M508E 11.12.NF.5 (1/2)
M508EN05

Nikon

Time Lapse Imaging System

BioStation IMQ

CELL-S2 / CELL-S2-P

Instructions

<System>

Introduction

Thank you for purchasing a Nikon product.

This instruction manual is written for the users of the Nikon Time Lapse Imaging System BioStation IMQ.

To ensure correct usage, read this manual carefully before operating the product.

Training

You can use this product without the need of special training sessions by reading this manual thoroughly before use. Please kindly contact the distributor if you have any questions or find any errors and anything you are aware of.

Contents

Safety Precautions

To ensure correct and safe operation, read this manual before using the product.

WARNING and CAUTION Symbols Used in This Manual

Although this product is designed and manufactured to be completely safe during use, incorrect usage or failure to follow the safety instructions provided may cause personal injury or property damage. To ensure correct usage, read this manual carefully before using the product. Do not discard this manual and keep it handy for easy reference.

Safety instructions in this manual are marked with the following symbols to highlight their importance. For your safety, always follow the instructions marked with these symbols.

Symbol	Description
WARNING	Disregarding instructions marked with this symbol may lead to serious injury or death.
CAUTION	Disregarding instructions marked with this symbol may lead to injury or property damage.

Warning Label and Symbols Used on the Product

The symbols used on the product indicate the need for caution during use. Refer to the instruction manual and read the relevant instructions before handling any part to which the symbols have been affixed.

Warning label/symbol	Description
	**Caution for ultraviolet light irradiation** This symbol on the upper part of the microscope calls your attention to the following: • Surroundings of the objective may be exposed to intense light including ultraviolet light while the illuminator is turned on. • The light including ultraviolet light may be irradiated outward if the slide door is opened during the fluorescent microscopy. • To check the surroundings of the objective during the fluorescent microscopy, open the sliding shade on the top of the microscope and look through the transparent window.
	**Biohazard** This symbol on the upper part of the microscope calls your attention to the following: • If a specimen is spilled onto the product, it may cause the danger of biohazard. • To avoid biohazard contamination, do not touch the contaminated portion with your bare hands. • Decontaminate the contaminated portion according to the safety standard of your facility.
	**Caution for heat** This symbol on the front of the humidifier heater inside the microscope calls your attention to the following: • The humidifier heater becomes very hot during operation of the product. • To prevent burn or fire, do not touch the humidifier heater nor place any flammable material near the product during operation.

* See Section 1.2.5, “Locations of Warning Label and Symbols” in Chapter 1, “Names of Each Part.”

⚠ WARNING

1. Intended use of this product (for medical care)

This product is intended primarily for microscopy and photomicrography of cells and tissues cultured in a petri dish.
Do not use this product for other purpose.

2. Intended user

It is intended for researchers and the medical professional and those who work on experimentations in the field of genetics, immunology, physiology, pharmacology, neurology, cellular biology and molecular biology.

3. Do not disassemble.

Disassembling may cause malfunction and will lead to the forfeiture of all claims against warranty. Do not disassemble any part that is not indicated in this manual. If you notice any abnormality, contact your nearest Nikon representative.

4. Read the instructions carefully.

To ensure safety, carefully read this manual and the manuals for associated devices (devices used with this product). Especially, be sure to follow the warnings and cautions indicated at the beginning of the manuals.

Note on using a light source

To perform the epi-fl microscopy with this product, a light source that has a mercury lamp is required. Take great care of the lamp in operating the light source. Read the instruction manual for the light source and follow the instructions and cautions for it.

5. Use the specified light source.

Use this product with the following light source. Do not use this product with the devices other than the following:

- Nikon INTENSILIGHT C-HGFIE HG Precentered Fiber Illuminator (light guide fiber provided)

6. Caution on the power cord

Make sure to use the specified power cord. Using a wrong power cord may result in malfunction or fire. The product is classified as subject to Class I protection against electrical shock. Make sure it is connected to an appropriate ground terminal (protective earth terminal).

For the specified power cord, see Chapter 6, “Specifications.”

To avoid an electric shock, be sure to turn off the power (flip the power switch to the “O” side) of this product before plugging the power cord into the wall outlet.

7. Note on the humidifier heater

The humidifier heater becomes very hot during operation of the product.

To prevent burn or fire, do not touch the humidifier heater nor place any flammable material near the humidifier heater.

⚠ WARNING

8. Ultraviolet light

When the epi-fl microscopy is performed, the surroundings of the objective are exposed to ultraviolet light that is harmful to your eyes and skin. Directly looking at ultraviolet light may cause snow blindness or, at worst, loss of vision. To avoid such injury, follow the instructions given below during the epi-fl microscopy:

- **Do not open the slide door.**

  The surroundings of the objective are exposed to very strong light including ultraviolet light during the fluorescent microscopy. The light may be irradiated outward if the slide door is opened.

- **Be sure to look through the transparent window when looking at the surroundings of the objective.**

  Slide open the sliding shade on the top of the microscope and look the surroundings through the transparent window.

- **Securely attach the light source to the product.**

  Always connect the light source to the product when the light source is ready to light up. Do not turn on the light source if it is not connected to the product, and do not disconnect the light source from the product if it is lit. When disconnecting the light source from the product, turn off the power to the light source, and then unplug the power cord from the wall outlet.

9. Notes on handling the CO_2 gas

The CO_2 gas with a low concentration flows into the culture chamber to keep the cells alive for this product. Ventilate the installation area sufficiently, because the CO_2 gas flows out from this product. To handle the CO_2 mixer, regulator, and CO_2 cylinder, be sure to follow the instructions shown below.

- **To use the CO_2 mixer, regulator, and the CO_2 cylinder, carefully read the instruction manuals provided by the manufacturers and make sure to follow the instructions.**
- **Install the CO_2 mixer, regulator, and CO_2 cylinder, and connect the tubes securely so that there is no leakage. Check periodically if any cracks or looseness of the tubes and connected areas exist.**

If the CO_2 gas is released in large quantities in the room, it may cause suffocation. Take the following measures immediately:

- **Evacuate immediately and stay away from the room.**
- **Take the predetermined procedure such as calling the security or fire department.**

The Occupational Safety & Health Administration (OSHA) specifies that exposure to carbon dioxide must be less than 5,000 ppm (0.5% CO_2) on average in the case of 40-hour week (8-hour day). Short time exposure within 15 minutes must be 30,000 ppm (3% CO_2) or less.

It is recommended to install the CO_2 concentration monitor or the like against leakage.

10. Notes on handing a hazardous specimen

Before handling a biological specimen, check whether or not the specimen is hazardous.

When handling a hazardous specimen with this product, follow the safety standard of your facility. When handling a hazardous, potentially infectious specimen, wear rubber gloves to avoid direct touch. If such specimen is spilled onto this product, the portion must be decontaminated in a safety manner. Follow the safety standard of your facility.

CAUTION

1. **Isolate this product from the power source during assembly, connecting/disconnecting cords, lamp replacement, and maintenance.**

   To prevent electric shock and malfunctions, be sure to turn off the power (flip the power switch to the “O” side) of this product and associated devices, and unplug the power cords from the wall outlet before assembling, connecting or disconnecting cables, or cleaning the microscope and the objectives.

2. **Do not wet the product.**

   Do not wet this product. If this product gets wet, a short circuit may occur resulting in a malfunction or an abnormal heating. If you wet this product, immediately turn off the power (flip the power switch to the “O” side) of this product and associated devices, and unplug the power cords from the wall outlet. Then, wipe off the water with a piece of dry cloth. If water enters the product, stop using the product, and contact your nearest Nikon representative.

3. **Do not place any object on the product.**

   Do not place any object on the product. The slide door and plate rail become deformed, resulting in a malfunction.

4. **Do not block the opening of the cooling fan on the back.**

   This product is equipped with the cooling fan on the rear side to cool down the inside of the product. Do not block the opening of the cooling fan covering the product with a piece of cloth, etc. The temperature inside of the system rises, resulting in a malfunction.

5. **Do not use the product covered with a piece of cloth.**

   Do not use the product covered with a piece of cloth, etc. Heat release is interfered, resulting in an abnormal heat and fire.

6. **Weak electromagnetic waves**

   This product emits weak electromagnetic waves. Keep this product and associated devices away from precision electronic equipment so as not to affect the accuracy of nearby precision electronic equipment. If the product or associated devices affects TV or radio reception, move the radio or TV a little further from the product (or associated devices).

7. **Dispose of the product according to the standard procedure specified for your facility.**

   To prevent biohazard risks, dispose of the product as contaminated equipment according to the standard procedure specified for your facility.

Notes on Handling the Product

1. Handling the Product

This product is a precision optical instrument. Handle the product carefully, and do not apply any vibration or shock.
In particular, objectives may lose accuracy when exposed to even a weak physical shock.

Cautions on moving the product

- The product weighs approximately 30 kg. The product must be carried by at least two people.
- Remove the specimen and the humidifier water tank, and disconnect the connected cables and the tubes before carrying the product.
  If other devices are attached to the product, also remove them before carrying the product.
- When carrying the product, hold the recess at the base on the front side and the handle on the rear side.
- Secure the movable parts before carrying the product.
  For details, refer to Section 7.1, “Assembly and Connection.”
- This product uses a floating structure to sustain vibration or impact. If this product is transported without the floating unit secured, it may be considerably damaged.
  For details on securing the floating units, see Section 7.1, “Assembly and Connection.”

Cautions on assembling and installing the product

- Avoid getting your finger or hand pinched.
- Scratches or fouling such as fingerprints on the optical parts (such as lenses or filters) will adversely affect the microscope image.
  Be careful not to scratch or touch the lenses and filters when assembling the optical parts.

2. Installation location and storage location

This product is a precision optical instrument. The product may get damaged or lose accuracy if it is used or stored under unsuitable conditions. When selecting the installation or storage location, note the following:

- Installation and storage conditions:
  Temperature: 0 to 40°C/relative humidity: 85% or less
  To prevent condensation, avoid the place where rapid temperature change occurs.
  When the product is installed or stored in hot, humid places, mold formation or condensation may occur, resulting in performance degradation or malfunctions.
- Operating conditions:
  Temperature: 18 to 28°C; Use the product in an air-conditioned room.
  Do not install the product in the place where rapid temperature change occurs such as the places close to the door or directly blown by the air-stream from the air conditioner.
- Avoid the locations where the product is exposed to direct sunlight.
- Install in a place with little dust and dirt.
- Install in a place with little vibrations.
  Do not install the CO_2 mixer in the same place as the microscope. The CO_2 mixer causes a vibration, resulting in performance deterioration.
- Install and store the product on a level, sturdy desk or table.
- Install the product in the location of 10 cm or more away from the surrounding walls.
- Install the product in the place where the power cord can be unplugged easily from the AC inlet of the product in emergency.
- Do not install the product in the narrow space such as a locker or a cabinet.
- Do not place anything on the product.
- Cover the product to avoid dust when storing.

- The C-HGFIE HG Precentered Fiber Illuminator generates intense heat. Therefore, place it at least 50 cm from the product and arrange a layout where the exhaust heat from the illuminator does not affect the product.

3. Notes on handling optical parts

Scratches or fouling such as fingerprints on the optical parts (such as lenses or filters) will adversely affect the microscope image.

Be careful not to scratch or touch the optical parts. If the optical part gets fouling on it, clean it according to Chapter 5, “Care and Maintenance.”

4. Control PC

The product comes with a control PC.
Do not use any other PC to operate the product.
Do not modify the control PC.
Do not install any software other than Nikon recommends.

5. Contents in the Package

- Microscope
- Culture chamber (BS-IM-C chamber)
- 4-quadrant dish positioning adapter (for the BS-IM-C chamber)
- Humidifier water tank, humidifier water tank cover, silicon sheet
- Silicon tubes for the BS-IM-C chamber
  (two types: wet mixed gas tube, exhaust tube)
- CO_2 mixed gas tube
- Evaporating dish
- Cover of the filter cube port
- Ergonomic controller
- USB cables: one black cable and one blue cable
- RS232C cable
- Sterilizing filter and two adapters for the sterilizing filter
- Hexagonal screwdrivers (three types: 2 mm, 2.5 mm, 3 mm)
- Instruction manuals

Options

- Culture chamber (BS-IM-MC MOT chamber, lid stand)
- Silicon tubes for the BS-IM-MC MOT chamber
  (two types: wet mixed gas tube, exhaust tube)

1 Name of Each Part

1.1 System Configuration

The BioStation IMQ is composed of the following devices.
For handling the control PC, HG precentered fiber illuminator, CO_2 mixer, and CO_2 cylinder, refer to the instruction manuals provided with the devices.

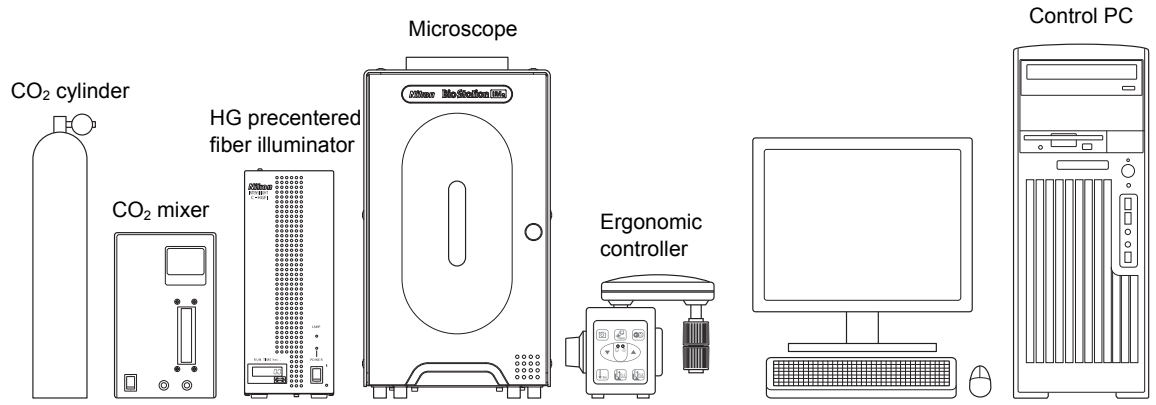


Figure 1.1-1 System Configuration

1.2 Microscope

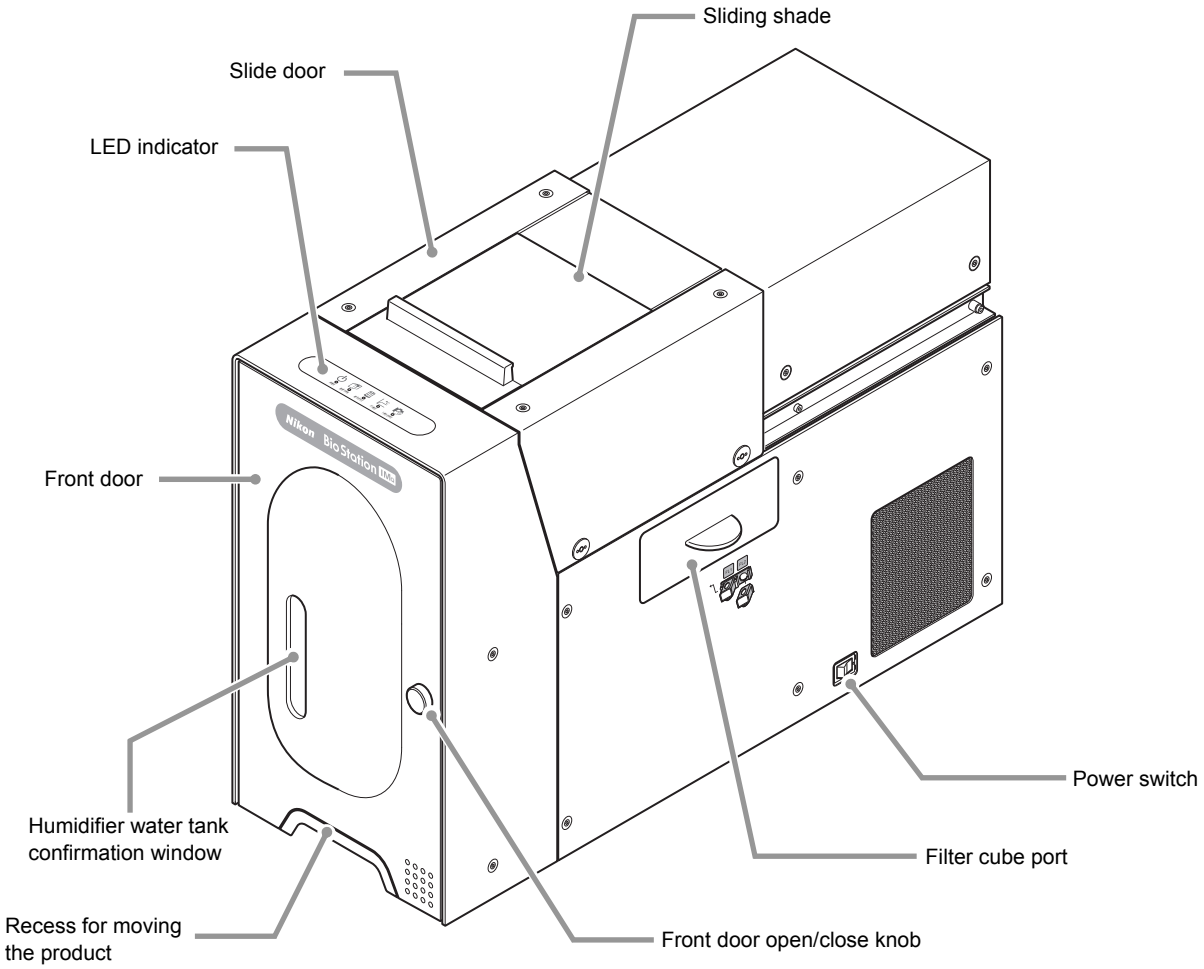


Figure 1.2-1 Microscope

1.2.1 Rear View

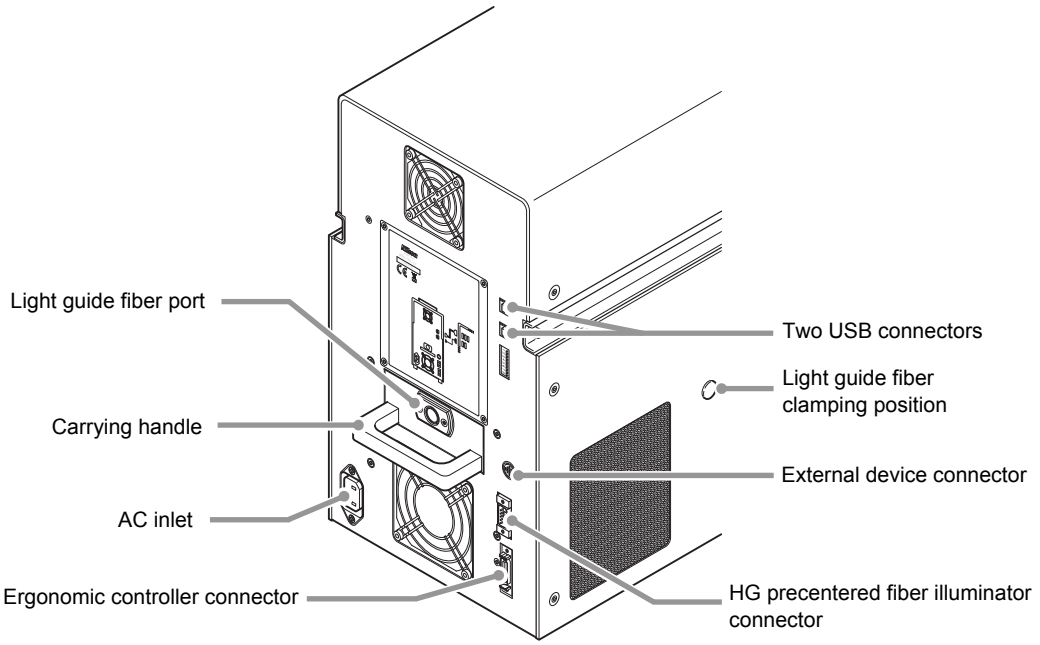


Figure 1.2-2 Rear view of the microscope

1.2.2 LED Indicator

The LED indicator is on the top of the microscope.

Figure 1.2-3 LED indicator

Table 1.2-1 LED indicator functions

Lamp	Meaning	Emission color	Detail
POWER	Status of the power	Green	This lamp lights up when the power is turned on.
DOOR OPEN	Status of the door	Yellow	This lamp lights up when the slide door or the filter cube port is opened. When both of them are closed, the lamp goes out. When either of them is opened during the time-lapse experiment, the lamp blinks.
NO BOTTLE	Status of the humidifier water tank	Yellow	This lamp blinks when the humidifier bottle is not equipped.
STABLE	Status of the temperature control	Green	This lamp lights up when the temperature of the culture chamber, the humidifier, and so on reach to the setting values and become stable.
TIME-LAPSE	Status of the time-lapse	Green	This lamp lights up during time-lapse experiment.

1.2.3 View When the Front Door Opened

Figure below shows the BS-IM-C chamber.

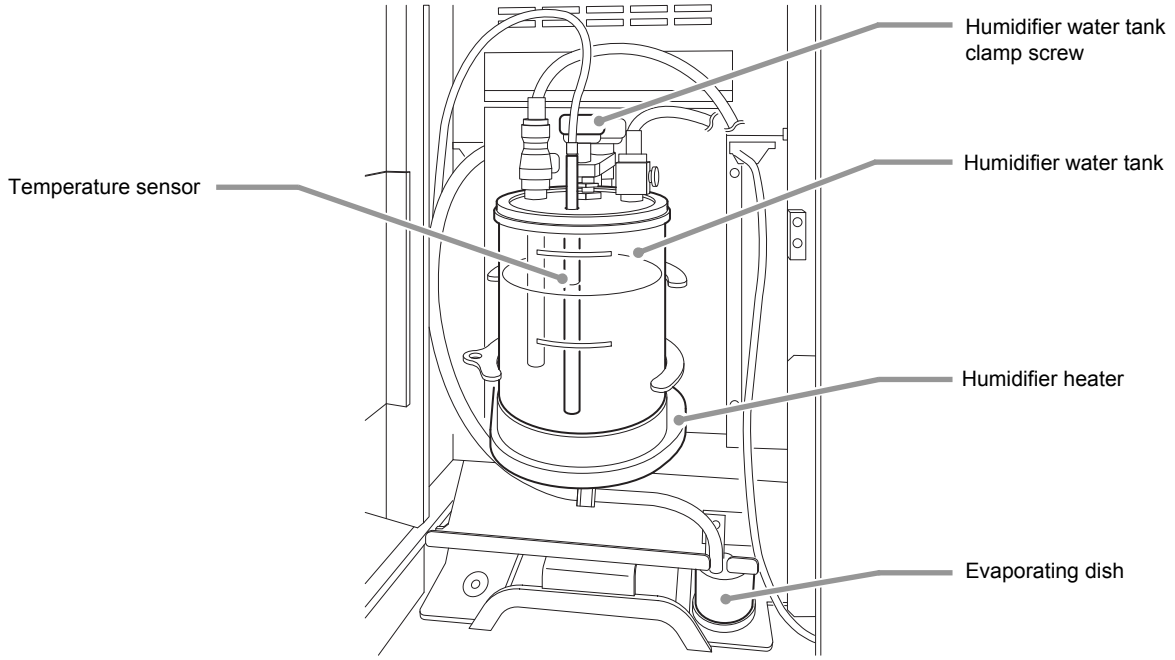


Figure 1.2-4 Surroundings of the humidifier water tank

1.2.4 View When the Slide Door Opened

BS-IM-C chamber

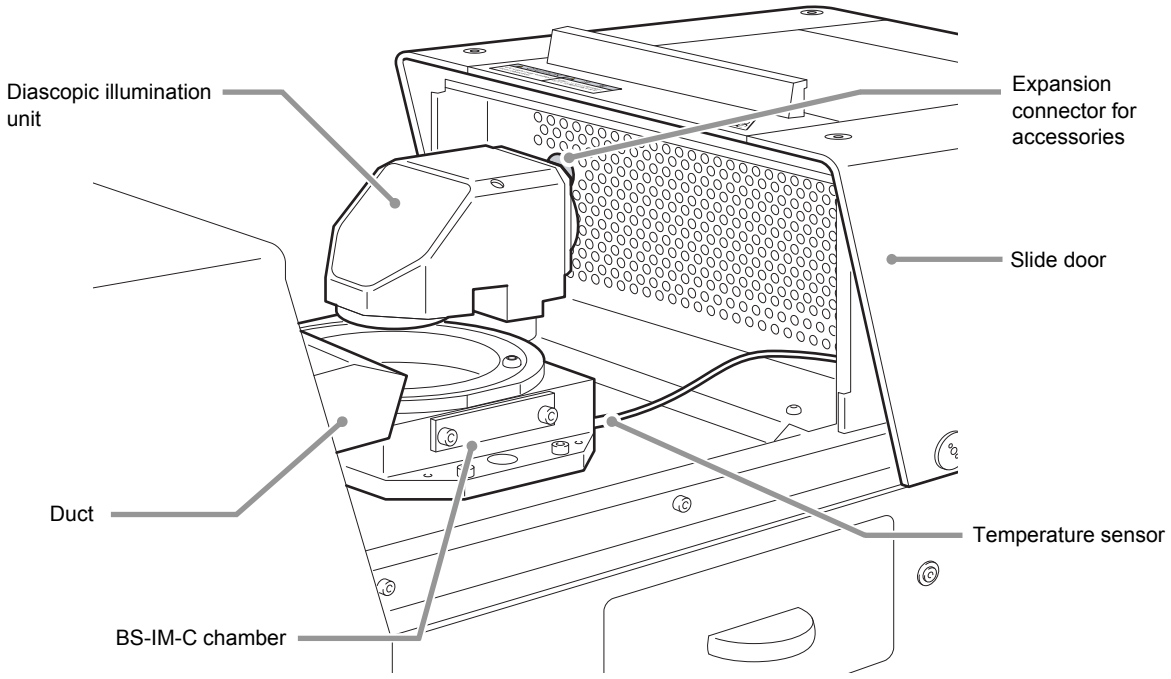


Figure 1.2-5 Surroundings of the BS-IM-C chamber

BS-IM-MC MOT chamber

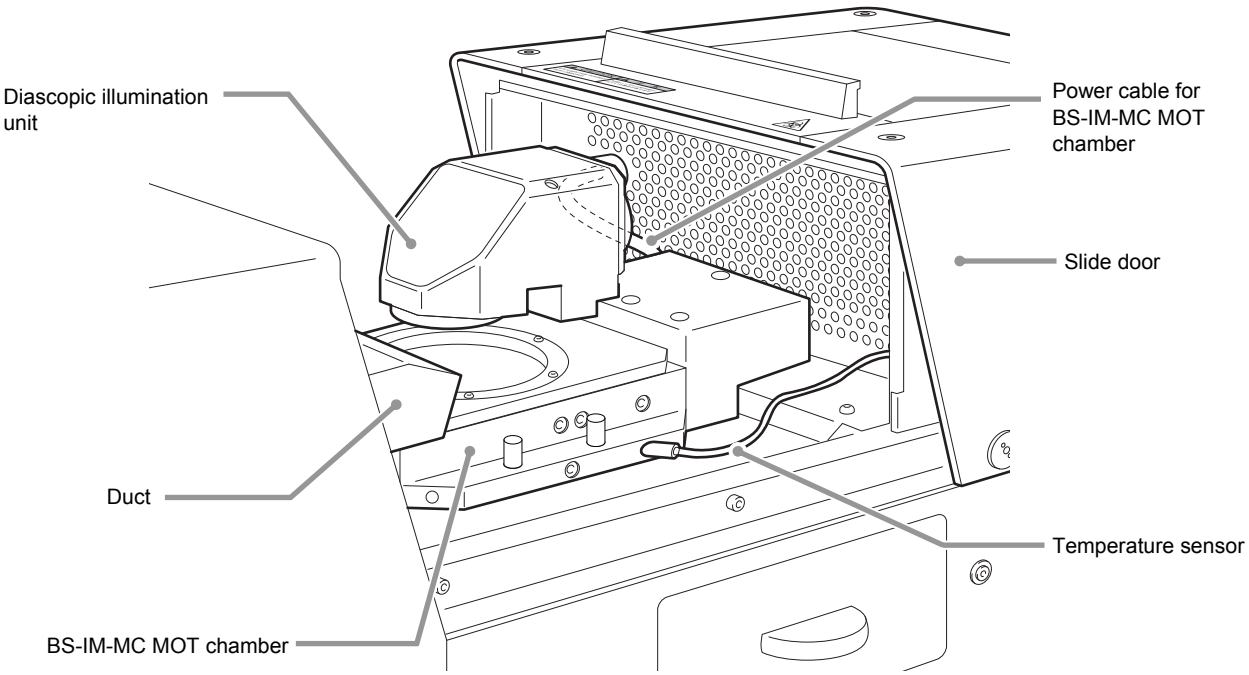


Figure 1.2-6 Surroundings of the BS-IM-MC MOT chamber

1.2.5 Locations of Warning Label and Symbols

Figure below shows the BS-IM-C chamber.

