

Nikon

Zoom Photo Slit Lamp
FS-3V

Instructions



NIKON CORPORATION

1. Operating Precautions



This instrument is designed for ophthalmic diagnosis and microphotography. Do not use the instrument for any other purposes.




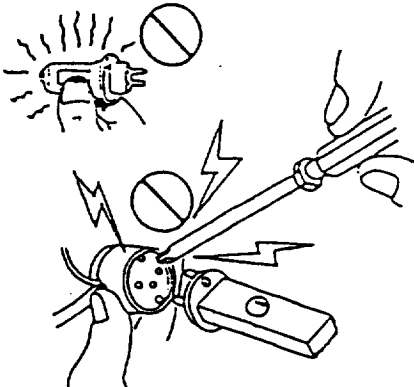
The product (this instrument) and the manual you purchased contain some warnings and precautions that you should follow to use the instrument safely and to prevent injuries to you or other person and damages to your property. Keep this manual in a safe and handy location such as the vicinity of the instrument.



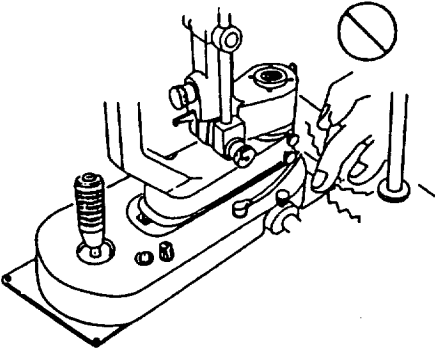
The following symbols are used in the warnings and precautions. Study and grasp the meanings of the symbols before reading the main body of this manual.

 Warning	This symbol shows that a death or personal injury might occur if you disregard this warning and use the instrument improperly.
 Caution	This symbol shows that only a personal injury or damage to a material might occur if you disregard this precaution and use the instrument improperly.

Symbols Used in Illustrations

	This symbol identifies a warning (including precautions). The contents of the warning are depicted in the triangle.
	This symbol identifies a prohibited action. The prohibited action is depicted within or near the circle.

<p> Warning</p> <p> Hot</p> <p>The halogen lamp used as the illumination lamp is extremely hot while it is on. When replacing this lamp, be sure to turn off the power, unplug the power cord, and wait 10 minutes or so until the lamp bulb is sufficiently cooled down. Then, replace the lamp with a Nikon-endorsed lamp. If immediate replacement is required, hold the bulb using a thick cloth.</p> <p> Electric shock</p> <p>Do not insert a foreign substance such as a screwdriver into the flash tube slot. Failure to observe this precaution may result in burn or electric shock.</p>	
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<p> Caution</p> <p> Do not hit or catch patient's fingers.</p> <p>Take care not to hit or catch patient's fingers between the instrument bottom and table top when sliding the main unit forward or laterally with the joystick lever. For safety, instruct the patient to place hands on knees or outside of the chin rest column. Take special care when guiding a child or low-vision patient in the dark room.</p>	
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⚠ Caution Be sure to ground the instrument properly.

⚠ Caution
Make sure that the input power voltage indicated in the voltage indicator window on the illumination power supply and program power supply matches the input power source.

⚠ Caution
Install the instrument on a flat surface in a clean room free from dust and moisture.

⚠ Caution
Use extreme caution when handling the power cord.

- Avoid bending the cord near the connector plug.
- When unplugging the cord, do not grasp it by the cord but grasp the plug.

⚠ Caution
Do not use any type of fuses other than Nikon endorsed ones. When replacing a fuse, be sure to turn off the POWER switch and disconnect the power cord from the power outlet.

⚠ Caution
Do not touch the bulb surface of the illumination lamp (Halogen lamp) or flash tube with hand. If you inadvertently touch it or it gets dirty, in which case the dirt may be scorched by the heat from the lamp. Wipe any fat or dirt off the bulb with alcohol.

Do not touch the glass bulb.

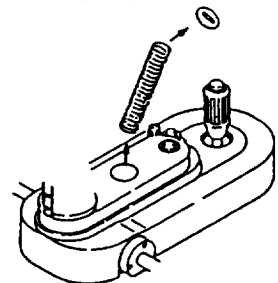


⚠ Caution
When the instrument is not in use, keep the POWER switch in the OFF position and disconnect the power cord from the power outlet. Place the attached vinyl cover over the instrument to keep it clean.

⚠ Caution
Handle the flash tube gently. Take care not to damage the bulb surface.

⚠ Caution
Do not loosen or remove the internal subspring cap. Inadvertent loosening of the cap may cause the built-in subspring to spring out of the assembly.

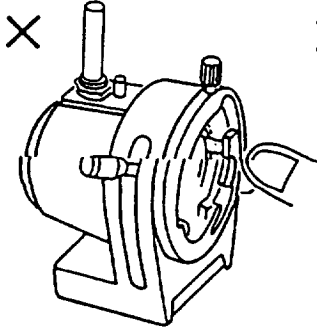
Subspring cap



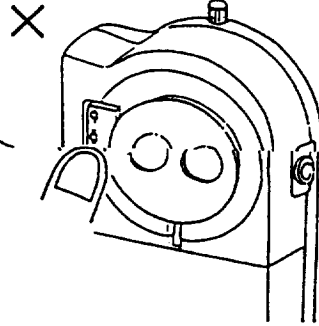
⚠ Caution

Never touch the following components as they would affect the instrument's performance:

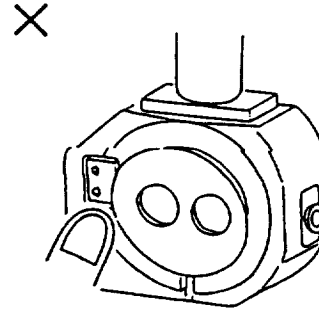
Magnet
(zoom lens barrel
assembly)



Electronics board
(35mm photographic
attachment)



Electronics board
(Polaroid photographic
attachment)



⚠ Caution

A magnet is present inside the right-side zoom magnification control lever as shown in the above figure. Keep magnetic cards and other substances that are susceptible to magnetism away from the magnet.

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1. Component Reference

1-1 Eyepiece Block

Eyepiece tube

Adjust the spacing between the left and right eyepiece tubes to the pupillary distance of the examiner (Page 16).

Tonometer adapter

Install the tonometer here.

Eyesight adjustment ring

Turn this ring before starting observation to compensate for differences in eyesight between the left and right eyes of the examiner and ensure easy viewing. (Page 16)

Rubber eyecup

Collapse the rubber eyecups when the examiner wears spectacles (Page 16).

Zoom magnification control lever

Used to change the magnification continuously.

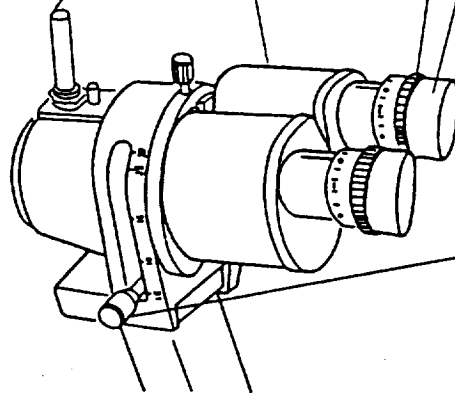


Figure 1

1-2 Chin Rest

Patient eye level index

The upper index of the two indexes grooved on each of the chin rest columns serves as a guide for the patient eye level.

Chin rest elevation handle

Turning this handle moves the chin rest up or down.

