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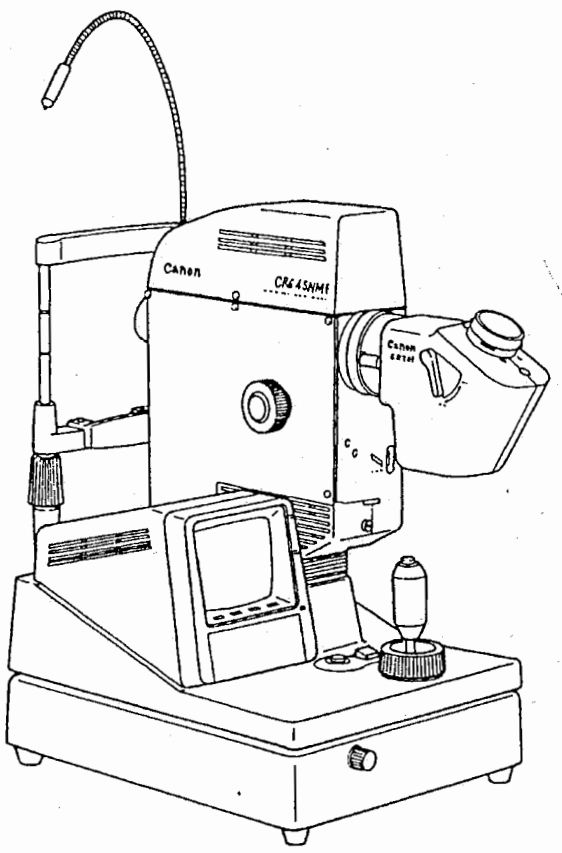
Find the *Canon CR-TA* at our website: ***Click HERE***

Canon

Non-Mydriatic Retinal Camera

CR6-45NM f

Operation Manual



Before using the instrument, be sure to read this manual thoroughly.
Keep the manual in easy-to-access place.

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PLEASE NOTE

1. The user is responsible for the use and maintenance of the product.
   We suggest that a member of the user's staff be designated as being in charge of maintenance so as to ensure that the product is kept in a safe and good condition.
   Also, medical products must be used only by a qualified person.
2. In no event will Canon be liable for direct or indirect consequential damage arising out of the use of this product.
3. This product may malfunction due to electromagnetic waves caused by portable personal telephones, transceivers, radio-controlled toys, etc.
   Be sure not to have objects such as these, which affect this product, brought near the product.
4. Canon reserves the right to change the specifications, configuration and appearance of the product without prior notice.

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Safety Information

Regulations

For U. S. A.

Do not make any changes or modifications to the equipment unless otherwise specified in the manual. If such changes or modifications should be made, you could be required to stop operation of the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference in which case the use will be required to correct the interference at his own expense.

Use of shielded cable is required to comply with class A limits in Subpart B of Part 15 of FCC rules.

For Canada

This equipment complies with the Canadian ICES-003 class A specifications.

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General Safety Information

Follow the safety instructions in this manual and all warnings and cautions printed on the warning labels.
Ignoring such cautions or warnings while handling the product may result in injury or accident.
Be sure to read and fully understand the manual before using this product.
Keep this manual for future reference.

Meaning of Caution Signs

⚠ WARNING	This indicates a potentially hazardous situation which, if not heeded, could result in death or serious injury to you or others.
⚠ CAUTION	This indicates hazardous situations which, if not heeded, may result in minor or moderate injury to you or others, or may result in machine damage.
NOTE	This is used to emphasize essential information. Be sure to read this information to avoid incorrect operation.

Installation and Environment of Use

⚠ WARNING	Do not install the instrument near any flammable chemicals such as alcohol, thinner, benzine, etc. If chemicals are spilled or evaporate, it may result in fire or electric shock through contact with electric parts inside the instrument. Also, some disinfectants are flammable. Be sure to take care when using them.
⚠ CAUTION	Do not install the instrument in a location with the conditions listed below. Otherwise, it may result in failure or malfunction, fall or cause fire or injury. • Close to facilities where water is used. • Where it will be exposed to direct sunlight. • Close to or on air-conditioner or ventilation equipment. • Close to or on a heat source such as a heater. • Prone to vibration. • Insecure trolley or stand. • Dusty environment. • Saline or sulfurous environment. • High temperature or high humidity. • Freezing or condensation.

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⚠ CAUTION	Place the instrument on a firm table. Do not place it extremely near the edge of the table in order to avoid damage or injury due to falling.
⚠ CAUTION	Do not cover the vent holes on the cover. Otherwise, the temperature in the instrument will rise and may cause fire.

Installation Operation

⚠ WARNING	Do not connect the instrument with anything other than specified. Otherwise, it may result in fire or electric shock. Also, when other equipment is going to be connected to the CR6-45NMf using the connector for interface, be sure to check after the connection that leakage current is within the tolerable value. For details, please contact Canon representative or distributor.

Power Supply

⚠ WARNING	Only operate the instrument with the type of power supply indicated on the rating plate. Otherwise, it may result in fire or electric shock.
⚠ WARNING	Be sure to turn OFF the power switch before connecting or disconnecting the cables. Also, do not handle them with wet hands. Otherwise, you may get an electric shock that may result in death or serious injury.
⚠ WARNING	Securely plug in the power cable into the AC outlet. If contact failure occurs, or if dust or metal object come in contact with the exposed metal prong of the plug, fire or electric shock may result.
⚠ WARNING	Be sure to hold the plug or connector to disconnect the cable. If you pull the cable, the core wire may be damaged, resulting in fire or electric shock.
⚠ WARNING	Do not cut or process the cables. Also, do not place anything heavy, including the instrument on it, step on it, pull it, bend it, or bundle it. Otherwise, the cable may be damaged, which may result in fire or electric shock.
⚠ WARNING	Do not get the power for more than one instrument from the same AC outlet. Otherwise, it may result in fire or electric shock.

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⚠ CAUTION	The instrument is shipped with a grounding type (three-core) power cable. To reduce the risk of electric shock, always plug the cable into a grounded power outlet.
⚠ CAUTION	To make it easy to disconnect the plug at any time, avoid putting any obstacles near the outlet.
⚠ CAUTION	Replace the battery of the 35 mm film camera with the specified type only. Also, do not recharge, disassemble or dispose of in fire or water. Otherwise, it may explode and result in fire or injury. Lithium batteries may harm the environment if disposed of thoughtlessly. Be sure to dispose of them in accordance with the law and recommended practices of the country where the instrument is being used.

Handling

⚠ WARNING	Never disassemble or modify the product as it may result in fire or electric shock. Also, since the instrument incorporates high-voltage parts that may cause electric shocks and other hazardous parts, touching them may cause death or serious injury.
⚠ WARNING	Do not place anything on top of the instrument. Otherwise, the object may fall and cause injury. Also, if metal objects such as needle or clip falls into the instrument, or if liquid is spilled, it may result in fire or electric shock.
⚠ WARNING	When the instrument is going to be moved, be sure to turn OFF the power switch, unplug the power cable from the AC outlet, and disconnect other cables. Otherwise, the cable may be damaged, which may result in fire or electric shock. Also, when the instrument is going to be carried, be sure to tighten the stage holding knob, support the bottom of the instrument and hold it horizontally. Do not hold it by the face rest or other parts as they may come off and result in injury.
⚠ WARNING	Do not hit or drop the instrument. The instrument may be damaged if it receives a strong jolt, which may result in fire or electric shock if the instrument is used without it being repaired.
⚠ CAUTION	Wipe the forehead rest with ethanol or glutaraldehyde solution to disinfect it each time a different examinee uses it, in order to prevent infection. Please consult a specialist for the procedure for disinfection.

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⚠ CAUTION	Change the chin rest paper each time the examinee changes in order to keep the chin rest clean.
⚠ CAUTION	Do not place your hand or fingers between the stage and base. Also, ensure that the examinee does not place his/her hand or fingers there either. Otherwise, fingers may be hurt.
⚠ CAUTION	When the instrument is not going to be used, turn OFF the power switch. Also, unplug the power cable from the AC outlet when it is not going to be used for a long time.
⚠ CAUTION	This instrument incorporates a lithium battery, which may pollute the environment if the instrument is abandoned. Please ask a professional waste disposal company to handle disposal, or contact Canon representative or distributor before disposing of the instrument.

When Problem Occurs

⚠ WARNING	Should any of the following occur, immediately turn OFF the power switch, unplug the power cable from the AC outlet, and contact Canon representative or distributor. • When there is smoke, odd smell or abnormal sound. • When liquid has been spilled into the instrument or a metal object has entered through an opening. • When the product has been dropped and it is damaged

Maintenance and Inspection

⚠ WARNING	For safety reasons, be sure to turn OFF the power switch when the inspections indicated in this manual are going to be performed. Otherwise, it may result in electric shock.
⚠ WARNING	When the instrument is going to be cleaned, be sure to turn OFF the power switch and unplug the power cable from the AC outlet. Never use alcohol, benzine, thinner or any other flammable cleaning agents. Otherwise, fire or electric shock may result.
⚠ WARNING	When the lamp is going to be replaced, be sure to turn OFF the power switch, unplug the power cable from the AC outlet, and wait until the lamp has cooled before replacing it. Otherwise, you may get an electric shock or be burned.

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⚠ WARNING	When the fuse is going to be replaced, be sure to turn OFF the power switch and unplug the power cable from the AC outlet before replacing it. Be sure to replace the fuse with the specified type only. Otherwise, fire or electric shock may result.
⚠ WARNING	The instrument must be repaired by a qualified engineer only. If it is not repaired properly, it may cause fire, electric shock, or accident.
⚠ CAUTION	For safety reasons, be sure to inspect the instrument daily before using it.

