

INSTRUCTION MANUAL
RETINAL CAMERA

TRC-50EX

Topcon TRC-50EX Retinal Camera Instruction Manual

For digital camera upgrades and service contact:

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INTRODUCTION

Thank you for your purchasing the TOPCON TRC-50EX Retinal Camera.

THIS INSTRUMENT HAS THE FOLLOWING FEATURES:

- This instrument assists the user in obtaining pictures of exceptional and stable quality.
 - The instrument is easier to use and operate than previous models.
 - A wide variety of optional accessories are available for diverse photographic and imaging purposes.
-

This manual provides an outline, basic operation, troubleshooting, maintenance and cleaning methods for the TRC-50EX Retinal Camera.

Please carefully read the "Display for Safe Use" and the "Safety precautions" before putting this instrument into operation.

Always keep this manual at hand.

PRECAUTIONS



- Ensure that this instrument is used and stored in a controlled environment under normal temperature and humidity conditions, and avoid direct exposure to sunlight.
 - Never install this instrument on an uneven or loose floor.
 - Always check that all cables are correctly connected before use.
 - Be sure to ground the instrument for compatibility with high currents. Never disable the grounding plug of the power cord.
 - Use a power supply within the range of $\pm 10\%$ of the rated voltage of AC100V $\pm 10\%$ (50/60 Hz).
 - Keep the installation site always clean, and while the instrument is not in operation, turn off the power switch and use the dust cover.
 - To obtain clear images, be sure the objective lens is not smeared with fingerprints and/or stains.
-

DISPLAY FOR SAFE USE




In order to encourage the safe use of products and prevent any danger to the operator and others or damage to existing facilities, important warnings are put on the products and inserted in the instruction manuals.

We suggest that everyone understand the meaning of the following displays and icons before reading the "Safety precautions" and text.

Meaning of displays

Display	Meaning
 WARNING	Ignoring or disregarding this display may result in serious injury or lead to life threatening situations.
 CAUTION	Ignoring or disregarding this display may lead to personal injury or severe instrument or facilities damage.
<ul style="list-style-type: none">■ Injury potential includes hurt, burn, electric shock, etc.■ Facilities damage refers to extensive damage to buildings, equipment and furniture.	

Meaning of icons



Icons	Meaning
	This indicates Mandatory Action. Specific content is expressed with words or an image located close to the icon.
	This icon indicates Hazard Alert (Warning). Specific content is expressed with words or an image located close to the icon.
	This indicates Prohibition. Specific content is expressed with words or an image located close to the icon.

SAFETY PRECAUTIONS






This instruction manual specifies safety precautions necessary to prevent accidents.

Always observe these precautions and use the instrument correctly.








⚠ DANGER

Icons	Prevention item	Page
 Mandatory	<ul style="list-style-type: none"> After fluorescein is injected, ensure that the patient is not afflicted with an allergic reaction or shock. Fluorescein may cause an allergic reaction or shock as side effects that can, if serious, result in death. If there are signs of an allergic reaction or shock, stop photographic operation immediately and give appropriate first-aid treatment. 	41
 Mandatory	<ul style="list-style-type: none"> We suggest inspecting for any side effects of fluorescein by performing a preliminary test. Fluorescein is capable of producing lethal side effects. 	41











⚠ WARNING

Icons	Prevention item	Page
 No Disassembling	<ul style="list-style-type: none"> Do not disassemble, remodel or repair this instrument. Such actions may cause electric shock. If repairing is necessary, be sure to contact your authorized dealer and ask for repair services. 	18
 No Disassembling	<ul style="list-style-type: none"> Do not remove covers from the bottom, power supply unit and main body. Such actions may result in electric shock. 	18
 No contact with water	<ul style="list-style-type: none"> Keep this instrument away from water or other liquids. A fire or electric shock may otherwise occur. 	
 Prohibited	<ul style="list-style-type: none"> Avoid the presence of water-filled glasses or other containers in the vicinity. Infiltration of water may lead to a fire or electric shock. 	41
 Prohibited	<ul style="list-style-type: none"> Do not insert or drop metals into the ventilation holes or clearances. Such actions may invoke electric shock. 	









! WARNING

Icons	Prevention Item	Page
 Mandatory	<ul style="list-style-type: none"> Pay attention to the side effects of mydriatic drops. Mydriatic drops may invoke severe side effects. 	27 36 41
 Mandatory	<ul style="list-style-type: none"> Connect the power plug to a grounded three-pin AC outlet. Other types of outlets may not allow grounding, possibly causing a fire or electric shock due to short circuits. 	20
 Mandatory	<ul style="list-style-type: none"> Disconnect the power plug from the outlet before removing a fuse for replacing. Removing the fuse cover without disconnecting the power plug, may result in electric shock. Also avoid connecting the power plug to the outlet with the fuse uncovered. 	64
 Mandatory	<ul style="list-style-type: none"> Be sure to use a properly rated fuse provided in the accessory box. Use of other than a properly rated fuse may lead to a fire at the time of a malfunction. 	64
 Mandatory	<ul style="list-style-type: none"> Disconnect the power plug from the outlet before uncovering the lamphouse cover. Electric shock may occur if you uncover the lamp house without disconnecting the power plug. Also ensure that the power plug is not connected to the outlet while the lamp house is uncovered. 	18 44 64
 Mandatory	<ul style="list-style-type: none"> Disconnect the power plug from the outlet before assembling the instrument. Electric shock may otherwise occur. Conversely, do not connect the power plug to the outlet when assembling the instrument. 	
 Unplug	<ul style="list-style-type: none"> In the event of any conditions such as smoke, turn off the power switch immediately and disconnect the power plug from the outlet. Continued use in spite of such conditions, may lead to a fire. For repair service, contact your authorized dealer. 	

CAUTION

Icons	Prevention Item	Page
 Prohibited	<ul style="list-style-type: none"> • Ensure that the illumination lamp is not brighter than necessary. Excessive intensity may result in patient discomfort. 	27 36 41
 Prohibited	<ul style="list-style-type: none"> • Ensure that light brighter than necessary is not used for photography. Excessive intensity may result in patient discomfort. 	36 41
 Prohibited	<ul style="list-style-type: none"> • Do not install the instrument on a slope or in a unstable place. The instrument may become unstable, fall or harm people nearby. 	18 46 64
 Prohibited	<ul style="list-style-type: none"> • Do not connect or disconnect the power plug with the wet hands. Such actions may invoke electric shock. 	
 Prohibited	<ul style="list-style-type: none"> • Avoid insertion of the hands between the power supply unit and the base. When the base is moved, the hands may be pinched or injured. 	27 36 41 46 47
 Prohibited	<ul style="list-style-type: none"> • Ensure that nobody's hands are inserted between the main body and the lower arm. When the main body is tilted, the hands may be pinched or injured. 	27 36 41 46
 Prohibited	<ul style="list-style-type: none"> • Ensure that nobody's hands are inserted between the chinrest support and the lower or upper arm. * This warning is mostly directed towards the patient. When the main body is moved, the hands may be pinched or injured. 	27 36 41 46
 Prohibited	<ul style="list-style-type: none"> • Do not hold the head strap or chinrest support when transporting the instrument. Such action may lead to dropping the instrument and may cause bodily injuries. 	18
 Prohibited	<ul style="list-style-type: none"> • Do not replace the lamp immediately after it burns out. The lamp unit will still be extremely hot. You may get burnt if you touch it. 	64
 Prohibited	<ul style="list-style-type: none"> • Do not replace any filters just after the lamp is turned off. The lamp unit will still be extremely hot. You may get burnt if you touch it. 	44

! CAUTION

Icons	Prevention Item	Page
 Mandatory	<ul style="list-style-type: none"> • Pay attention to the clearance between the objective lens and the patient. When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury. 	27 36 41 46 47
 Mandatory	<ul style="list-style-type: none"> • Ensure that the instrument is transported by two persons both holding the bottom. Single-handed transportation is very dangerous, possibly causing the one who is carrying to hurt his back or become injured if they drop the instrument. Holding other than the bottom may also pinch the hands and result in dropping the instrument. 	18
 Mandatory	<ul style="list-style-type: none"> • Prior to transportation, suppress camera motions by turning the base fixing lever and the swing arm locking lever. Transportation without setting these levers may unbalance the instrument, thereby resulting in dropping the instruments. 	18
 Mandatory	<ul style="list-style-type: none"> • Prior to transportation, suppress vertical motions by locking the tilt brake lever. Transportation without setting this lever may unbalance the instrument, thereby resulting in dropping the instrument. 	18
 Mandatory	<ul style="list-style-type: none"> • When setting the tilting unit stopper, ensure that the screwdriver is inserted completely into the hole in the tilting unit. If incompletely inserted, the screwdriver may come off, causing the main body to fall off and may result in bodily injuries. 	22
 Mandatory	<ul style="list-style-type: none"> • Disconnect the power plug from the outlet before measuring the power frequency. Electric shock may otherwise occur. 	20
 Mandatory	<ul style="list-style-type: none"> • Ensure that the 35mm camera is installed firmly by fastening the 35mm camera body locking lever. If installed loose, the camera may fall off, resulting in severe damage to the unit and possible bodily injury. 	27 53
 Mandatory	<ul style="list-style-type: none"> • When installing accessories, secure them firmly by fastening the accessory locking lever. If installed loose, the accessories may fall off, leading to possible bodily injury. 	53

USAGE AND MAINTENANCE

Purpose

This retinal camera is a precision electrical device for medical use that must be used under the instructions of a doctor.

User maintenance

Unless specified in this manual, the maintenance work shall be conducted only by a trained service technician, to ensure the safety and performance of the instrument. The following maintenance tasks however, may be executed by the customer. Regarding the maintenance method, review the applicable text in this manual.

Fuse replacement

The primary and secondary fuses for the main body may be replaced by a non-trained service technician. For details, refer to the applicable text in this manual.

Lamp replacing

Illumination lamp and xenon lamp may be replaced by a non-trained technician. For details, refer to the applicable text in this manual.

Cleaning of the objective lens

The objective lens may be cleaned by a non-trained technician. For details, refer to the applicable text in this manual.

TOPCON GENERAL INSTRUMENT STATEMENTS

- TOPCON shall not take any responsibility for damage due to fire, earthquakes, actions by third persons and other accidents, or the negligence and misuse by the user or use under unusual conditions.
- TOPCON shall not take any responsibility for damage derived from the inability to use this equipment, such as a loss of business profit and suspension of business.
- TOPCON shall not take any responsibility for damage caused by operations other than those described in this Instruction Manual.
- Diagnoses made are the responsibility of pertaining doctors and TOPCON shall not take any responsibility for the results of such diagnoses.

WARNING INDICATIONS AND POSITIONS

To ensure safe usage of this equipment, precaution indications are provided.
Abide the following warning instructions .

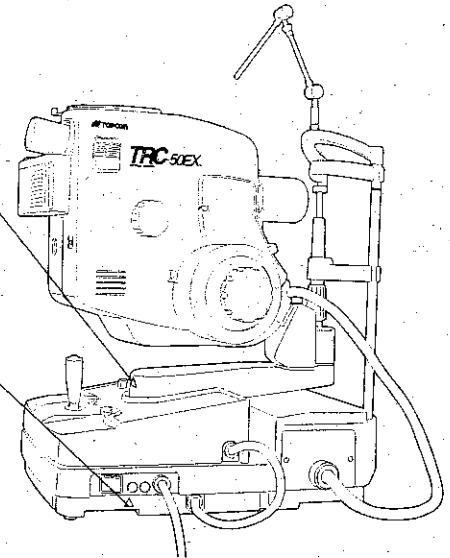
CAUTION

Observe the following safety precautions when operating the main body

- Be careful not to have your fingers pinched between any movable parts.
- Exercise caution not to allow the instrument to bump against the eye or nose of the patient.

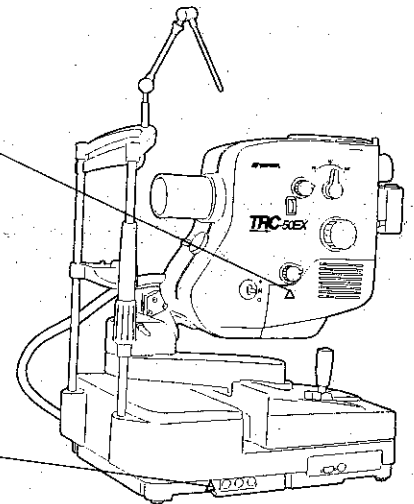


- When replacing the fuse, turn off the power switch and unplug the power cord in advance. Electric shock may otherwise occur.
- Use only a properly rated.



CAUTION

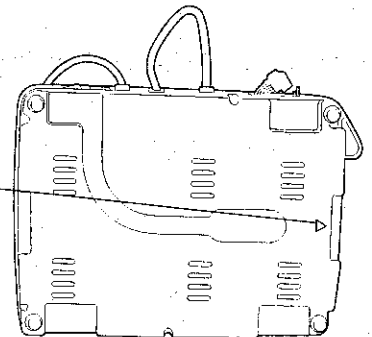
- Before replacing the lamp unit, turn off the power switch to prevent electric shock.
- Avoid replacing the lamp unit just after the lamp is turned off because it is still hot enough to cause burns.



- When replacing the fuse, turn off the power switch and unplug the power cord in advance to prevent electric shock.
- Use only a properly rated.

CAUTION

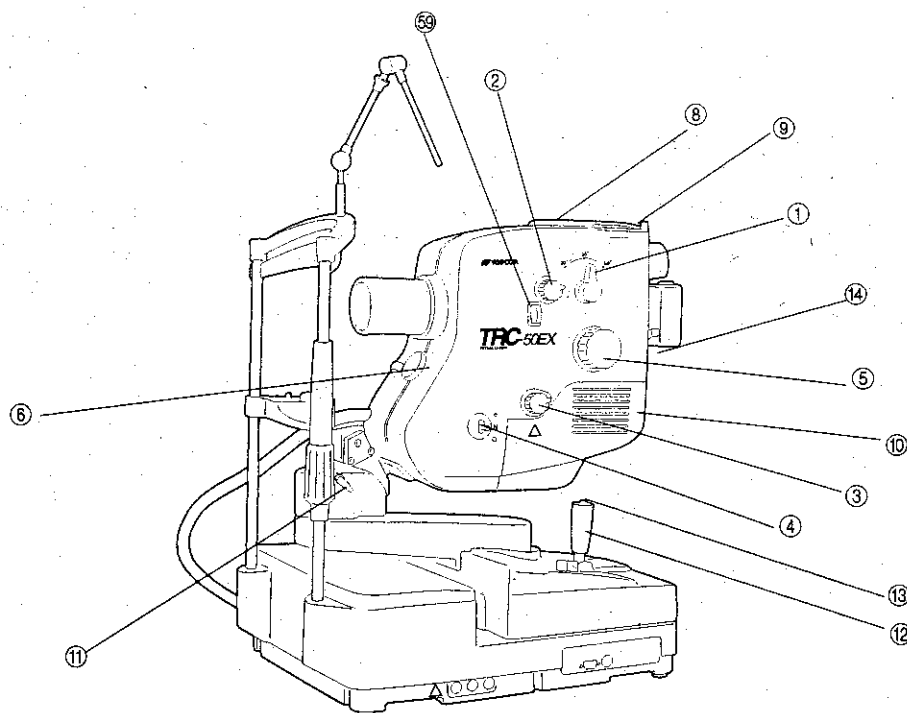
- Do not remove this cover. Such an action presents unnecessary risks.



