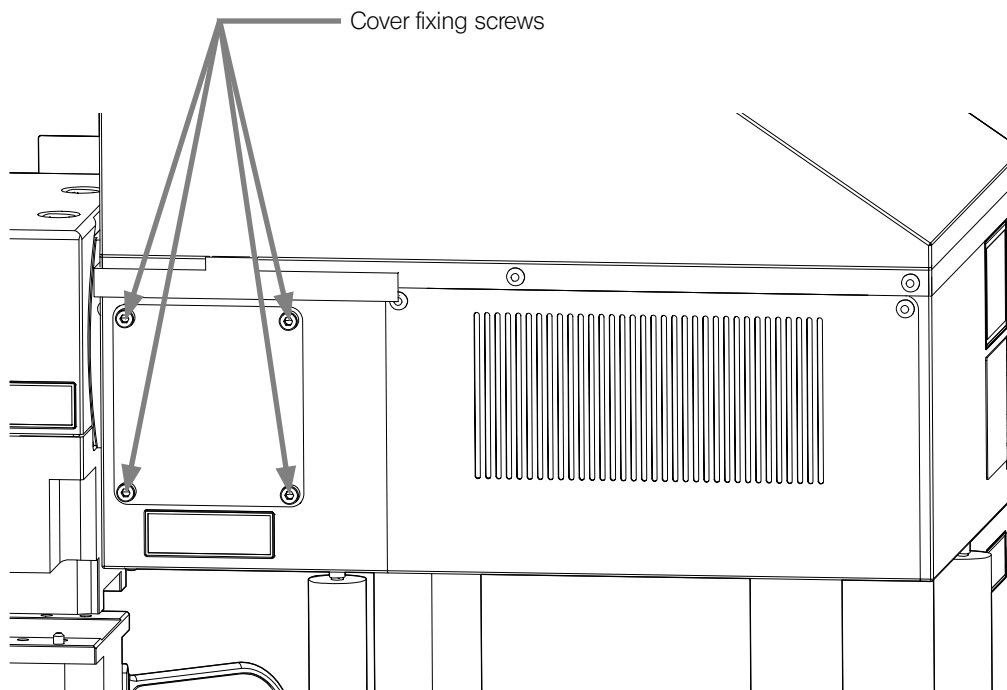
⊙ If the power of the system is turned ON, check that the system starts initializing when the cover is attached.

