Nikon

Motorized Units for ECLIPSE TE2000-E/TE2000-U/TE2000-S

T-HUBC HUB Controller

T-RCP Remote Control Pad

T-A-E Motorized DIC Analyzer

T-ND6-E Sextuple Motorized DIC Nosepiece

T-CT-E Motorized Condenser Turret

T-FLEW-E EX Filter Wheel

T-FLBW-E BA Filter Wheel

T-FLC-E Motorized Cassette Holder

T-FL-E Motorized Epi-Fl Attachment

T-EFN Focus Knob

Instructions

Thank you for purchasing a Nikon product.

This instruction manual is intended for users of the motorized units for the Nikon's inverted microscopes “ECLIPSE TE2000 Series”. To ensure correct use, read this manual carefully before operating any of the units.

- This manual may not be reproduced or transmitted in whole or in part without Nikon's express consent.
- The contents of this manual are subject to change without notice.
- Although every effort has been made to ensure the accuracy of this manual, if you note any points that are unclear or incorrect, please contact your nearest Nikon representative.
- Some of the products described in this manual may not be included in the set you have purchased.
- Be sure to read the instruction manuals for any other products that are to be used in combination with the units.
- Be sure to read “Information you need to know before reading this manual” on P. 6.

Warning/Caution symbols used in this manual

Although Nikon products are designed to provide you with the utmost safety during use, incorrect usage or disregard of the instructions can cause personal injury or property damage and will lead to the forfeiture of all claims against warranty. For your safety, read the instruction manual carefully and thoroughly before using the units. Do not discard this manual; instead, keep it handy for easy reference.
In this manual, safety instructions are indicated with the symbols shown below. Be sure to follow the instructions associated with these symbols to ensure correct and safe operation.

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

Meaning of symbols appearing on the equipment

The symbol appearing on the product indicates the need for caution at all times during use.
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 the 12V100W 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 sample 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.

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 (transmitted) and episcopic (reflected) 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.

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. **Check the AC adapter of the HUB controller.**

   The HUB controller is powered by the AC adapter. Be sure to use the specified adapter model meeting the requirements given below. Use of any other type of adapter can result in malfunction, excessive heating, and/or fire.

   - 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, always turn off the power switch (switch to “O”) of the HUB controller before attaching the AC adapter.
   - Specified AC adapter

Manufacturer:	PHIHONG ENTERPRISE (Taiwan)
Model:	PSA30U-120 (N)
Rated input voltage:	AC 100-240 V, 0.7 A, 50/60 Hz
Voltage fluctuation:	±10%
Rated output voltage:	DC 12 V
Rated output current:	2.5 A
Others:	UL Listed product, GS approved, CE satisfied

4. **Power cords for power supply and AC adapter of HUB controller**

   To prevent electric shock, always turn off the power switch (switch to “O”) for the power supply and HUB controller before attaching or detaching the power cord. Use one of the power cords specified below. Use of an improper 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 ground terminal.

   ● Using units in areas where the supply voltage is 100 to 120 V

     UL Listed detachable power cord set, 3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 V AC minimum.

   ● Using units in areas where the supply voltage is 220 to 240 V

     Approved according to EU/EN standards, 3 conductor grounding Type HO5VV-F, 3 m long maximum, rated at 250 V AC minimum.

5. **Heat from the light source**

   - The lamp and the lamphouse become extremely hot by the lamp illumination. To avoid burns, do not touch the lamphouse while the lamp is lit or for thirty 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 thirty minutes after it has been turned off.
   - The bottom plate of the power supply becomes hot during use. Do not block the ventilation holes on the side of the power supply.

6. **Read the instruction manuals thoroughly.**

   You must connect each of the motorized units for the TE2000 Series to the microscope to enable operation. Be sure to read this manual and the manual supplied with the microscope thoroughly. Follow all instructions, including all warnings and cautions.

   Before using the motorized epi-fl attachment, be sure to read the instruction manual for the attachment thoroughly, as well as the manual for the high-intensity light source. Extreme caution must be exercised, particularly when handling the super-high-pressure mercury lamp.

   Be sure to read the instruction manual for the DIC attachment thoroughly before using this attachment.

7. **Hazardous sample**

   This microscope and associated units are mainly for use in microscopic observation and micromanipulation of living cells and tissue cultures in Petri dishes, microtiter plates, etc. When handling a sample, check to determine whether the sample is hazardous. Handle hazardous samples according to the standard procedure of your laboratory. If the sample is of an infectious nature, wear rubber gloves to avoid infection, and be careful not to spill the sample. In the event of spillage of a sample from a vessel onto the microscope or associated units, decontaminate the contaminated portion according to the standard procedure of your laboratory.

CAUTION

1. **Verify the compatibility of the lamp, dia-illuminator, and power supply.**

   The dia-illuminator and the power supply must be used with compatible lamp ratings (12V100W or 6V30W) and the correct regional supply voltage. Check the instruction manual supplied with your microscope to make sure that your specification combination is correct. Use of an improper specification combination can result in fire, electric shock, and/or malfunction.

   - In this manual, we assume that you will use the following specification combination: T-DH dia-illuminator 100W, TE2-PS100W power supply, LHS-H100P-1 12V100W lamphouse, 12V100W halogen lamp
   - When using the 6V30W halogen lamp, you cannot adjust the lamp voltage (brightness) or turn the lamp on or off from the T-RCP remote control pad or PC. In this case, use the brightness adjustment dial on your microscope or the brightness adjustment dial on the power supply.

2. **Turning off the power during assembly, connection/disconnection of cords, and lamp replacement**

   To prevent electric shock and/or malfunction, always turn off the power switch (switch to “O”) and unplug the power cord from the wall outlet before assembly, before connecting or disconnecting cords, and before replacing the lamp.

3. **Precautions when replacing the lamp**

   - To avoid burns, wait at least 30 minutes after the lamp is turned off to allow time for the lamp 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 connecting or disconnecting the lamphouse.
   - Do not touch the lamp glass with bare hands, as this can leave behind fingerprints and oil that etch the lamp surface, reducing lamp intensity. Remove any fingerprints and stains from the lamp immediately.
   - Securely attach the lamphouse cover after replacing the lamp. Never illuminate the lamp with the lamphouse cover open. Do not break used lamps; instead dispose of them as special industrial waste or according to the laws applicable to your municipal waste system.

4. **Do not allow the microscope or units to become wet.**

   If the microscope or any of the units gets wet, a short circuit may result, causing malfunction or excessive heating. If you accidentally spill liquid on the microscope or on any unit, immediately turn off the power switch (switch to “O”) and unplug the power cord from the wall outlet. Then use a dry cloth to remove the moisture. If liquid enters the microscope or any unit, do not use the microscope; instead, notify your nearest Nikon representative.

5. **Weak electromagnetic waves**

   This microscope and associated units 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 further from the microscope (or the unit).

6. **Precautions in 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 TE2000 Series is a precision optical instrument. Using or storing such units under unsuitable conditions may damage them or adversely affect accuracy. See "Installation locations" on page 5 and ensure that you are using your units in an appropriate environment.
7. **Precautions in moving the microscope**

   When moving the microscope, never attempt to grasp it by the coarse and fine focusing knobs, eyepiece tube, stage, dia-illuminator, or other such parts, as doing so can cause such parts to come off, resulting in injury or malfunction. 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 dia-illuminator (the area between the two mounts at the rear of the microscope).
8. **Be careful of the protruding rack of the T-SR rectangular stage.**

   The rack of the T-SR rectangular stage will protrude when the stage is moved. Avoid contact with the rack when reaching for the focusing knobs or nosepiece to avoid injury form the rack edge.
9. **Motorized parts**

   Some of the TE2000 Series units are electrically operated. To avoid injury, avoid touching any of these parts during operation.

   Motorized parts:

   Motorized nosepiece

   Motorized condenser turret

   Motorized focusing module (TE2000-E)
10. **Disposal of the microscope or associated units**

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

Notes on handling the motorized units for the TE2000 Series

1. **Handle each unit gently.**

   Each of the motorized units is a precision optical instrument. Handle them carefully and do not subject them to strong shocks.

   The precision of the objectives in particular can be adversely affected even by weak shocks.
2. **Dirt on the lens**

   Scratches, dirt, or fingerprints on optical parts (such as the lens and filters) will adversely affect the microscope image. If these parts become dirty, clean them by following the instructions described in the "Care and maintenance" section at the end of this manual.
3. **Dirt on the lamp**

   Do not touch the lamp with your bare hands. Dirt or fingerprints on the lamp will cause uneven illumination and shorten the life of the lamp. When handling the lamp, wear gloves.

4. Installation locations

Using or storing motorized units under unsuitable conditions may damage them or adversely affect accuracy. Observe the following when selecting the installation location.

- Choose a flat surface as free of vibration as possible.
- Choose a location less exposed to hazards in the event of collisions, earthquakes, or other potential disasters. If required to keep the device from falling, use strong rope or other means to secure the microscope to the working desk or to another heavy, stable item.
- Avoid brightly lit locations, such as rooms that receive direct sunlight.
- Choose a location that is free of dust or dirt.
- Do not use any of the motorized units in a warm (60°C or higher) or humid (85% relative humidity or higher) location; otherwise, mold or condensation will form on the lenses and filters.
- Position at an adequate distance from nearby walls, as the lamphouse will become hot when the lamp is illuminated.
- When using the “T-DH dia-illuminator 100W” leave sufficient space between the microscope and the nearest wall to permit the user to see the caution symbols on the dia-illuminator and the lamphouse. If you are planning to use the tilting function of the “T-DH dia-illuminator 100W” (provided, for example, to allow specimen replacement), even more space is required to allow the illuminator to tilt backward.
- Room light directly above the microscope may enter the objective as extraneous light (this is particularly true when using a condenser lens with a longer working distance, such as SLWD, ELWD, and LWD lenses). To prevent this, we recommend that the room light above the microscope be turned off when examining the image.

5. Focusing knobs

- Never turn the focus knobs on the left and right sides of the microscope in opposite directions at the same time, as doing so can damage the microscope.
- Turning the coarse focus knob farther than its travel limit will damage the microscope. Never use undue force to turn the knob.
- (For TE2000-E only) The coarse focus knob turns in sync with motorized Escape/Refocus movements. To prevent malfunctions, avoid contact with the coarse focus knob during motorized Escape/Refocus movements.

6. Protect the ports.

When not using a port, be sure to attach the supplied cap. This keeps extraneous light and dust from entering the microscope.

7. Vibrations caused by operation of motorized units

Motorized units are designed to minimize the vibrations generated during operation. However, these vibrations may adversely affect microscopy, depending on the application.

8. Indication of Z-axis position (TE2000-E)

The Z-axis position appears on the T-RCP remote control pad. However, position accuracy is not guaranteed, as this pad is not a measuring instrument.

Information you need to know before reading this manual

The inverted microscopes TE2000 Series are system microscopes whose parts can be selected as desired, according to your needs. Several types of each part are available, such as three main bodies, two dia-illuminators and four eyepiece tubes. This manual mainly covers the motorized parts.

Keep the following in mind when reading the manual:

1. Not all types of microscope main bodies and non-motorized parts, are covered in the manual (refer to “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.
2. For reasons of space, abbreviations are used in this manual instead of the full model name for each part. Refer to “Parts of the microscope covered in this manual” on the next page for a full names of the abbreviations used.
3. Always attach the T-HUBC HUB Controller to the microscope to control motorized parts.
4. You will need the T-RCP remote control pad or a PC to manipulate motorized parts.

Parts of the microscope covered in this manual

Parts of the microscope covered in this manual

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

	Full name	Abbreviated name
1	TE2000-E	Main body
1-1	TE2000-E	Main body
1-2	T-EFN Focus Knob	T-EFN focus knob
2	T-TD eyepiece tube D	Eyepiece tube D
3	CFI eyepiece	Eyepiece
4	TE2-PS100W power supply	Power supply
5	Power cord	Power cord
6	T-DH dia-illuminator 100W	Dia-illuminator
7	LHS-H100P-1 12V100W lamphouse	Lamphouse
8	12V100W halogen lamp	Lamp
9	System condenser	System condenser
9-1	T-CT-E Motorized Condenser Turret	Motorized condenser turret
9-2	Condenser module	Condenser module
9-3	LWD condenser lens	LWD lens
10	T-SR rectangular stage	Stage
11	T-ND6-E Sextuple Motorized DIC Nosepiece	Motorized nosepiece
12	Objective	Objective
13	T-HUBC HUB Controller	HUB controller
14	T-AC adapter	AC adapter (for HUB controller)
15	Power cord	Power cord
16	T-RCP Remote Control Pad	Remote control pad

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

	Full name	Abbreviated name
17	T-FL-E Motorized Epi-FI Attachment	Epi-fl w/motorized shutter
18	T-FLC-E Motorized Cassette Holder	Motorized cassette holder
19	Filter block	Filter block
19-1	DIA-ILL. Filter block	DIA filter block
19-2	Fluorescence filter block	Fluorescence filter block
20	T-FLZA Epi-FI light source zoom adapter	Light source adapter
21	Super high pressure mercury light source	Epi-fl light source
21-1	Hg lamphouse	Hg lamphouse
21-2	Hg lamp	Hg lamp
21-3	Collector lens	Collector lens
21-4	Super-high-pressure mercury lamp power supply	Hg lamp power supply
22	T-FLEW-E EX Filter Wheel	EX Filter Wheel
23	Excitation filter	Excitation filter
24	T-FLBW-E BA Filter Wheel	BA Filter Wheel
25	Barrier filter	Barrier filter

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

	Full name	Abbreviated name
26	T-P DIC polarizer	Polarizer
27	T-A-E Motorized DIC Analyzer	Motorized analyzer
28	DIC prism for objective	DIC prism for objective

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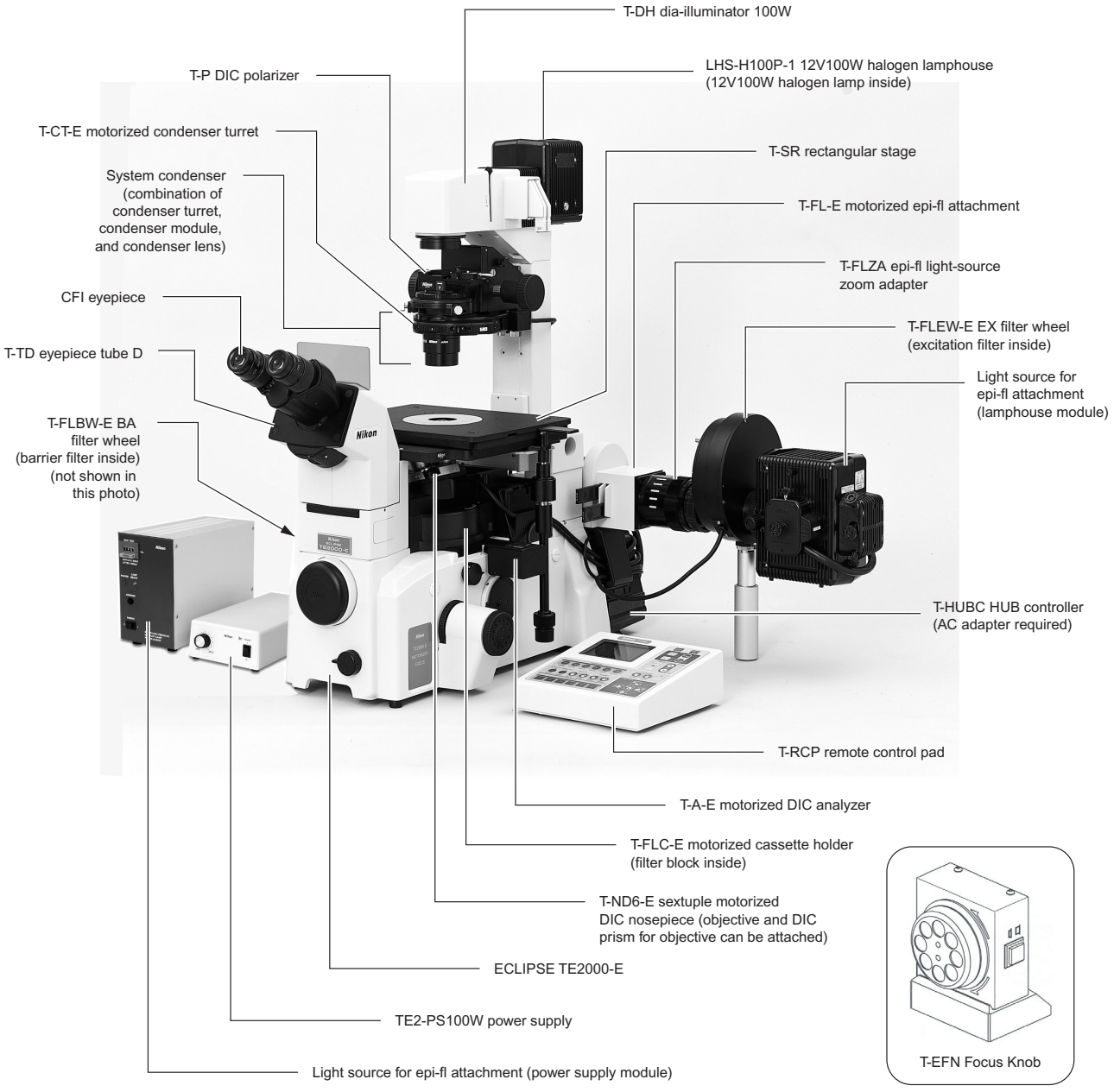
I

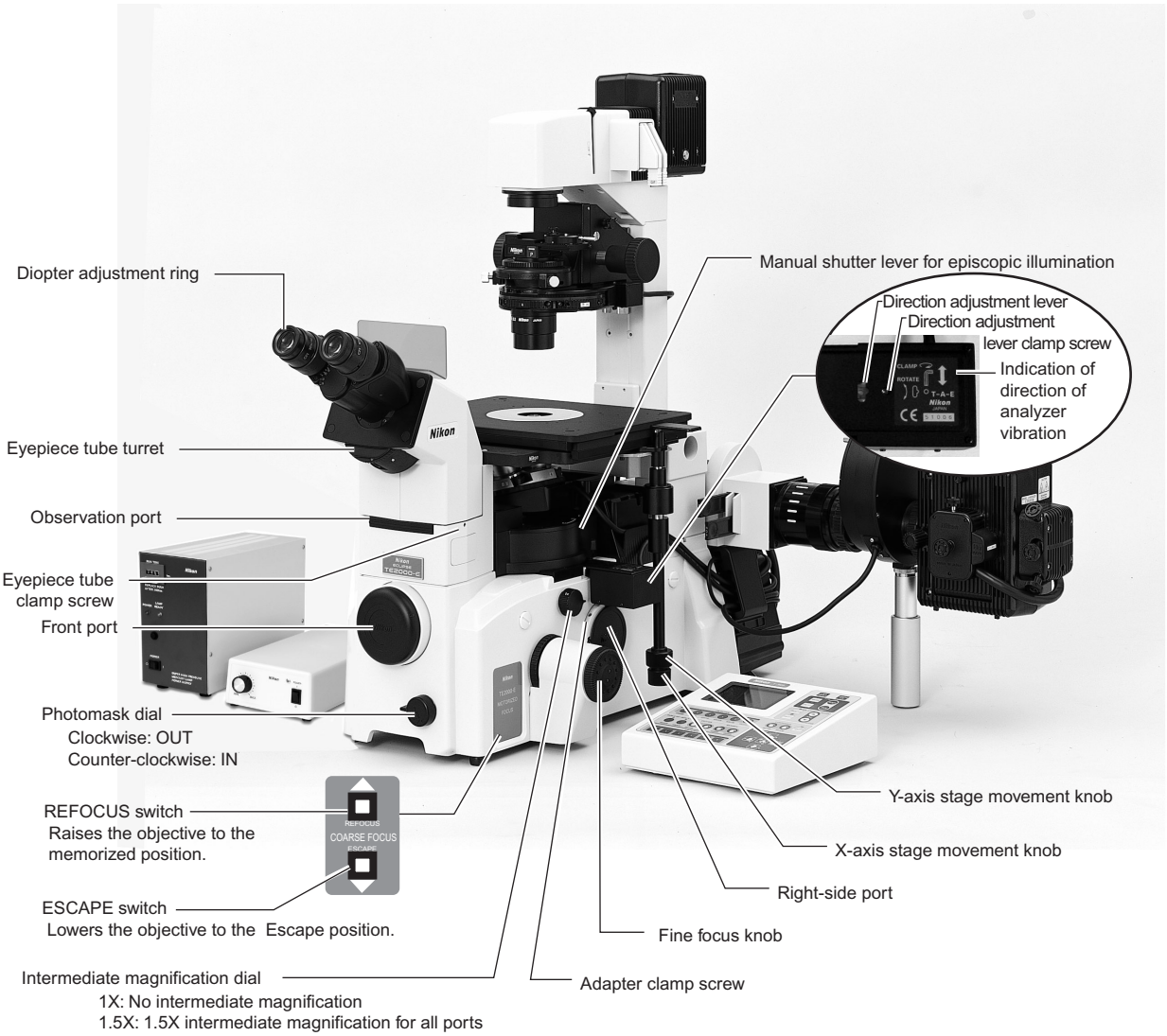
Microscope parts and names

1 Names of parts



2 Names of controls

Right side



Left side

A: Adapter clamp screw

B: Left-side port

C: Optical path switching module locking screw

Remove this screw before use.