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1. Features

The Canon Non-Mydriatic Retinal Camera *CR6-45NMf* is not only capable of taking pictures of the retinal image without using mydriatic drugs but is also capable of performing filter photography (fluorescein angiography) using mydriatic drugs.
Various forms of photography can be performed with our optional 35 mm Film Camera *CR-RE*, with the Dual Polaroid Back Unit *CR-PC DUAL*, or with the Polaroid Color Back Unit *CR-PC2* attached to the CR6-45NMf.
Also, retinal images can be recorded or stored with an external image recorder by attaching a TV camera to the retinal camera with our Dual Angle TV Adapter *CR-TA* or *CR-TAf*.

(1) Photography using Filters (Fluorescein Angiography)

By using our optional CF-TAf, you can take a picture using filters, and immediately display the fluorescent image on an external monitor and record it as an electronic image.
The CR-TAf can also be used for non-mydriatic color photography.

(2) Easy Positioning and Focusing

An internal eye fixation lamp lights for the examinee even while you are observing the eye front image during non-mydriatic retinal photography, meaning that fixation of the eye is easier.
Positioning of the eye can be easily performed by aligning split images of pupil, displayed larger than with our former type of non-mydriatic retinal camera, on the monitor.
Also, sharp retinal image can be obtained just by aligning the split bars displayed on the monitor.

(3) Improved Induction Method

The new eye fixation target which is displayed for the examinee while the retinal image is being observed in non-mydriatic retinal photography mode can be moved anywhere just by inclining the fixation target control button. Thus, you can induce and take a picture of the most appropriate position. Also, the target is enlarged when the button is pressed, making it easier to fix and induce the eye of an examinee who may have had difficulty seeing the small target before.

(4) Photography of Eye with Strong Myopia or Hyperopia

The new FCD (Flash Compensation by Diopter) function allows you to take a picture in appropriate brightness even of an eye having strong myopia or hyperopia because the flash intensity is compensated for automatically.

(5) Photography of Small Pupil

By using the S.P (Small Pupil) knob, you can take a picture of an eye which is difficult to dilate in non-mydriatic retinal photography mode.

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2. Notes for Using the Instrument

(1) Before Performing Photography

1) Clean the contacts on the mounts of the retinal camera and the optional unit (CR-RE / CR-PC DUAL / CR-PC2 / CR-TA / CF-TAf) before attaching the optional unit to the retinal camera.
If the contacts are dirty, it may result in contact failure or may cause corrosion of contacts.

2) Check and clean the objective lens before taking a photograph, as any stains or scratches on it will be printed on film as white spots.

3) Sudden heating of the room in cold areas will cause condensation to form on the objective lens and on optical parts inside the instrument. In this case, wait until condensation disappears before performing measurement.

4) Check the battery voltage of the CR-RE before turning ON the power of the retinal camera whenever 35mm photography is going to be performed. If the battery is weak, the retinal camera will not operate normally.

(2) During Photography

1) Be careful that the examinee's eye does not become contracted by the light of the monitor reflected from the white gown of the examinee.

2) Do not forcibly pull out the photograph of the CR-PC DUAL / CR-PC2 or prevent it from coming out.

(3) After Performing Photography

1) Turn OFF the power, place the cap over the objective lens, and place the dust cover over the instrument. You cannot take a good picture when the objective lens is dusty.

2) Dust will enter the optional unit and the retinal camera when the optional unit is detached.
Be sure to attach the dust caps on both mounts and put the optional unit in a vinyl bag or the like.

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(4) During Cleaning and Disinfection

1) If the surface of the objective lens is wiped when dust or dirt is on it, it will be scratched.
Also, do not wipe the objective lens with ethyl alcohol or with cleaning paper containing silicone. Otherwise, the surface will be corroded, or will be stained.

2) Do not use anything other than neutral detergent for cleaning the cover of the instrument. Otherwise, the coating will be corroded. ☞ Section 6.3.3

3) Do not wipe parts other than forehead rest and chin rest with ethanol or glutaraldehyde solution. Otherwise, the coating will be corroded.

(5) Environment of Use

1) Dust in the air will not only attach to the objective lens, but will also attach onto the optical parts inside the instrument. You cannot take a good picture when dust is on them.
Please keep the room clean.

(6) During Installation

1) Handle the instrument carefully, as preadjustment may be altered if the instrument receives a strong jolt.

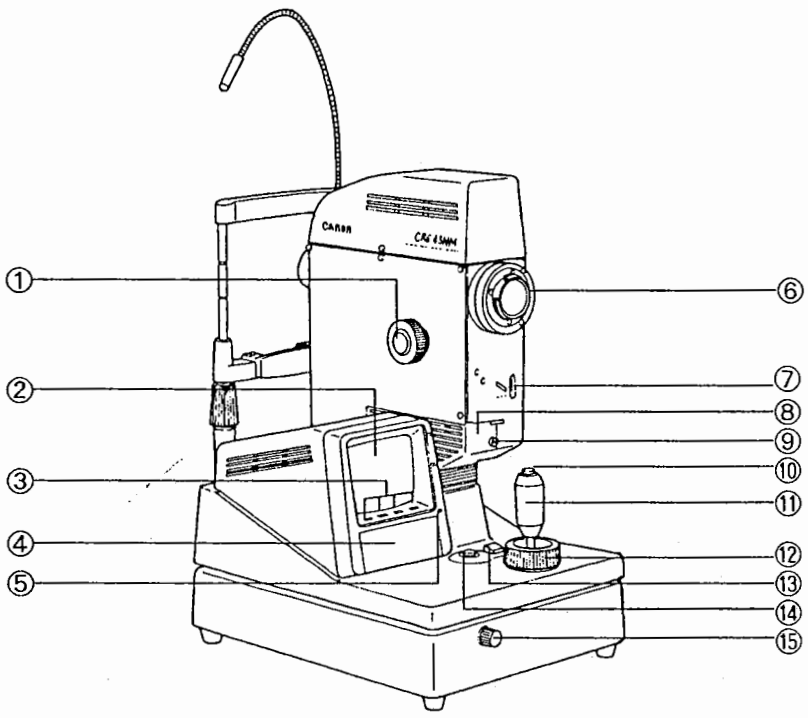
2) Blow off the dust in the connectors of the cables with a blower before connecting them.
Otherwise, connection failure may occur.

3) Do not scratch or leave fingerprints or stains on the filter.

4) When the instrument is going to be transported by means such as an automobile, or when it is going to be transported for a long distance , it must be protected against vibration and shocks.
Contact Canon representative or distributor for advice on the procedure for packing it.

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3. Description



① Focus knob

Used for focusing on examinee's eye.

② Monitor

Eye front image, retinal image and displays for settings will appear on the monitor.

③ Setting switches

Used for selecting functions or setting data.

④ Monitor adjusting knob cover

Behind the cover, there are knobs for adjusting the display on monitor.

V.HOLD knob : Knob for vertial synchronization
H. HOLD knob : Knob for horizontal synchronization.
BRIGHT. knob : Knob for adjusting the brightness.
CONT. knob : Knob for adjusting the contrast.

⑤ Power lamp

Lights when the power is turned ON, and blinks while the power saving system is working.

⑥ Optional unit mount

Mount for attaching optional unit.

⑦ Data card slot

Slot to insert data card for 35 mm photography.

⑧ Lamp box cover

Remove this cover for replacing the lamp for observation.

⑨ Lamp box screw

Cover of lamp box can be removed by loosening this screw.

⑩ Shutter release button

Press this button to take a picture.

⑪ Operation lever

Used for positioning the retinal camera in relation to the examinee's eye.

⑫ Height adjusting ring

Used for adjusting the height of the retinal camera.

⑬ [ALIGNMENT] switch

Switch for changing the display on monitor from eye front image to retinal image.

⑭ Fixation target control button

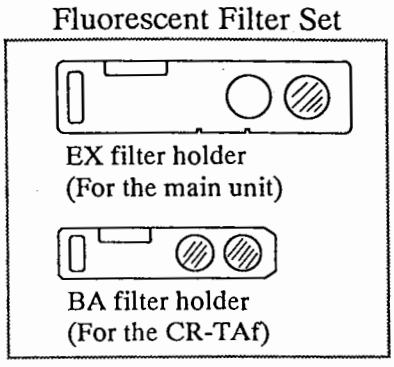
Used for moving the eye fixation target during observation of retinal image in non-mydriatic retinal photography mode. Eye fixation target will not be displayed in filter photography mode.

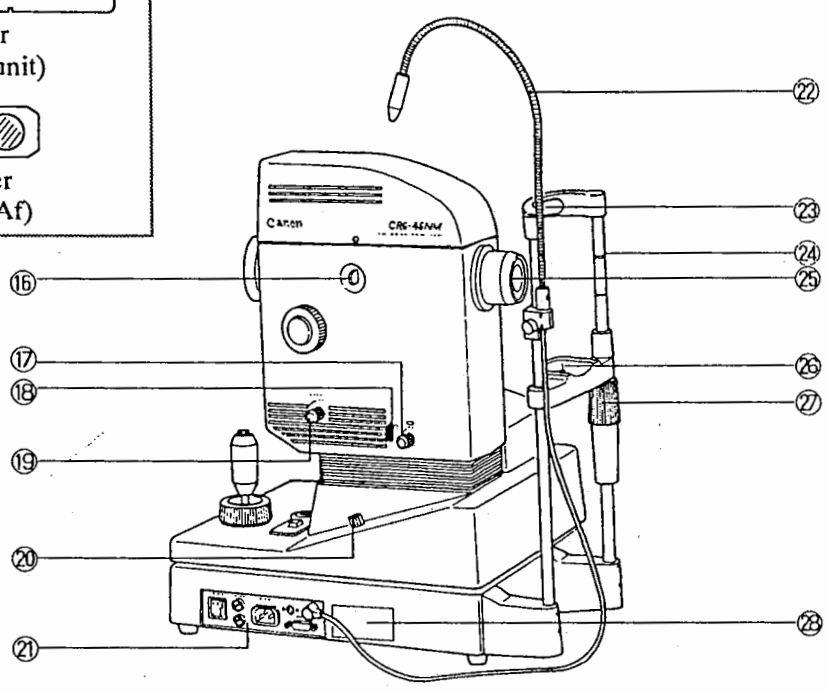
⑮ Stage holding knob

Used for holding the stage.