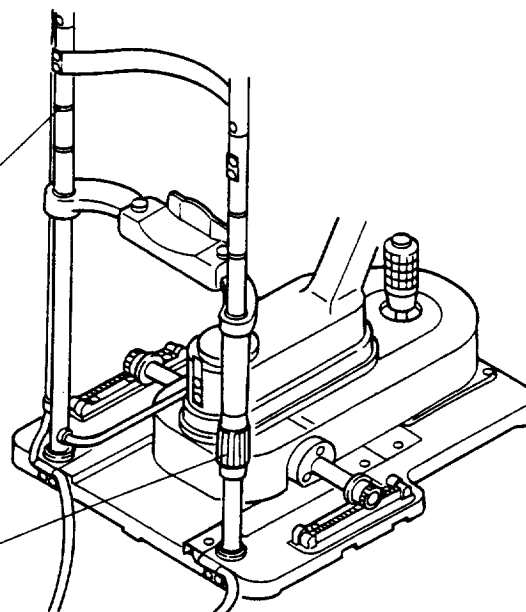


Figure 2

1-3 Illuminator Block

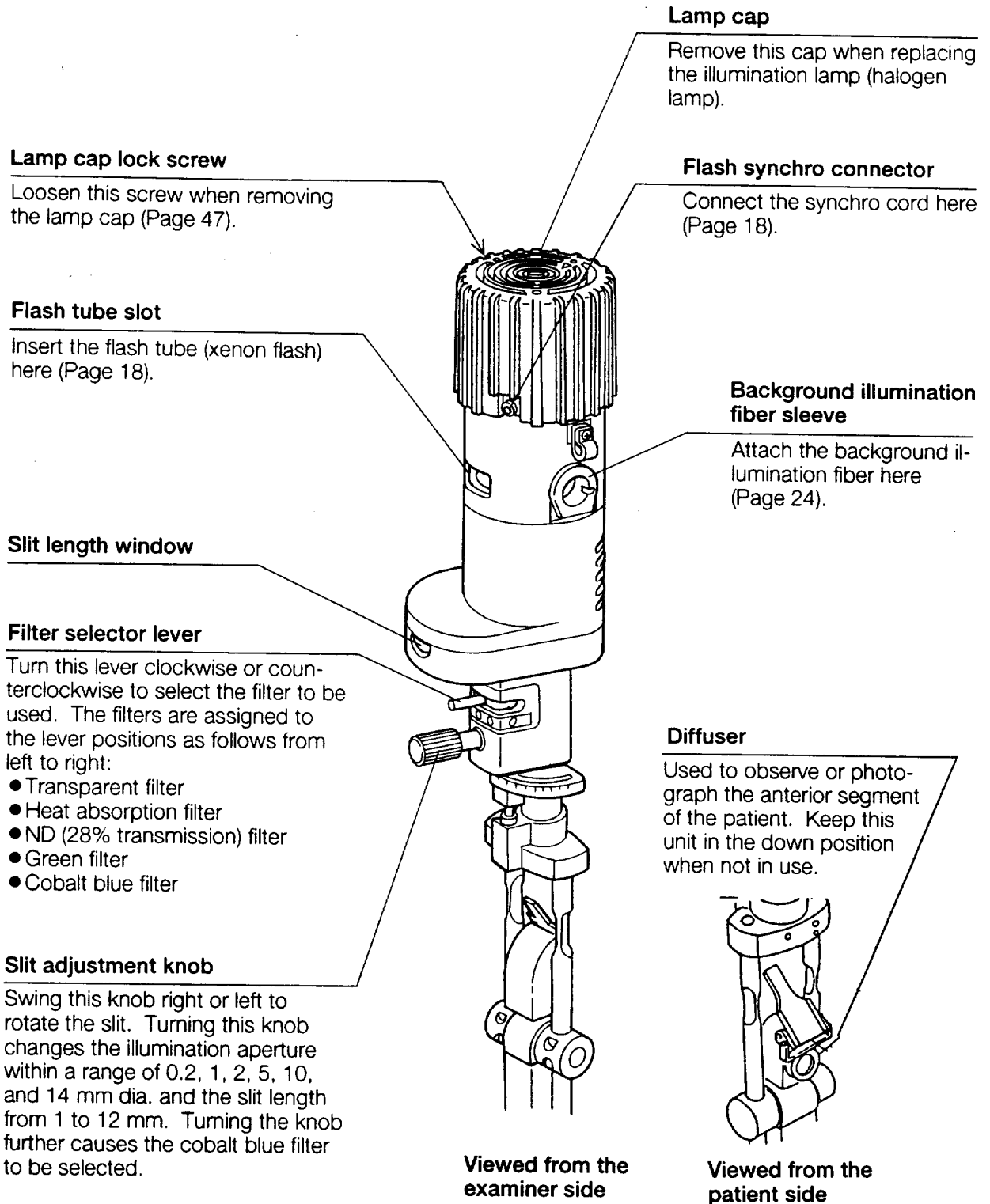


Figure 3

1-4 Cross-slide Table

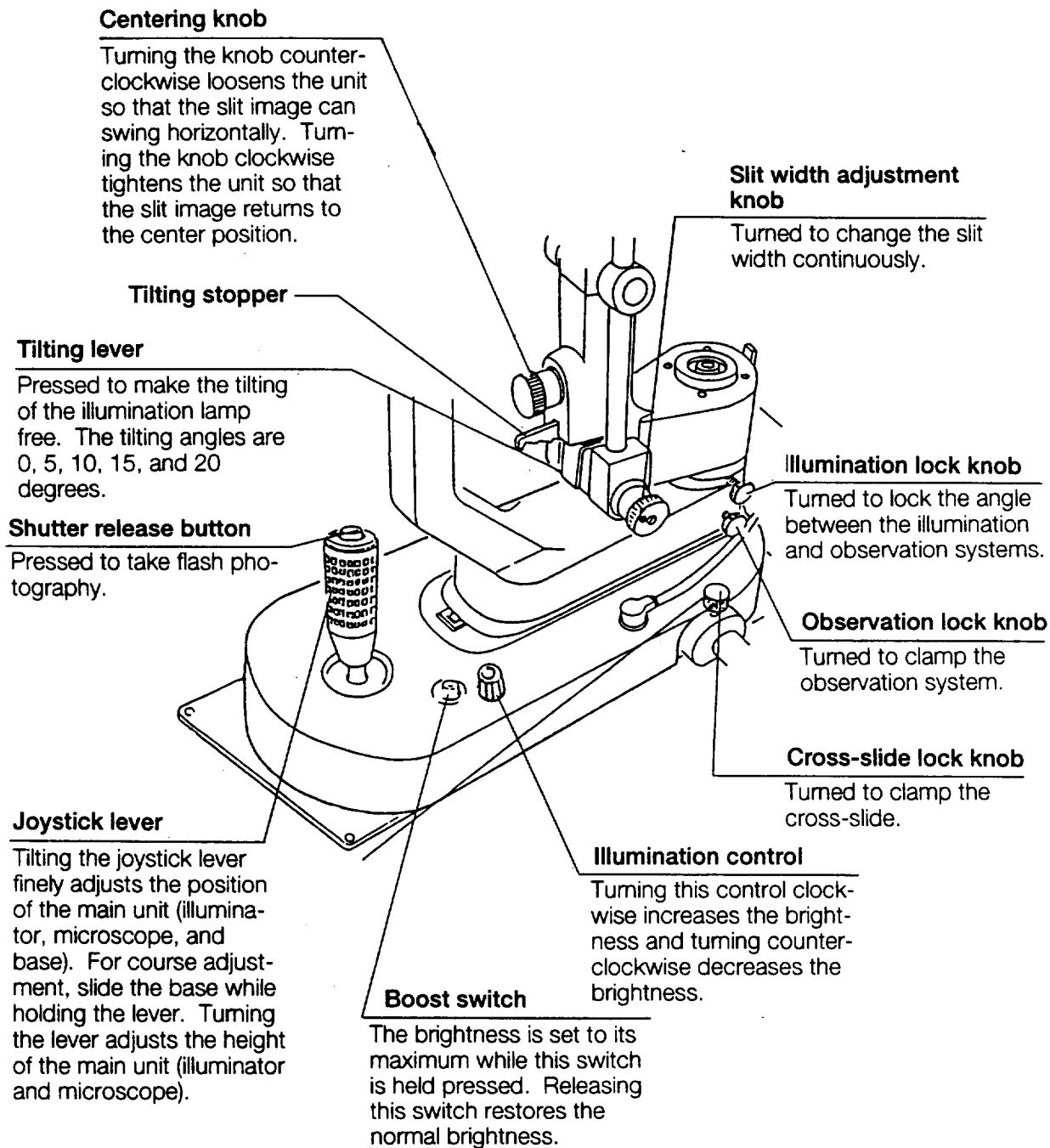


Figure 4

1-5 Program Power Unit

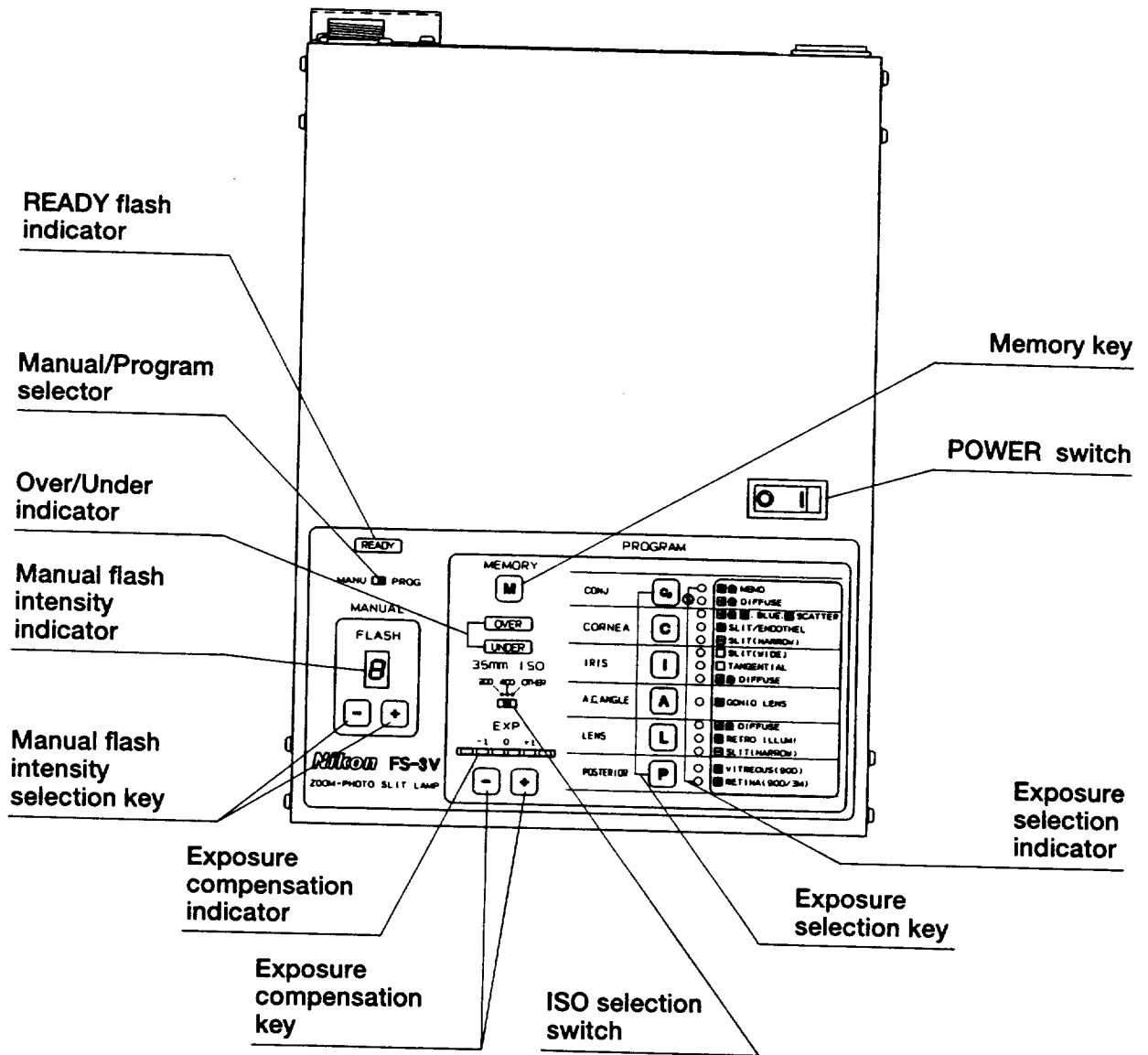


Figure 5

The following power-related symbols are labeled on the program power unit:

POWER switch

	Power off
	Power on

Power input panel

	AC		Caution. See the Instructions.
	Fuse		B-type instrument
	Input/output		

2. Installation

2-1 Required Tools

- Phillips screwdriver
- Hex wrench (for M6 nuts)
- Spanner (for M15 nuts)

2-2 Main Unit and Cross-slide Table

• Wooden table

- (1) Install and fix the (two) mounting bars on the illumination power unit as shown in Figure 6 (using a Phillips screwdriver).
- (2) Install and fix the illumination power unit on the back side of the table top as shown in the figure (using hex wrench).
- (3) Install and fix the table top to the Nikon power table (using hex wrench).
- (4) Install and fix the chin/forehead rest columns on the table top as shown in the figure (using a spanner).

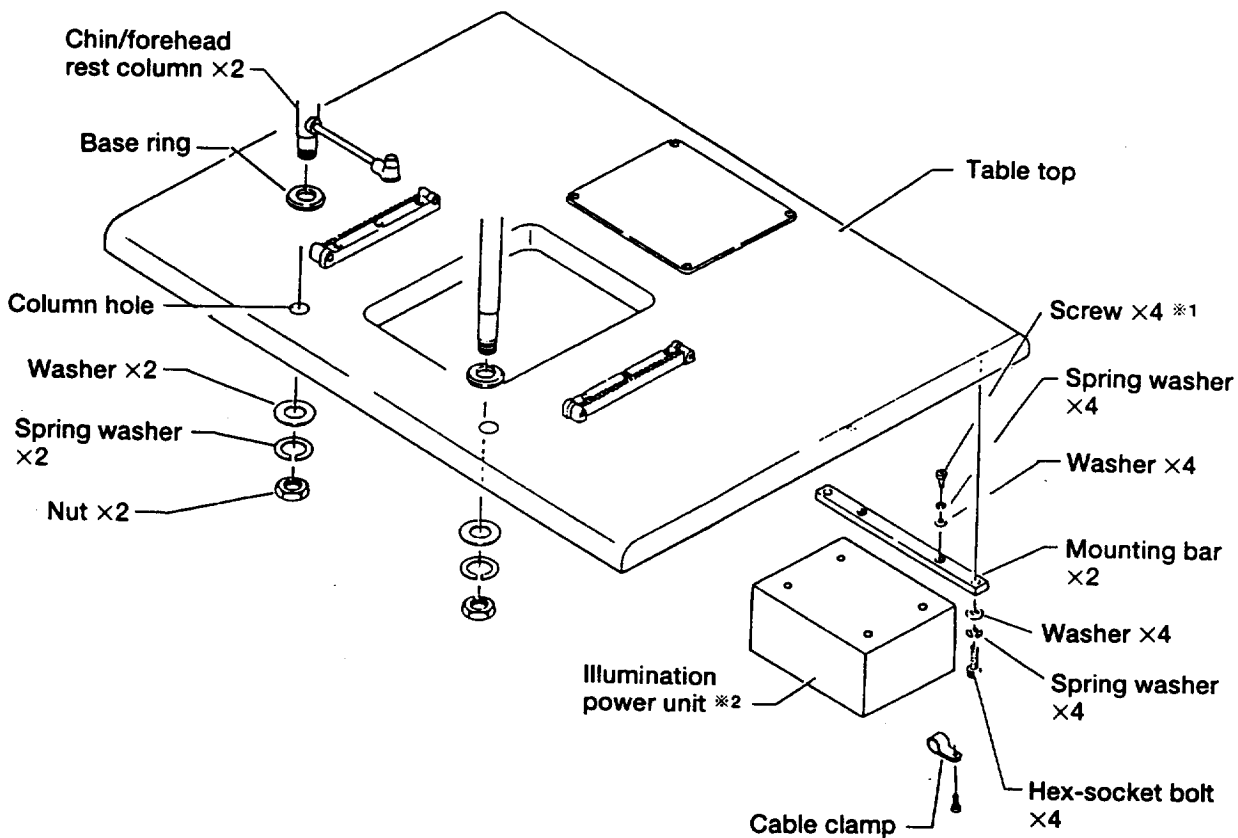


Figure 6

※ 1: Use the screws that come with the FS-3V. Do not use any screws that are longer than the attached screws.

※ 2: The illumination power unit is required only when no photographic attachment is installed.

- (5) Insert the metal shaft into the mounting hole in the cross-slide table.
- (6) Tighten the cross-slide table clamp screw to secure the metal shaft.
- (7) Mount the gears on both ends of the metal shaft. While turning the gear slightly clockwise and counterclockwise, set the gear so that the protrusion inside the gear gets engaged with the mating groove in the metal shaft.

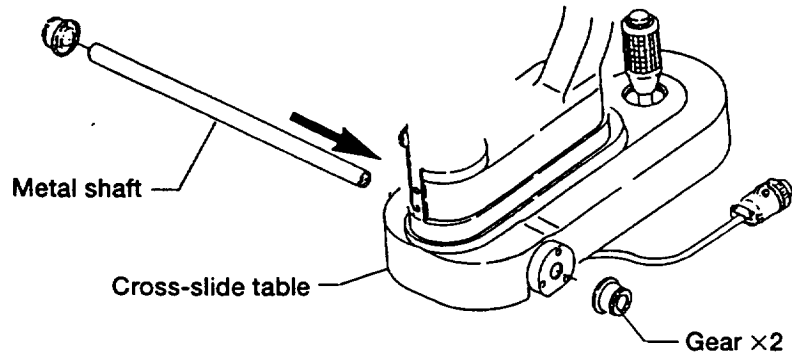


Figure 7

- (8) Place the main unit on the table top.

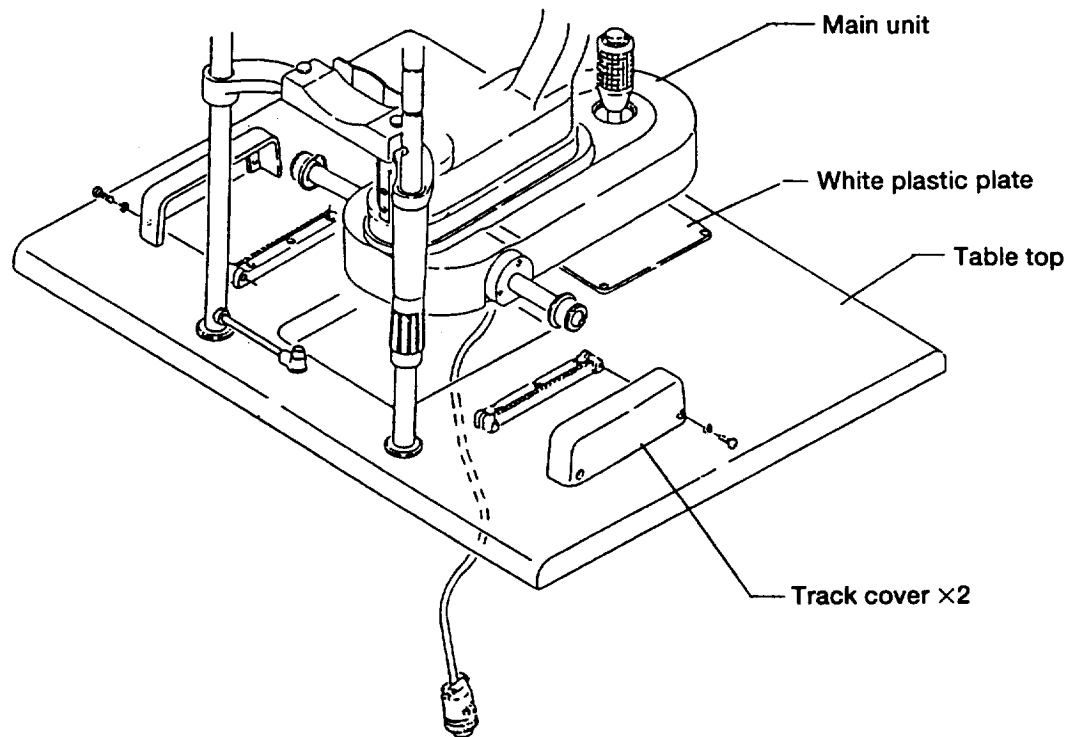


Figure 8

Align the edges of the white plastic plate with bottom side of the cross-slide table so that the cross-slide table slides accurately and smoothly.

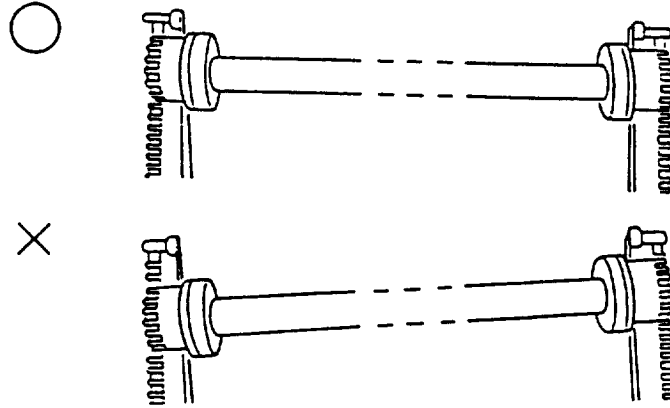


Figure 9

(9) Secure the track covers with attached Phillips head screws (using a Phillips screwdriver).

● **Metal table (clamping the columns from beneath)**

- (1) Install and fix the chin/forehead rest column on the table top as shown in Figure 10 (using the attached clamping attachments).
After tightening the nut, screw an attached set screw into the nut from the bottom side of the nut to prevent the nut from loosening (using a small flat-top screwdriver).
- (2) Clamp the illumination power unit cord and ground cable which come out of the cross-slide table bottom plate with the attached cable clamps as shown in the figure (using a Phillips screwdriver).
- (3) Fix both ends of the ground cable on the cross-slide table bottom and the table top as shown in the figure (using a Phillips screwdriver).
(These cables may thread through either left or right access hole in the table.)

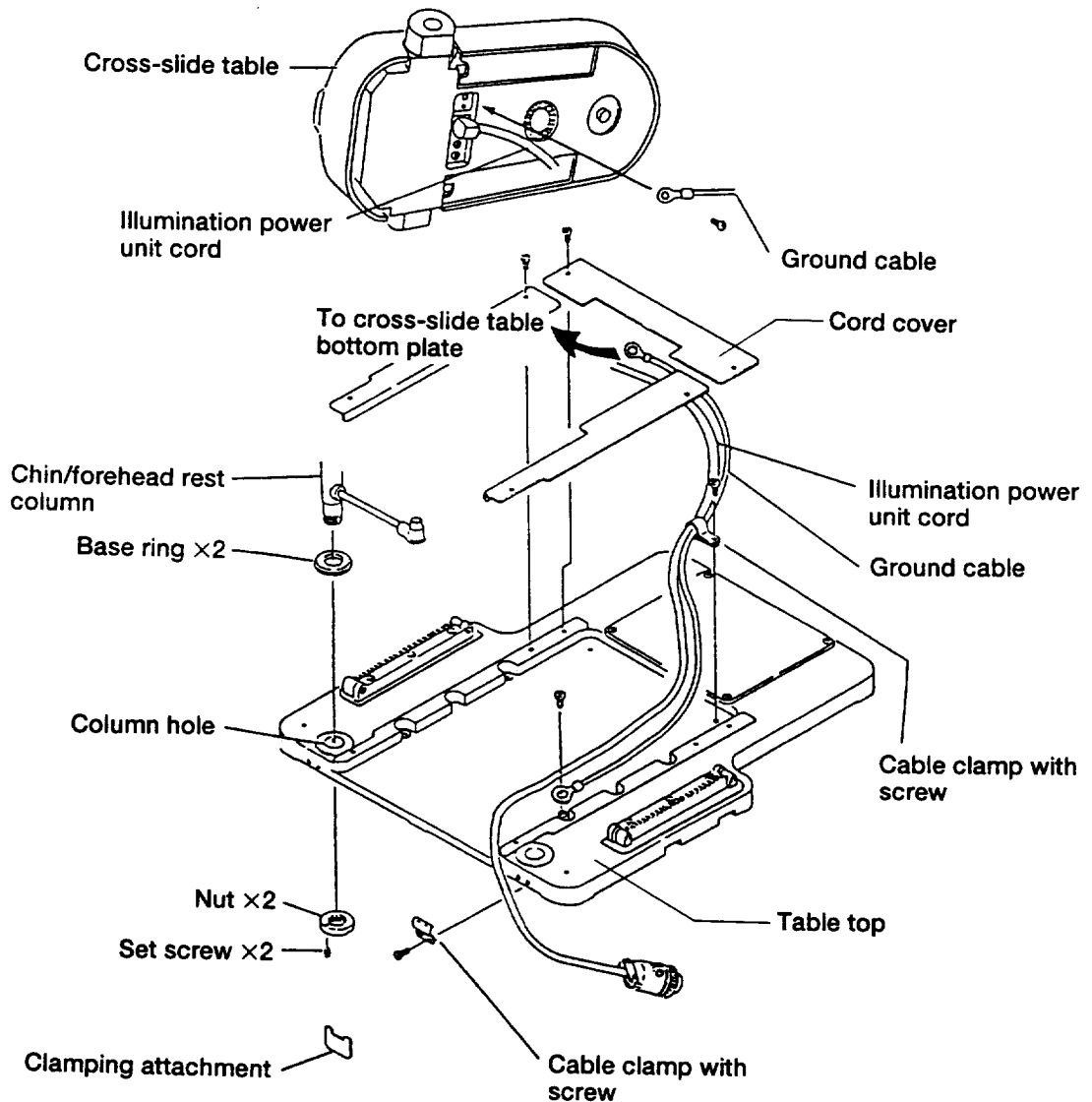


Figure 10

- (4) Install the metal shaft and gears in the same manner as with the wooden table top. Mount the main unit on the metal table. Finally, fix the track covers (Pages 11 and 12).



● **Metal table**

- (1) Remove (three) cable covers from the table top using a Phillips screwdriver.
- (2) Insert the chin/forehead rest column on the table top as shown in Figure 10. After inserting the column, mount and tighten attached set screws using an attached tool.
- (3) Clamp the illumination power unit cord and ground cable which come out of the cross-slide table bottom plate with the attached cable clamps as shown in the figure (using a Phillips screwdriver).
- (4) Fix both ends of the ground cable on the cross-slide table bottom and the table top as shown in the figure (using a Phillips screwdriver).
(These cables may thread through either left or right access hole in the table.)