D: Coarse focus knob

E: Dia-illumination ON/OFF switch

F: Brightness adjustment dial

This dial is disabled when brightness is adjusted using the remote control pad.

G: Output port

H: Cover locking screw

I: Aperture diaphragm centering screw for episcopic illumination

J: Aperture diaphragm open/close lever for episcopic illumination

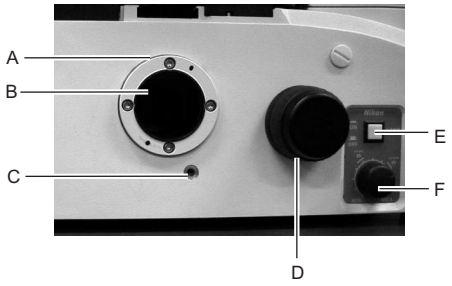
K: Field diaphragm open/close lever for episcopic illumination

L: Field diaphragm centering screw for episcopic illumination

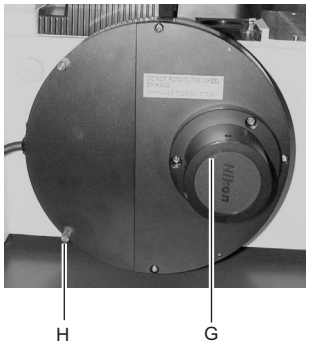
M: Objective

N: DIC prism for objective

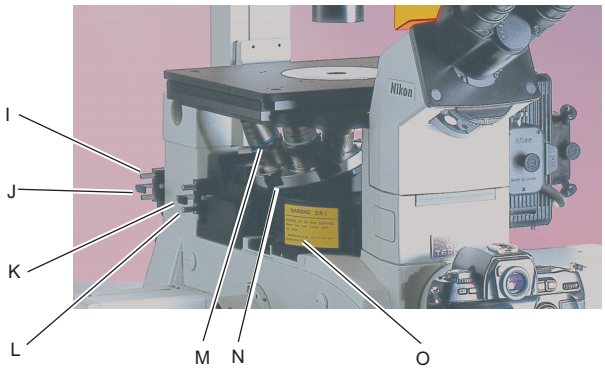
O: Filter block port



No parts attached to the side port



Note: Parts for epi-fl microscopy are attached in this photo.



Rear

A: Mount for epi-fl attachment

B: Mount for HUB controller

C: LAMP CTRL connector (LAMP CTRL)

D: Microscope control connector 1 (MIC CTRL1)

E: Microscope control connector 2 (MIC CTRL2)

Note: Microscope control connectors 1 and 2 are available only with the TE2000-E.

F: NOSEPIECE

Attach the T-ND6-E sextuple motorized DIC nosepiece.

G: ANALYZER

Attach the T-A-E motorized DIC analyzer.

H: EX FILTER

Attach the T-FLEW-E EX filter wheel.

I: FL SHUTER

Attach the T-FL-E motorized epi-fl attachment.

J: CONDENSER

Attach the T-CT-E motorized condenser turret.

K: FL BLOCK

Attach the T-FLC-E motorized cassette holder.

L: BA FILTER

Attach the T-FLBW-E BA filter wheel.

M: AUX

Connect the T-EFN focus knob here.
(The T-EFN focus knob is supplied with the TE2000-E only.)

N: SHUTTER

Refer to “22. Connection of external equipment” in “VI. Assembly.”

O: STAGE

Refer to “22. Connection of external equipment” in “VI. Assembly.”

P: PC

Attach the PC.

Q: EXP

Refer to “22. Connection to the EXP connector” in “VI. Assembly.”

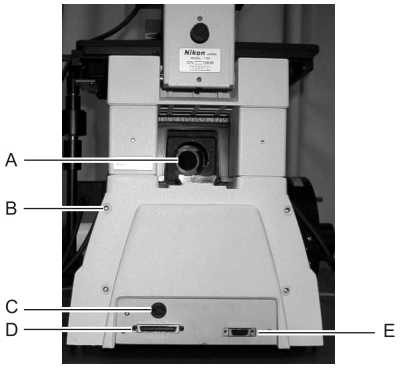
R: TE-PS

Attach the power supply.

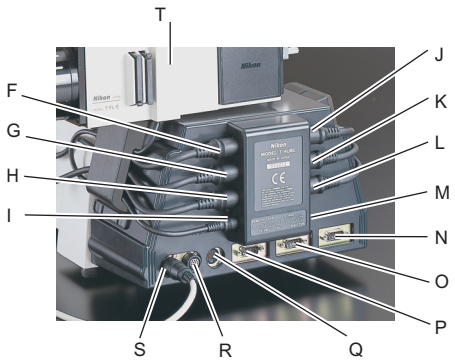
S: REMOTE

Attach the T-RCP remote control pad.

T: T-FL-E motorized epi-fl attachment



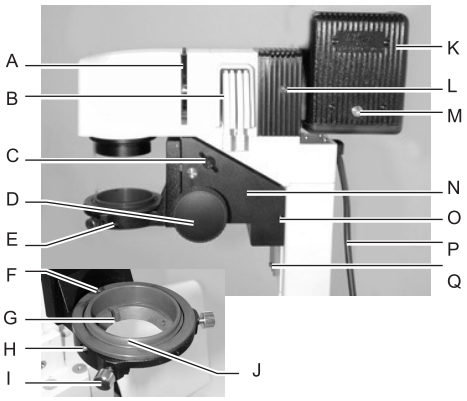
When no equipment is mounted

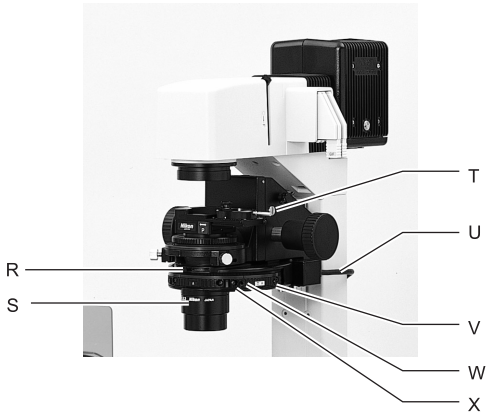


When the HUB controller is mounted

Dia-illuminator

A: Field diaphragm lever
B: Filter sliders
C: Condenser refocusing clamp
(works only when LWD condenser lens is attached)
D: Condenser focus knob
E: Condenser clamp screw
F: Condenser mount positioning pin
G: Condenser mount positioning groove
H: Condenser mount rotation clamp screw
I: Condenser centering screw
J: Condenser mount (rotatable)
K: Lamphouse
L: Lamphouse clamp screw
M: Lamphouse cover clamp screw
N: Condenser holder (removable)
O: Condenser holder clamp screw
P: Lamp cable
Q: Condenser holder securing screw
R: Aperture diaphragm lever
S: Condenser lens
T: Polarizer knob
U: HUB controller connection cable
V: Condenser module
W: Annular diaphragm centering screw
X: Condenser module clamp screw





HUB controller

A: Microscope control cable 1

B: Lamp control cable (HUB1)

C: Microscope control cable 2

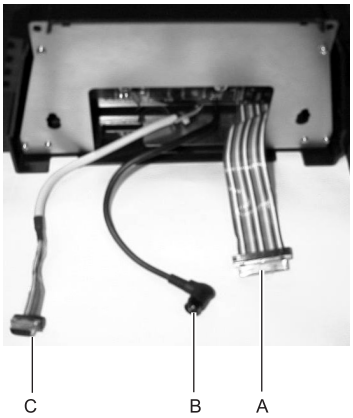
* A and C are used only for connection to the TE2000-E.

Use the supplied lamp control cable (HUB2) to connect the TE-PS connector and the power supply's EXTERNAL connector.

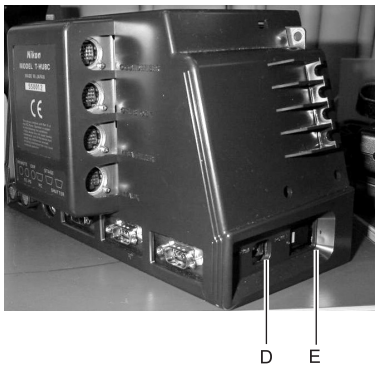
D: DC input connector (DC 12V3A)

E: Power switch (POWER)

Rear



Side

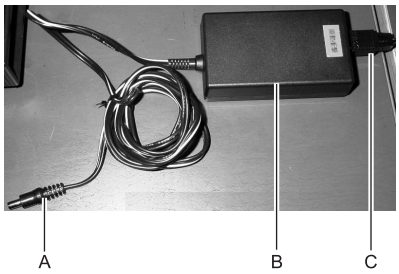


AC adapter for the HUB controller and the power cord (for AC adapter)

A: DC plug

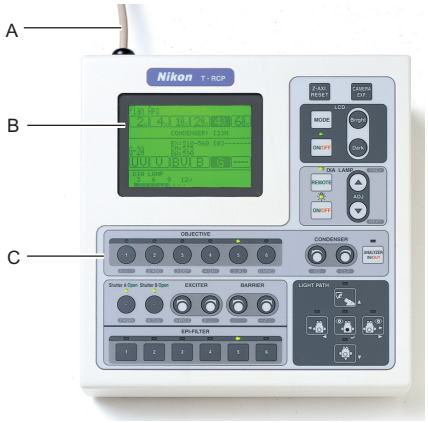
B: AC adapter

C: Power cord (for AC adapter)



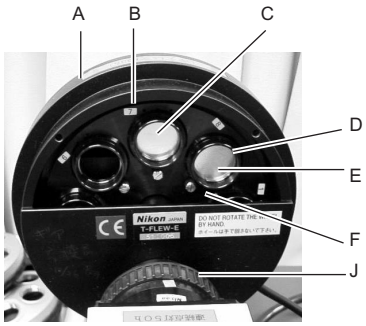
Remote control pad

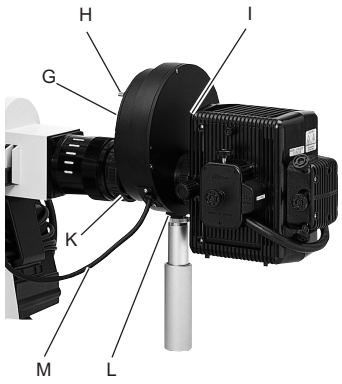
A: Remote control pad power cable
B: Status indicator LCD
C: Key switches and status indicator LEDs



EX filter wheel

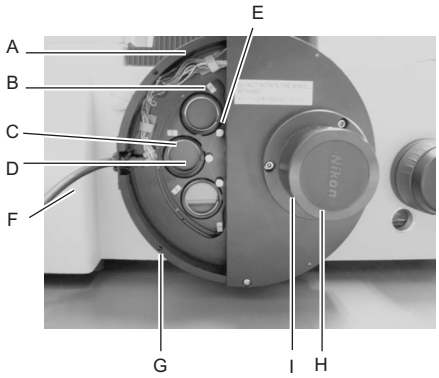
A: Wheel
B: Filter position number
C: Light shielding plate
D: Filter retaining ring
E: Filter receiver
F: Filter receiver locking screw
G: Cover
H: Cover locking screw
I: Lamphouse mount
J: Bayonet ring
K: Mount for epi-fl attachment
L: Mount for supporting rod
M: HUB controller connection cable





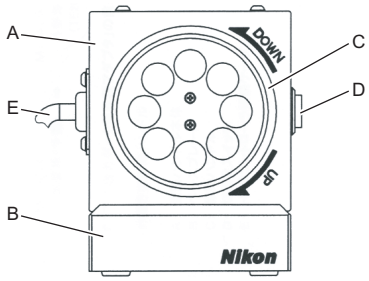
BA filter wheel

A: Wheel
B: Filter position number
C: Filter retaining ring
D: Filter receiver
E: Filter receiver locking screw
F: HUB controller connection cable
G: Cover locking screw
H: Output port
I: Adapter clamp screw



T-EFN Focus Knob

A: T-EFN focus knob main unit
B: Base plate
C: Focus knob
D: Selector switch
E: HUB controller connection cable



Adapters for the output port

T-BPA photo adapter

Allows mounting of equipment such as microphotography attachments.

Various TV adapters

Power supply

WARNING

The bottom of the power supply becomes hot while in use. Do not block the air vents on the sides of the power supply.

A: Brightness adjustment dial

This dial adjusts the lamp brightness when the EXTERNAL switch is off.

B: Pilot lamp

C: Power switch

Flip the switch to "|" to turn on the power. At this time, the pilot lamp lights.

Flip this switch to "O" to turn off the power.

D: AC input connector

Connect the power cord specified in the "Electrical Specifications."

E: EXTERNAL switch

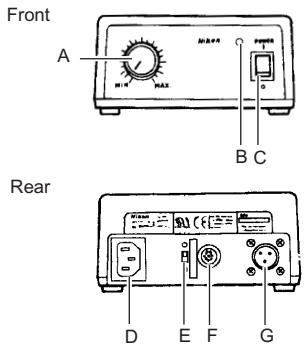
Turning this switch ON disables the brightness adjustment dial on the power supply. The controls on the left side of the microscope, the remote control pad, or the PC can then be used to adjust the brightness and to turn the illumination on or off.

F: EXTERNAL connector

Connect the lamp control cable (HUB2) supplied with the HUB controller between this connector and the TE-PS connector on the rear of the HUB controller.

G: OUTPUT connector

This connector is provided for lamp output. Connect the lamp cable from the dia-illuminator to this connector.



■ Connector Pin Assignments

OUTPUT connector
(Sanwa Electric: SNS-1603-RSFb)

Pin 1: Output+

Pin 2: Output-

Pin 3: Unused

EXTERNAL connector
(Hirose Electric: HR12-10R-8SC)

Pin 1: Brightness adjustment dial (10 kΩ): Input

Pin 2: Brightness adjustment dial (10 kΩ): Input

Pin 3: Lamp ON/OFF input
(Open: ON, 0 V: OFF)

Pin 4: 0 V

Pin 5: Control voltage input for brightness adjustment: Input

Pin 6: External control: Output
(Open: control disabled, 0 V: control enabled)

Pin 7: 0 V

Pin 8: Output monitor: Output

II

Setup before starting microscopy

Before starting microscopy, you need to make the appropriate connections between units and to program the remote control pad with the necessary information. Shown below are the steps you must follow to proceed with the setup before beginning microscopy.

- Follow all of these steps when using the remote control pad for the first time.
- For more information on each task, see the corresponding section in the instruction manual for the remote control pad.
- If your microscope is not yet assembled, see “VI. Assembly” first.
- If you use the PC instead of the remote control pad to control the microscope, see “V. Online and remote operation.”

1 Make connections and set up units.

1-1 Connect motorized units to the HUB controller.

1-2 Turn on the EXTERNAL switch on the dia-illumination lamp power supply.

1-3 Select the N.C. mode on the Uniblitz shutter controller.

(* This step is necessary only if you are using the Uniblitz shutter controller.)

⇩

2 Program the remote control pad with information on the connected unit.

2-1 Specify objective information.

2-2 Specify condenser module information.

2-3 Specify filter block information.

2-4 Specify excitation filter information.

2-5 Specify barrier filter information.

Do not skip these steps.

⇩

3 Set Uniblitz shutter controller connection.

(* This step is necessary only if you are using the Uniblitz shutter controller.)

⇩

4 Assign the shutter to be used to the shutter key of the remote control pad.

(* This step is necessary only if you use the T-FL-E motorized epi-fl attachment or the Uniblitz shutter controller.)

⇩

5 **Assign the motorized unit to be used to the foot switch.**

(* This step is necessary only if you use the foot switch.)

⇩

6 **Program the remote control pad to display the Z-axis position.**

III

Microscopy

Motorized units for the TE2000 Series are designed to ensure easier operation when the remote control pad is programmed with various information. When using the remote control pad for the first time, be sure to refer to “II. Setup before starting microscopy” and program the pad with the TE2000 status and connected unit information before beginning microscopy.

This chapter describes the procedure for each of the following microscopy methods:

1 Bright-field (BF) microscopy

2 Phase contrast (Ph) microscopy

3 Differential interference contrast (DIC) microscopy

4 Epi-fl microscopy

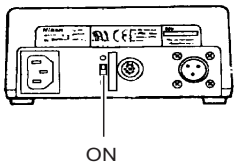
5 Photomicrography

- See “IV. Operation of each part” for information on how to operate specific parts of the microscope.
- If your microscope is not yet assembled, see “VI. Assembly” first.
- See the instruction manual for the epi-fl attachment and the DIC attachment when either of these attachments is mounted to the microscope.
- See the instruction manual for the remote control pad regarding data to program the pad.
- See “V. Online and remote operation” and “22. Connection of external equipment” in “VI. Assembly” if you wish to use the HUB controller to manipulate an XY stage or motorized shutter attachment from a manufacturer other than Nikon.
- Be sure to read the instructions provided under “! WARNING”, “! CAUTION” and “Notes on handling the motorized units for the TE2000 Series” before using the TE2000. Follow all instructions.
- Also be sure to carefully read the instruction manual for the attachments (e.g., epi-fl attachment, DIC attachment) you intend to use with the TE2000 and follow the precautions given in the manual.

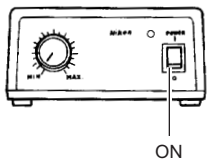
1 Bright-field (BF) microscopy

1 Turn on the power.

1-1 Set the EXTERNAL switch at the rear of the power supply to “ON.”

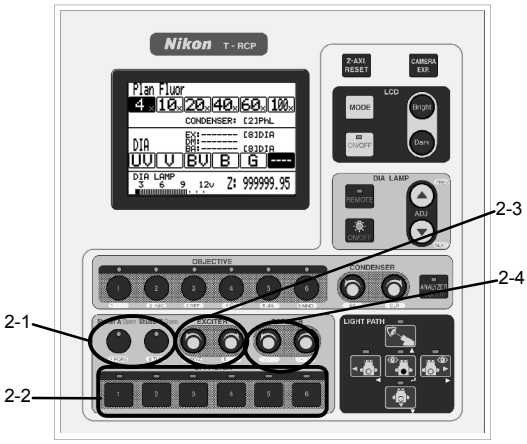


1-2 Flip the power switch at the front of the power supply to “|” to turn on the power.
The pilot lamp lights to indicate that power is on.



1-3 Flip the power switch of the HUB controller to “|” to turn on the power.

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



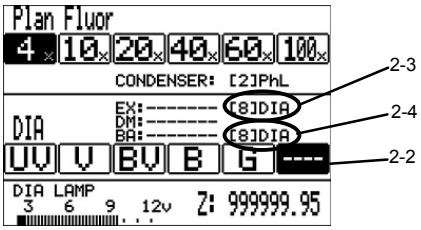
2-1 To interrupt the optical path for episcopic illumination, press the Shutter A or B key to select “CLOSE.” The LED lights orange when “CLOSE” is selected.

2-2 Remove the fluorescence filter block from the optical path.
To do this, press the EPI-FILTER key so that “---” is highlighted on the LCD.

2-3 Remove the excitation filter from the optical path.
To do this, press one of the EXCITER keys so that “DIA” appears on the LCD.

2-4 Remove the barrier filter from the optical path.
To do this, press one of the BARRIER keys so that “DIA” appears on the LCD.

