



Nikon

Inverted Microscope

ECLIPSE

Ti-U* *Ti-U/B

Ti-S* *Ti-S/L100

Instructions

Introduction

Thank you for purchasing a Nikon product.

This instruction manual is written for users of Nikon Inverted Microscope Eclipse Ti-U, Ti-U/B, Ti-S, and Ti-S/L100.

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

- No part of this manual may be reproduced or transmitted in any form without prior written permission from Nikon.
- The contents of this manual are subject to change without notice.
- Although every effort has been made to ensure the accuracy of this manual, errors or inconsistencies may remain. If you note any points that are unclear or incorrect, please contact your nearest Nikon representative.
- Some of the equipment described in this manual may not be included in the set you have purchased.
- If you intend to use any other equipment with this product, read the manual for that equipment too.
- When using TI-HUBC/B Hub Controller B with the microscope, also refer to the instructions manual provided with the hub controller.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



Safety Precautions

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

Warning and Caution Symbols in this Manual



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

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

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

Symbols on the Product

The symbols on the product indicate the need for caution at all times during use. Before operating a part labeled with the following symbols, refer to the instruction manual and read the relevant instructions.

Symbol	Meaning
	CAUTION: HOT This symbol can be found on the top of the dia pillar illuminator and on the 12V 100W lamphouse, and cautions the following: <ul style="list-style-type: none">• The lamp and the lamphouse will be extremely hot while and immediately after using the lamp.• To avoid the risk of burns, do not touch the lamp and the lamphouse while or immediately after using the lamp.• When replacing the lamp, wait for the lamp and the lamphouse to cool sufficiently.
	Biohazard This symbol can be found on the upper part of the microscope, and cautions the following: <ul style="list-style-type: none">• The product may become biohazardous if a specimen is spilled onto the product.• To avoid exposure to biohazard, do not touch contaminated parts with your bare hands.• Decontaminate the contaminated parts according to the standard procedures for your facility.



Warning

1. Intended application of the product

The product is intended mainly for microscopic observations and micromanipulations of living cells and tissues under diascopic or episcopic illumination. It is designed for the purposes of experimentations and observations at hospitals or laboratories in the fields of genetics, immunology, physiology, pharmacology, neurology, cellular biology, and molecular biology.

The product is classified as an in-vitro diagnostic medical device.

2. Do not disassemble.

Disassembling this product may result in electric shock or malfunction. Malfunctions and damage due to such mishandlings will not be warranted. Do not disassemble any part that is not indicated in this manual. If you experience problems with the product, contact Nikon.

3. Read the instructions thoroughly.

To ensure safety, thoroughly read this manual and the manuals for other equipment to be used with this product. In particular, be sure to follow the warnings and cautions at the beginning of the manuals.

4. Check the input voltage.

The dia illumination lamp uses one of two types of power supply devices.

- **TI-PS100W Power Supply:**

The TI-PS100W Power Supply device can be used with 100 to 240 VAC at 50/60 Hz, and can be used with most wall outlets in the world. Under normal use, you will not need to pay particular attention to the supplied power voltage.

- **TE-PS30W Power Supply A or TE-PSE30 Power Supply A:**

The input voltage ratings are indicated on the rear panel of the power supply device. Before connecting the power cord, check that the indicated input voltage matches the voltage of the wall outlet. If the indicated input voltage does not match your regional voltage supply, do not use the power supply device, and contact Nikon. Use of a power supply device with the inappropriate voltage rating may result in overheating or fire due to overcurrent, and may also cause damage the power supply device and connected devices.

5. Cautions on the power cord

Be sure to use specified power cord for the power supply device. Use of other power cords may result in malfunction, overheat, or fire.

- See Chapter 7, "Specifications" for the specified power cord.
- To prevent electric shock, turn off the POWER switch (press the "O" side of the POWER switch) on the power supply device before connecting or disconnecting the power cord.
- Note that the power supply device is classified as Class I for electric shock protection. Be sure to connect it to a protective ground terminal.

**Warning****6. Check the combination of dia pillar illuminator, lamp, and power supply device.**

The combination of the dia pillar illuminator and the power supply device is specified based on the lamp ratings (12V/100W or 6V/30W) and the power voltage. Use them in the correct combination according to the instructions on page 55. Use of the devices in a wrong combination may result in malfunction, overheat, or fire.

7. Cautions on heat from the light source

The lamp and the lamphouse become extremely hot when the lamp is turned on. Follow the cautions below to prevent burns and fire.

- To avoid burns, do not touch the lamp and the lamphouse while the lamp is on or for approximately thirty minutes after it has been turned off.
- To avoid the risk of fire, do not place fabric, paper, or highly flammable volatile materials (i.e. gasoline, petroleum benzine, paint thinner, and alcohol) near the lamphouse while the lamp is on or for about thirty minutes after it has been turned off.
- Do not block the air vents on the lamphouse. If the lamphouse becomes covered or items are placed on the lamphouse, heat dissipation may be hindered, causing the lamphouse to become abnormally hot.
- The bottom of the power supply device becomes hot during use. Do not cover the air vents on the side of the power supply device.

8. Cautions on lamp replacement

- When replacing the lamp, wait approximately thirty minutes after turning off the lamp, and make sure that the lamp and the lamphouse have cooled sufficiently.
- To prevent electric shock and product damage, turn off the power switch (set the switch to the "O" side) and unplug the power cords from the wall outlets before replacing the lamp.
- After replacing the lamp, close and secure the lamphouse cover. Never use the product with the lamphouse cover left open.
- Do not break the used lamp. It should be disposed of as an industrial waste, according to the local regulations and rules.

9. Notes on handling hazardous specimens

The product is intended mainly for microscopic observations and micromanipulations of specimens such as living cells and tissues in a Petri dish. Note the following when handling the specimens:

- Before handling a specimen, check whether it is hazardous. Wear rubber gloves when handling hazardous (i.e. potentially infectious) specimens.
- Be careful not to spill the specimen. If a specimen is spilt onto the microscope, decontaminate according to the standard procedures for your facility.



Warning

10. Notes on handling flammable solvents

The following flammable solvents are used with the product:

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

Never hold a flame near these solvents. When using a solvent, thoroughly read the instructions provided by the manufacturer, and handle correctly and safely. Note the following precautions when using solvents with the product.

- Keep solvents away from the lamp, the lamphouse, the power supply device, and any other parts that may become hot.
- Keep solvents away from the product and its surroundings when turning on/off the power switch or plugging/unplugging the power cord.
- Be careful not to spill the solvents.

**Caution****1. Turn off the power during installation, assembly, connection/disconnection of cables, and maintenance.**

To prevent electric shock and fire, be sure to turn off the POWER switch on the power supply device (press the “O” side of the POWER switch) and unplug the power cords before installing or assembling the product, connecting or disconnecting cables, replacing the lamp, or performing maintenance tasks such as cleaning of the lenses.

2. Do not wet the product or allow intrusion of foreign matters.

Do not wet or spill liquids onto the product, as it may result in malfunction, overheat, or electric shock. If water or other liquids are accidentally spilled onto the product, immediately turn off the POWER switch (press the “O” side of the POWER switch) and unplug the power cord from the wall outlet. Then, wipe off the liquid with a piece of dry cloth. Intrusion of foreign matters into the product may also result in malfunctions. If liquids or foreign matters enter the product, do not use the product, and contact Nikon.

3. Weak electromagnetic waves

The product emits weak electromagnetic waves. Do not install the product near precision electronic devices to avoid affecting their performance. If signal reception by a TV or radio is affected, move the TV or radio set away from the product.

4. Cautions on moving the product

- When carrying the product, hold the product firmly by the bottom front recess and the bottom rear.
- When moving the product, do not hold by the focusing knobs, eyepiece tube, stage, or dia pillar illuminator. The parts may become detached and cause the product to fall, and may also result in malfunctions and loss of precision.

5. Cautions on assembling the product

- Take care to avoid pinching your fingers and hands.
- Scratches and dirt (i.e. fingerprints) on optical components such as lenses and filters will degrade the microscope image. When assembling the product, be careful not to scratch or directly touch the optical components.

6. Cautions on the protruding rack of the rectangular stage

The stage rack of TI-SR Rectangular Mechanical Stage will protrude when the stage is operated. When operating the focus knobs or the nosepiece, be careful not to strike your hands against the rack. Contact with the edges of the rack may result in injury.

7. Disposal

To avoid biohazard risks, dispose of the product as contaminated equipment, according to the standard procedures for your facility.

Notes on Handling the Product

1. Handle with care.

The product is a precision optical instrument. Handle the product with care and avoid physical shocks and vibrations.

In particular, the precision of objectives may be lost by even weak physical shocks.

2. Installation location and storage location

The product is a precision optical instrument. Use or storage of the product under inappropriate conditions may result in malfunctions or loss of precision. The following conditions must be considered for the installation location and the storage location.

- Install the product in a location with a temperature of 0 to 40°C and a relative humidity of 85% or less (no condensation).
Store the product in a location with a temperature of -20 to 60°C and a relative humidity of 90% or less (no condensation).
Use or storage of the product in a hot or humid location may result in molding of or condensation on the lenses, loss of precision, and malfunctions.
- Install the product in a place with little dust and dirt.
When storing the product, place a cover over the product to protect it from dust.
- Install the product in a place with little vibration.
- Install and store the product on a level and sturdy table or stage that can bear the weight of the product.
Install the product in a location with minimal exposure to hazards in the event of earthquakes and other potential disasters. If necessary, secure the product to the working desk or other heavy and stable items with a strong rope or other means, so as to prevent it from falling.
- Avoid placing the product in direct sunlight or immediately under the room lights.
The image quality is degraded in a bright environment due to the extraneous light entering the objective. A room light immediately above the microscope may also enter the objective as extraneous light, especially when using a condenser lens with a longer working distance (i.e. ELWD and LWD). In this case, it is recommended that you turn off the room light above the microscope.
- Install the product at least 10cm away from the surrounding walls.
When using TI-DH Dia Pillar Illuminator 100W, install the product at least 15cm away from the wall, so that the caution labels on the dia pillar illuminator and the lamphouse are visible. Note that TI-DH Dia Pillar Illuminator 100W can be inclined backward to secure working space. To utilize this function, install the product so that there is enough space between the product and the wall for the dia pillar illuminator to be inclined.
- Do not install the product in a closed space such as a locker or a cabinet.
- Do not place items on the product.
- Install the product so that the power cord to the power supply can be unplugged immediately in case of an emergency.

3. Notes on handling optical parts

Scratches and dirt (i.e. fingerprints) on optical components such as lenses and filters will degrade the microscope image.

Handle the optical components with care, so as not to damage them. If they require cleaning, refer to Chapter 6, "Daily Maintenance".

4. Notes on handling the lamp

Do not touch the lamp glass with your bare hands. Fingerprints and other dirt on the lamp may result in uneven illumination and reduce the service life of the lamp. Wear gloves or use other pieces of clothes when handling the lamp.

5. Notes on using the focus knobs

- Never rotate the left and right focus knobs in the opposite directions at the same time. Doing so may damage the product.
- Do not rotate the focus knobs past their limit. Doing so may damage the product.

6. Protecting the ports.

The product has multiple ports. To keep out extraneous light and dust, attach the provided caps to the ports that are not in use.

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1

Part Names

This chapter describes the name of each part of the product.

When using the product for the first time, refer to this chapter and check the name and the position of each part. Also refer to this chapter for names and positions of the controls whenever necessary.

- The components of the microscope can be selected to suit the application. However, the lamp, the dia pillar illuminator, and the power supply device must be used in specific combinations. Do not use these devices in an inappropriate combination. For combinations of the lamp, the dia pillar illuminator, and the power supply device, refer to page 55.
- For details on microscopy procedures, see Chapter 2, "Microscopy". For details on the operation of each part, see Chapter 3, "Operation".
- If the microscope has not been assembled yet, first refer to Chapter 4, "Assembly".

1.1 Microscope Configuration

1.1.1 Ti-U, Ti-U/B

The illustrations below show the Ti-U microscope body with the following accessories:
 TI-DH Dia Pillar Illuminator 100W, TI-C Condenser Turret, D-LH/LC Precentered Lamphouse LC, 12V 100W halogen lamp, TI-PS100W Power Supply, TI-SR Rectangular Mechanical Stage, TI-T-B Eyepiece Base Unit, TI-TD Eyepiece Tube B, CFI 10x eyepieces, TI-ND6 Sextuple DIC Nosepiece, objectives, etc.

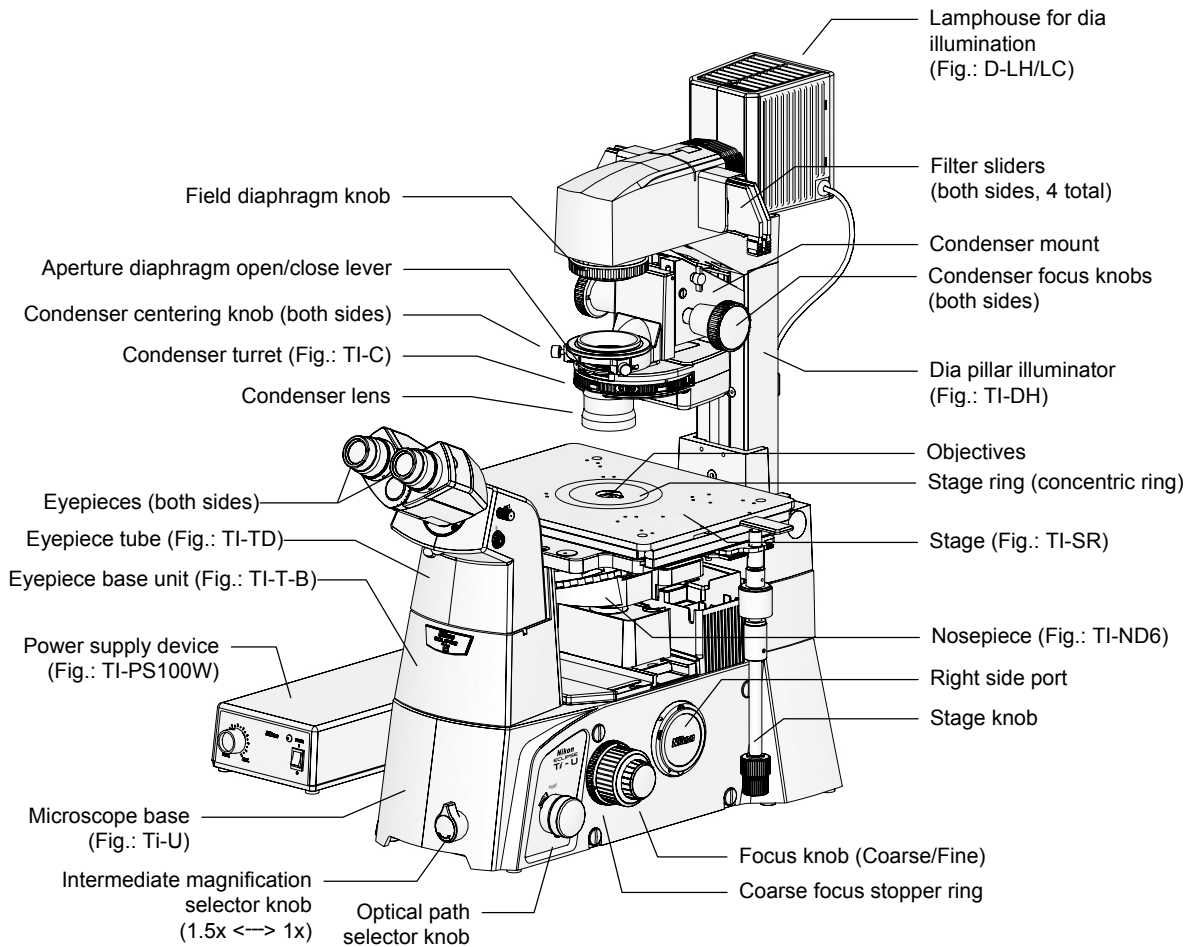


Figure 1-1 Ti-U

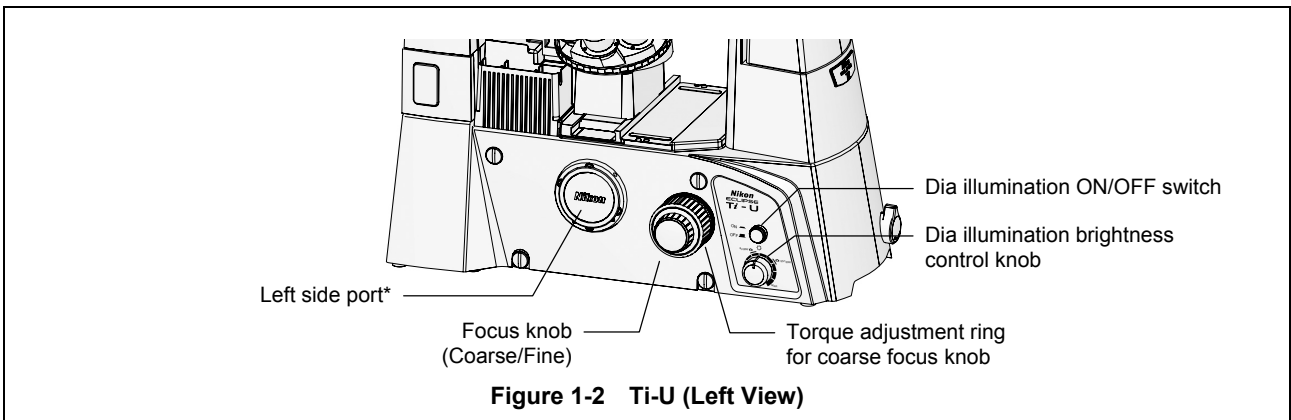


Figure 1-2 Ti-U (Left View)

* Attach a protective cap on the side port when the side port is not in use.

1.1.2 Ti-S, Ti-S/L100

The illustrations below show the Ti-S microscope body with the following accessories:

TI-DS Dia Pillar Illuminator 30W, ELWD-S Condenser, TE-PS30 30W Power Supply, TI-SR Rectangular Mechanical Stage, TI-T-B Eyepiece Base Unit, TI-TS Eyepiece Tube B, CFI 10x eyepieces, TI-N6 Sextuple Nosepiece, objectives, etc.

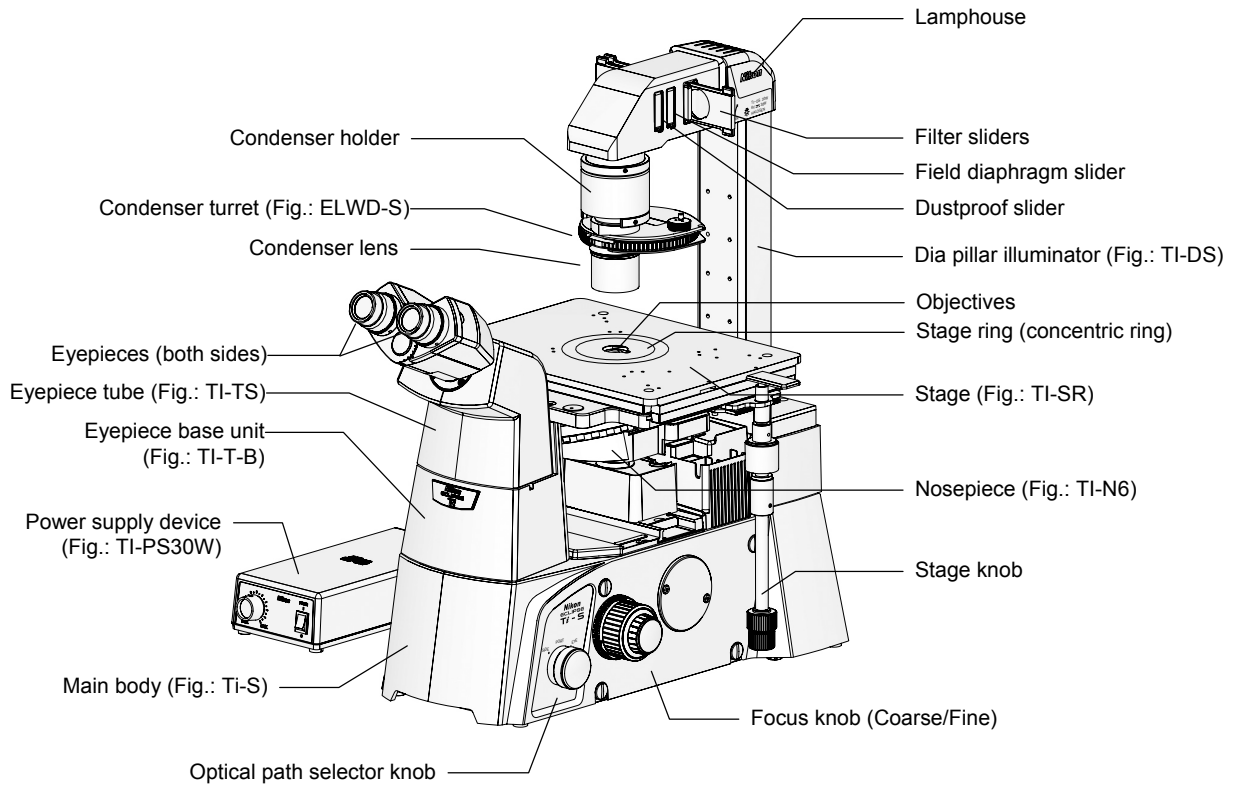


Figure 1-3 Ti-S

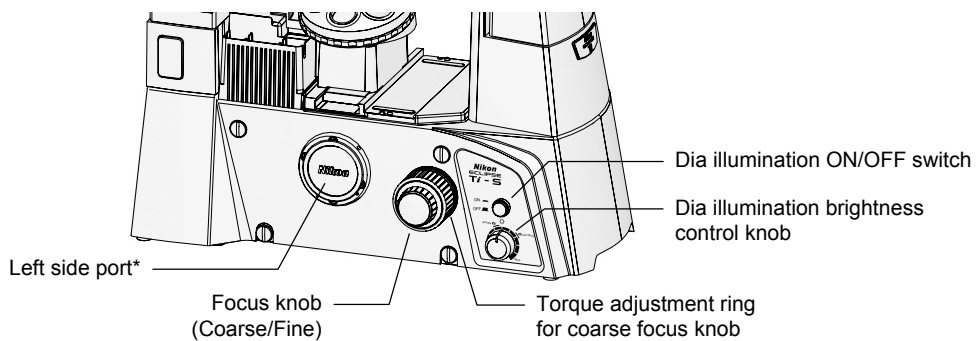


Figure 1-4 Ti-S (Left View)

* Attach a protective cap on the side port when the side port is not in use.

1.2 Microscope Base

To keep out extraneous light and dust, be sure to attach the provided caps to all ports not in use.

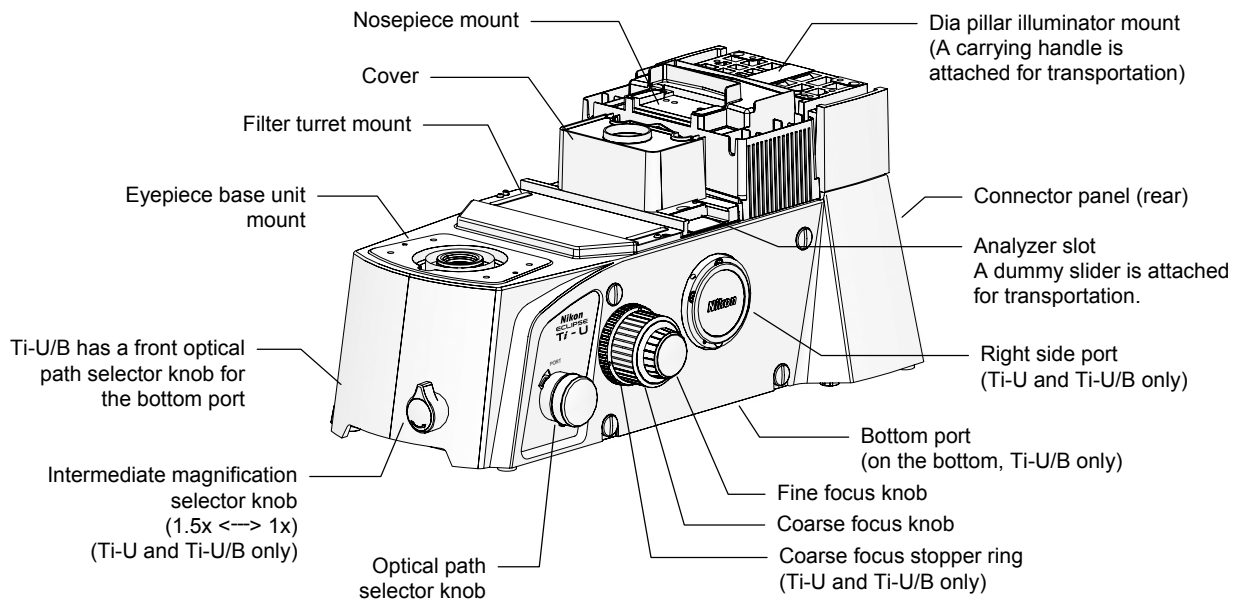


Figure 1-5 Microscope Base

Optical Path Selector Knob Operation

Ti series microscopes have multiple output ports. Use the optical path selector knob to select the output port for the microscope image.

Ti-U		Ti-U/B		Ti-S		Ti-S/L100	
EYE	Visual observation 100%	EYE	Visual observation 100%	EYE	Visual 100%	EYE	Visual observation 100%
R	Right side port 100%	R	Right side 100%	SIDE	Visual observation 20%, Left side port 80%	SIDE	Left side port 100%
AUX	Prism attachment position	B	Bottom port 100%				
L	Left side port 100%	L	Left side 100%				

Left View

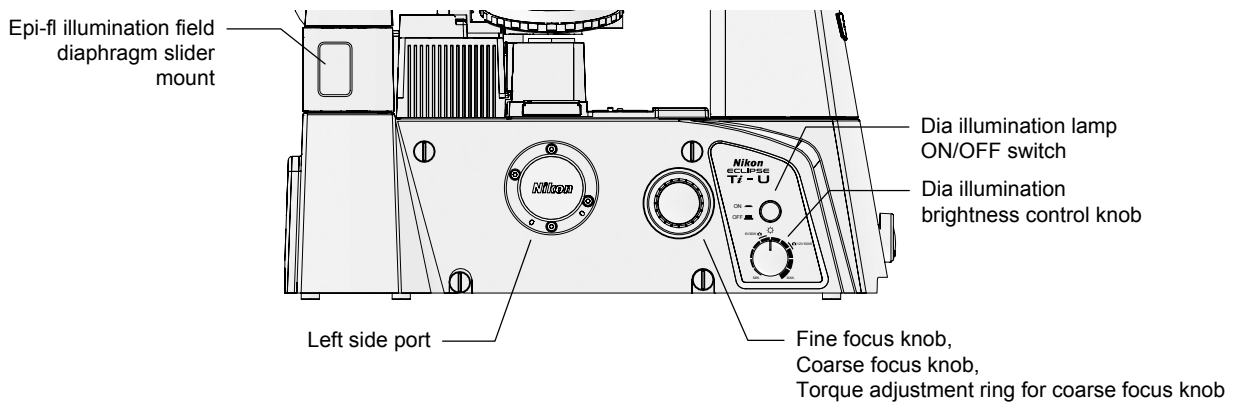


Figure 1-6 Microscope Base (Left View)

Rear View (Connector Panel)

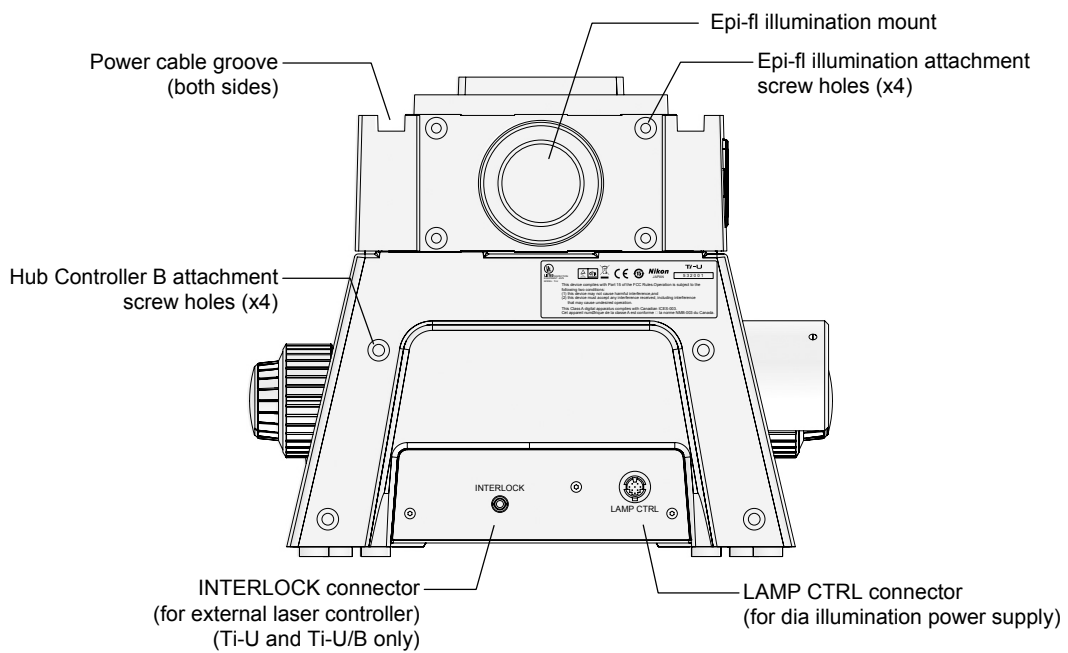


Figure 1-7 Microscope Base (Rear View)

1.3 Eyepiece Base Unit, Eyepiece Tube, and Eyepieces

The following eyepiece base units, eyepiece tubes, and eyepieces can be mounted on the observation port of the microscope.

TI-T-B Eyepiece Base Unit

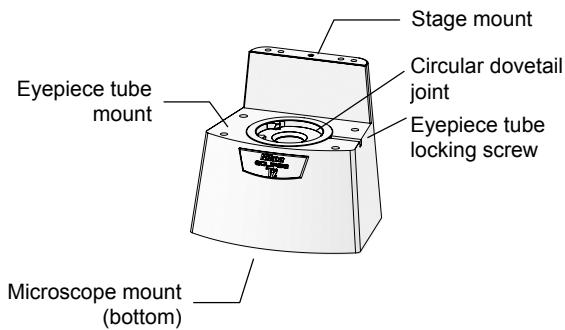


Figure 1-8 TI-T-B Eyepiece Base Unit

Basic eyepiece base unit.

A circular dovetail joint is provided on the top surface for eyepiece tube attachment. Attach an eyepiece tube for visual observation.

If you will not be performing visual observation, you do not need to attach an eyepiece tube. In this case, be sure to attach a cover onto the circular dovetail joint.

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

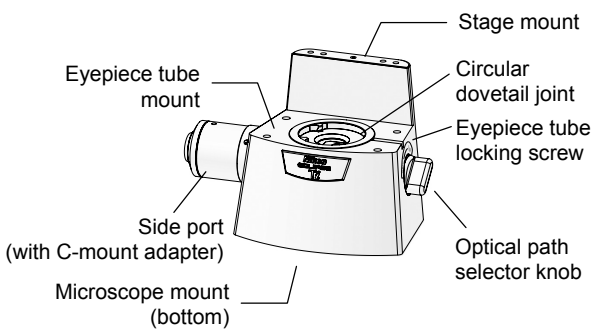


Figure 1-9 TI-T-BS Eyepiece Base Unit

Eyepiece base unit with a camera port.