## 2 DM unit for the SIM scanner

### 1 Attaching and removing to/from FV30-HSUMP

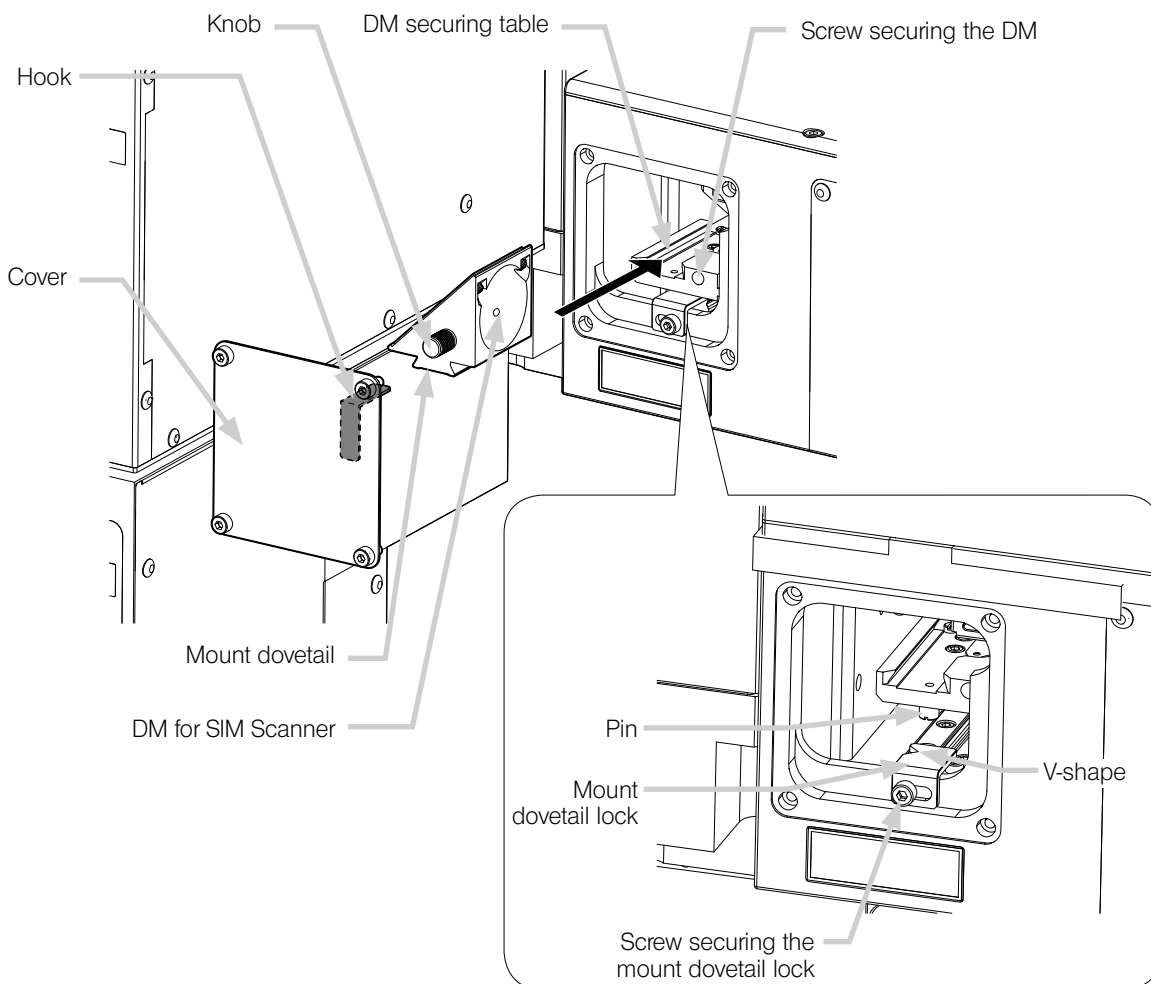
#### Attaching and removing the cover

1. Remove the cover of FV30-HSUMP by loosening the cover fixing screws (four locations) of FV30-HSUMP using the Allen screwdriver provided with the system.



### Attaching and removing the DM unit

1. Hold the knob of the DM unit and slide the DM securing table so that the pin of the DM securing table comes to the V-shape groove position of the mount dovetail lock of FV30-HSUMP.
2. Loosen the screw securing the mount dovetail lock of FV30-HSUMP using the Allen screwdriver provided with the system and move the mount dovetail lock toward the right so that the V-shape groove is completely pushed to the pin of the DM securing table.
3. Tighten the screw securing the mount dovetail lock.
4. Loosen the screw securing the DM on FV30-HSUMP using the Allen screwdriver provided with the system, and remove the DM by pulling it out.
5. Securely insert the mount dovetail of the DM into the mounting frame of FV30-HSUMP unit until it meets the end of the frame.  
Tighten the screw securing the DM using the Allen screwdriver provided with the system.
6. Loosen the screw securing the mount dovetail lock, remove the V-shape groove from the pin of the DM securing table and tighten the screw securing the mount dovetail lock.



7. After attaching or removing the part, reposition the cover and secure it by tightening the cover fixing screws using the Allen screwdriver provided with the system.
- ⊙ At this time, the hook on the back side of the cover must be in the direction shown in the picture.
- ⊙ If the power of the system is turned ON, check that the system starts initializing when the cover is attached.