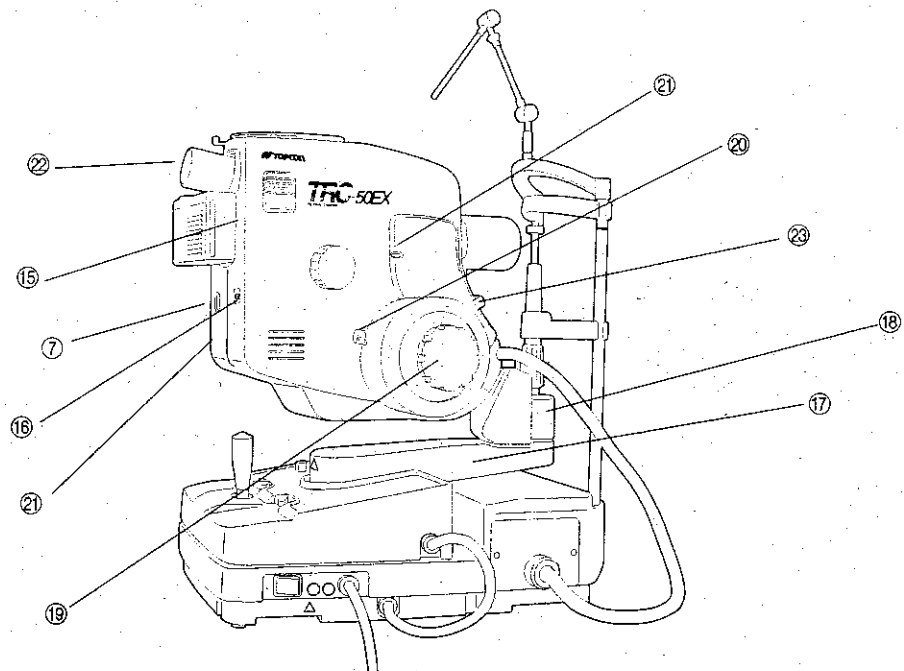
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Main Body

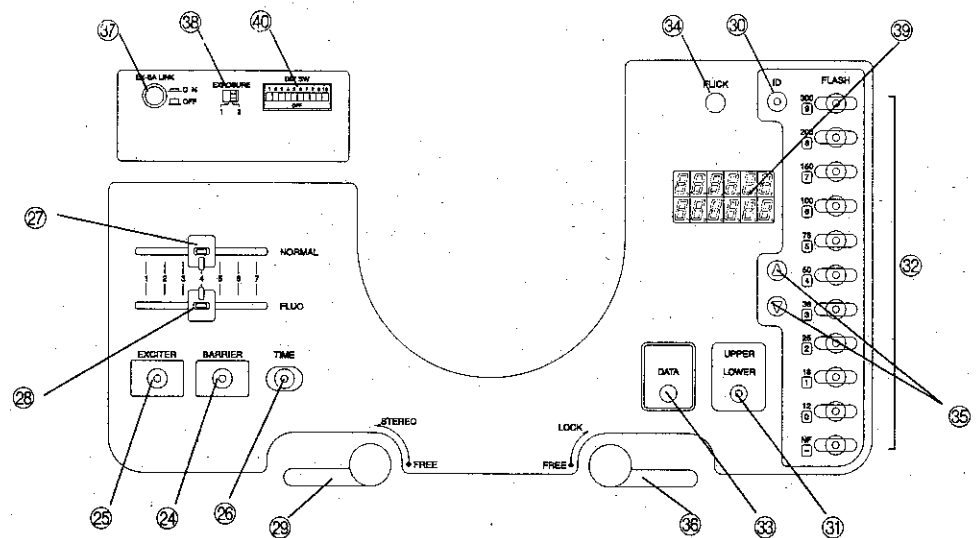


- ① Angle changing lever 50°, 35° or 20° can be selected as an angle of coverage.
- ② Diopter compensation knob Used to compensate the dioptric power of strong myopia and hyperopia in the patient and also used for ocular anterior photography.
- ③ Filter switching knob Changed for different kinds of photography.
- ④ Illumination diaphragm lever When dilation is sufficient, set on N. When dilation is not sufficient, set the angle to 35° or 20° and set on “.”. In the case of fluorescein angiography, set on “•”..
- ⑤ Focusing knob
- ⑥ Internal fixation target mount The optional internal fixation target can be mounted.
- ⑦ Data plate insertion slot The data plate on which patient's information is written can be inserted for photographing information together with the retinal image.
- ⑧ Accessories mount Optional accessories (Polaroid attachments, different relay lenses) can be mounted here.
- ⑨ Accessory locking lever
- ⑩ Lamphouse cover
- ⑪ Swing arm locking lever
- ⑫ Control lever Enables traverse and fore-and-aft fine adjustment of the main body. Vertical adjustment of the main body is also possible by this lever.
- ⑬ Astigmatic correction knob Rotated for obtaining a uniform focus, when taking peripheral photographs.



- ⑬ Shutter release button Xenon lamp flashes upon depressing the shutter release button.
- ⑭ 35 mm camera body locking lever
- ⑮ Mount for 35 mm camera body
- ⑯ Alignment illumination point switch
- ⑰ Lower arm
- ⑱ Upper arm Swings up to 30° to the right and left.
- ⑲ Tilting handle Swings up to 15° upward and 10° downward.
- ⑳ Tilt brake lever Turned to make tilt free and locked, and for adjusting the brake force.
- ㉑ Horizontal index window Indicates red when the main body is level (tilt 0°).
- ㉒ Finder
- ㉓ Cable holder

Control Unit



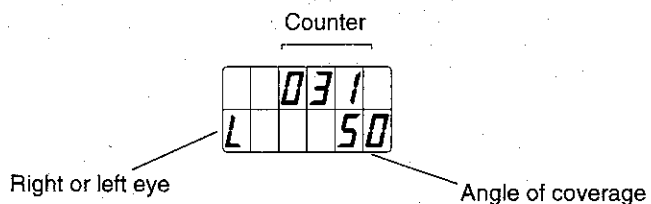
- ②④ BARRIER switch.....Press the switch to set the barrier filter. Press again to remove the filter.
- ②⑤ EXCITER switch.....Press this switch to set the excitation filter. Press again to remove the excitation filter.
- ②⑥ TIME switch.....The timer starts upon pressing once and stops when pressed a second time.
- ②⑦ NORMAL knobIllumination adjustment for normal color photography.
- ②⑧ FLUO knobIllumination adjustment for fluorescein photography.
- ②⑨ STEREO lever.....Tighten the lever and stereo photography is possible by moving the base right and left.
- ③⑩ ID switch.....Under the ID mode, the switch sets the DATA input mode, and fixes the input data (numerals) (cancels the DATA input mode).
.....In the counter mode, pressing this switch clears the counter to "001."
- ③⑪ UPPER/LOWER selector switch
.....When UPPER is selected, photography by the UPPER set camera is possible.
.....When POWER SAVE works, push this switch to resume.
- ③⑫ Flash intensity switch
.....Photography light intensity can be selected in 11 steps. NF means no light emission from the xenon flash lamp.
.....Under the ID mode, the switches work as the numeral keys "-", 0 to 9" for data input.
- ③⑬ DATA switch.....To photograph the patient physical record, push the switch and let the xenon lamp flash.
- ③⑭ FLICK switchSwitches the fixation target between lighting and flicking.
- ③⑮ Flash correction switches
.....Increases or decreases the preset light intensity. Press the Δ button to increase it or the ∇ button to decrease it. For example, when the preset light quantity is 36WS, one press of the Δ button changes the setting to a value between 36WS and 50WS and illuminates both switches (36) and (50).
- ③⑯ Base fixing lever (LOCK)

- ③⑦ EX-BA LINK switch..... With this switch set to ON, fluorescein filter is interlocked at the time of (FA Filter Setting)..... photographic operation. Interlocking can be canceled by turning it off. (Photographing is possible using a blue filter.)
- ③⑧ EXPOSURE switch..... Set this switch to "1" for manual mode or to "2" for program mode.
- ③⑨ Data display unit..... Displays data recorded on film (counter, timer, I.D., angle of coverage and left or right eye).
- ④⑩ Dip switches

Data shown on the data display unit

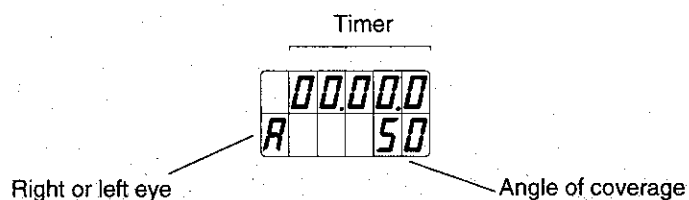
• Counter mode

The displayed data is restored to "001" when the ID switch is pressed.



• Timer mode

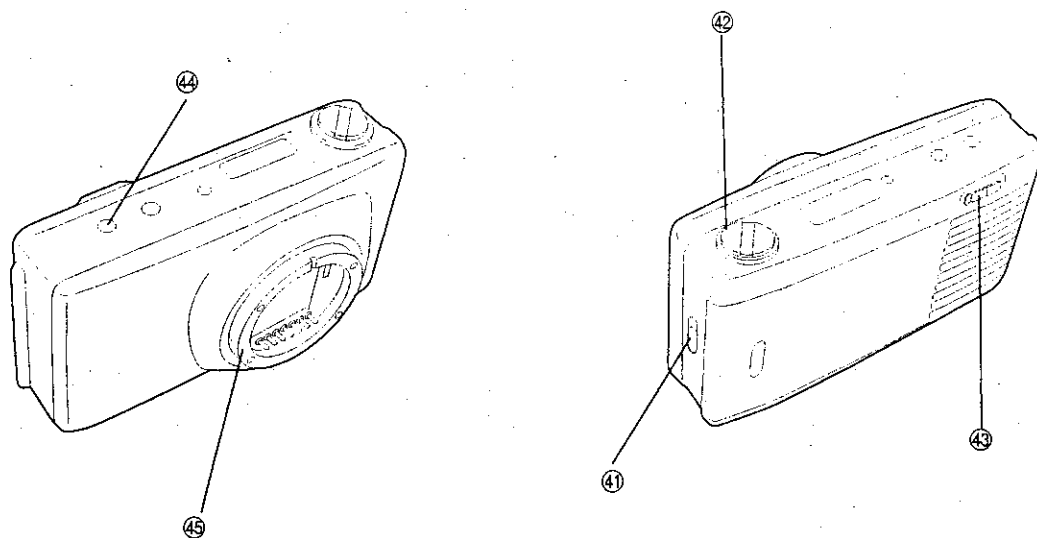
This mode is activated when the TIMER switch is pressed once.



• ID mode

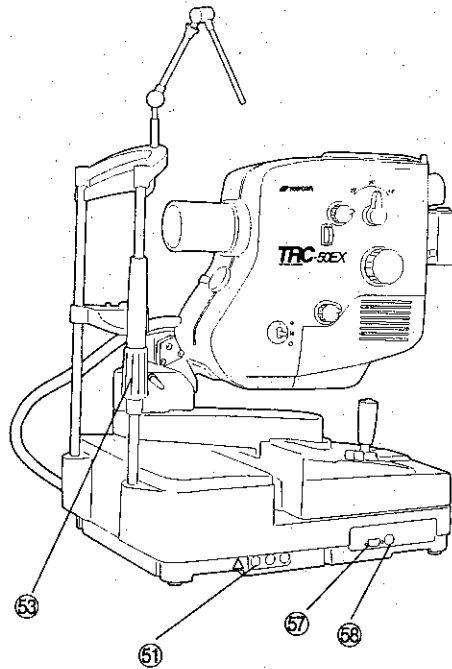
Refer to "Recording Patient Data by ID Mode."

35 mm camera

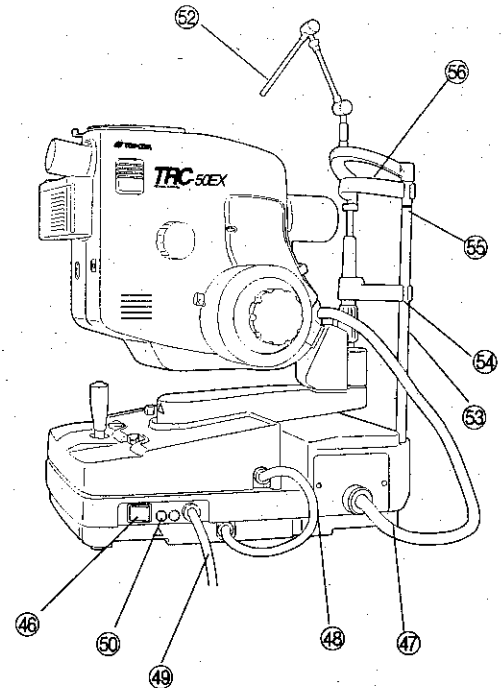


- ④① Back-cover release lever
- ④② Rewinding crank
- ④③ Rewind switch
- ④④ Film counter
- ④⑤ Mount

Power Supply Unit



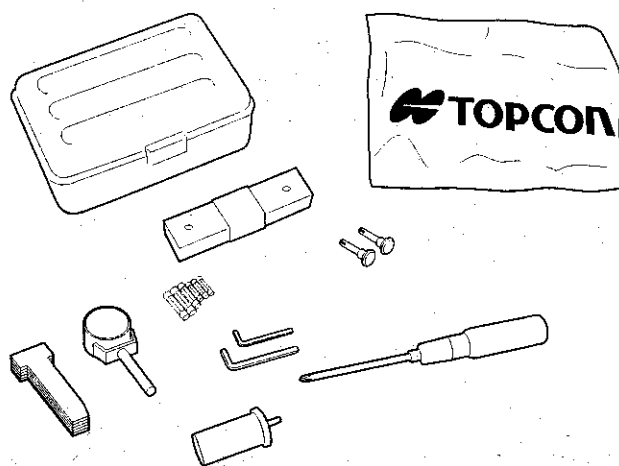
- ④⑥ Power switch
- ④⑦ Body connection cord
- ④⑧ Base connecting cord
- ④⑨ Power cord
- ⑤① Primary fuse holder
- ⑤① Secondary fuse holder
- ⑤② External fixation target
- ⑤③ Chinrest adjusting knob



- ⑤④ Chinrest
- ⑤⑤ Height level marker: Patient's eye must be aligned with this marking.
- ⑤⑥ Head strap
- ⑤⑦ CONTROL terminal: Used for connection with IMAGE net.
- ⑤⑧ DATA terminal: Used for communications with IMAGE net.