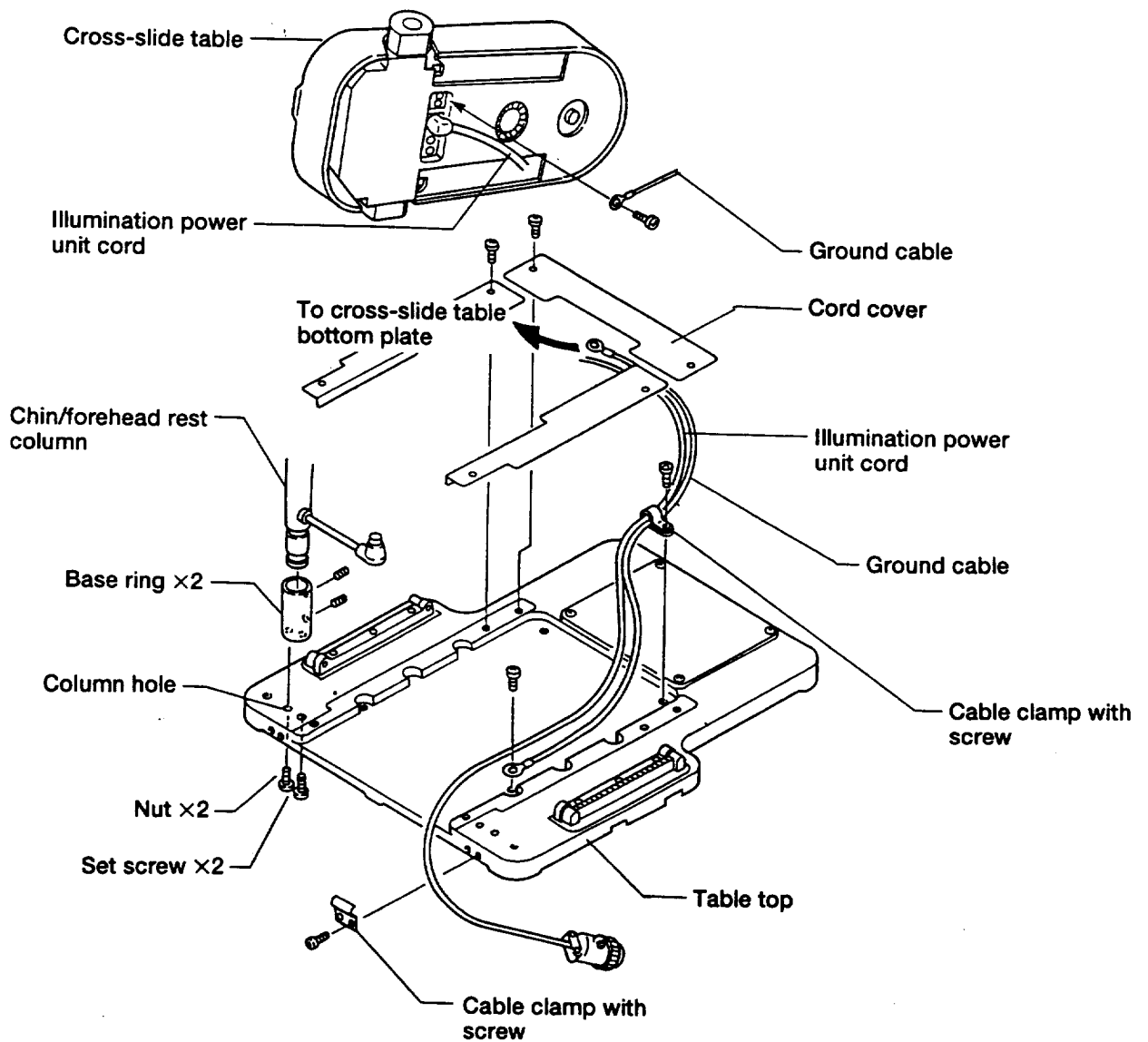


Figure 10

- (5) Install the metal shaft and gears in the same manner as with the wooden table top. Mount the main unit on the metal table. Finally, fix the track covers (Pages 11 and 12).

2-3 Eyepiece Lens

Insert the eyepiece lenses in the eyepiece tube sleeve with the index line facing upward.

Be sure to insert the eyepiece with reticle into the right-side eyepiece tube sleeve.

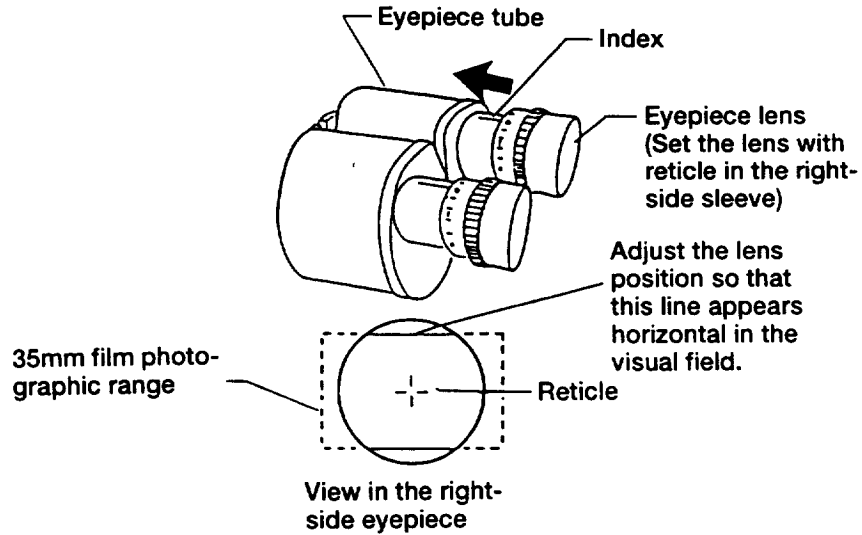
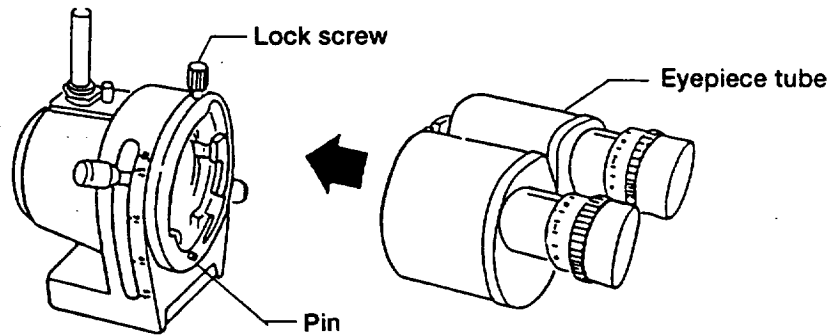


Figure 11

2-4 Eyepiece Tube

Align the groove on the bottom part of the eyepiece tube with the pin on the main unit (or a 35mm photographic attachment or other intermediate attachment). Secure the eyepiece tube with the attached lock screw.



(The eyepiece tube in the above figure is mounted on the main unit directly.)

Figure 12

2-5 Mirror

Insert the mirror as shown in Figure 13. Two types of mirror are available: one with a projection and without a projection.

When using the instrument in the tilt-up mode, use a mirror without a projection to prevent eclipse from occurring in the view field.

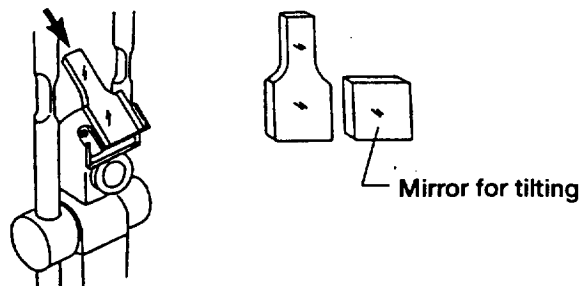


Figure 13

2-6 Illumination Cables

Plug the illumination cables into the matching sockets as shown in Figures 14-1 and 14-2.

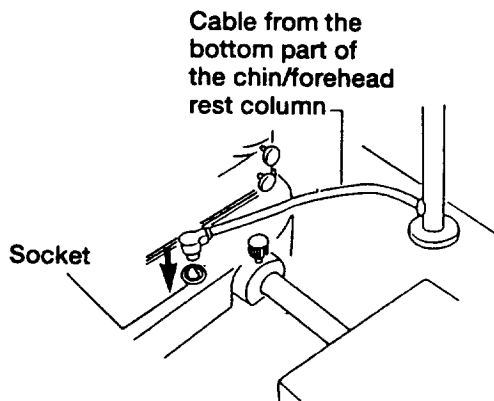


Figure 14-1

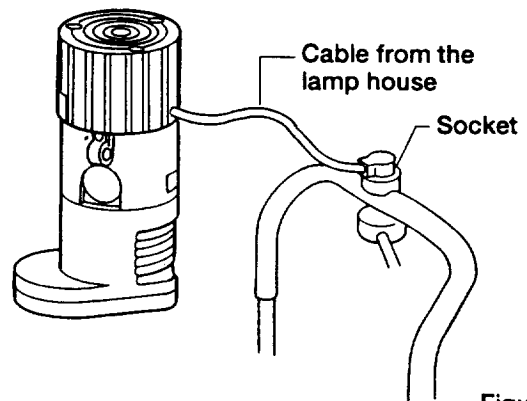


Figure 14-2

2-7 Cabling the Illumination Power Unit

(When not using the program power unit)

(When using the program power unit, refer to P.19)

- (1) Plug the cable from the cross-slide table into the matching socket on the illumination power unit and secure it by turning the lock ring.

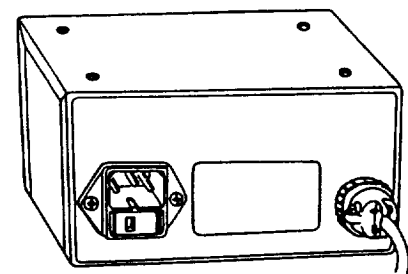
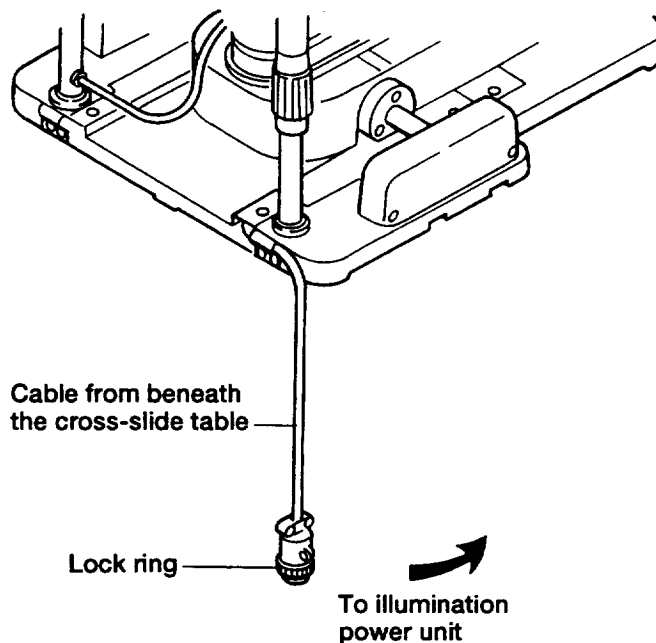


Figure 15

Turn the lock ring fully clockwise to secure the cable.

- (2) Finally, connect the attached power cord to the power input socket on the illumination power unit.

3. Diopter Adjustment

Make diopter an adjustment before starting an observation or photography session. Skipping this step may result in out-of-focus photography.

- (1) Insert the end of the target rod into the center hole, which is the center of rotation, in the microscope block and illuminator tower and turn it so that its black flat surface faces the microscope mirror.
- (2) Set the illuminator tower to the 0-degree position.
- (3) Turn on the illumination power unit (set the POWER switch to the "I" position). Set the slit width to an appropriate value for easy viewing.
- (4) Turn the zoom magnification control lever to the minimum magnification position.

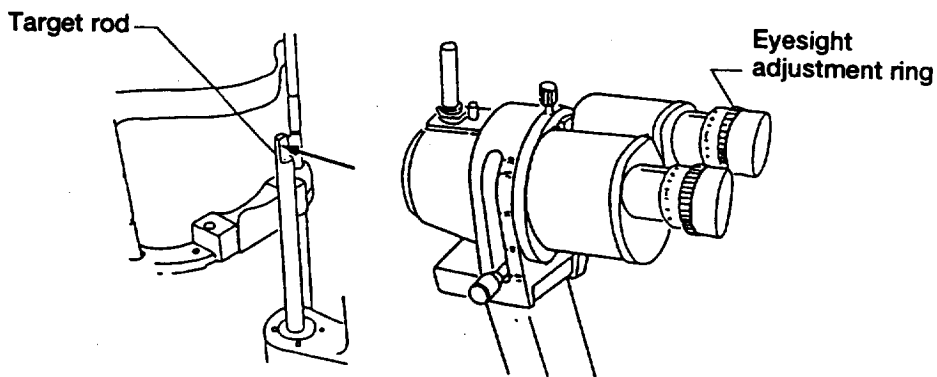


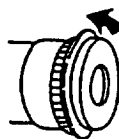
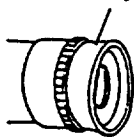
Figure 16

- (5) Set the pupillary distance by adjusting the spacing between the left and right eyepiece tubes.
- (6) Turn the eyesight adjustment ring of the right-side eyepiece fully counterclockwise.
- (7) While observing through the right eyepiece tube, turn the eyesight adjustment ring clockwise until the reticle in the eyepiece is seen most sharply. (If the ring is turned too far, turn the ring counterclockwise again to its end and restart the adjustment).
- (8) Turn the eyesight adjustment ring of the left-side eyepiece fully counterclockwise.
- (9) While observing through the left eyepiece tube, turn the eyesight adjustment ring clockwise until the flat surface of the target rod is seen most sharply. (If the ring is turned too far, turn the ring counterclockwise again to its end and restart the adjustment).

The ambient light may be screened by extending the rubber eyecup on the eyepiece.

An examiner who wear spectacles should collapse the rubber eyecup.

Rubber eyecup



- (10) Turn the right-side eyepiece without moving the eyesight adjustment ring so that the reticle in the right-side eyepiece rests horizontally in the view field.

4. Photographic Unit Installation

4-1 35mm Photographic Unit Installation

1) Installation procedure

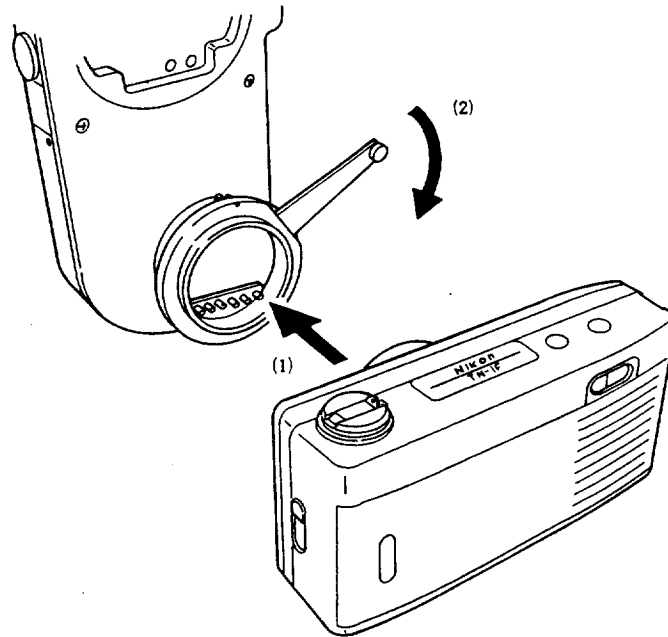


Figure 18 A

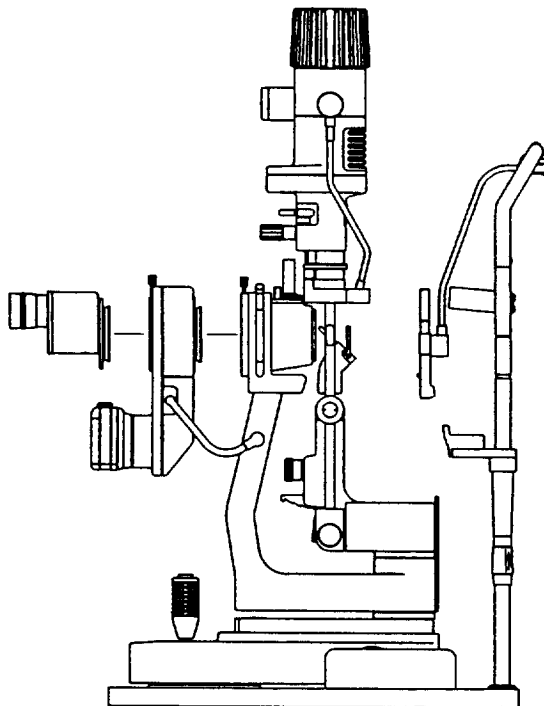


Figure 18 B

- (1) Fit the dedicated camera TN-1F on the mount of the 35mm photographic attachment.
- (2) While pressing the camera against the mount, turn the lever as shown in Figure 18A.
- (3) Plug the cable from the 35mm photographic unit into the receptacle on the arm block of the microscope main unit.