### 3

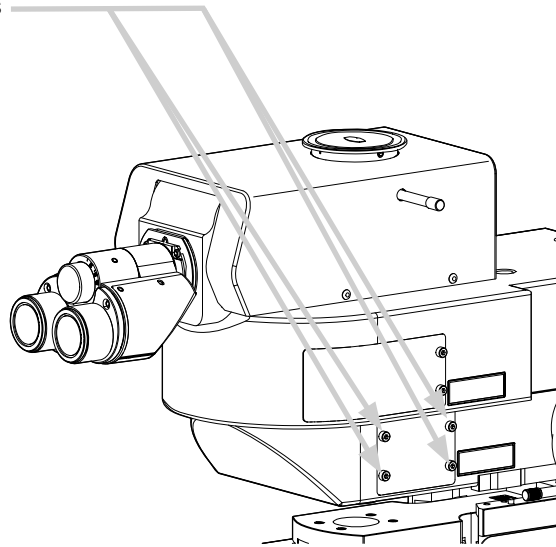
## DM unit for external NDD

### 1 Attaching and removing to/from FV30-RFABXL

#### Attaching and removing the cover

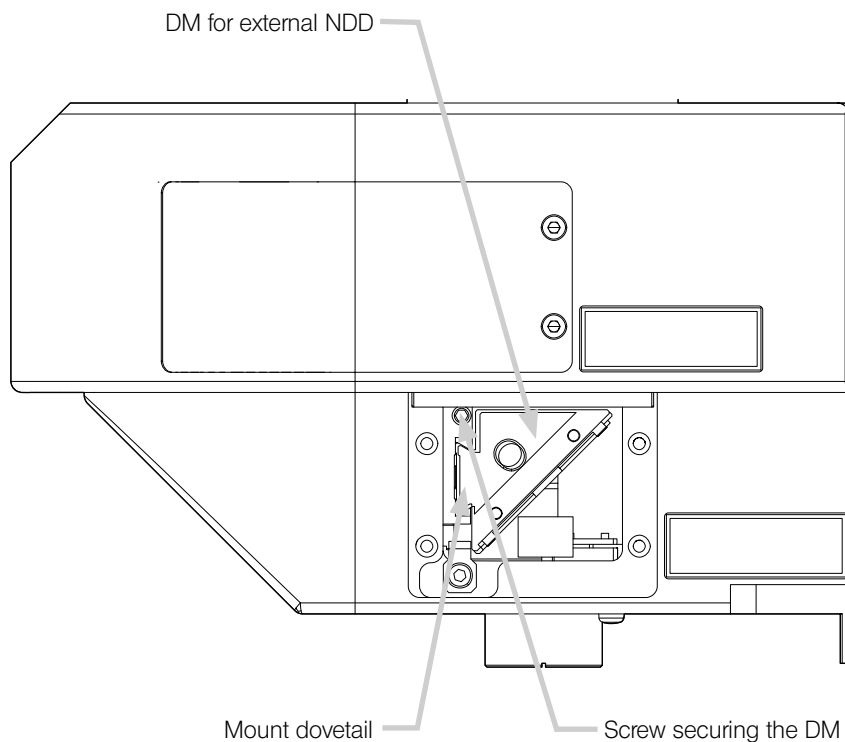
1. Remove the cover of FV30-RFABXL by loosening the cover fixing screws (four locations) of FV30-RFABXL using the Allen screwdriver provided with the system..

Cover fixing screws



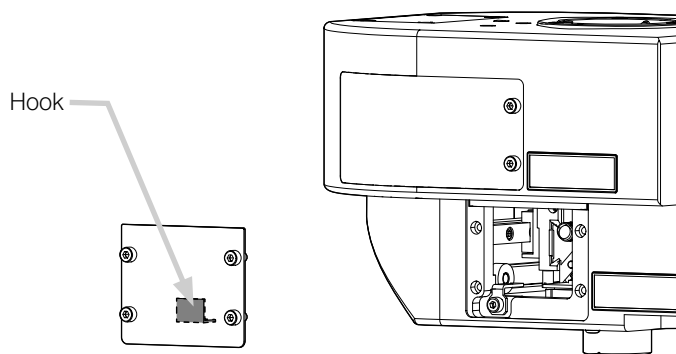
### Attaching and removing the DM unit

1. Loosen the screw securing the DM on FV30-RFABXL using the Allen screwdriver provided with the system, and remove the DM by pulling it out.
2. Securely insert the mount dovetail of the DM into the mounting frame of FV30-RFABXL unit until it meets the end of the frame.  
Tighten the screw securing the DM using the Allen screwdriver provided with the system.



- 3 After attaching or removing the part, reposition the cover and secure it by tightening the cover fixing screws using the Allen screwdriver provided with the system.

⊙ At this time, the hook on the back side of the cover must be in the direction shown in the picture.