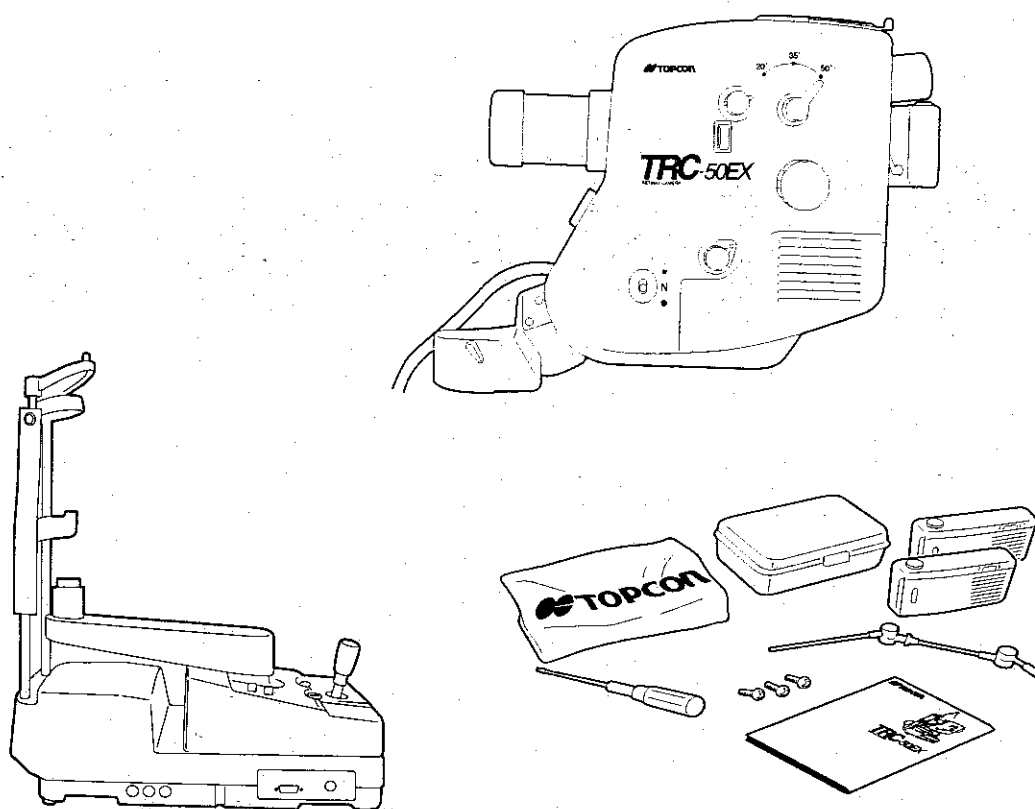
Accessories

	Quantity		Quantity
• Accessories case	1	• Hexagonal wrench (large)	1
• Dust cover	1	• Hexagonal wrench (small)	1
• Chinrest paper	1	• Phillips screwdriver	1
• Chinrest paper fastening pins	2	• Tilt brake lever	1
• Fuses	5	• Internal Fixation target	1
• Data plate	5		



ASSEMBLY

Components



Description		Quantity	Casing	Description	Quantity	Casing
Main body		1	Main body	Dust cover	1	Main body
Power supply unit		1	Power supply unit	Instruction Manual	1	Main body
Accessories case			Power supply unit	35mm camera	2	Power supply unit
Available in the case	• Chinrest paper	1		Fixation target	1	Power supply unit
	• Chinrest paper fastening pins	4		Phillips screwdriver	1	Main body
	• Fuses	5		Connector cover	3	Main body
	• Data plate	5		set screw		
	• Hexagonal wrench (large)	1				
	• Hexagonal wrench (small)	1				
	• Tilt brake lever	1				

Assembling procedure

When handling the main body and power supply unit, hold them firmly. If dropped or if your hands and fingers are caught between components, they may cause injury.

CAUTION

- Do not disassemble, remodel or repair this instrument. Such actions may cause electric shock. If repairing is necessary, be sure to contact your authorized dealer and ask for repair services.

CAUTION

- Do not remove covers from the bottom, power supply unit and main body. Such actions may result in electric shock.

CAUTION

- Disconnect the power plug from the outlet before assembling the instrument. Electric shock may otherwise occur. Conversely, do not connect the power plug to the outlet when assembling the instrument.

CAUTION

- Do not install the instrument on a slope or in a unstable place. The instrument may become unstable, fall or harm people nearby.

CAUTION

- Do not hold the head strap or chinrest support when transporting the instrument. Such action may lead to dropping the instrument and may cause bodily injuries.

CAUTION

- Ensure that the instrument is transported by two persons both holding the bottom. Single-handed transportation is very dangerous, possibly causing the one who is carrying to hurt his back or become injured if they drop the instrument. Holding other than the bottom may also pinch the hands and result in dropping the instrument.

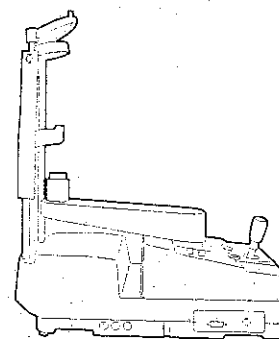
CAUTION

- Prior to transportation, suppress camera motions by turning the base fixing lever and the swing arm locking lever. Transportation without setting these levers may unbalance the instrument, thereby resulting in dropping the instrument.

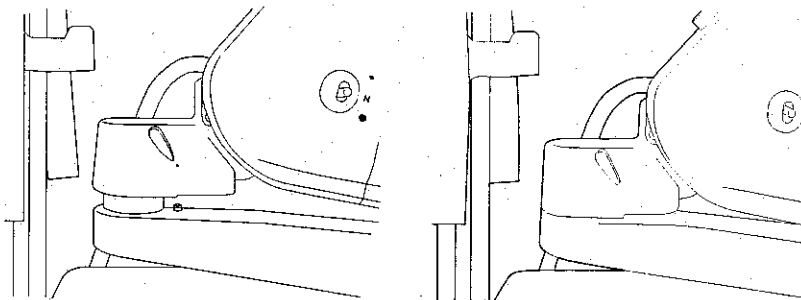
CAUTION

- Prior to transportation, suppress vertical motions by locking the tilt brake lever. Transportation without setting this lever may unbalance the instrument, thereby resulting in dropping the instrument.

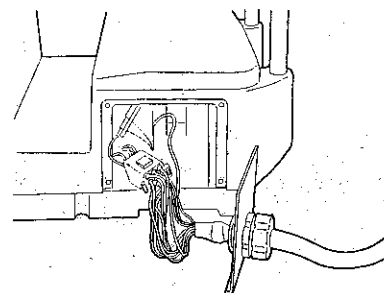
- (1) Remove the power supply unit from its storage box and place on a table.
• Be careful not to have your fingers pinched.



- (2) Set the upper arm fixing knob to the dot mark position.



- (3) Insert the upper arm over the shaft protruding from the lower arm.
Fasten the screw at the tip of the upper arm, using the attached hexagonal wrench.

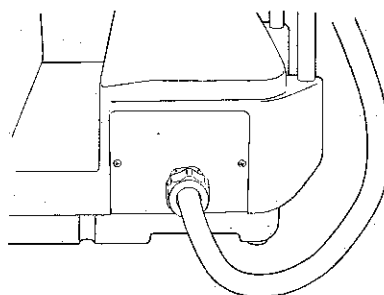


- (4) From the punched portion provided on side face of the power supply unit, take out the connector (socket).

- (5) Connect the connector (socket) to the connector (plug) of the main body.

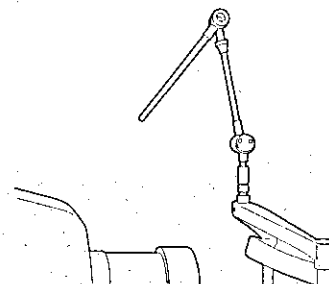
- (6) Also, connect another connector (plug) to the connector (socket) provided on the substrate.

- (7) Place the cord back into position without bending it, and fit the connector cover onto the side of the power supply unit. Fix the connector cover with screws.



- (8) Mount the external fixation target.

- (9) Install a 35 mm camera.
(Refer to "Preparations for Photography" in the Instruction Manual.)



Checking after assembly

WARNING

- Connect the power plug to a grounded three-pin AC outlet.

Other types of outlets may not allow grounding, possibly causing a fire or electric shock due to short circuits.

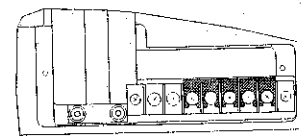
CAUTION

- Disconnect the power plug from the outlet before measuring the power frequency.

Electric shocks may otherwise occur.

(1) Checking the primary voltage

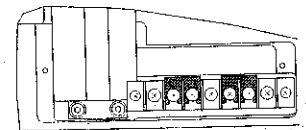
Check that input voltage is within the range of $\pm 10\%$ of the rated voltage. For higher input voltage, a constant-voltage power supply (commercial product) must be used.



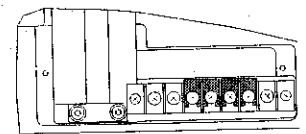
120 V

(2) Checking the power supply outlet

15A or higher electric current capacity is required. Make sure that your outlet is compatible with the three-pin plug of this instrument. In the event of incompatibility, consult an electrician and be sure to ground the instrument.



220/230 V



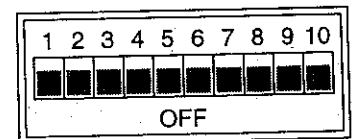
240 V

(3) Checking power frequency

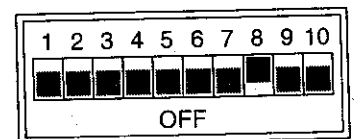
First of all turn the power switch OFF and disconnect the power cord from the outlet. Then, check that the No. 8 switch of the dip switch is set to the position corresponding to the frequency of your area.

Power frequency is set to 50 Hz at shipping. Check the frequency of your available power, and set the No. 8 switch to upper position for 60 Hz frequency.

Use of the instrument with 50 Hz power frequency in a 60 Hz area, results in the insufficient brightness of illumination lamp and the inability to adjust the optimum light intensity.



50 Hz



60 Hz

(4) Checking the control lever operation

Loosen the base fixing knob and operate the control lever to check if it moves smoothly.

- a. Horizontal movement
- b. Fore-and-aft movement
- c. Vertical movement

(5) Checking tilt balance

After any optional accessories are installed, tilt the body by loosening the tilt brake lever and check its balance.

Before shipping, the product is adjusted to keep balance when a Polaroid attachment is installed. Depending on the optional accessories installed, this balance may be incorrect. In such cases, adjust the balance as per the instructions given in "Tilting Power Balance Adjustment."

(6) Checking the illumination lamp

Connect the power cord and turn on the power switch. Check for illumination light by putting your hands before the objective lens.

(7) Checking the xenon lamp

Check if the xenon lamp illuminates by pressing the shutter release button with the UPPER/LOWER selector switch set to LOWER.

Tilt balance adjustment

The tilt has been adjusted based on the weight including Polaroid attachment. If a video set is installed or a Polaroid attachment is dismantled, the weight changes, unbalancing the tilt. In such cases, the tilt must be adjusted by the following method:

CAUTION

- When setting the tilting unit stopper, ensure that the screwdriver is inserted completely into the hole in the tilting unit.

If incompletely inserted, the screwdriver may come off, causing the main body to fall off and may result in bodily injuries.

(1) Tighten the tilt brake knob until it is locked and install optional accessories.

- Tilt brake knob is free when loosened and locked when tightened. Brake is increasingly applied as this knob is fastened.
- Tilt brake knob is rotatable up to about 2.5 turns to shift from free mode to the completely locked mode. Do not fasten the tilt brake knob too tight.

(2) Loosen the tilt brake knob until it becomes free and check the tilt balance.

(3) Remove a single screw and remove the tilt cover.

(4) Loosen the safety stopper screw.

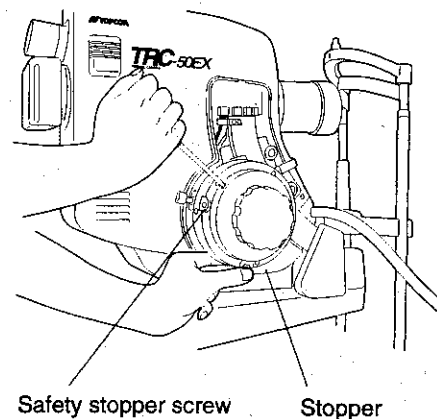
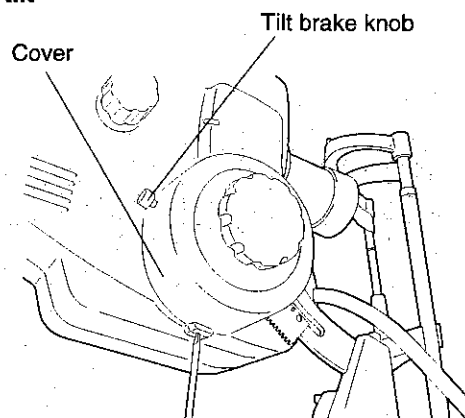
- Give about four turns to the safety stopper screw. There is no need to remove the screw.

(5) (If the body is heavy and too low)

Insert a screwdriver into the hole at the bottom of the tilting unit, turn it clockwise a little and while holding it in that position, grab the stopper as shown in the photo and pull it in the arrowhead direction.

- If the body is light and too high, insert a screwdriver into the hole at the top of the tilting unit and turn it counterclockwise.

(6) While holding the screwdriver as in step (5), turn it slightly clockwise until stopper disengages. Now, wind the spring by turning the screwdriver until the stopper is inserted.



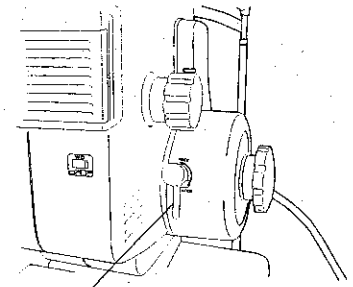
- After making sure that the stopper is completely inserted, pull out the screwdriver.
- (7) **Repeat the spring winding operations in steps (5) and (6) until the body stays level.**
- Verify tilt balance by carrying out tilting operation.
- (8) **Tighten the safety stopper screw and install the cover.**

Tilt Brake Lever adjustment

The attachment of the tilt brake lever allows for simple locking and releasing of the tilt mechanism.

How to attach tilt brake lever:

- (1) **Adjust the tilt balance according to accessories mounted.**
 - Refer to "Checking tilt balance".
- (2) **Turn the tilt brake knob to the locking position (clockwise).**
- (3) **Attach the tilt brake lever pointing toward the LOCK position.**
- (4) **Set the tilt brake lever to the "FREE" position and check the tilt operation tension. Set the LEVER to the "LOCK" position and check the locking capability.**
 - The position of the tilt brake lever will provide a range of tension for optimum performance. If the tilt capability is too loose, readjust the tilt brake lever on the knob to achieve the proper range of tension.
- (5) **When the proper range of tension is achieved, securely tighten set screws A and B.**
 - When readjusting the tilt balance due to addition or removal of accessories, it will be necessary to readjust and re-position the TILT BALANCE LEVER.

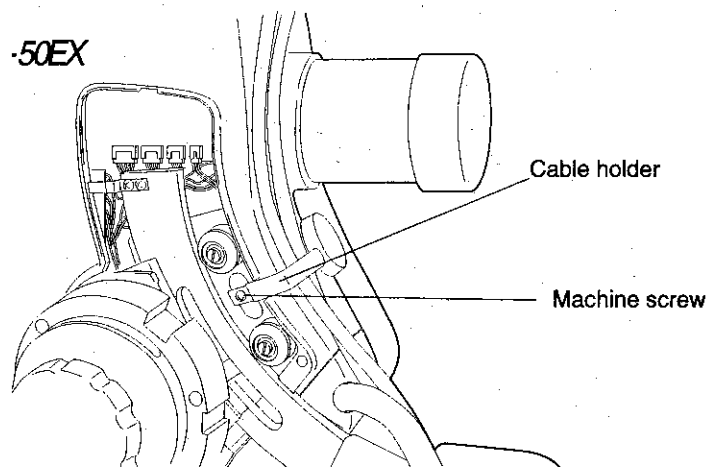


Tilt brake lever

Cable holder adjustment

In order to use an optional accessory video relay lens, the cable holder can be adjusted according to the number and thickness of cables used for the video camera.

