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Nikon

ECLIPSE

Motorized Units for Ti Series
Instructions

TI-HUBC/A Hub Controller A

TI-HUBC/B Hub Controller B

TI-ERGC Ergo Controller

TI-S-EJOY Stage Joystick for Motorized Stage

TI-ND6-E Sextuple Motor DIC Nosepiece

TI-CT-E Motorized Condenser Turret

TI-FLEW-E EX Filter Wheel

TI-FLBW-E BA Filter Wheel

TI-FLC-E Motorized Epi-fl Filter

TI-FLC-E/HQ Motorized Epi-fl Filter

TI-S-ER Motorized Stage with Encoders

TI-S-E Motorized Stage

Introduction

Thank you for purchasing a Nikon product.

This instruction manual is written for users of motorized units for Nikon's ECLIPSE Ti Series of inverted microscopes.

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

- No part of this manual may be reproduced or transmitted in any form without prior written permission from Nikon.
- The contents of this manual are subject to change without notice.
- Although every effort has been made to ensure the accuracy of this manual, errors or inconsistencies may remain. If you note any points that are unclear or incorrect, please contact your nearest Nikon representative.
- Some of the equipment described in this manual may not be included in the set you have purchased.
- If you intend to use any other equipment with this product, read the manual for that equipment too.
- Be sure to read "Notation and Configuration of This Manual" on page 10.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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.

Meaning of symbols appearing on the equipment

Symbols appearing on a product indicate necessary cautions for using the product. Always refer to the instruction manual and read the relevant instructions before manipulating any part to which the symbol has been affixed.

Symbol	Meaning
	**Caution for heat** This symbol, visible on the top of the dia-illuminator and 12V 100W lamphouse, calls your attention to the following: • The lamphouse becomes very hot during and immediately after illumination. • Burn risk. Do not touch the lamphouse during or immediately after illumination. • Make sure that the lamphouse is sufficiently cool before replacing the lamp.
	**Biohazard** This symbol on the stage calls your attention to the following: • Spillage of a specimen from a vessel onto the microscope and associated units presents a biohazard risk. • To avoid biohazard contamination, do not touch the contaminated portion with your bare hands. • Decontaminate the contaminated portion according to the standard procedure of your laboratory.
	**General caution** This symbol is displayed on the top of the protection plate (for nosepiece) appended to the Ti-E and Ti-E/B and the protection plate (for PFS6 nosepiece) appended to the TI-ND6-PFS motorized PFS6 nosepiece. It calls your attention on the following: • To avoid danger of jamming your fingers, be sure to secure this plate in its correct position.

Warning

1. Intended product use

This microscope and associated units are intended mainly for use in microscopic observation and in the micromanipulation of living cells and tissue using diascopic and episcopic illumination. They are designed for the main purposes of experimentation and observation, in hospitals or other laboratories, of such cells and tissue within the fields of genetics, immunology, physiology, pharmacology, neurology, cellular biology, and molecular biology.

This product is an in-vitro diagnostic medical device.

2. Do not disassemble.

Disassembly may cause malfunction and/or electrical shock, and will lead to the forfeiture of all claims against warranty. Do not disassemble any part other than as specifically instructed in this manual. If you experience any problems with the units, notify your nearest Nikon representative.

3. Read the instruction manuals thoroughly.

For safety, be sure to read this manual and the manual supplied with your product thoroughly. Take special care to obey the warnings and cautions at the beginning of these manuals.

4. Check the input voltage

- **Hub controller A and hub controller B AC adapter:**
  The AC adapter for the hub controller A and hub controller B supports 100 to 240 V, 50 to 60 Hz AC power and can be used to connect to AC power outlets in all countries. No specific cautions regarding supply voltage are required under normal use.
- **When using the TI-PS100W power supply:**
  The TI-PS100 W power supply supports 100 to 240 V, 50/60 Hz AC power and can be used to connect to AC power outlets in all countries. No specific cautions regarding supply voltage are required under normal use.
- **When using the TE-PS30W power supply A or the TE-PSE30W power supply A:**
  The input voltage is indicated on the rear panel of the power supply. Check that the supply voltage of the AC power outlet matches the input voltage before plugging in the power cord. Where the indicated input voltage differs from the region's supply voltage, contact your dealer immediately and do not attempt the use the power supply, as doing so may result in overheating and fire due to excess current. Damage may also result to both the power supply and the connected device.
- **When using the TI-S-CON motorized stage controller:**
  The motorized stage controller supports 100 to 240 V, 50/60 Hz AC power and can be used to connect AC power outlets in all countries. No specific cautions regarding the supply voltage are required under normal use.
- **When using optional motorized units:**
  Check that the voltage and frequency of the power source is within the specified range. Using a power source that does not meet the specified rating could cause the device to malfunction as well as damage or fire.

Warning

5. Cautions regarding the AC adapter of the hub controller

The hub controller A and hub controller B are powered by the AC adapter. Be sure to use the specified adapter model. Use of any other type of adapter can result in malfunction, excessive heating, and/or fire.

- For details about the specified AC adapter of the hub controller A, see Chapter 9, “Specifications,” in Part 1, “For Users of Ti-E and Ti-E/B.” For details about the specified AC adapter of the hub controller B, see Chapter 9, “Specifications,” in Part 2, “For Users of Ti-U, Ti-U/B, Ti-S, and Ti-S/L100.”
- To prevent malfunction and/or fire, be sure to use the AC adapter in a well ventilated location.
- To ensure that it radiates heat properly and does not overheat, never cover or place any object on the adapter.
- To prevent malfunction or damage to the device, always turn off the POWER switch of the hub controller (switch to “OFF”) before attaching the AC adapter.

6. Check the power cord

To prevent electric shock, always turn off the POWER switch of the power supply and the HUB controller (switch to “OFF” or “O”) before plugging in or unplugging the power cord.

Always use the power cords specified below for the power supply and AC adapter. Use of any other power cord can result in fire or other hazard. Also note that the power supply is classified as subject to protection class I against electric shock. Therefore, be sure to connect it to a protective earth terminal.

For details about the specified power cord, see Chapter 9, “Specifications,” in Part 1, “For Users of Ti-E and Ti-E/B,” and Chapter 9, “Specifications,” in Part 2, “For Users of Ti-U, Ti-U/B, Ti-S, and Ti-S/L100.”

7. Verify the compatibility of the lamp, dia pillar illuminator, and power supply.

The dia pillar illuminator and power supply must be used with compatible lamp ratings (12V 100W or 6V 30W) and the correct power-supply voltage. Check the instructions on p.1-61 or p.2-51 to verify that you are using the correct combination. Use of an incompatible combination can result in malfunction, excessive heating, and/or fire.

8. Heat from the light source

When the lamp is on, the lamp and lamphouse become extremely hot. Obey the following in order to avoid burns, fire, or other hazards.

- To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.
- To avoid the risk of fire, do not place fabric, paper or highly flammable volatile materials such as gasoline, petroleum benzine, paint thinner or alcohol near the lamphouse while the lamp is lit or for about 30 minutes after it has been turned off.
- Do not obstruct the ventilation holes of the lamphouse. To ensure that it radiates heat properly and does not overheat, never cover or place any object on the lamphouse.
- The bottom of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.

Warning

9. Precautions when replacing the lamp

- When replacing the lamp, wait at least 30 minutes after the lamp is turned off to allow time for the lamp and lamphouse to cool.
- To avoid electric shock or malfunction, always turn off the power switch (switch to “O”) and unplug the power cord from the wall outlet before replacing the lamp.
- Securely attach the lamphouse cover after replacing the lamp. Never use this product with the lamphouse cover open.
- Do not break used lamp bulbs. Have them disposed of as industrial waste by a waste-disposal specialist, or dispose of them in accordance with your local government regulations.

10. Precautions when operating motorized units

Certain operations of this system can be controlled electrically, including rotating the nosepiece, raising/lowering the nosepiece (focusing), opening/closing the shutter of the light source, and rotating the motorized FL turret. You can also operate the motorized units remotely by using the Ti series controllers or a computer. Take the following precautions when controlling units electrically in order to avoid accidents.

- Check the condition of the entire microscope system before operation and make sure that it is safe to use motorized operation.
- Keep your fingers and hands away from the nosepiece, objective lens, stage, parts arranged on the stage, specimen containers, and the like. Your fingers or hand could become pinched if they are touching these parts when you operate the microscope or its units. Keep your hands away from the microscope and it’s parts while in operation.
- Make sure that the optical paths of the entire microscope system are set properly when turning the light source on and off, closing the light-source shutter, modulating light and rotating the motorized FL turret. The light source is extremely bright; if the light path is not properly configured, illumination could spill into the ambient, and if it bright light enters the eyepiece, it could injure the eye.

11. Hazardous specimens

This microscope and associated units are intended mainly for use in microscopic observation and in the micromanipulation of specimens in Petri dishes and the like (living cells and tissue). Check the following when handling specimens.

- When handling specimens, always check whether they are hazardous beforehand. Always handle infectious or other hazardous specimens using rubber gloves.
- Take care not to spill specimens. If you spill a specimen on the microscope, decontaminate the contaminated areas according to the standard procedures of your laboratory.

Warning

12. Notes on handling flammable solvents

The following flammable solvents are used with the product:

- Immersion oil (Nikon immersion oil for oil immersion objectives)
- Absolute alcohol (ethyl alcohol or methyl alcohol for cleaning optical parts)
- Petroleum benzine (for wiping the immersion oil)
- Medical alcohol (for disinfecting the microscopy)

Never hold a flame near these solvents. To use solvent, read the instructions provided by the manufacturer and handle the solvent correctly and safely. Note the following precautions to use a solvent with the product.

- Keep solvent from the heat of the lamp, the lamphouse, and the power supply device.
- Do not bring solvent near the product or its surroundings when turning on/off the power switch or plugging/unplugging the power cord.
- Be careful not to spill solvent.

Caution

1. Turn off the power during installation, connection/disconnection of cords, and maintenance.

To prevent electric shock, fire, or other hazards, always turn off the POWER switch of the AC adapter and power supply (switch to “OFF” or “O”) and unplug the power cord of the power supply from the wall outlet before installation, assembly, connecting or disconnecting cords, and performing maintenance, such as replacing lamps or cleaning lenses.

2. Keep the microscope and its parts from becoming wet and free from foreign matter.

If the microscope or any of the units gets wet, a short circuit may result, causing malfunction, excessive heating, electric shock, or other hazard. If the microscope or any of its units gets wet, immediately turn off the POWER switch (switch to “OFF” or “O”) and unplug the power cord from the wall outlet. Then wipe off all moisture with a dry cloth or the like. Foreign matter entering the microscope or its units can cause the same types of malfunction. If the microscope or a unit becomes wet or foreign matter gets inside it, contact your Nikon representative; do not use it.

3. Weak electromagnetic waves

Keep this microscope and associated units away from precision electronic equipment. They emit weak electromagnetic fields that may affect the accuracy of nearby precision electronic equipment. If the microscope or a unit affects TV or radio reception, move the radio or TV a little further from the microscope (or the unit).

4. Precautions when moving the microscope

- When moving the microscope, never attempt to grasp it by the focusing knobs, eyepiece tube, stage, dia pillar illuminator, or other such parts, as doing so can cause such parts to come off, and/or result in malfunction or adversely affect accuracy.
- Always detach the eyepiece tube, stage, lamphouse, and the light source for the epi-fl attachment, securely tighten the pillar tilting clamp screw, and grasp the microscope by the recess at the bottom front of the microscope and the bottom of the back of the microscope.

5. Precautions when assembling and installing the microscope

- Be careful to avoid pinching your fingers or hands in the equipment during assembly.
- Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Be careful not to scratch or directly touch the lens and filters during assembly.
- Each of the motorized units for the Ti series is a precision optical instrument. Using or storing such units under unsuitable conditions may damage them or adversely affect accuracy. See “2. Installation and storage locations” on page 8 and ensure that you are using your units in an appropriate environment.

6. Disposal

To avoid biohazard risk, dispose of the microscope or associated units as contaminated material according to the standard procedures of your laboratory.

Notes on handling the motorized units for the Ti series

1. Handle each unit with care.

Each of the motorized units is a precision optical instrument. Handle them with care and do not subject them to shocks or vibration.
The precisions of the objectives are particularly susceptible to even weak shocks.

2. Installation and storage locations

The microscope and each of its units is a precision optical instrument. Using or storing them under unsuitable conditions may damage them or adversely affect accuracy. Install and store the microscope and its units in locations meeting the following criteria.

- Select an indoor location with a temperature of 0 to 40°C and a relative humidity of 85% or less (free of condensation). Store the microscope and its units at a temperature of between 20 to 60°C and a relative humidity not exceeding 90% (free of condensation). Installation or storage in locations with high humidity may cause mold or condensation to form on the lenses, resulting in damage or loss of precision.
- Select a location free of dust and dirt.
  Cover the microscope and its units prior to storage.
- Select a location with minimal vibration.
- Install and store the system on a solid and stable shelf or table without risk of breaking.
  Choose a location less exposed to hazard from earthquakes and other accidents and disasters.
  Install the system so that there is no danger of tipping or falling; secure the system to a worktable or safe heavy object using strong cord or the like.
- Avoid locations exposed to direct sunlight or directly beneath interior lights as well as bright areas. If the surroundings are bright, ambient light will enter the objective lens and adversely affect viewing. In addition, the presence of lighting fixtures directly above the microscope may result in ambient light entering the objective lens (long-distance condenser lenses like the ELWD, and LWD are especially susceptible to this). In such a case, turn off the overhead lighting fixtures when using the microscope.
- Because the lamphouse becomes hot when the lamp is lit, install the system at least 10 cm from any walls.
  When using the TI-DH dia pillar illuminator 100W, install the microscope at least 15 cm from any walls, so that the symbols on the pillar and lamphouse are visible. The TI-DH dia pillar illuminator 100W can also be tilted back when changing specimens and the like. If you use this feature, make sure to add extra separation from the wall for the distance that the dia pillar illuminator tilts outward.
- Do not use the system in confined or enclosed spaces such as on shelves or in lockers.
- Do not place objects on top of the microscope or its units.
- Install the system in a location that enables you to easily unplug the power cord from the AC adaptor's AC inlet in the event of an emergency.

3. Handling optical components

Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Handle optical components with care to avoid scratches. If an optical component becomes dirty, clean it following the instructions in Chapter 8, "Care and Maintenance."

4. Handling the lamp

Never touch the glass portion of the lamp with your bare hands. Dirt or fingerprints on the surface of the glass could cause uneven illumination or shorten the lifespan of the lamp. Wear gloves when handling the lamp, and take care to avoid scratching the lamp or getting it dirty.

5. Focusing knobs

- Never twist the focusing knobs on the left and right in opposite directions at once. Doing so could damage the microscope.
- Never use undue force to turn the focusing knobs. Turning a knob further than its travel limit will damage the microscope.

6. Protect the ports.

This product provides multiple ports. In order to prevent dirt or ambient light from entering the microscope, always keep unused ports covered with the supplied caps.

7. Caution on motorized devices

Do not move any motorized devices forcibly by hand. Do not hold or interfere moving motorized parts.

8. Vibrations caused by use of motorized units

Although the motorized units are designed to minimize the vibrations generated during operation, these vibrations may adversely affect microscopy in some situations.

9. Indication of Z-axis position (Ti-E, Ti-E/B)

The Z-axis position appears on the front of the Ti-E or Ti-E/B main unit and on the TI-RCP remote control pad. However, position accuracy is not guaranteed, as this pad is not a measuring instrument.

Notation and Configuration of This Manual

The Ti series of inverted microscopes are system microscopes whose parts can be selected as desired, according to your needs. The Ti series includes several types of each part, including six main bodies, two dia pillar illuminators, and three eyepiece tubes. This manual mainly covers the motorized parts.

Keep the following in mind when reading the manual:

- Not all types of microscope main bodies and non-motorized parts are covered in the manual (see “Parts of the microscope covered in this manual” on the next page). See the instruction manual for the microscope if you are using any parts not shown on the list.
- For reasons of space, this manual uses abbreviations instead of the full model name for each part as appropriate. See “Parts of the microscope covered in this manual” on the next page for the full names corresponding to these abbreviations.
- Always attach the TI-HUBC/A hub controller A (for Ti-E, Ti-E/B) or TI-HUBC/B hub controller B (for Ti-U, Ti-U/B, Ti-S, Ti-S/L100) to the microscope to control motorized parts.
- You will need the TI-RCP remote control pad (only for Ti-E, Ti-E/B), TI-ERGC ergo controller, and TI-S-EJOY stage joystick for motorized stage, or a personal computer, to manipulate motorized parts.

Parts of the microscope covered in this manual (abstract)

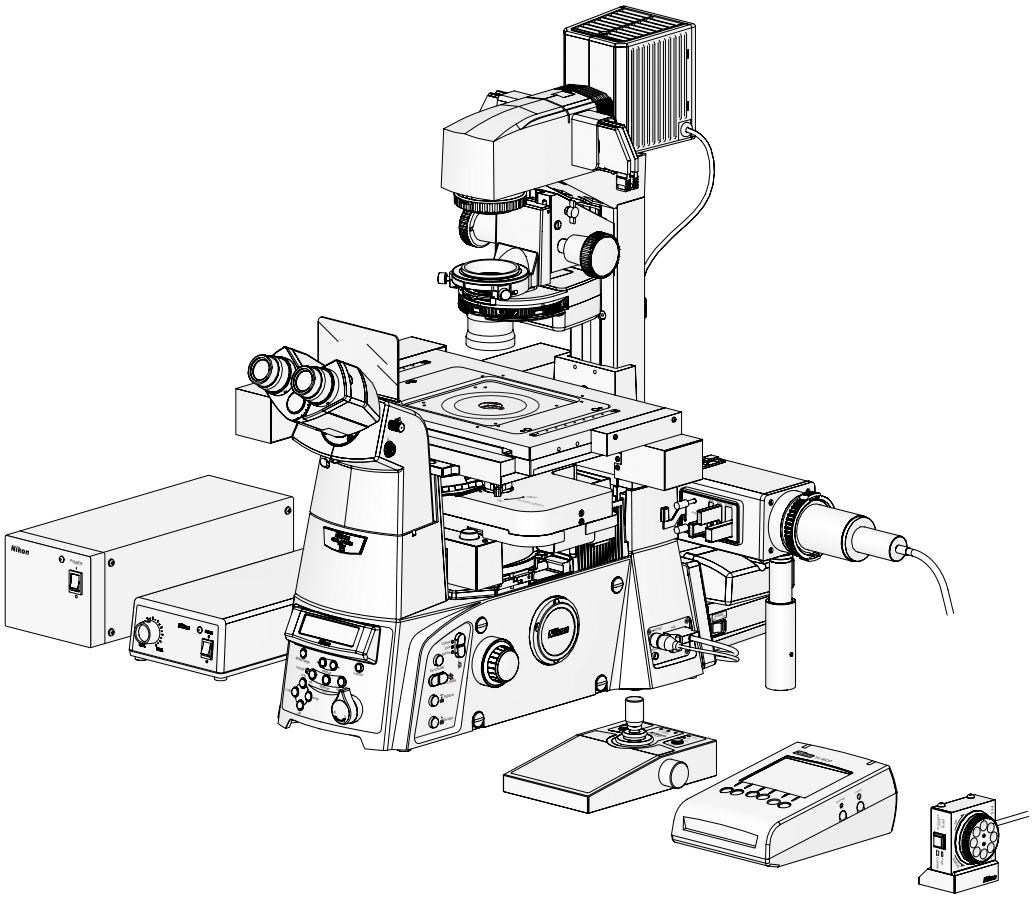

Figure: An example of system configuration

Parts of the microscope covered in this manual

A. Parts needed for bright-field (BF) microscopy

	Full name	Abbreviated name
1	Ti-E Inverted Microscope	Ti-E Main body
2	Ti-E/B Inverted Microscope (Bottom Port)	Ti-E/B Main body
3	Ti-U Inverted Microscope	Ti-U Main body
4	Ti-U/B Inverted Microscope (Bottom Port)	Ti-U/B Main body
5	Ti-S Inverted Microscope	Ti-S Main body
6	Ti-S/L100 Inverted Microscope	Ti-S/L100 Main body
7	TI-T-B Eyepiece Base Unit	Eyepiece tube base B
8	TI-T-BPH Eyepiece Base Unit/PH W/Port	Eyepiece tube base BPH
9	TI-T-BS Eyepiece Base Unit W/Side-port	Eyepiece tube base BS
10	TI-TD Eyepiece Tube D	Eyepiece tube TD
11	TI-TS Eyepiece Tube S	Eyepiece tube TS
12	TI-TERG Ergonomic Eyepiece Tube	Eyepiece tube TERG
13	CFI eyepiece	Eyepiece
14	TI-PS 100W Power Supply 100-240 V	Power supply
15	Power cord	Power cord (for power supply)
16	TI-100WRC 100W Lamphouse Remote Cable	Remote cable
17	TI-DH Dia Pillar Illuminator 100W	Dia pillar illuminator
18	D-LH/LC Precentered Lamphouse W/LC	Lamphouse
19	12V 100W halogen lamp	Halogen lamp
20	System condenser	System condenser
20-1	TI-CT-E Motorized Condenser Turret	Motorized condenser
20-2	Condenser cassette	Condenser cassette
20-3	TI-C-CLWD condenser lens	CLWD lens
21	TI-S-ER Motorized Stage with Encoders	Motorized stage (w/encoder)
22	TI-S-E Motorized Stage	Motorized stage (without encoder)
23	TI-S-CON Motorized Stage Controller	Motorized stage controller
24	TI-ND6-E Sextuple Motor DIC Nosepiece	Motorized nosepiece
25	TI-ND6-PFS Perfect Focus W/Motor Nosepiece	PFS motorized nosepiece
26	PFS offset controller	PFS offset controller
27	Objective lens	Objective lens
27	TI-HUBC/A Hub Controller A	Hub controller A
29	TI-HUBC/A Hub Controller B	Hub controller B
30	TI-AC/A AC Adapter for Hub C/A	AC adapter A
31	TI-AC/B AC Adapter for Hub C/B	AC adapter B
32	Power cord	Power cord (for AC adapter)
33	TI-RCP Remote Control Pad	Remote control pad
33-1	Touch panel LCD screen	Touch panel
34	TI-ERGC Ergo Controller	Ergo controller
35	TI-S-EJOY Stage Joystick for Motorized Stage	Joystick controller

B. Parts added to those in List A for epi-fl microscopy

	Full name	Abbreviated name
36	TI-FL Epi-fl Attachment	Epi-fl attachment
37	TI-FLC-E Motorized Epi-fl Filter Turret	Motorized FL turret
38	TI-FLC-E/HQ Motorized Epi-fl Filter Turret	Motorized FL turret HQ
39	Filter block	Filter block
40	T-FLZA light source zoom adapter	Light source adapter
41	Super high-pressure mercury light source	Mercury light source
41-1	Mercury lamphouse	Mercury lamphouse
41-2	Mercury lamp	Mercury lamp
41-3	Collector lens	Collector lens
41-4	Super high-pressure mercury lamp power supply	Mercury lamp power supply
41-5	Intensilight C-HGFIE pre-centered fiber optic light source (motorized type)	Motorized HG fiber optic light source
42	TI-FLEW-E EX Filter Wheel	Motorized excitation filter wheel
43	Excitation filter	Excitation filter
44	TI-FLBW-E BA Filter Wheel	Motorized absorption filter wheel
45	Absorption filter	Absorption filter

C. Parts added to those in List A for differential interference contrast microscopy

	Full name	Abbreviated name
46	T-P2 polarizer	Polarizer
47	TI-A Analyzer Block	Analyzer block
48	T-A2 analyzer	Analyzer slider
49	Objective lens DIC prism	Objective DIC prism

About this Manual

This instruction manual is made up of two parts. Refer to the part which deals with the microscope system you are using.

- **Part 1 For Users of Ti-E and TiE-B**
- **Part 2 For Users of Ti-U, Ti-U/B, Ti-S, and Ti-S/L100**

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Part 1

For Users of Ti-E and Ti-E/B

ECLIPSE

Motorized Units for Ti Series
Instructions

Contents

Part 1 For Users of Ti-E and Ti-E/B

1 Microscope Part and Names

This chapter describes the main controls of the Ti-E and Ti-E/B motorized units and their names.

Before using any motorized unit for the first time, refer to this chapter to check the name and location of each control. Also refer to this chapter any time you wish to check the location or name of a control in order to operate the microscope in practical use.

- Before using the microscope system for the first time, configure the system in accordance with Chapter 2, “Pre-microscopy Configuration.”
- See Chapter 3, “Microscopy,” for instructions on performing actual microscopic observation and Chapter 4, “Operation of Each Part,” for details about operating each part.
- If you have not finished assembling the microscope system, see Chapter 6, “Assembly.”
- If you use the microscope without attaching TI-HUBC/A hub controller A to the Ti-E or Ti-E/B main body, see the instruction manual for the Ti-E and Ti-E/B main body.

1.1 System Configuration

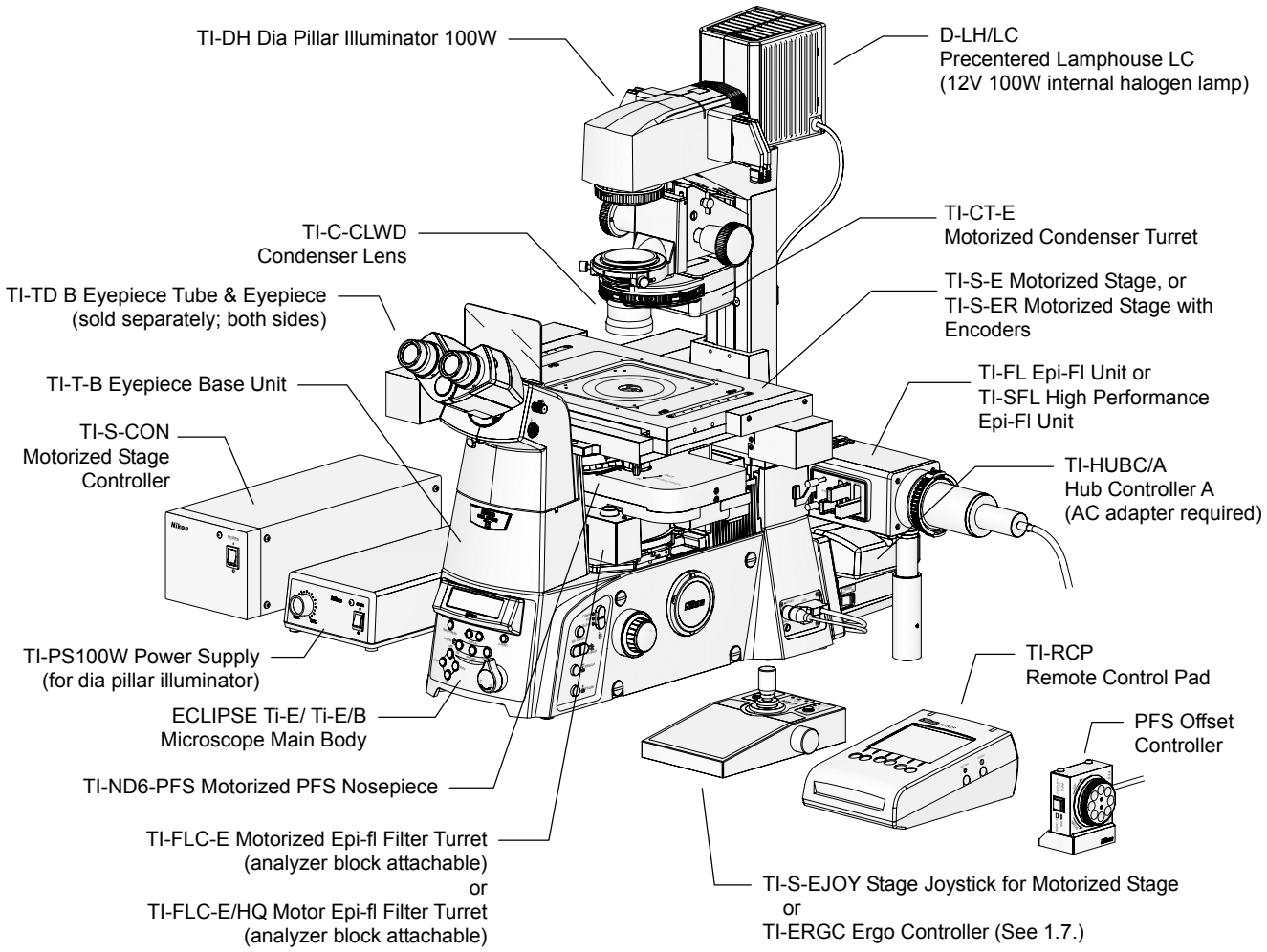


Figure 1.1-1 System configuration example (Ti-E/Ti-E/B)

1.2 Names of Controls

Front and right side

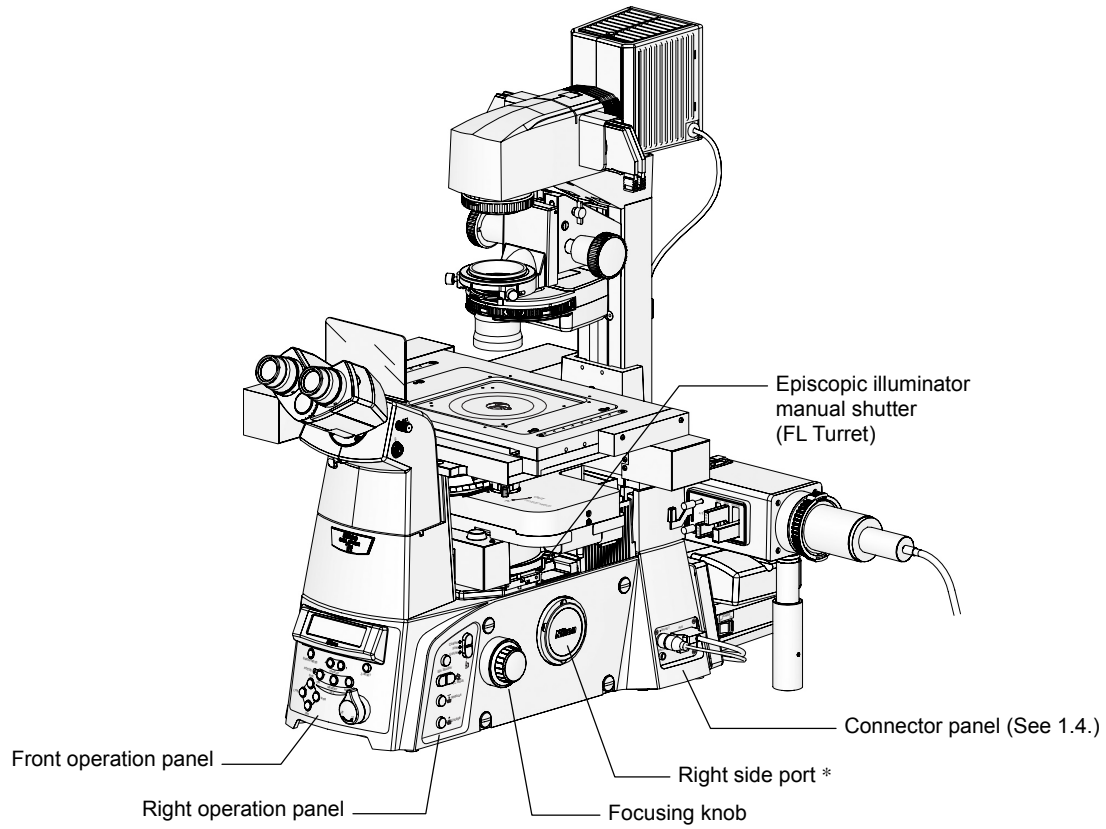


Figure 1.2-1 Names of controls(Ti-E/Ti-E/B)

Left side

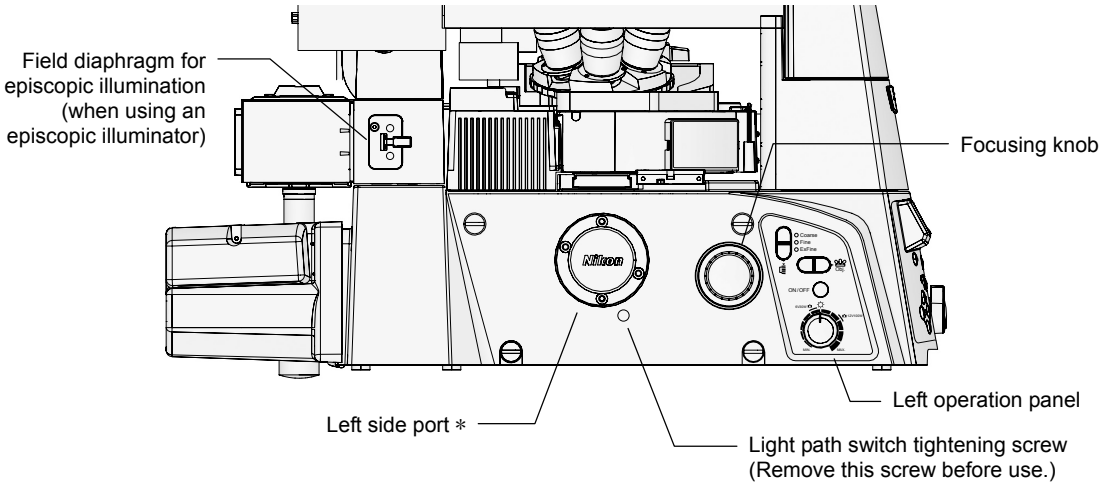


Figure 1.2-2 Names of controls (left side)

* Keep the protector cap on whenever the side port is not in use.

With an episcopic illuminator

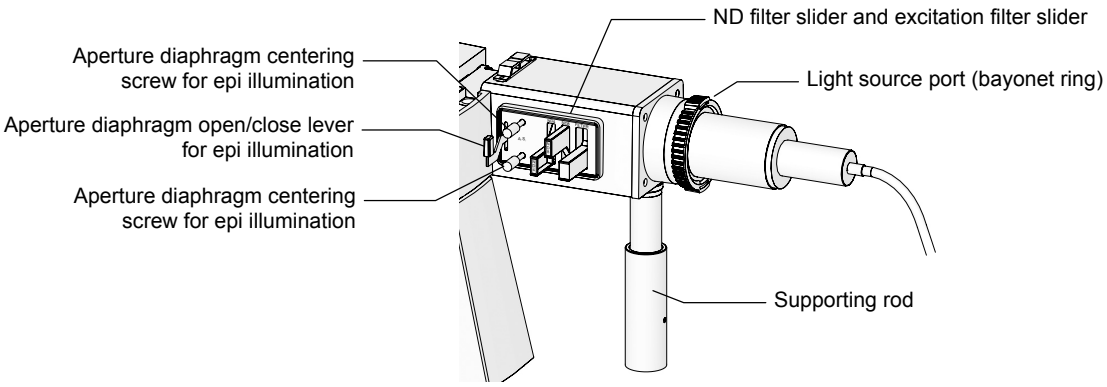


Figure 1.2-3 Epi-fl illuminator (right side view)

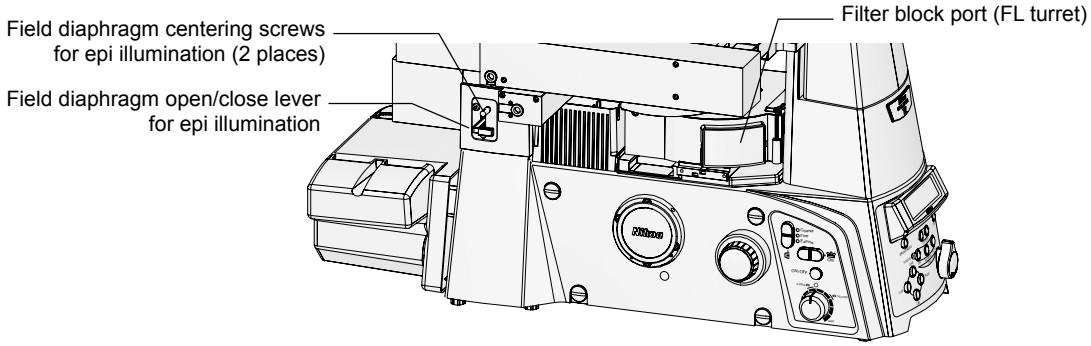


Figure 1.2-4 Epi-fl illuminator (left side view)

With the motorized excitation filter wheel

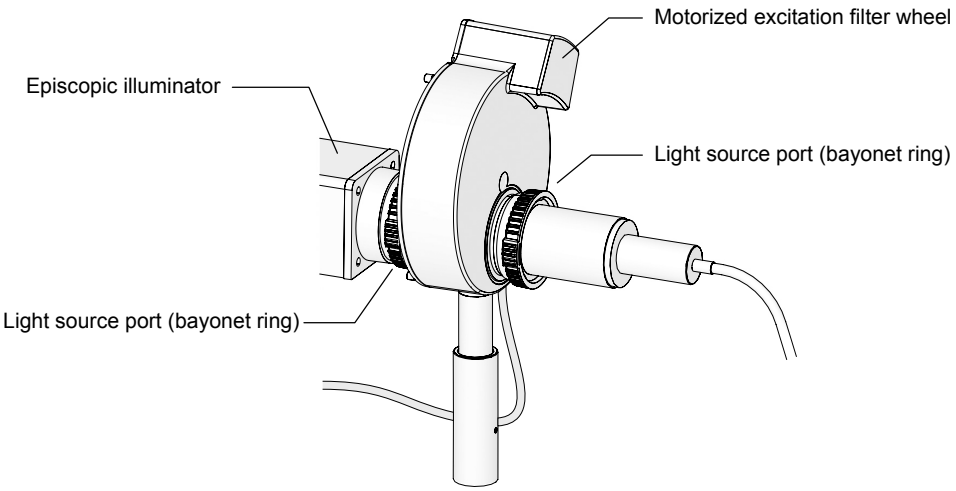


Figure 1.2-5 View after the motorized excitation filter wheel is attached

With the motorized barrier filter wheel

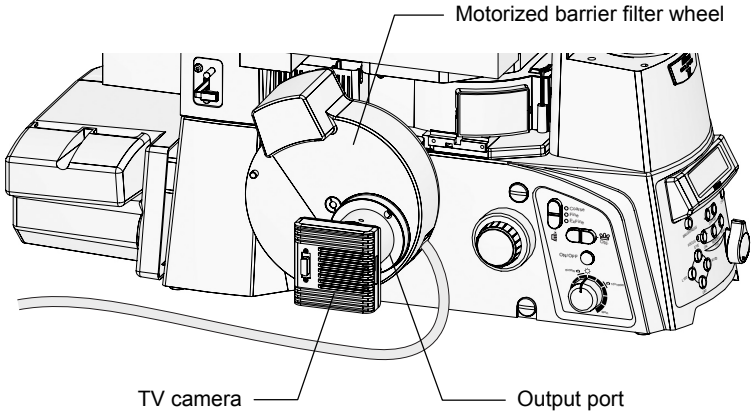


Figure 1.2-6 View after the motorized barrier filter wheel is attached (a camera attached)

1.3 Operation Panels (Microscope Main Body)

Front Operation Panel

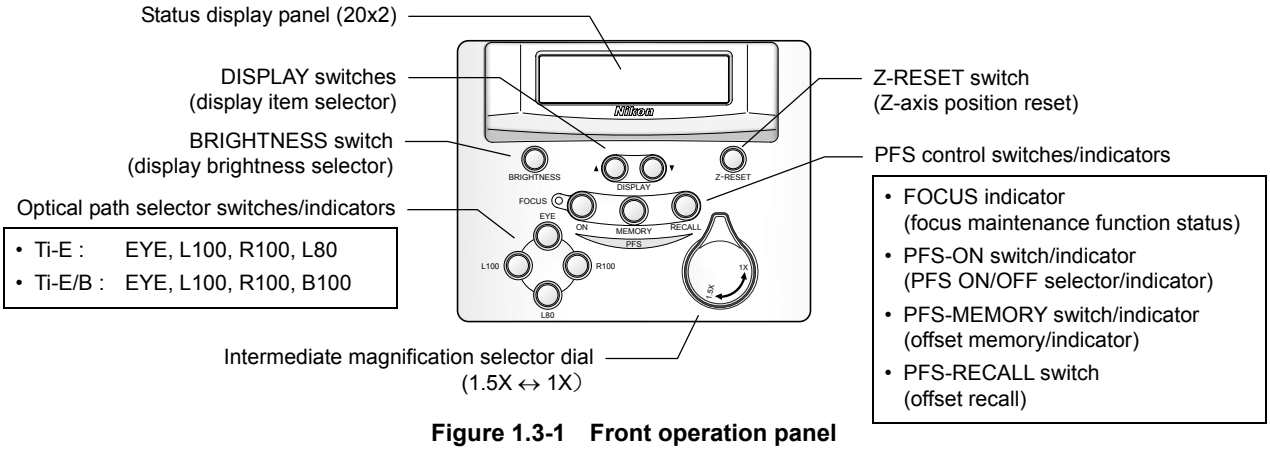


Figure 1.3-1 Front operation panel

Left Operation Panel

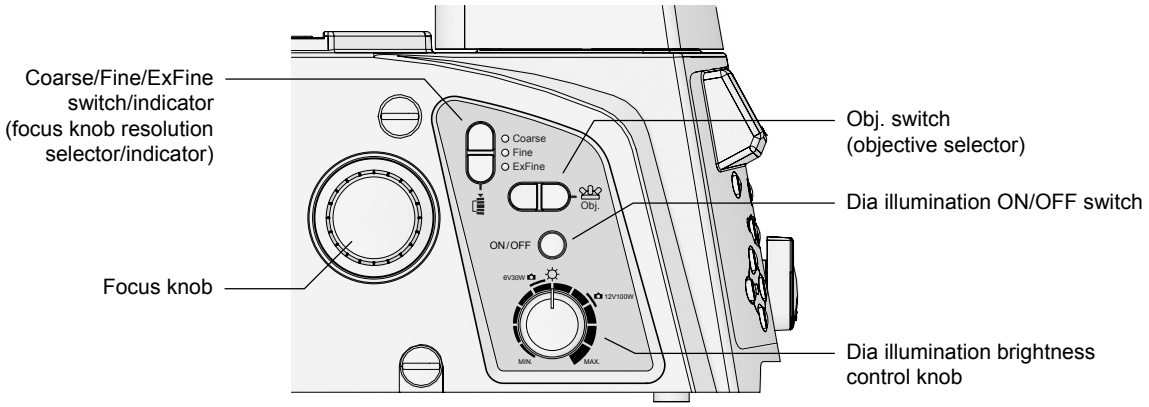


Figure 1.3-2 Left operation panel

Right Operation Panel

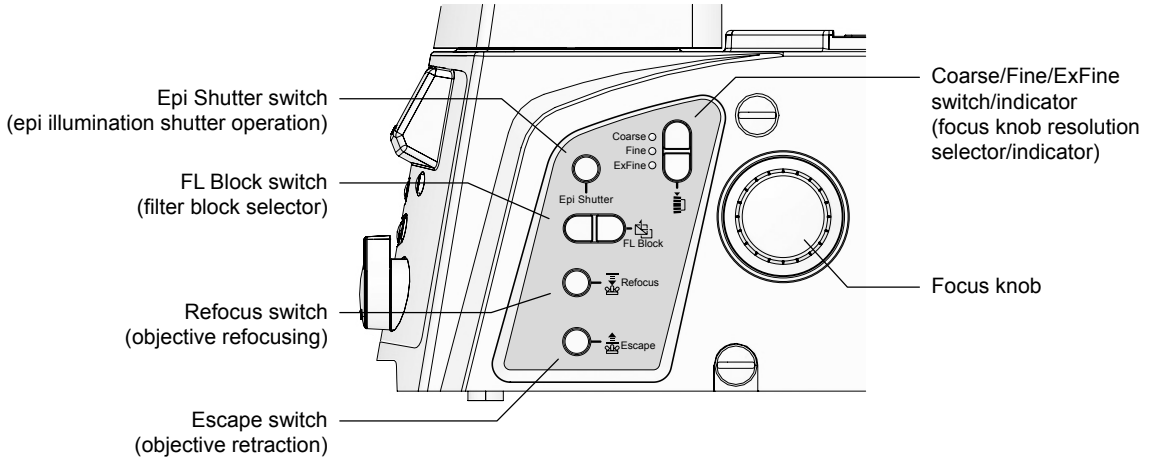


Figure 1.3-3 Right operation panel

1.4 Connectors (Microscope Main Body)

In order to prevent dirt or ambient light from entering the microscope, always cover any unused ports with the supplied caps.

Connector panel (right side)

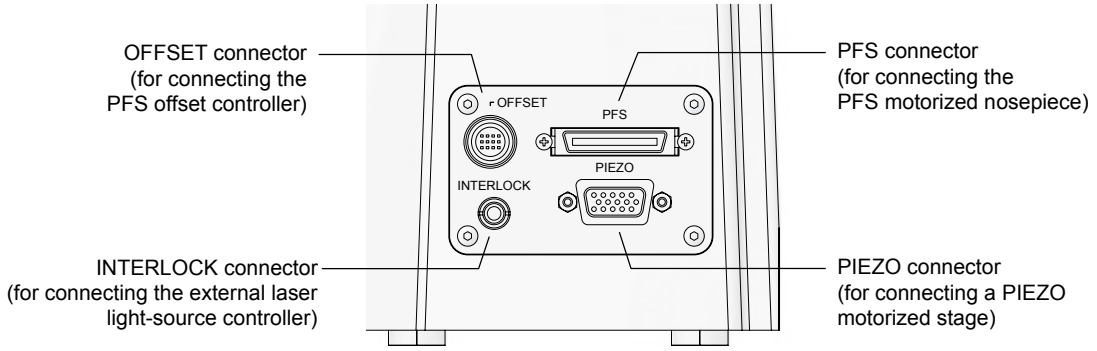


Figure 1.4-1 Right connector panel

Connector panel (rear)

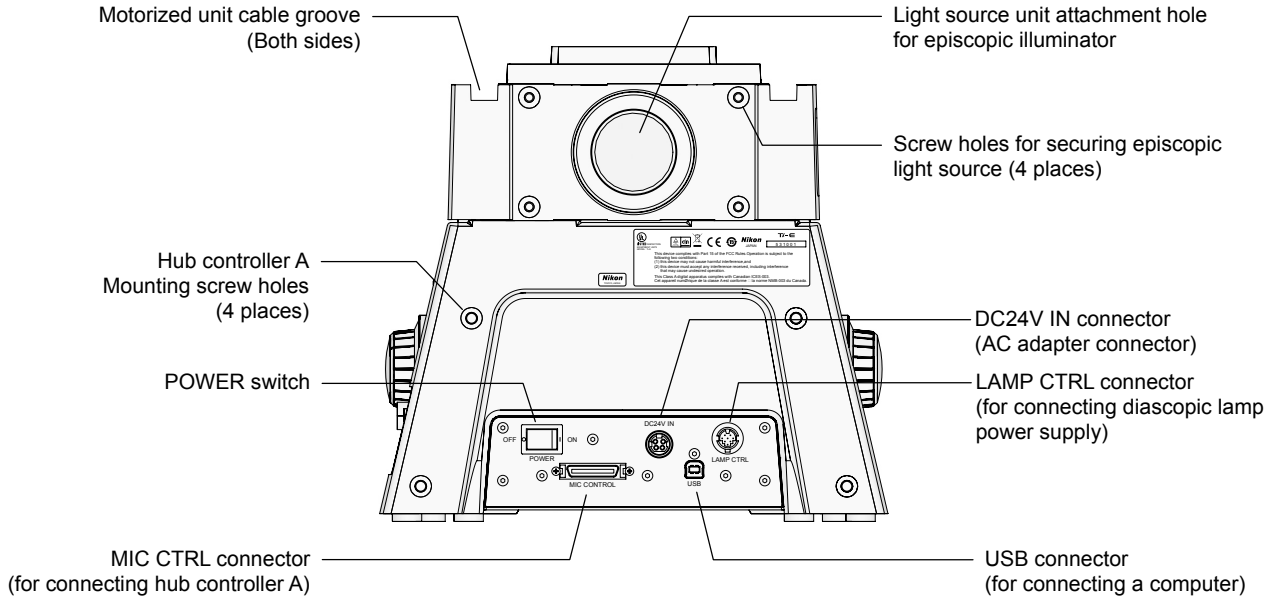


Figure 1.4-2 Microscope base (rear)

1.5 Hub Controller A

Front (microscope main body)

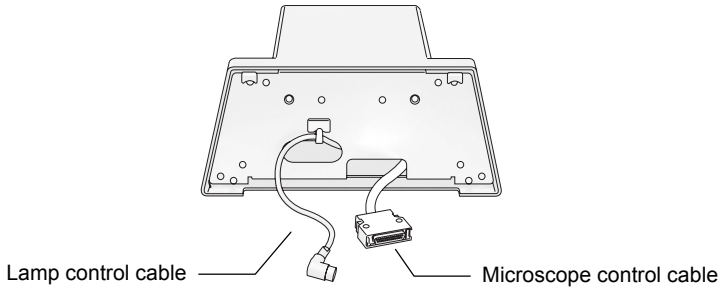


Figure 1.5-1 HUB controller A front

Power connector and power switch

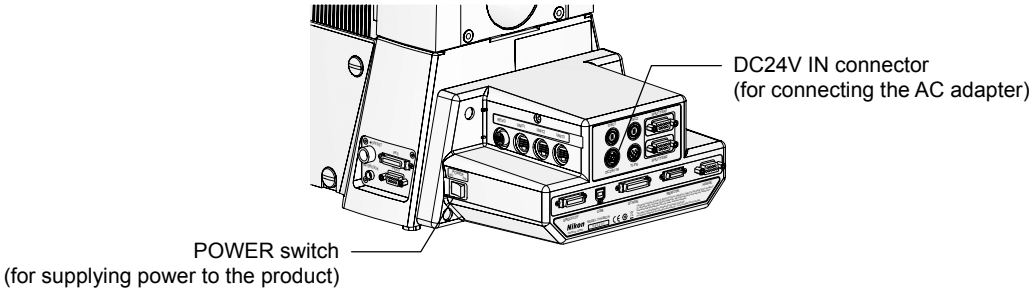


Figure 1.5-2 Power connector and power switch

AC adapter

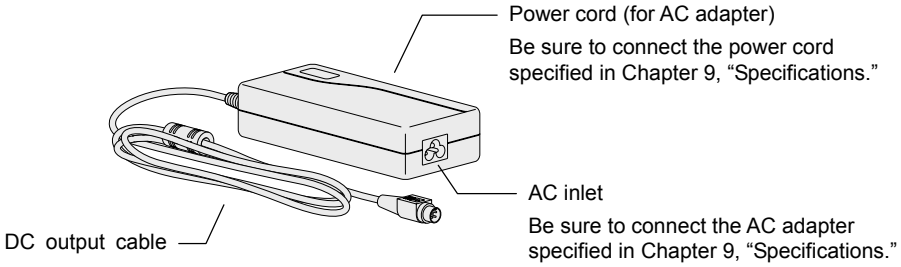


Figure 1.5-3 AC adapter

Connector panel (rear)

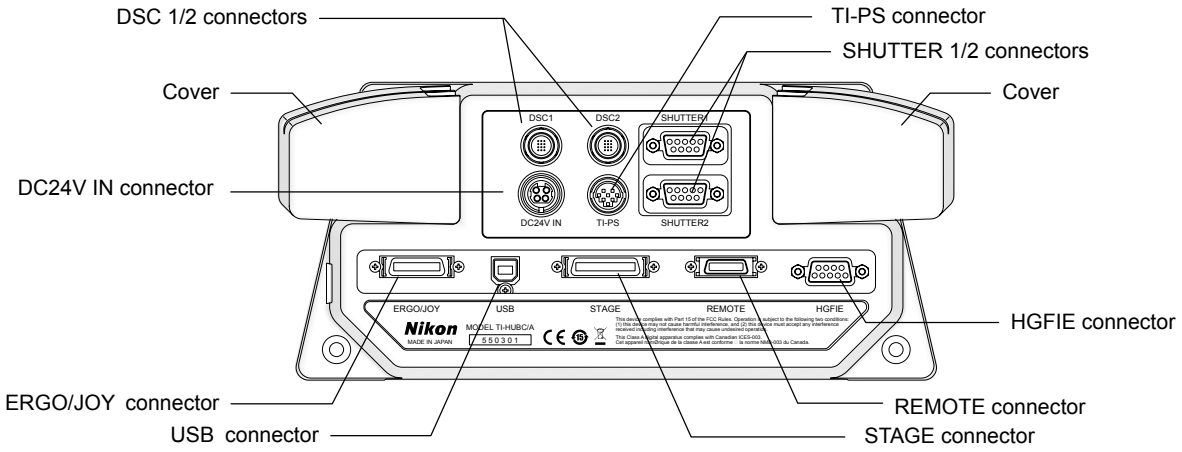


Figure 1.5-4 Connector panel

SHUTTER 1/SHUTTER 2 connectors

See Section 6.25.2 “Connecting Motorized Shutters,” in Chapter 6, “Assembly.”

DSC 1/2 connectors

See Section 6.25.3 “Connecting a Digital Camera for Microscopy,” in Chapter 6, “Assembly.”

DC24V IN connectors

Connects the AC adapter.

TI-PS connector

Connects the TI-PS100W power supply, TI-PS30W power supply A, or TI-PSE30 power supply A.

ERGO/JOY connector

Connects the TI-ERGC ergo controller or the TI-S-EJOY joystick controller. These units cannot be connected simultaneously.

USB connector

Connects a personal computer (PC).

STAGE connector

See Section 6.9.2 “Attaching a Motorized Stage,” in Chapter 6, “Assembly.”

REMOTE connector

Connects the TI-RCP remote control pad.

HGFIE connector

Connects the Intensilight C-HGFIE precentered fiber optic light source (motorized type).

REVO connector (right side, in the cover)

Connects the TI-ND6-E sextuple motorized DIC nosepiece.

UNIT1 - UNIT7 connectors (left and right sides, in the covers)

Connects the following optional motorized units.

- TI-CT-E motorized condenser turret
- TI-FLC-E motorized epi-fl filter turret
- TI-FLC-E/HQ motor epi-fl filter turret
- TI-FLEW-E EX filter wheel
- TI-FLBW-E BA filter wheel
- TI-TIRF-E motorized illuminator unit

The motorized TIRF light source uses two connectors.

1.6 Remote Control Pad

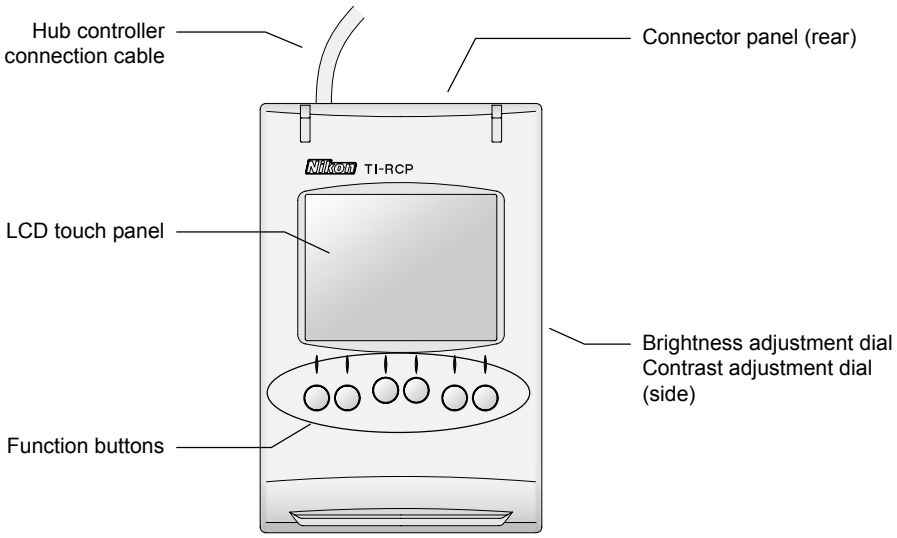


Figure 1.6-1 Remote control pad

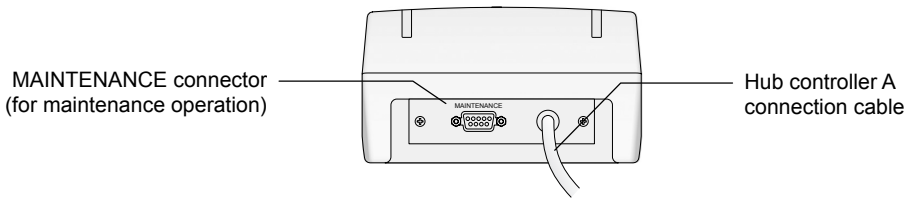


Figure 1.6-2 Connector panel

1.7 Ergo Controller

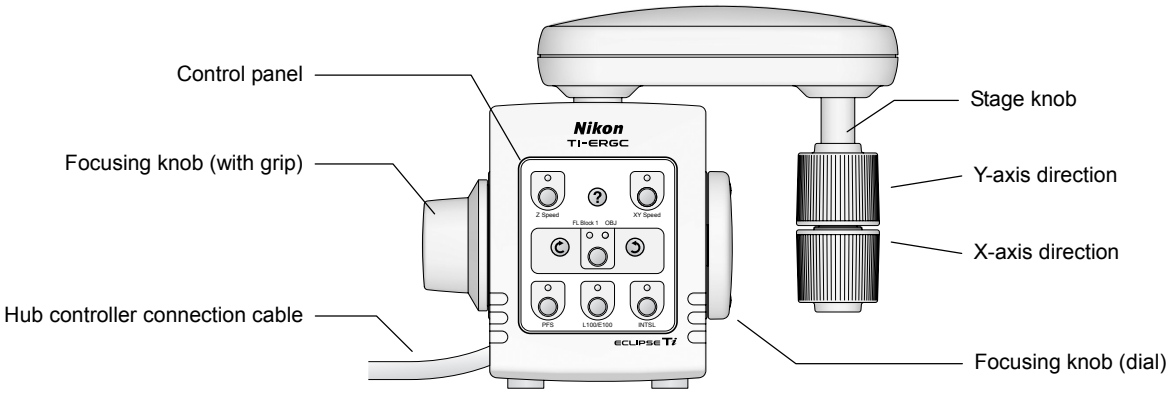


Figure 1.7-1 Ergo controller

1.8 Joystick Controller

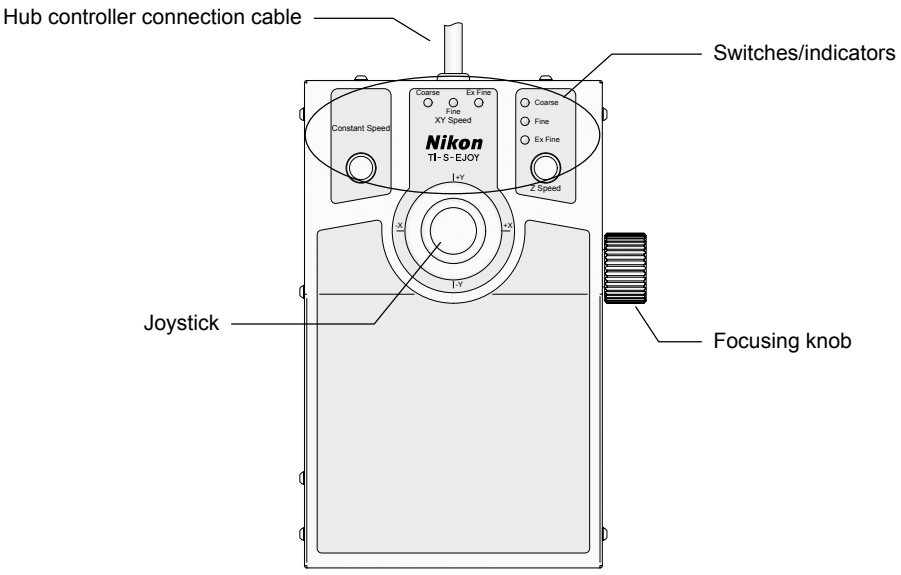


Figure 1.8-1 Joystick controller

1.9 Eyepiece Tube Base, Eyepiece Tube, Eyepiece

The following eyepiece tube bases, eyepiece tubes, and eyepieces can be attached to the microscopy port of the microscope.

TI-T-B Eyepiece Base Unit

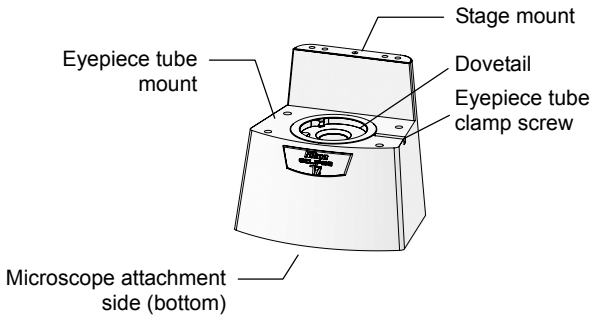


Figure 1.9-1 TI-T-B eyepiece base unit

This is a basic type eyepiece tube base.

There is a dovetail (truncated cone) joint at the top to attach an eyepiece tube, which is used for visible observation.

If you don't need visible observation, the mount can be left unused. In this case, attach a cover to the dovetail joint.

TI-T-BS Eyepiece Base Unit (with Side Port)

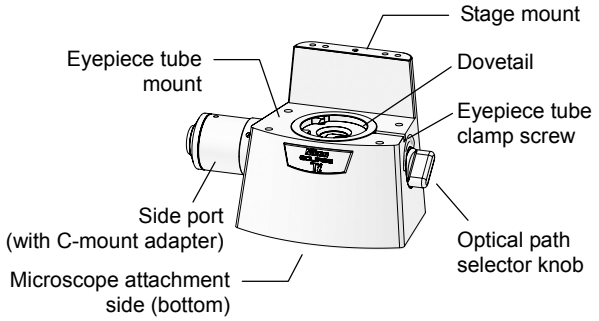


Figure 1.9-2 TI-T-BS eyepiece base unit

This is an eyepiece tube base with a camera port.

Use the optical path selector knot at right to change the optical path between the eyepiece side and the side port side.

A direct C-mount adapter is attached to the side port for camera connection.

TI-T-BPH Eyepiece Base Unit (for External Phase Contrast)

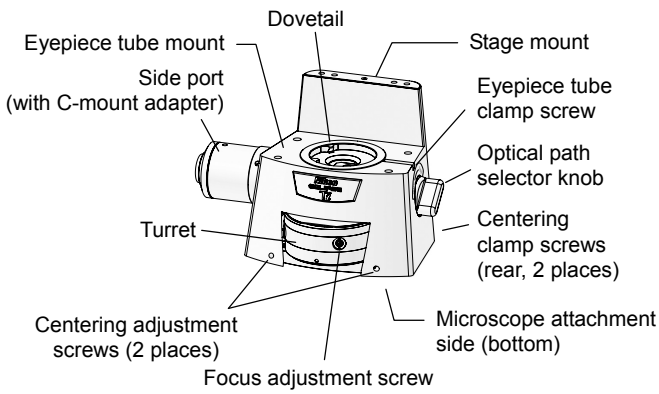


Figure 1.9-3 TI-T-BPH eyepiece base unit

This is an eyepiece tube base for external phase contrast microscopy.

A turret is provided at the front to attach external phase plates. Three positions, “A” to “C”, are available. Focus settings can be adjusted for three positions individually. Besides, phase plates can be centered with the screws at both side and clamped with the screw at the back.

A side port with a C-mount adapter is provided at left. Use the optical path selector knot at right to change the optical path between the eyepiece side and the side port side.

Use the side port for photomicroscopy of external phase contrast microscopy.

For the procedure of the external phase contrast microscopy, see the Ti-E / Ti-E/B series instruction manual.

TI-TS Eyepiece Tube B

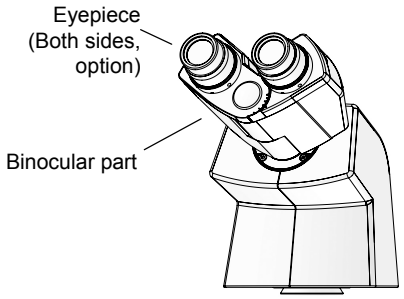


Figure 1.9-4 TI-TS eyepiece tube B

The TI-TS is a basic type eyepiece tube.

TI-TD Eyepiece Tube B

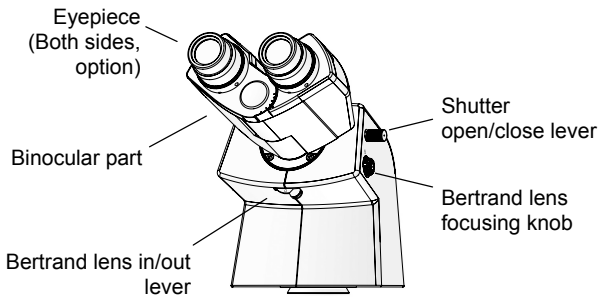


Figure 1.9-5 TI-TD eyepiece tube B

This is an eyepiece tube with a manual shutter and a Bertrand lens.

The optical path for the binocular part can be blocked with the shutter for photomicrography.

Besides, the objective pupil can be observed when the Bertrand lens is placed in the optical path.

TI-TERG Ergonomic Eyepiece Tube

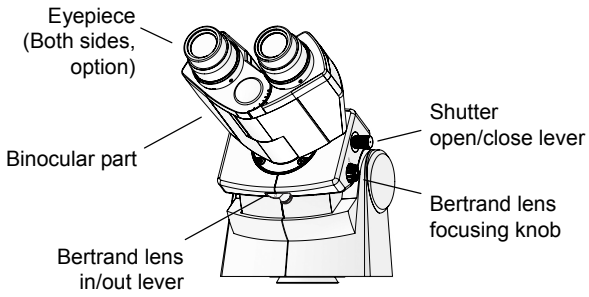


Figure 1.9-6 TI-TERG ergonomic eyepiece tube

This is an eyepiece tube with a tilt mechanism for user's physical attribute.

This eyepiece tube has a manual shutter and a Bertrand lens. The optical path for the binocular part can be blocked with the shutter for photomicrography. Besides, the objective pupil can be observed when the Bertrand lens is placed in the optical path.

1.10 Dia Pillar Illuminator

The following two types of pillar illuminators can be attached to a Ti series microscope. The illuminators have different specifications for available lamp ratings (12V 100W or 6V 30W) and microscopy methods. Use an appropriate one for your purpose.

1.10.1 TI-DH Dia Pillar Illuminator 100W

The TI-DH dia pillar illuminator 100W requires a lamphouse and a condenser.

The following figure shows a configuration with the D-LH/LC precentered lamphouse and the TI-C condenser turret (system condenser).

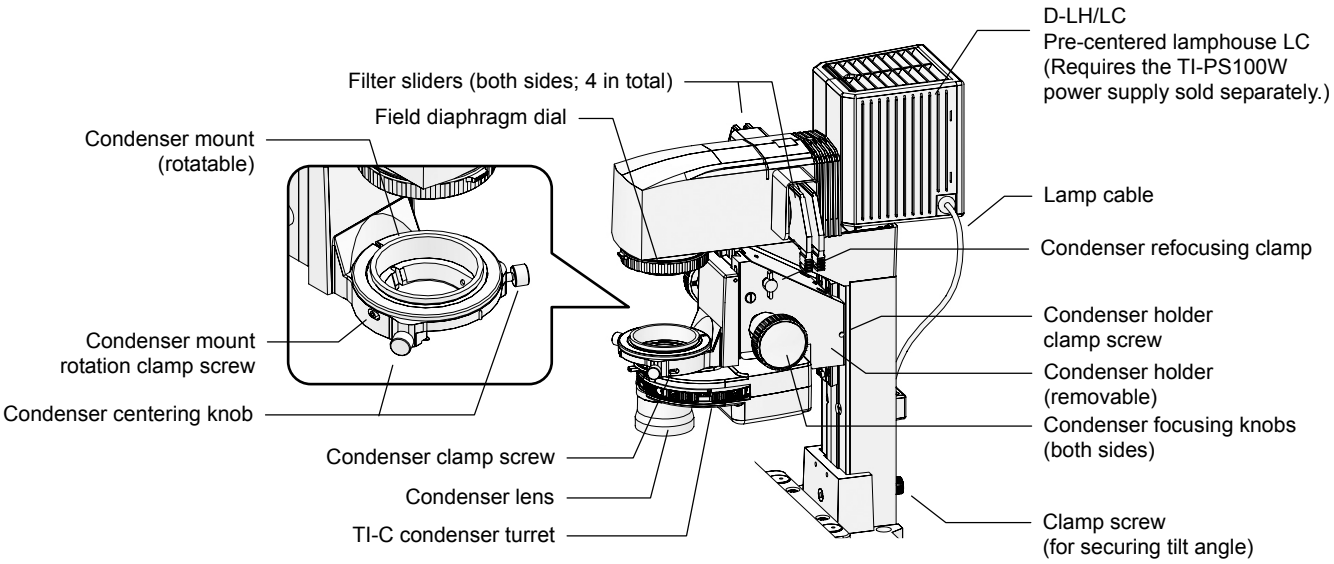


Figure 1.10-1 TI-DH dia pillar illuminator 100W
(With lamphouse and system condenser attached)

1.10.2 TI-DS Dia Pillar Illuminator 30W

The TI-DS dia pillar illuminator 30W includes a built-in lamphouse. But it requires a condenser.

The following figure shows a configuration with the ELWD-S condenser.

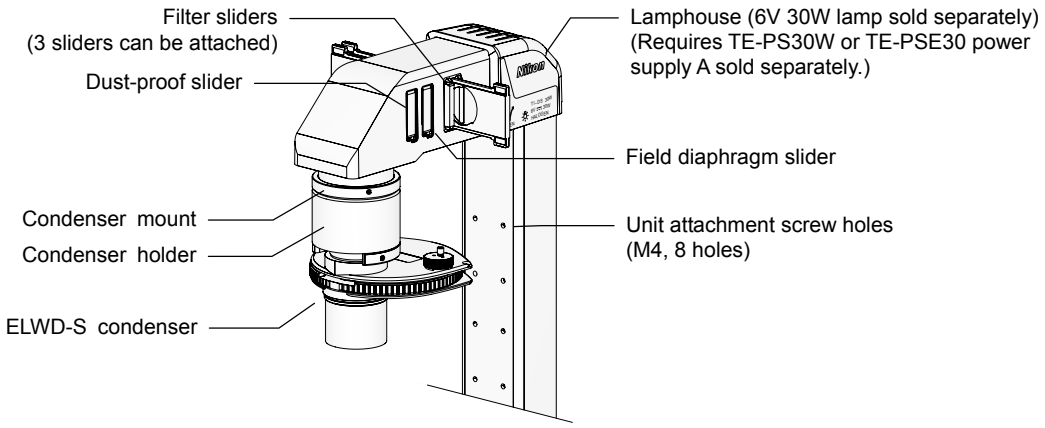


Figure 1.10-2 TI-DS dia pillar illuminator 30W
(with ELWD-S condenser attached)

1.11 Motorized Condenser Turret

Optical elements required for the microscopy method can be attached to the TI-CT-E motorized condenser turret to enable motorized switching of the optical elements.

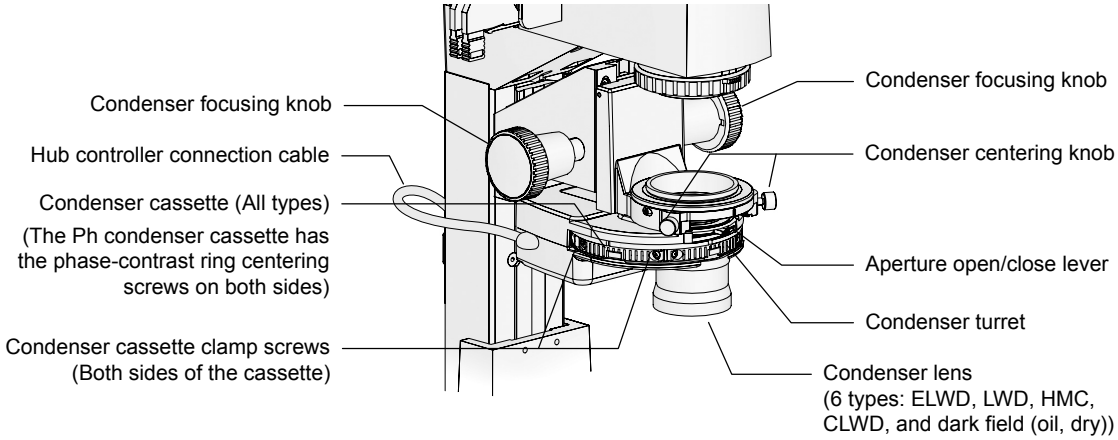


Figure 1.11-1 TI-CT-E motorized condenser turret (with TI-DH dia pillar illuminator 100W attached)

* To use HMC or a dark field (oil or dry), attach a relevant condenser lens to the TI-DF condenser adapter and then attach the adapter to the condenser turret.

1.12 Motorized Excitation Filter Wheel

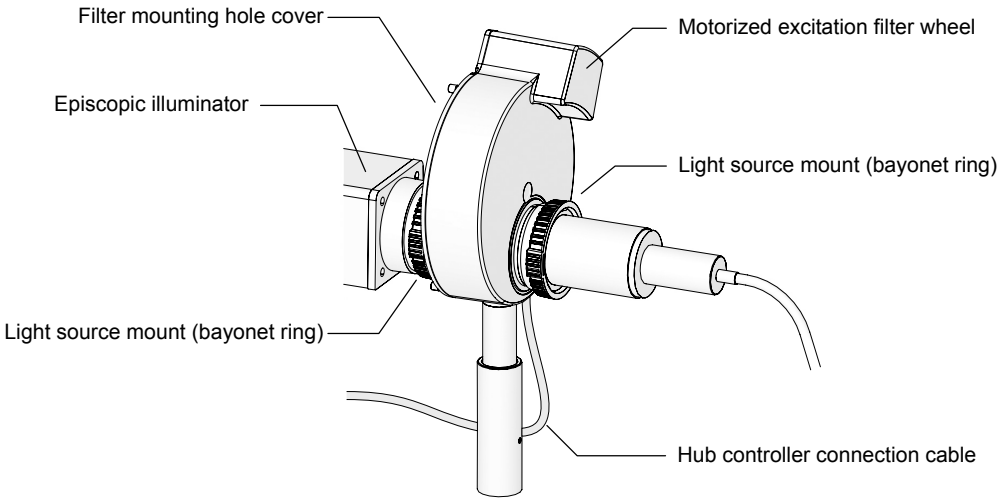
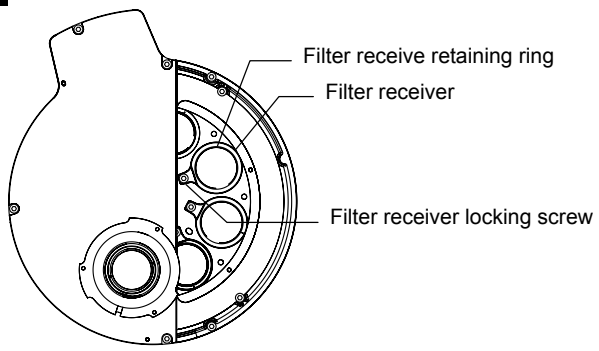


Figure 1.12-1 View after the motorized excitation filter wheel is attached

View after the port cover is removed



* Address numbers are affixed to filter receivers.

Figure 1.12-2 View after the port cover is removed

1.13 Motorized Barrier Filter Wheel

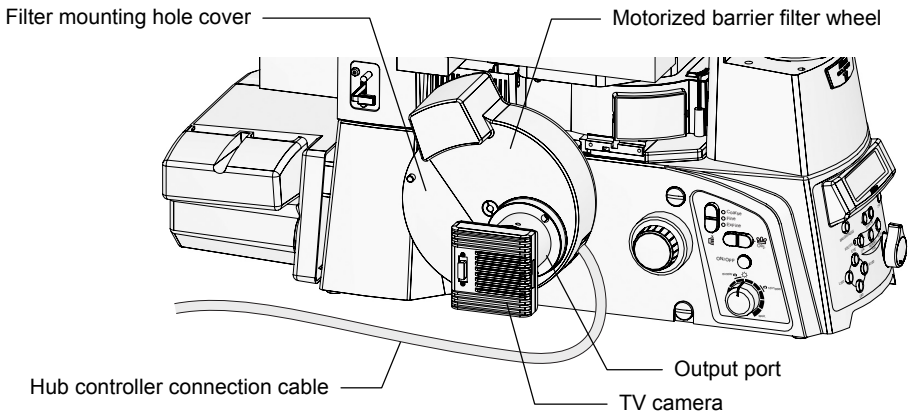
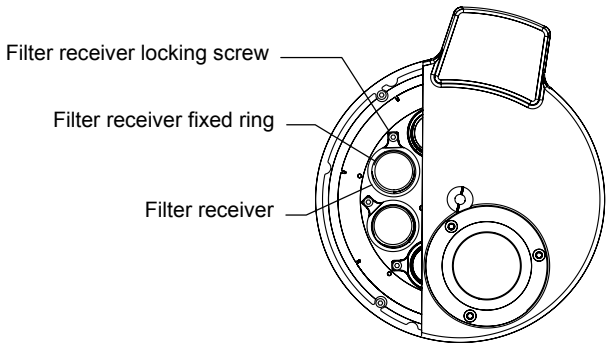


Figure 1.13-1 View after the motorized barrier filter wheel is attached (with a camera)

View after the port cover is removed



* Address numbers are affixed to filter receivers.

Figure 1.13-2 View after the port cover is removed

1.14 Motorized FL Turret and Motorized FL Turret HQ

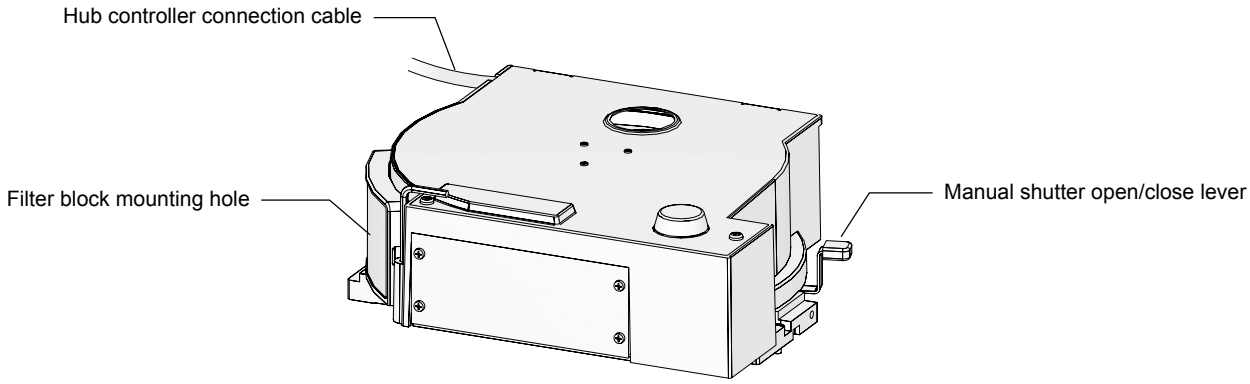


Figure 1.14-1 Motorized FL turret and Motorized FL turret HQ

1.15 Motorized Nosepiece

1.15.1 Motorized Nosepiece

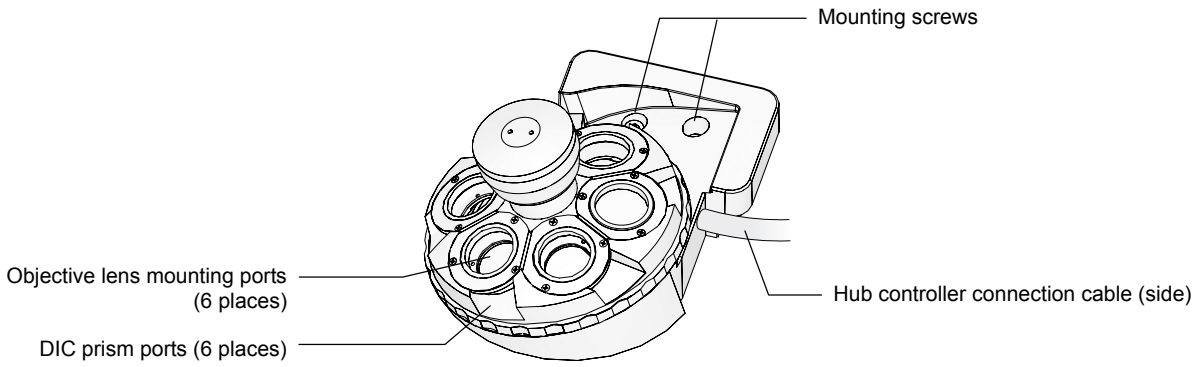


Figure 1.15-1 Motorized nosepiece

1.15.2 PFS Motorized Nosepiece (TI-ND6-PFS Perfect Focus Unit)

The PFS motorized nosepiece (TI-ND6-PFS Perfect Focus Unit) integrates a 6-hole DIC compatible motorized nosepiece and the Perfect Focus System. Offset is adjusted using the dedicated PFS offset controller.

PFS Motorized Nosepiece

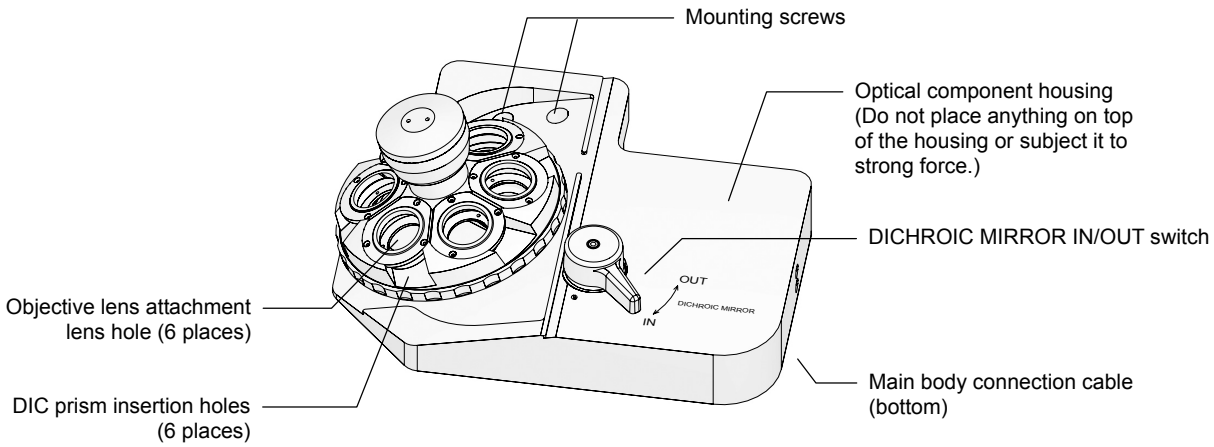


Figure 1.15-2 PFS motorized nosepiece

PFS Offset Controller

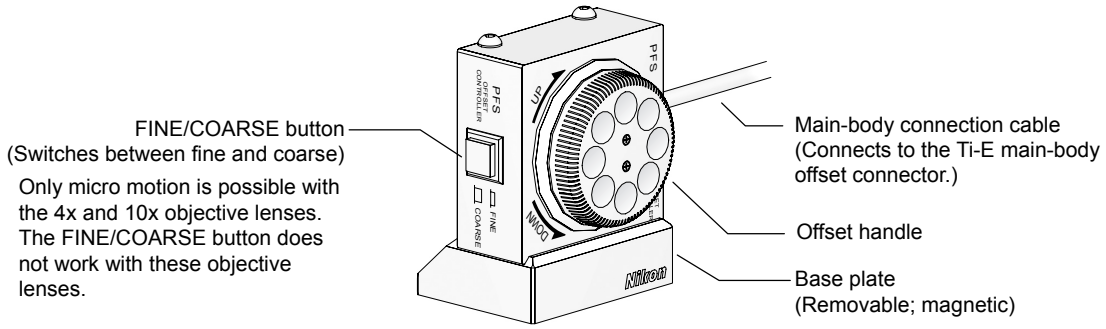


Figure 1.15-3 PFS offset controller

* The offset controller body and base plate are connected via a magnet. Exercise caution when lifting the offset controller as the base plate could detach and fall.

1.16 Motorized Stage

Motorized Stage and Motorized Stage with Encoders

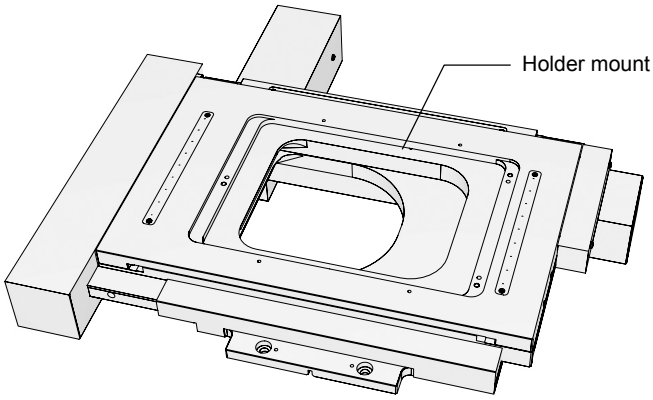


Figure 1.16-1 Motorized stage (Motorized stage with encoders)

Motorized Stage Controller

The motorized stage controller supplies power to and controls the motorized stage and connects the hub controller to the motorized stage.

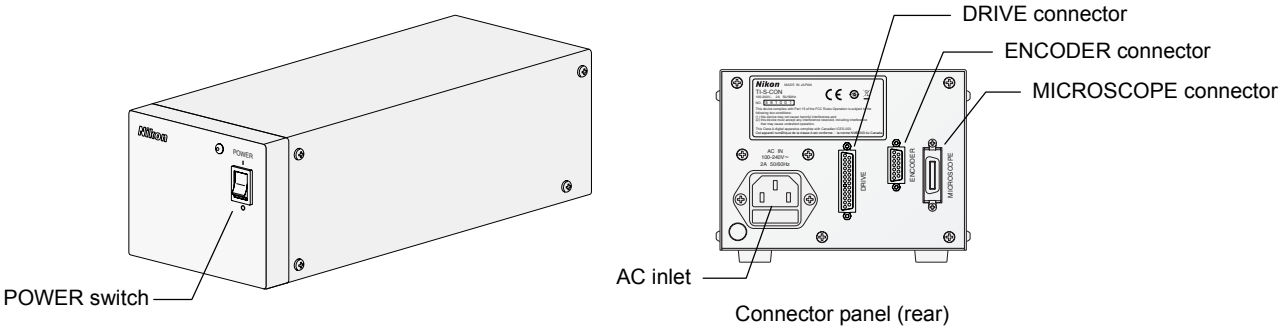


Figure 1.16-2 Motorized stage controller

1.17 Power Supply

1.17.1 TI-PS100W Power Supply

Warning

The bottom of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.

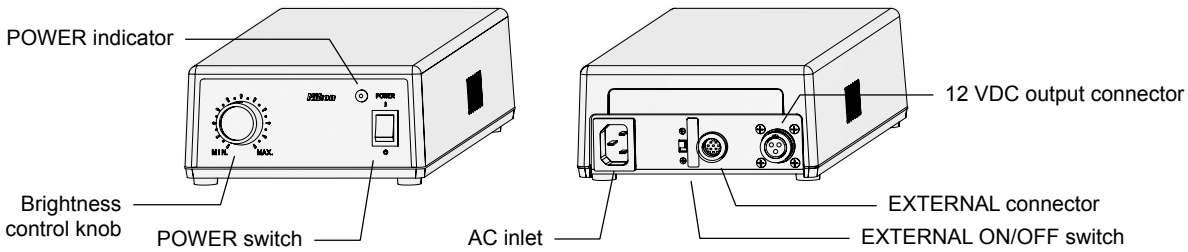


Figure 1.17-1 TI-PS100W power supply

POWER switch

This is the power switch for the power supply. DC power is output from the 12 VDC output connector in the rear of the power supply when the switch is set to " I ". Set the switch to "O" to turn off the power.