2) Installing the flash tube (xenon flash) on the main unit

Be sure to set the POWER switch to the OFF position when installing a flash tube.

- (1) Insert the flash tube into the trigger circuit base. Then, fix the tube with the two attached screws (using a Phillips screwdriver).

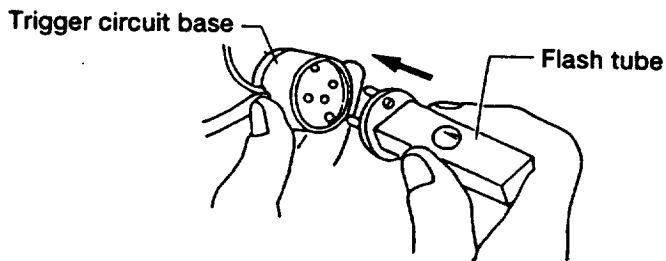


Figure 19-1

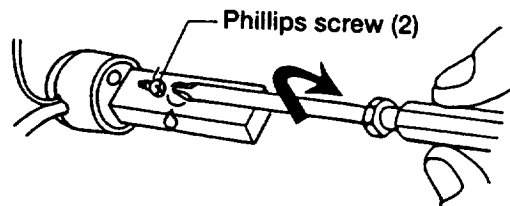


Figure 19-2

- (2) Pull out (two) flash tube caps.
- (3) Insert the flash tube fully into the main unit from the slot on the examiner side as shown in Figure 20-2.
- (4) Plug the synchro cable into the flash tube synchro connector. Secure the flash tube cable on the side surface below the lamp house with a cable clamp (using a Phillips screwdriver). Bundle the cable from the lamp house and flash tube cable with the attached cable tie (the flash tube movement may be hampered if the cables are laid too tight).

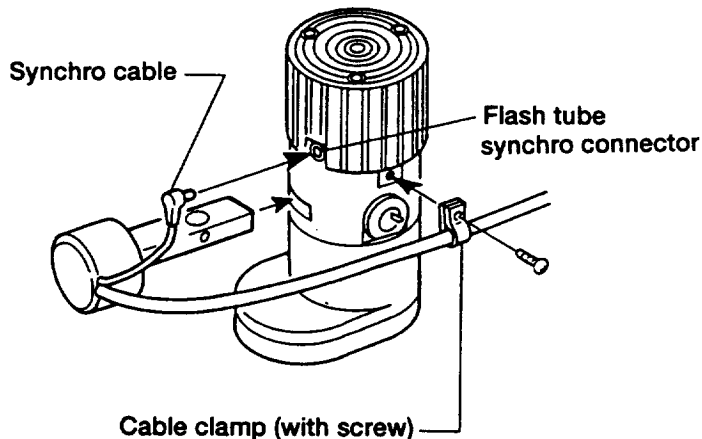


Figure 20-1

Connect the synchro cable and synchro connector as shown in the above figure. Do not connect them to other types of photographic equipment.

- (5) Force the flash tube cable into the cable clamps (3) located along the chin/forehead rest column.

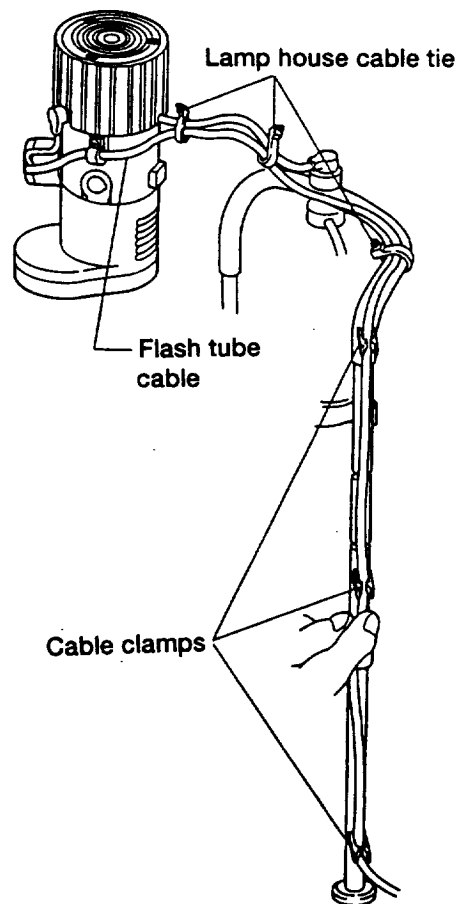


Figure 20-2

3) Cabling the program power unit

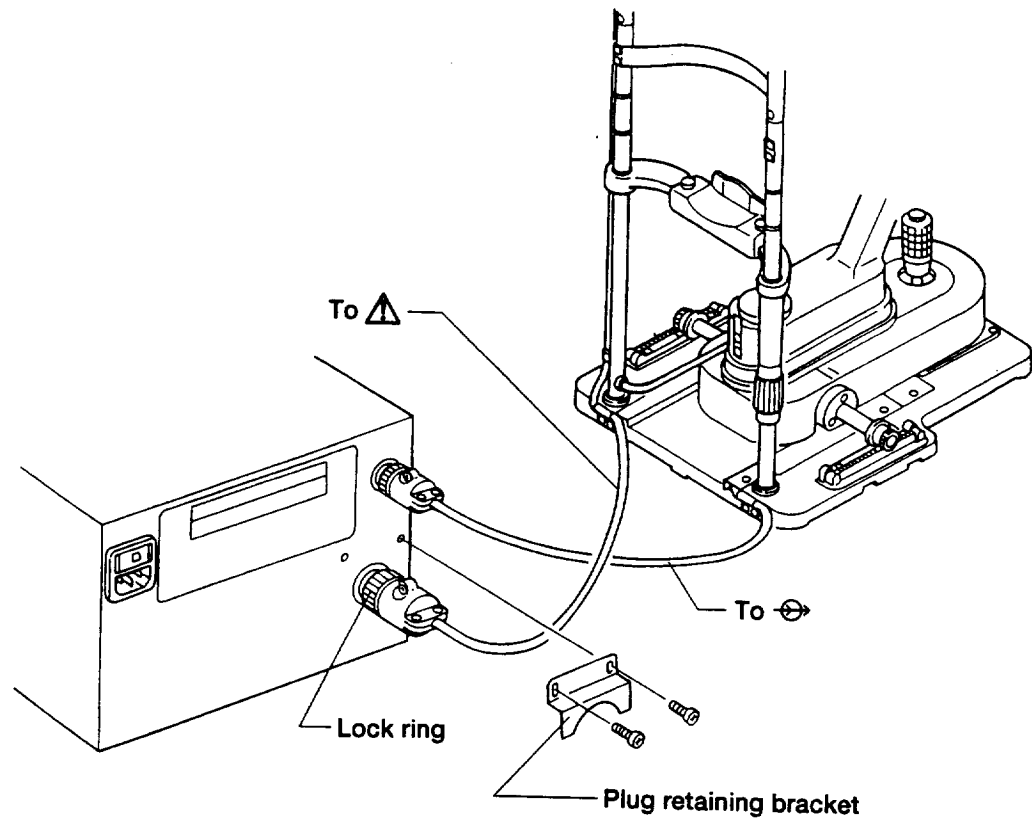


Figure 21

Turn the lock ring fully clockwise to clamp the cable.

4-2 Loading a Film into the 35mm Camera and Rewinding

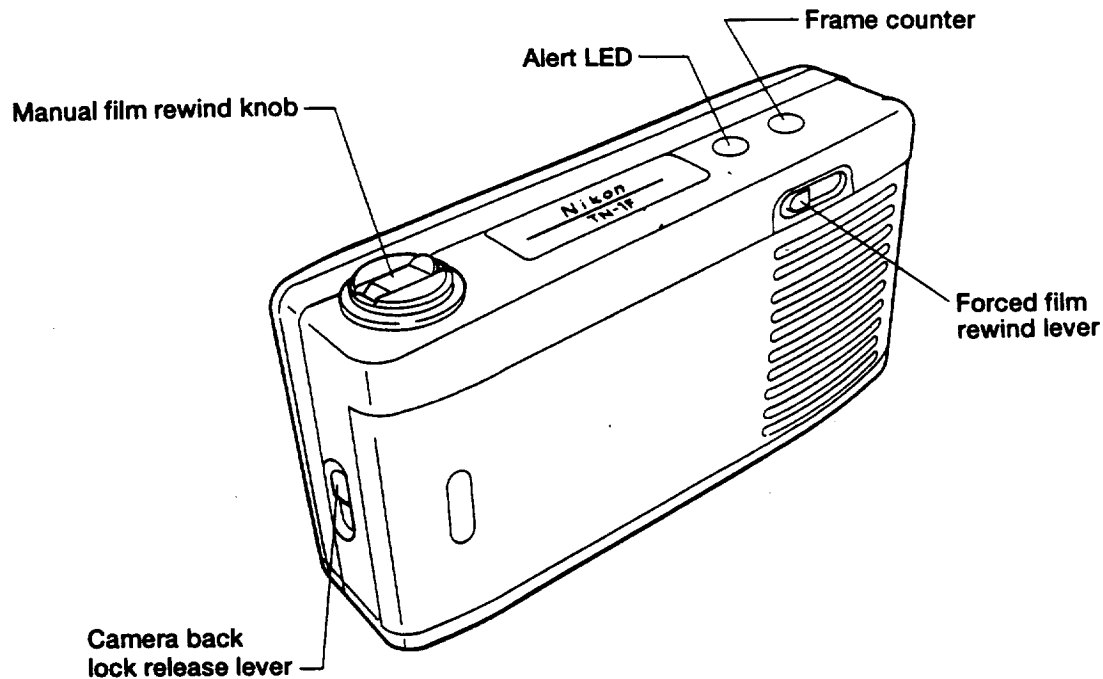


Figure 22

Loading a film

- (1) Set the POWER switch on the program power unit to ON ("I" position).
- (2) Raise the camera back lock release lever and open the camera back.
- (3) Insert a 35mm film. Fit film sprocket holes on gear teeth and pull the film leader up to the red mark inside the camera body.
- (4) Close the camera back.
- (5) Press the shutter release button on the joystick lever.
The film will automatically advance and the frame counter will indicate "1".

Caution

If you fail to load a camera, the alert LED blinks along with the alert sound. Release the camera back lock and retry the film loading.

Automatic film rewind

When a film reaches its end, the film automatically rewinds after the alert LED lights momentarily with the alert sound. You can also force the film to rewind in the middle of film by sliding the forced film rewind lever to the left-side position.

Manual film rewind

You can rewind a film manually by sliding the forced film rewind lever to the left-side position and rotating the manual film rewind knob clockwise even when the main switch on the power unit is set to OFF or the 35 mm camera is not installed on the slit lamp.

Caution

If the camera receives high-level, external noise, the frame counter light might occasionally go off. However, this does not affect taking pictures. When you power the camera off and on again, the counter light will go on.

4-3 Polaroid Attachment Installation

- **When installing only the Polaroid attachment**
Plug the cable from the Polaroid attachment into the receptacle on the arm block of the microscope main unit.

The 35mm/POLA selector switch may be set to either position.

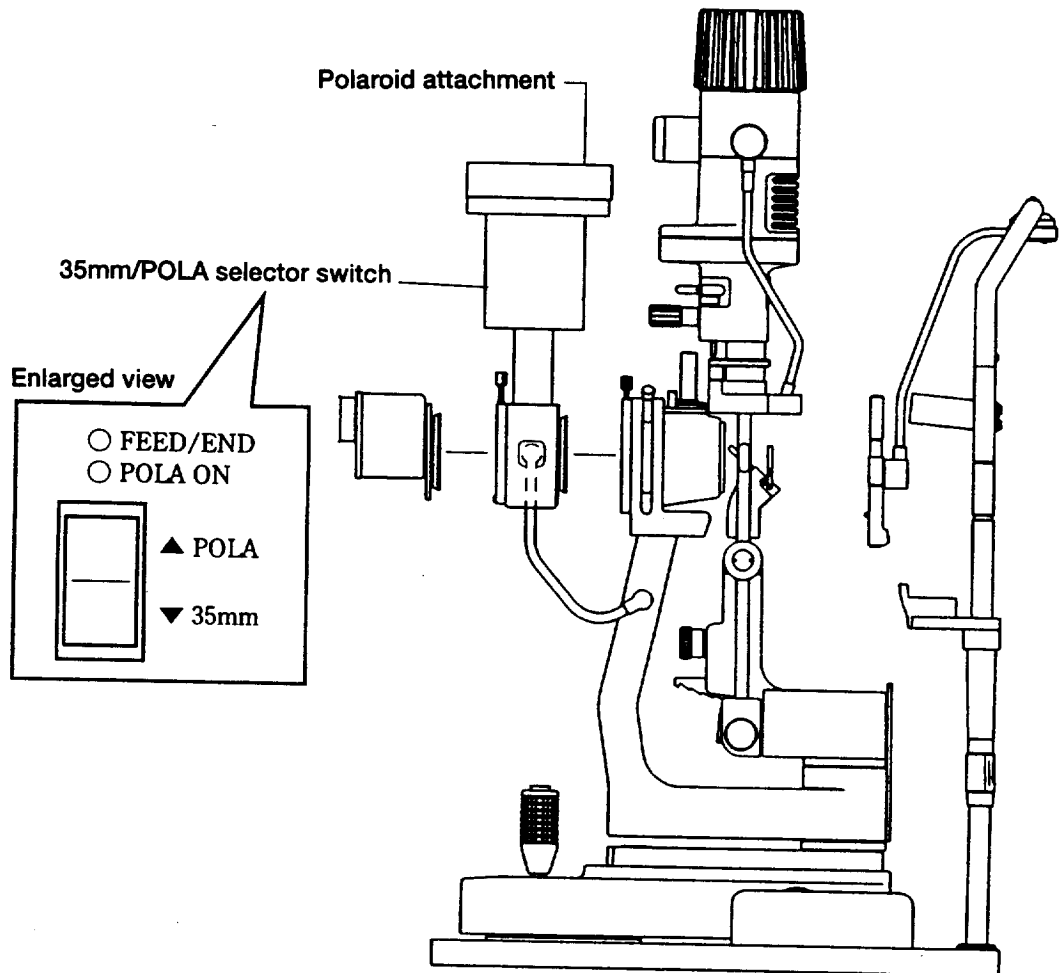


Figure 23

- **When installing both the Polaroid attachment and 35mm photographic attachment**
Plug the cable from the 35mm photographic attachment into the receptacle on the arm block of the microscope main unit. Plug the cable from the Polaroid attachment into the receptacle located on the left side of the 35mm photographic attachment.

Set the 35mm/POLA selector switch as follows:
Polaroid photography ⇨ Press on the "POLA" side.
35mm photography ⇨ Press on the "35mm" side.

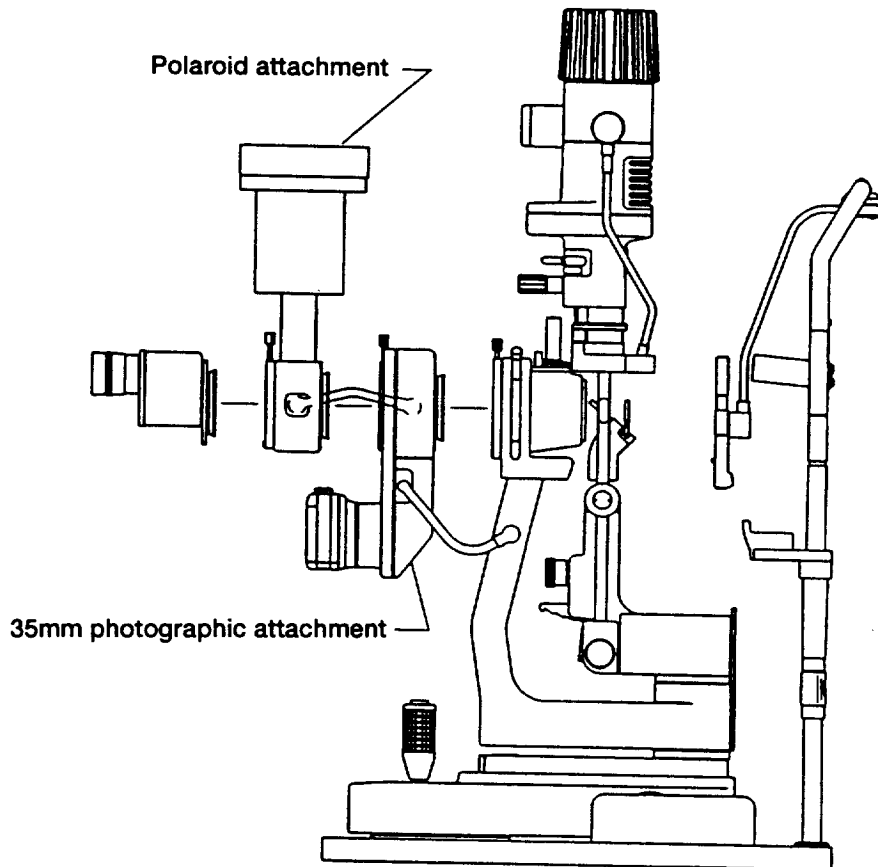


Figure 24

It is recommended that auxiliary springs be inserted into the cross-slide table if the vertical movement of the main unit gets slower because of two types of attachments being installed (contact your Nikon sales representative).