Rotate the optical path selector knob on the right to distribute the light between the eyepiece tube and the side port.

The side port is equipped with a C-mount adapter for attaching microscopy cameras.

TI-T-BPH External Phase Contrast Eyepiece Base Unit

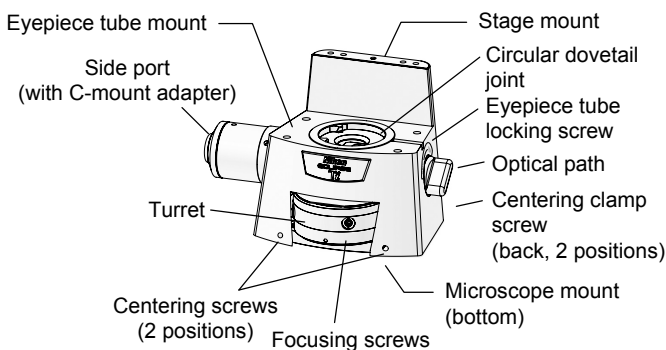


Figure 1-10 TI-T-BPH Eyepiece Base Unit

Eyepiece base unit for external phase contrast microscopy.

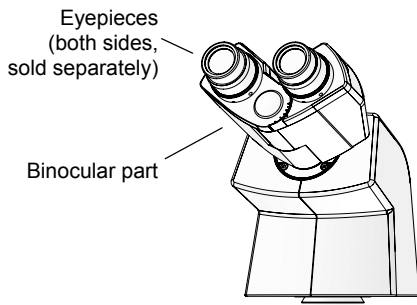
A turret for phase contrast rings is provided on the front of the eyepiece base unit. The turret has three positions (A, B, and C) that can each hold an external phase contrast phase plate. The focus can be adjusted independently for each position. The turret has screws on its sides for centering the phase contrast rings, and clamp screw on its back for fixing the adjusted position.

On the left side, a side port with a C-mount adapter is provided. On the right side, an optical path selector knob is provided for light distribution between the eyepiece tube and the side port.

When performing photomicroscopy during external phase contrast microscopy, use this side port.

1.3 Eyepiece Base Unit, Eyepiece Tube, and Eyepieces

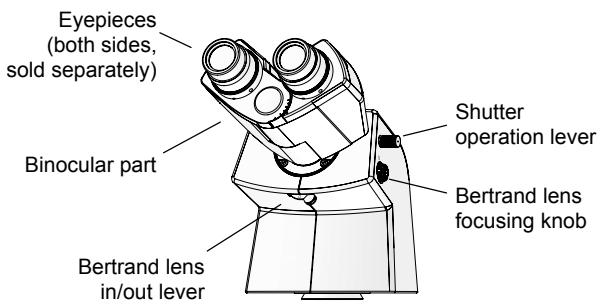
TI-TS Eyepiece Tube B



Simple and basic eyepiece tube.

Figure 1-11 TI-TS Eyepiece Tube B

TI-TD Eyepiece Tube B



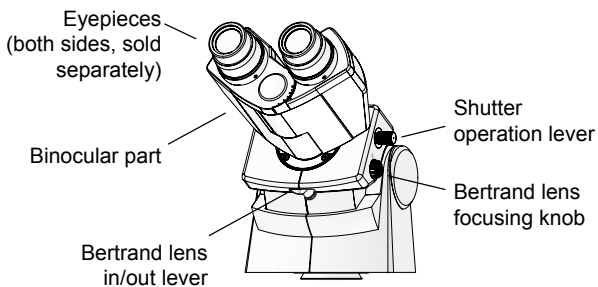
Eyepiece tube with a manual shutter and a Bertrand lens.

The shutter can be closed to cut off the optical path to the eyepieces, for example when observing with a camera.

The Bertrand lens can be moved into the optical path for observation of the objective pupil plane.

Figure 1-12 TI-TD Eyepiece Tube B

TI-TERG Ergonomic Eyepiece Tube



Eyepiece tube with an adjustable binocular that can be inclined to fit the user.

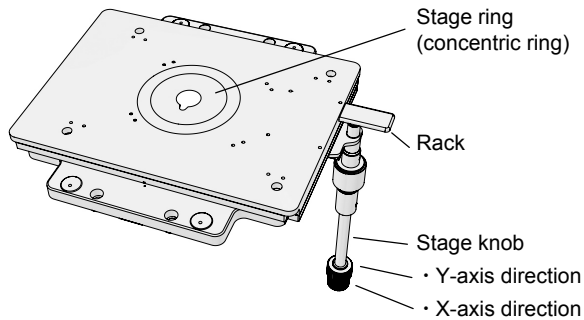
Like TI-TD Eyepiece Tube B, this eyepiece tube is equipped with a Bertrand lens. The optical path to the eyepieces can be cut off, for example when observing with a camera. The Bertrand lens can be moved into the optical path for observation of the objective pupil plane.

Figure 1-13 TI-TERG Ergonomic Eyepiece Tube

1.4 Stage

The following stages can be attached to the product.

TI-SR Rectangular Mechanical Stage



The specimen can be moved in the X and Y directions by operating the stage knob.

The rectangular mechanical stage comes with two stage clips for culture vessels, and the following two concentric rings.

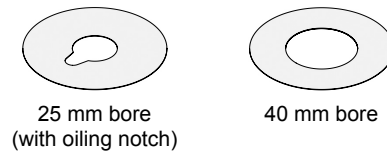
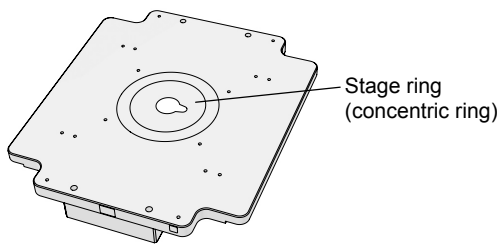


Figure 1-14 Rectangular Mechanical Stage

TI-SP Plain Stage



Simple, fixed stage for easy operation of specimens.

The plain stage comes with the following two concentric rings.

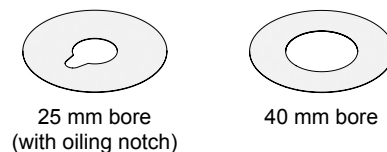
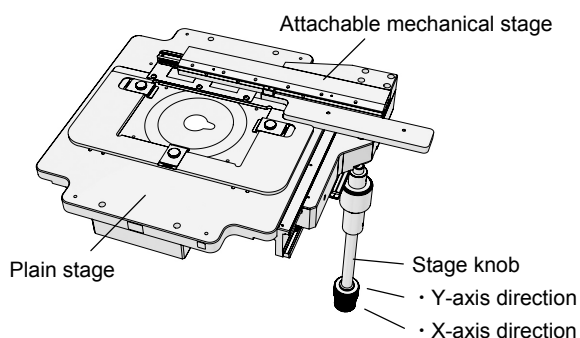


Figure 1-15 Plain Stage

TI-SAM Attachable Mechanical Stage



This stage is attached to the plain stage when using specimen holders. The specimen can be moved in the X and Y directions by operating the stage knob.

Various specimen holders can be used by attaching the following adapters to the provided microplate.

- MA60 microplate holder
- MA60 Petri dish holder
- MA glass slide holder
- 35 Petri dish holder

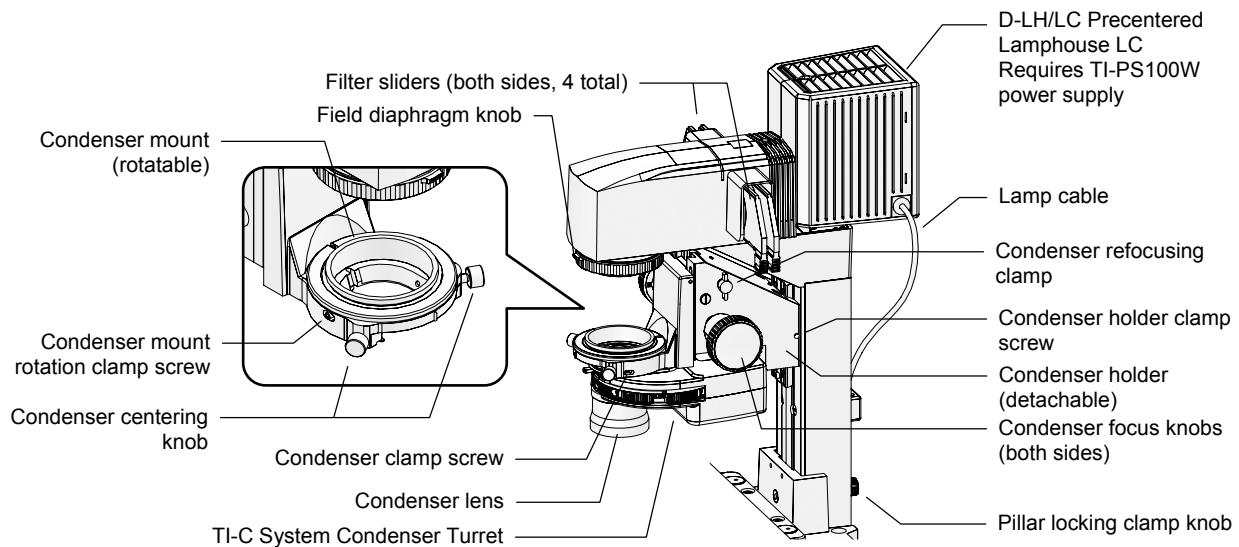
Figure 1-16 Attachable Mechanical Stage (on Plain Stage)

1.5 Dia Pillar Illuminator

Ti series microscopes can be used with the following two types of dia pillar illuminators. The two dia pillar illuminators differ in lamp rating (12V 100W or 6V 30W) and support different microscopy methods. Select the dia pillar illuminator to suit your application.

1.5.1 TI-DH Dia Pillar Illuminator 100W

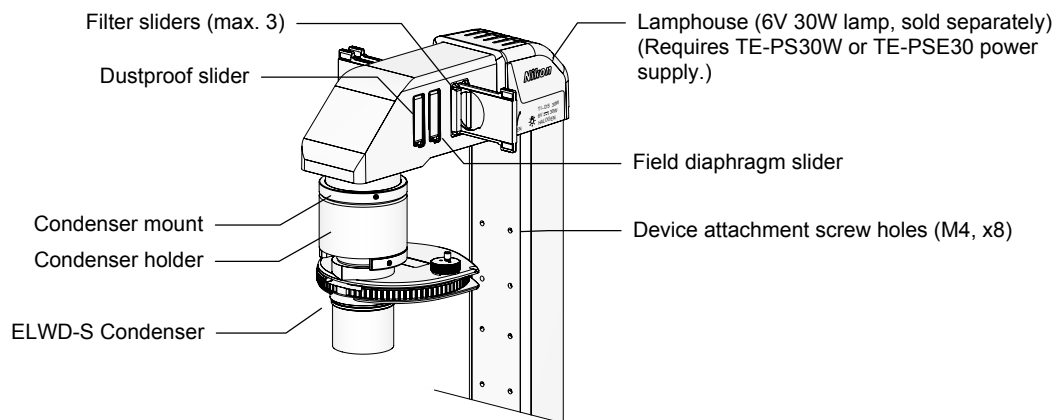
The TI-DH Dia Pillar Illuminator 100W is used with a separate lamphouse and condenser. The following illustration shows the TI-DH Dia Pillar Illuminator 100W with the D-LH/LC Precentered Lamphouse and the TI-C Condenser Turret (System Condenser) attached.



**Figure 1-17 TI-DH Dia Pillar Illuminator 100W
(with Lamphouse and System Condenser)**

1.5.2 TI-DS Dia Pillar Illuminator 30W

The TI-DS Dia Pillar Illuminator 30W has a built-in lamphouse, but requires a separate condenser. The following illustration shows the TI-DS Dia Pillar Illuminator 30W with the ELWD-S Condenser.



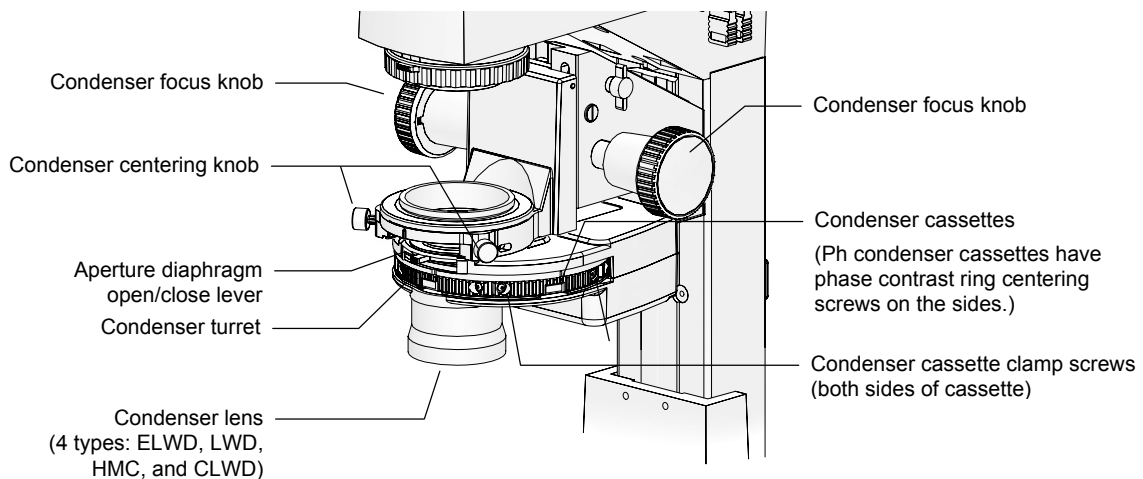
**Figure 1-18 TI-DS Dia Pillar Illuminator 30W
(with ELWD-S Condenser)**

1.6 Condenser

1.6.1 TI-C Condenser Turret (System Condenser)

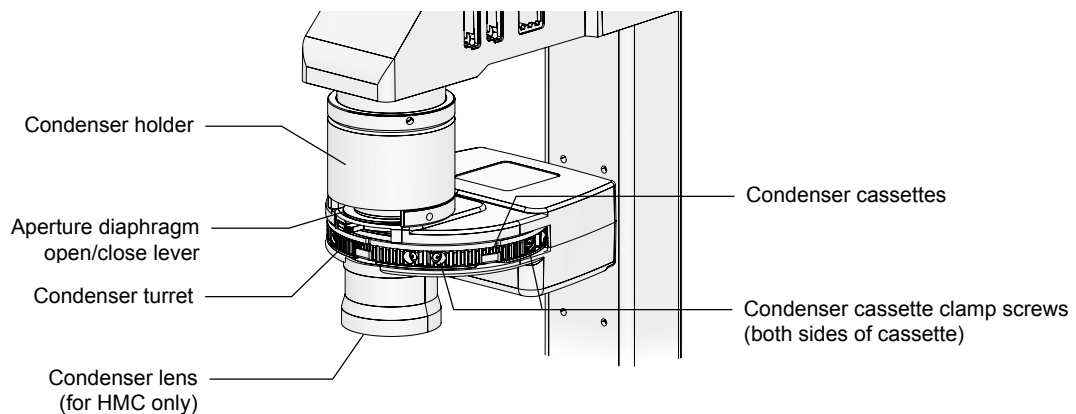
The TI-C Condenser Turret allows you to attach various optical elements to a turret and select them as necessary for different microscopy methods. This type of condenser is referred to as a “system condenser”.

System Condenser (Mounted on TI-DH Dia Pillar Illuminator 100W)



**Figure 1-19 TI-C Condenser Turret
(mounted on TI-DH Dia Pillar Illuminator 100W)**

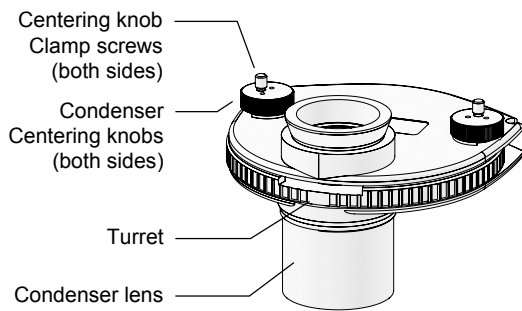
System Condenser (Mounted on TI-DS Dia Pillar Illuminator 30W)



**Figure 1-20 TI-C Condenser Turret
(mounted on TI-DS Dia Pillar Illuminator 30W)**

* The system condenser can be mounted on the TI-DS Dia Pillar Illuminator 30W for HMC observation only.

1.6.2 ELWD-S Condenser



The ELWD-S Condenser supports bright-field microscopy and phase contrast microscopy. It can be used with both 100W and 30W dia pillar illuminators.

Figure 1-21 ELWD-S Condenser

1.7 Power Supply

1.7.1 TI-PS100W Power Supply



Warning

The bottom of the power supply device becomes hot during use. Do not block the air vents on the side of the product.

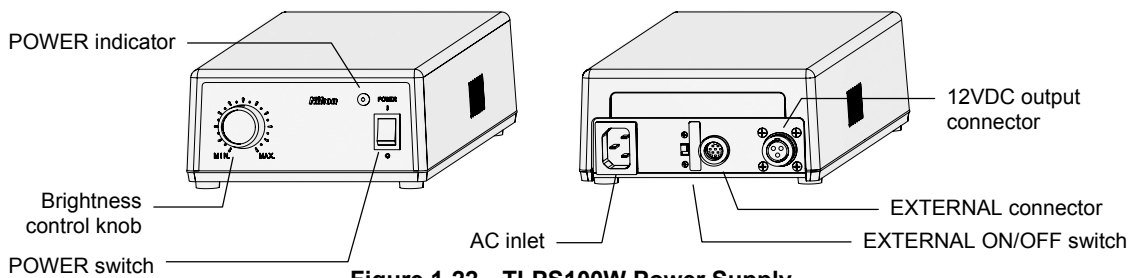


Figure 1-22 TI-PS100W Power Supply

POWER switch

This is the power switch for the power supply. Press the “I” side of the switch to turn on the power supply and output DC power from the 12VDC output on the rear. Press the “O” side of the switch to turn off the power supply.

POWER indicator

Lit when the power supply is on.

Brightness control knob

When the EXTERNAL switch is turned off, the knob controls the brightness of the lamp by adjusting the voltage supplied from the 12VDC output connector.

AC inlet

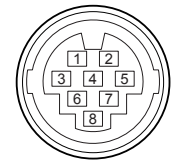
This is the connector for connecting the power supply device to a wall outlet. Be sure to use the specified power cord for the connection.

EXTERNAL (external control) ON/OFF switch

Turn this switch on to use the brightness control knob on the microscope for output voltage control. When this switch is turned off, the brightness control knob on the front of the power supply becomes enabled, and the brightness control knob on the microscope becomes disabled.

EXTERNAL (external control signal input) connector

Connect the control cable to this connector and the LAMP CTRL connector on the rear of the microscope.

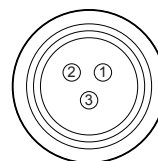


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	Output voltage ON/OFF switch (input)
4	GND (0V)
5	External voltage input for output voltage adjustment
6	EXTERNAL switch on/off detect signal (output)
7	GND (0V)
8	Output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

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

12VDC output connector

This connector supplies power to the 12V 100W halogen lamp. Connect the lamp cable for the pillar illuminator.



Pin	Signal
1	Output +
2	Output -
3	Not used

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

1.7.2 TE-PS30W Power Supply A (for 100-120V) TE-PSE30 Power Supply A (for 220-240V)



Warning

- Before turning on the power supply, check that the input voltage indicator matches the power voltage in your area. If the voltages do not match, do not turn on the product, and contact Nikon. Use of the product under a wrong voltage may result in malfunction or fire.
- The bottom of the power supply device becomes hot during use. Do not block the air vents on the side of the product.

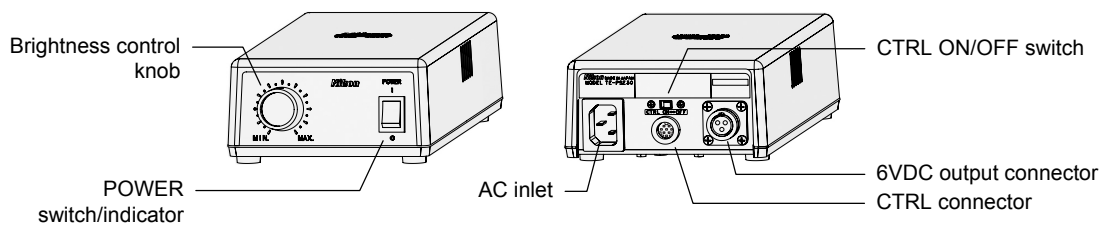


Figure 1-23 TE-PS30W, TE-PSE30 Power Supply A

POWER switch/indicator

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

Brightness control knob

When the CTRL switch is turned off, this knob controls the brightness of the lamp by adjusting the voltage output from the 6VDC output connector.

AC inlet

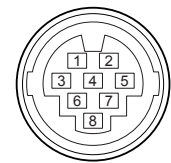
This is the connector for connecting the power supply device to a wall outlet. Be sure to use the specified power cord for the connection.

CTRL (external control) ON/OFF switch

Turn this switch on to use the brightness control knob on the microscope for output voltage control. When this switch is turned off, the brightness control knob on the front of the power supply becomes enabled, and the brightness control knob on the microscope becomes disabled.

CTRL (external control signal input) connector

Connect the control cable to this connector and the LAMP CTRL connector on the rear of the microscope.

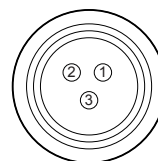


Pin	Signal
1	External resistor terminal for output voltage adjustment
2	External resistor terminal for output voltage adjustment
3	Output voltage ON/OFF switch (input)
4	GND (0V)
5	Not used
6	Not used
7	Not used
8	Not used

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

6VDC output connector

This connector supplies power to the 6V 30W halogen lamp. Connect the lamp cable for the pillar illuminator.



Pin	Signal
1	Output -
2	Not used
3	Output +

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

**Warning**

- Before using the product, thoroughly read the "Safety Precautions" at the beginning of this manual, and heed all warnings and cautions written therein.
- To use other equipment such as epi-fl attachment or differential interference contrast attachment, refer to the respective manuals and heed all warnings and cautions written therein.

**When using Ti-U, Ti-U/B, Ti-S, or Ti-S/L100 with
TI-HUBC/B Hub Controller B attached on the back**



Refer to the instruction manual provided with TI-HUBC/B Hub Controller B

TI-HUBC/B Hub Controller B is used to control motorized devices.

When TI-HUBC/B Hub Controller B is attached to the back of the microscope, operation procedures for the motorized devices will change. Refer to the instruction manual for the TI-HUBC/B Hub Controller B, and prepare and observe accordingly.

Note that the following two operations cannot be performed electrically even if the TI-HUBC/B Hub Controller B is attached:

- **6V 30W lamp operation:** Use the dia illumination ON/OFF switch.
- **6V 30W lamp voltage adjustment:** Use the brightness control knob on the microscope body or on the power supply device.

2.1 Introduction to Microscopy

The Ti series microscopes are system microscopes that offer a high degree of flexibility in system building for various purposes. A wide range of options is available for various parts, including the main body, dia illuminator, and eyepiece tube. For this reason, the operation procedures will vary depending on the system configuration.

In this chapter, the following two common configurations will be used as examples to explain the microscopy procedures.

Sample Configuration 1

Ti-U, TI-DH Dia Pillar Illuminator 100W, System Condenser, and TI-TD Eyepiece Tube B (See 2.2)

Bright-Field Microscopy (See 2.2.1)

Phase Contrast Microscopy (without External Phase Contrast Devices) (See 2.2.2)

External Phase Contrast Microscopy (See 2.2.3)

Sample Configuration 2

Ti-S, TI-DH Dia Pillar Illuminator 30W, ELWD-S Condenser, and TI-TS Eyepiece Tube B (See 2.3)

Bright-Field Microscopy (See 2.3.1)

Phase Contrast Microscopy (without External Phase Contrast Devices) (See 2.3.2)

- For the name and position of each part, refer to Chapter 1, “Part Names.”
- For details on operation methods, refer to Chapter 3, “Operation.”
- If the microscope has not been assembled yet, first refer to Chapter 4, “Assembly.”
- If the configuration of your microscope system differs from the examples used in this chapter, refer to the relevant sections of Chapter 3, “Operation.”
- If your microscope system has the epi-fl attachment or the differential interference contrast attachment, refer to the respective instruction manuals.
- If your microscope system is equipped with TI-HUBC/B Hub Controller B, refer to the instruction manual provided with the hub controller.

2.2 Sample Configuration 1: Ti-U, TI-DH Dia Pillar Illuminator 100W, System Condenser, and TI-TD Eyepiece Tube B

This section describes the microscopy procedures under the assumption that the following devices are attached to the microscope.

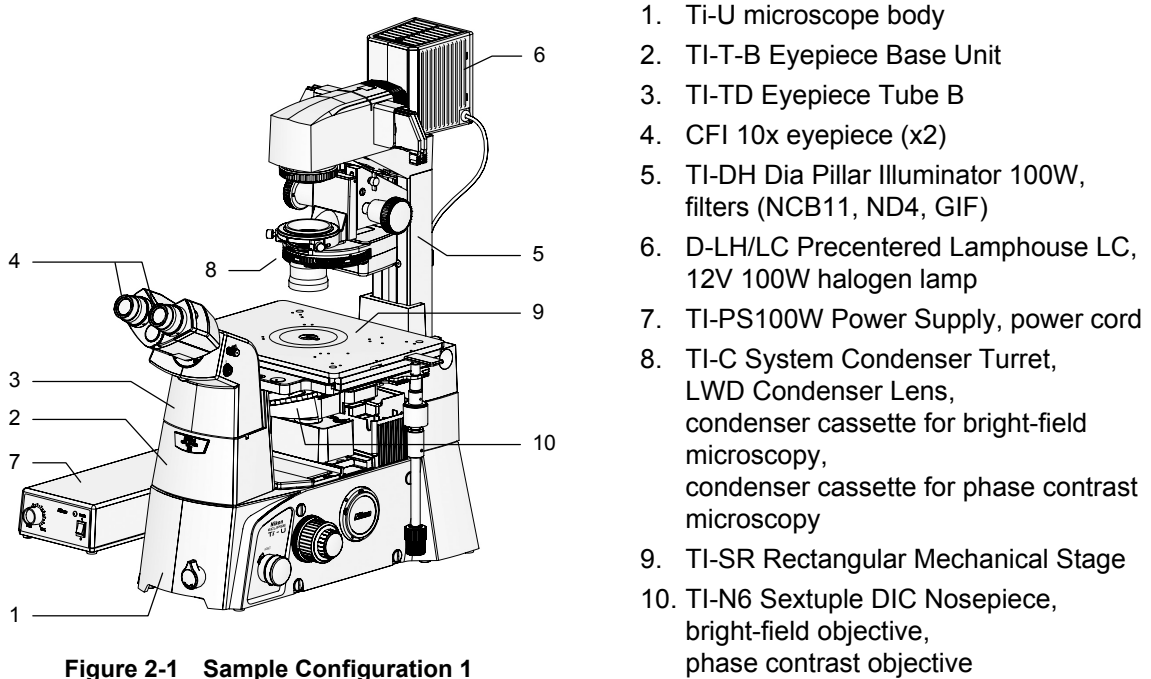


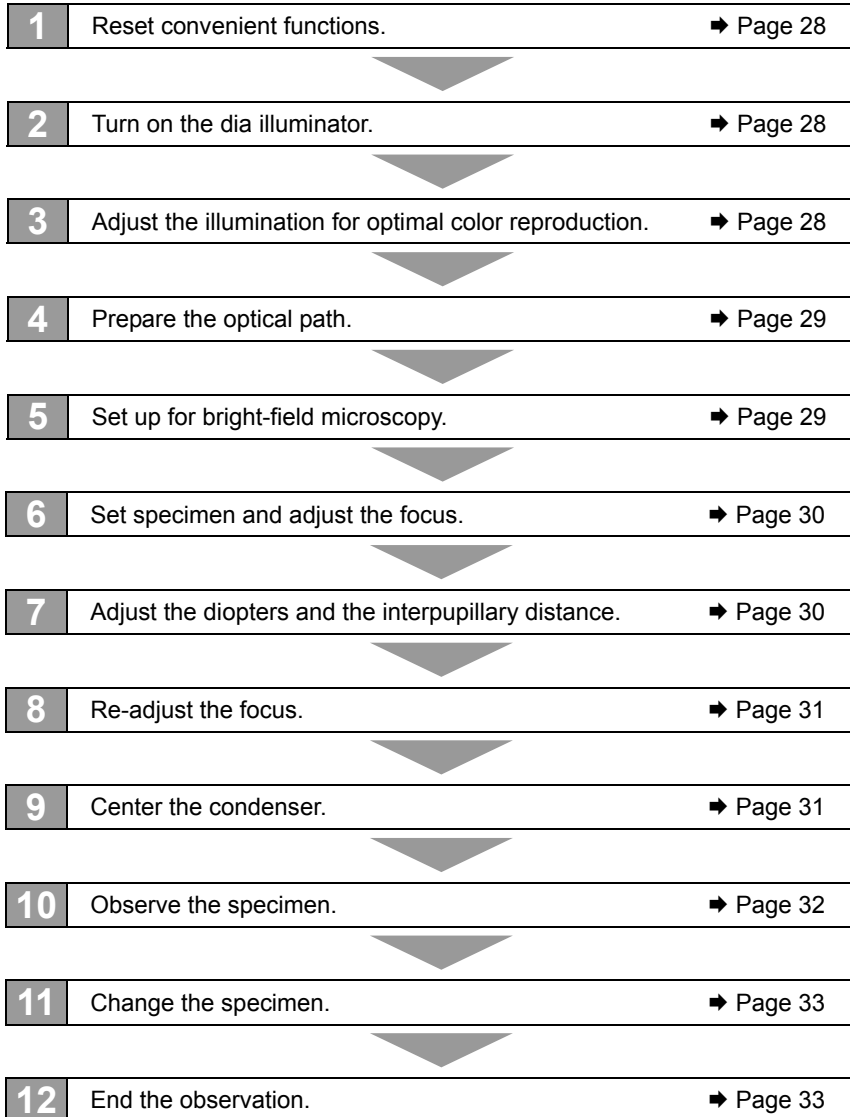
Figure 2-1 Sample Configuration 1

1. Ti-U microscope body
2. TI-T-B Eyepiece Base Unit
3. TI-TD Eyepiece Tube B
4. CFI 10x eyepiece (x2)
5. TI-DH Dia Pillar Illuminator 100W, filters (NCB11, ND4, GIF)
6. D-LH/LC Precentered Lamphouse LC, 12V 100W halogen lamp
7. TI-PS100W Power Supply, power cord
8. TI-C System Condenser Turret, LWD Condenser Lens, condenser cassette for bright-field microscopy, condenser cassette for phase contrast microscopy
9. TI-SR Rectangular Mechanical Stage
10. TI-N6 Sextuple DIC Nosepiece, bright-field objective, phase contrast objective

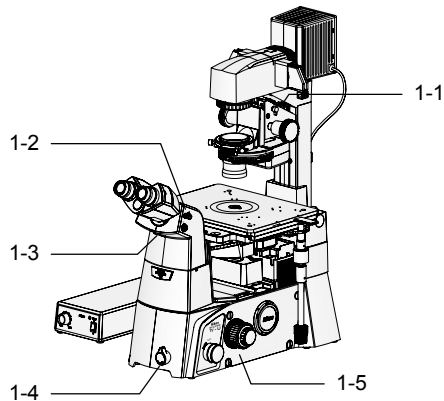
2.2.1 Bright-Field (BF) Microscopy

Bright-Field (BF) Microscopy Workflow

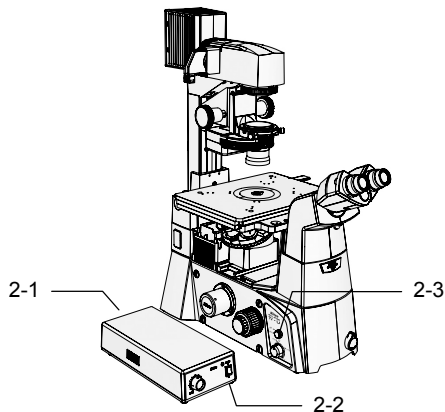
Outline: Remove all unnecessary optical elements from the optical path. Focus and center the condenser. Adjust the aperture diaphragm for a better image.