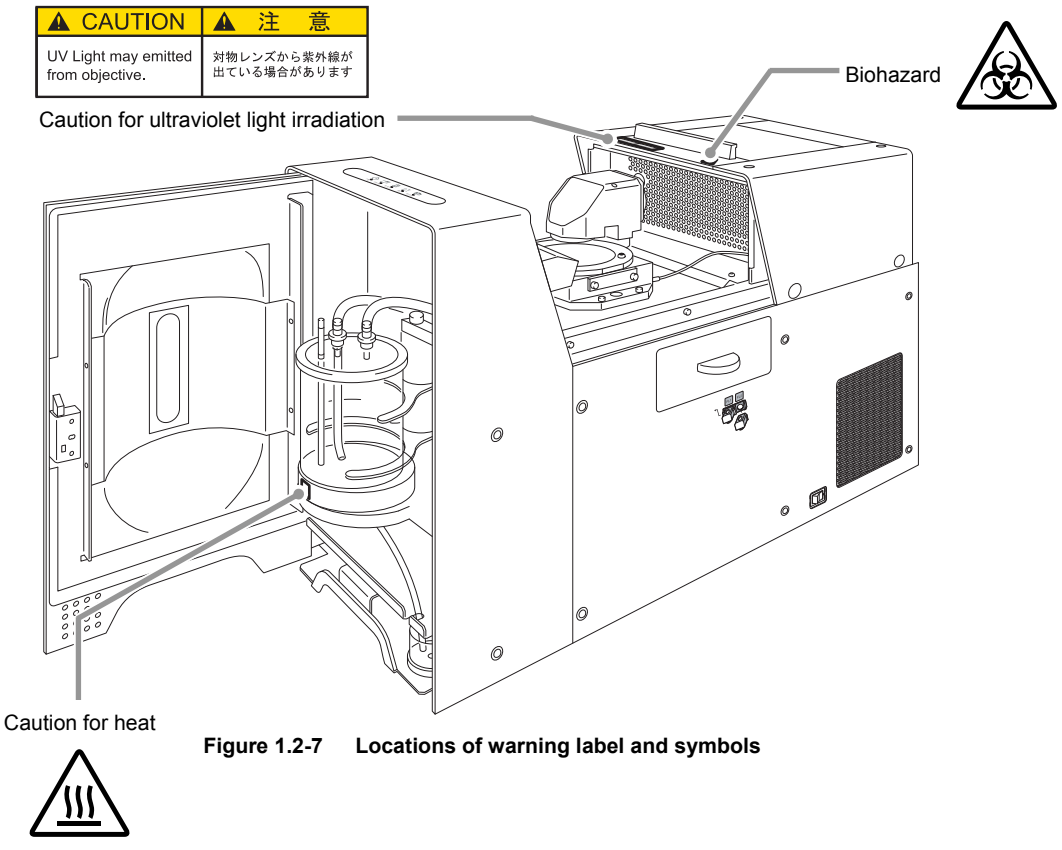


Figure 1.2-7 Locations of warning label and symbols

1.3 Ergonomic Controller

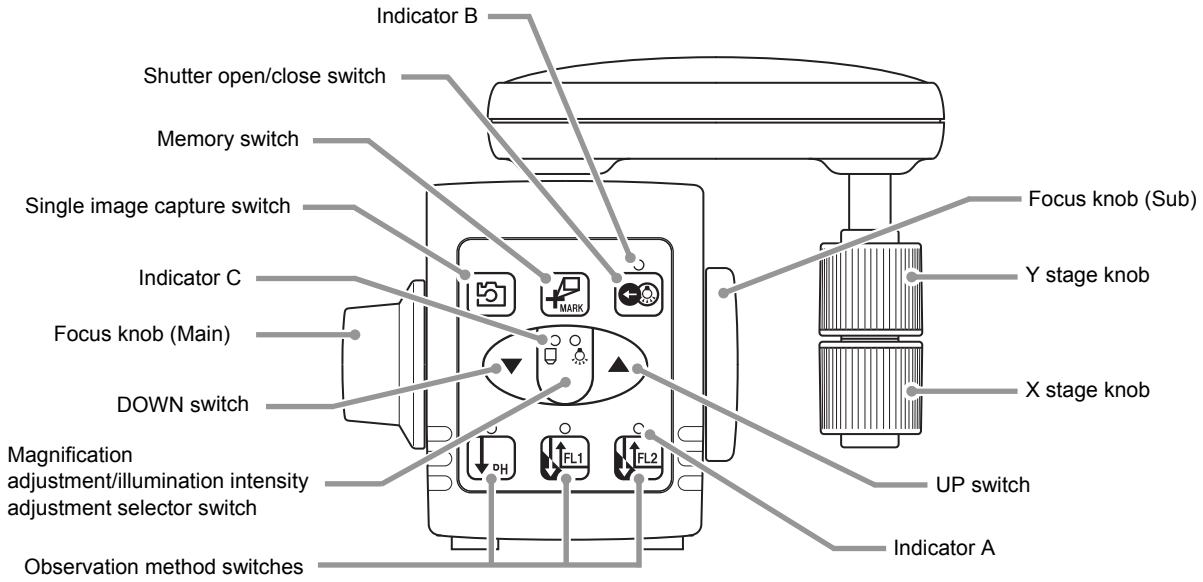


Figure 1.3-1 Ergonomic controller

Table 1.3-1 Ergonomic controller functions

Part name	Function	
Observation method switches	PH Phase contrast is selected and fluorescence filter cubes are automatically removed. FL1 Epifluorescence cube position 1 is selected. FL2 Epifluorescence cube position 2 is selected.	
Shutter open/close switch	The excitation light shutter built in the microscope is opened or closed.	
Single image capture switch	The currently observed image is captured.	
Magnification adjustment/illumination intensity adjustment selector switch	It toggles between objective magnification selection and illumination intensity adjustment.	
Memory switch	X, Y, and Z coordinates recorded by time-lapse experiment are recorded.	
UP switch	For magnification adjustment	Magnification is increased.
	For illumination intensity adjustment	Illumination intensity is increased.
DOWN switch	For magnification adjustment	Magnification is reduced.
	For illumination intensity adjustment	Illumination intensity is reduced.
Indicator A	The LED lamp of the selected observation method lights up.	
Indicator B	The LED lamp is lit when the shutter for excitation light is opened.	
Indicator C	The LED lamp of the selected function lights up.	
Focus knobs	Adjust the focus by rotating the focus knobs. You can adjust the focus with either focus knob. In the figure shown above, the left focus knob is the main knob.	
X stage knob	Observation point is moved in the X direction (right and left).	
Y stage knob	Observation point is moved in the Y direction (back and forth).	

1.4 C-HGFIE HG Precentered Fiber Illuminator (Motorized Operation Type)

This is used for fluorescent observation on the BioStation IM series.
The light is controllable from the control PC.

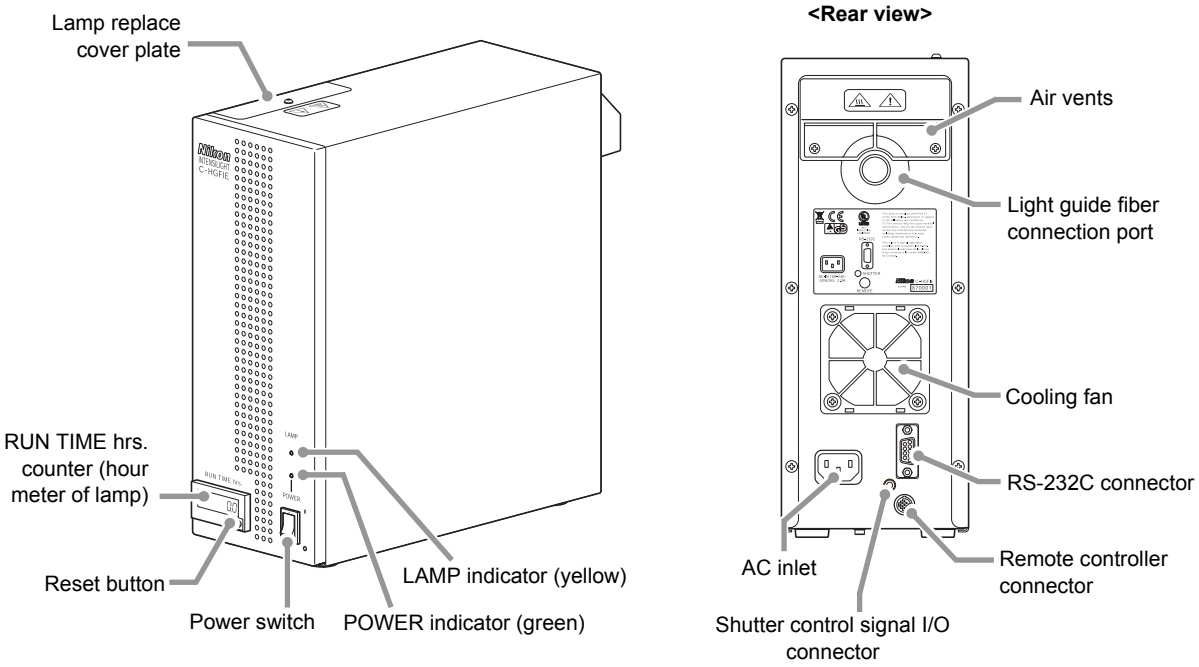


Figure 1.4-1 HG precentered fiber illuminator

1.5 C-HGFIF15 HG Fiber

This leads the light from the HG precentered fiber illuminator into the microscope.

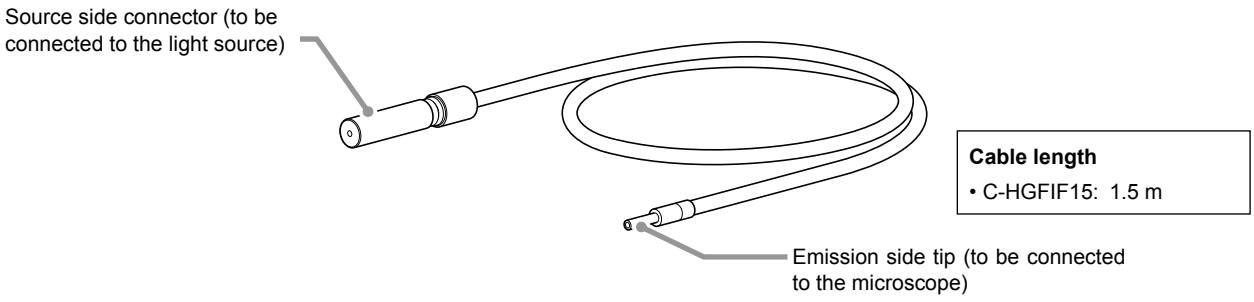


Figure 1.5-1 HG fiber

2 Preparations of a Time-lapse Experiment

This chapter describes the following procedures: starting up the product, setting a specimen, and operating the ergonomic controller.

2.1 Start-up

1. Turn on the microscope.

Turn the power switch on. Then, the “POWER” lamp of the LED indicator on the top of the microscope lights up.

As soon as the microscope is turned on, the temperature adjustment function starts. The temperature set at the previous operation is the target value. Since there is no set value of previous operation when the microscope is turned on for the first time, the default setting is the target value.

Default temperature setting
Temperature of the culture chamber: 37°C
Temperature of the humidifier water tank: 37°C

If room temperature is below 18°C or above 28°C the “POWER” lamp of the LED indicator blinks rapidly. Adjust the room temperature properly so that the performance of microscope becomes stable.

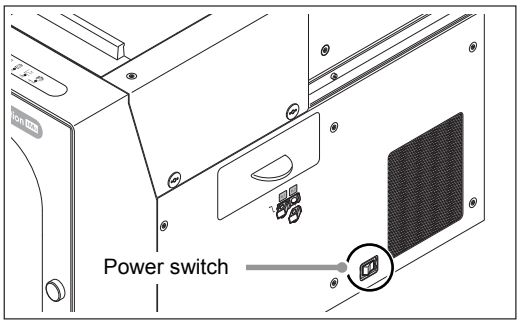


Figure 2.1-1 Turning on the microscope

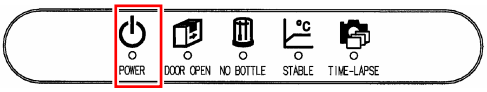


Figure 2.1-2 LED indicator (POWER)

2. Turn on the HG precentered fiber illuminator and the control PC.

For details, refer to the instruction manual for each device.

3. Start up the application software for the BioStation IM and set the temperature.

The standard setting value for the culture chamber is 37°C, but it can be set in the range shown below. For details on setting the temperature, see Section 1.2.2, “Status Display and Settings of the Microscope” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

Table 2.1-1 Temperature settings for the culture chamber and the humidifier water tank

	Standard temperature setting	Temperature range	Necessary condition
Culture chamber	37°C	32 to 38°C	9°C or more higher than the room temperature
Humidifier water tank	The same temperature as that of the culture chamber	32 to 40°C	Equal to or higher than the set value for the culture chamber and equal to or lower than the value 2°C higher than the actual temperature of the culture chamber

CAUTION

Notes on opening the doors on the product
The front door, slide door, and filter cube port must be shut while the product is warmed up or used as a microscope. If you need to open any door, shut it as soon as possible.

4. Warm up the microscope.

It takes approximately three hours to fully warm up the product and stabilize the performance before observation becomes available.

When observation becomes possible, the “STABLE” lamp of the LED indicator on the top of the microscope lights up.

Additionally, the screen display changes from “Unstable” (red) to “Stable” (blue).

Figure 2.1-3 LED indicator (STABLE)

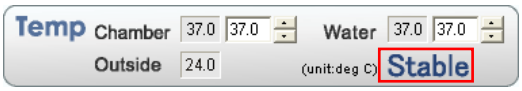


Figure 2.1-4 Screen display of the software

5. Turn on the CO_2 mixer.

For details, refer to the instruction manual for the CO_2 mixer.

> When using the BS-IM-MC MOT chamber, do not turn on the CO_2 mixer until the microscope is fully warmed up. Check that the “STABLE” lamp of the LED indicator is lit before turning on the CO_2 mixer. Otherwise, condensation may occur within the chamber.

Setting the CO_2 mixer

CO_2 concentration : 5%
Amount of flow : 150 ml

The above settings are standard. However, it is recommended to change the values depending on the color of phenol red solution added to the culture medium.

6. Register AF position of the reference mark (only for the BS-IM-MC MOT chamber.)

When using the BS-IM-MC MOT chamber with the AF mode enabled, register the AF position of the reference mark as described below. Check that the “STABLE” lamp of the LED indicator is lit before registering AF position of the reference mark.

Skip this step if the BS-IM-C chamber is used or the calibration is not performed.

(1) Check that the reference mark is displayed on the screen after the software is started, and click the Mark registration button.

If the reference mark is not within the screen, follow the instructions in Section 7.4, “Setting up the BS-IM-MC MOT chamber.”

If it is in the screen but not placed within the blue frame at the center of the screen, move the reference mark into the blue frame using the jog dial or the ergonomic controller.

When the Mark registration button is clicked, the AF positions of the reference marks for wells 1 to 4 are registered in order. This takes about four minutes.

When registration is complete, the image of well 1 is displayed on the Live observation screen.

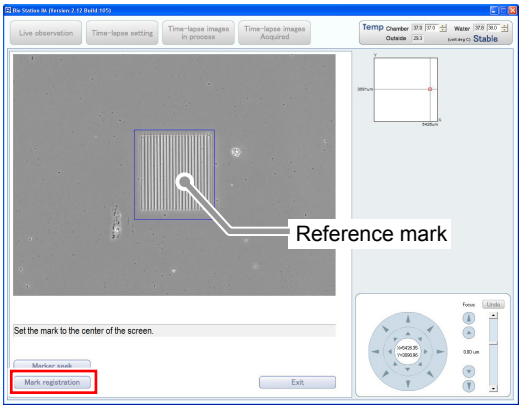


Figure 2.1-5 Reference mark register screen

2.2 Replacing the Filter Cube

The filter for the fluorescence microscopy can be replaced for each specimen.

1. Remove the cover of the filter cube port.

Remove the cover of the filter cube port on the right of the microscope.

When the cover is removed, the “DOOR OPEN” lamp of the LED indicator on the top of the microscope blinks.

When the filter magazine is moved to the far side, it automatically moves to the near side when the cover is removed.

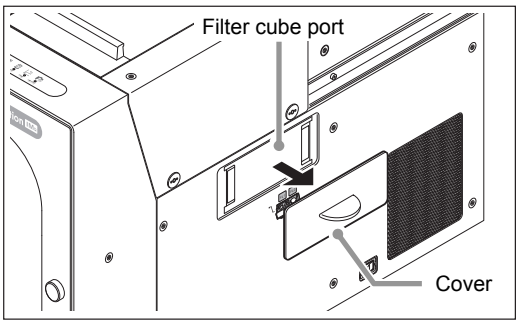


Figure 2.2-1 Removing the cover

2. Remove the filter magazine.

Remove the filter magazine from the sliding bracket as shown.

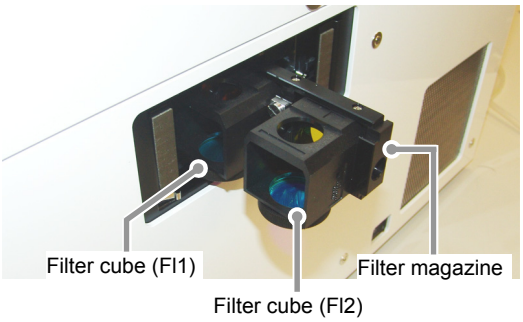


Figure 2.2-2 Removing the filter magazine

3. Replace the filter cube.

To replace the filter cube, slide it apart from the carrier bracket.

The filter cube shown as “FI1” on the display is located at the far side. The filter cube, “FI2,” is located at the near side.

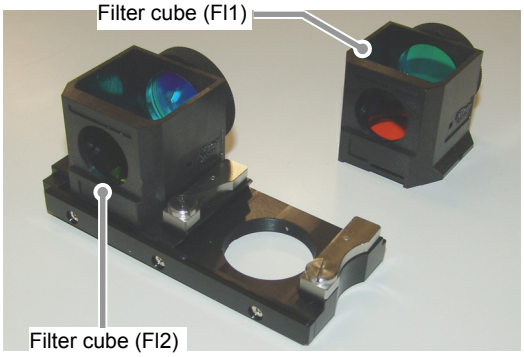


Figure 2.2-3 Replacing the filter cube

4. Attach the filter magazine.

Insert the filter magazine into the original position and attach the cover to the filter cube port.

When the cover is attached, the “DOOR OPEN” lamp of the LED indicator on the top of the microscope goes out.

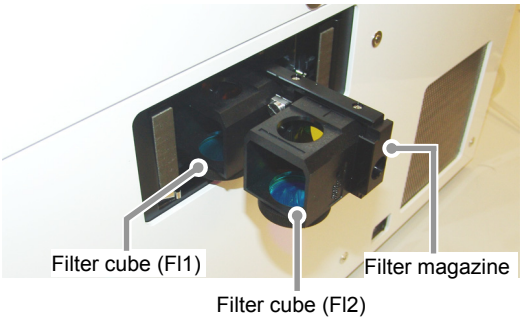


Figure 2.2-4 Inserting the filter magazine

2.3 Checking Water Amount and Supplying Water for the Humidifier Water Tank

Be sure to check the amount of water in the humidifier water tank before operating the product, for time-lapse experiment may last longer than a single day.
Keep the amount of water between the “min” and “max” lines on the humidifier water tank. If the amount of water is not correct, the humidifier may not work correctly.
After refilling the humidifier water tank, warm up the product until the water temperature reaches to the set value and the “STABLE” lamp of the LED indicator lights up.

Checking the amount of water in the humidifier water tank

The “NO BOTTLE” lamp of the LED indicator on the top of the microscope only indicates whether or not the humidifier water tank is set. It does not indicate the amount of water in the tank.

1. Open the front door.

Open the front door by turning the front door open/close knob.

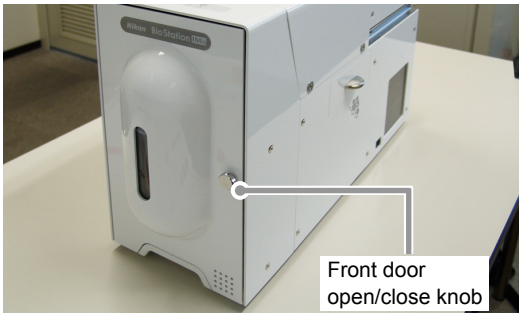


Figure 2.3-1 Opening the front door

2. Detach the quick-release joints of the CO_2 mixed gas tube and the wet mixed gas tube.

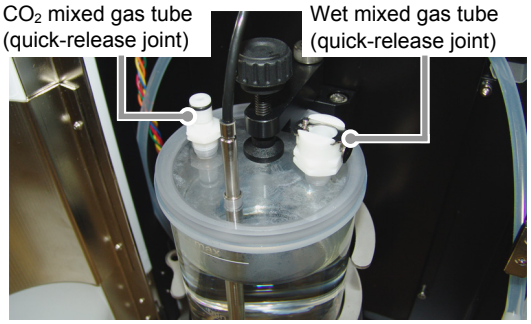


Figure 2.3-2 Removing the quick-release joints

3. Remove the temperature sensor from the humidifier water tank.

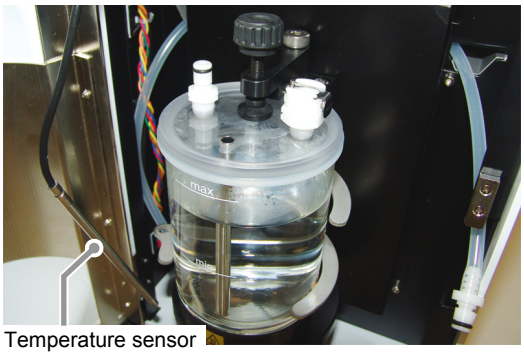


Figure 2.3-3 Removing the temperature sensor

4. Loosen the clamp screw for the humidifier water tank and retract it to remove the humidifier water tank.

When the humidifier water tank is removed, the “NO BOTTLE” lamp of the LED indicator on the top of the microscope blinks.

When it is removed, the humidifier heater is automatically turned off.

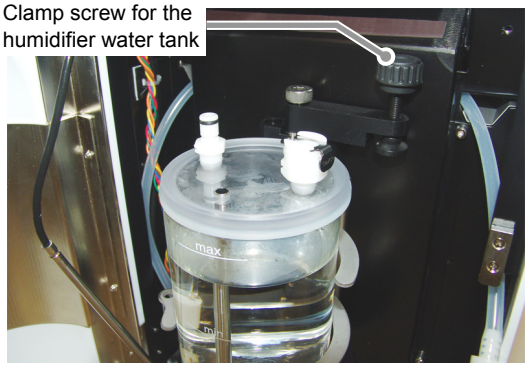


Figure 2.3-4 Loosening the clamp screw

Figure 2.3-5 LED indicator (NO BOTTLE)

5. Pour distilled water into the humidifier water tank.

Pour distilled water into the humidifier water tank until it reaches little below the “max” line. Use only distilled water.

6. Follow the removal procedure in reverse order to attach the humidifier water tank to the microscope.

When the humidifier water tank is attached, the “NO BOTTLE” lamp of the LED indicator on the top of the microscope goes out.

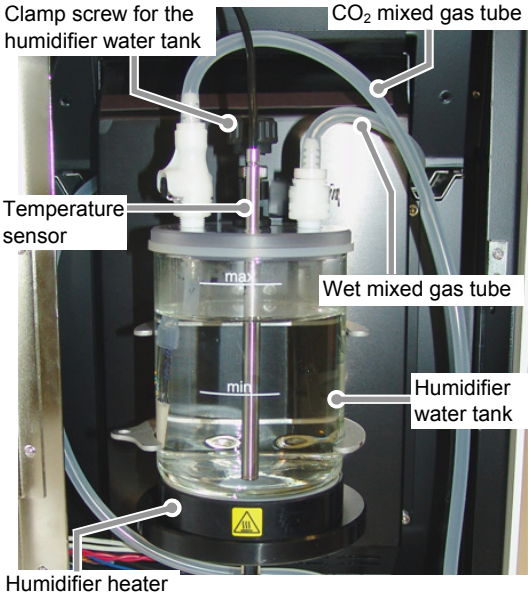


Figure 2.3-6 Attaching the humidifier water tank

Figure 2.3-7 LED indicator (NO BOTTLE)

7. Shut the front door.

Shut the front door properly by turning the front door open/close knob.

2.4 Setting a Specimen

CAUTION

Notes on setting a specimen

When a dish is taken out from an incubator, etc., condensation occurs on the cover of the dish caused by the temperature differences between the incubator and the room. The condensation fades gradually once the dish is set in the culture chamber. Perform the microscopy without the condensation, since the image in the phase contrast microscopy is degraded if the condensation remains.

If the contact surface between the bottom of the dish and the culture chamber is wet, the specimen may move during the time-lapse experiment or go out of focus. Check that the contact surface is free from water and culture medium.

If there is too much specimen in the glass bottom 4-well dish, the specimen may contact the upper lid, resulting in abnormal observation images. When filling the dish with a specimen, only fill up to two-thirds of the height of the dish.

1. Open the slide door.

Open the slide door on the top of the microscope by sliding it backward.

When the slide door is opened, the “DOOR OPEN” lamp of the LED indicator on the top of the microscope lights up.

The figure illustrated at the right shows the case for the BS-IM-C chamber. In this manual, the figure for the BS-IM-C chamber will be illustrated if the operating instruction of the MS-IM-MC MOT chamber is the same as that of the BS-IM-C chamber.

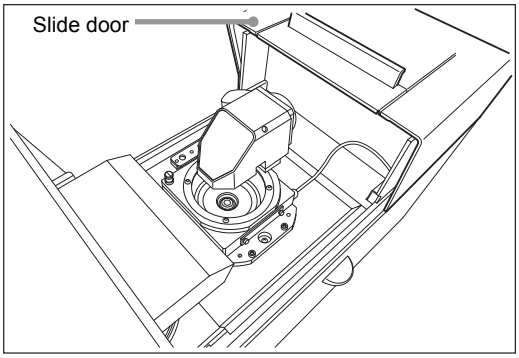


Figure 2.4-1 Opening the slide door

2. Retreat the diascopic illumination unit.

Move the diascopic illumination unit backward by rotating it.