Secure the attachments with the Lock screw.

4-4 Loading a Polaroid Film

Use a film of "type 779" (ISO 640) or better.

- (1) Slide the film change lever to open the cover. The "FEED/END" LED will light.
- (2) Insert a film pack. (Check the film loading direction).
- (3) Replace the cover.
- (4) Press the shutter release button on the joystick (or the light shielding plate feed button on the Polaroid attachment) once. No flash will be fired and the light-shielding plate be actuated, making the attachment ready for photography. The film counter indicates "10" and the "FEED/END" LED turns off.

The film counter window shows the number of remaining film sheets.

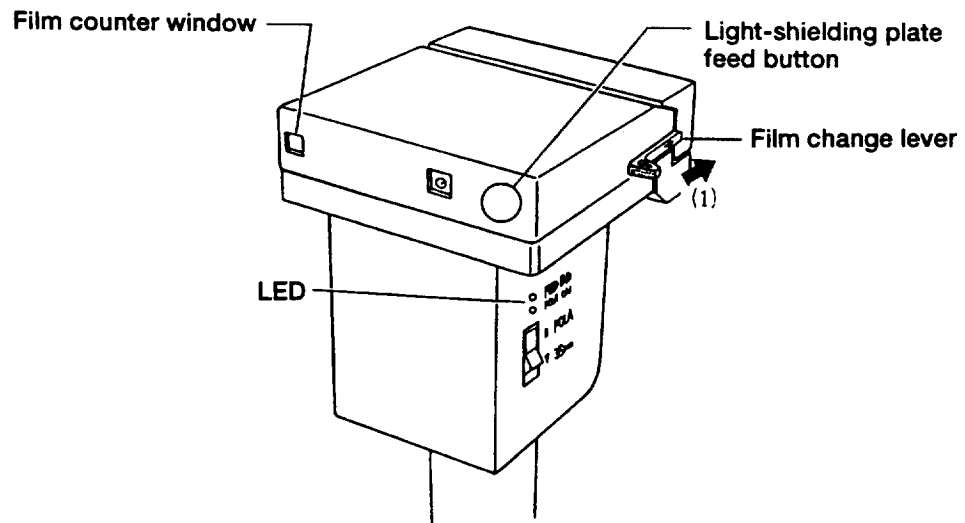


Figure 25

The LEDs on one side of the 35mm/POLA selector switch indicate the following conditions:

LED	Meaning
"FEED/END" LED ⇨ Lit	No film pack is loaded or the light-shielding plate is set.
"FEED/END" LED ⇨ lit with a beep	The last sheet of the film pack has been exposed (in which case the shutter release button will not work).
"POLA ON" LED ⇨ Lit	The FS-3V is ready for Polaroid photography.
"POLA ON" LED ⇨ Off	The FS-3V is ready for 35mm photography.

4-5 Illumination Fiber Installation

You can photograph the peripheral area of the slit light as well as the illuminated area using an illumination fiber.

- (1) Pull out the dust-proof cap from the mount block of the trigger circuit base.
- (2) Align the positioning pin located on one side of the trigger circuit base with the mating groove on the mount block and insert the fiber inlet head of the illumination fiber into the mount.
- (3) Align the two guide pins of the other end of the illumination fiber with the pin holes on the main unit and insert them into the main unit. Then, secure the illumination fiber with the attached set screw.
- (4) The aperture adjusting dial is used to adjust the luminous power of the fiber. See Pages 32 through 33 and 35 for standard aperture settings for various photographic positions.

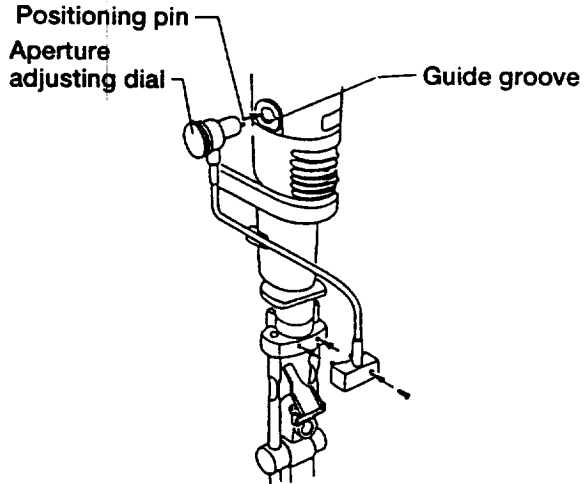


Figure 26

4-6 Program Power Unit Initialization

You can program the power unit according to the application of the FS-3V. The settings you programmed, which are listed below, are sustained even when the power unit is turned off.

When you confirm these settings, take the following steps as in programming them.

- "OTHER" position of the 35mm ISO settings indicated on the power unit.
- Exposure compensation required due to the differences in iris or fundus color.
- Compensation of CCD camera speed (when a still video adapter is used)
- Exposure alert tone pitch

Operating procedure

- (1) Turn on the power unit while holding the memory key **[M]** down.
- (2) Manipulate the MANUAL FLASH **[+]** and **[-]** keys to set one of digits "0" to "4".
- (3) Then press the **[M]** key.
- (4) You can make the settings listed below for each digit you selected. Use the keys that stay on or flash.

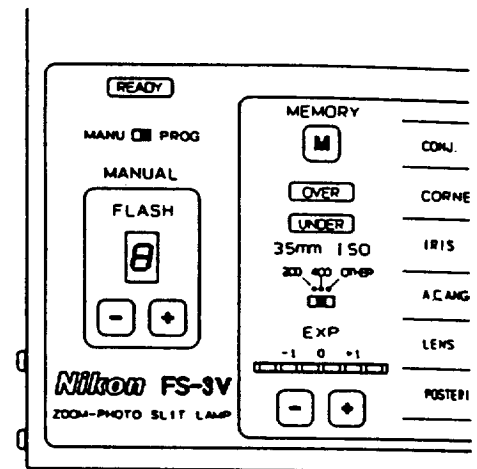


Figure 27

When "1" is selected → Set the value of the "OTHER" position of the 35mm ISO settings indicated on the power unit.

- ① Select one of the following options using the MANUAL FLASH **[+]** and **[-]** keys:
 - *A*: ISO = 800 (factory setting)
 - *b*: ISO = 100
 - *c*: ISO = 1600
- ② Press and hold down the **[M]** key for approximately 2 seconds, and the setting will be saved and the FS-3V returns to the state immediately after you took step (1). Tapping the **[M]** key will return the FS-3V into the state immediately after you took step (2) without saving the new setting.

Notes:

- For easy identification of the new setting, place the attached sheet indicating the new setting near the label "OTHER" on the power unit.
- The valid photographic area is limited only to bright segments such as the anterior segment if ISO = 100 is selected.
- The valid photographic area is limited only to dark segments such as the posterior segment if ISO = 1600 is selected.

When "2" is selected → Set the exposure compensation value to compensate for the differences in iris or fundus color.

The FS-3V is factory-set for colored race photographing in programmed exposure modes using Polaroid attachment and 35 mm photographic attachment. It can be adjusted for white race mode photographing by adjusting the exposure value for the iris and fundus segments (the exposure value at the photographic position identified by illuminated LED(s)).

① Select one of the following options using the EXP \oplus and \ominus keys:

- No exposure (LED off): For colored races (factory setting)
- EXP - Correct (minus side LED lit): For white races (the recommended setting is identified by two minus side LEDs)

② Press and hold down the \boxed{M} key for approximately 2 seconds, and the setting will be saved and the FS-3V returns to the state immediately after you took step (1). Tapping the \boxed{M} key will return the FS-3V into the state immediately after you took step (2) without saving the new setting.

When "3" is selected → Compensation for CCD camera speed (when a still video adapter is used)

① Select one of the following options using the MANUAL FLASH \oplus and \ominus keys:

- "d": Ordinary CCD camera/standard setting (factory setting)
- "E": Ordinary CCD camera/standard setting plus 1-step correction
- "F": Ordinary CCD camera/standard setting minus 1-step correction
- "G": KODAK DCS 420/ISO = 200
- "H": KODAK DCS 420/ISO = 400
- "I": KODAK DCS 420/ISO = 100

② Press and hold down the \boxed{M} key for approximately 2 seconds, and the setting will be saved and the FS-3V returns to the state immediately after you took step (1). Tapping the \boxed{M} key will return the FS-3V into the state immediately after you took step (2) without saving the new setting.

Refer to the instruction manual for the individual still video adapter for details.

When "4" is selected → Exposure alert tone pitch adjustment

You can set the presence or absence or the pitch of the alarming sound that is generated for over- and under-exposure conditions.

① Select one of the following options using the MANUAL FLASH \oplus and \ominus keys:

- "—": High
- "—": Middle
- "—": Deep
- " \square ": No sound

② Press and hold down the \boxed{M} key for approximately 2 seconds, and the setting will be saved and the FS-3V returns to the state immediately after you took step (1). Tapping the \boxed{M} key will return the FS-3V into the state immediately after you took step (2) without saving the new setting.

When "0" is selected → Quit the initialization mode.

Pressing \boxed{M} key, the FS-3V quits the initialization mode and returns to the normal operating state.

Note:

To restore the FS-3V into the factory-set state, power on the FS-3V while holding down both the EXP \oplus and \ominus keys. The FS-3V will return to the factory-set state with short beeps. Note that all settings including the customization settings for a still video adapter and those which are saved with the \boxed{M} key are reset to their factory-set values.

5. Photography Procedures

The FS-3V can run in two photography modes: programmed exposure photography and manual exposure photography.

5-1 Programmed Exposure Photography

1) Selecting the photography mode

Slide the manual/program selector switch to the "PROG" position.

2) Setting the ISO speed for 35mm photography

For 35mm photography, set the ISO speed switch to the ISO speed of the film to be used. The recommended ISO speed is 400. (The ISO speed switch may be set to any value in the Polaroid photography mode. In this mode, however, use a film of type 779.)

See Section 4-6, "Program Power Unit Initialization," on Page 25 when using the OTHER position of the ISO speed switch.

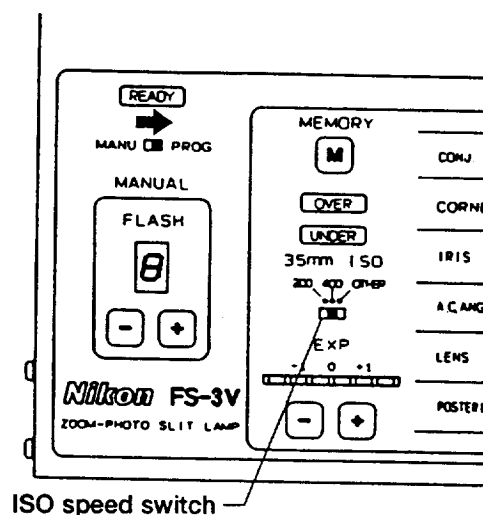








Figure 28

The film speed sensing feature of the TN-1F dedicated camera is disabled. Be sure to use the ISO speed switch on the program power unit to set the ISO speed for 35mm films.

3) Selecting the photographic area

Select the photographic area using the photographic area selector switch (Pages 32 and 33). For a control panel key that is assigned to two or more options, press the key the necessary number of times to select the corresponding option.

In the programmed exposure photography mode, make sure that the exposure mark on the slit width adjustment knob is in alignment with the corresponding exposure mark (one of , , , , , ) (→P. 32) on the program power unit control panel. Failure to observe this caution may result in over- or under-exposures.

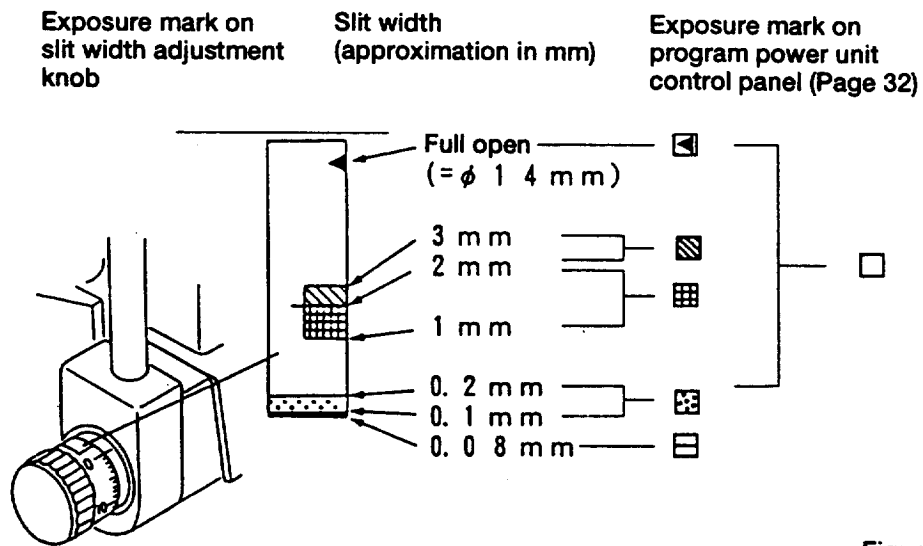
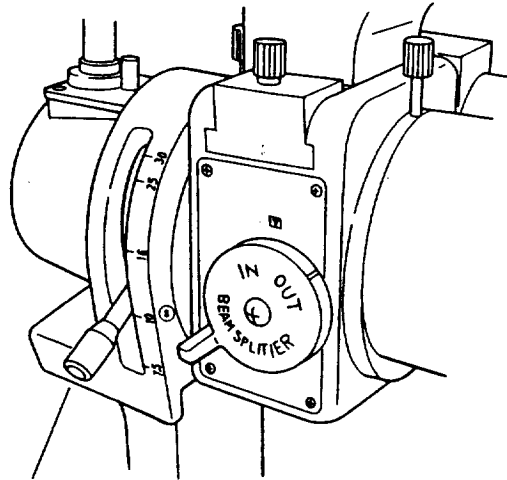
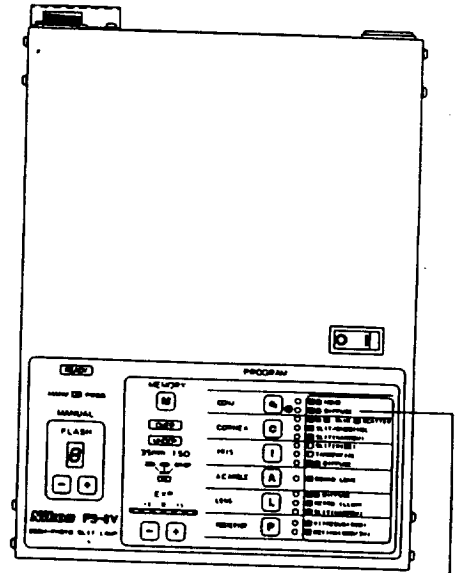


Figure 29

The FS-3V has an "S" mark which identifies the standard photographic mode attached to its microscope zoom magnification control lever and program power unit. When photographing the entire patient's eye periodically, set the zoom magnification control lever or the power unit to the "S" mark. In this way, it is easy to examine the progress of the condition of the patient with time.



Magnification: 10 times



Programming position:
CONJ (conjunctiva)/
DIFFUSE

Figure 30-1

Figure 30-2

- Make angle settings of the illumination and observation systems as follows:

- Use diffuser.

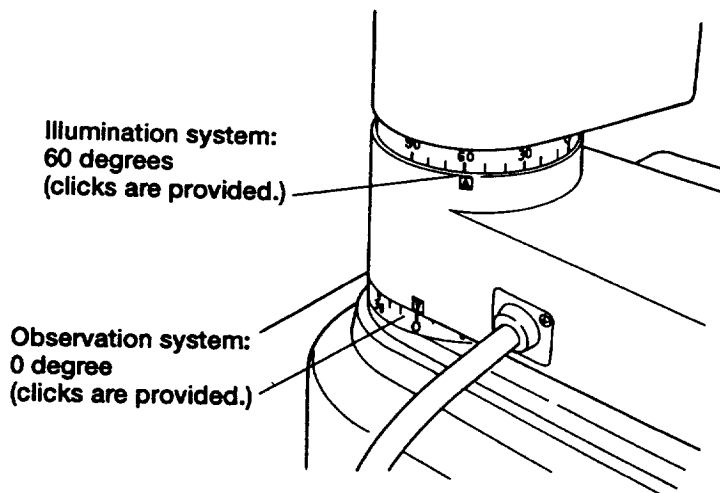


Figure 31-1

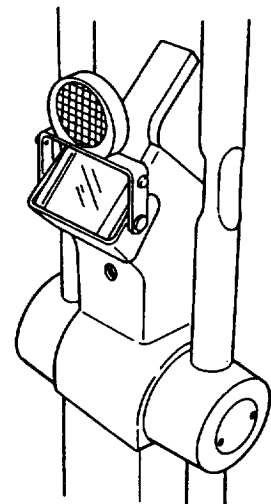


Figure 31-2

4) Exposure compensation

Each press of the exposure compensation key changes the exposure compensation value in increments of 0.5 step. The maximum exposure compensation value is ± 1.5 . The exposure compensation LEDs are set off when an exposure compensation value of 0 is selected.