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Fluorescent Filter Set





⑯ Diopter compensating slider

To be pulled when diopter of examinee's eye exceeds -12D to +15D.

⑰ [S.P (Small Pupil)] knob

Set it to ON when photographing eye smaller than the diameter required (4.0 mm).

⑱ [EX (Exciter) FILTER] holder

To be pulled to place the exciter filter into the optical path for filter photography.

⑲ [IR. (Infrared Ray) FILTER] knob

Must be set to "IN" for photography, and out for cleaning the objective lens.

⑳ [LAMP] knob

Used for adjusting the brightness for observation. Brightness in "3" is approximately 25% of brightness when knob is turned to "MAX", while "4" is approximately 45%, "5" is approximately 55%, and "7" is approximately 80%.

㉑ Power supply panel

See the next page.

㉒ External eye fixation lamp

Lamp for inducing the eye to be photographed to move to required position during filter photography.

㉓ Forehead rest

Place the examinee's forehead against this rest.

㉔ Height adjustment mark

Align the height of the examinee's eye with this mark by adjusting the height of chin rest.

㉕ Objective lens

This is the main lens for photography.

㉖ Chin rest

Place the examinee's chin on this rest.

㉗ Chin rest height adjusting ring

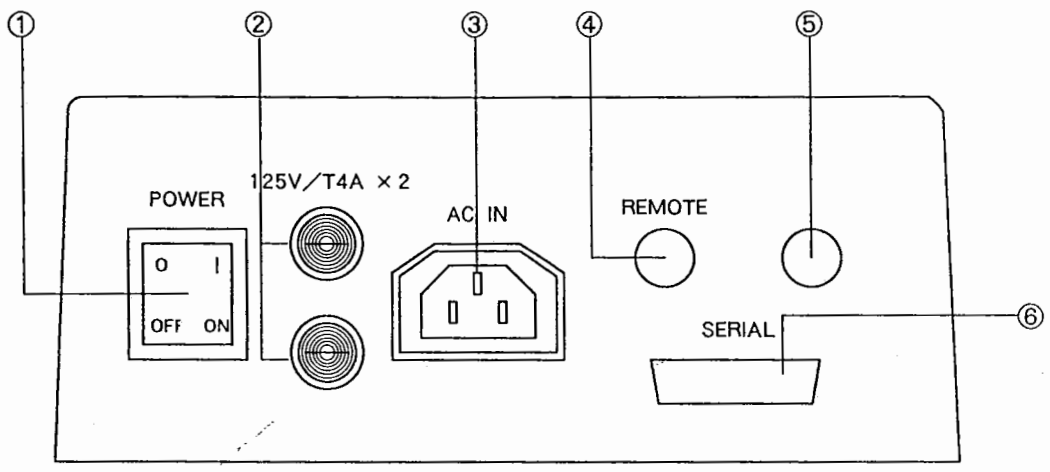
Used for adjusting height of chin rest.

㉘ Rating plate

Name of the product, rated voltage, body number, etc. are indicated on this plate.

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Power Supply Panel



① [POWER] switch

Used for turning power ON and OFF.

② Fuse holders

There are two holders and each contains a 125V 4A fuse.

③ [AC IN (Power)] connector

Connector for power cable.

④ [REMOTE] connector

RS422A connector. Used for connecting remote controller for entering ID number when external image recorder is going to be used.

⑤ External eye fixation lamp connector

Connector for connecting the external eye fixation lamp.

⑥ [SERIAL] connector

RS422A connector. Used for connecting an external image recorder.

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4. Photography

⚠ WARNING	Should any of the following occur, immediately turn OFF the power switch, unplug the power cable from the AC outlet, and contact Canon representative or distributor. • When there is smoke, odd smell or abnormal sound. • When liquid has been spilled into the instrument or a metal object has entered throught an opening. • When the product has been dropped and it is damaged.

NOTE: When any operation has been interrupted for more than 10 minutes with the power turned ON, power-saving system of the instrument operates. Lamps inside the instrument turn off and power lamp blinks while this system is operating. Press shutter release button in order to restore the function.

4.1 Non-Mydriatic Retinal Photography

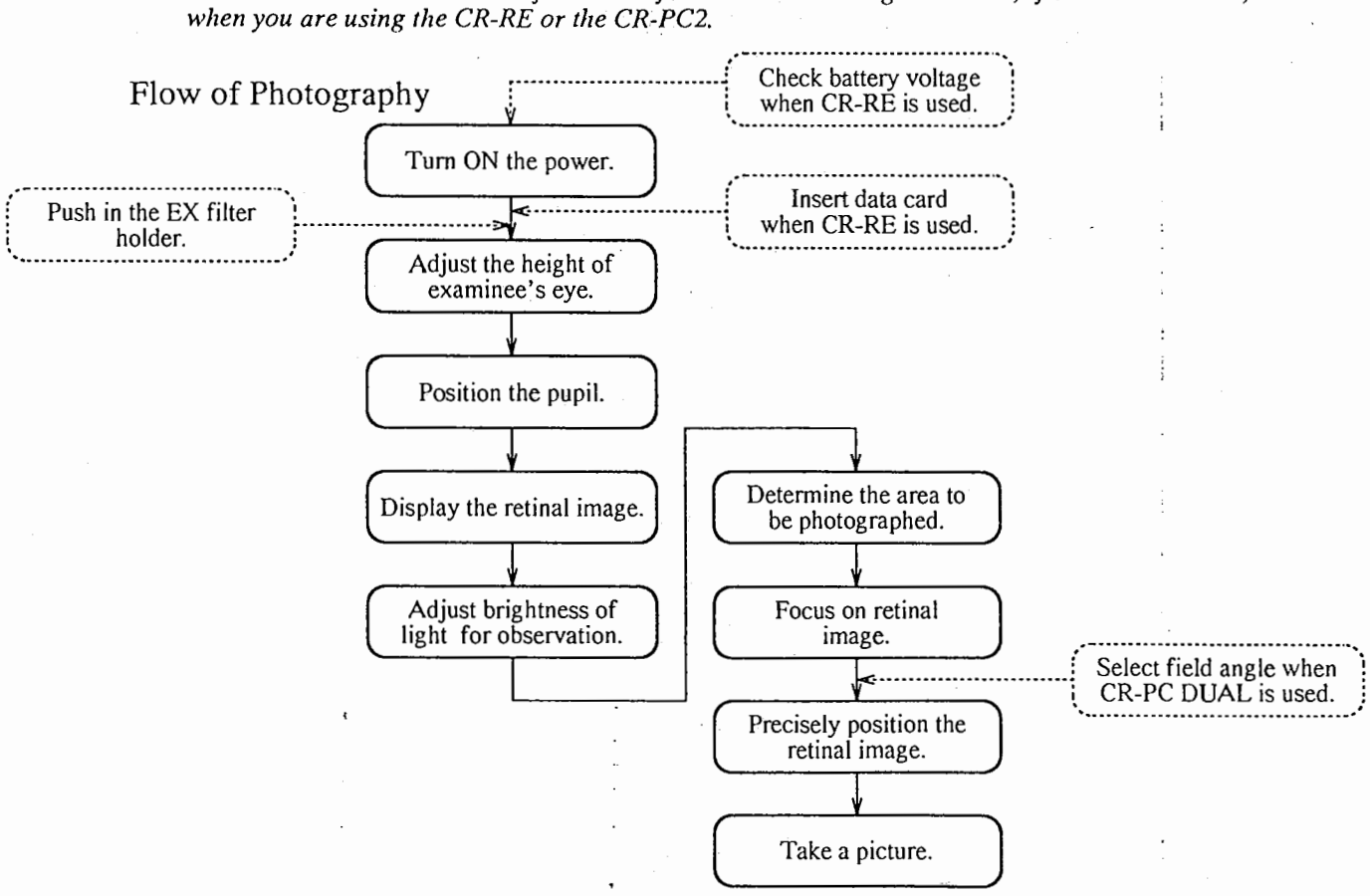
This chapter explains the procedure for performing non-mydriatic retinal photography with the 35 mm Film Camera *CR-RE*, Dual Polaroid Back Unit *CR-PC DUAL* and Polaroid Back Unit *CR-PC2*.

Refer to the respective manuals for the procedure for handling each unit.

If you are using external image recorder, please refer to the manual of the Dual Angle TV adapter CR-TA or CR-TAf.

NOTE: Be sure to disconnect the interface cable for the external image recorder, if one is connected, when you are using the CR-RE or the CR-PC2.