[On-screen information on the LCD]



■Supplementary information

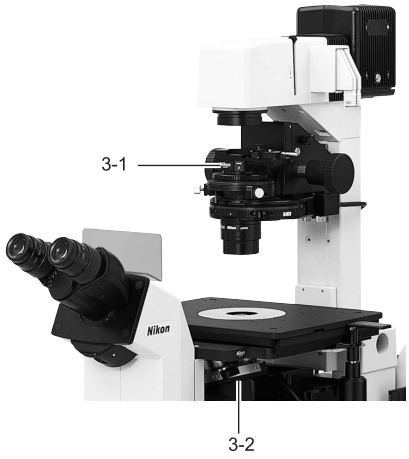
- To open or close the shutters with the Shutter keys, you need to assign the shutters to be operated by the Shutter A and B keys in advance. For more information, see “1.4. Setting Shutter Key Function” in the remote control pad instruction manual.
- To control a motorized shutter made by a manufacturer other than Nikon, see “22. Connection of external equipment” in “VI. Assembly.”
- Be sure to leave the cassette holder's manual shutter open when using the motorized epi-fl attachment.

III

3 Remove the DIC parts from the optical path.

3-1 Remove the polarizer from the optical path.

3-2 Remove the DIC prism for the objective from the optical path.



3-3 Remove the analyzer from the optical path.
To do this, press the ANALYZER IN/OUT key to select “OUT.” The LED lights orange when “OUT” is selected.

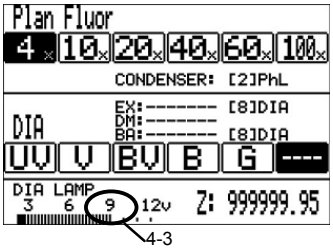
4 Set the dia-illumination brightness at 9 V.

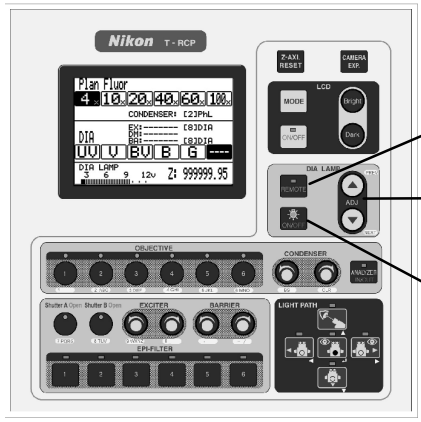
4-1 To allow brightness adjustment with the remote control pad, press the DIA LAMP REMOTE key to select “CTRL ON.” The LED lights green when “CTRL ON” is selected.

4-2 Light the dia-illumination lamp.
To do this, press the DIA LAMP ON/OFF key to select “LAMP ON.” The LED lights green when “LAMP ON” is selected.

4-3 Adjust the dia-illumination brightness.
To do this, use the DIA LAMP ADJ. keys to set the DIA LAMP reading on the LCD to “9” (9 V).

[On-screen information on the LCD]

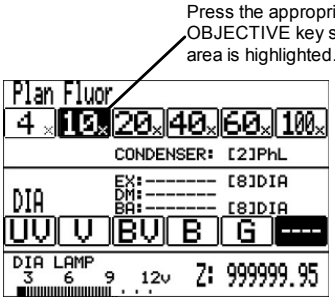


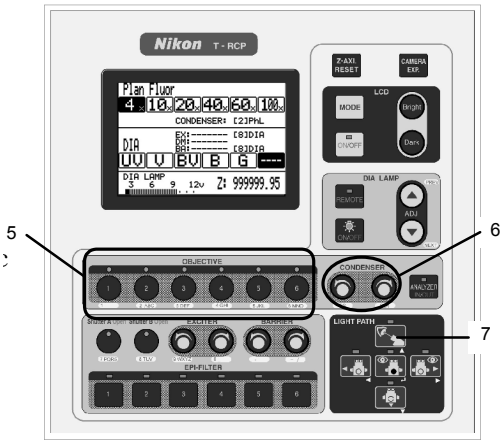


5 Select the 10x objective.

To do this, press the appropriate OBJECTIVE key to select “10x”. “10x” is highlighted on the LCD when selected.

[On-screen information on the LCD]

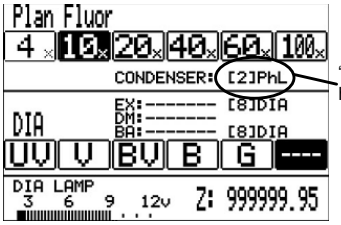




6 Select condenser module A. (Module A is provided for bright-field microscopy.)

To do this, press one of the CONDENSER keys to switch between modules. “BF” appears to the right of “CONDENSER” on the LCD when module A is selected.

[On-screen information on the LCD]



7 Select “Observation 100%”on the optical-path switching module.

To do this, press the Observation 100% key (one of the LIGHT PATH keys) so that the LED above this key lights.

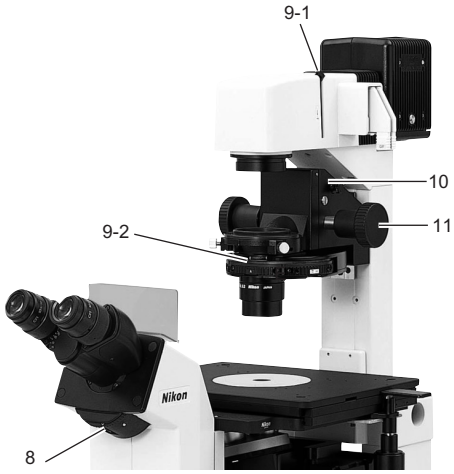
III

8 Turn the eyepiece tube turret to position “O.”

9 Fully open the field diaphragm and the aperture diaphragm for dia-illumination.

9-1 Fully open the field diaphragm.

9-2 Fully open the aperture diaphragm.



10 Release the condenser refocusing clamp.

11 Raise the condenser mount as far as it will go.

12 Select “1x” as the intermediate magnification.

13 Adjust the diopter.

To do this, follow the steps given below.

13-1 Bring the photomask into the optical path.

13-2 Look into the left eyepiece with your left eye. Turn the left diopter adjustment ring to bring the double crosshairs into focus.

13-3 Look into the right eyepiece with your right eye. Turn the right diopter adjustment ring to bring the double crosshairs into focus.

13-4 Remove the photomask from the optical path.

14 Widen or narrow the distance between the eyepieces.

15 Place a specimen on the stage and bring it into focus.

Use the coarse and fine focus knobs or the T-EFN focus knob to bring the specimen into sharp focus.

16 Center the condenser.

To do this, follow the steps below.

16-1 Select the 10x objective.
To do this, press the appropriate OBJECTIVE key so that “10x” is highlighted on the LCD.

16-2 Lower the field diaphragm lever until the field diaphragm image appears in the field of view.

16-3 Use the condenser focus knob to raise or lower the condenser mount so that the field diaphragm image comes into focus.

16-4 Use the condenser centering screws to move the field diaphragm image to the center of the field of view.

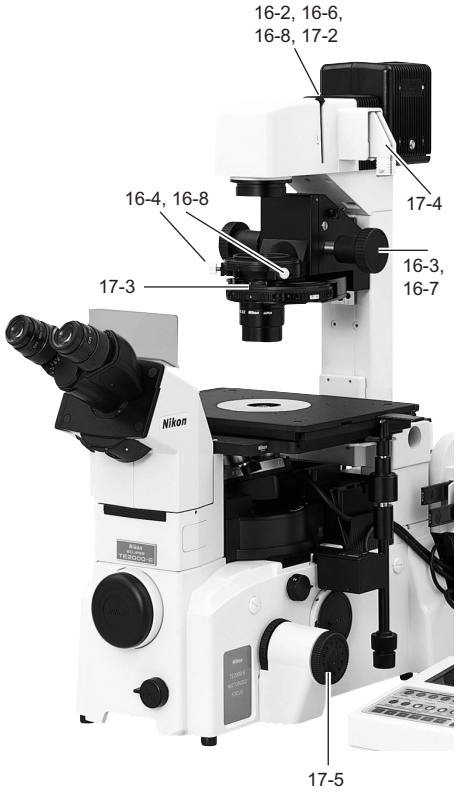
16-5 Select the 40x objective.
To do this, press the appropriate OBJECTIVE key so that “40x” is highlighted on the LCD.

16-6 Use the field diaphragm lever to adjust the size of the field diaphragm so that its image is nearly the same size as the field of view.

16-7 Raise or lower the condenser mount to bring the field diaphragm image into focus.

16-8 Move the field diaphragm image to the center of the field of view.

16-9 Select the 10x objective again.
To do this, press the appropriate OBJECTIVE key so that “10x” is highlighted on the LCD.



17 Perform observations using an objective with a different magnification value.

To do this, follow the steps given below.

17-1 Select a different objective (of the desired magnification) and move it into the optical path.
To do this, press the appropriate OBJECTIVE key and check that the desired magnification is highlighted on the LCD.

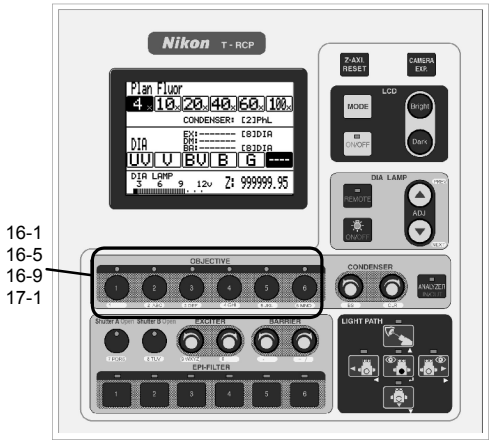
17-2 Adjust the field diaphragm image so that it is nearly the same size as the field of view.

17-3 Make sure that the aperture diaphragm is 70 to 80% of the N.A.(Numerical Aperture) of the objective.

17-4 Adjust the brightness.
To do this, move, ND filters in or out of the optical path until the desired brightness is obtained. If precise color fidelity is not necessary, use the DIA LAMP ADJ. key to make this adjustment.

■Supplementary information
The color cast changes if you use the brightness adjustment dials, the remote control pad, or PC commands to adjust the brightness. If color reproducibility is of prime importance (as in color photography), be sure to use the ND filters to adjust the brightness.

17-5 Bring the specimen image into focus.



III

18 Replace the specimen.

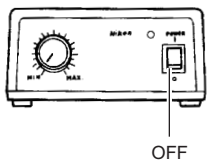
■Supplementary information
The tilting of the pillar, the REFOCUS/ESCAPE switches, and the condenser refocusing clamp are particularly useful with larger specimens.

19 When you are finished with microscopy

When you are finished, turn off the power. To do this, follow the steps given below.

19-1 Flip the power switch of the HUB controller to “O” to turn off the power.

19-2 Flip the power switch of the power supply to “O” to turn off the power.



19-3 Wait until the power supply and the lamphouse cool sufficiently, and then place the vinyl cover on the TE2000.

2 Phase contrast (Ph) microscopy

1 Bring the specimen into focus through bright-field microscopy.

To do this, follow steps 1 through 18 given in “1. Bright-field (BF) microscopy.”

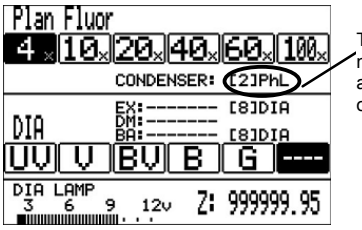
2 Move a Ph objective into the optical path.

To do this, press the desired OBJECTIVE key. Check the Ph code shown on the barrel of the objective.

3 Select the condenser module with the same Ph code as that on the objective and move it into the optical path.

To do this, press one of the CONDENSER keys so that the same code appears to the right of “CONDENSER” on the LCD as on the objective.

[On-screen information on the LCD]



This code must match the code appearing on the objective.

III

4 Fully open the field diaphragm and the aperture diaphragm for dia-illumination.

4-1 Fully open the field diaphragm.

4-2 Fully open the aperture diaphragm.

5 Center the annular diaphragm.

To do this, follow the steps given below.

5-1 Turn the eyepiece tube turret to position “B.”

5-2 Use the Bertrand lens focusing screw of the turret to bring the annular diaphragm image into focus.

5-3 Use a hexagonal screwdriver to turn two annular diaphragm-centering screws on the condenser module so that the annular diaphragm image coincides with the phase plate image.

5-4 Turn the eyepiece tube turret to position “O.”

6 Place a specimen on the stage for observation.

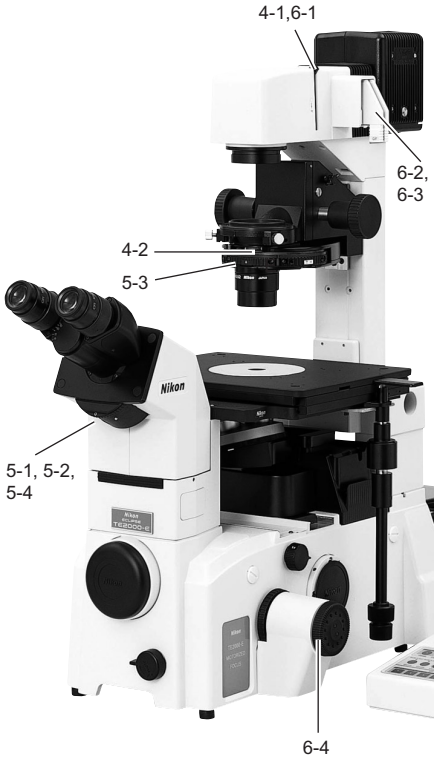
6-1 Adjust the field diaphragm image so that it is nearly the same size as the field of view.

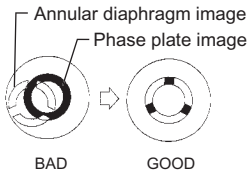
6-2 To improve contrast, move the GIF filter into the optical path in place of the NCB11 filter.

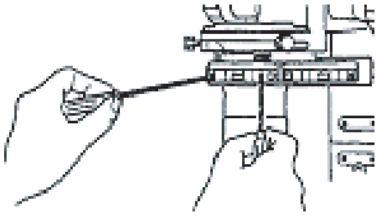
6-3 Adjust the brightness.
To do this, move ND filters in or out of the optical path until the desired brightness is obtained. If precise color fidelity is not necessary, use the DIA LAMP ADJ. key to make adjustments.

■Supplementary information
The color cast changes if you use the brightness adjustment dials, the remote control pad, or PC commands to adjust the brightness. If precise color fidelity is required (as in color photography), use the ND filters to adjust brightness.

6-4 Bring the specimen image into focus.







7 Performing observations using an objective with a different magnification value

To do this, follow the steps given below.

7-1 Select a different Ph objective (of the desired magnification) and move it into the optical path.
To do this, press the appropriate OBJECTIVE key.

7-2 Select the condenser module with the same Ph code as that of the objective and move it into the optical path.
To do this, press one of the CONDENSER keys so that the same Ph code appears to the right of "CONDENSER" on the LCD as on the objective.

7-3 Center the annular diaphragm. (See step 5.)

7-4 Check that the aperture diaphragm is fully open.

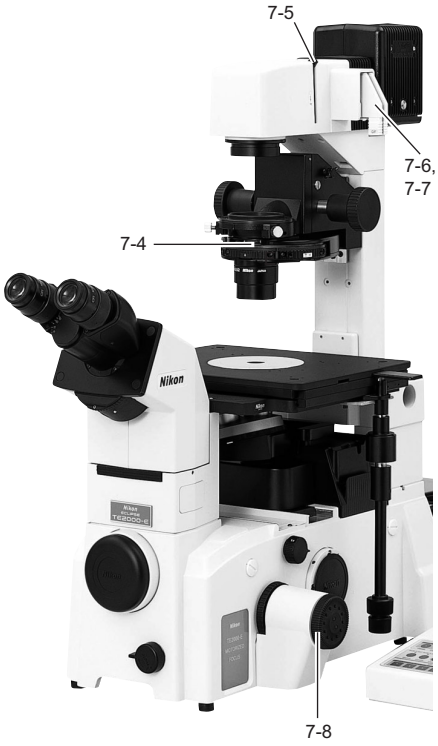
7-5 Adjust the field diaphragm image so that it is nearly the same size as the field of view.

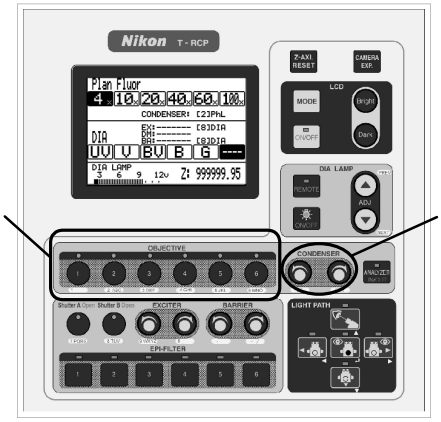
7-6 To improve contrast, bring the GIF filter into the optical path in place of the NCB11 filter.

7-7 Adjust the brightness.
To do this, move ND filters in or out of the optical path until the desired brightness is obtained. If precise color fidelity is not critical, use the DIA LAMP ADJ. key to make this adjustment.

■Supplementary information
The color cast changes if you use the brightness adjustment dials, the remote control pad, or PC commands to adjust the brightness. If precise color fidelity is required (as in color photography), use ND filters to adjust the brightness.

7-8 Bring the field diaphragm image into focus.





8 Replace the specimen.

■Supplementary information
The tilting of the pillar, the REFOCUS/ESCAPE switches, and the condenser refocusing clamp are particularly useful with larger specimens.

9 When you are finished with microscopy

Follow step 20 in "1. Bright-field (BF) microscopy."

III

3 Differential interference contrast (DIC) microscopy

See “II. Microscopy” in the instruction manual for the DIC attachment for information on DIC microscopy.

Follow the steps given below when you wish to use the remote control pad to switch between objectives and condenser modules, or to move the analyzer in and out of the optical path during DIC microscopy.

Switching between objectives

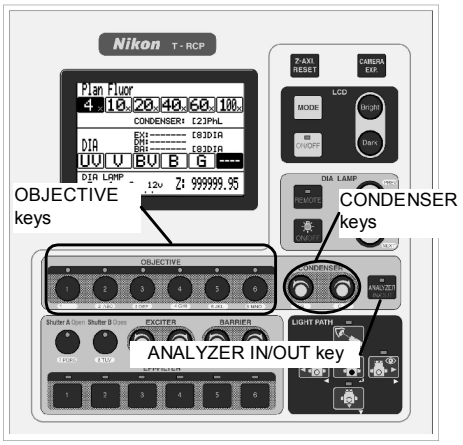
To do this, press the appropriate OBJECTIVE key to move the objective with the desired magnification into the optical path.

Switching between condenser modules

To do this, press one of the CONDENSER keys to bring the appropriate condenser module (i.e., with the same DIC code as that of the objective) into the optical path.

Move the analyzer in and out of the optical path.

To do this, press the ANALYZER IN/OUT key. The LED lights green and orange (respectively) when “IN” and “OUT” are selected.



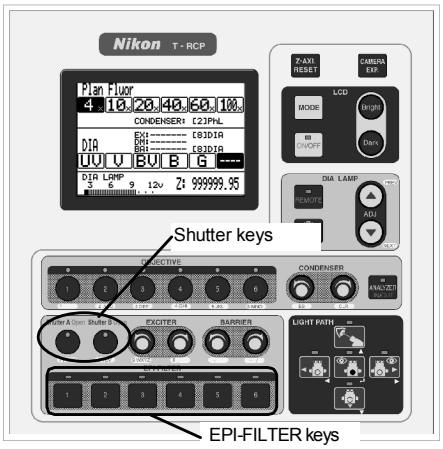
4 Epi-fl microscopy

See “III. Microscopy” in the epi-fl attachment instruction manual for information on epi-fl microscopy.

Follow the steps given below when you wish to use the remote control pad to open or close the motorized shutter and to switch between filter blocks during epi-fl microscopy.

Opening or closing the motorized shutter

To do this, press one of the Shutter keys.
The LED lights green and orange (respectively) when the shutter is open and closed.