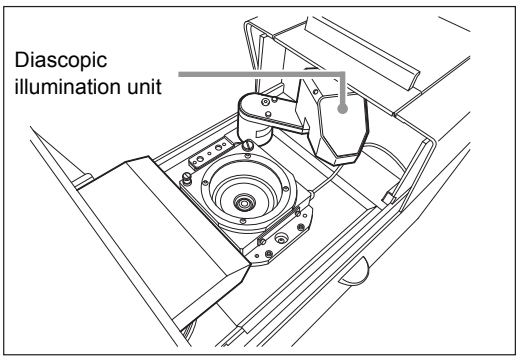


Figure 2.4-2 Retreating the diascopic illumination unit

3. Set specimen in the culture chamber.

BS-IM-C chamber

Open the rotatable cover of the BS-IM-C chamber by rotating it backward, then set the specimen.

* The 35-mm dish for the CELL-S2 is different from that for the CELL-S2-P.

  CELL-S2: Glass bottom dish
  Film bottom 4-quadrant dish

  CELL-S2-P: Plastic bottom dish

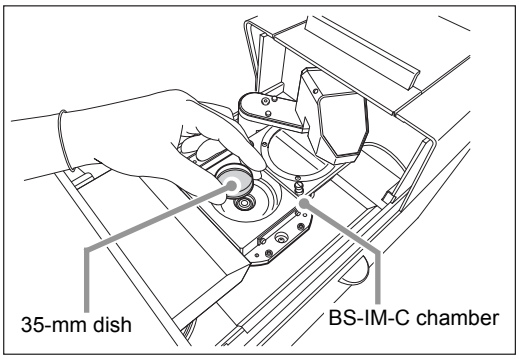


Figure 2.4-3 Setting specimen

Adjusting the correction ring

In the CELL-S2-P, a correction ring is attached to the objective. Adjustment of the correction ring corrects the spherical aberration caused by the difference in bottom thickness of the plastic bottom dish, and makes images clear.

Set the index of the bottom thickness of the dish in use rotating the knobs near the top of the objective.

For the bottom thickness, contact its manufacturer.

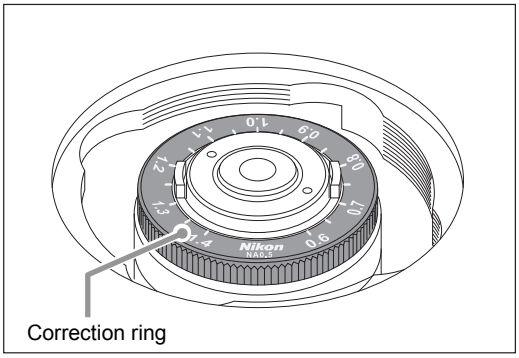


Figure 2.4-4 Correction ring on the objective

When the film bottom 4-quadrant dish is in use

When the film bottom 4-quadrant dish is set, use the 4-quadrant dish positioning adapter.

Place the adapter in the culture chamber, and then set the film bottom 4-quadrant dish, adjusting the adapter notch with the dish partition.

> When the 4-quadrant dish is used for the first time, check the positional relation between the cross line displayed on the Wide field screen and the disk partitions for the quadrants.
>
> For details, see Section 7.3, “Notes on Using the Film Bottom 4-Quadrant Dish” in this manual.

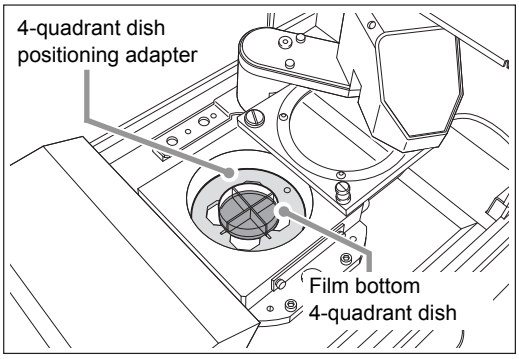


Figure 2.4-5 Setting the film bottom 4-quadrant dish

After setting the specimen, close the rotatable cover.

BS-IM-MC MOT chamber

(1) Remove the lid of BS-IM-MC MOT chamber and place it on the lid stand.

> Always place the lid on the lid stand located inside of the microscope main unit. If the lid is placed outside of the microscope, it may get cold, causing a longer time re-warming up till the "STABLE" lamp of the LED indicator lights up.

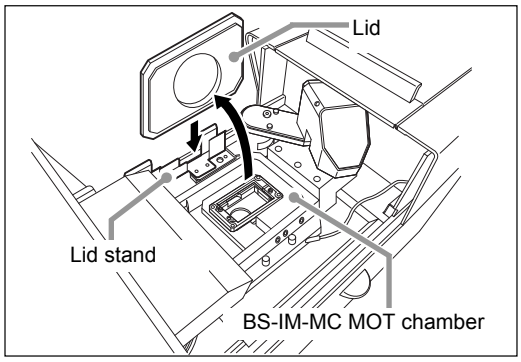


Figure 2.4-6 Setting the glass bottom 4-well dish (1)

(2) Water will accumulate in the water barrier within the BS-IM-MC MOT chamber. Use a dropper or other means to remove the water before or after observation.

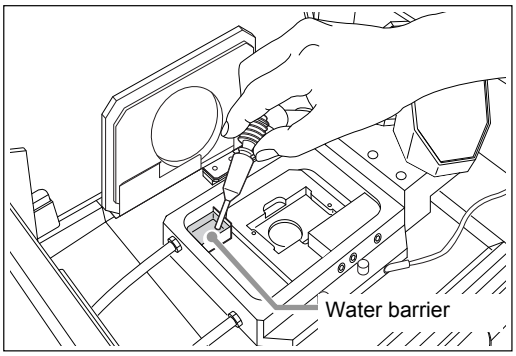


Figure 2.4-7 Setting the glass bottom 4-well dish (2)

(3) Loosen the screws and remove the dish fixing plate.

(4) Set the glass bottom 4-well dish (with the specimen) into the chamber, place the dish fixing plate on the dish, and secure the plate tightening the screws.

(5) Seal the BS-IM-MC MOT chamber with the lid.

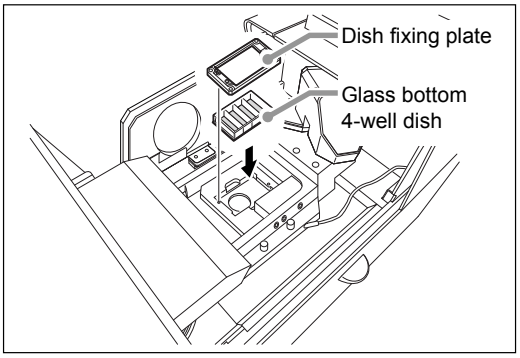


Figure 2.4-8 Setting the glass bottom 4-well dish (3)

4. Close the slide door.

Return the diascopic illumination unit to the original position and close the slide door by sliding it forward by hands.

When the slide door is closed, the "DOOR OPEN" lamp of the LED indicator on the top of the microscope is turned off.

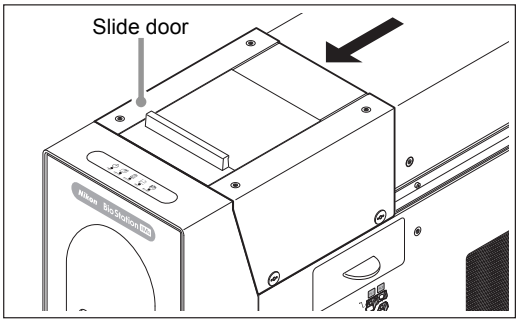


Figure 2.4-9 Closing the slide door

CAUTION

Set the dish as immediately as possible.

When the slide door is opened, the “STABLE” lamp goes off. When the slide door is shut and the temperature condition is stabilized, the “STABLE” lamp lights up again. The time required to light up the “STABLE” lamp again differs depending on the period of time the slide door was open and the environmental temperature condition. It takes at least ten minutes. Be sure to register time-lapse points after the “STABLE” lamp is lit.

2.5 End

1. **Click the Close button ( ) in upper right cover of the window.**

   This software closes, and the Windows desktop appears.

   Perform this operation when you detach the chamber. For the BS-IM-MC MOT chamber, this procedure must be carried out for safe detachment of the chamber. (This procedure triggers the dish mounting part take the position in readiness.)

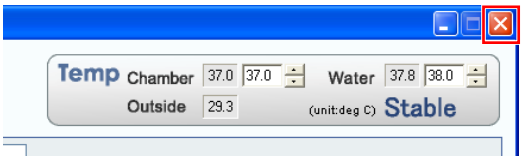


Figure 2.5-1 Close button

2. **Turn off the peripheral devices.**

   Turn off the HG precentered fiber illuminator, CO_2 mixer, and control PC. For details, refer to the instruction manual for each device.

3. **Turn off the microscope.**

   Turn the power switch off. Then, the “POWER” lamp of the LED indicator on the top of the microscope goes out.

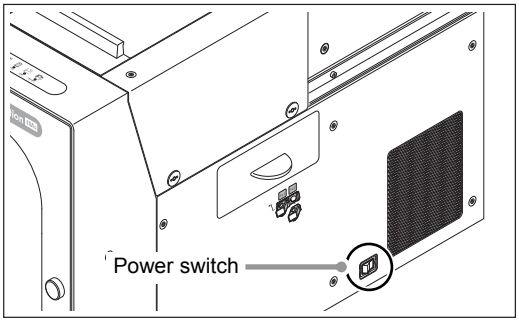


Figure 2.5-2 Turning off the microscope

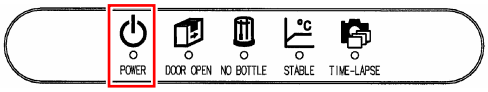


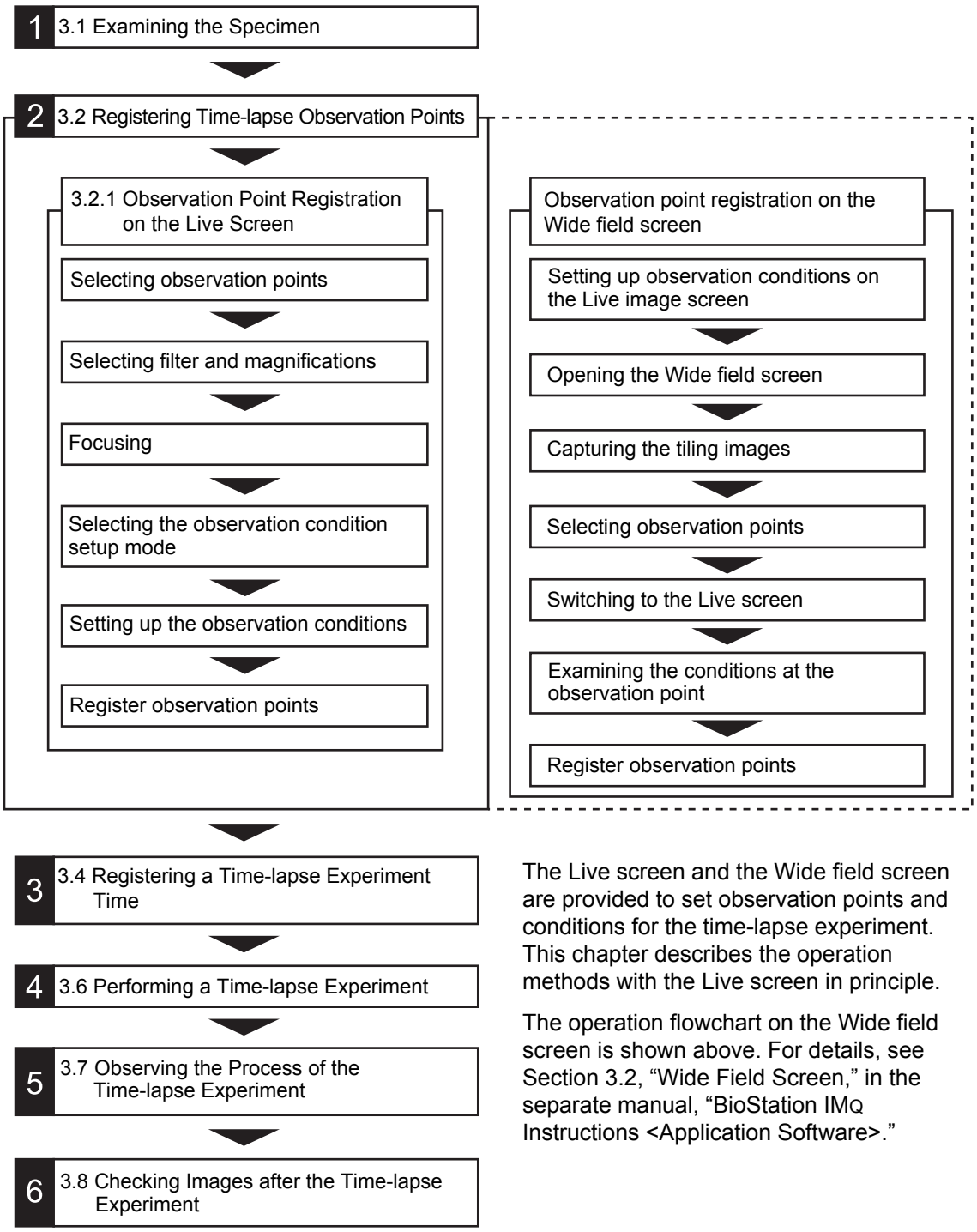
Figure 2.5-3 LED indicator (POWER)

3 Basic Operations

To perform time-lapse experiment, set the observation point, observation conditions, and capturing interval time for specimen.

Close all other running application software on the control PC before setting observation conditions for the time-lapse experiment.

Operation flowchart



The Live screen and the Wide field screen are provided to set observation points and conditions for the time-lapse experiment. This chapter describes the operation methods with the Live screen in principle.

The operation flowchart on the Wide field screen is shown above. For details, see Section 3.2, “Wide Field Screen,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

Figure 3.0-1 Operation flowcharts for time-lapse experiment

3.1 Examining the Specimen

On the Live observation screen, observe the condition and reaction of the specimen when fluorescent reagent is applied. Check whether the specimen is appropriate subject to perform the time-lapse experiment.

1. Display the Live observation screen.

Click the Live observation button.

For details on the Live observation screen, see Chapter 2, “Live Observation Screen,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

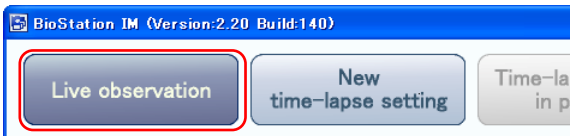


Figure 3.1-1 Live observation button

2. Select an observation point.

2-1. When using the BS-IM-MC MOT chamber, click the well switch button to select the well (1 to 4) to be used for observation.

The Well switch button is not shown for the BS-IM-C chamber, as there is no need to switch wells. Proceed to step 2-2.

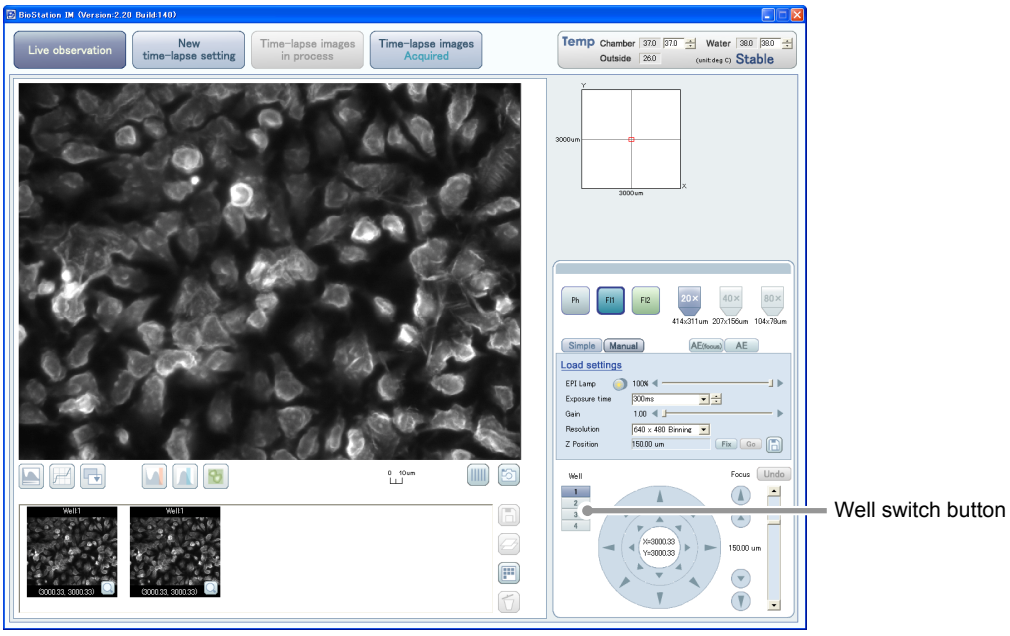


Figure 3.1-2 Live observation screen (BS-IM-MC MOT chamber)

2-2. Select an observation point by moving the stage.

There are four methods for moving the stage as follows:

(1) Clicking a point in the Observation point display to move the position to the center of the view

(2) Clicking a point in the Live observation image display area to move the position to the center of the view

(3) Operating the jog dial

(4) Operating the X, Y stage knobs of the ergonomic controller (See Section 1.3, “Ergonomic Controller.”)

> The screen illustrated below shows the case for using the BS-IM-C chamber. In this manual, the screen for the BS-IM-C chamber will be illustrated if the operating instruction of the MS-IM-MC MOT chamber is the same as that of the BS-IM-C chamber.

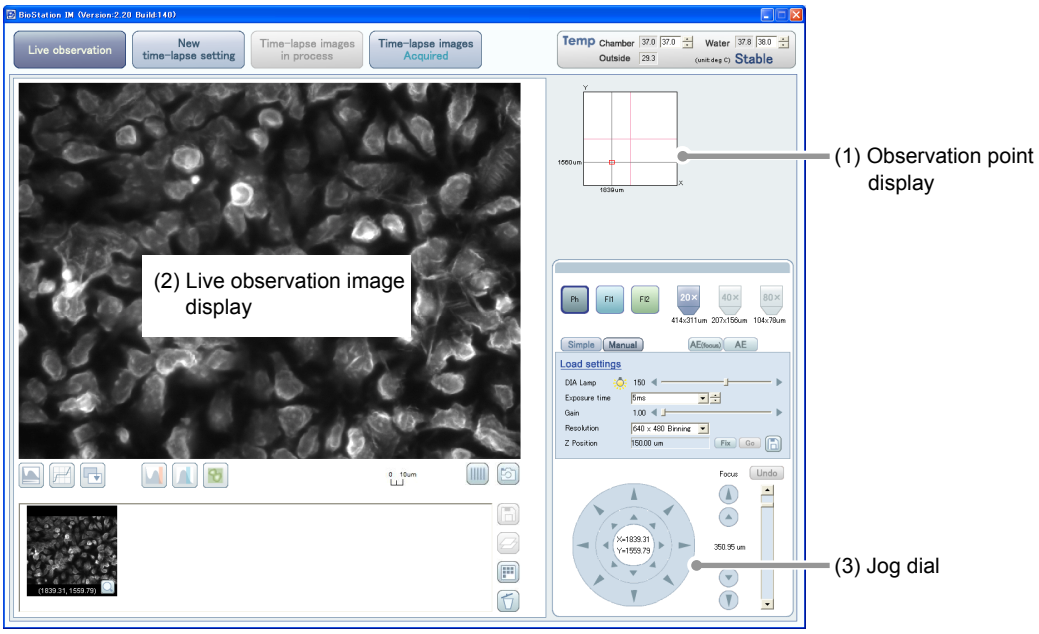


Figure 3.1-3 Live observation screen (BS-IM-C chamber)

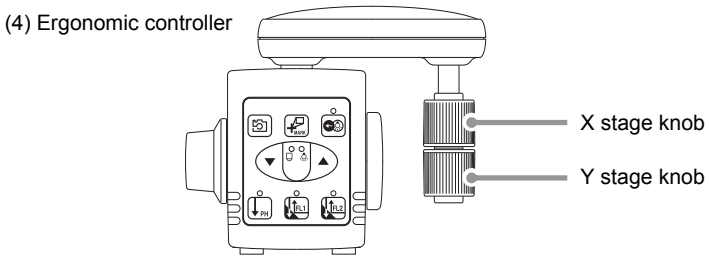


Figure 3.1-4 Ergonomic controller (stage movement)

3. Select filters and magnifications.

Click the buttons to select filters and magnifications for the observation.

This operation can be performed with the ergonomic controller too.
(See Section 1.3, “Ergonomic Controller.”)

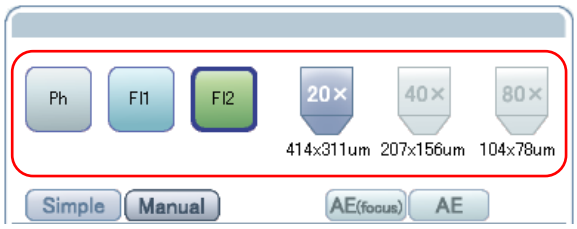


Figure 3.1-5 Filter buttons and magnification buttons

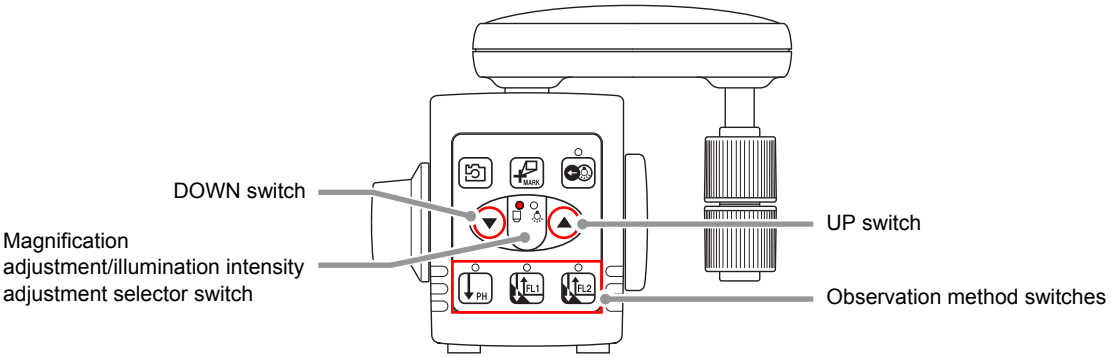


Figure 3.1-6 Ergonomic controller (filter (observation method) and magnification selection)

4. Focus on the specimen.

Focus on the specimen using the focus buttons or the focus slider.

This operation can be performed with the ergonomic controller too.
(See Section 1.3, “Ergonomic Controller.”)

After the focus adjustment, the focusing position can be registered with the Fix button at the right of the Z Position.
For details, see Section 2.2, “Setting Observation Conditions (Filter, Magnification, Mode, Z position, and Save)” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

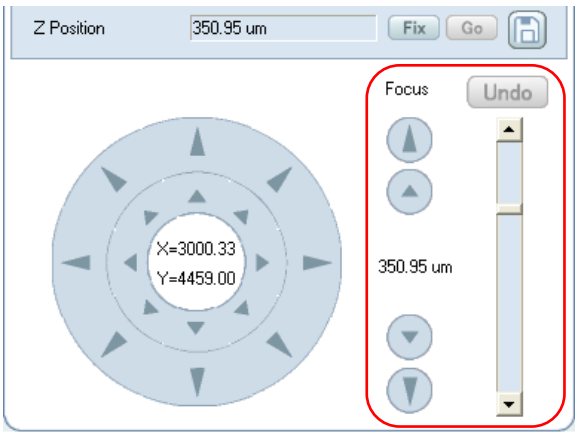


Figure 3.1-7 Operation for focusing

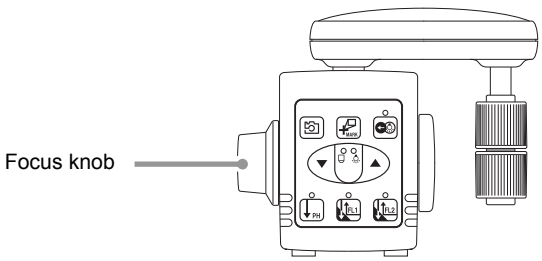


Figure 3.1-8 Ergonomic controller (Operation for focusing)

5. Select the observation condition setup mode.

Two modes are available for setting up the observation conditions: the Simple mode and the Manual mode.

Click the mode button to be used.

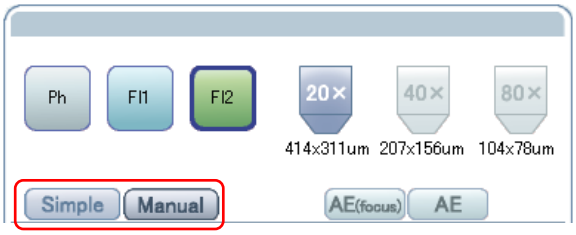


Figure 3.1-9 Observation condition setup mode

6. Set up the observation conditions.

This section describes the settings on the Manual mode.
For the settings on the Simple mode, see Section 2.2, “Setting Observation Conditions (Filter, Magnification, Mode, Z position, and Save),” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

Items can be set up manually. Besides, an existing file can be loaded with the Load settings button to restore the conditions. And the settings of the observation conditions can be saved to an observation condition file. For details on saving observation conditions, see Section 2.2.1, “Saving Observation Condition,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

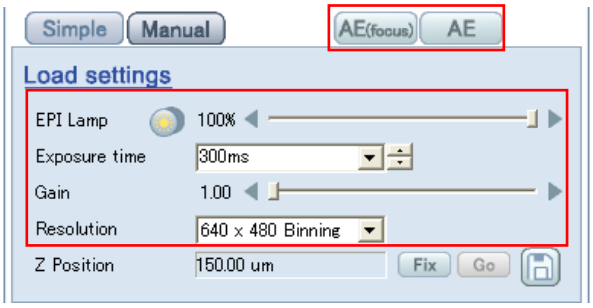


Figure 3.1-10 Setting observation condition on the Manual mode (fluorescent microscopy)

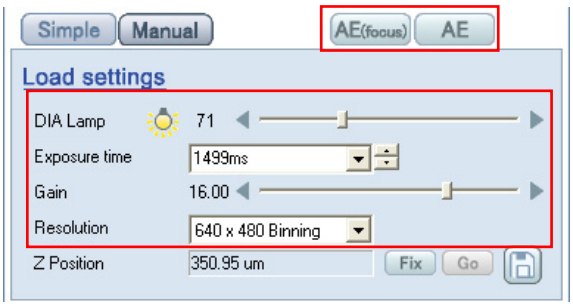


Figure 3.1-11 Setting observation condition on the Manual mode (phase contrast microscopy)

- AE (focus) button: automatic exposure adjustment with focus priority
- AE button: automatic exposure adjustment (one time)
- EPI Lamp: light intensity adjustment for episcopic illumination (only when FL filter is selected)
- DIA Lamp: light intensity adjustment for diascopic illumination (only when Ph filter is selected)
- Exposure time: exposure time setting
- Gain: gain compensation value setting
- Resolution: image resolution setting

For details on items of the Manual mode, see Section 2.2, “Setting Observation Conditions (Filter, Magnification, Mode, Z position, and Save),” and Section 2.3, “Setting Observation Conditions (Focus Mode, Automatic Exposure, Condition File Loading, Light Intensity, Exposure Time, Gain, and Resolution),” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

7. For the BS-IM-MC MOT chamber, repeat the procedure from Steps 2 to 6 to set the observation point for the other wells.