Flow of Photography



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4.1.1 Preparation

(1) Check the battery voltage. (When CR-RE is used)

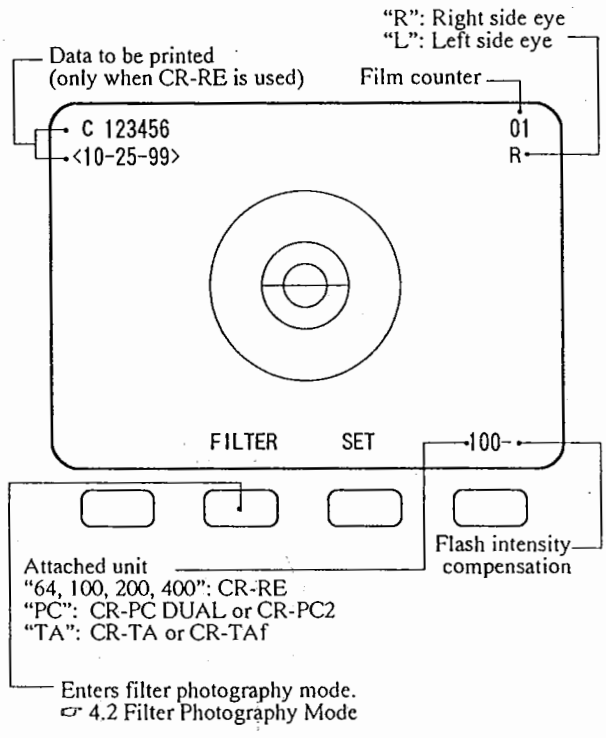
NOTE: Check the battery voltage of the CR-RE before turning ON the power of the retinal camera. If the battery is getting run down, the retinal camera will not operate normally.
☞ CR-RE operation manual

(2) Turn ON the power.

- The display for observing eye front image in non-mydriatic photography mode will appear on the monitor. Change the settings as required. ☞ Chapter 5

NOTES:

1. *If display on the monitor is not as shown, turn OFF the power and turn it ON again after about 10 seconds.*
2. *Do not remove the exciter filter holder from the instrument even in non-mydriatic retinal photography.*
3. *If message "CHECK FILTER" is displayed, push in the exciter filter holder in order to remove the exciter filter from the optical path. You cannot take a color picture with the filter in the optical path.*
4. *If any error message appears, refer to section 6.2.2.*
5. *If the displayed date is wrong, reset it by referring to (3) in section 5.4.*



■ Flash Intensity

35mm Film Camera CR-RE:

Flash intensity is automatically set according to the sensitivity of film loaded in the CR-RE. However, if the film does not have DX code, and/or if the ISO sensitivity is other than 64, 100, 200 or 400, the flash intensity will be set to ISO 100.

Dual Polaroid Back Unit CR-PC DUAL:

Film of either ISO 600 or ISO 640 can be used.
Flash intensity is automatically set according to the angle being selected.

Polaroid Back Unit CR-PC2:

Film of either ISO 600 or ISO 640 can be used.
Flash intensity is automatically set to ISO 600.

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■ **Compensation of Flash Intensity**

Flash intensity can be compensated for according to the brightness of examinee's eye.

When "+" is selected, flash intensity will increase by 0.5 step and the picture will become brighter.

When "−" is selected, it will decrease by 0.5 step and the picture will become darker.

The character (either space for normal, or +, or −) on the right-hand side of the display indicating the attached unit changes each time the switch on the far right side is pressed.

NOTE: When either + or − is selected, FCD (Flash Compensation by Diopter) function will not work. ☞ *(2) in section 5.2*

(3) Loosen the stage holding knob by turning it in counterclockwise direction.

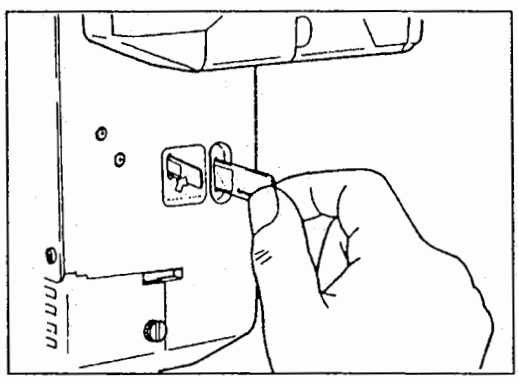
(4) Insert data card. (When CR-RE is used)

You can select any two of hand-written data, ID number, or date to be printed on 35 mm film.
☞ Section 5.4

If you wish to print hand-written data, write the necessary data within the frame on the data card with a felt-tipped pen.

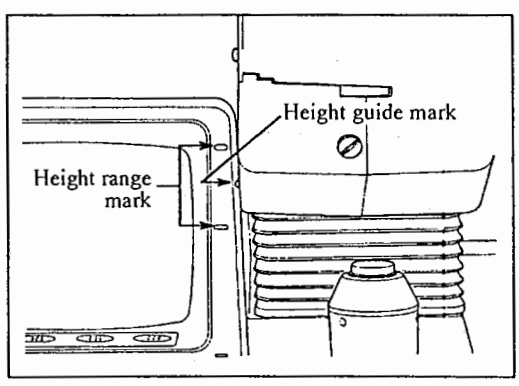
Insert the card into the slot with the writing facing toward the left side.

NOTE: It is recommended that a pen containing oil-based ink be used. Use alcohol to erase data written with it.



(5) Adjust the unit's height by turning the height adjusting ring.

Adjust the height so the height guide mark is in the center of the height range marks.



(6) Darken the room to a level where a newspaper can barely be read (= about 5 luxes).

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4.1.2 Positioning and Focusing

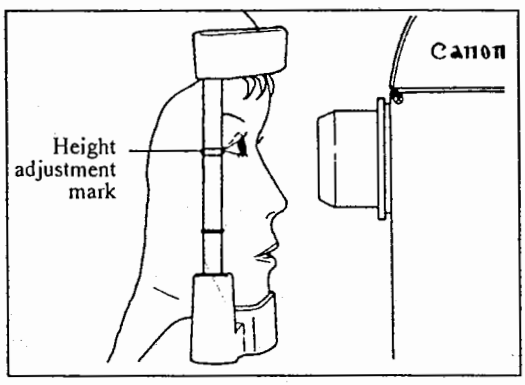
(1) Adjust the height of the examinee's eye.

⚠ CAUTION	Wipe the forehead rest with ethanol or glutaraldehyde solution to disinfect it each time a different examinee uses it, in order to prevent infection. Please consult a specialist for the procedure for disinfection. If you are using disinfectant other than those specified above, or if you are mixing another disinfectant with ethanol, please also consult a specialist because they may harm the forehead rest.
⚠ CAUTION	Change the chin rest paper each time the examinee changes in order to keep the chin rest clean.

NOTE: Confirm that the examinee is not wearing spectacles or contact lenses.

1) Have the examinee sit and place his/her face against the chin rest and forehead rest.

2) Adjust the height of the chin rest by turning the chin rest height adjusting ring so that the eye of the examinee is aligned with the height adjustment mark on the face rest pole.



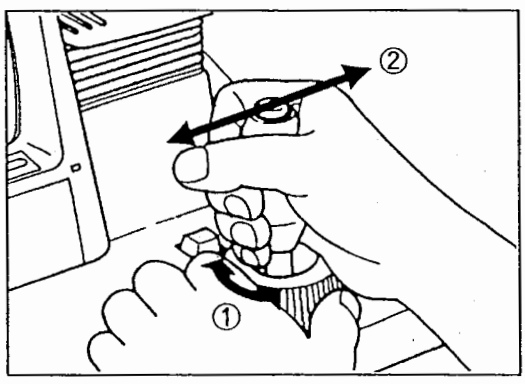
(2) Slide the operation lever to the side of the eye to be photographed.

(3) Position the pupil.

⚠ CAUTION	Do not place your hand or fingers between the stage and base. Also, ensure that the examinee does not place his/her hand or fingers there either. Otherwise, fingers may be hurt.

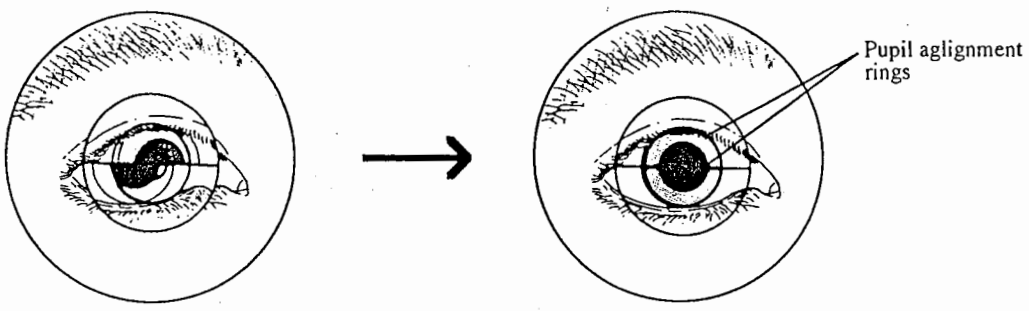
1) Looking at the monitor,
① turn the height adjusting ring and
② incline the operation lever right or left so that the eye front image is displayed almost at the center of the monitor.

Adjust the height of the chin rest by turning the chin rest height adjusting ring as required. Hold the operation lever and slide the stage if you need to move the unit more.



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2) Have the examinee stare at the blinking internal eye fixation lamp.
3) Incline the operation lever back and forth until the split images of the pupil are aligned.



★ If the pupil is smaller than the inner alignment ring:

➡ Darken the room more in order to hasten the dilation.

➡ If pupil is still small, use the "S.P function". ☞ See below.

■ S.P (Small Pupil) Function

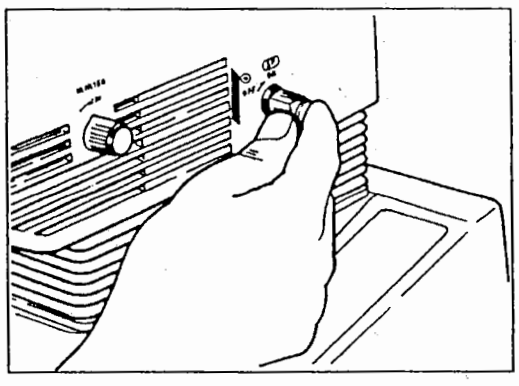
If the pupil is smaller than the inner alignment ring even after waiting for a while in a dark room, use ***S.P function.***

Even an eye whose pupil as small as 3.7mm in diameter will be able to be photographed.