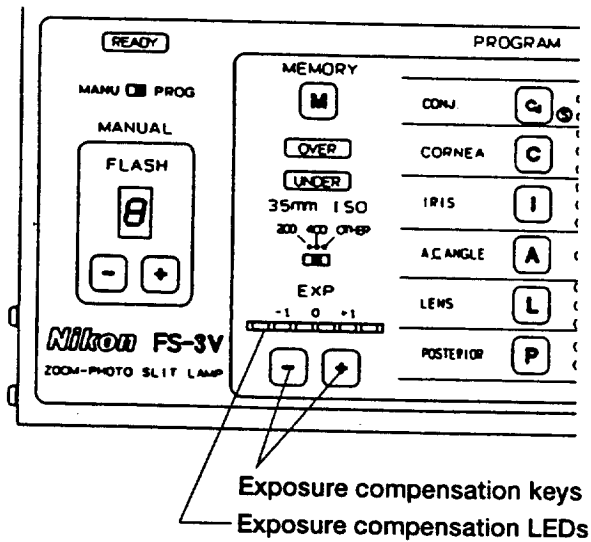


Figure 32

5) Photographing

You can take a photograph by pressing the shutter release button on the joystick lever.

Before taking a photograph, set the POWER ON/OFF switch on the program power unit to ON and make sure that the READY LED on the power unit control panel is lit. You can take no photograph when this LED is off.

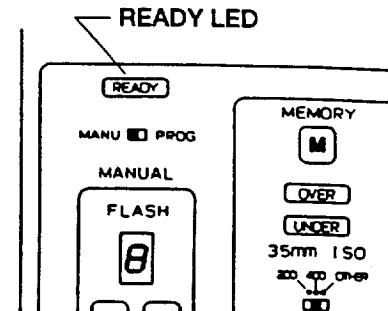


Figure 33

Unless specifically specified, set the filter to "No Filter" or "Heat Absorption Filter Only."

"OVER" and "UNDER" exposure warning LED indications (these LEDs are lit with short beeps.)

"OVER"

















The object is so bright that the resulting photo will be overexposed even if the flash intensity is set to its minimum.

You can take photos but it is recommended that you increase the magnification factor or use a film with a lower ISO speed such that the "OVER" LED turns off.

"UNDER"

The object is so dark that the resulting photo will be underexposed even if the flash intensity is set to its maximum.

You can take photos but it is recommended that you decrease the magnification or use a film with a higher ISO speed such that the "UNDER" LED turns off.

Diffuser	Slit width (full open = 14 mm dia.)	Background illumination fiber	Accessory	Factor for Exposure Compensation	Remarks	
○	 Full open	OFF	—	—	Approx. -0.5 step compensation for sclera.	
○	 Full open	OFF	—	Conjunctiva conditions Reflection from external area		
○	 Full open	OFF	—	Lesion condition	—	
×	 Full open	OFF	—	Lesion condition	Cobalt blue filter	
×	 2~3 mm	OFF	—	Lesion condition	Illumination by sclera diffusion method	
×		0.1~0.2 mm	M or OFF	—	Lesion condition	—
×		0.1~0.2 mm	OFF	Endothelium attachment	Lesion condition	Specular illumination with 60-degree angle
×	 0.08~0.1 mm	L or OFF	—	Lesion condition	+0.5 or +1 step compensation is required for slit widths of 0.08 mm or less.	
×	 0.2 mm	H or OFF	—	Iris color	Brown iris is standard for exposure.	
×	 0.2 mm	OFF	—	Iris color	Tangential illumination with 60-degree angle	
○	 Full open	OFF	—	Iris color	Brown iris is standard for exposure.	
×	 2~3 mm	OFF	GONIO lens	—	—	
○	 Full open	OFF	—	Degree of opacity	—	
×	 1~2 mm	OFF	Retro illumination unit	Reflection from retina	Retro illumination with 0-degree angle, mirror rotation	
×	 0.08~0.1 mm	L or OFF	—	Degree of opacity	—	
×	 2~3 mm	OFF	90D lens	Lesion condition	—	
×	 2~3 mm	OFF	90D or 3-mirror lens	Reflection from retina	—	

5-2 Summary of Photo-taking Actions for Programmed Exposure Photographing

Refer to the chart shown below when manipulating the diffuser, slit width control, and illumination fiber. Adjust the slit width so that the exposure mark on the program power unit aligns with the exposure mark on the slit width adjusting knob (Page 28).

Program Power Unit Symbols		Photographic Area
Exposure Selection Key	Exposure Selection LED and Exposure Mark	
CONJ. (CJ)	MEMO	Patient record
	DIFFUSE	Conjunctiva, external surface
CORNEA (C)	BLUE, SCATTER	Cornea surface
		Cornea surface (fluorescent photography)
		Cornea surface (illumination by sclera diffusion method)
	SLIT/ENDOTHEL	Cornea surface (slit)
		Endothelium
SLIT (NARROW)	Cornea surface (narrow slit)	
IRIS (I)	SLIT (WIDE)	Iris (part)
	TANGENTIAL	Iris (tangential illumination)
	DIFFUSE	Iris (whole)
A. C. ANGLE (A)	GONIO LENS	Anterior chamber angle
LENS (L)	DIFFUSE	Crystalline lens (whole)
	RETRO ILLUMI	Crystalline lens (retro image)
	SLIT (NARROW)	Crystalline lens (narrow slit)
POSTERIOR (P)	VITREOUS (90D)	Retina with 90D lens
	RETINA (90D/3M)	Retina with 90D or 3-mirror lens

5-3 Manual Exposure Photography

1) Selecting the photography mode

Slide the manual/program selector switch to the "MANU" position.

2) Setting the flash intensity

Set the flash intensity with the manual flash intensity key. You can set a number from "0" to "8" and the sign "-" (Page 35). The "0" setting corresponds to the minimum flash intensity and the "-" setting disables flashing.

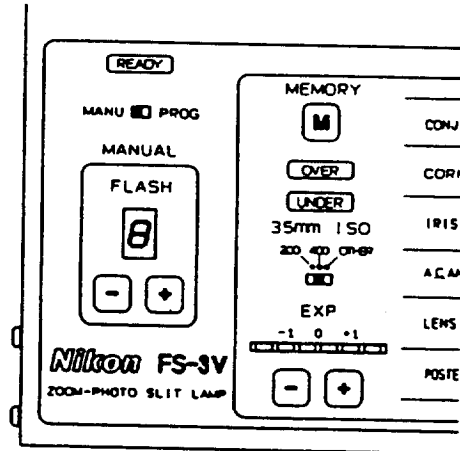


Figure 34

3) Photographing

You can take a photograph by pressing the shutter release button on the joystick lever.

Before taking a photograph, make sure that the READY LED on the power unit control panel is lit. You can take no photograph when this LED is off.

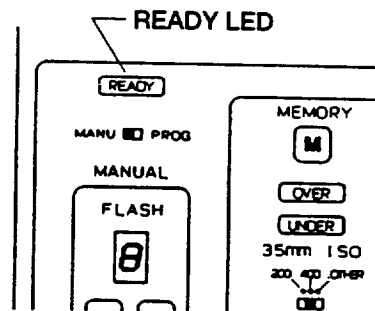


Figure 35

5-4 Summary of Photo-taking Actions for Manual Exposure Photographing

Film used: 35mm ISO 400 Magnification: Approx. 13 to 20

Filter: "No Filter" or "Heat Absorption Filter Only" is assumed unless specifically specified.

Photographic Area		Diffuser	Slit Width (Full Open = 14 mm dia.)	Flash intensity (Add 1 to the values listed below for Polaroid photography.)	Background Illumination Fiber
External area	External area (diffusing)	○	Full open	2	OFF
	Conjunctiva (diffusing)	○	Full open	2	OFF
	Sclera (diffusing)	○	Full open	1	OFF
Cornea	Cornea surface (diffusing)	○	Full open	4	OFF
	Cornea surface (fluor)(with blue filter)	×	Full open	4	OFF
	Cornea surface (sclera diffusion method)	×	2-3 mm	4	OFF
	Endothelium (with Endothelium attachment)	×	0.1-0.2 mm	5	OFF
	Slit	×	0.1-0.2 mm	5	M or OFF
		×	0.08-0.1 mm	6	L or OFF
		×	0.08 mm or less	7 or 8	L or OFF
Iris	Slit	×	0.2 mm or more	1	H or OFF
	(Tangential illumination)	×	0.2 mm or more	2	H or OFF
	(Diffusing)	○	Full open	6	OFF
Anterior chamber angle	(with Gonioscope lens)	×	2-3 mm	4	OFF
Crystalline lens	(Diffusing)	○	Full open	4	OFF
	Retro	×	1-2 mm	5	OFF
	Slit	×	0.08-0.1 mm	7	L or OFF
		×	0.08 mm or less	8	L or OFF
Fundus	(with 90D lens)	×	2-3 mm	4	OFF
	(with 3-mirror lens)	×	2-3 mm	4	OFF
Patient record	(Diffusing)	○	Full open	1	OFF

The flash intensity values listed in the chart on Page 35 assume the standard manual photographic conditions (35mm ISO 400 film, 13x to 20x). For the photographic conditions listed below, add or subtract appropriate correction values to the flash intensity values listed in the chart on Page 35.

1) When the magnification is changed

Magnification	Correction Value
7.5X to approx. 13X	-1
Approx. 20 to approx. 25X	+1
Approx. 25 to 32.3X	+2

2) When the film is changed

Film ISO	Correction Value
35 mm (ISO 200)	+2
35 mm (ISO 800)	-2

3) For Polaroid photography

Film	Correction value
Polaroid (ISO 640)	+1

Over- and under-exposure conditions will result if the compensation yields flash intensities of less than 0 and greater than 9, respectively.

Example: When taking an "iris (diffusing)" photograph at a magnification of 10X using an ISO 200 film, set the flash intensity to 7 based on the following computation:

6	-	1	+	2	=	7
↑		↑		↑		↑
Taken from the chart on Page 35		From correction table 1) above		From correction table 2) above		Flash intensity

5-5 Error Messages

This section describes the error messages that the FS-3V may indicate on the flash intensity indicator (Page 9) on the program power unit control panel and the actions you should take.

1) "E" (programmed photographic mode only)

When the flash intensity indicator shows "E," temporarily set the POWER switch to OFF.

Error display

This message indicates a poor connection between the power unit and the main unit or camera attachment. Turn off the power unit and check the cables.

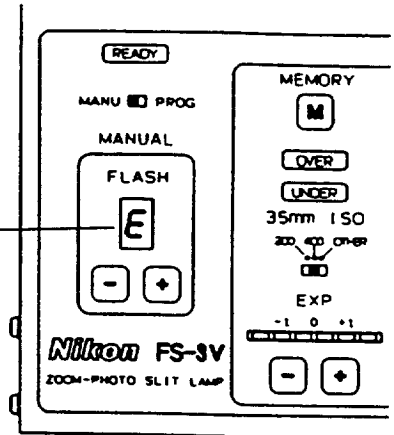


Figure 36

2) "H"

When the flash intensity indicator shows "H," temporarily set the POWER switch to OFF and to ON in several minutes. If the "H" message reappears, it indicates that the FS-3V is faulty. Stop using the FS-3V.

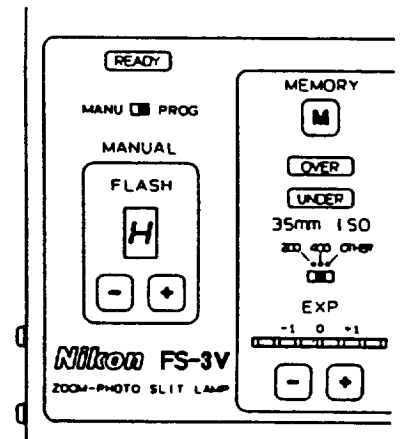


Figure 37

3) "F"

The "F" message is displayed when you keep flashing consecutively for a certain period of time to disable subsequent flashing. Wait several minutes and until the "F" message disappears before resume photographing.

4) "P"

This message indicates that the FS-3V settings have reset to their factory settings due to a memory error occurring in the program power unit. As the settings listed below are reset to their factory settings, they need be reset by the user. The exposure characteristics of the FS-3V is affected substantially if the settings of the 35mm ISO "OTHER" position is used and a 35mm film is used. Pressing any key turns off the "P" message and restores the FS-3V into its normal operating state.

- Initial settings stored in the program power unit (See Page 25).
- Customized programmed exposure values when a still video adapter is used (see the instruction manual for the still video adapter used).

5) "o"

This message indicates a memory error which is caused by an unidentified error. The settings listed below are invalid and cannot be used if the "o" message reappears when the FS-3V is switched off and on again. You can use the FS-3V, however, if the factory settings are adequate. Pressing any key turns off the "o" message and restores the FS-3V into its normal operating state.

- Initial settings stored in the program power unit (See Page 25).
- Customized programmed exposure values when a still video adapter is used (see the instruction manual for the still video adapter used).

6) "y"

This message indicates an error that occurred near the ISO speed switch. The FS-3V will be defective if the "y" message persists when you slide the switch several times. You can use the FS-3V, however, in the manual exposure mode.

5-6 Note

The FS-3V photographs the image that is viewed through the right-hand eyepiece lens. Check the photographic area referring to the reticle before taking a photograph (Page 14). Note that the FS-3V does not use for photography the image that is viewed through the left-hand eyepiece lens.

6. Options (Other than the Camera Attachment)

6-1 Non-contact Endothelium Attachment

You can observe and photograph endothelium cells without applanating the patient's cornea by replacing the objective lens with the non-contact endothelium attachment.

The valid observation magnification range is from 56.3X to 241.9X. The photographic magnification range is from 7.5X to 32.2X for the 35mm camera and from 15.0X to 64.4X for the Polaroid attachment.

1) Installation

- (1) Remove the objective lens case from the main unit by turning it counterclockwise. Use the attached rubber band for easy removal.

- **Do not touch the lens surface.**
- **The objective lens case you removed may have a shim attached. Never remove this shim from the objective lens case.**

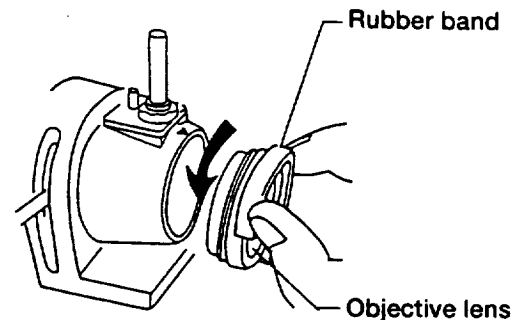


Figure 38-1

- (2) Align the index line of the endothelium attachment with the triangle mark on the main unit and insert the attachment into the main unit.

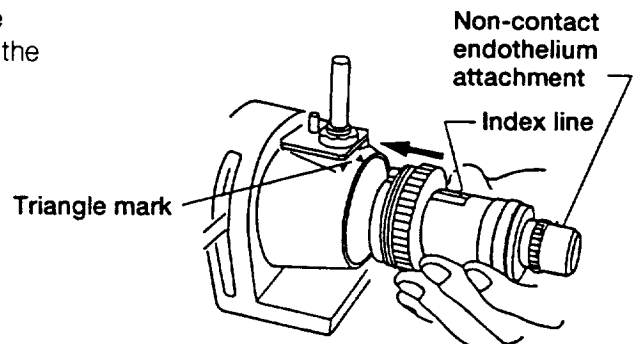


Figure 38-2

- (3) While holding the endothelium attachment with one hand, turn the lock ring with the other hand to secure the attachment.

Place the attached cap on the endothelium attachment when not in use.

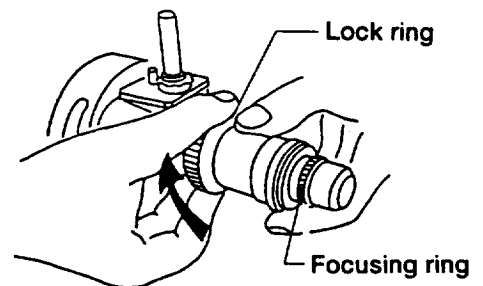


Figure 38-3

2) Specular method

The specular reflection method is used to take photographs of endothelium.

It is necessary to orient the illumination system (I) and microscope (M) in the "regular reflection position" (where the perpendicular line (P) becomes the bisector of (I) and (M)).

The appropriate angle between (I) and (M) is approximately 60 degrees and the appropriate slit width is from 0.1 to 0.2 mm.

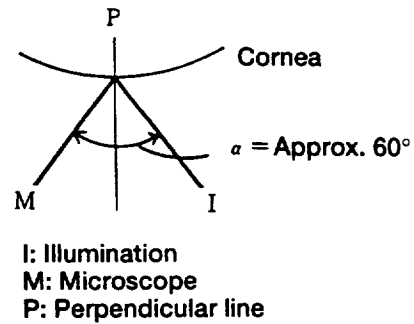


Figure 39-1

Endothelium cells are viewed as shown in the figure to the right. The reflection from the corneal surface appears extremely bright. To find endothelial cells easily, find this reflection first, then search for nearby endothelium cells. (You can find endothelium cells easier at lower magnifications. Change to a higher magnification once you located endothelium cells.)