- (1) **Remove the tilt cover.**
 - Refer to "Tilt balance adjustment".
- (2) **Loosen the screw from the cable holder and refasten it as required by the cables used.**

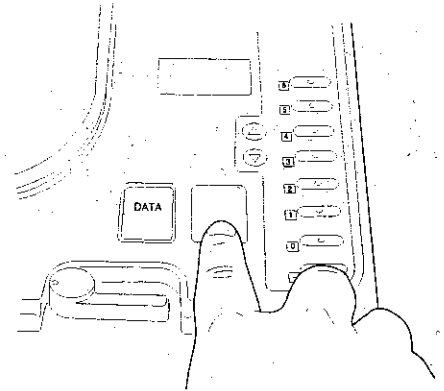


PREPARATIONS FOR USE

Power saving function

This system incorporates a power saving function.

- (1) The power saving function of this system automatically shuts off the power supply for the observation lamp when 30 minutes have passed without photographing.
However, in the case of fluorescein photography, the time is extended to one hour.
- (2) When the power saving function is activated, the LED of the UPPER/LOWER selector switch blinks. To return to the normal status, press the UPPER/LOWER selector switch.



BASIC OPERATION

WARNING

- Pay attention to the side effects of mydriatic drops. Mydriatic drops may invoke severe side effects.

CAUTION

- Ensure that the illumination lamp is not brighter than necessary. Excessive intensity may result in patient discomfort.

CAUTION

- Avoid insertion of the hands between the power supply unit and the base.
When the base is moved, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the main body and the lower arm.
When the main body is tilted, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the chinrest support and the lower or upper arm.
* This warning is mostly directed towards the patient.
When the main body is moved, the hands may be nipped or injured.

CAUTION

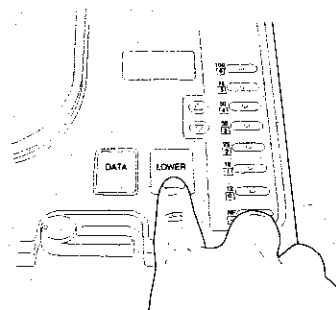
- Ensure that the 35mm camera is installed firmly by fastening the 35mm camera body locking lever.
If installed loose, the camera may fall off, resulting in severe damage to the unit and possible bodily injury.

CAUTION

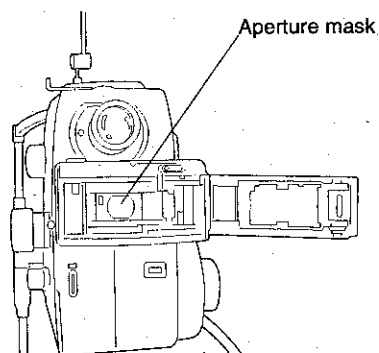
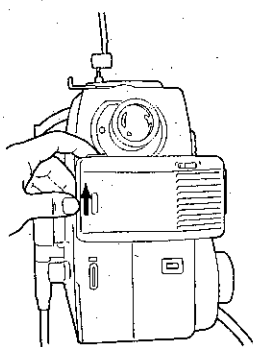
- Pay attention to the clearance between the objective lens and the patient.
When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury.

Preparing a 35 mm camera

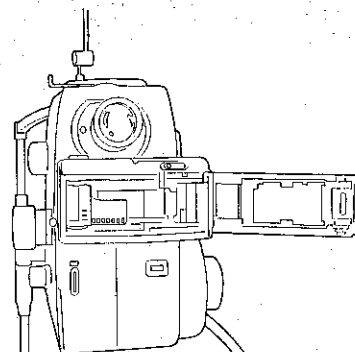
- (1) Turn ON the power switch of the power supply unit.
- (2) Press UPPER/LOWER selector switch to "LOWER" on the control unit.
This operation is unnecessary if there are no accessories installed.



- (3) Pull the back-cover locking lever upward.
35mm camera back-cover will be opened.

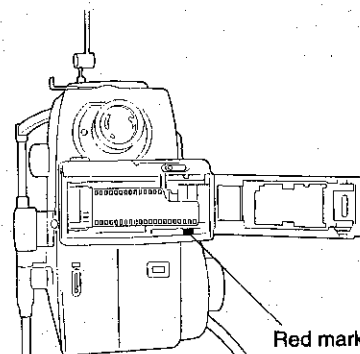


- (4) Put film in cartridge chamber.
Do not touch the aperture mask on the film rail.
It is easily damaged.



- (5) Draw out the end of film until it reaches the red mark and close the back cover.
Film is automatically wound until the film counter reads "1."

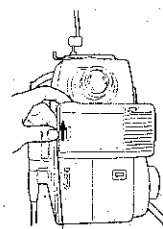
- When a 35 mm camera separately loaded with new film is mounted onto the main body, the film is automatically wound until the film counter reads "1."



Film rewinding and unloading

In the normal mode:

- (1) When film is used up, the red LED at the top of camera starts flashing with a sound of the buzzer and the film is rewound automatically.
- (2) After the film is rewound, open the back-cover by pushing up the back-cover release lever on the side of camera and unload the film.

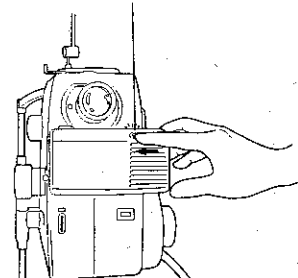


Back-cover release lever

In the intermediate rewinding mode:

- (1) When the film is partially used, if the rewind switch on the upper right of the back of camera is slid to the left, the red LED at the top of camera starts flashing with a sound of the buzzer, and the film is rewound automatically.

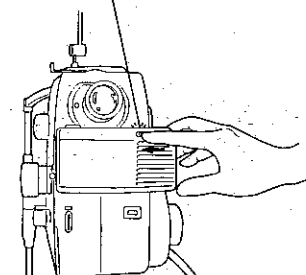
Rewind switch



Rewind switch

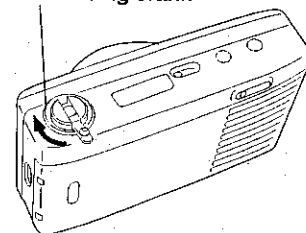
In the manual rewinding mode:

- (1) Dismount the 35 mm camera from the main body and slide the rewind switch to the left.



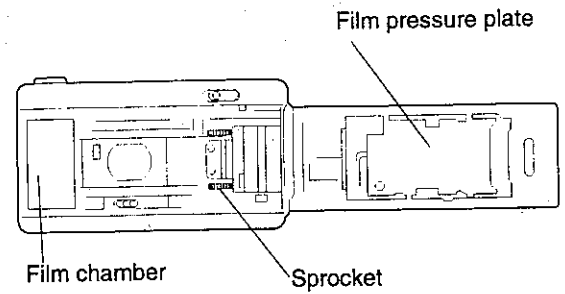
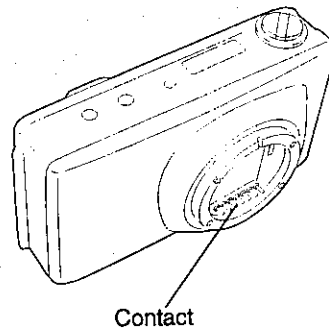
Rewinding crank

- (2) Erect the rewinding crank on the top left of camera and turn the crank clockwise until it becomes loose.



Precautions when handling a 35 mm camera

- Wipe the contacts on the camera mount gently with a clean cloth, from time to time, in order to maintain good electrical connection.
- Clean the film chamber, sprocket and film pressure plate, from time to time, in order to prevent scratches on the film.



Preparations for photography

- (1) **Mount 35mm camera onto the main body.**
Align the slot of the camera mount with the marking point of the mount for the 35mm camera body. Next, mount the 35mm camera, pressing it against the main body.

Turn the 35mm camera body locking lever in the counter-clockwise direction and until it firmly locks the body into place.

To detach the camera body, hold the 35mm camera body in the right hand, and turn the locking lever clockwise to the position of the stopper with the left hand. Then, pull out the 35mm camera body.

- (2) **Film loading**
See "Preparing a 35mm camera".

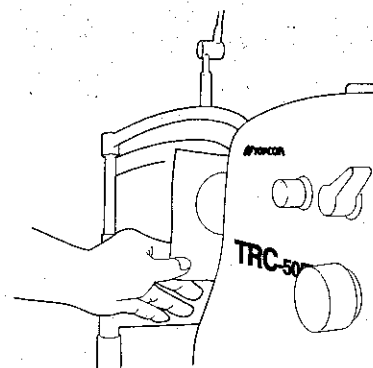
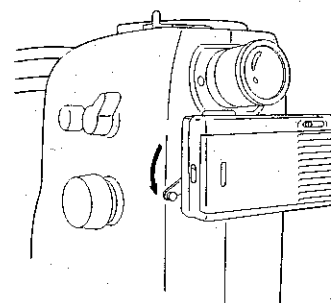
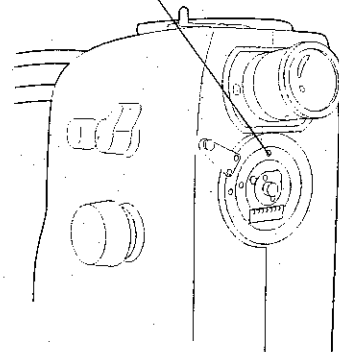
- (3) **Adjustment of the eyepiece**
How to adjust the eyepiece:
Place a white sheet of paper in front of the objective lens for this purpose.

First, unfocus the eyepiece by rotating its adjustment ring in the counter-clockwise direction, which will make the cross-hairs appear completely blurred.

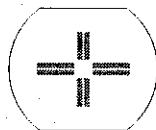
Next, rotate the adjustment ring slowly in the clockwise direction while checking the cross-hair image in the field of view. Stop when the image is sharply focused.

* Inaccurate diopter adjustment results in unfocused photos.

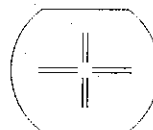
Positioning pin



Finder field-of-view



Out of focus

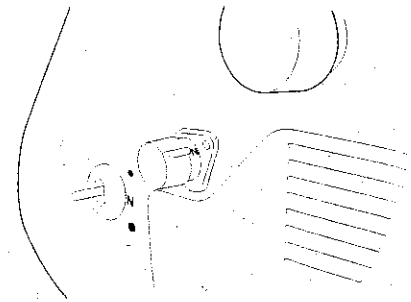


In focus

- (4) **Set the filter switching knob so as to meet the particular photographing purpose.**

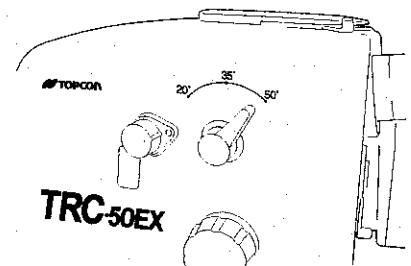
Set the filter switching knob to "N". "N" is suitable for normal photography, while "G" is used when contrast of blood vessels is to be emphasized.

For F1, F2 settings, see "Photography with optional filters".



- (5) **Set the angle changing lever to the required angle of coverage.**

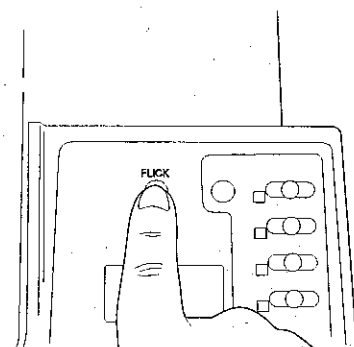
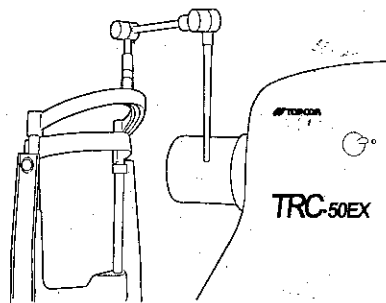
Check that the angle changing lever is clicked. If this lever is not clicked, retinal images may be distorted and the picture itself may be blurred.



- (6) **Guide the patient's eye so that the target part of the fundus can be photographed.**

Guiding the patient's eye:

Guide the patient's eye as appropriate by moving the external fixation target. If the eye subject to the examination is hard to focus on the target due to astigmatism, press the FLICK switch to flash the external fixation target for easier focusing.



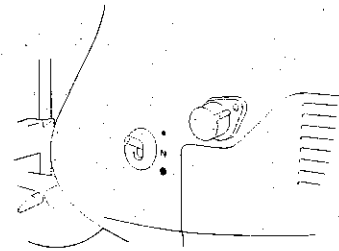
Preparing the patient

- (1) After the patient's pupil is adequately dilated by applying mydriatic drops, lower the room lights.

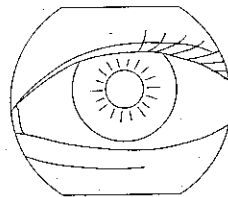
Confirm whether the patient's pupil are dilated sufficiently.

If dilation is inadequate:

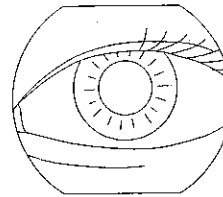
When the pupils are only dilated between $\varnothing 4.5\text{mm}$ to $\varnothing 5\text{mm}$, set the illumination diaphragm lever to the "•" position. Also, photograph at an angle of coverage of 35° or 20° . When photographed at the 50° angle, it may not be possible to eliminate flare completely.



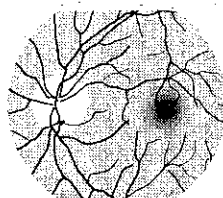
* Do not set the illumination diaphragm lever to the "•" position other than when dilation of the pupil is inadequate.



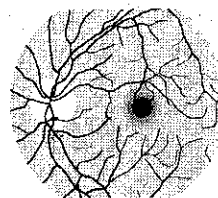
$\varnothing 5.0\text{mm}$



$\varnothing 6.5\text{mm}$



35°

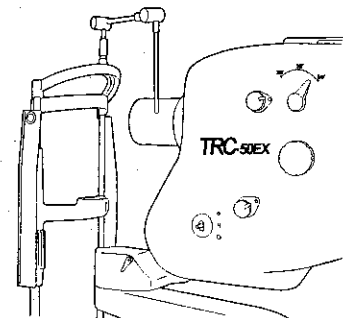


50°

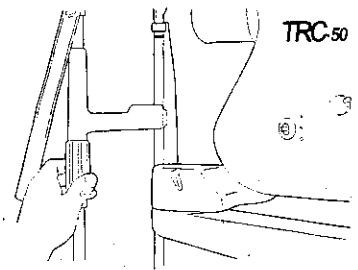
- (2) Seat the patient properly.

Patient should be seated as follows:

- Have the patient, with completely dilated pupil, sit down in front of the instrument.
- Adjust the height of the instrument table and the chinrest in order to rest the chin properly on the chinrest and the forehead against the head strap.
- The height of the chinrest can be adjusted by rotating the chinrest adjusting knob.