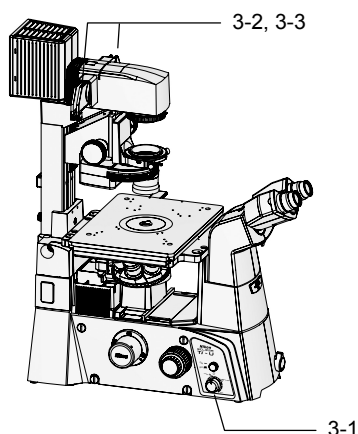
2.2 Sample Configuration 1: TI-U, TI-DH Dia Pillar Illuminator 100W, System Condenser, and TI-TD Eyepiece Tube B

1 Reset convenient functions.

1. Release the condenser refocusing clamp on the dia pillar illuminator by rotating it counterclockwise.
2. Open the shutter at the eyepiece by pushing in the shutter operation lever on the right side of the eyepiece tube.
3. Move the Bertrand lens out of the optical path by moving the Bertrand lens in/out lever on the front of the eyepiece tube to position "O".
4. Rotate the intermediate magnification selector dial on the front of the microscope to the "1x" side.
5. Release the coarse focus stopper ring on the right side of the microscope by rotating it counterclockwise.

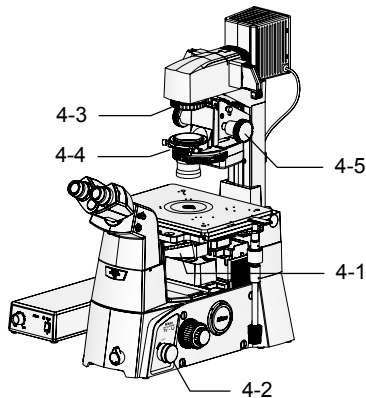
2 Turn on the dia illuminator.

1. Set the EXTERNAL switch on the back of the power supply to "ON".
2. Turn on the power supply by pressing the "I" side of the POWER switch on the power supply.
3. Turn on the lamp by pressing the dia illumination ON/OFF switch on the left side of the microscope.

3 Adjust the illumination for optimal color reproduction.

1. Rotate the brightness control knob on the left side of the microscope to the "12V100W" position.
2. Move the NCB11 filter on the dia pillar illuminator into the optical path.
3. Move the ND4 filter on the dia pillar illuminator into the optical path.

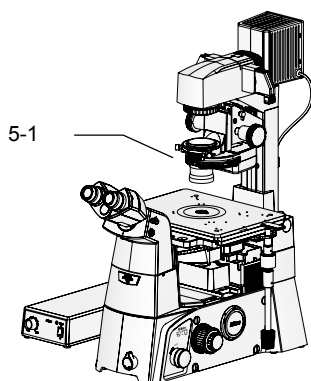
4 Prepare the optical path.



1. Move the 10x objective into the optical path by rotating the nosepiece.
2. Set the optical path selector knob on the right side of the microscope to "EYE".
Direct a 100% light towards the observation port (eyepiece tube).
3. Fully open the aperture diaphragm by rotating the aperture diaphragm knob on the dia pillar illuminator clockwise to the limit.
4. Fully open the aperture diaphragm by rotating the aperture diaphragm operation lever on the system condenser clockwise to the limit.
5. Lower the condenser mount to the limit by rotating the condenser focus knob on the dia pillar illuminator.

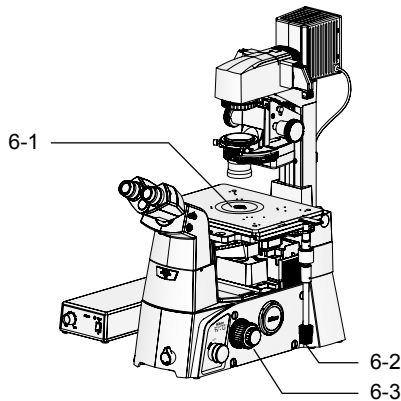
- If an ELWD condenser lens is attached to the system condenser, place the condenser mount 1cm below the upper limit.
- If using the ELWD-S condenser, place the condenser mount 2cm below the upper limit.

5 Set up for bright-field microscopy.



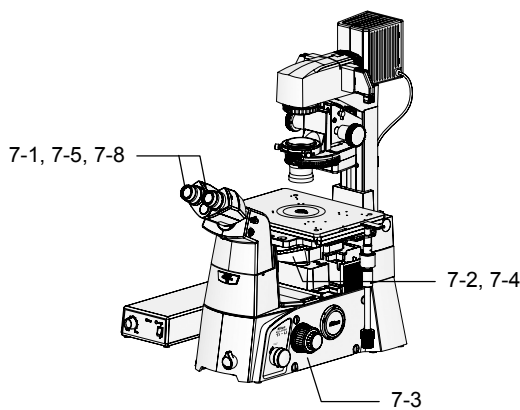
1. Move the condenser cassette for bright-field microscopy into the optical path by rotating the condenser turret to position "A".

6 Set specimen and adjust the focus.



1. Place the specimen onto the stage.
2. Move the stage to bring the observation target into the center of the field of view.
3. Look into the eyepiece. Adjust the focus onto the specimen by rotating the focus knobs.

7 Adjust the diopters and the interpupillary distance.



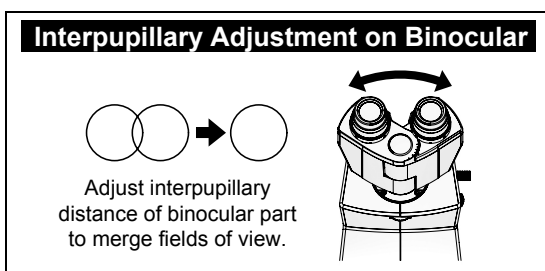
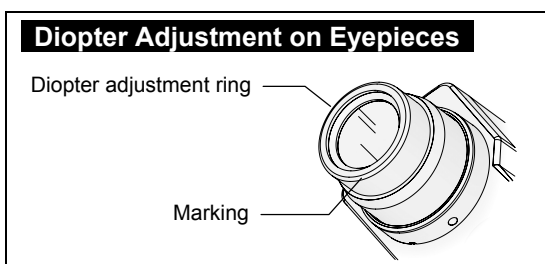
1. On each eyepiece, rotate the diopter adjustment ring to align its lower end with the marking on the eyepiece.
This will be the reference position for diopter adjustment.
2. Move the 40x objective into the optical path by rotating the nosepiece.
3. Look into the left eyepiece with your left eye. Adjust the focus onto the specimen by rotating the focus knobs.
4. Move the 10x objective into the optical path by rotating the nosepiece.
5. Look into the left eyepiece with your left eye. Adjust the focus onto the specimen by rotating the diopter adjustment ring on the left eyepiece.

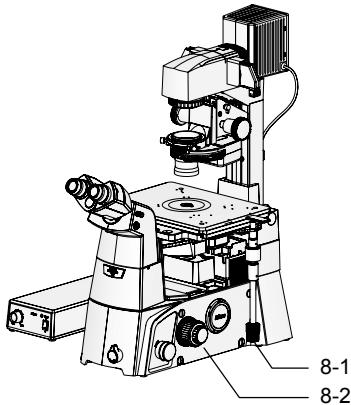
Do not touch the focus knobs at this time.

6. Repeat steps 2 thru 5 two times.
7. Adjust the right eyepiece.

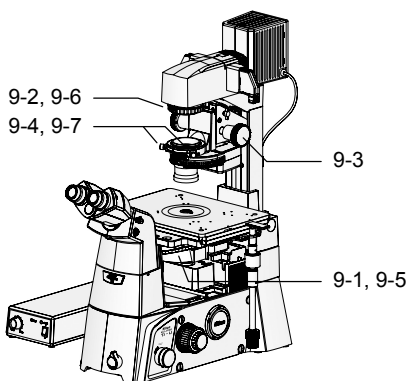
Repeat steps 2 thru 6, but this time using the right eyepiece instead of the left.

8. Adjust the interpupillary distance of the binocular part to merge the two fields of view.



8 Re-adjust the focus.

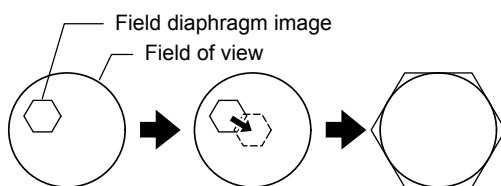
1. Look into the eyepiece. Move the stage to bring the observation target into the center of the field of view.
2. Focus on the target by rotating the focus knobs.

9 Center the condenser.

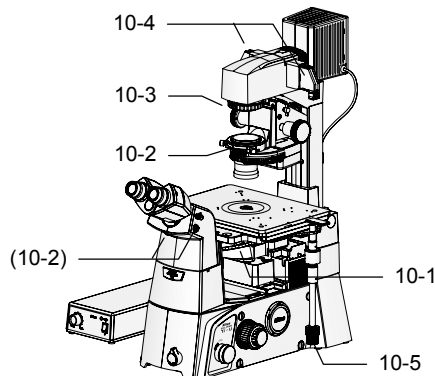
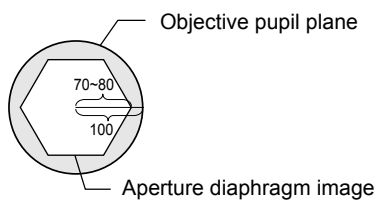
1. Check that the 10x objective is in the optical path.

If not, move the 10x objective into the optical path by rotating the nosepiece.

2. Rotate the field diaphragm knob on the dia pillar illuminator until the field diaphragm image is visible in the field of view.
3. Adjust the focus onto the field diaphragm image by rotating the condenser focus knob on the dia pillar illuminator.
4. Move the field diaphragm image to the center of the field of view by turning the two condenser centering screws on the dia pillar illuminator.
5. Move the 40x objective into the optical path by rotating the nosepiece.
6. Adjust the size of the field diaphragm image to closely match the size of the field of view, by rotating the field diaphragm knob on the dia pillar illuminator.
7. Move the field diaphragm image to the center of the field of view by turning the two condenser centering screws on the dia pillar illuminator.

Field Diaphragm Adjustment

Move field diaphragm image into center of field of view. Adjust its size to match field of view.

10 Observe the specimen.**Aperture Diaphragm Adjustment**

Adjust the size of the aperture diaphragm image to 70-80% the size of the objective pupil plane.

1. Move any one of the objectives into the optical path by rotating the nosepiece.
2. Adjust the size of the aperture diaphragm to "70-80% the size of the NA of the objective" by moving the aperture diaphragm operation lever on the system condenser.

Move the Bertrand lens into the optical path by moving the Bertrand lens in/out lever on the eyepiece tube to position "B". This will allow you to observe the objective pupil plane and the aperture diaphragm image. Adjust the focus by rotating the Bertrand lens focusing knob on the right side of the eyepiece tube, and then adjust the size of the aperture diaphragm image to 70-80% the size of the objective pupil plane.

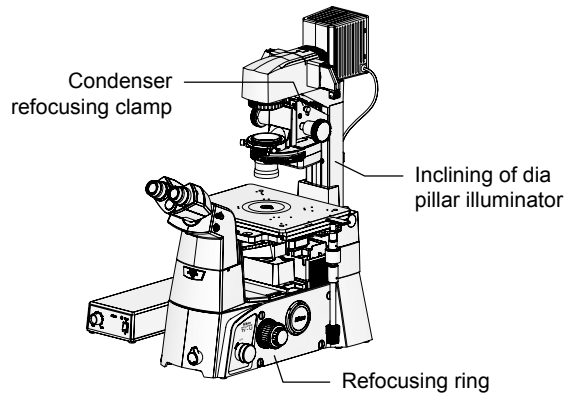
When done, move the Bertrand lens out of the optical path by moving the operation lever to position "O".

3. Adjust the size of the field diaphragm image to closely match the size of the field of view, by rotating the field diaphragm knob on the dia pillar illuminator.
4. Adjust the brightness for the field of view by moving the ND filters on the dia pillar illuminator in and out of the optical path.

If color reproducibility is not required, brightness adjustment can be performed by changing the lamp voltage with the dia illumination brightness control knob on the left side of the microscope.

5. Move the stage to bring the observation target into the center of the field of view. Adjust the focus by rotating the focus knobs.

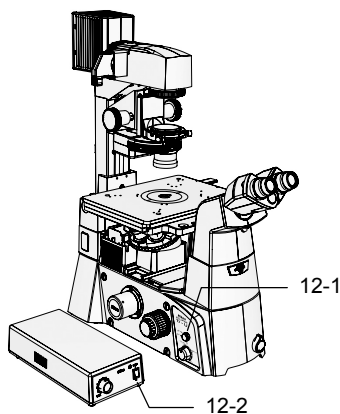
11 Change the specimen.



Use the following functions as necessary.

- **Inclining of dia pillar illuminator**
When using the 100W dia pillar illuminator, the entire dia pillar illuminator can be inclined backward by loosening the fixing knob on its back side, so as to secure more working space.
- **Coarse focus stopper ring**
Once you have adjusted the focus, you may choose to tighten the stopper ring. This will prevent the nosepiece from being elevated past the focal point, even when the coarse focus knob is rotated.
- **Condenser refocusing clamp**
If there is a need to move the condenser up and down, tighten the condenser refocusing clamp before moving the condenser. This will make it easier to restore the condenser to the original position.

12 End the observation.



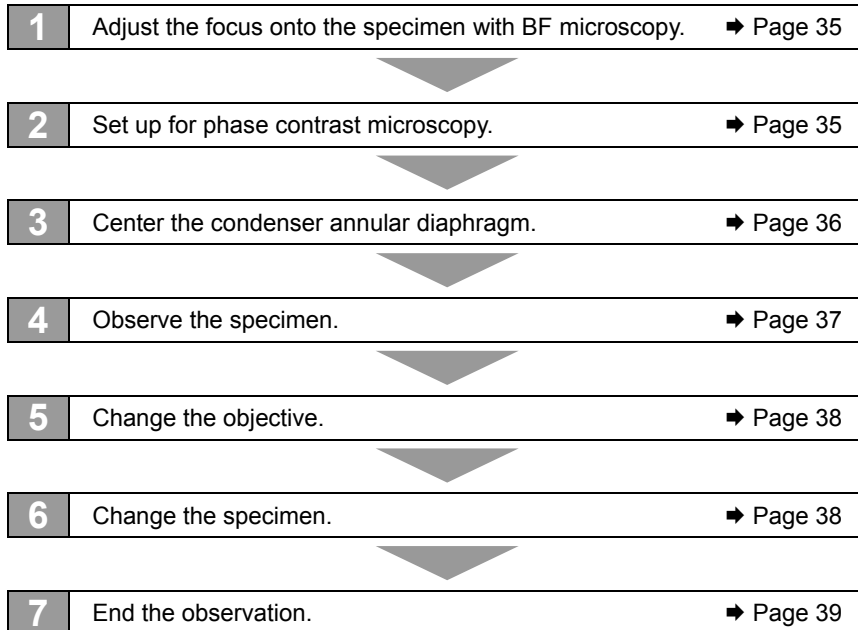
1. Turn off the dia illumination by pressing the dia illumination ON/OFF switch on the left side of the microscope.
2. Turn off the power supply by pressing the "O" side of the POWER switch on the back of the power supply.

If placing a cover on the microscope, wait until the lamp has cooled sufficiently.

2.2.2 Phase Contrast (Ph) Microscopy

Phase Contrast (Ph) Microscopy Workflow

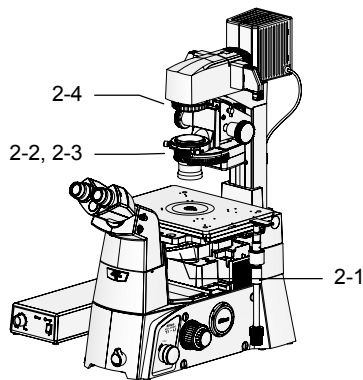
Outline: Place a phase contrast objective and a condenser cassette that have the same Ph code into the optical path. Center the position of the condenser annular diaphragm in the condenser cassette so that it is aligned with the phase plate ring in the objective.



1 Adjust the focus onto the specimen with BF microscopy.

For the BF microscopy procedure, refer to Section 2.2.1 “Bright-Field (BF) Microscopy”.

2 Set up for phase contrast microscopy.

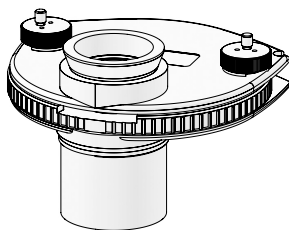


1. **Move a phase contrast objective into the optical path by rotating the nosepiece.**
Check the Ph code of the objective.
2. **Rotate the system condenser turret to the position for the Ph code of the objective.**
3. **Fully open the aperture diaphragm by rotating the aperture diaphragm operation lever on the system condenser clockwise to the limit.**

If the aperture diaphragm is not fully open, the optical path of the annular diaphragm will overlap with the aperture diaphragm, and the phase contrast effect cannot be achieved. Be sure to fully open the aperture diaphragm when performing phase contrast microscopy.

4. **Fully open the aperture diaphragm by rotating the aperture diaphragm knob on the dia pillar illuminator clockwise to the limit.**

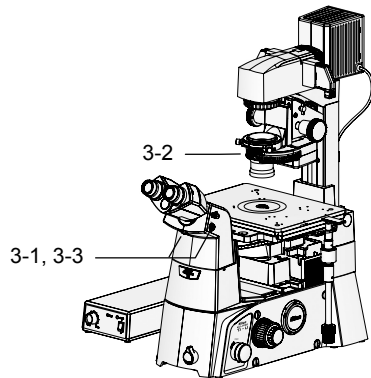
When using the ELWD-S condenser



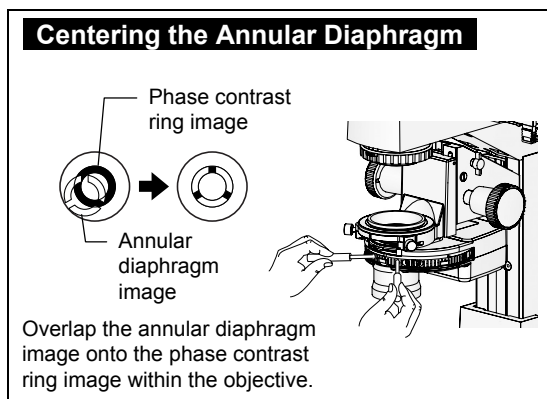
ELWD-S Condenser

It does not need to be fully opened in step 3, as it has no effect on the optical path for phase contrast. The ELWD-S condenser is designed so that all annular diaphragms become centered when the annular diaphragm is centered at the “PhL” position. Move the “PhL” objective into the optical path, rotate the condenser turret to the “PhL” position, and proceed to the next step.

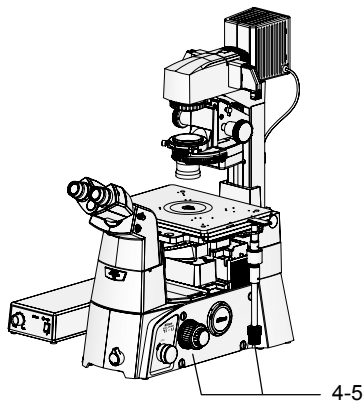
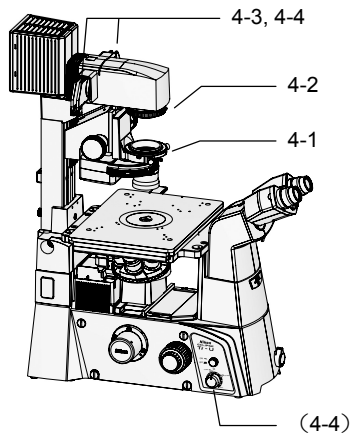
3 Center the condenser annular diaphragm.



1. Move the Bertrand lens into the optical path by moving the Bertrand lens in/out lever to position "B". Adjust the focus onto the annular diaphragm image by rotating the Bertrand lens focusing knob on the right side of the eyepiece tube.
2. Using the provided hex screwdriver, rotate the two annular diaphragm centering screws on the condenser cassette, and adjust the position of the annular diaphragm image so that it overlaps with the phase contrast ring image within the objective.
3. Move the Bertrand lens in/out lever back to position "O".



4 Observe the specimen.



1. Check that the aperture diaphragm of the condenser is fully open.
2. Adjust the size of the field diaphragm image to closely match the size of the field of view, by rotating the field diaphragm knob on the dia pillar illuminator.
3. Move the NCB11 filter on the dia pillar illuminator out of the optical path, and move the GIF filter into the optical path.

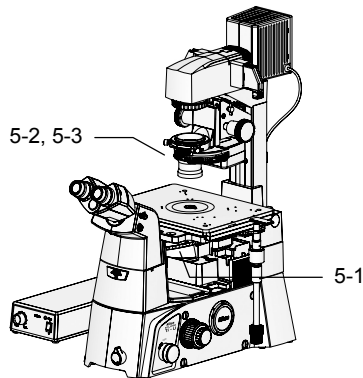
The GIF filter improves the contrast for phase contrast microscopy.

4. Adjust the brightness for the field of view by moving the ND filters on the dia pillar illuminator in and out of the optical path.

If color reproducibility is not required, brightness adjustment can be performed by changing the lamp voltage with the dia illumination brightness control knob on the left side of the microscope.

5. Move the stage to bring the observation target into the center of the field of view. Adjust the focus by rotating the focus knobs.

5 Change the objective.

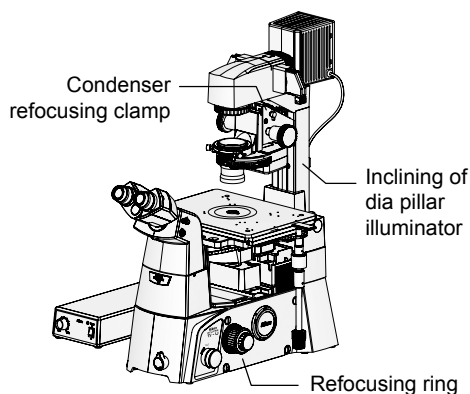


1. **Move another phase contrast objective into the optical path by rotating the nosepiece.**
Check the Ph code of the objective.
2. **Rotate the condenser turret to the position for the Ph code of the objective.**
3. **Center the annular diaphragm that is now in the optical path.**

For the centering procedure, refer to step 3 on page 36.

- When attaching phase contrast cassettes to the system condenser, you will need to center all phase contrast cassettes.
- When using the ELWD-S condenser, all annular diaphragms can be simultaneously by centering the annular diaphragm at the “PhL” position.

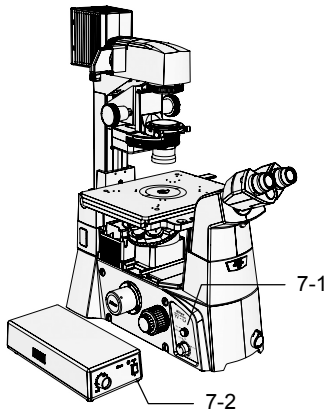
6 Change the specimen.



Use the following functions as necessary.

- **Inclining of dia pillar illuminator**
When using the 100W dia pillar illuminator, the entire dia pillar illuminator can be inclined backward by loosening the fixing knob on its back side, so as to secure more working space.
- **Coarse focus stopper ring**
Once you have adjusted the focus, you may choose to tighten the stopper ring. This will prevent the nosepiece from being elevated past the focal point, even when the coarse focus knob is rotated.
- **Condenser refocusing clamp**
If there is a need to move the condenser up and down, tighten the condenser refocusing clamp before moving the condenser. This will make it easier to restore the condenser to the original position.

7 End the observation.



1. Turn off the dia illumination by pressing the dia illumination ON/OFF switch on the left side of the microscope.
2. Turn off the power supply by pressing the "O" side of the POWER switch on the back of the power supply.

If placing a cover on the microscope, wait until the lamp has cooled sufficiently.

2.2.3 External Phase Contrast Microscopy

External phase contrast microscopy is a microscopy method proposed by Nikon to be a new standard function of inverted research microscopes.

Traditionally, phase contrast microscopy required the use of special objectives with a built-in phase ring. The phase ring is coated with a phase film, as well as an ND film (light reduction film) for reducing the amount of zero-order light (direct light) that passes. These films sometimes affect imaging and laser transmission, making the phase contrast objectives difficult to use for other applications (i.e. optical tweezers and total reflection fluorescence microscopy) (See Figure 2-2).

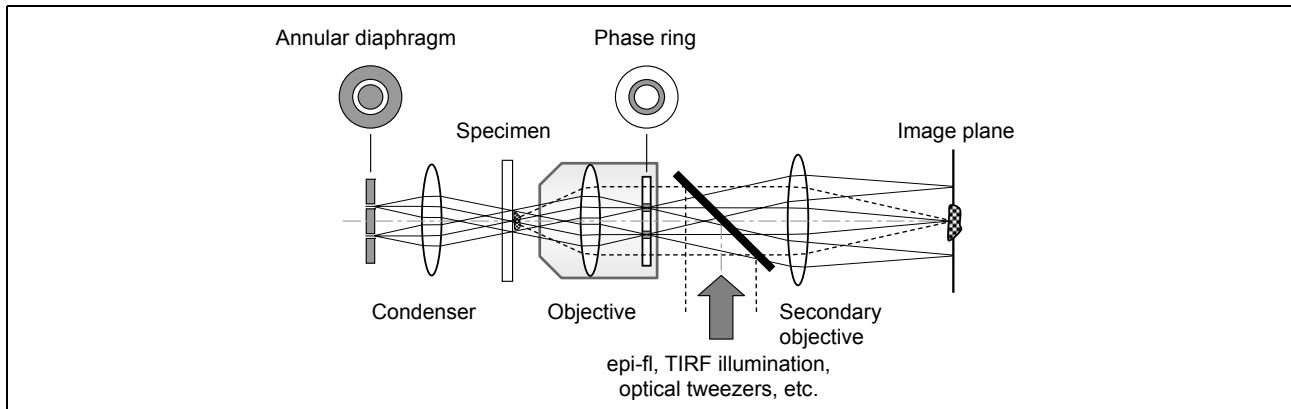


Figure 2-2 Optical Path for Traditional Phase Contrast Microscopy

An external phase contrast system takes an image on the primary image plane, and refocuses it on the secondary image plane via relay optics. The adoption of such an optical system allows the phase ring to be placed midway in the relay optics, instead of in the objective. In other words, the phase ring can be moved out of the objective (See Figure 2-3). As a result, phase contrast microscopy can now be performed with normal objectives (without a phase ring), and phase contrast objectives are no longer required.

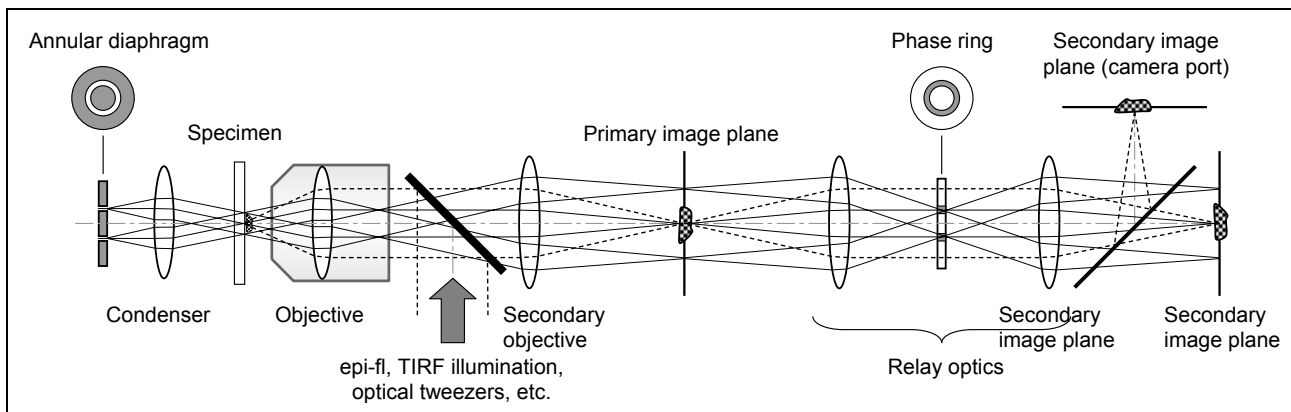


Figure 2-3 Optical Path for External Phase Contrast Microscopy

A camera port is also provided on the external phase contrast optics system, enabling photomicroscopy of phase contrast images. For example, a primary image plane camera port (i.e. side port of an inverted microscope) can be used to capture bright fluorescent images unaffected by the phase ring, while by switching the optical path, the camera port on the external phase contrast eyepiece base unit can be used to capture phase contrast images.

The external phase contrast system also supports high-NA TIRF (total internal reflection fluorescence) objectives such as Apo TIRF 60x H/1.49 and Apo TIRF 100x H/1.49, allowing TIRF objectives to be fully utilized for applications that require bright fluorescence images (i.e. monomolecular fluorescence microscopy), while also allowing morphological observations to be performed without changing the objective.

Selecting Objectives and Phase Plates

To perform external phase contrast microscopy, you will need to use the TI-T-BPH External Phase Contrast Eyepiece Base Unit.

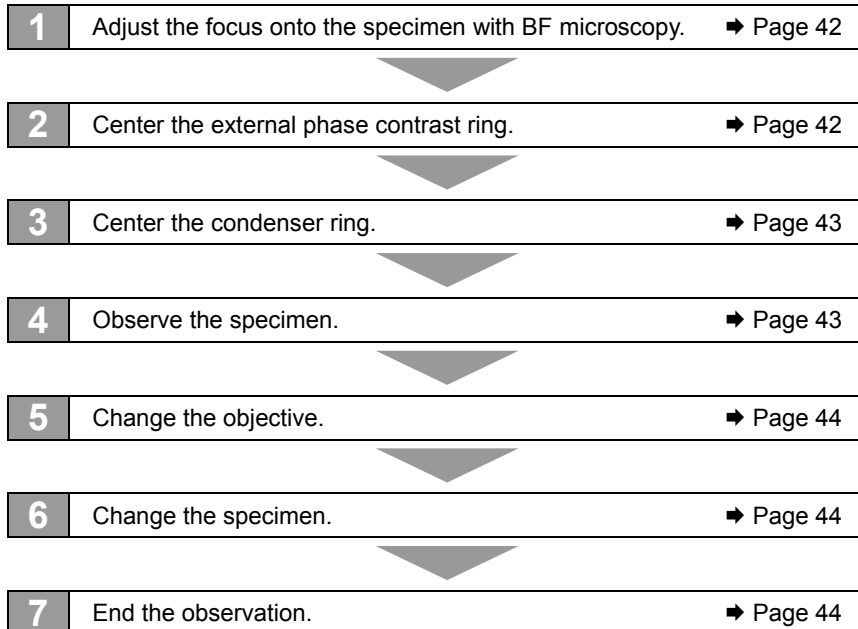
You will also need to select a phase plate that is suitable for the objective being used, and attach it to the eyepiece base unit. Refer to the following table to select an objective and an appropriate phase plate.

Up to three phase contrast plates (A, B, and C) can be attached to the TI-T-BPH External Phase Contrast Eyepiece Base Unit.