■Supplementary information

- To open or close the shutters with the Shutter keys, you need to assign the shutters to be operated to the Shutter A and B keys in advance. For more information, see “1.4. Setting Shutter Key Function” in the instruction manual for the remote control pad.
- Be sure to leave the cassette holder's manual shutter open when using the motorized epi-fl attachment.
- To control a motorized shutter attachment made by a manufacturer other than Nikon, see “22. Connection of external equipment” in “VI. Assembly.”

Switching between filter blocks

To do this, press the appropriate EPI-FILTER key to move the filter block suitable for the target excitation method into the optical path.

III

5 Photomicrography

This section describes the procedure for taking pictures using daylight-type color film loaded in a single-lens reflex camera attached to the front port of the microscope. See the camera instruction manual for instructions on using the camera. Make sure that the camera is loaded with film. See “20. Photomicrography” in “IV. Operation of each part” for more information on photomicrography.

1 Bring the specimen into focus through bright-field microscopy.

To do this, follow steps 1 through 18 in “1. Bright-field (BF) microscopy.”

2 Attach the camera and turn on the power to the camera.

3 Make the necessary settings on the camera.

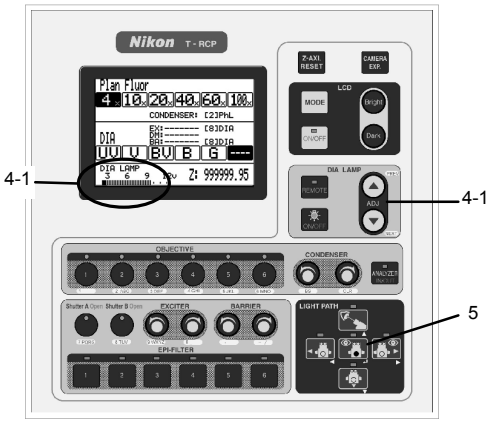
To do this, first select “Aperture-priority auto mode” as the exposure mode.

Then select “+2/3” for exposure compensation. (Keep in mind that this value applies only when a 35-mm SLR camera is attached to the front port.)

4 Adjust the brightness for optimal color reproduction.

4-1 First, adjust the dia-illumination brightness.
To do this, use the DIA LAMP ADJ. keys to set the DIA LAMP reading on the LCD to “9” (9 V).

4-2 Move the NCB11 filter into the optical path.

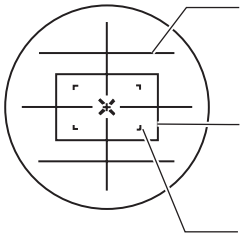


5 Point the optical path toward the camera.

To do this, press the LIGHT PATH key.

6 Bring the photomask into the optical path.

7 Move the target area into the photoframe.



When a digital camera is attached to the front port via a T-BFA F-mount adapter (1X)

When a 35-mm single-lens reflex camera is attached to the front port via a T-BSLR SLR adapter (2.5X)

When a digital camera is attached to the front port via a T-BDCA direct C-mount adapter (2.5X)

8 Close the field diaphragm for dia-illumination until it is only slightly larger than the photoframe.

9 Bring both photoframe and specimen into focus.

■Supplementary information

If you use an objective of low magnification, turn the eyepiece tube turret to position “M.” This will make it easier to achieve proper focus. Be careful to avoid touching the diopter adjustment rings.

10 Move the aperture diaphragm for dia-illumination to adjust the contrast, depth of field, and resolution.

11 Check the camera exposure time.

Longer than “1/8s” → Acceptable

“1/8s” or shorter → Bring the ND filter into the optical path to ensure that the exposure time is longer than “1/8s.”

■Supplementary information

Color reproduction is not critical for microphotography using monochrome film. Therefore, you can use the brightness adjustment dials, the remote control pad, or PC commands to reduce brightness.

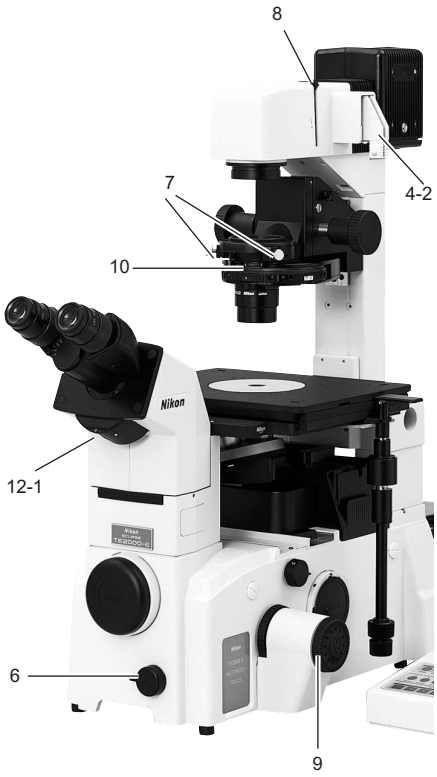
12 Keep extraneous light from entering the eyepieces.

To do this, follow the steps given below.

12-1 Turn the eyepiece tube turret to position “C.”

12-2 Cover the camera finder.

13 Release the shutter (make an exposure).



III

IV

Operation of each part

This chapter describes how to operate the TE2000 Series motorized units.

- See “III. Microscopy” for instructions on performing microscopy.
- If your microscope is not yet assembled, see “VI. Assembly” first.
- See the instruction manual of the epi-fl attachment or the DIC attachment when either of these attachments is mounted to the microscope.
- See the instruction manual supplied with the microscope for information on target units not described in this chapter.

WARNING

Be sure to read and observe the instructions provided under “! WARNING,” “! CAUTION,” and “Notes on handling the motorized units for the TE2000 Series” before using any of the motorized units.

Also be sure to carefully read the instruction manual for the attachment you intend to use in combination with the TE2000 (the epi-fl attachment or DIC attachment, for example). Observe the precautions given in the manual.

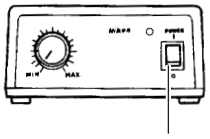
1 Power ON/OFF

Turn the power supply on or off.

The power switch is located on the front of the power supply.

Flip the power switch to "|" to turn on the power. The pilot lamp lights when the power is on.

Flip the switch to "O" to turn off the power. The pilot lamp goes out when the power is off.



Power switch

CAUTION

Check the specification combination for the lamp, dia-illuminator, and power supply.

The dia-illuminator and the power supply must be used in the correct combination of specifications with respect to the lamp ratings (12 V, 100 W or 6 V, 30 W) and the regional supply voltage. Check the instruction manual supplied with your microscope to make sure that your specification combination is correct. Use of an improper combination may result in fire, electric shock, and/or malfunction.

- In this manual, we assume that you are using the following specification combination:
  T-DH dia-illuminator 100W, TE2-PS100W power supply, LHS-H100P-1 12V100W lamphouse, 12V100W halogen lamp
- When using the 6V 30W halogen lamp, you cannot adjust the lamp voltage (brightness) from the T-RCP remote control pad or from the PC. Use the brightness adjustment dial on your microscope or the brightness adjustment dial on the power supply.

IV

Turn the HUB controller on or off.

The power switch is located on the side of the HUB controller.

Flip the power switch to "|" to turn on the power. This illuminates the power switch when the power is on.

Flip the switch to "O" to turn off the power. The power switch goes out when the power is off.

Power switch

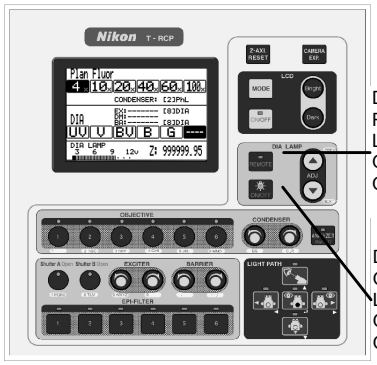
2 Lamp ON/OFF

Use the DIA LAMP REMOTE key (one of the keys on the remote control pad) to select “ON.” When “ON” is selected, you can use the DIA LAMP ON/OFF key (one of the keys on the remote control pad) to turn the 12V100W lamp on or off.

LED status:

ON: Green

OFF: Orange



- When the DIA LAMP REMOTE key lights green, you can use the remote control pad to turn the lamp on or off.
- If the DIA LAMP REMOTE key lights orange, you can use the dia-illumination ON/OFF switch, located on the microscope base, to turn the lamp on or off.
- Keep in mind that you cannot use the remote control pad or PC commands to turn the 6V30W lamp on or off.

3 Brightness adjustment

You can use ND filters (dimming filters), brightness adjustment dials, the remote control pad, or PC commands to adjust brightness.

■Supplementary information

See the microscope instruction manual for instructions on how to use the brightness adjustment dials (one on the front of the power supply and the other on the left side of the microscope base).

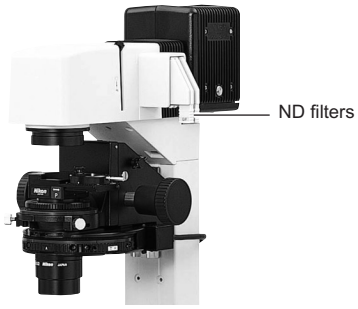
Adjustment with ND filters

Filters that reduce the amount of light passed are called ND filters. Higher filter numbers indicate filters that pass progressively less light, producing darker images.

ND filters are used for brightness adjustment when color fidelity is critical (as in photography using daylight-type color film) because they do not alter the color cast.

ND2: Light quantity reduced to 1/2

ND16: Light quantity reduced to 1/16



Attach the ND filters to the filter slider on the dia-illuminator.

Adjustment by varying the lamp voltage

Two brightness adjustment dials are available--one on the front of the power supply and the other on the left side of the microscope base. Additionally, a DIA LAMP ADJ. key is provided on the remote control pad. Turn one of these dials or press the key to change the voltage supplied to the lamp, thus changing the lamp brightness and color cast.

Higher voltages result in brighter illumination with a blue cast, while lower voltages produce less illumination with a red cast.

Normally, select a voltage level between 6 and 12 V.

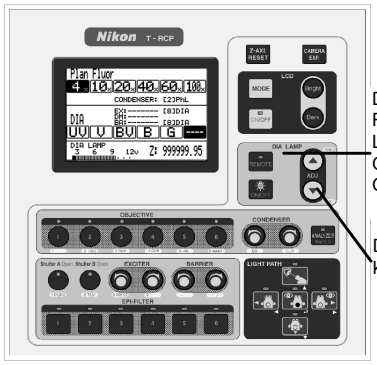
Remember that you cannot use the two adjustment dials (on the front of the power supply and on the left side of the microscope base) and the DIA LAMP ADJ. key (on the remote control pad) at the same time.

You must use the EXTERNAL switch at the rear of the power supply or the DIA LAMP REMOTE key on the remote control pad to select which of these controls is to be enabled.

When you set the EXTERNAL switch to “ON,” the brightness adjustment dial on the power supply is disabled. In this case, you can use the dial on the side of the microscope, the DIA LAMP ADJ. key on the remote control pad, or PC commands to adjust the lamp brightness.

■Supplementary information

You will find that the brightness obtained with one adjustment dial set at a specific voltage level differs slightly from that obtained with the other dial or from the DIA LAMP ADJ. key set at the same voltage level. If you wish to reproduce colors accurately (as in photography using daylight-type color film), set the lamp voltage at the rated lamp voltage and move the NCB11 filter into the optical path to achieve illumination that is closest to white light. (In this case, use ND filters to adjust the brightness.)

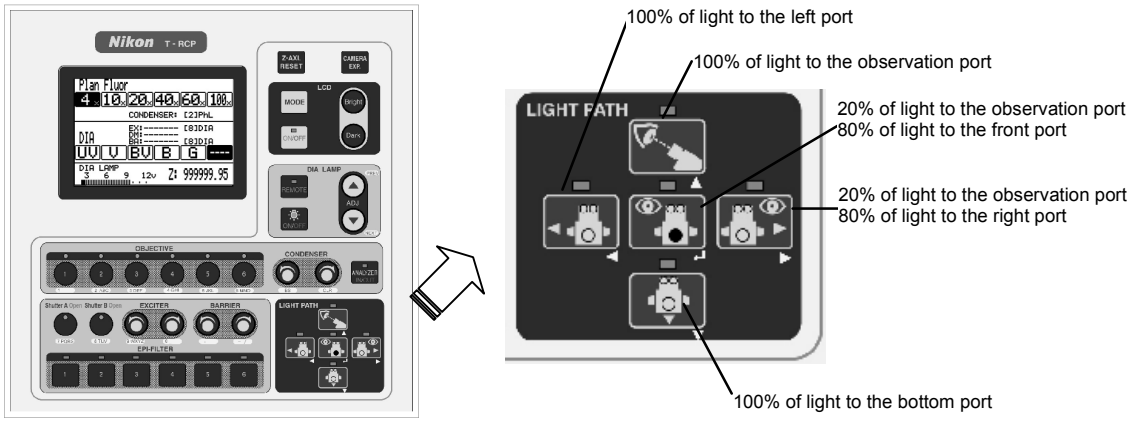


- When the DIA LAMP REMOTE key lights green, you can use the remote control pad to adjust the brightness.
- If the DIA LAMP REMOTE key lights orange, you can use the brightness adjustment dial on the side of the microscope to adjust the brightness.
- Keep in mind that you cannot use the remote control pad or PC commands to change the voltage applied to the 6V30W lamp.

IV

4 Optical path switching

Use the LIGHT PATH keys on the remote control pad to send the image to the desired ports.



5 How to use filters

Lord the appropriate filters into the four filter sliders of the dia-illuminator.

The following filters are available:

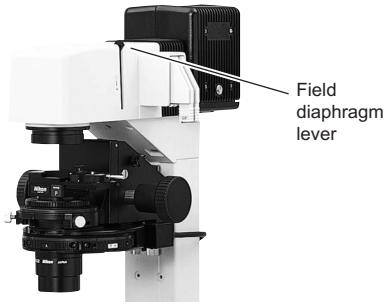
Filter	Description
ND2	Designed for brightness adjustment in normal microscopy and photomicrography. Reduces light quantity to 1/2. (Approx. 50% transmissivity)
ND16	Designed for brightness adjustment in normal microscopy and photomicrography. Reduces light quantity to 1/16. (Approx. 6% transmissivity)
NCB11	Designed for color temperature correction in normal microscopy and daylight-type color photomicrography. This filter provides optimal color reproduction when placed in the optical path with the brightness adjustment dial set at the same voltage level as the rated lamp voltage. (Remove this filter from the optical path during monochrome photomicrography.)
GIF	Green interference filter. Designed for microscopy with monochromatic light and for improved contrast during monochrome photomicrography.
HA	Designed to reduce the impact of illumination heat on the specimen. The dia-illuminator comes equipped with a heat absorption filter. Add this filter if your specimen is susceptible to the effects of heat.
D	Designed to ensure uniform illumination. Make sure that this filter is attached closest to the lamphouse.

6 How to use the field diaphragm

The field diaphragm is designed to ensure that the illumination falls only on the target area of the specimen. You can open the diaphragm to the maximum setting by raising the field diaphragm lever to the uppermost position.

Normally, set the field diaphragm so that it is only slightly larger (or smaller) than the microscopy field of view. Illuminating an area that is too wide can lead to entry of stray light, causing flare and reducing image contrast.

Correct adjustment of the field diaphragm is critical, particularly in photomicrography. In general, the best results can be obtained by closing the diaphragm so that it is slightly wider than the area to be photographed (frame indicating the area to be photographed). Remember that closing the diaphragm too narrowly can cause vignetting.



7 How to use the aperture diaphragm

The aperture diaphragm is designed to adjust the numerical aperture (N.A.) of the illumination system.

Aperture affects the optical resolution, brightness, contrast, and depth of field. Smaller apertures produce lower optical resolution and brightness, but improved contrast and depth of field. Because these characteristics are related and cannot be controlled independently, the aperture must be adjusted to best suit the specimen and the microscopy purpose.

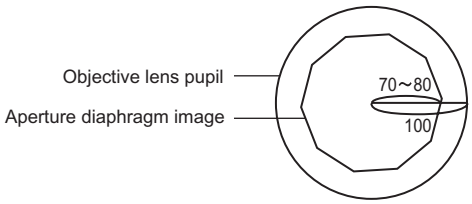
Adjustment of the aperture diaphragm is important, particularly for bright-field microscopy, DIC microscopy, and photomicrography. Generally, setting the aperture at 70 to 80% of the objective N.A. provides good images with appropriate contrast.

Adjust the aperture while observing the diaphragm image.

Close the diaphragm by moving the aperture diaphragm lever to the left; open the diaphragm by moving it to the right. Adjust the aperture so that it is 70 to 80% of the size of the exit pupil of the objective.

Turn the eyepiece tube turret to position “B” to move the Bertrand lens into the optical path, then focus with the Bertrand lens-focusing screw. This will make it possible for you to observe the objective pupil (bright circle) and the aperture diaphragm image.

When you use the system condenser for Ph microscopy, be sure to fully open the aperture diaphragm. (The optical path is interrupted if the diaphragm is left closed.)



IV

8 Eyepiece tube turret

Position of the turret			Description
	O	Empty	
	B	Bertrand lens	Allows observation of the objective pupil. Use the focusing screw to bring the exit pupil into focus. If you use a manipulator, you can use this lens to observe the tip of the manipulator above the objective.
	C	Shutter	Keeps extraneous light from entering the eyepieces during photomicrography.
	M	2.5X magnifier	Applies 2.5x intermediate magnification only to the image seen through the eyepieces. This position is effective when only slight enlargement is necessary or if you wish to achieve focus during photomicrography using an objective of 4 to 20X magnification.

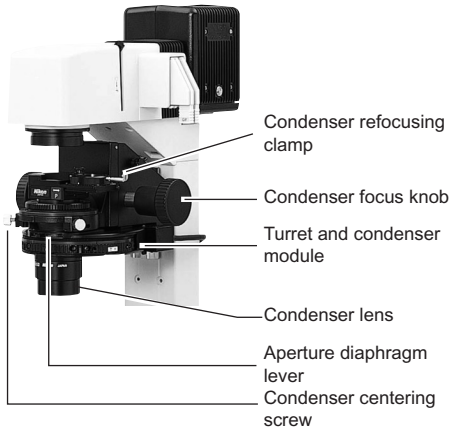
9 System condenser

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

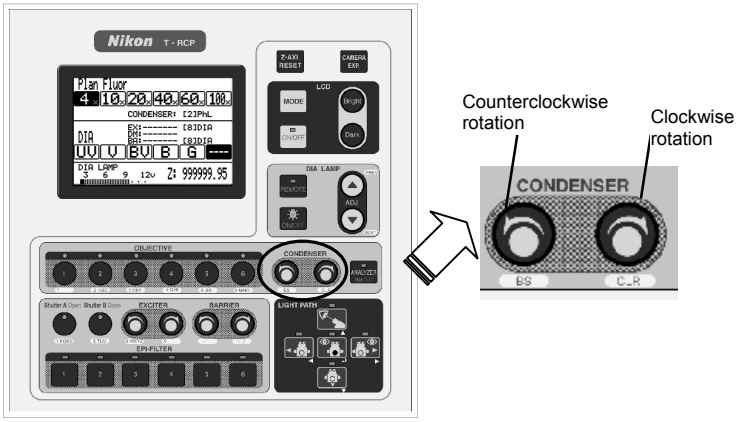
With conventional microscopes, it is necessary to replace the condenser according to the type of microscopy--for example, a Ph condenser is required for Ph microscopy and a DIC condenser is required for DIC microscopy.

In contrast, the system condenser for this microscope features condenser modules with optical elements. Up to five modules can be incorporated into the unit. As a result, you can simply rotate the turret to perform the desired microscopy, without changing condensers.

Modules can be arranged as desired in the turret if they are applicable to the currently used condenser lens (two types of condenser lenses are available). Modules can be replaced without detaching the condenser from the microscope, permitting the user to employ a variety of microscopy methods within a short time.



Press the CONDENSER key when you wish to switch between condenser modules with the remote control pad.



- When performing Ph microscopy, be sure to move the condenser module with the same Ph code as that of the objective into the optical path and center the annular diaphragm before starting Ph microscopy. Also be sure to open the aperture diaphragm fully. Leaving the diaphragm closed will block the optical path.