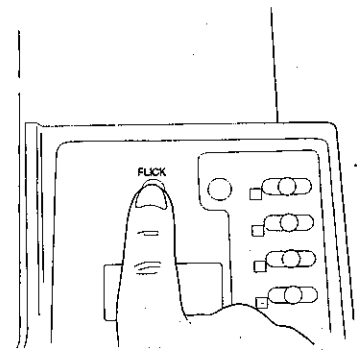
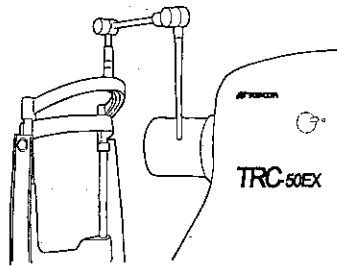
- Ensure that the patient's eye is approximately in alignment with the high level marker.
- The height of Instrument Table can be adjusted with the AIT up-down switch available on the Instrument Table.
-



(3) Guide the patient's eye so that the target part of the fundus can be photographed.

Guiding the patient's eye:

Guide the patient's eye as appropriate by moving the external fixation target. If the eye subject to the examination is hard to focus on the target due to astigmatism, press the FLICK switch to flash the external fixation target for easier focusing.



Flash intensity setting

This instrument enables two types of photography that can be selected by the EXPOSURE switch. Set this switch to "1" for manual mode or to "2" for program mode.

- Manual mode

This is the mode where a desired flash intensity can be set by means of the flash intensity switch.

- Program mode

This is the mode where a standard flash intensity necessary for each photographing purpose, is automatically set. Refer to the exposure guide in the table below:

Flash intensity can be corrected by means of the flash correction switch.

EXPOSURE GUIDE

Type of Photography Control Setting	35mm Color			Polaroid Color		Fluorescein	Red-Free
ISO Film Speed	64	100	200	640	150	400	400
Flash Intensity Switch	50	36	18	50	150	200	18
Upper/Lower Selector	Lower/Upper			Upper		Lower/Upper	
Flash Intensity Switch (For SONY DXC-970MD/950P)	25					36	100

* The indicated flash intensity setting is for the average pigmented retinal area.

35mm color photography

WARNING

- Pay attention to the side effects of mydriatic drops. Mydriatic drops may invoke severe side effects.

CAUTION

- Ensure that the illumination lamp is not brighter than necessary. Excessive intensity may result in patient discomfort.

CAUTION

- Ensure that light brighter than necessary is not used for photography. Excessive intensity may result in patient discomfort.

CAUTION

- Avoid insertion of the hands between the power supply unit and the base. When the base is moved, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the main body and the lower arm. When the main body is tilted, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the chinrest support and the lower or upper arm.
 - * This warning is mostly directed towards the patient.When the main body is moved, the hands may be pinched or injured.

CAUTION

- Pay attention to the clearance between the objective lens and the patient. When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury.

- (1) **Press the UPPER/LOWER selector switch of the control unit to set on LOWER.**

If no accessories are installed on the accessories mount, this operation is unnecessary.

* For manual exposure, set a flash intensity.

- (2) **Set the filter switching knob to "N".**

- (3) **Make preparations for recording patient data.**

How to photograph the patient's data on the data plate:

- When using the data plate

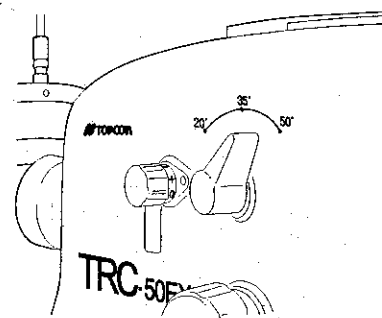
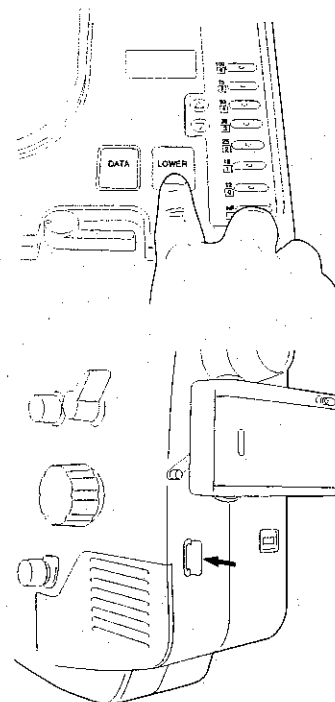
Write down the required information on the provided data plate and insert it in the data plate insertion slot. It will be photographed together with the retinal image.

- When recording together with ocular anterior photography

Write data within $\varnothing 30\text{mm}$ on a patient physical record, set the diopter compensation knob on either (+) or (A), and focus.

By pressing the DATA switch of control unit, the xenon lamp will flash and the data is recorded.

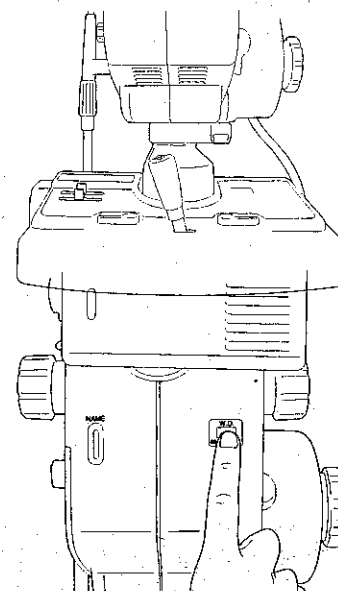
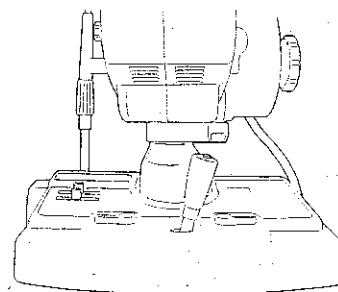
* When setting the ID mode, see "Recording patient data by ID mode".



(4) Alignment of the light beam onto the patient's pupil

How to properly align the light beam:

First look at the patient's pupil from the side of the instrument. To coincide the light beam properly to the patient's pupil, move the main body into a position 50mm in front of the patient's eye, with the control lever positioned straight. Then adjust the control lever to the right and left and rotate it to move the main body up or down, until the light beam is coincident with the patient's pupil. Then, finely adjust the control lever to focus the ring slit image on the cornea coaxially with the patient's pupil.

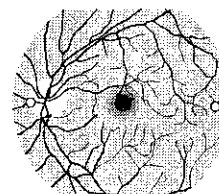
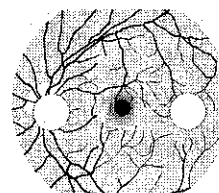


(5) Finely adjust the main body longitudinally to illuminate the retina evenly.

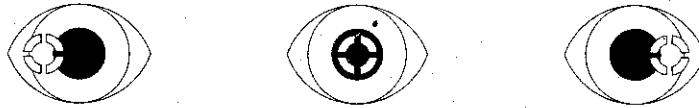
• When the alignment illumination points are used:

Move the main body into a position about 50mm in front of the patient's eye, with the control lever positioned straight. Then adjust the control lever to the right or left and rotate it to move the main body up or down until the light beam becomes coaxial with the patient's pupil, when alignment illumination points appear on both sides in the finder. Make these points the smallest.

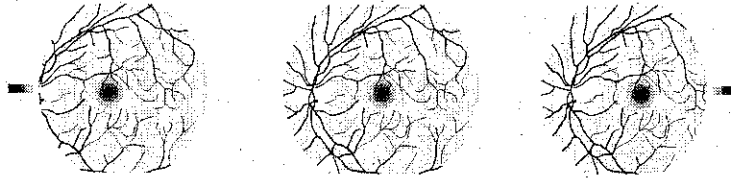
If the patient moves the eyes or when photographing the periphery, sometimes the alignment illumination points disappear.



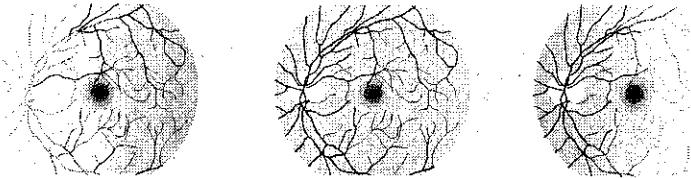
- Ring slit images on cornea



- Images observed by viewfinder



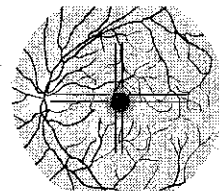
- Images filmed by camera



(6) Focusing the retinal image

How to sharply focus the retinal image:

After confirming that the finder field-of-view is in focus, turn the focusing knob so that not only the retinal image but also the cross-hairs are observed sharply and distinctly in the field at the same time.



How to photograph retinal peripheries:

Move the external fixation target and have the patient fixate with the eye that is not being photographed.

It will be possible to photograph the peripheries and other sections of the retina, by tilting and/or swinging the main body.

(7) Setting the angle of coverage

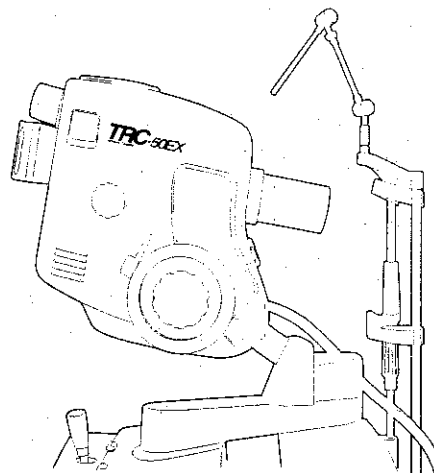
* Pay attention to the relationship between the angles of coverage and flare or the focus:

If flare is eliminated at the 50° angle of coverage, no flare occurs at 35° or 20°.

Furthermore, refocusing is unnecessary at 50° if the retinal image has already been properly focused at 35° or 20°.

(8) Depress the shutter release button.

- Set the tilt brake lever to a desired position before using the instrument.



Fluorescein photography

Fundamentally, make the same adjustments as noted for color retinal photography, and focus the retinal image properly. The only difference is the insertion of the fluorescein filters and intravenous injection of fluorescein to the patient.

CAUTION

- After fluorescein is injected, ensure that the patient is not afflicted with an allergic reaction or shock. Fluorescein may cause an allergic reaction or shock as side effects that can, if serious, result in death. If there are signs of an allergic reaction or shock, stop photographic operation immediately and give appropriate first-aid treatment.

CAUTION

- We suggest inspecting for any side effects of fluorescein by performing a preliminary test. Fluorescein is capable of producing lethal side effects.

WARNING

- Avoid the presence of water-filled glasses or other containers in the vicinity. Infiltration of water may lead to a fire or electric shock.

WARNING

- Pay attention to the side effects of mydriatic drops. Mydriatic drops may invoke severe side effects.

CAUTION

- Ensure that the illumination lamp is not brighter than necessary. Excessive intensity may result patient discomfort.

CAUTION

- Ensure that light brighter than necessary is not used for photography. Excessive intensity result in patient discomfort.

CAUTION

- Avoid insertion of the hands between the power supply unit and the base. When the base is moved, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the main body and the lower arm. When the main body is tilted, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the chinrest support and the lower or upper arm.
 - * This warning is mostly directed towards the patient.When the main body is moved, the hands may be pinched or injured.

CAUTION

- Pay attention to the clearance between the objective lens and the patient. When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury.

(1) Load the 35mm camera with ISO 400 black and white film.

(2) Set the filter switching knob to "N".

(3) Prepare the patient data to be included in photography.

Write data within a $\varnothing 30\text{mm}$ area on the patient physical record, set the diopter compensation knob to (+) or (A) and focus, set the exciter filter by pressing the EXCITER switch, and then press the DATA switch.

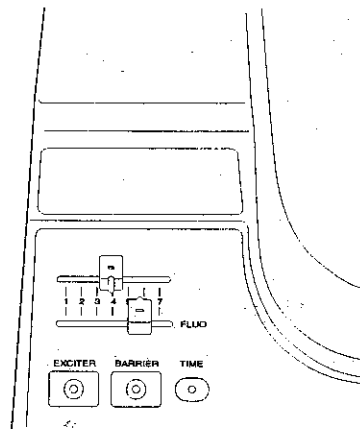
* When setting the ID mode, see "Recording patient data by ID mode".

(4) Turn the EX-BA LINK (FA Filter Setting) switch ON. (Auto mode)

(5) Set a fluorescent illumination light intensity using the FLUO knob.

How to adjust the required illumination for fluorescein photography:

Adjust the FLUO knob to the required illumination, which can be preset freely with its exclusive knob. The illumination is automatically changed to the preset intensity, when the excitation filter is pushed on.



(6) Make the same adjustments, as noted for color retinal photography, and focus the retinal image properly.

If alignment illumination points are not necessary, press the alignment illumination point switch to remove them.

(7) Then, prepare the intravenous injection of fluorescein.

How to take distinct photographs:

If too much time is taken in giving the intravenous injection, the fluorescein will be diffused in the blood vessels and a good photograph will not be possible.

- (8) **Depress the timer switch at the same time as an intravenous injection of fluorescein is given to the patient.**

When the timer starts, it will beep every second up to 20 seconds. Also, the timer switch will blink simultaneously every second until the timer goes OFF.

- (9) **Press the BARRIER switch and the EXCITER switch.**

If only the EXCITER switch is pressed, the excitation filter is set, and with each press of the shutter release button, the barrier filter is withdrawn and inserted into the optical path.

After photography, when the TIME switch is turned off, the BARRIER and EXCITER switches also turn off simultaneously.

- (10) **Depress the shutter release button.**

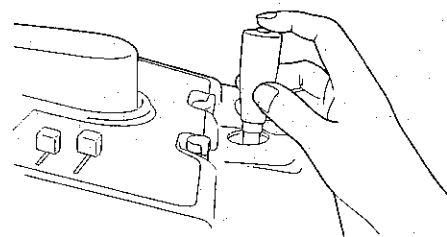
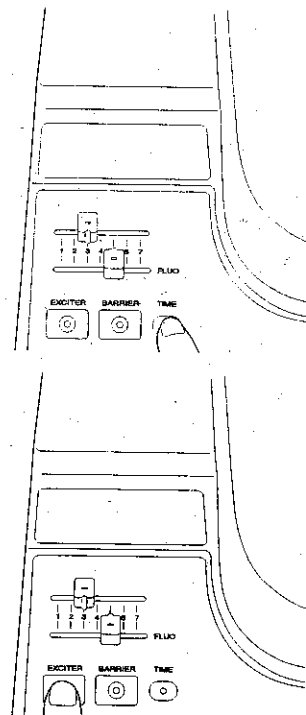
- (11) **Develop the film.**

How to develop properly:

Development of the film, in the case of fluorescein retinal photography, should differ according to conditions and, therefore, the film should be developed under inspection.

The following is a guide for developing films under average conditions:

- a) Film: Kodak TRI-X-PAN (ISO 400)
- b) Developer: D76
- c) Development: Tank development with developer temperature 22°C and 13 to 15 minutes of development.
- d) Fixing time: 10 to 20 minutes
- e) Washing time: More than 30 minutes.



OPERATIONS FOR ADDITIONAL USES

Photography with optional filters

Prior to photographic operation, install a desired filter into the F1 or F2 removable filter frame.