POWER indicator

Lights when the power supply power is on.

Brightness control knob

When the EXTERNAL switch is set to the OFF position, this knob can be used to adjust the lamp brightness by adjusting the voltage output from the 12 VDC output connector in the rear of the unit.

AC inlet

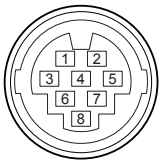
This connector is for connecting the power supply to an AC power source. Only connect the specified power cord to the AC inlet.

EXTERNAL (external control) ON/OFF switch

Set this switch to ON in order to control the output voltage using the brightness control knob on the microscope. When this switch is set to OFF, external control is deactivated, and operation of the brightness control knob on the front of the power supply is enabled.

EXTERNAL (external control signal input) connector

Connects to the TI-PS connector on the hub controller A with the control cable.

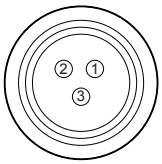


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	Output voltage ON/OFF switch (input)
4	GND (0V)
5	External voltage input for output voltage adjustment
6	EXTERNAL switch on/off detect signal (output)
7	GND (0V)
8	Output voltage monitor terminal (output)

Connector: HR12-10R-8SC (Hirose Electric Co., Ltd.)

12VDC output connector

Connector for supplying power to the 12V 100W halogen lamp. Connects the lamp cable of the dia pillar illuminator.



Pin	Signal
1	Output +
2	Output -
3	Not used

Connector: SRCN2A13-3S (Japan Aviation Electronics Industry, Ltd.)

1.17.2 TE-PS30 Power Supply A (for Countries Where the Supply Voltage is 100 to 120 V) TE-PSE30 Power Supply A (for Countries Where the Supply Voltage is 230 V)

Warning

- **Check that the input voltage indicator meets the input voltage to be used before connecting the power cord. If the input voltage indication does not match your regional voltage supply, do not use the power supply device. And, contact your nearest Nikon representative. If used with a wrong voltage, the product will be broken or a fire may occur.**
- **The bottom of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.**

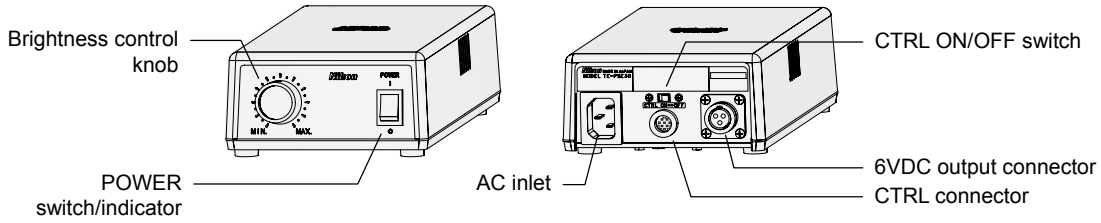


Figure 1.17-2 TE-PS30W, TE-PSE30 power supply A

POWER switch/indicator

This is the power switch for the power supply. Press the " I " side of the switch to turn on the power supply and output DC power from the 6VDC output on the rear. The switch is lit when the power supply is on. Press the "O" side of the switch to turn off the power supply.

Brightness control knob

When the CTRL switch is set to the OFF position, this knob can be used to adjust the lamp brightness by adjusting the voltage output from the 6 VDC output connector in the rear of the unit.

AC inlet

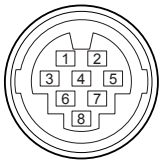
This connector is for connecting the power supply to an AC power source. Only connect the specified power cord to the AC inlet.

CTRL (external control) ON/OFF switch

Set this switch to ON in order to control the output voltage using the brightness control knob on the microscope. When this switch is set to OFF, the brightness control knob on the microscope is deactivated, and operation of the brightness control knob on the front of the power supply is enabled.

CTRL (external control signal input) connector

Connects to the TI-PS connector on the hub controller A with the control cable.

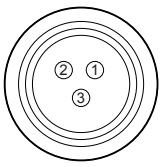


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	Output voltage ON/OFF switch (input)
4	GND (0V)
5	Not used
6	Not used
7	Not used
8	Not used

Connector: HR12-10R-8SC (Hirose Electric Co., Ltd.)

6 VDC output connector

Connector for supplying power to the 6V 30W halogen lamp. Connect the lamp cable of the dia pillar illuminator here.



Pin	Signal
1	Output -
2	Not used
3	Output +

Connector: SRCN2A13-3S (Japan Aviation Electronics Industry, Ltd.)

2 Pre-microscopy Configuration

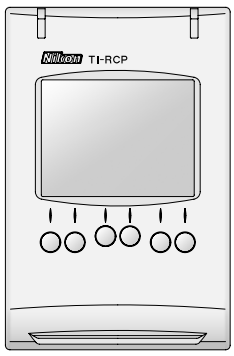
Before starting microscopy with motorized units attached to the microscope main body, you must first connect the motorized units, and make the necessary configurations to the remote control pad and ergo controller. Shown below are the steps you must follow to perform setup before beginning microscopy.

- Follow all of these steps when using the remote control pad or ergo controller for the first time.
- For more information on each task, see the corresponding section in the instruction manual for the remote control pad.
- If you have not finished assembling the microscope, see Chapter 6, “Assembly.”
- If you use a computer instead of the remote control pad or ergo controller to control the microscope, see Chapter 5, “Online and Remote Operation.”

1 Make connections and set up the motorized units.

1. Connect the motorized units to the hub controller A.
2. Slide the EXTERNAL ON/OFF switch knob on the power supply to the “ON” side.

2 Specify the information about the connected unit on the remote control pad.

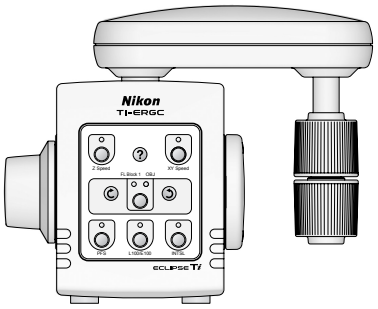


1. Specify the objective lens information.
2. Specify the condenser cassette information.
3. Specify the filter block information.

   (If you are using an analyzer block, also specify the information for the analyzer block.)
4. Specify the information for the excitation and barrier filters.
5. Specify the information for the motorized shutter and digital camera.

For more information, see Chapter 2, “Pre-microscopy Configuration,” in the instruction manual for the remote control pad.

3 Assign the units to be operated via the control panel of the ergo controller.



The buttons on the control panel of the ergo controller are set to standard functions, but you can change these settings as necessary.

Change the settings via the remote control pad or a computer. See Chapter 5, “Operation and Display Functions,” in the instruction manual of the remote control pad or the setup application “Ti Control.”

3 Microscopy

Warning

- **Before using this product, thoroughly read the Safety Precautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **If you use this product with other devices (such as the epi-fl attachment or differential interference contrast attachment), also read the instruction manuals for those devices thoroughly, and obey all the warnings and cautions described there as well.**

Caution

- **In order to use the Ti Series motorized attachments, it is necessary to register information on the components attached to the motorized units on the HUB controller A using the remote control pad or the Ti Series dedicated software "Ti Control". Be sure to carry out the set up procedures prior to commencing operation whenever operating the microscope system for the first time after assembly, modifying the system configuration or replacing optical components. Refer to the remote control pad instruction manual when registering components with the remote control pad, and refer to the "Ti Control" instruction manual for information on operating methods and registration procedures using the "Ti Control" software.**
- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt. Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image.**
- **Each of the motorized units of the Ti series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precisions of the objectives are particularly susceptible to even weak shocks.**

This chapter describes the procedure for conducting actual microscopic observation with motorized units attached to the Ti-E / Ti-E/B microscope main body. This chapter describes the procedures for microscopy using the following four methods:

1 Bright-field (BF) microscopy

2 Phase-contrast (Ph) microscopy

3 Differential interference contrast (DIC) microscopy

4 Episcopic fluoro (Epi-fl) microscopy

3.1 Before Beginning Microscopy

By registering various information about the Ti Series motorized attachments on the hub controller A, the attachments can be simply operated using the remote control pad, ergo controller or computer. Before performing actual microscopy, check the following items to ensure the correct and safe use of these units.

- If you are using the microscope system for the first time after assembling the microscope system and attaching the units, configure information about the status of the units and attached devices in accordance with Chapter 2 “Pre-microscopy Configuration.”
- If you have not finished assembling the microscope system, see Chapter 6, “Assembly.”
- See Chapter 1, “Microscope Parts and Names,” for the names and locations of the main controls of the microscope system, and Chapter 4 “Operation of Each Part,” for details about operating each part.
- If your microscope’s module configuration is different from the configurations described here, see Chapter 4 “Operation of Each Part.”
- See Chapter 5, “Online and Remote Operation,” and Section 6.25, “Connecting External Devices,” in Chapter 6, “Assembly,” if you wish to use hub controller A to manipulate an XY stage or motorized shutter attachment.
- If an epi-fl attachment, differential interference contrast attachment, or the like is attached to your microscope, also read the instruction manuals supplied with those products.
- See the instruction manual of the remote control pad for details about settings available on the remote control pad.

3.2 Bright-field (BF) Microscopy

This section describes the procedure for bright-field microscopy. Here, the following assumptions are made:

- You are using a motorized HG fiber-optic light source (Intensilight) as your episcopic illuminator, connected to the HGFIE connector of the hub controller A.
- Motorized FL turret: To be used at first tier (can also be used at second tier).

1 Turn on the power of the microscope system.

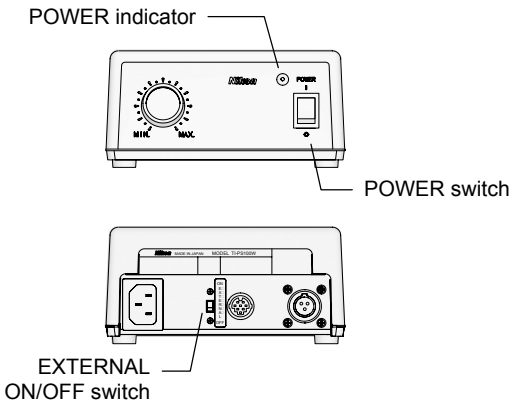


Figure 3.2-1 Power supply

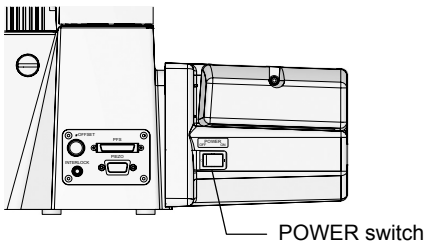


Figure 3.2-2 Hub controller A

1. **Turn on the power of the motorized HG fiber-optic light source (Intensilight).**

   For the operating procedure, see the instruction manual of the motorized HG fiber-optic light source (Intensilight).
2. **Slide the EXTERNAL ON/OFF switch on the back of the power supply to the "ON" side.**
3. **Flip the POWER switch to " I " on the front of the power supply to turn on the power supply.**

   When the power comes on, the POWER indicator will light up.
4. **If the motorized stage (or motorized stage with encoders) and/or motorized shutter are used, turn them on.**

   Turn on other motorized devices that require individual power sources in this step.
5. **Flip the POWER switch to "ON" on the right side of hub controller A to turn on the hub controller A and the microscope.**
6. **If a digital camera for microscopy is used, turn it on.**

   For the operating procedure, see the instruction manual of the digital camera.
7. **If a personal computer (PC) is used, turn on the power of the PC, and then start software "Ti Control."**

   For the operating procedure, see the instruction manuals of the PC and "Ti Control."

2 Remove the epi-fl components from the optical path.

Operation via the remote control pad

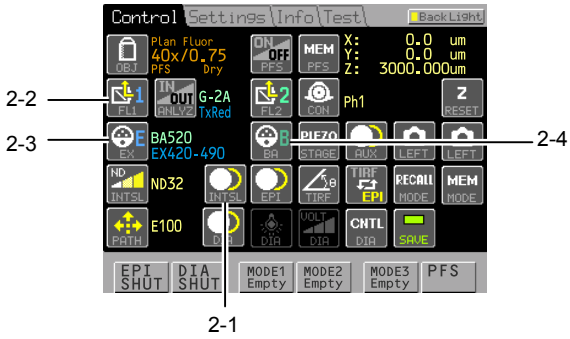


Figure 3.2-3 Remote control pad

1. **Block the epi-fl optical path.**

   The shutter opens/closes each time the [INTSL] button is pressed. The button icon appearance indicates the shutter condition.
2. **Remove the FL block from the optical path.**

   Press the [FL 1] button to open the second screen and select the "-----" column.
3. **Remove the excitation filter from the optical path.**

   Press the [EX] button to open the second screen and select the "-----" column.
4. **Remove the barrier filter from the light source.**

   Press the [BA] button to open the second screen and select the "-----" column.

Operation via the ergo controller

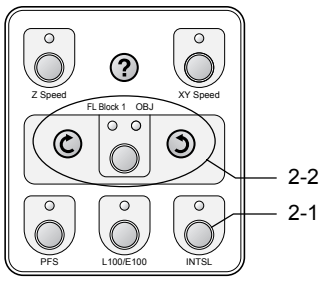


Figure 3.2-4 Ergo controller

1. **Shield the epi-fl optical path.**

   Press the [INTSL] button. The button indicator lights.
2. **Remove the FL block from the optical path.**

   Press the [FL Block 1/OBJ] button to light the FL Block 1 indicator. Press the Rotate turret button, and select the empty location.

Perform steps **3** and **4** on the remote control pad.

Operation via the Ti-E

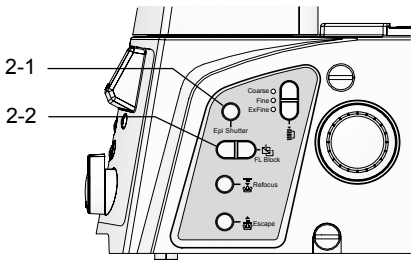


Figure 3.2-5 Right side of Ti-E

1. **Shield the epi-fl optical path.**

   Press the Epi Shutter button on the right side. Each time the button is pressed, the shutter toggles between open and closed.
2. **Remove the FL block from the optical path.**

   Press the FL Block switch on the right side, and select the empty position.

Perform steps **3** to **4** on the remote control pad.

To open and close the shutter using the Epi Shutter button on the right side of the microscope, you must connect it so that the external shutter trigger signal can control the shutter. See Section 6.25.2, "Connecting Motorized Shutters," in Chapter 6, "Assembly," for details.

3 Remove DIC components from the optical path.

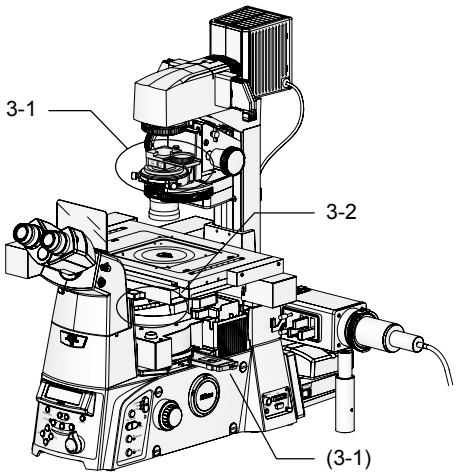


Figure 3.2-6 DIC components

When using differential interference components, remove them from the optical path.

1. **Remove the polarizer from the optical path.**

   When using a manual analyzer, remove it from the optical path as well.

2. **Remove the objective DIC prism from the optical path.**

4 Set the diascopic illumination brightness to “9V”.

Operation via the remote control pad

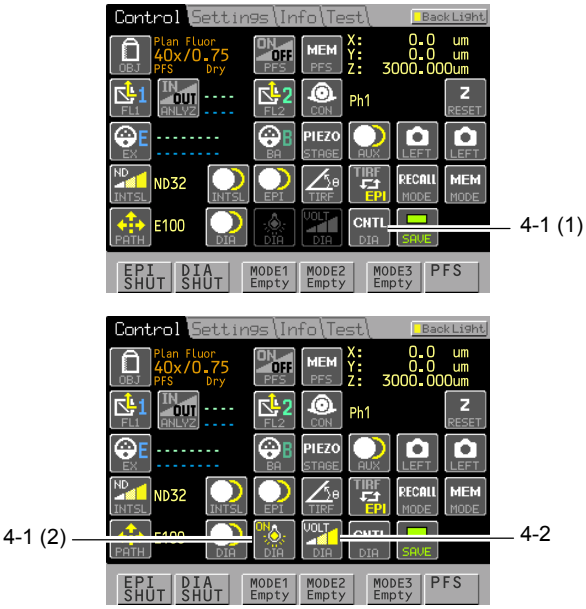


Figure 3.2-7 Remote control pad

1. **Turn on the diascopic lamp.**
   (1) Press the [CNTL DIA] button, and set diascopic remote operation to “ON”.
   (2) Press the [DIA] button, setting the diascopic lamp to “ON”. The lamp lights up.
2. **Adjust the diascopic brightness.**
   Press the [DIA VOLT] button to open the second screen and press the [+] or [-] button to set the DIA Lamp indicator to “9V”.

Operation via the Ti-E

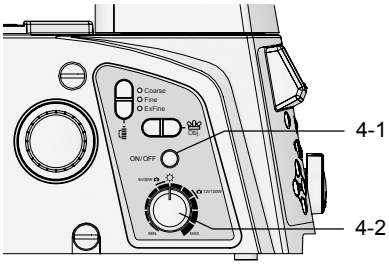


Figure 3.2-8 Left side of Ti-E

1. **On the left side of the microscope, press the diascopic lamp ON/OFF button, and turn on the diascopic lamp.**
   Each time you press the button, the lamp toggles between on and off.
2. **Turn the diascopic lamp dimming dial on the left side of the computer, and set the position to “9V”.**

The diascopic lamp cannot be used from both the remote control pad and the main microscope body. When operating the lamp from the main microscope body, press the [CNTL DIA] button on the remote control pad to turn off the lamp’s remote operation.

5 Change to a 10x objective.

Operation via the remote control pad

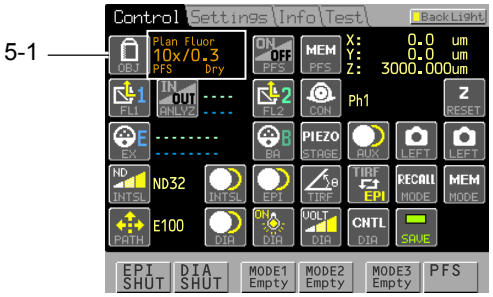


Figure 3.2-9 Remote control pad

1. **Press [OBJ] button to open the second screen, select “10x” and insert the 10x objective in the optical path.**

   Information about the objective in the optical path is displayed to the right of the button.

Operation via the ergo controller

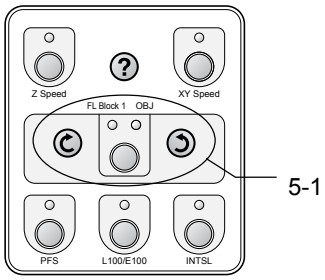


Figure 3.2-10 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the OBJ indicator. Press the rotate button to switch the objective.**

Operation via the Ti-E

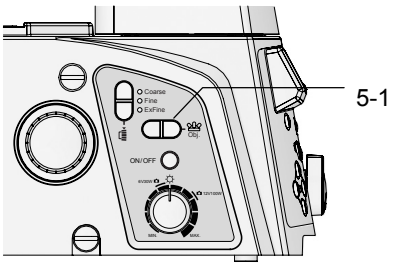


Figure 3.2-11 Left side of Ti-E

1. **Press the Obj. switch on the left side of the microscope to switch objectives.**

6 Set the condenser cassette to “A” (dedicated cassette for bright field).

Operation via the remote control pad

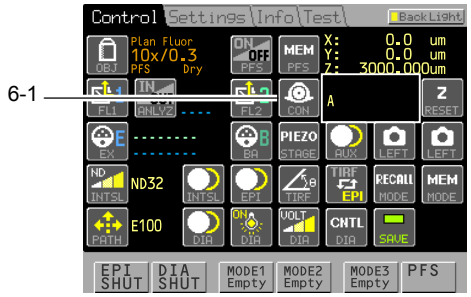


Figure 3.2-12 Remote control pad

1. **Press the [CON] button to open the second screen and switch the condenser cassette to “A” (intermediate).**

   Information about the condenser in the optical path is displayed to the right of the button.

7 Switch the optical path to “Observation port 100%”.

Operation via the remote control pad

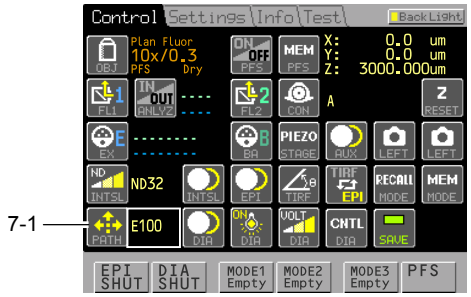


Figure 3.2-13 Remote control pad

1. **Press the [PATH] button to open the second screen and switch the optical path to “E100” (observation port 100%).**

   The current optical path setting is displayed beside the button.

Operation via the ergo controller

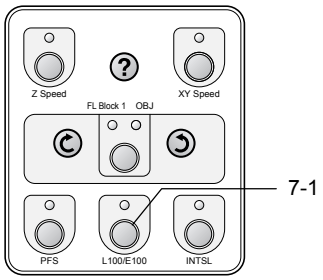


Figure 3.2-14 Ergo controller

1. **Press the [L100/E100] button so the button indicator lights.**

   The [L100/E100] button indicator is lit when the optical path is set to “E100” (observation port 100%).

Operation via the Ti-E

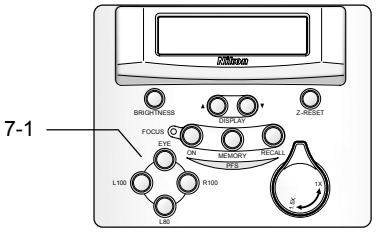


Figure 3.2-15 Ti-E front control panel

1. **Press the “EYE” light-path switch on the front control panel.**

8 Move the Bertrand lens in/out lever to “O”.

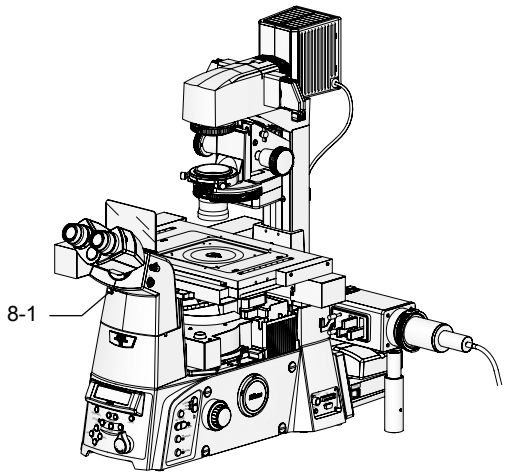


Figure 3.2-16 Bertrand lens in/out lever

1. **Move the Bertrand lens in/out lever on the front of the eyepiece tube to “O”, and remove the Bertrand lens from the light source.**

9 Fully open the dia-illuminator field diaphragm and aperture diaphragm.

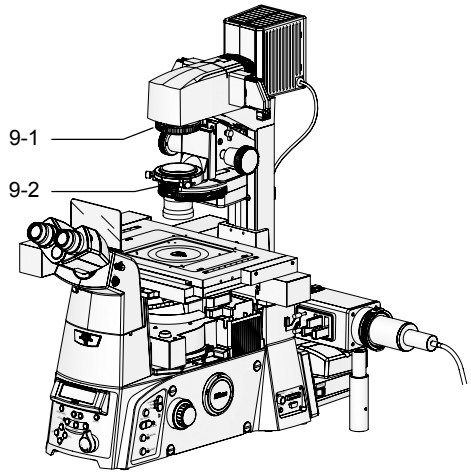


Figure 3.2-17 Field diaphragm and aperture diaphragm

1. **Move the field diaphragm ring on the Dia-illuminator, and set the field diaphragm to “fully open.”**
2. **Move the aperture diaphragm lever on the system condenser, and set the aperture diaphragm to “fully open.”**

10 Raise the condenser mount to its upper limit position.

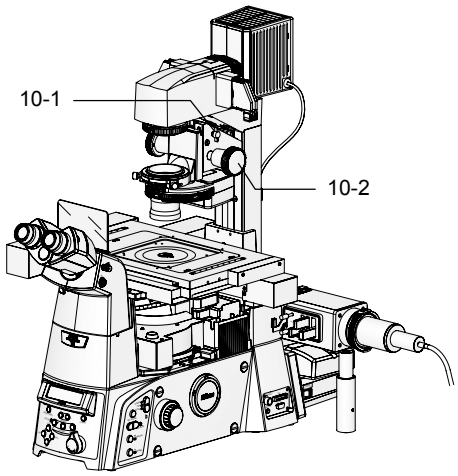


Figure 3.2-18 Condenser mount operation

1. **Rotate the condenser refocusing clamp on the dia pillar illuminator counterclockwise to remove it.**
2. **Rotate the condenser focusing knob on the dia pillar illuminator and raise the condenser mount to its upper limit position.**

11 Set the magnification to “1x”.

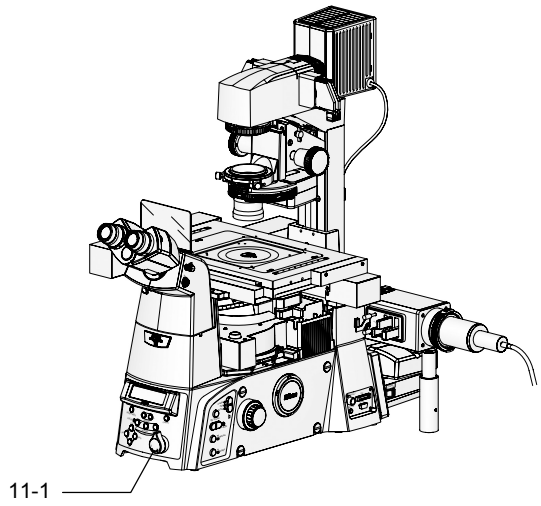


Figure 3.2-19 Intermediate magnification selector knob operation

1. **Set the intermediate magnification selector knob on the front control panel to “1x”.**

12 Place a specimen on the stage and adjust the focus.

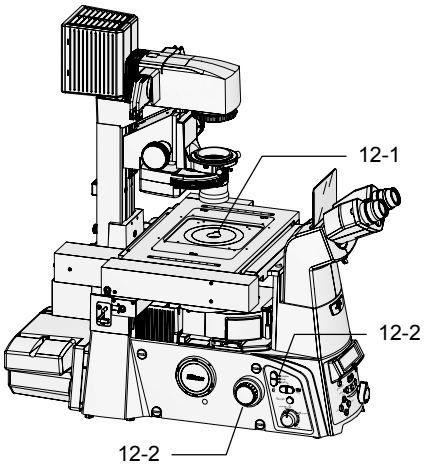


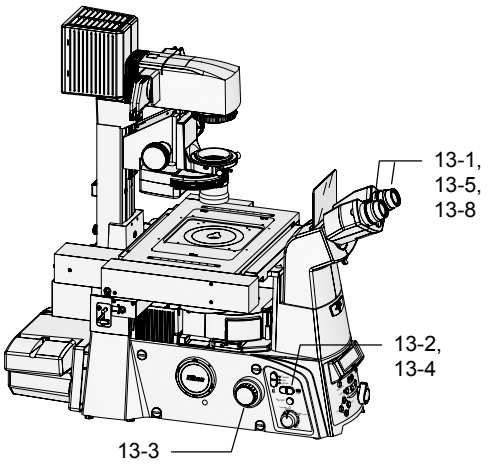
Figure 3.2-20 Focusing operation

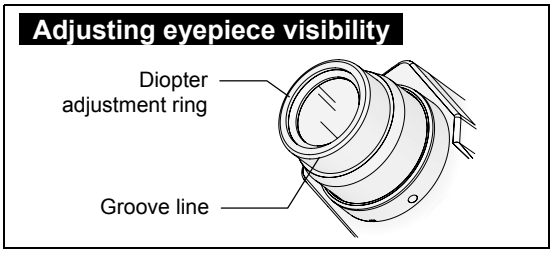
1. **Place a specimen on the stage.**
2. **While looking through the eyepiece, focus on the specimen with the focusing knobs on both sides of the microscope.**

   The nosepiece focusing speed can be changed using the Coarse/Fine/ExFine switch.

   Focusing can also be performed using the joystick controller and Ergo controller focusing knob.

13 Adjust eyepiece diopters and interpupillary distance.





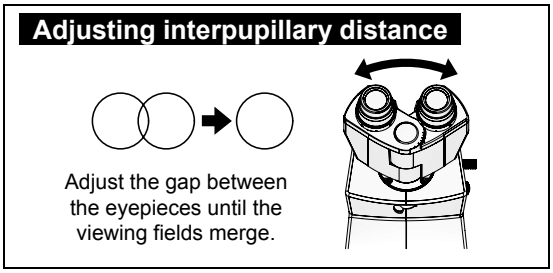


Figure 3.2-21 Visibility and gap adjustment

1. **For right and left eyepieces, rotate the diopter adjustment rings on the eyepieces so that their bottom edges are adjusted to the groove lines on the eyepieces.**

   This is the zero point adjustment of diopter.
2. **Place the 40x objective into the optical path.**
3. **Look into the left eyepiece with your left eye and focus on the specimen with the focus knob on the microscope body.**
4. **Place the 10x objective into the optical path.**
5. **Look into the left eyepiece with your left eye and focus on the specimen with the diopter adjustment ring on the left eyepiece.**

   Do not touch the focus knob on the microscope body in this step.
6. **Repeat steps 2 to 5 two times.**
7. **Adjust diopter for the right eyepiece in the same manner.**

   Perform steps 2 to 6 for the right eyepiece interpreting “left” as “right.”
8. **Adjust the interpupillary distance of the binocular part to merge both fields of view.**

14 Focus on the specimen again.

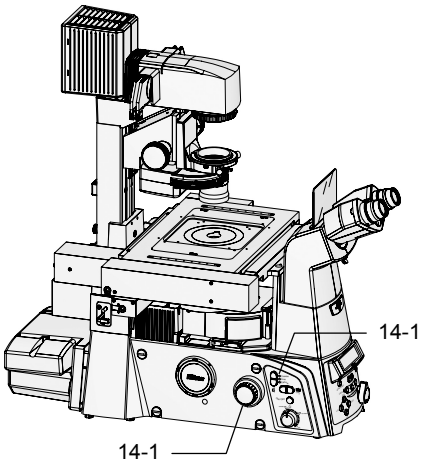


Figure 3.2-22 Focusing operation

1. **While looking through the eyepiece, focus on the specimen again with the focusing knobs on both sides of the microscope.**

   The nosepiece focusing speed can be changed using the Coarse/Fine/ExFine switch.

   Focusing can also be performed using the joystick controller and ergo controller focusing knob.

15 Center the condenser.

Operation via the remote control pad

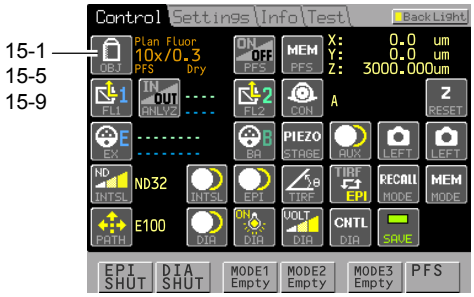
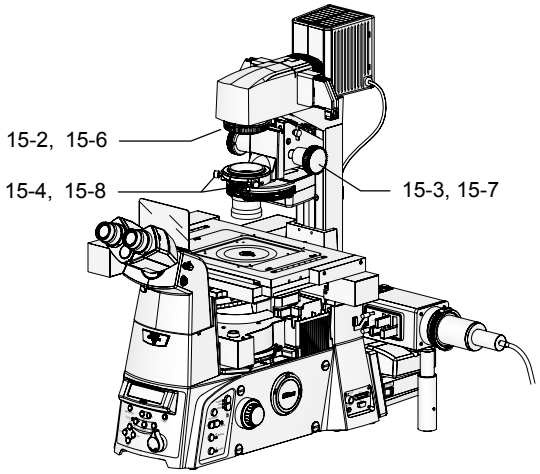
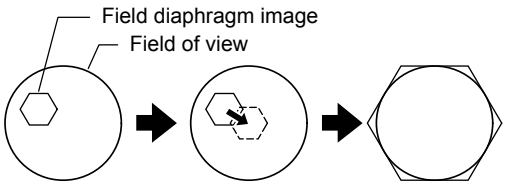


Figure 3.2-23 Remote control pad



Field diaphragm adjustment



Move the field diaphragm image to the center of the field of view and resize the diaphragm to a size almost same as the field of view.

Figure 3.2-24 Centering the condenser

1. **Set the objective to 10x.**

   Press the [OBJ] button to open the second screen and set the 10x objective.
2. **Turn the field diaphragm dial until the field diaphragm image comes into view.**
3. **Move the condenser mount vertically using the condenser focusing knob to focus the field diaphragm image.**
4. **Move the diaphragm image into the center of the field of view using the two condenser centering knobs.**
5. **Set the objective to 40x.**

   Press the [OBJ] button to open the second screen and set the 40x objective.
6. **Adjust the field diaphragm dial until the field diaphragm image is nearly the same size as the field of view.**
7. **Turn the condenser focusing knob to move the condenser mount vertically so that the field diaphragm image is focused on.**
8. **Move the diaphragm image into the center of the field of view using the two condenser centering knobs.**
9. **Return the objective to 10x.**

   Press the [OBJ] button to open the second screen and set the 10x objective.

Operation via the ergo controller

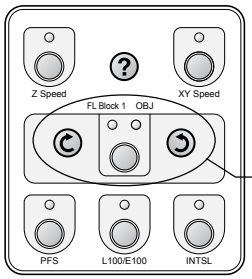


Figure 3.2-25 Ergo controller

1, 5, 9

Press the [FL Block 1/OBJ] button to light the OBJ indicator. Press the Rotate turret button, and switch the objective.

See “Operation via the remote control pad” for further information.

Operation via the Ti-E

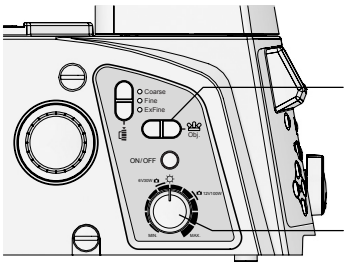


Figure 3.2-26 Left side of Ti-E

1, 5, 9

Press the Obj. switch on the left side of the microscope to switch objectives.

See “Operation via the remote control pad” for further information.

16 Perform microscopy.

Operation via the remote control pad

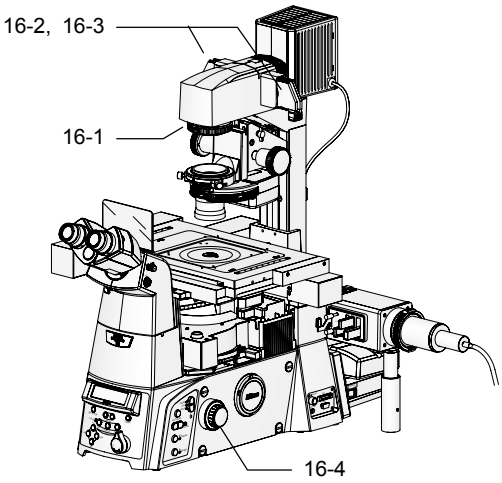


Figure 3.2-27 Adjusting the brightness and focus

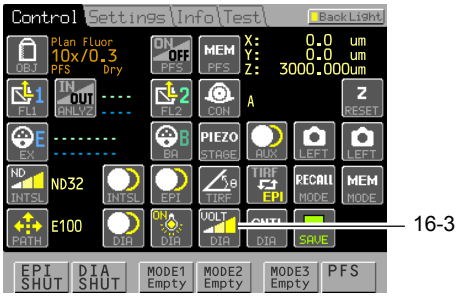


Figure 3.2-28 Remote control pad

1. **Turn the field diaphragm dial until the field-diaphragm image is nearly the same size as the field of view.**
2. **Place a GIF filter in the optical path in place of an NCB11 filter to improve contrast.**
3. **Adjust the brightness.**

   Adjust the brightness by operating the dia pillar illuminator's ND filter. If you are not especially concerned about color reproduction, press the [DIA VOLT] button to open the second screen and change the lamp voltage.
4. **Adjust the focus.**

If you adjust the brightness by changing the lamp voltage, the brightness and hue of the lamp will change. If reproducing colors accurately is important (e.g. for color photography), keep the lamp voltage fixed, and use an ND filter to adjust the brightness.

Operation via the Ti-E

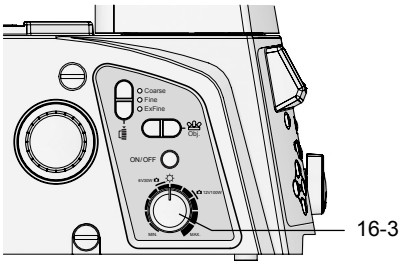


Figure 3.2-29 Left side of Ti-E main body

3. **If you are not especially concerned about color reproduction, adjust the brightness using the diascopic lamp brightness control knob on the left side of the microscope.**

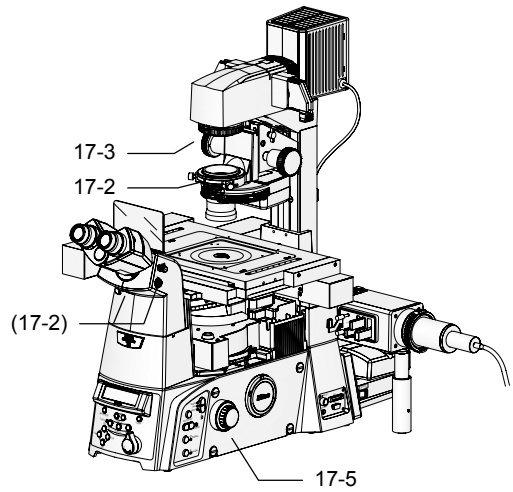
See "Operation via the remote control pad" for further information.

The diascopic lamp cannot be used from both the remote control pad and the main microscope body. When operating the lamp from the main microscope body, press the [CNTL DIA] button on the remote control pad to turn off the lamp's remote operation.

17 Perform microscopy with different magnifications.

Operation via the remote control pad

Figure 3.2-30 Remote control pad



1. **Change the objective.**

   Press the [OBJ] button to open the second screen and place the desired objective into the optical path.

2. **Set the aperture diaphragm to 70% to 80% of the size of the objective NA.**

   The objective' pupil surface and the aperture diaphragm image can be observed by setting the Bertrand lens in/out lever on the eyepiece to "B" and inserting the lens in the optical path. Now turn the Bertrand lens focusing knob on the right eyepiece to focus and adjust until the aperture diaphragm image is 70% to 80% of the size of the objective pupil surface.

   After adjusting, return the Bertrand lens in/out lever to the "O" side and remove the Bertrand lens from the optical path.

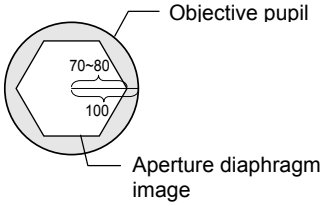
3. **Set the field diaphragm to nearly the same size as the field of view.**

4. **Adjust the brightness.**

   Adjust the brightness by operating the dia-illuminator's ND filter. If you are not especially concerned about color reproduction, adjust using the [DIA VOLT] button.

5. **Adjust the focus.**

Aperture diaphragm adjustment



Adjust the aperture diaphragm to a size of 70% to 80% of the objective pupil.

Figure 3.2-31 Adjusting field diaphragm and aperture diaphragm

If you adjust the brightness by changing the lamp voltage, the brightness and hue of the lamp will change. If reproducing colors accurately is important (e.g. for color photography), keep the lamp voltage fixed, and use an ND filter to adjust the brightness.

Operation via the ergo controller

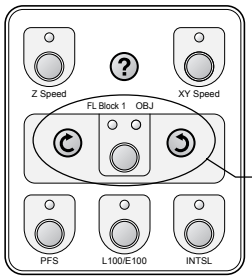


Figure 3.2-32 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the OBJ indicator. Press the Rotate turret button, and switch the objective.**

See “Operation via the remote control pad” for further information.

Operation via the Ti-E

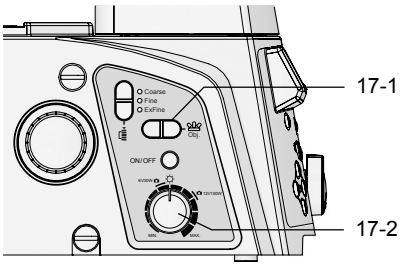


Figure 3.2-33 Left side of Ti-E

1. **Press the Obj. switch on the left side of the microscope to switch objectives.**
2. **If you are not especially concerned about color reproduction, adjust the brightness using the diascopic lamp dimming dial on the left side of the microscope.**

See “Operation via the remote control pad” for further information.

The diascopic lamp cannot be used from both the remote control pad and the main microscope body. When operating the lamp from the main microscope body, press the [CNTL DIA] button on the remote control pad to turn off the lamp’s remote operation.

18 Change specimens.

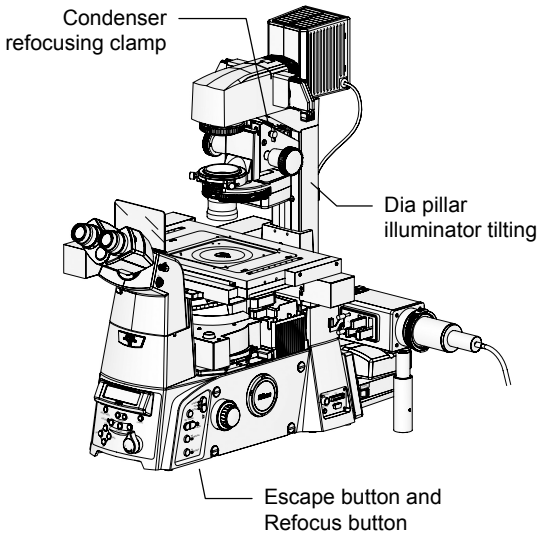


Figure 3.2-34 Changing the specimen

The following feature can be handy when required.

- **Tilting the dia pillar illuminator**

  Loosening the clamp knob on the back of the dia pillar illuminator 100W tilts the pillar, allowing you to create an extra working space.

- **Escape Button and Refocus Button**

  When you need to retract the objective, press the Escape button on the right control panel to temporarily retract the objective.

  Pressing the Refocus button then returns the objective to about the same position without having to turn the focusing knob.

- **Condenser refocusing clamp**

  When you need to raise or lower the condenser, tightening the condenser refocusing clamp before doing so allows the condenser to be returned to its original position with ease.

19 Finish microscopy.

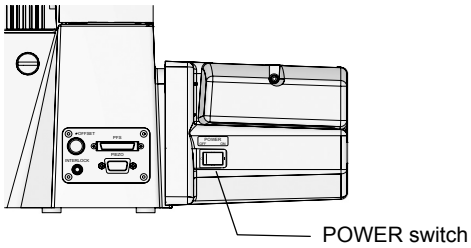


Figure 3.2-35 POWER switch (hub controller A)

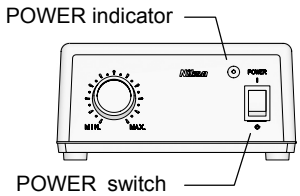


Figure 3.2-36 POWER switch (power supply)

When you are finished with all microscopy, power off the units.

1. **Flip the POWER switch on the right side of the hub controller A to "OFF" to turn off the power of the hub controller A and the microscope.**
2. **Flip the POWER switch on the front of the power supply to "O" to turn off the power supply.**

   The POWER indicator goes off.

3.3 Phase-contrast (Ph) Microscopy

This section describes the procedure for phase-contrast microscopy. Here, the following assumptions are made:

- You are using a motorized HG fiber-optic light source (Intensilight) as your episcopic illuminator, connected to the HGFIE connector of the hub controller A.
- Motorized FL turret: Use at first tier (can also be used at second tier).

1 Using bright-field microscopy, focus on the specimen.

For the procedure of bright field microscopy, see Section 3.2, “Bright-field (BF) Microscopy.”

2 Insert a phase-contrast objective into the optical path.

Operation via the remote control pad

Figure 3.3-1 Remote control pad

1. **Press the [OBJ] button to open the second screen and place the desired objective into the optical path.**
2. **Make sure that “Ph code” is displayed on the objective bracelet.**

Operation via the ergo controller

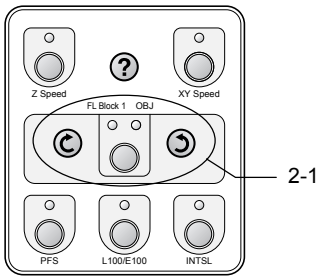


Figure 3.3-2 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the OBJ indicator. Press the Rotate turret button, and insert a phase-contrast objective into the optical path.**

See “Operation via the remote control pad” for further information.

Operation via the Ti-E

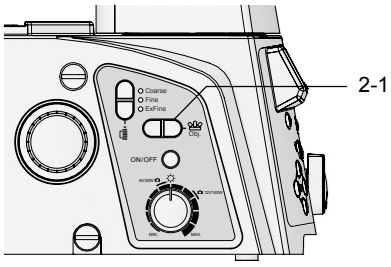


Figure 3.3-3 Left side of Ti-E

1. **Press the Obj switch on the left side of the microscope to insert a phase-contrast objective into the optical path.**

See “Operation via the remote control pad” for further information.

3 Insert a condenser cassette with the same Ph code as the objective into the optical path.

Operation via the remote control pad

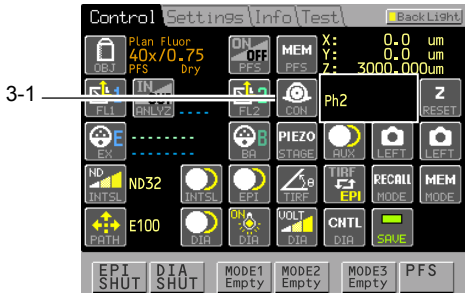


Figure 3.3-4 Remote control pad

1. **Press the [CON] button to open the second screen and insert a condenser cassette with the same Ph code as the objective into the optical path.**

   Set the same Ph code as the objective's Ph code in the display field next to the button.

4 Fully open the dia pillar illuminator field diaphragm and aperture diaphragm.

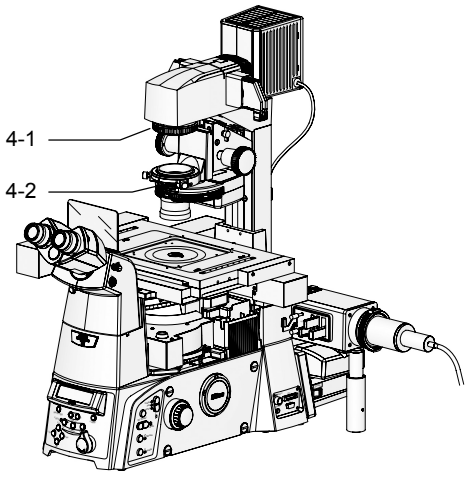


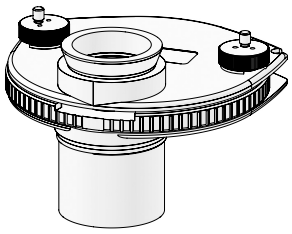
Figure 3.3-5 Field diaphragm and aperture diaphragm

1. **Move the field diaphragm ring on the dia pillar illuminator, and set the field diaphragm to "fully open."**
2. **Move the aperture diaphragm lever on the system condenser, and set the aperture diaphragm to "fully open."**

Narrowing the aperture diaphragm causes the optical path of the annular diaphragm to affect the aperture diaphragm such that a phase contrast effect cannot be achieved.

When performing phase-contrast microscopy, ensure that the aperture diaphragm is fully open.

When using the ELWD-S Condenser

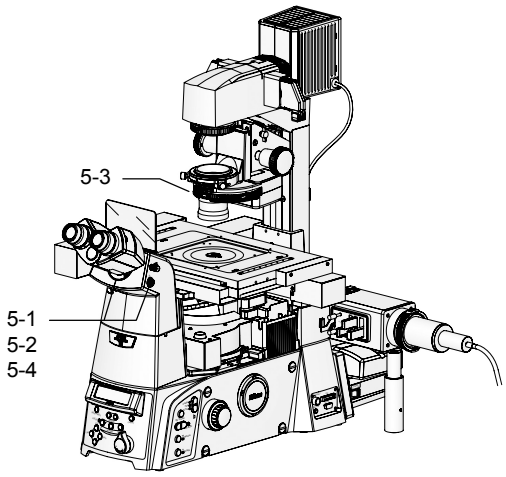


ELWD-S Condenser

The ELWD-S condenser aperture diaphragm is only intended for use with bright-field optical paths and has no affect upon phase-contrast optical paths, so there is no need to fully open the aperture diaphragm in Step 4-2.

Performing annular diaphragm centering at the [PhL] position when using the ELWD-S condenser causes the remaining annular diaphragms to be simultaneously centered. Place the [PhL] objective in the optical path and set the condenser turret to the [PhL] position then proceed to the next step.

5 Center the annular diaphragm.



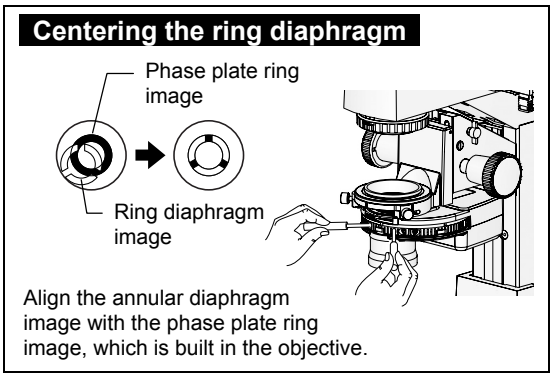


Figure 3.3-6 Centering the annular diaphragm

1. **Set the Bertrand lens in/out lever to “B”.**

   The eyepiece tube’s Bertrand lens enters the optical path.
2. **Turn the Bertrand lens focusing knob on the eyepiece tube to focus on the annular diaphragm.**
3. **Use a hexagonal screwdriver to turn two annular diaphragm centering screws on the condenser cassette, and overlay the annular diaphragm image over the image of the phase-contrast ring.**
4. **Return the Bertrand lens in/out lever to “O”.**

   The Bertrand lens is removed from the optical path.

6 Perform microscopy.

Operation via the remote control pad

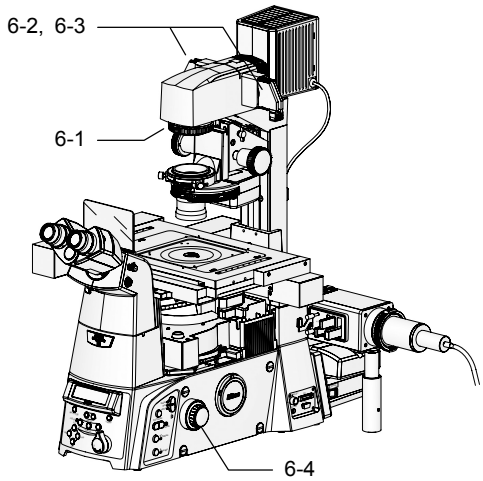


Figure 3.3-7 Adjusting brightness and focus

Figure 3.3-8 Remote control pad

1. **Turn the field diaphragm dial until the field-diaphragm image is nearly the same size as the field of view.**
2. **In order to improve the contrast, place a GIF filter in the optical path in place of an NCB11 filter.**
3. **Adjust the brightness.**

   Adjust the brightness by operating the dia pillar illuminator's ND filter. If you are not especially concerned about color reproduction, press the [DIA VOLT] button to open the second screen and change the lamp voltage.
4. **Adjust the focus.**

If you adjust the brightness by changing the lamp voltage, the brightness and hue of the lamp will change. If reproducing colors accurately is important (e.g. for color photography), keep the lamp voltage fixed, and use an ND filter to adjust the brightness.

Operation via the Ti-E

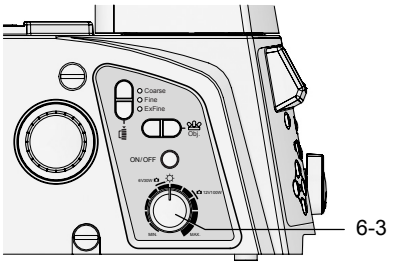


Figure 3.2-9 Left side of Ti-E main body

3. **If you are not especially concerned about color reproduction, adjust the brightness using the diascopic lamp brightness control knob on the left side of the microscope.**

See "Operation via the remote control pad" for further information.

The diascopic lamp cannot be used from both the remote control pad and the main microscope body. When operating the lamp from the main microscope body, press the [CNTL DIA] button on the remote control pad to turn off the lamp's remote operation.

7 Perform microscopy with different magnifications.

Operation via the remote control pad

Figure 3.3-10 Remote control pad

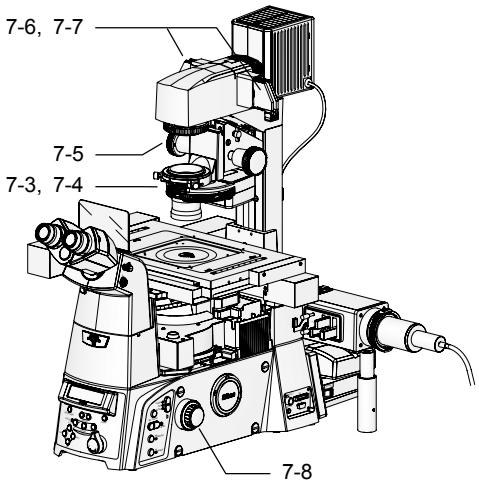


Figure 3.3-11 Ring diaphragm/field diaphragm/aperture diaphragm

1. **Change to a phase-contrast objective with the desired magnification.**

   Press the [OBJ] button to open the second screen and place the desired objective into the optical path.
2. **Insert a condenser cassette with the same Ph code as the objective into the optical path.**

   Press the [CON] button to open the second screen and insert a condenser cassette with the same Ph code as the objective into the optical path.
3. **Center the annular diaphragm.**

   See step 5 on page 1-48 for instructions on performing this adjustment.
4. **Make sure that the aperture diaphragm is fully open.**
5. **Adjust the field diaphragm so that it is nearly the same size as the field of view.**
6. **In order to improve the contrast, place a GIF filter in the optical path in place of an NCB11 filter.**
7. **Adjust the brightness.**

   Adjust the brightness by operating the dia pillar illuminator's ND filter. If you are not especially concerned about color reproduction, press the [DIA VOLT] button to open the second screen and change the lamp voltage.
8. **Adjust the focus.**

If you adjust the brightness by changing the lamp voltage, the brightness and hue of the lamp will change. If reproducing colors accurately is important (e.g. for color photography), keep the lamp voltage fixed, and use an ND filter to adjust the brightness.

Operation via the ergo controller

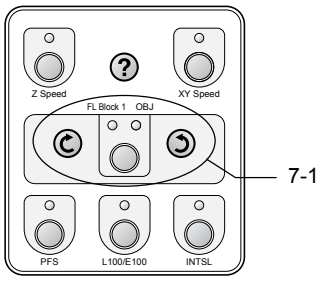


Figure 3.3-12 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the OBJ indicator. Press the Rotate turret button, and switch the objective.**

See "Operation via the remote control pad" for further information.

Operation via the Ti-E

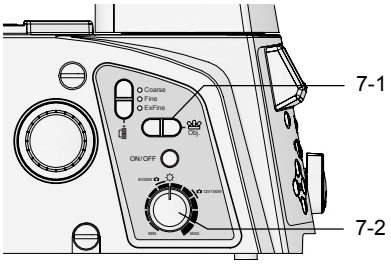


Figure 3.3-13 Left side of Ti-E

1. **Press the Obj. switch on the left side of the microscope to switch to the desired objective.**
2. **If you are not especially concerned about color reproduction, adjust the brightness using the diascopic lamp brightness control knob on the left side of the microscope.**

See “Operation via the remote control pad” for further information.

The diascopic lamp cannot be used from both the remote control pad and the main microscope body. When operating the lamp from the main microscope body, press the [CNTL DIA] button on the remote control pad to turn off the lamp’s remote operation.

8 Change specimens.

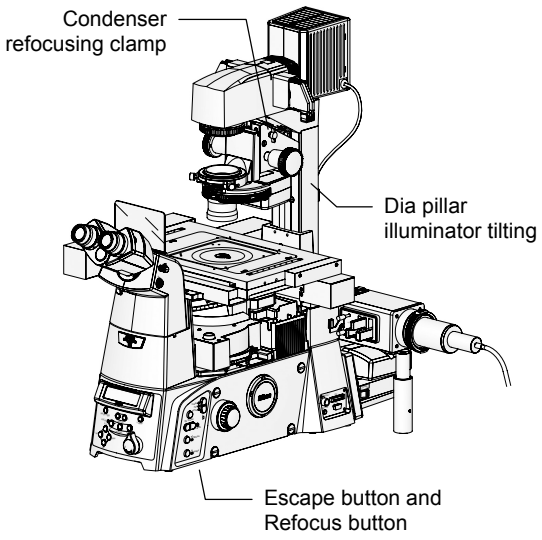


Figure 3.3-14 Changing the specimen

The following feature can be handy when required.

- **Tilting the dia pillar illuminator**

  Loosening the clamp knob on the back of the dia pillar illuminator 100W tilts the pillar, allowing you to create extra working space.

- **Escape Button and Refocus Button**

  When you need to retract the objective, press the Escape button on the right control panel to temporarily retract the objective.

  Pressing the Refocus button then returns the objective to about the same position without having to turn the focusing knob.

- **Condenser refocusing clamp**

  When you need to raise or lower the condenser, tightening the condenser refocusing clamp before doing so allows the condenser to be returned to its original position with ease.

9 Finish microscopy.

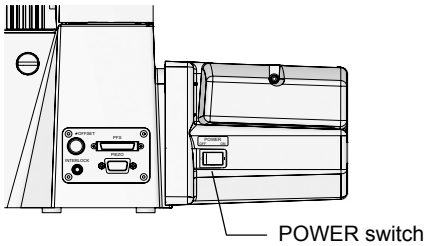


Figure 3.3-15 POWER switch (hub controller A)

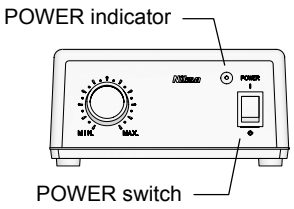


Figure 3.3-16 POWER switch (power supply)

When you are finished with all microscopy, power off the units.

1. **Flip the POWER switch on the right side of the hub controller A to "OFF" to turn off the power of the hub controller A and the microscope.**
2. **Flip the POWER switch on the front of the power supply to "O" to turn off the power supply.**

   The POWER indicator goes off.

3.4 Differential Interference Contrast (DIC) Microscopy

Please read Chapter 2, “Microscopy,” in “Differential Interference Contrast Attachment Instructions” for instructions on performing differential interference contrast (DIC) microscopy. This section describes how to perform the following operations from the remote control pad, ergo controller, or Ti-E during DIC microscopy:

- Switch objectives
- Switch condenser cassettes
- Insert/remove analyzers

This section describes the procedure for differential interference contrast (DIC) microscopy. Here, the following assumptions are made:

- You are using a motorized HG fiber-optic light source (Intensilight) as your episcopic illuminator, connected to the HGFIE connector of the hub controller A.
- Motorized FL turret: Use at first tier (can also be used at second tier).

1 Change the objective.

Operation via the remote control pad

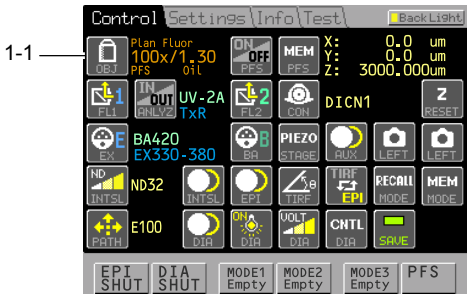


Figure 3.4-1 Remote control pad

1. **Press the [OBJ] button to open the second screen and place the DIC objective into the optical path.**

Operation via the Ergo controller

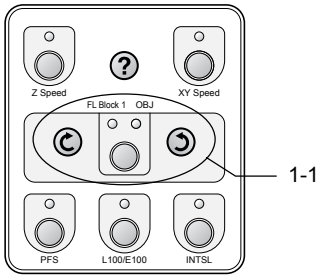


Figure 3.4-2 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the FL Block 1 indicator. Press the Rotate turret button, and switch the objectives.**

Operation via the Ti-E

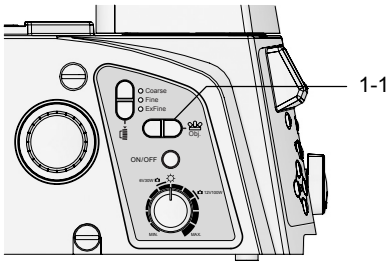


Figure 3.4-3 Left side of Ti-E

1. **Press the Obj. switch on the left side of the microscope to switch the objectives.**

2 Change the condenser cassette.

Operation via the remote control pad

Figure 3.4-4 Remote control pad

1. **Press the [CON] button to open the second screen and insert a condenser cassette with the same DIC code as the objective into the optical path.**

   The DIC code is displayed on the bracelet of the objective.

3 Insert/remove an analyzer block into/from the optical path.

Operation via the remote control pad

Figure 3.4-5 Remote control pad

1. **Press the [ANLYZ] button to insert/remove an analyzer block into/from the optical path.**

   Each time you press the button, the analyzer block toggles between inserted and removed. The current status of the block (IN/OUT) is displayed via the [ANLYZ] button icon.

   IN:  OUT: 

Operation via the ergo controller

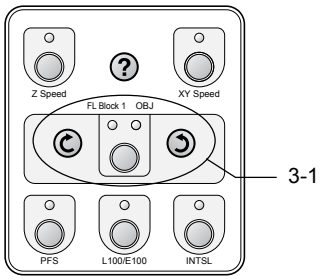


Figure 3.4-6 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the FL Block 1 indicator. Press the Rotate turret button, and insert/remove the analyzer block into/from the optical path.**

Operation via the Ti-E

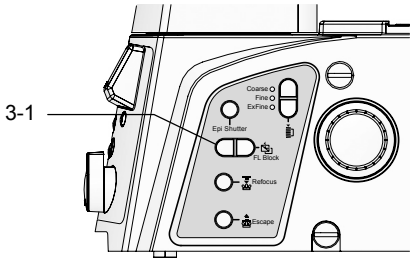


Figure 3.4-7 Left side of Ti-E

1. **Press the FL Block switch on the right side of the microscope to insert/remove the analyzer block into/from the optical path.**

3.5 Episcopic Fluoroescence (Epi-fl) Microscopy

See Chapter 2, “Microscopy (Ti-FL),” or Chapter 5, “Microscopy (Ti-SFL),” of the “TI-FL Epi-Fl Illuminator / TI-SFL High Performance Epi-Fl Illuminator Instructions” for instructions on performing episcopic fluoro (Epi-fl) microscopy. This section describes how to perform the following operations from the remote control pad, ergo controller, or Ti-E during epi-fl microscopy:

- Opening and closing the motorized shutter
- Switching FL blocks

This section describes the procedure for differential interference contrast (DIC) microscopy. Here, the following assumptions are made:

- You are using a motorized HG fiber-optic light source (Intensilight) as your episcopic illuminator, connected to the HGFIE connector of the hub controller A.
- If you use TI-SFL high performance epi-fl illuminator, Nikon recommend using a super high-pressure mercury lamp with high intensity.
- Motorized FL turret: Use at first tier (can also be used at second tier).

1 Open or close the motorized shutter.

Operation via the remote control pad

Figure 3.5-1 Remote control pad

1. **Press the [INTSL] button to open or close the shutter.**

   Each time the button is pressed, the shutter opens or closes. The status of the shutter (open/closed) is shown by the button icon.

Operation via the ergo controller

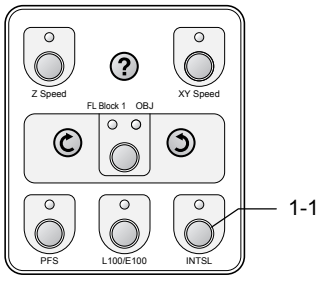


Figure 3.5-2 Ergo controller

1. **Press the [INTSL] button to alternately open and close the shutter.**

   Each time the button is pressed, the shutter opens or closes. When the shutter is open, the indicator is off; when it is closed, the indicator is lit.

Operation via the Ti-E

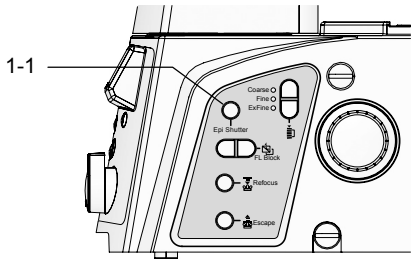


Figure 3.5-3 Right side of the Ti-E main body

1. **Press the Epi Shutter button on the right side of the microscope to alternately open and close the shutter.**

   Each time the button is pressed, the shutter opens or closes.

In order to open and close the shutter using the Epi Shutter button on the right side of the microscope, you must connect the shutter so that it can be controlled via an external trigger signal. See Section 6.25.2, “Connecting Motorized Shutters,” in Chapter 6, “Assembly,” for details.

2 Change filter blocks.

Operation via the remote control pad

Figure 3.5-4 Remote control pad

1. **Press the [FL 1] button to open the second screen so that the filter block used for microscopy is inserted into the optical path.**

   The name of the filter block currently in the optical path appears to the right of the button.

Operation via the ergo controller

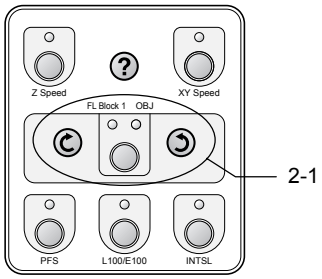


Figure 3.5-5 Ergo controller

1. **Press the [FL Block 1/OBJ] button to light the FL Block 1 indicator. Press the Rotate turret button, and insert the filter block used for microscopy into the optical path.**

Operation via the Ti-E

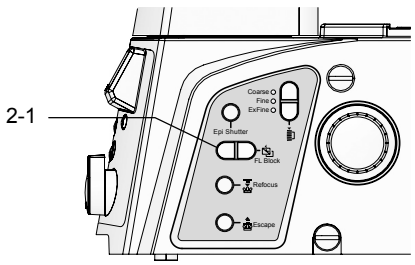


Figure 3.5-6 Left side of Ti-E

1. **Press the FL Block switch on the right side of the microscope, and insert the filter block to be used for microscopy into the optical path.**

4 Operation of Each Part

Warning

- **Before using this product, thoroughly read the Safety Cautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **Also read the user's manuals for any other devices (such as the Epi-fl attachment or differential interference contrast attachment) used with this product if available, and obey all the warnings and cautions described there as well.**

Caution

- **The Ti series uses motorized units. For this reason, it is necessary to register the information for motorized attachments to the hub controller A using the remote control pad or using Ti Control, the dedicated setup application for the Ti series. Be sure to perform setup before operation when first using the microscope after assembly is complete, when the system configuration has changed, when optical parts have been changed, or the like. See the instruction manual of the remote-control pad for details about using the remote control pad to perform registration. See the instructions for Ti Control for information on using Ti Control and performing registration with this application.**
- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt.**
- **Each of the motorized units of the Ti Series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precisions of the objectives are particularly susceptible to even weak shocks.**

This chapter describes how to operate the motorized units of the Ti Series.

- See Chapter 3, "Microscopy," for instructions on performing microscopy.
- If you have not finished assembling the microscope system, see Chapter 6, "Assembly."
- If an Epi-fl attachment, differential interference contrast attachment, or the like is attached to your microscope, read the instruction manuals supplied with those products as well.
- See the instruction manual supplied with the microscope for information on any units not described in this chapter.

4.1 Turning the Power On and Off

4.1.1 Power ON/OFF Procedure

Perform the following procedure to turn on the devices of which the microscope system is composed:

> If you turn on the devices in the order different from described in this manual, communications between the devices may be performed incorrectly, thus the microscope system may not function correctly. Make sure to turn on the devices in the following order:

1. **Motorized HG fiber-optic light source (Intensilight)**

   For the operating procedure, see the instruction manual of the Motorized HG fiber-optic light source (Intensilight).

2. **Dia pillar illuminator power supply**

   See Section 4.1.2, “Power Source of the Dia-illumination Power Supply,” for details.

3. **Motorized devices (motorized stage, motorized shutter, etc.)**

   The power source of the motorized stage can be operated using the motorized stage controller. See Section 4.1.3, “Power Source of Motorized Stage Controller,” for details.

   Turn on other motorized devices that require individual power sources in this step.

4. **Hub controller A and microscope main body**

   See Section 4.1.4, “Power Sources of the Hub Controller A and Microscope Main Body,” for details.

5. **Digital camera for microscopes**

   If a digital camera for microscopy is used, turn its power on after turning on the hub controller A. For the operating procedure, see the instruction manual of the relevant digital camera.

6. **Personal computer (PC) and software “Ti Control”**

   If you use a PC for microscopy, make sure that other devices have already been turned on, and then start software “Ti Control.” It does not matter if you turn on the PC beforehand. For the operating procedure, see the instruction manuals of the PC and “Ti Control.”

4.1.2 Power Source of Dia-illuminator Power Supply

Caution

- **Check the combination of lamps, dia-illuminators, and power supplies.**

  The dia pillar illuminator and the power supply must be used in the correct combination of specifications with respect to the lamp ratings (12V 100W or 6V 30W) and the regional supply voltage. Refer to the instruction manual included with the microscope main body to select the correct combination. Use of an improper combination may result in fire, electric shock, and/or malfunction.

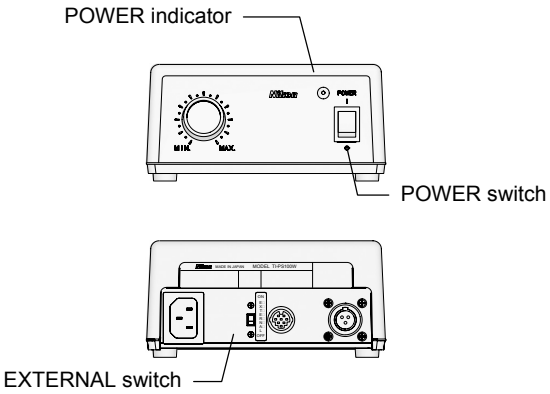


Figure 4.1-1 Power supply of dia-illuminator

Turn on the dia-illuminator power supply. Perform the following procedure.

1. **Make sure that the power supply and the hub controller A are correctly connected.**

   See Chapter 6, “Assembly,” for details about connections.

2. **Check the setting of the EXTERNAL switch (or CTRL switch) on the back of the power supply.**

   Set the switch to “ON” to enable brightness adjustment via the remote control pad and Dimming dial of the microscope. Set it to “OFF” to enable the Dimming dial of the power supply.

   See Section 4.2.2, “Power Supply Configuration,” for details.

3. **Flip the POWER switch on the front of the power supply to “ I ” to turn on the power of the power supply.**

   When the power comes on, the POWER indicator will light.

   * On the TE-PS30W and TE-PSE30, the switch itself does double duty as the power pilot lamp.

4. **If you want to turn off the power, set the POWER switch on the front of the power supply to “O”.**

   Make sure that the POWER indicator (or POWER switch) goes off.

4.1.3 Power of Motorized Stage Controller

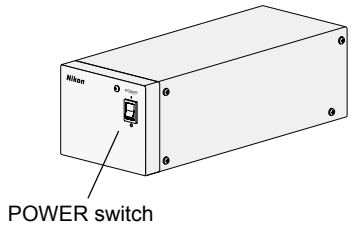


Figure 4.1-2 Motorized stage controller

Turn on the motorized stage controller. Perform the following procedure:

1. **Make sure that the motorized stage (or motorized stage with the linear encoder) and the hub controller A are connected to the motorized stage controller.**

   See Chapter 6, “Assembly,” for details about connections.

2. **Flip the POWER switch on the front of the motorized stage controller to “ I ”.**

   The motorized stage controller and the motorized stage (or motorized stage with the linear encoder) are powered on.

3. **Flip the POWER switch to “O” if you want to turn off the motorized stage controller and the motorized stage (or motorized stage with the linear encoder).**

4.1.4 Power Sources of Hub Controller A and Microscope Main Body

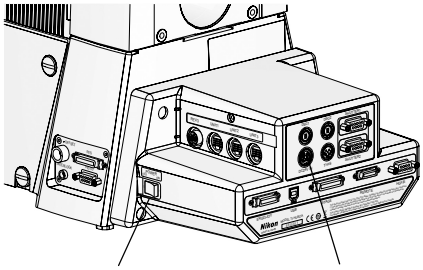


Figure 4.1-3 Turning the hub controller A power on and off

Turn on the power of the hub controller A and the microscope. Perform the following procedure:

1. **Make sure that the AC adapter (for the hub controller A) is connected to the 24 V DC IN connector on the back of the hub controller A.**

   See Chapter 6, “Assembly,” for details about connections.

2. **Turn on the POWER switch on the right side of the hub controller A.**

   The hub controller A and the microscope main body are powered on.

3. **Flip the POWER switch to “OFF” if you want to turn off the power of the hub controller A and the microscope main body.**

4.2 Operating the Dia Illumination Lamp

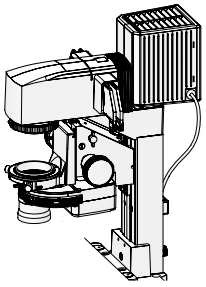
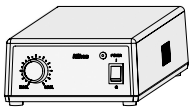
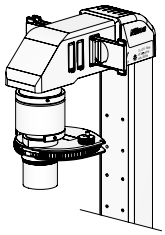
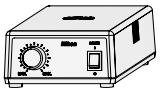
Caution

When the 6V30W halogen lamp is used, the lamp voltage (brightness) cannot be adjusted from the remote control pad or PC. Use the diascopic lamp brightness control knob on the microscope main body or the brightness control knob on the power supply.

4.2.1 Combinations of Lamps, Dia Pillar illuminators, and Power Supplies

The dia pillar illuminator and the power supply must be used in the correct combination of specifications with respect to the lamp rating used (12V 100W or 6V 30W). Check the table below for the correct combinations of lamps, dia pillar illuminators, and power supplies. Other combinations cannot be used.

Table 4.2-1 Combinations of lamps, dia pillar illuminators, and power supplies

<table>
<tr><th>Lamp rating</th><th>Dia pillar illuminator</th><th colspan="2">Power supply</th></tr>
<tr><td>12V 100W halogen lamp
(OSRAM HLX 64623
or PHILIPS7724I)</td><td>TI-DH 100W dia pillar illuminator
  </td><td colspan="2">TI-PS100 power supply
(For 100 to 240V region)
  </td></tr>
<tr><td rowspan="2">6V 30W halogen lamp
(PHILIPS 5761)</td><td rowspan="2">TI-DS 30W dia pillar illuminator
  </td><td>TE-PS30W
power supply A
(For 100 to 120V region)</td><td>TE-PSE30
power supply A
(For 230V region)</td></tr>
<tr><td colspan="2"> 
* Appearance of 100 to 120V and 230V is the same.</td></tr>
</table>

4.2.2 Power Supply Configuration

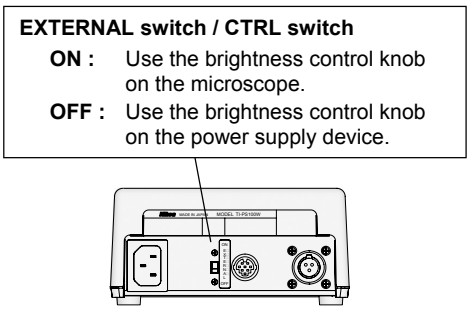


Figure 4.2-1 Power supply rear

You can control turning the diascopic lamp on and off and the brightness from the left control panel of the microscope or the remote control pad (for TI-PS100W) by setting the EXTERNAL switch (or CTRL switch) on the back of the power supply.

Set the EXTERNAL (CTRL) switch to “ON” to operate from the microscope or remote control pad, and to “OFF” to enable the brightness control knob on the power supply.

The readings on the microscope and power supply brightness control knobs may differ from the actual brightness.

4.2.3 Operating the Dia Illumination Lamp

(1) Turn the dia illumination lamp on or off

- **Operate using:** remote control pad / microscope main body / PC

Operation via the remote control pad

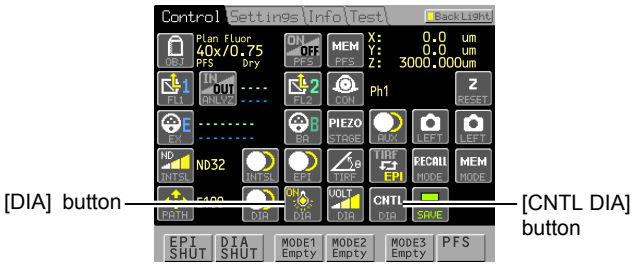


Figure 4.2-2 Turning the dia illumination lamp on and off

1. **Make sure that the EXTERNAL switch at the rear of the power supply is on.**

   See Section 4.2.2, “Power Supply Configuration.”
2. **From the [Control] screen, press the [DIA] button (DIA Remote) to enable diascopic lamp mode operation.**
3. **Each time you press the [DIA] button (DIA Lamp), the diascopic lamp toggles on and off.**

- If the EXTERNAL switch on the back of the power supply is on and remote operation is enabled, the lamp can be operated from the remote control pad.
- It is not possible to turn a 6V 30W lamp on or off from the remote control pad.

Operating from the microscope main body

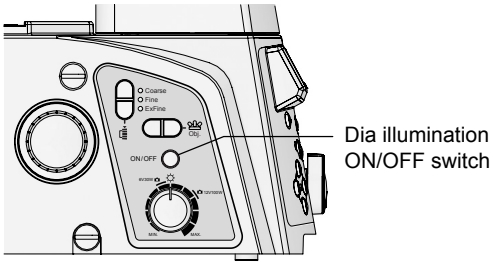


Figure 4.2-3 Turning the dia illumination lamp on and off

1. **Make sure that the EXTERNAL (CTRL) switch at the rear of the power supply is on.**

   See Section 4.2.2, “Power Supply Configuration.”
2. **Press the dia illumination lamp ON/OFF switch on the left side of the microscope.**

   Each time you press the switch, the diascopic lamp toggles on and off.

(2) Adjust the brightness by changing the lamp voltage

- **Operate using:** remote control pad / microscope main body / power supply / PC

Operation via the remote control pad

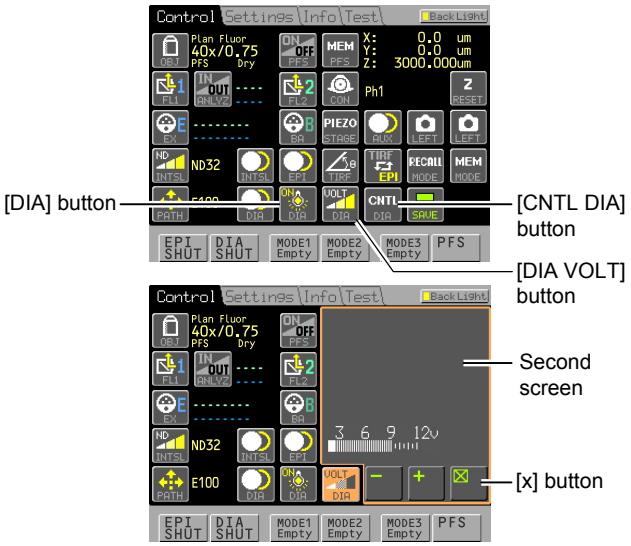


Figure 4.2-4 Changing the dia-illuminator lamp voltage

1. **Turn on the EXTERNAL switch on the back of the power supply.**

   See Section 4.2.2, “Power Supply Configuration.”
2. **From the [Control] screen, press the [CNTL DIA] button (DIA Remote) to enable diascopic lamp mode operation.**
3. **Press the [DIA VOLT] button to open the second screen, then press the [+] and [-] buttons to adjust the brightness of the diascopic lamp.**

   The lamp voltage appears as an indicator gage.
4. **Press the [x] button to close the second screen.**

- Changing the lamp voltage changes the brightness and hue of the lamp. Raising the voltage makes the lamp brighter with a stronger blue tint; lowering the voltage makes the lamp dimmer with a stronger red tint.
- The voltage should normally be kept in the range of 6V to 12V.

Changing to white light

When you are emphasizing color reproduction, set the lamp voltage to the same value of the rating of the lamp you are using (for the TI-PS100W, this is 12 V → “12”), and insert an NCB11 filter into the optical path. The light will be the most white in this state. Adjust the brightness via the ND filter of the dia-illuminator.

Operating from the microscope main body

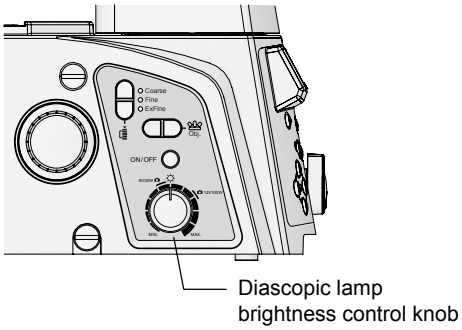


Figure 4.2-5 Diascopic lamp brightness control knob

1. **Turn on the EXTERNAL (CTRL) switch on the back of the power supply.**

   See Section 4.2.2, “Power Supply Configuration.”
2. **Turn the diascopic lamp brightness control knob on the left side of the microscope.**

Changing to white light

When you are emphasizing color reproduction, set the dimming dial to 6V 30W or 12V 100W in accordance with the diascopic lamp you are using, and insert an NCB11 filter into the optical path. The light will be the most white in this state. Adjust the brightness via the ND filter of the dia-illuminator.

Operating from the power supply

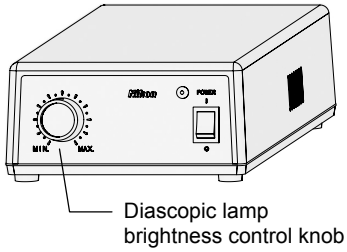


Fig 4.2-6 Diascopic lamp brightness control knob

1. **Turn off the EXTERNAL (CTRL) switch on the back of the power supply.**

   See Section 4.2.2, “Power Supply Configuration.”
2. **Turn the diascopic lamp brightness control knobon the front of the power supply.**

- **It is not possible to simultaneously operate the brightness control knobs on the microscope and power supply. Use the EXTERNAL switch on the power supply to switch between which brightness control knob to activate.**
- **The readings on the remote control pad, brightness control knob on the power supply, and brightness control knob on the microscope may differ from the actual brightness.**

4.2.4 Adjusting the Brightness with ND Filters

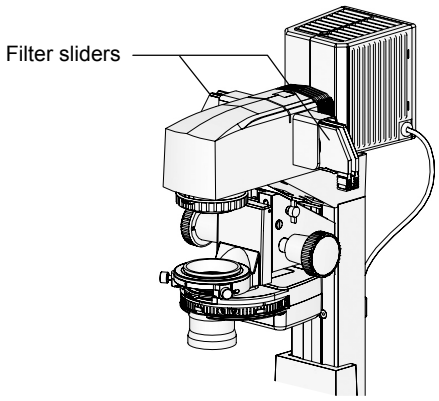


Figure 4.2-7 Adjusting the brightness with ND filters

Dimming filters that reduce the amount of light passed are called ND (neutral density) filters.

The higher the ND filter number, the less light passes through, and the darker the image. ND filters are used to adjust the brightness when color fidelity is critical (for example, when photographing via the microscope) because they do not affect the color cast.

To use ND filters, insert them into the filter slider of the dia-illuminator.

- **ND2 :** Reduces the light intensity to 1/2. (50% transmittance)
- **ND4 :** Reduces the light intensity to 1/4. (25 % transmittance)
- **ND8 :** Reduces the light intensity to 1/8. (12.5 % transmittance)
- **ND16 :** Reduces the light intensity to 1/16. (6.3 % transmittance)

4.3 Using the Controls Panels on the Main Body

The Ti-E / Ti-E/B main body has control panels on the front, left, and right sides. The switches and buttons on these control panels can be used to electronically control each part.

4.3.1 Front Control Panel

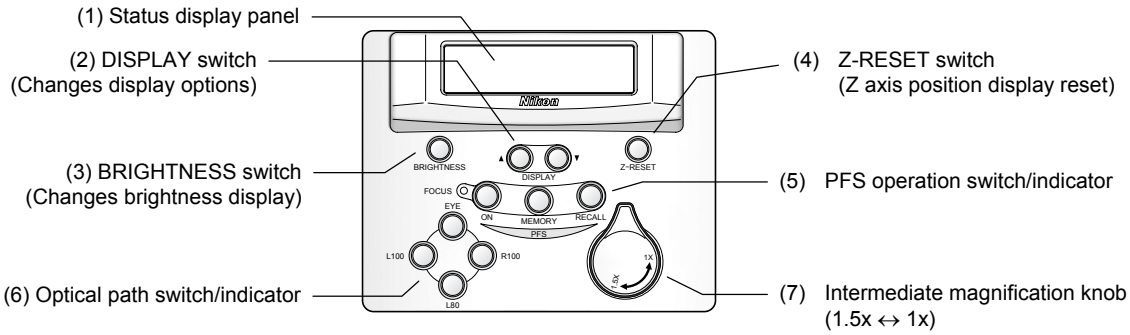


Figure 4.3-1 Front operation panel

(1) Status display panel

Displays the microscope status. There are several display patterns; select the one that is easiest for you to use. The default pattern is shown after the microscope is power-cycled. (See the next page.)

(2) DISPLAY buttons

Use the up and down buttons (▲/▼) to switch the contents of the status display panel. Multiple display patterns are available. (See the next page.)

(3) BRIGHTNESS button

This switch adjusts the brightness of the status display panel and main unit indicators (LEDs), and switches them off. Use this switch to extinguish the indicators when you are performing fluorescent or other microscopy in a dark room, and don't want to leave any light. Pressing the button alternates between [panel visible, LEDs on] → [panel dimmed, LEDs dimmed] → [panel hidden, LEDs off].

(4) Z-RESET button

This button resets the Z-axis position display on the status display panel to zero. Set the Z-axis position display to a positive value to move the nosepiece upward, and to a negative value to move it downward. You can focus on an arbitrary position and reset the Z-axis position display to that position in order to use it as the standard position.

* The Z-axis position display on the remote control pad is not reset.

(5) PFS control buttons/indicators

These controls are for maintaining the focus of observation using the Perfect Focus System (PFS).

FOCUS indicator: This displays whether focus is sustainable. This flashes when the objective is in the focal range. When the focus reaches the standard position, it becomes solidly lit.

ON button: Toggles the focal maintenance (PFS control) on and off. The switch is lit when PFS is on.

MEMORY button: Stores an offset from the standard position to an arbitrary focal point. The switch is lit when there is an offset registered.

RECALL button: Restores an offset.

For the operating procedure for PFS observation, see the Ti-E / Ti-E/B series instruction manual or the instruction manual of the TI-RCP remote control pad.

(6) Optical path switch/indicator

Selects the optical image output port. The switch of the selected port lights. See Section 4.4, “Changing Optical Paths,” for details.

(7) Intermediate magnification knob

This inserts and removes lenses in the microscope, switching the microscope’s magnification between 1x (same magnification as objective) and 1.5x (1.5x magnification of objective). The setting of the intermediate magnification selector knob is valid for all optical image output ports.

Display patterns of the status display panel

You can select one of the following 11 display patterns for the status display panel by pressing the DISPLAY button. The items displayed vary for each screen; switch to the appropriate screen as necessary.