Comparison of condenser lenses

	LWD condenser lens	ELWD condenser lens
N.A.	0.52	0.3
Working distance	30 mm	75 mm
Available microscopy	BF, Ph, DIC	BF, Ph
Applicable condenser module	BF: “A” Ph: “PhL,” “Ph1,” “Ph2,” “Ph3” DIC: “DIC L,” “DIC M,” “DIC H” HMC: “MC1,” “MC2,” “MC3”	BF: “A” Ph: “PhL,” “Ph1,” “Ph2”
Other	• The condenser refocusing clamp may be used. • A supplementary lens is not used with this microscope.	

10 Diopter adjustment

Follow the steps given below to adjust the diopter. This adjustment corrects the dioptric difference between the left and right eyes, facilitating observation with both eyes. Additionally, this adjustment maintains an appropriate tube length to allow high-grade objectives to deliver maximum performance while reducing the defocusing normally experienced when objectives are changed.

1 Turn the photomask dial on the front of the microscope fully counterclockwise to move the photomask into the optical path.

2 Look into the right eyepiece with your right eye and turn the diopter adjustment ring on the right eyepiece so that the double crosshairs come into sharp focus.

3 Look into the left eyepiece with your left eye and turn the diopter adjustment ring on the left eyepiece so that the double crosshairs come into sharp focus.

11 Focusing module

Fine focus knob modes

Select “Fine,” “Middle,” or “Coarse” as the mode for the fine focus knob or the T-EFN focus knob.

For more information on how to select a desired mode with the remote control pad, see “5.1. Changing Operation Mode of Fine Focus Knob” in the remote control pad instruction manual.

“Coarse” is the mode initially selected for the fine focus knob.

■Supplementary information

The following shows the distances traveled by the focusing module per rotation of the fine focus knob in each mode. Note that these distances are approximate and vary depending on how fast the knob is turned.

Fine: 25 μm/rotation
Middle: 50 μm/rotation
Coarse: 100 μm/rotation

Also note that the distance traveled by the focusing module per rotation of the coarse focus knob is 4.9 mm.

REFOCUS/ESCAPE switches (for TE2000-E only)

The REFOCUS/ESCAPE switches at the side of the focus knob on the right side of the microscope are used to mark the vertical position of the objective when the specimen is in focus.

Pressing the ESCAPE switch (the lower switch) lowers the objective to the Escape position (2 mm below the standard position) while memorizing the objective position at which the switch was pressed. Pressing the REFOCUS switch (the upper switch) will raise and return the objective to the memorized position. Use these switches to facilitate refocusing when the objective must be lowered for specimen changes and objective switching.

- The fine focus knob is disabled at the Escape position.
- If the objective is at the Escape position, turning the coarse focus knob to move the objective position more than 0.5 mm will clear the memorized position.
- Pressing the REFOCUS switch and ESCAPE at the same time will clear the memorized position.
- If the T-ND6-E sextuple motorized DIC nosepiece and the T-RCP remote control pad are also in use, automatic Escape/Refocus movements can be set to correspond to objective switching. For detailed information, see the instruction manual for the T-RCP remote control pad.

CAUTION

- The coarse focus knob turns during Escape/Refocus movements. To prevent malfunctions, avoid contact with the coarse focus knob while these movements occur.
- Turning the coarse focus knob will turn the motor set inside. On rare occasions, you may find that the coarse focus knob fails to turn smoothly. This is because it engages the gear inside the motor. To restore smooth movement, slightly turn the coarse focus knob in the opposite direction, then turn once again in the original direction.

Displaying the Z-axis position on the remote control pad and resetting the position to 0

1) Displaying the Z-axis position

You can display the Z-axis position on the remote control pad.

For more information, see “1.6. Indicating Z-Axis Position” in the remote control pad instruction manual.

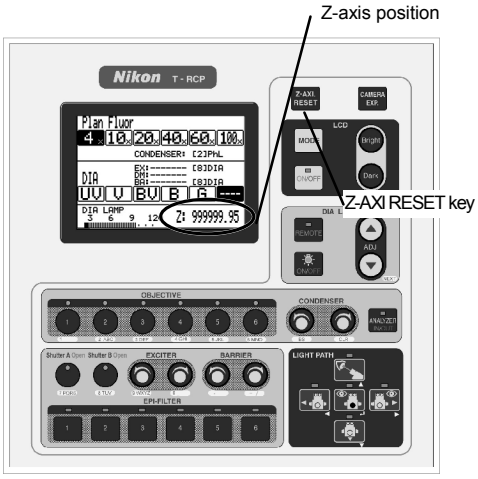
Note that the pad is initially programmed not to display this position.

■Supplementary information

Precise positional accuracy is not guaranteed, as this pad is not a measuring instrument.

2) Resetting the position to 0

You can use the Z-AXI. RESET key to reset the position to 0.

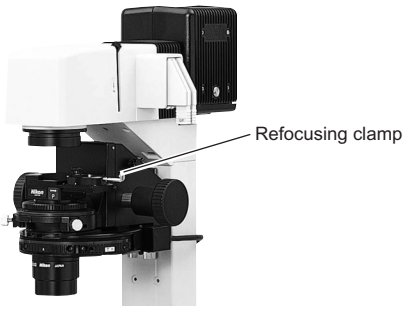


12 Dia-illuminator

Condenser refocusing clamp (may be used only when LWD condenser lens is attached)

First, turn the condenser focus knob to form the field diaphragm image on the specimen surface. Then, turn the condenser refocusing clamp fully clockwise. This stores the condenser position at which the field diaphragm image forms on the specimen surface.

When you need to raise the condenser to replace the specimen, this clamp lets you return the condenser to the initial position at which the field diaphragm image is formed simply by lowering the condenser as far as it will go. Use this feature when using a condenser lens with a high N.A., or if you cannot tilt the dia-illuminator. The condencer refocusing clamp works in the range of 13 mm.

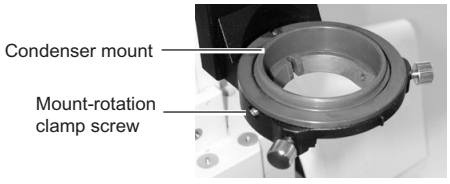


Rotating the condenser mount

To rotate the condenser mount, loosen the condenser mount rotation clamp screw.

Use this feature to adjust the condenser turret orientation when mounting the DIC attachment.

When using the system condenser without attaching a polarizer to the condenser holder (as in BF or Ph microscopy), use this feature to rotate the condenser turret clockwise or counterclockwise, and then clamp it, in order to provide space for a manipulator or other equipment.



Tilting the pillar

The pillar can be tilted to provide ample space for replacing a large specimen.

Loosen the tilting clamp screw on the back of the illuminator and hold the illumination section by the front to gently tilt the illuminator backward.

Normally, the tilting clamp screw can be left unlocked.

Note that the tilting clamp screw should be locked to prevent the pillar from accidentally falling in the event a relatively heavy item is attached to the pillar.

CAUTION

- Be careful not to catch your fingers in the hinge when tilting the pillar or moving it back to its upright position.
- Be sure to securely attach any relatively heavy items (e.g., the high-intensity lamphouse) to the pillar, as such items may fall off when mounting screws are loosened and the pillar is tilted. In particular, the high-intensity lamphouse and the lamphouse adapter must be securely attached.

Screw holes for securing attachments

The four M4 tapped holes on the front surface of the dia-illuminator can be used to secure a manipulator or other attachments. The upper two holes are provided for attachments that should be moved away from the stage when the dia-illuminator is tilted, while the lower two holes are used for attachments that should remain on the stage when the dia-illuminator is tilted.

13 Stage

Normally, mount the stage so that its handle is aligned with the back right of the microscope. It is also possible to mount the stage in the position diagonally opposite, with the handle at the front left. The handle comes equipped with a universal joint and can be adjusted to any angle.

The tapped holes on the top and bottom plates of the stage can be used to mount a manipulator or other attachment.

Two types of stage rings are available: one with a diameter of 20 mm and one with a diameter of 40 mm. Select the appropriate stage ring according to the size of the specimen container.

If the 40-mm stage ring is used, 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.

CAUTION

The stage rack protrudes during operation. To avoid injury, exercise caution to avoid striking your hand against the rack when manipulating the focusing knobs or the nosepiece.

14 Objectives

Ph objectives

A Ph objective is marked with a Ph code: PhL, Ph1, Ph2, or Ph3. Always use the annular diaphragm (or condenser module) with the same Ph code as the objective during Ph microscopy, regardless of the magnification of the objective .

Objective with correction ring

An inverted microscope is frequently used to observe specimens through the bottom plate of a laboratory dish or culture bottle made of glass or plastic. In such applications, the thickness of the bottom plate varies from one container to another. Therefore, normal objective (with cover glass 0.17-mm thick) may not provide clear images, preventing the microscope from delivering full performance. In this case, we recommend using an objective with a correction ring to compensate for the thickness of the bottom plate.

However, note that this cannot compensate for wedge-like changes in thickness, such as those encountered on the edge of a container. Use this to compensate for uniform thicknesses.

- Adjusting the correction ring

  1 Turn the correction ring to select the setting that matches the thickness of the container's bottom plate. The thickness should be a measured value or the value stated by the manufacturer of the container. (If available, an acrylic stage ring provides improved efficiency, allowing you to see the operation module from above the stage.)

  2 Use the focus knobs to bring the specimen into focus.

  3 If the image has poor resolution and/or contrast, rotate the correction ring slightly clockwise or counterclockwise. You will find that the specimen is slightly out of focus when the ring is rotated. Use the fine focus knob to restore focus.

  4 When the image begins to display better resolution and contrast, rotate the correction ring a little further in the same direction, and then re-focus.
  On the other hand, if you find that image resolution and contrast deteriorate when the correction ring is rotated in a given direction, rotate it in the opposite direction (about twice as many turns as the previously rotation), and then re-focus.
  Rotate the ring as necessary to determine the appropriate direction for obtaining a better image.

  5 Note the correction ring setting that provides the best image. You will find this helpful when using containers with different bottom plate thickness. (The 0-mm setting on the correction ring is used for microscopy of specimens without cover glass using an upright microscope.)

Cover glass thickness

Every objective is marked with the thickness of the cover glass to be used with that lens. (“∞/0.17” shows that a 0.17-mm-thick cover glass should be used.)

When you use an objective marked “0.17,” place the specimen so that the 0.17 mm thick cover glass faces the objective. (In the case of an inverted microscope, place the specimen so that the cover glass faces down.)

When you use an objective marked “1.2,” the normal slide glass thickness is 1.2 mm. Place the specimen so that the slide glass faces the objective. (In the case of an inverted microscope, place the specimen so that the cover glass faces up.)

To observe a specimen in a laboratory dish or the like with high magnification through glass of non-conforming thickness, we recommend using an objective with a correction ring to correct potential optical errors generated by glass thickness.

Oil-immersion objective

The objective marked “Oil” is an oil-immersion objective.

Always fill the space between the end of the objective and the specimen with the supplied oil (Nikon immersion oil) before using the objective. Use non-fluorescent oil (optional) when carrying out fluorescent microscopy using an oil immersion objective designed for fluorescent microscopy.

Keep air bubbles out of the oil, as they will degrade image visibility. Look for air bubbles by inspecting the exit pupil (bright circle) of the objective. (To inspect the exit pupil of the objective, turn the eyepiece tube turret to position “B” and use the Bertrand lens-focusing screw to focus. If your microscope does not have an eyepiece tube turret, remove one eyepiece and insert the centering telescope with an adapter and turn the eyepiece of the centering telescope to focus.)

To remove air bubbles, rotate the nosepiece slightly and move the oil-immersed objective back and forth once or twice. Or, wipe off the oil, then reapply.

If an excessive amount of oil is applied, oil will flow out and adhere to the stage and other components. Use only the minimum amount of oil required to fill the space between the end of the objective and the specimen. Be careful not to apply oil to any other components.

Oil remaining on the oil immersion objective or adhering to the surface of a dry objective can significantly reduce image visibility. Thoroughly wipe off the oil from the objective surface and make sure that all other objective are free of oil.

To remove oil, moisten a lens tissue or clean cloth with petroleum benzine and lightly wipe the lens surface a few times. Use an unused part of the lens tissue every time. For best results, finish by wiping with pure alcohol (ethyl or methyl alcohol).

If petroleum benzine is not available, use methyl alcohol. Note that this alcohol does not remove oil as well as petroleum benzine. Therefore, you will need to wipe the surface several times. (Usually, three or four wipes will clean the surface.) Because pure alcohol and petroleum benzine are quite flammable, exercise great caution when handling them and when switching power switches on or off. Also take care to avoid using the oil in proximity to flames.

The acrylic stage ring (optional) will facilitate the task, as you may leave the culture dish on the stage during immersion. First set the stage ring so that its opening runs along the rim of the nosepiece. Then rotate the nosepiece until the objective shows through the opening of the stage ring. Hold the nosepiece in this position to immerse the objective.

Water-immersion objective

The objective marked “WI” is a water-immersion objective. (A lens with a longer working distance is provided for upright microscopes.)

Always fill the space between the end of the objective and the specimen with demineralized or distilled water. (Do not use tap water for immersion; otherwise, when the lens dries, impurities may stick to the surface and cause scratches during cleaning.)

The Plan Apo 60xWI objective (N.A. = 1.2) has a correction ring to compensate for the difference in cover glass thickness to minimize optical aberrations. The “17” marking represents 0.17 mm. Before using a cover glass, measure the cover glass thickness with a micrometer or the like and turn the ring to select the setting that matches the measured thickness.

15 DIC attachment

See “II. Microscopy” and “III. Principles of DIC microscopy” in the DIC attachment instruction manual for information on using this attachment.

See “3. Differential interference contrast (DIC) microscopy” in “III. Microscopy” of this manual for instructions on how to use the remote control pad to switch between objective and condenser modules and how to move the analyzer in and out of the optical path during DIC microscopy.

16 Epi-fl attachment

See “IV. Operation of each part” for information on how to operate this attachment.

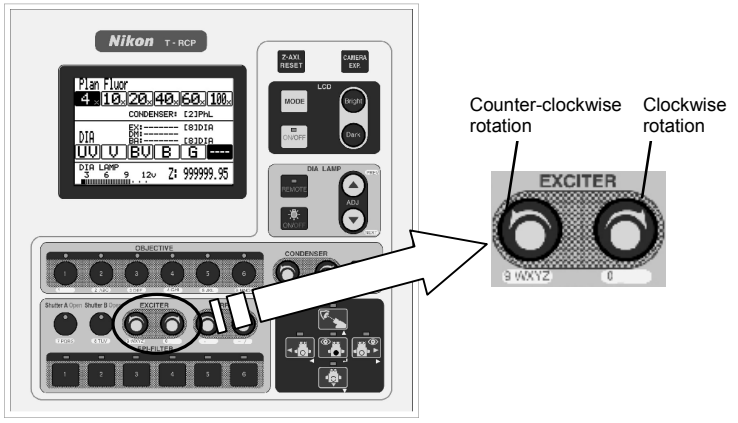
See “4. Epi-fl microscopy” in “III. Microscopy” of this manual for instructions on how to use the remote control pad to open or close the motorized shutter and to switch between filter blocks during epi-fl microscopy.

17 EX filter wheel

You can switch between excitation filters (filters for use in 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.

Press the EXCITER key on the remote control pad to switch between excitation filters.



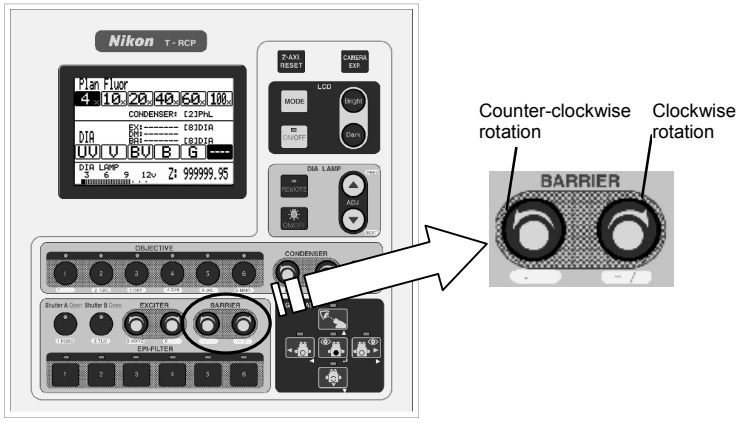
You can program the remote control pad to interlock excitation filters with the motorized cassette holders switching. See the remote control pad instruction manual for more information.

18 BA filter wheel

You can switch between barrier filters (filters for use in 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.

Press the BARRIER key on the remote control pad to switch between barrier filters.



You can program the remote control pad to interlock barrier filters with motorized cassette holders switching. See the remote control pad instruction manual for more information.

19 HUB controller

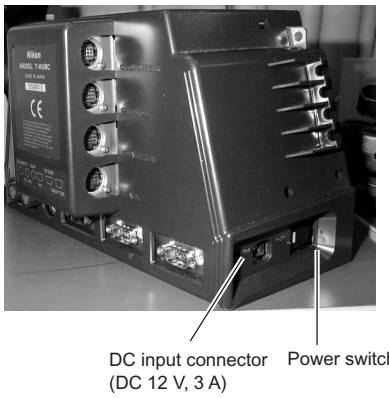
The power switch (POWER) is located on the side of the HUB controller.

Flip the switch to "|" to turn on the power. At this time, this illuminates the switch lights.

Flip this switch to "O" to turn off the power. At this time, this switch goes out.

The DC input connector (DC 12 V, 3 A) is provided on the side of the HUB controller.

Attach the DC plug of the AC adapter (for the HUB controller) to the DC input connector (DC 12 V, 3 A).



20 Photomicrography

For information on how to attach and use the camera and photomicrographic equipment, see the instruction manuals supplied with the respective items of equipment.

Note that you may observe vignetting in the image in the upper part of the camera finder even when all microscope parts have been adjusted properly. This will not affect the photomicrography results.

IV

Photomicrography equipment and ports

Remember that each port is designed to accommodate specific items of equipment. See the list below for easy identification.

Photomicrographic equipment	Port	Required adapter (intermediate magnification)	Other
Digital still camera (F-mount) allowing photomicrography in aperture-priority auto mode (A), such as the D1X, D1H, and D1	Front port	T-BFA F-mount adapter (1X)	Set the intermediate magnification dial to "1.5X." "1X" will produce an image with dark corners.
35-mm SLR camera (F-mount) allowing photomicrography in aperture-priority auto mode (A), such as the FM3A, FE10, FE2, FE, F100, F90, F70, F801 Series, F601 Series, F501, F5, F4m, and F3	Front port	T-BSLR SLR camera adapter (2.5X)	
Digital still camera for microscopes DXM1200, DN100, etc.	Front port, side port, and bottom port	T-BDCA direct C-mount adapter	
Photomicrographic equipment for microscopes U-III, H-III, P-III, etc.	Side port, observation port	Side port: T-BPA photo adapter Observation port: Attach to the vertical tube of the trinocular eyepiece tube (eyepiece tube of the upright microscope) that is mounted to the intermediate tube.	PLI projection lens required. When photomicrographic equipment is attached to the side port, the Polaroid (or 35-mm) camera back cover will not fully open. The rectangular photomask frame represents the image area to be captured when using a PLI 2.5X projection lens. When using a projection lens of another magnification value, inspect the area through the finder on your photomicrographic equipment.

Photomicrography procedure and check items

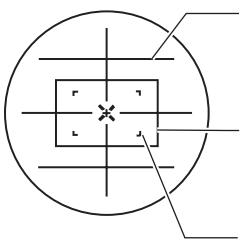
In photomicrography, appropriate illumination and achieving proper focus are of prime importance.

First, adjust your microscope as for normal microscopy. Then follow the steps given below.