	Condenser phase contrast code (Supported condenser lens)	Objective	External phase contrast ring
1	Ph3 (LWD, CLWD)	P Apo 60x WI (NA1.2)	60x/Ph3
2	Ph3 (LWD, CLWD)	P Apo VC 60x WI (NA1.2)	60x/Ph3
3	Ph3 (LWD, CLWD)	P Apo VC 60x H (NA1.4)	60x/Ph3
4	Ph4 (CLWD)	Apo TIRF 60x H (NA1.49)	60x/Ph4
5	Ph4 (CLWD)	P Apo TIRF 60x H (NA1.45)	60x/Ph4
6	Ph3 (LWD, CLWD)	P Apo VC 100x H (NA1.4)	100x/Ph3
7	Ph4 (CLWD)	Apo TIRF 100x H (NA1.49)	100x/Ph4

External Phase Contrast Microscopy Workflow

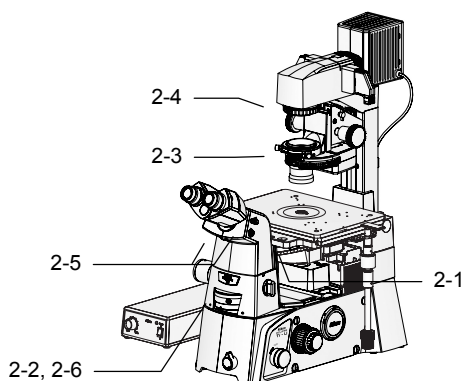
Outline: Place the objective (refer to the table below), the condenser lens, and the condenser cassette into the optical path. Center the positions of the eyepiece base unit (TI-T-BPH) and the ring in the condenser cassette.



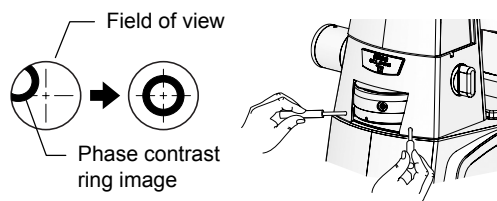
1 Adjust the focus onto the specimen with BF microscopy.

For the BF microscopy procedure, refer to Section 2.2.1 “Bright-Field (BF) Microscopy”.

2 Center the external phase contrast ring.



Centering the External Phase Contrast Ring



Move the external phase contrast ring image into the center of the field of view.

1. **Move an external phase contrast objective into the optical path by rotating the nosepiece.**
Check the Ph code of the objective.
2. **Rotate the eyepiece base unit turret to the external phase contrast ring that is suitable for the objective in the optical path.**
Set to position “A”, “B”, or “C”. Position “O” is empty.
3. **Rotate the condenser turret to position “A”, for bright-field microscopy. Fully open the aperture diaphragm by rotating the aperture diaphragm operation lever clockwise to the limit.**

If the aperture diaphragm is not fully open, the optical path of the annular diaphragm will overlap with the aperture diaphragm, and the phase contrast effect cannot be achieved.

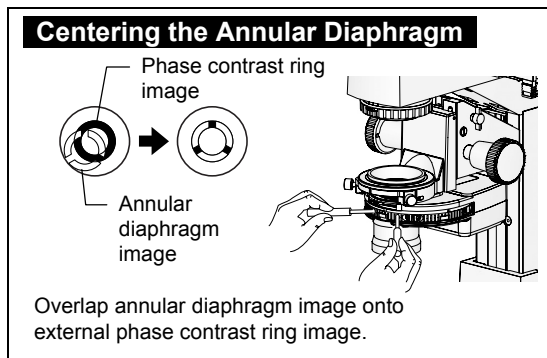
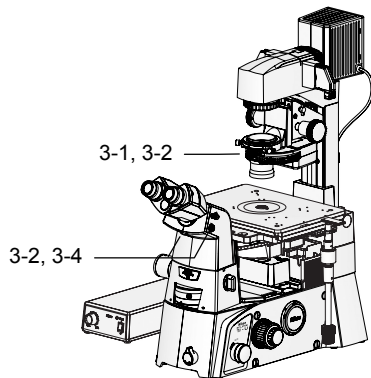
4. **Fully open the aperture diaphragm by rotating the aperture diaphragm knob on the dia pillar illuminator clockwise to the limit.**
5. **Move the Bertrand lens into the optical path by moving the Bertrand lens in/out lever on the front of the eyepiece tube to position “B”. Adjust the focus onto the external phase contrast ring placed into the optical path by the eyepiece base unit, by rotating the Bertrand lens focusing knob.**
6. **Insert the provided hex wrench into the centering screw hole on the front of the eyepiece base unit, and adjust the external phase contrast ring into the center of the field of view.**

After adjusting, tighten the two centering clamp screws on the back of the eyepiece base unit.

When centering with the eyepiece base unit turret, the whole turret will be moved, unlike when adjusting the condenser turret. Adjustment is not made independently for each phase plate.

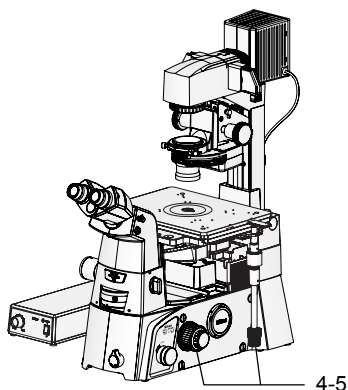
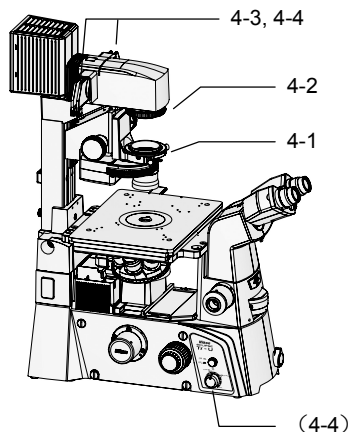
* If adjustment with the above procedure is difficult, attach the provided target (adjustment tool) onto the nosepiece. Using the bright-field illumination, adjust the position of the external phase contrast ring so that its image becomes concentric with the target.

3 Center the condenser annular diaphragm.



1. Rotate the condenser turret to the position for the Ph code of the external phase contrast ring in the optical path.
2. With the Bertrand lens adjusted in step 2 in the optical path, use the provided hex screwdriver to adjust the two annular diaphragm centering screws on the condenser cassette so that the annular diaphragm image overlaps with the phase contrast ring image.
3. Check that the two images are concentric.
4. Move the Bertrand lens out of the optical path by moving the Bertrand lens in/out lever back to position "O".

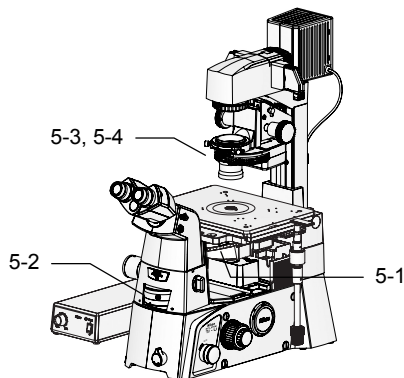
4 Observe the specimen.



1. Fully open the aperture diaphragm of the condenser.
2. Adjust the size of the field diaphragm image to closely match the size of the field of view, by rotating the field diaphragm knob on the dia pillar illuminator.
3. Move the NCB11 filter on the dia pillar illuminator out of the optical path, and move the GIF filter into the optical path.
The GIF filter improves the contrast for phase contrast microscopy.
4. Adjust the brightness with the "ND filters" on the dia pillar illuminator.

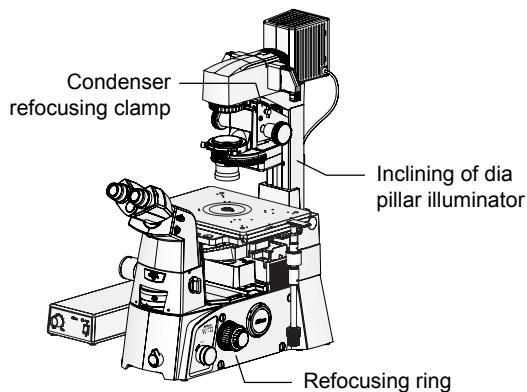
If color reproducibility is not required, brightness adjustment can be performed by changing the lamp voltage with the dia illumination brightness control knob on the left side of the microscope.

5. Move the stage to bring the observation target into the center of the field of view. Adjust the focus by rotating the focus knobs.

5 Change the objective.

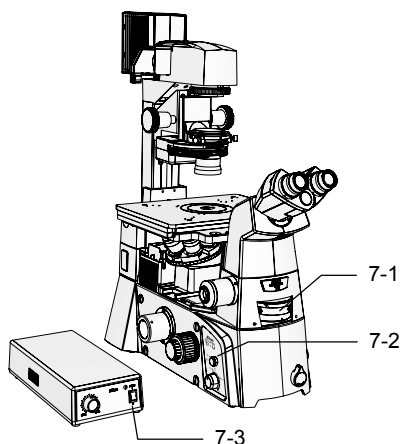
1. Move another external phase contrast objective into the optical path by rotating the nosepiece.
2. Rotate the eyepiece base unit turret to the position for the external phase contrast ring that is suitable for the objective in the optical path.
3. Rotate the condenser turret to the position for the Ph code of the objective.
4. Center the annular diaphragm of the condenser.

For the centering procedure, refer to step 3 on page 43.

6 Change the specimen.

Use the following functions as necessary.

- **Inclining of dia pillar illuminator**
When using the 100W dia pillar illuminator, the entire dia pillar illuminator can be inclined backward by loosening the fixing knob on its back side, so as to secure more working space.
- **Coarse focus stopper ring**
Once you have adjusted the focus, you may choose to tighten the stopper ring. This will prevent the nosepiece from being elevated past the focal point, even when the coarse focus knob is rotated.
- **Condenser refocusing clamp**
If there is a need to move the condenser up and down, tighten the condenser refocusing clamp before moving the condenser. This will make it easier to restore the condenser to the original position.

7 End the observation.

1. Rotate the eyepiece base unit turret to the "O" (empty) position.
2. Turn off the dia illumination by pressing the dia illumination ON/OFF switch on the left side of the microscope.
3. Turn off the power supply by pressing the "O" side of the POWER switch on the back of the power supply.

If placing a cover on the microscope, wait until the lamp has cooled sufficiently.

2.3 Sample Configuration2: Ti-S, TI-DH Dia Pillar Illuminator 30W, ELWD-S Condenser, and TI-TS Eyepiece Tube B

This section describes the microscopy procedures under the assumption that the following devices are attached to the microscope.

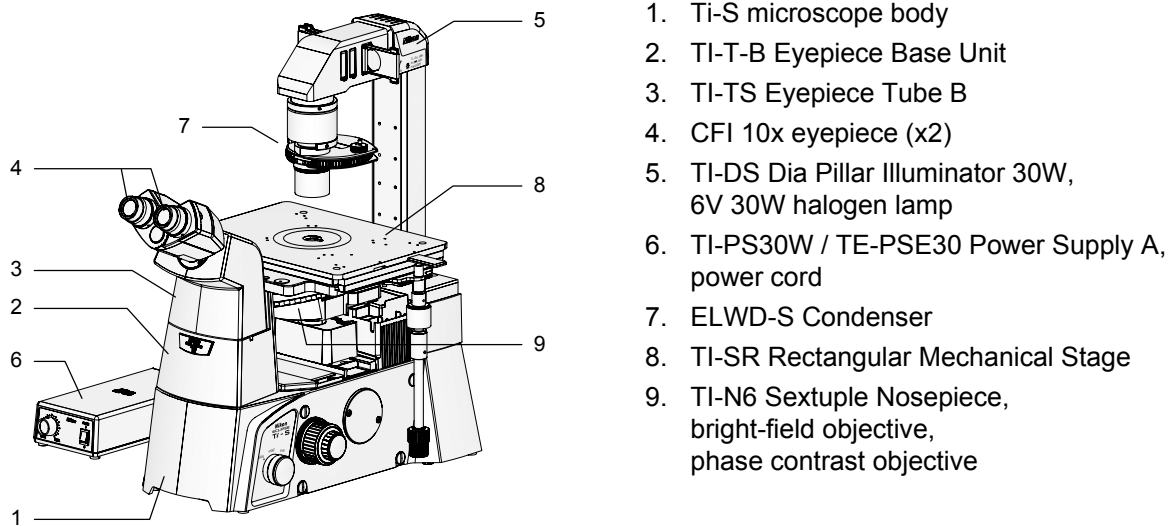
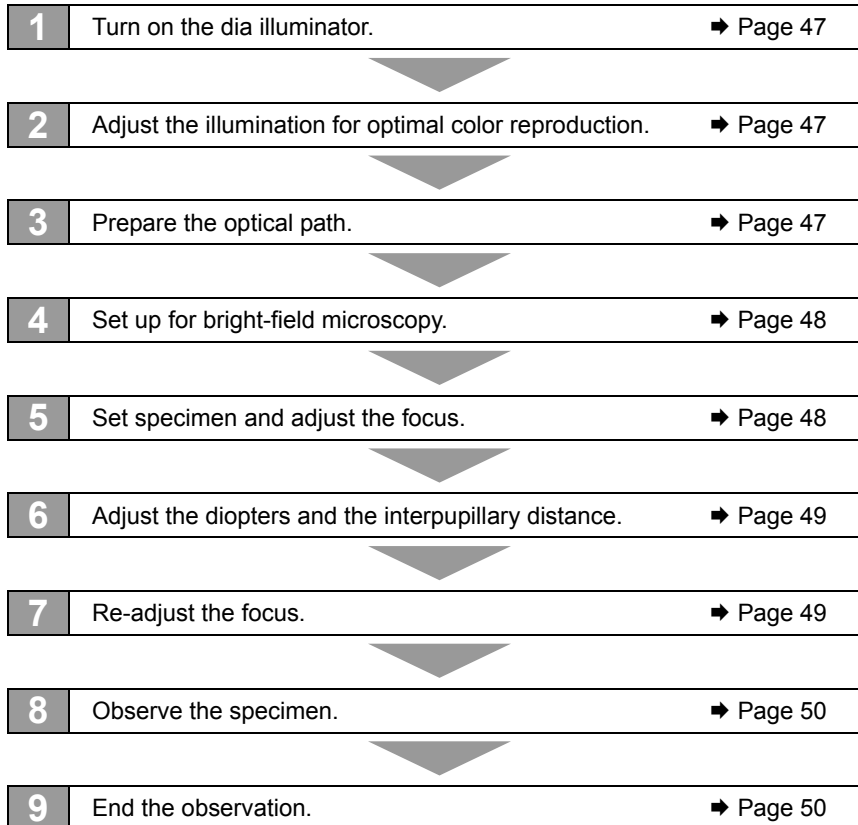


Figure 2-4 Sample Configuration 2

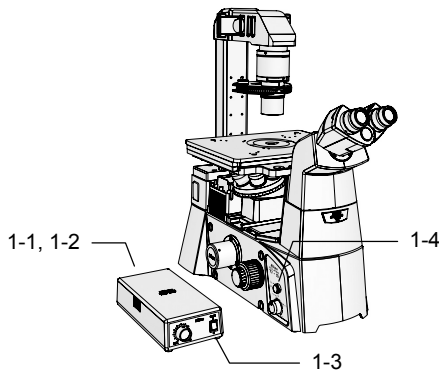
2.3.1 Bright-Field (BF) Microscopy

Bright-Field (BF) Microscopy Workflow

Outline: Remove all unnecessary optical elements from the optical path. The field diaphragm of the TI-DS Dia Pillar Illuminator 30W has a fixed opening size. The aperture diaphragm of the ELWD-S condenser is used only for bright-field microscopy.

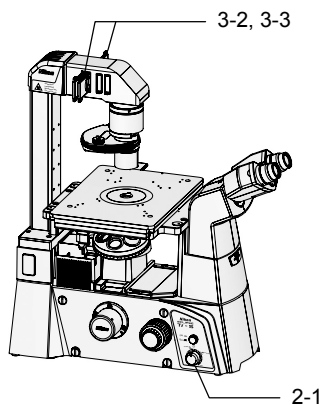


1 Turn on the dia illuminator.



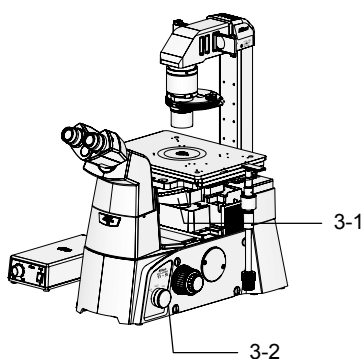
1. Check that the “input voltage indicator” on the back of the power supply matches the power voltage in your area.
If the voltages do not match, immediately disconnect the power cable and contact Nikon. Do NOT turn on the power.
2. Set the CTRL switch on the back of the power supply to “ON”.
3. Turn on the power supply by pressing the “I” side of the POWER switch on the power supply.
4. Turn on the lamp by pressing the “dia illumination ON/OFF switch” on the left side of the microscope.

2 Adjust the illumination for optimal color reproduction.



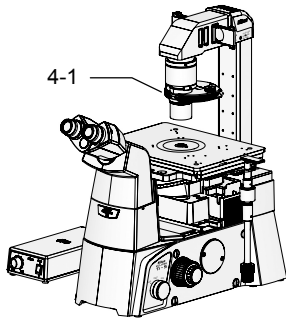
1. Rotate the dia illumination brightness control knob on the left side of the microscope to the “6V30W” position.
2. Move the NCB11 filter on the dia pillar illuminator into the optical path.
3. Move the ND4 filter on the dia pillar illuminator into the optical path.

3 Prepare the optical path.



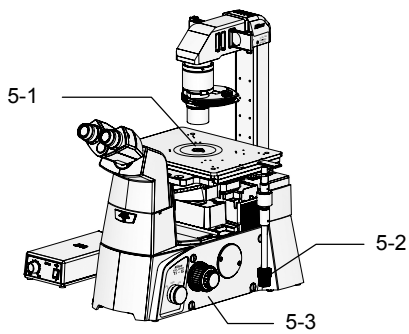
1. Move the 10x objective into the optical path by rotating the nosepiece.
2. Set the optical path selector knob on the right side of the microscope to “EYE”.
Direct a 100% light towards the observation port (eyepiece tube).

4 Set up for bright-field microscopy.



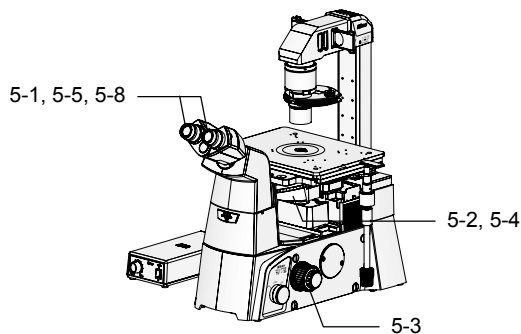
1. Open the optical path by rotation the condenser turret to position "A".

5 Set specimen and adjust the focus.

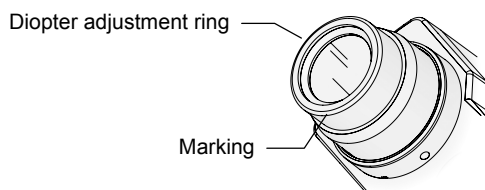


1. Place the specimen onto the stage.
2. Move the stage to bring the observation target into the center of the field of view.
3. Look into the eyepiece. Adjust the focus onto the specimen by rotating the focus knobs.

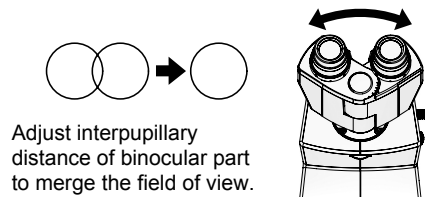
6 Adjust the diopters and the interpupillary distance.



Diopter Adjustment on Eyepieces



Interpupillary Adjustment on Binocular



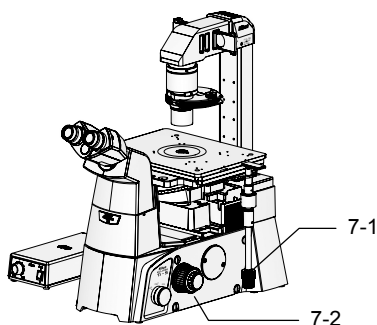
Adjust interpupillary distance of binocular part to merge the field of view.

1. On each eyepiece, rotate the diopter adjustment ring to align its lower end with the marking on the eyepiece.
This will be the reference position with zero diopter adjustment.
2. Move the 40x objective into the optical path by rotating the nosepiece.
3. Look into the left eyepiece with your left eye. Adjust the focus onto the specimen by rotating the focus knobs.
4. Move the 10x objective into the optical path by rotating the nosepiece.
5. Look into the left eyepiece with your left eye. Adjust the focus onto the specimen by rotating the diopter adjustment ring on the left eyepiece.

Do not touch the focus knobs at this time.

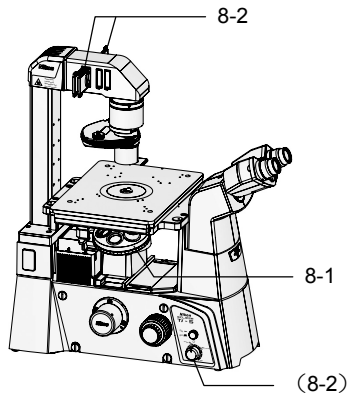
6. Repeat steps 2 thru 5 two times.
7. Adjust the right eyepiece.
Repeat steps 2 thru 6, but this time using the right eyepiece instead of the left.
8. Adjust the interpupillary distance of the binocular part to merge the two fields of view.

7 Re-adjust the focus.



1. Look into the eyepiece. Move the stage to bring the observation target into the center of the field of view.
2. Look into the eyepiece. Adjust the focus onto the specimen by rotating the focus knobs.

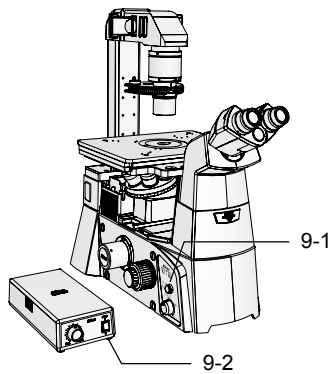
8 Observe the specimen.



1. Move any one of the objectives into the optical path by rotating the nosepiece.
2. Adjust the brightness for the field of view by moving the ND filters on the dia pillar illuminator in and out of the optical path.

If color reproducibility is not required, brightness adjustment can be performed by changing the lamp voltage with the dia illumination brightness control knob on the left side of the microscope.

9 End the observation.



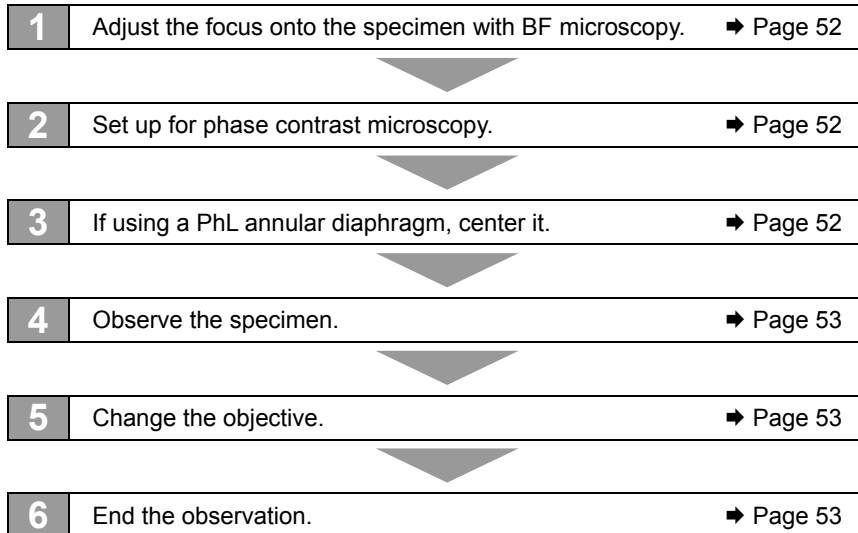
1. Turn off the dia illumination by pressing the dia illumination ON/OFF switch on the left side of the microscope.
2. Turn off the power supply by pressing the "O" side of the POWER switch on the back of the power supply.

If placing a cover on the microscope, wait until the lamp has cooled sufficiently.

2.3.2 Phase Contrast (Ph) Microscopy

Phase Contrast (Ph) Microscopy Workflow

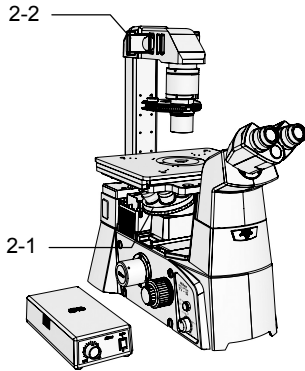
Outline: Move an annular diaphragm with the same Ph code as the objective into the optical path, by sliding the Ph annular diaphragm slider. PhL annular diaphragm must be centered before use.



1 Adjust the focus onto the specimen with BF microscopy.

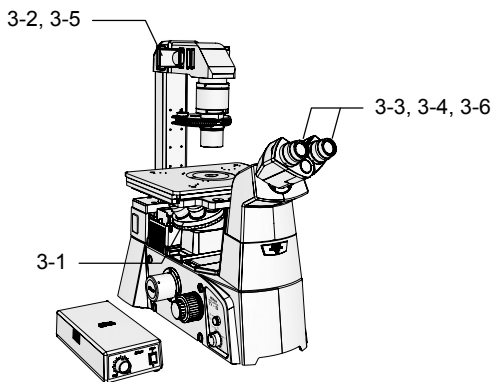
For the BF microscopy procedure, refer to Section 2.3.1 “Bright-Field (BF) Microscopy”.

2 Set up for phase contrast microscopy.



1. Move a phase contrast objective into the optical path by rotating the nosepiece. Check the Ph code of the objective.
2. Move an annular diaphragm with the same Ph code as the objective into the optical path, by sliding the Ph annular diaphragm slider.

3 If using a PhL annular diaphragm, center it.



1. Check that a phase contrast objective labeled “PhL” is in the optical path.
2. Move the “PhL” annular diaphragm into the optical path by sliding the Ph annular diaphragm slider.
3. Remove one of the eyepieces. Using the adapter, attach a centering telescope instead.
4. Adjust the focus onto the annular diaphragm image by rotating the eyepiece on the centering telescope.
5. Using the provided hex screwdriver, rotate the two annular diaphragm centering screws on the condenser, and adjust the position of the annular diaphragm image so that it overlaps with the phase contrast ring image within the objective.
6. Remove the centering telescope and the adapter. Re-attach the eyepiece.

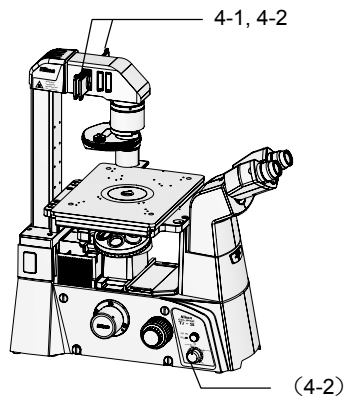
Centering Telescope

Adjust the focus by holding the flange and rotating the eyepiece.

Centering the Annular Diaphragm

Overlap the annular diaphragm image onto the phase contrast ring image within the objective.

4 Observe the specimen.



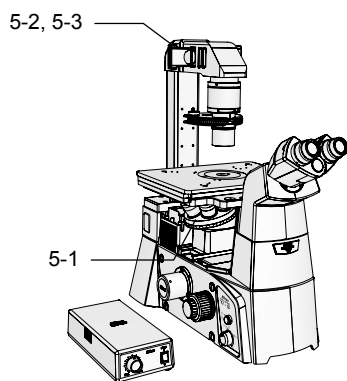
1. Move the NCB11 filter on the dia pillar illuminator out of the optical path, and move the GIF filter into the optical path.

The GIF filter improves the contrast for phase contrast microscopy.

2. Adjust the brightness for the field of view by moving the ND filters on the dia pillar illuminator in and out of the optical path.

If color reproducibility is not required, brightness adjustment can be performed by changing the lamp voltage with the dia illumination brightness control knob on the left side of the microscope.

5 Change the objective.



1. Move another phase contrast objective into the optical path.

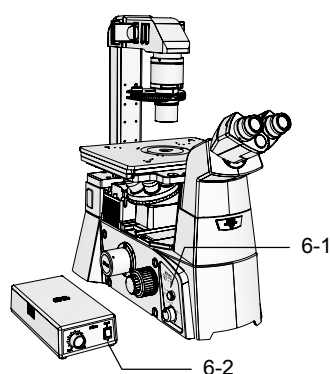
Check the Ph code of the objective.

2. Slide the Ph annular diaphragm slider to the position with the same Ph code as the objective.

3. If using a PhL annular diaphragm, center it.

For the centering procedure, refer to step 3 on page 52.

6 End the observation.



1. Turn off the dia illumination by pressing the dia illumination ON/OFF switch on the left side of the microscope.
2. Turn off the power supply by pressing the "O" side of the POWER switch on the back of the power supply.

If placing a cover on the microscope, wait until the lamp has cooled sufficiently.

3

Operation



Warning

- **Before using the product, thoroughly read the "Safety Precautions" at the beginning of this manual, and heed all warnings and cautions written therein.**
- **To use other equipment such as epi-fl attachment or differential interference contrast attachment, refer to the respective manuals and heed all warnings and cautions written therein.**

This chapter describes the operation methods for each part of the product.

- For the name and position of each part, refer to Chapter 1, "Part Names."
- For the microscopy procedure, refer to Chapter 2, "Microscopy."
- If the microscope has not been assembled yet, first refer to Chapter 4, "Assembly."
- If your microscope system has the epi-fl attachment or the differential interference contrast attachment, refer to the respective instruction manuals.
- If your microscope system is equipped with TI-HUBC/B Hub Controller B, refer to the instruction manual provided with the hub controller.

3.1 Dia Illumination On/Off

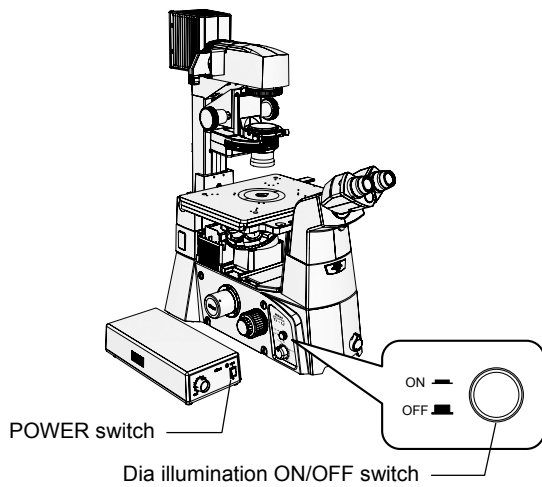


Figure 3-1 Dia Illumination On/Off

Power for dia illumination is supplied by a power supply.

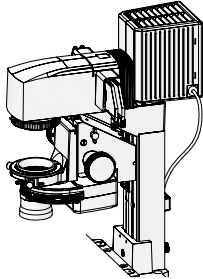
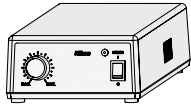
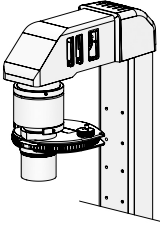
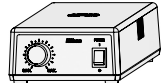
Turn the power supply on/off by setting the POWER switch on the front of the power supply to the “I” side (ON) or the “O” side (OFF). When the power is ON, the POWER indicator * will be lit.

When the power supply is ON, the dia illumination can be turned on/off by pressing the “dia illumination ON/OFF switch” on the left side of the microscope.