Pattern	Display Item	Example
A	**Upper:** Z-axis position (in microns) **Lower:** Output port selection, switch focusing knob resolution	Z: -123.456um E100 Coarse
B	**Upper:** Objective status (1) **Lower:** Output port selection, switch focusing knob resolution, PFS status	P Fluor 100x/1.30 E100 Coarse PFS:Off
C	**Upper:** Objective status (2), Z-axis position (in microns) **Lower:** Output port selection, switch focusing knob resolution, PFS status	PF100x Z: 124.370um E100 Coarse PFS:Off
D	**Upper:** Z-axis position (in microns) **Lower:** Output port selection, switch focusing knob resolution	PF100x Z: 124.370um E100 Coarse PFS:Off
E	**Upper:** Objective status (2), filter block second-tier status **Lower:** Output port selection, switch focusing knob resolution, filter block status	PF100x TxRed-2 E100 Coarse UV-2A
F	**Upper:** Objective status (2), Stage X position **Lower:** Output port selection, Stage Y position	PF100x X: 12345.6um E100 Y: 12345.6um
G	**Upper:** Objective status (2), EPI shutter status **Lower:** Output port selection, switch focusing knob resolution, filter block status	PF100x EPI:O E100 Coarse UV-2A
H	**Upper:** Objective status (2), filter block status, EPI shutter status **Lower:** Excitation filter – Barrier filter	PF100x UV-2A EPI:O EX330-380 BA420
I	**Upper:** Objective status (2), Z-axis position (in microns) **Lower:** PFS status, filter block status, EPI shutter status	PF100x Z: -123.450um PFS:OFF UV-2A EPI:O
J	**Upper:** Objective status (2), Fiber-optic light source ND value/shutter status **Lower:** Output port selection, switch focusing knob resolution, filter block status	PF100x ND32/O E100 Coarse UV-2A
K	**Upper:** Objective status (2), filter block status, Fiber-optic light source ND value/shutter status **Lower:** Excitation filter, Barrier filter	PF100x UV-2A ND32/O EX330-380 BA420
L	**Upper:** Objective status (2), Z-axis position (in microns) **Lower:** PFS status, filter block status, Fiber-optic light source ND value/shutter status	PF100x Z: -123.450um PFS:OFF UV-2A ND32/O

When a motorized device is not connected, the display area of the device is left blank on the status display panel. When information such as the objective is not set, the display area is also left blank.

Display details

Objective status (1) [Objective name, zoom, NA]	000x/0.00	Blank	: Achromat
	Apo TIRF 000x/0.00	Apo TIRF	: Apo TIRF
	Plan 000x/0.00	Plan	: Plan
	P Apo 000x/0.00	P Apo	: Plan Apo
	P Apo TIRF 000x/0.00	P Apo TIRF	: Plan Apo TIRF
	P Apo VC 000x/0.00	P Apo VC	: Plan Apo VC
	P Fluor 000x/0.00	P Fluor	: Plan Fluor
	Plan UW 000x/0.00	Plan UW	: Plan UW
	S Fluor 000x/0.00	S Fluor	: S Fluor
	S P Fluor 000x/0.00	S P Fluor	: S P Fluor
	HMC 000x/0.00	HMC	: HMC
	Other 000x/0.00	Other	: Others
Objective status (2) [Objective name, zoom]	000x	Blank	: Achromat
	A 000x	A	: Apo TIRF
	P 000x	P	: Plan
	PA000x	PA	: Plan Apo (TIRF/VC)
	PT000x	PT	: Plan Apo TIRF
	PV000x	PV	: Plan Apo VC
	PF000x	PF	: Plan Fluor
	P 000x	P	: Plan UW
	SF000x	SF	: S Fluor
	SP000x	SP	: S P Fluor
	HM000x	HM	: HMC
	OT000x	OT	: Others
Output port status	E100	Microscopy port 100%	
	L80	Left port 80%, microscopy port 20%	
	L100	Left port 100%	
	R80	Right port 80%, microscopy port 20%	
	R100	Right port 100%	
	B100	Bottom port 100%	
Z-axis position	Z: 0000.000um	Positive: Number equals the amount objective rises	
	Z:-0000.000um	Negative: Number equals the amount objective lowers	
Switch focusing knob resolution	Coarse		
	Fine		
	ExFine		
PFS status	PFS:On	PFS on	
	PFS:Off	PFS off	
	PFS:Out	No diachroic mirror in optical path	
	PFS:DIS	Outside PFS range	
	PFS:ERn	Error (See Chapter 7, “Troubleshooting.”)	
Filter block status	XXXXX	Name of filter block in motorized FL turret (first tier) optical path	
Filtyer block second tier status	XXXXX	Name of filter block in motorized FL turret (first tier) optical path	
Stage X/Y position	X: 00000.0um	Motorized stage X coordinate	
	Y: 00000.0um	Motorized stage Y coordinate	
EPI shutter status	EPI:O	EPI shutter open	
	EPI:C	EPI shutter closed	
Excitation filter	EX000-000	Excitation filter name	
Barrier filter	BA000-000	Barrier filter name	
Fiber-optic light source ND value/shutter status	ND00/O	ND value/shutter open	
	ND00/C	ND value/shutter closed	

4.3.2 Left Control Panel

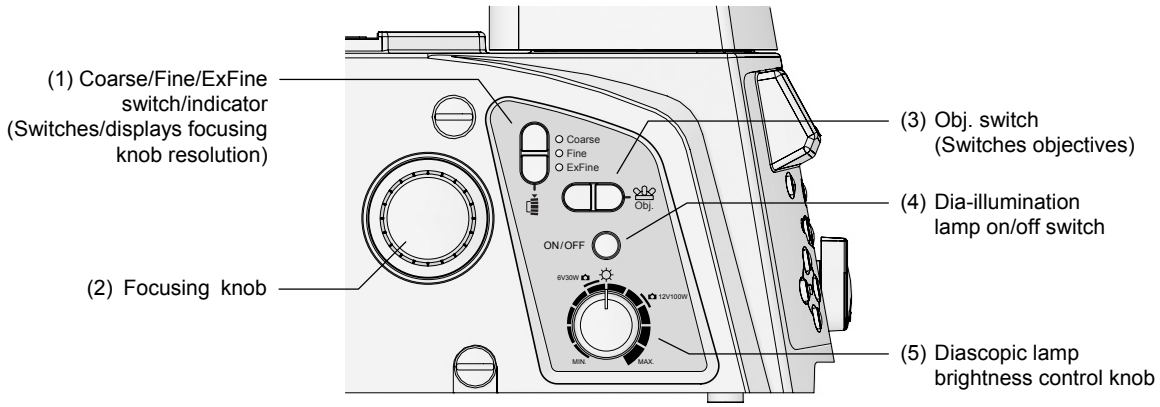


Figure 4.3-2 Left control panel

(1) Coarse/Fine/ExFine switch/indicator (switches displays focusing knob resolution)

This switches the vertical drive resolution of the nosepiece when the focusing knobs on the left and right sides are operated. Pressing the top switch cycles the resolution between ExFine (extra fine), Fine, and Coarse, in that order; pressing the bottom switch cycles it in the opposite order.

The drive resolution selection is displayed on the switch indicator and the status display panel.

See Section 4.13, “Using the Focusing Module,” for details.

(2) Focusing knob

This knob adjusts the focus by moving the nosepiece up and down. Rotate the knob counter-clockwise (as seen from left of microscope) to move it upward, and clockwise to move it downward.

(3) Obj. switch (switches objectives)

Rotates the PFS motorized nosepiece or motorized DIC 6 nosepiece to switch the objective in the optical path. Press the switch back to rotate the nosepiece clockwise, and forward to rotate it counter-clockwise.

(4) Dia-illumination lamp on/off switch

This turns the dia-illumination lamp on and off. Depress the button to turn on the diascopic lamp. Press it again to turn it off.

See Section 4.2.3, “Operating the Dia Illumination Lamp,” for details.

(5) Diascopic lamp brightness control knob

Adjusts the lamp brightness by adjusting the voltage applied to the diascopic lamp. Raising the voltage makes the lamp brighter with a stronger blue tint; lowering the voltage makes the lamp dimmer with a stronger red tint.

When you are emphasizing color reproduction, set the position to 6V 30W or 12V 100W in accordance with the diascopic lamp you are using, and insert an NCB11 filter into the optical path.

See Section 4.2.3, “Operating the Dia Illumination Lamp,” for details.

4.3.3 Right Control Panel

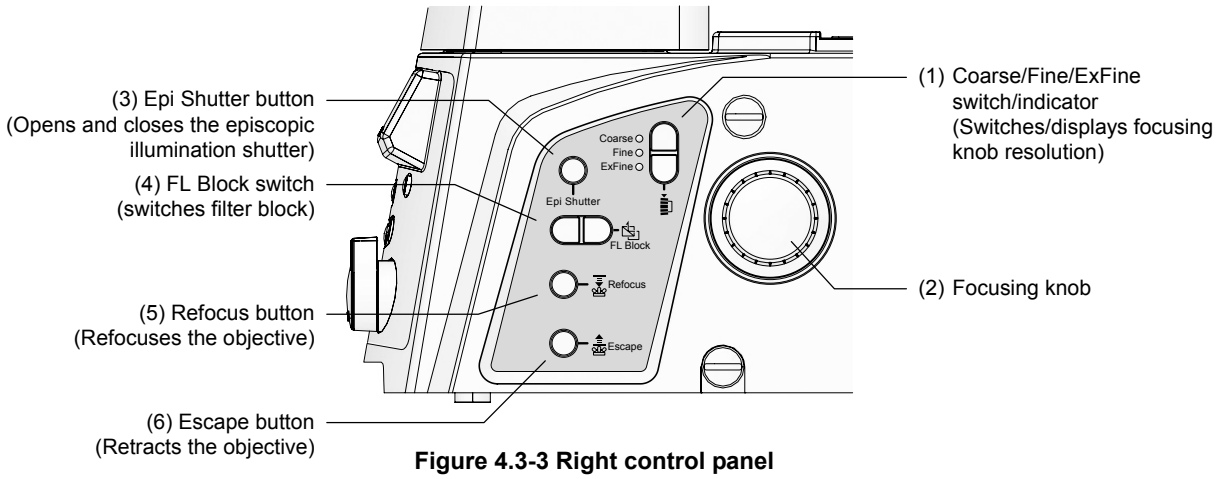


Figure 4.3-3 Right control panel

(1) Coarse/Fine/ExFine switch/indicator (switches displays focusing knob resolution)

This switches the vertical drive resolution of the nosepiece when the focusing knobs on the left and right sides are operated. Pressing the top switch cycles the resolution between ExFine (extra fine), Fine, and Coarse, in that order; pressing the bottom switch cycles it in the opposite order.

The drive resolution selection is displayed on the switch indicator and the status display panel.

See Section 4.13, “Using the Focusing Module,” for details.

(2) Focusing knob

This knob adjusts the focus by moving the nosepiece up and down. Rotate the knob clockwise (as seen from right of microscope) to move it downward, and counter-clockwise to move it upward.

(3) Epi Shutter switch (open/close the episcopic shutter)

This switch opens and closes the motorized shutter of the episcopic (reflected) illumination.

(4) FL Block switch (filter block switch)

This rotates the motorized FL turret to switch the filter block in the optical path.

(5) Refocus button (refocuses the objective)

Returns the position of an objective retracted via the Escape switch to the position it had immediately prior to retraction.

See Section 4.13, “Using the Focusing Module,” for details.

(6) Escape button (retracts the objective)

Use this to move an objective to the retract position (1.5 mm below the standard position).

See Section 4.13, “Using the Focusing Module,” for details.

4.4 Changing Optical Paths

- **Operate using:** remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad

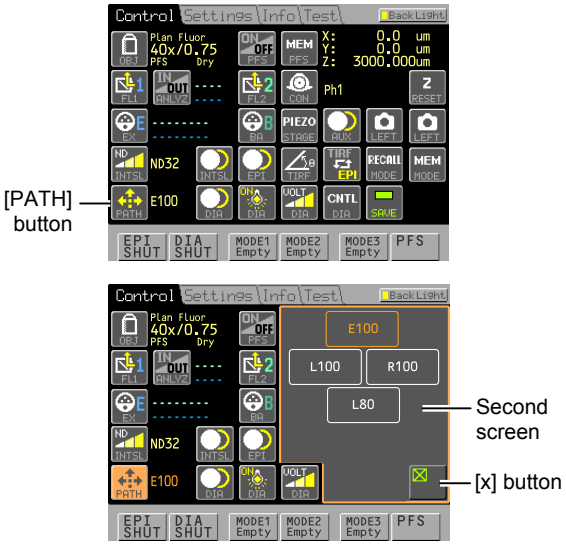


Figure 4.4-1 Changing optical paths

1. **On the [Control] screen, press the [PATH] button (Optical Path) to open the second screen, then press the desired optical path display to select the optical path.**

For Ti-E

	Button	Light distribution
(1)	E100	Eyepiece observation port 100%
(2)	L100	Left side port 100%
(3)	R100	Right side port 100%
(4)	L80	Left side port 80%, eyepiece observation port 20%

* (3) or (4) may be set to R80 (right side port 80%, eyepiece observation port 20%) depending on your purchased configuration.

For Ti-E/B

	Button	Light distribution
(1)	E100	Eyepiece observation port 100%
(2)	L100	Left side port 100%
(3)	R100	Right side port 100%
(4)	B100	Bottom port 100%

* (3) may be set to R80 (right side port 80%, eyepiece observation port 20%) or L80 (left side port 80%, eyepiece observation port 20%), depending on your purchased configuration.

2. **Press the [x] button to close the second screen.**

Operating from the ergo controller

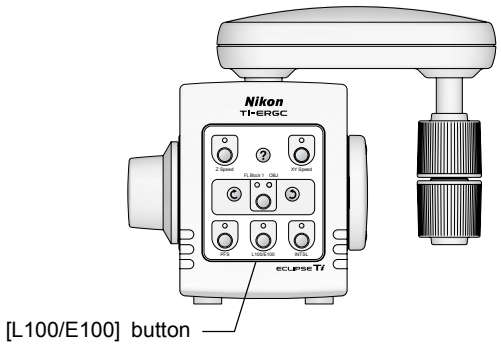


Figure 4.4-2 Changing optical paths

Press the [L100/E100] button to switch optical paths.

- **LED On:** Left port 100% (L100)
- **LED Flashing:** Microscopy port 100% (E100)

- The [L100/E100] button is set as default. You can change the setting to another button, or change the switch destination to another port. For more information on performing setup, see Section 4.23, “Using the Ergo Controller.”
- If the LED is off, it means that an optical path other than L100 or E100 is selected.

Operating from the microscope main body

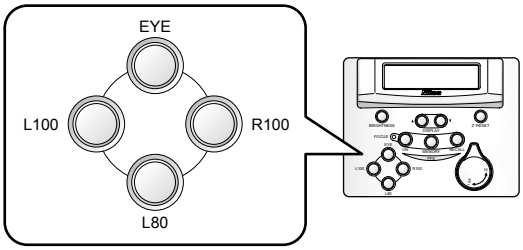


Figure 4.4-3 Ti-E optical path selector switches

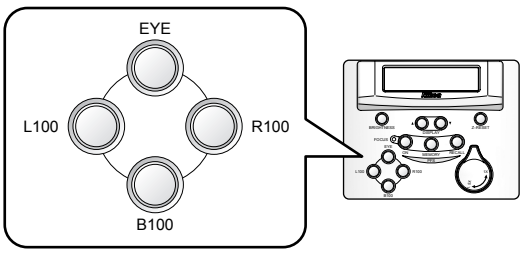


Figure 4.4-4 Ti-E/B optical path selector switches

Press the optical path switches on the front control panel to select the desired optical path. The selected port button lights, and the port name appears on the status display panel.

For Ti-E

	Switch	Light distribution
(1)	EYE	Eyepiece observation port 100%
(2)	L100	Left side port 100%
(3)	R100	Right side port 100%
(4)	L80	Left side port 80%, eyepiece observation port 20%

* (3) or (4) may be set to R80 (right side port 80%, eyepiece observation port 20%) depending on your purchased configuration.

For Ti-E/B

	Switch	Light distribution
(1)	EYE	Eyepiece observation port 100%
(2)	L100	Left side port 100%
(3)	R100	Right side port 100%
(4)	B100	Bottom port 100%

* (3) may be set to R80 (right side port 80%, eyepiece observation port 20%) or L80 (left side port 80%, eyepiece observation port 20%), depending on your purchased configuration.

4.5 Using Filters

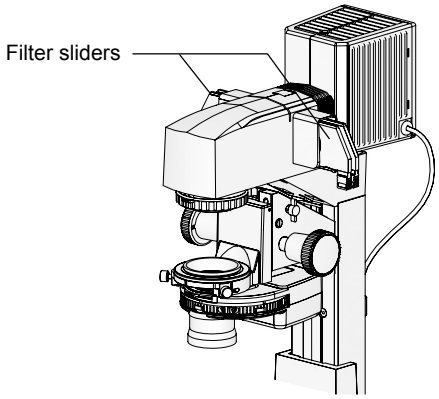


Figure 4.5-1 Filter slider (dia pillar illuminator 100W)

You can attach four filter sliders to the dia pillar illuminator 100W, and three to the dia pillar illuminator 30W.

Insert the desired filters for your purpose into the filter slider.

The available filters are described below.

Table List of Filters

Filter	Description
ND2	A neutral density (ND) filter for adjusting brightness for general microscopy and image capture. Dims the quantity of light to 1/2 (penetration: about 50%)
ND4	A neutral density (ND) filter for adjusting brightness for general microscopy and image capture. Dims the quantity of light to 1/4 (penetration: about 25%)
ND8	A neutral density (ND) filter for adjusting brightness for general microscopy and image capture. Dims the quantity of light to 1/8 (penetration: about 12.5%)
ND16	A neutral density (ND) filter for adjusting brightness for general microscopy and image capture. Dims the quantity of light to 1/16 (penetration: about 6.3%)
NCB11	A neutral color balance (NCB11) filter for general microscopy and color TV camera photography. Color reproduction is best when this filter is inserted into the optical path, and the lamp voltage is set to the same display as the lamp rating. Remove from optical path when performing monochrome imaging.
GIF	This is a green interference (GIF) filter. This improves the contrast for single-color microscopy and monochrome imaging.
D	This is a diffusion (D) filter. This is a frosted-glass filter for diffusing light. Use it to create uniform illumination.
HA	This is a heat barrier (HA) filter for absorbing heat contained in illumination. It reduces the impact of heat on the specimen. Although the dia-illuminator has a built-in heat filter, use this filter in combination for specimens that are particularly susceptible to heat.
IR	This is an infrared (IR) blocking filter for PFS. Use this to use the PFS feature when dia-illumination is on.

4.6 Using the Field Diaphragm

(TI-DH dia pillar illuminator 100W only)

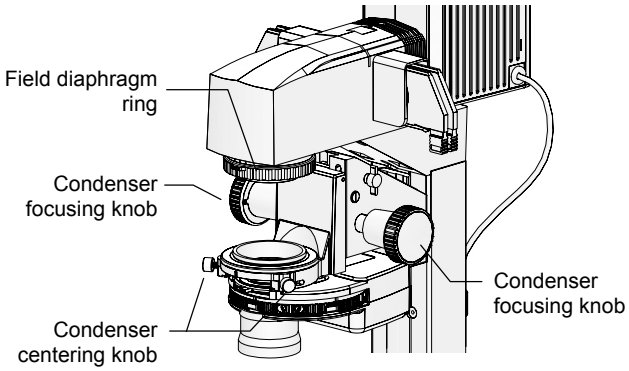


Figure 4.6-1 Field diaphragm ring

The field diaphragm restricts the field of view of the microscope to the illumination range of the illumination.

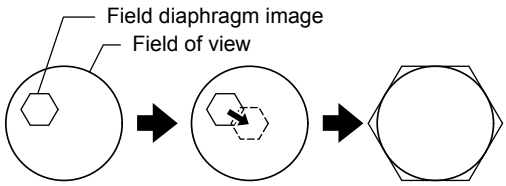
Rotating the field diaphragm counter-clockwise (as seen from above) widens the aperture diameter; rotating it clockwise narrows the aperture diameter.

Normally, microscopy is conducted with the illumination narrowed to about the outer edge (or inner edge) of the field of view. If the radius of illumination is wider than necessary, peripheral stray light will become mixed with the illumination, causing flares and reducing the contrast of the optical image.

It is particularly important to narrow the field of view when photographing optical images. Good results can generally be obtained by narrowing the field of view to slightly wider than the size of the imaging element (frame showing the imaging range). If you narrow it too closely to the imaging radius, part of the periphery of the image could be cut off, so this should be avoided.

> The size of the field diaphragm of the TI-DS dia pillar illuminator 30W is fixed. The size cannot be adjusted.

Adjusting the field diaphragm



Move the field diaphragm image to the center of the field of view and resize the field diaphragm image to a size same as the field of view.

Figure 4.6-2 Field diaphragm adjustment

1. **Insert a 10x objective into the optical path.**
2. **Turn the field diaphragm dial of the dia pillar illuminator until the field diaphragm image is visible in the field of view, then tighten the field diaphragm.**
3. **Rotate the condenser focusing knobs on the dia pillar illuminator, and bring the field diaphragm image into focus.**
4. **Rotate the condenser centering knob on the dia pillar illuminator, and bring the field diaphragm image into the center of the field of view.**
5. **Insert a 40x objective into the optical path.**
6. **Turn the field diaphragm dial of the dia pillar illuminator until the field diaphragm image is nearly the same size as the field of view.**
7. **Rotate the condenser centering knob on the dia pillar illuminator, and bring the field diaphragm image into the center of the field of view.**

4.7 Using the Aperture Diaphragm

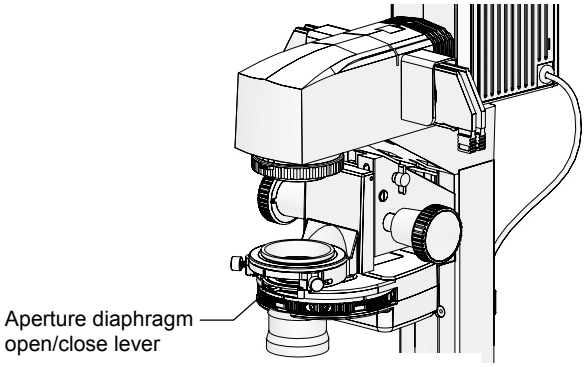
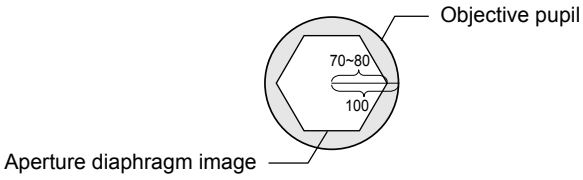


Figure 4.7-1 Aperture diaphragm lever



Adjust the aperture diaphragm to a size of 70% to 80% of the objective pupil.

Figure 4.7-2 Aperture diaphragm adjustment

The aperture diaphragm is used to adjust the number of illumination apertures.

Adjusting the size of the aperture diaphragm changes the resolution, brightness, contrast, and focal depth of the microscope image. Narrowing the aperture diaphragm reduces the resolution and brightness, and increases the contrast and focal depth. These are linked, and cannot be adjusted independently. You must adjust the size of the aperture diaphragm according to the specimen and your purpose.

It is particularly important to adjust the aperture diaphragm when performing bright-field microscopy, DIC microscopy, and image capture using a camera. Narrowing the number of objective apertures to 70-80% generally enables the capture of a good image with appropriate contrast.

You should adjust the size of the aperture diaphragm while actually viewing the image. Rotating the aperture diaphragm lever to the left reduces the radius of the diaphragm, while rotating it to the right increases it. Adjust the size of the aperture diaphragm to 70-80% of the size of the objective pupil.

Using the Bertrand lens in/out lever

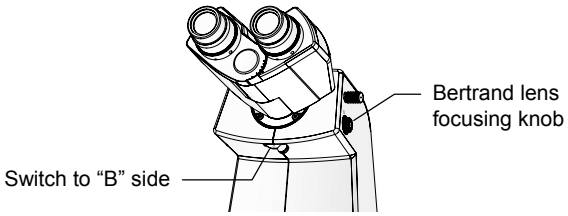


Figure 4.7-3 Adjustment using the Bertrand lens

Perform adjustments using the Bertrand lens inbuilt into the eyepiece tube when using the TI-TD B eyepiece tube or TI-TERG tilting eyepiece tube.

Flip the Bertrand lens in/out lever on the lower front of the eyepiece tube to “B” to insert the Bertrand lens into the optical path. If you turn the Bertrand lens focusing knob on the right-hand side in this state and focus, you can see the pupil of the objective (bright circle) and the aperture diaphragm image.

Adjustment using the centering telescope

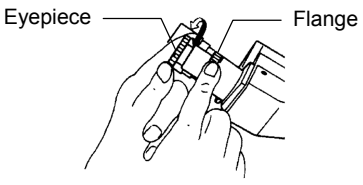


Figure 4.7-4 Adjustment using the centering telescope

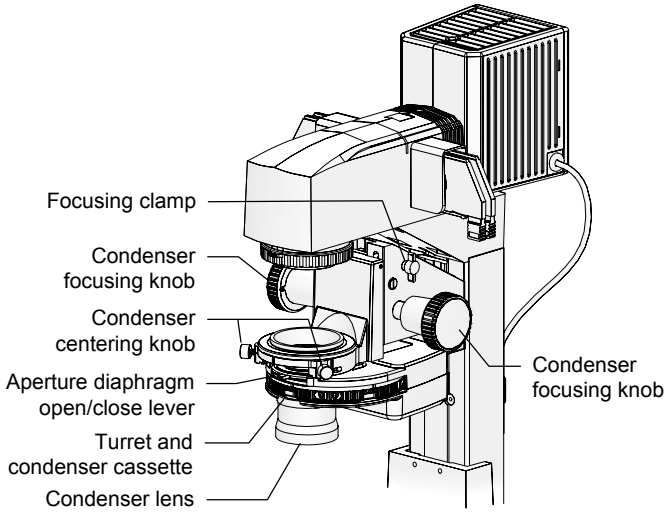
For the TI-TS B eyepiece tube, perform adjustment using the centering telescope.

Remove one eyepiece from the binocular eyepiece tube, and attach the centering telescope (sold separately) via an adapter. Rotate the eyepiece of the centering telescope to bring it into focus. The objective pupil (or circle) and aperture diaphragm image will be visible.

Notes on condensers and aperture diaphragms

- When performing Ph microscopy via a TI-C condenser turret, be sure to open the aperture diaphragm all the way. Leaving the diaphragm closed will block the optical path.
- The ELWD-S condenser aperture diaphragm is for the field of view optical path only. The phase-contrast annular diaphragm is independent, so changing the size of the diaphragm will not affect the ring.

4.8 Using the Motorized Condenser Turret



* The motorized condenser cable is on the left side

Figure 4.8-1 TI-CT-E Motorized condenser turret (system condenser)

The condenser serves two purposes: first, it collects light for diascopic illumination, and second, it optically modulates the collected light to permit various types of microscopy.

With conventional microscopes, it was necessary to replace the condenser according to the type of microscopy. For example, a phase contrast (Ph) condenser is required for Ph microscopy and a DIC condenser is required for DIC microscopy.

The system condenser stores optical elements in condenser cassettes. Up to five of these can be inserted into the condenser turret, making it possible to easily switch microscopy methods simply by rotating the turret.

Modules can be arranged as desired in the turret if they are applicable to the currently used condenser lens (six types of condenser lenses are available). It is also possible to switch condenser cassettes even with the condenser attached to the microscope, making it possible to conduct any number of types of microscopy in a short amount of time.

Performing Ph microscopy

When performing Ph microscopy, be sure to move the condenser cassette with the same Ph code as that of the objective and external phase-contrast ring into the optical path and center the annular diaphragm before starting. When doing this, be sure to open the aperture diaphragm all the way. If the diaphragm is closed, the optical path will be blocked.

4.8.1 Changing Condenser Cassettes

- **Operate using:** remote control pad, ergo controller, PC

Operation via the remote control pad

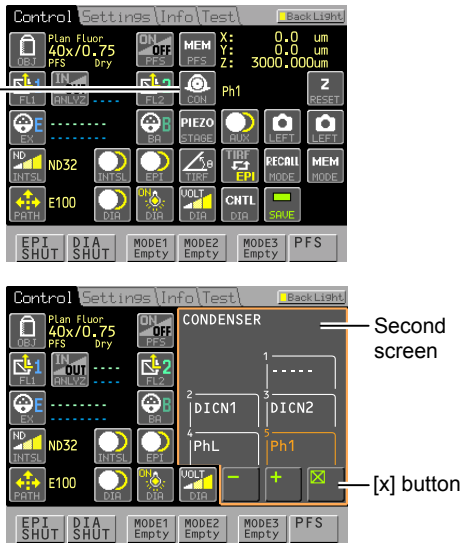


Figure 4.8-2 Switching condenser cassettes

1. **On the [Control] screen, press the [CON] button (Condenser cassette), open the second screen, and select the condenser cassette in the Condenser cassette window.**
   - \+ Rotate the nosepiece clockwise.
   - \- Rotate the nosepiece counterclockwise.
   - 1-5 Select an address directly.
2. **Press the [x] button to close the second screen.**

You must configure the pad in order to display the information for the condenser cassette assigned to each address in the Condenser cassette window.

Operating via the ergo controller

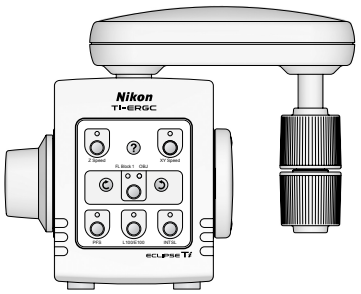


Figure 4.8-3 Ergo controller

Operation via the ergo controller is not enabled by default. See Section 4.23, “Using the Ergo Controller,” for instructions on setting up the ergo controller to operate the motorized condenser turret.

4.8.2 Comparison of Condenser Lenses

The following two types of condenser lens can be mounted on the TI-CT-E condenser turret:

Table Comparison of condenser lenses

	LWD condenser lens	CLWD condenser lens	ELWD condenser lens
NA	0.52	0.72	0.3
Working distance	30 mm	13 mm	75 mm
Supported microscopy methods	Bright-field, phase contrast, DIC	Bright-field, phase contrast	Bright-field, phase contrast
Supported condenser cassettes	Bright-field: A Phase contrast: PhL, Ph1, Ph2, Ph3 DIC: DIC L, DIC M, DIC H HMC: MC1, MC2, MC3	Bright-field: A Phase contrast: Ph1, Ph2, Ph3, Ph4	Bright-field: A Phase contrast: PhL, Ph1, Ph2
Remarks	Supporting condenser refocus clamp	Requires TI-DF condenser adapter.	

* Condenser lenses of HMC, oil immersion type for dark-field, and dry type for dark-field are available.

4.9 Operating the Eyepiece Tube

4.9.1 Adjusting the Diopter

Adjusting the diopter corrects the dioptric difference between the left and right eyes of the observer, facilitating observation with both eyes. Additionally, this adjustment maintains an appropriate tube length to allow objectives to deliver maximum performance while reducing the defocusing normally experienced when objectives are changed.

Perform the following procedure to adjust the diopter:

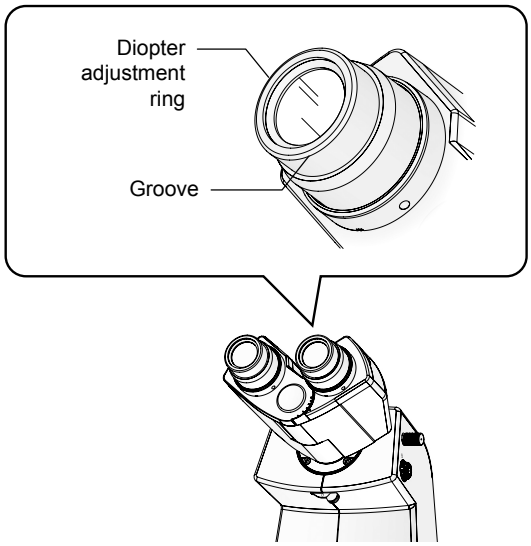


Figure 4.9-1 Adjusting the diopter

1. **Adjust the focus of the 10x objective onto the specimen under the bright-field microscopy settings.**
2. **For right and left eyepieces, rotate the diopter adjustment rings on the eyepieces so that their bottom edges are adjusted to the groove lines on the eyepieces.**

   This is the zero position for diopter adjustment.
3. **Place the 40x objective into the optical path.**
4. **Look into the left eyepiece with your left eye and focus on the specimen with the focus knob on the microscope body.**
5. **Place the 10x objective into the optical path.**
6. **Look into the left eyepiece with your left eye and focus on the specimen with the diopter adjustment ring on the left eyepiece.**

   Do not touch the focus knob on the microscope body in this step.
7. **Repeat steps 3 to 6 two times.**
8. **Adjust the right eyepiece.**

   Perform steps 2 to 7 for the right eyepiece interpreting “left” as “right.”

4.9.2 Adjusting the Interpupillary Distance

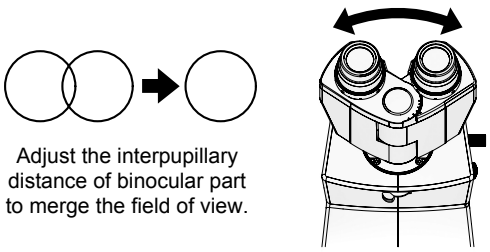


Figure 4.9-2 Interpupillary distance adjustment

Adjusting the distance between the eyepieces refers to adjusting the distance between the eyepieces to match the distance between the eyes of the observer. This adjustment facilitates observation with both eyes.

After the diopter adjustment is complete, place a 10x objective in the optical path, and bring the specimen into focus. At this time, look through the eyepieces with both eyes, and adjust the space between the eyepieces so that a single field of view is visible.

The binocular eyepiece tube has a measure showing the distance between eyepieces. Remembering your own distance will enable you to easily adjust the distance the next time you use the microscope.

4.9.3 Using the Eyepiece Tube Shutter

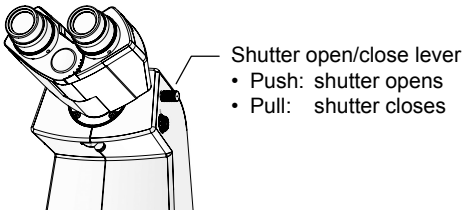


Figure 4.9-3 Shutter open/close lever

A manual shutter is built in the TI-TD B eyepiece tube and the TI-TERG ergonomic eyepiece tube.

To place the shutter into the optical path and close the optical path, pull the shutter open/close lever on the right side. To remove the shutter and open the optical path, push in the lever fully.

* Note that the TI-TS B eyepiece tube does not have a shutter.

4.9.4 Using the Bertrand Lens

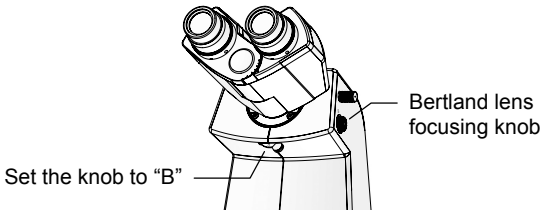


Figure 4.9-4 Bertrand lens operation

A Bertrand lens is built in the TI-TD B eyepiece tube and the TI-TERG ergonomic eyepiece tube.

Move the Bertrand lens into the optical path by rotating the Bertrand lens in/out lever at the lower front of the eyepiece tube to “B”. Rotate the Bertrand lens focusing knob on the right to adjust the focus. This will allow you to view the objective pupil (a bright circle) and the aperture diaphragm image.

Position	Optical element	Remarks
O	Opening	Select this position to observe the image with the binocular part.
B	Bertrand lens	Select this option to observe the objective pupil. Focus on the pupil with the focusing knob. This position is used to adjust the aperture diaphragm or center the diaphragm for phase contrast microscopy. When a manipulator is attached, the tip of the manipulator can be observed with this position.

* The TI-TS B eyepiece tube has no Bertrand lens.

4.10 Using the Analyzer

If you attach an analyzer block to the motorized FL turret (first tier), you can insert the analyzer block into the optical path by following the steps below.

- **Operate using:** remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad

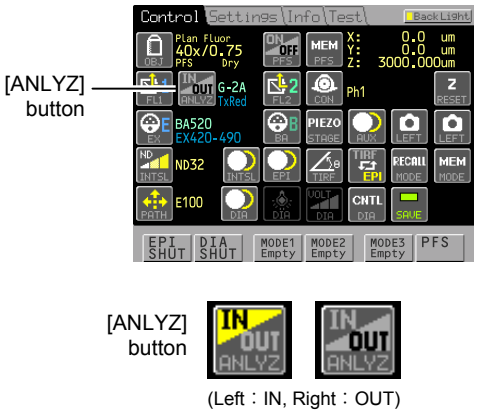


Figure 4.10-1 Inserting/removing analyzer blocks

1. **From the [Control] screen, press the [ANLYZ] button (Analyzer). Each press of the button switches the Analyzer block between IN and OUT.**

   When an analyzer block is in the optical path, the [IN] label of the [ANLYZ] button turns yellow.

   When the analyzer block is removed from the optical path, the filter block that was in the optical path immediately before the analyzer block was inserted will be inserted back into the optical path.

In order to operate the analyzer block, you must correctly attach the analyzer block to the motorized FL turret on first tier (the bottom level) and configure the analyzer block attachment in the setup procedure. See the instruction manual of the remote control pad for details.

Operating via the ergo controller

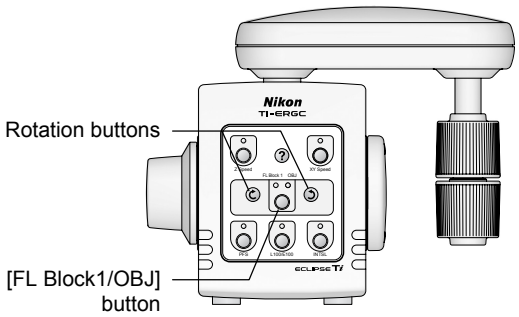


Figure 4.10-2 Inserting/removing analyzer blocks

1. **Press the [FL Block1/OBJ] button to turn on the FL Block 1 indicator.**
2. **Press the clockwise/counterclockwise rotation buttons to rotate the motorized FL turret (first tier), and set the analyzer block in the optical path.**

Operation via the microscope main body

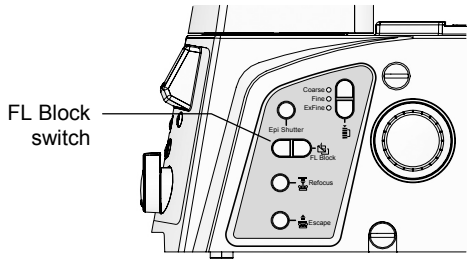


Figure 4.10-3 Right side of Ti-E

1. **Press the FL Block switch on the right side of the microscope, and insert the analyzer block into the optical path.**

4.11 Using the Motorized Nosepiece

You can switch the objectives attached to the motorized nosepiece. You can attach up to six objectives to the nosepiece.

- **Operate using:** Remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad

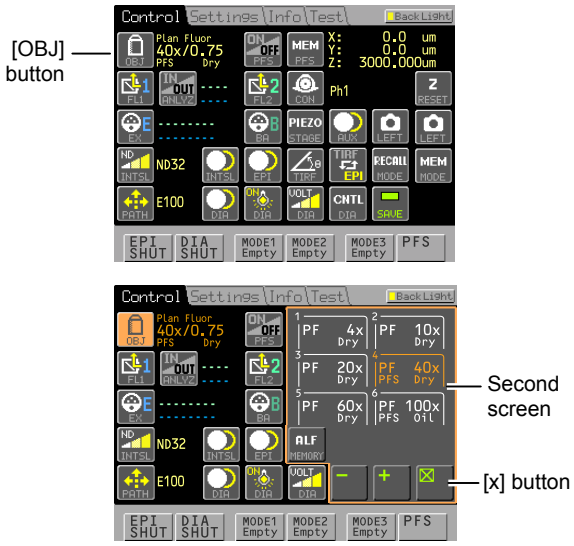


Figure 4.11-1 Switching objectives

1. **On the [Control] screen, press the [OBJ] button (Objective), open the second screen, and select the desired objective.**
   - \+ Rotate the nosepiece clockwise.
   - \- Rotate the nosepiece counterclockwise.
   - 1-5 Select an address directly.
2. **Press the [x] button to close the second screen.**

In order to correctly display the information about the objective mounted at each address, you must register the objective information during setup. See the instruction manual of the remote control pad for details.

Operating via the ergo controller

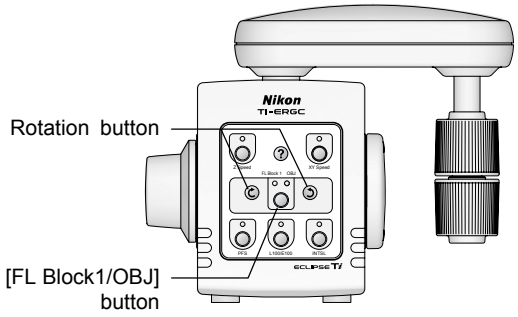


Figure 4.11-2 Switching objectives

1. **Press the [FL Block1/OBJ] button to turn on the OBJ indicator.**
2. **Press the clockwise/counterclockwise rotation buttons to rotate the motorized nosepiece and insert the desired objective into the optical path.**

Operation via the microscope main body

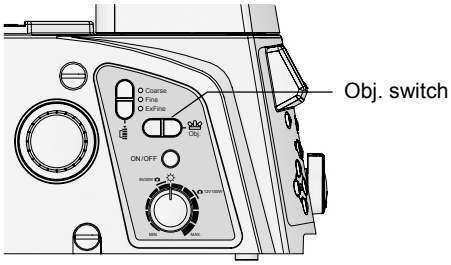


Figure 4.11-3 Switching objectives

1. **Operate the Obj. switch on the left side of the microscope to rotate the motorized nosepiece and switch objectives.**

   You can rotate the nosepiece clockwise or counterclockwise depending on the direction you operate the switch in.

4.12 Using Objectives

4.12.1 Phase Contrast Objectives

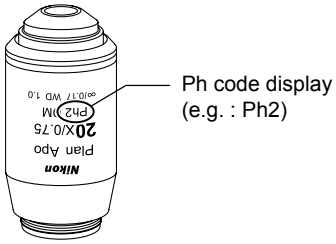


Figure 4.12-1 Example of phase-contrast objective

Objectives for phase contrast microscopy have “Ph” codes, which are one of the following: PhL, Ph1, Ph2, or Ph3. When performing phase contrast microscopy, use an annular diaphragm with the same Ph code as the objective, regardless of the magnification of the objective.

4.12.2 Cover Glass Thickness

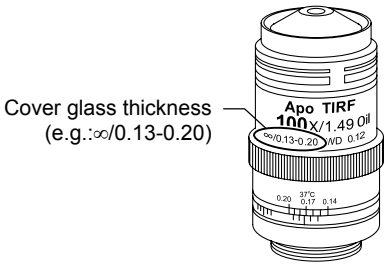


Figure 4.12-2 Example of cover glass thickness

The designated cover-glass thickness is engraved on the objective. For example, “∞/0.17” indicates a designated cover-glass thickness of 0.17 mm.

If you observe a specimen through glass that is outside the designated thickness (e.g. in a Petri dish) at high magnification, then we recommend using an objective with a correcting ring that can optically compensate for the glass thickness. (See 4.12.3.)

Glass thickness: 0.17 mm

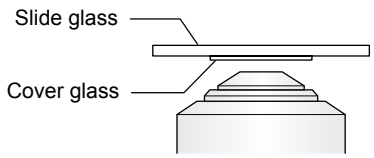


Figure 4.12-3 Glass thickness of 0.17 mm

If you use an objective engraved with “0.17”, the cover-glass thickness is 0.17 mm. Place the cover glass facing downward, and set the specimen so that the cover glass faces the objective.

Glass thickness: 1.2 mm

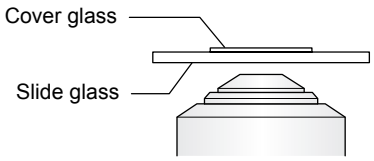


Figure 4.12-4 Glass thickness of 0.17 mm

If you use an objective engraved with “1.2”, then since ordinary slide glass is 1.2 mm thick, place the cover glass facing upward, and set the specimen so that the slide glass faces the objective.

4.12.3 Objectives with Correction Rings

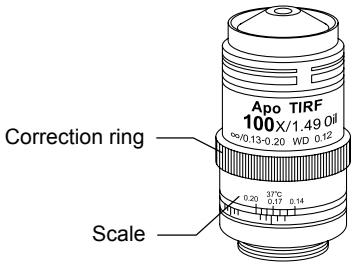


Figure 4.12-5 Example of objective with correction ring

When using an inverted microscope, you may sometimes observe specimens through the bottom plate (glass or plastic) of a Petri dish or a culture bottle. Since the thickness of the bottom plates of these containers vary, it is not possible to capture good images using ordinary objectives (for 0.17-mm thick glass bottoms), making it impossible to fully harness the microscope's capabilities.

In such a case, you can correct for the thickness of the container's bottom by using an objective with a correction ring.

Note that you cannot correct for differences in the thickness of the bottom (e.g. the borders of the container). Please use it on an area with uniform thickness.

Adjusting the correction ring

1. **Align the scale on the objective's correction ring to the thickness of the container bottom.**

   Either actually measure the thickness of the bottom, or refer to the reference value provided by the container manufacturer. If you have an acrylic double ring, using it will allow you to work more efficiently because the control area is visible from above the stage.
2. **Turn the focusing knob to bring the specimen into focus.**
3. **If the image has poor resolution or contrast, turn the correction ring on the objective slightly to the left or right.**

   The image will go slightly out of focus, so rotate the focusing knob to bring it back into focus.
4. **If the resolution and contrast of the image have improved, turn the correction ring slightly in the same direction, and refocus.**

   Conversely, if the resolution and contrast grow worse than before, rotate the correction lens in the opposite direction, about twice as much as you turned it the first time, then refocus.

   Continue turning the ring in the direction where the visibility improves, and away from the direction where the visibility worsens, in order to find the position where visibility is best.

- If you note the reading on the correction ring's scale in the most visible position, it will serve as a reference when using containers with bottoms of different thicknesses.
- Set the correction ring to the 0-mm position when observing a specimen with no cover glass, using an upright microscope.

4.12.4 Oil Immersion Objectives

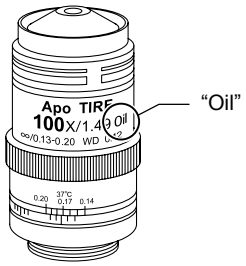


Figure 4.12-6 Example of oil immersion objective

Objectives labeled "Oil" are oil immersion objectives.

When you use an oil immersion objective, the space between the tip of the lens and the specimen is filled with oil (Nikon immersion oil). Use non-fluoroscopic oil when performing FL microscopy with oil immersion objectives for FL microscopy.

Oil immersion method

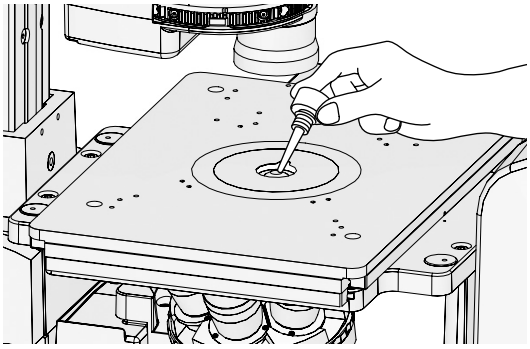


Figure 4.12-7 Performing oil immersion

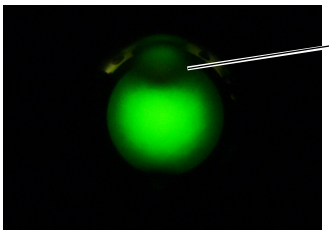
1. **Turn the focusing knob to lower the objective.**
2. **Making sure that no bubbles enter the oil, cover the tip of the objective with the minimum amount of oil required.**

   If you put too much oil on the lens, the excess oil could leak out, adhering to the stage or other components. Only use the minimum amount of oil necessary (enough to fill the gap between the objective tip and specimen), and be careful not to get oil on other components.
3. **Place a specimen on the stage.**
4. **Turn the focusing knob to slowly raise the objective, and inject oil into the gap between the objective and specimen.**
5. **Make sure not to get bubbles in the oil.**

   If bubbles get into the oil, it will degrade visibility. Check for bubbles following the steps outlined on the next page.

Checking for air bubbles

(1) When observing the pupil of the objective with the Bertrand lens



(2) From state above, field of view with focus of Bertrand lens changed:

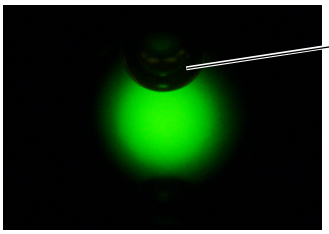


Figure 4.12-8 Example of observing air bubbles using the Bertrand lens

You can determine whether there are bubbles by observing the pupil surface of the objective. Flip the Bertrand lens in/out lever to “B” and adjust the focus using the Bertrand lens focusing knob, or remove an eyepiece and attach a centering telescope, then adjust the focus by rotating the eyepiece of the centering telescope. This will enable you to view the surface of the objective pupil.

If there are bubbles in the oil, rotate the nosepiece slightly, and move the objective immersed in oil back and forth once or twice to remove the bubbles. If the bubbles cannot be removed, wipe the oil off, then insert it again.

Wiping off the oil

When you are finished with microscopy, wipe the oil from the tip of the objective.

Wipe gently two or three times with a lens tissue containing petroleum benzene or a clean cloth to wipe off the oil. Wipe the surface clean, but do not use the tissue/cloth on the same place twice. When finished, clean with pure alcohol (ethyl or methyl alcohol).

If you cannot use petroleum benzene, use methyl alcohol instead. However, as the cleaning power of methyl alcohol is weak, it is necessary to repeat the wiping process several times (normally 3 to 4 times will suffice).

Be very careful not to damage the specimen when removing oil adhered to it.

Caution

- **If you fail to wipe the oil from the oil immersion objective, or coat the tip of a dry objective with oil, it will significantly lower the visibility of the image. After use, cleanly wipe off the oil, and make sure that there is no oil adhered to other objectives.**
- **Pure alcohol and petroleum benzene are both highly flammable, so handle them with great care. Do not use them near open flames or near power switches.**

Reapplying oil

If you must repeatedly perform oil immersion, you can use the Escape/Refocus button to efficiently perform focusing.

Additionally, the 25-mm stage ring and acrylic stage ring have a notch for supplying oil, so you can perform oil immersion with a Petri dish or another specimen in place. After setting the stage ring so that the notch is aligned with the rotation direction of the nosepiece, hold the nosepiece in place by hand so that the objective comes to the notch, then perform oil immersion.

4.12.5 Water Immersion Objectives

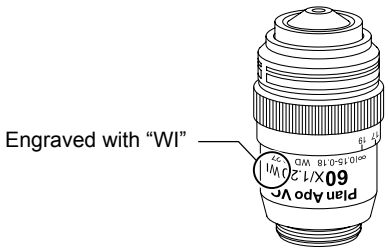


Figure 4.12-9 Example of water immersion objective

Objectives engraved with “WI” are water immersion objectives. (Lenses with long working distances are for upright microscopes.)

When using water immersion objectives, fill the gap between the objective tip and the specimen with purified or distilled water.

Caution

- **When performing water immersion on objectives, avoid using tapwater. If tapwater is used, when the water dries from the lens tip, impurities will harden on the surface of the glass, and could leave scratches when cleaned.**
- **The Plan Apo 60 x WI (NA = 1.2) has a correction ring in order to obtain the optimum aberration conditions with regard to variation in thickness of cover glass. The “17” label on the gage signifies 0.17 mm. Before using a cover glass, measure the thickness of the cover glass using a micrometer or the like, and adjust the meter of the correction ring to that value to correctly compensate for the thickness.**

4.13 Using the Focusing Module

Caution

Never attempt to the following, as they may result in product malfunction

- **Rotating the left and right focus knobs in opposite directions.**
- **Continuing to rotate the coarse or fine focus knob even after the knob reaches the limit.**

4.13.1 Operating the Focusing Knobs

Operation via the microscope main body

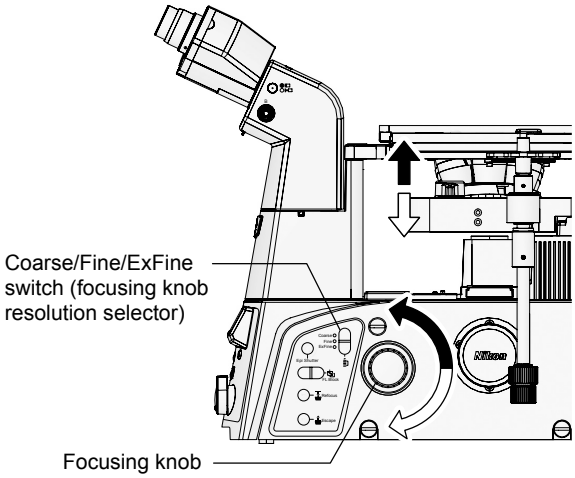
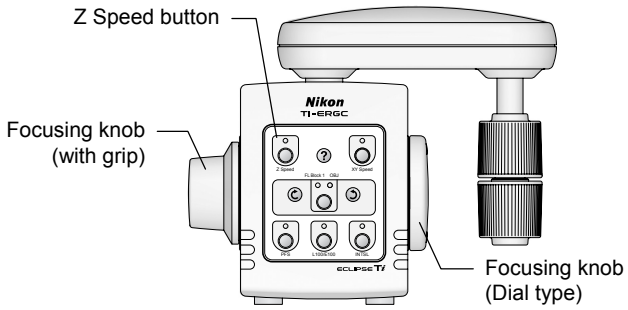


Figure 4.13-1 Focusing knob and moving nosepiece vertically

Operation via the ergo controller



Z Speed indicator	Focusing knob resolution
Off	Coarse
On	Fine
Flashing	ExFine (extra fine)

Figure 4.13-2 Ergo controller focusing knob

The Ti-E focusing module is motor controlled. You can move the nosepiece up and down by turning the focusing knobs on either side of the main body. The arrows in the figure to the left show the correspondence between the direction that the focusing knob is rotated, and the direction in which the objective travels (up or down).

* The stroke of the focusing operation is about 9.5 mm.

The focusing knob can be operated from the microscope main body, the ergo controller, and the joystick controller.

Switching the focusing knob resolution

You can set the drive resolution of the focusing knobs to one of the following three levels. The values can be set for the left and right knobs.

Setting	Movement per rotation
Coarse	300 µm/rev (ref. value) *
Fine	50 µm/rev
ExFine (extra fine)	6.25 µm/rev

* In coarse mode, the amount of movement varies according to the speed at which the focusing knob is rotated.

The focusing knob resolution can be switched from the microscope main body, the ergo controller, and the joystick controller.

Operation via the joystick controller

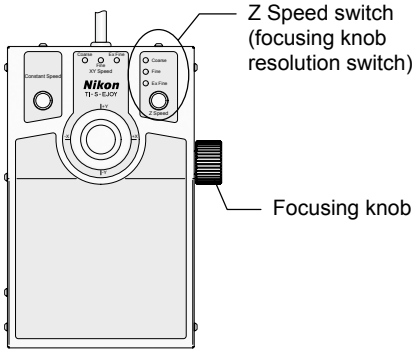


Figure 4.13-3 Joystick controller focusing knob

Focusing knob resolution and Z-axis position display

The current resolution of the focusing knob and the Z-axis position are shown on the status display panel.

■ Example of focusing knob resolution and Z-axis position display

```
Z: +124.225um
E100 Fine
```

The Z-axis position does not appear on the touch panel of the remote control pad.

4.13.2 Retracting and Refocusing Objectives

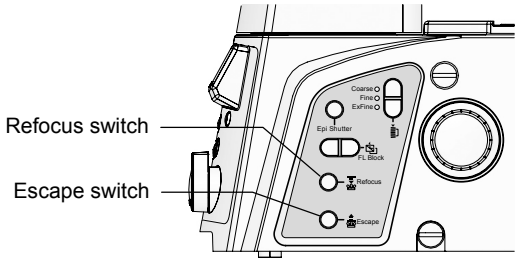
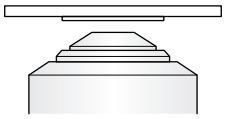
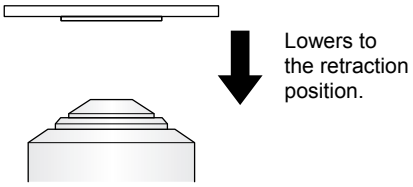


Figure 4.13-4 Escape switch and Refocus switch

(1) Bring into focus.



(2) Press the Escape switch.



(3) Press the Refocus switch.

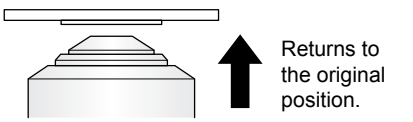


Figure 4.13-5 Retracting and refocusing objectives

The Escape switch (retract objective) and Refocus switch (refocus objective) on the right side move the objective into the retraction position (about 1.5 mm below the standard position), then return the retracted objective to its original position before retraction.

Press the Escape button at the focal position to lower the objective to the retraction position with the focal position kept in memory.

Press the Refocus button to return the objective to the focal position stored in memory. This makes it easy to focus the lens again.

This is useful when you want to temporarily lower the objective, such as when changing specimens or switching objectives.

- When the objective is in the retraction position, turning the focusing knob will not change the position of the objective.
- When the objective is in the retraction position, pressing the Escape switch while holding down the Refocus switch will reset the focal position in memory and enable the focusing knob to be operated.

If you are using the combination of the TI-ND6-PFS Perfect Focus Unit/T-ND6-E Sextuple motorized DIC nosepiece and the TI-RCP remote control pad, you can set up the system to automatically retract/refocus objectives when they are switched. See the instruction manual included with the TI-RCP remote control pad for details.

4.13.3 Using the Z-RESET Button

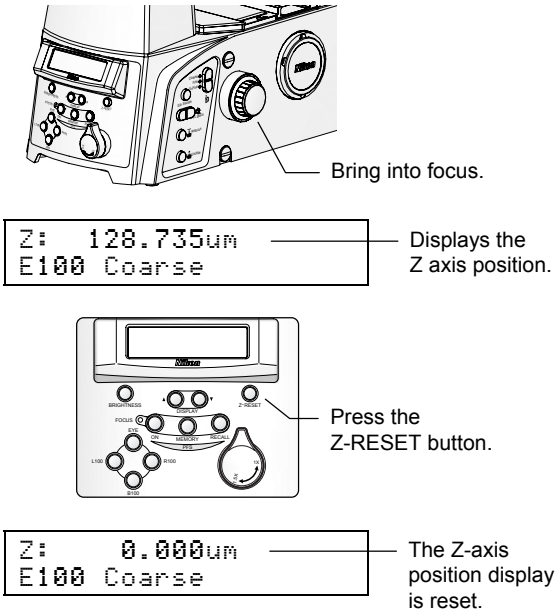


Figure 4.13-6 Using the Z-RESET button

The focusing module Z-axis position display on the status display panel is shown as a positive value when the nosepiece is moved upward, and a negative value when it is moved downward.

You can use the Z-axis position as a standard for focusing by pressing the Z-RESET button on the front control panel when focused at an arbitrary position, and resetting the Z-axis position display to zero.

- Because the microscope is not a measuring device, we cannot guarantee the accuracy of the Z-axis position display.
- Operating the Z-RESET button on the microscope main body will not reset the Z-axis position display on the remote control pad to zero.

4.13.4 Resetting the Z-axis Position Display on the Remote Control Pad to Zero

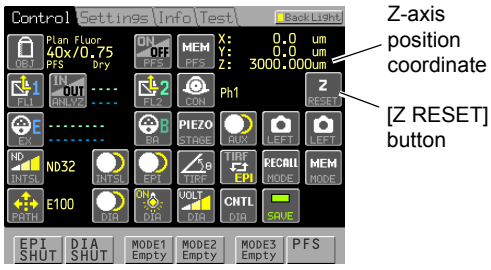


Figure 4.13-7 Resetting the Z-axis display to zero

From the [Control] screen, press the [Z RESET] button (Z-axis Zero Reset) to reset the Z-axis display on the remote control pad to zero.

- Because the microscope is not a measuring device, we cannot guarantee the accuracy of the Z-axis position display.
- Operating the Z-RESET button on the remote control pad will not reset the Z-axis position display on the status display panel of the microscope main body.

4.14 Operating the Dia Pillar Illuminator 100W

This section describes the operation of the TI-DH dia pillar illuminator 100W.

4.14.1 Condenser Refocusing Clamp

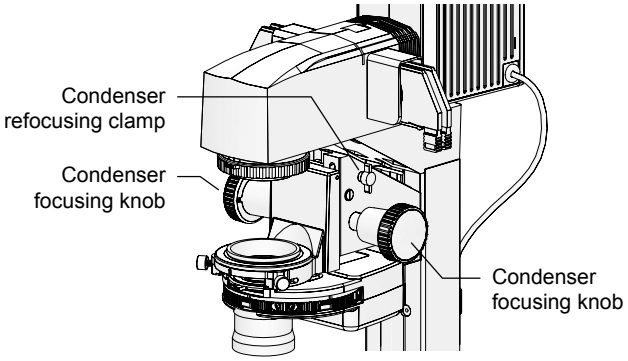


Figure 4.14-1 Dia pillar illuminator 100W

If you turn the condenser focusing knob and form the field diaphragm image on the specimen surface, then the position will be marked when you rotate the condenser refocusing clamp clockwise as far as it will go.

Even if you retract the condenser upward in order to change specimens, when you lower it as far as it will go, it will then return to the original position at which the field diaphragm image is formed. Use then when using a high-magnification condenser, or when using a pillar that cannot be tilted. The condenser refocusing clamp moves in a range of 13 mm.

4.14.2 Rotating the Condenser Mount

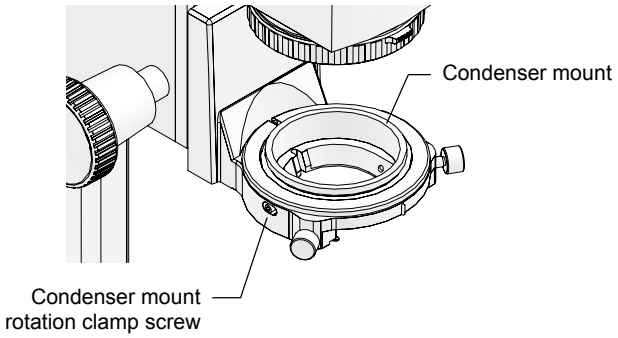


Figure 4.14-2 Condenser mount

If you loosen the condenser mount rotation clamp screw, you can rotate the condenser mount. You can use this to adjust the turret orientation when using a DIC component.

If you are using a system condenser without a polarizer attached to the condenser holder (for bright-field and phase contrast microscopy), you can use this feature to rotate the turret right or left, then secure it to create a space to attach a manipulator or the like.

4.14.3 Tilting the Pillar

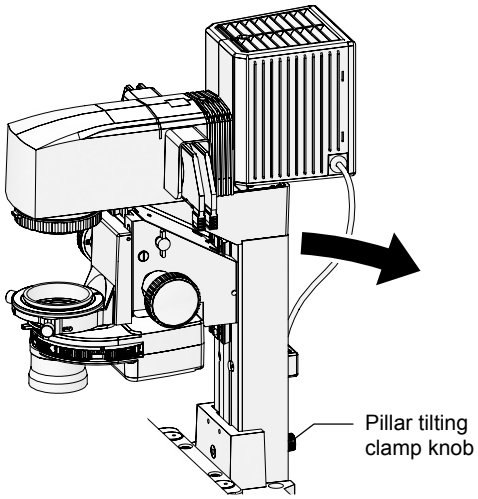


Figure 4.14-3 Tilting the pillar

When replacing large specimens, you can create a working space by tilting the pillar.

To tilt the pillar, loosen and remove the clamp knob on the back of the pillar, then holding the front of the dia pillar illuminator, gently tip it back.

In normal use environments, you can use the microscope with the pillar tilting clamp knob on the back of the pillar removed. However, if you will be attaching a relatively heave item to the dia pillar illuminator, then you should tighten the pillar tilting clamp knob in order to prevent the dia pillar illuminator from tipping over unexpectedly.

Caution

- **When tilting the pillar or returning it to an upright position, be very careful not to get your hand or fingers caught in the hinges.**
- **When attaching relatively heave components to the pillar, ensure that they are mounted securely. If the mounting screws or the like are loose, then the pillar could come off when it is tilted. Be especially sure to securely fasten high brightness lamphouses and lamphouse adaptors.**

4.14.4 Screw Holes for Securing Attachments

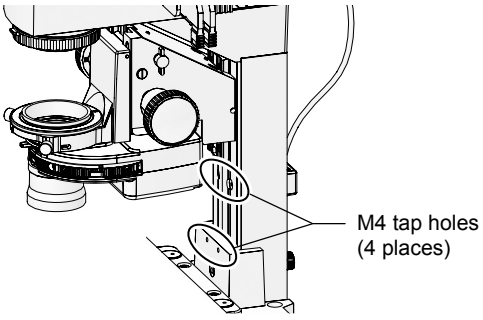


Figure 4.14-4 Screw holes for securing attachments

There are four M4 tap holes on the front of the pillar. They can be used to attach manipulators and other attachments.

Use the two top screw holes to mount attachments that you want to move out of the way of the stage when the pillar is tilted. Use the two bottom screw holes to mount attachments that you wish to remain over the stage when the pillar is tilted.

4.15 Using Motorized Stages

4.15.1 Using the Specimen Holder

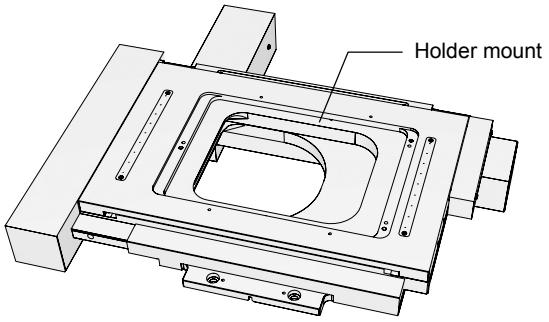


Figure 4.15-1 Motorized stage

On the holder mount of the motorized stage, various specimen holders can be attached.

There are tap holes on the top and bottom of the stage, which can be used to secure manipulators and the like.

> The stage is typically attached with the knob positioned in the far right. It is also possible to rotate the stage 180 degrees and attach it with the knob in the near left.

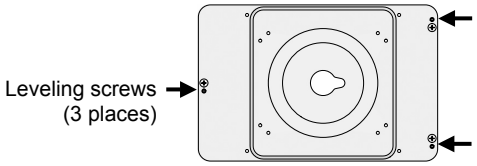
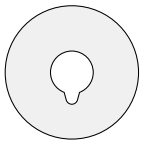


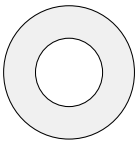
Figure 4.15-2 Stage ring holder

Stage ring holder

Holder for mounting a stage ring. Two rings whose inner diameters are 25 mm and 40 mm are available.



Inner diameter: 25 mm
(with a notch for oiling)



Inner diameter: 40 mm

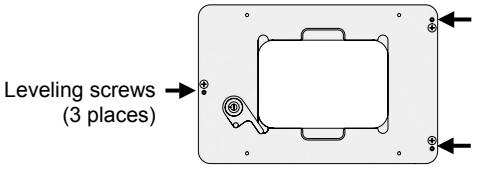


Figure 4.15-3 Well plate holder

Well plate holder

Holder for mounting a well plate used for cell culture. The well plate can be fixed easily using the lever in the front.

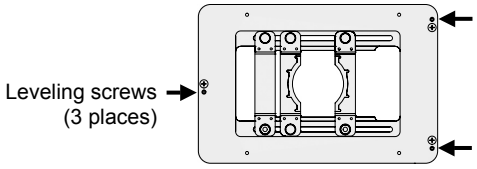


Figure 4.15-4 Universal holder

Universal holder

Holder for mounting a Petri dish or flask. Various types of Petri dishes and flasks can be mounted.

> There are leveling screws at three locations shown by the arrows on the specimen holders mentioned above. The level of the specimen holder upper surface can be adjusted using a hexagonal screwdriver (2 mm) provided with the microscope main body.

4.15.2 Moving the Motorized Stage

Motorized stages can be controlled via the stage knobs on the ergo controller (X-axis and Y-axis knobs) or the joystick controller.

- **Operate using:** ergo controller / joystick controller / PC / remote control pad (coordinate display only)

Caution

- **It is not possible to use both the joystick controller and ergo controller at the same time.**
- **Moving the stage significantly out of the observation range can cause the objective to strike the bottom of the stage when the nosepiece is rotated. In this case, fully lower the nosepiece, then change the objective.**

Operation via the ergo controller

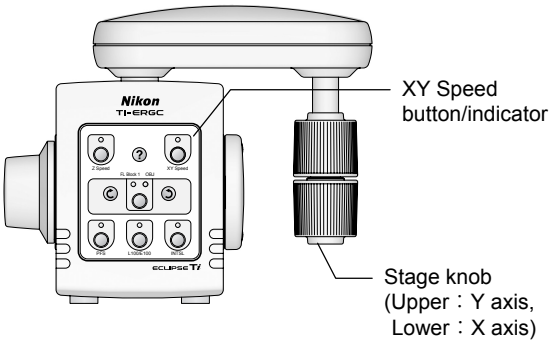


Figure 4.15-5 Ergo controller stage knob

1. **Press the [XY Speed] button on the control panel (standard setting) to switch the stage movement amount between the following three modes: Coarse, Fine, and Extra Fine.**

XY Speed indicator	Motorized stage resolution
Off	Coarse
On	Fine
Flashing	ExFine (Extra Fine)

2. **Move the stage by turning the stage knob.**

   To move the stage in the Y direction, use the upper knob. To move the stage in the X direction, use the lower knob.

Operation via the joystick controller

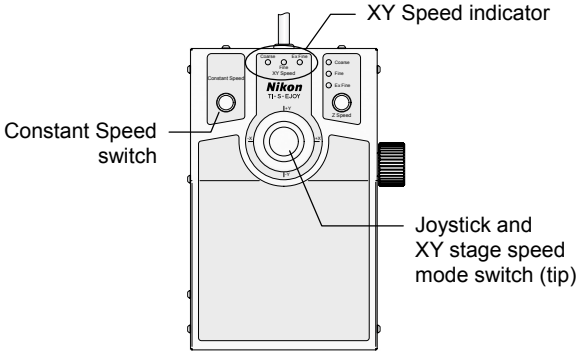


Figure 4.15-2 Joystick controller

1. **Turn the XY stage speed mode switch on the end of the joystick to switch between three stage movement modes: Coarse, Fine, and ExFine.**

   The drive resolution selection is displayed on the XY Speed indicator.

XY Speed indicator	Motorized stage resolution
Coarse	Coarse
Fine	Fine
ExFine	ExFine（Extra Fine）

2. **Operate the joystick to move the stage.**

   The speed of movement of the stage varies depending on the angle at which the joystick is inclined. The greater the angle, the faster the XY stage moves, within the range of the operation mode (coarse/fine/extra fine).

Constant speed mode

Using the Constant Speed switch you can switch to constant speed mode. While the motorized stage normally moves at a rate determined by the angle of the joystick, if you use the constant speed mode, the stage will move at the constant speed stored in memory, regardless of the angle of inclination of the joystick.

See Section 4.24, “Using the Joystick Controller,” for details.

Displaying coordinates on the remote control pad

Figure 4.15-3 Remote control pad

You can read the travel distance of the motorized stage in the X and Y directions (coordinates) from the touch panel of the remote control pad.

4.16 Using the DIC Attachment

Read Chapter 2, “Microscopy,” and Chapter 3, “Principle of DIC Microscopy,” in the Differential Interference Contrast Attachment instruction manual. See Section 3.4, “Differential Interference Contrast (DIC) Microscopy,” of Chapter 3, “Microscopy,” in this Part for instructions on using PC commands to switch objectives, switch condenser cassettes, and use inserts from the analyzer’s optical path while performing differential interference contrast (DIC) microscopy.

4.17 Using the Epi-fl Attachment

See Chapter 3, “Operation of Each Part (Ti-FL),” or Chapter 6, “Operation of Each Part (Ti-SFL),” of the “TI-FL Epi-FI Illuminator / TI-SFL High Performance Epi-FI Illuminator Instructions” for instructions on using the epi-fl attachment. See Section 3.5, “Episcopic Fluoroescence (Epi-fl) Microscopy,” of Chapter 3, “Microscopy,” in this Part for instructions on using PC commands to open and close the motorized shutter and switch filter blocks while performing epi-fl microscopy.

4.18 Using the Motorized Excitation Filter Wheel

If you are using a motorized excitation filter wheel, you can switch between excitation filters (used for epi-fl microscopy) by means of an electric motor. You can attach as many as eight excitation filters to the motorized excitation filter wheel, 25 mm in diameter and up to 6 mm each in thickness.

- **Operate using:** remote control pad / ergo controller / PC

Operation via the remote control pad

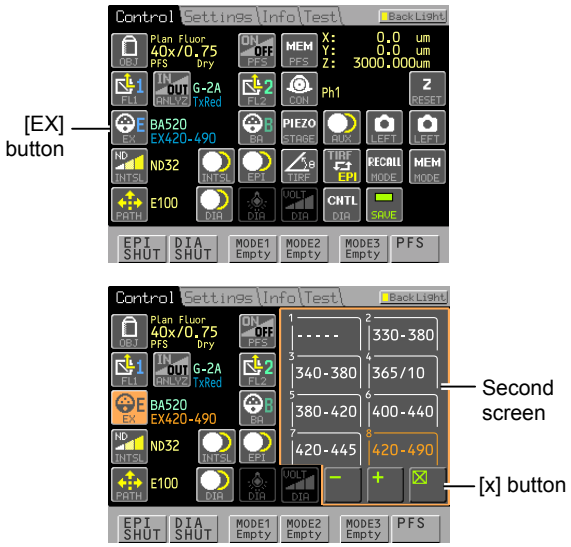


Figure 4.18-1 Switching the excitation filter

1. **On the [Control] screen, press the [EX] button (EX Filter), open the second screen, and select the excitation filter.**
   - \+ Rotate the filter wheel clockwise.
   - \- Rotate the filter wheel counterclockwise.
   - 1-8 Select an address directly.
2. **Press the [x] button to close the second screen.**

In order to correctly display the information about the excitation filter mounted at each address on the second screen, you must register the excitation filter information during setup. See the instruction manual of the remote control pad for details.

Operation via the ergo controller

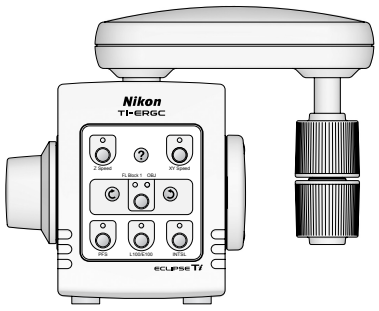


Figure 4.18-2 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized excitation filter wheel via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

4.19 Using the Motorized Barrier Filter Wheel

If you are using a motorized barrier filter wheel, you can switch between barrier filters (used for epi-fl microscopy) by means of an electric motor. You can attach as many as eight barrier filters to the motorized barrier filter wheel, 25 mm in diameter and up to 6 mm each in thickness.

- **Operate using:** remote control pad / ergo controller / PC

Operation via the remote control pad

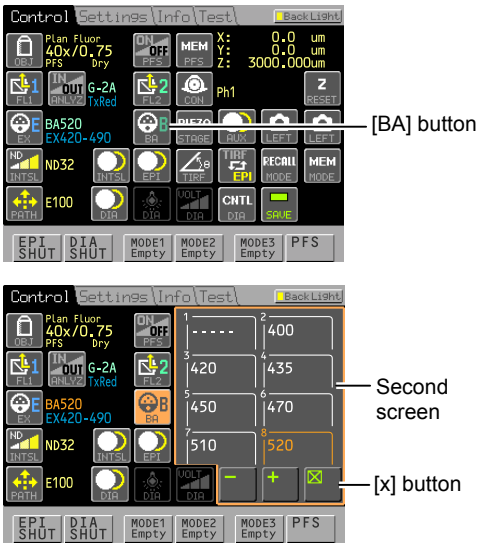


Figure 4.19-1
Switching the motorized barrier filter wheel

1. **On the [Control] screen, press the [BA] button (BA Filter), open the second screen, and select the barrier filter.**
   - \+ Rotate the filter wheel clockwise.
   - \- Rotate the filter wheel counterclockwise.
   - 1-8 Select an address directly.
2. **Press the [x] button to close the second screen.**

To correctly display data pertaining to barrier filters attached to each address on the second screen, you must register barrier filter data when performing set up. See the instruction manual of the remote control pad for details.

Operation via the ergo controller

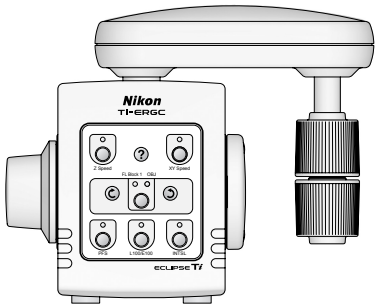


Figure 4.19-2 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized barrier filter wheel via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

4.20 Using the Motorized FL Turret and Motorized FL Turret HQ

If you are using a motorized FL turret or Motorized FL turret HQ, you can switch between filter blocks (used for epi-fl microscopy) by means of an electric motor. Also, when performing microscopy using a stage-up kit, you can stack two motorized FL turrets, and up to six filter blocks can be attached to each one (for a total of 12).

The operation of the motorized FL turret and motorized FL turret HQ is the same.

- **Operate using:** remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad

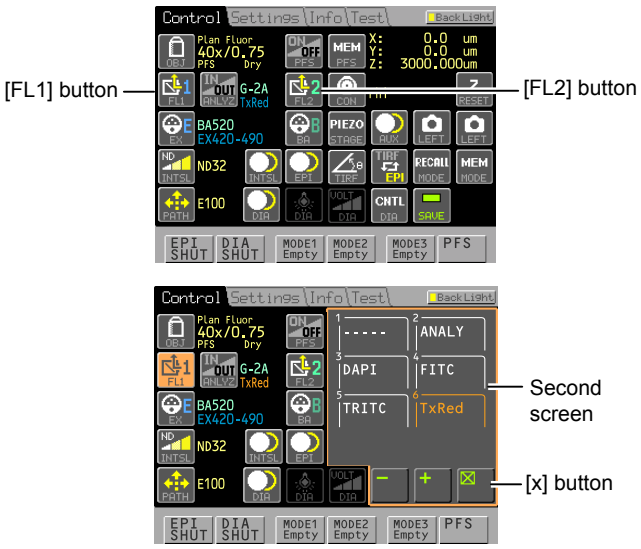


Figure 4.20-1 Operating the motorized FL turret

1. **From the [Control] screen, press the [FL1] button (Filter Block-1) or [FL2] button (Filter Block-2), then select the desired filter block in the Filter Block window.**
   - \+ Rotate the turret clockwise.
   - – Rotate the turret counterclockwise.
   - 1-6 Select an address directly.
2. **Press the [x] button to close the second screen.**

- In order to correctly display the information about the filter block mounted at each address on the second screen, you must register the filter block information during setup. See the instruction manual of the remote control pad for details.
- If you have two motorized FL turrets attached (top and bottom), and the targets of the [FL1] and [FL2] buttons are reversed, you can correct the correspondence of the buttons by reversing the connections to the hub controller A.
- You can also change the button correspondence by programming the remote control pad. See the instruction manual of the remote control pad for details.

Operation via the ergo controller

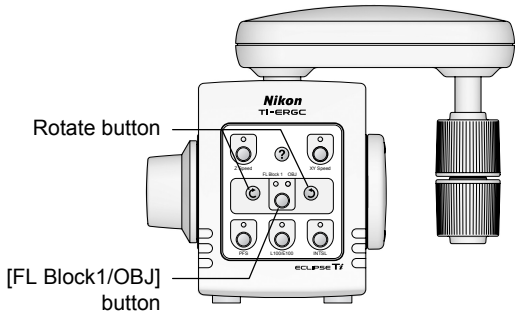


Figure 4.20-2 Inserting/removing filter blocks

1. **Press the [FL Block1/OBJ] button, and light the FL Block 1 indicator.**
2. **Press the left and right Rotate buttons to rotate the motorized FL turret (first tier), and set the filter block in the optical path.**

- If you have attached a two-tier motorized FL turret, the top (second tier) motorized FL turret is not set to be operated in the standard setting.
- For information on configuring the system to operate the top motorized FL turret via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

Operation via the microscope main body

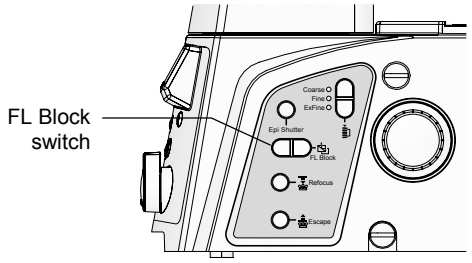


Figure 4.20-3 Right side of Ti-E

1. **Operate the FL Block switch on the right side of the microscope to rotate the motorized FL turret (level 1) and switch filter blocks.**

   You can rotate the turret clockwise or counterclockwise depending on the direction you operate the switch in.

If you have attached a two-tier motorized FL turret, the top (second tier) motorized FL turret cannot be operated from the microscope main body.

4.21 Using the Motorized Shutter

In order to use a motorized shutter, you must connect the shutter so that it can be controlled via an external shutter trigger signal. See Chapter 6, “Assembly,” – “6.25. Connecting External Devices” for details.

4.21.1 Motorized Shutter for Episcopic Illumination

- **Operate using:** remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad

[EPI] button 

(left: open shutter; right: close shutter)

Figure 4.21-1 Opening and closing the shutter for episcopic illumination

1. **Pressing the [EPI] button (EPI shutter) on the [Control] screen, toggles the motorized shutter for episcopic illumination open and closed.**

   The shutter’s opened/closed state is displayed via the button icons.

Operation via the ergo controller

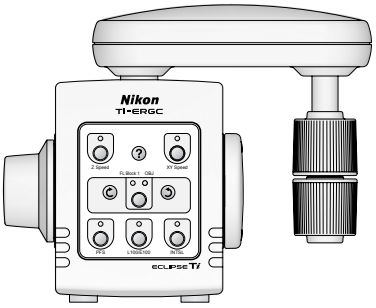


Figure 4.21-2 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized shutter for episcopic illumination via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

Operation via the microscope main body

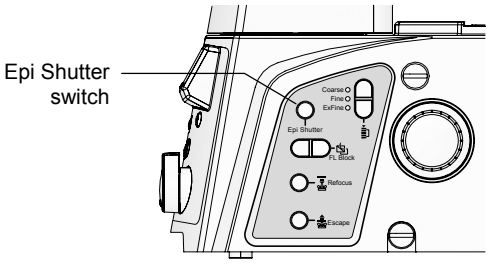


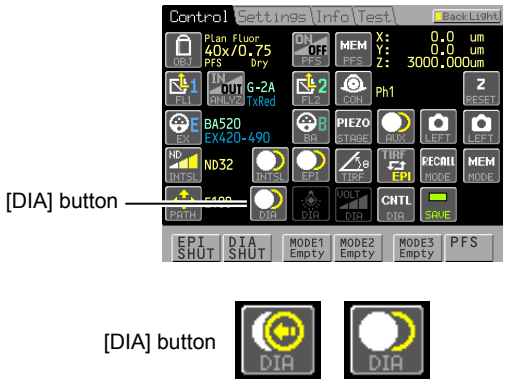
Figure 4.21-3 Ti-E main body right side

1. **Press the EPI Shutter button on the right side to open or close the epi-illumination shutter.**

4.21.2 Motorized Shutter for Diascopic Illumination

- **Operate using:** remote control pad / ergo controller / PC

Operation via the remote control pad



[DIA] button

(left: open shutter; right: close shutter)

Figure 4.21-4 Opening/closing the motorized shutter of the diascopic illumination

1. **Pressing the [DIA] button (DIA shutter) on the [Control] screen, toggles the motorized shutter of the diascopic illumination open and closed.**

   The icons on each button show whether a shutter is open or closed.

Operation via the ergo controller

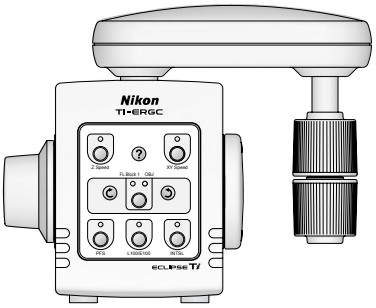


Figure 4.21-5 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized shutter for diascopic illumination via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

4.21.3 Spare Motorized Shutter

- **Operate using:** remote control pad / ergo controller / PC

Operation via the remote control pad

[AUX] button 

(left: open shutter; right: close shutter)

Figure 4.21-6
Opening/closing the spare motorized shutter

1. **Pressing the [AUX] button (AUX shutter) on the [Control] screen, toggles the spare motorized shutter open and closed.**

   The icons on each button show whether a shutter is open or closed.

Operation via the ergo controller

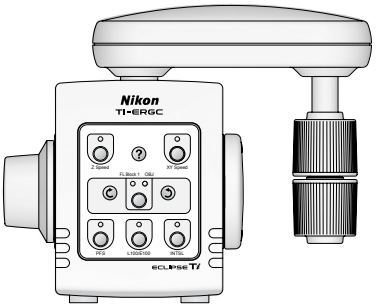


Figure 4.21-7 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate a spare (AUX) shutter via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

4.22 Using the Motorized HG Fiber Optic Light Source

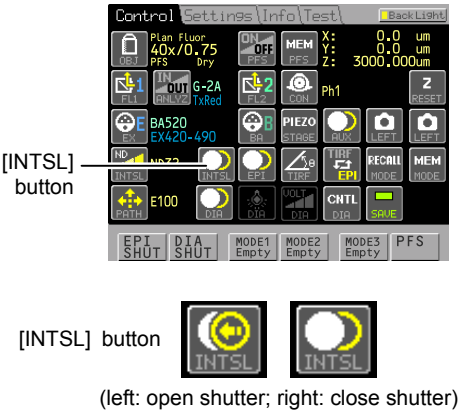
This describes the motorized HG fiber optic light source as connected to the HGFIE connector (Intensilight) of the hub controller A.

4.22.1 Opening or Closing the Shutter

The operation below, allows you to open and close the built motorized HG fiber optic light source (Intensilight).

- **Operate using:** remote control pad / microscope main body / ergo controller / PC

Operation via the remote control pad



(left: open shutter; right: close shutter)

Figure 4.22-1
Opening and closing the intensilight shutter

1. **Pressing the [INTSL] button (Intensilight) on the [Control] screen, toggles the motorized HG fiber optic light source (Intensilight) shutter between open and closed.**

   The icons on each button show whether a shutter is open or closed.

Operation via the ergo controller

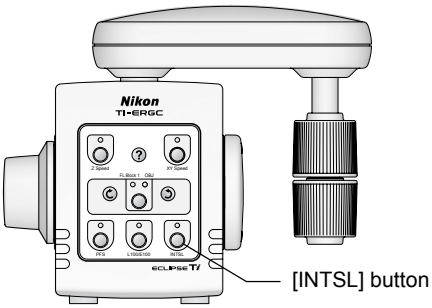


Figure 4.22-2 Ergo controller

1. **The motorized HG fiber optic shutter (Intensilight) opens and closes each time the [INTSL] button is pressed.**

   The [INTSL] button indicator is lit when the shutter is closed, and off when the shutter is open.