3.2 Registering Time-lapse Observation Points

The Live screen and the Wide field screen are provided to set observation points and conditions of the time-lapse experiment.
This chapter describes the operation methods with the Live screen in principle. The Live screen sets observation points and conditions with an observing live image and the Wide field screen sets them with a captured tiled image.

3.2.1 Observation Point Registration on the Live Screen

1. Display the New time-lapse setting screen.

Click the New time-Lapse setting button.

For details on the New time-lapse setting screen, see Chapter 3, “New Time-lapse Setting Screen,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

Figure 3.2-1 Displaying the New time-Lapse setting screen

2. Display the Live screen.

Click the Live button.

Figure 3.2-2 Displaying the Live screen

3. Select an observation point.

Select an observation point by moving the stage.

Operations are the same as that on the Live observation screen. (See Step 2 in Section 3.1, “Examining the Specimen.”)

4. Select filters and magnifications.

Select check boxes of filters and magnifications for use of observation (multiple filters and magnifications are selectable).
Note that at least one filter and one magnification must be selected.

The Ph, FI1, and FI2 filters and only the 20x magnification are selected in the figure shown at right. Additionally, the image of 20x for FI2 filter is currently displayed on the Live screen.

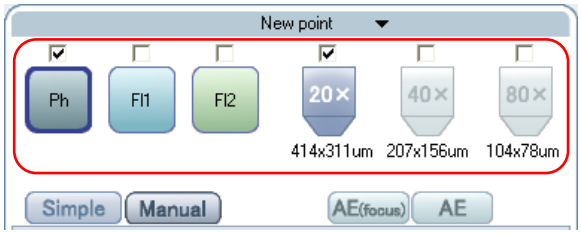


Figure 3.2-3 Filter buttons and magnification buttons

5. Focus on the specimen.

Focus on the specimen using the focus buttons or the focus slider.

Operations are the same as that on the Live observation screen. (See Step 4 in Section 3.1, “Examining the Specimen.”)

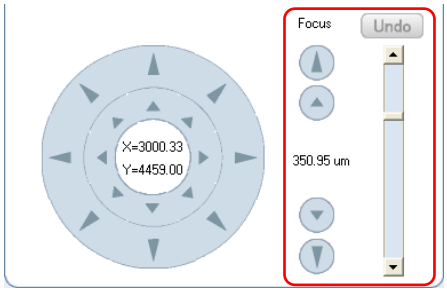


Figure 3.2-4 Operation for focusing

6. Select the observation condition setup mode.

Two modes are available for setting up the observation conditions: the Simple mode and the Manual mode.

Click the mode button to be used.

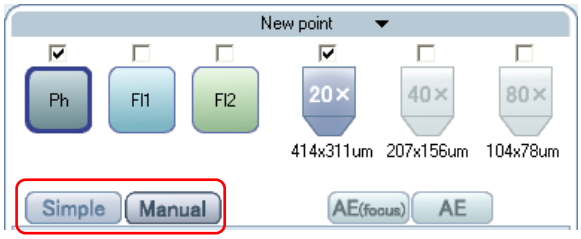


Figure 3.2-5 Observation condition setup mode

7. Set up the observation conditions.

Set the observation conditions for each combination of the filters and the magnifications specified in Step 4.
For the case in Step 4, set the observation conditions for the following combinations:
Ph (phase contrast microscopy) + 20x, Fl1 (fluorescence filter 1) + 20x, and Fl2 (fluorescence filter 2) + 20x

Observation condition setting methods are the same as that on the Live observation screen. (See Step 6 in Section 3.1, “Examining the Specimen.”)

8. Register observation points and conditions.

Click the Time-lapse point registration button to register the observation point and the observation conditions.

Repeat the steps for setting up observation conditions and registering the conditions for each observation point to register multiple observation points into the time-lapse experiment scheme.

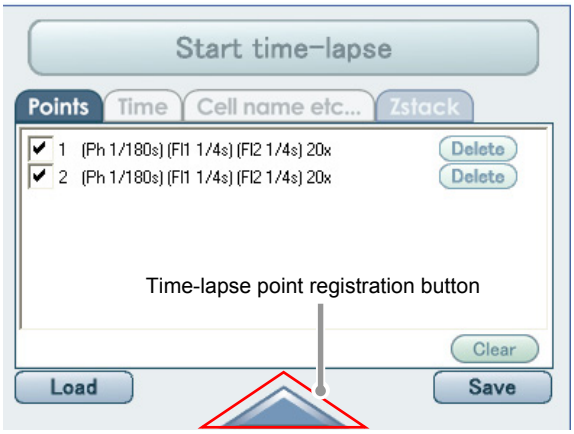


Figure 3.2-6 Registering observation points

Numbering for the registered observation points

All registered observation points will be numbered in sequence of registration.

For the BS-IM-MC MOT chamber, the registration number is prefixed with the well number.

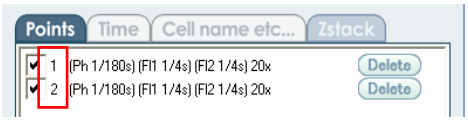


Figure 3.2-7 Numbering for registered observation points (BS-IM-C chamber)

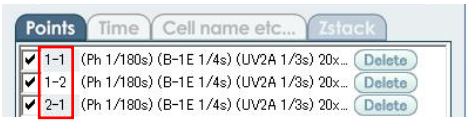


Figure 3.2-8 Numbering for registered observation points (BS-IM-MC MOT chamber)

When the Time-lapse point registration button is clicked, the condition is calibrated automatically and the image of the registered position appears.
This is a necessary sequence for a long time-lapse experiment to achieve a stable position repeatability, but sometimes the image may be shifted slightly from the previous one.
If the appeared image needs to be corrected, highlight the observation point to be corrected and adjust its XYZ positions. Then click the Time-lapse point registration button again.

Registering multiple observation points in the Z direction

To register multiple observation points in the Z direction at the same X-Y coordinates, use the Z-stack function.

Specify the travel amount in the Z direction (Step: μm) and the travel count (Steps). Multiple observation points are set up automatically.

For details on the Z-stack function, see Section 3.1.6, “Time-lapse Experiment Scheme (Zstack Tab)” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

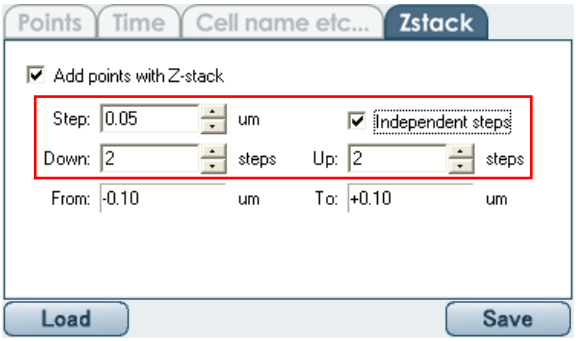


Figure 3.2-9 Zstack tab

3.3 Changing Observation Conditions and Deleting Observation Points

To change an observation condition for each observation point, perform the following procedure.

3.3.1 Changing Observation Conditions

1. Display the Live screen of the New time-lapse setting screen.

Click the Live button.
The Live screen of the New time-lapse setting screen appears.

Figure 3.3-1 Displaying the Live screen

2. Select an observation point to change its setting.

There are two methods for selecting an observation point.

- Click the down arrow button at the right of the New point of the observation condition settings and select an observation point in the list. The Point information dialog box appears.

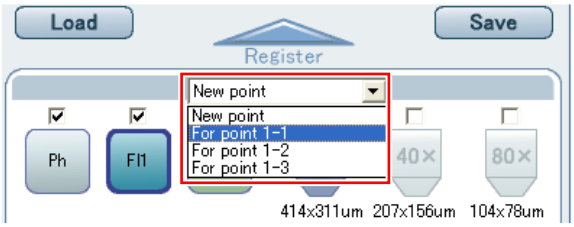


Figure 3.3-2 Selecting an observation point

- On the Points tab, click the observation point to be changed.

  The Point information dialog box appears.

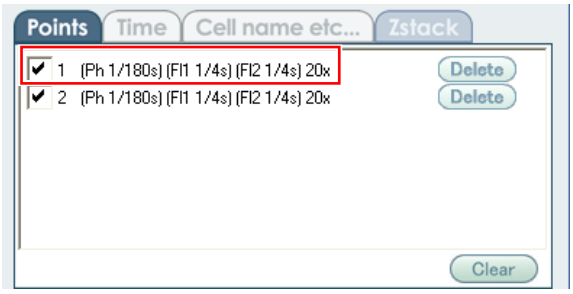


Figure 3.3-3 Selecting an observation point

To change displayed observation condition settings to new settings, click the Go button.
To delete the selected observation point, click the Delete button.
To cancel the changes, click the Close button. The Point information dialog box closes without applying the changes.

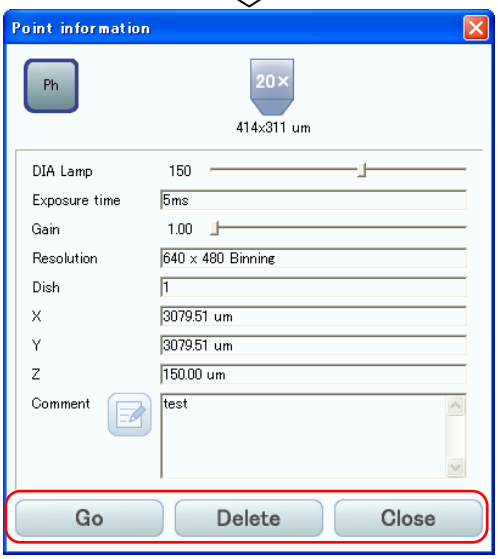


Figure 3.3-4 Point information dialog box

3.3.2 Deleting Observation Points

1. Display the New time-lapse setting screen.

Click the New time-lapse setting button.

Figure 3.3-5 Displaying the New time-lapse setting screen

2. Delete observation point.

On the Points tab, click the Delete button of the observation point to be deleted.

The delete confirmation dialog box appears.

Figure 3.3-6 Deleting the observation point

To delete the observation point, click the OK button.
To cancel the operation, click the Cancel button.
The confirmation dialog box closes.

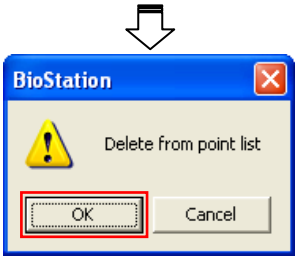


Figure 3.3-7 Delete confirmation dialog box

3.4 Registering the Time-lapse Experiment Time

To perform a time-lapse experiment, specify an interval time and a total observation time.

Registering multiple time-lapse experiment times is available.

This software can register multiple time-lapse experiment times, which are composed of different total observation time and capturing interval time.

When a time-lapse experiment starts, the multiple time-lapse experiment times registered with the Time tab are automatically applied in descending order.

Additionally, even during the time-lapse experiment, adding a new time-lapse experiment time and changing or deleting unperformed time-lapse experiment time are available.

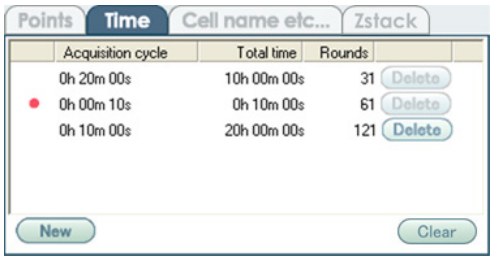


Figure 3.4-1 Time tab

3.4.1 Registering the Time-lapse Experiment Time for Image Capturing

1. Change the time-lapse experiment scheme view to "Time."

Click the Time tab of the New time-lapse setting screen.

Figure 3.4-2 Switching to the Time tab

2. Set time-lapse experiment time.

Click the New button.
The Timelapse dialog box (for new registration) appears.

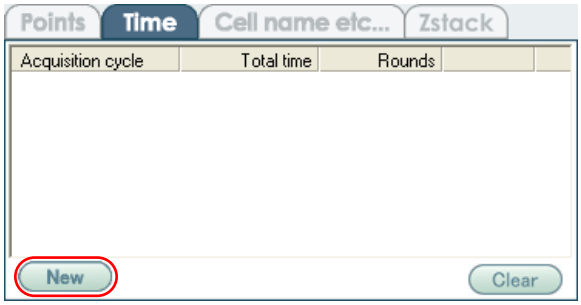


Figure 3.4-3 New button

Input capturing interval time in the Acquisition cycle box and total observation time in the Total time box.
The number of rounds (Rounds) is automatically calculated from values of Acquisition cycle and Total time and displayed.

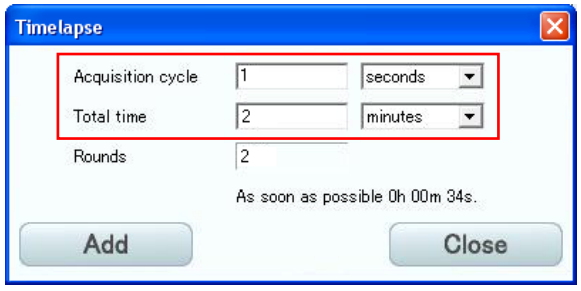


Figure 3.4-4 Setting capturing interval time and total observation time

3. Register time-lapse experiment time.

Click the Add button.
The Timelapse dialog box is closed and the time-lapse experiment time set on the Time tab is registered.

To register multiple time-lapse experiment time, repeat this procedure.

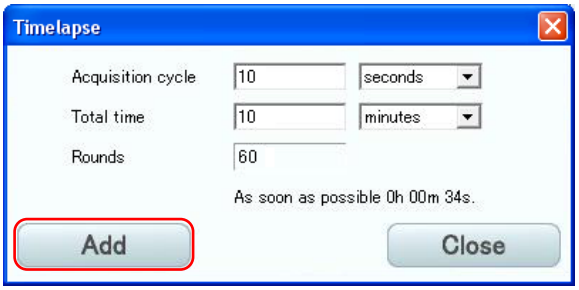


Figure 3.4-5 Registering capturing interval time and total observation time

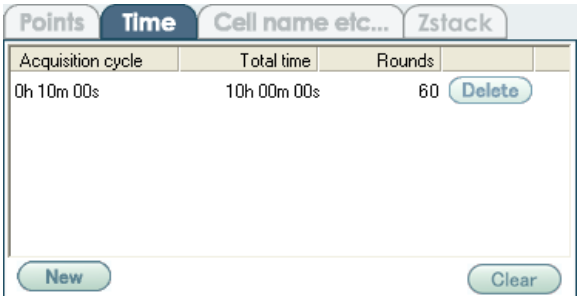


Figure 3.4-6 Displaying interval time

Details on setting time-lapse experiment time

If the registered time-lapse experiment time cannot be executed, a warning mark appears in upper right corner of the time-lapse experiment scheme view.

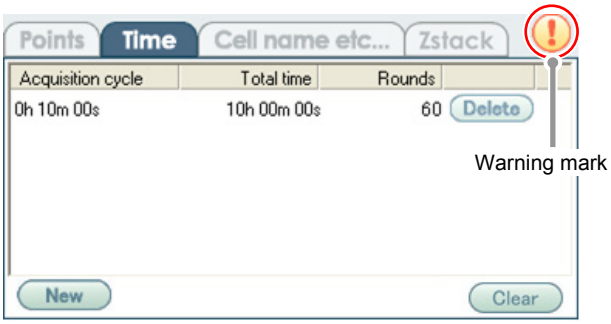


Figure 3.4-7 Warning mark

3.4.2 Registering the Time-lapse Experiment Time for Stream Capturing

To perform stream capturing during a time-lapse experiment, configure the stream setting following the procedure shown below.

Stream setting limitations

The following observation conditions must be applied for the stream setting. The Stream setting box does not appear on the Timelapse dialog box unless all of the following conditions are met.

- The exposure time must be less than a second.
- One type each for the filter and the objective must be selected.
- A single observation point (Z-stack) must be applied in the Z direction.

1. Change the time-lapse experiment scheme view to "Time."

Click the Time tab on the New time-lapse setting screen.

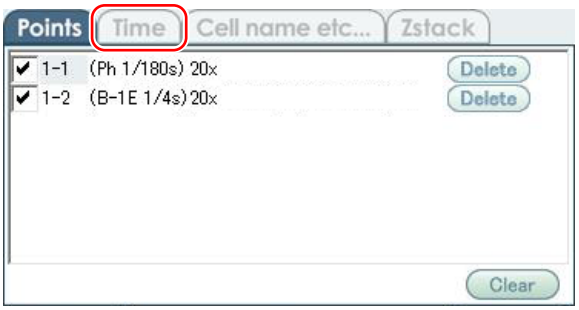


Figure 3.4-8 Selecting the Time tab

2. Set the stream time.

Click the New button.

The Timelapse dialog box (for new registration) appears.

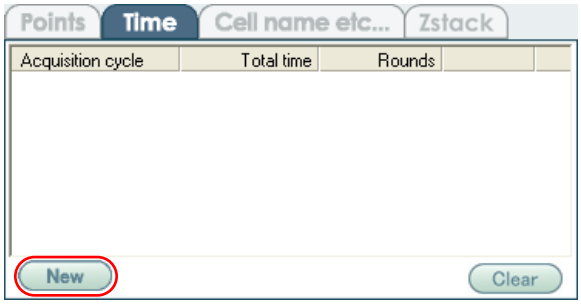


Figure 3.4-9 Clicking the New button

Check the Stream setting checkbox.

Set the stream capturing time in the Stream time box (setting range: 1 to 3600 seconds.)

The shortest interval time to be set is displayed below the Stream setting box.

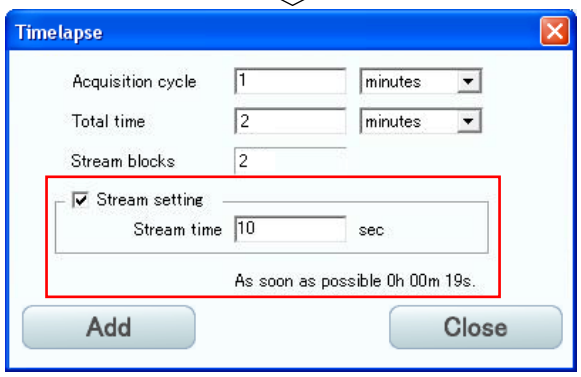


Figure 3.4-10 Setting the stream time

3. Set the time-lapse experiment time.

Input the capturing interval in the Acquisition cycle box. This value must be equal to or longer than the value shown below the Stream setting box.

Input the total observation time in the Total time box.

The number of Stream blocks (number of captures) is automatically calculated from values of Acquisition cycle and Total time.

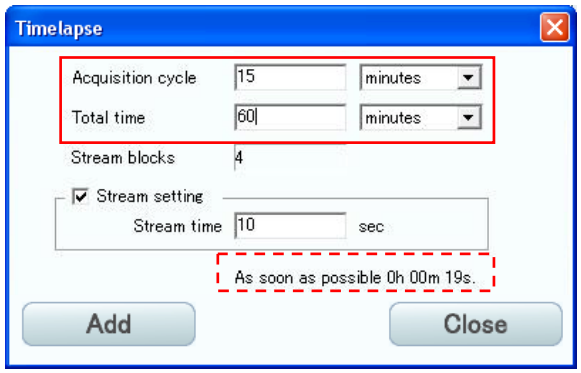


Figure 3.4-11 Setting the Acquisition cycle and Total time

4. Register the time-lapse experiment time.

Click the Add button.

The Timelapse dialog box closes, and the registered time-lapse experiment time is displayed on the time-lapse experiment scheme view.

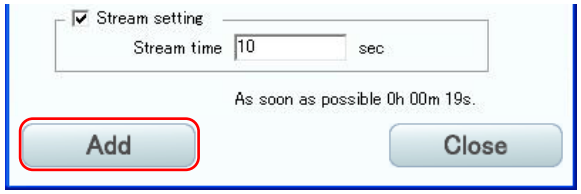


Figure 3.4-12 Registering the Stream time

When Stream setting is enabled, the Time tab is replaced with Stream tab.

Repeat this procedure to register multiple time-lapse experiment times.

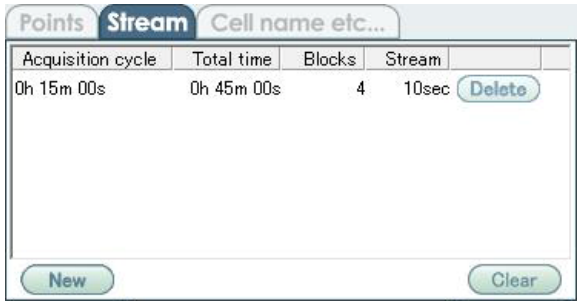


Figure 3.4-13 Displaying the Stream setting

Timing for the Stream capturing

Stream blocks will be started using standard rounds.

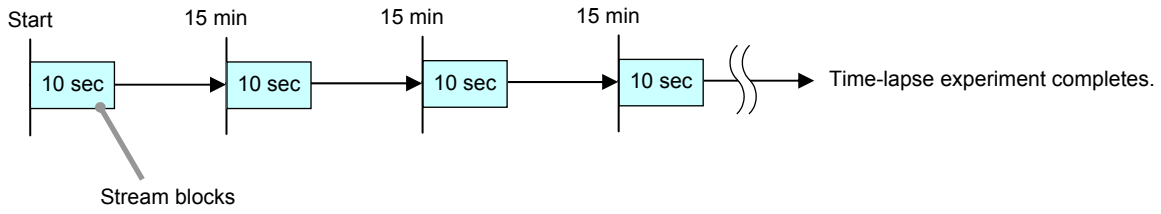


Figure 3.4-14 Timing for the Stream capturing

3.5 Changing and Deleting a Time-lapse Experiment Time

Change or delete the registered time-lapse experiment time when it cannot to be executed.

3.5.1 Changing the Time-lapse Experiment Time

1. Display the New time-lapse setting screen.

Click the New time-lapse setting button.

Figure 3.5-1 Displaying the New time-lapse setting screen

2. Select the time-lapse experiment time to be changed.

On the Time tab, click the time-lapse experiment time to be changed.
The Timelapse dialog box (for setting change) appears. Change the settings of the time-lapse experiment.

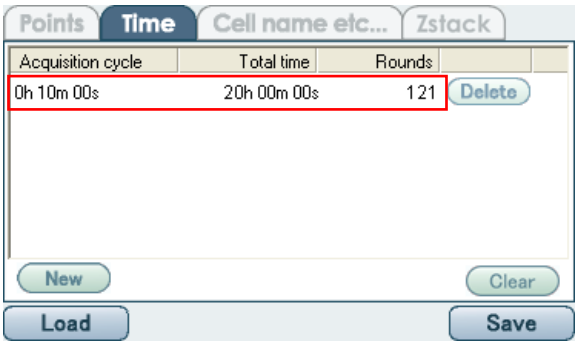


Figure 3.5-2 Time-lapse experiment time

To close the Timelapse dialog box with the changes applied, click the Apply button.
To delete the selected time-lapse experiment time, click the Delete button.
To close the Timelapse dialog box without applying the changes, click the Close button.

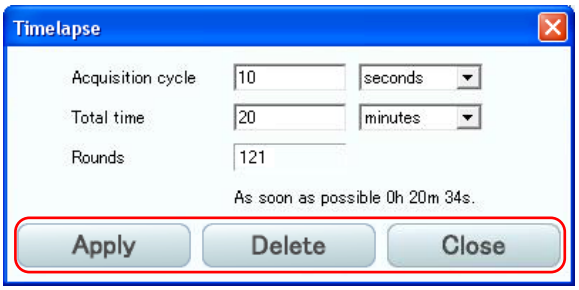


Figure 3.5-3 Timelapse dialog box

3.5.2 Deleting the Time-lapse Experiment Time

1. Display the New time-lapse setting screen.

Click the New time-lapse setting button.

Figure 3.5-4 Displaying the New time-lapse setting screen

2. Delete the time-lapse experiment time.

On the Time tab, click the Delete button shown next to the time-lapse experiment time to be deleted.

The delete confirmation dialog box appears.

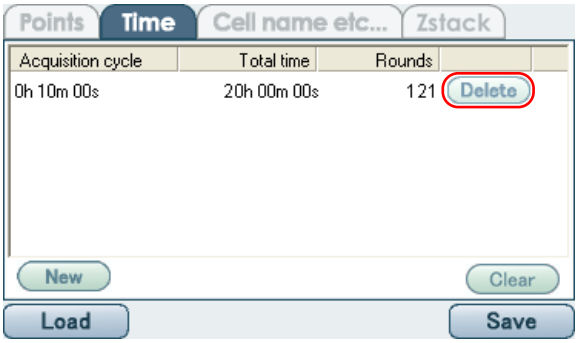


Figure 3.5-5 Deleting the time-lapse experiment time

To delete the selected time-lapse experiment time, click the OK button.
To close the confirmation dialog box without deleting, click the Cancel button.

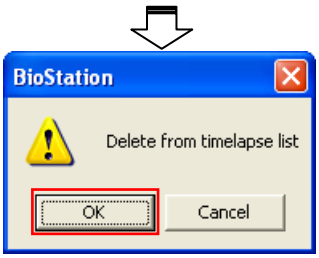


Figure 3.5-6 Delete confirmation dialog box

3.6 Performing a Time-lapse Experiment

1. Make sure that the microscope is ready for time-lapse experiment.

Check that the status of the culture chamber and humidifier water tank appears to be “Stable.”

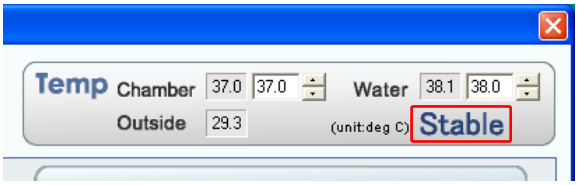


Figure 3.6-1 Checking condition of the microscope for time-lapse experiment

2. Start time-lapse experiment.

Click the Start time-lapse button.

The Confirmation window of time-lapse experiment settings appears.

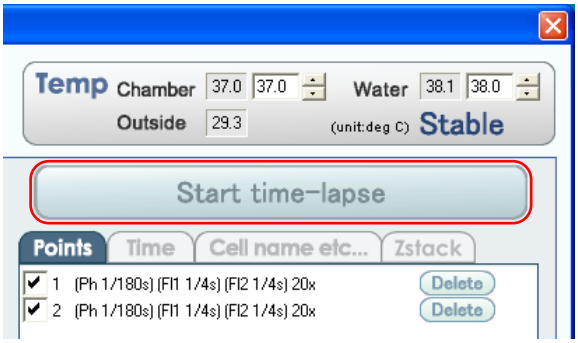


Figure 3.6-2 Performing time-lapse experiment

When settings are appropriate for time-lapse experiment, click the Start time-lapse button. The Windows Save As dialog box appears.

To change the settings, click the Back to setting button.

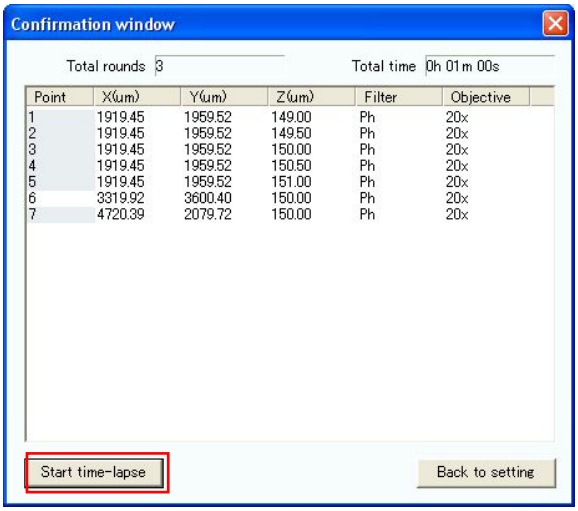


Figure 3.6-3 Checking settings for time-lapse experiment

3. Save time-lapse experiment results in a file.

Input a file name for time-lapse experiment results and click the Save button.