* On TE-PS30W and TE-PSE30, the POWER switch has a built-in power indicator.

Combination of Lamp, Dia Pillar Illuminator, and Power Supply

The combination of the dia pillar illuminator and the power supply will differ depending on the rating of the lamp used (12V 100W or 6V 30W). Refer to the following table for the correct combination of lamp, dia pillar illuminator, and power supply. Do not use the devices in any other combination.

Lamp rating	Dia pillar illuminator	Power supply	
12V 100W halogen lamp (OSRAM HLX 64623 or PHILIPS 77241)	TI-DH Dia Pillar Illuminator 100W 	TI-PS100W Power Supply (for 100-240V) 	
6V 100W halogen lamp (PHILIPS 5761)	TI-DS Dia Pillar Illuminator 30W 	TE-PS30W Power Supply A (for 100-120V)	TE-PSE30 Power Supply A (for 230V)
		 * Both power supply units have the same appearance.	

3.2 Brightness Adjustment

The brightness of the dia illumination can be adjusted with the dia illumination brightness control knob or the ND filters.

3.2.1 Brightness Adjustment with the Brightness Control Knob

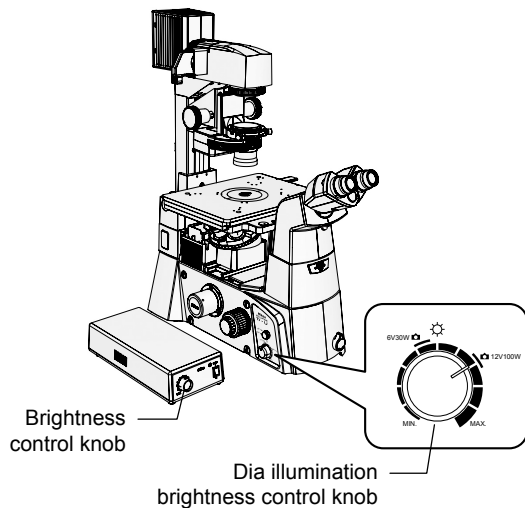


Figure 3-2 Brightness Adjustment with the Brightness Control Knob

EXTERNAL switch/CTRL switch

- ON :** Use the brightness control knob on the microscope.
- OFF :** Use the brightness control knob on the power supply device.

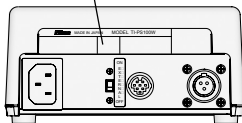


Figure 3-3 Power Supply (Rear View)

Two brightness control knobs are provided for the dia illumination: one on the left side of the microscope, and the other on the front of the power supply.

When the brightness control knob is rotated, the lamp voltage changes, changing the brightness and the color of the lamp. When the voltage is increased, the light becomes bright and blueish. When the voltage is decreased, the light becomes dark and reddish.

White light

When accurate color reproduction is critical, set the brightness adjustment knob to the “6V30W” or “12V100W” position depending on the lamp used, then move the NCB11 filter into the optical path. This setting will provide the whitest light. To adjust the brightness, adjust the ND filters on the dia pillar illuminator.

Brightness control knob selection

The brightness control knobs on the microscope and the power supply are mutually exclusive. Use the EXTERNAL switch (or CTRL switch) on the back of the power supply to select which knob is to be used. If the switch is ON, the knob on the microscope will be enabled; if the switch is OFF, the knob on the power supply will be enabled.

The two knobs are not calibrated. A particular setting on one knob may result in a different brightness than for the same setting on the other knob.

3.2.2 Brightness Adjustment with ND Filters

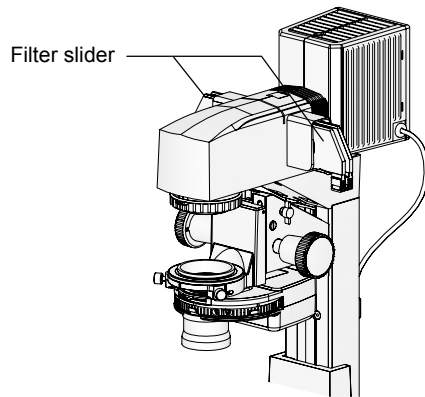


Figure 3-4 Brightness Adjustment with ND Filters

Filters for brightness adjustment are referred to as “ND filters” (ND: Neutral Density).

Filters with higher ratings have lower transmittance, and produces darker images. These filters are useful for adjusting the brightness when color reproducibility is critical (i.e. for photomicroscopy), as they do not affect the color of the light.

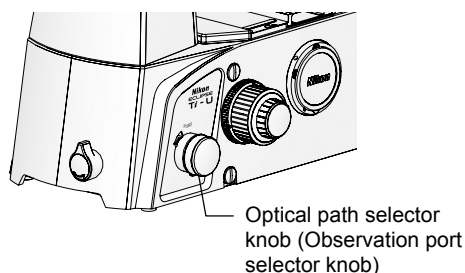
Use the ND filters by attaching them to the filter sliders on the diaphragm illuminator.

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

3.3 Optical Path Selection

The microscope has several observation ports. Use the optical path selector knob on the right side of the microscope to distribute the optic image to the ports.

3.3.1 Ti-U, Ti-U/B Optical Path Selection



On Ti-U and Ti-U/B, the optic image observation port can be selected by rotating the optical path selector knob on the right side of the microscope.

The following tables show the PORT knob positions and the corresponding light intensity distribution.

Figure 3-5 Ti-U, Ti-U/B Optical Path Selection

Table 3.3-1 Optical path selector knob on the Ti-U

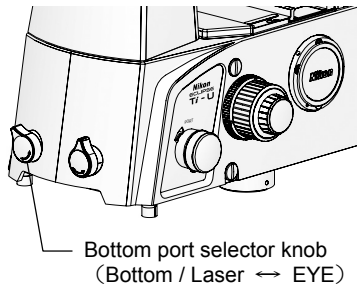
Knob position	Light distribution (%)		
	Observation port	Left side port	Right side port
EYE	100	—	—
R (NOTE 1)	—	—	100
AUX (NOTE 1)	—	—	—
L	—	100	—
Available attachments	— (NOTE 2)	Digital cameras, TV cameras	

Table 3.3-2 Optical path selector knob on the Ti-U/B

Knob position	Light distribution (%)			
	Observation port	Left side port	Right side port	Bottom port
EYE	100	—	—	—
R (NOTE 1)	—	—	100	—
B	—	—	—	100
L	—	100	—	—
Available attachments	— (NOTE 2)	Digital cameras, TV cameras		

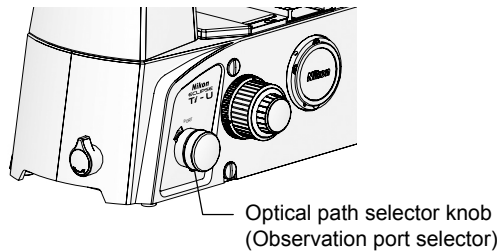
NOTE 1: For positions “R” and “AUX”, an optional prism can be attached at the time of purchase. By using the prism, the light intensity can be split to multiple ports, i.e. EYE : R = 20 : 80.

NOTE 2 : By attaching an external phase contrast eyepiece base unit (TI-T-BPH) or an eyepiece base unit with camera port (TI-T-BS), a camera port will be available for the “EYE” position, in addition to observation via the eyepieces.

Bottom Port (Ti-U/B Only)**Figure 3-6 Bottom Port (Ti-U/B Only)**

Ti-U/B has a bottom port for outputting the optic image from the bottom of the microscope.

To use the bottom port, rotate the optical path selector knob on the side of the microscope to position “B”, and the bottom port selector knob to the “Bottom/Laser” side. The optical path to the observation port will be directed at the bottom port.

3.3.2 Ti-S, Ti-S/L100 Optical Path Selection**Figure 3-7 Ti-S, Ti-S/L100 Optical Path Selection**

On Ti-S and Ti-S/L100, the optic image observation port can be selected by rotating the optical path selector knob on the right side of the microscope.

The following tables show the optical path selector knob positions and the corresponding light intensity distribution.

Table 3.3-3 Optical path selector knob on the Ti-S

Knob position	Light distribution (%)		
	Observation port	Left side port	Right side port
EYE	100	—	—
SIDE (NOTE 1)	20	80	—
Available attachments	— (NOTE 2)	Digital cameras, TV cameras	

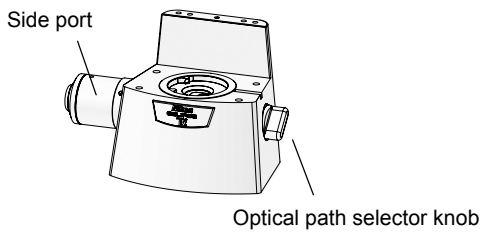
Table 3.3-4 Optical path selector knob on the Ti-S/L100

Knob position	Light distribution (%)		
	Observation port	Left side port	Right side port
EYE	100	—	—
SIDE	—	100	—
Available attachments	— (NOTE 2)	Digital cameras, TV cameras	

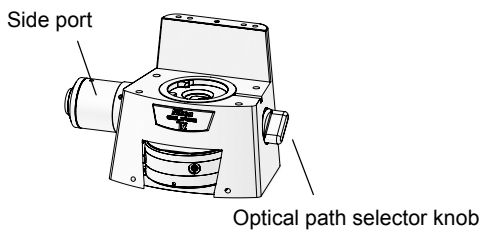
NOTE 1: For positions “SIDE”, an optional prism can be attached at the time of purchase. By using the prism, the light intensity can be split to multiple ports, i.e. EYE : R = 20 : 80.

NOTE 2: By attaching an external phase contrast eyepiece base unit (TI-T-BPH) or an eyepiece base unit with camera port (TI-T-BS), a camera port will be available for the “EYE” position, in addition to observation via the eyepieces.

3.3.3 Eyepiece Base Unit Options



TI-T-BS Eyepiece Base Unit with Side Port



TI-T-BPH External Phase Contrast Eyepiece Base Unit

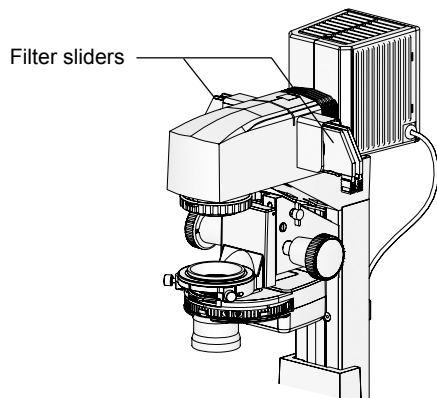
TI-T-BS Eyepiece Base Unit with Side Port and TI-T-BPH External Phase Contrast Eyepiece Base Unit have a side port equipped with a C-mount adapter.

When using these eyepiece base units, you will be able to use both the eyepiece observation port and the base unit side port. To do so, select the eyepiece observation port with the optical selector switches.

To switch between the eyepiece observation port and the side port, use the selector knob on the right side of the eyepiece base unit.

Figure 3-8 Eyepiece Base Unit Side Ports

3.4 Filter Operation



Filter sliders can be attached to the pillar illuminator (up to four on the 100W model, and three on the 30W model).

Use the necessary filters by attaching them to the filter sliders.

The following filters are available:

Figure 3-9 Filter Sliders (Dia Pillar Illuminator 100W)

Filter name	Description
ND2	Adjusts the brightness for normal microscopy or photomicroscopy (ND: Neutral Density). Reduces the light intensity to 1/2. (Transmittance: Approx. 50%)
ND4	Adjusts the brightness for normal microscopy or photomicroscopy (ND: Neutral Density). Reduces the light intensity to 1/4. (Transmittance: Approx. 25%)
ND8	Adjusts the brightness for normal microscopy or photomicroscopy (ND: Neutral Density). Reduces the light intensity to 1/8. (Transmittance: Approx. 12.5%)
ND16	Adjusts the brightness for normal microscopy or photomicroscopy. (ND: Neutral Density) Reduces the light intensity to 1/16. (Transmittance: Approx. 6%)
NCB11	Corrects the color temperature for normal microscopy or filming by daylight type color TV cameras (NCB: Neutral Color Balance). Color reproducibility is optimal when this filter is placed in the optical path and the lamp voltage is matched to the lamp rating. Keep this filter out of the optical path when filming in black and white.
GIF	Green interference filter. Improves the contrast for when observing under a monochrome light or when filming in black and white.
D	Diffusion filter. This filter is made of frosted glass and will diffuse light. Use this filter to equalize the illumination.
HA	Absorbs the heat rays in the illumination (HA: Heat Absorption). This filter reduces the effect of heat on the specimen. While the dia pillar illuminators have a built-in heat insulation filter, it is recommended that this filter be used for specimens that are sensitive to heat.

3.5 Field Diaphragm Operation

(TI-DH Dia Pillar Illuminator 100W only)

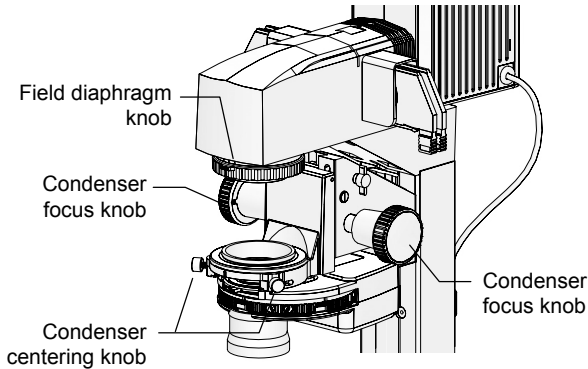


Figure 3-10 Field Diaphragm Knob

The field diaphragm is used to limit the irradiation area of the lamp to the microscope's field of view.

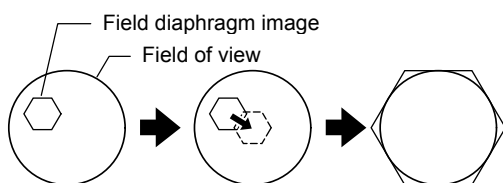
As viewed from the top of the pillar illuminator, a counterclockwise rotation of the field diaphragm knob increases the diameter of the irradiation area, and a clockwise rotation decreases the diameter of the irradiation area.

Usually, the irradiation area is adjusted to a size that circumscribes (or inscribes) the field of view. An unnecessarily large irradiation area will result in stray light and flare, thereby reducing the contrast of the optic image.

Field diaphragm adjustment is particularly important when performing photomicroscopy. Typically, adjusting the irradiation area to be slightly larger than the size of the image sensor (indicated by the capture area frame) will yield favorable results. Avoid making the size of the irradiation area too close to the size of the image sensor, as it may result in vignetting.

The field diaphragm of the TI-DS Dia Pillar Illuminator 30W has a fixed opening size. It cannot be adjusted.

Field diaphragm adjustment



Move field diaphragm image into center of field of view. Adjust its size to match field of view.

Figure 3-11 Field Diaphragm Adjustment

1. Move the 10x objective into the optical path.
2. Rotate the field diaphragm knob on the dia pillar illuminator until the field diaphragm image is visible in the field of view.
3. Adjust the focus onto the field diaphragm image by rotating the condenser focus knob on the dia pillar illuminator.
4. Move the field diaphragm image to the center of the field of view by rotating the two condenser centering knobs on the dia pillar illuminator.
5. Move the 40x objective into the optical path.
6. Adjust the size of the field diaphragm image to closely match the size of the field of view, by rotating the field diaphragm ring on the dia pillar illuminator.
7. Move the field diaphragm image to the center of the field of view by rotating the two condenser centering knobs on the dia pillar illuminator.

3.6 Aperture Diaphragm Operation

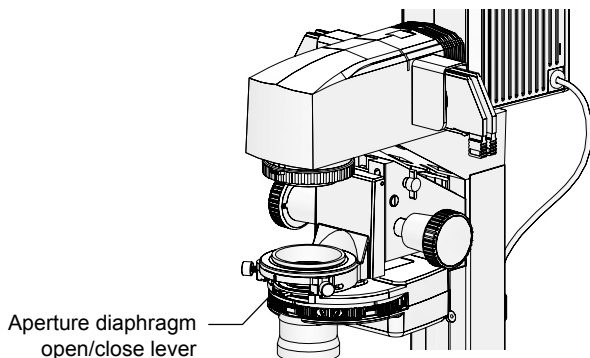
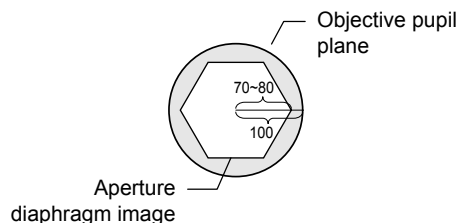


Figure 3-12 Aperture Diaphragm Open/Close Lever



Adjust the size of the aperture diaphragm image to 70-80% the size of the objective pupil plane.

Figure 3-13 Aperture Diaphragm Adjustment

The aperture diaphragm adjusts the numerical aperture of the illumination system.

By adjusting the aperture diaphragm, you can adjust the resolution, brightness, contrast, and focal depth of the microscope image. Closing the aperture diaphragm will reduce the resolution and brightness, and increase the contrast and focal depth. These properties are interrelated, and cannot be adjusted independently. Adjust the aperture diaphragm according to the specimen and purpose.

Aperture diaphragm adjustment is particularly important for bright-field microscopy, DIC microscopy, and photomicroscopy. Typically, adjusting the aperture diaphragm to 70-80% of the numerical aperture of the objective will result in an appropriate contrast and a favorable image.

Adjust the aperture diaphragm while looking at the actual diaphragm image. Rotate the aperture diaphragm operation lever counterclockwise to close the aperture, or clockwise to open the aperture. Adjust the aperture diaphragm so that the size of the diaphragm image is at 70-80% of the size of the objective pupil plane.

Adjustment with Bertrand Lens on Eyepiece Tube

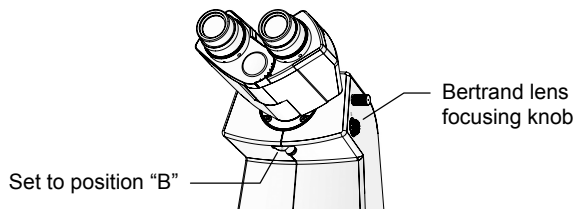


Figure 3-14 Adjustment with Bertrand Lens

When using TI-TD Eyepiece Tube B or TI-TERG Ergonomic Eyepiece Tube, use the Bertrand lens in the eyepiece tube for adjustment.

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

Adjustment with Centering Telescope

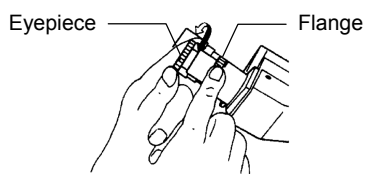


Figure 3-15 Adjustment with Centering Telescope

When using TI-TS Eyepiece Tube B, use the centering telescope for adjustment.

Remove one of the eyepieces. Using the adapter, attach a centering telescope instead. Rotate the eyepiece of the centering telescope to adjust the focus. This will allow you to view the objective pupil plane (a bright circle) and the aperture diaphragm image.

Precautions on Condenser and Aperture Diaphragm

- Be sure to fully open the aperture diaphragm when performing phase contrast microscopy with the TI-C Condenser Turret. If the aperture diaphragm is not fully open, the optical path will be blocked.
- The aperture diaphragm of the ELWD-S condenser is used only for bright-field microscopy. This aperture diaphragm is independent of the phase contrast annular diaphragm. Adjustment of the aperture diaphragm will not affect the annular diaphragm.

3.7 Condenser Operation

3.7.1 TI-C Condenser Turret (System Condenser)

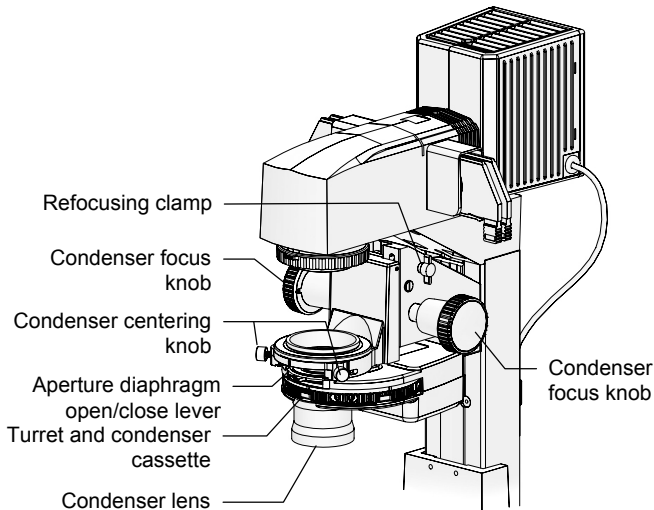


Figure 3-16 TI-C Condenser Turret (System Condenser)

The condenser has two functions: the first is to focus the dia illumination light, and the second is to apply optical modulation to enable the various microscopy methods.

Traditionally, the condenser had to be changed depending on the microscopy method.

On the other hand, a system condenser can have up to five condenser cassettes in its turret, each with different optical elements. Thus, the microscopy method can be changed simply by rotating the turret.

The condenser cassettes can be freely arranged on the turret, as long as they are compatible with the condenser lens (there are three types). Condenser cassettes can be changed without removing the condenser from the microscope, allowing several microscopy methods to be used within a short time span.

When using the TI-CT-E Motorized Condenser Turret, refer to the instruction manual provided with TI-HUBC/B Hub Controller B.

Phase Contrast Microscopy

When performing phase contrast microscopy, use a condenser cassette that has the same Ph code as the objective and the external phase contrast ring, and center the annular diaphragm after moving the condenser cassette into the optical path. Be sure to fully open the aperture diaphragm. If the aperture diaphragm is not fully open, the optical path will be blocked.

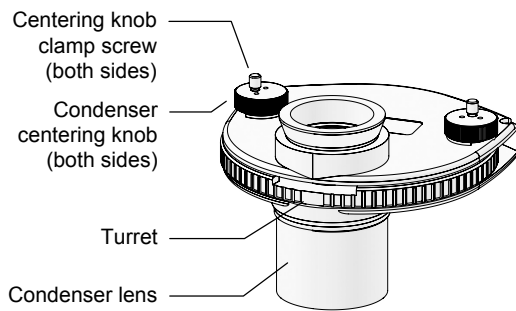
Comparison of Condenser Lenses

Three types of condenser lenses can be attached to the TI-C Condenser Turret.

Table Comparison of condenser lenses

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

3.7.2 ELWD-S Condenser



The ELWD-S Condenser supports bright-field microscopy and phase contrast microscopy. The ELWD-S Condenser can be used with both 100W and 30W pillar illuminators.

Figure 3-17 ELWD-S Condenser

3.8 Eyepiece Tube Operation

3.8.1 Diopter Adjustment

Diopter adjustment corrects the difference in the left and right fields of view, making binocular observation easier. The eyepiece tube length will be maintained, allowing for the objective to perform optimally with minimal focus loss upon objective change.

To perform diopter adjustment, follow the instructions below.

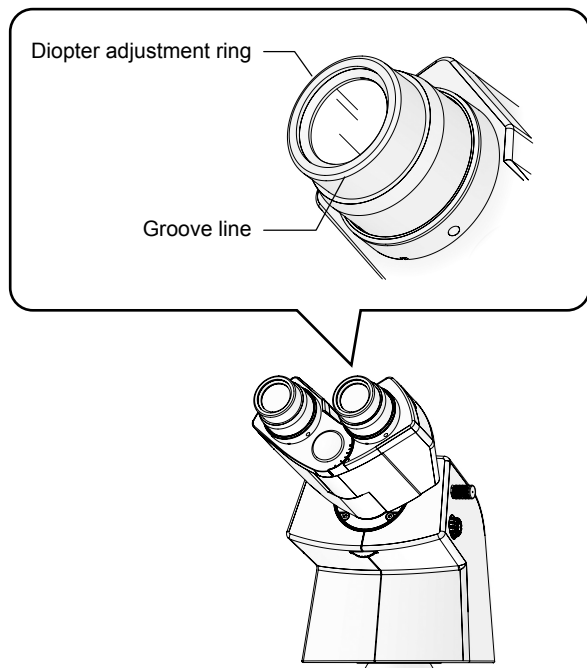


Figure 3-18 Diopter Adjustment

1. **Adjust the focus of the 10X objective onto the specimen under the bright-field microscopy settings.**

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

This is the zero position for diopter adjustment.

3. **Place the 40x objective into the optical path.**

4. **Look into the left eyepiece with your left eye and focus on the specimen with the focus knob on the microscope body.**

5. **Place the 10x objective into the optical path.**

6. **Look into the left eyepiece with your left eye and focus on the specimen with the diopter adjustment ring on the left eyepiece.**

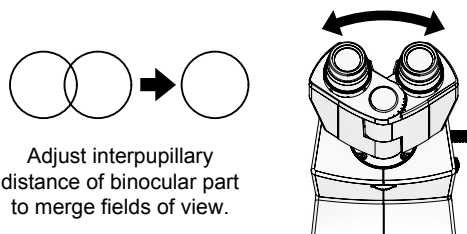
Do not touch the focus knob on the microscope body in this step.

7. **Repeat steps 3 to 6 two times.**

8. **Adjust the right eyepiece.**

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

3.8.2 Interpupillary Distance Adjustment



Adjust interpupillary distance of binocular part to merge fields of view.

Figure 3-19 Interpupillary Distance Adjustment

Interpupillary distance adjustment adjusts the distance between the eyepieces to better suit the user. This will make binocular observation easier.

When diopter adjustment is complete, move the 10x objective into the optical path, and adjust the focus onto the specimen. Look into the eyepieces with both eyes, and adjust the interpupillary distance of the binocular part so that the two fields of view overlap into one.

The binocular part has an interpupillary distance scale. It is recommended that you remember your own interpupillary distance for easier adjustment in the future.

3.8.3 Eyepiece Tube Shutter Operation

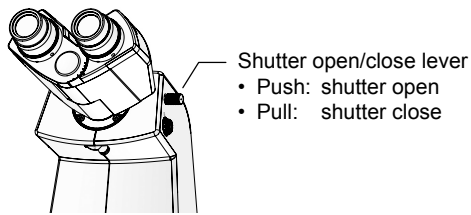


Figure 3-20 Shutter Operation Lever

TI-TD Eyepiece Tube B and TI-TERG Ergonomic Eyepiece Tube have a built-in manual shutter mechanism.

Pull out the shutter operation lever on the right side of the eyepiece tube to push the shutter into the optical path. Push in the lever to the limit to open the shutter.

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

3.8.4 Bertrand Lens Operation

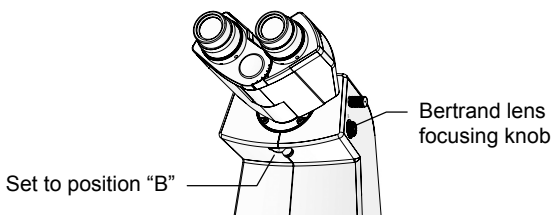


Figure 3-21 Bertrand Lens Operation

TI-TD Eyepiece Tube B and TI-TERG Ergonomic Eyepiece Tube have a built-in Bertrand lens.

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

Position	Optical element	Description
O	Blank	Use to observe the microscope image with the eyepiece tube.
B	Bertrand lens	Use to observe the objective pupil plane. Use the focusing knob to adjust the focus onto the pupil plane. The Bertrand lens is used for aperture diaphragm adjustment, as well as for centering during phase contrast microscopy. It can also be used to observe the tip of the manipulator above the objective, if using a manipulator.

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

3.9 Focusing Mechanism Operation

3.9.1 Coarse Focus Knob and Fine Focus Knob



Caution

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

- Rotating the left and right focus knobs in the opposite directions.
- Rotating the focus knobs past their limit.

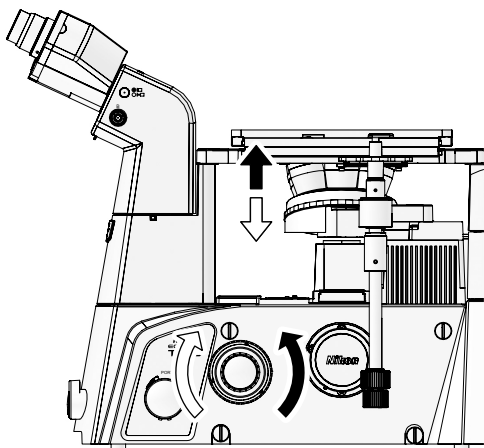


Figure 3-22 Focus Knobs and Nosepiece Movement

The focus is adjusted by rotating the focusing knobs on the sides of the microscope to move the elevating section of the objective (nosepiece) up and down.

The figure on the left illustrates the relationship between the rotational direction of the focus knobs and the vertical motion of the objective.

* The stroke for focus adjustment is 10 mm from the reference position.

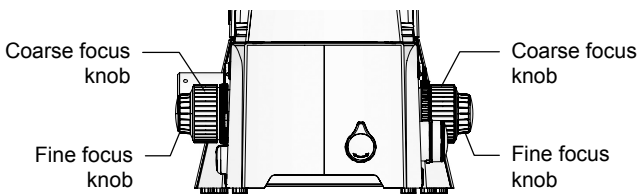
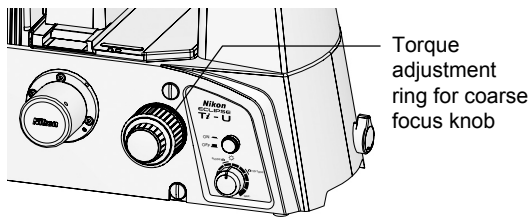


Figure 3-23 Focus Knobs and Nosepiece Movement

There are two focus knobs: the “coarse focus knob” for large movements and the “fine focus knob” for small movements. The traveling distance of the objective for each knob is as follows:

Rotation of knob	Distance traveled by objective
Fine focus knob, 1 marking	1 μ m
Fine focus knob, 1 rotation	0.1 mm
Coarse focus knob, 1 rotation	5 mm

3.9.2 Torque Adjustment for Coarse Focus Knob

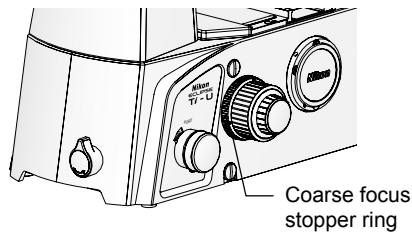
The focus knob on the left side of the microscope is equipped with a “torque adjustment ring” for adjusting the tightness of the coarse focus knob.

To tighten the coarse focus knob, rotate the “torque adjustment ring” counterclockwise. To loosen the knob, rotate the ring clockwise.

Figure 3-24 Torque Adjustment Ring for Coarse Focus Knob

**Caution**

Excessive loosening of the coarse focus ring will result in the nosepiece lowering under its own weight, resulting in a loss of focus during the observation. Adjust the torque appropriately.

3.9.3 Coarse Focus Stopper Ring (Ti-U, Ti-U/B Only)**Figure 3-25 Coarse Focus Stopper Ring**

The focus knob on the right side of the microscope is equipped with a “coarse focus stopper ring” for fixing the coarse knob at the position at which the focus is on the specimen.

By tightening this ring, you can prevent the nosepiece from being elevated past the set point, even when the coarse focus knob is rotated. (You will still be able to move the nosepiece up and down with the fine focus knob.)

By using this function, you can easily bring the objective back into focus by simply rotating the coarse focus knob to the limit, for example, after moving the objective out of the way for specimen replacement.

It is also useful when the objective and the specimen are in extremely close proximity (i.e. due to a thick bottom plate), that the magnification cannot be changed without lowering the objective first.

If you are not using the coarse focus stopper ring, be sure to release the clamp by rotating the ring counterclockwise to the limit.