Operation from the microscope main body

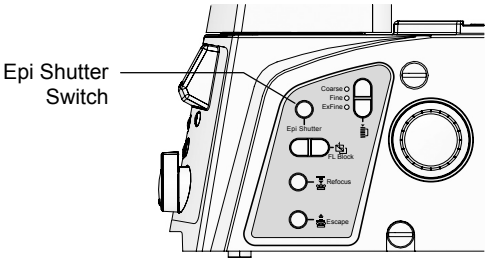


Figure 4.22-3 Ti-E main body right

1. **The motorized HG fiber optic shutter (Intensilight) opens and closes each time the right [Epi Shutter] switch is pressed.**

In order to open and close the shutter using the Epi Shutter button on the right side of the microscope, you must connect the shutter so that it can be controlled via an external trigger signal. See Section 6.25.2, “Connecting Motorized Shutters,” in Chapter 6, “Assembly,” for details.

4.22.2 Adjusting the Brightness (Switch ND Filters)

In the operation below, you will change the built-in ND filter of the motorized HG fiber optic light source (Intensilight), and adjust the brightness of the illumination.

- **Operate using:** remote control pad / ergo controller / PC

Operation via the remote control pad

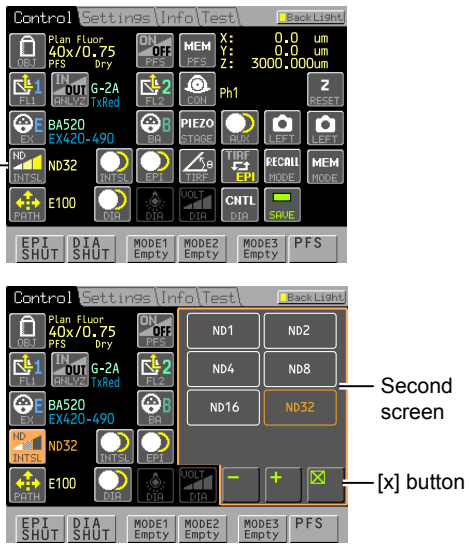


Figure 4.22-4 Changing ND filters for Intensilight

1. **From the [Control] screen, press the [INTSL ND] button (Intensilight ND), then select the desired ND filter in the second screen.**
   - \+ Raises the ND value each time pressed. ND1 → ND2 → ND4 → ND8 → ND16 → ND32
   - \- Lowers the ND value each time pressed. ND32 → ND16 → ND8 → ND4 → ND2 → ND1
   - ND1-32 Select the ND value directly.
2. **Press the [x] button to close the second screen.**

Operation via the ergo controller

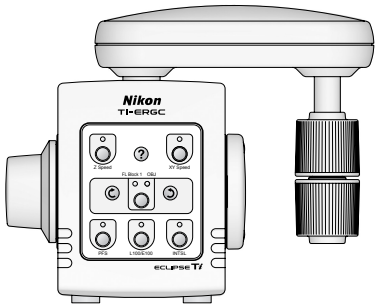


Figure 4.22-5 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the ND filters of the motorized HG fiber optic light source (Intensilight) via the ergo controller, see Section 4.23, “Using the Ergo Controller.”

4.23 Using the Ergo Controller

The ergo controller is used with the hub controller A connected to the microscope. The following operations are possible using the ergo controller:

- Operate a motorized stage as if it were a manual stage.
- Operate motorized units on the microscope remotely

You can also freely assign buttons on the ergo controller to such frequently performed operations as opening and closing motorized shutters and switching objectives.

4.23.1 Appearance of the Ergo Controller

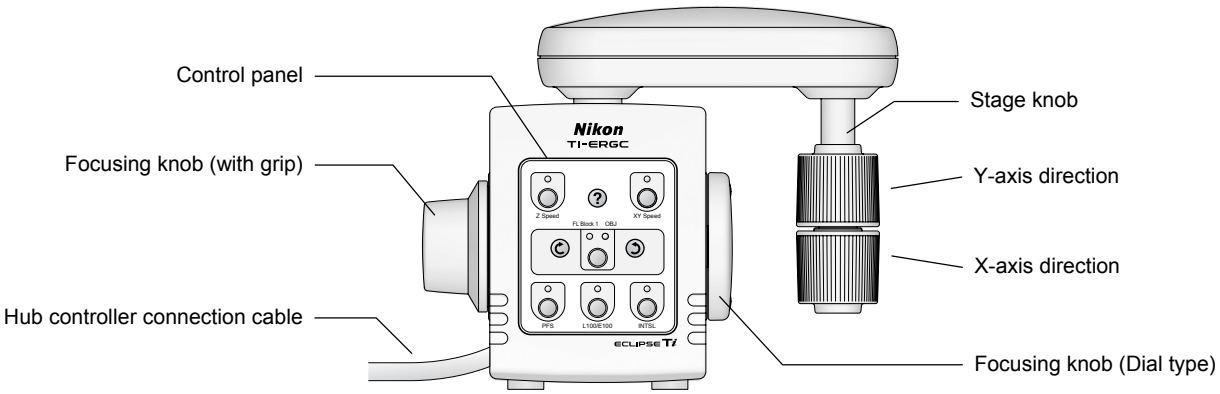


Figure 4.23-1 Appearance of the ergo controller

4.23.2 Connecting to the Hub Controller

In order to use the ergo controller, you must connect the hub connection cable of the ergo controller to the hub controller A. See Section 6.20, “Ergo Controller,” in Chapter 6, “Assembly,” for details about performing this connection.

Since the hub connection cable is two meters long, the ergo controller can be used to operate the microscope remotely.

The ergo controller can also be connected to the hub controller B, used by the Ti-U, Ti-U/B, Ti-S, and Ti-S/L100. Note, however, that in this case some of the available functions are different.

4.23.3 Using the Knobs

Focusing knob

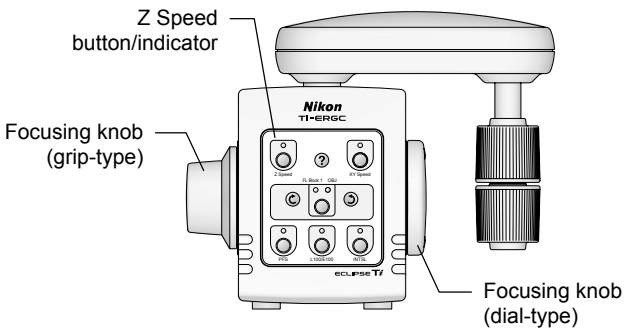


Figure 4.23-2 Focusing knobs

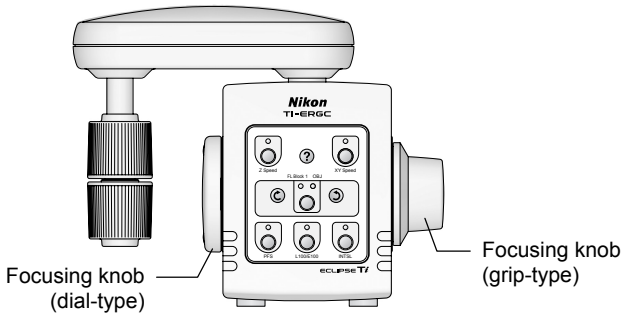


Figure 4.23-3 Focusing knob when changed

Focusing knob

The focusing knob on the ergo controller can be used in the same manner as the focusing knobs on the microscope main body.

Press the [Z Speed] button on the ergo controller's control panel to switch the focusing knob resolution between three operating modes: coarse, fine, and extra fine (set to "coarse" by default). The current resolution of the focusing knob is shown by the indicator below the Z Speed button indicator, as follows:

Z Speed indicator	Focus knob resolution
Off	Coarse
On	Fine
Flashing	ExFine (Extra Fine)

Changing focusing knobs

The grip-type focusing knob is magnetic, and the dial-type focusing knob is snap-in; you can remove them by pulling them out. You can also remove them, and switch them into easy-to-control positions.

Stage knob

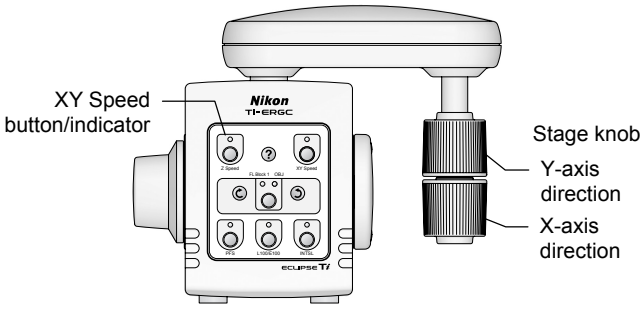


Figure 4.23-4 Stage knob screw

Stage knob

The stage knob enables you to operate a motorized stage as if it were a manual stage.

Press the [XY Speed] button on the ergo controller's control panel to switch the stage knob between three operating modes: coarse, fine, and extra fine. The initial setting is coarse. The current stage knob resolution displays under the XY Speed button indicator as below.

XY Speed indicator	Stage knob resolution
Off	Coarse
On	Fine
Flashing	ExFine (Extra Fine)

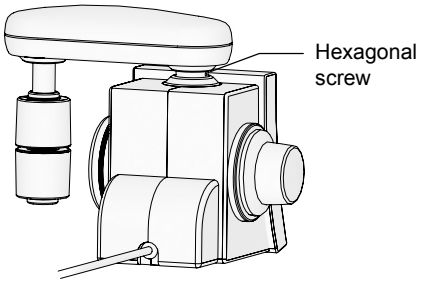


Figure 4.23-5 Stage knob screw

Stage knob orientation

The stage knob's relative position can be freely altered by loosening the hexagonal screw at the base of the bridge. After you have changed to an easy-to-operate position, tighten the hexagonal screw again.

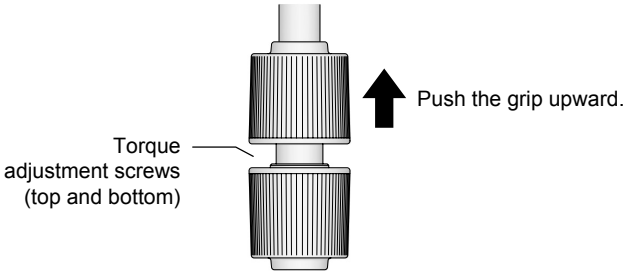


Figure 4.23-6
Adjusting the rotation torque of the stage knob screw

Adjusting the rotation torque

You can fine-tune the torque on the grips of the stage knob. Push up the top grip to reveal the torque adjustment screw. Loosen or tighten the top and bottom screws to adjust the torque on the respective grips.

4.23.4 Using the Control Panel

The front of the ergo controller has a 9-button control panel. You can use these buttons to control the microscope and its peripheral units remotely.

The button layout is shown below.

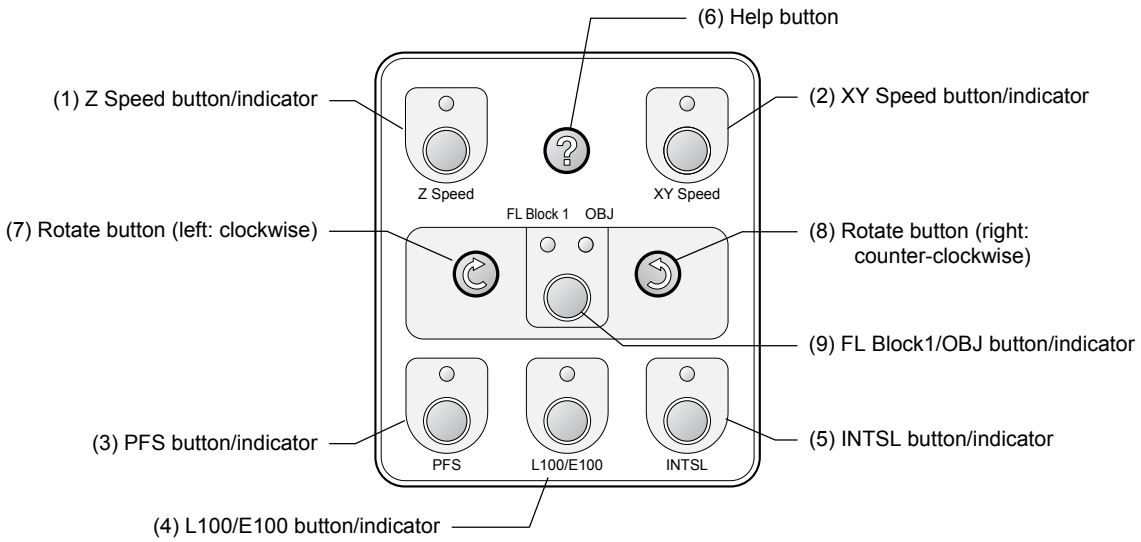


Figure 4.23-7 Ergo controller control panel

Table 4.23-1 Button functions and factory standard settings

No.	Button label	Function
(1)	Z Speed	Switches the focusing knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; flashing: extra fine)
(2)	XY Speed	Switches the stage knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; flashing: extra fine)
(3)	PFS	Turns the PFS on and off (indicator lit: PFS on; off: PFS off)
(4)	L100/E100	Switches optical path: Left port 100%, microscopy port 100% (Indicator lit: E100; off: L100)
(5)	INTSL	Opens and closes motorized HG fiber optic light source (Indicator lit: closed; off: open)
(6)	? (Help)	Displays current button layout on PC
(7)	(rotate)	Rotates clockwise (select what to rotate using button 9)
(8)	(rotate)	Rotates counterclockwise (select what to rotate using button 9)
(9)	FL Block1/OBJ	Selects what to rotate using buttons 7 and 8 (indicator lit: operation target) • FL Block1 Motorized FL turret (first tier) • OBJ Motorized nosepiece

- If you connect the microscope and the hub controller A, then connect the motorized stage, PFS motorized nosepiece, motorized FL turret, and motorized HG fiber optic light source, the default settings can be used as-is.
- The PFS button will not function if a motorized nosepiece is connected.
- Six of the nine buttons (1 to 5 and 9) can be freely assigned to the function of your choosing.

4.23.5 Assigning Functions

Six of the nine buttons ((1) to (5) and (9)) can be freely assigned to the function of your choosing.

Functions that can be assigned using buttons (1) to (5)

Buttons (1) to (5) can be freely assigned to the functions shown in the table below.

Table 4.23-2 Functions that can be freely assigned using buttons (1) to (5)

Button label	Function
Z Speed	Switches the focusing knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; flashing: extra fine)
XY Speed	Switches the stage knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; flashing: extra fine)
PFS	Turns the PFS on and off (indicator lit: PFS on; off: PFS off)
(OBJ)	Rotates motorized nosepiece or PFS motorized nosepiece clockwise (select what to rotate using button (9))
(OBJ)	Rotates motorized nosepiece or PFS motorized nosepiece counterclockwise (select what to rotate using button (9))
INTSL	Opens and closes motorized HG fiber optic light source (Indicator lit: closed; off: open)
TIRF/EPI	Switches the optical path to TIRF/Epi (indicator lit: Epi; off: TIRF)
TIRF Angle	Switches TIRF illumination angle drive operation (Indicator lit: illumination angle can be adjusted via stage knob; off: cannot be adjusted)
EPI	Opens and closes the epi-illumination shutter (indicator lit: open; off: open)*
DIA	Opens and closes the dia-illumination shutter (indicator lit: open; off: open)*
AUX	Opens and closes the spare (AUX) shutter (indicator lit: open; off: open)*
L100	Selects optical path of Left port 100% (Indicator lit: L100; off: other)
E100	Selects optical path of Microscopy port 100% (Indicator lit: E100; off: other)
R100	Selects optical path of Right port 100% (Indicator lit: R100; off: other)
L80	Selects optical path of Left port 90%, microscopy port 20% (Indicator lit: L80; off: other)
R80	Selects optical path of Right port 80%, microscopy port 20% (Indicator lit: R80; off: other)
B100	Selects optical path of Bottom port 100% (Indicator lit: B100; off: other)
L100/E100	Switches optical path to Left port 100%, microscopy port 100% (Indicator on: E100, blink: L100, off: other)

* In order to use a motorized shutter, you must connect the shutter so that it can be controlled via an external shutter trigger signal. See Section 6.25, “Connecting External Devices,” in Chapter 6, “Assembly,” for details.

Functions assignable to button (9)

You can assign button (9) to two motorized units to be controlled via buttons (7) to (8).

Each time you press button (9), the indicator above the button toggles between off and on. Buttons (7) and (8) rotate the motorized unit displayed above the lit indicator.

Table 4.23-3 Functions that can be freely assigned using button (9) (two can be set)

Button label	Function
FL Block1	Rotate motorized FL turret (first tier)
FL Block2	Rotate motorized FL turret (second tier)
OBJ	Rotate motorized nosepiece
INTSL ND	Cycle brightness of motorized HG fiber optic light source (ND filter)
EX	Rotate motorized excitation filter wheel
BA	Rotate motorized barrier filter wheel
CON	Rotate motorized condenser turret
Path	Cycle optical path

Assigning functions

Use the remote control pad or a PC to change the functions assigned to the buttons from the standard values set in the factory.

- **Operate using:** remote control pad / PC

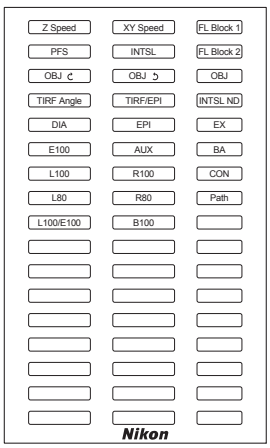


Figure 4.23-8 Function label stickers

See the instruction manual for the remote control pad or the instruction manual for the Ti Control setup application for instructions on assigning functions to buttons (1) to (5) and (9) on the ergo controller.

After re-assigning buttons using this function, select the appropriate supplied function label stickers, and affix them to the buttons as appropriate.

4.24 Using the Joystick Controller

Use the joystick controller with the hub controller A connected to the microscope main body.

4.24.1 Appearance of the Joystick Controller and Functions of Each Part

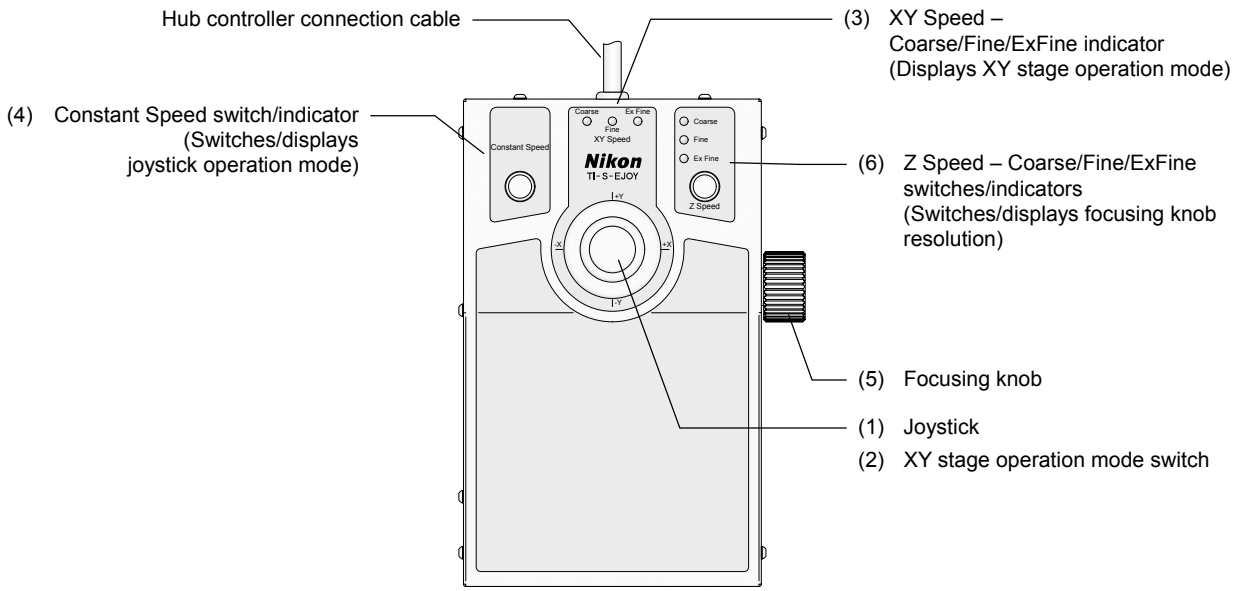


Figure 4.24-1 Joystick controller external view

(1) Joystick

This moves the motorized stage on the XY plane. Tilt the joystick to the right or left to move the stage on the X axis, and tilt it forward or back to move it on the Y axis. Tilt it diagonally to move the stage on both the X and Y axes at once, in accordance with the direction you tilted it.

The speed of movement of the stage varies according to the angle at which you tilt the joystick. The greater the angle, the faster the XY stage moves, within the range of the operation mode (Coarse / Fine / ExFine).

(2) XY stage operation mode switch

This rotary switch is on the tip of the joystick. Use it to change the operation mode of the XY stage when controlled via the joystick.

Turn this switch to the right to change the operation mode in the order of coarse, fine, and extra fine. Turn it to the left to change the operation mode in the reverse order. The operation mode selection is displayed by the XY Speed indicator.

(3) XY Speed indicator (Coarse/Fine/ExFine) indicators

This displays the current operation mode of the XY stage.

(4) Constant Speed button and indicator (Toggle/display joystick constant speed mode)

This button stores the XY stage movement speed, and switches to constant speed mode.

Press this button while moving the XY stage via the joystick to store the current speed of movement as the constant speed.

When constant speed mode is selected, the button's indicator lights. If the joystick is operated while this indicator is lit, the stage will move at the stored constant speed, regardless of the angle of the joystick.

To cancel constant speed mode, press the button again. Fixed speed mode is also automatically canceled when the operation mode is changed.

(5) Focusing knob

This knob adjusts the focus by moving the nosepiece up and down. Rotate the knob clockwise (as seen from right of controller) to move it downward, and counter-clockwise to move it upward.

(6) Z Speed – Coarse/Fine/ExFine switch/indicator

This changes the speed at which the nosepiece moves up and down when the Z-axis knob is operated. Each time the button is pressed, the operation mode changes in the order of coarse, fine, and extra fine. (Press it again to return to coarse.)

4.24.2 Connecting to the Hub Controller

In order to use the joystick controller, you must connect its Hub connector cable to the hub controller A. See Section 6.21, “Joystick Controller” in Chapter 6, “Assembly,”for instructions on performing this connection.

Since the hub connector cable is 1.5 meters long, you can control the microscope via the joystick controller from a distance.

The joystick controller can also be connected to the hub controller B used by the Ti-U, Ti-U/B, Ti-S, and Ti-S/L100. Note, however, that in this case, some of the functions are different.

5 Online and Remote Operation

You can control motorized units connected to the hub controller A from your computer (IBM PC or compatible) by connecting the PC to the hub controller A.

Caution

You can control motorized units from your computer by connecting the hub controller A to your computer. Take the following precautions when controlling units electrically in order to avoid accidents.

- **Always check the units before manipulating them, and make sure that it is safe to use motorized operation.**
- **Keep your fingers and hands away from movable parts of the motorized unit. Your fingers or hand could become pinched if they are touching these parts when you operate the microscope or its units.**
- **Make sure that the light paths of the entire microscope system are set properly when opening or closing the light-source shutter, or rotating the FL turret. The light source is extremely bright; if the light path is not properly configured, illumination could spill into the ambient, and if bright light enters the eyepiece, it could injure the eye.**
- **Before beginning actual use, be sure to set up your microscope system using the setup application.**

Connecting to a computer

Connect the USB connector in the back of the hub controller A to the computer with a USB cable.

Communication cable

General-purpose USB cable (3 meters or shorter)

USB communication specification

USB 1.1

Communication command

Please contact your nearest Nikon representative.

6 Assembly

Warning

- **Before assembling, connecting, or operating any unit, thoroughly read the Safety Precautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **To avoid electric shock, fire, or malfunction, always turn off the power switch of all units and unplug their power cords from the wall outlets.**

Caution

- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Be careful to avoid pinching your fingers or hands in the equipment during assembly.**
- **Make sure that the light source power is off before attaching or removing optical parts, such as lenses or filters.**
- **Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt.**
- **Each of the motorized units of the Ti Series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precisions of the objectives are particularly susceptible to even weak shocks.**

This chapter describes the procedure for attaching motorized units to the main microscope body.

Read and follow the instructions in this chapter when installing, assembling, or connecting motorized units.

Required tools

- Two 2-mm hexagonal screwdrivers (supplied with the microscope)
- One 3-mm hexagonal wrench (supplied with the microscope)
- One 4-mm hexagonal screwdriver (supplied with the microscope)
- One 2.5-mm hexagonal wrench (supplied with the motorized condenser turret)
- One Phillips screwdriver (supplied with the motorized stage or the motorized stage with encoders)

Installation location

See “Notes on handling the motorized units for the Ti series” at the beginning of this manual to select an appropriate location.

6.1 Microscope Main Body (Base)

Caution

Precautions for installation

- **Make sure that two people or more install the unit because this system is heavy.**
- **When carrying the base, grasp it firmly by the recess at the bottom front, and the carrying handle at the back.**

Install the microscope main body in an appropriate location.

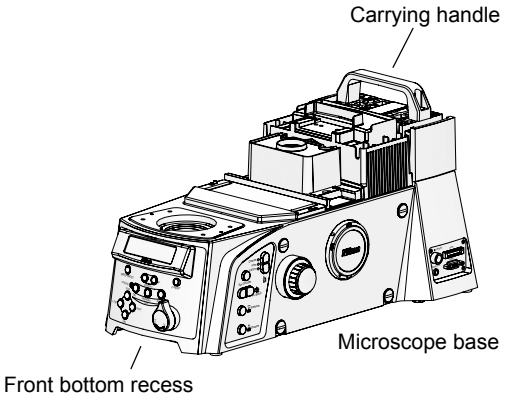


Figure 6.1-1 Installing the microscope base

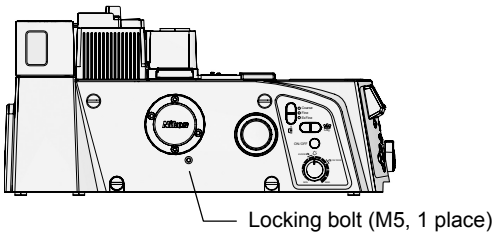


Figure 6.1-2 Location of locking bolt

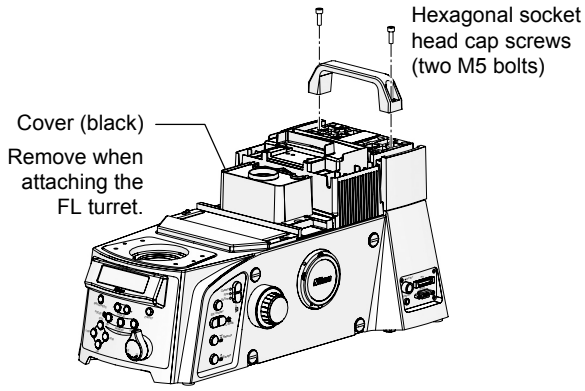


Figure 6.1-3 Removing carrying handle

1. **Select a location to install the base.**

   See “Installation and storage locations” under “Notes on handling the motorized units for the Ti series” at the beginning of this manual to select an appropriate location.

2. **Remove the microscope base from the package and place it on a stable surface.**

3. **Remove the locking bolt.**

   The locking bolt on the left of the main body is attached for shipping. Using the 4 mm hexagonal screwdriver supplied with the microscope main body, remove the locking bolt, then cover the locking-bolt hole using the supplied rubber cap.

Make sure to attach the locking bolt before turning on the power. If the power is turned on with the locking bolt removed, it will not be possible to perform microscopy. Doing so could also damage the microscope.

4. **Remove the two hexagonal socket head cap screws using the 4 mm hexagonal screwdriver supplied with the main microscope body, and remove the carrying handle.**

5. **When mounting the FL turret, remove the black cover from the nosepiece mount.**

6.2 Hub Controller A

Attach the HUB controller A to the rear of the microscope main body.

6.2.1 Connecting to the Microscope Main Body

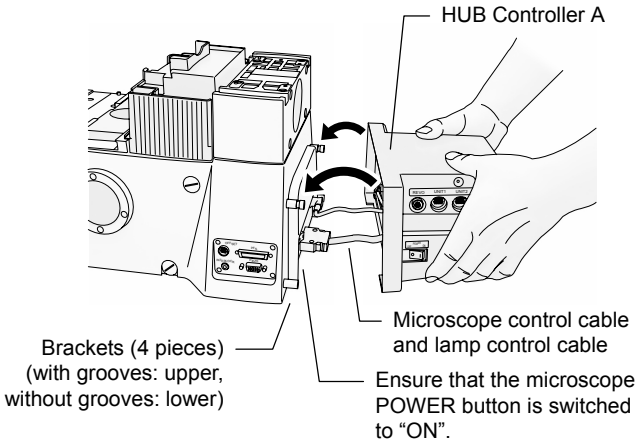


Figure 6.2-1 Connecting the hub controller A

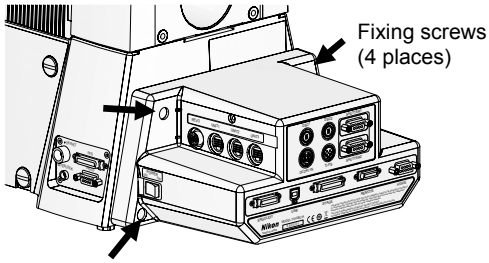


Figure 6.2-2 Mounting the hub controller A

1. **Mount the hub controller A brackets in the four bracket holes on the bank of the microscope main body.**

   Two of the brackets have grooves, and two do not. Mount items with grooves on top, and the ones without on the bottom.
2. **Flip the POWER switch of the microscope main body to “ON”.**
3. **Connect the microscope control cable (with rectangular connector) of the hub controller A to the MIC CTRL connector on the back of the microscope.**
4. **Connect the lamp control cable (with circular connector) of the hub controller A to the LAMP CTRL connector on the back of the microscope.**
5. **Lift the hub controller A, and mount its two interior hooks into the grooves of the brackets mounted on top in step 1.**
6. **Using the four screws supplied with the hub controller A, lock the hub controller A onto the brackets.**

6.2.2 Connecting Motorized Units

Connect the motorized unit connection cables to any of the connectors UNIT 1 to UNIT 7 located on both sides of the hub controller A. Note that the connectors for some motorized unit connection terminals, such as for the motorized nosepiece, are specified.

See the assembly instructions for each of the motorized units for details on how to connect them.

See Section 6.24, “AC Adapter,” for information on connecting the AC adapter.

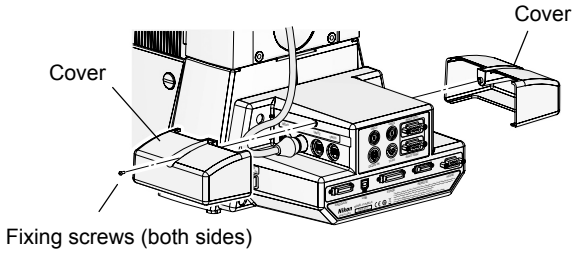


Figure 6.2-3 Connector connection cover

The connector connection covers

You can place covers over the connection ports of the REVO and UNIT 1 to 7 connectors on the side of the hub controller A. After the connection of the motorized units is complete, use the covers to protect the connection ports.

6.3 Eyepiece Base

Mount the eyepiece tube base onto the microscope main body.

6.3.1 Installing the TI-T-B and TI-T-BS

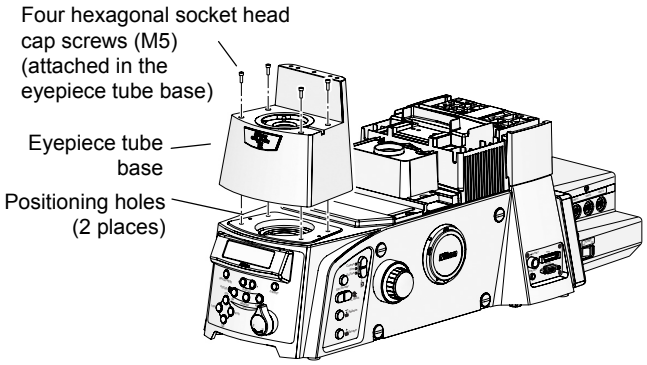


Figure 6.3-1 Attaching the eyepiece base unit (TI-T-B, TI-T-BS)

1. **Place the eyepiece base unit onto the front part of the microscope base, so that the eyepiece tube mount of the eyepiece base unit faces the front.**

   There are two positioning pins on the bottom of the eyepiece base unit. Align these pins with the holes on the microscope base.

2. **Secure the eyepiece base unit by tightening four hex socket head screws with the provided 4 mm hex screwdriver.**

6.3.2 Installing the TI-T-BPH External Phase Contrast Eyepiece Base Unit

To perform external phase contrast microscopy, attach an external phase contrast eyepiece base unit onto the microscope base, and attach a phase plate suitable for the selected condenser lens and objective to the eyepiece base unit.

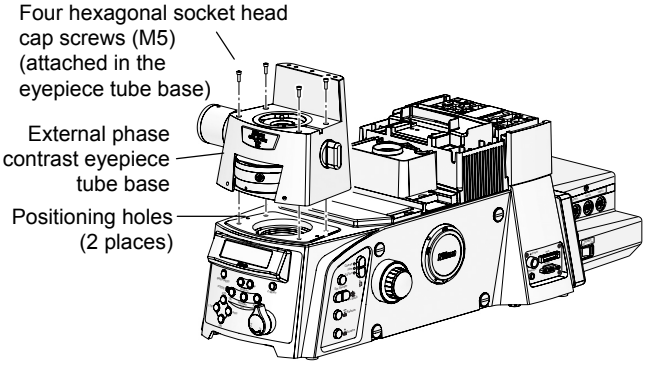


Figure 6.3-2 Attaching the external phase contrast eyepiece base unit

1. **Place the TI-T-BPH external phase contrast eyepiece base unit onto the front part of the microscope base.**

   There are two positioning pins on the bottom of the eyepiece base unit. Align these pins with the holes on the microscope base.

2. **Secure the eyepiece base unit by tightening four hex socket head screws with the provided 4 mm hex screwdriver.**

Selecting an objective lens and phase plate

You must select a phase plate that matches the objective lens being used. Referring to the table below, select an objective lens to use, and the corresponding required phase plate. You can attach up to three phase plates (A to C) to the external phase contrast eyepiece tube base.

Table 6.3-1 Selecting objective lenses and phase plates

	Condenser phase contrast code (corresponding condenser lenses)	Eligible objective lens	Phase plate
1	Ph3 (LWD, CLWD)	P Apo 60x WI (NA1.2)	60x/Ph3
2	Ph3 (LWD, CLWD)	P Apo VC 60x WI (NA1.2)	60x/Ph3
3	Ph3 (LWD, CLWD)	P Apo VC 60x H (NA1.4)	60x/Ph3
4	Ph4 (CLWD)	Apo TIRF 60x H (NA1.49)	60x/Ph4
5	Ph4 (CLWD)	P Apo TIRF 60x H (NA1.45)	60x/Ph4
6	Ph3 (LWD, CLWD)	P Apo VC 100x H (NA1.4)	100x/Ph3
7	Ph4 (CLWD)	Apo TIRF 100x H (NA1.49)	100x/Ph4

Installing and replacing phase plates

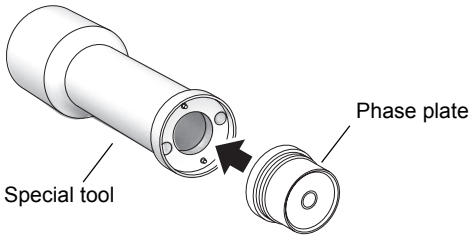


Figure 6.3-3 Special tool and phase plate

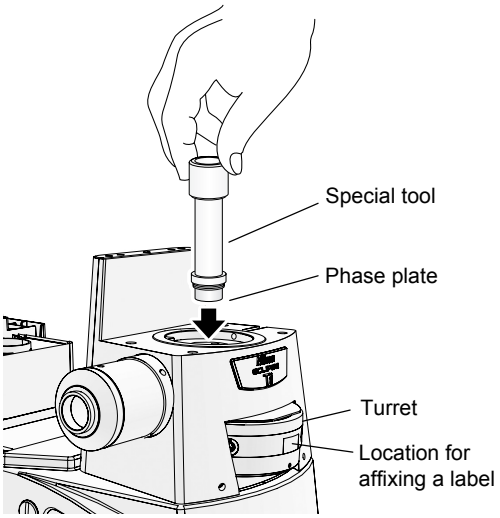


Figure 6.3-4 Installing and replacing phase plates

Installing phase plates

A special tool is included with TI-T-BPH eyepiece base unit. Use this special tool when attaching or replacing the phase plate.

1. **Align the holes on the phase plate to the two pins on the end of the special tool, and attach the phase plate to the tool.**

   The phase plate will be attached magnetically to the special tool.
2. **Select position A, B, or C by rotating the turret on the external phase contrast eyepiece base unit.**
3. **Insert the special tool and the phase plate into the optical path hole on the top of the eyepiece base unit. Screw in the phase plate into the socket on the turret.**
4. **Remove the special tool and affix the provided label below the indication on the front of the turret.**
5. **Repeat steps 1 thru 4 for positions A thru C, as necessary.**

Replacing phase plates

1. **Select position A, B, or C by rotating the turret on the external phase contrast eyepiece base unit.**
2. **Insert the special tool into the optical path hole on the eyepiece base unit. Align the two pins on the special tool to the holes on the phase plate.**
3. **Remove the phase plate from the socket by rotating the tool counterclockwise.**
4. **Remove the phase plate by pulling out the special tool.**

   The phase plate is attached magnetically to the special tool, and can be retrieved by lifting the tool.
5. **Attach other phase plate as described above in “Installing phase plates.”**

6.4 Eyepiece Tube and Eyepiece

Mount the lens on the eyepiece tube base, and then the eyepiece on the binocular portion of the eyepiece tube.

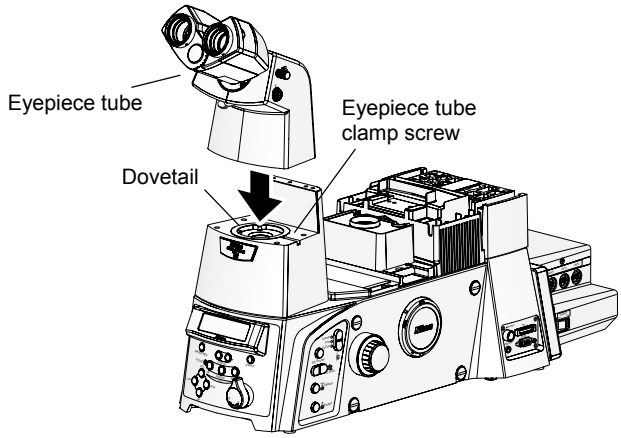


Figure 6.4-1 Installing the eyepiece tube

1. **Using a 2 mm hexagonal screwdriver, loosen eyepiece tube clamp screw on the observation port on top of the eyepiece tube base.**
2. **Place the eyepiece tube on the eyepiece tube base, then press the protruding part of the bottom of the eyepiece tube into the rounded dovetail of the eyepiece tube base.**
3. **Use a 2 mm hexagonal screwdriver to tighten the eyepiece tube clamp screw, and make sure that there is no rattling between the eyepiece tube and eyepiece tube base.**
4. **Mount the eyepiece on the binocular part of the eyepiece tube.**

   Align the three grooves on the eyepiece with the three projections on the eyepiece sleeve, and insert them. Make sure that the left and right lenses on the eyepiece have the same magnification.

   Place rubber caps over the eyepieces if available.

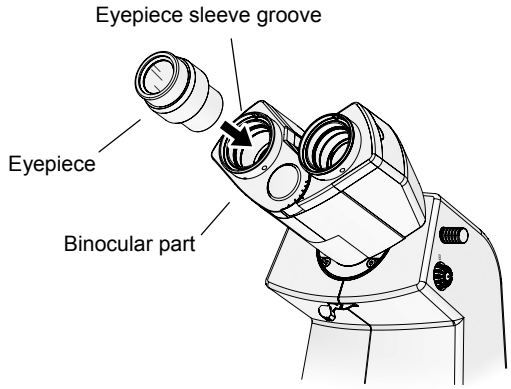


Figure 6.4-2 Installing the eyepieces

6.5 Motorized Nosepiece

Mounting the FL turret

You must attach an FL turret to the microscope main body in order to perform microscopy using an FL block, including Epi-fl microscopy and TIRF microscopy. Before mounting the motorized nosepiece, see Section 6.15, “Motorized FL Turret,” and complete the mounting of the FL turret. Beside, you must attach the protection plate too.

6.5.1 Attaching the PFS Motorized Nosepiece

When using the FL turret, attach a protection plate (for use with the PFS6 nosepiece) between the FL turret and the nosepiece. See Section 6.5.3, “Attaching the Protection Plate,” for details. The protection plate (for PFS6 nosepiece) is provided with the Perfect Focus Unit.

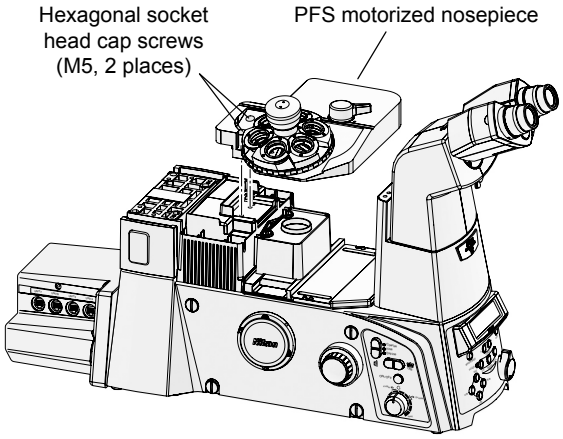


Figure 6.5-1 Installing the PFS motorized nosepiece

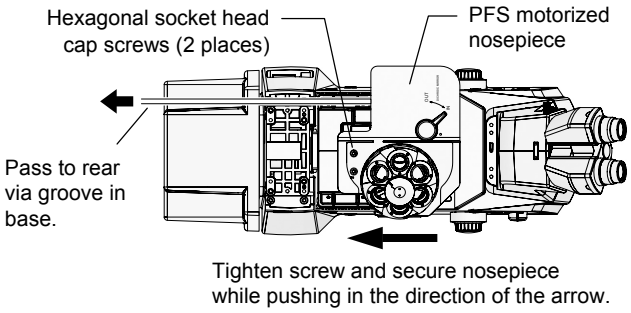


Figure 6.5-2 Securing the PFS motorized nosepiece (seen from above)

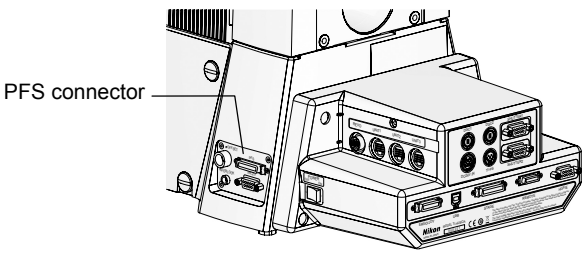


Figure 6.5-3 PFS connector

1. **Align the PFS motorized nosepiece correctly and attach it to the rectangular groove in the focusing area at the center of the microscope base.**
2. **Face the nosepiece toward the rear of the microscope, and while pressing it in, secure the nosepiece by tightening the two hexagonal socket head cap screws (M5) supplied with the nosepiece.**
3. **Pass the cable protruding from the PFS motorized nosepiece to the back of the microscope via the groove on the microscope base.**

   Ensure that the cable runs through the groove on the base to prevent it from interfering with microscope operation.
4. **Connect the PFS motorized nosepiece cable to the PFS connector on the rear of the main microscope body.**

Mount the objective lenses after completing the mounting of the stage.

6.5.2 Mounting the Motorized Nosepiece

When using the FL turret, attach a protection plate (for use with the nosepiece) between the FL turret and the motorized nosepiece. See Section 6.5.3, “Attaching the Protection Plate,” for details. The protection plate (for nosepiece) is provided with Ti-E / Ti-E/B.

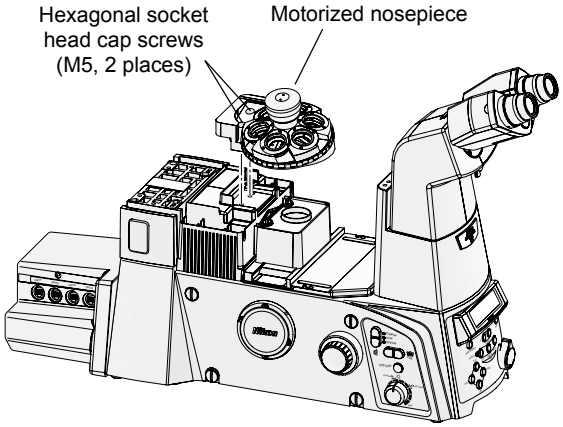


Figure 6.5-4 Installing the motorized nosepiece

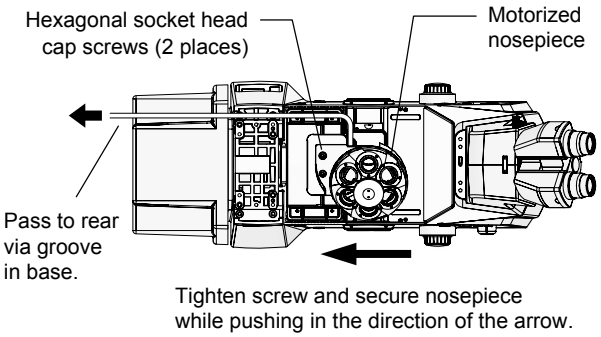


Figure 6.5-5 Securing the motorized nosepiece (seen from above)

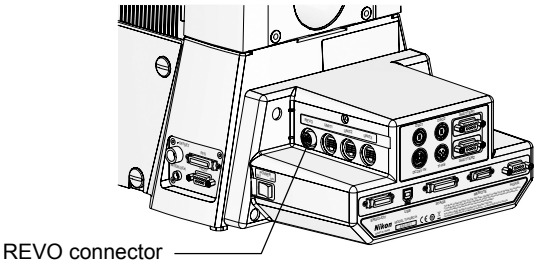


Figure 6.5-6 REVO connector position

1. **Align the nosepiece correctly and attach it to the rectangular groove in the focusing area at the center of the microscope base.**

2. **Face the nosepiece toward the rear of the microscope, and while pressing it in, secure the nosepiece by tightening the two hexagonal socket head cap screws (M5) supplied with the nosepiece.**

3. **Pass the cable protruding from the motorized nosepiece to the back of the microscope via the groove on the microscope base.**

   Ensure that the cable runs through the groove on the base to prevent it from interfering with microscope operation.

4. **Connect the motorized nosepiece cable to the REVO connector on the right side of the hub controller A.**

Mount the objective lenses after completing the mounting of the stage.

6.5.3 Attaching the Protection Plate

(When using an FL turret)

When an FL turret is mounted on the Ti-E / Ti-E/B, a protection plate must be attached between the FL turret and the nosepiece. The part to be attached varies depending on the nosepiece, so attach the protection plate to suit the nosepiece you are using in accordance with the following steps.

(1) When using a PFS motorized nosepiece (TI-ND6-PFS)

The protection plate supplied with the TI-ND6-PFS Perfect Focus Unit (for the PFS6 nosepiece) is a protective part designed to fill the space between the PFS motorized nosepiece and the FL turret (TI-FLC, TI-FLC-E, TI-FLC-E/HQ) to prevent the user from injury due to their hands or fingers being caught in this gap.

When using an FL turret, be sure to attach the protection plate (for the PFS6 nosepiece) in accordance with the following steps when mounting the PFS motorized nosepiece:

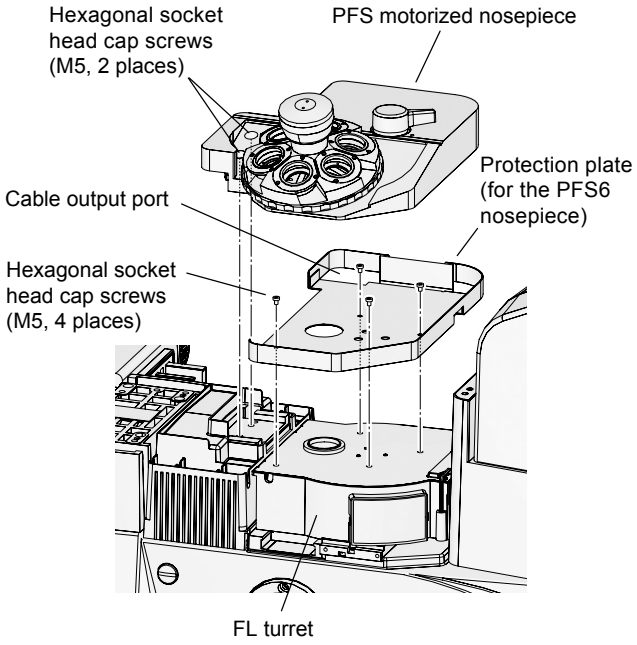


Figure 6.5-7 Attaching the protection plate (for the PFS6 nosepiece)

1. **Remove the four hexagonal socket head cap screws (M3) securing the FL turret using the 2 mm hexagonal screwdriver supplied with the Ti-E / Ti-E/B.**

2. **Attach the protection plate (for the PSF6 nosepiece) on the top of the FL turret and secure it firmly using the four hexagonal socket head cap screws (M3) removed in Step 1.**

3. **Pass the PFS motorized nosepiece connection cable through the cable output port on the protection plate and mount the PFS motorized nosepiece on the Ti-E / Ti-E/B using the 4 mm hexagonal screwdriver supplied with the Ti-E / Ti-E/B.**

   See Section 6.5.1, “Attaching the PFS Motorized Nosepiece,” for details on how to mount the nosepiece.

(2) When using the motorized nosepiece (TI-ND6-E)

The protection plate supplied with the Ti-E / Ti-E/B main body (for the nosepiece) is a protective part designed to fill the space between the nosepiece (TI-N6, TI-ND6, TI-ND6-E) and the FL turret (TI-FLC, TI-FLC-E, TI-FLC-E/HQ) to prevent the user from injury due to their hands or fingers being caught in this gap.

When using an FL turret, be sure to attach the protection plate in accordance with the following steps when mounting the nosepiece:

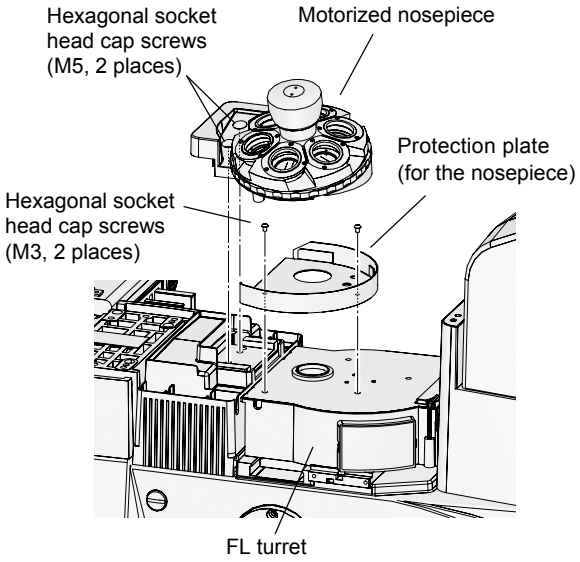


Figure 6.5-8 Attraching the protection plate (for the nosepiece)

1. **Remove two of the four hexagonal socket head cap screws (M3) securing the FL turret (TI-FLC, TI-FLC-E, TI-FLC-E/HQ) as shown in the diagram on the left using the 2 mm hexagonal screwdriver.**

2. **Attach the protection plate (for the nosepiece) on the top of the FL turret and secure it firmly using the two hexagonal socket head cap screws (M3) removed in step 1.**

3. **Mount the motorized nosepiece (TI-ND6-E) on the Ti-E / Ti-E/B and secure with the 4 mm hexagonal screwdriver.**

   See Section 6.5.2, “Attaching the Motorized Nosepiece,” for details on how to mount the nosepiece.

6.6 Dia Pillar Illuminator and Lamphouse

Attach the diascopic light illumination pillar on the microscope base.
Both a 100W and a 30W dia pillar illuminators are available in the TI series.

6.6.1 Attaching the TI-DH Dia Pillar Illuminator 100W

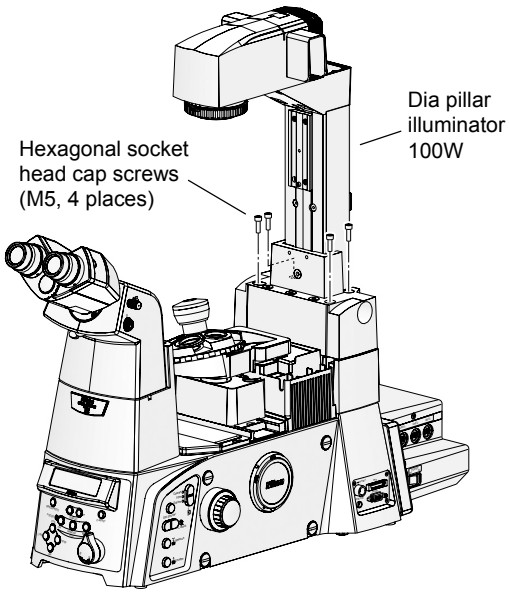


Figure 6.6-1 Installing the dia pillar illuminator 100W

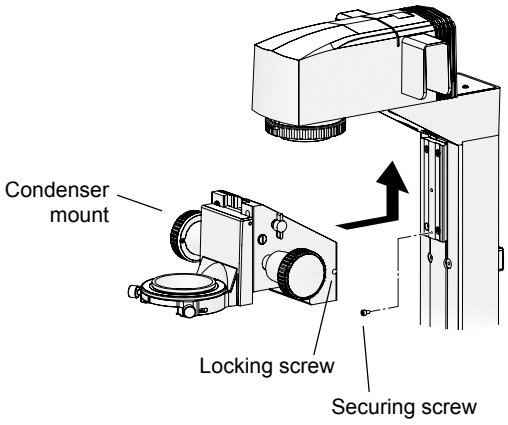


Figure 6.6-2 Installing the condenser mount

Attach the dia pillar illuminator 100W on the microscope base.

To prevent the dia pillar illuminator from tipping over support it with your hand while performing this step.

1. **Place the dia pillar illuminator on the mount on the back of the base.**

   There are positioning pins on the mount of the base. Align the pins with the pin holes of the dia pillar illuminator.

2. **Tighten the four hexagonal socket head cap screws (M5) supplied with the dia pillar illuminator using the 4 mm hexagonal screwdriver to secure them.**

3. **Attach the condenser mount to the dia pillar illuminator.**

   (1) Remove the securing screw.

   (2) Slide the condenser mount from the bottom to the top along the dovetail groove to attach the mount (slide it fully upward).

   (3) Use a hexagonal screwdriver to securely tighten the locking screw on the right side of the condenser mount.

   (4) Attach the securing screw at its original position.

   (5) If you are using a condenser other than an ELWD or ELWD-S, loosen the condenser-mount locking screw, slide the condenser mount down until it touches the securing screw, and then re-tighten the locking screw in this state.

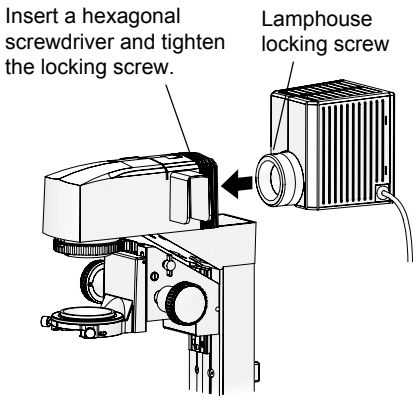


Figure 6.6-3 Installing lamphouse

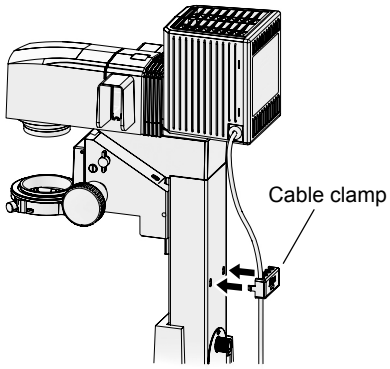


Figure 6.6-4 Locking clamp

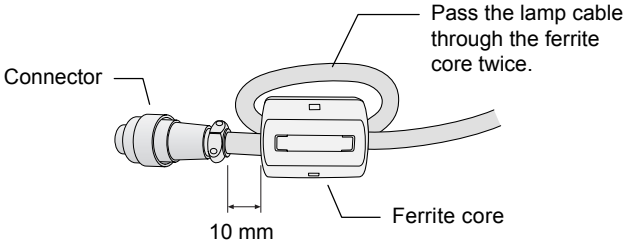


Figure 6.6-5 Attaching the ferrite core

4. Attach the lamphouse to the dia pillar illuminator.

> **Precautions against heat:**
> **To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.**

(1) Snap the lamphouse into the lamphouse mount on top of the dia pillar illuminator.

Make sure that the groove of the circular mount of the lamphouse is aligned with the pin of the dia pillar illuminator at this time.

(2) Insert a 2 mm hexagonal screwdriver into the hole on the dia pillar illuminator and tighten the lamphouse locking screw to secure the lamphouse.

(3) Using the cable clamp on the back of the dia pillar illuminator, secure the lamphouse cable.

The cable clamp is secured to the dia pillar illuminator hole by two prongs on both sides. Squeeze the cable clamp from both sides to detach the prongs and remove it.

It is possible to pass up to four cables through the cable clamp.

5. Attach the supplied ferrite core to the position on the lamp cable connector side.

(1) Remove the tab and open the ferrite core

(2) Wind the lamp cable around the ferrite core so that it passes through the core twice.

Make the ferrite core position about 10 mm apart from the lamp cable connector.

(3) Close the ferrite core.

See Section 6.23, “Diascopic Illumination Power Supply,” for details about connecting the lamphouse to the power supply and the main microscope body.

6.6.2 Attaching the TI-DS Dia Pillar Illuminator 30W

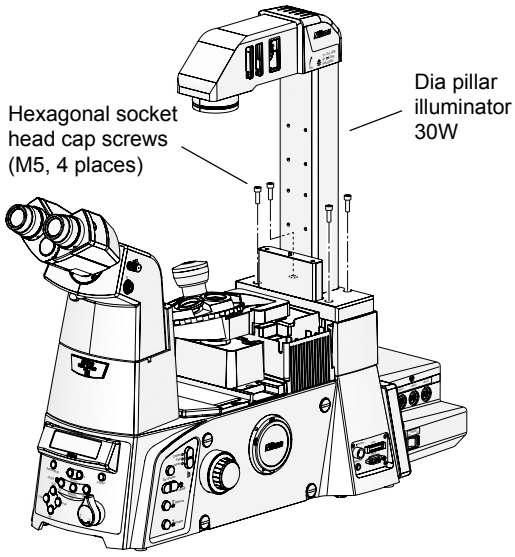


Figure 6.6-6 Attaching the dia pillar iuminator 30W

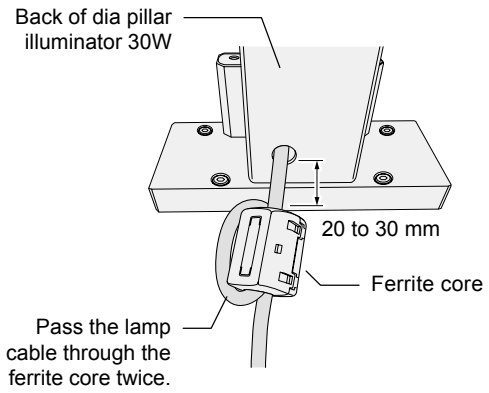


Figure 6.6-7 Ferrite core assembly

Attach the dia pillar illuminator 30W on the microscope base.

To prevent the dia pillar illuminator from tipping over support it with your hand while performing this step.

1. **Place the dia pillar illuminator on the mount on the base.**

   There are positioning pins on the mount of the base. Align the pins with the pin holes of the dia pillar illuminator.

2. **Use a 4mm hexagonal screwdriver to secure the dia pillar illuminator by tightening the four hexagonal socket head cap screws (M5) supplied with the dia pillar illuminator.**

3. **Attach the supplied ferrite core to the position on the lamp cable connector side.**

   (1) Remove the tab and open the ferrite core

   (2) Wind the lamp cable around the ferrite core so that it passes through the core twice.

   Make the ferrite core position about 20 to 30 mm apart from the lamp cable connector.

   (3) Close the ferrite core.

See Section 6.23, “Diascopic Illumination Power Supply,” for details about connecting the lamphouse to the power supply and the main microscope body.

6.7 Dia Pillar Illuminator Lamps

Caution

- **Lamps, dia pillar illuminators, and power supplies must be used in determined combinations. See Section 4.2.1, "Combinations of Lamps, Dia Pillar Illuminators, and Power Supplies" to select an appropriate combination. Always use the specified type of lamp.**
- **Before replacing a lamp, you must turn off the power switch of the power supply, and unplug the power cord.**
- **The lamp and the area around it become very hot during and immediately after illumination. When replacing a lamp, wait for about 30 minutes after turning off the power to allow time for it to cool sufficiently.**
- **Never touch the glass portion of the lamp with your bare hands. Dirt or fingerprints glass could cause uneven illumination or shorten the lifespan of the lamp. Use gloves or other protective equipment when handling lamps.**
- **Securely close the lamphouse cover after replacing the lamp. Never turn on the lamp with the cover removed.**

6.7.1 For the TI-DH Dia Pillar Illuminator 100W

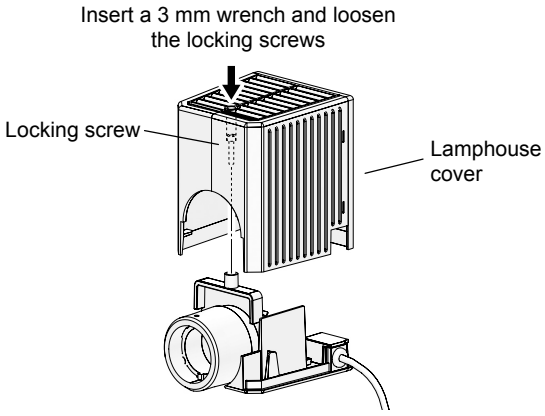
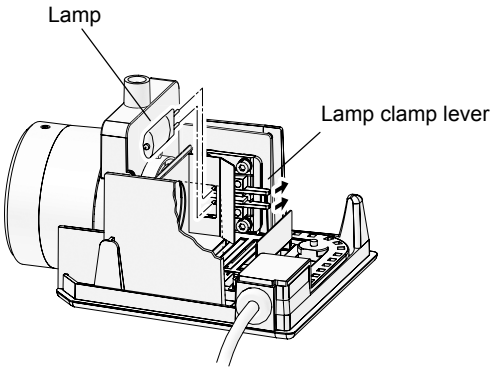


Figure 6.7-1 Removing the lamphouse cover



Pressing on the lamp clamp lever opens the pin holes of the socket. While pressing the lever, remove the lamps no longer being used and attach new ones

Figure 6.7-2 Replacing lamps

Precautions against heat:

To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.

1. **Insert a 3 mm hexagonal wrench (or hexagonal screwdriver) into the hole on top of the lamphouse cover, loosen the locking screw, and remove the lamphouse cover.**
2. **Press the lamp clamp lever, and remove the used lamp from the socket.**
3. **Insert a new lamp into the socket.**

   While pressing on the lamp clamp lever, press the lamp pins into the pin holes of the socket. Push the lamp all the way in, then release the lamp clamp lever.

   - Make sure you use the specified lamp type.
   - Do not touch the glass portion of the lamp with your bare hands.
   - When you release the lamp clamp lever, be careful not to tip the lamp.
4. **Return the lamphouse cover to its original position, and fasten it securely by tightening the locking screw.**

6.7.2 For the TI-DS Dia Pillar Illuminator 30W

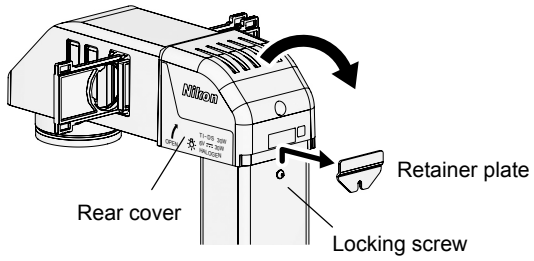


Figure 6.7-3 Opening the rear lamphouse cover

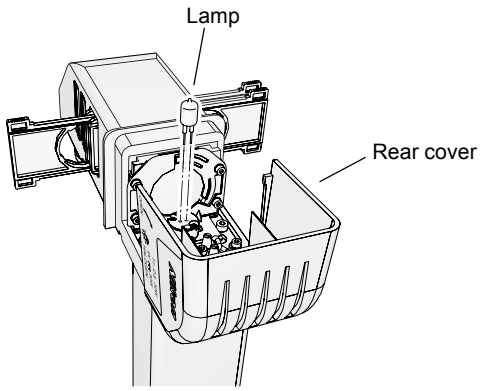
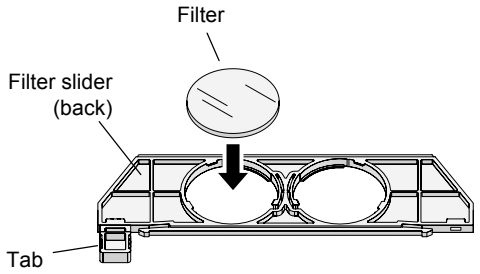


Figure 6.7-4 Replacing lamps

Precautions against heat:
To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.

1. **Loosen the locking screw on the back of the dia pillar illuminator and remove the retainer plate from the rear cover.**
2. **Open the dia pillar illuminator rear cover by lifting it up in a backwards direction.**
3. **Remove the used lamp from the socket.**
4. **Insert a new lamp into the socket.**
   - Make sure to use the specified lamp.
   - Do not touch the glass part of the lamp with bare hands.
5. **Close the rear cover.**
6. **Attach the retainer plate of the rear cover to its original position and fix it with the locking screw.**

6.8 Filter Slider



* Although the filter slider for the dia pillar illuminator 30W has a different shape, the method for securing the filters is the same.

Figure 6.8-1 Attaching filters

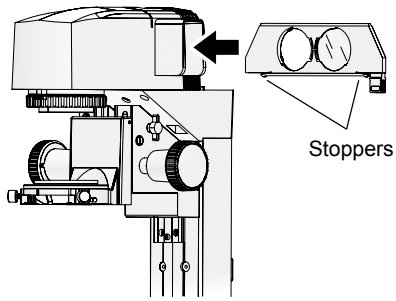


Figure 6.8-2 Inserting filter sliders (for the dia pillar illuminator 100W)

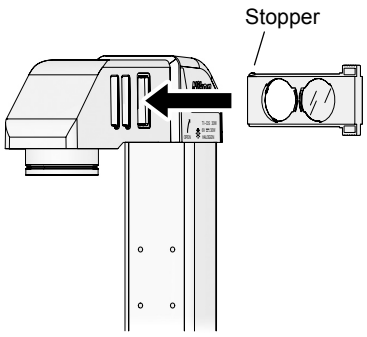


Figure 6.8-3 Inserting filter sliders (for the dia pillar illuminator 30W)

Attached the desired filter to the filter slider, and attach the filter slider to the slot of the dia pillar illuminator.

Do not touch filters or other optical components with your bare hands.

1. **Attach the desired filter to the filter slider.**

   Attach it from the back of the filter slider. The mounting hole has three stoppers to keep the filter from falling. Only one stopper can be moved to the side. Move this stopper aside, and attach the filter.

2. **Affix a label indicating the filter type on the grip of the filter slider.**

3. **Insert the filter slider into the slot of the dia pillar illuminator.**

   The filter slider has stoppers that determine the limit of slide operation. Press the stoppers up, and press the filter into the slot.

   Four filter sliders can be inserted for the dia pillar illuminator 100W and three filter sliders can be inserted for the dia pillar illuminator 30W.

   You can insert filters sliders from the right or the left. If they are all inserted from the same direction, they will be difficult to handle, so you should insert them alternately from the left and right.

For the dia pillar illuminator 100W, install the diffusion filter (filter slider D) into the nearest lamphouse to maintain uniformity with the dia pillar illuminator.

Removing filters

Tabs at both ends of the filter slider are at their end point when sliding. When removing a filter slider, you can slide it out by pushing the tab on the opposite side up with your finger, and removing the barrier. Applying undue force on the filter slider can break the tabs.

6.9 Stage

When attaching objective lenses to the nosepiece, perform the following steps after removing the objective lenses.

6.9.1 Attaching a Manual Stage

Attach a manual stage to the microscope base.

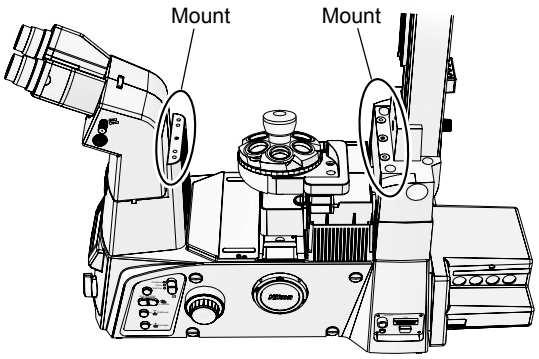


Figure 6.9-1 Stage mounting position

1. **Place the stage on the eyepiece tube base and dia pillar illuminator mounts.**

   The mount on the dia pillar illuminator has positioning pins. Place the stage on the pillar, aligning the holes on the bottom of the stage with the pins.

If your stage is equipped with a movement handle, you should normally position it so that the handle is at the back right of the microscope. You may also position the handle at the front left of the microscope.

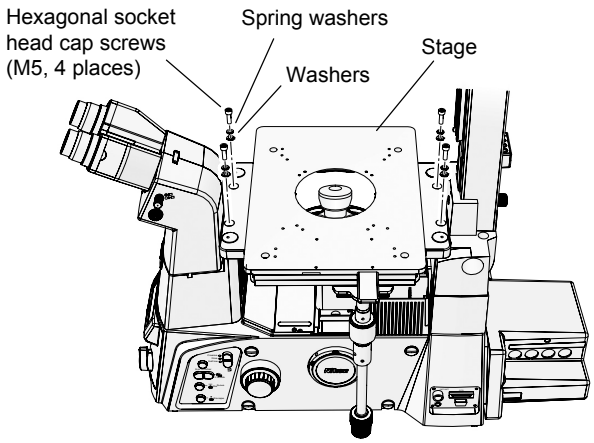


Figure 6.9-2 Installing the manual stage

2. **Secure the stage by tightening the four hexagonal socket head cap screws (M5) supplied with the stage.**

   Attach the locking hexagonal socket head cap screws with spring washers and washers.

6.9.2 Attaching a Motorized Stage

Install either the TI-S-E motorized stage or the TI-S-ER motorized stage with encoders onto the microscope base unit and connect the motorized stage, motorized stage controller and the hub controller A.

Caution

- **Be sure to hold the undermost base plate when handling the stage. Inadvertently holding other areas may adversely affect the accuracy of the microscope or damage it.**
- **The four support legs attached the base board are for use when placing the stage on a shelf. Remove the legs after attachment to the microscope if they are not required.**

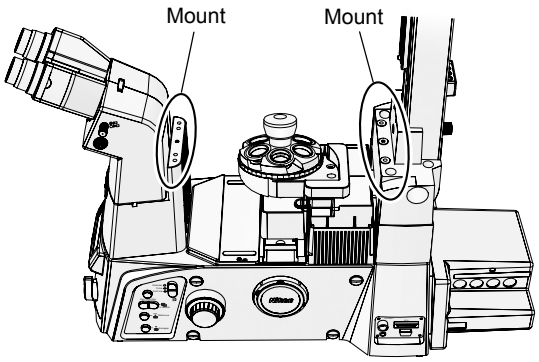


Figure 6.9-3 Stage mounting position

1. **Place the motorized stage on the mounts. One is on the eyepiece tube base, and the other is on the dia pillar illuminator.**

   The mount on the dia pillar illuminator has positioning pins. Place the stage on the pillar, aligning the holes on the bottom of the stage with the pins.

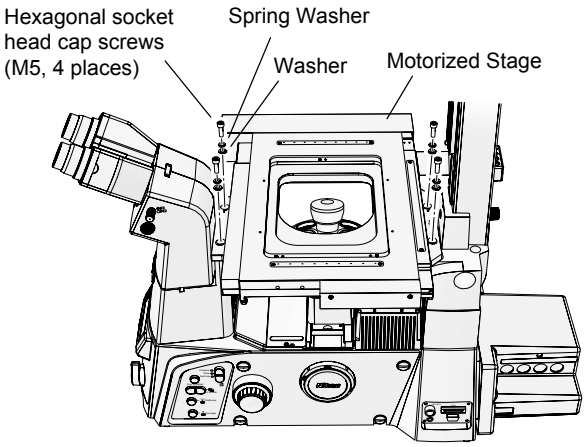


Figure 6.9-4 Installing the motorized stage

2. **Secure the stage by tightening the four hexagonal socket head cap screws (M5) supplied with the stage.**

   Attach the locking hexagonal socket head cap screws with spring washers and washers.

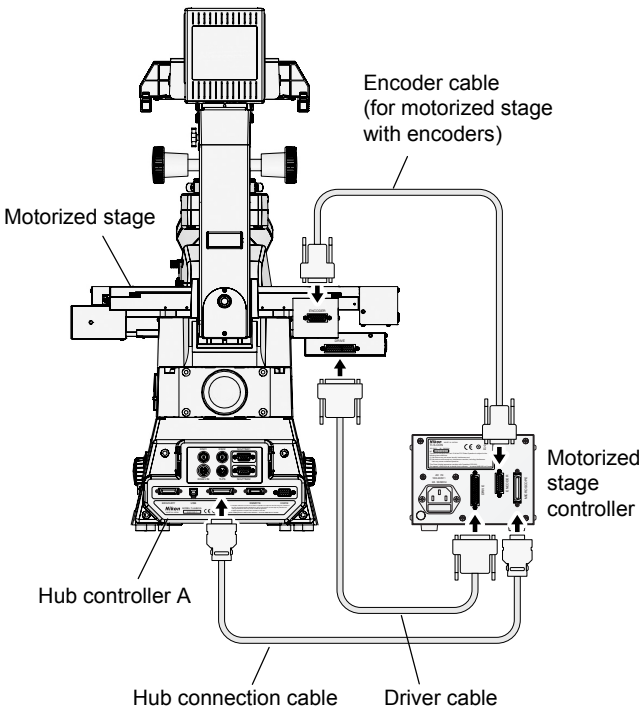


Figure 6.9-5 Connecting the motorized stage

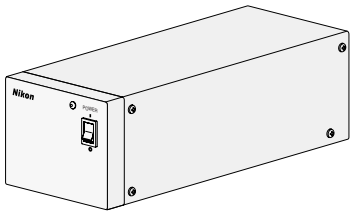


Figure 6.9-6 Motorized stage controller

3. Use the supplied cables to connect the motorized stage, motorized stage controller, and hub controller A.

(1) Connect the motorized stage controller's MICROSCOPE connector and the hub controller A's STAGE connector using the hub connection cable.

(2) Connect the DRIVE connectors of the stage controller and the motorized stage to each other using the driver cable.

(3) If you are using a motorized stage with an encoder, use encoder cables to connect the ENCODER connectors of the stage controller and motorized stage to each other.

4. Connect the power source of the motorized stage controller using the specified power cord.

6.10 Objectives

Attach the objective lenses to the nosepiece.

If the stage is not mounted, do so first.

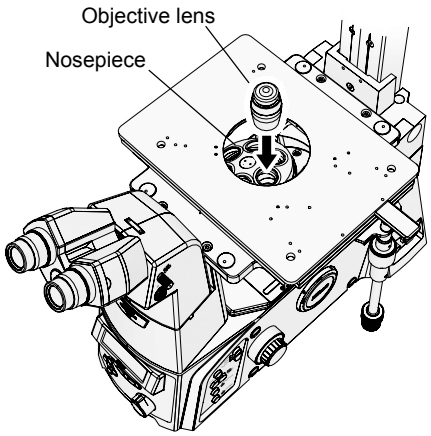


Figure 6.10-1 Attaching the objectives

1. **Remove annular rings, specimen holders, and the like from the stage.**
2. **Screw the objective lenses into the nosepiece mount through the hole in the stage.**

   Make sure that the magnification of the objective lenses increases when the nosepiece is rotated clockwise, as viewed from above the microscope.

Before using the microscope, be sure to program the TI-RCP Remote Control Pad or computer's setup application "Ti-Control" with information on the objective lenses attached to the nosepiece. For information on programming this information, see the Remote Control Pad instruction manual or the "Ti-Control" instruction manual.

6.11 Motorized Condenser Turret

Attach the T-CT-E Motorized Condenser Turret to the condenser mount of the dia pillar illuminator. If you are using a manual condenser, see the instruction manual supplied with the microscope main body.

6.11.1 Preparations

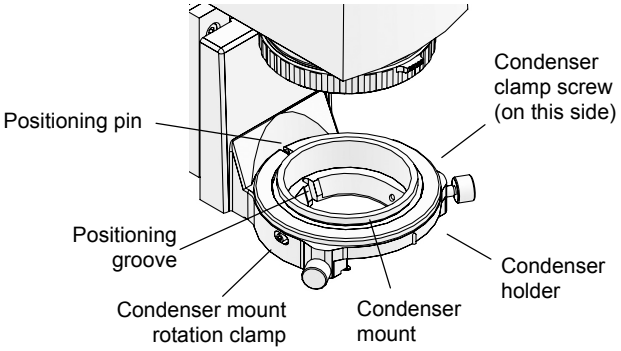


Figure 6.11-1 The condenser holder parts

1. **Use a hexagonal screwdriver to loosen the condenser clamp screw on the right side of the condenser holder.**

   The condenser clamp screw is in the back of the hole on the right side of the condenser holder.

   If the condenser mount is rotated from the standard position, then the back of the hole will not be visible. If this happens, loosen the mount rotation clamp screw and rotate the condenser mount manually, until the positioning groove in the mount is aligned with the positioning pin on the condenser holder. In this position, tighten the rotation clamp screw to secure the condenser mount.

6.11.2 Attaching the Motorized Condenser Turret

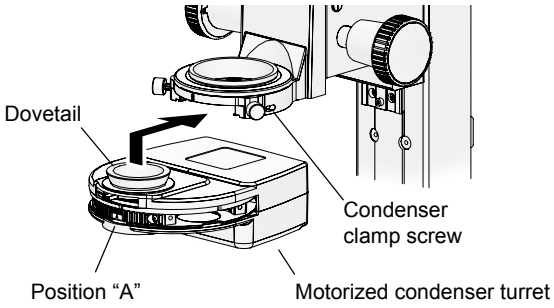


Figure 6.11-2 Installing the motorized condenser turret

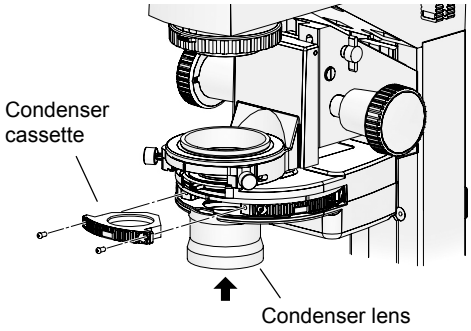


Figure 6.11-3 Attaching the condenser cassette and condenser lens

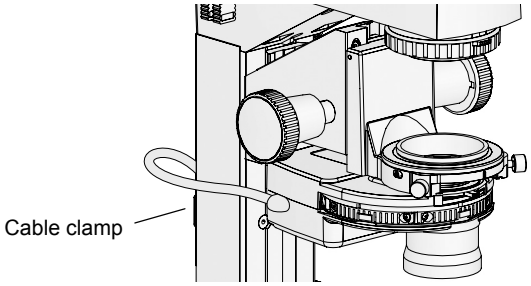


Figure 6.11-4 Wiring

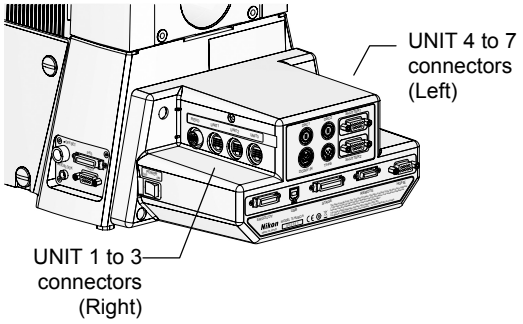


Figure 6.11-5 Connecting to the hub controller A

1. **Make the indicator of the motorized condenser face forward, and insert the motorized condenser turret into the dovetail of the condenser holder, then secure it by tightening the condenser clamp screw.**

   Attach the motorized condenser turret so that it slides from the front.

2. **Insert the condenser cassette into the motorized condenser cassette, and secure it using two hexagonal socket head cap screws.**

   You can attach up to five condenser cassettes to the motorized condenser turret. Attach the modules so that the module numbers increase when rotated clockwise as viewed from above the turret.

3. **Screw the condenser lens into the mount on the bottom of the condenser turret.**

   For information on combinations of condenser lenses and condenser cassettes, see Chapter 4, “Operation of Each Part,” – “4.8 Using a Motorized Condenser Turret.” Note that the auxiliary lens included with the LWD condenser lens cannot be used with the Ti series.

4. **Connect the motorized condenser turret cable to any of the UNIT 1 to UNIT 7 connectors of the hub controller A.**

   Perform the cabling so that the cables do not interfere with the motion of the equipment. Use the cable clamp on the back of the dia pillar illuminator to secure the cables.

   The hub controller A automatically detects motorized units connected to it. You can connect them to any of the connectors of UNIT 1 to 7.

Before using the microscope, be sure to program the information on the condenser cassettes attached to the motorized condenser turret using the remote control pad or the computer’s setup application “Ti-Control.” For information on programming this information, see the Remote Control Pad instruction manual or the “Ti-Control” instruction manual.

6.12 Side Port

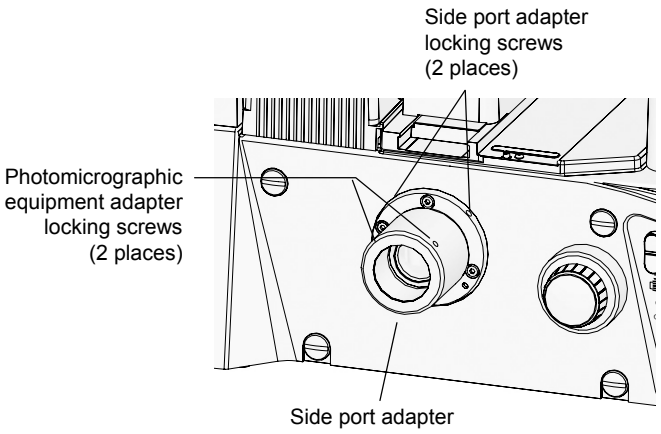


Figure 6.12-1 Mounting the side port adapter

1. **Loosen the two side port adapter locking screws, and remove the plastic cap attached to the side port.**
2. **Insert the side port adapter into the side port, and secure it by tightening the side port adapter locking screw.**
3. **Attach adapters to the photomicrographic equipment.**
4. **Insert the photomicrographic equipment and the adapter into the side port adapter and secure by tightening the two photomicrographic equipment adapter locking screws.**

- When mounting a photomicrographic equipment, an adapter supporting the attachment is needed. First mount the adapter for the photomicrographic equipment, then mount the attachment on a side port adapter for each adapter.
- Keep a cap on all unused ports at all time, in order to protect the ports.

- **Example: Attaching the C mount TV camera to the direct C mount adapter**

  (1) Screw the C mount TV camera securely into the direct C mount adapter.

  (2) Insert the direct C mount adapter into the side port adapter and secure by tightening the photomicrographic equipment adapter locking screws.

- When removing a photomicrographic equipment, loosen the photomicrographic equipment adapter locking screws while holding the photomicrographic equipment in place.
- Loosening the locking screws without holding the photomicrographic equipment in place may result in the photomicrographic equipment being dropped. Be sure to hold the photomicrographic equipment steady when loosening side port adapter locking screws and photomicrographic equipment adapter locking screws.

6.13 Bottom Port (Ti-E/B Only)

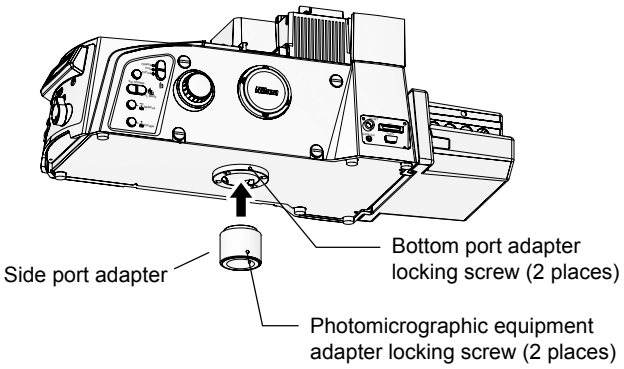


Figure 6.13-1 Mounting a bottom port adapter

1. **Loosen the two bottom port adapter clamp screws, and remove the metal cap attached to the bottom port.**
2. **Mount the bottom port adapter to the bottom port and secure by tightening the two bottom port adapter locking screws.**
3. **Attach adapters to the photomicrographic equipment.**
4. **Insert the photomicrographic equipment and adapter into the bottom port adapter, and secure them by tightening the two photomicrographic equipment locking screws.**

- When mounting a photomicrographic equipment, an adapter supporting the attachment is needed. First mount the adapter for the photomicrographic equipment, then mount the attachment on a bottom port adapter for each adapter.
- Keep a cap on all unused ports at all time, in order to protect the ports.

- **Example: Attaching the C mount TV camera to the direct C mount adapter**

  (1) Screw the C mount TV camera securely into the direct C mount adapter.

  (2) Insert the direct C mount adapter into the bottom port adapter, and secure it by tightening the photomicrographic equipment locking screw.

- When removing a photomicrographic equipment, loosen the photomicrographic equipment adapter locking screws while holding the photomicrographic equipment in place.
- Loosening the locking screws without holding the photomicrographic equipment in place may result in the imaging equipment being dropped. Be sure to hold the photomicrographic equipment steady when loosening bottom port adapter locking screws and photomicrographic equipment adapter locking screws.

6.14 Epi-fl Attachment

To perform epi-fl microscopy, you must mount a motorized FL turret (see the next page) and epi-fl attachment on the microscope main body, and attach an episcopic (reflected) light source and motorized shutter on the epi-fl attachment.

See the instruction manual for the epi-fl attachment for instructions on mounting the epi-fl attachment.

> See Section 6.15, “Motorized FL Turret,” for details on how to mount the motorized FL turret. See the instruction manual for the epi-fl attachment for instructions on attaching and using the epi-fl attachment, light source, and motorized shutter.

6.15 Motorized FL Turret

Mount the motorized FL turret onto the microscope main body.

In order to perform epi-fl microscopy, you must mount an epi-fl attachment to the microscope main body. See the instruction manual of your epi-fl attachment for instructions on mounting this attachment.

6.15.1 Mounting a Motorized FL Turret

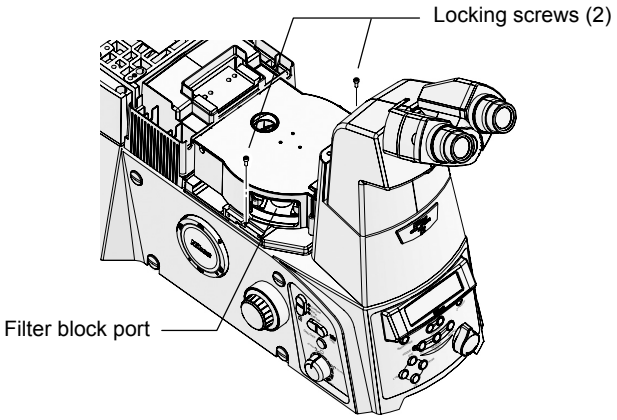


Figure 6.15-1 Mounting a motorized FL turret

1. **Remove the two screws and take off the FL turret mount cover.**

2. **Press the FL turret into the mounting groove on the right side of the microscope, then use a hexagonal screwdriver to tighten the two screws.**

   Tighten the locking screws on the left side with the filter block port cover removed.