1	Adjust the diopter.	Rotate the diopter adjustment rings so that the photomask's double crosshairs come into sharp focus.
2	Adjust illumination. Eliminate uneven illumination.	Lamp voltage: Set the voltage at the same level as the rated lamp voltage for color photomicrography. Filter: Move the NCB11 filter into the optical path during color photomicrography. Add color compensation filters, if necessary. Condenser: Focus and center the condenser. Center the annular diaphragm for Ph microscopy. Normally, the aperture diaphragm should be set at 70 to 80% of the objective N.A. Open the aperture diaphragm fully for Ph microscopy using the system condenser. Camera: “+2/3” exposure adjustment will produce good results when you attach a 35-mm SLR camera to the front port.
3	Switch between optical paths.	Use the LIGHT PATH key on the remote control pad to guide the image into the port to which photomicrographic equipment is attached. (If this directs 100% of the light to the port, you will need to switch back to the observation port frequently.)
4	Check the trimming	Use the photomask.
5	Bring the film surface into focus.	Use the focus knobs to bring both the photomask and the specimen image into sharp focus. When using a 4 to 40X objective, turn the eyepiece tube turret to position “M” to enlarge only the image on the eyepiece and to achieve proper focus. (Do not touch the diopter adjustment ring of the eyepiece after turning the eyepiece tube turret to position “M.”)
6	Shut out extraneous light.	Field diaphragm: Close the diaphragm until it is slightly larger than the photo frame. Eyepieces: Turn the eyepiece tube turret to position “C” or cover the eyepieces with a piece of cloth. Finder of the camera or photomicrographic equipment: Cover the finder with a piece of cloth or finder cap. (Leave the cover on unless you need to look into the finder.)
7	Eliminate the impact of vibrations.	If the exposure time is shorter than “1/8s,” insert ND filters in the optical path to reduce image brightness and lengthen the exposure time.” (With monochromatic film, you can also adjust the lamp voltage to reduce the image brightness.) Use the release or self-timer of the camera.
8	Release the shutter (perform exposure).	

Photomask and area to be photographed

Turn the photomask dial counterclockwise to move the photomask into the optical path. Use the photomask for diopter adjustment or trimming during photomicrography.



When a digital camera is attached to the front port via a T-BFA F-mount adapter (1X)

When a 35-mm single-lens reflex camera is attached to the front port via a T-BSLR SLR adapter (2.5X)

When a digital camera is attached to the front port via a T-BDCA direct C-mount adapter (2.5X)

V

Online and remote operation

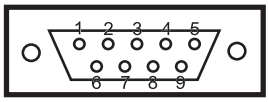
You can control the HUB controller from your PC (IBM PC or compatible) by connecting the PC to the HUB controller.

Connecting the PC

Use the D-Sub 9-pin cross cable to connect the PC connector on the HUB controller and the serial port of your PC.

PC connector pin No.	Signal	Input/Output
1	DCD	—
2	RxD	Input
3	TxD	Output
4	DTR	Output
5	SG	(GND)
6	DSR	Input
7	RTS	—
8	CTS	—
9	RI	—

PC connector: D-Sub 9-pin male



Pins 1, 7, 8, and 9 are open within the HUB controller.

Data communication cable

Use a general-purpose cross cable with a D-Sub 9-pin female connector at each end. (3 m or shorter)

Serial interface communication specifications

Applicable interface	RS-232C (as per EIA)
Baud rate	9600 bps
Data bits	8 bit
Start bit	1
Stop bit	1
Parity check	No

Communications commands

Contact your nearest Nikon representative for detailed information.

VI

Assembly

WARNING

- Be sure to read through and follow the instructions provided under "! WARNING," "! CAUTION," and "Notes on handling the motorized units for the TE2000 Series" before assembling the TE2000.
- To prevent electric shock and fire, always turn off all power switches (switch to "O") and unplug the power cords from the wall outlet.

CAUTION

- When not using a port, be sure to attach the supplied cap. If not, extraneous light and dust will enter the microscope.
- Be careful not to pinch your fingers or hands during assembly.
- Scratches and fingerprints on the lenses will degrade the microscope image. Handle lenses carefully during assembly.
- Each of the motorized units for the TE2000 Series is a precision optical instrument. Handle the units carefully and avoid subjecting them to strong shocks. In particular, the precision of the objectives can be adversely affected even by weak shocks.

Required tools

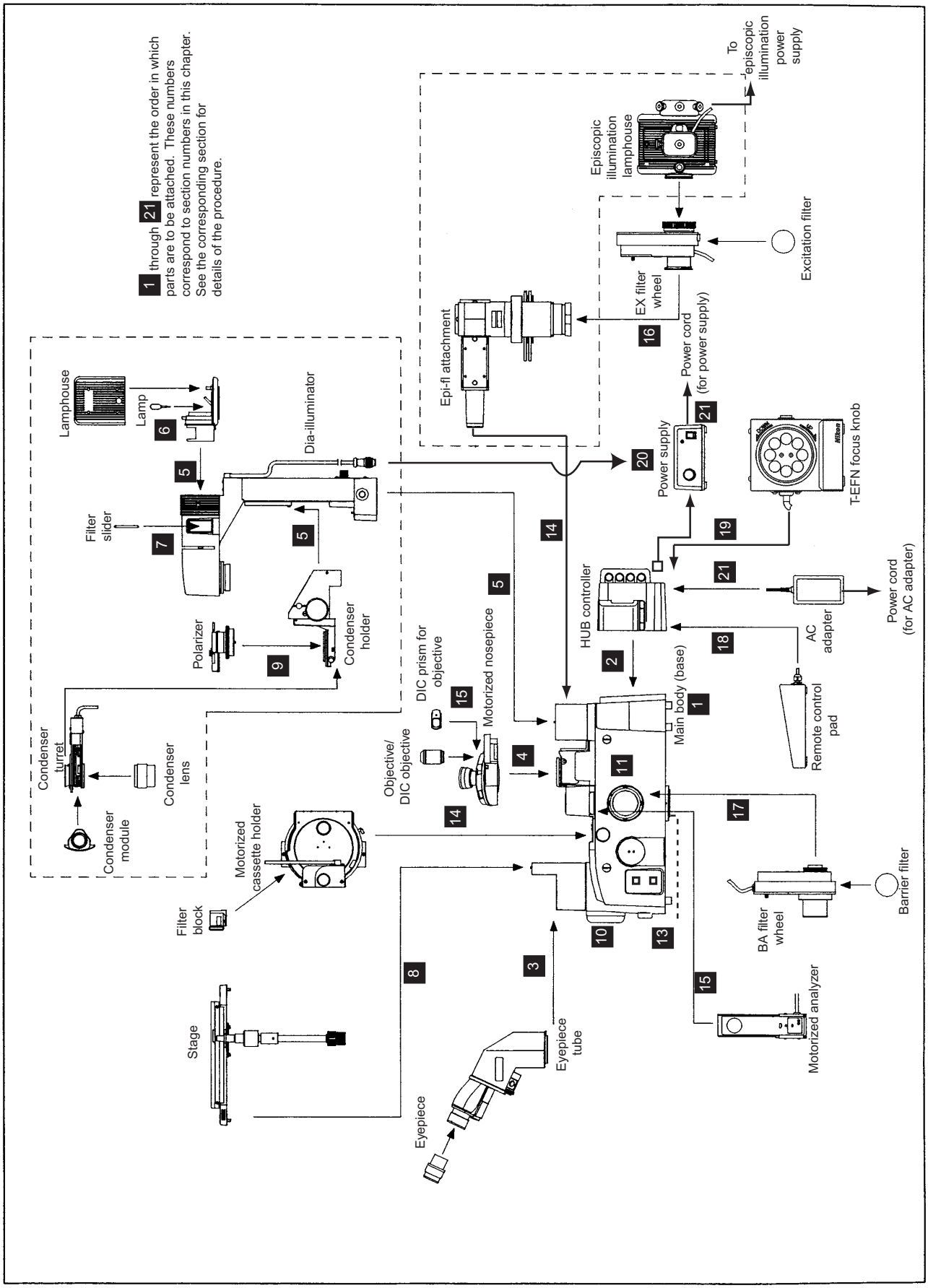
Two 2-mm hexagonal screwdrivers (supplied with the microscope)

One 4-mm hexagonal screwdriver (supplied with the microscope)

One 2.5-mm hexagonal wrench (supplied with the motorized cassette holder)

Installation location

See "Notes on handling the motorized units for the TE2000 Series" at the beginning of this manual to select an appropriate location.


1 through 21 represent the order in which parts are to be attached. These numbers correspond to section numbers in this chapter. See the corresponding section for details of the procedure.
To episcopic illumination power supply
Episcopic illumination lamphouse
Excitation filter
EX filter wheel
16
Power cord (for power supply)
Epi-fl attachment
Lamphouse
Lamp
6
Dia-illuminator
5
Filter slider
7
5
Polarizer
9
Condenser holder
Condenser turret
Condenser lens
Condenser module
Motorized cassette holder
Filter block
Stage
8
Eyepiece
3
Eyepiece tube
DIC prism for objective
15
Motorized nosepiece
5
Objective/ DIC objective
4
14
14
11
10
13
Main body (base)
1
HUB controller
2
20
Power supply
21
21
T-EFN focus knob
19
14
21
AC adapter
Power cord (for AC adapter)
18
Remote control pad
17
BA filter wheel
Barrier filter
15
Motorized analyzer

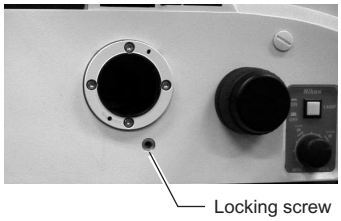
VI

1 Installation of the main body (base)

1 Remove the microscope from the package and place it on a stable surface.
The base is heavy, so hold it securely by the recess at the bottom front and by the carrying handle on the back of the microscope base.

2 Remove the locking screw from the left side of the microscope base and then fit a blind plate into the hole.

3 When mounting the epi-fl attachment, remove the black cover from the nosepiece mount.



2 HUB controller

Connecting the HUB controller and the microscope (TE2000-E)

1 Attach the four HUB controller brackets to the HUB controller mount on the back of the microscope main body by twisting the brackets. Be sure to attach the brackets with threaded holes to the upper section of the controller.

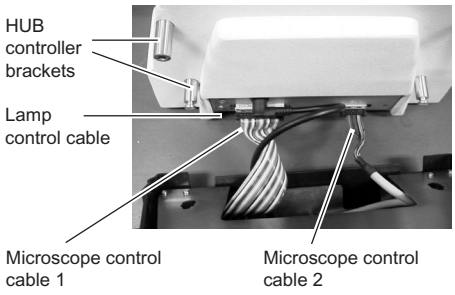
2 Connect the lamp control cable (HUB1) to the LAMP CTRL connector on the back of the microscope main body.

3 Connect microscope control cable 1 to the MIC CTRL1 connector on the back of the microscope.

4 Connect microscope control cable 2 to the MIC CTRL2 connector on the back of the microscope.

5 Lift the HUB controller and attach the HUB controller brackets (located on the back of the microscope main body) to the four holes on the back of the HUB controller. Attach the brackets to the lower holes first, as this will make it easier to attach the remaining brackets to the upper holes.

6 Use the supplied screws to secure the HUB controller to the HUB controller brackets on the back of the microscope main body.



Connecting the HUB controller and the microscope (TE2000-U, TE-2000S)

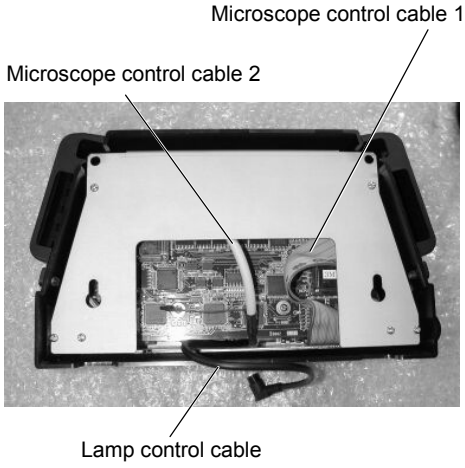
1 Attach the four HUB controller brackets to the HUB controller mount on the back of the microscope main body by twisting the brackets. Be sure to attach the brackets with threaded holes to the upper section of the controller.

2 Connect the lamp control cable to the LAMP CTRL connector on the back of the microscope main body.

3 Place microscope control cables 1 and 2 with the connector covers attached inside the HUB controller (between the CPU board and chassis).
Do not connect microscope control cables to the microscope.

4 Lift the HUB controller and attach the HUB controller brackets (located on the back of the microscope main body) to the four holes on the back of the HUB controller. Attach the brackets to the lower holes first, as this will make it easier to attach the remaining brackets to the upper holes.

5 Use the supplied screws to secure the HUB controller to the HUB controller brackets on the back of the microscope main body.



Connecting the HUB controller and motorized units

To use a motorized unit, connect the cable for each unit to the connector on the back of the HUB controller. For more information on connections between the HUB controller and a specific motorized unit, see the corresponding section in this chapter.

■Supplementary information

For information on how to connect the AC adapter, see “21. Connection of the power cord and the AC adapter” in this chapter.

3 Eyepiece tube

1 Use a hexagonal screwdriver to loosen the eyepiece clamp screw for the observation port at the front of the base.

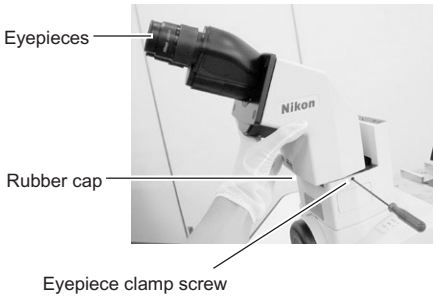
2 Remove the rubber cap.

3 Fully slide the eyepiece tube from the front and use the clamp screw to secure the tube in place.

4 Attach the rubber cap.

5 Attach the eyepieces.

(Align the three grooves on the eyepiece with the three projections on the eyepiece sleeve. Make sure that the eyepieces on the right and left are of the same magnification. Place rubber eye guards on the eyepieces, if available.)



4 Motorized nosepiece and objectives

1 Attach the nosepiece to the rectangular groove at the center of the microscope base.

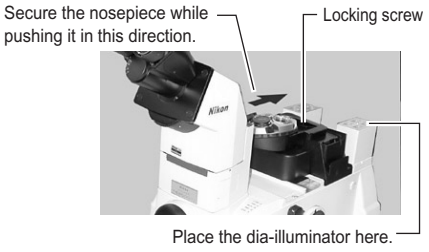
2 Secure the nosepiece in place with two M5 hexagonal bolts while pushing it from the front toward the back of the microscope.

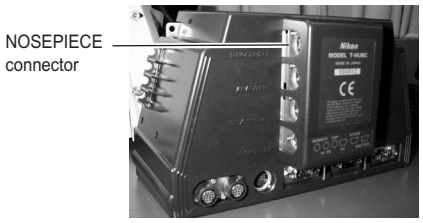
3 Fit the objectives into the nosepiece. Make sure that the objectives are selected in ascending order of magnification, as the nosepiece is to be rotated clockwise, as viewed from above the microscope.

4 Connect the cable to the NOSEPIECE connector on the HUB controller.

■Supplementary information

Before using the nosepiece, be sure to program the remote control pad with information on the objectives attached to the nosepiece. For information on programming the remote control pad, see “1.2 Setting Attachment Information (objectives).”





VI

5 Dia-illuminator

1 Remove the carrying handle from the back of the microscope.

2 Place the dia-illuminator on the mount on the back of the base. Make sure that positioning pins on the mount fit properly into the pin holes on the dia-illuminator.

3 Secure the dia-illuminator with the four M5 hexagonal bolts.

Attaching the condenser mount

1 Remove the securing screw from the condenser mount metal section of the dia-illuminator.

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

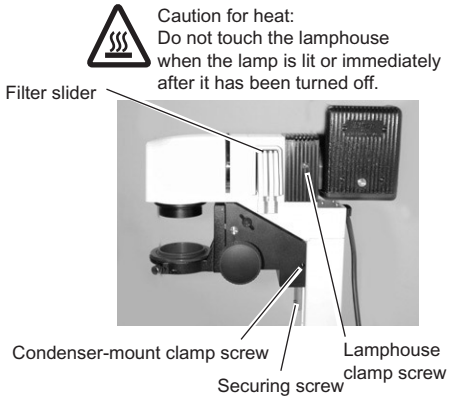
3 Securely tighten the clamp screw on the right side of the condenser mount.

4 Reattach the securing screw.

Attaching the lamphouse

1 Insert the lamphouse into the upper section of the dia-illuminator. At this time, make sure that the positioning pin on the dia-illuminator fits into the groove on the circular mount of the lamphouse.

2 Securely tighten the clamp screw on the right of the dia-illuminator.



6 Lamp (lamp replacement)

CAUTION

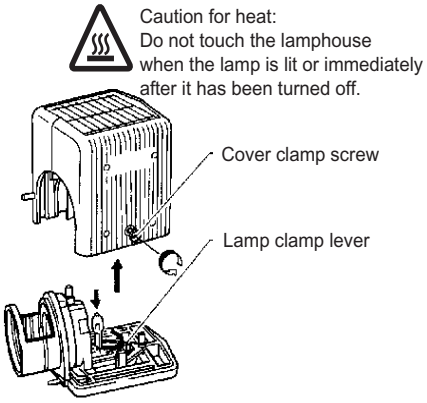
- The combination of specifications for the lamp, dia-illuminator, and power supply must be appropriate. Check the instruction manual supplied with your microscope to make sure that your specification combination is correct. Use only the lamp specified.
- Be sure to turn off the power switch and unplug the power cord before replacing the lamp.
- The lamp and nearby parts are extremely hot when the lamp is lit and immediately after it has been turned off. Before replacing the lamp, turn off the power and allow the lamp and nearby parts to cool.
- Do not touch the lamp with your bare hands. Dirt or fingerprints on the lamp will cause uneven illumination and shorten the life of the lamp. Wear gloves when handling lamps.
- Securely attach the lamphouse cover after lamp replacement. Never light the lamp with the lamphouse cover left open.

1 Use a coin or similar object to loosen the screw on the right side of the lamphouse to detach the cover.

2 Fit the lamp into the socket firmly, as far as it will go, while pushing the lamp clamp lever downward.

3 Release the lamp clamp lever. At this time, make sure that the lamp is not tilted. If so, reattach the lamp in an upright position.

4 Reattach the lamphouse cover and secure it with the clamp screw on the right side.

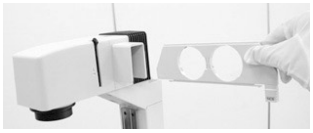


7 Filter slider

1 Attach filters to the filter sliders. (Push aside the claw on the circular mount when attaching filters.)

2 Insert filter sliders into the dia-illuminator.

3 Make sure that filter slider D is attached closest to the lamphouse.



8 Stage

1 Place the stage on the mounts — one on the front of the base and the other on the dia-illuminator.

2 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.

3 Secure the stage with four M5 hexagonal bolts.

■Supplementary information

If you use a motorized XY stage, connect the cable to the STAGE connector on the HUB controller.

VI

9 Condenser

1 Loosen the condenser clamp screw inside the hole on the right side of the condenser holder. (The condenser clamp screw will not be visible when you look into the hole if the condenser mount has been rotated from its reference position. In this case, loosen the mount-rotation clamp screw and manually rotate the mount so that the positioning groove within the mount is aligned with the positioning pin of the condenser holder. Then tighten the rotation clamp screw in this position.)

2 Slide the turret under the condenser holder with the rectangular section facing backward and tighten the condenser clamp screw to secure it.

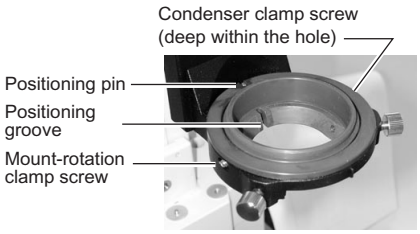
3 Insert the condenser modules into the turret and secure them with two hexagonal screws each. (You can attach up to five condenser modules. Arrange the modules so that they are selected in ascending order of number markings, as the turret is rotated clockwise when seen from above the turret.

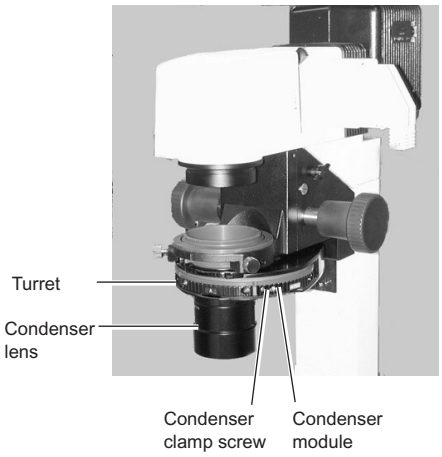
4 Screw the condenser lens into the bottom of the turret. (See “9. System condenser” in “IV. Operation of each part” for the correct combination of condenser lens and condenser module. The auxiliary lens, supplied with the LWD condenser lens, is not used with the TE2000 Series.)