NOTE: Do not use this function for taking a picture of a fully dilated eye. Otherwise, you will not be able to take a picture of proper density due to excessive exposure.

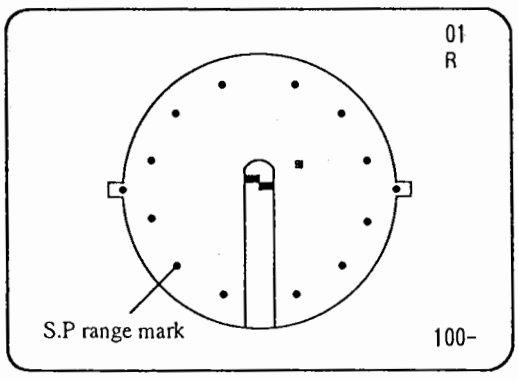
① Set the [S.P] knob to "ON".

NOTE: Unless "|" mark on the knob is properly aligned with "ON" or "OFF" mark on the instrument, darkness of image on film may become uneven.



② Press [ALIGNMENT] switch.
Area that will be photographed will be indicated by dotted circle.

NOTE: Image outside the dotted circle will not be photographed. Also, flare may be printed outside the dotted circle.



③ Follow the same steps as from (5) on the next page.

NOTE: "S.P" will be printed on 35 mm film. ☞ (1) of section 4.1.3

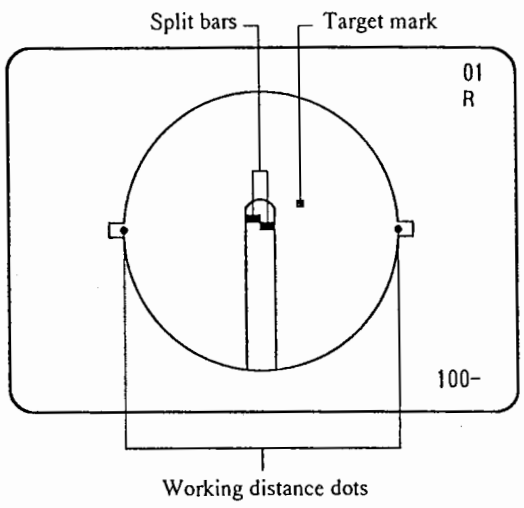
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(4) Press [ALIGNMENT] switch to display the retinal image on the monitor.

- When the stage is slid to the opposite side when the retinal image is displayed, the display will change to eye front image.

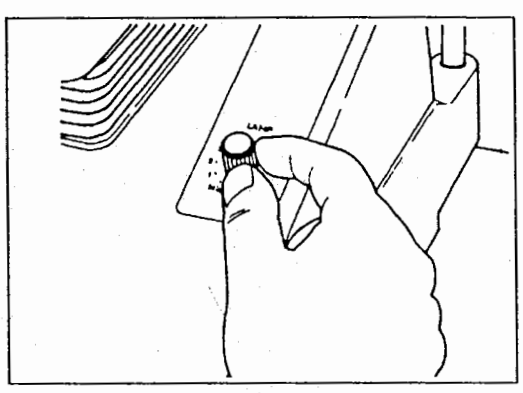
★ If split bars cannot be seen
★ If working distance dots cannot be seen

☞ Section 6.2.1



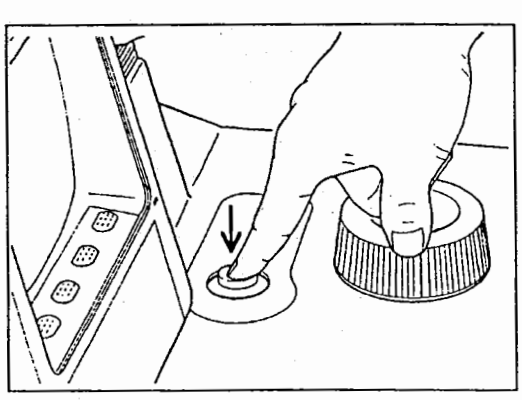
(5) Looking at the monitor, adjust the brightness for observation by turning the [LAMP] knob.
Usually, it should be set to 4 or 5.
Adjust the brightness and contrast of the monitor by using the monitor knobs as required.

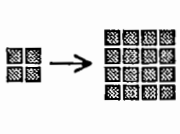
NOTE: It will be difficult to see the working distance dots and split bars during observation of retinal image if the brightness is set too high.



(6) Have the examinee place his/her face firmly against the forehead rest and chin rest.

(7) Determine the area to be photographed.
1) Have the examinee stare at the square green eye fixation target.
If he/she cannot see the target well, press the fixation target control button down.
The size of the target will alternate between normal and four times larger for a few seconds.

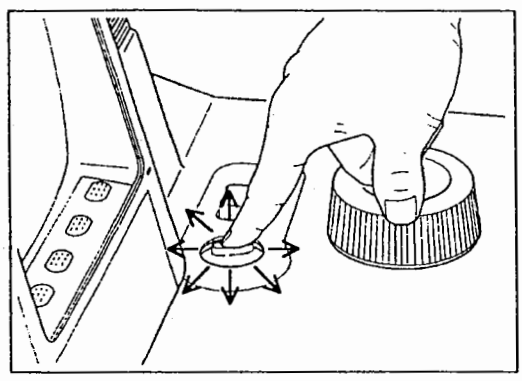




While the target is enlarged, target mark on the monitor will blink.

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2) Incline the fixation target control button to move the eye fixation target to the position where you wish to induce the examinee's eye, as required.

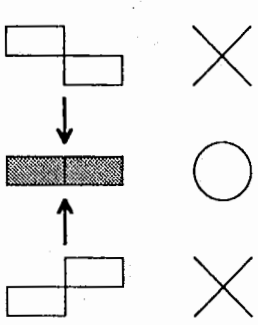


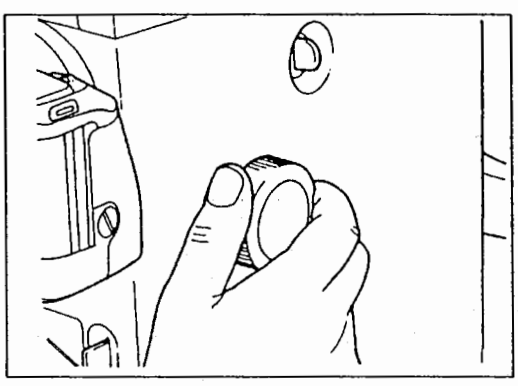
★ If there is flare
★ If working distance dots cannot be seen

☞ Section 6.2.1

(8) Align the split bars by turning the focus knob.

Focusing is correct when the split bars are aligned.



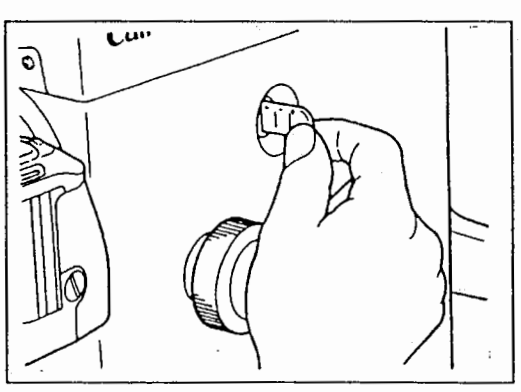


If the examinee's eye is opaque, press the switch on the far left side to display the word "OPACITY" on the monitor.
The word will be printed on the 35 mm film with the retinal image. ☞ (1) of section 4.3

★ If split bars cannot be seen ☞ Section 6.2.1

★ If split bars do not align

➡ Diopter of examinee's eye is out of the range from -12D to +15D.
In this case, pull out the diopter compensating slider.
If it is pulled out one step, − (minus) lens will be set, and if it is pulled out two steps, + (plus) lens will be set.
Whenever it is pulled out, split bars will disappear.
Turn the focus knob and focus on the retinal image.

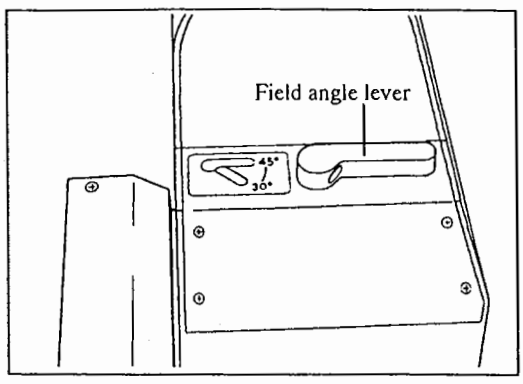


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(9) Select field angle. (When CR-PC DUAL is used)

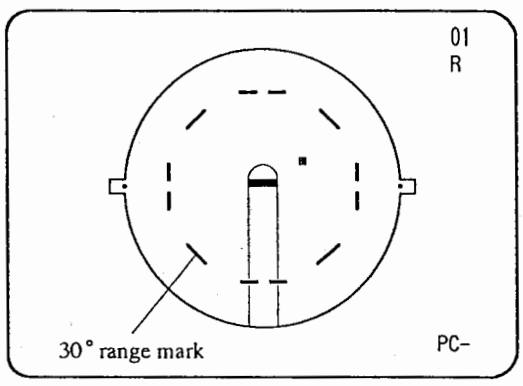
Properly set the field angle lever to either 45 ° or 30 °.

NOTE: Unless the lever is turned properly until it stops, retinal image will not be photographed.



When 30 ° is selected, approximate image area that will be photographed will be indicated.