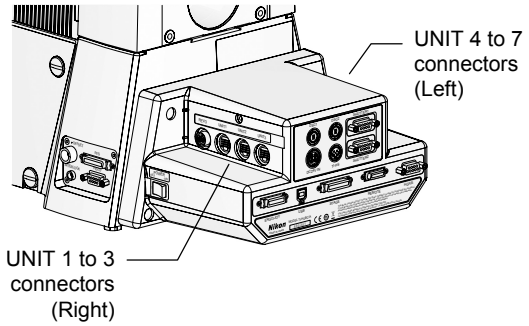


Figure 6.15-2 Connecting to the hub controller A

3. **Connect the motorized FL turret cable to any of the UNIT 1 to UNIT 7 connectors of the hub controller A.**

   Pass the cable to the back of the microscope via the groove in the microscope base.

   The hub controller A automatically recognizes motorized units attached to it. You can connect the cable to any of the UNIT 1 to UNIT 7 connectors.

Creating a two-tier motorized FL turret configuration

You can use a motorized FL turret and epi-fl attachment together in a two-tier configuration by using the TI-BSUK70 stage-up kit. In this case, the bottom tier is first tier (FL1), and the top tier is second tier (FL2). You must connect and program the filter block in the same way as when only one tier is used.

6.15.2 Mounting Filter Blocks

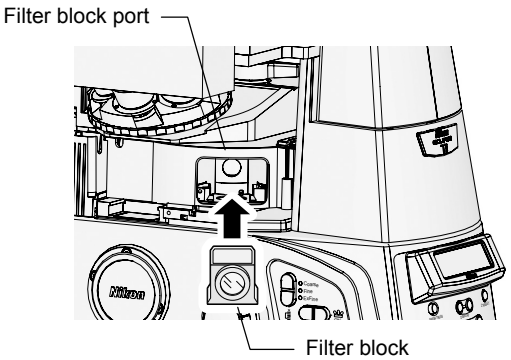


Figure 6.15.3 Mounting filter blocks

Finish assembling all other units before attaching filter blocks.

1. **Make sure that the power switch of the hub controller A is off.**
2. **Open the cover on the filter block port of the motorized FL turret.**
3. **Check the position display (address) of the turret, and manually rotate the turret so that the desired address is positioned at the aperture.**
4. **Align the filter block (or analyzer block) with the turret's dovetail and insert it as far as it will go.**
5. **Repeat steps 3 and 4 to attach the desired filter blocks.**
6. **Affix the sticker labels corresponding to the types of filter block used.**
7. **Attach the filter block port cover to the original position.**

Before using the microscope, be sure to program the information on the filter blocks attached to the motorized FL turret using the remote control pad or the computer's setup application "Ti Control."
For information on programming this information, see the Remote Control Pad instruction manual or the "Ti Control" instruction manual.

6.16 DIC Attachment

To perform differential interference contrast (DIC) microscopy, attach an analyzer, polarizer, DIC-compatible nosepiece, condenser DIC prism, and objective-lens DIC prism to the microscope. See the instruction manual for the DIC attachment for instructions on attaching and using this product.

6.17 Motorized Excitation Filter Wheel

6.17.1 Mounting the Motorized Excitation Filter Wheel

Mount the TI-FLEW-E EX filter wheel on the epi-fl attachment.
If you have not finished assembling the epi-fl attachment, do so first.

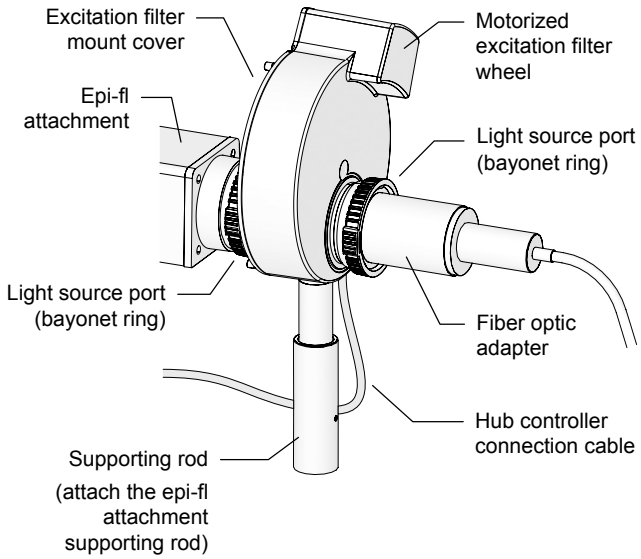


Figure 6.17-1 Mounting a motorized excitation filter wheel

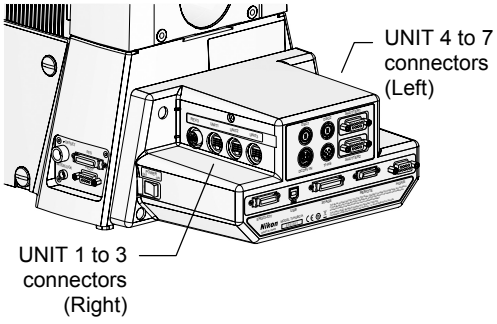


Figure 6.17-2 Connecting to the hub controller A

1. **If a supporting rod is attached to the epi-fl attachment, remove it.**
2. **Attach the epi-fl attachment's light source adapter to the motorized excitation filter wheel.**
   (1) Turn the bayonet ring on the light source adapter of the epi-fl attachment in the "O" direction.
   (2) Press in the epi-fl attachment mount of the motorized excitation filter wheel.
   (3) Turn the bayonet ring in the "C" direction to secure the motorized excitation filter wheel.
3. **Attach the supporting rod to the motorized excitation filter wheel.**
   (1) Loosen the clamp screw of the supporting rod.
   When the clamp screw is loosened, the length of the supporting rod can be adjusted.
   (2) Screw the supporting rod into the supporting rod mount of the motorized excitation filter wheel.
   (3) Allow the tip of the supporting rod to touch the installation surface, and adjust it to a length where there is no excess of force applied to the Epi-fl attachment or the motorized excitation filter wheel.
   (4) Tighten the clamp screw to lock the length of the supporting rod.
4. **Attach the light source to the light source port of the motorized excitation filter wheel.**
   If you will be attaching a motorized HG fiber-optic light source, see Section 6.22, "Motorized HG Fiber Optic Light Source." If you want to attach another type of light source, see the instruction manual provided with that light source.
5. **Connect the motorized excitation filter wheel cable to any of the UNIT 1 to 7 connectors on the hub controller A.**
   The hub controller A automatically detects motorized units connected to it. You can connect them to any of the UNIT 1 to 7 connectors.

6.17.2 Attaching Excitation Filters

Assemble all other units before attaching the excitation filters.

Caution

Make sure that the light source is turned off before attaching or removing excitation filters.

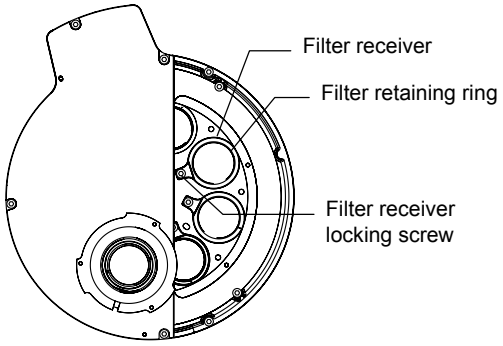


Figure 6.17-3 Attaching an excitation filter

Before attaching an excitation filter, make sure that the power switch of the hub controller A is turned off. Attach the motorized excitation filter wheel by rotating it manually.

1. **Loosen the locking screw, and remove the cover of the excitation filter mount.**
2. **Check the position indicators (addresses) on the wheel, and turn the wheel manually until the desired filter position is visible.**
3. **Extract the filter receiver by removing the filter receiver locking screws using the 2 mm hexagonal screwdriver.**
4. **Detach the filter retaining ring from the filter receiver.**

   Detach the light-shielding plate, as well, if applicable.
5. **Place an excitation filter (or light shielding plate) in the filter receiver and secure it with the filter retaining ring.**

   Be sure to attach a light-shielding plate to each of the filter receivers without excitation filters, unless you choose to leave a specific address empty (i.e., with no filter receiver attached).
6. **Insert the filter receiver into the wheel. Turn the filter receiver and secure it in position with the locking screw.**
7. **Return the excitation filter mount cover to its original position, and secure it by tightening the locking screw.**

Before using the microscope, be sure to program the information on the excitation filters attached to the motorized excitation filter wheel using the remote control pad or the computer's setup application "Ti Control." For information on programming this information, see the Remote Control Pad instruction manual or the "Ti Control" instruction manual.

6.18 Motorized Barrier Filter Wheel

6.18.1 Mounting the Motorized Barrier Filter Wheel

Attach the TI-FLBW-E BA filter wheel directly to the side port of the microscope main body.

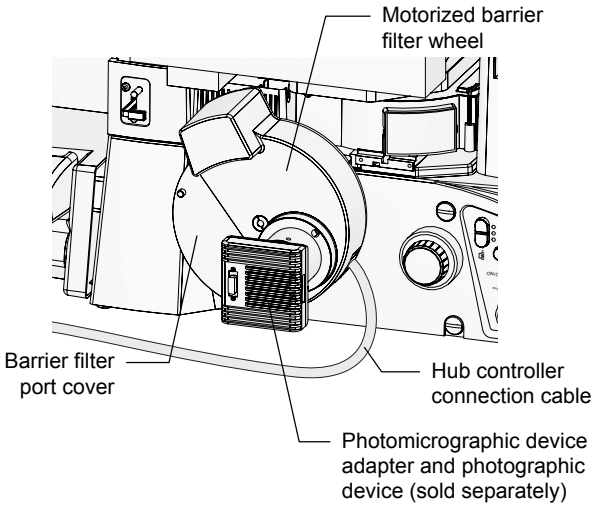


Figure 6.18-1
Attaching a motorized barrier filter wheel

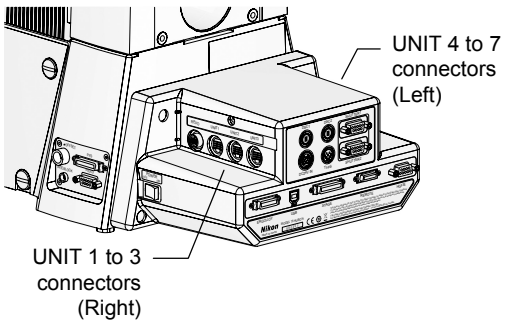


Figure 6.18-2 Connecting to the hub controller A

1. **If a side-port adapter is attached to the left side port, remove it.**
2. **Align the motorized barrier filter wheel positioning pin with the hole on the microscope, insert the microscope attachment into the left side port, and tighten the adapter clamp screw on the microscope to secure the wheel.**
3. **Loosen the adapter clamp screw of the motorized barrier filter wheel and detach the plastic cap from the output port.**
4. **Attach the appropriate adapter to the photomicrographic equipment and insert that adapter into the output port. Next, secure the adapter with the adapter clamp screw.**
5. **Connect the motorized barrier filter wheel cable to any of the UNIT 1 to 7 connectors on the hub controller A.**

   The hub controller A automatically detects motorized units connected to it. You can connect them to any of the UNIT 1 to 7 connectors.

6.18.2 Attaching Barrier Filters

Assemble all other units before attaching the barrier filters.

Caution

Make sure that the light source is turned off before attaching or removing barrier filters.

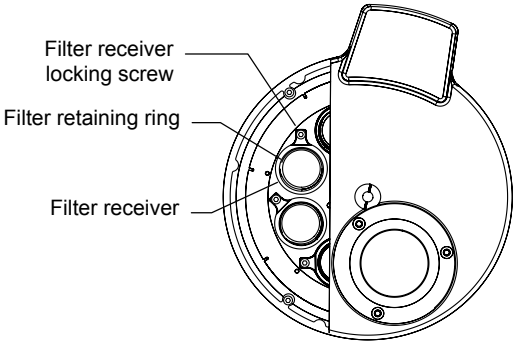


Figure 6.18-3 Attaching the barrier filters

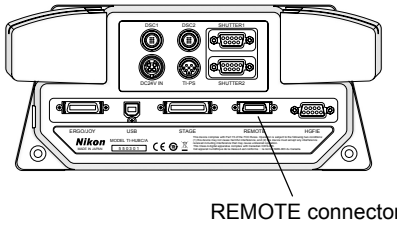
Before attaching a barrier filter, make sure that the power switch of the hub controller A is turned off. Attach the motorized barrier filter wheel by rotating it manually.

1. **Loosen the locking screw, and remove the cover of the barrier filter mount.**
2. **Check the position indicators (addresses) on the wheel, and turn the wheel manually until the desired filter position is visible.**
3. **Use a 2 mm hexagonal screwdriver to release and remove the filter receiver locking screw.**
4. **Detach the filter retaining ring from the filter receiver.**
5. **Place and barrier filter in the filter receiver and secure it with the filter retaining ring.**
6. **Insert the filter receiver into the wheel. Turn the filter receiver and secure it in position with the locking screw.**
7. **Return the barrier filter mount cover to its original position, and secure it by tightening the locking screw.**

Before using the microscope, be sure to program the information on the barrier filters attached to the motorized barrier filter wheel using the remote control pad or the computer's setup application "Ti Control." For information on programming this information, see the Remote Control Pad instruction manual or the "Ti Control" instruction manual.

6.19 Remote Control Pad

Connect the TI-RCP remote control pad to the hub controller A.

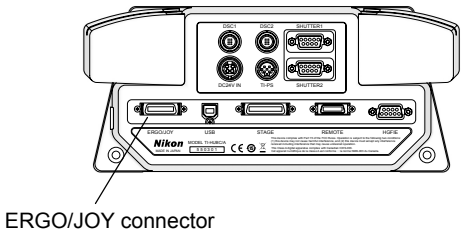


Connect the remote control pad cable to the REMOTE connector of the hub controller A.

Figure 6.19-1 Connecting the remote control pad

6.20 Ergo Controller

Connect the TI-ERGC ergo controller to the hub controller A.



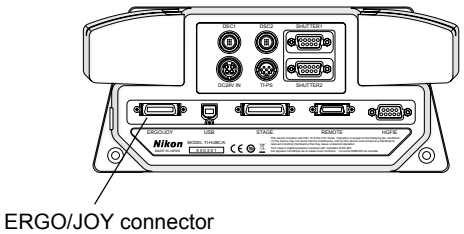
Connect the ergo controller cable to the ERGO/JOY connector of the hub controller A.

It is not possible to connect both the ergo controller and joystick controller at the same time.

Figure 6.20-1 Connecting the ergo controller

6.21 Joystick Controller

Connect the TI-S-EJOY stage joystick (joystick controller) for motorized stage to the hub controller A.



Connect the joystick controller cable to the ERGO/JOY connector of the hub controller A.

It is not possible to connect both the ergo controller and joystick controller at the same time.

Figure 6.21-1 Connecting the joystick controller

6.22 Motorized HG Fiber Optic Light Source

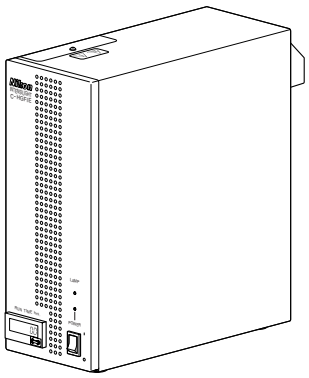


Figure 6.22-1 Motorized HG fiber optic light source

Attach a motorized HG fiber-object light source (Intensilight) to the light-source mount of the epi-fl attachment.

Connecting a motorized HG fiber-object light source (Intensilight) makes it possible to perform a number of actions from the remote control pad or Ergo controller, including opening and closing the light-source shutter and adjusting the volume of light.

If you do not perform electronic control, you may use a manual HG fiber-object light source (C-HGFI). In these cases, refer to the instruction manuals supplied with those attachments.

6.22.1 Connecting the Light-Guide Fiber

Use light-guide fiber to connect the illuminator to the motorized HG fiber-optic light source.

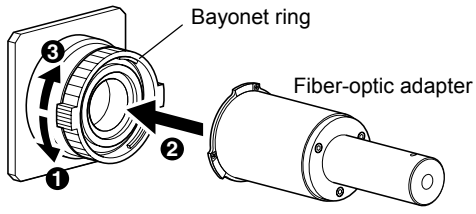


Figure 6.22.2 Attaching a fiber-optic adapter

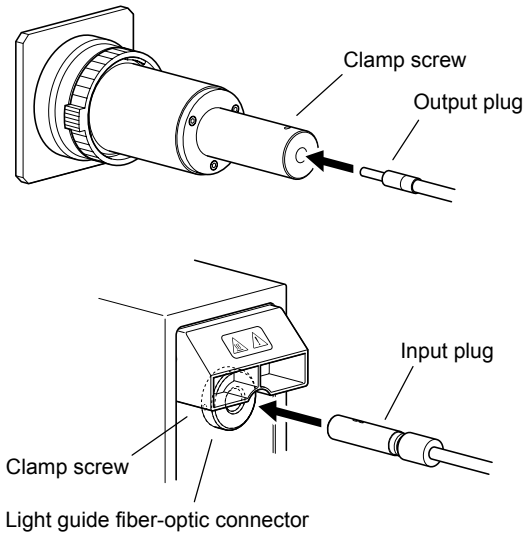


Figure 6.22-3 Connecting the light guide fiber

1. **Attach a C-HGFIA fiber-optic adapter to the illuminator mount.**
   (1) Turn the bayonet ring on the mount counter-clockwise to unlock it.
   (2) Connect the C-HGFIA fiber-optic adapter to the mount, aligning it with the positioning pins.
   (3) Turn the bayonet ring clockwise to secure it.

2. **Insert the output plug of the light-guide fiber (C-HGFIF15 or C-HGFIF30) into the connector. Press it in all the way, then tighten the fiber-optic adapter clamp screw to secure it.**
   Use a hexagonal screwdriver to tighten the clamp screw.

3. **Insert the input plug of the light-guide fiber into the motorized HG fiber-optic light source. Press it in all the way, and then tighten the clamp screw to tighten it.**
   Use a hexagonal screwdriver to tighten the clamp screw.

For safety, the fiber-optic connector of the motorized HG fiber-optic light source includes a mechanical shutter. If the input plug comes out, the shutter is designed to close automatically.

6.22.2 Connecting the Control Cable

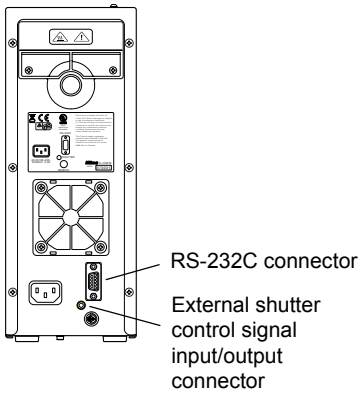


Figure 6.22-4
Motorized HG fiber-optic light source (rear)

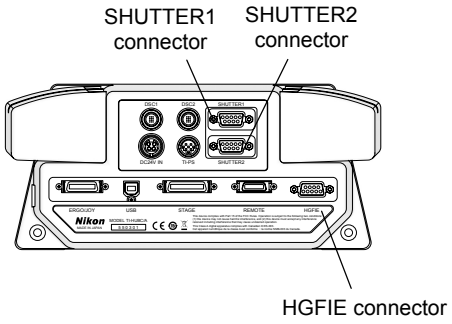


Figure 6.22-5
Connecting the motorized HG fiber-optic light source

(1) Connecting an RS-232C cable

Use the RS-232C cross cable to connect the RS-232C connector of the motorized HG fiber-optic light source to the HGFIE connector of the hub controller A.

(2) Connecting a shutter trigger cable

Connect a dedicated cable between the external shutter control signal input/output connector of the motorized HG fiber-optic light source and the SHUTTER1 or SHUTTER2 connector of the hub controller A.

6.22.3 Connecting the Power Source

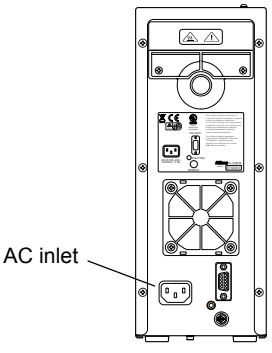


Figure 6.22-6
Motorized HG fiber-optic light source (rear)

You must connect a power source in order to use the motorized HG fiber-optic light source. Plug the specified power code into an AC outlet.

6.23 Diascopic Illumination Power Supply

A power supply is required to light the diascopic lamp. Check that the power supply POWER is switched off (positioned on the “O” side) and connect the power supply according to the following steps.

About the episcopic illuminator power source

The light source for episcopic illumination requires a separate power source. See the instruction manuals of each attachment for details on how to connect this power supply.

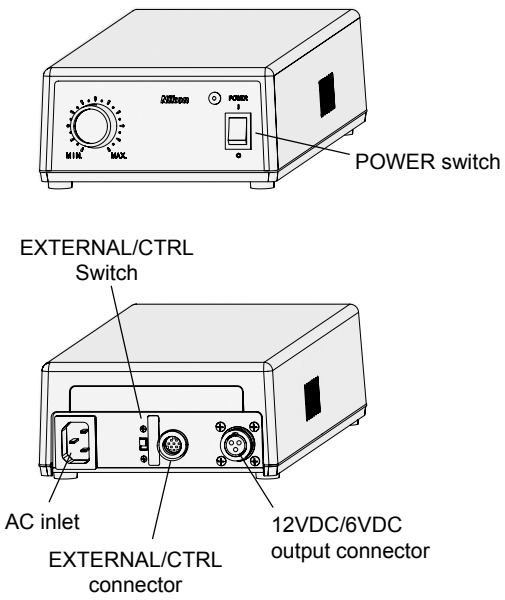


Figure 6.23-1 Power supply

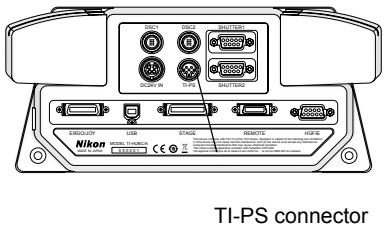


Figure 6.23-2 Ti-E / Ti-E/B main body rear

(1) Lamp cable

Connect the lamp cable from the illumination pillar to the power supply’s DC output connector. The lamp cable connector features a lock ring. Secure the lamp cable with this lock ring.

For the dia pillar illuminator 100W

Connect the lamp cable from the lamphouse (D-LH/LC) to the 12VDC output connector of the TI-PS100W power supply.

Ensure that the ferrite core is correctly attached to the position on the connector side of the lamp cable when connecting. (See 6.6.1.)

For the dia pillar illuminator 30W

Connect the lamp cable from the dia pillar illuminator to the 6VDC output connector of the TE-PS30W/ TE-PSE30 power supply A.

Ensure that the ferrite core is correctly attached to the position on the pillar side of the lamp cable when connecting. (See 6.6.2.)

(2) Control cable

Connect one end of the control cable to the TI-PS connector on the rear of the hub controller A, and connect the other end to the TI-PS100W power supply’s EXTERNAL connector or the TE-PS30W/ TE-PSE30 power supply A’s CTRL connector.

(3) Power cord

Connect the power cord to the power supply’s AC inlet and plug it into the power point.

To prevent electric shock, only connect the power cord after completing all assembly and connection tasks.

6.24 AC Adaptor

The power of the hub controller A is supplied via an AC adapter.

Warning

- **To prevent electric shock, always turn off the power switch of the power supply and hub controller A (switch to "O") before plugging or unplugging the AC adapter or power cord.**
- **Be sure to use the specified combination of AC adapter and power cord models meeting the requirements given below. Use of any other type of adapter or power cord can result in malfunction, excessive heating, and/or fire. See Chapter 9, "Specifications," for information about specified AC adapters and power cords.**

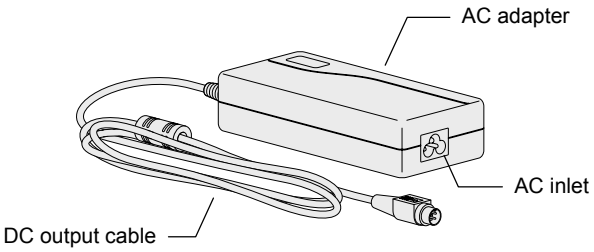


Figure 6.24-1 AC adaptor

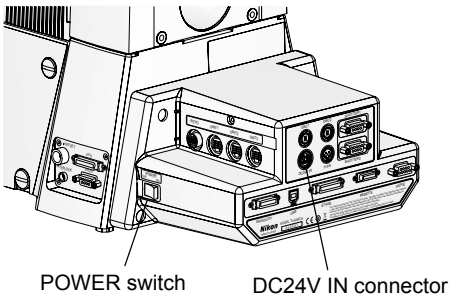


Figure 6.24-2 Power source for hub controller A

This system power is supplied via an AC adapter.

The system's AC adapter supports 100–240 V, 50–60 Hz AC power and can be used to connect to AC power outlets in all countries.

1. **Make sure that the power switch of the power supply for the hub controller A is off (set the POWER switch to "OFF").**
2. **Connect the DC output cable on the AC adapter to the DC24V IN connector (24 VDC) on the back of the hub Controller A.**
3. **Connect the power cord to the AC inlet of the AC adapter, and plug the cord into an AC wall outlet.**

Power source of microscope main body

The power source of the microscope main body is supplied from the hub controller A. The microscope main body is automatically powered on in conjunction with the operation of the power switch on the hub controller A.

6.25 Connecting External Devices

See the instruction manuals supplied with each external unit for instructions on assembling that unit.

6.25.1 Connecting to a Computer

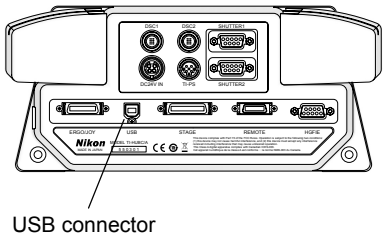


Figure 6.25-1 Connecting to a computer

If you connect the hub controller A with a computer (IBM PC or compatible) using a USB interface, you can control the microscope and attachments from the computer.

See Chapter 5, “Online and Remote Operation,” for details.

6.25.2 Connecting Motorized Shutters

Before using the microscope, be sure to program the information on the motorized shutter using the remote control pad or the computer's setup application "Ti Control." For information on programming this information, see the Remote Control Pad instruction manual or the "Ti Control" instruction manual.

Connecting motorized shutters

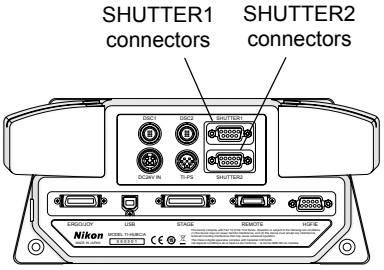
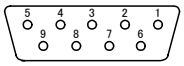


Figure 6.25-2 Connecting third-party motorized shutters



D-sub 9-pin female connector

Figure 6.25-3 Pin layout of SHUTTER 1/SHUTTER 2 connectors

The hub controller A has two connectors for connecting motorized shutters. It is possible to control the two shutters from the remote control pad, ergo controller, or computer.

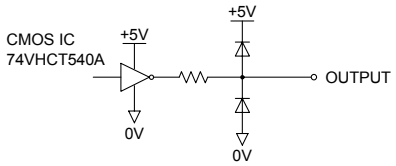
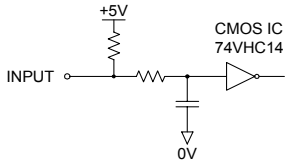
Use the dedicated cable to connect the external control signal input/output connector of the fiber-optic light source to the SHUTTER 1 or SHUTTER 2 connector of the hub controller A.

* Some manufacturer's shutters may not function appropriately even if they are connected. Contact your local Nikon representative for details.

Connect pin 1 and GND (pin 6 or 7) on the SHUTTER 1 (or SHUTTER 2) connector on the back of the hub controller A to the shutter input of the motorized shutter, and connect the shutter output of the motorized shutter to pin 2 and GND (pin 6 or 7) of the SHUTTER 1 (or SHUTTER 2) connector. This enables the motorized shutter to be opened or closed from the remote control pad, ergo controller, or computer.

When the hub controller A power is off, the shutter is always closed. To open or close the shutter, turn on the power of the hub controller A, and operate the motorized shutter button on the remote control pad.

Table 6.25-1 SHUTTER1/SHUTTER2 connector signals

Pin number	Input/Output	Specifications
1	Output	**Shutter output signal**  (1) Using Nikon Intensilight (momentary operation): On/Off: Momentarily outputs Hi as soon as the key is pressed. (2) Others (alternate operation): On: Outputs Hi; Off: Outputs low Note: You must program the shutter information in the remote control pad or computer beforehand.
2	Input	**Shutter FB input signal**  Low input: OPEN; Hi input: CLOSE
3	—	Prohibited to use.
4	—	Prohibited to use.
5	—	Prohibited to use.
6	—	GND
7	—	GND
8	—	Prohibited to use.
9	—	Prohibited to use.

Operating the motorized shutter

You can control motorized shutters by manufacturers other than Nikon via the remote control pad or Ergo controller.

Operation via the remote control pad

Figure 6.25-4 Remote control pad

DIA Shutter button:
(left: open shutter,
right: close shutter)

Figure 6.25-5
Opening and closing the DIA motorized shutter

EPI Shutter button:
(left: open shutter,
right: close shutter)

Figure 6.25-6
Opening and closing the EPI motorized shutter

AUX Shutter button:
(left: open shutter,
right: close shutter)

Figure 6.25-7
Opening and closing the AUX motorized shutter

(1) If the DIA (diascopic) motorized shutter is connected to the SHUTTER 1 (or SHUTTER 2) connector:

The shutter opens and closes each time the DIA shutter button is pressed.

(2) If the EPI (episcopic) motorized shutter is connected to the SHUTTER 1 (or SHUTTER 2) connector:

The shutter opens and closes each time the EPI shutter button is pressed.

(3) If the AUX (other) motorized shutter is connected to the SHUTTER 1 (or SHUTTER 2) connector:

The shutter opens and closes each time the AUX shutter button is pressed.

Operation via the ergo controller

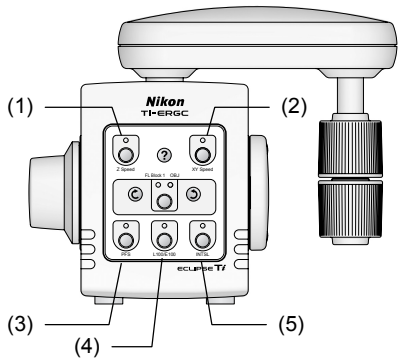


Figure 6.25-8 Ergo controller

Assign functions to keys (1) to (5) on the ergo controller to open and close the epi-illumination shutter, dia-illumination shutter, motorized HG fiber-optic shutter, and additional shutters by pressing the various keys.

The indicators on each key show whether a shutter is open or closed as follows:

- **Indicator on:** Shutter is closed.
- **Indicator off:** Shutter is open.

See Chapter 4, “Operation of Each Part,” – “4.23 Using the Ergo Controller” for details on setup and operation.

6.25.3 Connecting a Digital Camera for Microscopy

Before using the microscope, be sure to program the information on the motorized shutter using the remote control pad or the computer's setup application "Ti Control." For information on programming this information, see the Remote Control Pad instruction manual or the "Ti Control" instruction manual.

The Ti series microscopes have multiple observation ports, to which various types of digital cameras for microscopy can be attached via applicable adaptors.

Attaching a digital camera

Attach a digital camera to the microscopy port of the microscope or eyepiece tube base. Use a direct C mount adapter or the like to do this.

If you are using an eyepiece tube base with side port, a direct C mount adapter is supplied.

Connecting a camera controller

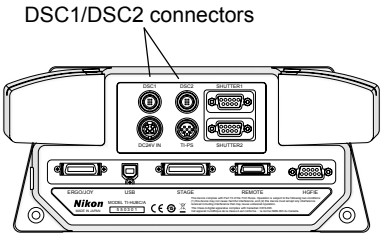


Figure 6.25-9 Connecting a digital camera

HR25-7R-4S
(Hirose Electric Co., Ltd.)
Female connector

Figure 6.25-10 Connector layout of DSC1/DSC2 connectors

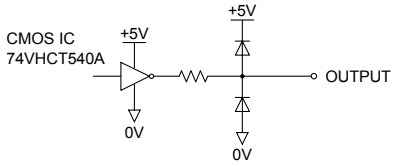
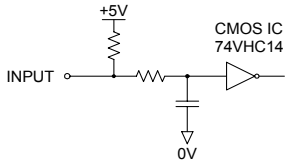
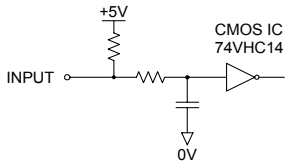
The hub controller A has two connectors for connecting digital cameras, and it is possible to snap the shutters of two digital cameras from the remote control pad or computer.

Use the dedicated cable to connect the EX.IO connector of the camera control unit (DS-L2, DS-U2 etc.) to the DSC1 or DSC2 connector of the hub controller A.

* Some manufacturer's cameras may not function appropriately even if they are connected. Contact your local Nikon representative for details.

Connect pin 1 on the DSC1 (or DSC2) connector on the back of the hub controller A to the shutter input of the digital camera, connect pin 2 (or pin 3) to the shutter (status) output of the digital camera, and connect pin 4 to GND of the digital camera. This enables the camera shutter to be snapped from the remote control pad or computer.

Table 6.25-2 SHUTTER1/SHUTTER2 connector signals

Pin number	Input/Output	Specifications
1	Output	**Camera shutter output signal**  (1) Using Nikon DS-L2 or DS-U2 (momentary operation): On/Off: Momentarily outputs Hi as soon as the key is pressed.
2	Input	**Camera shutter input signal 1**  Camera status signal input
3	Input	**Camera shutter input signal 2**  Camera status signal input
4	—	GND

Connecting the earth strap (only for DS-Qi1Mc digital camera)

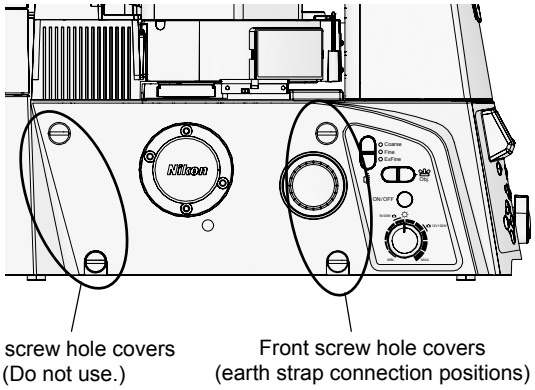


Figure 6.25-11 Connecting the earth strap

When using the digital camera for microscopy DS-Qi1Mc, be sure to use the earth strap provided together with the Ti camera trigger cable for the DS-Qi1Mc to connect the camera to the microscope main body.

1. **Choose the position to which the earth strap is connected.**

   Use either of the upper or lower front (observer side) screw hole cover of four at a side of the microscope. (Use the lower front screw hole cover when using the bottom port.) You may use a screw hole cover on either the left side or the right side.

2. **Remove the screw hole cover you chose, and then connect one end of the earth strap to the screw hole on the microscope with a fixing screw (provided with the earth strap).**

3. **Connect the other end of the earth strap to the earth strap fixing position on the camera with a fixing screw (provided with the earth strap).**

7 Troubleshooting

If the microscope or its associated components are used improperly, it is possible that this product will not function correctly, even though there is nothing wrong with the microscope or its components. If one of the situations described below occurs, please try the remedy listed in the table and check the behavior again before requesting repairs.

For problems not listed below and in case the problem persists, disconnect the device and contact your local Nikon representative.

7.1 Microscopic Image

Symptom	Cause	Remedy
Field of view vignetting. **Field of view not visible.** **Uneven brightness in field of view.**	Parts are not properly installed.	Install the parts properly.
	Stage ring is in the optical path.	Reposition the specimen.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.
	Field diaphragm is too narrow.	Open the field diaphragm slightly larger than the field of view.
	Lens or container is dirty.	Clean the lenses. Use clean containers.
Dirt or dust in field of view.	Lens or container is dirty.	Clean the lenses. Use clean containers.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.
Poor image quality. **Poor contrast or resolution.**	Lens or container is dirty.	Clean the lenses. Use clean containers.
	The correction ring of the objective not set to the thickness of the container's bottom plate.	Adjust the ring.
	The variation in the thickness of the container bottom plate is too much for the objective to correct for.	Use a container whose bottom-plate thickness is uniform enough to correct for.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.
No phase contrast effect (using Ph microscopy).	You are using a bright-field objective.	Use a phase-contrast objective.
	Condenser annular diaphragm is not in the optical path.	Select an annular diaphragm with the same Ph code as the Ph objective, and move it into the optical path.
	Annular diaphragm is not centered.	Center the annular diaphragm.
	System condenser's aperture diaphragm is not fully open.	Fully open the diaphragm.
Uneven focus.	Nosepiece is not attached properly.	Attach the nosepiece properly.
Image flows.	Specimen tilted with respect to stage surface.	Position the specimen correctly on the stage.
	Nosepiece is not attached properly.	Attach the nosepiece properly.
	Annular diaphragm is not centered.	Center the annular diaphragm.
	Dia-illuminator is tilted.	Return to upright position, as far as it will go.
Yellowish image.	NCB11 filter is not in the optical path.	Move it into the optical path.
	Lamp voltage is too low.	Use the brightness control knob to set the lamp voltage to the rated level.
Field of view too bright.	ND filter is not in the optical path.	Move it into the optical path.
	Lamp voltage is too high.	Turn the brightness control knob to lower the lamp voltage.
Field of view too dark.	Aperture diaphragm is too narrow.	Set to 70 to 80% of the size of the objective N.A.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.

7.2 Operation (Bright Field / Phase Contrast)

Symptom	Cause	Remedy
Does not focus when objective is raised to uppermost position.	Stage is not mounted properly.	Mount the stage properly.
	Objective refocusing ring is clamped.	Fully release the clamp.
Does not focus with 20x or 40x objective.	The variation in the thickness of the container bottom plate is too much for the objective to correct for.	Use a container whose bottom-plate thickness is uniform enough to correct for.
Images in right and left eyepiece do not align.	Distance between eyepieces is not adjusted.	Adjust the distance between the eyepieces.
Eyes become fatigued.	Diopter is not adjusted.	Adjust the diopter.
	Brightness is not appropriate.	Adjust the brightness with the brightness control knob or ND filters.

7.3 Electrical

7.3.1 Microscope

Symptom	Cause	Remedy
Lamp does not light up.	Proper cord is not connected or connected improperly.	Connect the cord properly.
	The lamp is burned out.	Replace with the specified lamp type.
Lamp burns out prematurely.	Incompatible lamp is being used.	Replace with the specified lamp type.
Microscope's dia-illumination on/off switch does not function properly.	Lamp control cable is not connected or connected improperly.	Connect the cable properly.
	The lamp is burned out.	Replace with the specified lamp type.
	Operation from the remote control pad is currently being specified with the "DIA Remote" button on the remote control pad. (The "DIA Remote" button is active.)	Press the "DIA Remote" button so that it is grayed out (inactivated).
Microscope's brightness control knob does not function properly.	Lamp control cable not connected or connected improperly.	Connect the cable properly.
	EXTERNAL switch at the rear of the power supply is off.	Turn on the switch.
	Operation from the remote control pad is currently being specified with the "DIA Remote" button on the remote control pad. (The "DIA Remote" button is active.)	Press the "DIA Remote" button so that it is grayed out (inactivated).
The position of the light path does not appear on the touch panel of the remote control pad.	Microscope control connection cable is not connected or connected improperly.	Connect the cable properly.
The position of the Z-axis does not appear on the touch panel of the remote control pad.	Microscope control connection cable is not connected or connected improperly.	Connect the cable properly.
Remote control pad's dia-illumination on/off switch does not function properly.	Lamp control cable is not connected or connected improperly.	Connect the cable properly.
	The lamp is burned out.	Replace with the specified lamp type.
	Operation from the microscopy is currently being specified with the "DIA Remote" button on the remote control pad. (The "DIA Remote" button is inactive.)	Press the "DIA Remote" button so that it is active.
The [DIA Remote] button on the remote control pad does not function properly.	Lamp control cable is not connected or connected improperly.	Connect the cable properly.
	EXTERNAL switch at the rear of the power supply is off.	Turn on the switch.
	Operation from the microscopy is currently being specified with the "DIA Remote" button on the remote control pad. (The "DIA Remote" button is inactive.)	Press the "DIA Remote" button so that it is active.

7.3.2 Power Supply

Symptom	Cause	Remedy
Power cannot be turned on with the power switch.	Proper cord is not connected or connected improperly.	Turn off the power, then connect the power cord properly.
The brightness control knob on the power supply does not function properly.	EXTERNAL switch at the rear of the power supply is on.	Turn off the switch.

7.3.3 Hub Controller

Symptom	Cause	Remedy
Power cannot be turned on with the POWER switch.	AC adapter power cord is not connected or connected improperly, or DC plug for AC adapter is not connected or connected improperly.	Turn off the power, then connect the power cords properly.

7.3.4 Remote Control Pad

Symptom	Cause	Remedy
No display on touch panel.	Remote control pad connection cable is not connected or connected improperly.	Connect the cable properly.

7.3.5 Motorized Nosepiece

Symptom	Cause	Remedy
Motorized nosepiece connection not displayed on touch panel of remote control pad.	Motorized nosepiece connection cable is not connected or connected improperly.	Connect the cable properly.
	Objective information is not set.	Specify the objective information. See the instruction manual of the remote control pad for details.

7.3.6 Motorized Condenser Turret

Symptom	Cause	Remedy
Motorized condenser turret connection not displayed on touch panel of remote control pad.	Motorized condenser turret connection cable is not connected or connected improperly.	Connect the cable properly.
	Condenser cassette information is not set.	Specify the condenser cassette information. See the instruction manual of the remote control pad for details.

7.3.7 Motorized FL Turret

Symptom	Cause	Remedy
Motorized cassette holder connection not displayed on touch panel of remote control pad.	Motorized FL turret connection cable is not connected or connected improperly.	Connect the cable properly.
	Filter block information is not set.	Specify the filter block information. See the instruction manual of the remote control pad for details.

7.3.8 Motorized Excitation Filter Wheel

Symptom	Cause	Remedy
Motorized excitation filter wheel connection not displayed on touch panel of remote control pad.	Motorized excitation filter wheel connection cable is not connected or connected improperly.	Connect the cable properly.
	Excitation filter information is not set.	Set the excitation filter information. See the instruction manual of the remote control pad for details.

7.3.9 Motorized Barrier Filter Wheel

Symptom	Cause	Remedy
Motorized barrier filter wheel connection not displayed on touch panel of remote control pad.	Motorized barrier filter wheel connection cable is not connected or connected improperly.	Connect the cable properly.
	Barrier filter information is not set.	Set the barrier filter information. See the instruction manual of the remote control pad for details.

7.3.10 Analyzer Block

Symptom	Cause	Remedy
The status does not appear on the touch panel of the remote control pad.	Motorized FL turret connection cable is not connected or connected improperly.	Connect the cable properly.
	The analyzer block is not configured.	Specify the analyzer block information. See the instruction manual of the remote control pad for details.

7.3.11 Motorized Shutter (Epi-fl Attachment)

Symptom	Cause	Remedy
The status does not appear on the touch panel of the remote control pad.	Motorized shutter connection cable is not connected or connected improperly.	Connect the cable properly.
	No motorized shutter operation is not assigned to the “Shutter” button.	Assign motorized shutter operation to the “Shutter” button. See the instruction manual of the remote control pad for details.

7.4 Epi-fl and DIC Microscopy

Symptom	Cause	Remedy
Image not visible even though lamp is lit.	Shutter is in the optical path.	Remove shutter from optical path.
	Incorrect filter block is selected.	Select the correct FL block.
	Combination of an excitation filter, a barrier filter, and a dichroic mirror is not appropriate, or one or more of them are missing.	Use filter blocks in the correct combination.
	Light source is improperly centered.	Center the lamp. Center the lamp again while viewing a fluorescent image, especially when using a 100x objective.
Image extremely dark, even though lamp is lit.	ND filter is in the optical path.	Remove ND filter from optical path as necessary.
	Combination of an excitation filter, a barrier filter, and a dichroic mirror is not appropriate for the specimen.	Use a filter-block combination suited to the specimen.
	Halogen lamp is used to observe a dark specimen.	Change the light source to a mercury lamp.
	Specified objective is not used during UV and V excitation.	Use the specified objective.
Illumination light leaking into observation port.	Filter blocks is not positioned properly.	Push filter blocks all the way to the back of the turret and secure them fully.
Poor contrast.	Immersion oil is emitting light by fluorescence.	Use non-fluorescent oil (Nikon immersion oil DF).
	Slide glass is emitting light by fluorescence.	Use non-fluorescent slide glass.
	Room is too bright.	Dim the light in the room.
Poor image quality.	Cover glass is not attached.	Attach the cover glass. (Note that you do not need to attach cover glass if you use an NCG objective.)
	Tip of the immersion objective is not immersed in oil.	Immerse in specified type of oil.
	Specified type of immersion oil is not used.	Use specified type of immersion oil.
	Filter block is not appropriate for the specimen.	Use a filter block suited to the specimen.
Field of view vignetting.	ND filter slider and shutter are not fully pulled out or pushed in.	Push them all the way in or pull them all the way out.
	Filter blocks are not positioned properly.	Push filter blocks all the way to the back of the turret and secure them fully.
	Objective DIC prism is in intermediate position.	Move DIC prism fully into the optical path.
Improper contrast with DIC microscopy	Correct condenser cassette is not selected.	Select a condenser cassette appropriate for the condenser lens. Select a condenser cassette compatible with the code of the objective.
	Objective DIC prism is not in the optical path.	Move DIC prism fully into the optical path.
	Combination of an objective and objective DIC prism is not correct.	Use a DIC prism suited to the objective.

Symptom	Cause	Remedy
Poor image contrast or quality.	Condenser is not properly oriented.	Redeploy crossed Nicols.
	Correct condenser cassette is not selected.	Select a condenser cassette appropriate for the condenser lens. Select a condenser cassette compatible with the code of the objective.
	Combination of an objective and objective DIC prism is not correct.	Use a prism slider suited to the objective.
	There are air bubbles in section of lens immersed in oil.	Use the Bertrand lens to rotate the nosepiece slightly while observing the focal surface of the objective. If air bubbles move as the nosepiece is rotated, the air bubbles are in the objective. If they remain in the same position, they are in the condenser. In either case, wipe the oil from the lens, and perform oil immersion again.

8 Care and Maintenance

Cleaning Optical Components

Keep the lenses, filters, and other optical components free of dust and fingerprints. Dirty lenses or filters will degrade the image quality. If lenses become dirty, clean them as described below.

- Use a soft brush or gauze to gently dust or brush off dust.
- Use a soft, clean lens tissue (or cotton cloth or gauze) moistened with pure alcohol (ethyl or methyl alcohol), only when removing fingerprints or oil stains.
- Use only petroleum benzine to remove immersion oil from immersion oil objective lenses. When finished, clean with pure alcohol (ethyl or methyl alcohol) for best results. If petroleum benzine is not available, use methyl alcohol. Since alcohol does not remove oil as well as petroleum benzine, you will need to wipe the surface several times (three or four wipes will usually be sufficient).
- Do not use petroleum benzine to clean the entrance lens at the bottom of the eyepiece tube or prism surface of the eyepiece tube.
- Because pure alcohol and petroleum benzine are highly flammable, exercise great caution when handling them and when switching power switches on or off. Do not use near open flames.
- Handle pure alcohol with care, following the instructions provided by the manufacturer.

Cleaning the Microscope Main Body

- We recommend that you use a silicon cloth to clean the microscope or associated units.
- For persistent dirt, dampen a piece of gauze with a small amount of diluted neutral detergent and wipe lightly.
- Using organic solvents could result in discoloration of the plastic parts.

Disinfecting the Microscope

- We recommend that you use 70% medical alcohol for normal disinfection of the microscope or associated units.
- If a specimen is spilled onto the microscope or associated units, determine whether the specimen is hazardous. If the specimen is hazardous, follow your standard laboratory procedures.
- Using organic solvents could result in discoloration of the plastic parts.

Storage

- Store the microscope and its motorized units in a dry place where mold is unlikely to grow.
- Store the objective lenses and eyepieces in a desiccator or similar container with a drying agent.
- Place vinyl covers over the microscope and motorized units to protect them from dust.
- Turn off the POWER switch on the microscope (set to “OFF”) and allow the lamp and parts around it to cool before covering with a vinyl cover.

Periodic Inspections (Paid Service)

We recommend that you have your microscope and motorized units inspected on a regular basis (Nikon provides periodic inspections as a fee-based service). Contact your nearest Nikon representative for details.

9 Specifications

9.1 When the Microscope (Ti-E or Ti-E/B) Is Used with TI-HUBC/A Hub Controller A and TI-DH Dia Pillar Illuminator 100W

Combination	Ti-E, Ti-E/B + TI-HUBC/A Hub Controller A + TI-DH 100W Dia Pillar Illuminator + TI-PS100W Power Supply	
Size	260 (W) x 635 (D) x 729 (H) mm	
Weight	28.5 kg	
Optical system	Objective lens: Eyepiece: Nosepiece:	CFI60 Field number 22 Six sockets
Mechanical system	Focusing mechanism: Focusing knob:	Stroke: 9.5 mm Coarse: 300 μm/revolution (reference value) * Fine: 50 μm/revolution Fine scale: 6.25 μm * This value is intended as a reference only because the actual amount of coarse movement varies depending on how fast the focusing knob is rotated.
D-LH/LC Precentered Lamphouse LC	Input ratings: Lamp ratings: Specified lamp: Average lamp life:	12 VDC and 100 W 12 V and 100 W halogen lamp Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724I) 2000 hours
TI-PS100W Power Supply	Input rating: Built-in fuse rating: Output rating: Max output current: Shock-protection class: Others:	100-240 VAC (±10%), 1.8 A, 50/60 Hz 250V T4A 12 VDC, 100 W 8.4 A Class I UL listed product, GS approved
Operating environment	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2000 m maximum Degree 2 Category II
Storage and transport environment	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)

9.2 When the Microscope (Ti-E or Ti-E/B) Is Used with TI-HUBC/A Hub Controller A and TI-DS Dia Pillar Illuminator 30W

Combination	When used in 100–120 V region: Ti-E, Ti-E/B + TI-HUBC/A Hub Controller A + TI-DS Dia Pillar Illuminator 30W + TE-PS30W Power Supply A When used in 220–240 V region: Ti-E, Ti-E/B + TI-HUBC/A Hub Controller A + TI-DS Dia Pillar Illuminator 30W + TE-PSE30 Power Supply A		
Size	260 (W) x 635 (D) × 619 (H) mm		
Weight	24.5 kg		
Optical Specifications	Objective lens: Eyepiece: Nosepiece:	CFI60 Field number 22 Six sockets	
Mechanical specifications	Focusing mechanism: Focusing knob:	Stroke: Coarse: Fine: Fine scale:	9.5 mm 300 μm/revolution (reference value) * 50 μm/revolution 6.25 μm
	* This value is intended as a reference only because the actual amount of coarse movement varies depending on how fast the focusing knob is rotated.		
TI-DS Dia Pillar Illuminator 30W	Input rating: Lamp rating: Lamp type: Average lamp life:	6 VDC, 30 W 6 V 30 W halogen lamp Halogen lamp (PHILIPS 5761) 100 hours	
TE-PS30W Power Supply A **TE-PSE30 Power Supply A**	Input rating: Built-in fuse rating: Output rating: Max output current: Shock-protection class: Others:	TE-PS30W TE-PSE30 250 V F2AH 6 VDC, 30 W 5.0 A Class I TE-PS30W TE-PSE30	100–120 VAC (±10%), 50/60 Hz, 0.7 A 230 VAC (±10%), 50/60 Hz, 0.3 A UL listed product GS approved
Operating environment	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2000 m maximum Degree 2 Category II	
Storage and transport environment	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)	

9.3 AC Adapter (for TI-HUBC/A Hub Controller A)

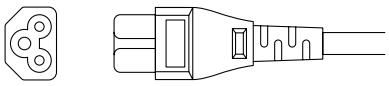
Model	RC120-24T
Manufacturer	Futaba Electric Co., Ltd. (Japan)
Input voltage rating	100–240 VAC, 1.5 A, 50–60 Hz
Voltage fluctuation	±10%
Output voltage rating	24 VDC
Output current rating	5 A
Others	UL listed product, NEMKO approved, CE satisfied, PSE approved

9.4 Motorized Stage / Motorized Stage with Linear Encoder

Model name	TI-S-E / TI-S-ER
Input ratings	100-240 VAC, 2 A, 50-60Hz
Voltage fluctuation	±10%
Operating conditions	Temperature: 0 to 40°C Relative humidity: 85% RH maximum (no condensation)
Storage and transport conditions	Temperature: -20 to +60°C Relative humidity: 90% RH maximum (no condensation)
Others	CE satisfied

9.5 Power Cord

9.5.1 Power Cord for AC Adapter

AC socket configuration	
When used in 100-120 V region, outside Japan	UL listed detachable power cord set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 1.8 m long maximum, rated at 125 VAC minimum)
When used in 220-240 V region	Detachable power cord set approved according to EU/EN standard, 3 conductor grounding (3 conductor grounding Type H05VV-F, 2.5 m long maximum, rated at 250 VAC minimum)
When used inside Japan	PSE approved detachable power cord set, 3 conductor grounding (3 conductor grounding Type VCTF 3x0.75 mm^2, 1.8 m long maximum, rated at 125 VAC minimum)

9.5.2 Power Cord for Power Supply and the Motorized Stage Controller

AC socket configuration	
When used in 100-120 V region, outside Japan	UL listed detachable power cord set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 3 m long maximum, rated at 125 VAC minimum)
When used in 220-240 V region	Detachable power cord set approved according to EU/EN standard, 3 conductor grounding (3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 VAC minimum)
When used inside Japan	PSE approved detachable power cord set, 3 conductor grounding (3 conductor grounding Type VCTF 3x0.75 mm^2, 3 m long maximum, rated at 125 VAC minimum)

9.6 Safety Standards Compliance

When Ti-E or Ti-E/B microscope used with TI-PS100W Power Supply or TE-PS30W Power Supply A	• This is a UL-listed product. • This product complies with FCC Part 15B Class A. This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate 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 a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. • This product complies with Canadian EMI. (ICES-003 Class A) This Class A digital apparatus complies with Canadian ICES-003. Cet appreil numérique de classe A est conforme à la norme NMB-003 du Canada.
When Ti-E or Ti-E/B microscope used with TI-PS100W Power Supply or TE-PSE30 Power Supply A	• CE marking • This product meets EU IVD Directive requirements. (GM approved: in vitro diagnostic medical device) • This product meets EU Low Voltage Directive requirements. • This product meets EU EMC Directive requirements. (EN61326) • This product complies with Australian EMI. (AS/NZS CISPR11)

Note that the microscope will not meet the above standards if used in combination with a motorized XY stage or motorized shutter made by any manufacturer other than Nikon.

Part 2

For Users of Ti-U, Ti-U/B, Ti-S, and Ti-S/L100

ECLIPSE

Motorized Units for Ti Series
Instructions

Contents

Part 2 For Users of Ti-U, Ti-U/B, Ti-S, Ti-S/L100

1 Microscope Part and Names

This chapter describes the main controls of the Ti-U/Ti-U/B and Ti-S/Ti-S/L100 motorized units and their names.

Before using any motorized unit for the first time, refer to this chapter to check the name and location of each control. Also refer to this chapter any time you wish to check the location or name of a control in order to operate the microscope in practical use.

- Before using the microscope system for the first time, configure the system in accordance with Chapter 2, “Pre-microscopy Configuration.”
- See Chapter 3, “Microscopy,” for instructions on performing actual microscopic observation and Chapter 4, “Operation of Each Part,” for details about operating each part.
- If you have not finished assembling the microscope system, see Chapter 6, “Assembly.”
- If you use the microscope without attaching TI-HUBC/B hub controller B to the Ti-U or Ti-U/B (Ti-S or Ti-S/L100) main body, see the instruction manual for the Ti-U and Ti-U/B (Ti-S and Ti-S/L100) main body.

1.1 System Configuration

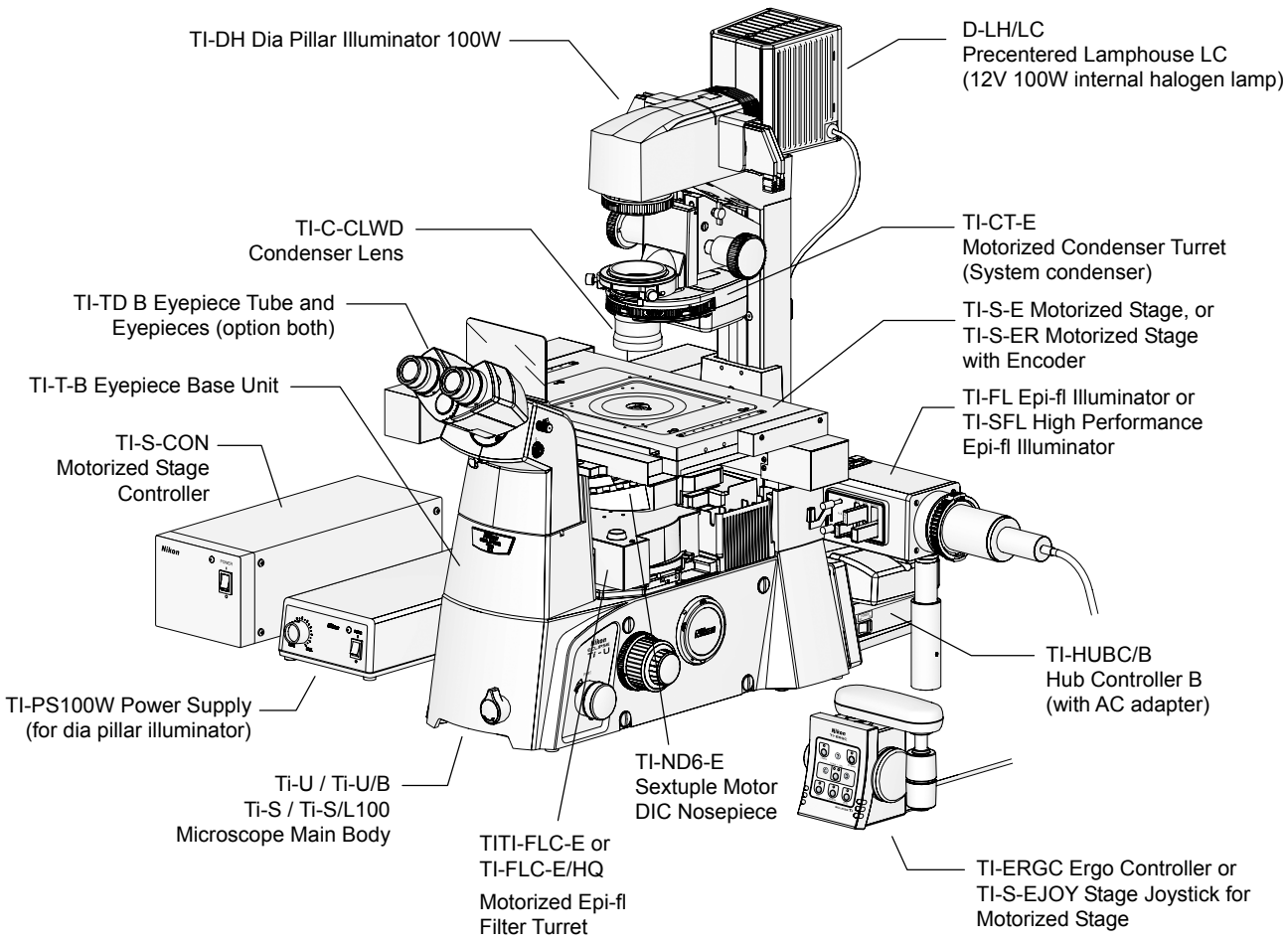


Figure 1.1-1 System configuration (Ti-U)

1.2 Names of Controls (Microscope Body)

Front & right side

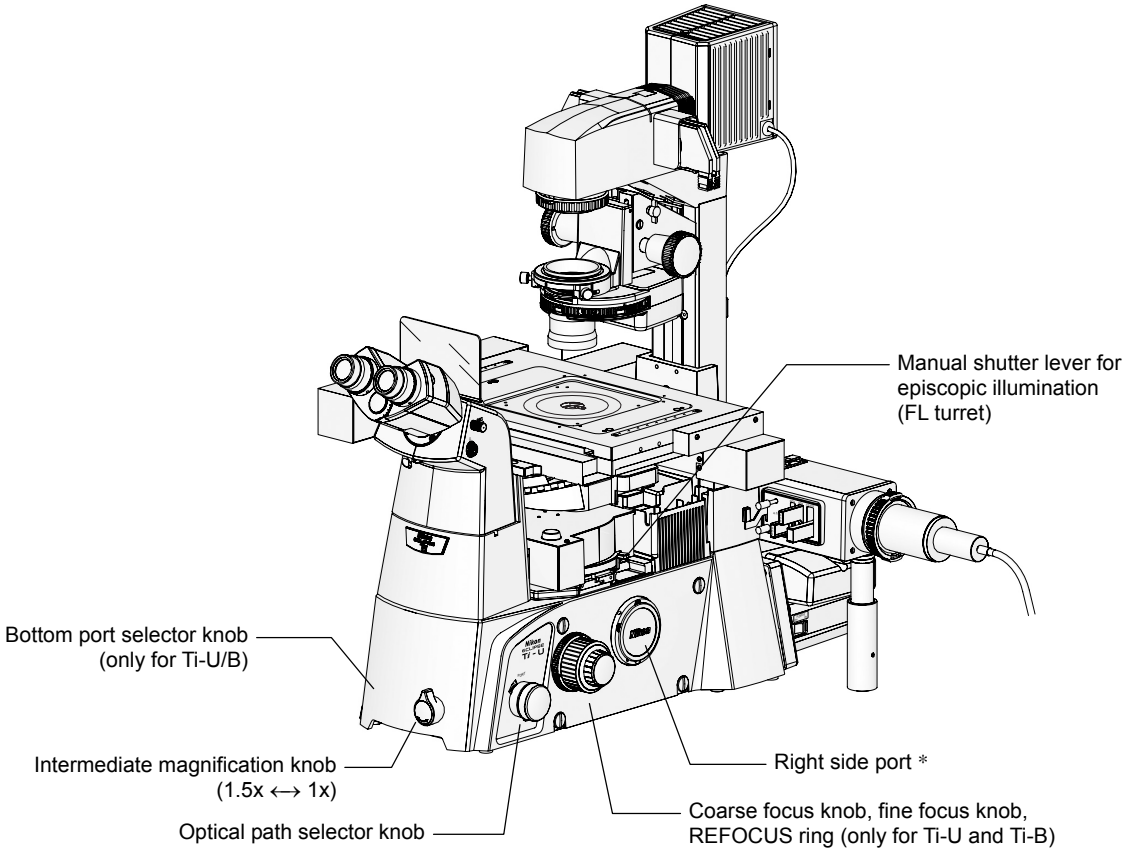


Figure 1.2-1 Names of controls

Left side

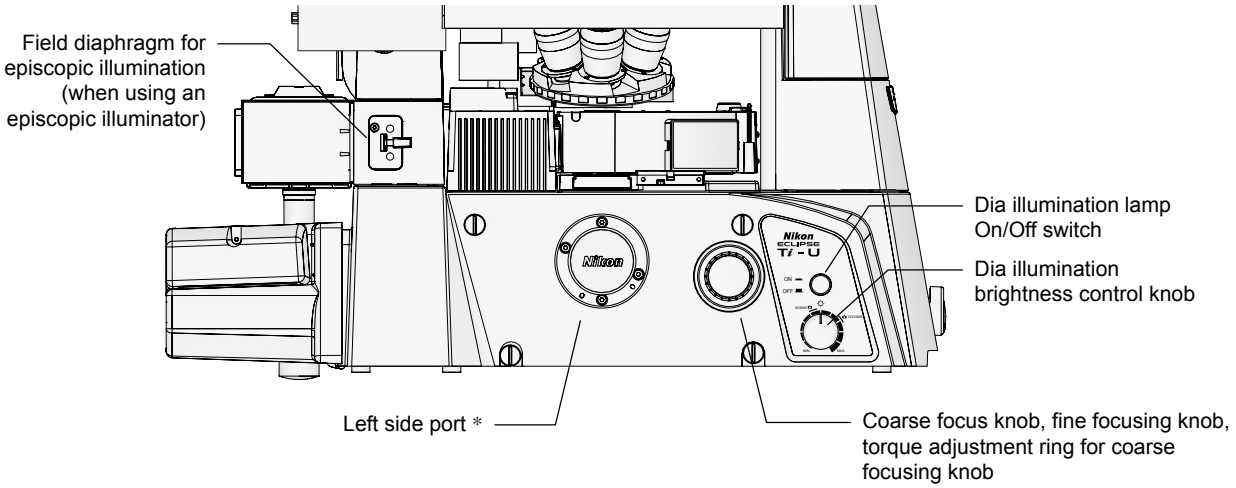


Figure 1.2-2 Names of controls (left side)

* When the side port is not used, attach a protective cap.

Microscope body rear view

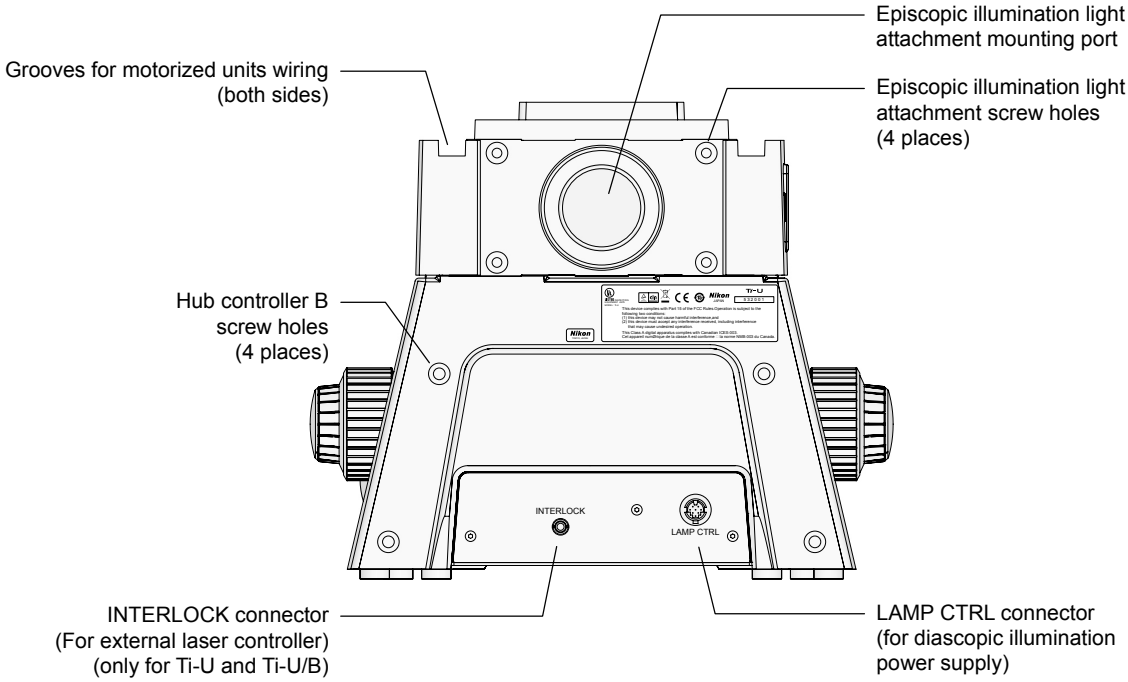


Figure 1.2-3 Microscope base rear view

1.3 Names of Controls (Common Parts)

With an epi-fl illuminator

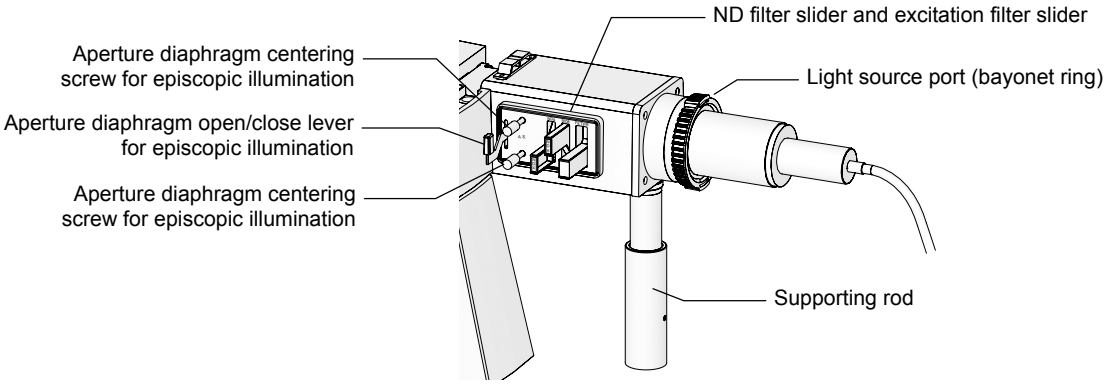


Figure 1.3-1 Right side view after an episcopic illuminator is attached

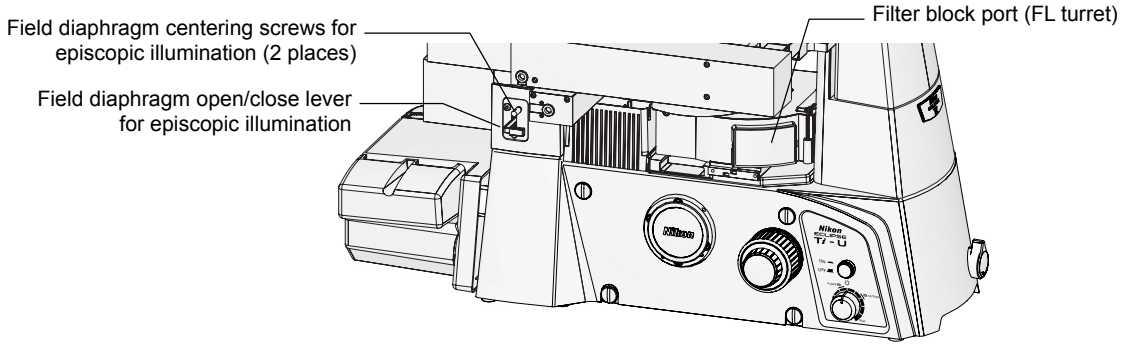


Figure 1.3-2 Left side view after an episcopic illuminator is attached

With the motorized excitation filter wheel

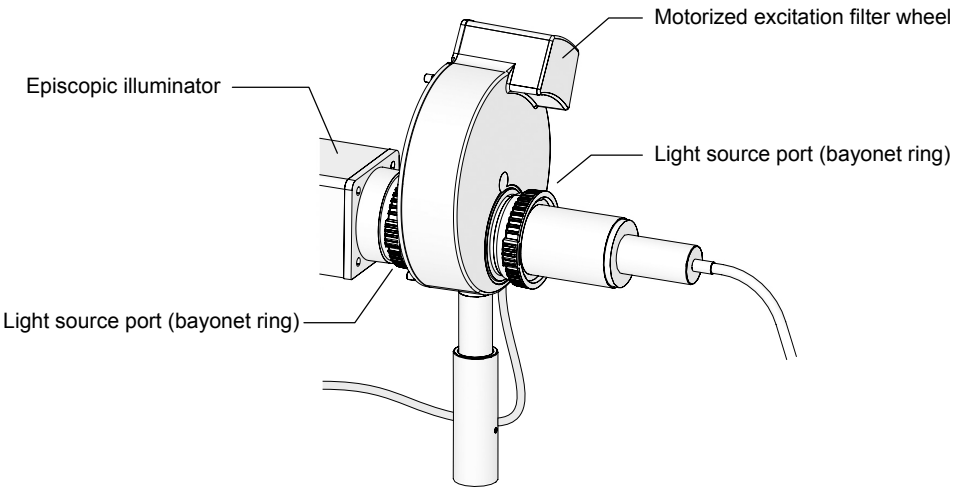


Figure 1.3-3 View after the motorized excitation filter wheel is attached

With the motorized barrier filter wheel

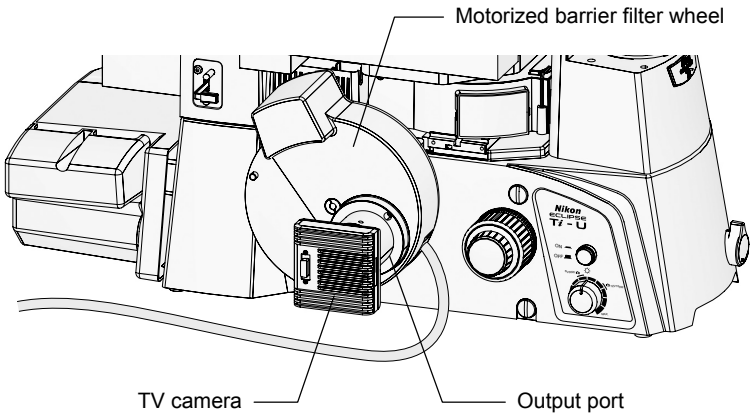


Figure 1.3-4 View after the motorized barrier filter wheel is attached (a camera attached)

1.4 Hub Controller B

Front view (microscope body side)

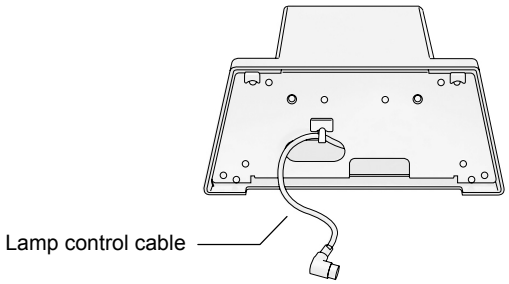


Figure 1.4-1 Front view of the hub controller B

Power connector and power switch

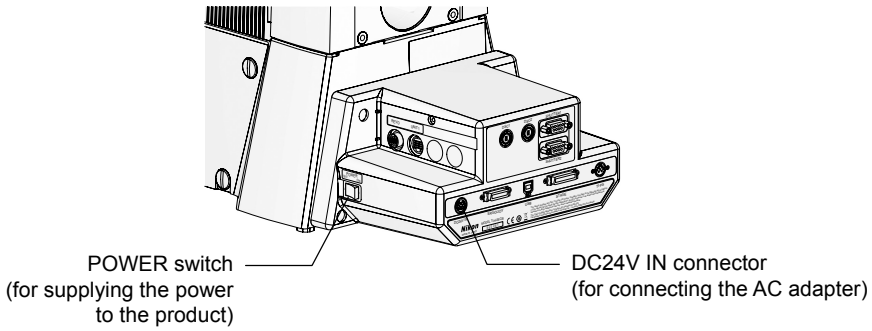


Figure 1.4-2 Power connector and power switch

AC adapter

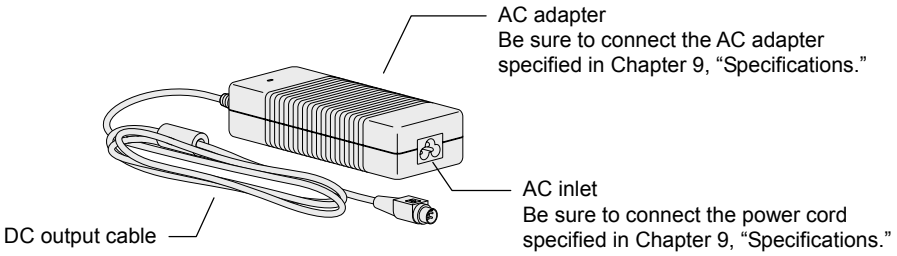


Figure 1.4-3 AC adapter

Connector panel (rear view)

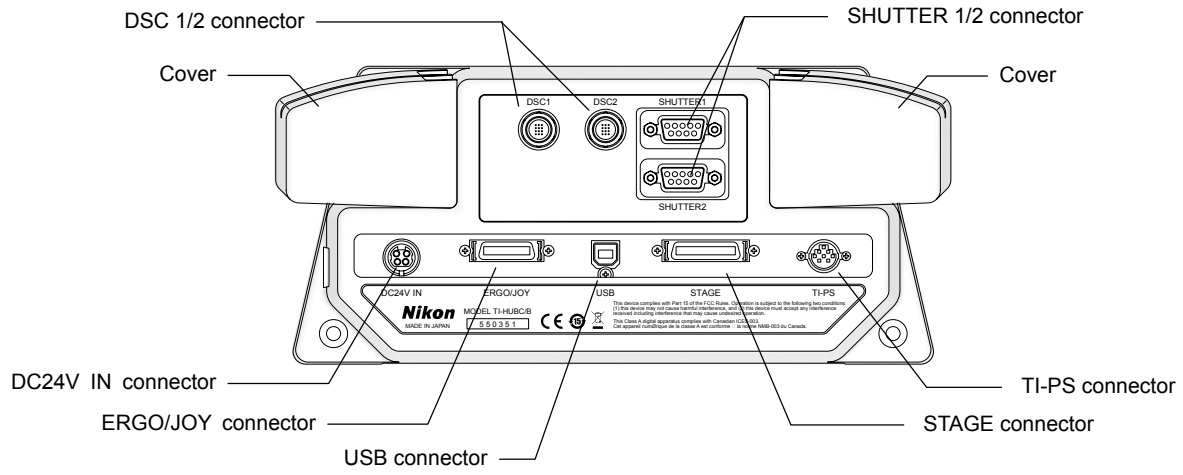


Figure 1.4-4 Connector panel

SHUTTER1/SHUTTER2 connector

See Section 6.23.2, “Connecting a Motorized Shutter,” in Chapter 6, “Assembly.”

DSC 1/2 connector

See Section 6.23.3, “Connecting a Digital Camera for Microscopy,” in Chapter 6, “Assembly.”

DC24V IN connector

Connects the AC adapter.

ERGO/JOY connector

Connects the TI-ERGC ergo controller or the TI-S-EJOY joystick controller. These units cannot be connected simultaneously.

USB connector

Connects a PC.

STAGE connector

See Section 6.9.2, “Attaching a Motorized Stage,” in Chapter 6, “Assembly.”

TI-PS connector

Connects the TI-PS100W power supply, TE-PS30W power supply a, or TE-PSE30 power supply A.

REVO connector (right side, in the cover)

Connects the TI-ND6-E sextuple motor DIC nosepiece.

UNIT1／UNIT2 connector (left and right sides, in the covers)

Up to two of the following motorized units can be connected.

- TI-CT-E motorized condenser turret
- TI-FLC-E motorized epi-fl filter turret
- TI-FLC-E/HQ motor epi-fl filter turret
- TI-FLEW-E EX filter wheel
- TI-FLBW-E BA filter wheel
- TI-TIRF-E motorized illuminator unit

When the TI-TIRF-E motorized illuminator unit (TIRF) is connected, it is the only unit that can be connected, because it occupies two connectors.

1.5 Ergo Controller

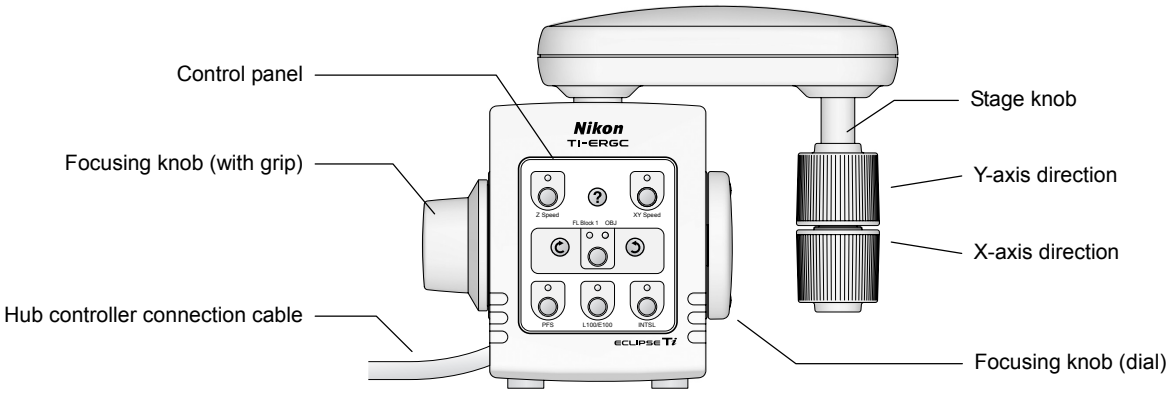


Figure 1.5-1 Ergo controller

1.6 Joystick Controller

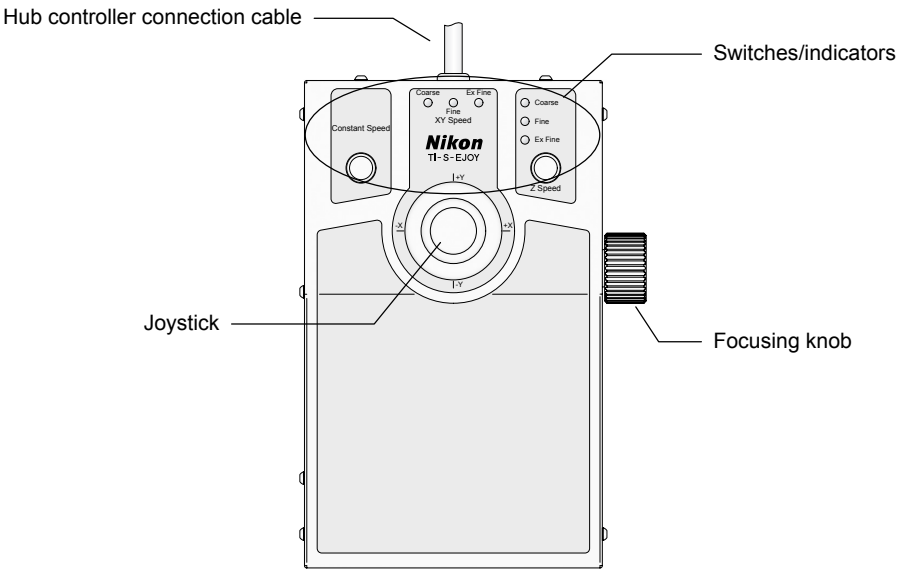


Figure 1.6-1 Joystick controller

1.7 Eyepiece Tube Base, Eyepiece Tube, and Eyepiece

The following eyepiece tube bases, eyepiece tubes, and eyepieces can be attached to the observation port of the microscope.

TI-T-B Eyepiece Base Unit

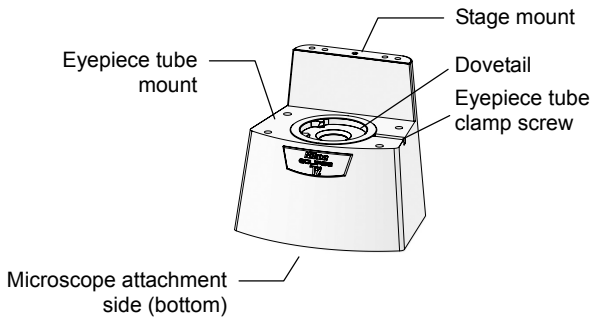


Figure 1.7-1 TI-T-B eyepiece base unit

This is a basic type eyepiece tube base.

There is a dovetail (truncated cone) joint at the top to attach an eyepiece tube, which is used for visible observation.

If you don't need visible observation, the mount can be left unused. In this case, attach a cover to the dovetail joint.

TI-T-BS Eyepiece Base Unit (with Side Port)

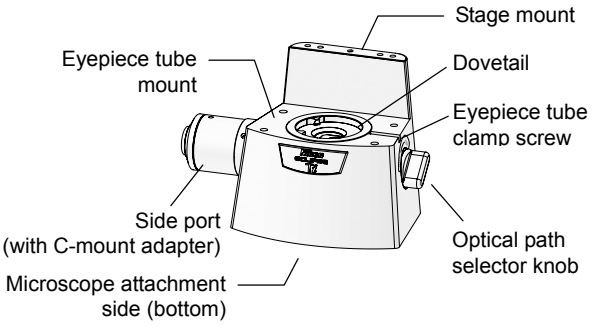


Figure 1.7-2 TI-T-BS eyepiece base unit

This is an eyepiece tube base with a camera port.

Use the optical path selector knot at right to change the optical path between the eyepiece side and the side port side.

A direct C-mount adapter is attached to the side port for camera connection.

TI-T-BPH Eyepiece Base Unit (for External Phase Contrast)

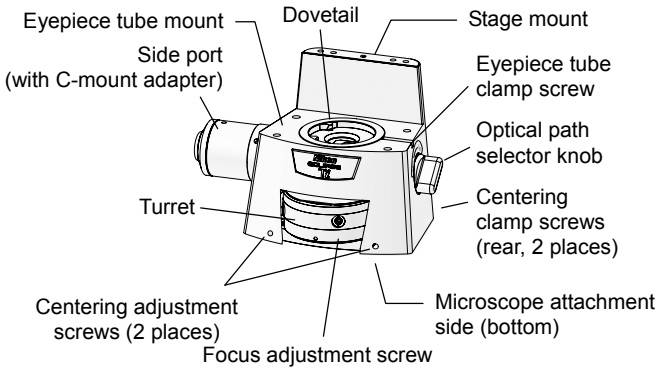


Figure 1.7-3 TI-T-BPH eyepiece base unit

This is an eyepiece tube base for external phase contrast microscopy.

A turret is provided at the front to attach external phase plates. Three positions, “A” to “C”, are available. Focus settings can be adjusted for three positions individually. Besides, phase plates can be centered with the screws at both side and clamped with the screw at the back.

A side port with a C-mount adapter is provided at left. Use the optical path selector knot at right to change the optical path between the eyepiece side and the side port side.

Use the side port for photomicroscopy of external phase contrast microscopy.

> For the procedure of the external phase contrast microscopy, see the Ti-U / Ti-U/B / Ti-S / Ti-S/L100 series instruction manual.

TI-TS Eyepiece Tube B

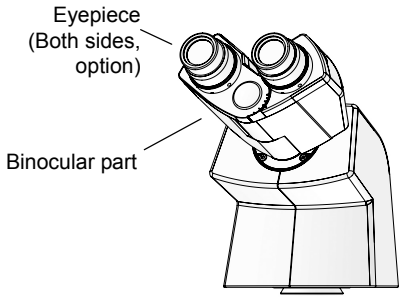


Figure 1.7-4 TI-TS eyepiece tube B

This is a basic type eyepiece tube.

TI-TD Eyepiece Tube B

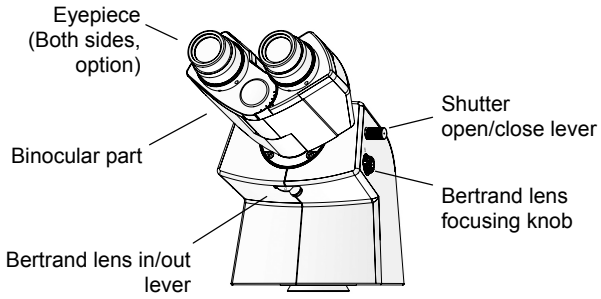


Figure 1.7-5 TI-TD eyepiece tube B

This is an eyepiece tube with a manual shutter and a Bertrand lens.

The optical path for the binocular part can be blocked with the shutter for photomicrography.

Besides, the objective pupil can be observed when the Bertrand lens is placed in the optical path.