The Time-lapse images in process screen appears and time-lapse experiment starts automatically.

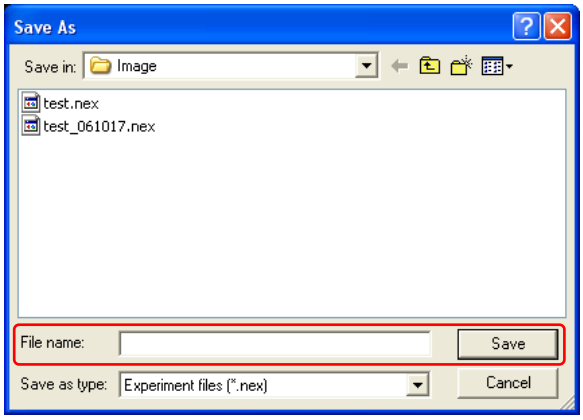


Figure 3.6-4 Saving the time-lapse experiment result file

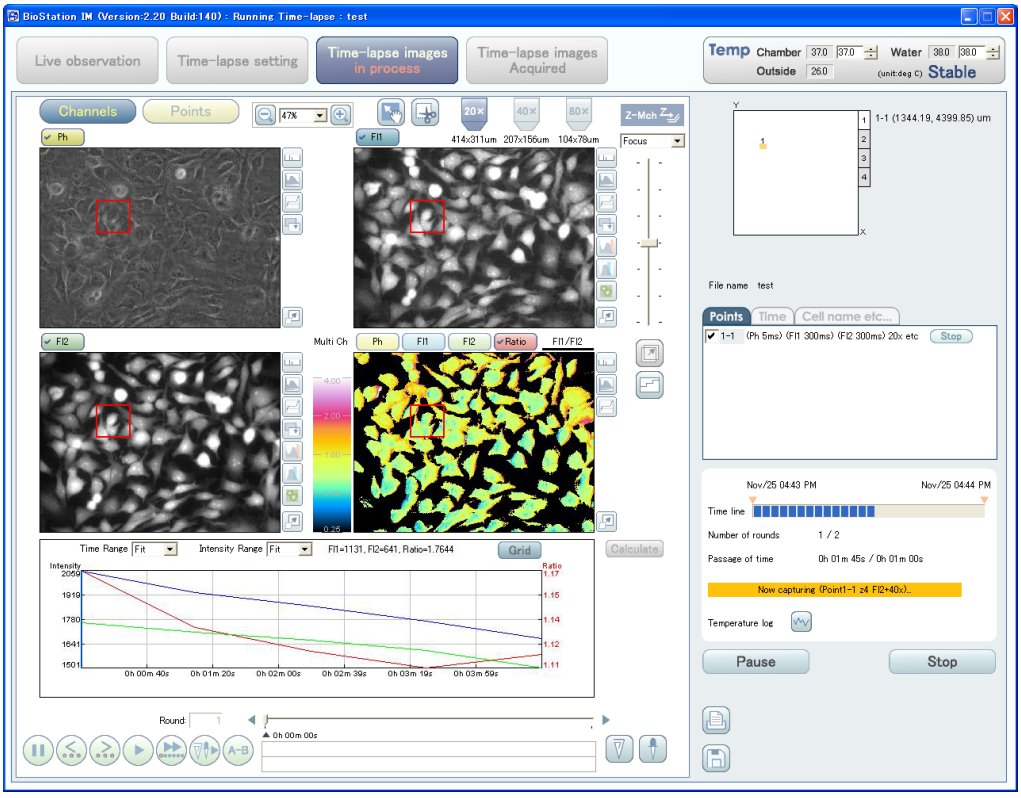


Figure 3.6-5 Time-lapse images in process screen

3.7 Observing the Process of the Time-lapse Experiment

When time-lapse experiment is started, the Time-lapse images in process screen automatically appears. This screen shows process of time-lapse experiment. This screen cannot be displayed by operating any buttons.

There are the Channels display and the Points display for the Time-lapse images in process screen.

For details on the Time-lapse images in process screen, see Chapter 4, “Time-lapse Images in Process Screen,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

Table 3.7-1 Channels display and Points display

Item	Function
Channels	Four display areas are provided for one observation point. Three filter images, filters overlapped image, and Ratio image can be displayed at the same time.
Points	One display area is provided for one observation point. Switch the display area to display each filter image and overlapped image. Therefore, up to four observation points can be observed at the same time.

3.7.1 Channels Display

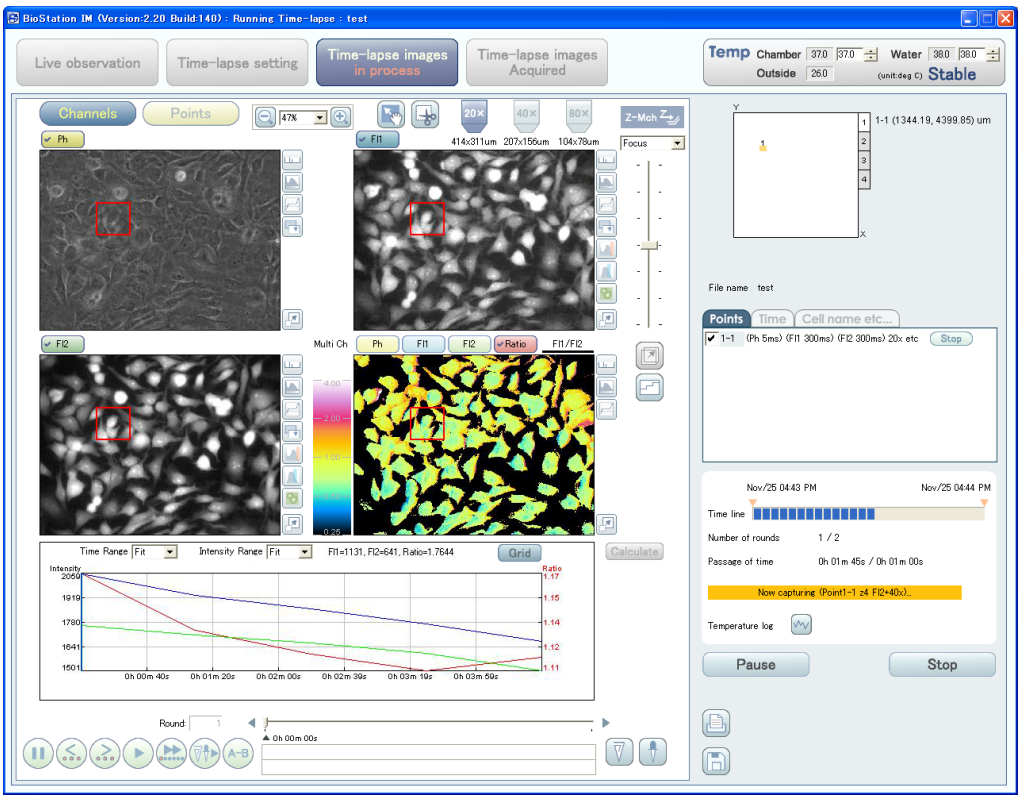


Figure 3.7-1 Time-lapse images in process screen (Channels)

3.7.2 Points Display

Functions other than the way to display images are the same as those for the Time-lapse images in process Screen (Channels).

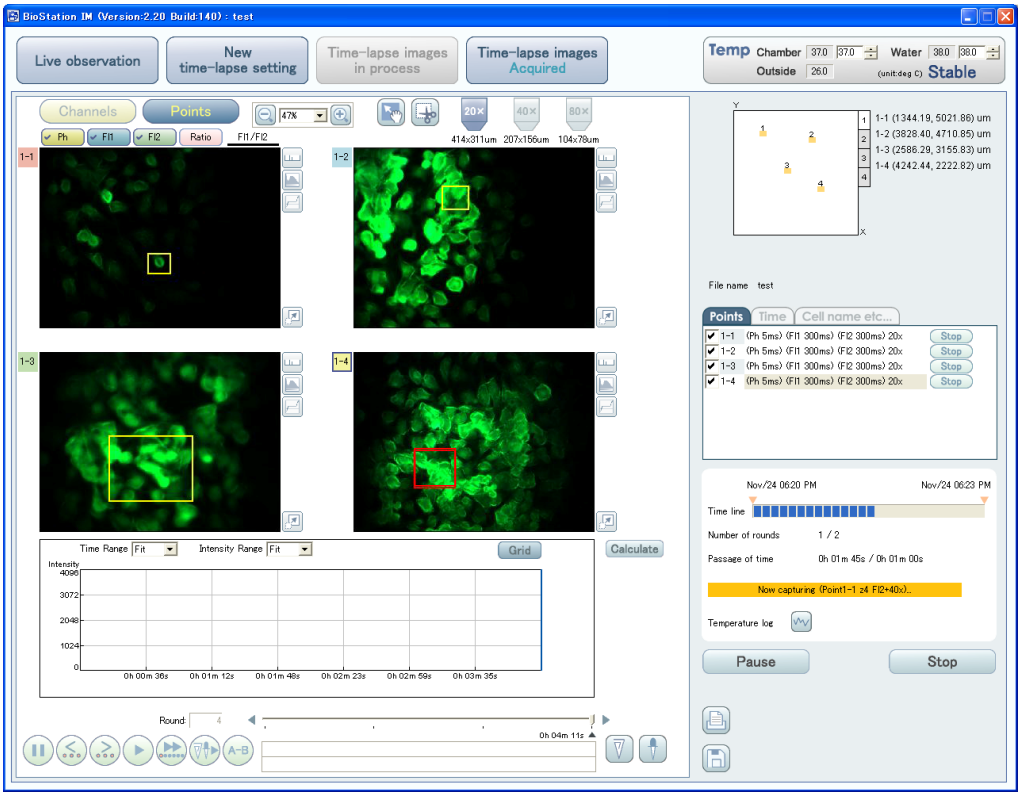


Figure 3.7-2 Time-lapse images in process screen (Points)

3.8 Changing Observation Conditions during a Time-Lapse Experiment

To change the observation conditions such as the coordinates of the registered observation points and exposure conditions during a time-lapse experiment, pause the time-lapse experiment and after changing the settings, restart the time-lapse experiment.
Note that the clock for time-lapse experiment does not stop even if the time-lapse experiment is paused. If a capture timing comes while the observation conditions are being modified, no image is captured and a black image is recorded.

1. Pause the time-lapse experiment temporarily.

On the Time-lapse images in process screen displayed during a time-lapse experiment, click the Pause button. The Pause confirmation dialog box appears.

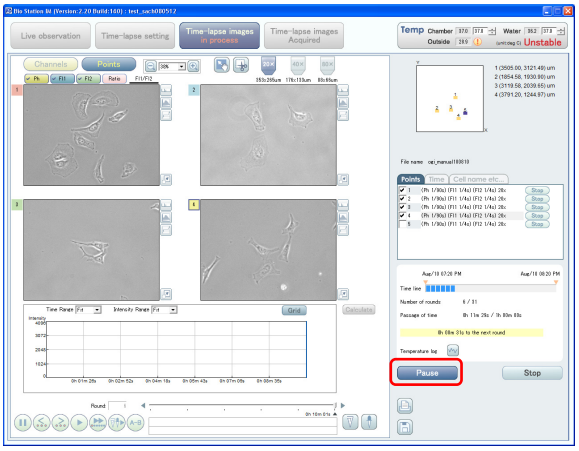


Figure 3.8-1 Pause a time-lapse experiment

To pause the time-lapse experiment, click the Yes button.
To close the confirmation dialog box without pausing the time-lapse experiment, click the No button.

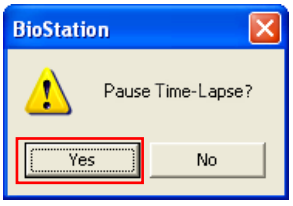


Figure 3.8-2 Pause confirmation dialog box

2. Change the observation conditions for time-lapse.

Click the Modify time-lapse setting button.

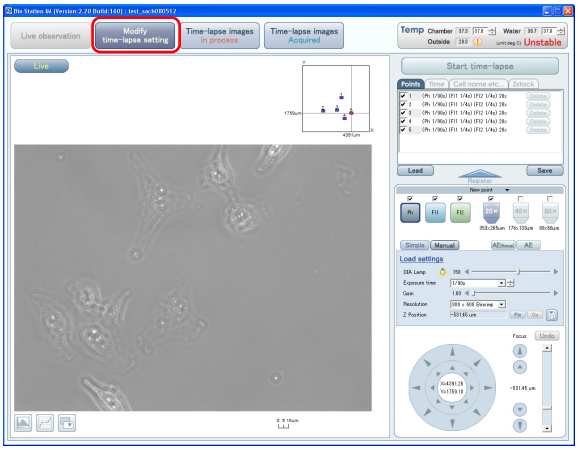


Figure 3.8-3 Changing the time-lapse settings

3. Select an observation point to change its setting.

On the Points tab, click the observation point to be changed.
The Point information dialog box appears.

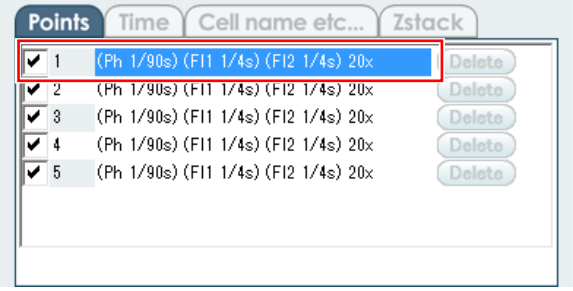


Figure 3.8-4 Selecting an observation point

Click the Go button on this dialog box. The objective is moved to the selected observation point and the live image for the observation point is displayed.

To cancel the changes, click the Close button. The Point information dialog box closes without applying the changes.

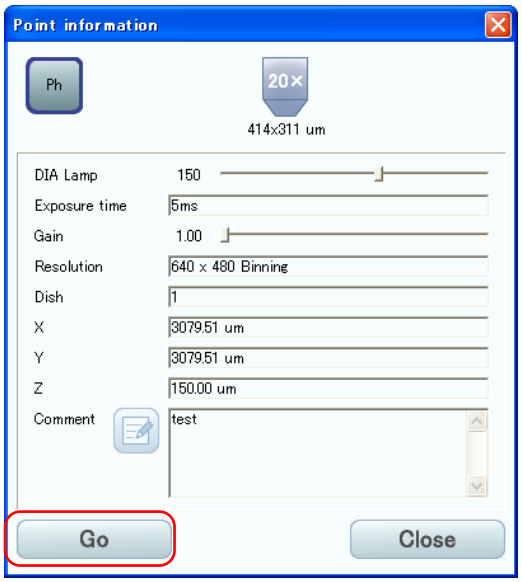


Figure 3.8-5 Point information dialog box

4. Change the observation conditions for registered observation point.

Operate the ergonomic controller or software to modify the coordinate and/or exposure conditions.

Operations are the same as that on the Live observation screen. (See Step 2-2, 4, and 6 in Section 3.1, “Examining the Specimen.”)

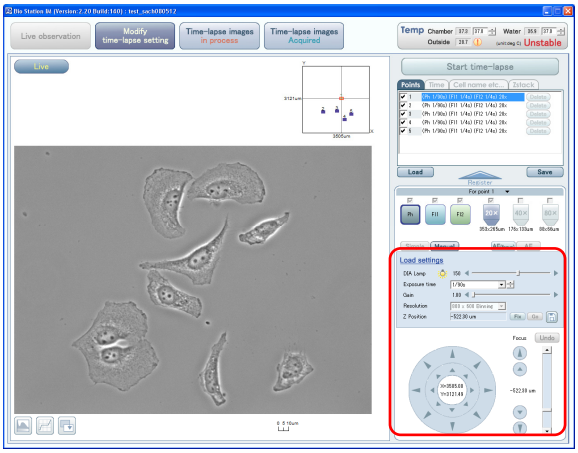


Figure 3.8-6 Changing the time-lapse settings

5. Register and update the modified observation point and observation conditions.

Click the Time-lapse point registration button to register and update the observation point and the observation conditions.

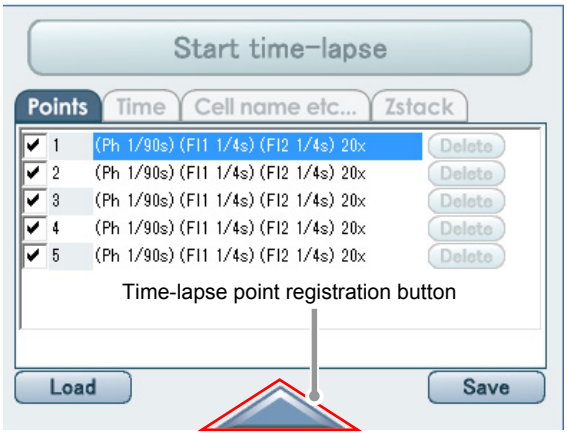


Figure 3.8-7 Registering and updating observation point

6. Restart the time-lapse.

Click the Start time-lapse button to restart the time-lapse.

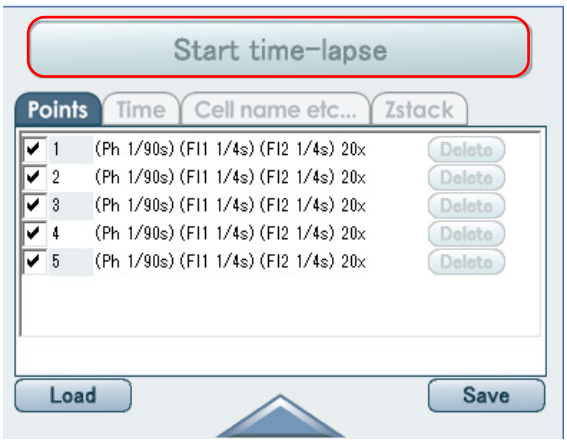


Figure 3.8-8 Restart the time-lapse

3.9 Checking Images after the Time-lapse Experiment

This screen automatically appears when time-lapse experiment completes.
On this screen, loading and playing the saved file of time-lapse experiment results are available.
There are the Channels display and the Points display for the Time-lapse images Acquired screen.
Various functions are different from those of the Time-lapse images in process screen.

For details on the Time-lapse images Acquired screen, see Chapter 5, “Time-lapse Images Acquired Screen,” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

3.9.1 Channels Display

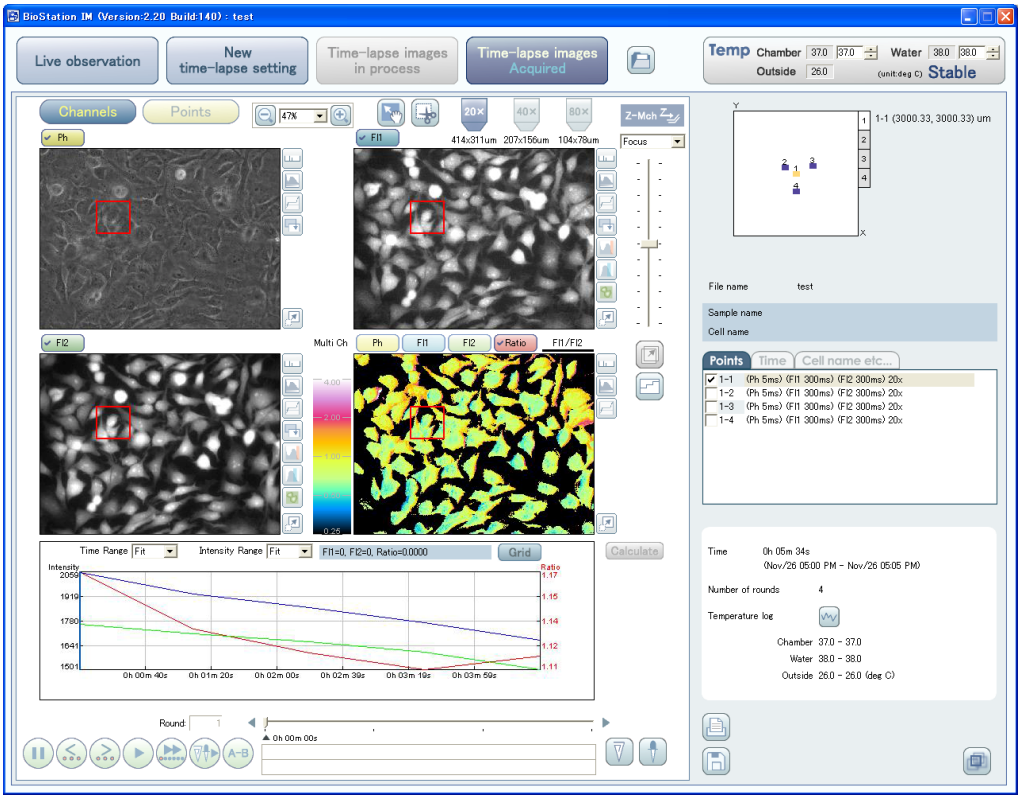


Figure 3.9-1 Time-lapse images Acquired screen (Channels)

3.9.2 Points Display

On this screen, one observation point occupies one display area. A filtered image or an overlapped filtered image of the observation point can be displayed on the area when specified. Up to four observation points can be observed at the same time.
Functions other than the way to display images are the same as those for the Time-lapse images in process Screen (Channels).

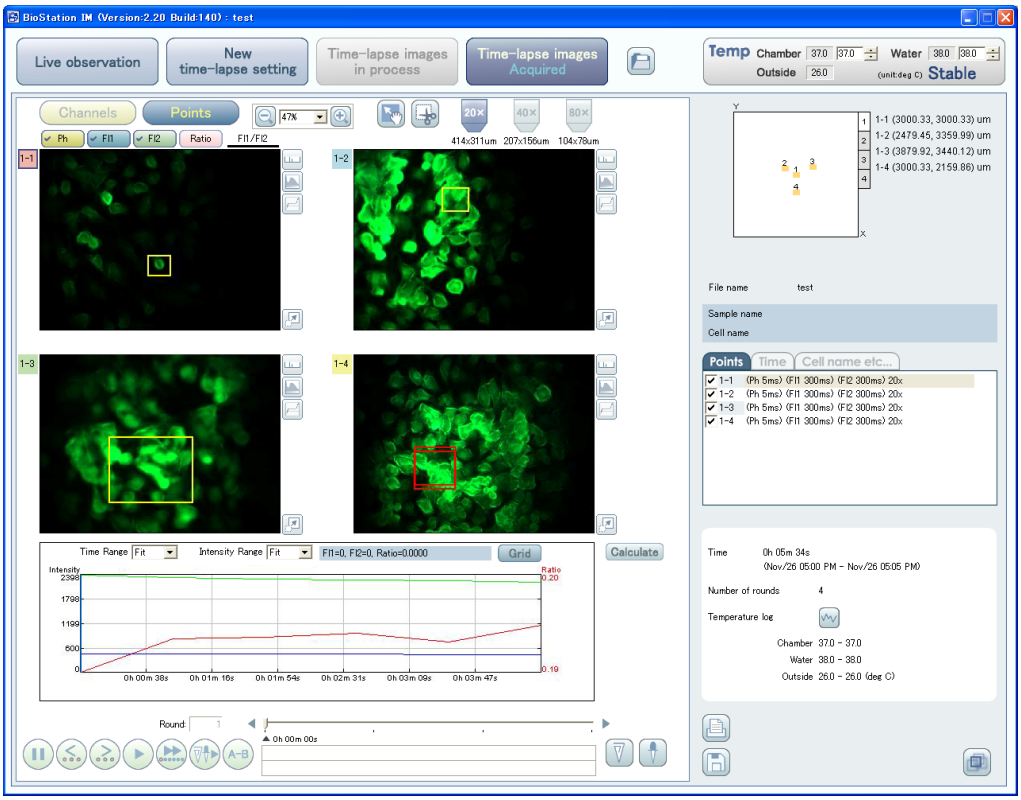


Figure 3.9-2 Time-lapse images Acquired screen (Points)

4 Troubleshooting

Misuse of the product may adversely affect performance, even if the product is not damaged. If any of the following troubles occurs, be sure to check the following table for possible causes before requesting service.

Contact your nearest Nikon representative if the troubles cannot be resolved by taking the following countermeasures.

4.1 Troubleshooting on the Microscope Main Unit

4.1.1 Troubleshooting on Image Viewing

Trouble	Cause	Countermeasure
The field of view is vignetted or uneven in brightness. The image is invisible or dark.	The light guide fiber is not connected correctly.	Connect it correctly. (See page 61.)
	The objective or specimen is contaminated with dirt or dust.	Clean the objective or specimen.
	The specimen is stored in nonstandard case.	Store the specimen in the specified case.
Dirt or dust is seen in the viewfield.	The objective or specimen is contaminated with dirt or dust.	Clean the objective or specimen.
It is impossible to focus on the target cell.	The dish in use is not the specified dish.	Use the specified dish. (see page 13.)
	You are trying to focus on a floating cell.	Focus on the cell that exists on the bottom of the 35-mm dish. This product is designed to observe the specimen that exists on the bottom of the dish.
The image goes out of focus during time-lapse experiment.	The specimen setting part of the culture chamber is wet.	Clean the specimen setting part.
	The temperature in the product installation place changes rapidly.	Use the product in an air-conditioned room. However, do not install the product in the place where the product is directly blown by the wind from the air conditioner, nor the place in the temperature changes rapidly such place as near the door.
	The time-lapse experiment was started before the “STABLE” lamp lights up.	Start the time-lapse experiment after the “STABLE” lamp is lit.
	The time-lapse point was registered before the “STABLE” lamp lights up.	Register time-lapse points after the “STABLE” lamp is lit.
The XY position of the specimen shifts during a time-lapse experiment.	The specimen setting part of the culture chamber is wet.	Clean the specimen setting part.
Images in phase contrast microscopy are dark.	The diascopic illumination unit is moved to the escape position.	Place the diascopic illumination unit into the optical path.
The image is not clear.	The thickness of the glass bottom dish is different from the reference value. (for CELL-S2)	Use the glass bottom dish whose thickness is 0.17 mm.
	The adjustment of the correction ring of the objective is not correct. (for CELL-S2-P)	Turn the correction ring to set the mark to the thickness of the plastic bottom dish.

Trouble	Cause	Countermeasure
Image contrasts are poor in fluorescent observation.	The sliding shade is open and ambient light enters in.	Close the sliding shade.

4.1.2 Troubleshooting on Operation

Trouble	Cause	Countermeasure
The product cannot be turned on.	The power cord is not connected.	Connect it correctly. (See page 59.)
	The local voltage to be used is different from the voltage specified to the product.	Check the local voltage and connect the product to the proper power supply.
The temperature inside the culture chamber is unstable. (The "STABLE" lamp goes out.)	Warming-up started after turning on the power does not complete yet.	Wait until warming-up completes. (See page 8.)
	The slide door remains opened, or it is frequently opened and closed.	Minimize opening of the slide door and wait until the temperature stabilizes.
	The ambient temperature changes rapidly.	Install the product in the place where the temperature is stable.
The temperature inside the culture chamber does not rise nor reach the setting value.	The set temperature is extremely high or low.	Adjust the temperature to be controllable range in the culture chamber.
	The slide door remains open.	Close the slide door.
	The slide door was opened during warming-up.	Minimize opening of the slide door and wait until the temperature stabilizes.
	The cover on the filter cube port is removed.	Attach the cover on the filter cube port. (See page 9.)
	The front door of the microscope remains open.	Close the front door.
	The duct is tipped up.	Pull the duct down.
	Warming-up started after turning on the power does not complete yet.	Wait until warming-up completes. (See page 8.)
	The temperature sensors are not attached.	Attach the temperature sensors for the culture chamber and the humidifier water tank. (See pages 54 to 56.)
	The temperature control function or the temperature sensors is damaged.	Contact your nearest Nikon representative.
	The room temperature is extremely high or low.	Use the product at a temperature between 18 and 28°C.
CO_2 concentration does not increase.	The CO_2 cylinder is not connected, or the valve is shut.	Connect the CO_2 cylinder correctly and open the valve.
	The tube for the CO_2 mixer is disconnected.	Connect the tube for the CO_2 mixer correctly. (See page 57.)
	The CO_2 mixer is turned off.	Turn on the CO_2 mixer.
	The gas pressure in the CO_2 cylinder decreases.	Replace the CO_2 cylinder.
	The CO_2 mixer or the CO_2 concentration sensor is damaged.	Contact your nearest Nikon representative.