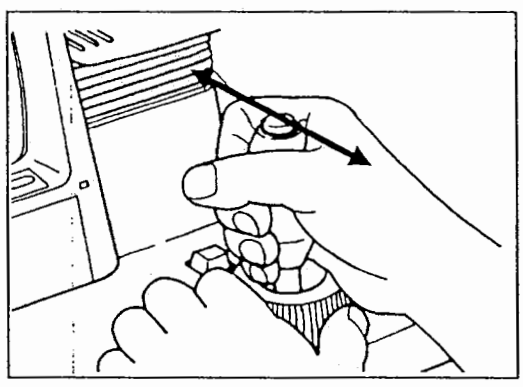
These marks appear only when retinal image is displayed on monitor.



(10) Precisely adjust the position of retinal image.

Incline the operation lever forward and backward so that both working distance dots are displayed the smallest.

Also, precisely adjust the position of the working dots so they are equally positioned from top and bottom, and from right and left.

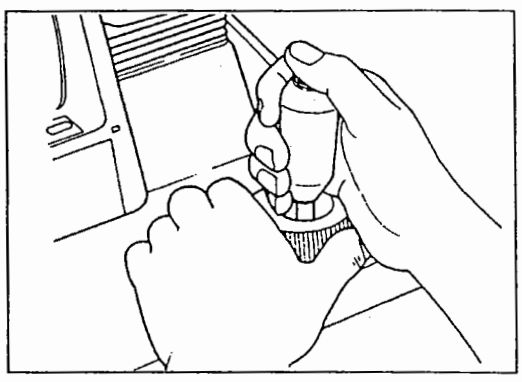


NOTE: Unless the retinal image is positioned properly, flare will appear in the periphery of the retinal image when the picture is taken.

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4.1.3 Photography

(1) Press shutter release button.



- After a picture is taken, eye front image will be displayed.
- Film counter displayed on monitor will count up.

★ **If the picture is not good** ☞ Section 6.2.1

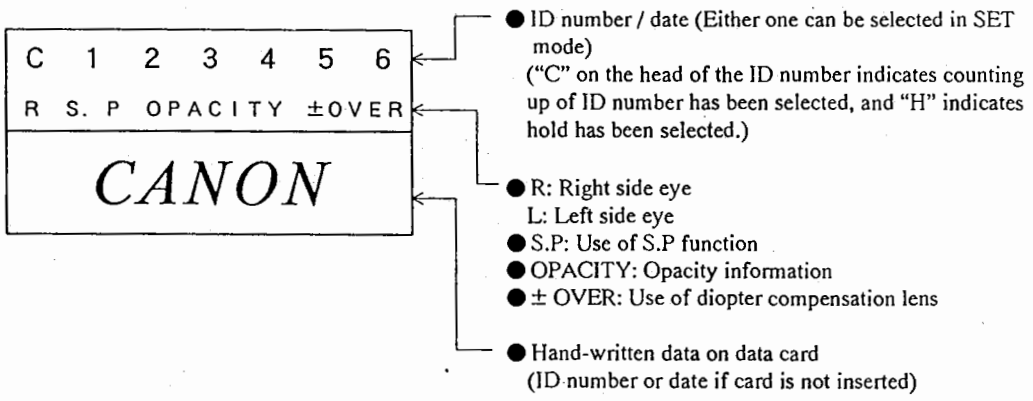
NOTE: Photography cannot be performed while the instrument is charging up, i.e. just after attachment of optional unit or just after photography.
Approximately 30 seconds is required for charge-up to be completed.
However, it may take a little longer when the power voltage is low.
During the charge-up, the sign indicating the attached unit blinks on the monitor.

【In 35 mm Photography】

The retinal image and the selected data will be photographed.

- Film will automatically wind up and frame counter on the CR-RE will increase by one.

Example of Printed Data



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【In Polaroid Photography】

Photograph automatically comes out.

It takes about two to three minutes until the film is developed.

Look at the photograph to confirm the picture is good.

- If the picture is bright or dark, compensate the flash intensity and take a picture again.
- No data will be printed. If data is required, write it on the space on film.
- Film counter on the unit will decrease by one every time a picture is taken.

NOTE: Do not forcibly pull out the photograph or prevent it from coming out.

(2) If you are taking a picture of the other eye:

Eye will be contracted after a picture is taken.

Wait for at least five minutes until the eye is sufficiently dilated.

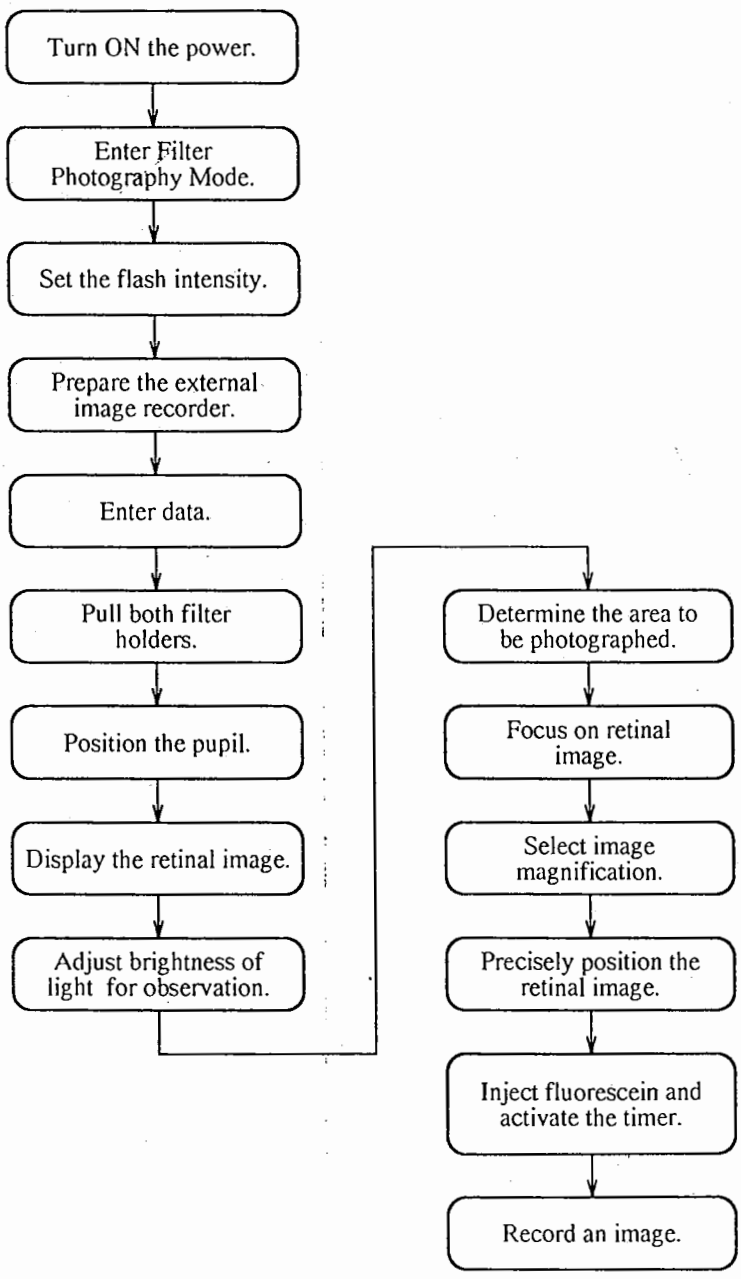
Then, take a picture.

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4.2 Filter Photography

This chapter explains the procedure for filter photography (fluorescein angiography).
Filter photography requires the use of the Dual Angle TV Adapter CR-TAf, external image recorder, TV camera and an external monitor.
Refer to the respective manuals for the procedure for handling each unit.

Flow of Photography



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4.2.1 Preparation

NOTE: Use mydriatic drug so the examinee's pupil is widely dilated by the time of photography.

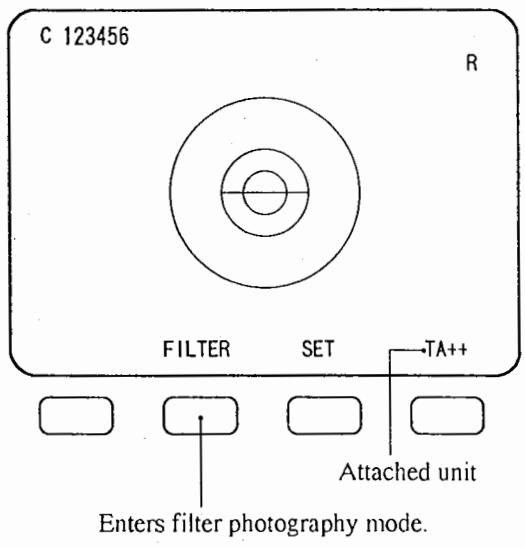
(1) Turn ON the power.

NOTE: Power must be turned ON in the order of TV camera, external image recorder, retinal camera and external monitor.

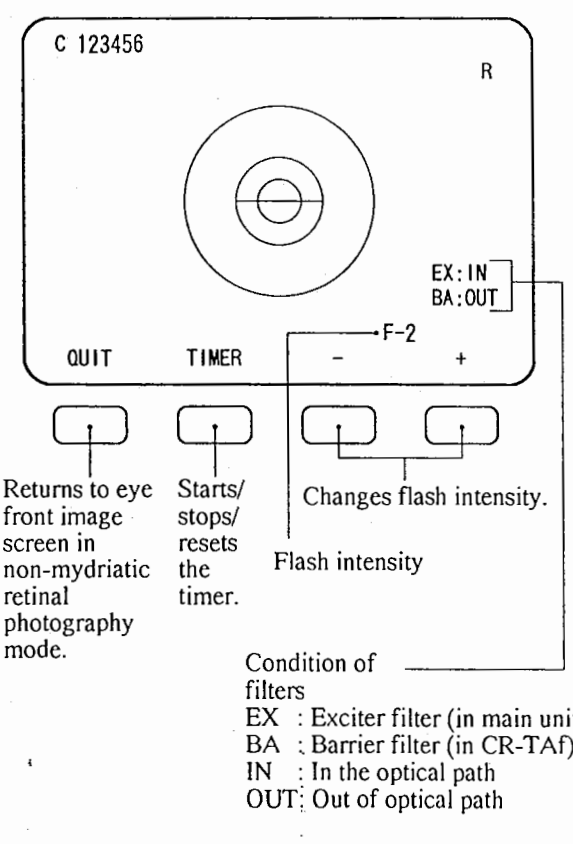
- The display for observing eye front image in non-mydriatic retinal photography mode will appear on the monitor.