Example of use: Switching the objective

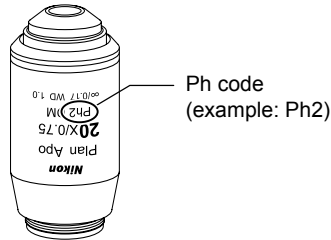
1. **With the focus on the specimen, rotate the coarse focus stopper ring clockwise to the limit.**
2. **Lower the nosepiece by rotating the coarse focus knob. Rotate the nosepiece and switch the objective.**
3. **Elevate the nosepiece by slowly rotating the coarse focus knob to the limit.**

When the limit is reached, the focus should be approximately on the specimen.

4. **Accurately adjust the focus by rotating the fine focus knob.**

3.10 Objective Operation

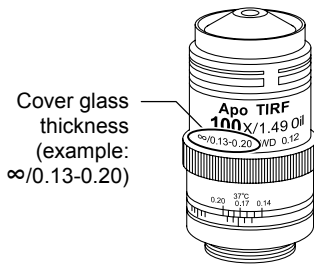
3.10.1 Phase Contrast Objectives



Phase contrast objectives are labeled with a “Ph code” (PhL, Ph1, Ph2, or Ph3). When performing phase contrast microscopy, use an annular diaphragm or condenser cassette that has the same Ph code as the objective, regardless of the magnification of the objective.

Figure 3-26 Phase Contrast Objective (Example)

3.10.2 Cover Glass Thickness

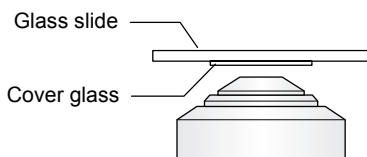


Objectives are labeled with the supported cover glass thickness. For example, “∞/0.17” indicates a cover glass thickness of 0.17 mm.

When observing at high magnification through glass that is thicker than the supported glass thickness (i.e. when observing a specimen in a Petri dish), it is recommended that you use an objective with a correction ring so that the optical system can be adjusted accordingly. (See Section 3.10.3, “Objectives with Correction Ring”)

Figure 3-27 Cover Glass Thickness (Example)

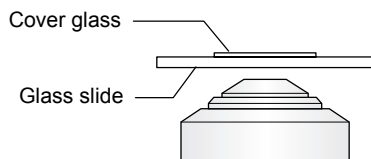
Glass Thickness of 0.17 mm



When using an objective labeled “0.17”, face the cover glass downward, and set the specimen so that the cover glass faces the objective. (The cover glass has a thickness of 0.17 mm.)

Figure 3-28 Glass Thickness of 0.17 mm

Glass Thickness of 1.2 mm



When using an objective labeled “1.2”, face the cover glass upward, and set the specimen so that the glass slide faces the objective. (The glass slide has a thickness of 1.2 mm.)

Figure 3-29 Glass Thickness of 1.2 mm

3.10.3 Objectives with Correction Ring

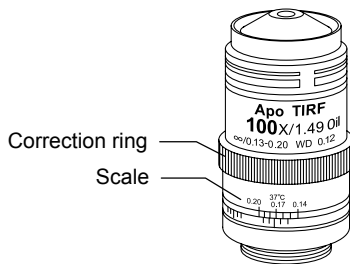


Figure 3-30 Objective with Correction Ring (Example)

Inverted microscopes are sometimes used to observe through the bottom plate (glass or plastic) of a Petri dish or a culture vessel. In such a case, the microscope may not perform optimally with standard objectives (for glass covers with a thickness of 0.17 mm), as the thickness of the bottom plate varies from container to container.

By using an objective with a correction ring, you will be able to compensate for the thickness of the bottom plate.

Note, however, that correction is not possible where there is a change in the thickness of the bottom plate (i.e. around the periphery of the container). Use the correction function where the thickness of the bottom plate is uniform.

Correction Ring Adjustment

1. **Adjust the objective correction ring to match the reading on the scale to the thickness of the container's bottom plate.**

For the thickness of the bottom plate, take an actual measurement or refer to the specifications provided by the manufacturer.

An acrylic concentric ring is useful as it will allow you to view the operating parts from above the stage as you work.

2. **Focus on the specimen by rotating the focus knobs.**
3. **If the resolution and contrast of the image are poor, slightly rotate the correction ring on the objective in either direction.**

This will shift the focus slightly. Readjust the focus by turning the fine focus knob.

4. **If resolution and contrast are improved, rotate the correction ring slightly in the same direction, and readjust the focus.**

If resolution and contrast are lost, rotate the correction ring in the opposite direction by approximately twice the amount rotated in the previous step. Readjust the focus.

Repeat the process to obtain the optimal image.

- It is recommended to note the optimal correction ring setting for use as reference in using containers of different thicknesses.
- The 0 mm position of the correction ring corresponds to the position for observing a no-cover-glass specimen on an upright microscope.

3.10.4 Oil Immersion Objectives

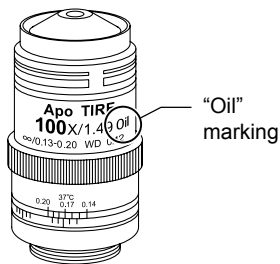


Figure 3-31 Oil Immersion Objective (Example)

Objectives with the “Oil” label are oil immersion objectives.

When using an oil immersion objective, fill the space between the objective tip and the specimen with oil (Nikon Immersion Oil). When performing epi-fl microscopy with an epi-fl oil immersion objective, use a non-fluorescent oil.

Applying Oil

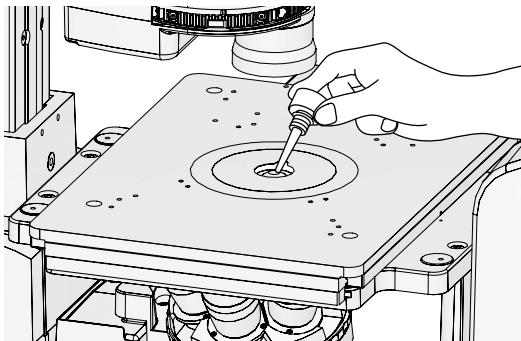


Figure 3-32 Applying Oil Immersion

1. Lower the objective by rotating the focus knobs.
2. Taking care not to let bubbles form, apply the bare minimum amount of oil onto the tip of the objective.

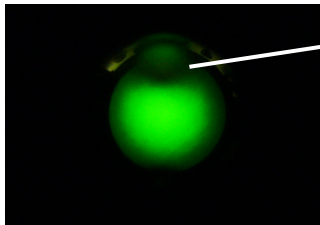
If too much oil is applied, the excess oil may overflow onto the stage and other parts. Use as little oil as possible (just enough to fill the space between the objective tip and the specimen), and take care not to allow the oil to get on other parts.

3. Place the specimen onto the stage.
4. Slowly raise the objective by rotating the focus knobs, allowing the oil to fill the space between the objective tip and the specimen.
5. Check that no air bubbles have formed in the oil.

Bubbles in the oil will adversely affect the viewing of the image. Refer to the following section and check for bubbles.

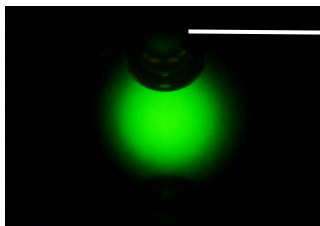
Checking for Air Bubbles

(1) Objective pupil plane under observation with Bertrand lens



Light partially blocked in upper section of field of view.

(2) Field of view with focus of Bertrand lens shifted from the above state



Air bubble recognized in upper section of field of view.

To check for air bubbles, observe the objective pupil plane. The objective pupil plane can be observed by rotating the Bertrand lens in/out lever to position "B" and adjusting the focus with the Bertrand lens focusing knob, or by replacing an objective with a centering telescope and adjusting the focus with its eyepiece.

If you detect bubbles in the oil, attempt to remove them by rotating the nosepiece slightly to move the oil-immersed objective back and forth in the oil one or two times. If the bubbles cannot be removed, wipe off the oil, and reapply new oil.

Figure 3-33 Air Bubble Observation with Bertrand Lens (Example)

Removing Oil

After using an oil immersion objective, wipe the oil off from its tip.

To remove the oil, gently wipe two or three times with a lens tissue or gauze dampened with petroleum benzene. It is recommended that you avoid using the same area of the tissue or gauze repeatedly. After wiping with petroleum benzene, wipe with absolute alcohol (ethyl or methyl) for a better finish.

If petroleum benzene is unavailable, use methyl alcohol. However, as methyl alcohol does not clean as well as petroleum benzene, it will be necessary to wipe a few more times. (Three to four wipes are usually sufficient.)

When wiping oil off of the specimen, take care not to damage the specimen.



Caution

- Residual oil on an oil-immersion objective or oil adhered to the tip of a dry-type objective will degrade the image quality significantly. After use, thoroughly wipe off all oil, and make sure that no oil adheres to the tips of other objectives.
- Absolute alcohol and petroleum benzene are highly flammable. Handle with care. Do not use near an open flame, or operate a power switch in the vicinity.

Reapplying Oil

When performing oil immersion repeatedly, use the Escape switch and Refocus switch for faster focus adjustment.

A 25 mm or acrylic concentric ring is useful as it will allow you to apply the oil via its oiling notch, without needing to remove the specimen (i.e. Petri dish). Set the concentric ring so that its notch matches the rotational direction of the nosepiece, hold the nosepiece so that the objective is aligned with the notch, and apply the oil.

3.10.5 Water Immersion Objectives

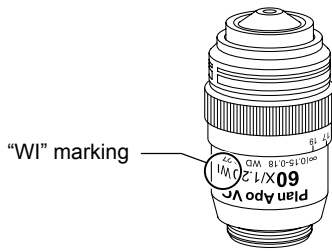


Figure 3-34 Water Immersion Objective (Example)

Objectives with the “WI” label are water immersion objectives. (Those with long operating distances are for upright microscopes.)

When using a water immersion objective, fill the space between the objective tip and the specimen with deionized or distilled water.



Caution

- Do NOT use tap water. If tap water is used, impurities may adhere to and solidify on the lens, causing the lens to become scratched when being cleaned.
- Plan Apo 60xWI (NA=1.2) is equipped with a correction ring to achieve optimal aberration on cover glasses of different thicknesses. A reading of “17” on the scale indicates 0.17 mm. When using a cover glass, measure the thickness of the cover glass with a micrometer, and adjust the correction ring for the thickness for a more accurate correction.

3.11 TI-DH Dia Pillar Illuminator 100W Operation

This section describes operations specific to TI-DH Dia Pillar Illuminator 100W.

3.11.1 Condenser Refocusing Clamp

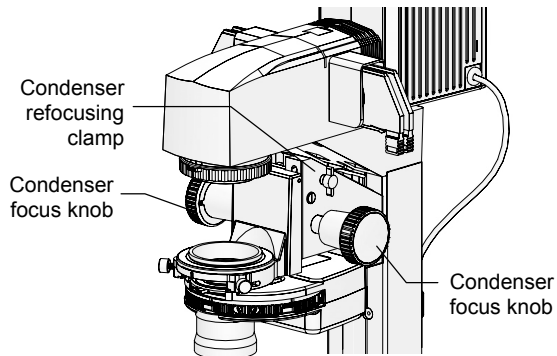


Figure 3-35 Pillar Illuminator 100W

Form the field diaphragm image on the specimen surface by rotating the condenser focus knob. Rotate the condenser refocusing clamp clockwise to the limit to mark this position.

When the condenser is elevated to change the specimen, it can easily be brought back down to the initial position (at which the field diaphragm image is formed) by rotating the condenser focus knob to the limit. This function is useful for use with high magnification condensers or when the pillar cannot be inclined. The condenser refocusing clamp has a range of motion of 13 mm.

3.11.2 Condenser Mount Rotation

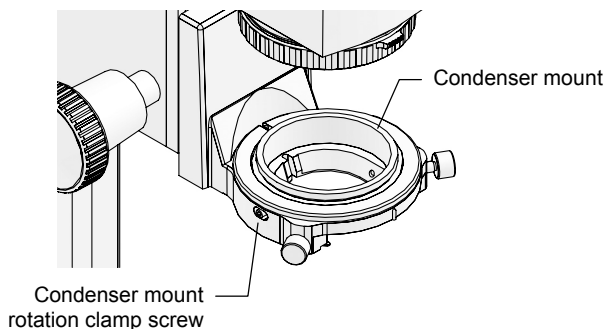


Figure 3-36 Condenser Mount

The condenser mount can be rotated if the condenser mount rotation clamp screw is loosened.

Use this function to adjust the orientation of the turret when using the DIC attachment.

When using the system condenser without a polarizer on the condenser holder (i.e. for bright-field or phase contrast microscopy), this function can also be used to rotate and fix the turret. This will allow you to secure a space for manipulator attachment.

3.11.3 Pillar Inclination

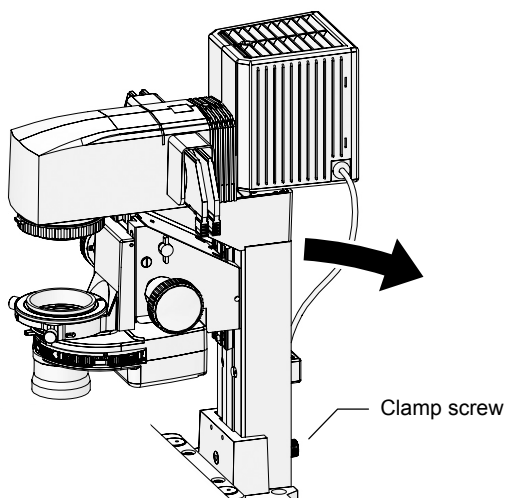


Figure 3-37 Pillar Inclination

When replacing a large specimen, the pillar can be inclined to secure working space.

To incline the pillar, loosen and release the clamp knob on its back side. Hold the front side of the dia illuminator, and slowly let the pillar incline backward.

Under normal use, the clamp knob on the pillar can be left released. However, be sure to tighten the clamp knob when attaching relatively heavy objects to the pillar, so as to prevent it from falling.



Caution

- When moving the pillar into and out of an incline, take caution not to get your hands and fingers caught in the hinge.
- When attaching relatively heavy objects to the pillar, be sure to secure them properly. A loose screw may result in the attachment falling off when the pillar is inclined. In particular, be sure to properly secure high-intensity lamphouses and lamphouse adapters.

3.11.4 Device Attachment Screw Holes

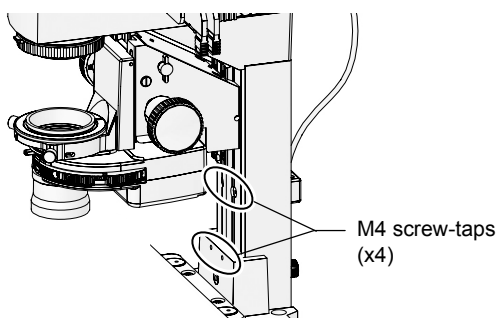


Figure 3-38 Device Attachment Screw Holes

Four M4 screw-taps are provided on the front of the pillar for attaching devices such as manipulators.

Use the upper two holes to attach devices that should be moved out of the way when the pillar is inclined. Use the lower two holes to attach devices that should remain positioned over the stage when the pillar is inclined.

3.12 TI-SR Rectangular Mechanical Stage

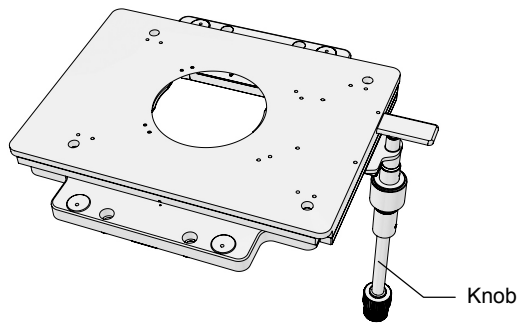


Figure 3-39 Rectangular Mechanical Stage

The knob on the rectangular mechanical stage uses a universal joint, and can be operated freely at any angle.

The stage is provided with screw-taps on both the top and bottom surfaces for attaching devices such as manipulators.

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

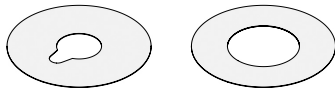


Figure 3-40 Concentric Rings

Two concentric rings of different sizes are provided with the microscope (25 mm dia. and 40 mm dia.). Use whichever is appropriate depending on the size of the specimen.

When using the 40 mm ring, the objective may collide with the bottom surface of the stage if the nosepiece is rotated with the stage moved out of the observation area. In such a case, first lower the nosepiece to the limit, and then switch the objective.



Caution

The stage rack will protrude when the stage is operated. When operating the focus knobs or the nosepiece, take caution not to strike your hands against the rack. Contact with the edges of the rack may result in injury.

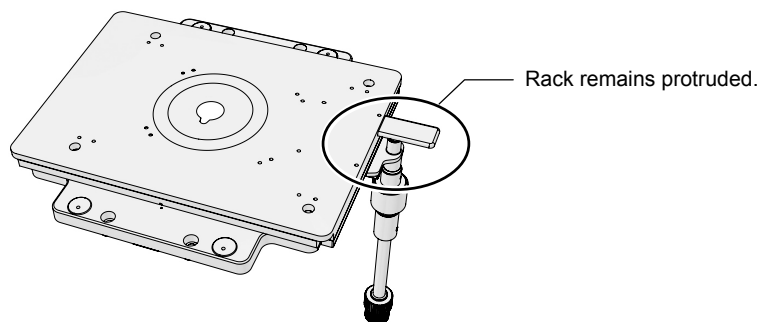


Figure 3-41 Rectangular Mechanical Stage Rack

4

Assembly



Warning

- Before assembling or connecting devices, thoroughly read the “Safety Precautions” at the beginning of this manual, and heed all warnings and cautions written therein.
- To prevent electric shock, fire, and product damage, turn off the power switch on all devices, and unplug the power cords.



Caution

- Take care to avoid pinching your fingers and hands.
- Scratches and dirt on optical components (i.e. lenses and filters) will degrade the microscope image. Keep them free of scratches, dust, fingerprints, and other dirt.
- The product is a precision optical instrument. Handle the product with care, and avoid subjecting it to strong physical shocks. In particular, the accuracy of objectives may be lost by even weak physical shocks.

This chapter describes the installation, assembly, and setup of the product in the actual sequence. Assemble the product as described in this chapter.

**When using Ti-U, Ti-U/B, Ti-S, or Ti-S/L100 with
TI-HUBC/B Hub Controller B attached on the back**



Refer to the instruction manual provided with TI-HUBC/B Hub Controller B

Required tools

- 2 mm hex screwdriver (x2) (included with product)
- 3 mm hex wrench (x1) (included with product)
- 4 mm hex screwdriver (x1) (included with product)

Installation conditions

Refer to the “Notes on Handling the Product” at the beginning of this manual and install the product in an appropriate location.

Checking the power supply voltage

When using TE-PS30W Power Supply A or TE-PSE30 Power Supply A with the product, check that the input voltage indicated on the power supply device matches the power voltage in your area. If the voltages do not match, do not use the power supply, and contact Nikon. Use of a power supply with the incorrect voltage rating may result in malfunctions, electric shock, or fire.

Assembly diagram

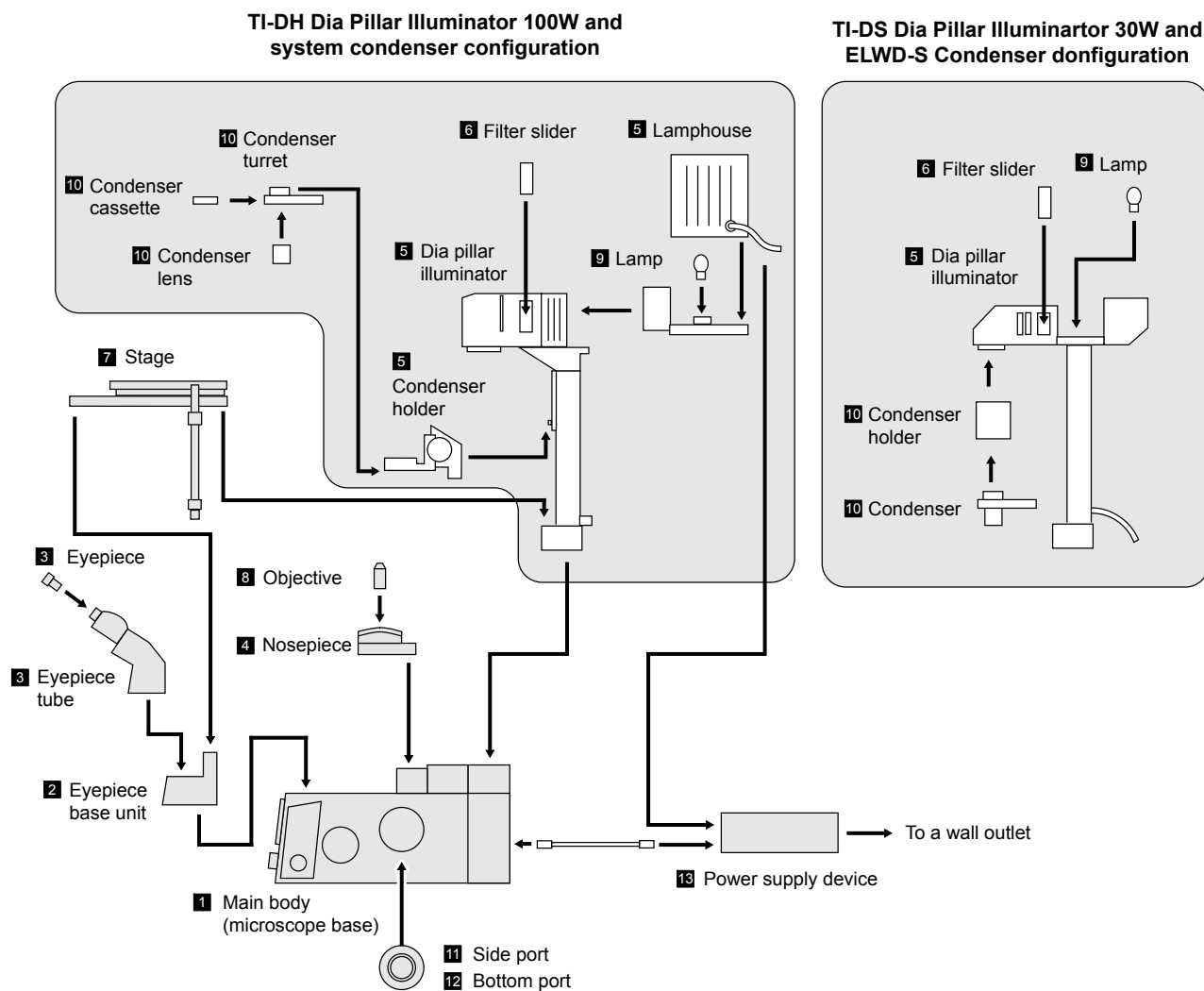


Figure 4-1 Assembly Diagram

1 Installing the microscope body (microscope base)

Install the microscope in an appropriate location.

1. Select a location for the installation.

For the installation location, refer to "Installation location and storage location" in "Notes on Handling the Product" at the beginning of this manual.

2. Take out the main body (microscope base) from the box and place it on a stable surface.

Notes on installation

- The microscope base is heavy. Be sure to move the microscope in a group of two or more people.
- When lifting the microscope base, hold it securely by the recess at the bottom front and the carrying handle at the rear.

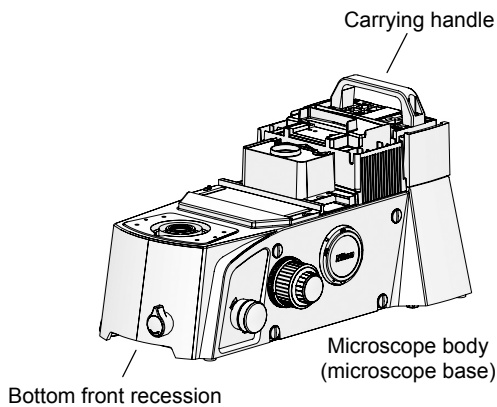


Figure 4-2 Microscope Body Installation

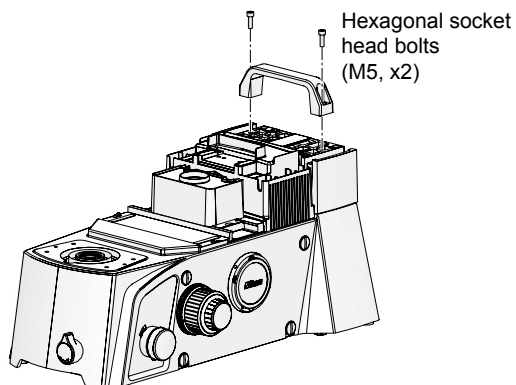


Figure 4-3 Carrying Handle Removal

3. Remove the carrying handle by loosening the two hex socket head screws with the provided 4 mm hex screwdriver.

2 Attaching the eyepiece base unit

(1) Attaching TI-T-B, TI-T-BS

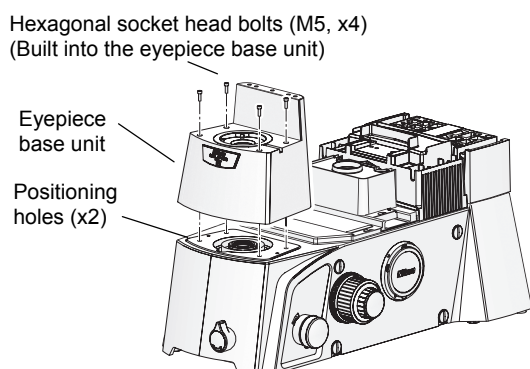


Figure 4-4 Eyepiece Base Unit Attachment

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

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

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

(2) Attaching the TI-T-BPH External Phase Contrast Eyepiece Base Unit

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

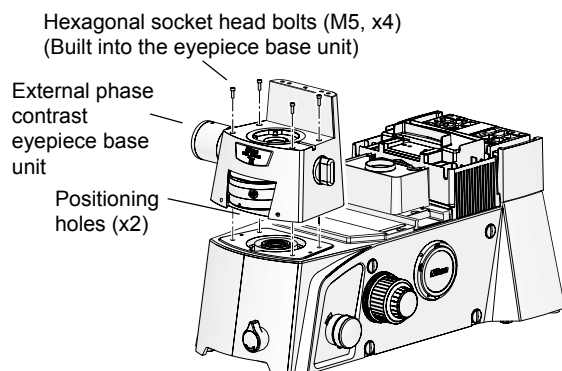


Figure 4-5 External Phase Contrast Eyepiece Base Unit Attachment

1. Place the TI-T-BPH External Phase Contrast Eyepiece Base Unit onto the front part of the microscope base.

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

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

Selecting Objectives and Phase Plates

The phase plate must be selected to suit the objective being used. Refer to the following table to select an objective and an appropriate phase plate. Up to three phase contrast plates (A, B, and C) can be attached to the TI-T-BPH External Phase Contrast Eyepiece Base Unit.

	Condenser phase contrast code (Supported condenser lens)	Objective	External phase contrast ring
1	Ph3 (LWD, CLWD)	P Apo 60x WI (NA1.2)	60x/Ph3
2	Ph3 (LWD, CLWD)	P Apo VC 60x WI (NA1.2)	60x/Ph3
3	Ph3 (LWD, CLWD)	P Apo VC 60x H (NA1.4)	60x/Ph3
4	Ph4 (CLWD)	Apo TIRF 60x H (NA1.49)	60x/Ph4
5	Ph4 (CLWD)	P Apo TIRF 60x H (NA1.45)	60x/Ph4
6	Ph3 (LWD, CLWD)	P Apo VC 100x H (NA1.4)	100x/Ph3
7	Ph4 (CLWD)	Apo TIRF 100x H (NA1.49)	100x/Ph4

Attaching and Replacing Phase Plates

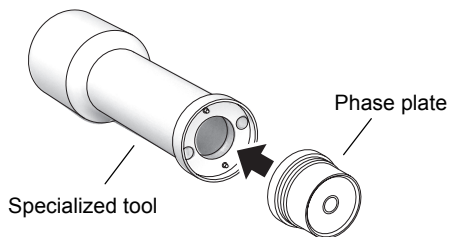


Figure 4-6 Specialized Tool and Phase Plate

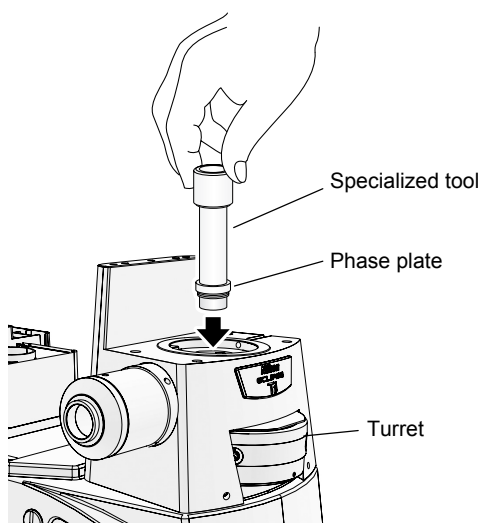


Figure 4-7 Attaching/Replacing the Phase Plate

Phase plate attachment

A specialized tool is included with TI-T-BPH Eyepiece Base Unit. Use this specialized tool when attaching or replacing the phase plate.

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

The phase plate will be attached magnetically to the specialized tool.

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

Phase plate replacement

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

The phase plate is attached magnetically to the specialized tool, and can be retrieved by lifting the tool.

5. **Attach other phase plate as described above in "Phase plate attachment".**

3 Attaching the eyepiece tube and eyepieces

Attach the eyepiece tube to the eyepiece base unit, and the eyepieces to the binocular part of the eyepiece tube.

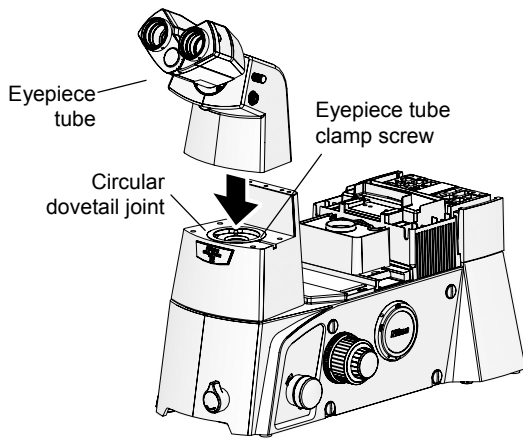


Figure 4-8 Eyepiece Tube Attachment

1. Using a 2 mm hex screwdriver, loosen the eyepiece tube clamp screw at the observation port on the front of the eyepiece base unit.
2. Mount the eyepiece tube onto the eyepiece base unit and insert the male circular dovetail joint on the bottom of the eyepiece tube into the female circular dovetail joint on the eyepiece base unit.
3. Tighten the eyepiece tube clamp screw with a 2 mm hex screwdriver. Check that the eyepiece tube and the eyepiece base unit are fixed securely.

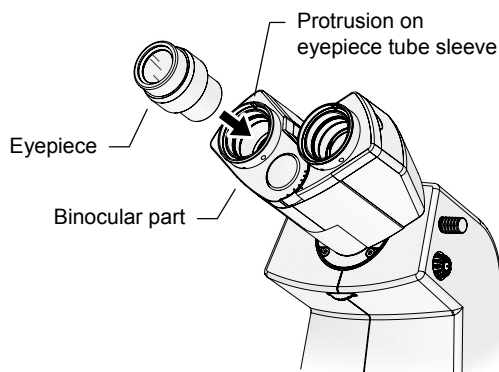


Figure 4-9 Eyepiece Attachment

4. Attach the eyepieces to the binocular part of the eyepiece tube.

When inserting, align any one of the three grooves on the eyepiece to one of the protrusions on the eyepiece tube sleeve. Select the same magnification for both left and right eyepieces.

To use rubber eye guards, attach them to the eyepieces.