WARNING

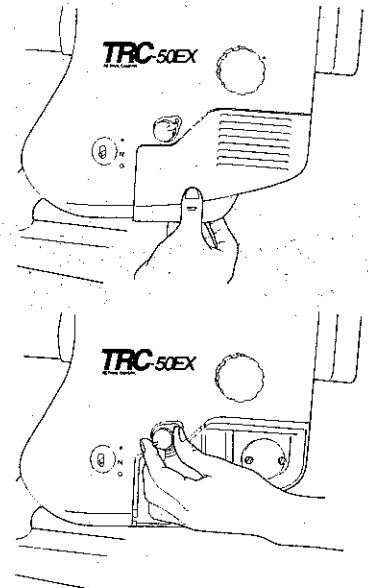
- Disconnect the power plug from the outlet before uncovering the lamphouse cover. Electric shock may occur if you uncover the lamp house without disconnecting the power plug. Also ensure that the power plug is not connected to the outlet while the lamp house is uncovered.

CAUTION

- Do not replace any filters just after the lamp is turned off. The lamp unit will still be extremely hot. You may get burnt if you touch it.

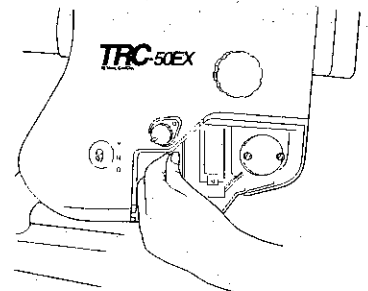
Connecting the exclusive cable

- (1) Turn the power switch OFF, and remove the power cord from the power outlet.
- (2) Next, take off the lamphouse cover. Lamphouse cover can be detached by pushing it up from the bottom and pulling it forward.
- (3) Remove the filter frame and take out the shield plate that is mounted inside the frame.
- (4) Mount a filter you like to the frame, and then insert it into the filter turret.
- (5) Put the lamphouse cover in place.



Photography method

- (1) Set the filter switching knob on F1 or F2.
- (2) Take photograph by the same procedure of regular 35mm color photography.



Photography using blue filter

For photography with the EXCITER filter, switch the auto mode of the EXCITER filter and BARRIER filter to the manual mode.

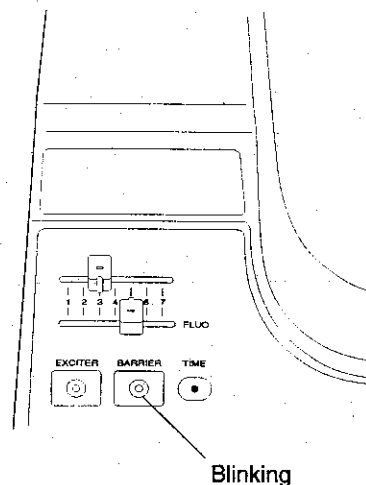
- (1) Set the filter switching knob to "N".
- (2) Turn the EX-BA LINK (FA Filter Setting) switch OFF. (Manual mode)

- Manual mode

The pressed switch turns on and the other blinks.

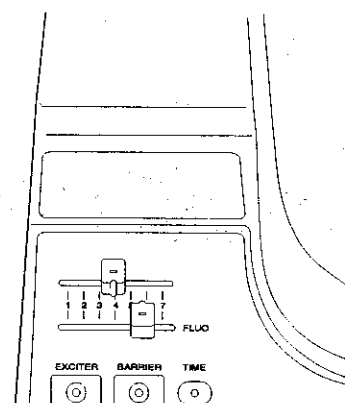
- Auto mode

The pressed switch turns on and the other won't.



Photography method

- (3) Press the EXCITER switch.
- (4) Adjust illumination for observation by FLUO knob.
Following the insertion of an EXCITER filter, illumination light intensity must be adjusted with the FLUO knob.
- (5) Conduct photography in the same manner as 35mm color photography.



Stereo photography

Illuminate the pupil of the patient ensuring that the brightness of retinal image is uniform. Then, carry out photographic operation with the STEREO lever locked. Basic procedures are the same as for 35 mm color photography.

CAUTION

- Avoid insertion of the hands between the power supply unit and the base.
When the base is moved, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the main body and the lower arm.
When the main body is tilted, the hands may be pinched or injured.

CAUTION

- Ensure that nobody's hands are inserted between the chinrest support and the lower or upper arm.
* This warning is mostly directed towards the patient.
When the main body is moved, the hands may be pinched or injured.

CAUTION

- Pay attention to the clearance between the objective lens and the patient.
When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury.

(1) Set the patient's pupil and the main body to proper position.

Coincide the light beam properly to the optical axis of the patient's pupil. If not, flare will occur on one side.

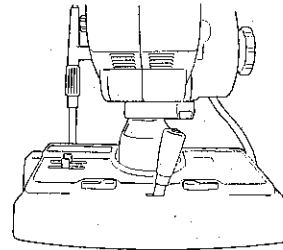
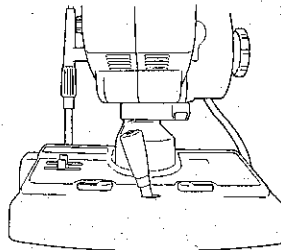
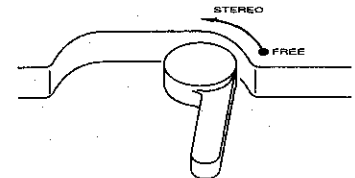
See "Alignment of the light beam onto the patient's pupil".

As flares are easy to appear at an angle of coverage of 50°, it is recommended to take stereo photography at an angle of coverage of 35° or 20°.

(2) Tighten the STEREO lever.

(3) Move the base gently to its limit in both the right and left directions and release the shutter.

If not moved fully, the stereoscopic effect will not be proper.



Recording patient data by ID mode

Setting the ID mode

⚠ CAUTION

- Do not install the instrument on a slope or in an unstable place. The instrument may become unstable, fall or harm people nearby.

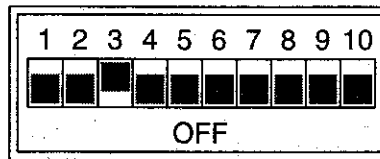
⚠ CAUTION

- Avoid insertion of the hands between the power supply unit and the base. When the base is moved, the hands may be pinched or injured.

⚠ CAUTION

- Pay attention to the clearance between the objective lens and the patient. When the main body is moved, the objective lens may bump against the patient's eye or nose inflicting a minor injury.

To activate the ID mode, set the dip switch "3" to ON (the side with a numerical indication.) Do not touch any switches other than "3" to avoid malfunctions that may otherwise occur.



ID mode

Recording patient data (ID mode)

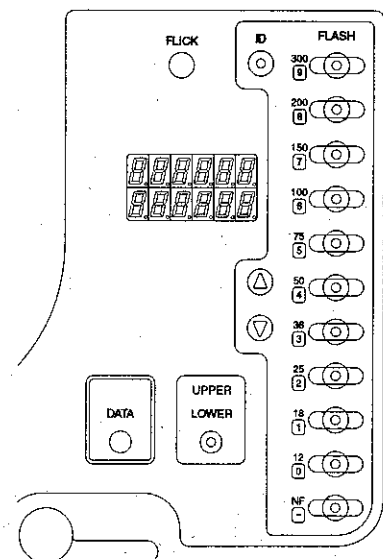
When the 35mm camera (UPPER, LOWER) is used, the patient data (12-digit number) is recorded simultaneously with retinal photography.

(1) The data input mode is set by pressing the ID switch while the buzzer sounds.

- When the data input mode is set, LEDs of the ID switch and flash intensity switch are turned on.

(2) Input the patient data.

- When the data input mode is set, the flash intensity switch works as "-", 0 to 9" input key.
- Up to twelve-digit number is input in two stages (6 digits at the upper stage and 6 digits at the lower stage).



- The buzzer sounds each time a figure is input. If the 13th figure is input, the buzzer sounds "twice" and rejects it.
- When the data plate is inserted, 6 digits of the upper stage are displayed, and the 7th figure is rejected with "two sounds" of the buzzer.
- Under the ID mode, the counter function is not available.

2	5	3	6	7	8
-	7	2	0	9	3

2	5	3	6	7	8
TOPCON					

- (3) Press the ID switch. The buzzer sounds "once" and the input data is registered.**
- Once the data is registered, the LEDs of ID switch and the flash intensity switch go out, indicating that the flash intensity changing function is active.
- (4) Focus the retina and photograph it by pressing the shutter.**
- If a data plate is inserted, both input data and data plate are photographed.

- (5) When inputting other data, start from the step (1).**

- Using the timer in fluorescein photography.
- Six-digit and the time are photographed together.
- When the TIME switch is started, the input data is displayed at the upper stage but, when photographed, the time comes at the upper stage and the data at the lower stage.
- If the input data exceeds 6 digits, when photographed, only the 6 digits displayed at the upper stage appear at the lower stage and the time comes at the upper stage.
- When the timer is turned off, all the input data is displayed.

2	5	3	6	7	8
-	7	2	0	9	3



00. 15. 3					
2	5	3	6	7	8

- (6) When the data is registered <step (3)>, the data input mode is finished.**

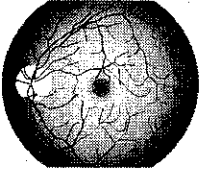
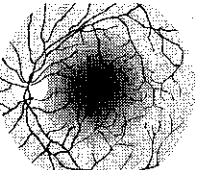

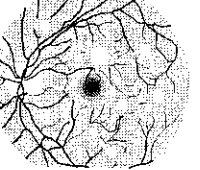
TROUBLE SHOOTING

Countermeasures to be taken in case of trouble

- If any trouble should occur, check the following items before contacting your authorized dealer.
- Pull out the power plug from the power outlet when lamps or fuses are to be checked.

Troubles	Check Points
(1) Illumination lamp does not light.	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁ and F₂. o Check whether the fixing screw of the illumination lamp is tightly screwed in. o Check if the light bulb has burnt out.
(2) Xenon lamp does not flash.	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁, F₂, F₃, F₄ and F₅. o Is the NF switch of the control unit depressed? o Is the xenon lamp firmly in place? o Has the xenon lamp been used more than its normal service life (10,000 flashes)?
(3) External fixation target does not light.	<ul style="list-style-type: none"> o Check fuses F₁, F₂ and F₅.
(4) 35mm LOWER camera does not work.	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁, F₂, F₃, F₄ and F₅. o Check whether the UPPER/LOWER selector switch of control unit is set to "LOWER". o Check whether the 35mm camera is securely attached.
(5) 35mm UPPER camera does not work.	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁, F₂, F₃, F₄ and F₅. o Check whether the UPPER/LOWER selector switch of control unit is set to "UPPER". o Check whether the 1X relay lens is attached firmly. o Check whether the camera is fixed properly to the 1X relay lens.

Troubles	Check Points
(6) Polaroid Attachment does not work.	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁, F₂, F₃, F₄ and F₅. o Check whether the UPPER/LOWER selector switch of control unit is set to "UPPER". o Check whether the Polaroid Attachment is securely attached on the accessory mount. o Check whether the Polaroid film is loaded in the Polaroid Attachment.
(7) No image on monitor screen when video relay lens adapter attached on the main body	<ul style="list-style-type: none"> o Has the power saving function been activated and the UPPER/LOWER selector switch flickering illuminates? If so, press the UPPER/LOWER selector switch. o Check fuses F₁, F₂, F₄ and F₅. o Check whether the UPPER/LOWER selector switch of control unit is set to "UPPER".
(8) Counter does not work.	<ul style="list-style-type: none"> o Check fuses F₁, F₂ and F₅.
(9) Timer does not work.	<ul style="list-style-type: none"> o Check fuses F₁, F₂ and F₅.
(10) Picture counter of 35mm camera does not light.	<ul style="list-style-type: none"> o Check fuses F₁, F₂ and F₅.
(11) Fluorescein filters do not work.	<ul style="list-style-type: none"> o Check fuses F₁, F₂, F₄ and F₅.
(12) Flare can not be eliminated at the 50° coverage	<ul style="list-style-type: none"> o Check whether the angle changing lever is properly positioned. o Check whether the illumination diaphragm lever is set to "•". o Check whether the patient's eye and the main body are properly positioned. o Is the patient's eye fully dilated?
(13) Correct focus is not possible.	<ul style="list-style-type: none"> o Check if the finder diopter is correctly adjusted. o Check whether the diopter compensation knob is properly adjusted for the patient's dioptric power. o Check whether the patient's eye is clouded, due to cataract or other diseases. o Check whether the patient's eye is filled with tear. o Check whether the patient's eye and the main body are properly positioned.

Troubles	Check Points
<p>(14) Operator cannot see the patient's eye.</p>	<ul style="list-style-type: none"> o Check whether the illumination lamp is on or not. o Check whether the cap of the objective lens is on or not. o Check whether both BARRIER and EXCITER switches are turned ON. o Check whether the angle changing lever is positioned between settings or not. o Check whether the diopter compensation knob is properly positioned.
<p>(15) Photograph of the retinal peripheries is dark.</p> 	<ul style="list-style-type: none"> o Check whether the distance between the patient's eye and the main body is longer than proper working distance.
<p>(16) Photograph of retinal center is dark.</p> 	<ul style="list-style-type: none"> o Check whether the pupil of the patient's eye is dilated sufficiently.
<p>(17) Photograph is influenced by overall flare.</p> 	<ul style="list-style-type: none"> o Check whether the distance between the patient's eye and objective lens is shorter than the proper working distance. o Check whether the illumination diaphragm lever is set on ".", when set for the 50° angle of coverage. o Check whether the light is too intense for photography.
<p>(18) Vague white dots are seen through the finder and also appear on the photograph</p> 	<ul style="list-style-type: none"> o Check whether there are tears on the patient's eye and on the objective lens surface. If so, see "Cleaning the objective lens".
<p>(19) Along with a beeping sound, "Err#" is intermittently displayed on the data display unit.</p>	<ul style="list-style-type: none"> o Refer to the error code list.

Error code list

In the event of "Err#" (# means an error number) being intermittently displayed on the data display unit with a beeping sound due to an operation error or a malfunction of the instrument, correct the error as instructed in the table below:

No.	Name	Cause	Corrective action
0	Memory data	CPU substrate is replaced or abnormal data stored in NV-RAM.	Press the ID switch.
1	Interlock	Lamphouse cover is open.	Close the lamphouse cover firmly.
2	Light emitting system	A fault in light emitting system	Turn off the power.
3	Charging voltage	Overcharging or charging voltage lower than required	Turn off the power switch.
5	Exciter filter	Exciter filter is malfunctioning.	Press the EXCITER switch.
6	Barrier filter	Barrier filter is malfunctioning.	Press the EXCITER switch.
7	Filter switching knob	Filter switching knob is not clicked.	Readjust it until it clicks.
8	35mm camera loading error	Film loading malfunction	Place the film properly
11	Video relay	Video relay mirror or filter is malfunctioning.	Press the EXCITER switch.

REFERENCE MATERIAL

Optional accessories

Optional accessories increase the range of photography possible with the models TRC-50EX.

CAUTION

- Ensure that the 35mm camera is installed firmly by fastening the 35mm camera body locking lever.

If installed loose, the camera may fall off, resulting in severe damage to the unit and possible bodily injuries.

CAUTION

- When installing accessories, secure them firmly by fastening the accessory locking lever.

If installed loose, the accessories may fall off, leading to possible bodily injuries.

Polaroid Attachment PA-50EX (for color photography)

For providing instant color photographs.

1X Relay Lens Adapter OR-1

Used when mounting the UPPER 35mm camera. With this adapter, two types of film can be used which are changed by switching the selector.

<Example>

- 35mm LOWER camera for fluorescein photograph by black and white film
- 35mm UPPER camera for normal color photograph by color film

Video Relay Lens Adapter

Used when a video camera is mounted.