(2) Loosen the stage lock knob.

(3) Press the switch under [FILTER] to enter filter photography mode.



- The display for observing eye front image in filter photography mode will be displayed.
- Charging of retinal camera is completed when the flash intensity is constantly displayed, and retinal camera is still charging up when the flash intensity is blinking.
- Press the switch under the word [QUIT] in order to return to display of non-mydriatic retinal photography mode.



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(4) Manually set the flash intensity.

Press the switch under [+] or [−] to set the flash intensity.

Each time the switch is pressed, the flash intensity changes by 0.5 step, and the display changes among F-1 through F-12.

• The setting is retained even after the power is turned OFF.

NOTE: The flash intensity differs according to the conditions of photography. Please check if you have obtained a good image by looking at the photographed image. If not, adjust the flash intensity starting from F-7.

■ Flash Intensity

Refer to the ISO sensitivity in the following table as a hint for determining the setting.

Manual Flash Intensity	F − 1	F − 3	F − 5	F − 7
Equivalent ISO Sensitivity	800	400	200	100

Flash intensity changes automatically according to the image magnification selected with the CR-TAf.

For example, if you set the image field lever of the CR-TAf to " × 2" when the flash intensity is set to F-5, the flash intensity will automatically change to F-8.

Although F-13 through F-15 may be displayed according to the selected image magnification, the flash intensity is equivalent to that of F-12.

NOTE: Following functions do not work in filter photography mode:

- *FCD (flash compensation by diopter) function*
- *S.P (small pupil) function*

(5) Prepare the external image recorder for recording.

☞ Operation manual of the external image recorder

(6) Enter data.

Enter the data to be recorded each time the examinee changes. ☞ Operation manual of the external image recorder

NOTE: Data such as ID number, date, etc. will not be output from the retinal camera to the external image recorder in filter photography mode. Use the ID number displayed on the monitor as a counter.

(7) Adjust the unit's height by turning the height adjusting ring.

☞ (5) in section 4.1.1

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(8) Pull the EX filter holder on the main unit until it stops.
- Exciter filter enters the optical path.

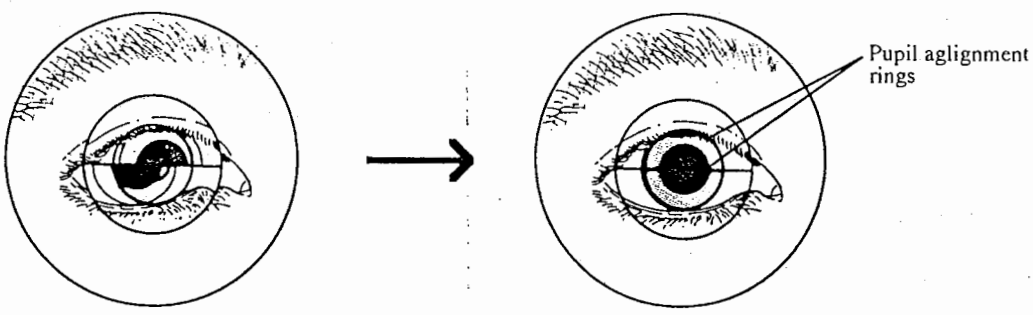
(9) Pull the BA filter holder of the CR-TAf until it stops.
- Barrier filter enters the optical path.

4.2.2 Positioning and Focusing

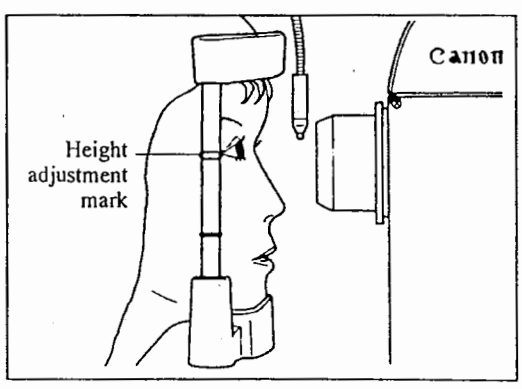
(1) Align the examinee's eye to the height adjustment mark on the face rest pole by turning the chin rest height adjusting ring.
☞ (1) in section 4.1.2

(2) Slide the operation lever to the side of the eye to be photographed.

(3) Align the split images of the pupil by using the height adjusting ring and operation lever.
☞ (3) in section 4.1.2

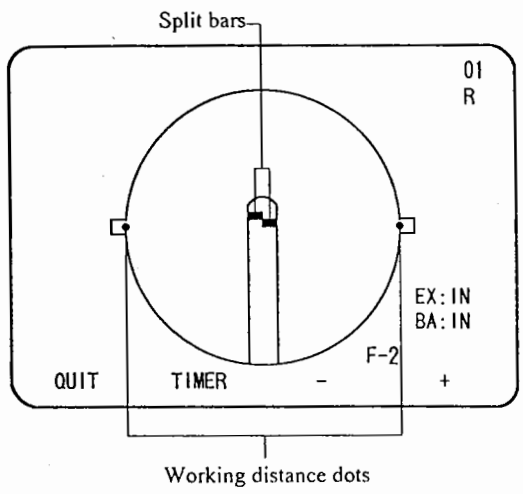


NOTES:
1. *Examinee will not be able to see the internal eye fixation target well after mydriatic drug is applied. Fix the examinee's eye by having him/her stare at the external eye fixation lamp.*
2. *Be sure to set S. P knob to OFF.*
   You will not be able to take a picture of proper density due to excessive exposure when S.P function is used for a fully dilated eye.
   When S.P knob is set to ON, "SP" will be displayed on the monitor as a warning.



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(4) Press [ALIGNMENT] switch to display the retinal image.
☞ (4) in section 4.1.2



(5) Looking at the monitor, adjust the brightness for observation by turning the [LAMP] knob. Usually, it should be set to 4 or 5.

NOTE: It will be difficult to see the working distance dots and split bars during observation of retinal image if the brightness is set too high.

(6) Have the examinee place his/her face firmly against the forehead rest and chin rest.

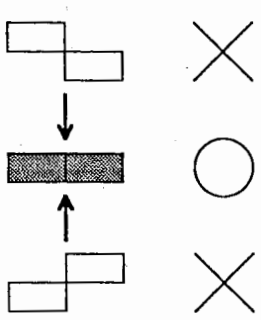
(7) Determine the area to be photographed.

Determine the area to be photographed by inducing the examinee's eye to move by having him or her look at the external eye fixation lamp.

NOTE: Make sure that the examinee's forehead and chin have not been detached from the respective rests.

(8) Align the split bars by turning the focus knob.

Focusing is correct when the split bars are aligned.

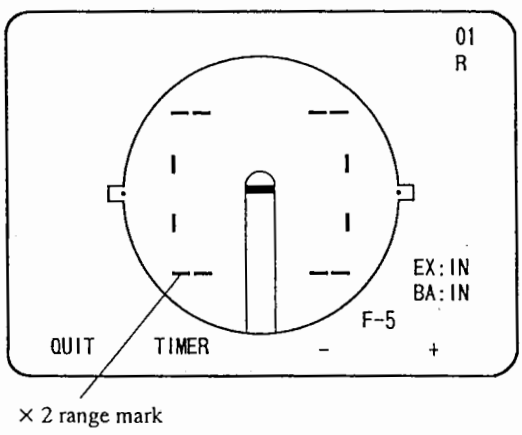


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(9) Select image magnification.

Properly set the image field lever of the CR-TAf to either "45°" or "× 2".

When "× 2" is selected, approximate image area that will be photographed will be indicated.



(10) Incline the operation lever forward and backward so that both working distance dots are displayed the smallest.

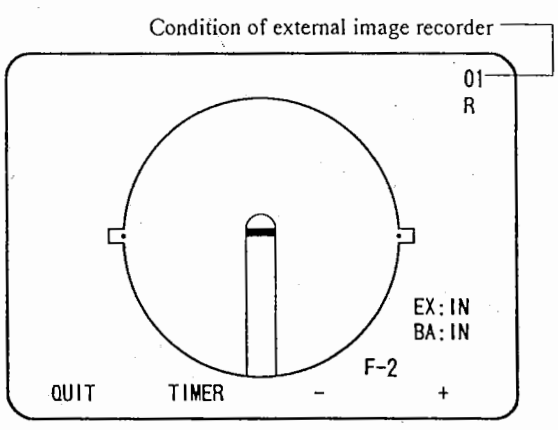
☞ (10) in section 4.1.2

4.2.3 Recording

(1) Confirm that the external image recorder is ready for recording.

When it is ready, "01" will be displayed on the monitor of the retinal camera.

When it is not ready, "■■" will blink on the monitor.



(2) Confirm that the display of EX and BA is "IN".

NOTE: You cannot take a picture unless both filters are in the optical path. If the display is "OUT", be sure to pull the filter holder out until it stops so the filter enters the optical path. After the filter holders are pulled out, be sure to confirm that the image is still properly focused.

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(3) Inject fluorescein and activate the timer.

Press the switch under [TIMER] to activate the timer simultaneously with the injection of fluorescein.