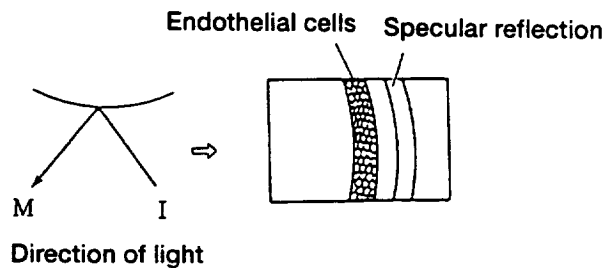


Figure 39-2

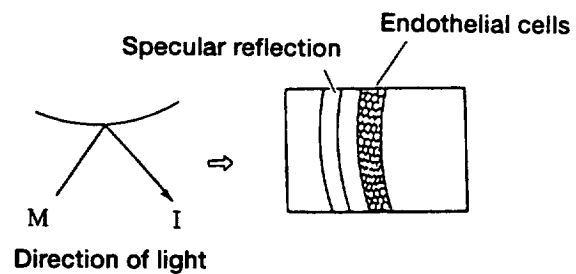
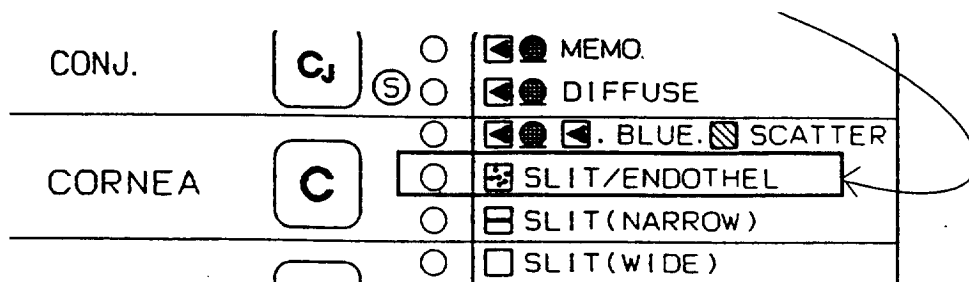


Figure 39-3

3) Photographic procedure

(1) Setting the program power unit

To perform programmed photography, set the program power unit as shown in the figure below (Pages 32 and 33).



To perform manual photography, refer to the following standard flash intensities (Pages 35 and 36).

Film speed	Slit Width	FS-3V Zoom Magnification control Lever Setting	Flash Intensity
35 mm ISO 400	0.1~0.2 mm	7.5X~13X	5
		20X~25X	6
		25X~32.3X	7
Polaroid Type 779 ISO 640	0.1~0.2 mm	※ 7.5X~13X	6
		20X~25X	7
		25X~32.3X	8

※ In the Polaroid photographic mode, the actual photographic magnifications twice the zoom magnification control lever setting.
(Example: 32.3X indicated ⇨ 64.4X Polaroid photographic magnification)

(2) Eyepiece lens

The FS-3V assumes that the right eye is used (you cannot use the FS-3V with the left eye).

- ① Do not forget to make a dioptric adjustment on the eyepiece lens. Be sure to focus on the reticle (Page 16).
- ② After completing the dioptric adjustment, turn the focusing ring on the endothelium attachment so that the surface of the target rod is in focus.

(3) Focusing

Focusing must be done basically using the joystick lever. For final minute focusing, turn the focusing ring on the endothelium attachment.

(4) Photographic magnification

The appropriate photographic magnification ranges from 7.5X to 32.3X (15X to 64.4X for Polaroid photographing). Judging from the size of endothelium cells, the recommended magnification range is approximately 25X to 32.3X (50X to 64.4X for Polaroid photographing). Use a lower magnification first, then change to a higher magnification once you find endothelium cells.

6-2 CCTV Attachment

You can record the observed image realtime by using an extension tube and a CCTV attachment. The FS-3V can connect to a CCTV using one of four types of mounts: 1/2-inch C-mount, 1/3-inch C-mount, bayonet mounts (for SONY CCTVs and for TOSHIBA CCTVs). When taking photos with a CCTV attachment, be sure to set the beam splitter located on the left side of the extension tube to the "IN" position. You can use the aperture adjusting lever to adjust the light quantity and the depth of field.

- When installing only a CCTV attachment
Install the CCTV attachment as shown in Figure 40.

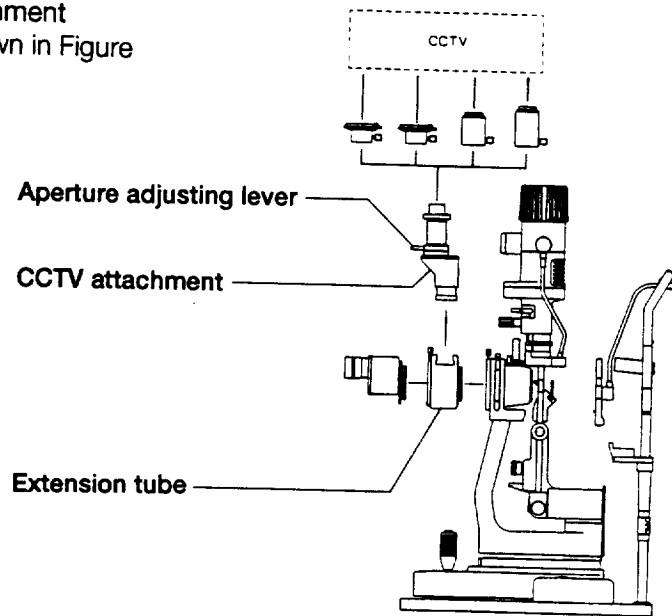


Figure 40

- When installing both CCTV and 35mm photographic attachments
Install the 35mm photographic attachment first on the zoom lens barrel assembly as shown in Figure 41. Subsequently, install the CCTV attachment with an extension tube.

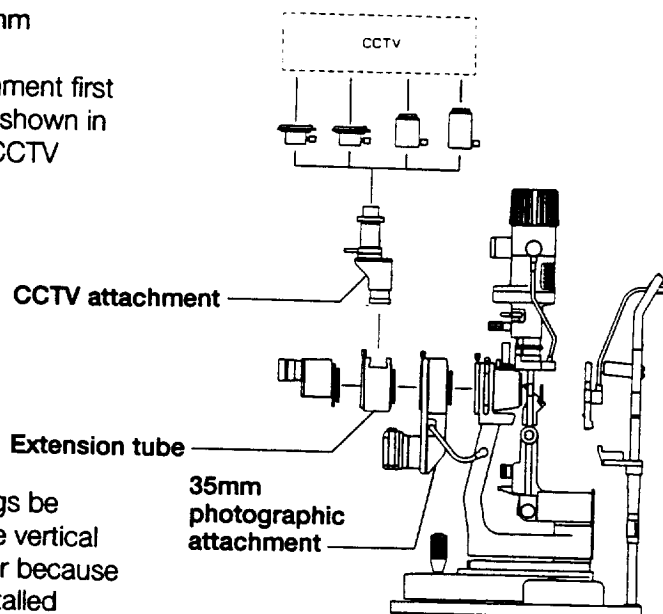


Figure 41

It is recommended that auxiliary springs be inserted into the cross-slide table if the vertical movement of the main unit gets slower because of two types of attachments being installed (contact your Nikon sales representative).

No CCTV attachment can be installed together with a Polaroid attachment or teaching tube.

6-3 Teaching Tube

Another person, in addition to the examiner, can observe the image by using an extension tube and a teaching tube.

When observing using a teaching tube, be sure to set the beam splitter located on the left side of the extension tube to the "IN" position.

- When installing only a teaching tube
Install the teaching tube as shown in Figure 42

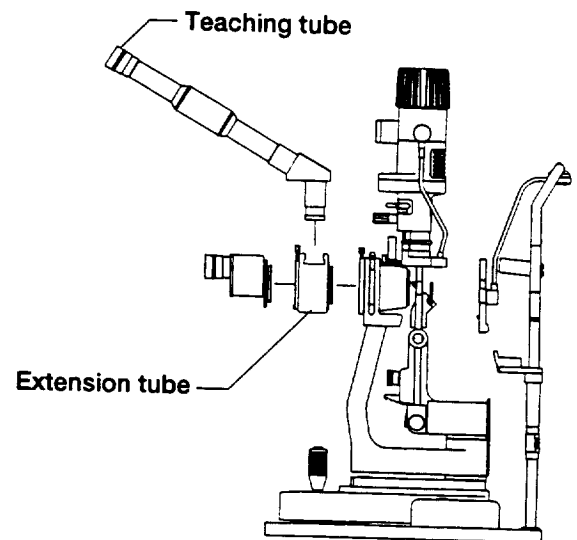


Figure 42

- When installing both teaching tube and 35mm photographic attachment
Install the 35mm photographic attachment first on the zoom lens barrel assembly as shown in Figure 43. Subsequently, install the teaching tube with an extension tube.

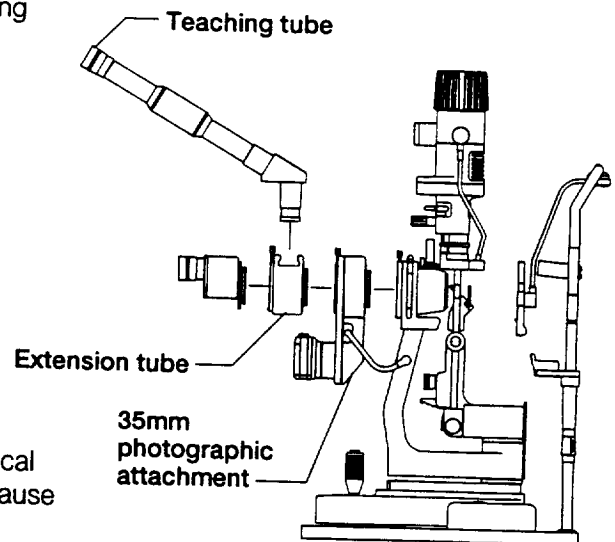


Figure 43

It is recommended that auxiliary springs be inserted into the cross-slide table if the vertical movement of the main unit gets slower because of two types of attachments being installed (contact your Nikon sales representative).

No teaching tube can be installed together with a Polaroid or CCTV attachment.

6-4 90D Holder

The 90D holder, when used with a Nikon 90D lens, enables stable fundus observation. See the figure shown below to install the 90D holder. For instructions on the 90D lens, refer to the instruction manual attached to the lens.

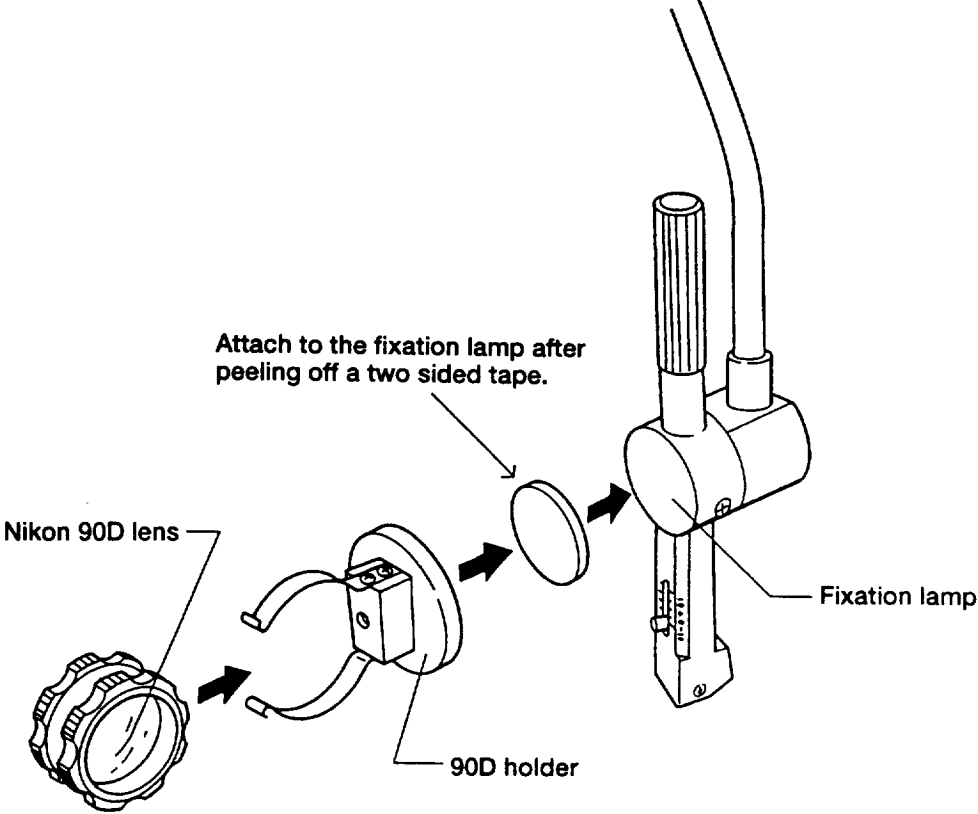


Figure 44

6-5 Retro Unit

The retro unit facilitates the observation of retro image that is derived from the light reflected from the fundus. It is used to observe cataract crystalline lenses and other crystalline lenses.

Setup

Remove the attached mirror and install the retro unit instead as shown in Figure 45.

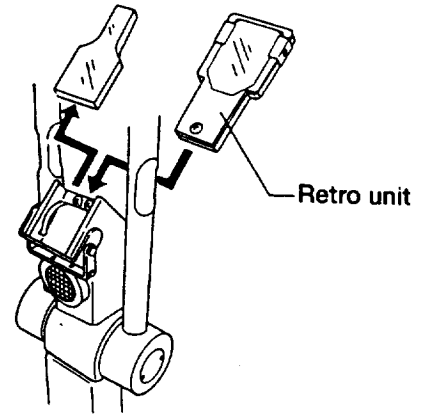


Figure 45

Observation procedure

Set and determine the mounting angles of the slit lamp observation and illumination systems as shown in Figure 46.

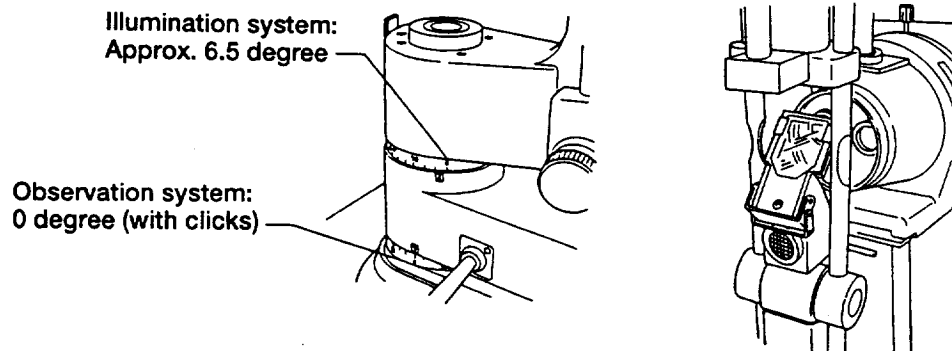


Figure 46

Loosen the centering knob to allow the illuminating light (slit light) to swing, and you can find the point where the light reflected from the fundus is the brightest. (Figure 47)

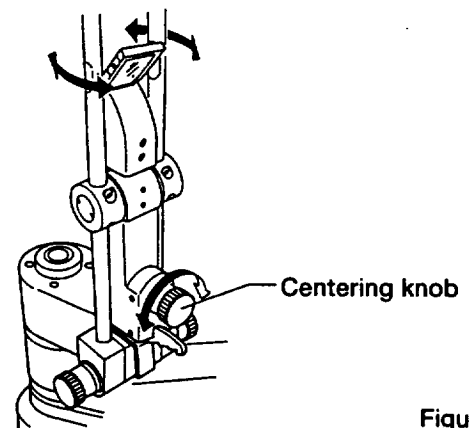


Figure 47

You observe the retro image with a single eye. You can observe the retro image through the eyepiece on the side on which the retro unit is installed. In the example in Figure 46, the retro image is observed through the right-hand side eyepiece. Note that no photograph can be taken when the retro image is observed through the left-hand side eyepiece.

7. Maintenance

7-1 Fuse Replacement

Be sure to unplug the power cord before replacing a fuse.

While inserting the tip of a flat-top screwdriver along the left or right tab of the fuse holder and holding the fuse holder by the left and right sides, pull out the fuse holder.

The ratings of the fuse for the illumination power (for 100V/120V area) are T 0.8 A/250V.