Trouble	Cause	Countermeasure
The ergonomic controller cannot be operated.	The cable is not connected correctly.	Connect it correctly. (See page 59.)
The temperature of the humidifier water does not rise nor reach the setting value.	The temperature sensor is not attached.	Attach the temperature sensor for the humidifier water tank. (See page 56.)
	Water in the humidifier water tank is not enough.	Add distilled water in the humidifier water tank. (See page 10.)
The pH of the culture medium changes rapidly.	The tubes are not connected correctly.	Connect the tubes correctly. (See page 57.)
	The rotatable cover on the culture chamber remains opened.	Close the rotatable cover on the culture chamber. (See page 13.)
	The gas pressure in the CO_2 cylinder decreases.	Replace the CO_2 cylinder with new one.
	The CO_2 mixer is damaged.	Refer to the instruction manual for the CO_2 mixer.
Cells die unexpectedly.	The excitation light is too strong.	Weaken the excitation light.
	The cells are subjected to the excitation light for a long time.	Shorten the time of excitation light irradiation.
Unable to perform the fluorescent microscopy.	The fluorescent filter is not in the optical path.	Attach the filter cube. (See page 9.)
	The HG precentered fiber illuminator is not turned on.	Turn on the HG precentered fiber illuminator.
	The light guide fiber is not connected correctly.	Connect the light guide fiber correctly. (See page 61.)
	The fluorescent shutter is closed.	Open the fluorescent shutter.
Condensation forms on the cover of the glass bottom dish for a long time.	The duct is tipped up.	Pull the duct down.

4.2 Troubleshooting on the BS-IM-MC MOT chamber

4.2.1 Troubleshooting on Image Viewing

Trouble	Cause	Countermeasure
Dirt or dust is seen in the view field.	The reference glass is contaminated with dirt or dust.	Clean the reference glass.
It is impossible to focus on the target cell.	The dish in use is not the specified dish.	Use the specified dish.
The image goes out of focus during time-lapse experiment.	The reference glass is contaminated with dirt or dust.	Clean the reference glass.
	Condensation occurs on the reference glass.	Adjust the temperature settings for the humidifier water tank and the amount of flow of the CO_2 mixer.
	The 4-well dish is not secured.	Place the dish fixing plate, and secure it tightening the screws.
	Too much culture medium is put in each well of the dish.	Put an appropriate amount of culture medium. (See page 12.)
Image contrasts are poor in phase contrast microscopy.	Observing point is close to the partition wall of the well.	Since each partition wall is relatively close in the Y direction, observe the point located near the center of the well (Y=2000 to 4000.)

4.2.2 Troubleshooting on Operation

Trouble	Cause	Countermeasure
It takes a long time to stabilize the temperature inside the culture chamber.	The lid of the culture chamber lost its heat for being left outside of the microscope.	Place the lid on the lid stand located inside of the microscope.
The pH of the culture medium changes significantly. Cells die unexpectedly.	The lid of the culture chamber is not placed properly.	Place the lid properly. (See page 14.)
Condensation occurs in the culture chamber.	The CO_2 mixer is turned on while microscope is warmed up.	Turn the CO_2 mixer on after the temperature of the microscope is stabilized.
The Well switch button is not displayed or well switching is not performed.	The power cable for BS-IM-MC MOT chamber is not attached.	Attach the power cable for BS-IM-MC MOT chamber, and then reboot the microscope and the application software.

5 Care and Maintenance

5.1 Cleaning Lenses

Do not let dust, fingerprint, etc. get on the lenses. Dirt on the lenses, filters, etc. will adversely affect the view of image. If any of the lenses gets dirty, clean them as described below.

- Remove dust with a soft brush or lightly wipe off with a gauze.
- Only if there are fingerprints or grease on a lens, dampen lightly a piece of soft, clean cotton cloth, lens tissue, or gauze with absolute alcohol (ethyl or methyl) and gently wipe off the dirt.
- Do not use any solvents other than absolute alcohol as they may damage the lens adhesion surfaces. Especially, do not use petroleum benzine for the lenses or filters.
- Absolute alcohol is extremely flammable. Keep this flammable solvents away from fire or sparks emitted when turning on/off the power switch of the illuminator.
- Follow the instructions provided by the manufacturer when using absolute alcohol.

5.2 Cleaning Inside the Culture Chamber

- Use soft clean lens tissue, cotton cloth or gauze moistened with a little absolute alcohol (ethyl or methyl).
- When a specimen is spilled onto the culture chamber, check that the specimen is hazardous or not. If the specimen is hazardous, follow your standard facility procedures.
- The BS-IM-C chamber and the humidifier water tank can be removed and treated with the autoclave sterilization.
- The BS-IM-MC MOT chamber cannot be treated with autoclave sterilization.
  If the specimen is spilled into the BS-IM-MC MOT chamber and enters moving parts or gaps between the glasses, contact your nearest Nikon representative.

5.3 Cleaning the Exterior of the Product

- For persistent dirt, dampen a piece of gauze with diluted neutral detergent and wipe gently.
- Using organic solvents may result in discoloration of the plastic parts.

5.4 Disinfection

- Disinfect the product with 70% medical alcohol in ordinary cases.
- When a specimen is spilled onto the microscope, check that the specimen is hazardous or not. If the specimen is hazardous, follow your standard facility procedures.
- Using organic solvents may result in discoloration of the plastic parts.

5.5 Maintenance of the Humidifier

- Check the amount of water in the humidifier water tank before operating and refill it if necessary.
- Water is poured into the evaporating dish as the exhaust air from the culture chamber contents water supplied by the humidifier.
  Clean the evaporating dish if necessary.

5.6 Storage

- Store this product in a dry place where mold is not likely to form.
- Put the dust-proof cover over this product to protect it from dust.
- For using an illuminator or etc., turn off the power (flip the power switch to the “O” side) of this product and wait until the lamp house cools down completely before setting the dust-proof cover back.

5.7 Regular Inspections (Charged)

Regular inspection (charged) is recommended to maintain the performance of the product. Contact your nearest Nikon representative for details.

6 Specifications

6.1 Operation Principles

Manipulate the Control PC or ergonomic controller to move the observation position or change the magnification and observe or capture an image of a cultured specimen on or in a vessel such as a Petri dish.

6.2 Performance Properties

Model		CELL-S2	CELL-S2-P
Imaging optics	Configuration	A single objective and a second-objective combination Variable magnification by selecting a second-objective	
	Objective	f = 5, NA = 0.8 Plan Fluor 40x DL (specially designed for the culture microscope)	f = 10, NA = 0.5 Plan Fluor 20x DL With a correction ring (correction range: 0.6 to 1.4 mm) (specially designed for the culture microscope)
	Intermediate magnification (second-objective)	0.5x (f = 100) / 1.0x (f = 200) / 2.0x (f = 400)	
	Optical magnification	20x/40x/80x	10x/20x/40x
Tiled image capture time (full view) *1	Phase contrast microscopy	6 minutes	1 minute 30 seconds
	Fluorescent microscopy (1 channel)	13 minutes 20 seconds	2 minutes 20 seconds
	Phase contrast, fluorescent-1, fluorescent-2 microscopy (3 channels)	46 minutes	7 minutes 20 seconds
1 round time for a time-lapse experiment	One observation point Phase contrast microscopy (1 channel)	BS-IM-C chamber: 1 second BS-IM-MC MOT chamber *2 AF-ON mode: 1 minute 25 seconds AF-OFF mode: 30 seconds	
	One observation point Fluorescent microscopy (1 channel)	BS-IM-C chamber: 2 seconds BS-IM-MC MOT chamber *2 AF-ON mode: 1 minute 30 seconds AF-OFF mode: 35 seconds	
	Five observation points Phase contrast microscopy (1 channel)	BS-IM-C chamber: 25 seconds BS-IM-MC MOT chamber *2 AF-ON mode: 2 minutes 50 seconds AF-OFF mode: 2 minutes	
	Five observation points Fluorescent microscopy (1 channel)	BS-IM-C chamber: 30 seconds BS-IM-MC MOT chamber *2 AF-ON mode: 3 minutes 10 seconds AF-OFF mode: 2 minutes 25 seconds	
	Five observation points Phase contrast, fluorescent-1, fluorescent-2 microscopy (3 channels)	BS-IM-C chamber: 60 seconds BS-IM-MC MOT chamber *2 AF-ON mode: 5 minutes 5 seconds AF-OFF mode: 4 minutes 20 seconds	

Model		CELL-S2	CELL-S2-P
Dish for specimens	BS-IM-C chamber	35-mm glass bottom dish / 35-mm film bottom 4-quadrant dish (Hi-Q4)	35-mm plastic bottom dish
	BS-IM-MC MOT chamber	Glass bottom 4-well dish (model No. 155383, manufactured by Nalge Nunc International K.K.)	Cannot be mounted

*1: The tiled image capture time (magnifications: Full) and the 1 round time for a time-lapse experiment shown above are a guide value for the standard specifications.
They vary depending on the observation points and exposure conditions.

*2: The time shown above indicates that the same number of observation points is set for each of the four wells for the BS-IM-MC MOT chamber.

Camera	DS-Qi1Mc CCD device: Monochrome 2/3 inch, 1280 x 960 pixel Flame rate 10 fps, progressive scan Cooling temperature: Ambient = -5°C Quantization: 12 bits
Environmental condition to be controlled	Culture chamber The temperature, humidity and CO_2 concentration are controlled. (For CO_2, the CO_2 mixer controls the concentration.) Temperature setting range for the culture chamber: 32 to 38℃ Standard environmental conditions: Temperature 37°C, humidity 95% or more, CO_2 5%
Observation means	With a PC monitor or so on (No eyepiece is equipped.)
Operation method	Center control with a PC Ergonomic controller
Microscopy	Epi-fl microscopy and diascopic phase contrast microscopy
Light source	Fluorescent light source: HG Precentered fiber illuminator (separate-typed) Diascopic light source: Built-in high intensity red LED (wavelength: 625 nm)
Observable range in the X and Y directions	BS-IM-C chamber (standard) 6 mm x 6 mm (The specimen position is fixed but the objective position moves horizontally.) BS-IM-MC MOT chamber (optional) Objective movement: 6 mm x 6 mm Well switching function: 36.6 mm (12.2 mm x 3) in the Y direction
Stroke in the Z direction	1.25 mm (The objective position moves vertically.)
Interface	Microscope • USB 2.0 device x 2 (for CCD camera x 1 and for microscope x 1) • RS232C x 1 (for HG precentered fiber illuminator) • Special interface for the ergonomic controller • Special interface for an external device
Input rating	100 VAC to 240 VAC, ±10%, 50/60 Hz, 3 A maximum
Power cord	• For countries where the supply voltage is 100 V to 120 V (excluding Japan): UL Listed detachable cord set (3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 VAC minimum) • For countries where the supply voltage is 220 V to 240 V: EU/EN-approved three-conductor power cord set (3 conductor grounding Type HO5VV-F, 3 m long maximum, rated at 250 VAC minimum • For Japan: Power cord set conforming with the Electrical Appliance and Material Safety Law (with PSE mark) (3 conductor grounding Type VCTF3 x 0.75 mm^2 3 m long maximum rated at 125 VAC minimum)

Software	OS: Windows XP professional SP2 E Windows Vista Business 32 bits SP1 E Windows 7 professional 32 bits E
Operating condition	Temperature: 18 to 28°C Humidity: 85% RH maximum Altitude: 2000 m maximum Pollution degree: Degree 2 Installation category: Category II Electric shock protection class: Class I Indoor use only
Storage condition	Temperature: 0 to 40°C Humidity: 85% RH maximum Altitude: 2000 m maximum Pollution degree: Degree 2 Installation category: Category II Electric shock protection class: Class I Indoor use only

6.3 Physical Properties

Transportation condition (when the product is packed)	Temperature: Humidity:	-20 to +50°C 90% RH maximum (no condensation)
External dimensions and weight	External dimensions: Weight:	220 mm (width) x 400 mm (height) x 620 mm (depth) (excluding protrusions) Approximately 30 kg
Safety standard compliance	• FCC 15B Class A satisfied. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant Part 15 of the FCC Rules.These limits are designed provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, and can radiated radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.Operation of this equipment in residential area is likely to cause harmful interference in which case the user will be required to correct the interference own expense. • This class A digital apparatus complies with Canadian ICES-003.Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada. • This product complies with Australian EMI (AS/NZS CISPR11). CE Marking  • In vitro diagnostic medical device directive satisfied. • Compliance with which EN standards, EN61010-1, EN61010-2-101, EN591, EN1658 and EN60825-1. • Low voltage directive satisfied. EN61010-1, EN60825-1 • EMC directive	

7 Assembly

7.1 Assembly and Connection

Be sure to read the “Safety Precautions” and follow the all instructions given there before assembling the product.

7.1.1 System Configuration

The BioStation IMQ is composed of the following parts.

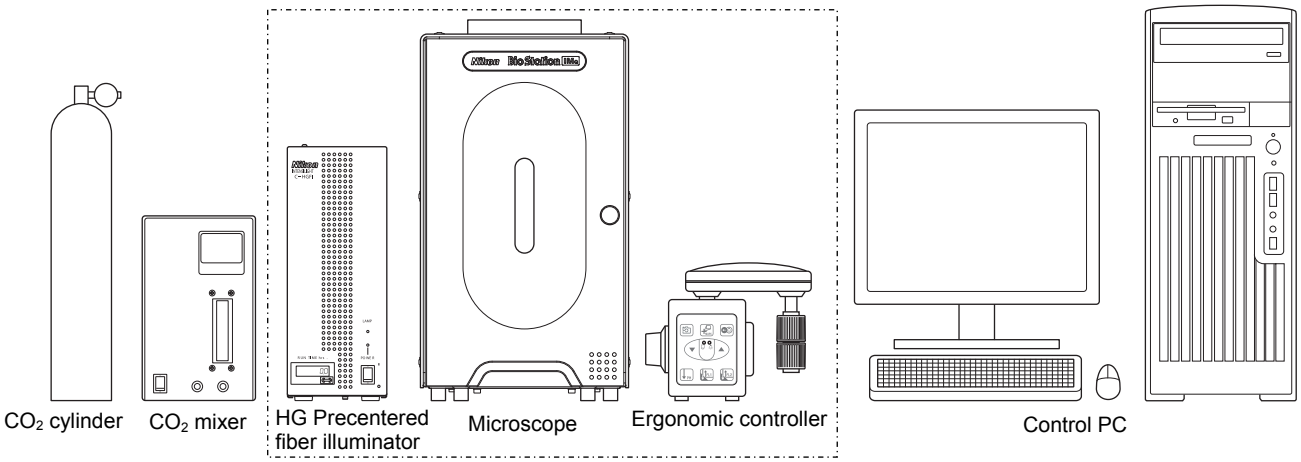


Figure 7.1-1 Configuration of the BioStation IMQ

Necessary tool

The following tools are required to assemble the product.

- Hexagonal screwdrivers (accessory)

7.1.2 Removing the Fixture

CAUTION

Caution in removing the fixture

When removing the fixture, be sure not to drop fixture securing bolts into the product. If the product is operated with the dropped bolts left inside, it may result in a malfunction.

Loosening the bolt securing the diascopic illumination unit

Open the slide door of the microscope and remove the fixture.

The diascopic illumination unit is secured with a hexagonal socket head bolt (1 piece). Fully loosen the bolt with the hexagonal screwdriver (2 mm).

And then, retract the diascopic illumination unit.

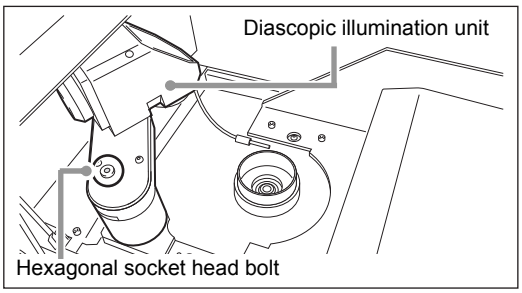


Figure 7.1-2 Loosening the bolt securing the diascopic illumination unit

Removing the fixture for the Z moving part of the objective

The fixture for this position is a screw-in type. Remove the fixture by rotating counterclockwise by hands.

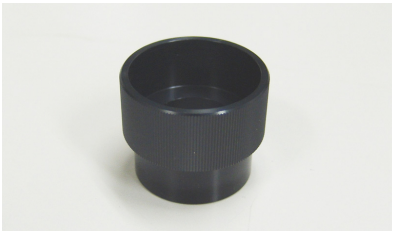


Figure 7.1-3 Fixture of the Z moving part of the objective (Detached)

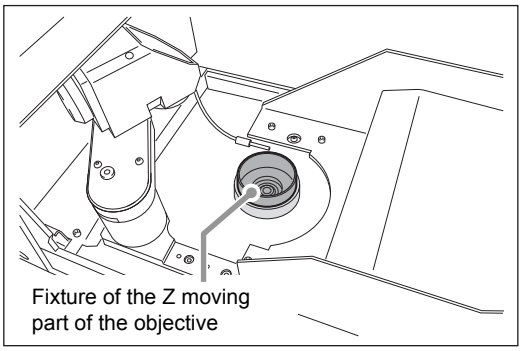


Figure 7.1-4 Removing the fixture for the Z moving part of the objective

Removing the fixture for the XY moving part of the objective

The fixture for this position is a screw-in type. Remove the fixture by rotating counterclockwise by hands.

Figure 7.1-5 Fixture for the XY moving part of the objective (Detached)

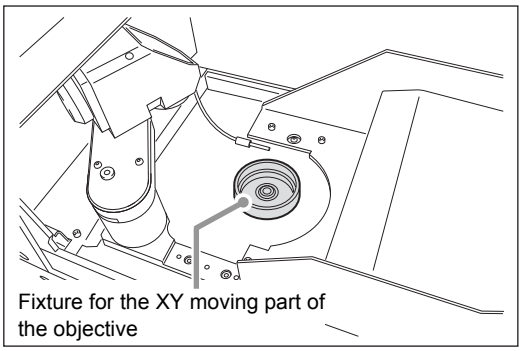


Figure 7.1-6 Removing the fixture of the XY moving part of the objective

Removing the fixture for the floating unit

The fixture for the floating unit is secured with seven hexagonal socket head bolts (M3: three pieces, M4: four pieces). Remove the bolts with the hexagonal screwdriver (2.5 mm and 3 mm).

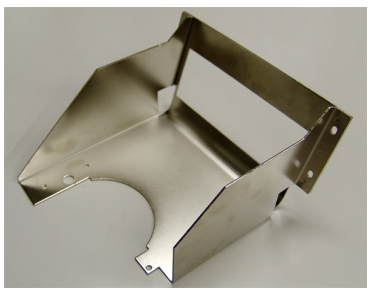


Figure 7.1-7 Fixture for the floating unit (Detached)

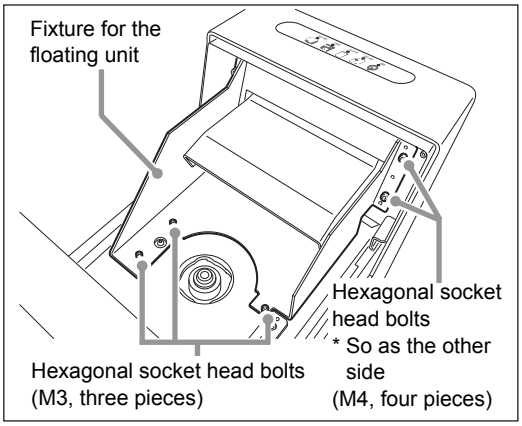


Figure 7.1-8 Removing the fixture for the floating unit

Removing the bar clamping the magnification selector dial and the filter magazine

Remove the cover of the filter cube port and check that the clamp bar is attached.

The clamp bar is secured with three M4 hexagonal socket head bolts. Loosen the bolts with the hexagonal screwdriver (3 mm).
* Loosen but not remove those bolts.

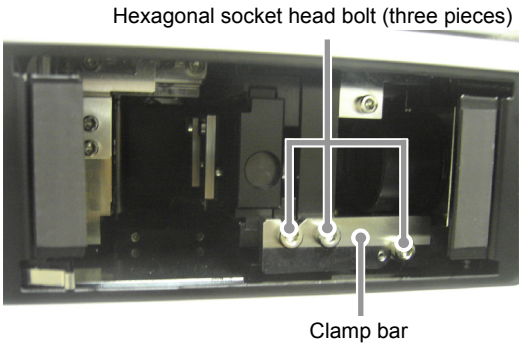


Figure 7.1-9 Removing the bar clamping the magnification selector dial (1)

Rotate the clamp bar counterclockwise by 90 degrees around the hexagonal socket head bolt located at the center as shown in the figure at right.

Secure the clamp bar, tightening the hexagonal socket head bolt located at the center.

Retighten the other two bolts securely so as not to fall.

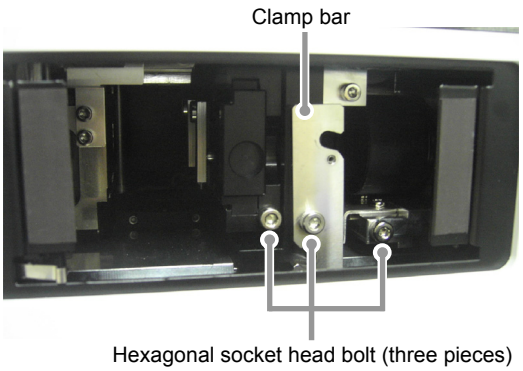


Figure 7.1-10 Removing the bar clamping the magnification selector dial (2)

7.1.3 Attaching Accessories

Attaching the culture chamber

1. Open the slide door.

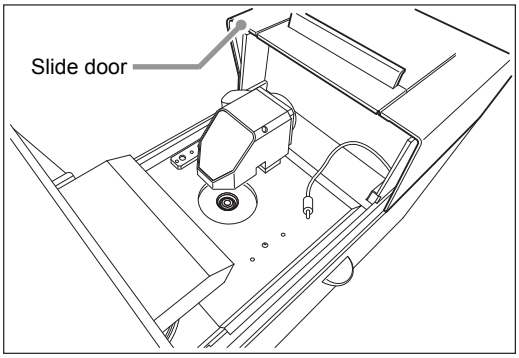


Figure 7.1-11 Opening the slide door

2. Retreat the diascopic illumination unit.

Additionally, tip up the duct.

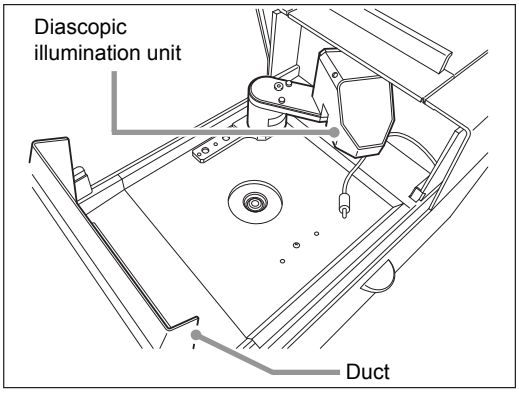


Figure 7.1-12 Retreating the diascopic illumination unit

3. Attach the culture chamber.

BS-IM-C chamber

Set the BS-IM-C chamber and secure it with three hexagonal socket head bolts using the hexagonal screwdriver (2.5 mm.)

BS-IM-MC MOT chamber

Set the BS-IM-MC MOT chamber and secure it with three knurled screws.

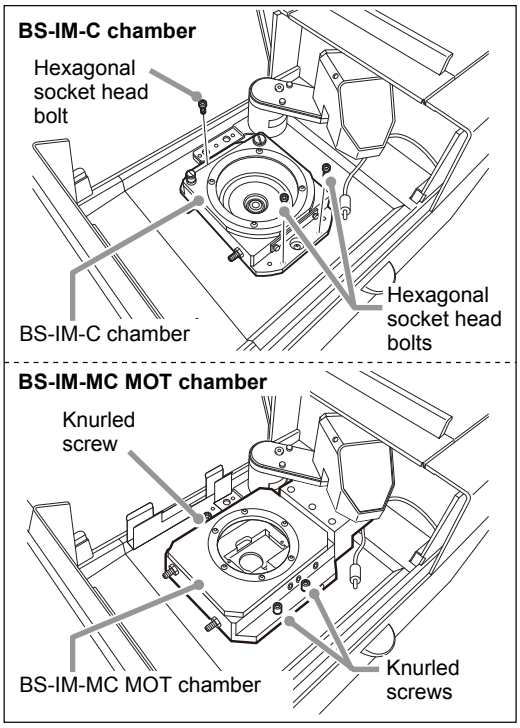


Figure 7.1-13 Attaching the culture chamber

4. Insert the temperature sensor into the culture chamber.

The temperature sensor port on the culture chamber is magnetic.

When the temperature sensor reaches the mounting position, clicking noise occurs and it is secured with the magnetic mechanism.

CAUTION

Be sure to attach the temperature sensor.

If no temperature sensor is attached, the temperature in the culture chamber cannot be controlled properly.

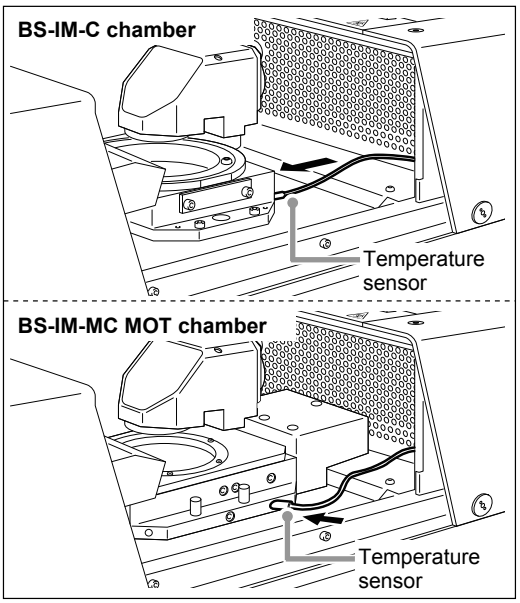


Figure 7.1-14 Attaching the temperature sensor

Attaching the humidifier water tank

1. Pour distilled water into the humidifier water tank.

Pour distilled water into the humidifier water tank until it reaches little below the "max" line.

2. Open the front door of the microscope.

Place a silicon sheet on the humidifier heater.