4 Attaching the nosepiece

Attach the nosepiece to the rectangular groove on the focusing part at the center of the microscope base.

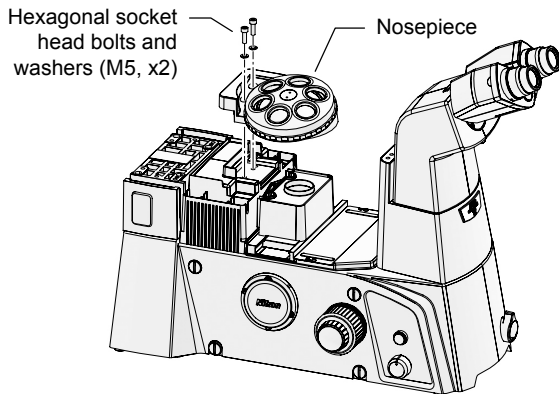
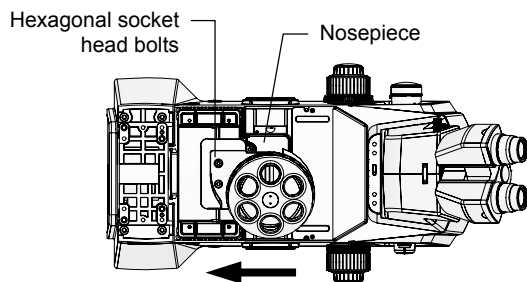


Figure 4-10 Nosepiece Attachment

1. **Adjust the orientation of the nosepiece, and place it on the rectangular groove on the focusing part at the center of the microscope base.**
2. **While pushing on the nosepiece from the front toward the rear, secure it by tightening the two M5 hex socket head screws provided with the nosepiece.**

Be sure to use washers with the hex socket head screws.

Do not attach the objectives until the stage has been attached.



Secure nosepiece by tightening bolts while pushing in the direction of the arrow.

Figure 4-11 Fixing the Nosepiece (Top View)

5 Attaching the dia pillar illuminator

Attach the dia pillar illuminator to the microscope base.

The TI series microscopes can be used with two types of dia pillar illuminators (100W and 30W).

(1) Attaching the TI-DH Dia Pillar Illuminator 100W

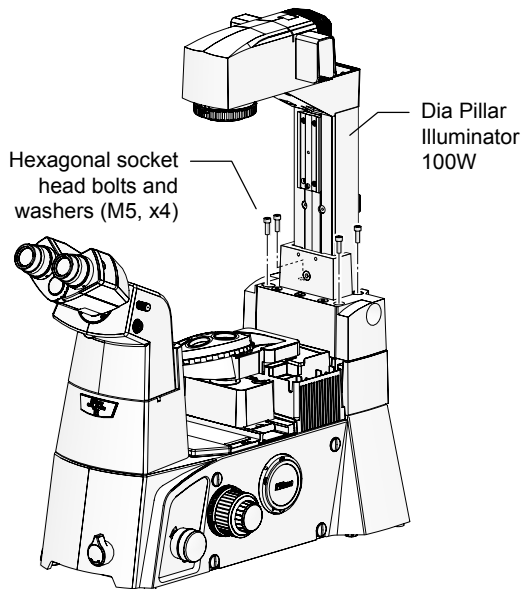


Figure 4-12 Dia Pillar Illuminator 100W Attachment

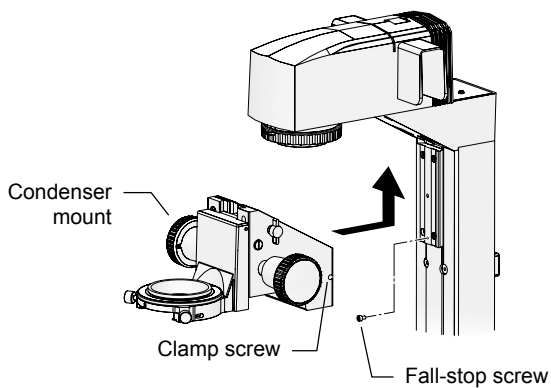


Figure 4-13 Condenser Mount Attachment

Attach TI-DH Dia Pillar Illuminator 100W to the microscope base.

When working, hold the dia pillar illuminator to prevent it from falling.

1. Mount the dia pillar illuminator onto the microscope base.

A positioning pin is provided on the microscope base. Align the pin hole on the dia pillar illuminator to the positioning pin.

2. Using the 4 mm hex screwdriver, secure the dia pillar illuminator by tightening the four M5 hex socket head screws provided with the dia pillar illuminator.

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

(1) Remove the fall-stop screw.

(2) Attach the condenser mount by sliding it onto the dovetail groove on the dia pillar illuminator.

Slide the mount upward to the limit.

(3) Using a hex screwdriver, securely tighten the clamp screw on the right of the condenser mount.

(4) Attach the fall-stop screw.

(5) When using a condenser lens other than ELWD or ELWD-S, loosen the clamp screw on the condenser mount and slide the condenser mount downward to the fall-stop screw, and then tighten the clamp screw securely in this position.

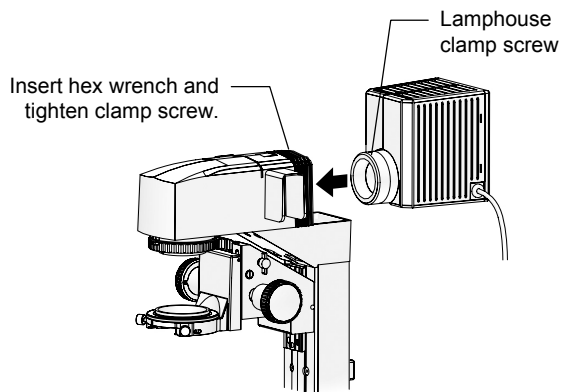


Figure 4-14 Lamphouse Attachment

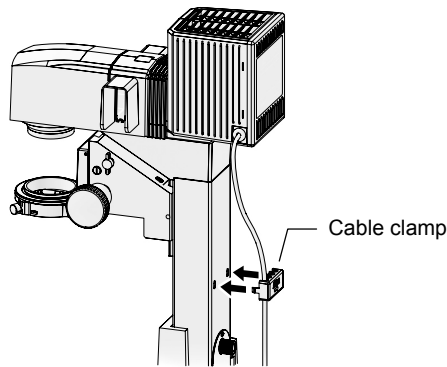


Figure 4-15 Fixing the Cable

4. Attach the lamphouse to the dia pillar illuminator.



CAUTION: HOT - Do not touch the lamp and the lamphouse while the lamp is on or for thirty minutes after it has been turned off.

- (1) Insert the lamphouse into the lamphouse mount at the top of the dia pillar illuminator. Align the positioning pin on the dia pillar illuminator with the groove on the cylinder of the lamphouse.
- (2) Insert a hex screwdriver into the hole on the top of the dia pillar illuminator. Secure the lamphouse by tightening the lamphouse clamp screw.
- (3) Secure the lamphouse cable with the cable clamp on the back of the dia pillar illuminator.

The cable clamp is attached to the dia pillar illuminator with the hooks on its sides. To remove the cable clamp, push in the hooks from the sides.

The cable clamp can hold up to four cables.

For details on connecting the lamphouse, the power supply device, and Ti-U, Ti-U/B, Ti-S, or Ti-S/L100, refer to Step 13 "Connecting the power supply device" in page 100.

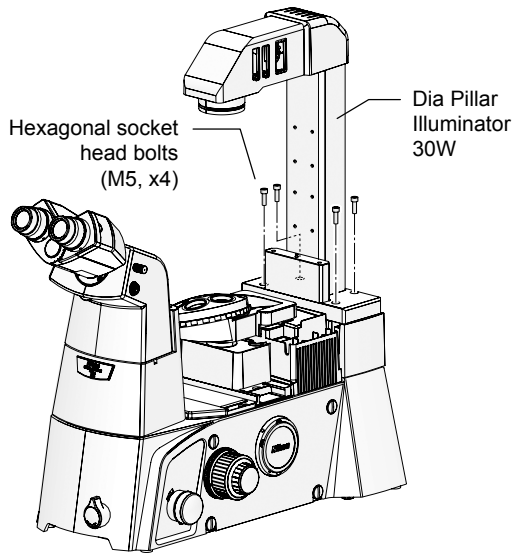
(2) Attaching the TI-DS Dia Pillar Illuminator 30W

Figure 4-16 Dia Pillar Illuminator 30W Attachment

Attach TI-DS Dia Pillar Illuminator 30W to the microscope base.

When working, hold the dia pillar illuminator to prevent it from falling.

1. Mount the dia pillar illuminator onto the microscope base.

A positioning pin is provided on the microscope base. Align the pin hole on the dia pillar illuminator to the positioning pin.

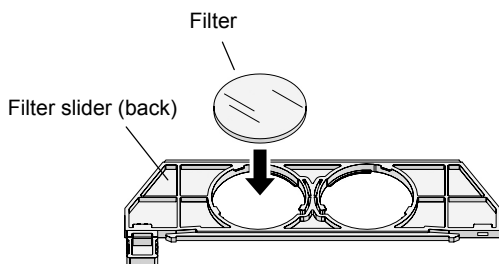
2. Using the 4 mm hex screwdriver, secure the dia pillar illuminator by tightening the four M5 hex socket head screws provided with the dia pillar illuminator.

For details on connecting the lamphouse, the power supply device, and Ti-U, Ti-U/B, Ti-S, or Ti-S/L100, refer to Step 13 "Connecting the power supply device" in page 100.

6 Attaching the filter slider

Attached the desired filter to the filter slider, and attach the filter slider to the slot of the dia-illuminator.

Do not touch filters or other optical components with your bare hands.



Although the filter slider for the 30W dia-illuminator has a different shape, the method for securing the filters is the same.

Figure 4-17 Attaching filters

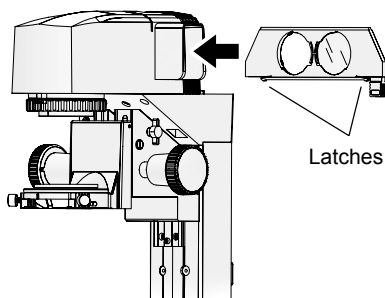


Figure 4-18 Inserting filter sliders (For 100 W type illuminator)

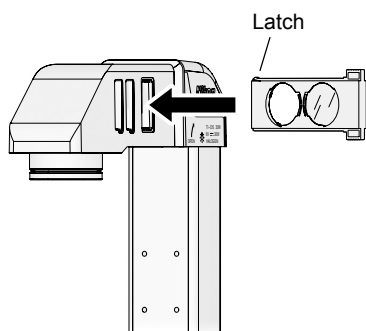


Figure 4-19 Inserting filter sliders (For 30 W type illuminator)

1. Attach the desired filter to the filter slider.

Attach it from the back of the filter slider. The mounting hole has three tabs to keep the filter from falling. Only one tab can be moved to the side. Move this tab aside, and attach the filter.

2. Affix a label indicating the filter type on the tab of the filter slider.

3. Insert the filter slider into the slot of the dia pillar illuminator.

The filter slider has latches that determine the limit of slide operation. Press the latches up, and press the filter into the slot.

You can insert up to four filter sliders for 100 W type illuminator and three filter sliders for 30 W type illuminator.

You can insert filters sliders from the right or the left. If they are all inserted from the same direction, they will be difficult to handle, so you should insert them alternately from the left and right.

To maintain uniformity with the Dia Pillar Illuminator 100W, install the diffusion filter (filter slider D) into the slot nearest to the lamphouse.

Removing a filter slider

Latches at both ends of the filter slider are at their end point when sliding. When removing a filter slider, you can slide it out by pushing the latch on the opposite side up with your finger to release the filter slider. Applying undue force on the filter slider can break the latches.

7 Attaching the stage

Attach the stage to the microscope base.

If objectives are attached to the nosepiece, remove them before attaching the stage.

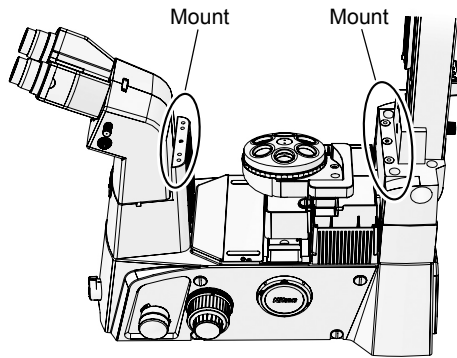


Figure 4-20 Stage Mounts

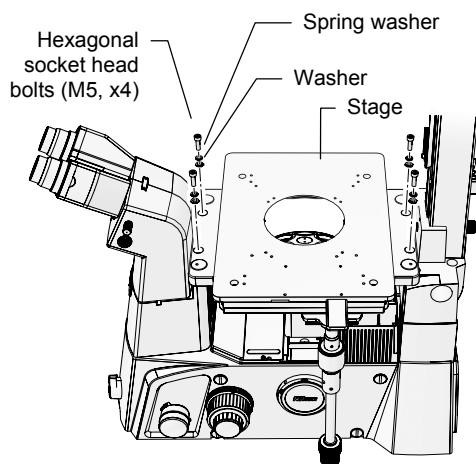


Figure 4-21 Stage Attachment

1. **Attach the stage to the positions of the eyepiece base unit and the positions of the dia pillar illuminator.**

Positioning pins are provided on the mount at the base of the dia pillar illuminator. Align the holes on the bottom of the stage to these pins.

Stages with a stage movement knob are typically attached with the knob positioned in the far right. However, they can also be rotated by 180 degrees and be attached with the knob in the near left.

2. **Secure the stage by tightening the four M5 hex socket head screws provided with the stage.**

Be sure to use spring washers and washers with the hex socket head screws.

8 Attaching objectives

Attach objectives to the nosepiece.

If the stage has not been attached, first attach the stage.

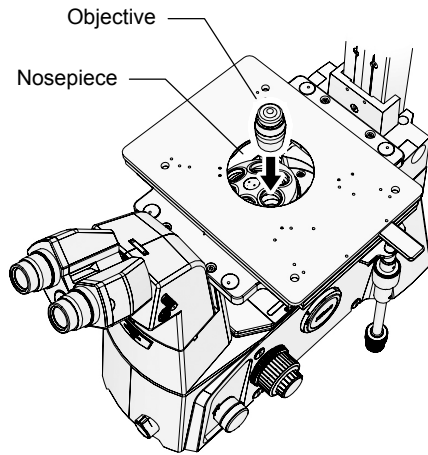


Figure 4-22 Objective Attachment

1. **Remove the concentric ring, specimen holder, and other equipment from the stage.**
2. **Screw in an objective into a socket on the nosepiece through the opening in the stage.**

Attach the objectives so that magnification is increased by rotating the nosepiece clockwise (as viewed from above).

9 Replacing the dia illumination lamp



Caution

- The lamp, the dia pillar illuminator, and the power supply must be used in specific combinations. See page 55 to select the correct combination of the devices. Be sure to use the specified lamps.
- When replacing the lamp, turn off the power switch and unplug the power cord.
- The lamp and its surroundings will be hot while the lamp is on and immediately after it is turned off. When replacing the lamp, wait approximately 30 minutes after turning off the lamp, and make sure that the lamp has cooled sufficiently before working.
- Do not touch the lamp glass with your bare hands. Fingerprints and other dirt on the lamp may result in uneven illumination and reduce the service life of the lamp. Wear gloves when handling the lamp.
- Securely close the lamphouse cover after replacing the lamp. Never turn on the lamp with the cover removed.

(1) For TI-DH Dia Pillar Illuminator 100W

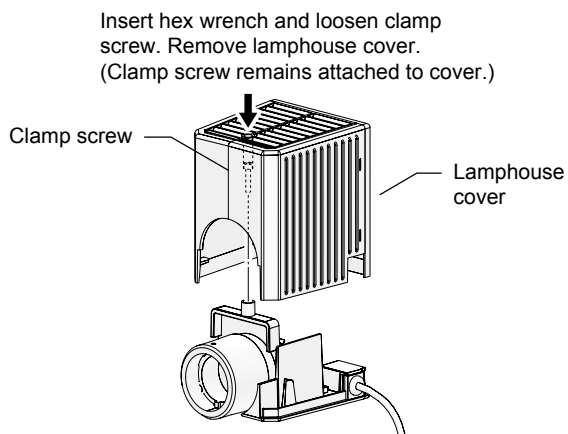
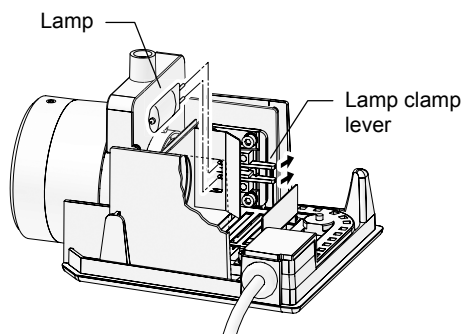


Figure 4-23 Lamphouse Cover Removal



Push in lamp clamp lever to open pin hole on socket. Remove used lamp while pushing in lever. Attach new lamp.

Figure 4-24 Lamp Replacement



CAUTION: HOT - Do not touch the lamp and the lamphouse while the lamp is on or for thirty minutes after it has been turned off.

1. Insert a hex wrench into the hole on the top of the lamphouse cover. Loosen the clamp screw and remove the lamphouse cover.
2. Push in the lamp clamp lever and remove the used lamp from the socket.

3. Insert a new lamp into the socket.

While pushing in the lamp clamp lever, push the lamp electrodes (pins) into the pin hole in the socket. Insert the lamp to the limit, and release the lamp clamp lever.

- Be sure to use the specified lamp.
 - Do not touch the lamp glass with your bare hands.
 - Make sure the lamp is not tilted when the lamp clamp lever is released.
4. Re-attach the lamphouse cover, and secure it by tightening the clamp screw.

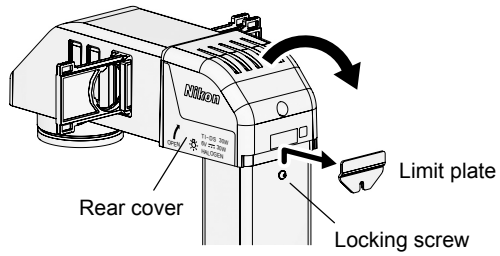
(2) For TI-DS Dia Pillar Illuminator 30W

Figure 4-25 Rear cover of the lamphouse

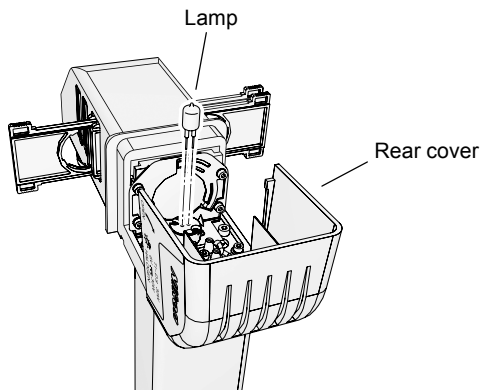


Figure 4-26 Replacing lamps



CAUTION: HOT - Do not touch the lamp and the lamphouse while the lamp is on or for thirty minutes after it has been turned off.

1. Loosen the clamp screw on the back of the dia pillar illuminator, and remove the limit plate from the rear cover.
2. Open the rear cover on the back of the dia pillar illuminator by lifting it backward.
3. Remove the used lamp from the socket.
4. Insert a new lamp into the socket.
 - Be sure to use the specified lamp.
 - Do not touch the lamp glass with your bare hands.
5. Close the rear cover.
6. Re-attach the limit plate onto the rear cover, and secure it by tightening the clamp screw.

10 Attaching the condenser

(1) Attaching to TI-DH Dia Pillar Illuminator 100W

The following condensers can be attached to TI-DH Dia Pillar Illuminator 100W:

- TI-C Condenser Turret (System Condenser)
- ELWD-S Condenser

(1) Preparation for attachment

Using a hex screwdriver, loosen the condenser clamp screw on the right side of the condenser holder.

- * The condenser clamp screw is located inside the hole on the right side of the condenser holder. If the condenser mount is shifted from the reference position, the screw will not be visible in the hole. In that case, loosen the condenser mount rotation clamp screw, align the positioning groove on the mount with the positioning pin on the condenser holder by rotating the mount, and then tighten the mount rotation clamp.

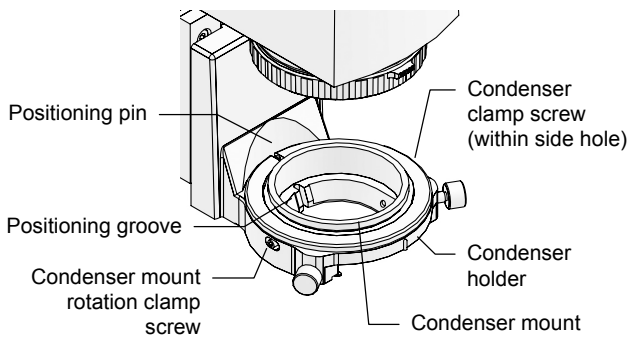


Figure 4-27 Condenser Holder

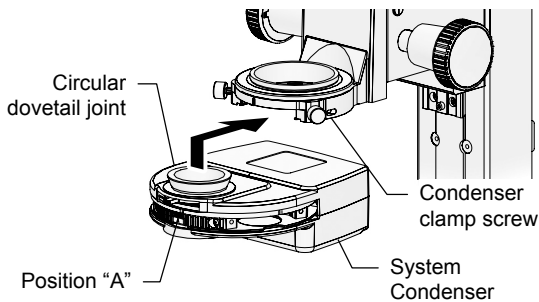


Figure 4-28 System Condenser Attachment

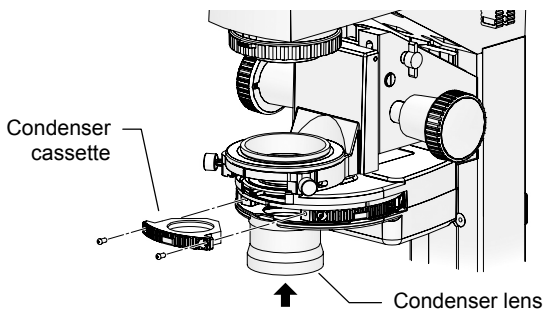


Figure 4-29 Condenser Cassette and Condenser Lens Attachment

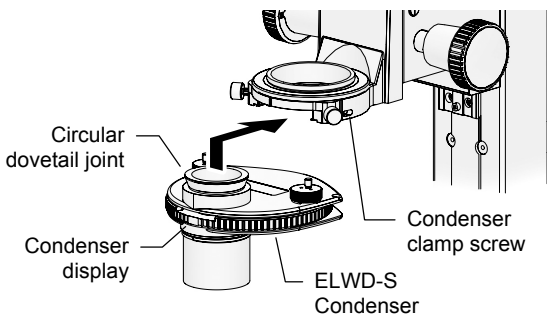


Figure 4-30 ELWD-S Condenser Attachment

(2) Attaching the system condenser

1. Rotate the condenser turret to the "A" position (vacant hole cassette position for bright-field microscopy).
2. With the "A" label facing the front (towards yourself), insert the circular dovetail joint on the system condenser into the bottom of the condenser holder, and secure it by tightening the condenser clamp screw.

Attach the condenser turret by sliding it in from the front.

3. Insert the condenser cassette into the condenser turret, and secure it with two hex socket head screws.

Up to five condenser cassettes can be attached to the turret. Attach the cassettes so that their numbering is increased by rotating the turret clockwise (as viewed from above).

4. Screw in the condenser lens into the bottom of the turret.

* For combinations of condenser lenses and condenser cassettes, see Chapter 3, "Operation".

(3) Attaching the ELWD-S condenser

With the indication on the turret facing the front (towards yourself), insert the condenser turret into the bottom of the condenser holder, and secure it by tightening the condenser clamp screw.

(2) Attaching the TI-DS Dia Pillar Illuminator 30W

The following condensers can be attached to TI-DS Dia Pillar Illuminator 30W:

- ELWD-S Condenser
- HMC Condenser

(1) Attaching the ELWD-S condenser

1. Secure the condenser holder to the dia pillar illuminator.
2. Attach the ELWD-S condenser to the condenser holder.

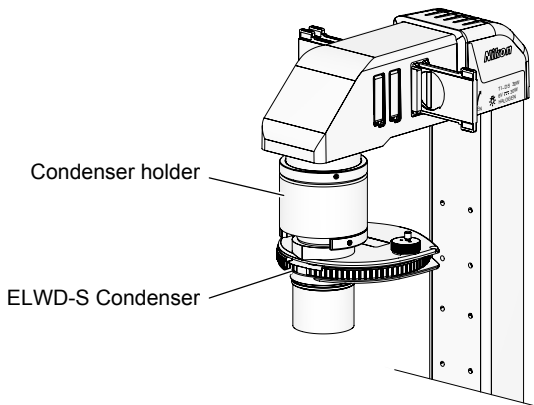


Figure 4-31 ELWD-S Condenser Attachment

(2) Attaching the HMC condenser

1. Attach the 52 mm polarization filter to the extension tube provided with the HMC condenser lens.

Threads are cut on the inside of the extension tube and on the outside of the polarization filter.
2. Attach the extension tube to the dia pillar illuminator.
3. Attach the condenser holder to the extension tube.
4. Attach the turret on the system condenser to the condenser holder.
5. Screw in the HMC condenser lens into the turret.
6. Attach the HMC condenser cassette to the turret.

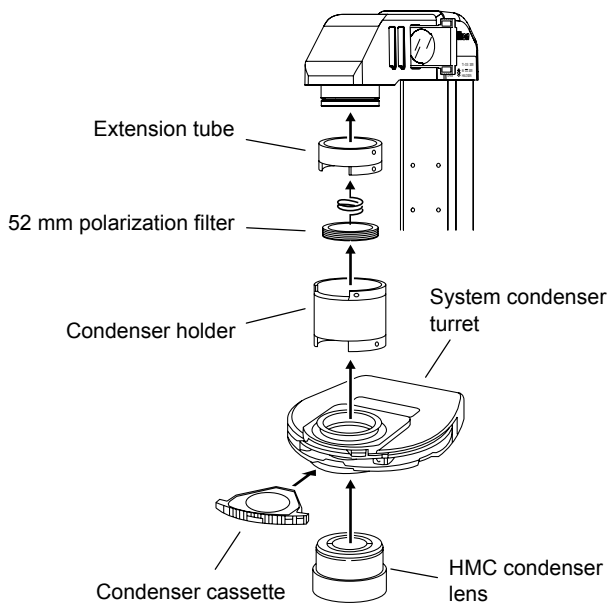


Figure 4-32 HMC Condenser Attachment (System Condenser)

11 Attaching the side port

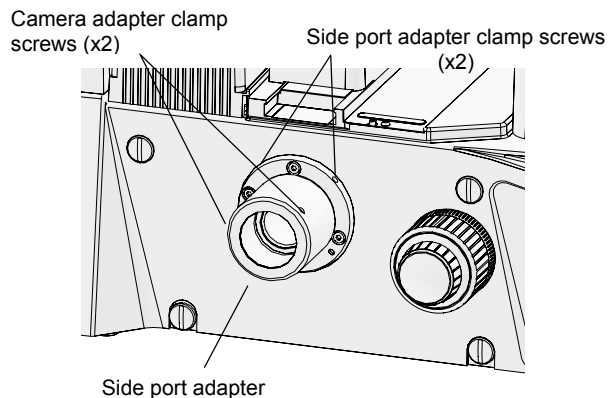


Figure 4-33 Side Port Adapter Attachment

1. Loosen the two side port adapter clamp screws and remove the plastic cap from the side port.
2. Insert the side port adapter into the side port, and secure it by tightening the clamp screw.
3. Attach adapters to the camera device.
4. Insert the adapters and the camera device into the side port adapter, and secure them by tightening the two camera adapter clamp screws.

- Camera devices require compatible adapters for attachment. First attach the adapters to the camera device, and then attach the camera device with the adapters into the side port adapter.
- Attach a protective cap onto the port when the port is not in use.

Example: Attaching the C mount TV camera to the direct C mount adapter

- (1) Screw the C mount TV camera securely into the direct C mount adapter.
- (2) Insert the direct C mount adapter into the side port adapter, and secure it by tightening the locking screw.

- When detaching photomicrographic equipment, hold it steady, and then loosen the locking screw.
- If the locking screw is loosened without holding the equipment, the equipment may drop. To avoid dropping photomicrographic equipment, make sure you have a firm grip before loosening the screw.

12 Attaching the bottom port (Ti-U/B only)

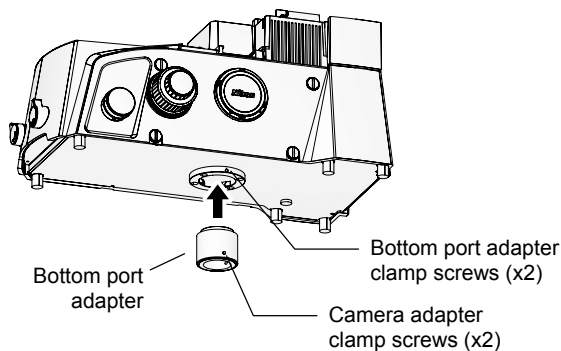


Figure 4-34 Bottom Port Adapter Attachment

1. Loosen the two bottom port adapter clamp screws and remove the metal cap from the bottom port.
2. Insert the bottom port adapter into the bottom port, and secure it by tightening the two bottom port adapter clamp screws.
3. Attach adapters to the camera device.
4. Insert the adapters and the camera device into the bottom port adapter, and secure them by tightening the two camera adapter clamp screws.

- Camera devices require compatible adapters for attachment. First attach the adapters to the camera device, and then attach the camera device with the adapters into the side port adapter.
- Attach a protective cap onto the port when the port is not in use.

Example: Attaching the C mount TV camera to the direct C mount adapter

- (1) Screw the C mount TV camera securely into the direct C mount adapter.
- (2) Insert the direct C mount adapter into the bottom port adapter, and secure it by tightening the locking screw.

- When detaching photomicrographic equipment, hold it steady, and then loosen the locking screw.
- If the locking screw is loosened without holding the equipment, the equipment may drop. To avoid dropping photomicrographic equipment, make sure you have a firm grip before loosening the screw.

13 Connecting the power supply device

A power supply device is required to turn on the dia illumination lamp. Check that the POWER switch on the power supply device is turned off (set to the "O" side), and then connect the power supply as described below.

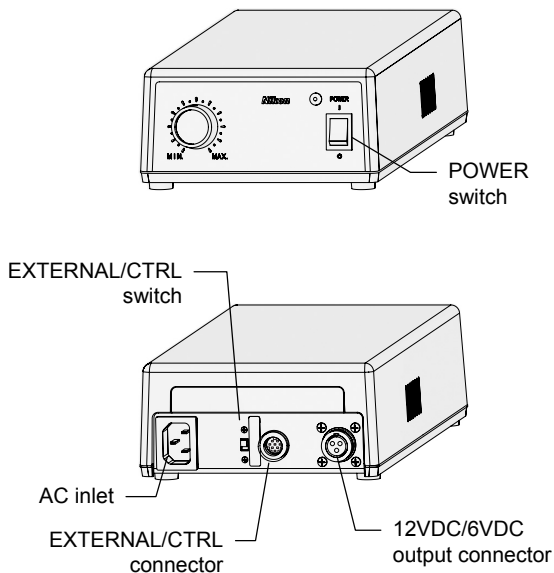


Figure 4-35 Power Supply

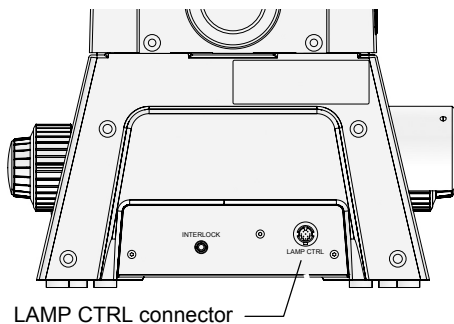


Figure 4-36 Ti-U, Ti-U/B (Rear View)

(1) Lamp cable

Connect the lamp cable from the dia pillar illuminator to the DC output connector on the power supply device. A lock ring is provided on the lamp cable connector. Secure the lamp cable with the lock ring.