5 Connect the HUB controller to the CONDENSER connector on the HUB controller.

■Supplementary information

Before using the condenser, program the remote control pad with information on the condenser modules attached to the turret. For information on programming the remote control pad, see “1.2 Setting Attachment Information (condenser modules).”





10 Front port

See “20. Photomicrography” in ““IV. Operation of each part” for a description of photomicrographic equipment that can be attached to the front port and a list of required adapters.

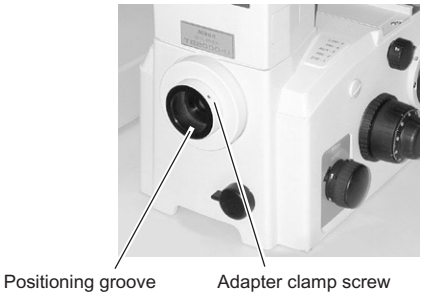
1 Manually remove the plastic cap from the front port.

2 Insert the adapter and secure it with a clamp screw. (When a positioning pin is available with the adapter, make sure that the pin is aligned with the positioning groove on the front port.)

3 Attach the photomicrographic equipment to the adapter.

Ex. Attaching the digital still camera D1 to the T-BFA F-mount adapter

Remove the plastic cap from the F-mount adapter. Slide the camera into the adapter, aligning the index marking on the camera with that on the adapter. Then turn the camera in the direction indicated by the arrow (counterclockwise) until a click is heard.



Detaching the camera

Turn the camera while holding down the lens detachment button. Turn the camera in the direction opposite to that indicated by the arrow (i.e., turn it clockwise) until it stops, and then gently detach it. To prevent damage to the F-mount, never attempt to turn the camera in the direction indicated by the arrow (i.e., do not turn it counterclockwise) when detaching the camera.

11 Side port

See “20. Photomicrography” in ““IV. Operation of each part” for a description of photomicrographic equipment that can be attached to the side port and for a list of required adapters.

1 Remove the plastic cap from the side port by loosening the clamp screw.

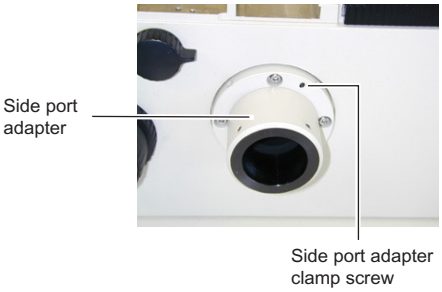
2 Insert the side port adapter and secure it with the clamp screw.

3 Insert the adapter into the side port adapter and secure it with a clamp screw.

4 Attach the photomicrographic equipment to the adapter.

Ex. Attaching the photomicrographic equipment U-III to the T-BPA photo adapter

Insert the PLI projection lens into the T-BPA photo adapter as far as it will go. Allow the finder to face forward and insert the photomicrographic equipment into the T-BPA photo adapter. Attach the connection ring firmly to the adapter to secure the adapter.



VI

12 Bottom port

See “20. Photomicrography” in ““IV. Operation of each part” for a description of photomicrographic equipment that can be attached to the bottom port and for a list of required adapters.

1 Remove the metal cap from the bottom port by loosening the clamp screw.

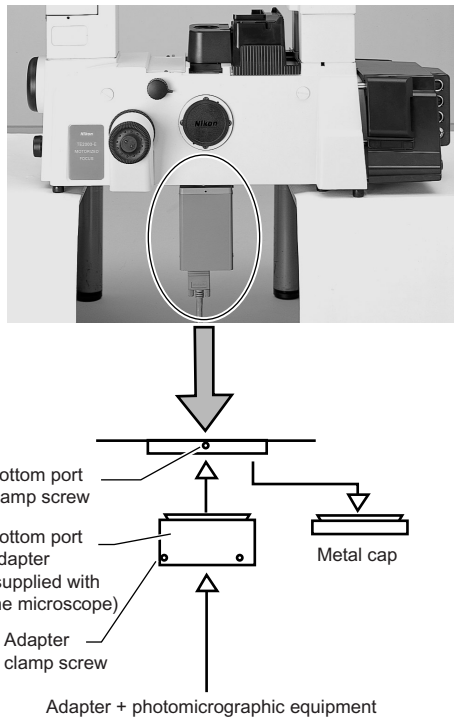
2 Insert the bottom port adapter and secure it with the clamp screw.

3 Attach the appropriate adapter to the photomicrographic equipment and insert that adapter into the bottom port adapter. Then secure the adapter with a clamp screw.

Ex. Attaching the C-mount TV camera to the direct C-mount adapter

Screw the direct C-mount adapter firmly into the C-mount TV camera. Insert the direct C-mount adapter firmly into the bottom port adapter and secure the former with a clamp screw.

When detaching photomicrographic equipment, grasp it firmly, then loosen the clamp screw. To avoid dropping photomicrographic equipment, make sure you have a firm grip before loosening the screw.



13 Attaching various units to the observation port

Detach the binocular eyepiece tube and attach the T-TI intermediate tube in its place. You can attach a trinocular eyepiece tube for an upright microscope or a teaching head to the intermediate tube.

14 Epi-fl attachment

See the instruction manual for the epi-fl attachment.

- After mounting this attachment to the microscope, connect the cable of this attachment and the motorized cassette holder cable (respectively) to the FL SHUTTER connector and the FL BLOCK connector on the HUB controller.

Specifying the Shutter key functions

To use the epi-fl attachment, you must assign the shutters to be operated to the Shutter keys on the remote control pad. For more information, see “1.4. Setting Shutter Key Function” in the instruction manual for the remote control pad.

■Supplementary information

- To open or close the shutters with the Shutter keys, you must assign the shutters to be operated to the Shutter A and B keys in advance. For more information, see “1.4. Setting Shutter Key Function” in the instruction manual of the remote control pad.
- To control a motorized shutter made by a manufacturer other than Nikon, see “22. Connection of external equipment.” in “VI. Assembly.”
- Be sure to leave the cassette holder's manual shutter open when using the motorized epi-fl attachment.

Attaching filter blocks

Attach the filter blocks after mounting all other parts and attachments to the microscope.

To rotate the turret to which to the filter blocks will be attached (i.e., the turret inside the cassette holder), first turn on the power for the HUB controller, and then use the FPI-FILTER key on the remote control pad to rotate the turret.

■Supplementary information

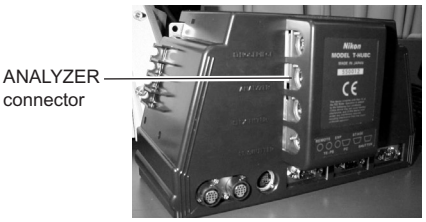
Before using filter blocks, program the remote control pad with information on the filter blocks attached to the cassette holder. For information on programming the remote control pad, see “1.2. Setting Attachment Information (filter blocks).”

VI

15 DIC attachment

See the instruction manual for the DIC attachment.

- After mounting this attachment to the microscope, connect the cable to the ANALYZER connector on the HUB controller.



16 EX filter wheel

Attach the EX filter wheel to the epi-fl attachment. If it is not attached, attach the epi-fl attachment to the microscope. Detach the supporting rod from the epi-fl attachment, as you will need to attach this to the EX filter wheel.

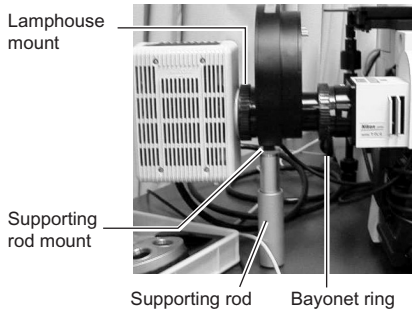
1 Turn the bayonet ring of the light source adapter in the “O” direction, slip the epi-fl attachment mount of the EX filter wheel into the ring, and turn the ring in the “C” direction to secure the wheel in position.

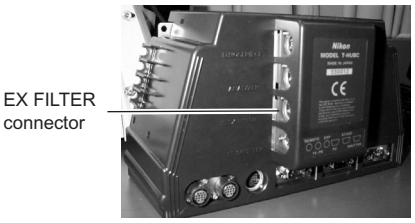
2 Loosen the clamp screw on the supporting rod so that the sliding section at the tip of the rod moves freely. Screw the supporting rod into the supporting rod mount on the EX filter wheel. Allow the tip of the rod to touch the installation surface and tighten the clamp screw.

3 Attach the light source to the lamphouse mount on the EX filter wheel. Be sure to attach collector lenses, as well.

For more information, see the instruction manual for the super-high-pressure mercury lamp power supply or for the high-intensity light source.

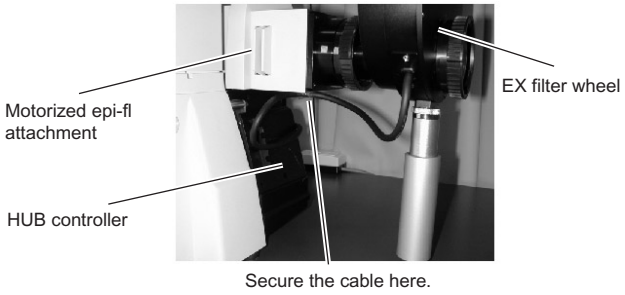
4 Connect the cable to the EX FILTER connector on the HUB controller.





Securing the EX filter wheel cable

When connecting the EX filter wheel cable to the HUB controller, be sure to secure the cable in the hole for the supporting rod of the motorized epi-fl attachment to prevent the cable from dragging (see below). Use the cable clip and M-5 screw provided to secure the cable in place.



Attaching excitation filters

Attach excitation filters after mounting all other parts and attachments to the microscope.

⚠ CAUTION

Be sure the light source is turned off when attaching or detaching excitation filters.

1 Loosen the cover clamp screw to detach the cover.

2 Turn the wheel so that the excitation filter attachment positions are visible.

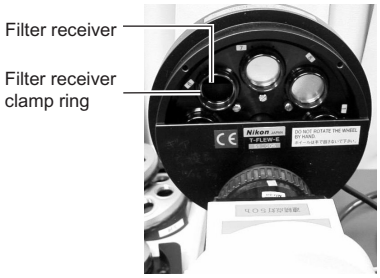
3 Loosen the filter receiver clamp screw to turn the receiver so that the notch is aligned with the filter receiver clamp screw. Then pull the filter receiver out of the wheel.

4 Detach the filter retaining ring from the filter receiver. Detach the light-shielding plate, as well, if applicable.

5 Place an excitation filter 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 Align the notch on the filter receiver with the filter receiver clamp screw to insert the receiver into the wheel. Turn the filter receiver and secure it in position with the clamp screw.

7 Tighten the cover clamp screw to secure the cover.

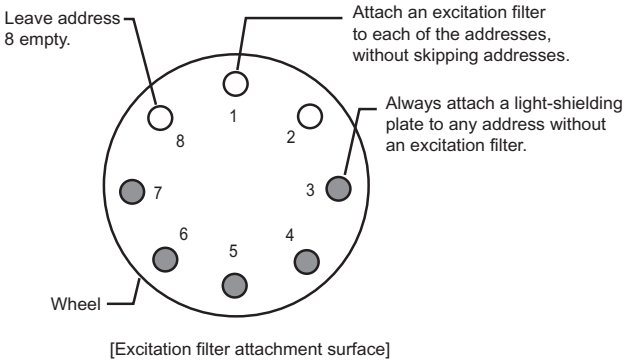


To turn the wheel to which the excitation filters are to be attached, first turn on the power to the HUB controller, and then use the EXCITER key on the remote control pad to rotate the wheel.

■Supplementary information

- Before using the excitation filters, program the remote control pad with information on the filters attached to the EX filter wheel. For information on programming the remote control pad, see “1.2. Setting Attachment Information (excitation filters).”
- When you switch between excitation filters, light entering the observation port may cause a glare that can affect vision, depending on the configuration of optical equipment. To prevent this glare, we recommend that excitation filters be arranged as follows on the wheel:

Example of excitation filter arrangement



[Excitation filter attachment surface]

VI

17 BA filter wheel

Attach the BA filter wheel to the left-side port of the microscope with no adapter.

If an adapter is attached on the side port, remove it.

1 Align the BA filter wheel positioning pin with the hole on the microscope, insert the microscope attachment part of the BA filter wheel into the side port, and tighten the adapter clamp screw on the microscope to secure the wheel.

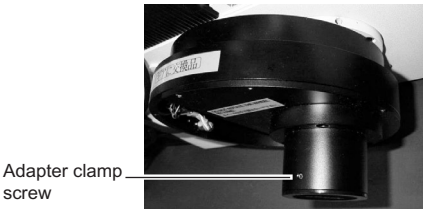
2 Loosen the adapter clamp screw and detach the plastic cap from the output port.

3 Attach the appropriate adapter to photomicrographic equipment and insert that adapter into the output port. Then secure the adapter with the adapter clamp screw.

Ex. Attaching the C-mount TV camera to the direct C-mount adapter

Screw the direct C-mount adapter firmly into the C-mount TV camera. Insert the direct C-mount adapter firmly into the output port and secure the adapter with a clamp screw.

4 Connect the cable to the BA FILTER connector on the HUB controller.



Attaching barrier filters

Attach barrier filters after mounting all other parts and attachments to the microscope.

CAUTION

Be sure the light source is turned off when attaching or detaching barrier filters.

1 Loosen the cover clamp screw to detach the cover.

2 Turn the wheel so that the barrier filter attachment positions are visible.

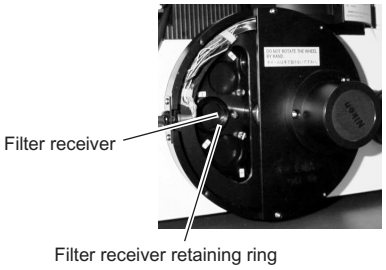
3 Loosen the filter receiver clamp screw to turn the receiver so that the notch is aligned with the filter receiver clamp screw. Then pull the filter receiver out of the wheel.

4 Detach the filter retaining ring from the filter receiver.

5 Place an excitation filter in the filter receiver and secure it with the filter retaining ring.

6 Align the notch on the filter receiver with the filter receiver clamp screw to insert the receiver into the wheel. Turn the filter receiver and secure it in position with the clamp screw.

7 Tighten the cover clamp screw to secure the cover.



To turn the wheel to which the barrier filters will be attached, first turn on the power for the HUB controller, and then use the BARRIER key on the remote control pad to rotate the wheel.

■Supplementary information

Before using barrier filters, program the remote control pad with information on the filters attached to the BA filter wheel. For information on how to programming the remote control pad, see “1.2. Setting Attachment Information (barrier filters).”

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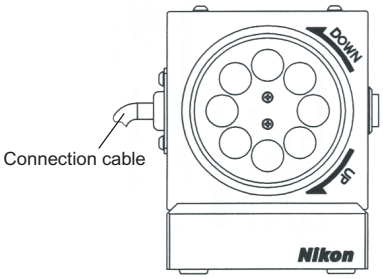
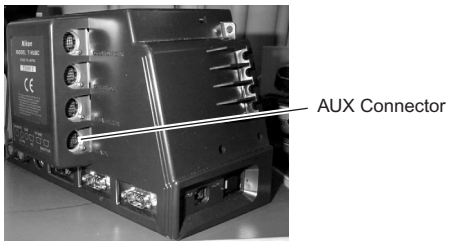
18 Remote control pad

Connect the remote control pad power cable to the REMOTE connector on the HUB controller.

19 T-EFN Focus Knob

Connect the knob's connection cable to the HUB controller's AUX Connector.





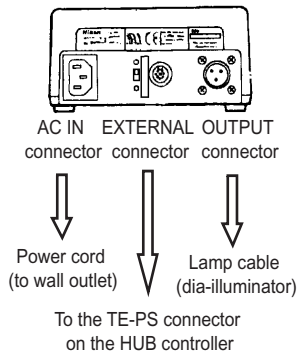
20 Power supply

1 Connect the lamp cable (cable from the dia-illuminator) to the OUTPUT connector, then firmly tighten the locking ring.

2 Connect the EXTERNAL connector and the TE-PS connector on the HUB controller with the control cable (HUB2).

3 Always use the power cords specified in “Electrical specifications.”

See “21. Connection of the power cord and the AC adapter” for more information on the power cord.



21 Connection of the power cord and the AC adapter

Connecting the power cord (for the power supply)

WARNING

To prevent electric shock, always turn off the power switch (switch it to “O”) for the power supply before attaching or detaching the power cord.

Always use one of the power cords specified below for the power supply. Use of an improper power cord can result in fire or other hazard. Also note that the power supply is classified as subject to class I electric shock protection. Be sure to connect it to the protective earth terminal.

- When the supply voltage is 100 to 120 V

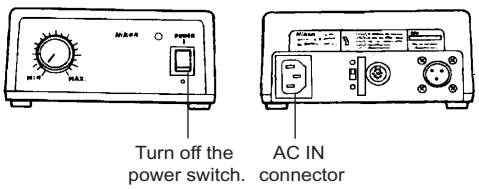
  UL listed detachable power cord set, 3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 V AC minimum.

- When the supply voltage is 220 to 240 V

  Approved according to EU/EN standards, 3 conductor grounding Type HO5VV-F, 3 m long maximum, rated at 250 V AC minimum.

1 Flip the power switch to “O” to turn off power.

2 Attach one end of the power cord (for the power supply) to the AC IN connector on the power supply and the other end to the wall outlet.



VI

Connecting the AC adapter (for the HUB controller)

WARNING

To prevent electric shock, always turn off the power switch (switch it to “O”) to the HUB controller before attaching or detaching the power cord.

Use only one of the power cords specified below for the AC adapter. Use of an improper power cord can result in fire or other hazard.

- When the supply voltage is 100 to 120 V

  UL listed detachable power cord set, 3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 V AC minimum.

- When the supply voltage is 220 to 240 V

  Approved according to EU/EN standards, 3 conductor grounding Type HO5VV-F, 3 m long maximum, rated at 250 V AC minimum.

WARNING

The HUB controller is powered through the AC adapter. Be sure to use a specified adapter model meeting the requirements described below. Use of any other type of AC adapter can result in malfunction, excessive heating, and/or fire.

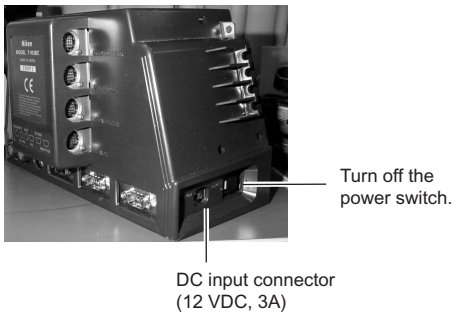
- To prevent malfunction and/or fire, be sure to use the AC adapter in a well-ventilated location. To ensure appropriate heat radiation and to prevent overheating, never cover it or place any object over it.
- To prevent malfunction, always turn off the power switch (switch it to “O”) of the HUB controller before attaching the AC adapter.
- Specified AC adapter

Manufacturer:	PHIHONG ENTERPRISE (Taiwan)
Model:	PSA30U-120 (N)
Rated input voltage:	AC100-240 V, 0.7 A, 50/60 Hz
Voltage fluctuation:	±10%
Rated output voltage:	DC 12 V
Rated output current:	2.5 A
Others:	UL Listed product, GS approved, CE satisfied

1 Flip the power switch on the HUB controller to “O” to turn off the power.

2 Insert the DC plug of the AC adapter into the DC input connector (12 VDC, 3 A) on the HUB controller.

3 Securely insert the AC plug of the power cord (for the AC adapter) into the wall outlet.



22 Connection of external equipment

See the manuals for the respective items of external equipment for instructions on how to attach them to the microscope.

PC

You can use your PC (IBM PC or compatible) to manipulate the microscope and its attachments via the HUB controller by connecting the PC to the HUB controller.

See “V. Online and remote operation” for more information.

Motorized XY stages and shutters made by manufacturers other than Nikon

You can manipulate optional equipment, such as motorized XY stages and shutters made by other manufacturers, via the HUB controller.

Contact your nearest Nikon representative for details. See the instruction manual for your equipment for information on operation.

23 Connection to the EXP connector

When connecting equipment to the EXP connector, be sure to connect pin 2 to ground and pins 3, 4, and 5 to 5 V to ensure that the HUB controller can detect equipment connected to the EXP connector.