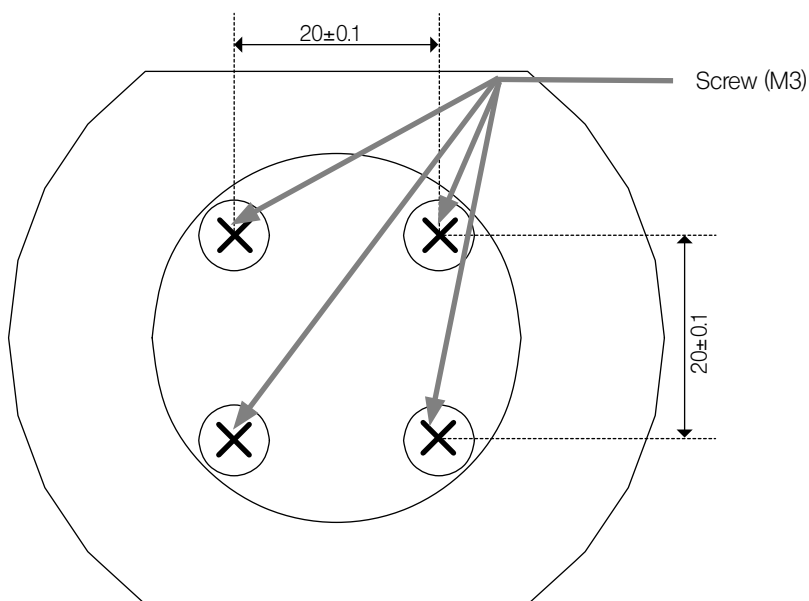
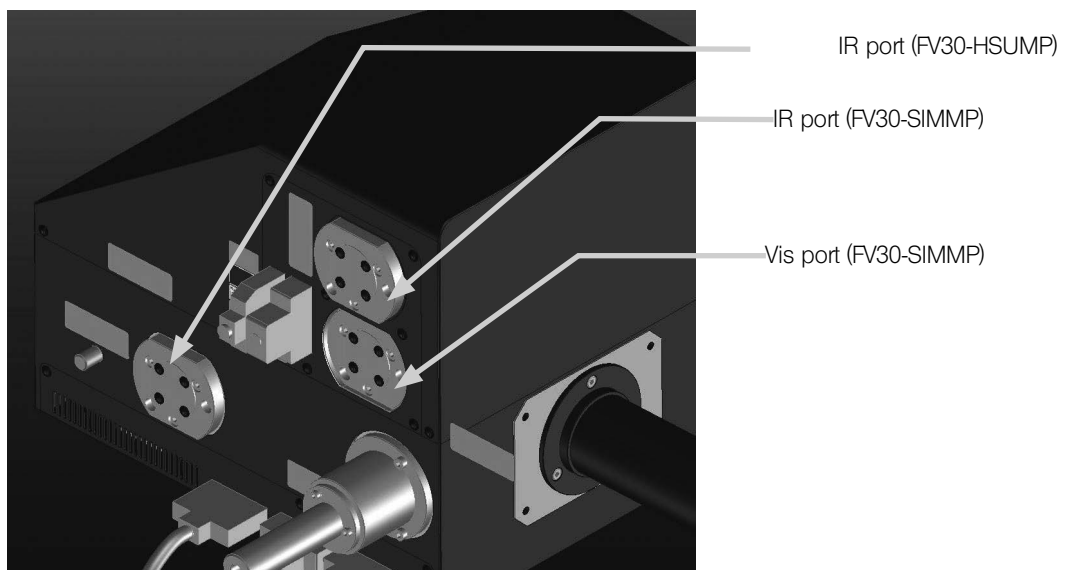
⊙ If the power of the system is turned ON, check that the system starts initializing when the cover is attached.

## 2-4 Work related to laser introduction

### 1 Opening and closing the laser port (FV30-LPADP)

© When FV30-LPADP is placed to laser ports of FV30-HSUMP and FV30-SIMMP, the secured cover can be removed with the screw (M3).

**CAUTION** Be sure to put the cover on when you finish service works.





© The table below shows the tolerance of the laser entering each port.

	FV30-HSUMP	FV30-SIMMP	
	IR port	IR port	Vis port
Applicable wavelength	700-1300 nm	700-1100 nm	400-650 nm
Tolerable power density	764 W/cm <sup>2</sup> Converted to average power • Average power; 3 W x 2 • Pulse width; 40 fsec or more • Frequency; 80 ± 2 MHz • Beam diameter; Ø1 mm or more	382 W/cm <sup>2</sup> Converted to average power • Average power; 3 W x 1 • Pulse width; 40 fsec or more • Frequency; 80 ± 2 MHz • Beam diameter; Ø1 mm or more	6.4 W/cm <sup>2</sup> • Average Power; 50mW x 1 (CW) • Beam diameter; Ø1 mm or more
Applicable beam shape	Diameter; Ø1.50 - 4.2 mm Wavefront; IRI 300 mm or more Value on the pupil conjugated surface in the scan mirror, which is 131.5 mm apart from the edge surface of FV30-LPADP.	Diameter; Ø1.50 - 4.2 mm Wavefront; IRI 300 mm or more Value on the pupil conjugated surface in the scan mirror, which is 131.5 mm apart from the edge surface of FV30-LPADP.	Diameter; Ø1.50 - 4.2 mm Wavefront; IRI 300 mm or more Value on the pupil conjugated surface in the scan mirror, which is 194.5 mm apart from the edge surface of FV30-LPADP.
Incident position accuracy	Shift: 1 mm or less against the Ø8 hole of FV30-LPADP Tilt: 90 ± 0.6° against the surface to which FV30-LPADP is pushed.		

- © The tolerable power density is the value when the incident position accuracy is satisfied.
- © If you observe the direct beam of the laser with the transmitted detector (TD) when specifications mentioned in the table above are satisfied, you will get the concentric uneven image in which the center area is brighter and the area farther from the center becomes darker.
- © If you increase the laser power when the unevenness is displaced from the center, the laser may be radiated to the stopper area of the scan mirror, etc. and the system may be damaged. Therefore unless the unevenness is in the center, set the laser power to 1% or less of the tolerable power density mentioned above.

**CAUTION** If the lasers which are not satisfied with above mentioned specifications enter into this system, it may result in injury or damage to the system.

- © It is strongly recommended that customer selected laser(s) satisfy the requirements of 21CFR Part 1040.10 and IEC60825-1. Refer to the ANSI Z136.1 for safe use of lasers for guidance or the IEC TR 60825-14 User's Guide on using Class 4 lasers.





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