For Dia Pillar Illuminator 100W

Connect the lamp cable from the D-LH/LC lamphouse to the 12VDC output connector on the TI-PS100W Power Supply.

For Dia Pillar Illuminator 30 W

Connect the lamp cable from the dia pillar illuminator to the 6VDC output connector on the TE-PS30W/TE-PSE30 Power Supply.

(2) Control cable

Connect one end of the control cable to the LAMP CTRL connector on the rear of the microscope, and the other end to the EXTERNAL connector on TI-PS100W Power Supply or the CTRL connector on TE-PS30W/TE-PSE30 Power Supply A.

(3) Power cord

Connect the plug end of the power cord to the wall outlet, and the other end to the AC inlet connector on the power supply.

To prevent electric shock, do not connect the power cord until all other assembly procedures are completed.

This is the end of the standard system assembly.
Refer to the figures on pages 101 and 102 to check the assembly result.

Ti-U System Configuration

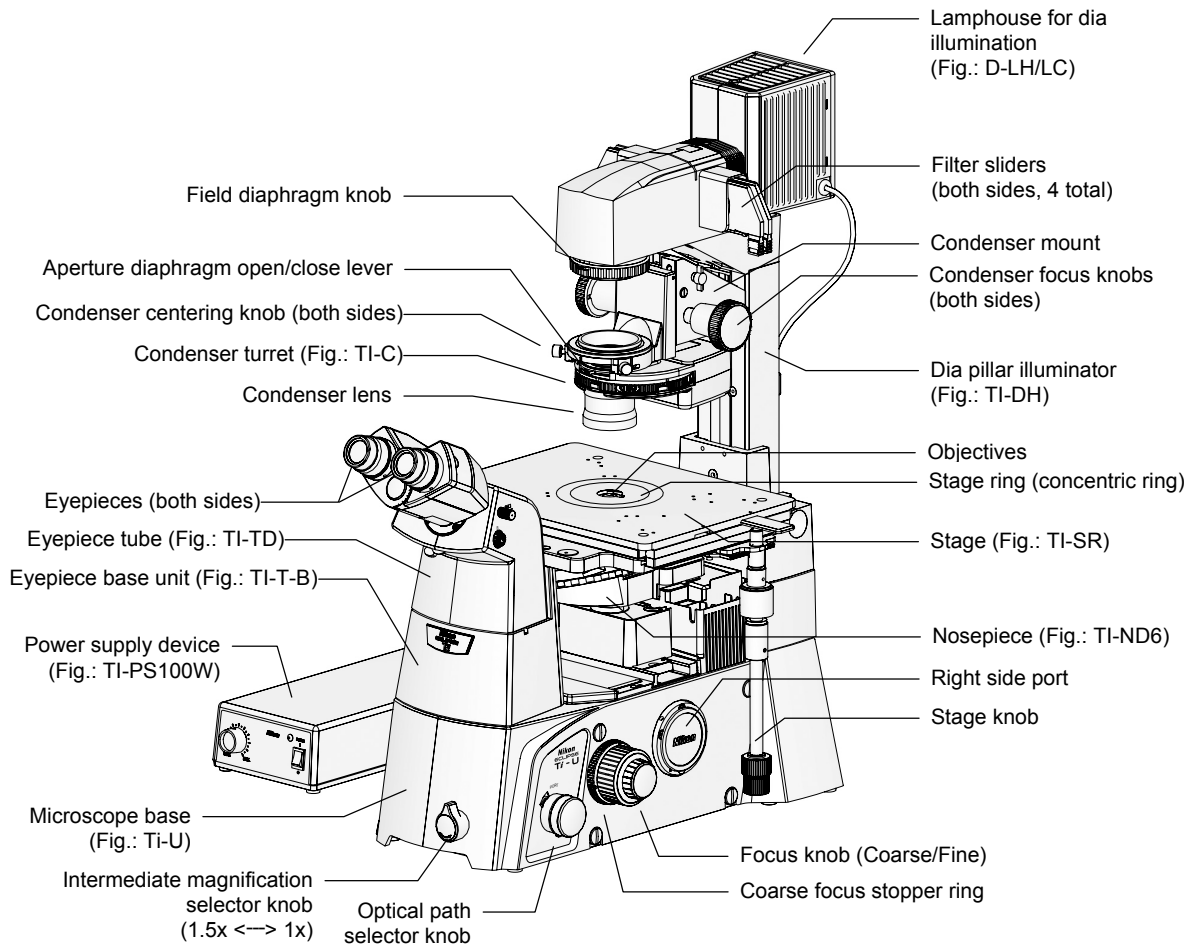


Figure 4-37 Ti-U

Ti-S System Configuration

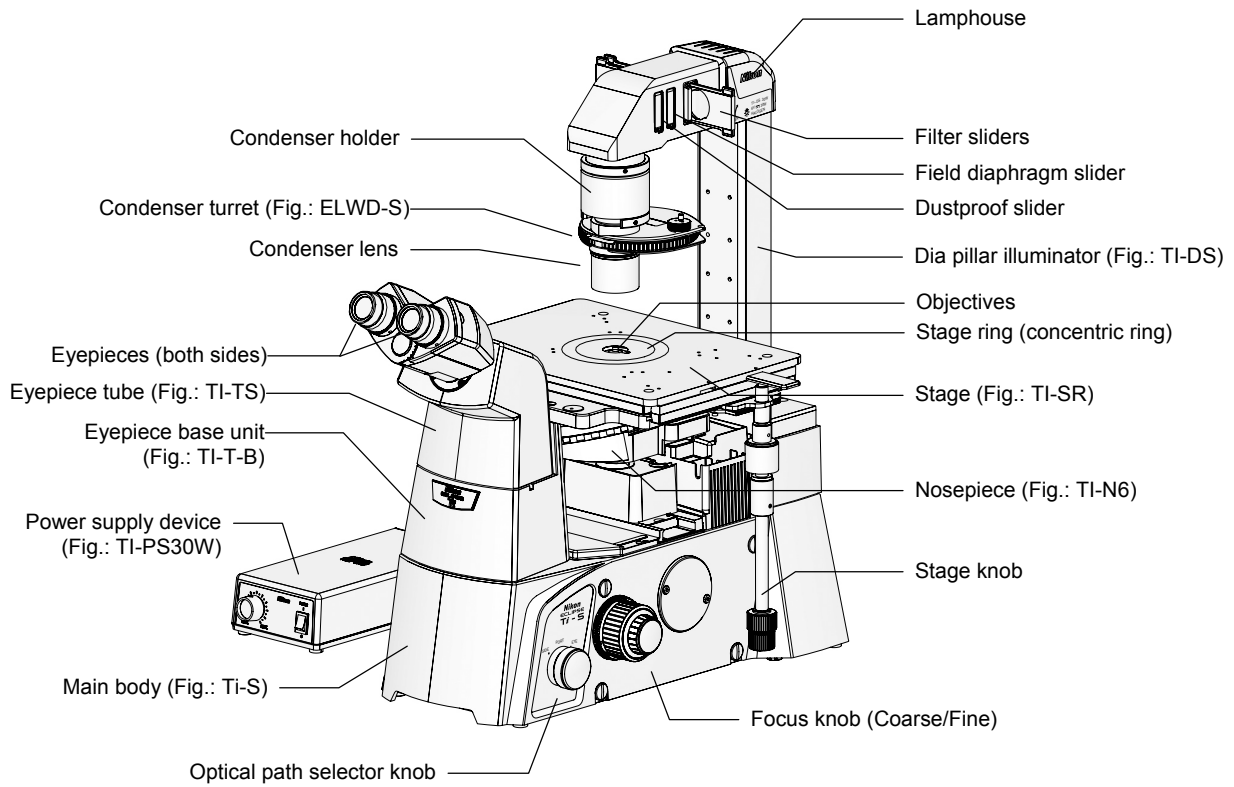


Figure 4-38 Ti-S

5

Troubleshooting

Misuse of the product may result in poor product performance, even if the product is properly functional. If you experience any of the following problems, check the following table for possible causes before requesting service.

If the problem is not listed below, or if the problem cannot be resolved by the suggested countermeasure, unplug the power cord and contact Nikon.

5.1 Image Viewing

Problem	Possible cause	Countermeasure
Vignetted field of view. No visible image. Uneven brightness in field of view. Image too dark.	Incorrectly attached part.	Attach all parts correctly.
	Movable part in inappropriate position.	The following parts must be moved to click-stop positions: optical path selector knob, nosepiece, filter sliders, condenser turret, and Bertrand lens in/out lever.
	Interference of the concentric ring on the stage with the optical path.	Move the specimen.
	Field diaphragm image not focused on focal plane of specimen.	Focus and center the condenser correctly.
	Opening of the field diaphragm too narrow.	Open the field diaphragm to be slightly larger than the field of view.
	Dirt or dust on the lens or other optical element, or on the culture vessel.	Clean the optical elements. Use a clean culture vessel.
Dirt or dust is seen in the field of view.	Dirt or dust on the lens or other optical element, or on the culture vessel.	Clean the optical elements. Use a clean culture vessel.
	Field diaphragm image not focused on focal plane of specimen.	Focus and center the condenser correctly.
Poor image quality. Poor contrast or resolution.	Dirt or dust on the lens or other optical element, or on the culture vessel.	Clean the optical elements. Use a clean culture vessel.
	Objective correction ring not matched to culture vessel's bottom plate thickness.	Use an appropriate correction ring.
	Culture vessel's bottom plate thickness is out of the objective's correction range.	Use a culture vessel with bottom plate thickness within the correction range.
	Field diaphragm image not focused on focal plane of specimen.	Focus and center the condenser correctly.
Phase contrast effect cannot be obtained in phase contrast microscopy.	Bright-field objective used.	Use a phase contrast objective.
	Condenser annular diaphragm not in the optical path.	Move an annular diaphragm with the same Ph code as the phase contrast objective into the optical path.
	Annular diaphragm not centered.	Center the annular diaphragm.
	Aperture diaphragm of system condenser not fully open.	Fully open the diaphragm.

5.1 Image Viewing

Problem	Possible cause	Countermeasure
Uneven focus.	Nosepiece attached incorrectly. Or its rotation is not stopped at a click-stop position.	Attach the nosepiece correctly and rotate it to a click-stop position.
Drifting image.	Specimen not level with stage.	Set the specimen onto the stage correctly.
	Nosepiece attached incorrectly. Or its rotation is not stopped at a click-stop position.	Attach the nosepiece correctly and rotate it to a click-stop position.
	Annular diaphragm not centered.	Center the annular diaphragm.
	Tilted dia pillar illuminator.	Return dia pillar illuminator to the upright limit position.
Yellow-tinged image.	NCB11 filter not in optical path.	Move the ND filter into the optical path.
	Lamp voltage too low.	Adjust brightness control knob to match lamp rating.
Field of view too bright.	ND filter not in optical path.	Move the ND filter into the optical path.
	Lamp voltage too high.	Lower lamp voltage with the brightness control knob.
Insufficient brightness in field of view.	Opening of the aperture diaphragm too narrow.	Set the aperture diaphragm to 70 to 80% of the numerical aperture of the objective.
	Field diaphragm image not focused on focal plane of specimen.	Focus and center the condenser correctly.
	Optical path selector knob not set to direct 100% light to observation port.	Set the knob to direct 100% light to the observation port.

5.2 Operation

Problem	Possible cause	Countermeasure
Image cannot be focused even with the objective at the highest position.	Stage attached incorrectly.	Attach the stage correctly.
	Coarse focus stopper ring clamped.	Loosen ring to the limit.
Image cannot be focused with 20x or 40x objective.	Culture vessel's bottom plate thickness is out of the objective's correction range.	Use a culture vessel with bottom plate thickness within the correction range.
When viewed through the binocular eyepiece, the images do not merge into a single image.	Interpupillary distance not adjusted.	Adjust the interpupillary distance.
Eye strain develops during observations.	Diopters not adjusted.	Adjust the diopters.
	Inappropriate brightness.	Adjust brightness of lamp, or use ND filters.

5.3 Electrical System

Problem	Possible cause	Countermeasure
There is no power even though the power switch is set to ON.	The power cord is not connected at all, or is not connected securely.	Turn off the power switch, and check connection of power cord.
The dia illuminator lamp does not light.	Dead lamp.	Replace with a specified lamp.
Dia illuminator lamp burns out in a short time.	Unsupported lamp used.	Replace with a specified lamp.
Brightness control knob on the microscope does not work.	Control cable not connected correctly.	Check connection of cable.
	EXTERNAL (or CTRL) switch on the power supply is turned off.	Turn the switch on.
Dia illumination ON/OFF switch on the microscope does not work.	Dead lamp.	Replace with a specified lamp.
	Control cable not connected correctly.	Check connection of cable.
The brightness control knob on the power supply device does not work.	EXTERNAL (or CTRL) switch on the power supply is turned on.	Turn the switch off.

6

Daily Maintenance

6.1 Cleaning Optical Components

Do not allow dust, fingerprints, or any other dirt to get on the optical components (i.e. lenses and filters). Dirt on optical components will degrade the image quality. If an optical component becomes dirty, clean them as described below.

- Remove any dust by brushing off with a soft brush or by wiping gently with gauze.
- If and only if there are fingerprints or grease on the optical component, wipe gently with a piece of soft, clean lens tissue, cotton cloth, or gauze dampened with a small amount of absolute alcohol (ethyl or methyl).
- When removing immersion oil from an objective, use only petroleum benzine. After wiping with petroleum benzine, wipe with absolute alcohol (ethyl or methyl) for a better finish. If petroleum benzine is unavailable, use methyl alcohol. However, as methyl alcohol does not clean as well as petroleum benzine, it will be necessary to wipe a few more times (usually three to four wipes).
- Never use petroleum benzine to clean the entrance lens or the prism surface of the eyepiece tube.
- Absolute alcohol is highly flammable. Handle with care. Do not use near an open flame, or operate a power switch in the vicinity.
- When using absolute alcohol, follow the instructions provided by the manufacturer.

6.2 Cleaning the Microscope Body

- Use silicon cloth to clean the microscope body.
- For persistent dirt, dampen a piece of gauze with neutral detergent and wipe gently.
- Do not use organic solvents. They may cause discoloration of plastic parts.

6.3 Disinfecting the Microscope

- Use a 70% medical alcohol for disinfection.
- If a specimen is spilt onto the microscope, check if the specimen is hazardous. If the specimen is hazardous, follow the standard procedures for your facility.
- Do not use organic solvents. They may cause discoloration of plastic parts.

6.4 Storage

- Store the product in a dry location where mold is unlikely to grow.
- Store the objectives and eyepieces in a desiccator or equivalent, along with some desiccant.
- Put a dust-proof cover over the product to protect it from dust.
- Before putting on the dust-proof cover, turn off the power switch on the equipment (set to the "O" position) and wait until the lamp has cooled sufficiently.

6.5 Periodic Inspections (Paid Service)

Periodic inspections (expenses charged) are recommended to maintain the performance of the product. For details, contact Nikon.

7

Specifications

7.1 Microscope (Ti-U, Ti-U/B, Ti-S, or Ti-S/L100) with TI-DH Dia Pillar Illuminator 100W

System configuration	Microscope, TI-DH Dia Pillar Illuminator 100W, and TI-PS100W Power Supply	
Dimensions	298 (W) x 559 (D) x 725 (H) mm	
Mass	26.5 kg	
Optical system	Objectives:	CFI60
	Eyepieces:	Field number 22
	Nosepiece:	Six sockets
Mechanical system	Focusing mechanism	Stroke: 10 mm
	Focus knob	Coarse focus: 5.0 mm per rotation
		Fine focus: 0.1 mm per rotation
		Calibration marking for fine focus: 1 μ m
D-LH/LC Precentered Lamphouse LC	Input ratings:	12 VDC, 100 W
	Lamp ratings:	12 V 100 W halogen lamp
	Specified lamp model:	Halogen lamp (OSRAM HLX 64623 or PHILIPS 7724I)
	Average lamp life:	2000 hours
TI-PS100W Power Supply	Input ratings:	100 to 240 VAC (\pm 10%), 1.8A, 50/60 Hz
	Built-in fuse ratings:	250V T4A
	Output ratings:	12 VDC, 100W
	Maximum output current:	8.4 A
	Electric shock protection class:	Class I
	Remarks:	UL listed product. GS approved.
Operating conditions	Temperature:	0 - 40°C
	Relative humidity:	85% RH max. with no condensation
	Altitude:	2000 m max.
	Pollution degree:	Degree 2
	Installation category:	Category II
	Indoor use only	
Transport and storage conditions	Temperature:	-20 - +60°C
	Relative humidity:	90% RH max. with no condensation


7.2 Microscope (Ti-U, Ti-U/B, Ti-S, or Ti-S/L100) with TI-DS Dia Pillar Illuminator 30W

System configuration	For countries with power supply of 100 to 120 VAC: Microscope, TI-DS Dia Pillar Illuminator 30W, and TE-PS30W Power Supply A For countries with power supply of 220 to 240 VAC: Microscope, TI-DS Dia Pillar Illuminator 30W, and TE-PSE30 Power Supply A
Dimensions	298 (W) x 497 (D) x 615 (H) mm
Mass	22 kg
Optical system	Objectives: CFI60 Eyepieces: Field number 22 Nosepiece: Six sockets
Mechanical system	Focusing mechanism Stroke: 10 mm Focus knob Coarse focus: 5.0 mm per rotation Fine focus: 0.1 mm per rotation Calibration marking for fine focus: 1 μ m
TI-DS Dia Pillar Illuminator 30W	Input ratings: 6 VDC, 30W Lamp ratings: 6 V 30 W halogen lamp Specified lamp model: Halogen lamp (PHILIPS 5761) Average lamp life: 100 hours
TE-PS30W Power Supply A TE-PSE30 Power Supply A	Input ratings: TE-PS30W: 100 to 120 VAC (\pm 10%), 50/60Hz, 0.7A TE-PSE30: 230 VAC (\pm 10%), 50/60 Hz, 0.3 A Built-in fuse ratings: 250 V F2AH Output ratings: 6 VDC, 30W Maximum output current: 5.0 A Electric shock protection class: Class I Remarks: TE-PS30W: UL listed product TE-PSE30: GS approved.
Operating conditions	Temperature: 0 - 40°C Relative humidity: 85% RH max. with no condensation Altitude: 2000m max. Pollution degree: Degree 2 Installation category: Category II Indoor use only
Transport and storage conditions	Temperature: -20 - +60°C Relative humidity: 90% RH max. with no condensation

7.3 Power Cord (for Power Supply Device)

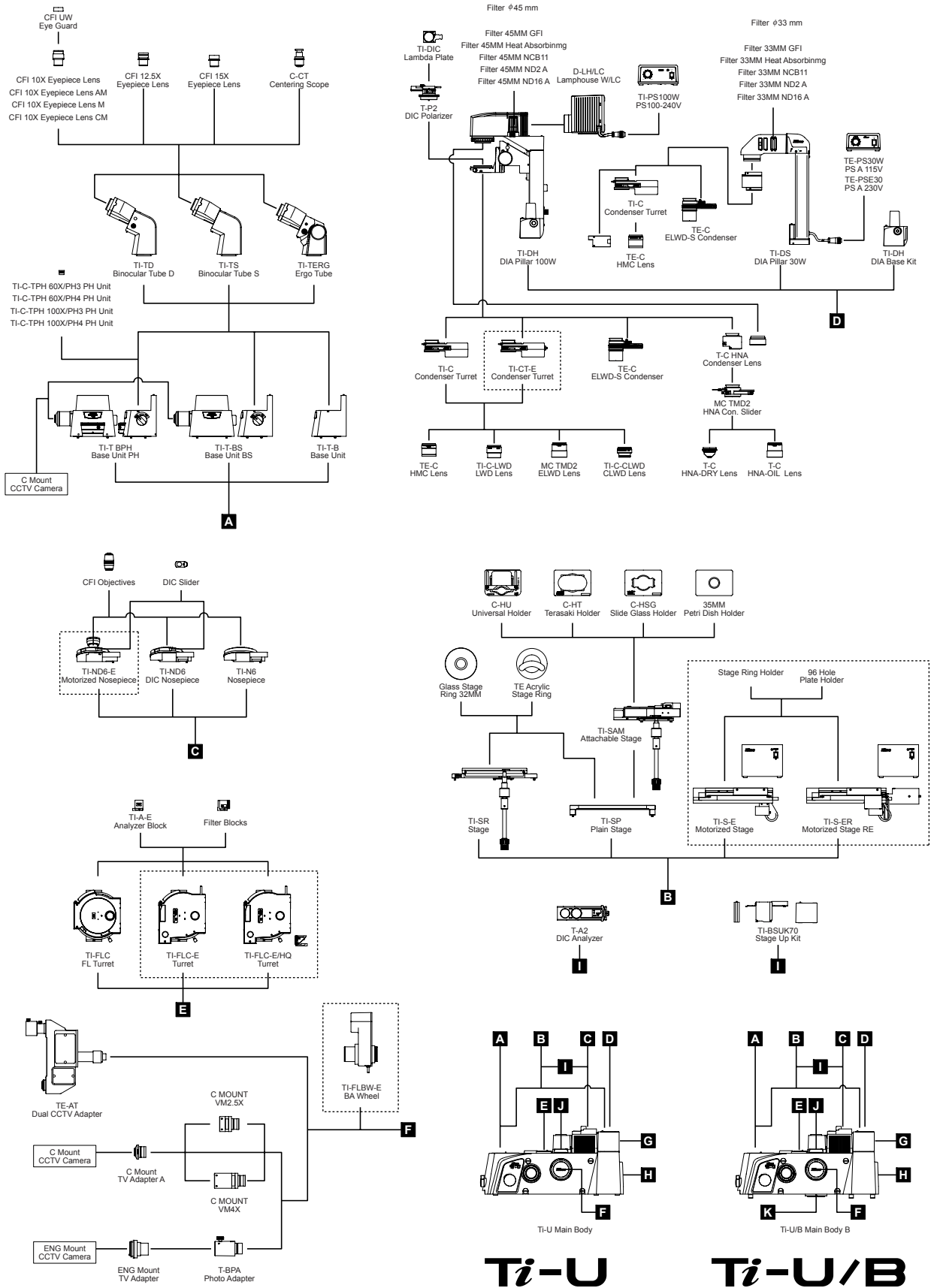
For countries where the power supply is 100 to 120 VAC but not Japan	UL listed detachable power cord set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 3 m long maximum, rated at 125V AC minimum)
For countries where the power supply is 220 to 240 VAC	Power cord set approved according to EU/EN standard, 3 conductor grounding (3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250V AC minimum)
For Japan	PSE approved detachable power cord set, 3 conductor grounding (3 conductor grounding Type VCTF 3x0.75mm ² , 3 m long maximum, rated at 125V AC minimum)

7.4 Safety Standards Compliance

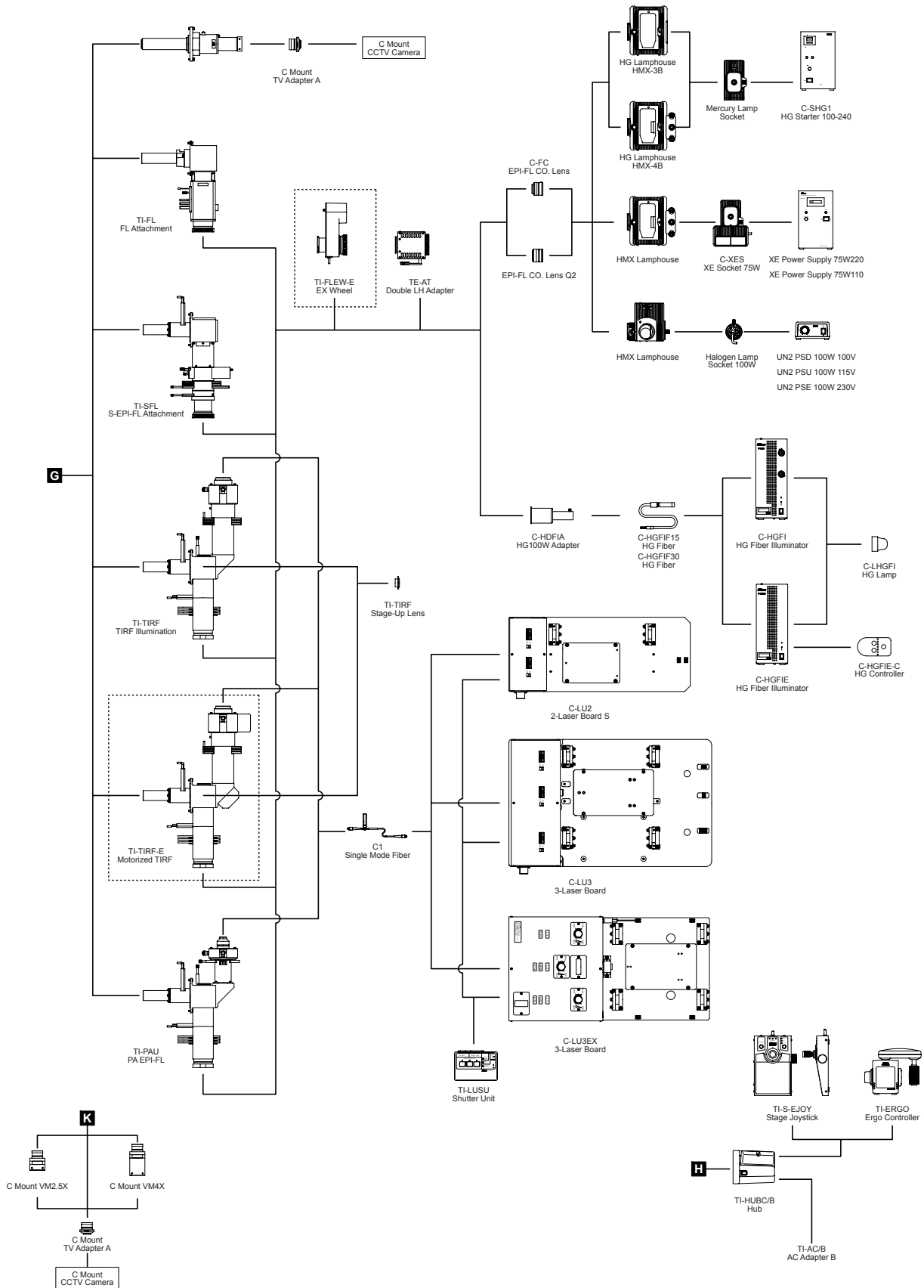
Tested under a configuration of microscope (Ti-U, Ti-U/B, Ti-S, or Ti-S/L100) and TI-PS100W Power Supply or TE-PS30W Power Supply A	<ul style="list-style-type: none"> UL listed product. This product meets FCC Part 15B Class A requirements: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. This product complies with Canadian EMI. (ICES-003 Class A) This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de classe A est conforme à la norme NMB-003 du Canada.
Tested under a configuration of microscope (Ti-U, Ti-U/B, Ti-S, or Ti-S/L100) and TI-PS100W Power Supply or TE-PSE30 Power Supply A	<ul style="list-style-type: none"> CE marking <ul style="list-style-type: none"> This product meets EU IVD Directive requirements. (GM-approved: in vitro diagnostic medical device) This product meets EU Low Voltage Directive requirements. This product meets EU EMC Directive requirements. (EN61326) This product complies with Australian EMC. (AS/NZS C1SPR11) 

System Diagram

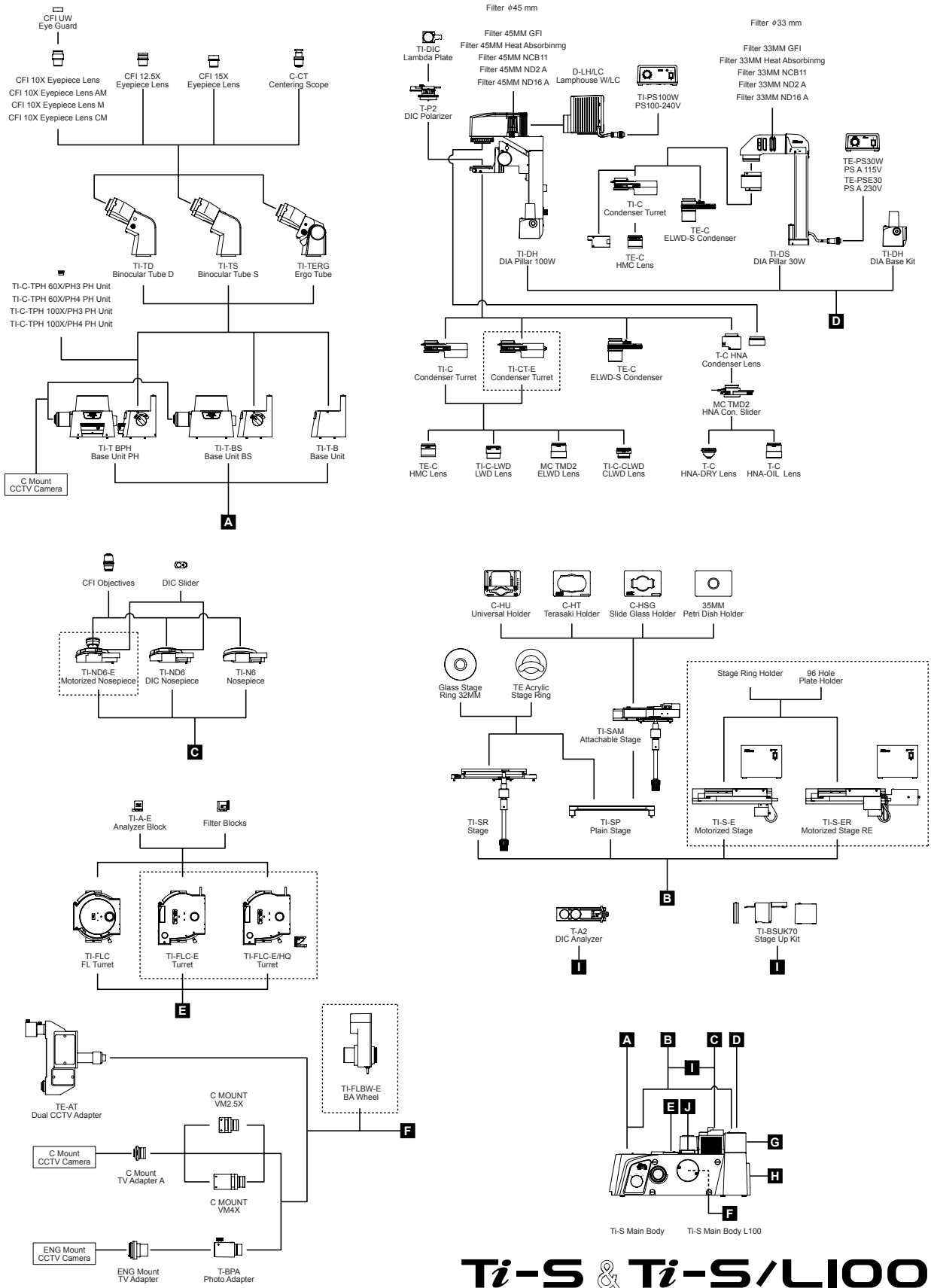
Ti-U, Ti-U/B System Diagram



System Diagrams



Ti-S, Ti-S/L100 System Diagram



System Diagrams