TI-TERG Ergonomic Eyepiece Tube

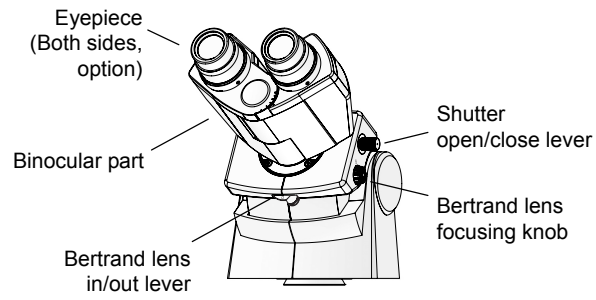


Figure 1.7-6 TI-TERG ergonomic eyepiece tube

This is an eyepiece tube with a tilt mechanism for user's physical attribute.

This eyepiece tube has a manual shutter and a Bertrand lens. The optical path for the binocular part can be blocked with the shutter for photomicrography. Besides, the objective pupil can be observed when the Bertrand lens is placed in the optical path.

1.8 Dia Pillar Illuminator

The following two types of pillar illuminators can be attached to a Ti series microscope. The illuminators have different specifications for available lamp ratings (12V 100W or 6V 30W) and microscopy methods. Use an appropriate one for your purpose.

1.8.1 TI-DH Dia Pillar Illuminator 100W

The TI-DH Dia Pillar Illuminator 100W requires a lamphouse and a condenser.
The following figure shows a configuration with the D-LH/LC pre-centered lamphouse and the TI-C condenser turret (system condenser).

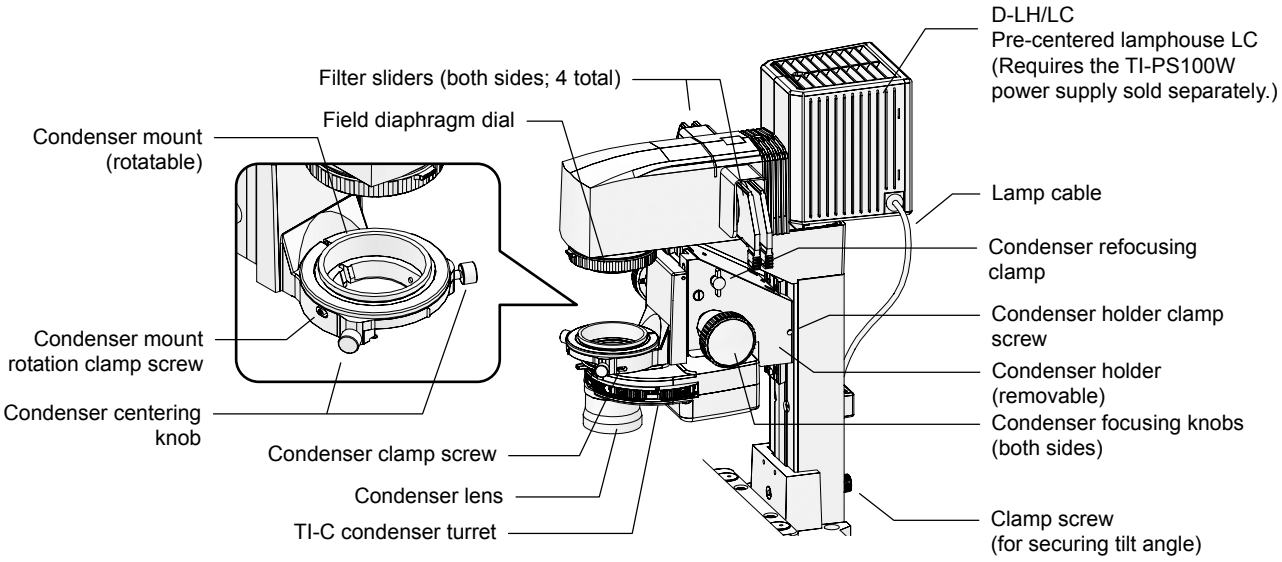


Figure 1.8-1 TI-DH dia pillar illuminator 100W (with lamphouse and system condenser attached)

1.8.2 TI-DS Dia Pillar Illuminator 30W

The TI-DS dia pillar illuminator 30W includes a built-in lamphouse. But it requires a condenser.
The following figure shows a configuration with the ELWD-S condenser.

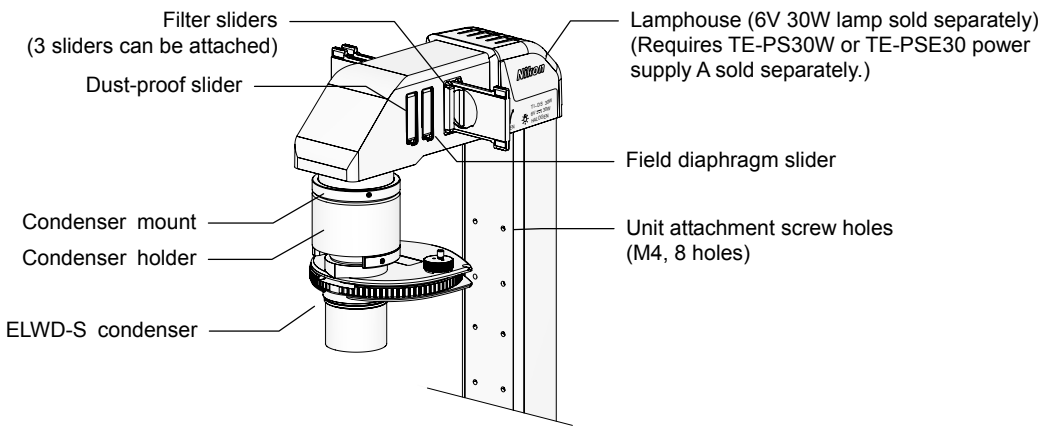


Figure 1.8-2 TI-DS dia pillar illuminator 30W (with ELWD-S condenser attached)

1.9 Motorized Condenser Turret

The TI-CT-E motorized condenser turret can be attached several optical elements and controlled electrically.

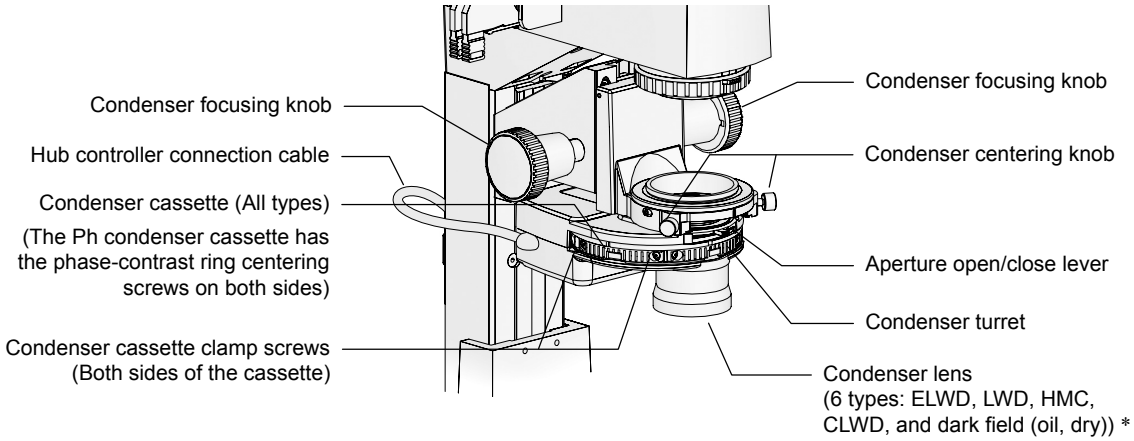


Figure 1.9-1 TI-CT-E motorized condenser turret (with the TI-DH dia pillar illuminator 100W attached)

* To use HMC or a dark field (oil or dry), attach a relevant condenser lens to the TI-DF condenser adapter and then attach the adapter to the condenser turret.

1.10 Motorized Excitation Filter Wheel

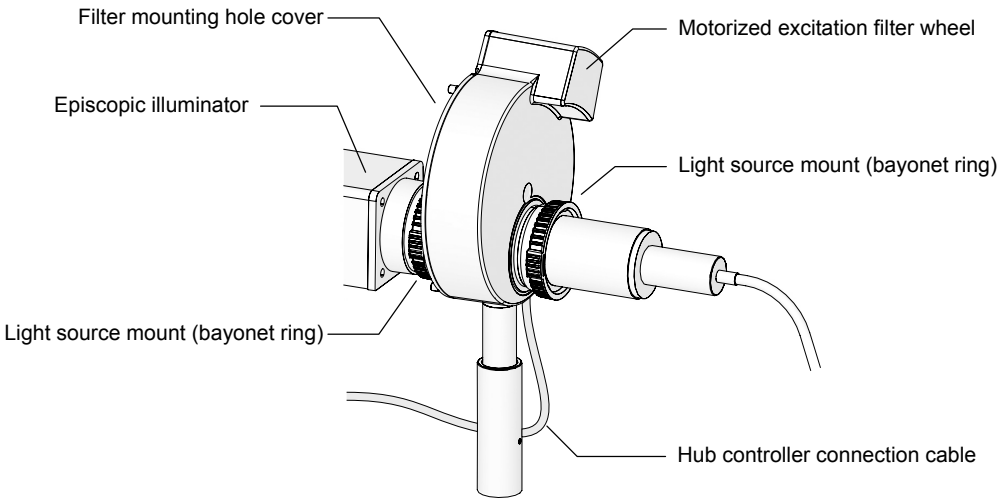
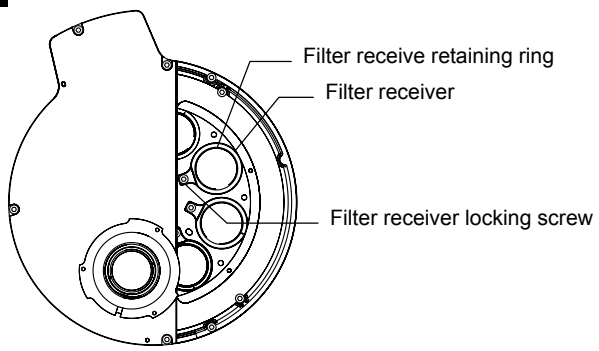


Figure 1.10-1 View after the motorized excitation filter wheel is attached

View after the port cover is removed



* Address numbers are affixed to filter receivers.

Figure 1.10-2 View after the port cover is removed

1.11 Motorized Barrier Filter Wheel

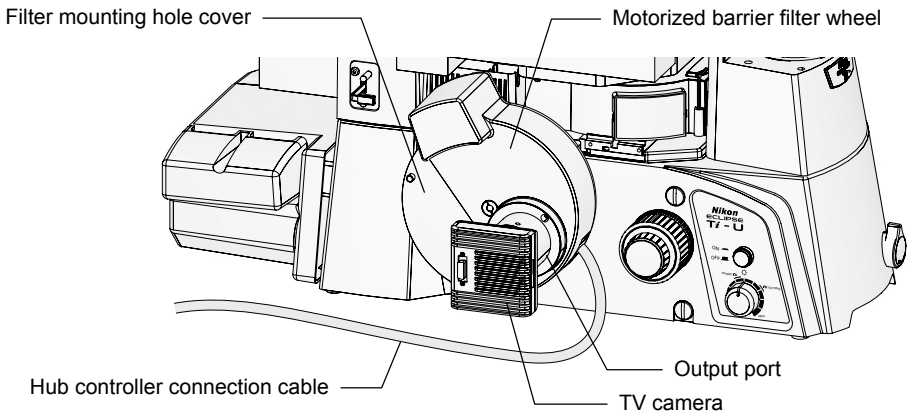
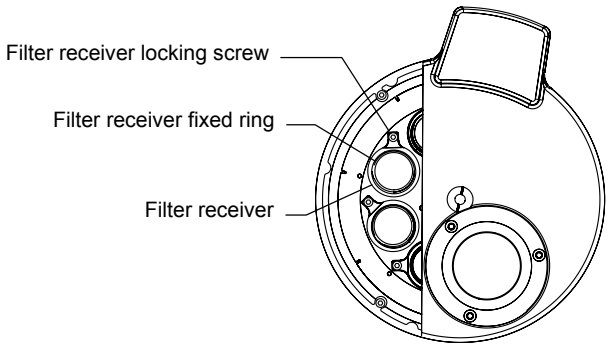


Figure 1.11-1 View after the motorized barrier filter wheel is attached (with a camera)

View after the port cover is removed



* Address numbers are affixed to filter receivers.

Figure 1.11-2 View after the port cover is removed

1.12 Motorized FL Turret and Motorized FL Turret HQ

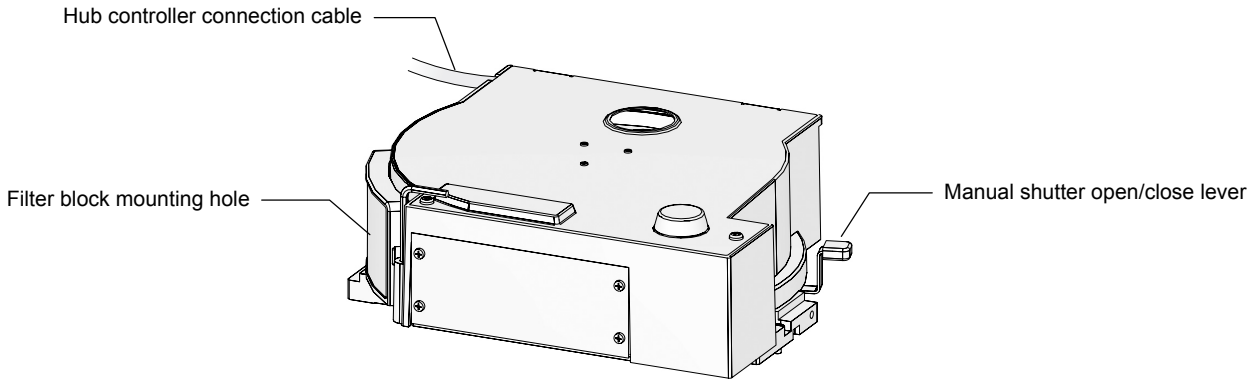


Figure 1.12-1 Motorized FL turret and Motorized FL turret HQ

1.13 Motorized Nosepiece

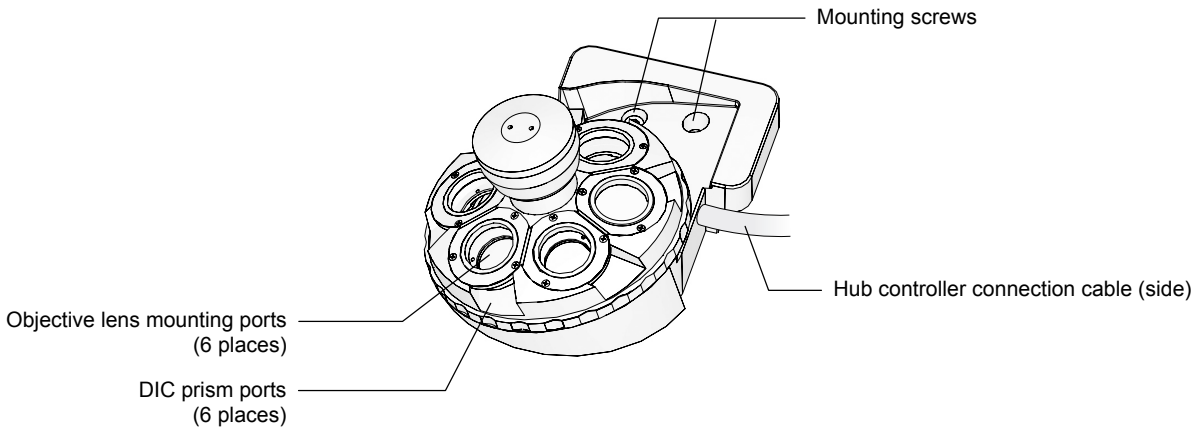


Figure 1.13-1 Motorized nosepiece

1.14 Motorized Stage

Motorized Stage and Motorized Stage with Encoders

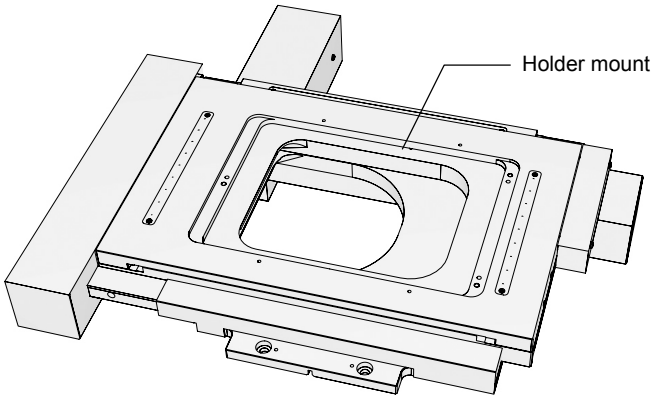


Figure 1.14-1 Motorized stage (motorized stage with encoders)

Motorized Stage Controller

The motorized stage controller supplies power to and controls the motorized stage and connects the hub controller to the motorized stage.

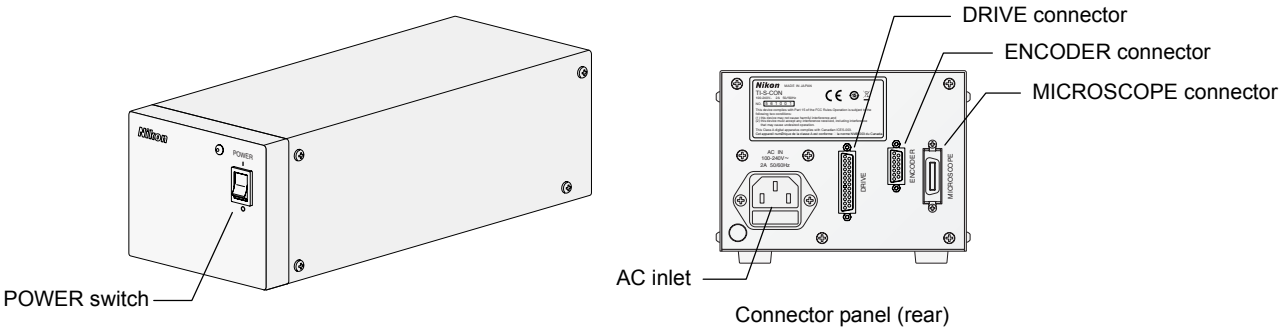


Figure 1.14-2 Motorized stage controller

1.15 Power Supply

1.15.1 TI-PS100W Power Supply

Warning

The bottom of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.

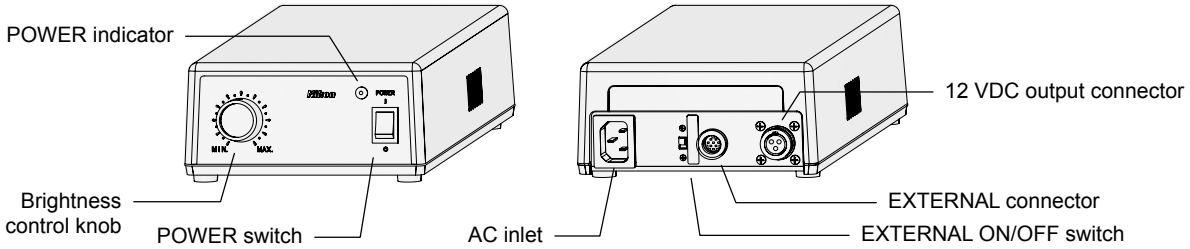


Figure 1.15-1 TI-PS100W power supply

POWER switch

This is the power switch for the power supply. DC power is output from the 12 VDC output connector in the rear of the power supply when the switch is set to " I ". Set the switch to "O" to turn off the power.

POWER indicator

Lights when the power supply power is on.

Brightness control knob

When the EXTERNAL switch is set to the OFF position, this knob can be used to adjust the lamp brightness by adjusting the voltage output from the 12 VDC output connector in the rear of the unit.

AC inlet

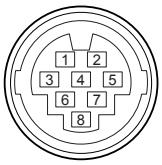
This connector is for connecting the power supply to an AC power source. Only connect the specified power cord to the AC inlet.

EXTERNAL (external control) ON/OFF switch

Set this switch to ON in order to control the output voltage using the brightness control knob on the microscope. When this switch is set to OFF, external control is deactivated, and operation of the brightness control knob on the front of the power supply is enabled.

EXTERNAL (external control signal input) connector

Connects to the TI-PS connector on the hub controller B with the control cable.

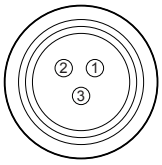


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	External switch connection for turning output voltage on/off (input)
4	GND (0V)
5	External voltage input for output voltage adjustment
6	EXTERNAL switch on/off detect signal (output)
7	GND (0V)
8	Output voltage monitor terminal (output)

Connector: HR12-10R-8SC (Hirose Electric Co., Ltd.)

12VDC output connector

Connector for supplying power to the 12V 100W halogen lamp. Connects the lamp cable of the dia pillar illuminator.



Pin	Signal
1	Output +
2	Output -
3	Not used

Connector: SRCN2A13-3S (Japan Aviation Electronics Industry, Ltd.)

1.15.2 TE-PS30 Power Supply A (for Countries Where the Supply Voltage is 100 to 120 V) TE-PSE30 Power Supply A (for Countries Where the Supply Voltage is 230 V)

Warning

- **Check that the input voltage indicator meets the input voltage to be used before connecting the power cord. If the input voltage indication does not match your regional voltage supply, do not use the power supply device. And, contact your nearest Nikon representative. If used with a wrong voltage, the product will be broken or a fire may occur.**
- **The bottom of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.**

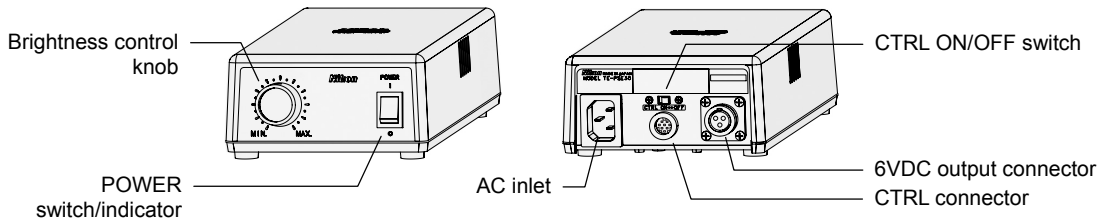


Figure 1-15-2 TE-PS30W, TE-PSE30 power supply A

POWER switch/indicator

This is the power switch for the power supply. Press the " I " side of the switch to turn on the power supply and output DC power from the 6VDC output on the rear. The switch is lit when the power supply is on. Press the "O" side of the switch to turn off the power supply.

Brightness control knob

When the CTRL switch is set to the OFF position, this knob can be used to adjust the lamp brightness by adjusting the voltage output from the 6 VDC output connector in the rear of the unit.

AC inlet

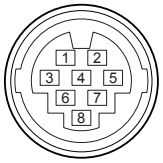
This connector is for connecting the power supply to an AC power source. Only connect the specified power cord to the AC inlet.

CTRL (external control) ON/OFF switch

Set this switch to ON in order to control the output voltage using the brightness control knob on the microscope. When this switch is set to OFF, the brightness control knob on the microscope is deactivated, and operation of the brightness control knob on the front of the power supply is enabled.

CTRL (external control signal input) connector

Connects to the TI-PS connector on the hub controller B with the control cable.

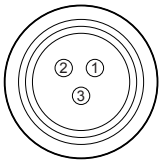


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	External switch connection for turning output voltage on/off (input)
4	GND (0V)
5	Not used
6	Not used
7	Not used
8	Not used

Connector: HR12-10R-8SC (Hirose Electric Co., Ltd.)

6 VDC output connector

Connector for supplying power to the 6V 30W halogen lamp. Connect the lamp cable of the dia pillar illuminator here.



Pin	Signal
1	Output -
2	Not used
3	Output +

Connector: SRCN2A13-3S (Japan Aviation Electronics Industry, Ltd.)

2 Pre-microscopy Configuration

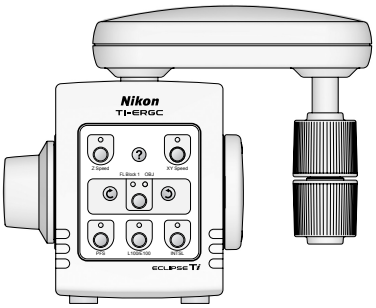
Before starting microscopy with motorized units attached to the microscope main body, you must first connect the motorized units, and make the necessary configurations to the ergo controller. Shown below are the steps you must follow to perform setup before beginning microscopy.

- Follow all of these steps when using the ergo controller for the first time.
- For more information on each task, see the corresponding section in the instruction manual for the application software, “Ti Control.”
- If you have not finished assembling the microscope, see Chapter 6, “Assembly.”
- If you use a computer instead of the ergo controller to control the microscope, see Chapter 5, “Online and Remote Operation.”

1 **Make connections and set up the motorized units.**

1. Connect the motorized units to the hub controller B.
2. Slide the EXTERNAL ON/OFF switch knob on the power supply to the “ON” side.

2 **Assign the units to be operated via the control panel of the ergo controller.**



The buttons on the control panel of the ergo controller are set to default functions, but you can change these settings as necessary.

Change the settings via a computer. See the instruction manual of the setup application software “Ti Control.”

3 Microscopy

Warning

- **Before using this product, thoroughly read the Safety Cautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **If you use this product with other devices (such as the epi-fl attachment or differential interference contrast attachment), also read the instruction manuals for those devices thoroughly, and obey all the warnings and cautions described there as well.**

Caution

- **In order to use the Ti Series motorized attachments, it is necessary to register information on the components attached to the motorized units on the hub controller B using the Ti Series dedicated software "Ti Control". Be sure to carry out the set up procedures prior to commencing operation whenever operating the microscope system for the first time after assembly, modifying the system configuration or replacing optical components. Refer to the "Ti Control" instruction manual for information on operating methods and registration procedures using the "Ti Control" software.**
- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt. Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image.**
- **Each of the motorized units of the Ti series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precisions of the objectives are particularly susceptible to even weak shocks.**

This chapter describes the procedure for conducting actual microscopic observation with motorized units attached to the Ti-U / Ti-U/B or Ti-S / Ti-S/L100 microscope main body. This chapter describes the procedures for microscopy using the following four methods:

1 Bright-field (BF) microscopy

2 Phase-contrast (Ph) microscopy

3 Differential interference contrast (DIC) microscopy

4 Episcopic fluorescence (epi-fl) microscopy

3.1 Before Beginning Microscopy

Motorized units for the Ti series are designed to ensure easier operation with the ergo controller or a PC when the hub controller b is set up with various information. Before performing actual microscopy, check the following items to ensure the correct and safe use of these units.

- If you are using the microscope system for the first time after assembling the microscope system and attaching the units, configure information about the status of the units and attached devices in accordance with Chapter 2, “Pre-microscopy Configuration.”
- If you have not finished assembling the microscope system, see Chapter 6, “Assembly.”
- See Chapter 1, “Microscope Parts and Names,” for the names and locations of the main controls of the microscope system, and Chapter 4, “Operation of Each Part,” for details about operating each part.
- If your microscope’s module configuration is different from the configurations described here, see Chapter 4, “Operation of Each Part.”
- See Chapter 5, “Online and Remote Operation,” and Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly,” if you wish to use the Hub controller B of a PC to manipulate an XY stage or motorized shutter attachment from a manufacturer other than Nikon.
- If an epi-fl attachment, differential interference contrast attachment, or the like is attached to your microscope, also read the instruction manuals supplied with those products.

3.2 Bright-field (BF) Microscopy

This section describes bright-field microscopy for the following conditions:

Attached motorized units

The following motorized units are attached and used in the system:

Motorized nosepiece, Motorized FL turret, Motorized condenser, Motorized shutter for episcopic illumination

For details on motorized shutter operation, see Chapter 5, “Online and Remote Operation,” and Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly.”

Ergo controller settings

Buttons on the front panel are re-assigned as provided in the following table:

Button	Setting *	Function
OBJ	CON	Condenser turret rotation
PFS	OBJ ↻ (CW)	Nosepiece rotation (clockwise)
E100/L100	OBJ ↺ (CCW)	Nosepiece rotation (counterclockwise)
INTSL	EPI Shutter	Epi illumination shutter open/close

* Affix function stickers on the panel of the ergo controller for these settings.

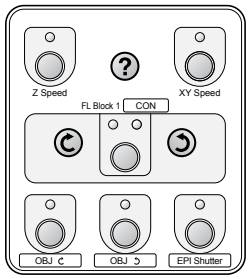


Figure 3.2-1
Ergo controller settings (with stickers)

1 Turn on the power of the microscope system.

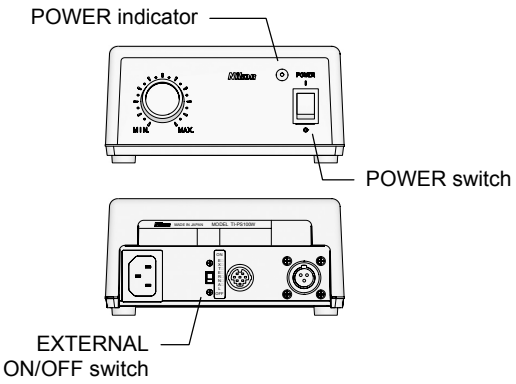


Figure 3.2-2 Power supply device

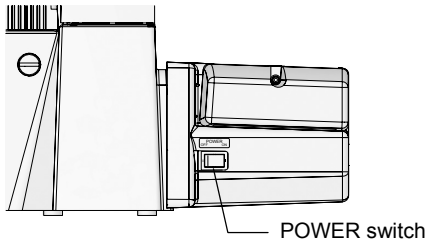


Figure 3.2-3 Hub controller B

1. **When you open or close the shutter from the ergo controller or PC using the motorized HG fiber-optic light source (Intenslight), first turn on the power of the motorized HG fiber light source.**

2. **Set the EXTERNAL ON/OFF switch on the back of the power supply body to the "ON" side.**

3. **Flip the POWER switch on the front of the power supply to "I" to turn on the power supply.**

   When the power comes on, the POWER indicator will light up.

4. **If the motorized stage (or motorized stage with encoders) and/or motorized shutter are used, turn them on.**

   Turn on other motorized devices that require individual power sources in this step.

5. **Flip the POWER switch on the right side of the hub controller B to "ON" to turn on the hub controller B.**

6. **If a digital camera for microscopy is used, turn it on.**

   For the operating procedure, see the instruction manual of the digital camera.

7. **If a personal computer (PC) is used, turn on the power of the PC, and then start software "Ti Control."**

   For the operating procedure, see the instruction manuals of the PC and "Ti Control."

2 Remove optical elements for epi-fl microscopy from the optical path.

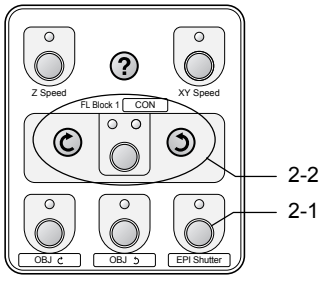


Figure 3.2-4 Ergo controller operation

1. **Block the optical path for the epi-fl illumination.**

   Press the EPI Shutter button to turn on the indicator of the button. *

2. **Remove the filter block from the optical path.**

   Press the FL Block 1/CON button to turn on the indicator for the FL Block 1. Press the rotation buttons so that the vacant hole is placed into the optical path.

* This is the case where the EPI Shutter function is assigned to the INTSL button.

3 Remove optical elements for DIC microscopy from the optical path.

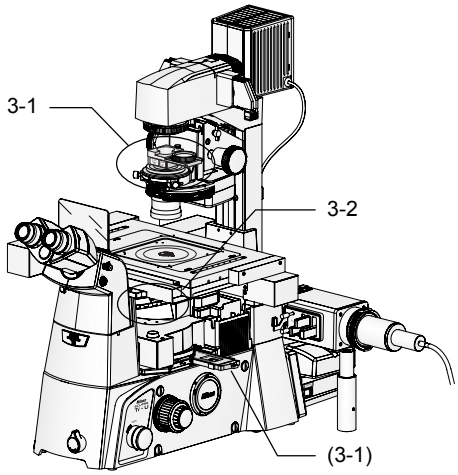


Figure 3.2-5 Optical elements for DIC microscopy

When optical elements for DIC microscopy are installed, remove them from the optical path.

1. **Remove the polarizer from the optical path.**

   When a manual analyzer is installed, remove it from the optical path.

2. **Remove the objective DIC prism from the optical path.**

4 Set the diascopic illumination brightness to “9V”.

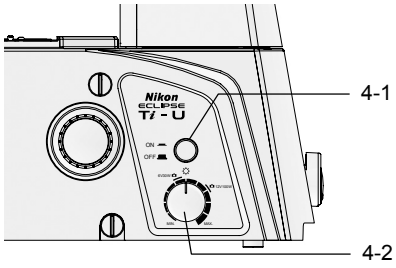


Figure 3.2-6 Left side of the microscope main body

1. **Press the diascopic illumination lamp ON/OFF switch on the left side of the microscope main body to turn on the diascopic illumination lamp.**

   The lamp turns on/off each time the switch is pressed.

2. **Rotate the diascopic illumination lamp control on the left side of the microscope body to the “9V” position.**

5 Place the 10x objective into the optical path.

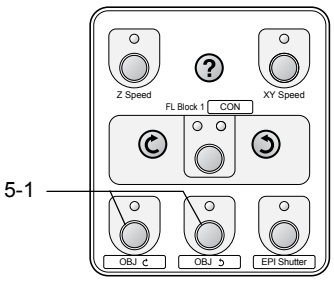


Figure 3.2-7 Ergo controller

1. **Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path.** *

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button and the OBJ ↺ (CCW) function is assigned to the E100/L100 button.

6 Select the “A” position (bright-field microscopy cassette) of the condenser cassette.

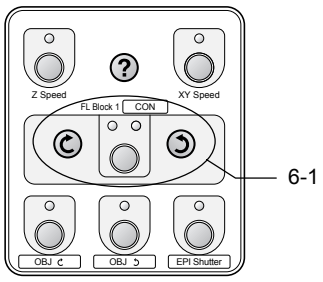


Figure 3.2-7 Ergo controller

1. **Press the FL Block 1/CON button to turn on the indicator for the CON. Press the rotation buttons so that the desired condenser cassette is placed into the optical path. ***

* This is the case where the CON (condenser) function is assigned to the OBJ button.

7 Change the optical path to E100 (observation port 100%).

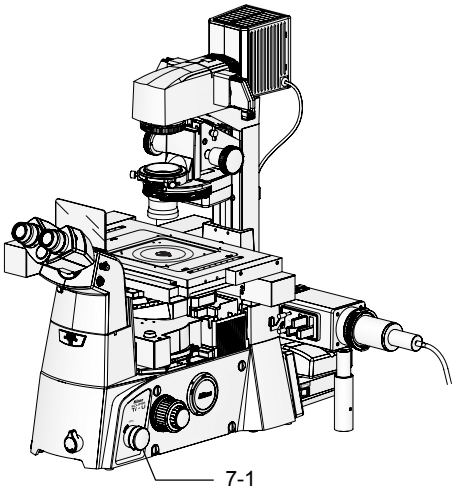


Figure 3.2-8 Optical path selector knob operation

1. **Change the optical path selector knob position on the right side of the microscope main body to “EYE”.**

8 Move the Bertrand lens in/out lever to “O”.

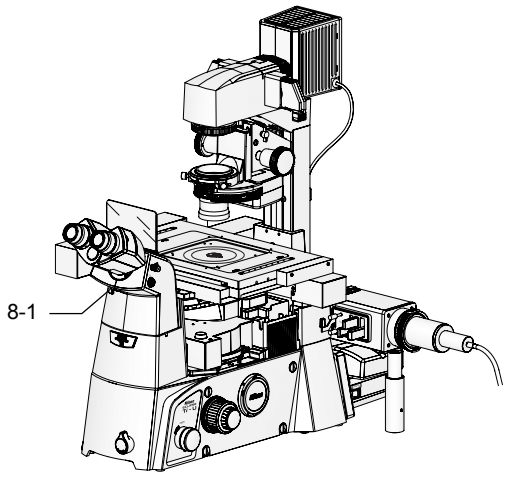


Figure 3.2-9 Bertrand lens in/out lever

1. **Move the Bertrand lens in/out lever on the front of the eyepiece tube to “O” to remove the Bertrand lens from the optical path.**

9 Fully open the dia-illuminator field diaphragm and aperture diaphragm.

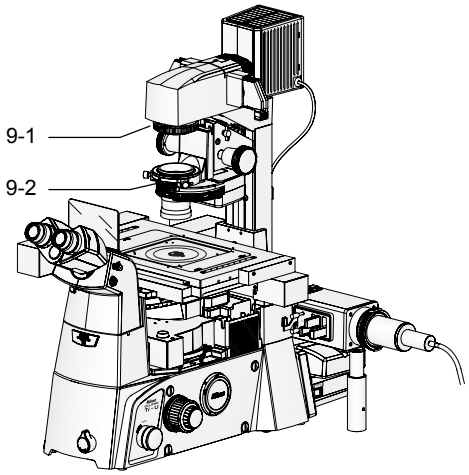


Figure 3.2-10 Field diaphragm and aperture diaphragm

1. **Rotate the field diaphragm knob on the dia pillar illuminator to open the field diaphragm fully.**
2. **Move the aperture diaphragm lever on the system condenser to open the aperture diaphragm fully.**

10 Raise the condenser mount to its upper limit position.

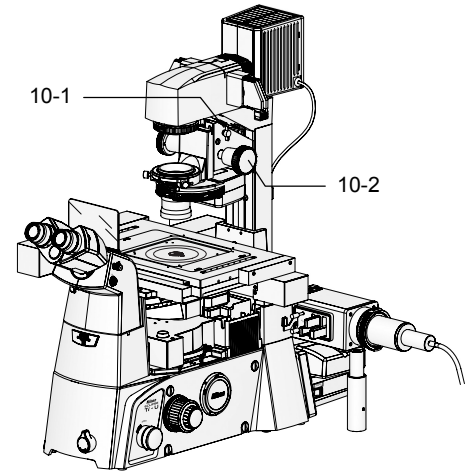


Figure 3.2-11 Condenser mount operation

1. **Rotate the condenser refocus clamp on the dia pillar illuminator counterclockwise to loosen it.**
2. **Rotate the condenser focusing knob on the dia pillar illuminator to raise the condenser mount to its upper limit position.**

11 Set the intermediate magnification selector knob to “1x”. (only for Ti-U and Ti-U/B)

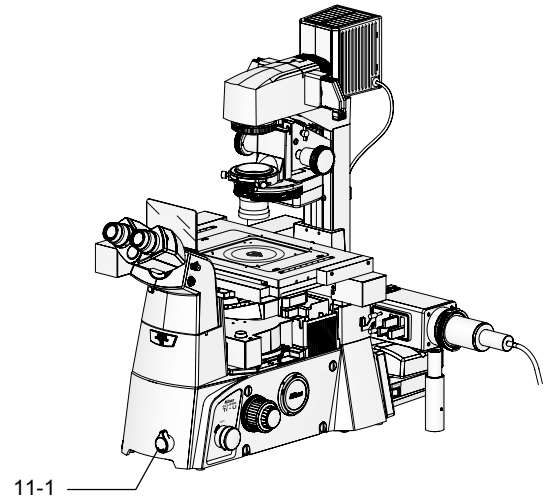


Figure 3.2-12 Intermediate magnification selector knob operation

1. **For the Ti-U and Ti-U/B, set the intermediate magnification selector knob on the front panel of the microscope to “1x”.**

12 Place a specimen and adjust the focus.

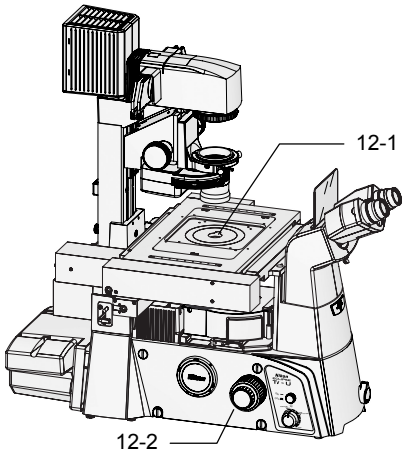
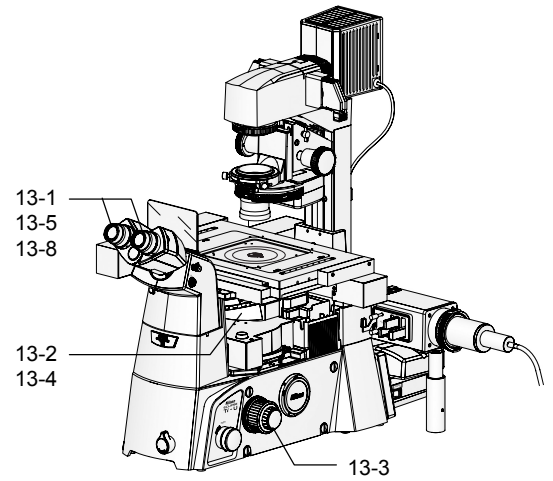
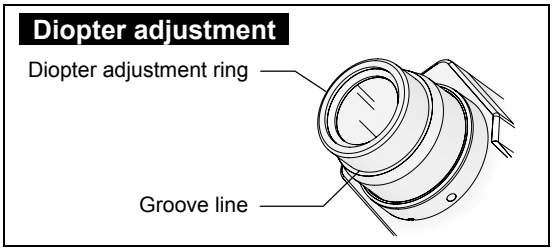


Figure 3.2-13 Focusing operation

1. **Place a specimen on the stage.**
2. **While looking through the eyepiece, focus on the specimen with the coarse/fine focusing knobs on the both sides of the microscope.**

13 Adjust eyepiece diopters and interpupillary distance.





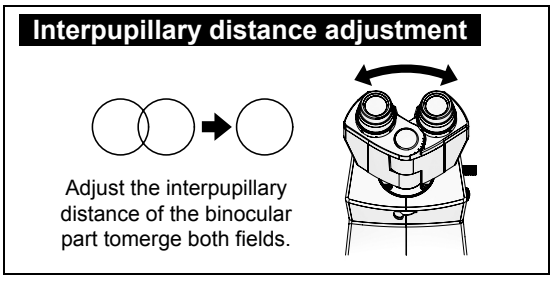


Figure 3.2-14 Adjusting diopters and interpupillary distance

1. **For right and left eyepieces, rotate the diopter adjustment rings on the eyepieces so that their bottom edges are adjusted to the groove lines on the eyepieces.**

   This is the zero point adjustment of diopter.

2. **Place the 40x objective into the optical path.**

3. **Look into the left eyepiece with your left eye and focus on the specimen with the focus knob on the microscope body.**

4. **Place the 10x objective into the optical path.**

5. **Look into the left eyepiece with your left eye and focus on the specimen with the diopter adjustment ring on the left eyepiece.**

   Do not touch the focus knob on the microscope body in this step.

6. **Repeat steps 2 to 5 two times.**

7. **Adjust diopter for the right eyepiece in the same manner.**

   Perform steps 2 to 6 for the right eyepiece interpreting “left” as “right.”

8. **Adjust the interpupillary distance of the binocular part to merge both fields of view.**

14 Focus on the specimen again.

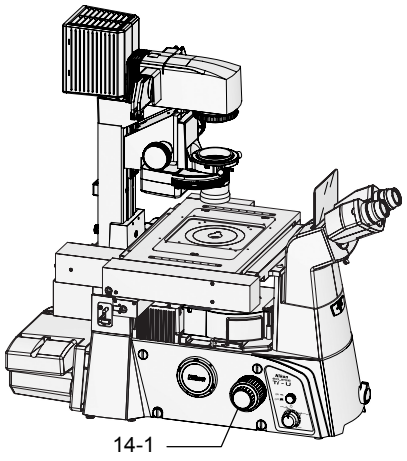


Figure 3.2-15 Focusing operation

1. **While looking through the eyepieces, focus on the specimen with the focusing knobs on both sides of the microscope.**

15 Center the condenser.

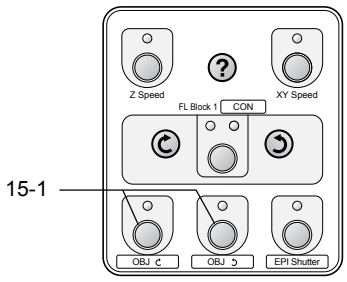
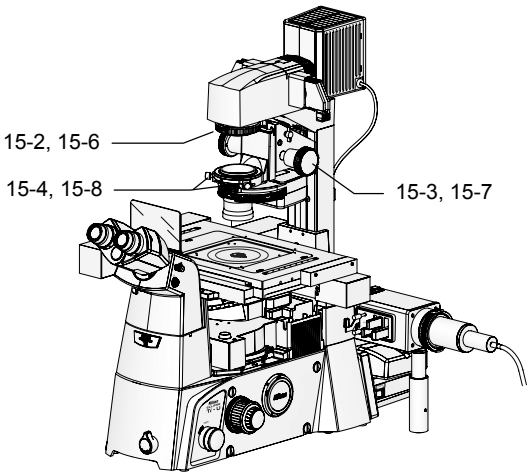
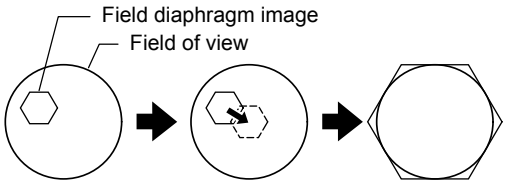


Figure 3.2-16 Ergo controller



Field diaphragm adjustment



Move the field diaphragm image to the center of the field of view and resize the diaphragm to a size almost same as the field of view.

Figure 3.2-17 Centering the condenser

1. **Place the 10x objective into the optical path.**
   Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. *
2. **Rotate the field diaphragm knob so that a field diaphragm image can be seen.**
3. **Focus on the field diaphragm image with the condenser focus knob. (The condenser mount moves vertically.)**
4. **Move the field diaphragm image into the center of the field of view using the two condenser centering knobs.**
5. **Place the 40x objective into the optical path.**
   Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. *
6. **Rotate the field diaphragm knob so that the field diaphragm image becomes almost the same size as the field of view.**
7. **Turn the condenser focusing knob to move the condenser mount vertically so that the field diaphragm image is focused on.**
8. **Move the field diaphragm image into the center of the field of view using the two condenser centering knobs.**
9. **Place the 10x objective into the optical path again.**
   Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. *

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button and the OBJ ↺ (CCW) function is assigned to the E100/L100 button.

16 Perform microscopy.

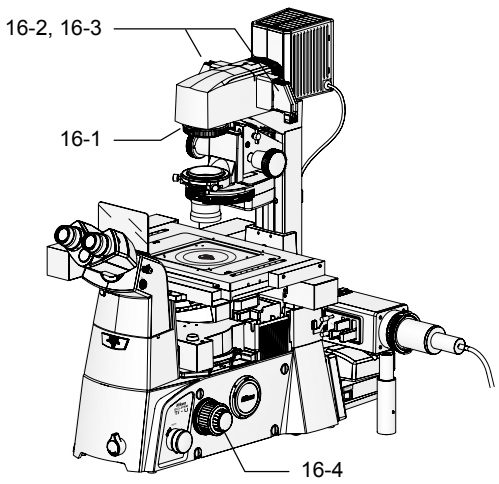


Figure 3.2-18 Brightness adjustment and focus adjustment

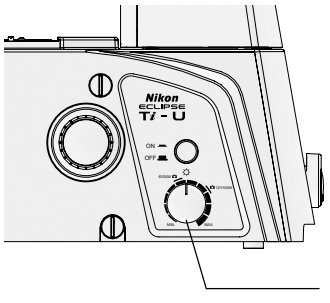


Figure 3.2-19 Left side of the microscope body

1. **Rotate the field diaphragm knob so that the field diaphragm image becomes almost the same size as the field of view.**

2. **Remove the NCB 11 filter and place the GIF filter from/to the optical path to improve image contrast.**

3. **Adjust the brightness for your convenience.**

   The ND filter on the dia pillar illuminator can be used to change the brightness.

   If color reproduction is not serious for your purpose, use the dia illumination lamp brightness control knob on the left side on the microscope body.

4. **Focus on the specimen.**

When the lamp voltage changes to adjust the brightness, illumination color changes. When color reproduction is serious for your purpose such as color photomicrography, do not touch the lamp brightness control knob (lamp voltage). Adjust brightness with ND filters.

17 Perform microscopy with different magnifications.

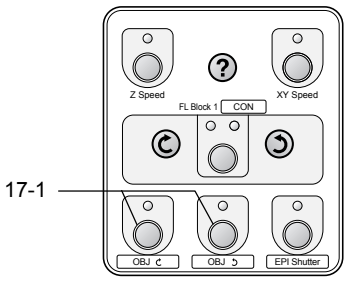
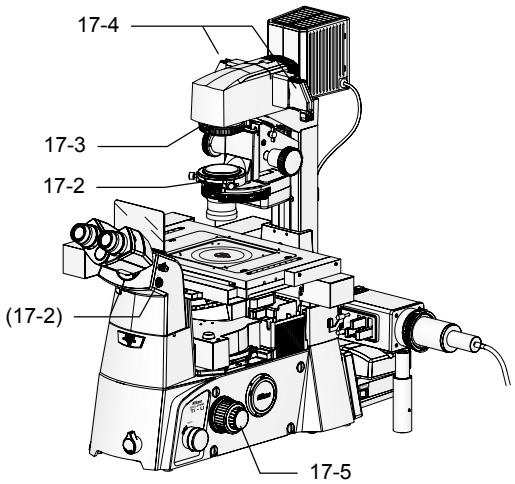
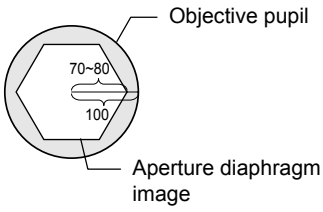


Figure 3.2-20 Ergo controller



Aperture diaphragm adjustment



Adjust the aperture diaphragm to a size of 70% to 80% of the objective pupil.

Figure 3.2-21 Field diaphragm and aperture diaphragm adjustment

1. **Change the objective.**

   Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. *

2. **Adjust the aperture diaphragm to a size of 70% to 80% of the numerical aperture (NA) of the objective.**

   Move the Bertrand lens in/out lever on the eyepiece tube to “B” side to place the Bertrand lens into the optical path. The objective pupil and an aperture diaphragm image can be seen. Focus on the aperture diaphragm image with the Bertrand lens focus knob on the right side of the eyepiece tube. Adjust the aperture diaphragm to a size of 70% to 80% of the objective pupil.

   Move the Bertrand lens in/out lever to “O” side to remove the Bertrand lens from the optical path again.

3. **Adjust the field diaphragm to a size almost the same as the field of view.**

4. **Adjust the brightness for your convenience.**

   The ND filter on the dia pillar illuminator can be used to change the brightness.

   If color reproduction is not serious for your purpose, use the dia illumination lamp brightness control knob on the left side on the microscope body.

5. **Focus on the specimen.**

When the lamp voltage changes to adjust the brightness, illumination color changes. When color reproduction is serious for your purpose such as color photomicrography, do not touch the lamp brightness control knob (lamp voltage). Adjust brightness with ND filters.

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button and the OBJ ↺ (CCW) function is assigned to the E100/L100 button.

18 Change specimens.

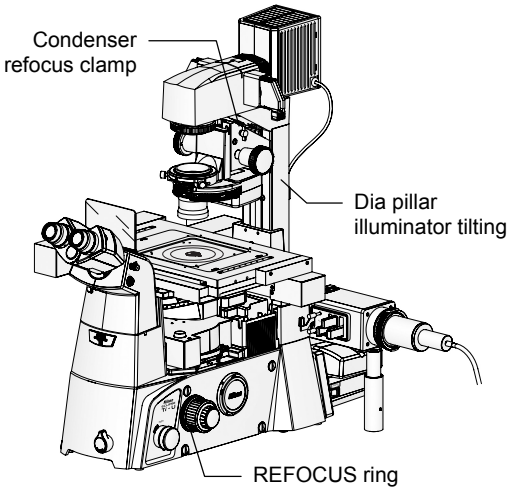


Figure 3.2-22 Changing the specimen

The following functions can be used if necessary:

- **Dia pillar illuminator tilting**

  Loosening the clamp knob on the back of the dia pillar illuminator 100W tilts the pillar, allowing you to create an extra working space.

- **REFOCUS ring (only for Ti-U and Ti-U/B)**

  When the objective requires to be lowered, the objective vertical position can be restored with facility using the REFOCUS ring. To use the ring, tighten it before lowering the objective.

  With this ring, upward movement of the objective is restricted at the position. Therefore, rotate the coarse focus knob to the limit to restore the objective vertical position.

- **Condenser refocus clamp**

  When the condenser requires to be moved, the condenser vertical position can be restored with facility using the condenser refocus clamp. To use the clamp, tighten it before moving the condenser.

19 Finish microscopy.

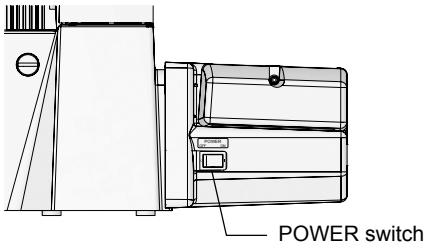


Figure 3.2-23
POWER switch (Hub controller B)

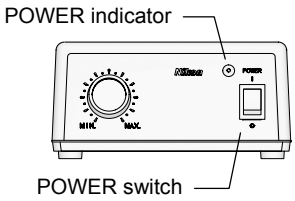


Figure 3.2-24
POWER switch (Power supply device)

When you are finished with all microscopy, power off the units.

1. **Flip the POWER switch on the right side of the hub controller B to “OFF” to turn off the power of the hub controller B and the microscope.**

2. **Flip the POWER switch on the front of the power supply to “O” to turn off the power supply.**

   The POWER indicator goes off.

3.3 Phase-contrast (Ph) Microscopy

This section describes phase-contrast (Ph) microscopy for the following conditions:

Attached motorized units

The following motorized units are attached and used in the system:

Motorized nosepiece, Motorized FL turret, Motorized condenser, Motorized shutter for episcopic illumination

For details on motorized shutter operation, see Chapter 5, “Online and Remote Operation,” and Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly.”

Ergo controller settings

Buttons on the front panel are re-assigned as provided in the following table:

Button	Setting *	Function
OBJ	CON	Condenser turret rotation
PFS	OBJ ↻ (CW)	Nosepiece rotation (clockwise)
E100/L100	OBJ ↺ (CCW)	Nosepiece rotation (counterclockwise)
INTSL	EPI Shutter	Epi illumination shutter open/close

* Affix function stickers on the panel of the ergo controller for these settings.

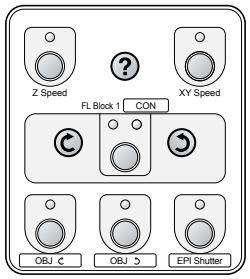


Figure 3.3-1
Ergo controller settings (with stickers)

1 Focus on the specimen under bright-field microscopy.

For procedure of bright-field microscopy, see Section 3.2, “Bright-field (BF) Microscopy.”

2 Place a phase-contrast objective into the optical path.

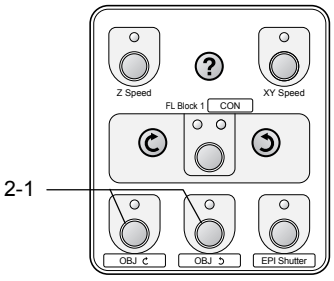


Figure 3.3-2 Ergo controller

1. **Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the phase-contrast objective into the optical path. ***
2. **Check the Ph code indicated on the objective body.**

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button and the OBJ ↺ (CCW) function is assigned to the E100/L100 button.

3 Place the condenser cassette having the same Ph code as the objective into the optical path.

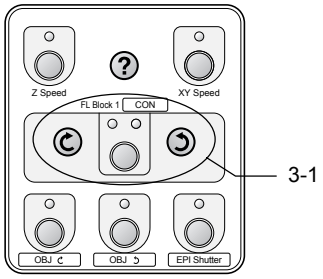


Figure 3.3-3 Ergo controller

1. **Press the FL Block 1/CON button to turn on the indicator for the CON. Press the rotation buttons so that the desired condenser cassette is placed into the optical path.** *

   Place the condenser cassette that has the same Ph code as the objective into the optical path.

* This is the case where the CON (condenser) function is assigned to the OBJ button.

4 Fully open the dia pillar illuminator field diaphragm and aperture diaphragm.

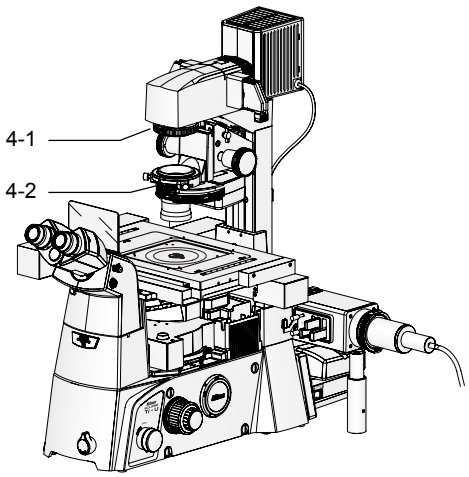


Figure 3.3-4
Field diaphragm and aperture diaphragm

1. **Turn the field diaphragm knob on the dia pillar illuminator to open the field diaphragm fully.**

2. **Move the aperture diaphragm lever on the system condenser to open the aperture diaphragm fully.**

If the aperture diaphragm opening size is reduced, the optical path is vignetted at the ring diaphragm and interferes with differential interference contrast effect. For DIC observation, fully open the aperture diaphragm.

When using the ELWD-S Condenser

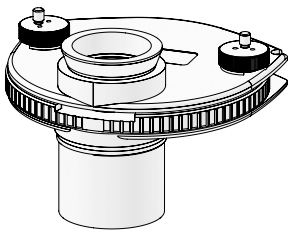
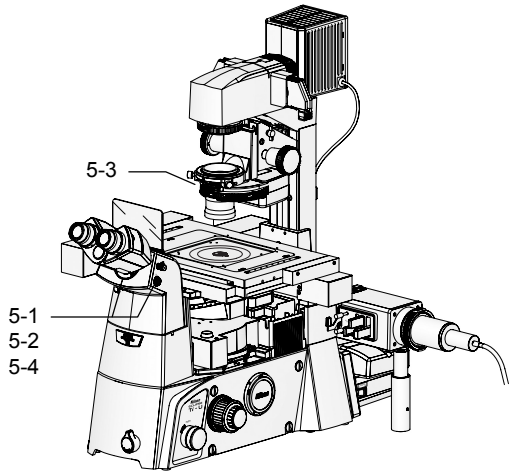


Figure 3.3-5 ELWD-S Condenser

The ELWD-S condenser aperture diaphragm is only intended for use with bright-field optical paths and has no affect upon phase-contrast optical paths, so there is no need to fully open the aperture diaphragm in Step 4-2.

Performing annular diaphragm centering at the [PhL] position when using the ELWD-S condenser causes the remaining annular diaphragms to be simultaneously centered. Place the [PhL] objective in the optical path and set the condenser turret to the [PhL] position then proceed to the next step.

5 Center the annular diaphragm.



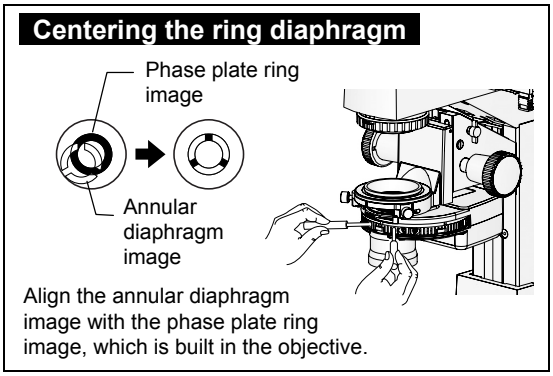


Figure 3.3-6 Centering the annular diaphragm

1. **Move the Bertrand lens in/out lever to the "B" side.**

   The Bertrand lens in the eyepiece tube is placed into the optical path.

2. **Focus on the annular diaphragm with the Bertrand lens focus knob on the right side of the eyepiece tube.**

3. **Turn two annular diaphragm centering screws using hexagonal driver to align the annular diaphragm image with the phase plate ring image.**

4. **Move the Bertrand lens in/out lever to the "O" side again.**

   The Bertrand lens is removed from the optical path.

6 Perform microscopy.

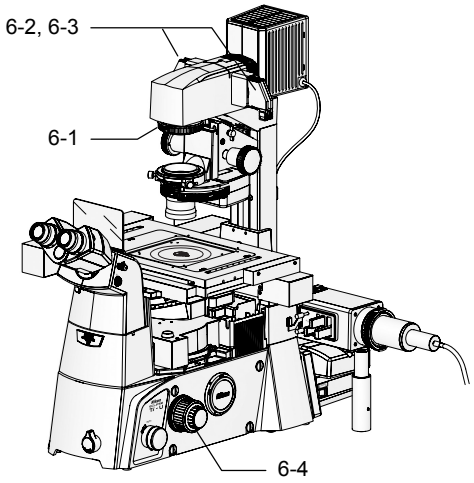


Figure 3.3-7 Brightness adjustment and focus adjustment

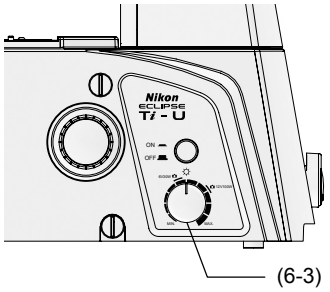


Figure 3.3-8 Left side of the microscope body

1. **Rotate the field diaphragm knob so that the field diaphragm image becomes almost the same size as the field of view.**

2. **Remove the NCB 11 filter and place the GIF filter from/to the optical path to improve image contrast.**

3. **Adjust the brightness for your convenience.**

   The ND filter on the dia pillar illuminator can be used to change the brightness.

   If color reproduction is not serious for your purpose, use the dia illumination lamp brightness control knob on the left side on the microscope body.

4. **Focus on the specimen.**

When the lamp voltage changes to adjust the brightness, illumination color changes. When color reproduction is serious for your purpose such as color photomicrography, do not touch the lamp brightness control knob (lamp voltage). Adjust brightness with ND filters.

7 Perform microscopy with different magnifications.

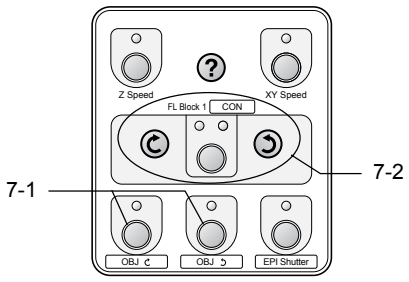


Figure 3.3-9 Ergo controller

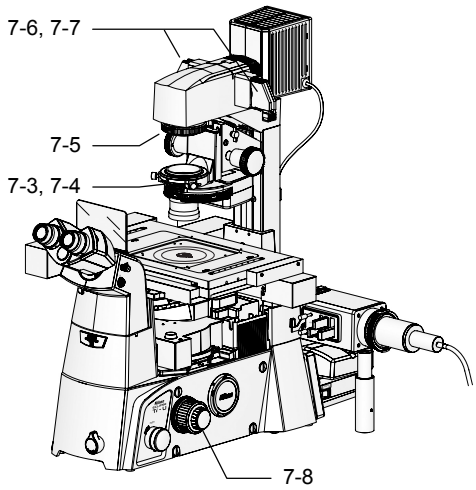


Figure 3.3-10 Ring diaphragm, aperture diaphragm, and field diaphragm

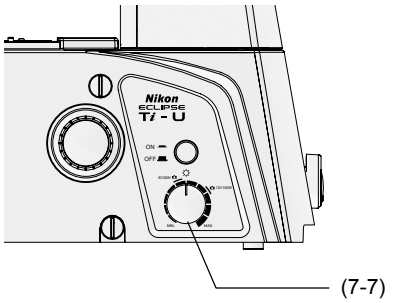


Figure 3.3-11 Left side of the microscope body

1. **Place a desired objective into the optical path.**

   Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. *

2. **Place the condenser cassette that has the same Ph code as the objective into the optical path.**

   Press the FL Block 1/CON button to turn on the indicator for the CON. Press the rotation buttons so that the desired condenser cassette is placed into the optical path. *

3. **Center the ring diaphragm.**

   For details on the adjustment, see step 5 on page 2-39.

4. **Check that the aperture diaphragm is fully open.**

5. **Adjust the field diaphragm to a size almost the same as the field of view.**

6. **Remove the NCB 11 filter and place the GIF filter from/to the optical path to improve image contrast.**

7. **Adjust the brightness for your convenience.**

   The ND filter on the dia pillar illuminator can be used to change the brightness.

   If color reproduction is not serious for your purpose, use the dia illumination lamp brightness control knob on the left side on the microscope body.

8. **Focus on the specimen.**

When the lamp voltage changes to adjust the brightness, illumination color changes. When color reproduction is serious for your purpose such as color photomicrography, do not touch the lamp brightness control knob (lamp voltage). Adjust brightness with ND filters.

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button, the OBJ ↺ (CCW) function is assigned to the E100/L100 button, and the CON (Condenser) function is assigned to the OBJ button.

8 Changing specimens

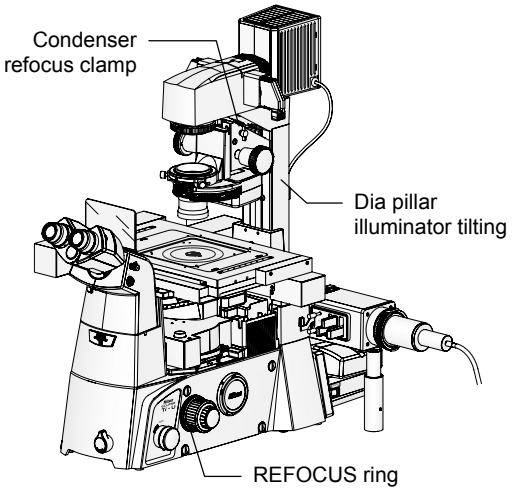


Figure 3.3-12 Changing the specimen

The following functions can be used if necessary:

- **Dia pillar illuminator tilting**

  Loosening the clamp knob on the back of the dia pillar illuminator 100W tilts the pillar, allowing you to create an extra working space.

- **REFOCUS ring (only for Ti-U and Ti-U/B)**

  When the objective requires to be lowered, the objective vertical position can be restored with facility using the REFOCUS ring. To use the ring, tighten it before lowering the objective.

  With this ring, upward movement of the objective is restricted at the position. Therefore, rotate the coarse focus knob to the limit to restore the objective vertical position.

- **Condenser refocus clamp**

  When the condenser requires to be moved, the condenser vertical position can be restored with facility using the condenser refocus clamp. To use the clamp, tighten it before moving the condenser.

9 Finish microscopy.

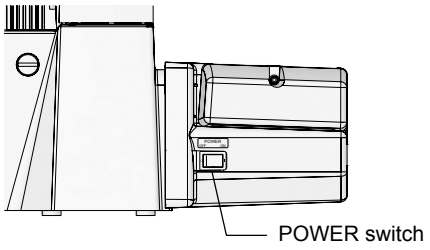


Figure 3.3-13 POWER switch (hub controller B)

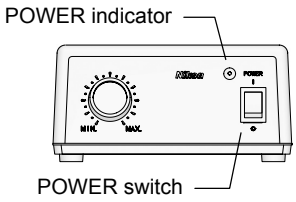


Figure 3.3-14 POWER switch (power supply device)

When you are finished with all microscopy, power off the units.

1. **Flip the POWER switch on the right side of the hub controller B to “OFF” to turn off the power of the hub controller B and the microscope.**

2. **Flip the POWER switch on the front of the power supply to “O” to turn off the power supply.**

   The POWER indicator goes off.

3.4 Differential Interference Contrast (DIC) Microscopy

For procedure of DIC microscopy, see Chapter 2, “Microscopy,” in the instruction manual for the DIC attachment.

This section describes how to perform the following operations from the ergo controller during DIC microscopy:

- Changing objectives
- Changing condenser cassettes
- Placing/removing the analyzer

This section describes DIC microscopy for the following conditions:

Attached motorized units

The following motorized units are attached and used in the system:

Sextuple Motor DIC Nosepiece, Motorized FL turret, Motorized condenser, Motorized shutter for episcopic illumination

For details on motorized shutter operation, see Chapter 5, “Online and Remote Operation,” and Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly.”

Ergo controller settings

Buttons on the front panel are re-assigned as provided in the following table:

Button	Setting *	Function
OBJ	CON	Condenser turret rotation
PFS	OBJ ↻ (CW)	Nosepiece rotation (clockwise)
E100/L100	OBJ ↺ (CCW)	Nosepiece rotation (counterclockwise)
INTSL	EPI Shutter	Epi illumination shutter open/close

* Affix function stickers on the panel of the ergo controller for these settings.

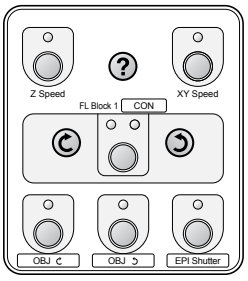


Figure 3.4-1
Ergo controller settings (with stickers)

1 Change the objective.

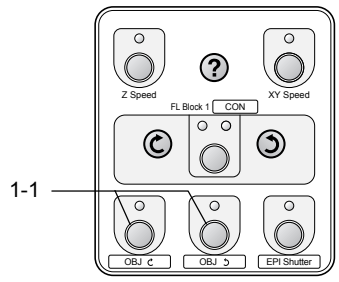


Figure 3.4-2 Ergo controller

1. **Press the OBJ ↻ (CW) button and the OBJ ↺ (CCW) button to place the objective into the optical path. ***

* This is the case where the OBJ ↻ (CW) function is assigned to the PFS button and the OBJ ↺ (CCW) function is assigned to the E100/L100 button.

2 Change the condenser cassette.

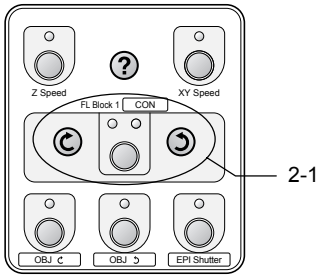


Figure 3.4-3 Ergo controller

1. **Press the FL Block 1/CON button to turn on the indicator for the CON. Press the rotation buttons so that the desired condenser cassette is placed into the optical path. ***

* This is the case where the CON (condenser) function is assigned to the OBJ button.

3 Insert/remove an analyzer block into/from the optical path.

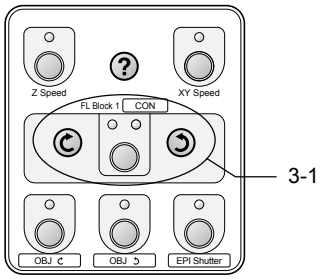


Figure 3.4-4 Ergo controller

1. **Press the FL Block 1/CON button to turn on the indicator for the FL Block 1. Press the rotation buttons so that the analyzer block is placed into the optical path.**

3.5 Episcopic Fluorescence (Epi-fl) Microscopy

For details on epi-fl microscopy, see Chapter 2, “Microscopy (TI-FL),” or Chapter 5, “Microscopy (TI-SFL),” in the instruction manual for TI-FL Epi-fl Illuminator/TI-SFL High Performance Epi-fl Illuminator.

This section describes how to perform the following operations from the ergo controller during epi-fl microscopy:

- Opening/closing the motorized shutter
- Changing FL blocks

This section describes episcopic fluorescence (epi-fl) microscopy for the following conditions:

Attached motorized units

The following motorized units are attached and used in the system:

Motorized nosepiece, Motorized FL turret, Motorized condenser, Motorized shutter for episcopic illumination

For details on motorized shutter operation, see Chapter 5, “Online and Remote Operation,” and Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly.”

Ergo controller settings

Buttons on the front panel are re-assigned as provided in the following table:

Button	Setting *	Function
OBJ	CON	Condenser turret rotation
PFS	OBJ ↻ (CW)	Nosepiece rotation (clockwise)
E100/L100	OBJ ↺ (CCW)	Nosepiece rotation (counterclockwise)
INTSL	EPI Shutter	Epi illumination shutter open/close

* Affix function stickers on the panel of the ergo controller for these settings.

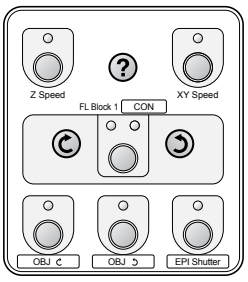


Figure 3.5-1
Ergo controller settings (with stickers)

1 Open or close the motorized shutter.

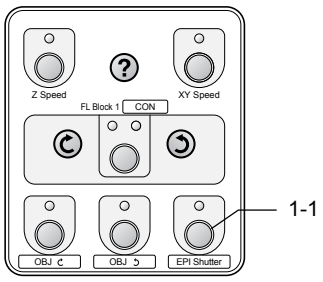


Figure 3.5-2 Ergo controller

1. **Press the EPI Shutter button to open or close the shutter.** *

   The shutter opens or closes each time the button is pressed. When the shutter is open, the indicator of the button turns off. When the shutter is closed, the indicator of the button turns on.

* This is the case where the EPI Shutter function is assigned to the INTSL button.

2 Change filter blocks.

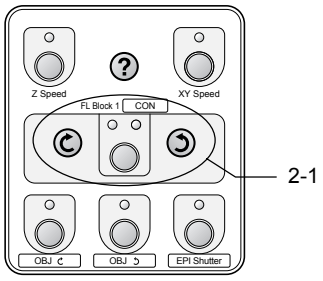


Figure 3.5-3 Ergo controller

1. **Press the FL Block 1/CON button to turn on the indicator for the FL Block 1. Press the rotation buttons so that the desired filter block is placed into the optical path.**

4 Operation of Each Part

Warning

- **Before using this product, thoroughly read the Safety Cautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **If you use this product with other devices (such as the Epi-fl illuminator or differential interference contrast attachment), also read the instruction manuals for those devices thoroughly, and obey all the warnings and cautions described there as well.**

Caution

- **To use motorized units for Ti series, information on the attached parts of the motorized units must be registered to the hub controller B via the application software, "Ti Control", which is used to setup Ti series microscopy system. When the microscope system is used for the first time after its assembly and installation or when the microscope system changes its unit configuration or its optical parts, perform the setup work before operation.**
  For details about operation method and registration method on Ti Control, see the instruction manual for Ti Control.
- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt.**
- **Each of the motorized units of the Ti series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precision of objectives is particularly susceptible to even weak shocks.**

This chapter describes how to operate the motorized units attached to the main microscope body, Ti-U, Ti-U/B, Ti-S, or Ti-S/L100.

- See Chapter 3, "Microscopy," for instructions on performing microscopy.
- If you have not finished assembling the microscope, see Chapter 6, "Assembly."
- If an Epi-fl illuminator, differential interference contrast attachment, or the like is attached to your microscope, also read the instruction manuals supplied with those products.
- See the instruction manual supplied with the microscope for information on any units not described in this chapter.

4.1 Turning the Power On and Off

4.1.1 Power ON/OFF Procedure

Perform the following procedure to turn on the devices of which the microscope system is composed:

> If you turn on the devices in the order different from described in this manual, communications between the devices may be performed incorrectly, thus the microscope system may not function correctly. Make sure to turn on the devices in the following order:

1. **Motorized HG fiber-optic light source (Intensilight)**

   For the operating procedure, see the instruction manual of the Motorized HG fiber-optic light source (Intensilight).

2. **Dia pillar illuminator power supply**

   See Section 4.1.2, “Power Supply Device for Dia illumination,” for details.

3. **Motorized devices (motorized stage, motorized shutter, etc.)**

   The power source of the motorized stage can be operated using the motorized stage controller. See Section 4.1.3, “Power of Motorized Stage Controller,” for details.

   Turn on other motorized devices that require individual power sources in this step.

4. **Hub controller B and microscope main body**

   See Section 4.1.4, “Power Supply of the Hub Controller B and Microscope Main Body,” for details.

5. **Digital camera for microscopy**

   If a digital camera for microscopy is used, turn its power on after turning on the hub controller B. For the operating procedure, see the instruction manual of the relevant digital camera.

6. **Personal computer (PC) and software “Ti Control”**

   If you use a PC for microscopy, make sure that other devices have already been turned on, and then start software “Ti Control.” It does not matter if you turn on the PC beforehand. For the operating procedure, see the instruction manuals of the PC and “Ti Control.”

4.1.2 Power Supply Device for Dia Illumination

Caution

- **Check the combination of lamp, dia pillar illuminator, and power supply device.**

  The dia pillar illuminator and the power supply must be used in the correct combination of specifications with respect to the lamp ratings (12V, 100W or 6V, 30W) and the regional supply voltage. Refer to the instruction manual included with the microscope main body to select the correct combination. Use of an improper combination may result in fire, electric shock, and/or malfunction.

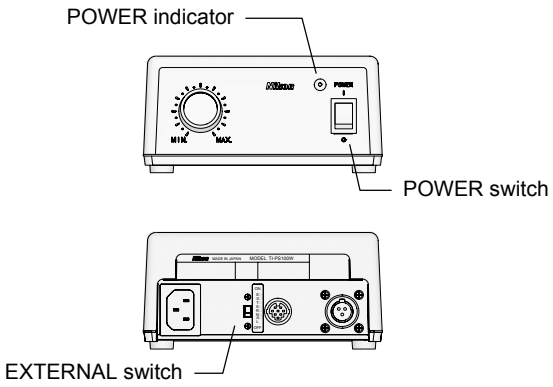


Figure 4.1-1 Power supply device for dia illumination

To turn on the power supply device for dia illumination, perform the following:

1. **Make sure that the power supply and the hub controller B are connected correctly.**

   For connection of the devices, see Chapter 6, “Assembly.”

2. **Check the EXTERNAL switch (or CTRL switch) on the back of the power supply device.**

   To enable the brightness control knob on the microscope, set the switch to “ON.” To enable the brightness control knob on the power supply device, set the switch to “OFF”.

   For details, see Section 4.2.2, “Power Supply Configuration.”

3. **Press the “ I ” side of the POWER switch on the front of the power supply body to turn on the power.**

   The POWER indicator turns on.

   * Note that the POWER switches on the TE-PS30W and TE-PSE30 has a built-in lamp instead.

4. **To turn off the power, set the POWER switch on the front of the power supply device to “O” side.**

   Check that the POWER indicator (or the lamp built in the POWER switch) turns off.

4.1.3 Power of Motorized Stage Controller

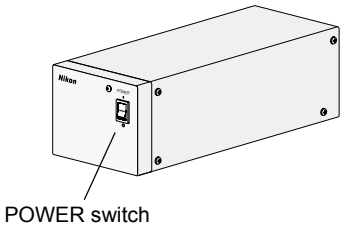


Figure 4.1-2 Motorized stage controller

Turn on the motorized stage controller. Perform the following procedure:

1. **Make sure that the motorized stage (or motorized stage with the linear encoder) and the hub controller B are connected to the motorized stage controller.**

   See Chapter 6, “Assembly,” for details about connections.

2. **Flip the POWER switch on the front of the motorized stage controller to “ I ”.**

   The motorized stage controller and the motorized stage (or motorized stage with the linear encoder) are powered on.

3. **Flip the POWER switch to “O” if you want to turn off the motorized stage controller and the motorized stage (or motorized stage with the linear encoder).**

4.1.4 Power Supply of the Hub Controller B and Microscope Main Body

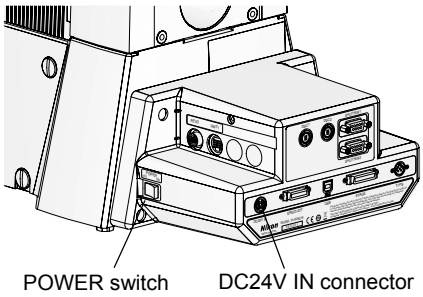


Figure 4.1-3 Power switch and connector for the hub controller B

To turn on the power supply of the hub controller B, perform the following:

1. **Check that the AC adapter for the hub controller B is connected to the DC24V IN connector on the rear of the hub controller B.**

   For connection of the devices, see Chapter 6, “Assembly.”

2. **Set the POWER switch on the right of the hub controller B to “ON.”**

   The power supply for the hub controller B turns on.

3. **To turn off the power supply of the hub controller B, set the POWER switch to “OFF”.**

4.2 Operating the Dia Illumination Lamp

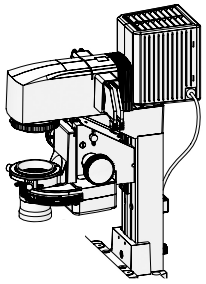
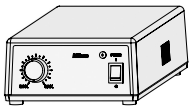
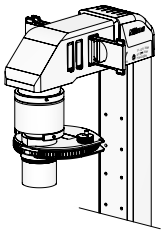
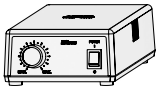
Caution

When the 6V 30W halogen lamp is used, the lamp voltage (brightness) cannot be adjusted from the PC. Use the diascopic lamp brightness control knob on the microscope main body or the brightness control knob on the power supply.

4.2.1 Combinations of Lamps, Dia Pillar Illuminators, and Power Supplies

The combination of the dia pillar illuminator and the power supply will differ depending on the rating of the lamp used (12V 100W or 6V 30W). Refer to the following table for the correct combination of lamp, dia pillar illuminator, and power supply device. Do not use the devices in any other combination.

Table 4.2-1 Combinations of lamps, dia pillar illuminators, and power supplies

<table>
<tr><th>Lamp ratings</th><th>Dia pillar illuminator</th><th colspan="2">Power supply device</th></tr>
<tr><td>12V, 100W halogen lamp
(OSRAM HLX 64623 or
PHILIPS 77241)</td><td>TI-DH dia pillar illuminator 100W
  </td><td colspan="2">TI-PS100W power supply
(for 100 to 240 V)
  </td></tr>
<tr><td rowspan="2">6V, 30W halogen lamp
(PHILIPS 5761)</td><td rowspan="2">TI-DS dia pillar illuminator 30W
  </td><td>TE-PS30W
power supply A
(for 100 to 120 V)</td><td>TE-PSE30
power supply A
(for 230 V)</td></tr>
<tr><td colspan="2"> 
* Both power supply units have the same appearance.</td></tr>
</table>

4.2.2 Power Supply Configuration

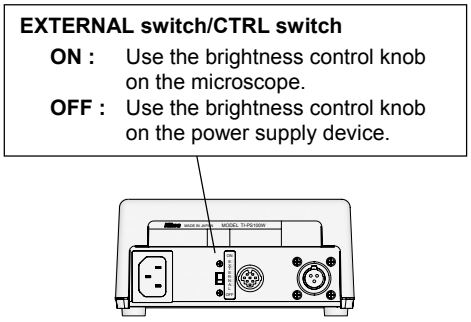


Figure 4.2-1
Rear view of the power supply device

Use the EXTERNAL switch (or CTRL switch) to enable dia pillar illuminator operation on the operation panel on the left side of the microscope body. (For the TI-PS100W, the dia pillar illuminator can be controlled on a PC.)

If the EXTERNAL (or CTRL) switch is ON, the knob on the microscope will be enabled; if the switch is OFF, the knob on the power supply device will be enabled.

The two knobs are not calibrated. A particular setting on one knob may result in a different brightness than for the same setting on the other knob.

4.2.3 Operating the Dia Pillar Illuminator Lamp

(1) Turning on/off the dia pillar illuminator lamp

Operation method: microscope body or PC

Operation on the microscope main body

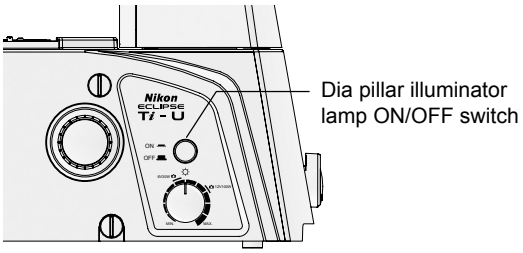


Figure 4.2-2 Turning on/off the dia pillar illuminator lamp

1. **Check that the EXTERNAL (or CTRL) switch on the rear of the power supply device is set to "ON."**

   See Section 4.2.2, "Power Supply Configuration."

2. **Press the dia pillar illuminator lamp ON/OFF switch on the left side of the microscope.**

   Each time you press the switch, the diascopic lamp toggles on or off.

(2) Brightness adjustment by changing the lamp voltage

Operation method: microscope body, power supply device, or PC

Operation on the microscope main body

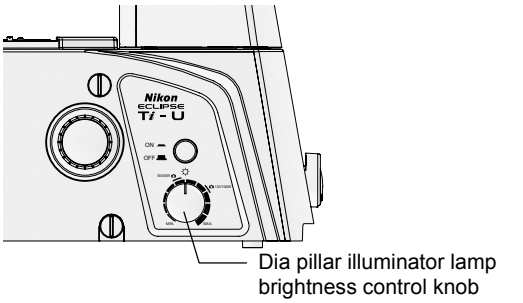


Figure 4.2-3 Dia pillar illuminator lamp brightness control knob

1. **Set the EXTERNAL (CTRL) switch on the rear of the power supply body to "ON".**

   See Section 4.2.2, "Power Supply Configuration."

2. **Turn the dia illumination lamp brightness control knob on the left side of the microscope.**

White light

When accurate color reproduction is critical, set the brightness control knob to the "6V 30W" or "12V 100W" position depending on the lamp used, then place the NCB11 filter into the optical path. This setting will provide the whitest light. To adjust the brightness, use the ND filters on the dia pillar illuminator.

Operation on the power supply device

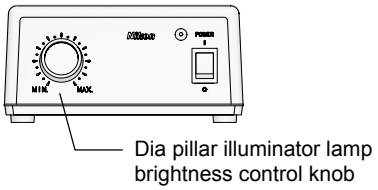


Figure 4.2-4 Dia pillar illuminator lamp brightness control knob

1. **Set the EXTERNAL (CTRL) switch on the rear of the power supply body to "OFF".**

   See Section 4.2.2, "Power Supply Configuration."

2. **Turn the dia pillar illuminator lamp brightness control knob on the front of the power supply device.**

- **It is not possible to simultaneously operate the brightness control knobs on the microscope and power supply. Use the EXTERNAL switch on the power supply to switch between which brightness control knob to activate.**
- **The two knobs are not calibrated. A particular setting on one knob may result in a different brightness than for the same setting on the other knob.**

4.2.4 Adjusting the Brightness with ND Filters

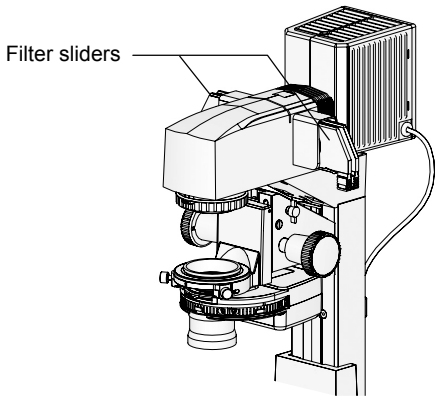


Figure 4.2-5 Brightness adjustment with ND filters

Filters for brightness adjustment are referred to as neutral density (ND) filters.

Filters with higher numbers have lower transmittance, and produces darker images. These filters are useful for adjusting the brightness when color reproducibility is critical (i.e. for photomicroscopy), as they do not affect the color of illumination light.

Use the ND filters by attaching them to the filter sliders on the dia pillar illuminator.

- **ND2**： Reduces the light intensity to 1/2. (50% transmittance)
- **ND4**： Reduces the light intensity to 1/4. (25 % transmittance)
- **ND8**： Reduces the light intensity to 1/8. (12.5 % transmittance)
- **ND16**： Reduces the light intensity to 1/16. (6.3 % transmittance)

4.3 Changing Optical Paths

Ti series microscopes have several observation ports. Use the optical path selector knob on the right side of the microscope to distribute the optical image to the ports.