Internal Fixation Target

This device is essential for examining photo-coagulation and amblyopia. The device can guide the eye to the points which is impossible with the external fixation target.

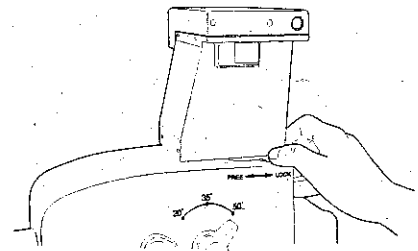
*** Note**

When mounting/dismounting an accessory, lock the tilting unit. If not, the mirror body will rise when the accessory is removed, or, when mounting, the mirror body moves independently and makes the operation difficult.

Accessory mounting/dismounting methods (for Polaroid attachment)

A 1X relay lens adapter or a video relay lens can also be installed by the same method.

- (1) **Lock the base fixing lever and the tilt brake lever.**
- (2) **Remove the accessory mount cap from the main body.**
- (3) **Uncover the Polaroid attachment and install it onto the optical head.**
Stand next to the optical head and connect the Polaroid attachment by pushing it straight down with both hands.
- (4) **Lock the attachment into place by turning the accessory locking lever.**

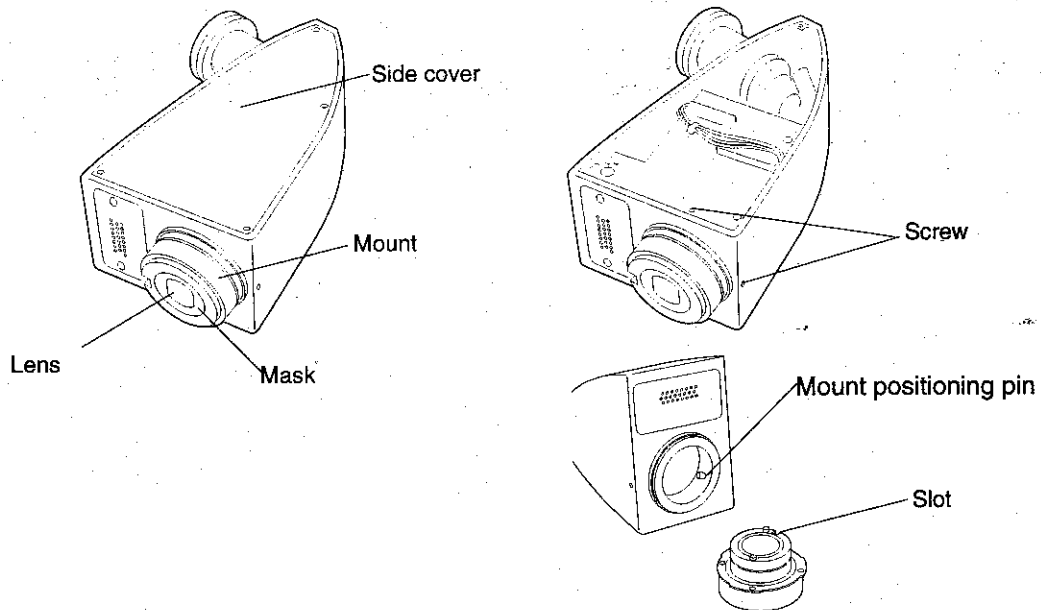


Detaching method

- (1) **Lock the base fixing lever and the tilt brake lever.**
- (2) **Release the accessory locking lever.**
- (3) **Detach the Polaroid attachment from the main body.**
To dismount the Polaroid attachment, stand next to the optical head and pull the Polaroid attachment straight up with both hands.
- (4) **Attach the accessory mount cap to the main body.**
- (5) **Put the accessory mount cap in place on the main body.**

Accessory lens cleaning methods

Dust or other impurities adhering to the lens, may be reflected in retinal images photographed. In the presence of such impurities, the lens must be cleaned by the methods as specified below:



Cleaning the outer side of lens:

- (1) Blow off dust or other impurities with a hand blower.
- (2) Remove dirt with lens cleaner.
Be careful not to damage mask in this cleaning process.

Cleaning the inner part of lens:

- (1) Loosen the machine screws (three) from the mount and pull the mount straight out in the arrowhead direction.
- (2) Blow off dust or other impurities or remove it with lens cleaner.
- (3) Reinstall the mount.
In the case of video relay lens adapter, one of the three machine screws is located inside the side cover.

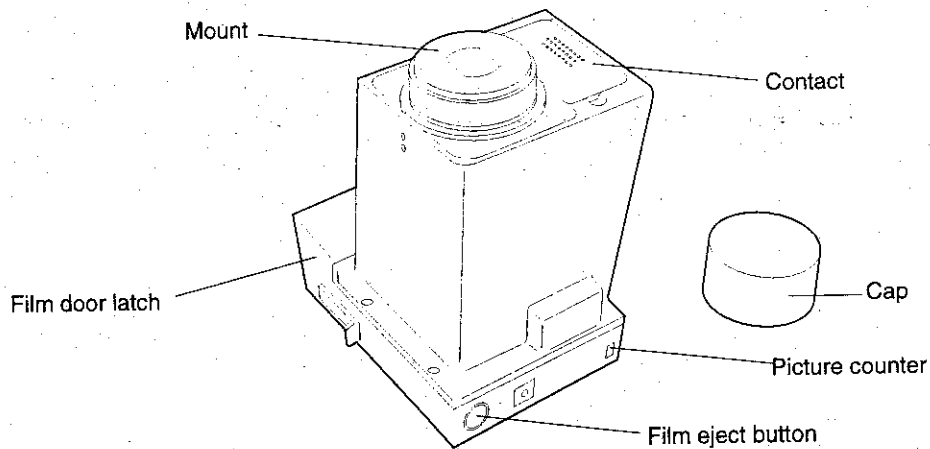
When cleaning a video relay lens, the top cover glass must be cleaned.

(Refer to "Cleaning the Objective Lens" for further information about lens cleaner.)

Insert the mount straight in a manner that the mount positioning pin aligns with the slot and fasten the machine screws.

Polaroid Attachment PA-50EX (for color photography)

• Nomenclature



(1) Set the UPPER/LOWER selector switch to "UPPER".

- If no film is loaded, the warning buzzer sounds until cover paper is removed.

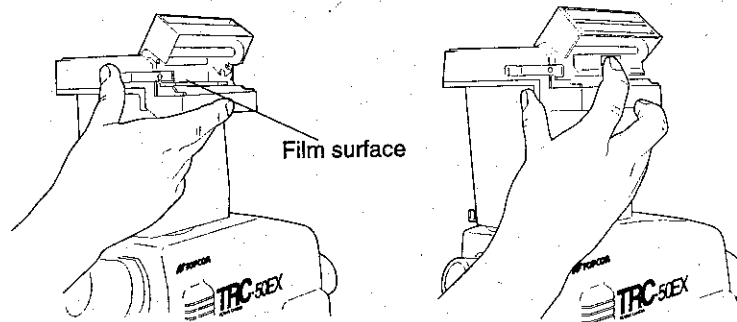
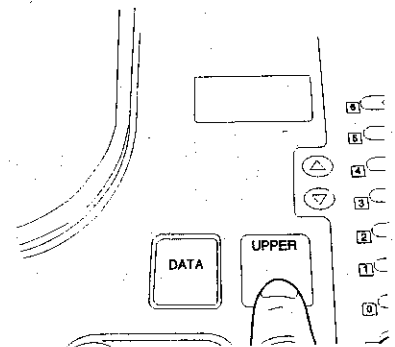
(2) Load the Polaroid film pack.

Push the film door latch in the arrow-indicated direction, and the film exit slot will open.

Insert the film pack fully, with the film surface pointing downwards.

Then close the film exit slot.

- In the event of a film pack incompletely inserted, the film exit slot cannot be closed. Try to insert the pack once more. Depress the film eject button once and eject the cover backing paper.



You do not need to press the film eject button except to remove cover paper.

- (3) **Alignment and photography are same as for normal retinal photography. By depressing the shutter release button of the control lever, the film is ejected automatically.**

- (4) **Development of the Polaroid film takes from 3 to 5 minutes.**

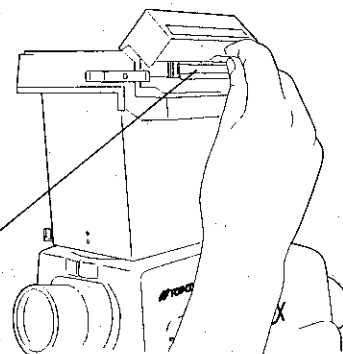
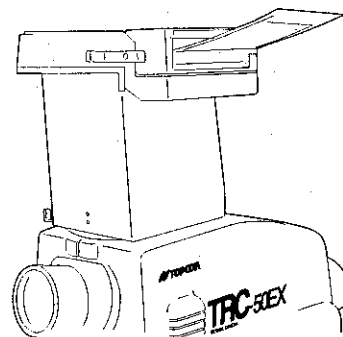
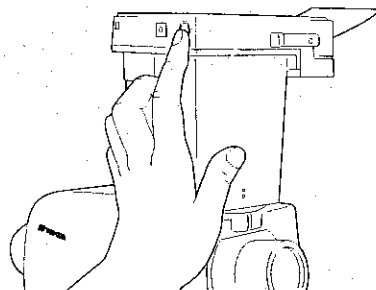
- (5) **One Polaroid film pack contains 10 sheets of film. The number of unexposed sheets remaining is displayed by the picture counter.**

When the picture counter indicates "0", a warning buzzer will sound. In order to stop the warning buzzer, set the UPPER/LOWER selector switch to "LOWER" or load a new film pack and take out the cover paper.

If the film pack is taken out and re-inserted while photographing, even when there is no remaining film, the buzzer does not sound.

- (6) **Push the film pack replacing lever in the arrowhead direction until the film exit slot opens and push it further to allow part of film pack to come out. Then, replace the pack with a new one.**

- Film can be unloaded by pulling the film pullout tab.



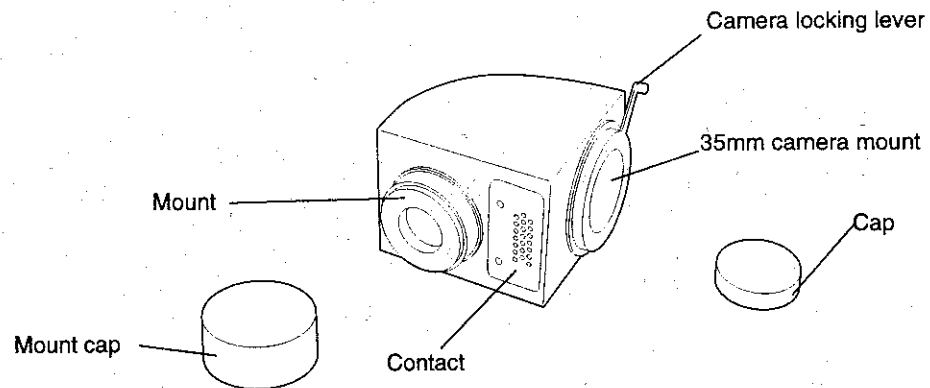
Film pullout tab

• Specifications

- o Angle of coverage: 50°, 35°, 20°
- o Area photographed on film: 74mmø x 62.6mm
- o Photographic magnifications: 5.3X at 50°, 7.0X at 35° and 12.2X at 20° (at 0 dpt)
- o Recommended film: Polaroid SX-70 (ISO 150) Type 779 (ISO 640)
- o Dimensions: 155(W) x 140(D) x 176(H)mm
- o Weight: 1.7kg

1X Relay Lens Adapter OR-1

• Nomenclature



Photography method

- (1) Set the UPPER/LOWER selector switch of the control unit to "UPPER".
- (2) Photography method is same as for normal color photography by 35mm LOWER camera.

• Specifications

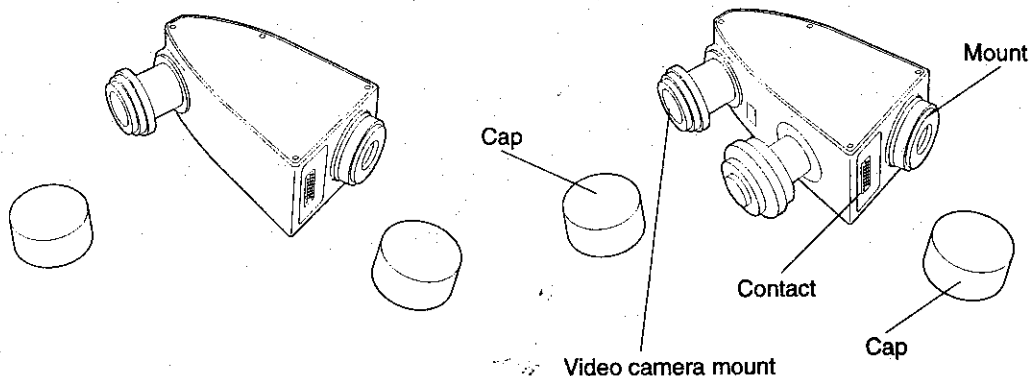
- o Angle of coverage: 50°, 35° and 20°
- o Area photographed on film: 26mmø x 22mm
- o Photographic magnifications (at 0 dpt): 1.8X at 50°, 2.5X at 35° and 4.3X at 20°
- o Data can be photographed simultaneously.
- o Dimensions: 110(W) x 140(D) x 137(H)mm
- o Weight: 1.5kg

Video Relay Lens Adapter

• Precautions and suggestions for use

This Instruction Manual commonly deals with four types of video relay lenses. So, be sure about the video camera used.

• Nomenclature



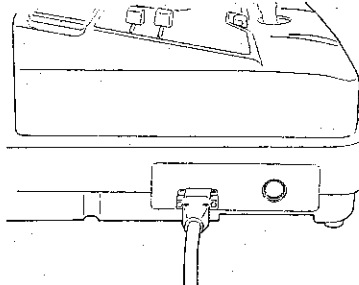
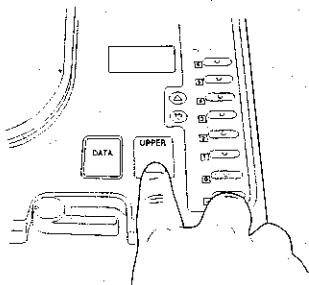
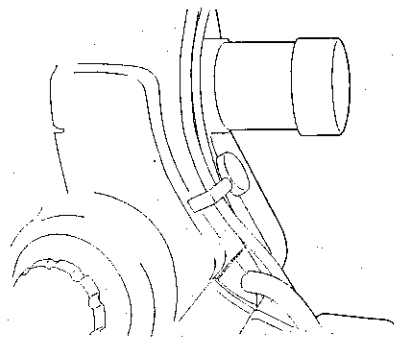
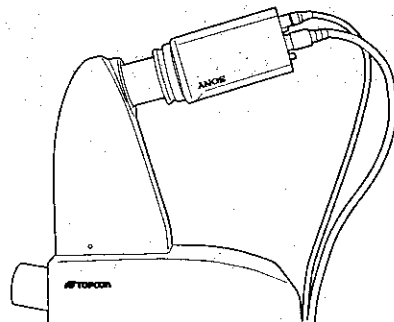
• How to attach the video camera

See the Instruction Manual for video camera.

• Cable connection

Insert cable into the cable holder on the main body.

- Do not pull up the cable holder.
- When connecting cable, assure a sufficient length so that the operation of retinal camera is not limited.
- Cable holder is adjustable in accordance with the number or thickness of cable. Adjusting method is described under "Assembling procedure."