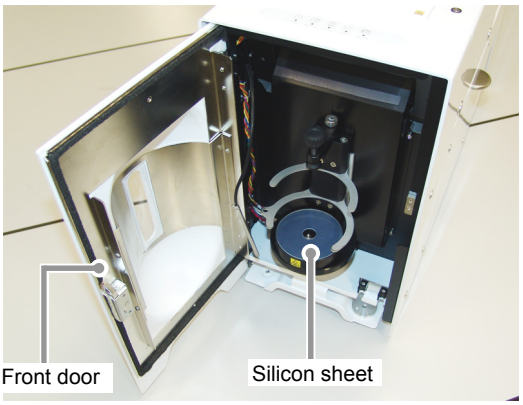


Figure 7.1-15 Opening the front door

3. Loosen the clamp screw for the humidifier water tank and retract it.

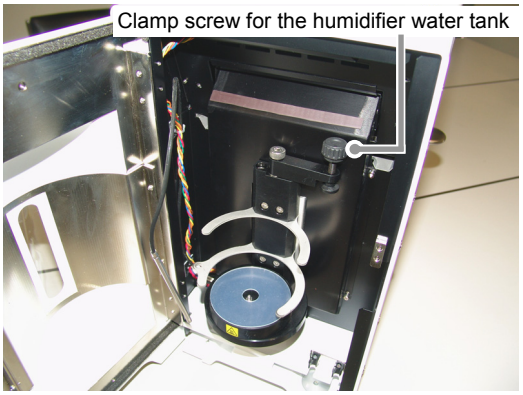


Figure 7.1-16 Retracting the clamp screw for the humidifier water tank

4. Set the humidifier water tank on the humidifier heater.

Make sure that the lid gasket seals the top of the tank completely.

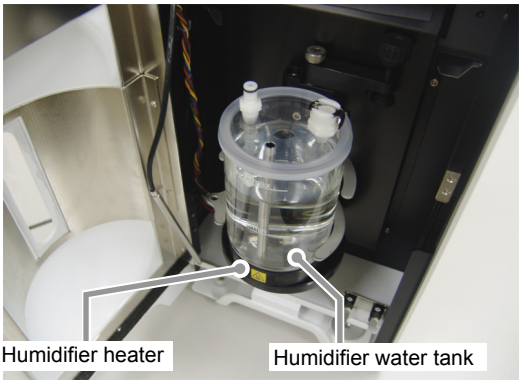


Figure 7.1-17 Setting the humidifier water tank

5. Insert the clamp screw for the humidifier water tank into the original position and tighten it.

CAUTION

Caution in tightening the clamp screw for the humidifier water tank

When tightening the clamp screw for the humidifier water tank by hand, do not tighten it excessively. It might cause the humidifier water tank crack.

Figure 7.1-18 Securing the humidifier water tank

6. Insert the temperature sensor into the humidifier water tank.

CAUTION

Be sure to attach the temperature sensor.

If no temperature sensor is attached, the humidification cannot be controlled properly.

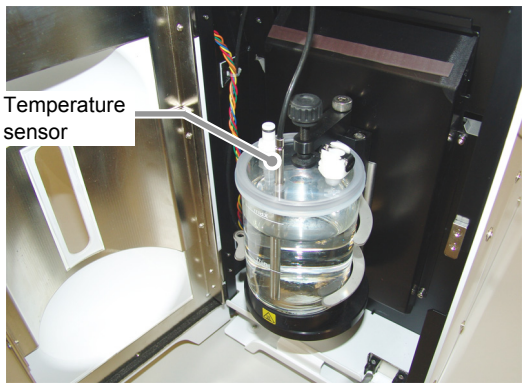


Figure 7.1-19 Setting the temperature sensor

7. Place the evaporating dish to the specified position.

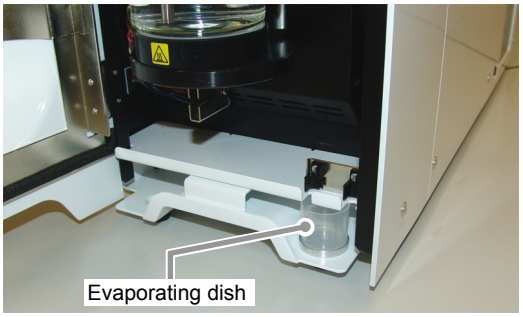


Figure 7.1-20 Setting the evaporating dish

7.1.4 Connecting the Tubes

Connect the culture chamber, humidifier water tank, CO_2 mixer, regulator, and CO_2 cylinder with the tubes.

⚠ CAUTION

For CO_2 mixer, regulator, and CO_2 cylinder handling, follow the instructions in the manual supplied with the unit or from the manufacturer.

The piping from the CO_2 cylinder to the CO_2 mixer has a section with high CO_2 concentration (100%) and high pressure.
Leakage from this section may lead to a high possibility of suffocation, and handle it with extra care.
Check periodically if any cracks or looseness of the tubes and connected areas exist.

Use the CO_2 mixer whose specifications match below.
CO_2 mixed gas concentration: 5% (adjustment desirable)
CO_2 mixed gas flow: 150 ml (adjustment desirable)
CO_2 mixed gas pressure: approx. 0.02 MPa
When a 5% CO_2 cylinder is connected, the CO_2 mixer is not necessary; however, a flow meter is required instead.
The regulator with a flow meter is also available in this case.
Follow the above specifications for the flow and the pressure of CO_2 mixed gas concentration if the regulator with a flow meter is used.
The CO_2 concentration may have to be adjusted when relatively weak cells such as primary cells are used.
It is recommended to use the 100% CO_2 cylinder and the CO_2 mixer together.

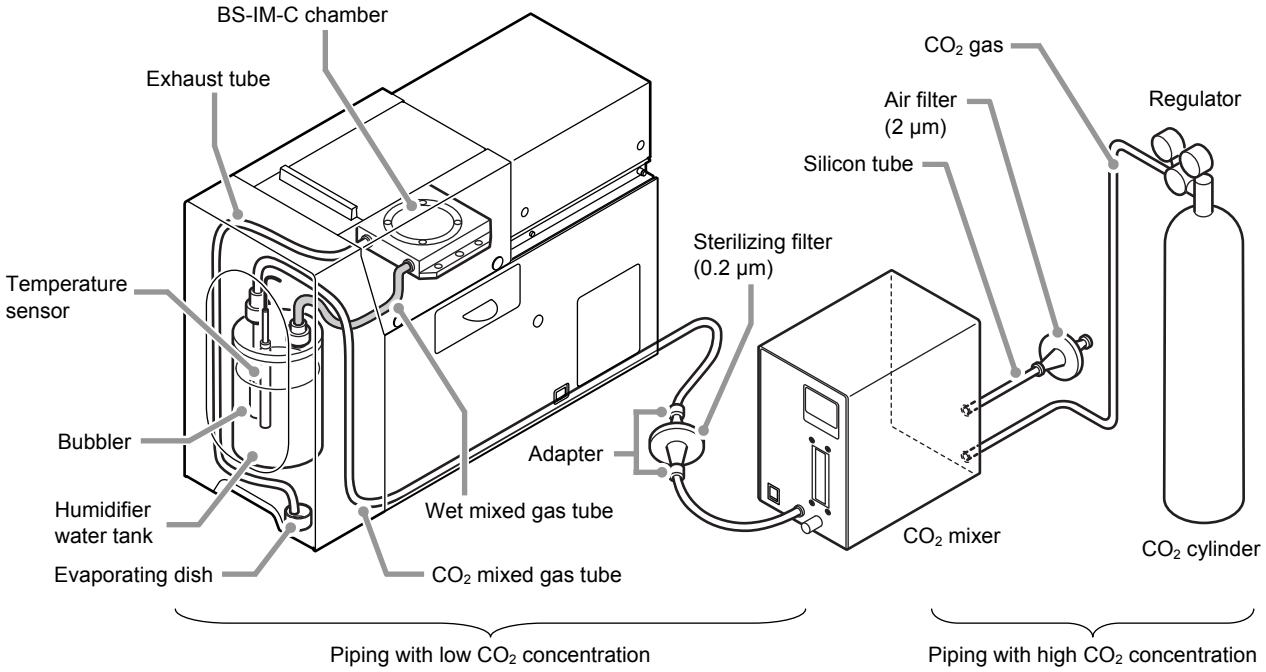


Figure 7.1-21 Piping diagram (BS-IM-C chamber)

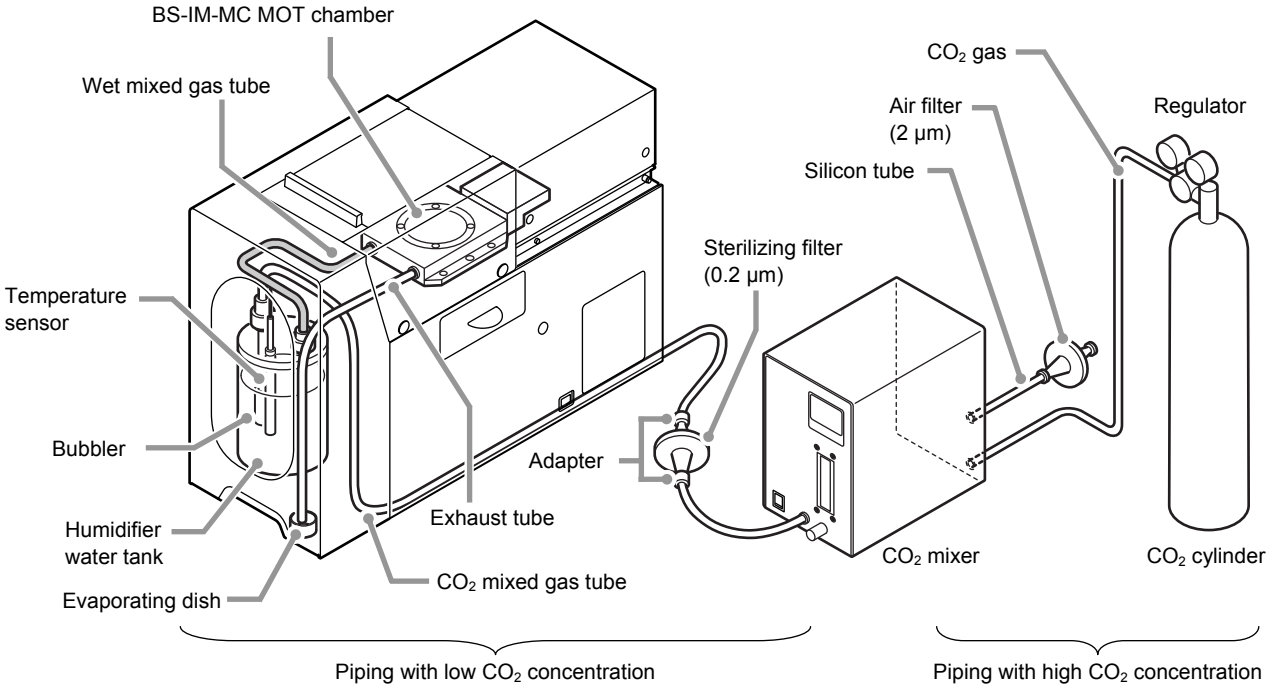


Figure 7.1-22 Piping diagram (BS-IM-MC MOT chamber)

When connecting tubes to the BS-IM-MC MOT chamber, be sure to use the tubes supplied with the chamber. Connect the wet mixed gas tube to the IN port of the chamber, and the exhaust tube to the OUT port. The positions of the IN/OUT ports are reversed from the ones for the BS-IM-C chamber.

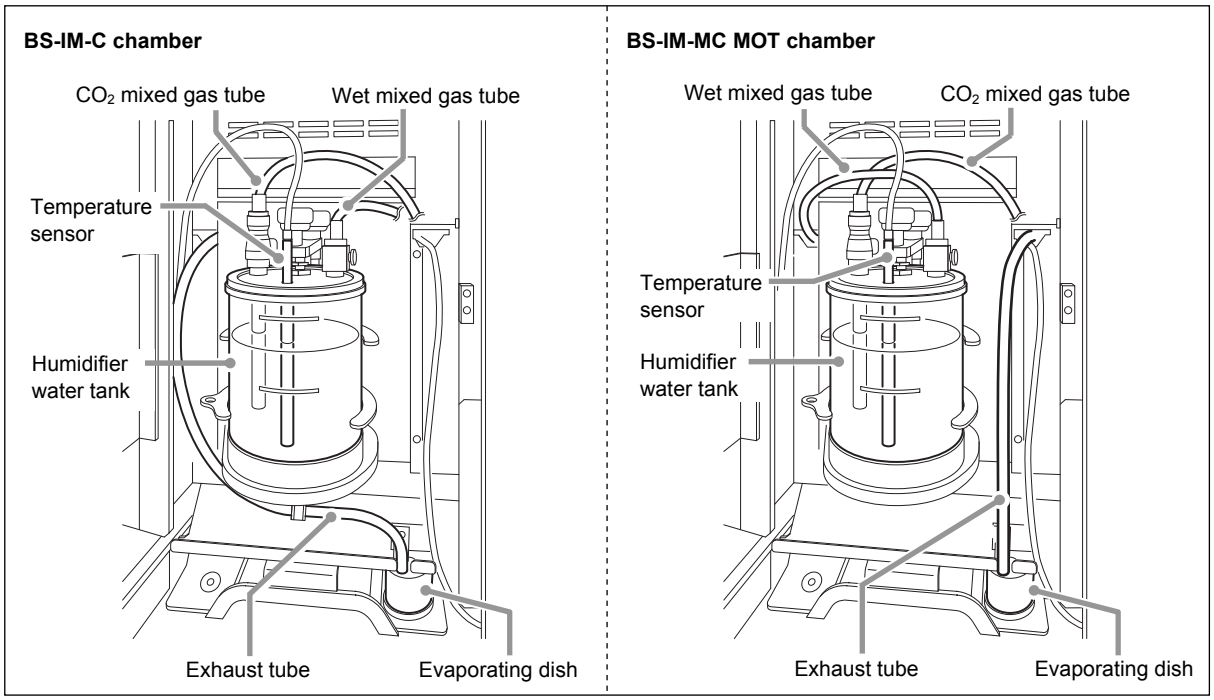


Figure 7.1-23 Surroundings of the humidifier water tank

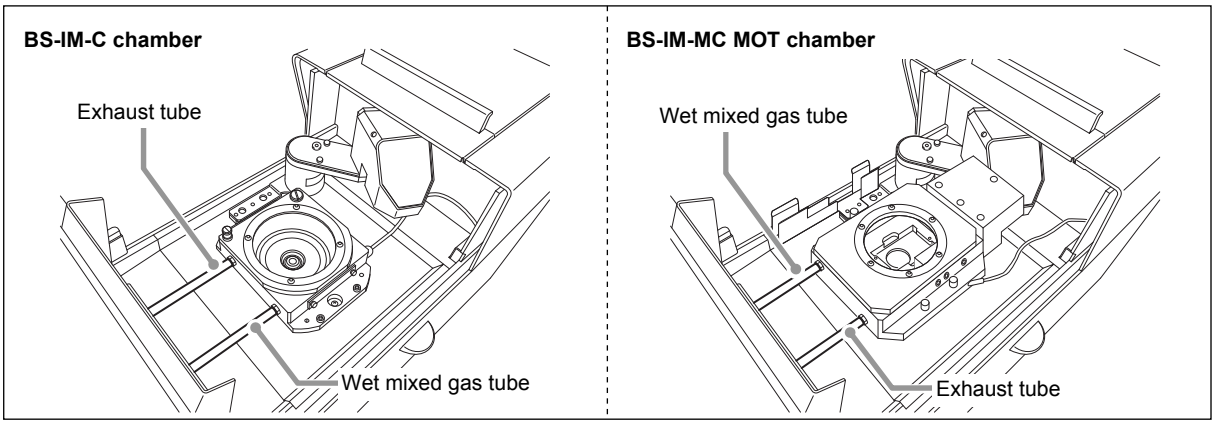


Figure 7.1-24 Surroundings of the culture chamber

7.1.5 Connecting the Cables

Connect the microscope, control PC, HG precentered fiber illuminator, CO_2 mixer, and ergonomic controller with the cables.

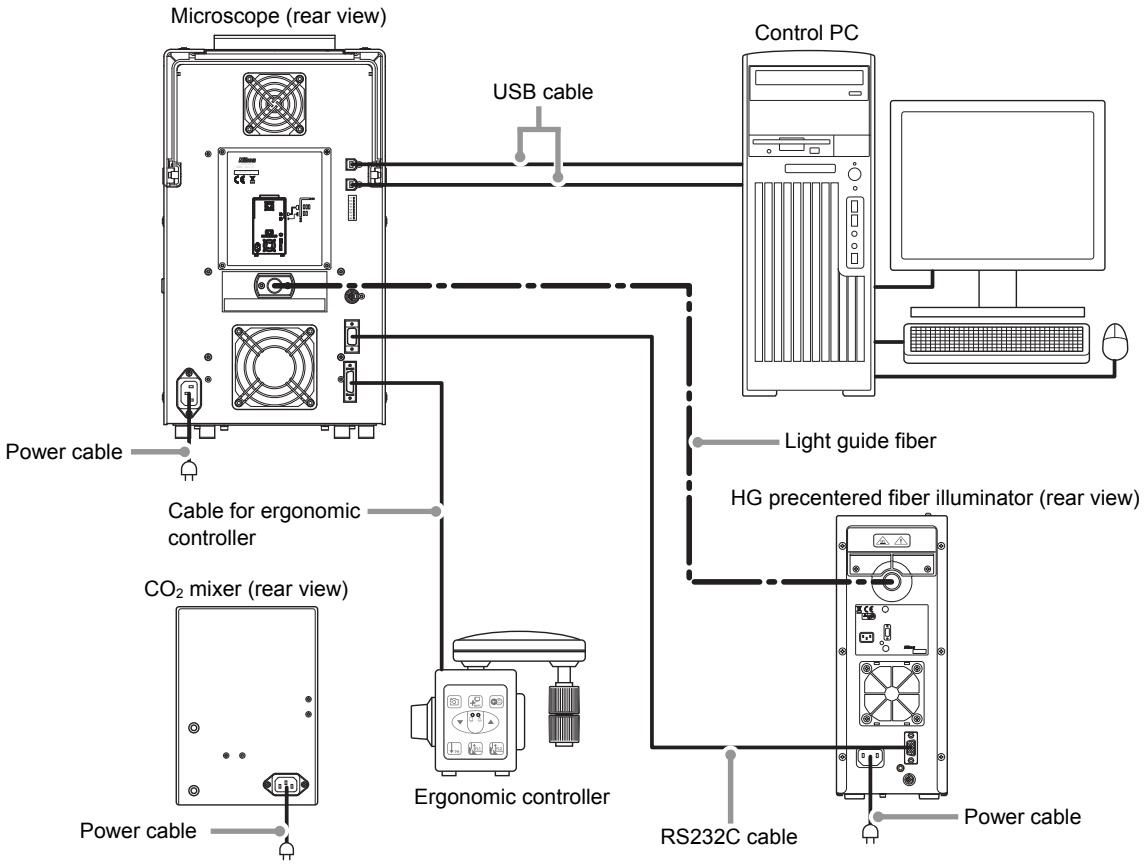


Figure 7.1-25 Wiring diagram

USB cable connection

Connect the microscope and the control PC with two USB cables.

1. Connect the camera USB cable (blue).

Use the blue USB cable to connect the upper USB connector (Camera USB) on the back of the microscope to the upper left USB connector on the back of the control PC.

2. Connect the microscope USB cable (black).

Use the black USB cable to connect the lower USB connector (Microscope USB) on the back of the microscope to the lower left USB connector on the back of the control PC.

USB cable connection on the back of the control PC shown at right below is an example of the back panel of the XW-6400 manufactured by Hewlett-Packard Co.

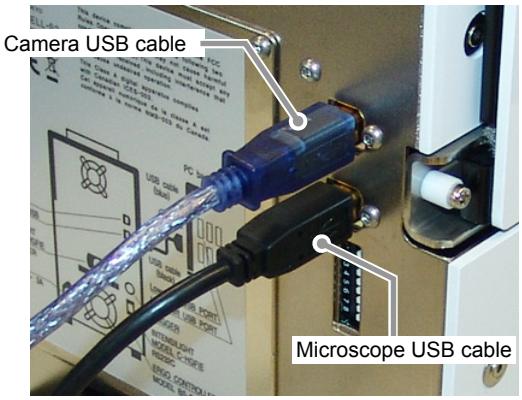


Figure 7.1-26 USB cable connection on the back of the microscope

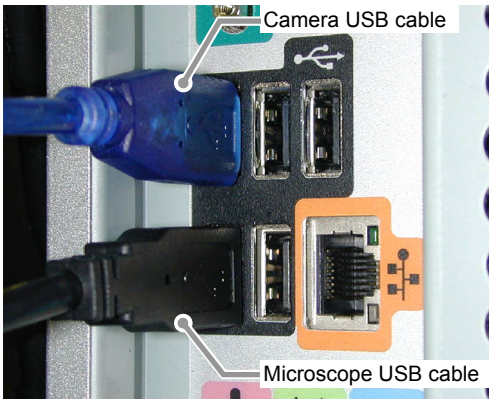


Figure 7.1-27 USB cable connection on the back of the control PC

3. Connect the USB cables of devices such as a mouse and a keyboard.

For the USB cables of devices such as a mouse and a keyboard, connect them to vacant USB connectors other than the two connectors on control PC described above.

⚠ CAUTION

Caution for the USB cable connections

If you change the connector for the USB cable after the setup, the OS of the control PC may request you to reinstall three device drivers for this product. To avoid this, connect the USB cables to the locations specified in this section and do not change the connections. If the OS of the control PC requests you to reinstall the device drivers, check that the USB cables are connected to the specified connectors.
If a USB cable is connected to an incorrect connector, reconnect it to the specified connector.
Additionally, be sure to use the provided USB cables for operational stability.

Attaching the light guide fiber

1. Insert the light guide fiber.

Insert the light guide fiber into the light guide fiber port on the rear of the microscope as far as it goes.

The light guide fiber is inserted by approximately 17 cm into the system.

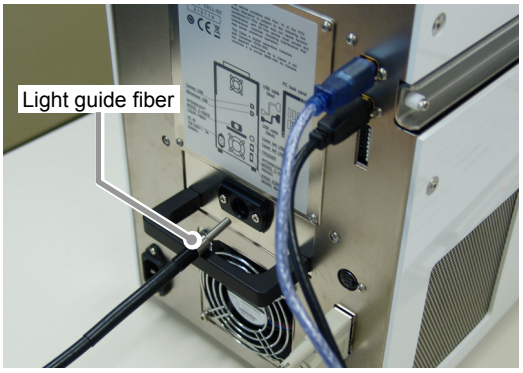


Figure 7.1-28 Inserting the light guide fiber

2. Remove the cover for the light guide fiber clamping point.

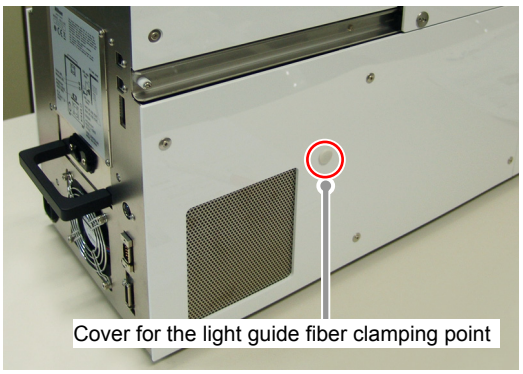


Figure 7.1-29 Removing the cover for the light guide fiber clamping point

3. Secure the light guide fiber.

First make sure that the clamp screw is loose enough to permit the fiber to be fully inserted until it stops and then tighten the clamp screw with the hexagonal screwdriver (2.5 mm).

After securing the light guide fiber, attach the cover for the light guide fiber clamping point.

And then, pull the light guide fiber to make sure that it is secured.

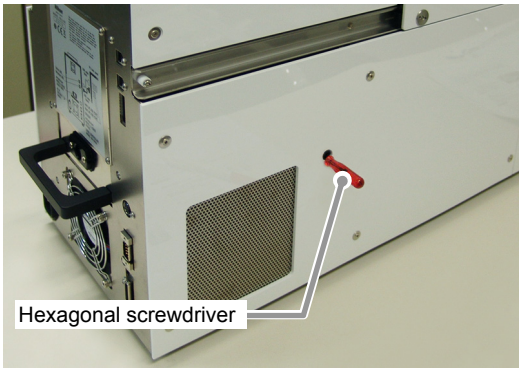


Figure 7.1-30 Attaching the light guide fiber

CAUTION

Caution for the light guide fiber attachment

Before attaching the light guide fiber, loosen the clamped floating unit.
When the floating unit is clamped, the guide hole on the housing is not aligned with the attaching fit hole on the floating unit, and the light guide cannot be fully inserted to the end.

7.1.6 Attaching the Fixture

Before carrying or shipping the microscope, attach the fixture to the microscope.

Setting the movable parts to clamping positions

Before the fixture can be attached, all moving parts must be in the proper position.

1. **Turn off the power switch of the microscope.**
   The cover of the filter cube port must be attached. If not, the filter cube switching mechanism does not move to the clamping position.
2. **While pressing any two buttons on the front panel of the ergonomic controller, turn on the microscope.**
   You can release the two buttons once the floating unit starts to move.
3. **Each movable part moves to the clamping position automatically after initialization.**
   When all movable parts move to their clamping positions, all LED indicator on the upper surface of the product blink for approximately three seconds.
4. **Turn off the power switch of the microscope.**

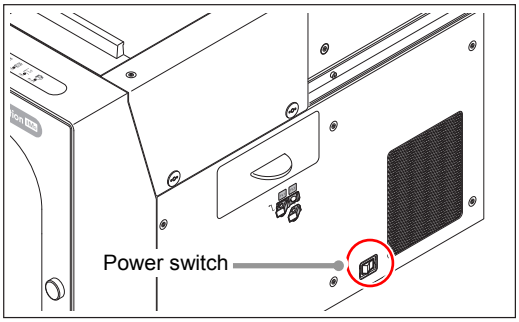


Figure 7.1-31 Power switch of the microscope

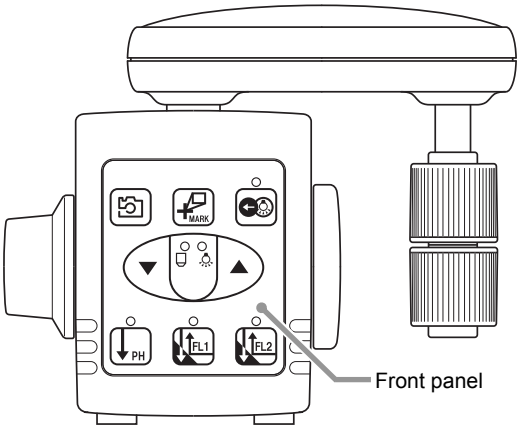


Figure 7.1-32 Ergonomic controller

Attaching the fixture

The microscope has five clamp positions as described below. Follow the removal procedure in reverse order to attach the fixture to the microscope.
* For clamping procedure, refer to “Removing the Fixture” in this chapter.

- Clamping the magnification selector dial and the filter magazine
- Attaching the fixture for the floating unit
- Attaching the fixture for the XY moving part of the objective
- Attaching the fixture for the Z moving part of the objective
- Clamping the diascopic illumination unit

CAUTION

Caution for the floating unit clamping

Before clamping the floating unit, remove the light guide fiber.
If the floating unit is clamped while the fiber is attached, excessive force is applied to the edge of the fiber, and the fiber may be unable to be removed or even may be damaged.

7.1.7 Parts Treatable in Autoclave Sterilization

The parts shown below can be treated in autoclave sterilization.

However, after treating each part with an autoclave, dry it completely with an apparatus such as dryer (60°C).