4.3.1 Selecting the Optical Path on the Ti-U and Ti-U/B

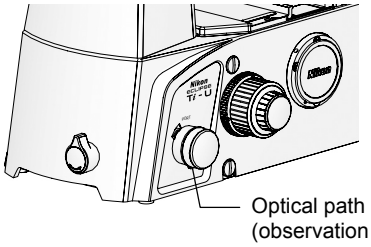


Figure 4.3-1 Ti-U, Ti-U/B optical path selection

On the Ti-U and Ti-U/B, the optical image observation port can be selected by rotating the optical path selector knob on the right side of the microscope.

The following tables show the optical path selector knob positions and the corresponding light intensity distribution.

Table 4.3-1 Optical path selector knob on the Ti-U

Knob position	Light distribution (%)		
	Observation port	Lest side port	Right side port
EYE	100	–	–
R (NOTE 1)	–	–	100
AUX (NOTE 1)	–	–	–
L	–	100	–
Available attachments	– (NOTE 2)	Digital cameras, TV cameras	

Table 4.3-2 Optical path selector knob on the Ti-U/B

Knob position	Light distribution (%)			
	Observation port	Lest side port	Right side port	Bottom port
EYE	100	–	–	–
R (NOTE 1)	–	–	100	–
B	–	–	–	100
L	–	100	–	–
Available attachments	– (NOTE 2)	Digital cameras, TV cameras		

NOTE 1: For positions “R” and “AUX”, an optional prism can be attached at the time of purchase. By using the prism, the light intensity can be split to multiple ports, i.e. EYE : R = 20 : 80.

NOTE 2： By attaching an external phase contrast eyepiece base unit (TI-T-BPH) or an eyepiece base unit with camera port (TI-T-BS), a camera port will be available for the “EYE” position, in addition to observation via the eyepieces.

Bottom port (Ti-U/B only)

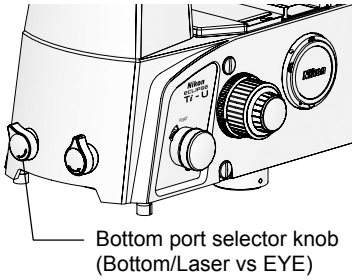


Figure 4.3-2 Bottom port (Ti-U/B only)

The Ti-U/B has a bottom port for outputting the optical image from the bottom of the microscope.

To use the bottom port, rotate the optical path selector knob on the side of the microscope to the “B” position, and the bottom port selector knob to the “Bottom/Laser” side. The optical path to the observation port will be directed at the bottom port.

4.3.2 Selecting the Optical Path on the Ti-S and Ti-S/L100

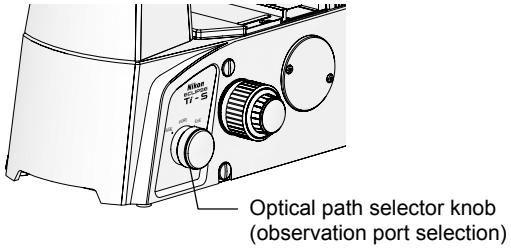


Figure 4.3-3 Ti-S, Ti-S/L100 optical path selection

On the Ti-S and Ti-S/L100, the optical image observation port can be selected by rotating the optical path selector knob on the right side of the microscope.

The following tables show the optical path selector knob positions and the corresponding light intensity distribution.

Table 4.3-3 Optical path selector knob on the Ti-S

Knob position	Light distribution (%)		
	Observation port	Lest side port	Right side port
EYE	100	–	–
SIDE (NOTE 1)	20	80	–
Available attachments	– (NOTE 2)	Digital cameras, TV cameras	

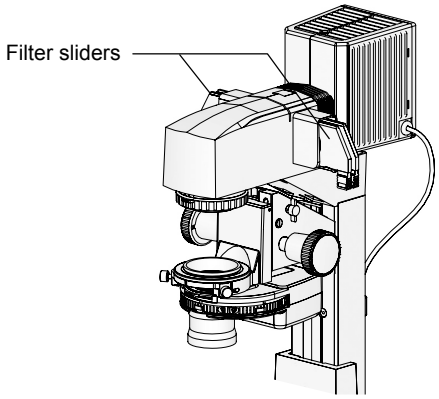
Table 4.3-4 Optical path selector knob on the Ti-S/L100

Knob position	Light distribution (%)		
	Observation port	Lest side port	Right side port
EYE	100	–	–
SIDE	–	100	–
Available attachments	– (NOTE 2)	Digital cameras, TV cameras	

NOTE 1: For positions “SIDE”, an optional prism can be attached at the time of purchase. By using the prism, the light intensity can be split to multiple ports, i.e. EYE : R = 20 : 80.

NOTE 2: By attaching an external phase contrast eyepiece base unit (TI-T-BPH) or an eyepiece base unit with camera port (TI-T-BS), a camera port will be available for the “EYE” position, in addition to observation via the eyepieces.

4.4 Using Filters



Filter sliders can be attached to the pillar illuminator (up to four sliders to the 100W model, and up to three sliders to the 30W model).

Use the necessary filters by attaching them to the filter sliders.

The following filters are available:

Figure 4.4-1 Filter sliders (dia pillar illuminator 100W)

Filter name	Description
ND2	Adjusts the brightness for normal microscopy or photomicroscopy. (ND: neutral density) Reduces the light intensity to 1/2. (Transmittance: approximately 50%)
ND4	Adjusts the brightness for normal microscopy or photomicroscopy. (ND: neutral density) Reduces the light intensity to 1/4. (Transmittance: approximately 25%)
ND8	Adjusts the brightness for normal microscopy or photomicroscopy. (ND: neutral density) Reduces the light intensity to 1/8. (Transmittance: approximately 12.5%)
ND16	Adjusts the brightness for normal microscopy or photomicroscopy. (ND: neutral density) Reduces the light intensity to 1/16. (Transmittance: approximately 6.3%)
NCB11	Corrects the color temperature for normal microscopy or photographing by daylight type color TV cameras. (NCB: Neutral Color Balance) Color reproducibility is optimal when this filter is placed in the optical path and the lamp voltage is matched to the lamp rating. Keep this filter out of the optical path when photographing monochrome images.
GIF	This is green interference filter (GIF). It improves image contrast when observing under a monochrome light or when photographing monochrome images.
D	This is diffusion filter. This filter is made of frosted glass and will diffuse light. Use this filter to equalize the illumination.
HA	Absorbs heat rays in the illumination. (HA: Heat Absorption) This filter reduces the effect of heat on the specimen. While the dia pillar illuminators have a built-in heat insulation filter, it is recommended that this filter be used for specimens that are sensitive to heat.

4.5 Using the Field Diaphragm

(Only for TI-DH Dia Pillar Illuminator 100W)

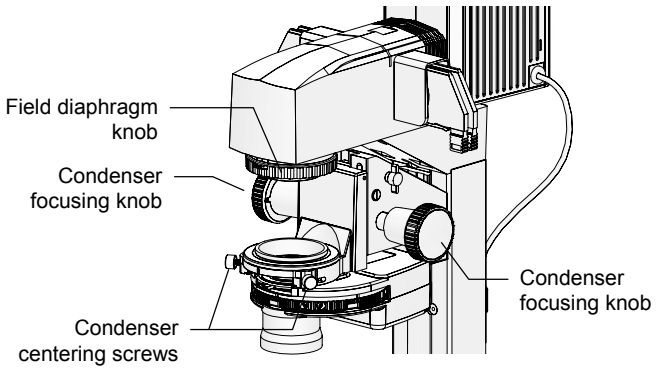


Figure 4.5-1 Field diaphragm knob

The field diaphragm is used to limit the irradiation area of the illumination to the field of view of the microscope.

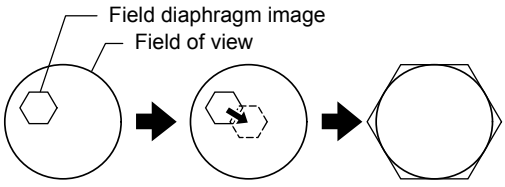
As viewed from the top of the pillar illuminator, a counterclockwise rotation of the field diaphragm knob increases the diameter of the irradiation area, and a clockwise rotation decreases the diameter of the irradiation area.

Usually, the irradiation area is adjusted to a size that circumscribes (or inscribes) the field of view. An unnecessarily large irradiation area will result in stray light and flare, thereby reducing the contrast of the optical image.

Field diaphragm adjustment is particularly important when performing photomicroscopy. Typically, adjusting the irradiation area to be slightly larger than the size of the image sensor (indicated by the capture area frame) will yield favorable results. Avoid making the size of the irradiation area too close to the size of the image sensor, as it may result in vignetting.

The field diaphragm of the TI-DS dia pillar illuminator 30W has a fixed opening size.
It cannot be adjusted.

Field diaphragm adjustment



Move the field diaphragm image to the center of the field of view and resize the field diaphragm image to a size same as the field of view.

Figure 4.5-2 Field diaphragm adjustment

1. **Place the 10x objective into the optical path.**
2. **Rotate the field diaphragm knob on the dia pillar illuminator to reduce the opening of the diaphragm until the field diaphragm image is visible in the field of view.**
3. **Focus on the field diaphragm image by rotating the condenser focus knob on the dia pillar illuminator.**
4. **Move the field diaphragm image to the center of the field of view using two condenser centering screws on the dia pillar illuminator.**
5. **Place the 40x objective into the optical path.**
6. **Rotate the field diaphragm knob on the dia pillar illuminator so that the field diaphragm image becomes almost the same size as the field of view.**
7. **Move the field diaphragm image to the center of the field of view using two condenser centering screws on the dia pillar illuminator.**

4.6 Using the Aperture Diaphragm

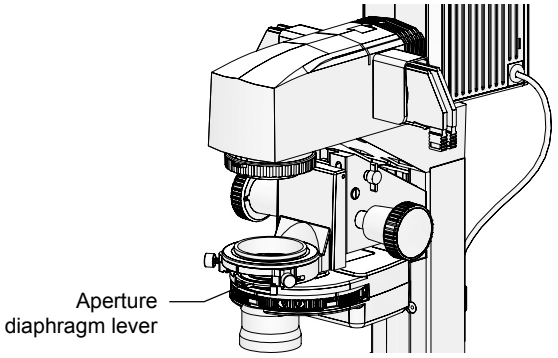
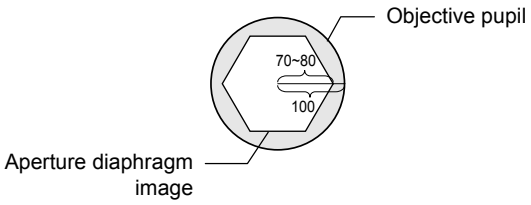


Figure 4.6-1 Aperture diaphragm lever



Adjust the aperture diaphragm to a size of 70% to 80% of the objective pupil.

Figure 4.6-2 Aperture diaphragm adjustment

The aperture diaphragm adjusts the numerical aperture of the illumination system.

By adjusting the aperture diaphragm, you can adjust the resolution, brightness, contrast, and focal depth of a microscope image. Closing the aperture diaphragm will reduce the resolution and brightness, and increase the contrast and focal depth. These properties are interrelated, and cannot be adjusted independently. Adjust the aperture diaphragm according to the specimen and purpose.

Aperture diaphragm adjustment is particularly important for bright-field microscopy, DIC microscopy, and photomicroscopy. Typically, adjusting the aperture diaphragm to 70-80% of the numerical aperture of the objective will result in an appropriate contrast and a favorable image.

Adjust the aperture diaphragm while looking at the actual diaphragm image. Rotate the aperture diaphragm lever counterclockwise to close the aperture, or clockwise to open the aperture. Adjust the aperture diaphragm so that the size of the diaphragm image is at 70-80% of the size of the objective pupil plane.

Adjustment with the Bertrand lens on the eyepiece tube

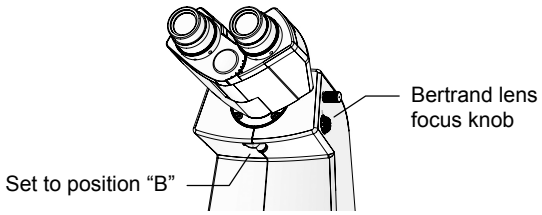


Figure 4.6-3 Aperture adjustment with the Bertrand lens

When the TI-TD B eyepiece tube or the TI-TERG Ergonomic Eyepiece Tube is used, adjust the aperture diaphragm with the Bertrand lens built in the eyepiece tube.

Move the Bertrand lens into the optical path by rotating the Bertrand lens in/out lever at the lower front of the eyepiece tube to “B”. Rotate the Bertrand lens focus knob on the right to adjust the focus. This will allow you to view the objective pupil (a bright circle) and the aperture diaphragm image.

Adjustment with the centering telescope

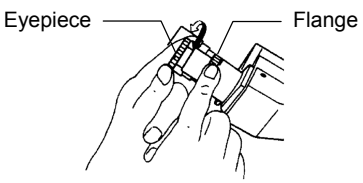


Figure 4.6-4 Adjustment with the centering telescope

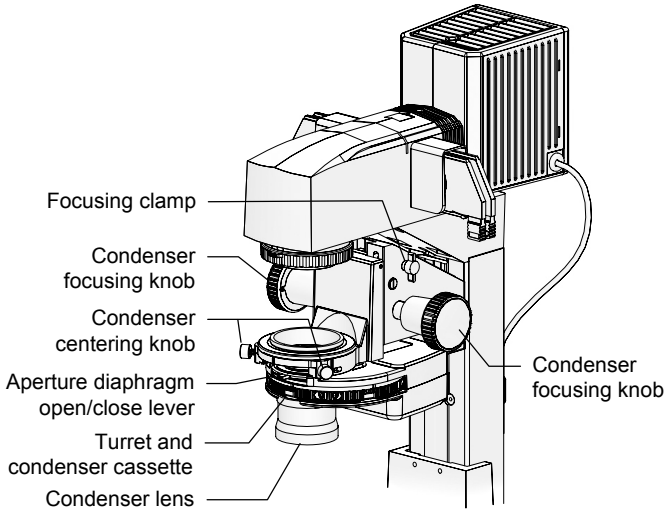
When the TI-TS B eyepiece tube, adjust the aperture diaphragm with the centering telescope.

Remove one of the eyepieces. Using the adapter, attach the centering telescope instead. Rotate the eyepiece of the centering telescope to adjust the focus. This will allow you to view the objective pupil (a bright circle) and the aperture diaphragm image.

Precautions on the condenser and aperture diaphragm

- Be sure to fully open the aperture diaphragm when performing phase contrast microscopy with the TI-C condenser turret. If the aperture diaphragm is not fully open, the optical path will be vignetted.
- The aperture diaphragm of the ELWD-S condenser is dedicated to bright-field microscopy. This aperture diaphragm is independent of the phase contrast ring diaphragm. Adjustment of the aperture diaphragm will not affect the ring diaphragm.

4.7 Using the Motorized Condenser Turret



* The motorized condenser cable is on the left side

Figure 4.7-1 TI-CT-E Motorized condenser turret (system condenser)

The condenser serves two purposes: first, it collects light for diascopic illumination, and second, it optically modulates the collected light to permit various types of microscopy.

With conventional microscopes, it was necessary to replace the condenser according to the type of microscopy. For example, a phase contrast (Ph) condenser is required for Ph microscopy and a DIC condenser is required for DIC microscopy.

The system condenser stores optical elements in condenser cassettes. Up to five of these can be inserted into the condenser turret, making it possible to easily switch microscopy methods simply by rotating the turret.

Modules can be arranged as desired in the turret if they are applicable to the currently used condenser lens (six types of condenser lenses are available). It is also possible to switch condenser cassettes even with the condenser attached to the microscope, making it possible to conduct any number of types of microscopy in a short amount of time.

Performing Ph microscopy

When performing Ph microscopy, be sure to move the condenser cassette with the same Ph code as that of the objective and external phase-contrast ring into the optical path and center the annular diaphragm before starting. When doing this, be sure to open the aperture diaphragm all the way. If the diaphragm is closed, the optical path will be blocked.

4.7.1 Changing Condenser Cassettes

Operation method: ergo controller or PC

Operation with the ergo controller

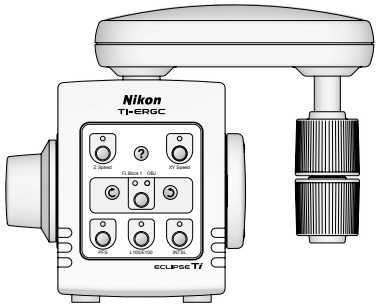


Figure 4.7-2 Ergo controller

The ergo controller settings does not include condenser cassette changing function for the motorized condenser by default.

For the setting methods to operate the motorized condenser with the ergo controller, see Section 4.21, “Operating the Ergo Controller.”

4.7.2 Comparison of Condenser Lenses

Three types of condenser lenses can be attached to the TI-CT-E motorized condenser turret.

Table Comparison of condenser lenses

	LWD condenser lens	CLWD condenser lens	ELWD condenser lens
NA	0.52	0.72	0.3
Working distance	30 mm	13 mm	75 mm
Supported microscopy methods	Bright-field, phase contrast, DIC	Bright-field, phase contrast	Bright-field, phase contrast
Supported condenser cassettes	Bright-field: A Phase contrast: PhL, Ph1, Ph2, Ph3 DIC: DIC L, DIC M, DIC H HMC: MC1, MC2, MC3	Bright-field: A Phase contrast: Ph1, Ph2, Ph3, Ph4	Bright-field: A Phase contrast: PhL, Ph1, Ph2
Remarks	Supporting condenser refocus clamp	Requires TI-DF condenser adapter.	

* Condenser lenses of HMC, oil immersion type for dark-field, and dry type for dark-field are available.

4.8 Operating the Eyepiece Tube

4.8.1 Adjusting the Diopter

Diopter adjustment corrects the visibility in the left and right fields of view, making binocular observation easier. The eyepiece tube length will be maintained, allowing for the objective to perform optimally with minimal focus loss upon objective change.

To perform diopter adjustment, follow the instructions below.

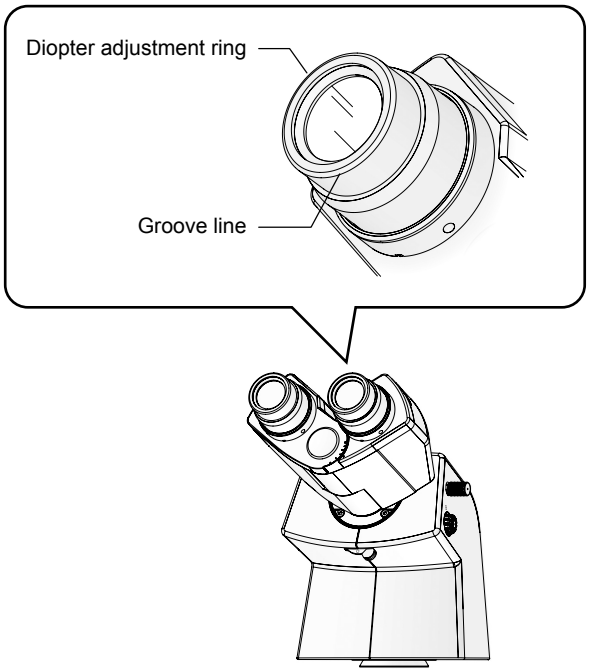


Figure 4.8-1 Diopter adjustment

1. **Adjust the focus of the 10x objective onto the specimen under the bright-field microscopy settings.**
2. **For right and left eyepieces, rotate the diopter adjustment rings on the eyepieces so that their bottom edges are adjusted to the groove lines on the eyepieces.**

   This is the zero position for diopter adjustment.
3. **Place the 40x objective into the optical path.**
4. **Look into the left eyepiece with your left eye and focus on the specimen with the focus knob on the microscope body.**
5. **Place the 10x objective into the optical path.**
6. **Look into the left eyepiece with your left eye and focus on the specimen with the diopter adjustment ring on the left eyepiece.**

   Do not touch the focus knob on the microscope body in this step.
7. **Repeat steps 3 to 6 two times.**
8. **Adjust the right eyepiece.**

   Perform steps 2 to 7 for the right eyepiece interpreting “left” as “right.”

4.8.2 Interpupillary Distance Adjustment

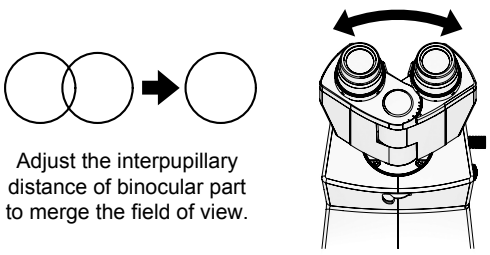


Figure 4.8-2 Interpupillary distance adjustment

Interpupillary distance adjustment adjusts the distance between the eyepieces to better suit the user. This will make binocular observation easier.

When diopter adjustment is complete, place the 10x objective into the optical path, and adjust the focus onto the specimen. Look into the eyepieces with both eyes, and adjust the interpupillary distance of the binocular part so that the two fields of view overlap into one.

The binocular part has an interpupillary distance scale. It is recommended that you remember your own interpupillary distance for easier adjustment in the future.

4.8.3 Eyepiece Tube Shutter Operation

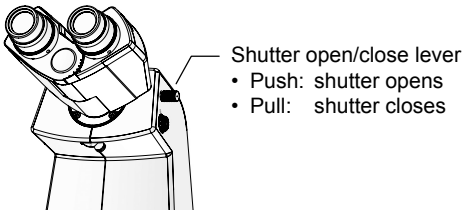


Figure 4.8-3 Shutter open/close lever

A manual shutter is built in the TI-TD B eyepiece tube and the TI-TERG ergonomic eyepiece tube.

To place the shutter into the optical path and close the optical path, pull the shutter open/close lever on the right side. To remove the shutter and open the optical path, push in the lever fully.

* Note that the TI-TS B eyepiece tube does not have a shutter.

4.8.4 Bertrand Lens Operation

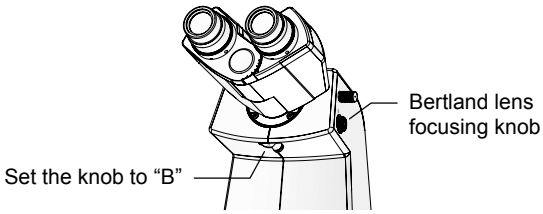


Figure 4.8-4 Bertrand lens operation

A Bertrand lens is built in the TI-TD B eyepiece tube and the TI-TERG ergonomic eyepiece tube.

Move the Bertrand lens into the optical path by rotating the Bertrand lens in/out lever at the lower front of the eyepiece tube to “B”. Rotate the Bertrand lens focusing knob on the right to adjust the focus. This will allow you to view the objective pupil (a bright circle) and the aperture diaphragm image.

Position	Optical element	Remarks
O	Opening	Select this position to observe the image with the binocular part.
B	Bertrand lens	Select this option to observe the objective pupil. Focus on the pupil with the focusing knob. This position is used to adjust the aperture diaphragm or center the diaphragm for phase contrast microscopy. When a manipulator is attached, the tip of the manipulator can be observed with this position.

* The TI-TS B eyepiece tube has no Bertrand lens.

4.9 Using the Analyzer

Operation method: ergo controller or PC

When an analyzer block is attached to the motorized FL turret (first tier), the analyzer block can be placed into the optical path as follows:

Operation with the ergo controller

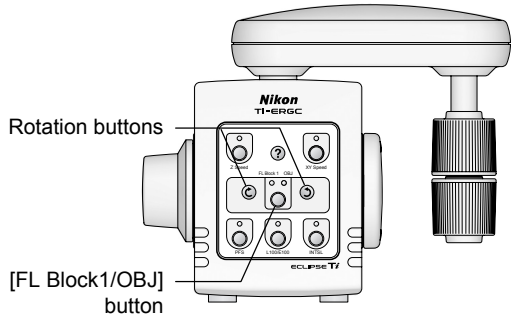


Figure 4.9-1 Analyzer block operation

1. **Press the [FL Block1/OBJ] button to turn on the FL Block 1 indicator.**
2. **Press the clockwise/counterclockwise rotation buttons to rotate the motorized FL turret (first tier), and set the analyzer block in the optical path.**

4.10 Using the Motorized Nosepiece

Operation method: ergo controller or PC

Objectives attached to the motorized nosepiece can be switched. Up to six objectives can be attached to the nosepiece.

Operation with the ergo controller

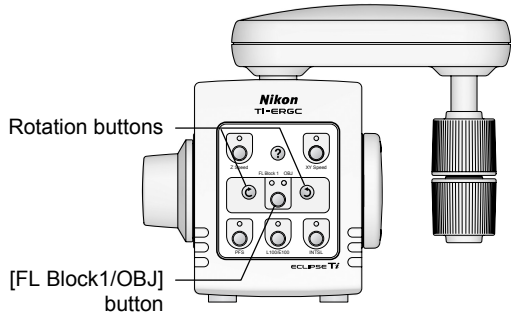


Figure 4.10-1 Switching objectives

1. **Press the [FL Block1/OBJ] button to turn on the OBJ indicator.**
2. **Press the clockwise/counterclockwise rotation button to rotate the motorized nosepiece and insert the desired objective into the optical path.**

4.11 Using Objectives

4.11.1 Phase Contrast Objectives

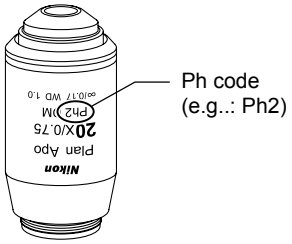


Figure 4.11-1 Phase contrast objective (example)

Phase contrast objectives are labeled with a “Ph code” (PhL, Ph1, Ph2, or Ph3). When performing phase contrast microscopy, use an annular diaphragm or condenser cassette that has the same Ph code as the objective, regardless of the magnification of the objective.

4.11.2 Cover Glass Thickness

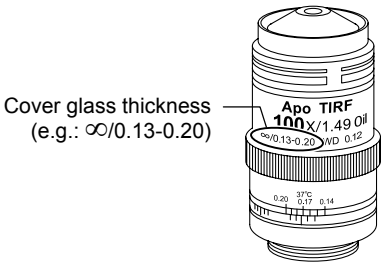


Figure 4.11-2 Cover glass thickness (example)

Objectives are labeled with the supported cover glass thickness. For example, “∞/0.17” indicates a cover glass thickness of 0.17 mm.

When observing at high magnification through glass that is thicker than the supported glass thickness (i.e. when observing a specimen in a Petri dish), it is recommended that you use an objective with a correction ring so that the optical system can be adjusted accordingly. (See 4.11.3.)

Glass thickness: 0.17 mm

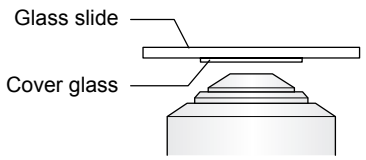


Figure 4.11-3 Glass thickness of 0.17 mm

When using an objective labeled “0.17”, face the cover glass downward, and set the specimen so that the cover glass faces the objective. (The cover glass has a thickness of 0.17 mm.)

Glass thickness: 1.2 mm

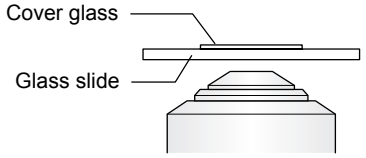


Figure 4.11-4 Glass thickness of 1.2 mm

When using an objective labeled “1.2”, face the cover glass upward, and set the specimen so that the glass slide faces the objective. (The glass slide has a thickness of 1.2 mm.)

4.11.3 Objectives with Correction Ring

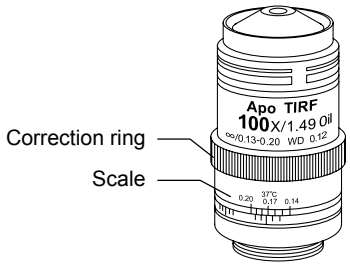


Figure 4.11-5 Objective with correction ring (example)

Inverted microscopes are sometimes used to observe specimens though the bottom plate (glass or plastic) of a Petri dish or a culture vessel. In such a case, the microscope may not perform optimally with standard objectives (for glass covers with a thickness of 0.17 mm), as the thickness of the bottom plate varies from container to container.

By using an objective with a correction ring, you will be able to compensate for the thickness of the bottom plate.

Note, however, that correction is not possible where there is a change in the thickness of the bottom plate (i.e. around the periphery of the container). Use the correction function where the thickness of the bottom plate is uniform.

Adjusting the correction ring

1. **Adjust the objective correction ring to match the reading on the scale to the thickness of the container's bottom plate.**

   For the thickness of the bottom plate, take an actual measurement or refer to the specifications provided by the manufacturer.

   An acrylic concentric ring is useful, as it will allow you to view the operating parts from above the stage as you work.

2. **Focus on the specimen by rotating the focus knobs.**

3. **If the resolution and contrast of the image are poor, slightly rotate the correction ring on the objective in either direction.**

   This will shift the focus slightly. Readjust the focus by turning the fine focus knob.

4. **If resolution and contrast are improved, rotate the correction ring slightly in the same direction, and readjust the focus.**

   If resolution and contrast are lost, rotate the correction ring in the opposite direction by approximately twice the amount rotated in the previous step. Readjust the focus.

   Repeat the process to obtain the optimal image.

- It is recommended to note the optimal correction ring setting for use as reference in using containers of different thicknesses.
- The 0-mm position of the correction ring corresponds to the position for observing a no-cover-glass specimen on an upright microscope.

4.11.4 Oil immersion Objectives

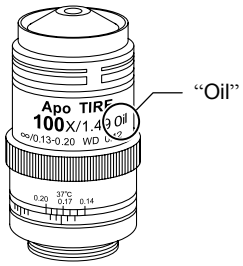


Figure 4.11-6 Oil immersion objective (example)

Objectives labeled "Oil" are oil immersion objectives.

When using an oil immersion objective, fill the space between the objective tip and the specimen with oil (Nikon immersion oil). When performing epi-fl microscopy with an epi-fl oil immersion objective, use non-fluorescent oil.

Oil immersion method

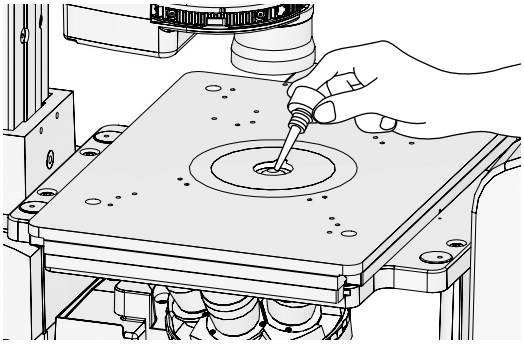


Figure 4.11-7 Oil immersion

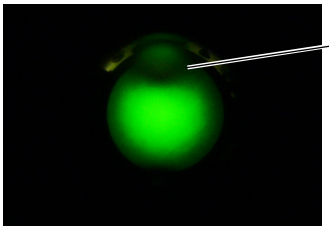
1. **Lower the objective by rotating the focus knobs.**
2. **Taking care not to let bubbles form, apply the bare minimum amount of oil onto the tip of the objective.**

   If too much oil is applied, the excess oil may overflow onto the stage and other parts. Use as little oil as possible (just enough to fill the space between the objective tip and the specimen), and take care not to allow the oil to get on other parts.
3. **Place a specimen onto the stage.**
4. **Slowly raise the objective by rotating the focus knobs, allowing the oil to fill the space between the objective tip and the specimen.**
5. **Check that no air bubbles have formed in the oil.**

   Bubbles in the oil will adversely affect the viewing of the image. Refer to the following section and check for bubbles.

Checking for air bubbles

(1) Objective pupil view when the Bertrand lens is placed:



(2) Objective pupil view when the Bertrand lens is focused:

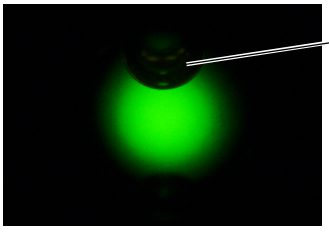


Figure 4.11-8 Air bubble check with the Bertrand lens

To check for air bubbles, observe the objective pupil plane. The objective pupil plane can be observed by moving the Bertrand lens in/out lever to the "B" position and adjusting the focus with the Bertrand lens focusing knob, or by replacing an objective with a centering telescope and adjusting the focus with its eyepiece.

If you detect bubbles in the oil, attempt to remove them by rotating the nosepiece slightly to move the oil-immersed objective back and forth in the oil one or two times. If the bubbles cannot be removed, wipe off the oil, and reapply new oil.

Wiping off the oil

After using an oil immersion objective, wipe the oil off from its tip.

To remove the oil, gently wipe two or three times with a lens tissue or gauze dampened with petroleum benzine. It is recommended that you avoid using the same area of the tissue or gauze repeatedly. After wiping with petroleum benzine, wipe with absolute alcohol (ethyl or methyl) for a better finish.

If petroleum benzine is unavailable, use methyl alcohol. However, as methyl alcohol does not clean as well as petroleum benzine, it will be necessary to wipe a few more times. (Three to four wipes are usually sufficient.)

When wiping oil off of the specimen, take care not to damage the specimen.

Caution

- **Residual oil on an oil-immersion objective or oil adhered to the tip of a dry-type objective will degrade the image quality significantly. After use, thoroughly wipe off all oil, and make sure that no oil adheres to the tips of other objectives.**
- **Absolute alcohol and petroleum benzine are highly flammable. Therefore, take enough care when handling them. Do not use near an open flame, or operate a power switch in the vicinity.**

Reapplying oil

When performing oil immersion repeatedly, use the Escape/Refocus switch for easier focus adjustment.

An acrylic concentric ring of 25 mm diameter is useful as it will allow you to apply oil without needing to remove the specimen (i.e. Petri dish). Set the concentric ring so that its notch matches the rotational direction of the nosepiece, hold the nosepiece so that the objective is aligned with the notch, and apply the oil.

4.11.5 Water Immersion Objectives

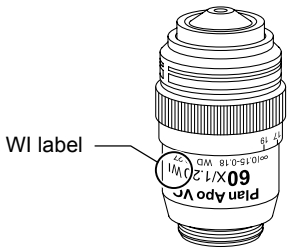


Figure 4.11-9 Water immersion objective (example)

Objectives with the “WI” label are water immersion objectives. (Those with long working distances are for upright microscopes.)

When using a water immersion objective, fill the space between the objective tip and the specimen with deionized or distilled water.

Caution

- **Do not use tap water. If tap water is used, impurities may adhere to and solidify on the lens, causing the lens to become scratched when being cleaned.**
- **Plan Apo 60xWI (NA=1.2) is equipped with a correction ring to achieve optimal aberration on cover glasses of different thicknesses. A reading of “17” on the scale indicates 0.17 mm. When using a cover glass, measure the thickness of the cover glass with a micrometer, and adjust the correction ring for the thickness for a more accurate correction.**

4.12 Using the Focusing Module

4.12.1 Coarse Focus Knob and Fine Focus Knob

Caution

Never attempt the following, as they may result in product malfunction.

- **Rotating the left and right focus knobs in opposite directions**
- **Continuing to rotate the coarse or fine focus knob even after the knob reaches the limit**

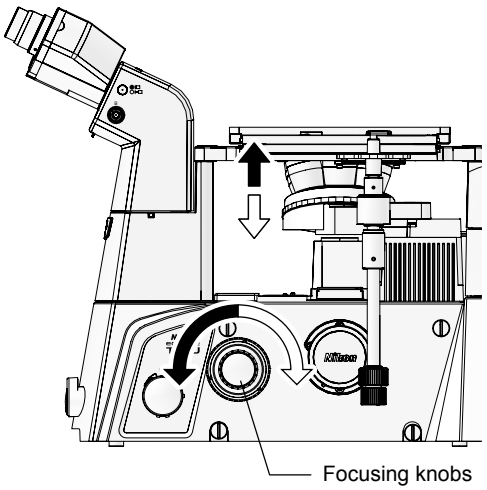


Figure 4.12-1 Focus knobs and nosepiece movement

The focus is adjusted by rotating the focus knobs on the sides of the microscope to move the elevating section of the objective (nosepiece) up and down.

The figure on the left illustrates the relationship between the rotational direction of the focus knobs and the vertical motion of the objective.

* The stroke for focus adjustment is 11 mm.

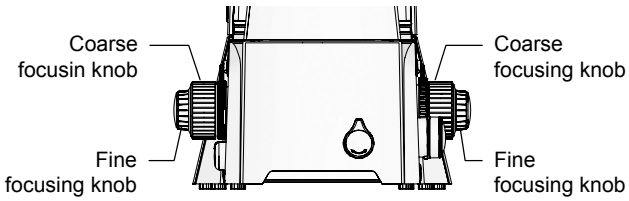


Figure 4.12-2 Focusing knobs

Coarse focusing knob and fine focusing knob

There are two focus knobs: the “coarse focusing knob” for large movements and the “fine focusing knob” for small movements. The traveling distance of the objective for each knob is as follows:

Rotation of knob	Objective travel distance
Fine focusing knob, 1 marking	1 μm
Fine focusing knob, 1 rotation	0.1 mm
Coarse focusing knob, 1 rotation	5 mm

4.12.2 Torque Adjustment for Coarse Focus Knob

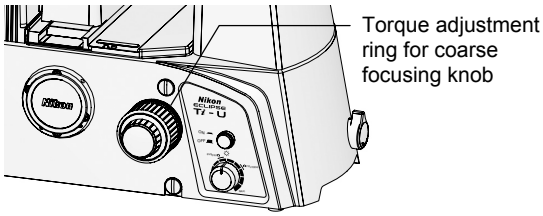


Figure 4.12-3
Torque adjustment ring for coarse focus knob

The focusing knob on the left side of the microscope is equipped with a “torque adjustment ring” for adjusting the tightness of the coarse focusing knob.

To tighten the coarse focusing knob, rotate the “torque adjustment ring” counterclockwise. To loosen the knob, rotate the ring clockwise.

Caution

Excessive loosening of the coarse focus ring will result in the nosepiece lowering under its own weight, resulting in a loss of focus during the observation. Adjust the torque appropriately.

4.12.3 REFOCUS Ring (Only for Ti-U and Ti-U/B)

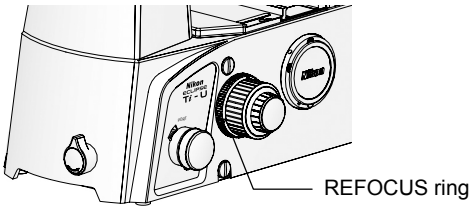


Figure 4.12-4 REFOCUS ring

The focus knob on the right side of the microscope is equipped with a “REFOCUS ring” for fixing the coarse knob at a position where the focus is on the specimen.

By tightening this ring, you can prevent the nosepiece from being elevated past the set point, even when the coarse focus knob is rotated. (You will still be able to move the nosepiece up and down with the fine focus knob.)

By using this function, you can easily bring the objective back into focus by simply rotating the coarse focus knob to the limit, for example, after moving the objective out of the way for specimen replacement.

It is also useful when the objective and the specimen are in extremely close proximity (i.e. due to a thick bottom plate), that the magnification cannot be changed without lowering the objective first.

If you are not using the REFOCUS ring, be sure to release the clamp by rotating the ring counterclockwise to the limit.

Example: Switching objectives

1. **With the focus on the specimen, rotate the REFOCUS ring clockwise to the limit.**
2. **Lower the nosepiece by rotating the coarse focus knob. Rotate the nosepiece to switch objectives.**
3. **Elevate the nosepiece by slowly rotating the coarse focus knob to the limit.**

   When the limit is reached, the focus should be approximately on the specimen.
4. **Focus on the specimen by rotating the fine focus knob.**

4.13 Using the Dia Pillar Illuminator 100W

This section describes operations specific to the TI-DH dia pillar illuminator 100W.

4.13.1 Condenser Refocusing Clamp

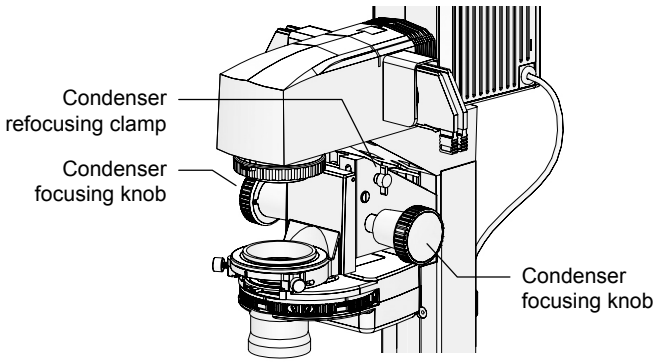


Figure 4.13-1 Dia pillar illuminator 100W

Form the field diaphragm image on the specimen surface by rotating the condenser focusing knob. Rotate the condenser refocusing clamp clockwise to the limit to mark this position.

When the condenser is elevated to change the specimen, it can easily be brought back down to the initial position (at which the field diaphragm image is formed) by rotating the condenser focusing knob to the limit. This function is useful for use with high magnification condensers or when the pillar cannot be inclined. The condenser refocusing clamp a travel distance of 13 mm.

4.13.2 Rotating the Condenser Mount

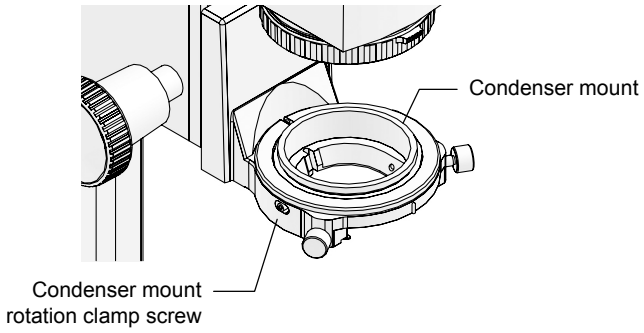


Figure 4.13-2 Condenser mount

The condenser mount can be rotated if the condenser mount rotation clamp screw is loosened.

Use this function to adjust the orientation of the turret when using the DIC attachment.

When using the system condenser without a polarizer on the condenser holder (i.e. for bright-field or phase contrast microscopy), use this function to rotate and fix the turret. This will allow you to secure a space for manipulator attachment.

4.13.3 Tilting the Pillar

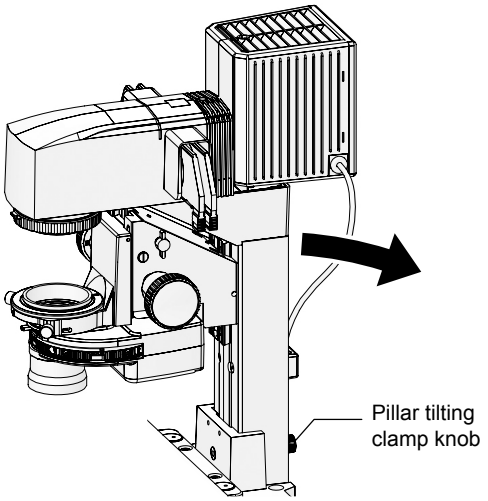


Figure 4.13-3 Titling the pillar

When replacing large specimens, the pillar can be inclined to secure a working space.

To incline the pillar, loosen and release the clamp screw on its back side. Hold the front side of the dia pillar illuminator, and slowly let the pillar incline backward.

Under normal use, the clamp screw on the pillar can be left released. However, be sure to tighten the clamp screw when attaching relatively heavy objects to the pillar, so as to prevent it from falling.

Caution

- **When moving the pillar into and out of an incline, take caution not to get your hands and fingers caught in the hinge.**
- **When attaching relatively heavy objects to the pillar, be sure to secure them properly. A loose screw may result in the attachment falling off when the pillar is inclined. In particular, be sure to properly secure the high-intensity lamphouse and lamphouse adapter.**

4.13.4 Screw Holes for Securing Attachments

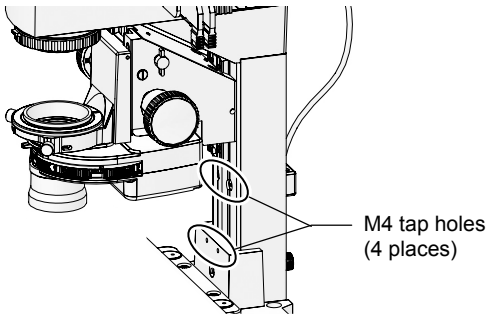


Figure 4.13-4 Screw holes for securing attachments

Four M4 tap holes are provided on the front of the pillar for attaching devices such as manipulators.

Use the upper two holes to attach devices that should be moved out of the way when the pillar is inclined. Use the lower two holes to attach devices that should remain positioned over the stage when the pillar is inclined.

4.14 Using Motorized Stages

Operation method: ergo controller, joystick controller, or PC

4.14.1 Using the Specimen Holder

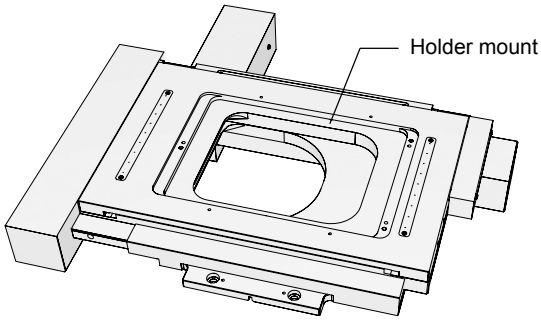


Figure 4.14-1 Motorized stage

On the holder mount of the motorized stage, various specimen holder can be attached.

There are tap holes on the top and bottom of the stage, which can be used to secure manipulators and the like.

> The stage is typically attached with the knob positioned in the far right. It is also possible to rotate the stage 180 degrees and attach it with the knob in the near left.

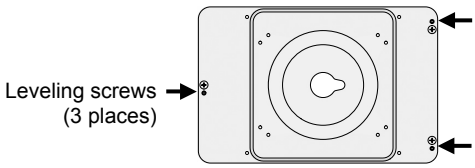
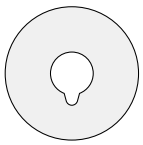


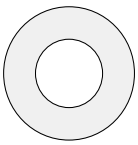
Figure 4.14-2 Stage ring holder

Stage ring holder

Holder for mounting a stage ring. Two rings whose inner diameters are 25 mm and 40 mm are available.



Inner diameter: 25 mm
(with a notch for oiling)



Inner diameter: 40 mm

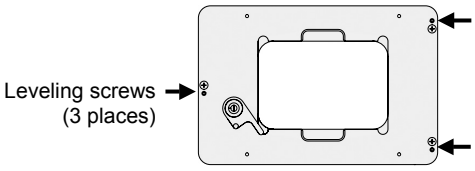


Figure 4.14-3 Well plate holder

Well plate holder

Holder for mounting a well plate used for cell culture. The well plate can be fixed easily using the lever in the front.

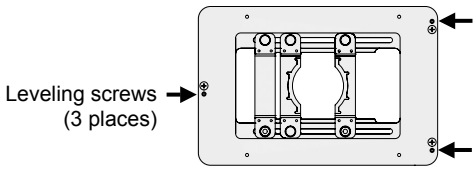


Figure 4.14-4 Universal holder

Universal holder

Holder for mounting a Petri dish or flask. Various types of Petri dishes and flasks can be mounted.

> There are leveling screws at three locations shown by the arrows on the specimen holders mentioned above. The level of the specimen holder upper surface can be adjusted using a hexagonal screwdriver (2 mm) provided with the microscope main body.

4.14.2 Moving the Motorized Stage

A motorized stage can be controlled with the stage knobs on the ergo controller (X-axis and Y-axis knobs) or the joystick controller.

Caution

- **It is not possible to use both the joystick controller and ergo controller at the same time.**
- **Moving the stage significantly out of the observation range can cause the objective lens to strike the bottom of the stage when the nosepiece is rotated. In this case, fully lower the nosepiece, and then change the objective.**

Operation via the ergo controller

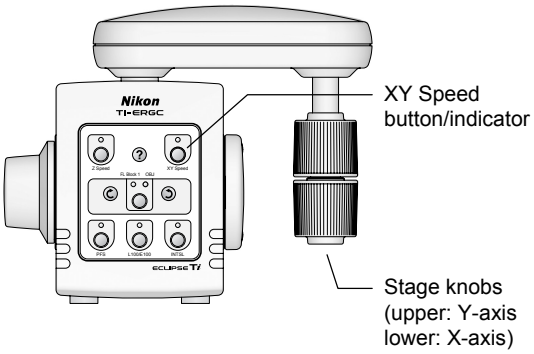


Figure 4.14-5 Ergo controller stage knobs

1. **Press the [XY Speed] button on the control panel (default setting) to switch the stage movement amount between the following three modes: Coarse, Fine, and Extra Fine.**

XY Speed indicator	Stage movement amount
Off	Coarse
On	Fine
Blinking	ExFine (extra fine)

2. **Move the stage by turning the stage knob.**

   To move the stage in the Y direction, use the upper knob. To move the stage in the X direction, use the lower knob.

Operation via the joystick controller

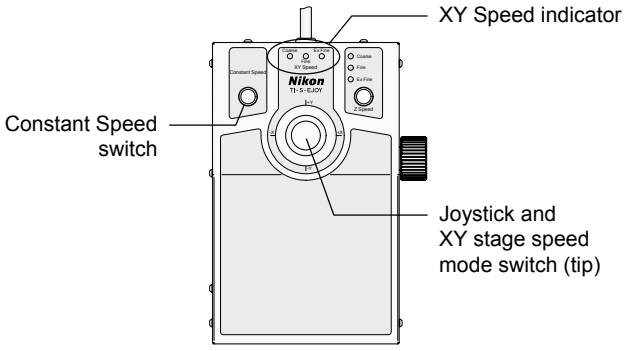


Figure 4.14-6 Joystick controller

1. **Turn the XY stage speed mode switch on the end of the joystick to switch between three stage movement modes: Coarse, Fine, and Extra fine.**The XY Speed indicator shows the stage movement amount.

XY Speed indicator	Stage movement amount
Coarse	Coarse
Fine	Fine
ExFine	ExFine (extra fine)

2. **Operate the joystick to move the stage**

   The speed of movement of the stage varies depending on the angle at which the joystick is inclined. The greater the angle, the faster the XY stage moves, within the range of the operation mode (coarse/fine/extra fine).

Constant speed mode

Using the Constant Speed switch you can switch to constant speed mode. While the motorized stage normally moves at a rate determined by the angle of the joystick, if you use the constant speed mode, the stage will move at the constant speed stored in memory, regardless of the angle of inclination of the joystick.

For details, see Section 4.22, “Operating the Joystick Controller.”

4.15 Using the DIC Attachment

Read Chapter 2, “Microscopy,” and Chapter 3, “Principle of DIC Microscopy,” in the Differential Interference Contrast Attachment instruction manual for instructions on the DIC attachment.

See Section 3.4, “Differential Interference Contrast (DIC) Microscopy,” of Chapter 3, “Microscopy” in this Part for instructions on the ergo controller operation to switch objectives, switch condenser modules, and place/remove the analyzer to/from the optical path while performing DIC microscopy.

4.16 Using the Epi-fl Attachment

See Chapter 3, “Operation of Each Part (Ti-FL),” or Chapter 6, “Operation of Each Part (Ti-SFL),” of the “TI-FL Epi-Fl Illuminator/TI-SFL High Performance Epi-fl Illuminator Instructions” for instructions on using the epi-fl illuminator.

See Section 3.5, “Episcopic Fluorescence (Epi-fl) Microscopy,” in Chapter 3, “Microscopy,” in this Part for instructions on using the ergo controller to open and close the motorized shutter and switch filter blocks while performing epi-fl microscopy.

4.17 Using the Motorized Excitation Filter Wheel

Operation method: ergo controller or PC

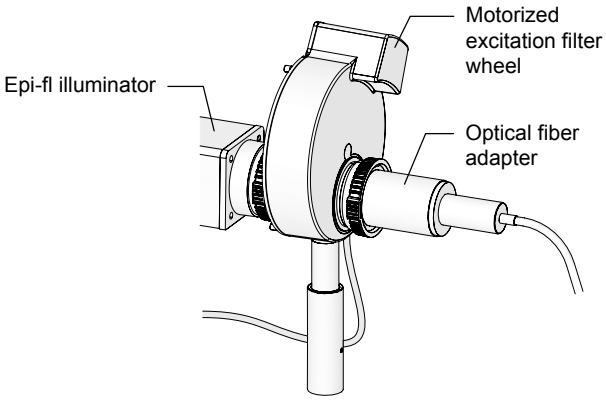


Figure 4.17-1 Motorized excitation filter wheel

You can switch between excitation filters (used for epi-fl microscopy) by means of an electric motor. You can attach as many as eight excitation filters, 25 mm in diameter and up to 6 mm each in thickness.

Operation via the ergo controller

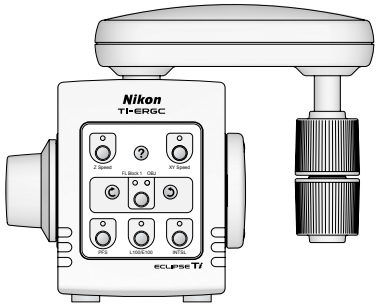


Figure 4.17-2 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized excitation filter wheel with the ergo controller, see Section 4.21, “Operating the Ergo Controller.”

4.18 Using the Motorized Barrier Filter Wheel

Operation method: ergo controller or PC

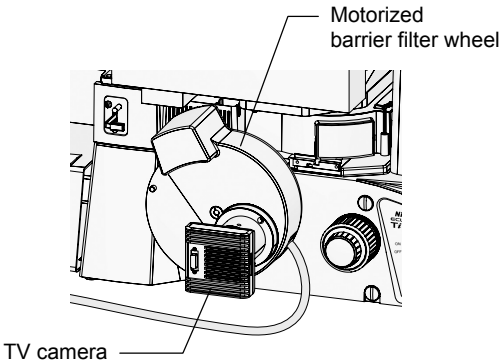


Figure 4.18-1 Motorized barrier filter wheel

You can switch between absorption filters (used for epi-fl microscopy) by means of an electric motor. You can attach as many as eight barrier filters, 25 mm in diameter and up to 6 mm each in thickness.

Operation via the ergo controller

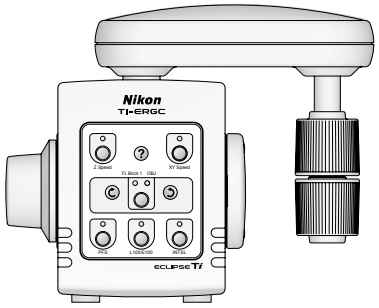


Figure 4.18-2 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized barrier filter wheel with the ergo controller, see Section 4.21, “Operating the Ergo Controller.”

4.19 Using the Motorized FL Turret and Motorized FL Turret HQ

Operation method: ergo controller or PC

When the motorized FL turret or the Motorized FL turret HQ is attached, filter blocks for epi-fl microscopy can be switched by means of an electric motor. Besides, two motorized FL turrets can be stacked, and up to six filter blocks can be attached to each one (for a total of 12).

* It is possible to operate two different types of FL turret (motorized FL turret and motorized FL turret HQ) simultaneously.

Operation via the ergo controller

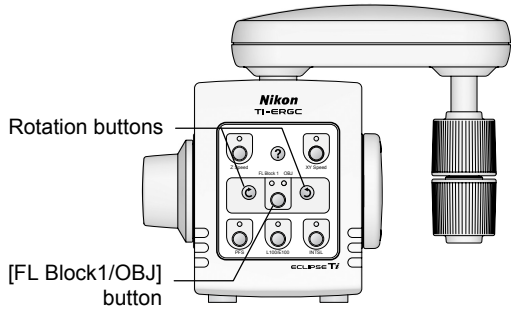


Figure 4.19-1 Operating the motorized FL turret

1. **Press the [FL Block1/OBJ] button and light up the FL Block 1 indicator.**
2. **Press the Rotate turret keys to rotate the motorized FL turret (first tier), and set the filter block into the optical path.**

- If you have attached two motorized FL turrets, the Ergo controller is not configured to operate the upper tier (second) by default.
- For information on configuring the system to operate two motorized FL turret with the ergo controller, see Section 4.21, “Operating the Ergo Controller.”

4.20 Using the Motorized Shutter

Operation method: ergo controller or PC

The hub controller B can be connected to three types of motorized shutters. (Up to two motorized shutters can be used simultaneously.)

- Motorized shutter for episcopic illumination
- Motorized shutter for diascopic illumination
- Motorized shutter for auxiliary equipment

To use a motorized shutter, an external trigger signal must be connected to the Hub controller B to control the shutter. See Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly,” for details.

Operation via the ergo controller

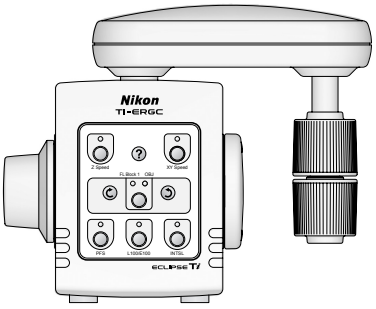


Figure 4.20-1 Ergo controller

Operations via the ergo controller are not enabled by default. For information on configuring the system to operate the motorized shutter for episcopic illumination via the ergo controller, see Section 4.21, “Operating the Ergo Controller.”

4.21 Operating the Ergo Controller

The ergo controller is used with the hub controller B connected to the microscope.
The following operations are possible using the ergo controller.

- Operate a motorized stage as if it were a manual stage.
- Operate motorized units on the microscope remotely.

You can also freely assign buttons on the ergo controller to such frequently performed operations as opening and closing motorized shutters and switching objectives.

4.21.1 Appearance of the Ergo Controller

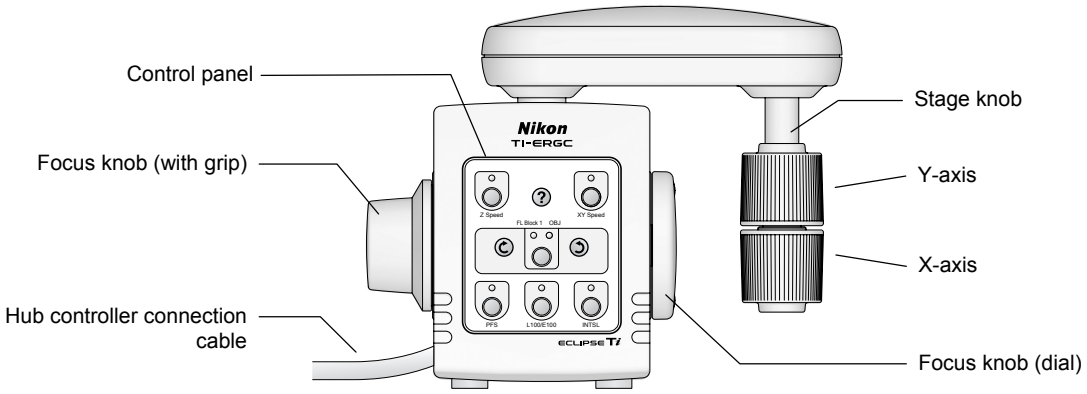


Figure 4.21-1 Appearance of the ergo controller

4.21.2 Connecting to the Hub Controller

In order to use the ergo controller, you must connect the hub connection cable of the ergo controller to the hub controller B. See Section 6.19, “Ergo Controller,” in Chapter 6, “Assembly,” for details about performing this connection.

Since the Hub connection cable is two meters long, the ergo controller can be used to operate the microscope remotely.

4.21.3 Using the Knobs

Stage knob

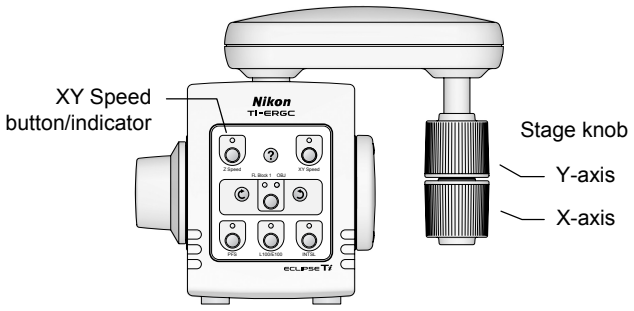


Figure 4.21-2 Stage knob operation

Stage knob operation

The stage knob enables you to operate a motorized stage as if it were a manual stage. Press the XY Speed button on the ergo controller's control panel to switch the stage knob between three operating modes: coarse, fine, and extra fine. The initial setting is coarse mode. The current operating mode of the stage knob is displayed with the XY Speed button indicator as follows:

XY Speed indicator	Stage knob operating mode
Off	Coarse
On	Fine
Blinking	ExFine (extra fine)

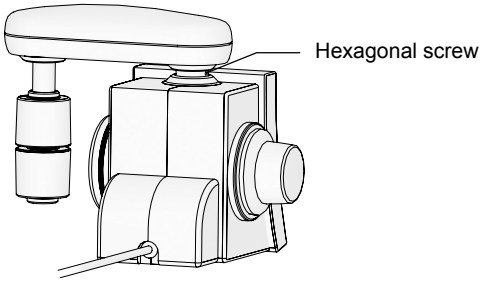


Figure 4.21-3 Stage knob screw

Stage knob orientation

You can freely change the relative position of the stage knob by loosening the hexagonal screw at the base of the rear bridge. After you have changed to an easy-to-operate position, tighten the hexagonal screw again.

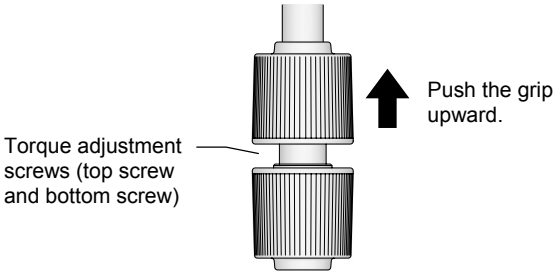


Figure 4.21-4
Torque adjustment for the stage knobs

Torque adjustment

You can fine-tune the torque on the grips of the stage knob. Push up the top grip to reveal the torque adjustment screw. Loosen or tighten the top and bottom screws to adjust the torque on the respective grips.

Focusing knob

The focus knob of the ergo controller cannot be used with the system configuration of the Ti-U, Ti-U/B, Ti-S, or Ti-S/L100 and the hub controller B.

4.21.4 Using the Control Panel

The front of the ergo controller has a 9-button control panel. You can use these buttons to control the microscope and its peripheral units remotely.

The button layout is shown below.

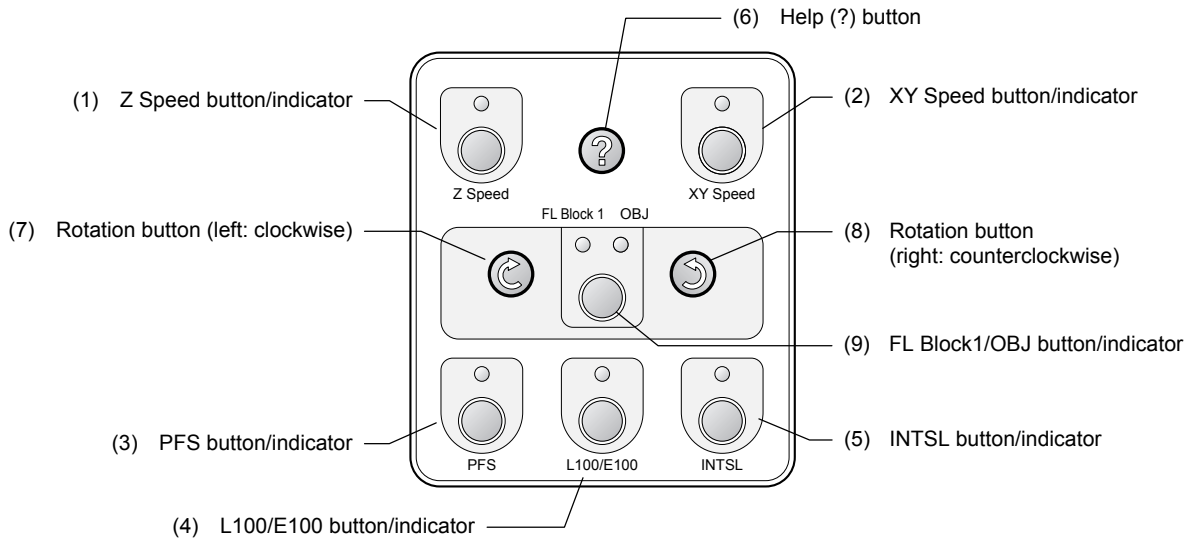


Figure 4.21-5 Control panel

Table 4.20-6 Button functions and default settings

No.	Button	Function
(1)	**Z Speed** *	Switches the focusing knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; blinking: extra fine)
(2)	**XY Speed**	Switches the stage knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; blinking: extra fine)
(3)	**PFS** *	Turns the PFS on and off (indicator lit: PFS on; off: PFS off)
(4)	**L100/E100** *	Switches optical path: Left port 100%/microscopy port 100% (Indicator lit: E100; blinking: L100; off: other port)
(5)	**INTSL** *	Opens and closes the shutter for motorized HG precentered fiber illuminator (Indicator lit: closed; off: open)
(6)	**? （Help）**	Displays the current function assignment of buttons to the PC monitor.
(7)	**（Rotation）**	Rotates clockwise. (Select what to rotate using button 9.)
(8)	**（Rotation）**	Rotates counterclockwise. (Select what to rotate using button 9.)
(9)	**FL Block1 / OBJ**	Selects what to rotate using buttons 7 and 8 (indicator lit: operation target) • FL Block1 Motorized FL turret (first tier) • OBJ Motorized nosepiece

- The motorized stage, motorized nosepiece, motorized FL turret cannot be operated with the ergo controller in the default settings.
- Four buttons, (1) Z Speed, (3) PFS, (4) L100/E100, and (5) INTSL, are available on the Ti-E and Ti-E/B. But these buttons are not available on the Ti-U, Ti-U/B, Ti-S, and Ti-S/L100.

4.21.5 Assigning Functions

Six of the nine buttons ((1) to (5) and (9)) can be freely assigned to the function of your choosing.

Functions assignable for buttons (1) to (5)

The following functions can be assigned for button (1) to (5).

Table 4.21-2 Functions assignable for button (1) to (5)

Button label	Function
XY Speed	Switches the stage knob operating mode between coarse, fine, and extra fine. (Indicator off: coarse; lit: fine; blinking: extra fine)
(OBJ)	Rotates motorized nosepiece clockwise. (Select what to rotate using button (9).)
(OBJ)	Rotates motorized nosepiece counterclockwise. (Select what to rotate using button (9).)
TIRF/EPI	Switches the optical path to TIRF/Epi (indicator on: Epi; off: TIRF)
TIRF Angle	Switches TIRF illumination angle operation. (Indicator lit: illumination angle can be adjusted via stage knob; off: cannot be adjusted)
EPI	Opens and closes the epi-illumination shutter (indicator lit: open; off: open) *
DIA	Opens and closes the dia-illumination shutter (indicator lit: open; off: open) *
AUX	Opens and closes the auxiliary shutter (indicator lit: open; off: open) *

* To use a motorized shutter, an external trigger signal must be connected to the hub controller B to control the shutter. See Section 6.23, “Connecting External Devices,” in Chapter 6, “Assembly,” for details.

Functions assignable to button (9)

You can assign button (9) to two motorized units to be controlled with buttons (7) and (8).

Each time you press button (9), the indicator above the key toggles between off and on. Buttons 7 and 8 rotate the motorized unit displayed above the lit indicator.

Table 4.21-3 Functions assignable for button (9)
(Two functions can be set.)

Button label	Function
FL Block1	Rotate motorized FL turret (first tier)
FL Block2	Rotate motorized FL turret (second tier)
OBJ	Rotate motorized nosepiece
EX	Rotate motorized excitation filter wheel
BA	Rotate motorized absorption filter wheel
CON	Rotate motorized condenser

Assigning functions

Operation method: ergo controller or PC

Use the setup application software “Ti Control” on a PC to change the functions of the buttons on the ergo controller.

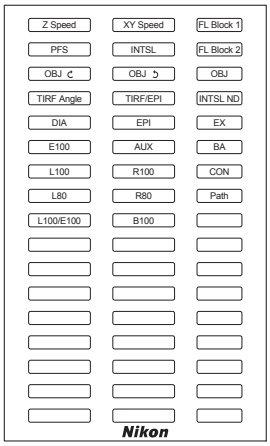


Figure 4.21-6 Function label sticker

For details on assigning functions for button (1) to (5) and (9) on the ergo controller, see the instruction manual for Ti Control.

Affix an appropriate sticker for a reassigned button from the provided function sticker sheet.

4.22 Operating the Joystick Controller

The joystick controller is used with the hub controller B connected to the microscope.

4.22.1 Appearance of the Joystick Controller and Functions of Each Part

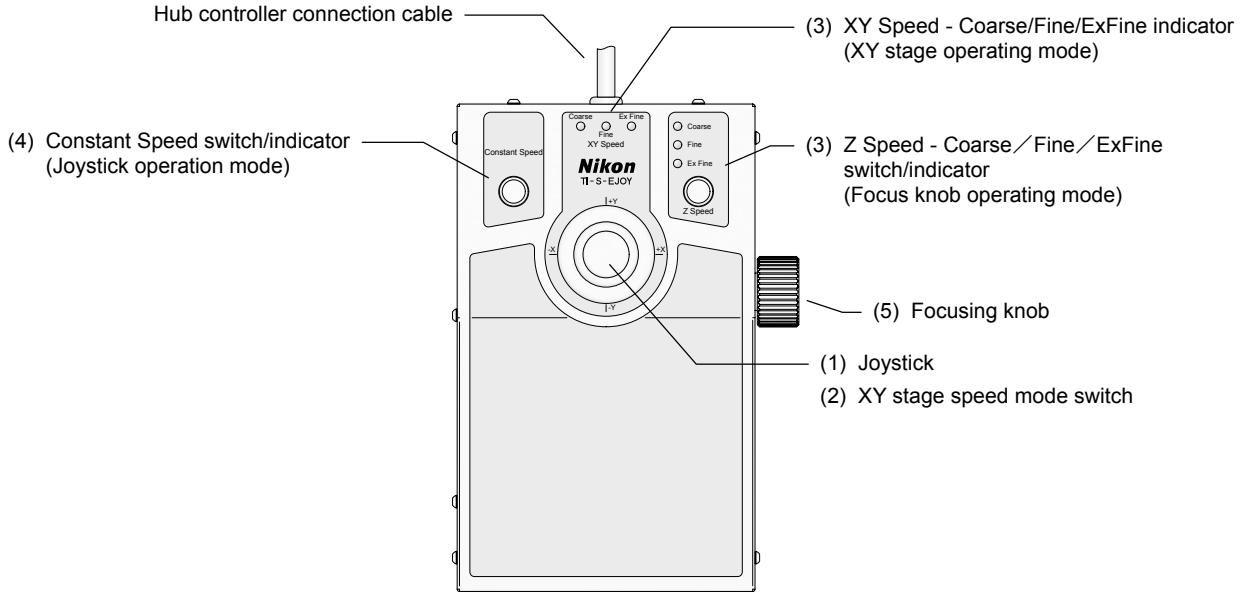


Figure 4.22-1 Appearance of the joystick controller

(1) Joystick

This moves the motorized stage on the XY plane. Tilt the joystick to the right or left to move the stage on the X axis, and tilt it forward or back to move it on the Y axis. Tilt it diagonally to move the stage on both the X and Y axes at once, in accordance with the direction you tilted it.

The speed of movement of the stage varies depending on the angle at which the joystick is inclined. The greater the angle, the faster the XY stage moves, within the range of the operation mode (coarse/fine/extra fine).

(2) XY stage operation mode switch

This rotary switch is on the tip of the joystick. Use it to change the operation mode of the XY stage when controlled via the joystick.

Turn this switch to the right to change the operation mode in the order of coarse, fine, and extra fine. Turn it to the left to change the operation mode in the reverse order. The speed mode selection is displayed by the XY Speed indicator.

(3) XY Speed ― Coarse / Fine / ExFine indicator (XY stage operation mode)

This displays the current operation mode of the XY stage.

(4) Constant Speed switch/indicator (Toggle/display joystick constant/speed mode)

This button stores the XY stage movement speed, and switches to constant speed mode.

Press this button while moving the XY stage via the joystick to store the current speed of movement as the constant speed.

When constant speed mode is selected, the button's indicator lights. If the joystick is operated while this indicator is lit, the stage will move at the stored constant speed, regardless of the angle of the joystick.

To cancel constant speed mode, press the button again. Constant speed mode is also automatically canceled when the operation mode is changed.

(5) Focusing knob

(6) Z Speed ― Coarse / Fine / ExFine switch/indicator

This is not available on the Ti-U, Ti-U/B, Ti-S, and Ti-S/L100.

4.22.2 Connecting to the Hub Controller

In order to use the joystick controller, you must connect its hub connector cable to hub controller B. See Section 6.20, “Joystick Controller,” in Chapter 6, “Assembly,” for instructions on performing this connection.

Since the hub connector cable is 1.5 meters long, you can control the microscope via the joystick controller from a distance.

5 Online and Remote Operation

You can control motorized units connected to the hub controller B from your computer (IBM PC or compatible) by connecting the PC to the hub controller B.

Caution

You can control motorized units from your computer by connecting the hub controller B to your computer. Take the following precautions when controlling units electrically in order to avoid accidents.

- **Always check the units before manipulating them, and make sure that it is safe to use motorized operation.**
- **Keep your fingers and hands away from movable parts of the motorized unit. Your fingers or hand could become pinched if they are touching these parts when you operate the microscope or its units.**
- **Make sure that the light paths of the entire microscope system are set properly when opening or closing the light-source shutter, or rotating the FL turret. The light source is extremely bright; if the light path is not properly configured, illumination could spill into the ambient, and if bright light enters the eyepiece, it could injure the eye.**
- **Before beginning actual use, be sure to set up your microscope system using the setup application.**

Connecting to a computer

Connect the USB connector in the back of the hub controller B to the computer with a USB cable.

Communication cable

General-purpose USB cable (3 meters or shorter)

USB communication specification

USB 1.1

Communication command

Please contact your nearest Nikon representative.

6 Assembly

Warning

- **Before assembling, connecting, or operating any unit, thoroughly read the Safety Cautions at the beginning of this document, and obey all the warnings and cautions described there.**
- **To avoid electric shock, fire, or malfunction, always turn off the power switch of all units and unplug their power cords from the wall outlets.**

Caution

- **Cover any unused ports with the supplied caps in order to prevent entry by ambient light or dust.**
- **Be careful to avoid pinching your fingers or hands in the equipment during assembly.**
- **Make sure that the light source power is off before attaching or removing optical parts, such as lenses or filters.**
- **Scratches, dirt, or fingerprints on the optical parts (such as the lens and filters) will adversely affect the microscope image. Take care to avoid scratching optical parts, or soiling them with fingerprints or dirt.**
- **Each of the motorized units of the Ti series is a precision optical instrument. Handle them with care, and take care to avoid subjecting them to strong shocks. The precision of the objective lenses is particularly susceptible to even weak shocks.**

This chapter describes the procedure for attaching motorized units to the main microscope body.

Read and follow the instructions in this chapter when installing, assembling, or connecting motorized units.

Required tools

- Two 2-mm hexagonal screwdrivers (supplied with the microscope)
- One 3-mm hexagonal screwdriver (supplied with the microscope)
- One 4-mm hexagonal screwdriver (supplied with the microscope)
- One 2.5-mm hexagonal wrench (supplied with the motorized condenser)
- One Phillips screwdriver (supplied with the motorized stage or the motorized stage with the linear encoder)

Installation location

See “Notes on handling the motorized units for the Ti series” at the beginning of this manual to select an appropriate location.

6.1 Microscope Main Body (Base)

Caution

Precautions for installation

- **The microscope body is heavy. Ensure that at least two people perform installation.**
- **When carrying the base, grasp it firmly by the recess at the bottom front, and the carrying handle at the back.**

Install the microscope main body in an appropriate location.

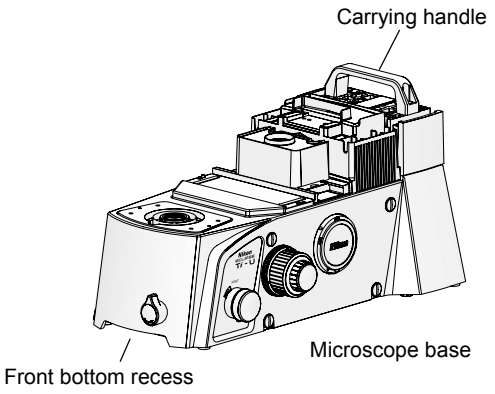


Figure 6.1-1 Installing the microscope base

1. **Select a location to install the base.**

   See “Installation and storage locations” under “Notes on handling the motorized units for the Ti series” at the beginning of this manual to select an appropriate location.

2. **Remove the microscope base from the package and place it on a stable surface.**

3. **Using the supplied hexagonal screwdriver, remove the two 4 mm hexagonal socket head cap screws, and remove the carrying handle.**

4. **When mounting the FL turret, remove the black cover from the nosepiece mount.**

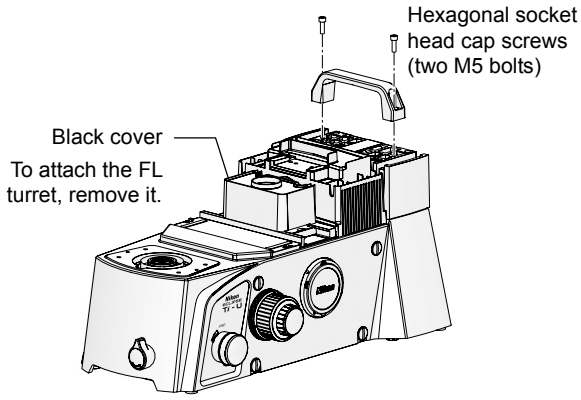


Figure 6.1-2 Removing carrying handle

6.2 Hub Controller B

Attach the hub controller B to the back of the microscope main body.

6.2.1 Connecting to the Microscope Main Body

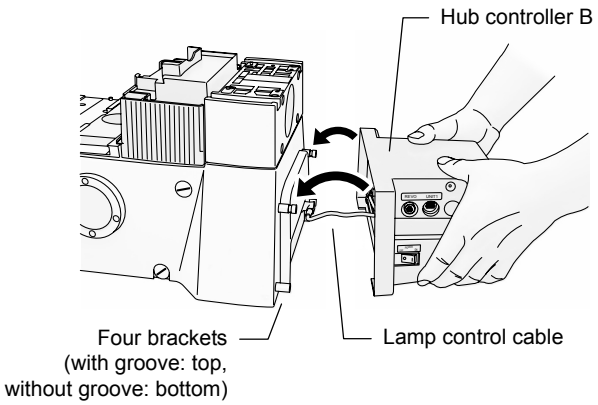


Figure 6.2-1 Connecting the hub controller B

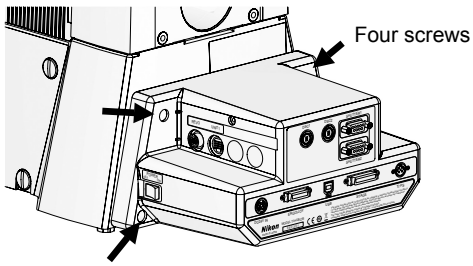


Figure 6.2-2 Connecting the hub controller B

1. **Mount the hub controller B brackets in the four bracket holes on the bank of the microscope main body.**

   Two of the brackets have grooves, and two do not. Mount items with grooves on top, and the ones without on the bottom.

2. **Connect the lamp control cable (with a circular connector) of the hub controller B to the LAMP CTRL connector on the back of the microscope.**

3. **Lift the hub controller B, and mount its two interior hooks into the grooves of the brackets mounted on top in step 1.**

4. **Using the four screws supplied with the hub controller B, lock the hub controller B onto the brackets.**

To connect an illuminator, which uses the INTERLOCK connector to the Ti-U or Ti-U/B, the cable must be connected to the INTERLOCK connector on the back of the microscope before the hub controller B installation.

6.2.2 Connecting Motorized Units

To use the hub controller B, connect the connection cables of each motorized unit to the hub controller B. See the assembly instructions for each motorized unit for instructions on performing this connection.

See Section 6.22, “AC Adapter,” for information on connecting the AC adapter.

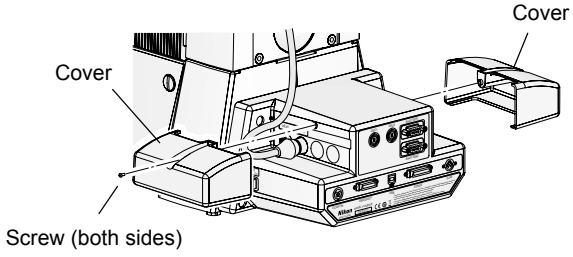


Figure 6.2-3 Connector connection cover

The connector connection covers:

You can place covers over the connection ports on the REVO, and UNIT 1 and 2 connectors on the side of the hub controller B. After the connection of the motorized units is complete, use the covers to protect the connection ports.

6.3 Eyepiece Base

Mount the eyepiece tube base onto the microscope main body.

6.3.1 Installing the TI-T-B and TI-T-BS

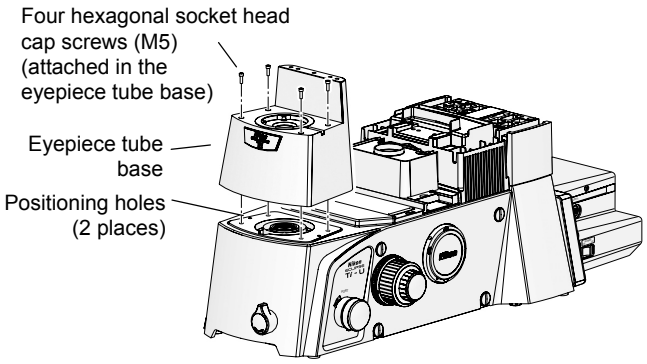


Figure 6.3-1 Attaching the eyepiece base unit (TI-T-B, TI-T-BS)

1. **Place the eyepiece base unit onto the front part of the microscope base, so that the eyepiece tube mount of the eyepiece base unit faces the front.**

   There are two positioning pins on the bottom of the eyepiece base unit. Align these pins with the holes on the microscope base.

2. **Secure the eyepiece base unit by tightening four hex socket head screws with the provided 4 mm hex screwdriver.**

6.3.2 Installing the TI-T-BPH External Phase Contrast Eyepiece Base Unit

To perform external phase contrast microscopy, attach an external phase contrast eyepiece base unit onto the microscope base, and attach a phase plate suitable for the selected condenser lens and objective to the eyepiece base unit.

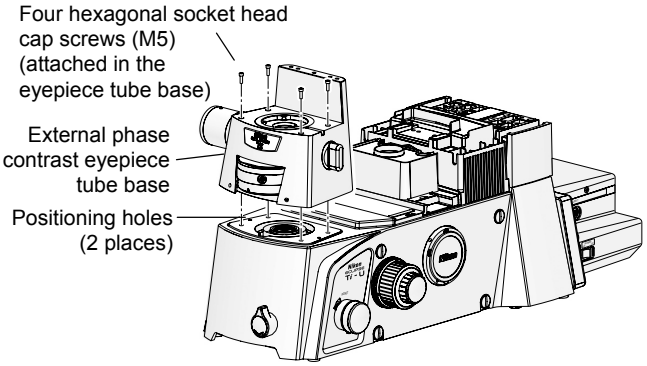


Figure 6.3-2 Attaching the external phase contrast eyepiece base unit

1. **Place the TI-T-BPH external phase contrast eyepiece base unit onto the front part of the microscope base.**

   There are two positioning pins on the bottom of the eyepiece base unit. Align these pins with the holes on the microscope base.

2. **Secure the eyepiece base unit by tightening four hex socket head screws with the provided 4 mm hex screwdriver.**

Selecting an objective lens and phase plate

You must select a phase plate that matches the objective lens being used. Referring to the table below, select an objective lens to use, and the corresponding required phase plate. You can attach up to three phase plates (A to C) to the external phase contrast eyepiece tube base.

Table 6.3-1 Selecting objective lenses and phase plates

	Condenser phase contrast code (corresponding condenser lenses)	Eligible objective lens	Phase plate
1	Ph3 (LWD, CLWD)	P Apo 60x WI (NA1.2)	60x/Ph3
2	Ph3 (LWD, CLWD)	P Apo VC 60x WI (NA1.2)	60x/Ph3
3	Ph3 (LWD, CLWD)	P Apo VC 60x H (NA1.4)	60x/Ph3
4	Ph4 (CLWD)	Apo TIRF 60x H (NA1.49)	60x/Ph4
5	Ph4 (CLWD)	P Apo TIRF 60x H (NA1.45)	60x/Ph4
6	Ph3 (LWD, CLWD)	P Apo VC 100x H (NA1.4)	100x/Ph3
7	Ph4 (CLWD)	Apo TIRF 100x H (NA1.49)	100x/Ph4

Installing and replacing phase plates

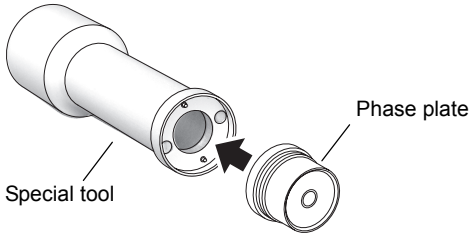


Figure 6.3-3 Special tool and phase plate

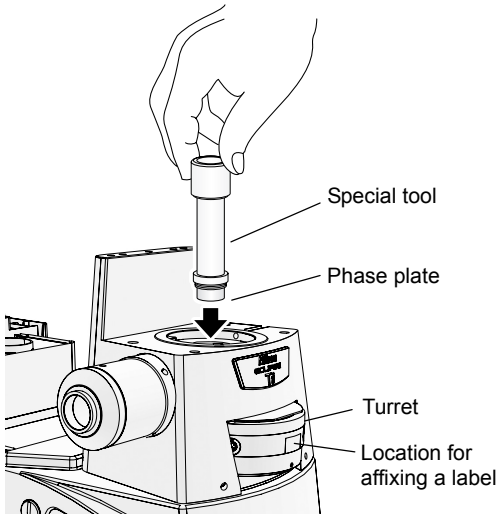


Figure 6.3-4 Installing and replacing phase plates

Installing phase plates

A special tool is included with TI-T-BPH eyepiece base unit. Use this special tool when attaching or replacing the phase plate.

1. **Align the holes on the phase plate to the two pins on the end of the special tool, and attach the phase plate to the tool.**

   The phase plate will be attached magnetically to the special tool.
2. **Select position A, B, or C by rotating the turret on the external phase contrast eyepiece base unit.**
3. **Insert the special tool and the phase plate into the optical path hole on the top of the eyepiece base unit. Screw in the phase plate into the socket on the turret.**
4. **Remove the special tool and affix the provided label below the indication on the front of the turret.**
5. **Repeat steps 1 thru 4 for positions A thru C, as necessary.**

Replacing phase plates

1. **Select position A, B, or C by rotating the turret on the external phase contrast eyepiece base unit.**
2. **Insert the special tool into the optical path hole on the eyepiece base unit. Align the two pins on the special tool to the holes on the phase plate.**
3. **Remove the phase plate from the socket by rotating the tool counterclockwise.**
4. **Remove the phase plate by pulling out the special tool.**

   The phase plate is attached magnetically to the special tool, and can be retrieved by lifting the tool.
5. **Attach other phase plate as described above in “Installing phase plates.”**

6.4 Eyepiece Tube and Eyepiece

Mount the lens on the eyepiece tube base, and then the eyepiece on the binocular portion of the eyepiece tube.