• **How to use the video relay lens adapter**

- (1) **Set the UPPER/LOWER selector switch to "UPPER".**
- (2) **Adjust the focus and optical axis by looking through the finder.**
If the instrument is in the manual exposure mode, set a flash intensity as per the exposure guide.
- (3) **Press the shutter release button, and retinal image is recorded by the image recorder.**

• **Specifications**

TL-201

Lens mount: Bayonet mount
Dimensions: 86(W) x 150(D) x 230(H)mm
Weight: 2kg

TL-205D

Lens mount: Bayonet mount, F-mount
Dimensions: 86(W) x 185(D) x 230(H)mm
Weight: 2.7kg

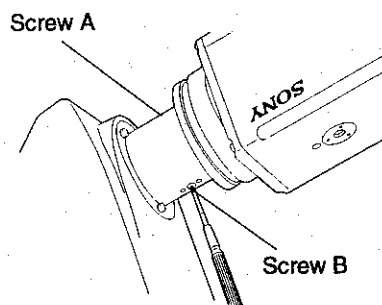
Type	Video camera	Photography
TL-201	DXC-970 MD	Color, FAG
TL-203	Mega Plus 1.4i	FAG
TL-205D	DXC-970 Mega Plus 1.4i	Color, FAG
TL-207	DCS-420	Color, FAG

Video relay lens adjusting method

If the image displayed on the monitor is out of focus or vertically or horizontally unbalanced, adjustment is necessary by the following method:

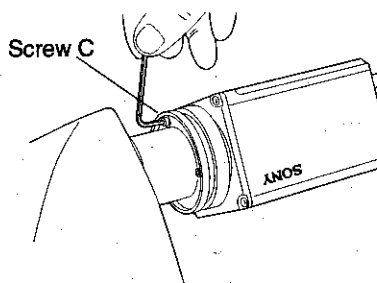
Focus adjustment:

- (1) Adjust the finder diopter.
- (2) Observe the model eye through the finder and adjust the focus using the focalizing handle.
- (3) Press the UPPER/LOWER selector switch to set it to UPPER.
- (4) Set dip switches 9 and 10 to ON.
- (5) Loosen screw A and make adjustment to a focal point by turning screw B with a minus screwdriver while viewing the image on the monitor.
- (6) Tighten screw A.
- (7) Return dip switches 9 and 10 to OFF.

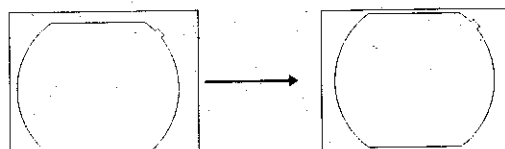


Positional adjustment:

- (1) Press the UPPER/LOWER selector switch to set it to UPPER.
- (2) Set dip switches 9 and 10 to ON.
- (3) Loosen screw C using an accessory hexagonal wrench (small).
- (4) Move the camera in the vertical and horizontal directions by viewing the monitor screen.
- (5) Tighten screw C.
- (6) Return dip switches 9 and 10 to OFF.

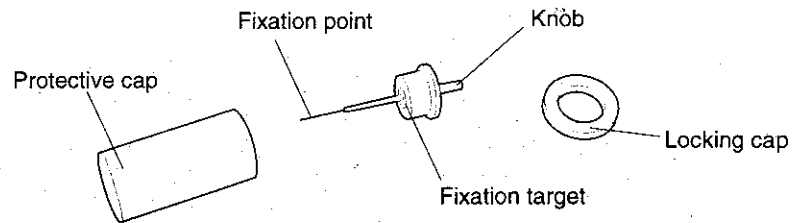


Make adjustments so that the image displayed on the screen becomes vertically and horizontally balanced.



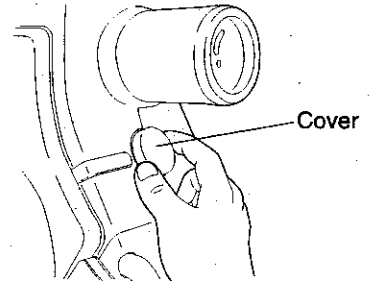
Internal Fixation Target

• Nomenclature



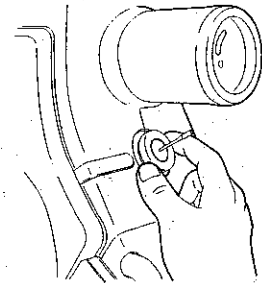
• How to attach the Internal Fixation Target

- (1) Take off the cover of the internal fixation target mount on the main body of retinal camera.

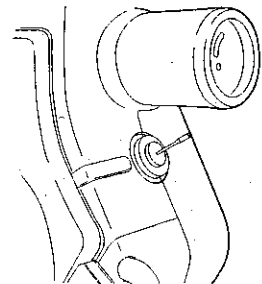


- (2) Take off the protective cap, align the fixation target with pin of the internal fixation target mount and insert straightly into the main body.

In the above case, great care must be exercised because the fixation point is slender and easily bent. For attachment, the fixation point should be pulled out as fully as possible, and the mount should be screwed in slowly and carefully, with the fixation point maintained vertically. And, until the locking cap is attached, the fixation point should not be moved.



- (3) Tighten the locking cap.



• Operating procedures

- (1) Move the knob and guide the patient's eye with the fixation point, while checking movement through the finder.

The knob moves in every direction. Up-and-down movement is used for obtaining proper focus, while right-and-left and back-and-forth movements are used to move the fixation point in the finder. Movement should be done slowly, in order not to confuse the patient when guiding the patient's eye.

- Along with the retinal image, the fixation point is also recorded.

SPECIFICATIONS

- Angle of coverage: 50°, 35°, 20° (Selectable)
- Working distance: 39mm
- Area photographed: 26mmø x 22mm
- Photographic magnifications: With 35mm camera at 0 dpt:
1.8X at 50°, 2.5X at 35° and 4.3X at 20°
- Total observation magnification (at 0 dpt): 10X at 50°, 13.3X at 35° and 23.3X at 20°
- Diopter compensation range for patient's eye:
 - 0 setting: -10 to + 6 dpt
 - + setting: + 5 to +23 dpt
 - setting: -23 to - 9 dpt
- A setting (Ocular anterior photography): +22 to +41 dpt
- Working distance adjustment: Two luminescent spots are used for guidance.
- Filters:
 - Fluorescein photography by black and white film: Spectrotech type interference filters
 - Red free photography: Green filter
 - Filter replacement is possible.
- Illumination diaphragm: Three step changing system
- Data photography:
 - Hand written data, exposure number or time can be selected.
 - (When setting the ID mode, choose either 12-digit data, hand written data or time.)
- Finder: Diopter correction range: -6D to +5D
- Base movements:
 - Coarse: 80mm longitudinally; 110mm laterally
 - Fine: 12mm cross-slide adjustment
- Base vertical travel: 30 mm(15mm up; 15mm down)
- Base swing: Up to ±30°
- Tilting angle: 15° up, 10° down
- Stereo photography: ±1mm
- Chinrest travel: 75mm
- Light source:
 - For observation: 12V 100W halogen lamp
 - For photography: Max. 280V 300WS xenon lamp;
 - adjustable in 21 steps
- Fixation target: External fixation target (Can be changed flickering illuminates and continuous illumination.)
- Power supply: AC 120V, AC 220V, AC 230V and AC 240V, adjustable with voltage selector 50/60Hz
- Power consumption: MAX. 2000VA, NORMAL 150VA
- Size (Main body): 340(W) x 505(D) x 589(H)mm
- Weight (Main body): 37kg

MAINTENANCE AND CHECKING

WARNING

- Disconnect the power plug from the outlet before removing a fuse for replacing.

Removing the fuse cover without disconnecting the power plug, may result in electric shock.

Also avoid connecting the power plug to the outlet with the fuse uncovered.

WARNING

- Be sure to use a properly rated fuse provided in the accessory box.

Use of other than a properly rated fuse may lead to a fire at the time of a malfunction.

WARNING

- Disconnect the power plug from the outlet before uncovering the lamp house cover.

Electric shock may occur if you uncover the lamp house without disconnecting the power plug.

Also ensure that the power plug is not connected to the outlet while the lamp house is uncovered.

CAUTION

- Do not install the instrument on a slope or in a unstable place.

The instrument may become unstable, fall or harm people nearby.

CAUTION

- Do not replace the lamp immediately after it is burnt out.

The lamp unit will still be extremely hot. You may get burnt if you touch it.

Daily care

(1) Dust can affect the performance of the instrument.

Protect the objective lens surface from dust, dirt and finger-prints, at all times, in order to obtain good photographs.

Always use the lens cap and dust cover when not in use.

If the objective lens become dirty, clean it according to "Cleaning the objective lens".

(2) To clean the main body, control unit, chinrest and forehead rest, use a soft dry cloth.

The plastic body of this instrument can be cleaned with neutral detergent if necessary to remove dirt.

Do not use chemicals or solvents because they may invoke deformation or discoloration.

(3) Turn the power switch OFF when the instrument is not in use.

Cleaning the objective lens

(1) Darken the room, set the UPPER/LOWER selector switch to "LOWER", set the normal color photography knob on "7" and look at the objective lens from a front oblique direction, any dirt can be seen clearly.

(2) If dust and dirt adhere the surface of the objective lens, blow them off, taking care not to let the blower touch the lens.

(3) If fingerprints and oil adhere:

(a) Blow off large dusts.

(b) Prepare a mixed solution containing two part of ethyl alcohol and 8 parts of ether.

(c) Moisten a clean gauze (washed and dried) with the mixed solution and wipe the lens surface gently in everwidening circles from the center out. If necessary, wipe repeatedly. Do not wipe dust on the lens surface or wipe the surface roughly, as it will cause scratches on the surface.

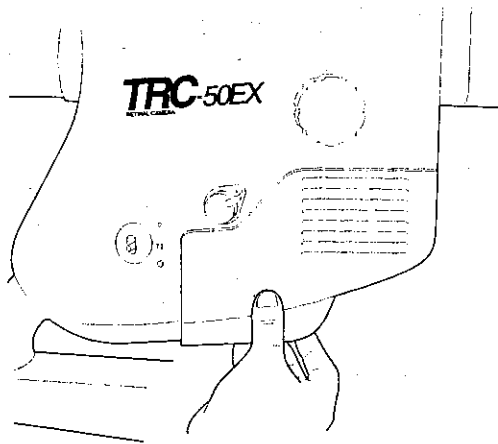
(4) If dirt is too difficult to remove, contact your authorized dealer.

Changing the lamp

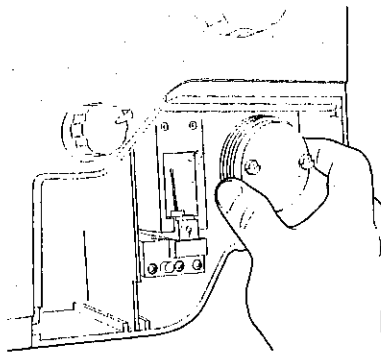
- Do not touch a lamp with bare fingers because the surface of the lamp will become dirty with finger-prints, etc. and these stains will lead to cloudiness of the lamp.
- The lamp is fragile to shock, therefore handle with extreme care.

Changing the lamp for observation

- (1) Turn the power switch OFF and disconnect the power cord from the outlet.
- (2) Detach the lamphouse cover by pushing it up from the bottom and pulling it forward.
When removing the lamphouse cover, hold its bottom and pull it down.



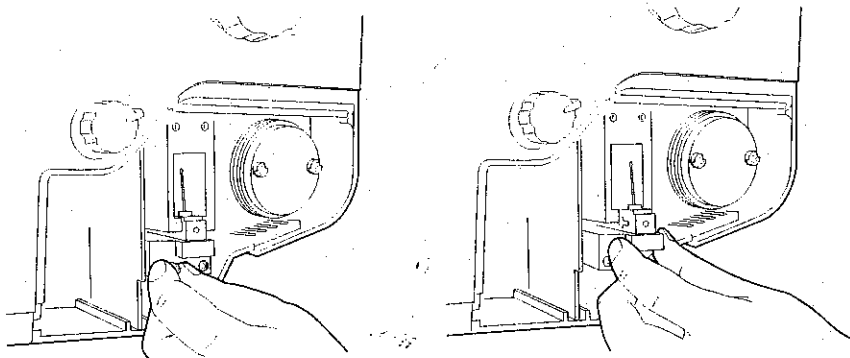
- (3) Unscrew two fixing screws of the illumination lamp and pull out the illumination lamp unit.



- (4) Insert the new illumination lamp straight in and tighten securely with the fixing screws of the illumination lamp.
- (5) Reattach the lamphouse cover.

Changing the xenon lamp

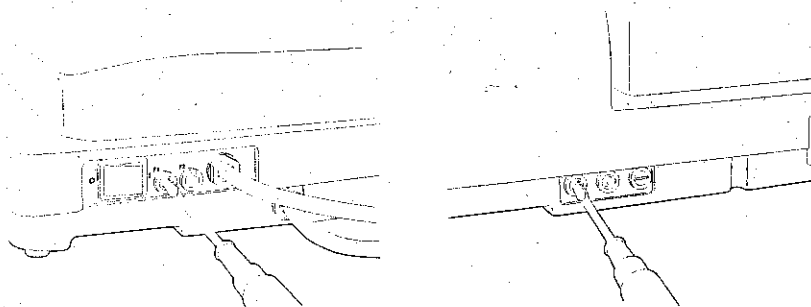
- (1) After switching off the power switch and disconnecting the power cord from the outlet, wait about 5 minutes for electric discharge, and take off the lamphouse cover.
- (2) Take off the xenon lamp fixing screw.
- (3) Slowly pull the xenon lamp straight out.



- (4) Insert the new xenon lamp straight in the receptacle it touches the end.
- (5) Tighten xenon lamp fixing screws fully in the clockwise direction with coin or screwdriver.
- (6) Attach the lamphouse cover.

Changing the fuses

- (1) Turn the power switch OFF and disconnect the power cord from the outlet.
- (2) While pressing the fuse holder, remove it by rotating in a counter-clockwise direction.
- (3) Replace with a fuse of the same rating. While pressing the fuse holder, attach by rotating in the clockwise direction.



Fuse No.	Use	When the fuse blows
F ₁ (15A or 8A)	Power input	Instrument will not work.
F ₂ (15A or 8A)	Power input	Instrument will not work.
F ₃ (3.15A)	Flash control	The buzzer keeps sounding and the system does not operate.
F ₄ (4A)	Control circuit	The buzzer keeps sounding and the system does not operate.
F ₅ (5A)	Control circuit	The system does not operate.

Schedule of expendables and spare parts

When ordering expendables and spare parts, please indicate the code number and the quantity required in addition to the description.

	Description	Code Number
Expendables	Xenon lamp	40413 16100
	Illumination lamp	40535 40200
	Chinrest paper	40310 40821
	Data plate	40405 16040
Spare parts	Fuses (F ₁)(F ₂)	40405 58050 15A 40405 58060 8A
	Fuse (F ₃)	40535 52090
	Fuse (F ₄)	40547 53040
	Fuse (F ₅)	40405 58070

When you have contact with us, advice us of the following data:

- Model name: TRC-50EX
 - Serial number: This is described on the rating nameplate on the right side of the base.
 - Period of use: Please inform us of the purchase date of this instrument.
 - State of malfunction: Please inform us of this data as minutely as possible.
-



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