The ratings of the fuses for the program power unit are:

- 100V/120V area: T 8A/250V
- 230V area: T 4A/250V

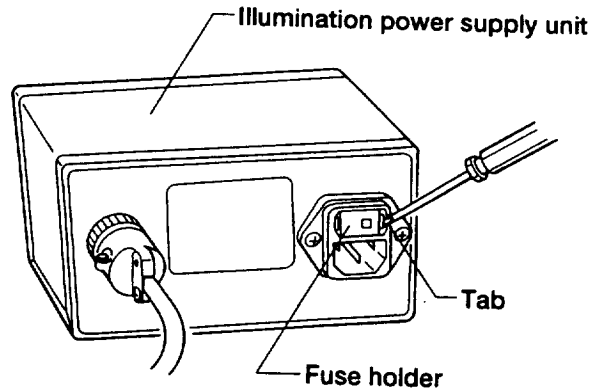


Figure 48

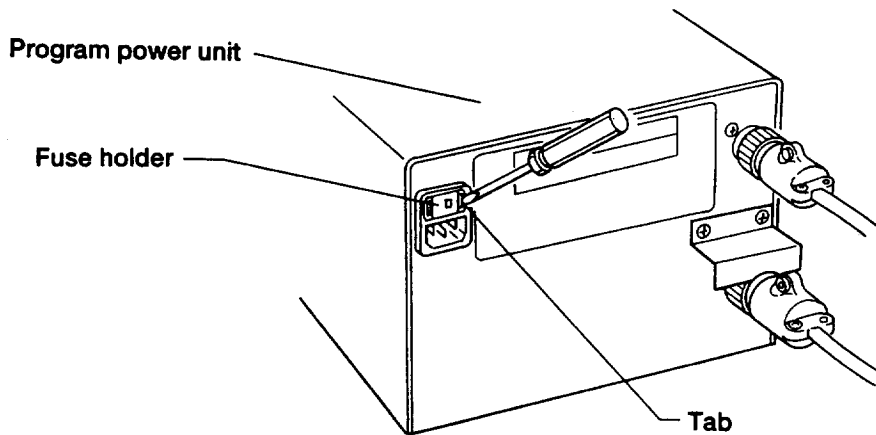


Figure 49

A voltage selector is housed on one side of the fuse holder. Set the orientation of the voltage selector so that the number identifying the correct operating voltage (100V in Japan) appears in the voltage display window.

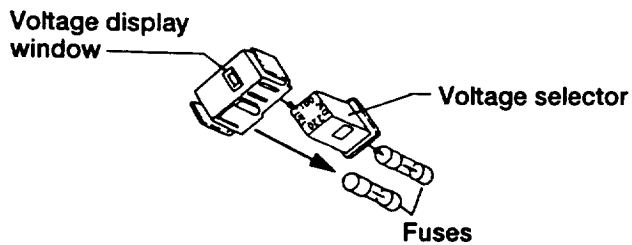


Figure 50

7-2 Illumination Lamp and Flash Tube Replacement

1) Illumination lamp replacement

Be sure to unplug the power cord before replacing the illumination lamp.

The lamp (halogen lamp) used as the illumination lamp is extremely hot while it is on. When replacing this lamp, be sure to turn off the power, unplug the power cord, and wait 10 minutes or so until the lamp bulb is sufficiently cooled down. Then, replace the lamp with a Nikon-endorsed lamp. If immediate replacement is required, hold the bulb using a thick cloth.

- (1) Turn the lamp cap lock screws (3 screws) counterclockwise and remove the cap (using a Phillips screwdriver).
- (2) Loosen the lamp clamp screw by turning it counterclockwise. Set the lamp retaining plate aside and, while grasping the lamp socket, pull the lamp assembly toward you. Pull the lamp out of the lamp socket.

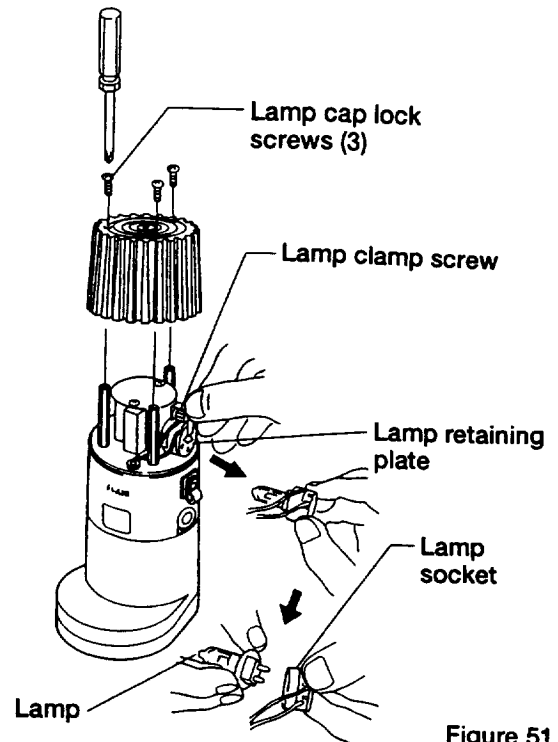


Figure 51

- (3) When installing a new lamp, make sure that the indent on the lamp socket is in exact alignment with the lamp house spring on the main unit side.

Do not touch the glass part of the lamp directly with fingers. Fingerprint or any dirt on the lamp may shorten the lamp's life.

- (4) Replace the lamp retaining plate and tighten the lamp clamp screw.

2) Flash lamp replacement

Be sure to set the POWER switch to OFF ("O" position) and unplug the power cord before replacing the flash lamp.

- (1) Using a Phillips screwdriver, loosen the cable clamp screw located on the bottom part of the side panel of the lamp house and remove the flash lamp cable (Figure 52).
- (2) Unplug the synchro cable from the flash synchro connector.
- (3) Pull the flash tube out of the socket.
- (4) Remove two Phillips screws with a Phillips screwdriver (Figure 53).
- (5) Remove the flash tube from the trigger circuit base (Figure 54).

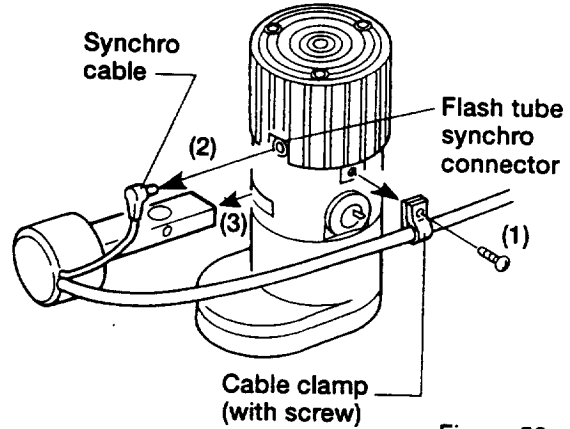


Figure 52

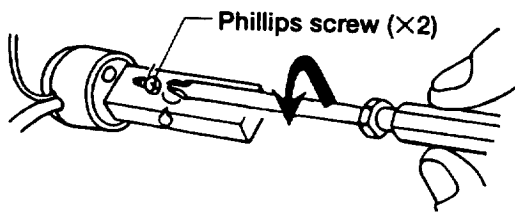


Figure 53

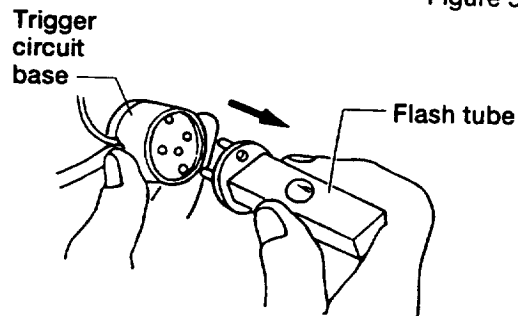


Figure 54

- (6) For the procedure to install a new flash tube, see "Installing the flash tube (xenon flash) on the main unit" on Page 18.

7-3 Cleaning

Clean the chin rest and forehead rest with alcohol.

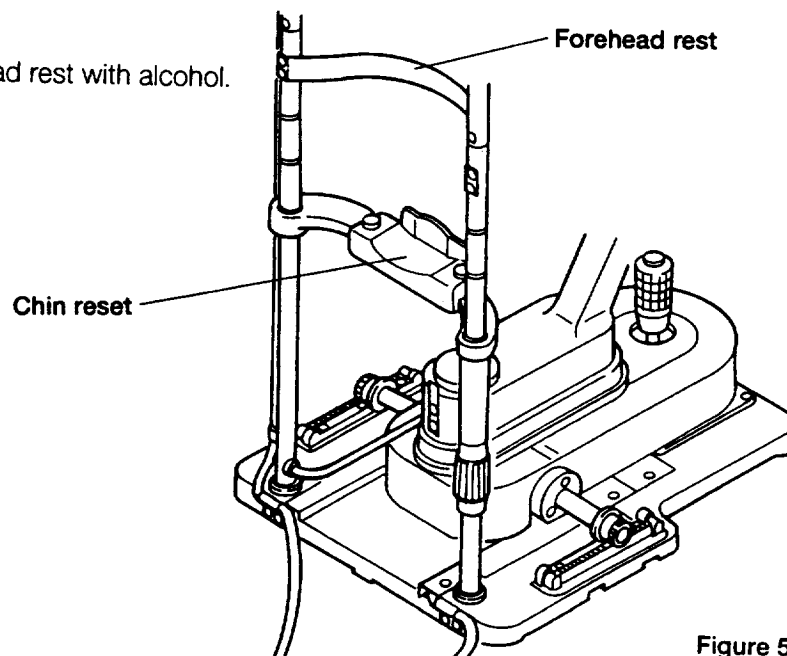


Figure 55

7-4 In Case the Slit Width Gets Narrower during Observation

The problem of the slit width getting narrower during observation is attributed to a slotted screw at the center of the slit width adjustment knob. Slightly turn this screw clockwise with a flat-top screwdriver.

- *Excessive tightening of the slotted screw clockwise will make the movement of the slit width adjustment knob slower.*
- *Do not turn the slotted screw fully counterclockwise. The screw will come off. Once this screw is removed, you may have to call your sales representative for repair.*

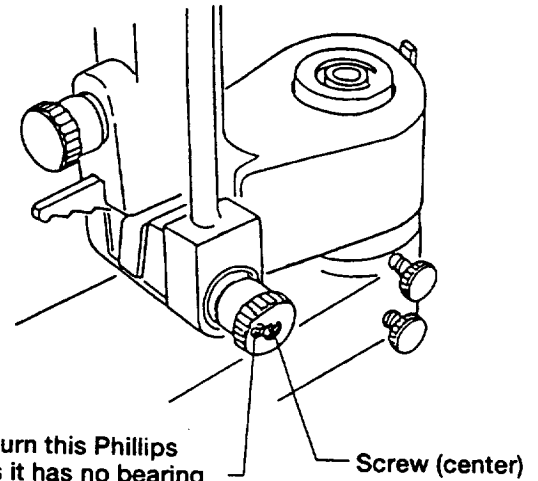


Figure 56

7-5 Zero-position Adjustment of the Slit Width Adjustment Knob

- (1) While observing through the eyepiece lens, turn the slit width adjustment knob clockwise and stop when the slit is fully closed.

Never turn the slit width adjustment knob counterclockwise.

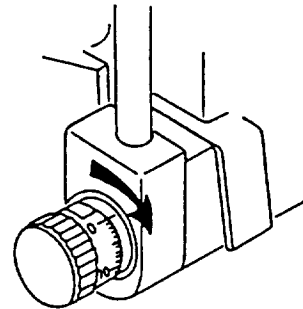


Figure 57

- (2) Loosen the set screw (located between the seals on the knob bottom) on the scale ring to set the scale ring free.

Do not turn the slit width adjustment knob at this moment.

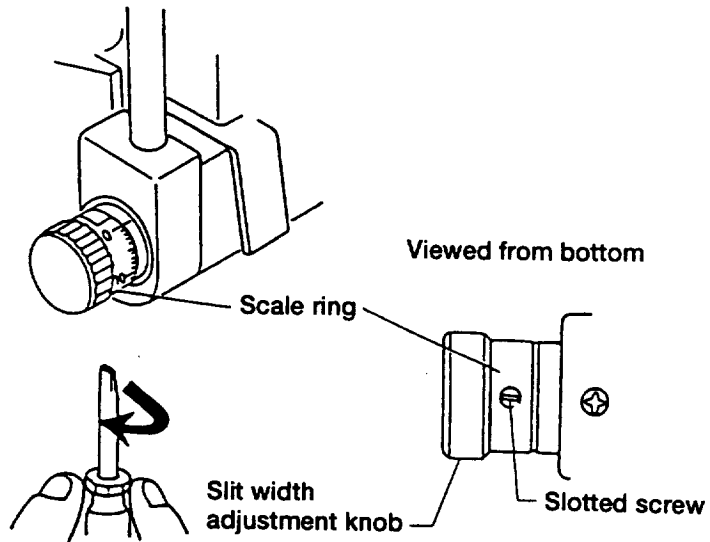


Figure 58

- (3) Turn the scale ring until the "0" index on the seal on the scale ring is in alignment with the reference index and tighten the set screw you loosened in step (2).

Do not turn the slit width adjustment knob at this moment.

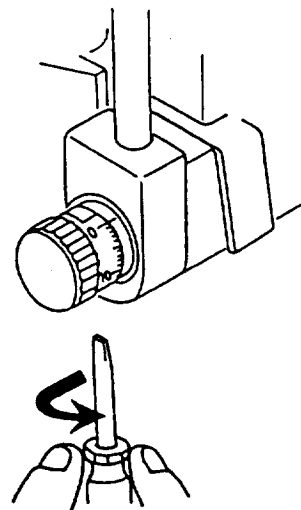



Figure 59

(4) Checking

Turn the slit width adjustment knob one turn clockwise and make sure that the slit is closed when the index line is set to "0." Repeat steps (1) to (3) if the slit is not closed.

8. Simple Checks

- (1) Make the following checks if the illuminator will not light or it turns off during use:
 - ① Neither pilot lamp on the illumination power supply nor illumination lamp will not light.
 - Check for a blown fuse.
 - Check connections between the power cord and power outlet, between the power cord and the power inlet at the illumination power supply in the main unit.
 - ② The pilot lamp on the illumination power supply is on but the illumination lamp will not light.
 - Make sure that the slit is open.
 - Check the illumination lamp for poor connection.
 - Check for blown illumination lamp.
- (2) If the microscope is out of focus, it may indicate that the eyepiece lens sleeve may not be inserted to its end.
- (3) A blurred illumination is an indication that the illumination lamp does not fit in place. Replace the illumination lamp if the problem is not corrected even when the lamp is reinstalled.
- (4) Other checks
 - ① The slit may appear like . This is caused when the illumination viewfield is set to as large as 14 mm dia. This raises no problem if the slit registration is sharp at its center part.
 - ② A complete slit shape may not be obtained at an illumination viewfield of 0.2 mm dia. This will, however, cause no problem.

9. Major Specifications

9-1 Main Unit

1) Illumination system

Slit width:	0 to 14 mm continuous
Illumination viewfield:	0.2, 1, 2, 5, 10, 14 mm, 1-12 mm continuous
Slit rotation:	0, 5, 10, 15, 20° (from bottom)
Filter:	Transparent, heat absorption, ND, green, cobalt blue
Light source:	12V, 30W halogen lamp (precenter)

2) Microscope

Type:	Stereoscopic zoom microscope (zoom ratio: 4.3X)
Objective lens magnification ratio:	0.6X to 2.58X
Eyepiece magnification (standard):	12.5x (20x is optional)
Total observation magnification:	7.5X to 32.3X (when 12.5X is used) 12X to 51.6X (when 20X is used)
Eyepiece diopter compensation range:	+5D to -5D
PD adjustment range:	55 mm to 75 mm
Working distance:	100 mm
Reaching distance:	335 mm (when a 35mm photographic attachment is used)

3) Cross-slide table

Horizontal motion:	100 × 110 mm (manipulated by the joystick lever)
Vertical motion:	30 mm (by turning the joystick lever)
Controls:	Shutter release button (on top of the joystick lever) Illumination control (top portion of cross-slide table) Boost switch (top portion of cross-slide table)

4) Physical dimensions

Height from table top to patient eye:	375 mm
Main unit dimensions :	330 × 735 × 405 mm (width × height × depth)

5) Weight:

Approx. 13 kg

9-2 Options

- 1) **35mm photographic attachment**
 - Photographic light path: Right eye (quick-turn mirror system)
 - Photographic magnification: 1X to 4.3X
 - Camera used: Nikon TN-1F

- 2) **Polaroid photographic attachment**
 - Photographic light path: Right eye (quick-turn mirror system)
 - Photographic magnification: 2X to 8.6X
 - Film used: Type 779

- 3) **Endothelium attachment**
 - Photographic light path: Right eye
 - Photographic magnification: 7.5X to 32.3X (with 35mm photographic attachment)
15X to 64.6X (with Polaroid photographic attachment)

- 4) **CCTV attachment**
 - Mount: C-mount or bayonet mount
 - Photographic magnification: 0.3X to 1.2X

- 5) **Teaching tube**
 - Photographic magnification: 7.5X to 32.3X

- 6) **Illumination power supply**
 - Input voltage: 100 VAC
 - Power consumption: 60 W
 - Weight: Approx. 1.6 kg

- 7) **Program power unit**
 - Light source: Xenon flash, 500 W/s
 - Exposure mode: Programmed exposure, manual exposure
 - Recharging time: Approx. 3 seconds maximum
 - Input voltage: 100 VAC
 - Power consumption: 1 kW max.
 - Weight: Approx. 9.6 kg

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