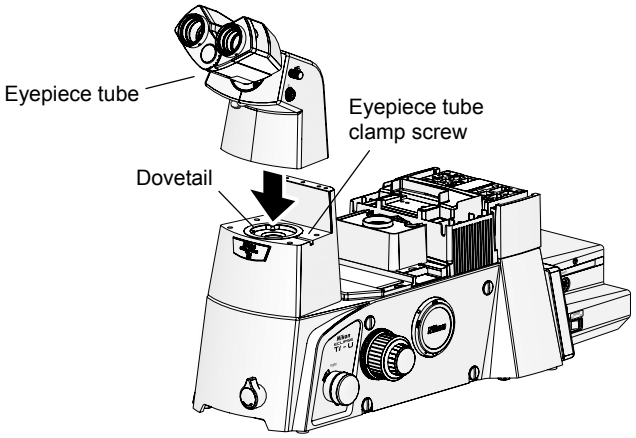


Figure 6.4-1 Installing the eyepiece tube

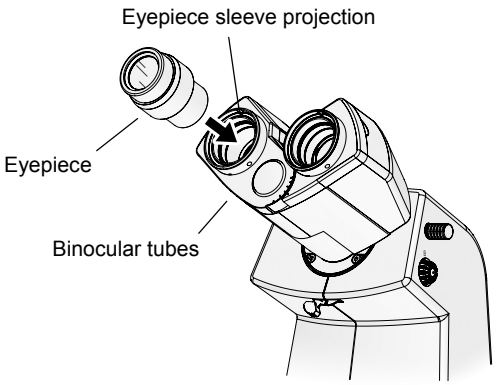


Figure 6.4-2 Installing the eyepieces

1. **Use the 2 mm hexagonal screwdriver to loosen the eyepiece tube clamp screw for the observation port at the front of the base.**

2. **Place the eyepiece tube on the eyepiece tube base, then press the protruding part of the bottom of the eyepiece tube into the rounded dovetail of the eyepiece tube base.**

3. **Use the 2 mm hexagonal screwdriver to tighten the eyepiece tube clamp screw, and make sure that there is no rattling between the eyepiece tube and eyepiece tube base.**

4. **Mount the eyepiece on the binocular tubes of the eyepiece tube.**

   Align the three grooves on the eyepiece with the three projections on the eyepiece sleeve, and insert them. Make sure that the left and right lenses on the eyepiece have the same magnification.

   Place rubber caps over the eyepieces if available.

6.5 Motorized Nosepiece

Mounting the FL turret

You must attach an FL turret to the microscope main body in order to perform microscopy using an FL block, including Epi-fl microscopy and TIRF microscopy. Before mounting the motorized nosepiece, see Section 6.15, “Motorized FL Turret,” and complete the mounting of the FL turret. Beside, you must attach the protection plate too.

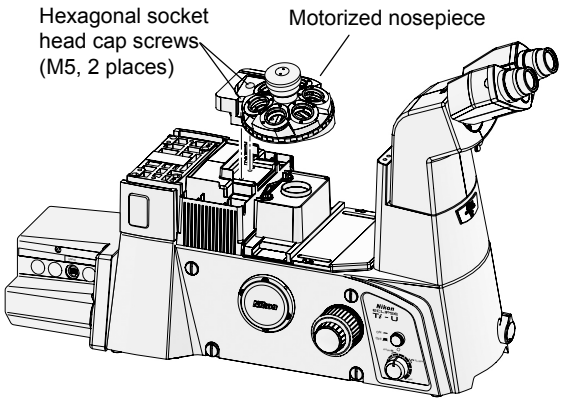


Figure 6.5-1 Attaching the nosepiece

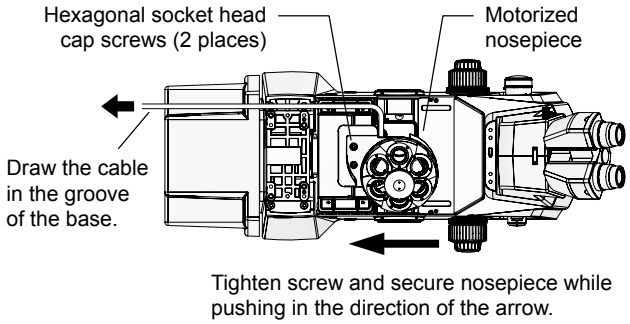


Figure 6.5-2 Securing the motorized nosepiece (top view)

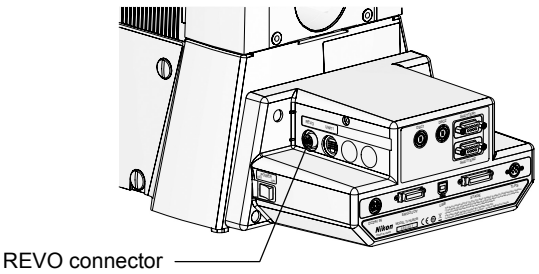


Figure 6.5-3 REVO connector

1. **Place the nosepiece on the base with the correct orientation.**
2. **Face the nosepiece toward the read of the microscope, and while pressing it in, secure the nosepiece by tightening the two hexagonal head cap screws (M5) supplied with the nosepiece.**
3. **Pass the cable protruding from the motorized nosepiece to the back of the microscope via the groove on the microscope base.**

   Be careful not to interfere the cable with other part. The cable must be drawn in the groove.
4. **Connect the motorized nosepiece cable to the REVO connector of the hub controller B.**

Mount the objective lenses after completing the mounting of the stage.

6.6 Dia Pillar Illuminator and Lamphouse

Attach the dia pillar illuminator 100W on the microscope base.
Two types of illuminator are available for Ti series system: 100W type and 30W type.

6.6.1 Attaching the TI-DH Dia Pillar Illuminator 100W

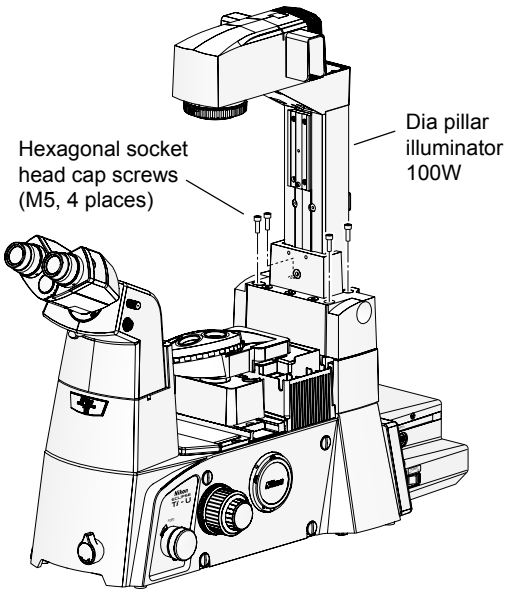


Figure 6.6-1 Installing the dia pillar illuminator 100W

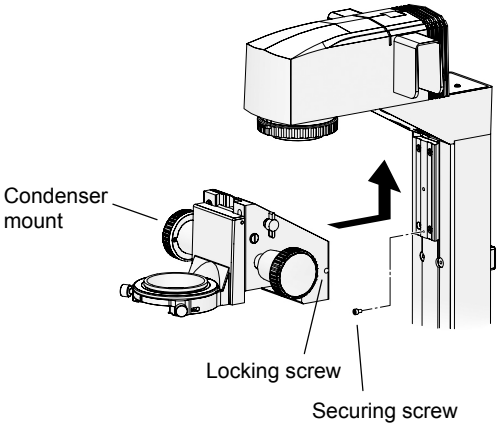


Figure 6.6-2 Installing the condenser mount

Attach the illuminator to the microscope base.

> To prevent the dia pillar illuminator from tipping over, support it with your hand while performing this step.

1. **Place the dia pillar illuminator on the mount on the back of the base.**

   There are positioning pins on the mount of the base. Align the pins with the pinholes of the dia pillar illuminator.

2. **Use the 4 mm hexagonal screwdriver to secure the dia pillar illuminator by tightening the four hexagonal socket head cap screws (M5) supplied with the dia pillar illuminator.**

3. **Attach the condenser mount to the dia pillar illuminator.**

   (1) Remove the securing screw.

   (2) Slide the condenser mount from the bottom to the top along the dovetail groove to attach the mount. (Slide it fully upward.)

   (3) Use a hexagonal screwdriver to securely tighten the locking screw on the right side of the condenser mount.

   (4) Attach the securing screw at its original position.

   (5) If you are using a condenser other than an ELWD or ELWD-S, loosen the condenser-mount locking screw, slide the condenser mount down until it touches the securing screw, and then re-tighten the locking screw in this state.

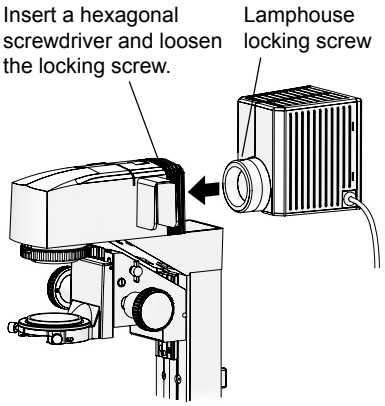


Figure 6.6-3 Installing lamphouse

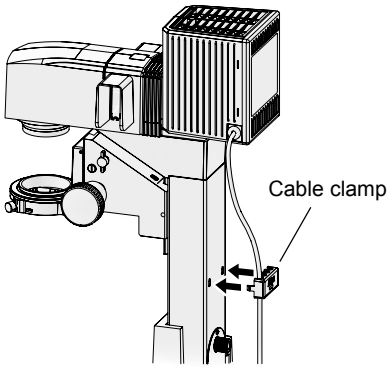


Figure 6.6-4 Locking clamp

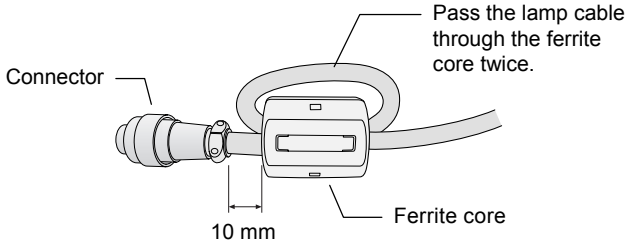


Figure 6.6-5 Attaching the ferrite core

4. Attach the lamphouse to the dia pillar illuminator.

> **Precautions against heat:**
> **To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.**

(1) Snap the lamphouse into the lamphouse mount on top of the dia pillar illuminator.

Make sure that the groove of the circular mount of the lamphouse is aligned with the pin of the dia pillar illuminator at this time.

(2) Insert the 2 mm hexagonal screwdriver into the hole on top of the dia pillar illuminator, and loosen the locking screw.

(3) Tighten the locking screw securely, and secure the lamphouse.

Using the cable clamp on the back of the dia pillar illuminator, secure the lamphouse cable.

The cable clamp is secured to the dia pillar illuminator hole by two prongs on both sides. Squeeze the cable clamp from both sides to detach the prongs and remove it.

It is possible to pass up to four cables through the cable clamp.

5. Attach the provided ferrite core near the connector of the lamp cable.

(1) Release the latch of the ferrite core.

(2) Turn the lamp cable around the ferrite core. The cable passes inside the core twice.

The ferrite core position must be about 10 mm from the connecter edge of the lamp cable.

(3) Close the ferrite core body.

See Section 6.21, “Diascopic Illumination Power Supply” for details about connecting the lamphouse, power supply, and hub controller B.

6.6.2 Attaching the TI-DS Dia Pillar Illuminator 30W

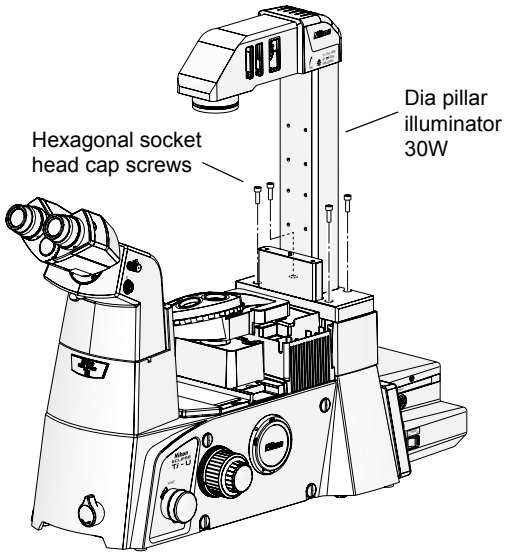


Figure 6.6-6 Attaching the dia pillar illuminator 30W

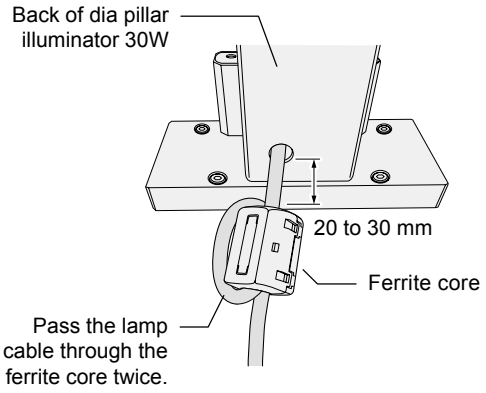


Figure 6.6-7 Attaching the ferrite core

Attach the dia pillar illuminator 30W to the microscope base.

To prevent the dia pillar illuminator from tipping over, support it with your hand while performing this step.

1. **Place the dia pillar illuminator on the mount on the back of the base.**

   There are positioning pins on the mount of the base. Align the pins with the pinholes of the dia pillar illuminator.

2. **Use the 4 mm hexagonal screwdriver to secure the dia pillar illuminator by tightening the four hexagonal socket head cap screws (M5) supplied with the dia pillar illuminator.**

3. **Attach the provided ferrite core to the lamp cable near the illuminator body.**
   (1) Release the latch of the ferrite core.
   (2) Turn the lamp cable around the ferrite core. The cable passes inside the core twice.

   The ferrite core position must be about 20 to 30 mm from the illuminator body.
   (3) Close the ferrite core body.

See Section 6.21, “Dia Illumination Power Supply,” for details about connecting the lamphouse, power supply, and hub controller B.

6.7 Replacing Dia Pillar Illuminator Lamps

Caution

- **Lamps, dia pillar illuminators, and power supplies must be used in determined combinations. See Section 4.2.1, "Combinations of Lamps, Dia Pillar Illuminator, and Power Supplies," to select an appropriate combination. Always use the specified type of lamp.**
- **Before replacing a lamp, you must turn off the power switch of the power supply (set it to "O"), and unplug the power cord.**
- **The lamp and the area around it become very hot during and immediately after illumination. When replacing a lamp, wait for about 30 minutes after turning off the power to allow time for it to cool sufficiently.**
- **Never touch the glass portion of the lamp with your bare hands. Dirt or fingerprints glass could cause uneven illumination or shorten the lifespan of the lamp. Use gloves or other protective equipment when handling lamps.**
- **Securely close the lamphouse cover after replacing the lamp. Never turn on the lamp with the cover removed.**

6.7.1 For the TI-DH Dia Pillar Illuminator 100W

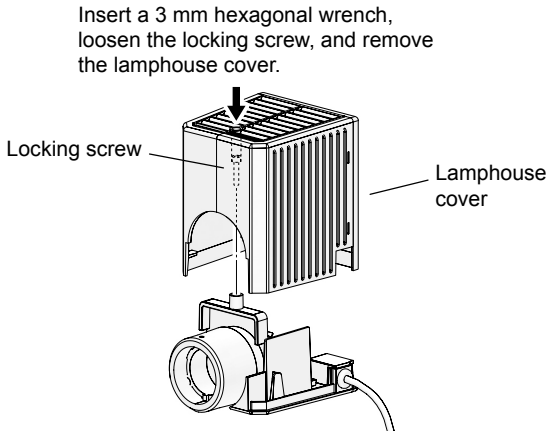
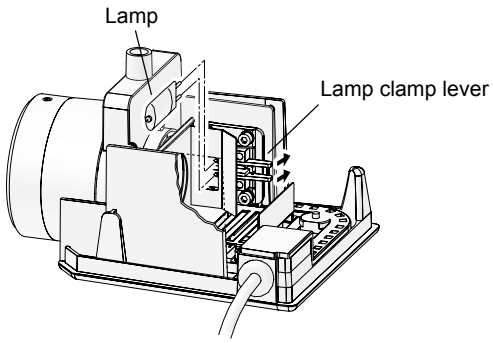


Figure 6.7-1 Removing the lamphouse cover



The pinhole of the socket opens when the lamp clamp lever is pressed. Detach the old lamp and attach a new lamp while pressing the lever.

Figure 6.7-2 Replacing lamps

Precautions against heat:
To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.

1. **Insert a 3 mm hexagonal wrench (or hexagonal screwdriver) into the hole on top of the lamphouse cover, loosen the locking screw, and remove the lamphouse cover.**

2. **Press the lamp clamp lever, and remove the used lamp from the socket.**

3. **Insert a new lamp into the socket.**

   While pressing on the lamp clamp lever, press the lamp pins into the pinholes of the socket. Push the lamp all the way in, then release the lamp clamp lever.

   - Make sure you use the specified lamp type.
   - Do not touch the glass portion of the lamp with your bare hands.
   - When you release the lamp clamp lever, be careful not to tip the lamp.

4. **Return the lamphouse cover to its original position, and fasten it securely by tightening the locking screw.**

6.7.2 For the TI-DS Dia Pillar Illuminator 30W

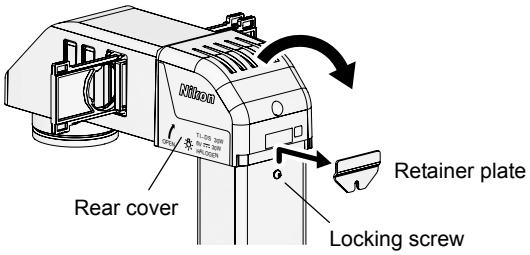


Figure 6.7-3 Opening the rear lamphouse cover

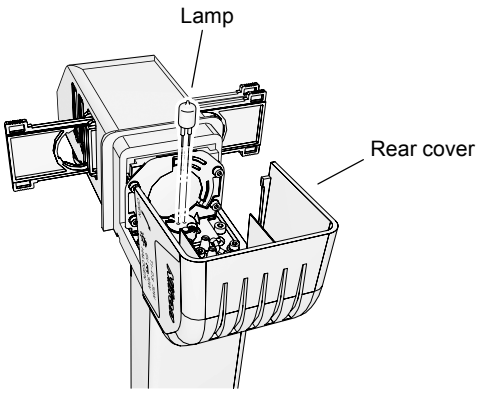


Figure 6.7-4 Replacing lamps

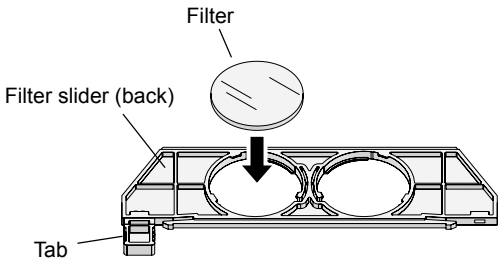
Precautions against heat:
To avoid burns, do not touch the lamphouse while the lamp is lit or for approximately 30 minutes after it has been turned off.

1. **Loosen the locking screw on the back of the dia pillar illuminator and remove the retainer plate.**
2. **Pull up and open the rear cover of the back of the pia pillar illuminator.**
3. **Remove the used lamp from the socket.**
4. **Insert a new lamp into the socket.**
   - Make sure to use the specified lamp type.
   - Do not touch the glass part of the lamp with bare hands.
5. **Close the rear cover.**
6. **Attach the retainer plate of the rear cover to its original position and fix it with the locking screw.**

6.8 Filter Slider

Attached the desired filter to the filter slider, and attach the filter slider to the slot of the dia pillar illuminator.

> Do not touch filters or other optical components with bare hands.



Although the filter slider for the dia pillar illuminator 30W has a different shape, the method for securing the filters is the same.

Figure 6.8-1 Attaching filters

1. **Attach the desired filter to the filter slider.**

   Attach it from the back of the filter slider. The mounting hole has three stoppers to keep the filter from falling. Only one stopper can be moved to the side. Move this stopper aside, and attach the filter.

2. **Affix a label indicating the filter type on the tab of the filter slider.**

3. **Insert the filter slider into the slot of the dia pillar illuminator.**

   The filter slider has stoppers that determine the limit of slide operation. Press the stoppers up, and press the filter into the slot.

   You can insert up to four filter sliders for the dia pillar illuminator 100W and three filter sliders for the dia pillar illuminator 30W.

   You can insert filters sliders from the right or the left. If they are all inserted from the same direction, they will be difficult to handle, so you should insert them alternately from the left and right.

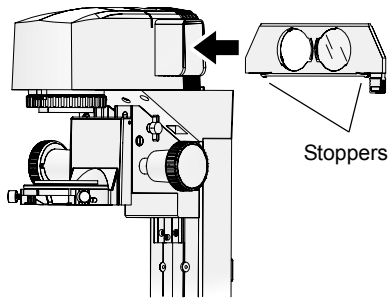


Figure 6.8-2 Inserting filter sliders (for dia pillar illuminator 100W)

> To maintain uniformity with the dia pillar illuminator 100W, install the diffusion filter (filter slider D) into the slot nearest to the lamphouse.

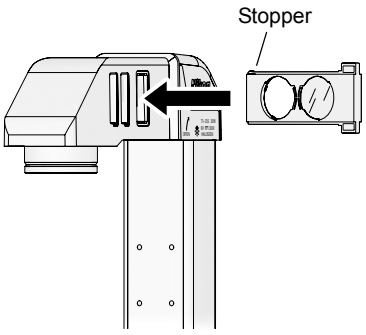


Figure 6.8-3 Inserting filter sliders (for dia pillar illuminator 30W)

Removing a filter slider

Stoppers at both ends of the filter slider are at their end point when sliding. When removing a filter slider, you can slide it out by pushing the stopper on the opposite side up with your finger to release the filter slider. Applying undue force on the filter slider can break the stoppers.

6.9 Stage

When objectives are attached to the nosepiece, perform the following steps after removing the objectives.

6.9.1 Attaching a Manual Stage

Attach a manual stage to the microscope base.

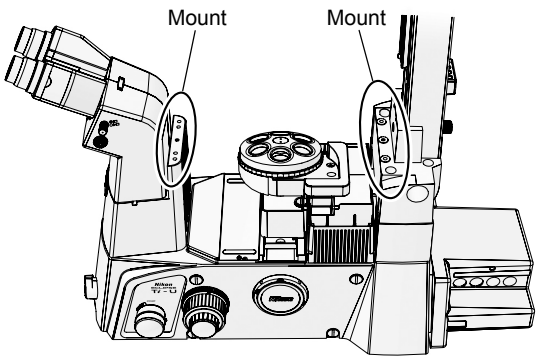


Figure 6.9-1 Stage mounting position

1. **Place the stage on the eyepiece tube base and dia-illuminator mounts.**

   The mount on the dia-illuminator has positioning pins. Place the stage on the pillar, aligning the holes on the bottom of the stage with the pins.

If your stage is equipped with a movement handle, you should normally position it so that the handle is at the back right of the microscope. You may also position the handle at the front left of the microscope.

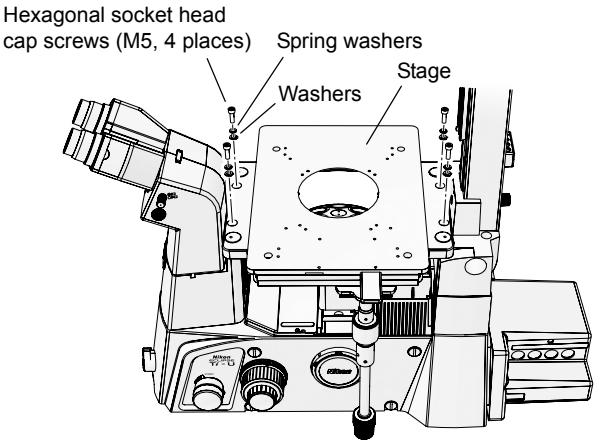


Figure 6.9-2 Installing the stage

2. **Secure the stage by tightening the four hexagonal socket head cap screws (M5) supplied with the stage.**

   Attach the locking hexagonal socket head cap screws with spring washers and washers.

6.9.2 Attaching a Motorized Stage

Attach a TI-S-E Motorized Stage or TI-S-ER Motorized Stage with Encoders to the microscope base and connect the motorized stage, motorized stage controller, and hub controller B.

Caution

- **When handling a stage, hold the lower side of the stage. If other part is grabbed, the accuracy of the stage may be degraded or broken. Be careful.**
- **The four legs of the base plate is used to place the stage on a worktable. If you do not need the legs, remove them.**

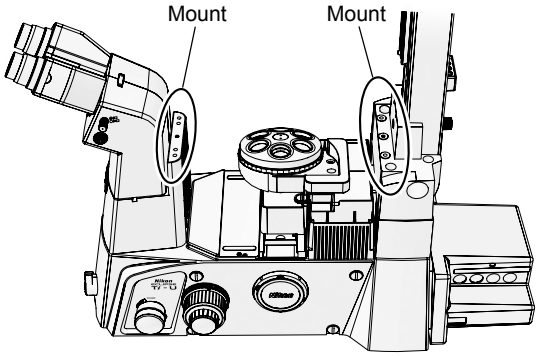


Figure 6.9-3 Stage mounting position

1. **Place the motorized stage on the mounts. One is on the eyepiece tube base, and the other is on the dia pillar illuminator.**

   The mount on the dia pillar illuminator has positioning pins. Place the stage on the pillar, aligning the holes on the bottom of the stage with the pins.

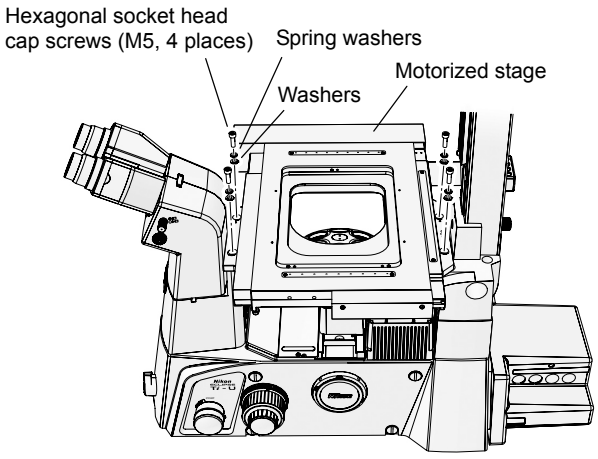


Figure 6.9-4 Attaching a motorized stage

2. **Secure the stage by tightening the four hexagonal socket head cap screws (M5) supplied with the stage.**

   Attach the locking hexagonal socket head cap screws with spring washers and washers.

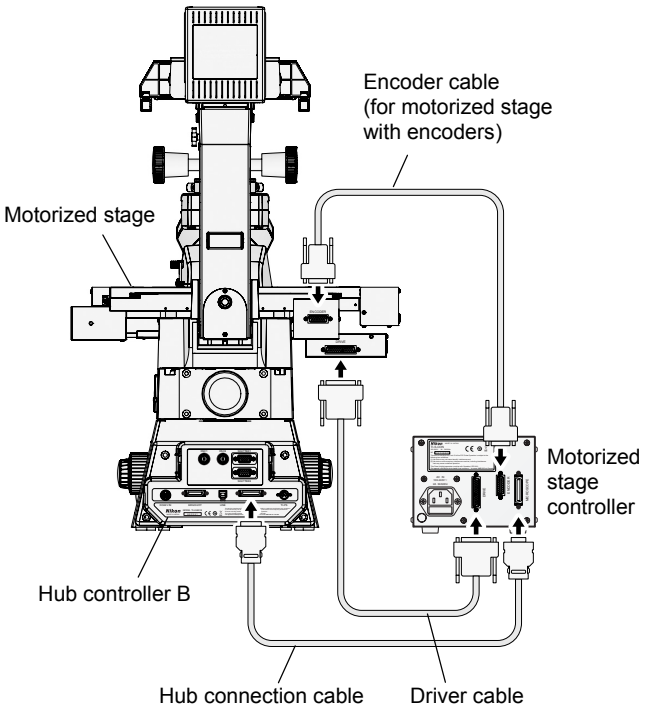


Figure 6.9-5 Connecting the motorized stage

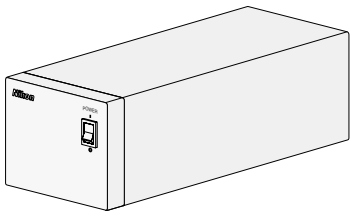


Figure 6.9-6 Motorized stage controller

3. Connect the cable to the motorized stage, motorized stage controller, and hub controller B.

(1) Use the hub connection cable to connect the MICROSCOPE connector on the motorized stage controller to the STAGE connector on the hub controller B.

(2) Use the driver cable to connect the DRIVE connector on the stage controller and the DRIVE connector on the motorized stage.

(3) If you are using a motorized stage with an encoder, use the encoder cable to connect the ENCODER connectors of the stage controller and motorized stage to each other.

4. Connect the power source of the motorized stage controller using the specified power cord.

6.10 Objectives

Attach the objectives to the nosepiece.

If the stage is not mounted, do so first.

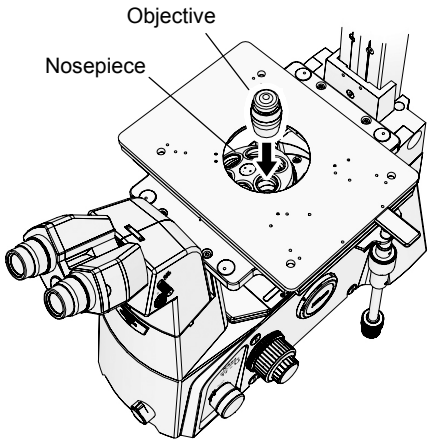


Figure 6.10-1 Attaching objectives

1. **Remove annular rings, specimen holders, and the like from the stage.**

2. **Screw the objectives into the sockets of the nosepiece through the hole in the stage.**

   Make sure that the magnification of the objectives increases when the nosepiece is rotated clockwise, as viewed from above the microscope.

Before using the microscope, be sure to register the information on the objectives attached to the motorized nosepiece using the setup application software, Ti Control. For more information, see the instruction manual for Ti Control.

6.11 Motorized Condenser Turret

Attach the TI-CT-E Motorized Condenser Turret to the condenser mount of the dia pillar illuminator. If you are using a manual condenser, see the instruction manual supplied with the microscope main body.

6.11.1 Preparations

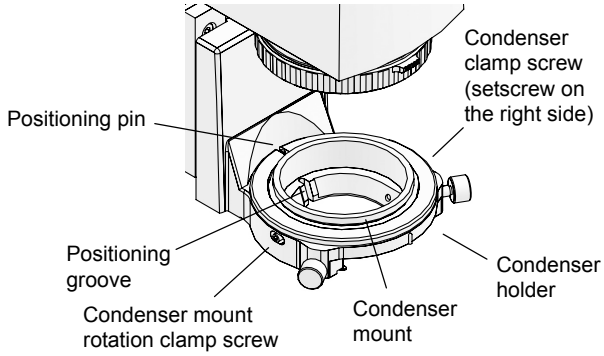


Figure 6.11-1 Condenser holder parts

1. **Use a hexagonal screwdriver to loosen the condenser clamp screw on the right side of the condenser holder.**

   The condenser clamp screw is a setscrew on the right side of the condenser holder.

   If the Condenser mount is rotated from the standard position, then the back of the hole will not be visible. If this happens, loosen the mount rotation clamp screw and rotate the condenser mount manually, until the positioning groove in the mount is aligned with the positioning pin on the condenser holder. In this position, tighten the rotation clamp screw to secure the condenser mount.

6.11.2 Attaching the Motorized Condenser Turret

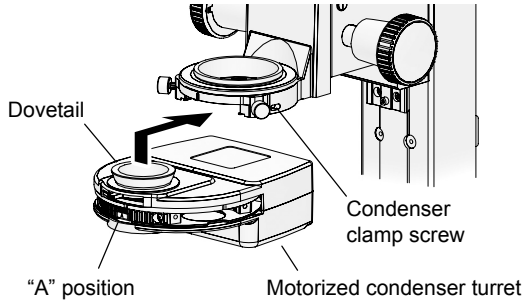


Figure 6.11-2 Installing the motorized condenser turret

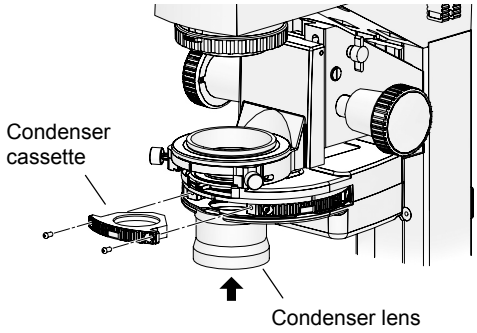


Figure 6.11-3 Attaching the condenser cassettes and condenser lens

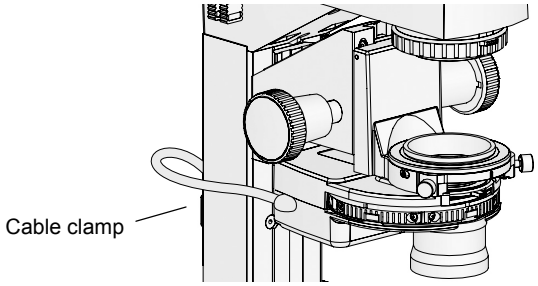


Figure 6.11-4 Cabling

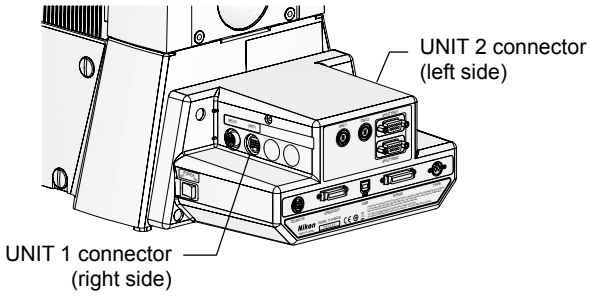


Figure 6.11-5 Connecting to the hub controller B

1. **Make the indicator of the motorized condenser face forward, and insert the motorized condenser turret into the dovetail of the condenser holder, then secure it by tightening the condenser clamp screw.**

   Attach the motorized condenser turret so that it slides from the front.

2. **Insert the condenser cassette into the motorized condenser turret, and secure it using two hexagonal socket head cap screws.**

   You can attach up to five condenser cassettes to the motorized condenser turret. Attach the cassettes so that the cassette numbers increase when rotated clockwise as viewed from above the turret.

3. **Screw the condenser lens into the mount on the bottom of the condenser turret.**

   For information on combinations of condenser lenses and condenser cassette, see Section 4.7, "Using a Motorized Condenser Turret," in Chapter 4, "Operation of Each Part." Note that the auxiliary lens included with the LWD condenser lens cannot be used with the Ti series.

4. **Connect the motorized condenser turret cable to either the UNIT 1 connectors or the UNIT 2 connector on the hub controller B.**

   Perform the cabling so that the cables do not interfere with the motion of the equipment. Use the cable clamp on the back of the dia pillar illuminator to secure the cables.

   The hub controller B automatically detects motorized units connected to it. You can connect them to either the UNIT 1 connector or the UNIT 2 connector.

Before using the microscope, be sure to register the information on the condenser cassettes attached to the motorized condenser turret using the setup application software, Ti Control. For more information, see the instruction manual for Ti Control.

6.12 Side Port

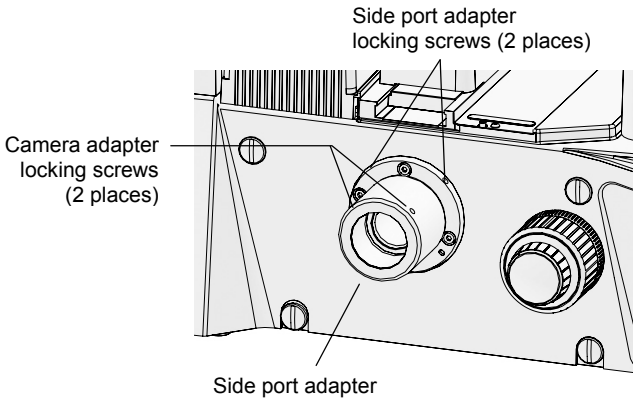


Figure 6.12-1 Mounting the side port adapter

1. **Loosen the locking screw, and remove the plastic cap attached to the side port.**
2. **Insert the side port adapter into the side port, and secure it by tightening the locking screw.**
3. **Attach adapters to the camera.**
4. **Insert the camera and adapter into the side port adapter, and secure them by tightening the locking screw.**

- When mounting a camera, an adapter supporting the camera is needed. First mount the adapter for the camera, and then mount the camera to the side port adapter with the adapter.
- Keep a cap on all unused ports at all time, in order to protect the ports.

Example: Attaching the C mount TV camera to the direct C mount adapter

(1) Screw the C mount TV camera securely into the direct C mount adapter.

(2) Insert the direct C mount adapter into the side port adapter, and secure it by tightening the locking screw.

- When detaching photomicrographic equipment, hold it steady, and then loosen the locking screw.
- If the locking screw is loosened without holding the equipment, the equipment may drop. To avoid dropping photomicrographic equipment, make sure you have a firm grip before loosening the screw.

6.13 Bottom Port (Ti-U/B Only)

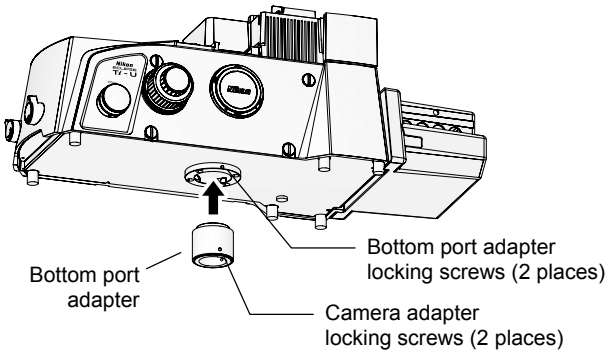


Figure 6.13-1 Mounting a bottom port adapter

1. **Loosen two clamp screws, and remove the metal cap attached to the bottom port.**
2. **Insert bottom port adapter into the bottom port, and secure it by tightening two locking screws.**
3. **Attach adapters to the camera.**
4. **Insert the camera and adapter into the bottom port adapter, and secure them by tightening two locking screws.**

- When mounting a camera, an adapter supporting the camera is needed. First mount the adapter for the camera, and then mount the camera to the bottom port adapter with the adapter.
- Keep a cap on all unused ports at all time, in order to protect the ports.

Example: Attaching the C mount TV camera to the direct C mount adapter

(1) Screw the C mount TV camera securely into the direct C mount adapter.

(2) Insert the direct C mount adapter into the bottom port adapter, and secure it by tightening the locking screw.

- When detaching photomicrographic equipment, hold it steady, and then loosen the locking screw.
- If the locking screw is loosened without holding the equipment, the equipment may drop. To avoid dropping photomicrographic equipment, make sure you have a firm grip before loosening the screw.

6.14 Epi-fl Attachment

To perform epi-fl microscopy, you must mount a motorized FL turret (see the next page) and epi-fl attachment on the microscope main body, and attach an episcopic (reflected) light source and motorized shutter on the epi-fl attachment.

See the instruction manual for the epi-fl attachment for instructions on mounting the epi-fl attachment.

> See Section 6.15, “Motorized FL Turret,” for details on how to mount the motorized FL turret. See the instruction manual for the epi-fl attachment for instructions on attaching and using the epi-fl attachment, light source, and motorized shutter.

6.15 Motorized FL Turret

Mount the motorized fl turret onto the microscope main body.

In order to perform epi-fl microscopy, you must mount an epi-fl attachment to the microscope main body. See the instruction manual of your epi-fl attachment for instructions on mounting the illuminator.

6.15.1 Mounting a Motorized FL Turret

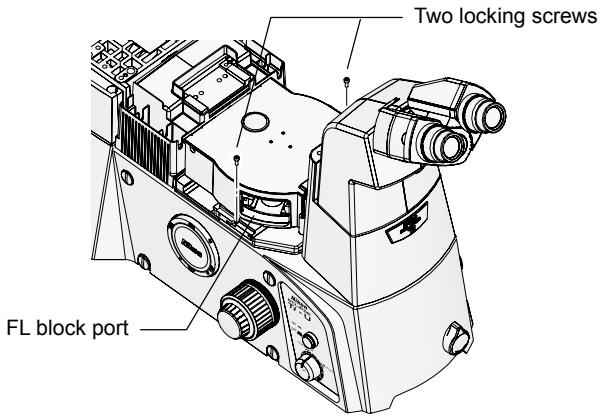


Figure 6.15-1 Mounting a motorized FL turret

1. **Detach two screws and remove the cover for the FL turret port.**

2. **Insert the FL turret into the mounting groove on the right side of the microscope, then use a hexagonal screwdriver to tighten the two screws.**

   Tighten the locking screws on the left side with the FL block port cover removed.

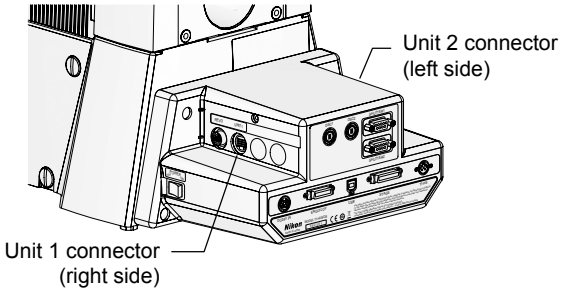


Figure 6.15-2 Connecting to the hub controller B

3. **Connect the motorized FL turret cable to the UNIT 1 or UNIT 2 connector of the hub controller B.**

   Pass the cable to the back of the microscope via the groove in the microscope base.

   The hub controller B automatically recognizes motorized units attached to it. You can connect the cable to either the UNIT 1 or UNIT 2 connector.

Creating a two-tier motorized FL turret configuration

You can use a motorized FL turret and epi-fl attachment together in a two-tier configuration by using the TI-BSUK70 stage-up kit. In this case, the lower tier is level one (FL1), and the upper tier is level 2 (FL2). You must connect and register the filter block in the same way as when only one tier is used.

6.15.2 Mounting Filter Blocks

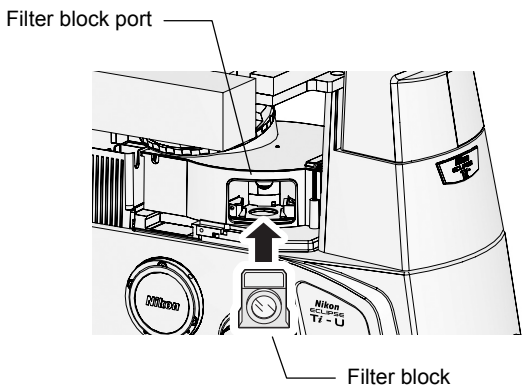


Figure 6.15-3 Mounting filter blocks

Finish assembling all other units before attaching filter blocks.

1. **Make sure that the power switch of the hub controller B is off.**
2. **Open the cover on the filter block port of the motorized FL turret.**
3. **Check the position display (address) of the turret, and manually rotate the turret so that the desired address is positioned at the aperture.**
4. **Align the filter block (or analyzer block) with the turret's dovetail and insert it as far as it will go.**
5. **Repeat steps 3 and 4 to attach the desired filter blocks.**
6. **Affix the sticker labels corresponding to the types of filter block used.**
7. **Attach the filter block port cover to the original position.**

Before using the microscope, be sure to register the information on the filter block attached to the motorized FL turret using the setup application software, "Ti Control." For more information, see the instruction manual for Ti Control.

6.16 DIC Attachment

To perform differential interference contrast (DIC) microscopy, attach an analyzer, polarizer, DIC-compatible nosepiece, condenser DIC prism, and objective DIC prism to the microscope.

See the instruction manual for the DIC attachment for instructions on attaching and using this product.

6.17 Motorized Excitation Filter Wheel

6.17.1 Motorized Excitation Filter Wheel

Mount the TI-FLEW-E EX filter wheel on the epi-fl attachment.

If you have not finished assembling the epi-fl attachment, do so first.

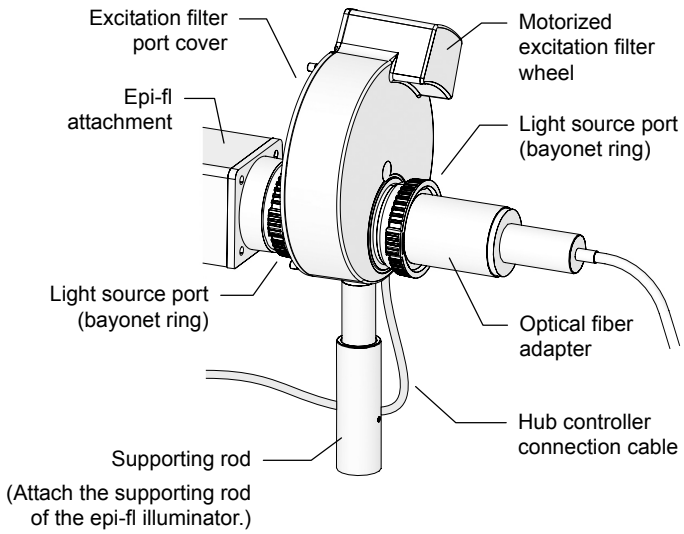


Figure 6.17-1 Mounting the motorized excitation filter wheel

1. **If a supporting rod is attached to the epi-fl attachment, remove it.**
2. **Attach the motorized excitation filter wheel to the light source port of the epi-fl attachment.**
   (1) Turn the bayonet ring on the light source adapter of the epi-fl attachment in the “O” direction.
   (2) Insert the epi-fl attachment mount of the motorized excitation filter wheel.
   (3) Turn the bayonet ring in the “C” direction to secure the motorized excitation filter wheel.
3. **Attach the supporting rod to the motorized excitation filter wheel.**
   (1) Loosen the clamp screw of the supporting rod. When the clamp screw is loosened, the length of the supporting rod can be adjusted.
   (2) Screw the supporting rod into the supporting rod mount of the motorized excitation filter wheel.
   (3) Allow the tip of the supporting rod to touch the installation surface, and adjust it to a length where there is no excess of force applied to the epi-fl attachment or the motorized excitation filter wheel.
   (4) Tighten the clamp screw to lock the length of the supporting rod.
4. **Attach the light source to the light source port of the motorized excitation filter wheel.**
   See the instruction manual for your light source attachment for details.
5. **Connect the motorized excitation filter wheel cable to any of the UNIT 1 or UNIT 2 connector on the hub controller B.**
   The hub controller B automatically detects motorized units connected to it. You can connect them to either the UNIT 1 connector or the UNIT 2 connector.

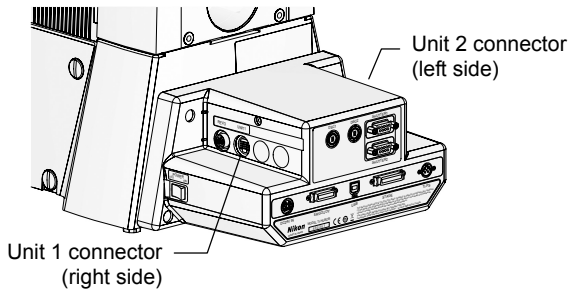


Figure 6.17-2 Connecting to the Hub controller B

6.17.2 Attaching Excitation Filters

Assemble all other units before attaching excitation filters.

Caution

Make sure that the light source is turned off before attaching or removing excitation filters.

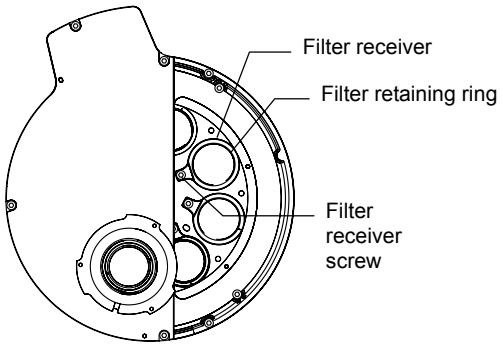


Figure 6.17-3 Attaching an excitation filter

Before attaching an excitation filter, make sure that the power switch of the hub controller B is turned off. Attach the motorized excitation filter wheel by rotating it manually.

1. **Loosen the locking screw, and remove the cover of the excitation filter mount.**
2. **Check the position indicators (addresses) on the wheel, and turn the wheel manually until the desired filter position is visible.**
3. **Detach the filter receiver screw with the 2 mm hexagonal driver and pull out the filter receiver.**
4. **Detach the filter retaining ring from the filter receiver.**

   Detach the light-shielding plate, as well, if applicable.
5. **Place an excitation filter (or light shielding plate) in the filter receiver and secure it with the filter retaining ring.**

   Be sure to attach a light-shielding plate to each of the filter receivers without excitation filters, unless you choose to leave a specific address empty (i.e., with no filter receiver attached).
6. **Push in the filter receiver into the wheel and tighten the filter receiver screw.**
7. **Return the excitation filter mount cover to its original position, and secure it by tightening the locking screw.**

Before using the microscope, be sure to register the information on the excitation filter attached to the motorized excitation filter wheel using the setup application software “Ti Control.” For more information, see the instruction manual for “Ti Control.”

6.18 Motorized Barrier Filter Wheel

6.18.1 Motorized Barrier Filter Wheel

Attach the TI-FLBW-E BA filter wheel directly to the side port of the microscope main body.

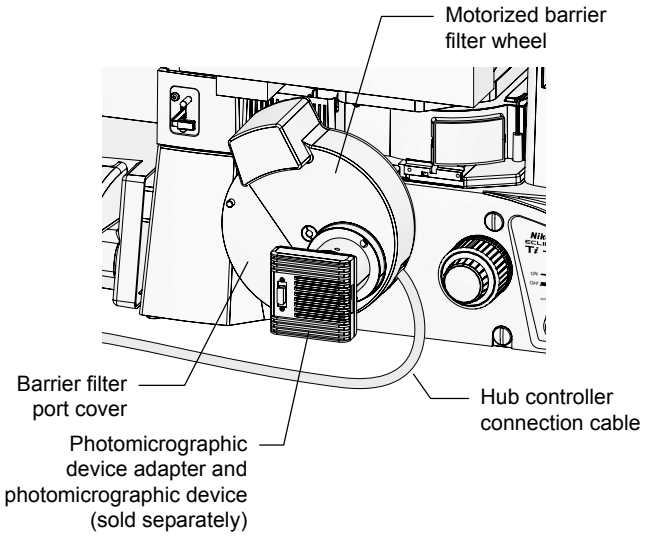


Figure 6.18-1 Motorized barrier filter wheel

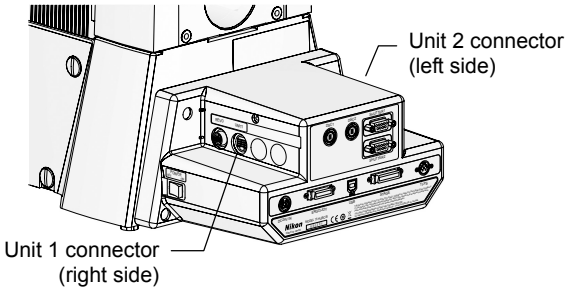


Figure 6.18-2 Connecting to the hub controller B

1. **If a side-port adapter is attached to the left side port, remove it.**
2. **Align the motorized barrier filter wheel positioning pin with the hole on the microscope, insert the microscope attachment into the left side port, and tighten the adapter clamp screw on the microscope to secure the wheel.**
3. **Loosen the adapter clamp screw of the motorized barrier filter wheel and detach the plastic cap from the output port.**
4. **Attach the appropriate adapter to the camera and insert that adapter into the output port. Next, secure the adapter with the adapter clamp screw.**
5. **Connect the motorized barrier filter wheel cable to any of the UNIT 1 or UNIT 2 connector on the hub controller B.**

   The hub controller B automatically detects motorized units connected to it. You can connect them to either the UNIT 1 connector or the UNIT 2 connector.

6.18.2 Attaching Barrier Filters

Assemble all other units before attaching barrier filters.

Caution

Make sure that the light source is turned off before attaching or detaching barrier filters.

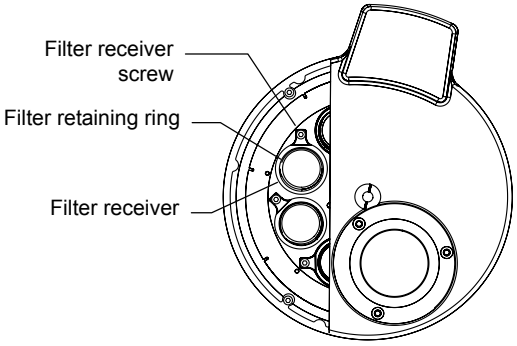


Figure 6.18-3 Attaching barrier filters

Before attaching a barrier filter, make sure that the power switch of the hub controller B is turned off. Attach the motorized barrier filter wheel by rotating it manually.

1. **Loosen the locking screw, and remove the cover of the barrier filter mount.**
2. **Check the position indicators (addresses) on the wheel, and turn the wheel manually until the desired filter position is visible.**
3. **Detach the filter receiver screw with the 2 mm hexagonal driver and pull out the filter receiver.**
4. **Detach the filter retaining ring from the filter receiver.**
5. **Place and barrier filter in the filter receiver and secure it with the filter retaining ring.**
6. **Push in the filter receiver into the wheel and tighten the filter receiver screw.**
7. **Return the barrier filter mount cover to its original position, and secure it by tightening the locking screw.**

Before using the microscope, be sure to register the information on the barrier filter attached to the motorized barrier filter wheel using the setup application software “Ti Control.” For more information, see the instruction manual for “Ti Control.”

6.19 Ergo Controller

Connect the TI-ERGC ergo controller to the hub controller B.

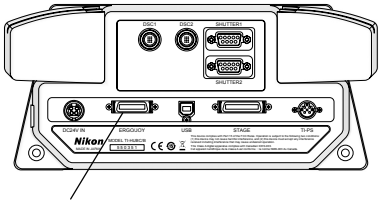


Figure 6.19-1 Connecting the ergo controller

Connect the ergo controller cable to the ERGO/JOY connector of the hub controller B.

> It is not possible to connect both the ergo controller and joystick controller at the same time.

6.20 Joystick Controller

Connect the TI-S-EJOY stage joystick (joystick controller) for motorized stage to the hub controller B.

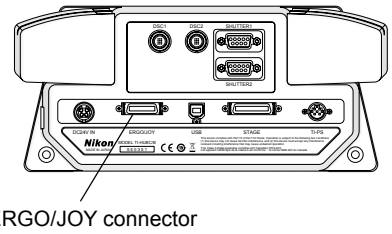


Figure 6.20-1 Connecting the joystick controller

Connect the joystick controller cable to the ERGO/JOY connector of the hub controller B.

> It is not possible to connect both the ergo controller and joystick controller at the same time.

6.21 Diascopic Illumination Power Supply

To use the diascopic illumination lamp, a power supply device is required. Make sure that the power switch of the power supply device is turned off (positioned to the “O” side) and then connect the power supply according to the followings:

Power supply device for epi illumination

To use the episcopic illumination light source, another power supply device is required. For details, see instruction manual for each device.

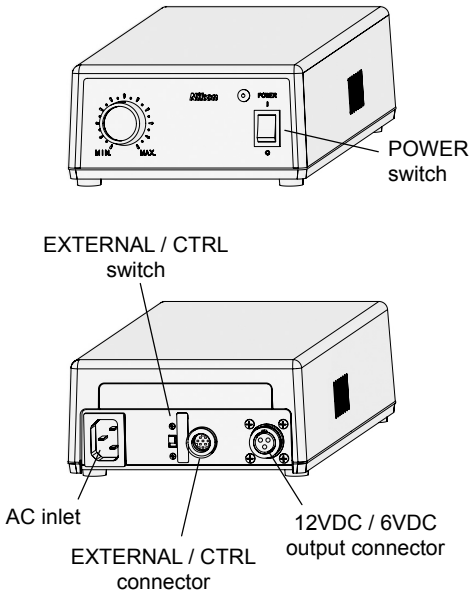


Figure 6.21-1 Power supply device

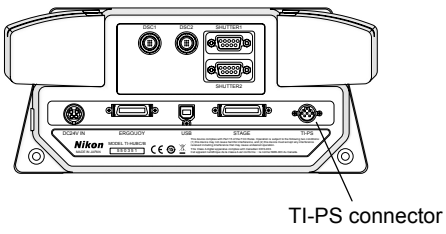


図 6.21-2 Hub controller B

(1) Lamp cable

Connect the lamp cable of the lamphouse to the DC output connector of the power supply device. A lock ring is provided to the connector of the lamp cable. Secure the lamp cable with the lock ring.

For the dia pillar illuminator 100W

Connect the lamp cable of the lamphouse (D-LH/LC) to the 12 VDC output connector of the TI-PS100W power supply.

Check that the ferrite core is correctly attached to the lamp cable (near the connector). (See 6.6.1.)

For the dia pillar illuminator 30W

Connect the lamp cable of the dia pillar illuminator to the 6 VDC output connector of the TE-PS30W / TE-PSE30 power supply A.

Check that the ferrite core is correctly attached to the lamp cable (near the dia pillar illuminator). (See 6.6.2.)

(2) Control cable

Connect the control cable to the TI-PS connector on the back of the hub controller B, and then connect its other end to the EXTERNAL connector of the TI-PS100W Power Supply or to the CTRL connector of the TE-PS30W / TE-PSE30 power supply A.

(3) Power cord

Connect the power cable to the AC inlet of the power supply device, and then connect the other end to a wall outlet.

To prevent electric shock, the power cable must be connected at the end of the assembly of the system.

6.22 AC Adapter

The power of the hub controller B is supplied via an AC adapter.

Caution

- **To prevent electric shock, always turn off the power switch of the power supply and hub controller B (switch to "OFF") before plugging or unplugging the AC adapter or power cord.**
- **Be sure to use the specified combination of AC adapter and power cord models meeting the requirements given below. Use of any other type of adapter or power cord can result in malfunction, excessive heating, and/or fire. See Chapter 9, "Specifications," for information about specified AC adapters and power cords.**

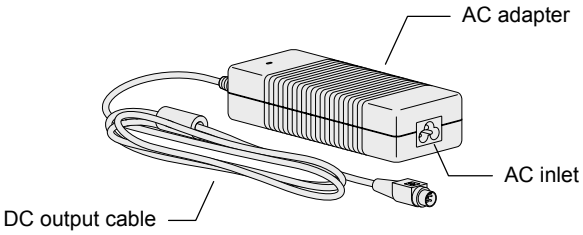


Figure 6.22-1 AC adapter

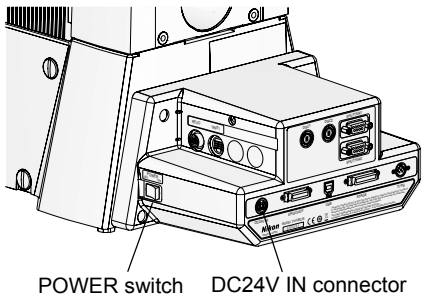


Figure 6.22-2 Power supply for the hub controller B

The system power is supplied via an AC adapter.

The AC adapter is ready for 100 to 240 VAC and 50 to 60 Hz. Therefore, it can be used all over the world.

1. **Make sure that the power switch of the power supply for the hub controller B is off (set to "OFF").**
2. **Connect the DC output cable on the AC adapter to the DC24V IN connector (24 VDC) on the back of the hub controller B.**
3. **Connect the power cord to the AC inlet of the AC adapter, and plug the cord into an AC wall outlet.**

6.23 Connecting External Devices

See the instruction manuals supplied with each external unit for instructions on installing that unit.

6.23.1 Connecting to a Computer

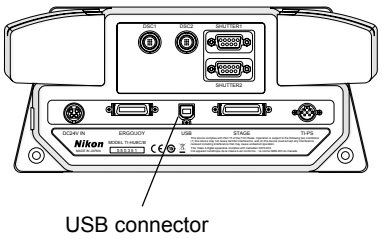


Figure 6.23-1 Connecting to a computer

If you connect the hub controller B with a computer (IBM PC or compatible) using a USB interface, you can control the microscope and attachments from the computer.

See Chapter 5, “Online and Remote Operation,” for details.

6.23.2 Connecting a Motorized Shutter

Before using the microscope, be sure to program the information on the motorized shutter using the computer's setup application "Ti Control." For information on programming this information, see the "Ti Control" instruction manual.

Connecting motorized shutters

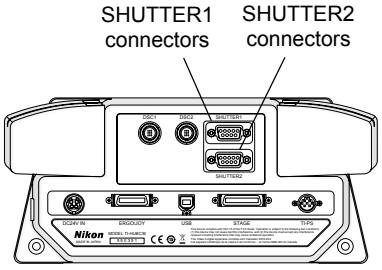
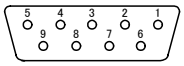


Figure 6.23-2 Connecting third-party motorized shutters



D-sub 9-pin female connector

Figure 6.23-3 Pin layout of SHUTTER 1/SHUTTER 2 connectors

The hub controller B has two connectors for connecting motorized shutters. It is possible to control the two shutters from the ergo controller, or computer.

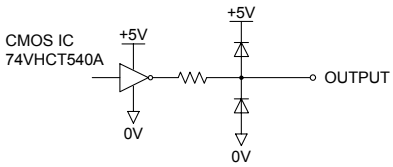
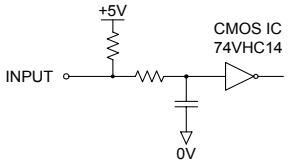
Use the dedicated cable to connect the external control signal input/output connector of the fiber-optic light source to the SHUTTER 1 or SHUTTER 2 connector of the hub controller B.

* Some manufacturer's shutters may not function appropriately even if they are connected. Contact your local Nikon representative for details.

Connect pin 1 and GND (pin 6 or 7) on the SHUTTER 1 (or SHUTTER 2) connector on the back of the hub controller B to the shutter input of the motorized shutter, and connect the shutter output of the motorized shutter to pin 2 and GND (pin 6 or 7) of the SHUTTER 1 (or SHUTTER 2) connector. This enables the motorized shutter to be opened or closed from the ergo controller or computer.

When the hub controller B power is off, the shutter is always closed. To open or close the shutter, turn on the power of the hub controller B, and operate the motorized shutter button from the ergo controller or computer.

Table 6.23-1 SHUTTER1/SHUTTER2 connector signals

Pin number	Input/Output	Specifications
1	Output	**Shutter output signal**  (1) Using Nikon Intensilight (momentary operation): On/Off: Momentarily outputs Hi as soon as the key is pressed. (2) Others (alternate operation): On: Outputs Hi; Off: Outputs low Note: You must program the shutter information in the computer beforehand.
2	Input	**Shutter FB input signal**  Low input: OPEN; Hi input: CLOSE
3	—	Prohibited to use.
4	—	Prohibited to use.
5	—	Prohibited to use.
6	—	GND
7	—	GND
8	—	Prohibited to use.
9	—	Prohibited to use.

Motorized shutter operation

You can control a third-party motorized shutter with the ergo controller.

Before using the microscope, be sure to register the information on the motorized shutter using the setup application software, Ti Control. For more information, see the instruction manual for Ti Control.

Operation with the ergo controller

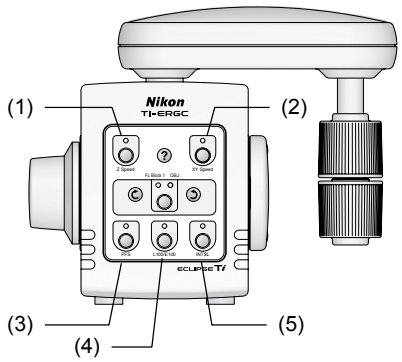


Figure 6.23-4 Ergo controller

By assigning functions to buttons (1) to (5) of the Ergo controller, you can open and close the Epi shutter, Dia shutter, and additional shutters by pressing the various buttons.

The indicators on each button show whether a shutter is open or closed as follows:

- Indicator on: Shutter closed
- Indicator closed: Shutter open

See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details on setup and operation.

6.23.3 Connecting a Digital Camera for Microscopy

Before using the microscope, be sure to program the information on the motorized shutter using the computer's setup application "Ti Control." For information on programming this information, see the "Ti Control" instruction manual.

The Ti series microscopes have multiple observation ports, to which various types of digital cameras for microscopy can be attached via applicable adaptors.

Attaching a digital camera

Attach a digital camera to the microscopy port of the microscope or eyepiece tube base. Use a direct C mount adapter or the like to do this.

If you are using an eyepiece tube base with side port, a direct C mount adapter is supplied.

Connecting a camera controller

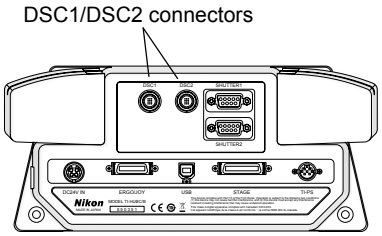


Figure 6.23-5 Connecting a digital camera

HR25-7R-4S
(Hirose Electric Co., Ltd.)
Female connector

Figure 6.23-6 Connector layout of DSC1/DSC2 connectors

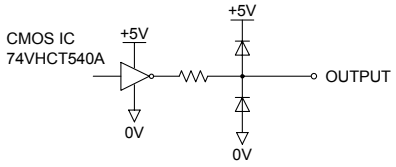
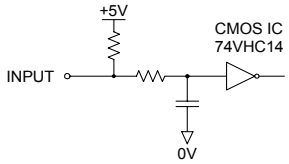
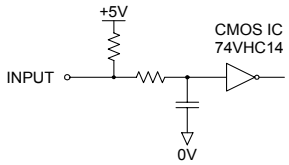
The hub controller B has two connectors for connecting digital cameras, and it is possible to snap the shutters of two digital cameras from the computer.

Use the dedicated cable to connect the EX.IO connector of the camera control unit (DS-L2, DS-U2 etc.) to the DSC1 or DSC2 connector of the hub controller B.

* Some manufacturer's cameras may not function appropriately even if they are connected. Contact your local Nikon representative for details.

Connect pin 1 on the DSC1 (or DSC2) connector on the back of the hub controller B to the shutter input of the digital camera, connect pin 2 (or pin 3) to the shutter (status) output of the digital camera, and connect pin 4 to GND of the digital camera. This enables the camera shutter to be snapped from the computer.

Table 6.23-2 DSC1/DSC2 connector signals

Pin number	Input/Output	Specifications
1	Output	**Camera shutter output signal**  (1) Using Nikon DS-L2 or DS-U2 (momentary operation): On/Off: Momentarily outputs Hi as soon as the key is pressed.
2	Input	**Camera shutter input signal 1**  Camera status signal input
3	Input	**Camera shutter input signal 2**  Camera status signal input
4	—	GND

Connecting the earth strap (only for DS-Qi1Mc digital camera)

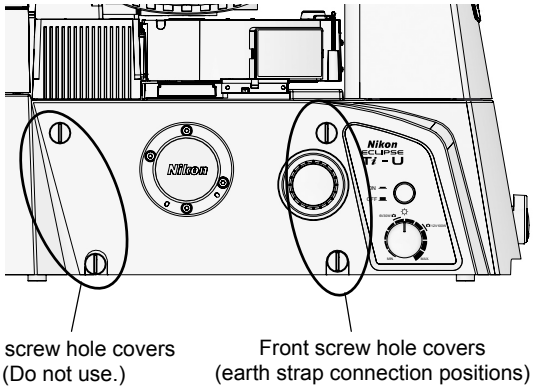


Figure 6.23-7 Connecting the earth strap

When using the digital camera for microscopy DS-Qi1Mc, be sure to use the earth strap provided together with the Ti camera trigger cable for the DS-Qi1Mc to connect the camera to the microscope main body.

1. **Choose the position to which the earth strap is connected.**

   Use either of the upper or lower front (observer side) screw hole cover of four at a side of the microscope. (Use the lower front screw hole cover when using the bottom port.) You may use a screw hole cover on either the left side or the right side.

2. **Remove the screw hole cover you chose, and then connect one end of the earth strap to the screw hole on the microscope with a fixing screw (provided with the earth strap).**

3. **Connect the other end of the earth strap to the earth strap fixing position on the camera with a fixing screw (provided with the earth strap).**

7 Troubleshooting

If the microscope or its associated components are used improperly, it is possible that this product will not function correctly, even though there is nothing wrong with the microscope or its components. If one of the situations described below occurs, please try the remedy listed in the table and check the behavior again before requesting repairs.

For problems not listed below and in case the problem persists, disconnect the device and contact your local Nikon representative.

7.1 Microscopic Image

Symptom	Cause	Remedy
Field of view vignetting. **Field of view not visible.** **Uneven brightness in field of view.**	Parts are not properly installed.	Install the parts properly.
	The concentric ring of the stage interferes the optical path.	Check and change the specimen setting.
	The field diaphragm image is not focused on the specimen surface	Focus and center the condenser.
	The field diaphragm is too narrow.	Open the field diaphragm slightly larger than the field of view.
	Lens or container is dirty.	Clean the lenses. Use clean containers.
Dirt or dust in field of view.	Lens or container is dirty.	Clean the lenses. Use clean containers.
	The field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.
Poor image quality. **Poor contrast or resolution.**	Lens or container is dirty.	Clean the lenses. Use clean containers.
	The correction ring of the objective is not set to the thickness of the container's bottom plate.	Adjust the ring.
	The variation in the thickness of the container bottom plate is too much for the objective to correct for.	Use a container whose bottom-plate thickness is uniform enough to correct for.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.
No phase contrast effect (using Ph microscopy).	You are using a bright-field objective.	Use a phase-contrast objective.
	Condenser annular diaphragm is not in the optical path.	Select an annular diaphragm with the same Ph code as the Ph objective, and move it into the optical path.
	Annular diaphragm is not centered.	Center the annular diaphragm.
	System condenser's aperture diaphragm is not fully open.	Fully open the diaphragm.
Uneven focus.	Nosepiece is not attached properly.	Attach the nosepiece properly.
Image flows.	Specimen is tilted with respect to stage surface.	Position the specimen correctly on the stage.
	Nosepiece is not attached properly.	Attach the nosepiece properly.
	Annular diaphragm is not centered.	Center the annular diaphragm.
	Dia pillar illuminator is tilted.	Return to upright position, as far as it will go.
Yellowish image.	NCB11 filter is not in the optical path.	Enter the filter into the optical path.
	Lamp voltage is too low.	Use the brightness control knob to set the lamp voltage to the rated level.
Field of view too bright.	ND filter is not in the optical path.	Enter the filter into the optical path.
	Lamp voltage is too high.	Use the brightness control knob to lower the lamp voltage.
Field of view too dark.	Aperture diaphragm is too narrow.	Set to 70–80% of the size of the objective NA.
	Field diaphragm image is not focused on the specimen surface.	Focus and center the condenser.

7.2 Operation (Bright Field/Phase Contrast Microscopy)

Symptom	Cause	Remedy
Does not focus when objective is raised to uppermost position.	Stage is not mounted properly.	Attach the nosepiece properly.
	Objective refocusing ring is clamped.	Fully release the clamp.
Does not focus with 20x or 40x objective.	The variation in the thickness of the container bottom plate is too much for the objective to correct for.	Use a container whose bottom-plate thickness is uniform enough to correct for.
Images in right and left eyepiece do not align.	Distance between eyepieces is not adjusted.	Adjust the distance between the eyepieces.
Eyes become fatigued.	Diopters are not adjusted.	Adjust the diopter.
	Brightness is not appropriate.	Adjust the brightness with the brightness control knob or ND filters.

7.3 Electrical Issues

7.3.1 Microscope

Symptom	Cause	Remedy
Lamp does not light up.	Proper cord is not connected or connected improperly.	Connect the cord properly.
	The lamp is burned out.	Replace with the specified lamp type.
Lamp burns out prematurely.	Incompatible lamp is being used.	Replace with the specified lamp type.
Microscope's dia-illumination on/off switch does not function properly.	Lamp control cable is not connected or connected improperly.	Connect the cable properly.
	The lamp is burned out.	Replace with the specified lamp type.
Microscope's brightness control knob does not function properly.	Lamp control cable is not connected or connected improperly.	Connect the cable properly.
	EXTERNAL switch at the rear of the power supply is off.	Turn on the switch.

7.3.2 Power Supply

Symptom	Cause	Remedy
Power cannot be turned on with the power switch.	Proper cord is not connected or connected improperly.	Turn off the power, then connect the power cord properly.
The brightness control knob on the power supply does not function properly.	EXTERNAL switch at the rear of the power supply is on.	Turn off the switch.

7.3.3 Hub Controller

Symptom	Cause	Remedy
Power cannot be turned on with the power switch.	AC adapter power cord is not connected or connected improperly, or DC plug for AC adapter is not connected or connected improperly.	Turn off the power, then connect the power cord properly.

7.3.4 Motorized Nosepiece

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized nosepiece connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.5 Motorized Condenser Turret

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized condenser turret connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.6 Motorized FL Turret

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized FL turret connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.7 Motorized Excitation Filter Wheel

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized excitation filter wheel connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.8 Motorized Barrier Filter Wheel

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized barrier filter wheel connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.9 Analyzer Block

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized FL turret connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.3.10 Motorized Shutter (Epi-fl Attachment)

Symptom	Cause	Remedy
Cannot be controlled from ergo controller.	Motorized shutter connection cable is not connected or connected improperly.	Connect the cable properly.
	Ergo controller buttons are not configured.	Configure the buttons on the control panel. See Section 4.21, “Operating the Ergo Controller,” in Chapter 4, “Operation of Each Part,” for details.

7.4 Epi-fl and DIC Microscopy

Symptom	Cause	Remedy
Image not visible even though lamp is lit.	Shutter is in the optical path.	Remove shutter from optical path.
	Incorrect filter block is selected.	Select the correct FL block.
	Combination of an excitation filter, an absorption filter, and a dichroic mirror is not appropriate, or one or more of them are missing.	Use filter blocks in the correct combination.
	Light source is improperly centered.	Center the lamp. Center the lamp again while viewing a fluorescent image, especially when using a 100x objective.
Image extremely dark, even though lamp is lit.	ND filter is in the optical path.	Remove ND filter from optical path as necessary.
	Combination of an excitation filter, an absorption filter, and a dichroic mirror is not appropriate for the specimen.	Use a filter-block combination suited to the specimen.
	Halogen lamp is used to observe a dark specimen.	Change the light source to a mercury lamp.
	Specified objective is not used during UV and V excitation.	Use the specified objective.
Illumination light leaking into observation port.	Filter blocks are not positioned properly.	Push filter blocks all the way to the back of the turret and secure them fully.
Poor contrast.	Immersion oil is emitting light by fluorescence.	Use non-fluorescent oil (Nikon immersion oil DF).
	Glass slide is emitting light by fluorescence.	Use non-fluorescent glass slide.
	Room is too bright.	Dim the light in the room.
Poor image quality.	Cover glass is not attached.	Attach the cover glass. (Note that you do not need to attach cover glass if you use an NCG objective.)
	Tip of the immersion objective is not immersed in oil.	Immerse in specified type of oil.
	Specified type of immersion oil is not used.	Use specified type of immersion oil.
	Filter block is not appropriate for the specimen.	Use a filter block suited to the specimen.
Field of view vignetting.	ND filter slider and shutter are not fully pulled out or pushed in.	Push them all the way in or pull them all the way out.
	Filter blocks are not positioned properly.	Push filter blocks all the way to the back of the turret and secure them fully.
	Objective DIC prism is in intermediate position.	Move DIC prism fully into the optical path.
Improper contrast with DIC microscopy.	Correct condenser module is not selected.	Select a condenser module appropriate for the condenser lens. Select a condenser module compatible with the code of the objective.
	Objective DIC prism is not in the optical path.	Move DIC prism fully into the optical path.
	Combination of an objective and objective DIC prism is not correct.	Use a DIC prism suited to the objective.

Symptom	Cause	Remedy
Poor image contrast or quality.	Condenser is not properly oriented.	Check and adjust the crossed Nicols image.
	Correct condenser module is not selected.	Select a condenser module appropriate for the condenser lens. Select a condenser module compatible with the code of the objective.
	Combination of an objective and objective DIC prism is not correct.	Use a prism slider suited to the objective.
	There are air bubbles in section of lens immersed in oil.	Use the Bertrand lens to rotate the nosepiece slightly while observing the focal surface of the objective. If air bubbles move as the nosepiece is rotated, the air bubbles are in the objective. If they remain in the same position, they are in the condenser. In either case, wipe the oil from the lens, and perform oil immersion again.

8 Care and Maintenance

Cleaning Optical Components

Keep the lenses, filters, and other optical components free of dust and fingerprints. Dirty lenses or filters will degrade the image quality. If lenses become dirty, clean them as described below.

- Use a soft brush or gauze to gently dust or brush off dust.
- Use a soft, clean lens tissue (or cotton cloth or gauze) moistened with pure alcohol (ethyl or methyl alcohol), only when removing fingerprints or oil stains.
- Use only petroleum benzine to remove immersion oil from immersion oil objective lenses. When finished, clean with pure alcohol (ethyl or methyl alcohol) for best results. If petroleum benzine is not available, use methyl alcohol. Since alcohol does not remove oil as well as petroleum benzine, you will need to wipe the surface several times (three or four wipes will usually be sufficient).
- Do not use petroleum benzine to clean the entrance lens at the bottom of the eyepiece tube or prism surface of the eyepiece tube.
- Because pure alcohol and petroleum benzine are highly flammable, exercise great caution when handling them and when switching power switches on or off. Do not use near open flames.
- Handle pure alcohol with care, following the instructions provided by the manufacturer.

Cleaning the Microscope Main Body

- We recommend that you use a silicon cloth to clean the microscope or associated units.
- For persistent dirt, dampen a piece of gauze with a small amount of diluted neutral detergent and wipe lightly.
- Using organic solvents could result in discoloration of the plastic parts.

Disinfecting the Microscope

- We recommend that you use 70% medical alcohol for normal disinfection of the microscope or associated units.
- If a specimen is spilled onto the microscope or associated units, determine whether the specimen is hazardous. If the specimen is hazardous, follow your standard laboratory procedures.
- Using organic solvents could result in discoloration of the plastic parts.

Storage

- Store the microscope and its motorized units in a dry place where mold is unlikely to grow.
- Store the objective lenses and eyepieces in a desiccator or similar container with a drying agent.
- Place vinyl covers over the microscope and motorized units to protect them from dust.
- Turn off the power switch on the microscope (set to “O”) and allow the lamp and parts around it to cool before covering with a vinyl cover.

Periodic Inspections (Paid Service)

We recommend that you have your microscope and motorized units inspected on a regular basis (Nikon provides periodic inspections as a fee-based service). Contact your nearest Nikon representative for details.

9 Specifications

9.1 When the Microscope (Ti-U or Ti-U/B) Is Used with TI-HUBC/B Hub Controller B and TI-DH Dia Pillar Illuminator 100W

Combination	Ti-U / Ti-U/B + TI-HUBC/B Hub Controller B + TI-DH Dia Pillar Illuminator 100W + TI-PS100W Power Supply	
Size	298 (W) x 635 (D) × 725 (H) mm	
Weight	28.5 kg	
Optical system	Objective： Eyepiece： Nosepiece：	CFI60 Field number 22 six sockets
Mechanical system	Focusing mechanism: Focus knob:	Stroke: 11 mm Coarse movement: 5.0 mm/revolution Fine movement: 0.1 mm/revolution Fine scale: 1 μm
D-LH/LC precentered lamphouse LC	Input ratings: Lamp ratings: Specified lamp: Average lamp life:	12 VDC and 100 W 12 V and 100 W halogen lamp Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724I) 2000 hours
TI-PS100W Power Supply	Input ratings: Built-in fuse ratings: Output ratings: Max output current: Shock-protection class: Others:	100-240 VAC (±10%), 1.8 A, 50/60 Hz 250V T4A 12 VDC and 100 W 8.4 A Class I UL listed product, GS approved
Operating conditions	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2,000 m maximum Degree 2 Category II
Storage and transport conditions	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)

9.2 When the Microscope (Ti-U or Ti-U/B) Is Used with TI-HUBC/B Hub Controller B and TI-DS Dia Pillar Illuminator 30W

Combination	For countries where the power supply is 100 to 120 VAC: Ti-U / Ti-U/B + TI-HUBC/B Hub Controller B + TI-DS Dia Pillar Illuminator 30W + TE-PS30W Power Supply A For countries where the power supply is 220 to 240 VAC: Ti-U / Ti-U/B + TI-HUBC/B Hub Controller B + TI-DS Dia Pillar Illuminator 30W + TE-PSE30 Power Supply A	
Size	298 (W) x 635 (D) × 615 (H) mm	
Weight	24.5 kg	
Optical system	Objective： Eyepiece： Nosepiece：	CFI60 Field number 22 six sockets
Mechanical system	Focusing mechanism: Focus knob:	Stroke: 11 mm Coarse movement: 5.0 mm/revolution Fine movement: 0.1 mm/revolution Fine scale: 1 μm
TI-DS Dia Pillar Illuminator 30W	Input ratings: Lamp ratings: Specified lamp: Average lamp life:	6 VDC and 30 W 6V 30W halogen lamp Halogen lamp (PHILIPS 5761) 100 hours
TE-PS30W Power Supply A TE-PSE30 Power Supply A	Input ratings: Built-in fuse ratings: Output ratings: Max output current: Shock-protection class: Others:	TE-PS30W： AC 100-120 V (±10%), 50/60 Hz, 0.7 A TE-PSE30： AC 230 V (±10%), 50/60 Hz, 0.3 A 250 V F2AH 6 VDC 30 W 5.0 A Class I TE-PS30W： UL listed product TE-PSE30： GS approved
Operating conditions	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2,000 m maximum Degree 2 Category II
Storage and transport conditions	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)

9.3 When the Microscope (Ti-S or Ti-S/L100) Is Used with TI-HUBC/B Hub Controller B and TI-DH Dia Pillar Illuminator 100W

Combination	Ti-S / Ti-S L100 + TI-HUBC/B Hub Controller B + TI-DH Dia Pillar Illuminator 100W + TI-PS100W Power Supply	
Size	298 (W) x 635 (D) × 725 (H) mm	
Weight	27 kg	
Optical system	Objective： Eyepiece： Nosepiece：	CFI60 Field number 22 six sockets
Mechanical system	Focusing mechanism: Focus knob:	Stroke: 11 mm Coarse movement: 5.0 mm/revolution Fine movement: 0.1 mm/revolution Fine scale: 1 μm
D-LH/LC precentered lamphouse LC	Input ratings: Lamp ratings: Specified lamp: Average lamp life:	12 VDC and 100 W 12 V and 100 W halogen lamp Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724I) 2000 hours
TI-PS100W Power Supply	Input ratings: Built-in fuse ratings: Output ratings: Max output current: Shock-protection class: Others:	100-240 VAC (±10%), 1.8 A, 50/60 Hz 250V T4A 12 VDC and 100 W 8.4 A Class I UL listed product, GS approved
Operating conditions	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2,000 m maximum Degree 2 Category II
Storage and transport conditions	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)

9.4 When the Microscope (Ti-S or Ti-S/L100) Is Used with TI-HUBC/B Hub Controller B and TI-DS Dia Pillar Illuminator 30W

Combination	For countries where the power supply is 100 to 120 VAC: Ti-S / Ti-S L100 + TI-HUBC/B HUB Controller B + TI-DS Dia Pillar Illuminator 30W + TE-PS30W Power Supply A For countries where the power supply is 220 to 240 VAC: Ti-S / Ti-S L100 + TI-HUBC/B HUB Controller B + TI-DS Dia Pillar Illuminator 30W + TE-PSE30 Power Supply A	
Size	298 (W) x 635 (D) × 615 (H) mm	
Weight	22.9 kg	
Optical system	Objective： Eyepiece： Nosepiece：	CFI60 Field number 22 six sockets
Mechanical system	Focusing mechanism: Focus knob:	Stroke: 11 mm Coarse movement: 5.0 mm/revolution Fine movement: 0.1 mm/revolution Fine scale: 1 μm
TI-DS Dia Pillar Illuminator 30W	Input ratings: Lamp ratings: Specified lamp: Average lamp life:	6 VDC and 30 W 6V 30W halogen lamp Halogen lamp (PHILIPS 5761) 100 hours
TE-PS30W Power Supply A TE-PSE30 Power Supply A	Input ratings: Built-in fuse ratings: Output ratings: Max output current: Shock-protection class: Others:	TE-PS30W： AC 100-120 V (±10%), 50/60 Hz, 0.7 A TE-PSE30： AC 230 V (±10%), 50/60 Hz, 0.3 A 250 V F2AH 6 VDC 30 W 5.0 A Class I TE-PS30W： UL listed product TE-PSE30： GS approved
Operating conditions	Temperature: Relative humidity: Altitude: Pollution degree: Installation category: Indoor use only	0 to 40°C * 5 to 40°C when TI-CT-E Motorized Condenser Turret, TI-FLC-E Motorized Epi-fl Filter Turret, or TI-FLC-E/HQ Motorized Epi-fl Filter Turret is used. 85% RH maximum (no condensation) 2,000 m maximum Degree 2 Category II
Storage and transport conditions	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)

9.5 AC adapter (for TI-HUBC/B Hub Controller B)

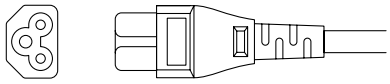
Model name	FSP120-ACB
Manufacturer	FSP Group Inc.
Input voltage rating	100-240 VAC, 2 A, 50-60 Hz
Voltage fluctuation	±10%
Output voltage rating	24 VDC
Output current rating	5 A
Others	UL listed product, GS approved, CE satisfied, PSE approved

9.6 Motorized Stage/Motorized Stage with Encoders

Model name	TI-S-E / TI-S-ER	
Input ratings	100-240 VAC, 2 A, 50/60Hz	
Voltage fluctuation	±10%	
Operating conditions	Temperature: Relative humidity:	0 to 40°C 85% RH maximum (no condensation)
Storage and transport conditions	Temperature: Relative humidity:	-20 to +60°C 90% RH maximum (no condensation)
Others	CE satisfied	

9.7 Power Cord

9.7.1 Power Cord for the AC Adapter

AC inlet and plug appearance	
When used in 100-120 V region, outside Japan	UL listed detachable power cord set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 1.8 m long maximum, rated at 125 VAC minimum)
When used in 220-240 V region	Detachable power cord set approved according to EU/EN standard, 3 conductor grounding (3 conductor grounding Type H05VV-F, 2.5 m long maximum, rated at 250 VAC minimum)
When used inside Japan	PSE approved detachable power cord set, 3 conductor grounding (3 conductor grounding Type VCTF 3x0.75 mm^2, 1.8 m long maximum, rated at 125 VAC minimum)

9.7.2 Power Cord for the Power Supply and the Motorized Stage Controller

AC inlet and plug appearance	
When used in 100-120 V region, outside Japan	UL listed detachable power cord set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 3 m long maximum, rated at 125 VAC minimum)
When used in 220-240 V region	Detachable power cord set approved according to EU/EN standard, 3 conductor grounding (3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 VAC minimum)
When used inside Japan	PSE approved detachable power cord set, 3 conductor grounding (3 conductor grounding Type VCTF 3x0.75 mm^2, 3 m long maximum, rated at 125 VAC minimum)

9.8 Safety Standards Compliance

When Ti-U / Ti-U/B / Ti-S / Ti-S/L100 microscope used with TI-PS100W Power Supply or TE-PS30W Power Supply A	• This is a UL-listed product. • This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate 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 a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. • This product complies with Canadian EMI.（ICES-003 Class A） This Class A digital apparatus complies with Canadian ICES-003. Cet appreil numérique de classe A est conforme à la norme NMB-003 du Canada.
When Ti-U / Ti-U/B / Ti-S / Ti-S/L100 microscope used with TI-PS100W Power Supply or TE-PSE30 Power Supply A	• CE marking • This product meets EU IVD Directive requirements. (GM approved: in vitro diagnostic medical device.) • This product meets EU Low Voltage Directive requirements. • This product meets EU EMC Directive requirements. (EN61326) • This product complies with Australian EMI. (AS/NZS CISPR11)

Note that the microscope will not meet the above standards if used in combination with a motorized XY stage or motorized shutter made by any manufacturer other than Nikon.