(1) Connecting the foot switch

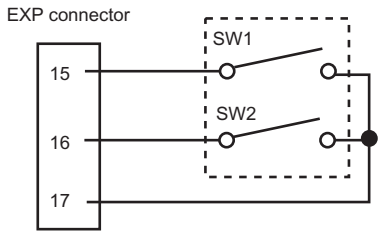
You can use the foot switch to manipulate motorized units for the TE2000 Series by connecting the switch to the EXP connector.

The DIC nosepiece, the condenser turret, the cassette holder, the EX filter wheel, and the BA filter wheel can be operated by means of the foot switch.

See the remote control pad instruction manual for instructions on selecting an appropriate motorized unit.

SW1:
The next-larger adjacent address is selected when this switch is closed.

SW2:
The next-smaller adjacent address is selected when this switch is closed.



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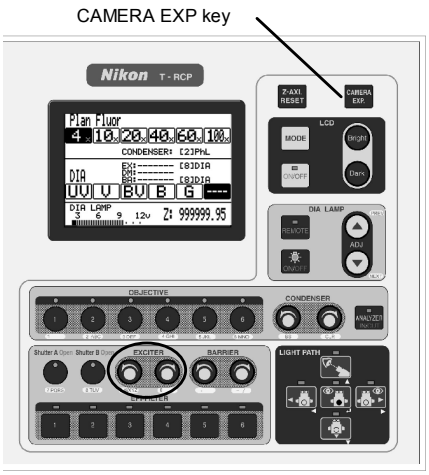
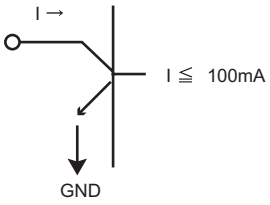
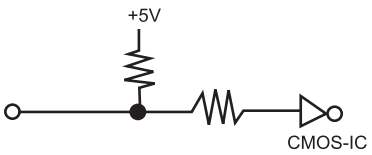
(2) Connecting a camera

You can use the CAMERA EXP switch on the remote control pad to release the shutter (to perform an exposure) by connecting pin 6 and the ground to the camera shutter input.

Note that the shutter will remain released when the HUB controller is off. Therefore, be sure to turn the camera on or off with the HUB controller on.



(3) Connector signal specification

Pin No.	Input/Output	Specification
1	Output	GND
2	Input	GND
3	Input	+5 V
4	Input	+5 V
5	Input	+5 V
6	Output	**Camera shutter output signal** Open-collector output  This transistor turns ON for a predetermined duration when the CAMERA EXP switch on the remote control pad is pressed.
7	Output	GND
8	—	Inhibited
9	—	Inhibited
10	—	Inhibited
11	—	Inhibited
12	—	Inhibited
13	Output	GND
14	Output	+5 V (15 mA max.)
15	Input	**Switch signal input (e.g., foot switch)** 
16	Input	Same as above
17	Output	GND
18	Output	+5 V (15 mA max.)

Pin No.	Input/Output	Specification
19	—	Unused
20	—	Unused

Connector: HR12-14RA-20SC (Hirose)

VII

Troubleshooting

If the microscope or any associated units do not function properly, take appropriate action as described below. If the problem is still not resolved after referring to "Troubleshooting," please contact your nearest Nikon representative.

1 Optical

Symptom	Cause	Remedy
Field of view vignetting. Uneven brightness in the field of view. Field of view not visible.	Parts not properly installed.	Install the parts (nosepiece, condenser, etc.) properly.
	Stage ring in the optical path.	Change the specimen position.
	Field diaphragm image not focused on the specimen surface.	Focus and center the condenser.
	Field diaphragm too narrow.	Open the field diaphragm until it is slightly larger than the field of view.
	Dirty lenses and containers.	Clean the lenses. Use clean containers.
Dirt or dust in the field of view.	Dirty lenses and containers.	Clean the lenses. Use clean containers.
	Field diaphragm image not focused on the specimen surface.	Focus and center the condenser.
Poor image quality, contrast and/or resolution.	Dirty lenses and containers.	Clean the lenses. Use clean containers.
	Correction ring to the objective not set to the thickness of the container bottom plate.	Adjust the ring.
	Container bottom plate varies in thickness to the extent that corrections for the objective cannot be made.	Use a container with a bottom plate of sufficient uniformity to permit correction.
	Field diaphragm image not focused on the specimen surface.	Focus and center the condenser.
No phase contrast effect (during Ph microscopy)	Bright-field objective has not been replaced with Ph objective.	Use a Ph objective.
	Condenser annular diaphragm 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.
	Condenser annular diaphragm not centered.	Center the annular diaphragm.
	Aperture diaphragm not fully open.	Fully open the diaphragm (only when using the system condenser).
Uneven focus	Nosepiece not attached properly.	Attach the nosepiece properly.
Image flows	Specimen tilted with respect to the stage surface.	Correctly position the specimen on the stage.
	Nosepiece not attached properly.	Attach it properly.
	Condenser annular diaphragm not centered.	Center the annular diaphragm.
	Dia-illuminator tilted.	Return the dia-illuminator to an upright position, as far as it will go.
Yellowish image	NCB11 filter not in the optical path.	Move the filter into the optical path.
	Lamp voltage too low.	Use the brightness adjustment dial to set the voltage level to the rated lamp voltage.
Field of view too bright.	ND filter not in the optical path.	Move the filter into the optical path.
	Lamp voltage too high.	Use the brightness adjustment dial to lower the voltage level.
Field of view too dark	Aperture diaphragm too narrow.	Open the aperture diaphragm so that it is at 70 to 80% of the objective N.A.
	Field diaphragm image not focused on the specimen surface.	Focus and center the condenser.

2 Operational (BF, Ph)

Symptom	Cause	Remedy
Focus not achieved when the objective is raised to the uppermost position.	Stage not mounted properly.	Mount the stage properly.
	Objective refocusing ring clamped.	Fully release the clamp.
Focus not achieved with 20X or 40X objective.	Container bottom plate varies in thickness to the extent that corrections for the objective cannot be made.	Use a container with a bottom plate of sufficient uniformity to permit correction.
Images seen through the right and left eyepieces do not match.	Distance between eyepieces not adjusted.	Adjust the distance between the eyepieces.
Eye fatigue	Diopter not adjusted.	Adjust the diopter.
	Improper brightness.	Adjust using the brightness adjustment dial or ND filters.

3 Electrical

Microscope

Symptom	Cause	Remedy
Lamp does not light.	Power cord not connected or connected improperly.	Connect the power cord properly.
	Burned-out lamp	Replace with the specified lamp type.
Prematurely burned-out lamp.	Non-conforming lamp used.	Replace with the specified lamp type.
Dia-illumination ON/OFF switch does not function properly.	One or both of the lamp control cables (HUB1 and HUB2) are not connected or are connected improperly.	Connect lamp control cables properly.
	Burned-out lamp.	Replace with the specified lamp type.
	ON/OFF by the remote control pad selected with the DIA LAMP REMOTE key (LED lit green)	Press the DIA LAMP REMOTE key so that the LED lights orange.
Brightness adjustment dial on the microscope does not function properly.	One or both of the lamp control cables (HUB1 and HUB2) are not connected or are connected improperly.	Connect the lamp control cables properly.
	EXTERNAL switch at the rear of the power supply is off.	Turn the EXTERNAL switch “ON.”
	ON/OFF by the remote control pad selected with the DIA LAMP REMOTE key (LED lit green).	Press the DIA LAMP REMOTE key so that the LED lights orange.
None of the LEDs above the LIGHT PATH keys lights to indicate the currently selected optical path.	Microscope control cable 1 not connected or connected improperly.	Connect control cable 1 properly.
Focus not achieved with the fine focus knob.	Microscope control cable 2 not connected or connected improperly.	Connect control cable 2 properly.
Z-axis position does not appear on the LCD (remote control pad).	Microscope control cable 2 not connected or connected improperly.	Connect control cable 2 properly.
	Remote control pad not programmed to display the Z-axis position.	Program the pad to display the Z-axis position. See the instruction manual for the remote control pad for more information.

Power supply

Symptom	Cause	Remedy
Power cannot be turned on with the power switch.	Power cord not connected or connected improperly.	Connect the power cord properly.
The brightness adjustment dial on the power supply does not function properly.	EXTERNAL switch at the rear of the power supply set to “ON.”	Set the EXTERNAL switch to “OFF.”

HUB controller

Symptom	Cause	Remedy
Power cannot be turned on with the power switch.	AC adapter power cord not connected or connected improperly, or DC plug for AC adapter not connected or connected improperly.	Connect the power cord and/or DC plug properly.

Remote control pad

Symptom	Cause	Remedy
No screen display on the LCD.	Power cable for remote control pad not connected or connected improperly.	Connect power cable properly.

Motorized nosepiece

Symptom	Cause	Remedy
Nosepiece connection not displayed on the LCD.	Nosepiece cable not connected or connected improperly.	Connect nosepiece cable properly.
	Remote control pad not programmed to display objective information.	Program remote control pad to display objective information. See the instruction manual for the remote control pad.

Motorized condenser turret

Symptom	Cause	Remedy
Turret connection not displayed on the LCD.	Turret cable not connected or connected improperly.	Connect turret cable properly.
	Remote control pad not programmed to display condenser module information.	Program the remote control pad to display condenser module information. See the instruction manual for the remote control pad.

Motorized cassette holder

Symptom	Cause	Remedy
Cassette holder connection not displayed on the LCD.	Cassette holder cable not connected or connected improperly.	Connect cassette holder cable properly.
	Remote control pad not programmed to display filter block information.	Program the remote control pad to display filter block information. See the instruction manual for the remote control pad.

EX filter wheel

Symptom	Cause	Remedy
EX filter wheel connection not displayed on the LCD.	EX filter wheel cable not connected or connected improperly.	Connect EX filter wheel cable properly.
	Remote control pad not programmed to display excitation filter information.	Program the remote control pad to display excitation filter information. See the instruction manual for the remote control pad.

BA filter wheel

Symptom	Cause	Remedy
BA filter wheel connection not displayed on the LCD.	BA filter wheel cable not connected or connected improperly.	Connect BA filter wheel cable properly.
	Remote control pad not programmed to display barrier filter information.	Program the remote control pad to display barrier filter information. See the instruction manual for the remote control pad.

Motorized analyzer

Symptom	Cause	Remedy
The analyzer LED on the remote control pad does not light green or orange to indicate whether or not it is in the optical path.	Analyzer cable not connected or connected improperly.	Connect analyzer cable properly.

Motorized shutter (epi-fl attachment)

Symptom	Cause	Remedy
The shutter LED on the remote control pad does not light green or orange to indicate that it is open or closed.	Shutter cable not connected or connected improperly.	Connect shutter cable properly.
	Motorized shutter not assigned to one of the Shutter keys.	Assign the motorized shutter to one of the Shutter keys. See the instruction manual for the remote control pad.

T-EFN focus knob

Symptom	Cause	Remedy
No focus adjustment when the selector switch on the T-EFN focus knob is switched on (only when the TE2000-E is used)	Knob connection cable is not connected or is improperly connected	Connect the cable properly.

4 Epi-fl and DIC microscopy

Symptom	Cause	Remedy
Image not visible when the lamp is lit.	Shutter in the optical path.	Remove the shutter from the optical path.
	Improperly selected filter block.	Select the correct filter block.
	Improper combination of excitation filter, barrier filter, and dichroic mirror, or one or more of the preceding missing.	Use filter blocks with a proper combination of filters and mirror.
	Light source improperly centered.	Center the lamp. Center the lamp again while looking at the fluorescent image, particularly when using the 100X objective.
Image too dark when lamp is lit.	ND filter in the optical path.	Remove ND filter from the optical path.
	Combination of excitation filter, barrier filter, and dichroic mirror not appropriate for the specimen	Use a filter block containing an appropriate combination of filters and mirror for the specimen.
	Halogen lamp used for dark specimen.	Replace the halogen lamp with an Hg lamp.
	Specified objectives not used during UV and V excitation.	Use the specified objectives.
Illumination light entering into the observation port.	Filter blocks not positioned properly.	Fully push filter blocks against the back of the turret and secure them properly.
Poor contrast	Immersion oil emitting light by fluorescence.	Use non-fluorescent oil (Nikon immersion oil DF).
	Slide glass emitting light by fluorescence.	Use non-fluorescent slide glass.
	Room too bright.	Darken the room.
Poor image quality.	Cover glass 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 not immersed in oil.	Immerse tip in the specified type of oil.
	Specified type of immersion oil not used.	Use the specified type of immersion oil.
	Filter block not appropriate for the specimen used.	Use a filter block appropriate for the specimen.
Field of view vignetting	ND filter slider and shutter not fully pulled out or pushed in.	Fully pull them out or push them in.
	Filter blocks not positioned properly.	Fully push filter blocks against the back of the turret and secure them properly.
	DIC prism for objective not in the optical path.	Move the DIC prism into the optical path.
Improper contrast with DIC microscopy.	Improper selection of condenser module.	Select a condenser module appropriate for the condenser lens. Select a condenser module with the same code as that of the objective.
	DIC prism for objective not in the optical path.	Move DIC prism into the optical path.
	Improper combination of objective and DIC prism for objective.	Select a DIC prism that suits the objective used.
Poor image quality or contrast.	Condenser not properly oriented.	Use crossed Nicols to orient the condenser properly.
	Improper selection of condenser module.	Select a condenser module that suits the condenser lens. Select a condenser module with the same code as that of the objective.
	Improper combination of objective and DIC prism for objective.	Select a DIC prism slider that suits the objective used.
	Air bubbles in the section of the lens immersed in oil.	Use the Bertrand lens to rotate the nosepiece slightly while observing the focusing surface of the objective. If air bubbles move as the nosepiece is rotated, the air bubbles are in the objective. If air bubbles remain in the same position, they are in the condenser. In the former case, remove oil from the objective; in the latter case, remove oil from the condenser. Finally, reimmerse the objective or condenser in oil.

VIII

Care and maintenance

1 Lens cleaning

Keep lenses clean and free of dust or fingerprints. Dirty lenses and filters can degrade image quality. Follow the steps given below to clean lenses if they are found to be dirty.

- Use a soft brush to remove dust or gauze to gently wipe it away.
- Use a soft, clean cloth, lens tissue, 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 lens. 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 repeatedly. (Usually, three or four wipes will be sufficient.)
- Do not use petroleum benzine to clean the entrance lens at the bottom of the eyepiece tube or prism surface of this tube.
- Because pure alcohol and petroleum benzine are quite flammable, exercise great caution in handling and when switching power switches on or off. Do not use in the proximity of flames.
- Handle pure alcohol with care, following the instructions provided by the manufacturer.

2 Cleaning

- We recommend that you use a silicon cloth to clean the microscope or associated units.
- For persistent dirt, dampen a piece of gauze with neutral detergent and wipe lightly.
- Using organic solvents could result in discoloration of the plastic parts.

3 Disinfecting

- We recommend that you use 70% medical alcohol for normal disinfection of the microscope or associated units.
- In case of spillage of a sample onto the microscope or associated units, determine whether the sample is hazardous. If the sample is hazardous, follow your standard laboratory procedures.
- Using organic solvents could result in discoloration of the plastic parts.

4 Storage

Store the microscope and its motorized units in a dry place where mold is unlikely to form.

Store the objectivees 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 and allow it to cool before covering.

5 Periodic inspection (paid service)

We recommend that your microscope and motorized units be inspected on a regular basis (Nikon provides periodic inspections as a fee-based service). Contact your nearest Nikon representative for details.

IX

Technical specifications

1 When the microscope (TE2000-E, TE2000-U, TE2000-S) is used in combination with the T-DH dia-illuminator 100W (for a 12V100W lamp)

Combination	Microscope + T-DH dia-illuminator 100W + TE2-PS100W power supply
Dimensions	568(W) × 727(D) × 703(H) mm
Weight	41 Kg
Opto-mechanical specification	Objectives: CFI60 Eyepieces: Field Number 22 Nosepiece : 6-place Focusing: Stroke 10 mm Coarse 4.9 mm/rev. Fine 0.1 mm/rev. Fine scale 0.05 μm (TE2000-E), 1 μm (TE2000-U,S)
Input ratings of T-DH dia-illuminator 100W	DC 12 V, 100 W
Lamp ratings	12V100W halogen lamp
Lamp type	Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724I)
Average lamp lifetime	2,000 hrs.
TE2-PS100W power supply	Input ratings: AC 100-240 V, 50/60 Hz, 2.4 A Voltage fluctuation: ±10% Output ratings: DC 12 V, 100 W, 8.4 A Built-in fuse ratings: 250 V, T4A Protection class: Class 1 Others: UL Recognized product, GS approved
Operating environmental conditions	Altitude: 2,000 m max. Temperature: 0 to 40℃ Relative humidity: 85% max. (non-condensing) Pollution degree: Degree 2 Indoor use only
Storage and transport environmental conditions	Temperature: -20 to +60℃ Humidity: max. 90% RH (no condensation)
Installation category	Category II

2 When the microscope (TE2000-E, TE2000-U, TE2000-S) is used in combination with the T-DS dia-illuminator 30W (for a 6V30W lamp)

Combination	When the supply voltage is 100 to 120 V: Microscope + T-DS dia-illuminator 30W + TE-PS30 power supply When the supply voltage is 220 to 240 V: Microscope + T-DS dia-illuminator 30W + TE-PSE30 power supply
Dimensions:	568(W) × 727(D) × 611(H) mm
Weight:	37 Kg
Opto-mechanical specification	Objectives: CFI60 Eyepieces: Field Number 22 Nosepiece: 6-place Focusing: Stroke 10 mm Coarse 4.9 mm/rev. Fine 0.1 mm/rev. Fine scale 0.05 µm (TE2000-E), 1 µm (TE2000-U,S)
Input ratings of T-DS dia-illuminator 30W	DC 6 V, 30 W
Lamp ratings	DC 6V30 W halogen lamp
Lamp	Halogen lamp (PHILIPS 5761)
Average lamp	lifetime: 100 hrs.
TE-PS30 power supply **TE-PSE30 power supply**	Input ratings: TE-PS30: AC 100-120 V, 50/60 Hz, 0.6 A TE-PSE30: AC 230 V, 50/60 Hz, 0.4 A Voltage fluctuation: ±10% Output ratings: DC 6 V, 30 W Built-in fuse ratings: 250 V, F2AH Protection class: Class 1 Others: TE-PS30: UL Recognized product TE-PSE30: GS approved
Operating environmental conditions	Altitude: 2,000 m max. Temperature: 0 to 40℃ Relative humidity: 85% max. (non-condensing) Pollution degree: Degree 2 Indoor use only
Storage and transport environmental conditions	Temperature: -20 to +60℃ Humidity: max. 90% RH (no condensation)
Installation category	Category II

3 Specified AC adapter for use with the HUB controller

Manufacturer:	PHIHONG ENTERPRISE (Taiwan)
Type:	PSA30U-120A (N)
Input rating:	AC 100-240 V, 0.7 A, 50/60 Hz
Voltage fluctuation:	±10%
Output rating:	DC 12 V
Rated output current:	2.5 A
Others:	UL Listed product, GS approved, CE satisfied

4 Power cords (for power supply and AC adapter of HUB controller)

Always use the following power cords:

- **When the supply voltage is 100 to 120 V**

  UL Listed detachable cord set, 3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 V AC minimum.

- **When the supply voltage is 220 to 240 V**

  Approved according to EU/EN standards, 3 conductor grounding Type HO5VV-F, 3 m long maximum, rated at 250 V AC minimum.

5 Conforming standards

Microscope (TE2000-E, TE2000-U, TE2000-S) used in combination with the TE2-PS100W power supply or TE-PS30 power supply	UL Listed Product.
	FCC 15B, Class A satisfied. 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 Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

* Note that the microscope will not meet the above standards if used in combination with a motorized XY stage or shutter made by any manufacturer other than Nikon.

Microscope (TE2000-E, TE2000-U, TE2000-S) used in combination with TE2-PS100W power supply or TE-PSE30 power supply	・ Meets EU IVD Directive (In vitro diagnostic medical device directive) requirements. ・ Meets EU LV Directive (Low voltage directive) requirements. ・ Meets EU EMC Directive requirements. (EN61326)

* Note that the microscope will not meet the above standards if used in combination with a motorized XY stage or shutter made by any manufacturer other than Nikon.