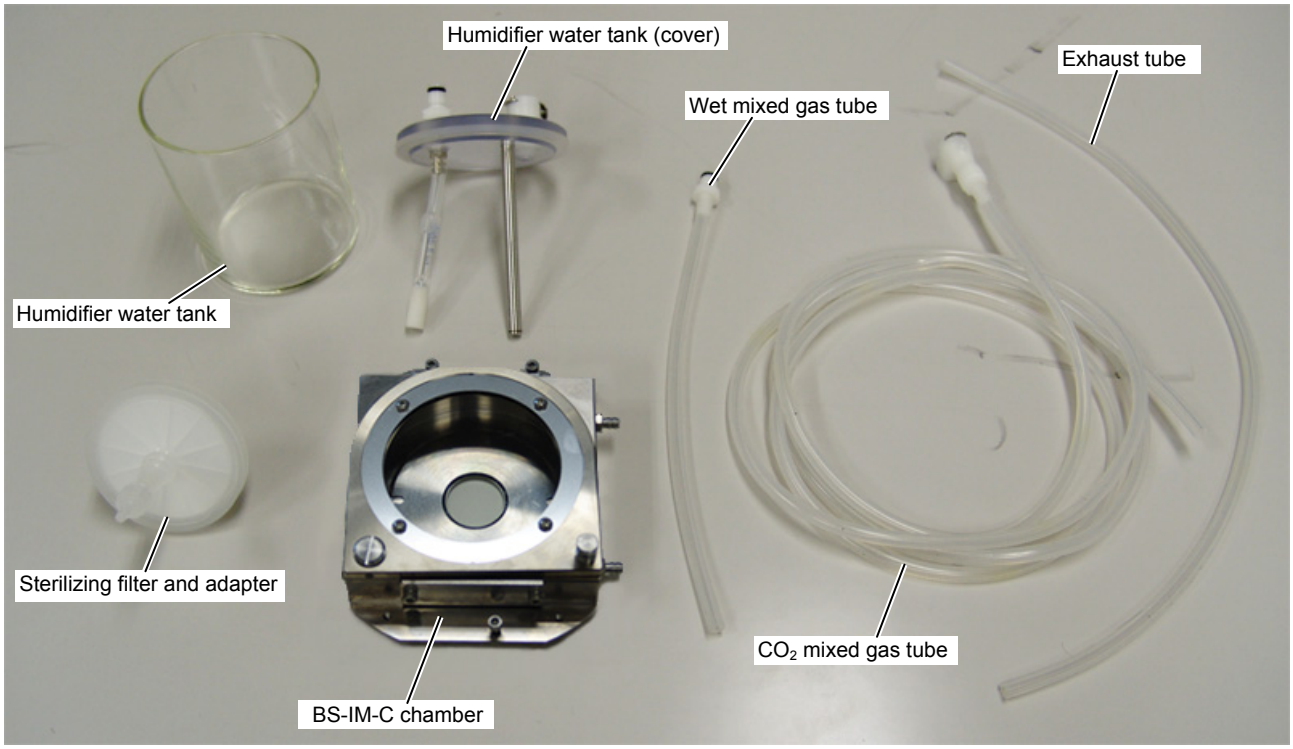


Figure 7.1-33 Parts treatable in autoclave sterilization

CAUTION

These parts have not been sterilized when arrived. Sterilize them as necessary. Note that the sterilizing filter is also not sterilized.

The sterilizing filter and tubes are consumables. They must be replaced when deteriorated or degraded.

Do not treat BS-IM-MC MOT chamber in autoclave sterilization.

7.2 Operating the Ergonomic Controller

7.2.1 Changing the Focus Knob Position

Default setting of the ergonomic controller is as follows: the right knob moves the stage in the X and Y directions and the left knob controls focusing.

If the right and left knobs are switched, the knob on the left side can move the stage in the X and Y directions and another knob on the right side can control focusing.

This chapter indicates the procedure for switching these knobs.

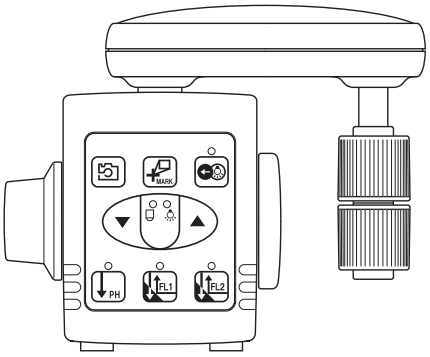


Figure 7.2-1 Default setting of the ergonomic controller

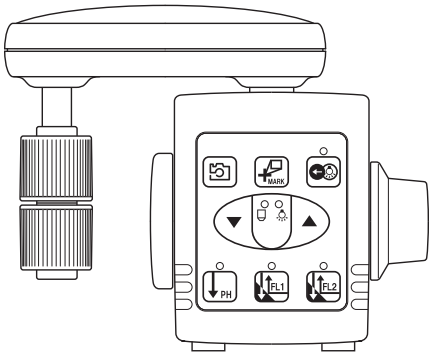


Figure 7.2-2 After switching the knobs on the ergonomic controller

1. Remove the focus knob on the left.

The focus knob is attached by a magnet and can be removed by hand.

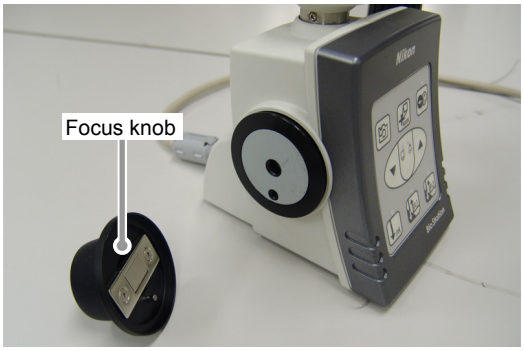


Figure 7.2-3 Removing the focus knob on the left

2. Use the hexagonal screwdriver (2 mm) to loosen the clamp screw fixing the bottom of the handle arm.

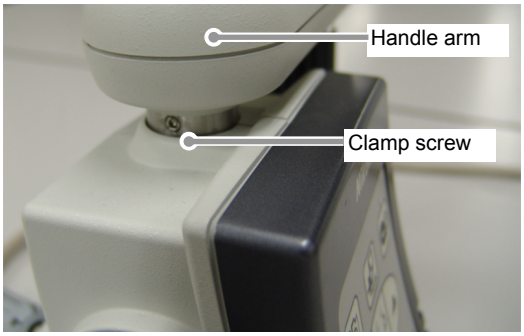


Figure 7.2-4 Loosening the clamp screw fixing the handle arm

3. Remove the focus knob on the right.

Retract the handle arm to the other side and gently remove the focus knob on the right by hand.

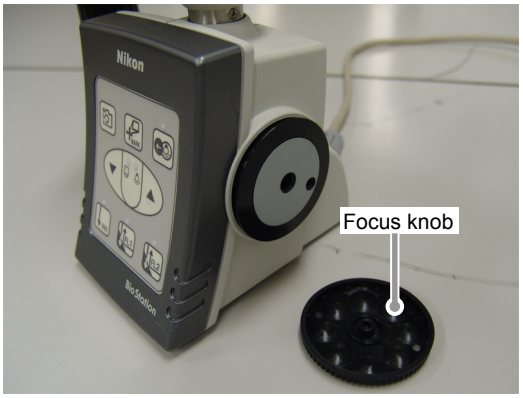


Figure 7.2-5 Removing the focus knob on the right

4. Attach a focus knob to the right and left sides.

Switch the right and left knobs and attach each of them. To attach the focus knob, align the locating pin on the focus knob with the locating pin hole on the ergonomic controller and then attach the focus knob.

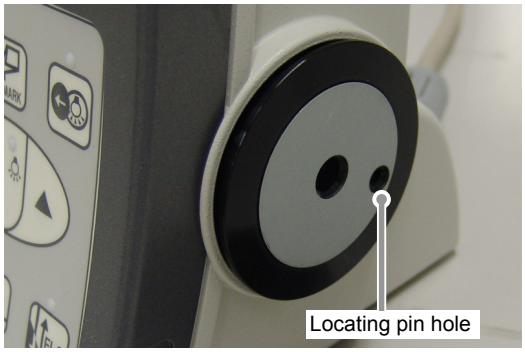


Figure 7.2-6 Attaching the focus knob

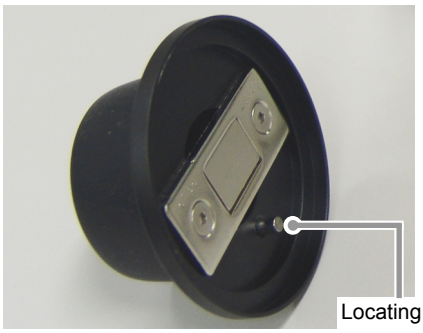


Figure 7.2-7 Focus knob

5. Tighten the clamp screw fixing the bottom of the handle arm.

Rotate the handle arm back to the other side and tighten the clamp screw.

Figure 7.2-8 Securing the handle arm

7.2.2 Adjusting the X Stage Knob and the Y Stage Knob

Adjusting the height of the knobs

The height of the X stage knob and the Y stage knob can be changed. Hold the knobs and move them vertically to your convenient height.

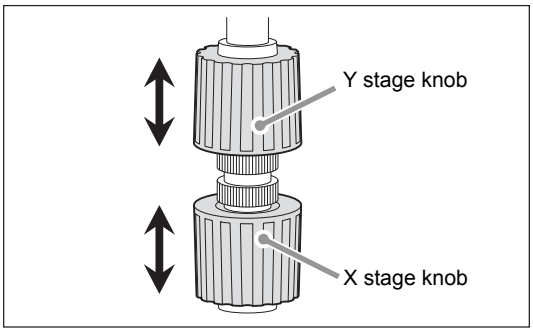


Figure 7.2-9 Height adjustment of the X stage knob and Y stage knob

Adjusting the torque of the knobs

There are torque adjustment wheels between the X stage knob and the Y stage knob. Move down the X stage knob and move up the Y stage knob to their limits. To increase the torque of a knob, rotate the wheel so that it moves closer to the knob. (To increase the torque, rotate the Y stage knob torque adjustment wheel counterclockwise viewed from the top, and rotate the X stage knob torque adjustment wheel clockwise viewed from the top.)

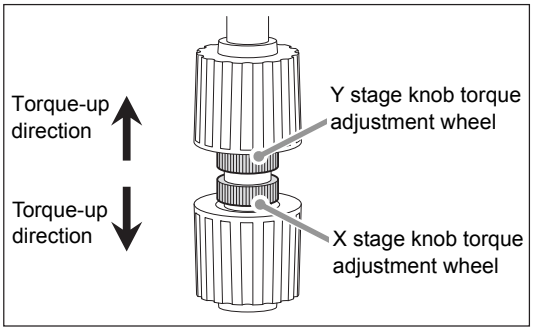


Figure 7.2-10 Torque adjustment of the X stage knob and Y stage knob

7.3 Notes on Using the Film Bottom 4-Quadrant Dish

Setting Hi-Q4 (film bottom 4-quadrant dish) in the Preference menu displays a cross line on the observation point indication (pink crosshair), indicating the registered time-lapse observation point belongs to which quadrant (I to IV).

For information, see Section 3.2.1, “Observation Point Verification Display” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

When the 4-quadrant dish is used for the first time, capture a tiled image on the Wide field screen, and then check the positional relation between the cross line displayed there and the disk partitions for four quadrants.

Usually, the cross line is in the partition thickness, but if the position where the culture chamber is secured to the main unit slips out of place, the partitions may be off from the cross line. If so, loosen the clamp bolt for the culture chamber, adjust it, and then secure it again.

For details on capturing a tiled image, see Section 3.2, “Wide Field Screen” in the separate manual, “BioStation IMQ Instructions <Application Software>.”

CAUTION

If the partitions of the 4-quadrant dish do not align with the cross line, the quadrants may be incorrectly identified when a place close to a partition is registered as a time-lapse observation point.

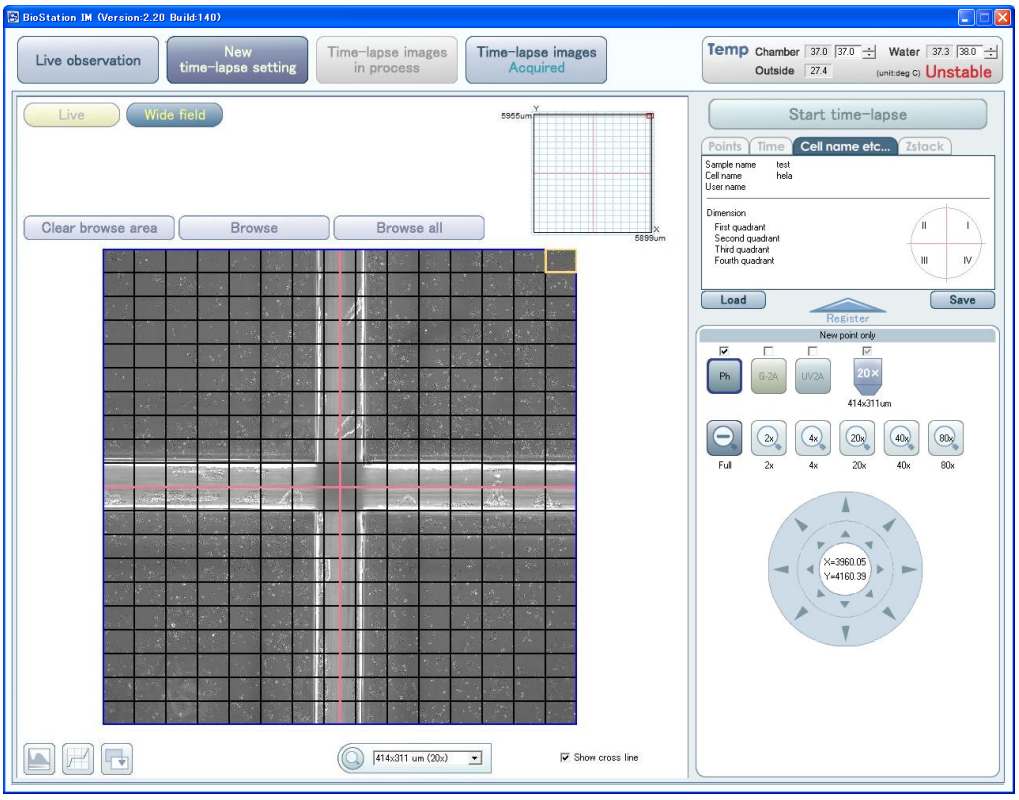


Figure 7.3-1 New time-lapse setting screen (Wide field screen) (When Hi-Q4 is set)

7.4 Setting up the BS-IM-MC MOT chamber

When attaching the BS-IM-MC MOT chamber to the microscope for the first time or after re-attaching the chamber, register the position of the reference mark as described below. Check that the “STABLE” lamp of the LED indicator is lit before performing this procedure.

1. **Click the Marker seek button on the reference mark register screen (displayed upon software startup).**

   The area around the reference mark is captured (three images each in the X and Y directions), and displayed on the screen in a tiled pattern.

   Three images are captured for the Z direction also (reference position/positive side/negative side).

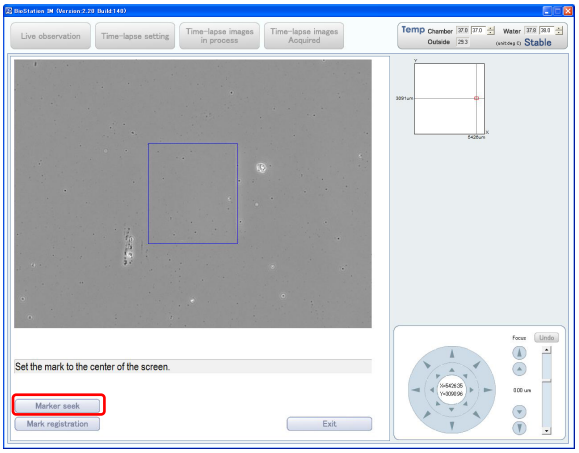


Figure 7.4-1 Reference mark register screen

2. **Move the Z-axis scroll bar to display the screen with the clearest focus on the reference mark.**

3. **Double-click the tile with the reference mark.**

   The clicked image is enlarged.

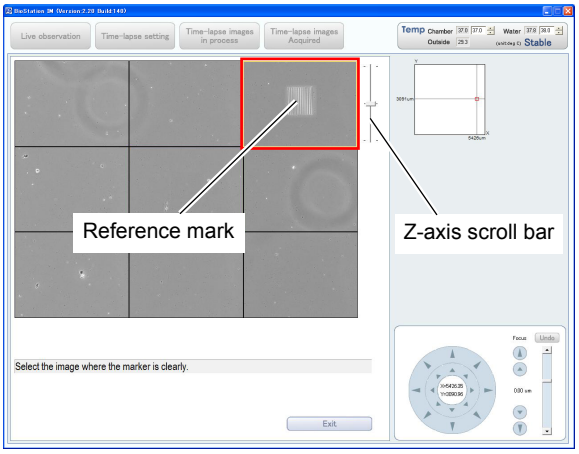


Figure 7.4-2 Tiled display of the area around the reference mark

4. **Move the reference mark into the blue frame at the center of the screen using the jog dial or the ergonomic controller.**

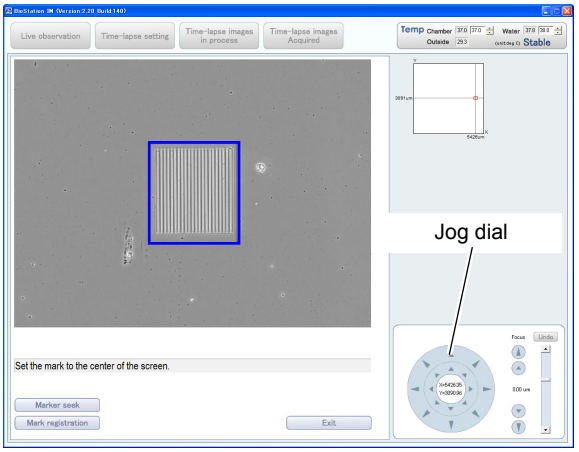


Figure 7.4-3 Positioning the Reference mark

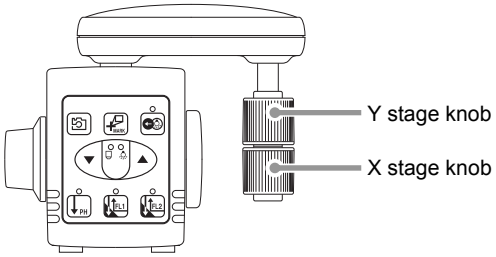


Figure 7.4-4 Ergonomic controller (stage movement)

5. Click the Mark registration button.

The AF positions of the reference marks for wells 1 to 4 are registered in order.

This will take about four minutes.

When registration is complete, the Live observation screen appears.

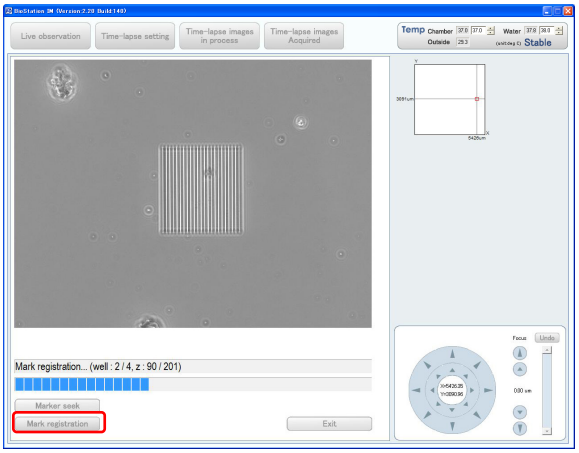


Figure 7.4-5 Registering the AF position of the Reference mark

Automatic focus (AF)

For position calibration, AF is performed on the reference marks written on the reference glass that is attached at the bottom of the dish mounting part. Single reference mark is aligned with each well of the dish.

Calibration is not carried out when the well is switched on the Live observation screen.

Calibration is carried out to make the observation point registration available each time the well is switched on the New time-lapse setting screen.

Calibration OFF mode (About the New time-lapse setting screen)

By default, the calibration using the reference marks is carried out each time the well is switched. However, the mode not to perform the calibration (Calibration OFF mode) is available for a quick setting. Do not select the Calibration OFF mode for promoting the position accuracy.

Calibration ON mode: Well switching takes about 15 seconds due for completion of AF.
1 round for a time-lapse experiment takes about 1 minute (for four calibrations.)

Calibration OFF mode: Well switching takes only about 1 second. 1 round for a time-lapse experiment takes about 5 seconds.

En Symbol for separate collection applicable in European countries

This symbol indicates that this product is to be collected separately.
The following apply only to users in European countries.

- This product is designated for separate collection at an appropriate collection point. Do not dispose of as household waste.
- For more information, contact the retailer or the local authorities in charge of waste management.

De Symbol für getrennte Wertstoff-/Schadstoffsammlung in europäischen Ländern

Dieses Symbol zeigt an, dass dieses Produkt separat entsorgt werden muss.
Folgendes gilt für Verbraucher in europäischen Ländern:

- Dieses Produkt darf nur separat an einer geeigneten Sammelstelle entsorgt werden. Eine Entsorgung im Hausmüll ist unzulässig.
- Wenden Sie sich für nähere Informationen bitte an Ihren Händler oder die örtlich für Abfallentsorgung zuständigen Behörden.

Fr Symbole pour la collecte sélective applicable aux pays européens

Ce symbole indique que ce produit doit être collecté séparément.
Les mesures suivantes concernent uniquement les utilisateurs européens.

- Ce produit doit être jeté séparément dans un point de collecte approprié. Ne jetez pas ce produit dans une poubelle réservée aux ordures ménagères.
- Pour plus d'information, contactez le détaillant ou les autorités locales responsables de la gestion des ordures.

Es Símbolo para recogida separada aplicable en países Europeos

Este símbolo indica que este producto se recogerá por separado.
Lo siguiente sólo se aplicará en países Europeos.

- Este producto ha sido designado para su recogida en un punto de almacenamiento apropiado. No lo tire como un deshecho doméstico.
- Para más información, contacte con el vendedor o autoridades locales al cargo de la gestión de residuos.

Dk Symbol for special bortskaffelse af denne type produkter i de europæiske lande

Dette symbol angiver, at dette produkt skal bortskaffes specielt.
Det efterfølgende er kun til forbrugere i de europæiske lande.

- Dette produkt skal bortskaffes på fx en genbrugsplads el .lign. Det må ikke smides væk som normalt husholdningsaffald.
- For yderligere information kontakt din forhandler eller de lokale myndigheder, som fx teknisk forvaltning.

Nl Symbool voor gescheiden inzameling zoals dat wordt gebruikt in Europese landen

Dit symbool betekent dat dit product apart moet worden ingezameld.
Het volgende is alleen van toepassing op gebruikers in Europa

- Dit product dient gescheiden ingezameld te worden op een daartoe bestemd inzamelpunt. Niet wegwerpen bij het normale huisvuil.
- Neem voor meer informatie contact op met het verkooppunt, of met de lokale instantie die verantwoordelijk is voor het verwerken van afval.

Pt Símbolo para recolha de resíduos em separado utilizado nos países Europeus

Este símbolo indica que este produto é para ser recolhido separadamente.
Esta norma aplica-se só para os utilizadores nos países Europeus.

- Este produto está designado para recolha de resíduos em separado num recipiente apropriado. Não deitar no caixote do lixo doméstico.
- Para mais informações, contactar o revendedor ou as autoridades locais responsáveis pela gestão dos resíduos.

It Simbolo per la raccolta differenziata applicabile nei paesi europei

Questo simbolo indica che il prodotto va smaltito separatamente.
La normativa che segue si applica soltanto agli utenti dei paesi europei.

- Il prodotto è designato per lo smaltimento separato negli appositi punti di raccolta. Non gettare insieme ai rifiuti domestici.
- Per maggiori informazioni, consultare il rivenditore o gli enti locali incaricati della gestione dei rifiuti.

This symbol is provided for use in the People's Republic of China, for environmental protection in the fields of electronic information products.

このマークは、中国のお客様に向けたもので、電子情報製品分野における環境保護を目的としています。

No Symbol for kildesortering i europeiske land

Dette symbolet indikerer at produktet skal kildesorteres.
De nedenstående punktene gjelder for alle europeiske brukere.

- Dette produktet skal kildesorteres og innleveres til dedikerte innsamlingspunkter. Må ikke kastes med normalt husholdningsavfall.
- For mer informasjon, ta kontakt med din forhandler eller lokale myndigheter.

Se Symbol för separat upphämtning i euopeiska länder

Den här symbolen anger att produkten måste hämtas separat.
Följande gäller bara användare i europeiska länder.

- Den här produkten är avsedd för separat upphämtning vid ett lämpligt uppsamlingsställe. Produkten får inte kastas i hushållsavfall.
- För mer information, kontakta återförsäljaren eller de lokala myndigheter som ansvarar för avfallshantering.

Fi Erillisen keräyksen merkki Euroopan maissa

Tämä merkki osoittaa, että tuote kerätään erikseen.
Seuraavat maininnat koskevat vain eurooppalaisia käyttäjiä.

- Tämä tuote kerätään erikseen asianmukaisista keräyspisteistä. Älä hävitä tuotetta talousjätteiden mukana.
- Lisätietoja saat jälleenmyyjältä tai paikallisilta jätehuoltoviranomaisilta.

Ru Символ сортировки мусора, использующийся в европейских странах

Данный символ означает, что этот продукт должен утилизироваться отдельно от других.
Приведенная ниже информация касается только пользователей из стран Европы.

- Данный продукт должен утилизироваться отдельно от других в соответствующих приемных пунктах. Не выбрасывайте данный продукт вместе с бытовым мусором.
- Дополнительную информацию Вы можете получить у продавца или у местных властей, отвечающих за утилизацию мусора.

Gr Σύμβολο για την ξεχωριστή αποκομιδή απορριμμάτων στις Ευρωπαϊκές χώρες

Αυτό το σύμβολο υποδηλώνει ότι η αποκομιδή αυτού του προϊόντος πρέπει να γίνει ξεχωριστά.
Τα κάτωθι απευθύνονται μόνο σε Ευρωπαίους χρήστες.

- Αυτό το προϊόν είναι σχεδιασμένο έτσι ώστε να γίνεται η αποκομιδή του σε ειδικά σημεία. Μην το πετάτε μαζί με τα υπόλοιπα απορρίμματα.
- Για περισσότερες πληροφορίες, επικοινωνήστε με τον διανομέα του προϊόντος ή με τις υπεύθυνες τοπικές αρχές για θέματα διαχείρισης απορριμμάτων.

Pl Symbol oznaczający segregowanie odpadów, stosowany w krajach Europy

Ten symbol oznacza, że produkt musi być wyrzucany oddzielnie.
Poniższe uwagi mają zastosowanie tylko dla użytkowników z Europy.

- Ten produkt jest przeznaczony do oddzielnej utylizacji i powinien być dostarczony do odpowiedniego punktu zbierającego odpady. Nie należy go wyrzucać z odpadami gospodarstwa domowego.
- Aby uzyskać więcej informacji, należy skontaktować się z przedstawicielem przedsiębiorstwa lub lokalnymi władzami odpowiedzialnymi za zarządzanie odpadami.

Hu Európai országokban érvénes "Elkülönített hulladékgyűjtés" jelzése

Ez a jelzés azt jelenti, hogy ezt a terméket elkülönítve kell gyűjteni.
Az alábbiak csak az európai országokban élő felhasználókra érvényes.

- Ezt a terméket a megfelelő hulladékgyűjtőhelyen, elkülönítve kell gyűjteni. Ne dobja ki háztartási hulladékként.
- További információkért forduljon a forgalmazóhoz, vagy a helyi hatóság hulladékgyűjtésért felelős részlegéhez.

Cz Symbol pro oddělený sběr odpadu platný v evropských zemích

Tento symbol znamená, že tento produkt se má odkládat odděleně.
Následující pokyny platí pro uživatele z evropských zemí.

- Tento produkt se má odkládat na místě sběru k tomuto účelu určeném. Neodhazujte spolu s domácím odpadem.
- Více informací o způsobu zacházení s nebezpečným odpadem vám podá příslušná místní instituce.

Jp ヨーロッパにおける廃棄物個別回収のシンボルマーク

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