- Time that has elapsed will be indicated on the external monitor in increments of 0.1 second.
- Each time the switch is pressed, the timer starts → stops → resets → starts . . .

(4) Record an image.

Press shutter release button at time when the fluorescein is anticipated to appear in the retina.

- The fluorescent image appears on the external monitor, and it is recorded in the external image recorder.
- The sub number of the ID number displayed on the external monitor counts up.

NOTE: Fluorescent image will not be displayed on the monitor of the retinal camera. Shutter release button must be pressed to confirm the emergence of the fluorescent image on the external monitor.

(5) Repeat recording of image as required.

After checking that the external image recorder is ready, repeat recording of image as required.

NOTES:
1. *If shutter release button is pressed when the external image recorder is not ready, retinal image will not be recorded, although the strobe tube of the retinal camera flashes. Message "CHECK RECORDER" will be displayed on the monitor of the retinal camera.*
2. *Interval of recording differs according to the selected flash intensity and the condition of the external image recorder. Be sure to check that the flash intensity is constantly displayed, i.e. not blinking, and "01" is displayed on the monitor of the retinal camera before recording an image again.*

(6) Press [ALIGNMENT] switch to return to the display for observing eye front image in filter photography mode.

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5. Various Settings [SET Mode]

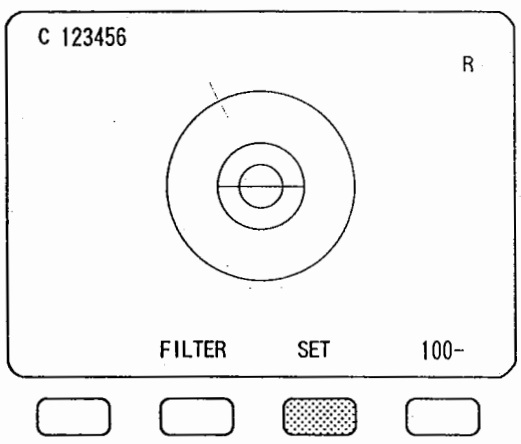
Various settings can be performed in *SET mode*.
There are four screens in this mode.

SET 1 screen: Settings for photography (use of split bars and FCD function)
SET 2 screen: Resetting of ID number (for 35 mm or filter photography)
SET 3 screen: Settings concerning data (ID number and date) to be printed (for 35 mm or filter photography)
SET 4 screen: Settings concerning eye fixation target

NOTE: Following functions do not work in filter photography mode, irrespective of the settings in SET mode:
- *FCD function*
- *Displaying of eye fixation target during observation of retinal image*

5.1 How to Enter SET Mode

(1) Press the switch under [SET] in eye front image screen on non-mydriatic retinal photography mode.
- SET mode menu will be displayed.

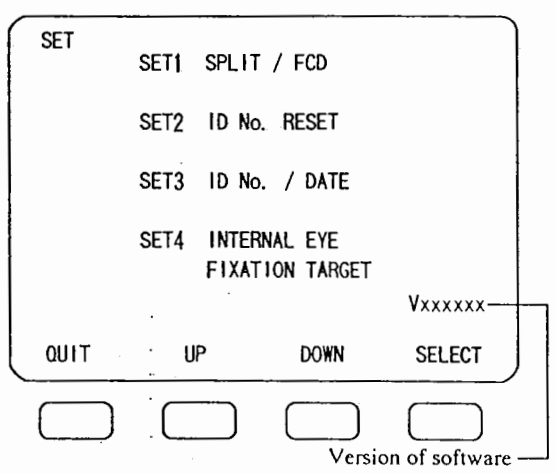


【Eye Front Image Screen in Non-Mydriatic Retinal Photography Mode】

(2) Press the switch under [UP] or [DOWN] to select the screen from SET 1 through SET 4.
- The selected one blinks.

(3) Press the switch under [SELECT].

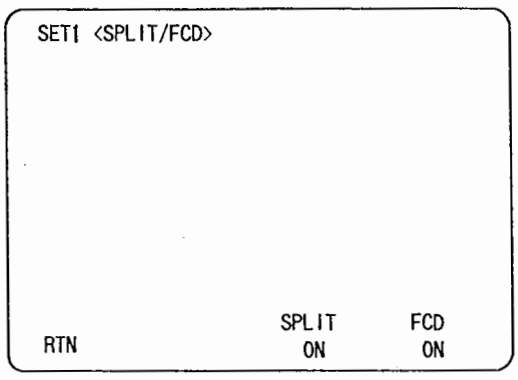
If you wish to return to eye front image screen from the menu, press the switch under [QUIT].



【SET Mode Menu Screen】

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5.2 SET 1 Screen (Settings for Photography)



【SET 1 Screen】

(1) Split Bars (SPLIT)

SPLIT ON : Split bars which are used for focusing appear on the monitor. However, they will automatically disappear when diopter compensating slider is pulled.

SPLIT OFF : Split bars are not displayed.

【How to change the setting】 Press the button under [SPLIT].

(2) Flash Compensation by Diopter (FCD)

NOTE: This does not function in filter photography mode.

FCD ON : Flash intensity is automatically compensated for when the examinee has strong myopia or hyperopia (within a range of -12D to -5D, and +8D to +15D).
FCD starts operating after focus knob is turned in retinal image screen.
However, it will not function even within those ranges in the following cases:

- Pupil is not positioned properly in eye front image screen.
- Flash intensity has been compensated for (+ or −).
- Diopter compensating slider has been pulled out.
- [S.P] knob is set to ON.

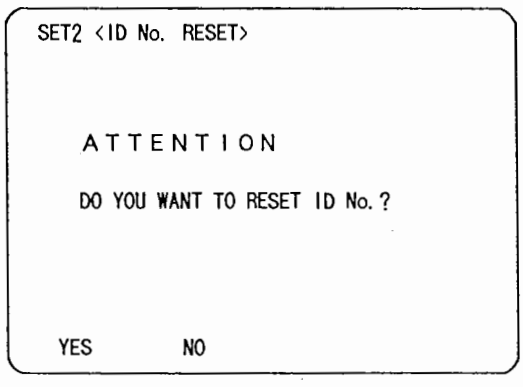
FCD OFF : Flash intensity is not compensated.

【How to change the setting】 Press the switch under [FCD].

When all the settings are completed, press the switch under [RTN].
Settings will be stored, and the display will return to
eye front image screen of non-mydriatic retinal photography mode.

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5.3 SET 2 Screen (Resetting of ID Number)

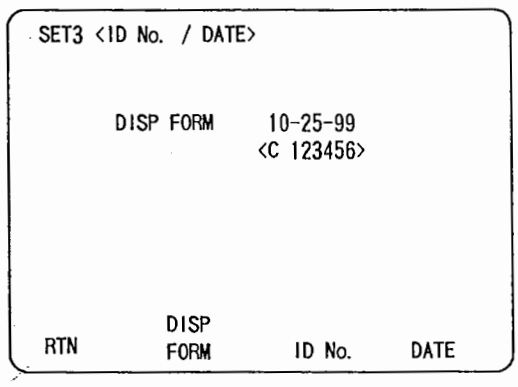


【SET 2 Screen】

ID number , which can be printed on 35 mm film in non-mydriatic retinal photography or can be used as a counter in filter photography, can be reset to "000001" here.
Message "ATTENTION DO YOU WANT TO RESET ID No.?" is displayed on the monitor.
Press the switch under [YES] to reset the number. Number is reset and the display will return to eye front image screen.
Press the switch under [NO] if you do not want to reset the number. The display will return to menu screen.

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5.4 SET 3 Screen (Settings Concerning Data to be Printed)



【SET 3 Screen】

(1) Position of ID Number and Date (DISP FORM)

NOTE: "DISP FORM" will not be displayed when CR-TAf is attached.

Position of ID number and date to be displayed on the monitor and printed on 35 mm film can be switched.

If data card is not inserted, ID number and date will be printed in the position as displayed on monitor. If data card is inserted, ID number or date, whichever is on the top, will be printed out with the data on card.

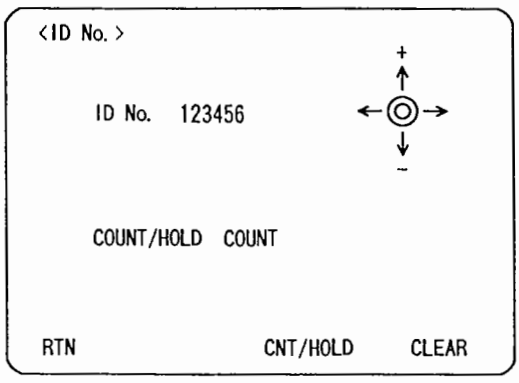
【How to change the setting】 Press the switch under [DISP FORM].

When the setting is completed, press the switch under [RTN].
Setting will be stored, and the display will return to
eye front image screen in non-mydriatic retinal photography mode.

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(2) ID Number and Counting Up (ID No.)

Press the switch under [ID No.] in SET 3 screen to enter <ID No.> screen.



【<ID No.> Screen】

1) Setting of ID Number (ID No.)

ID number of six digits can be set.

NOTE: ID number is only displayed as a counter on the monitor in filter photography mode. It will not be output to the external image recorder. Enter the ID number directly into the external image recorder if you need to record it with the image.
☞ Operation manual of the external image recorder

【How to set】 ① Press the switch under [CLEAR] in order to reset all digits to "0".
② Incline the fixation target control button to right or left to select the digit to be changed. The selected digit blinks.
③ Incline the fixation target control button forward or backward to change the number

2) Counting Up of ID Number (COUNT / HOLD)

Select whether to count up the ID number after every photograph (COUNT) or not (HOLD).

【How to change the setting】 Press the switch under [CNT/HOLD].

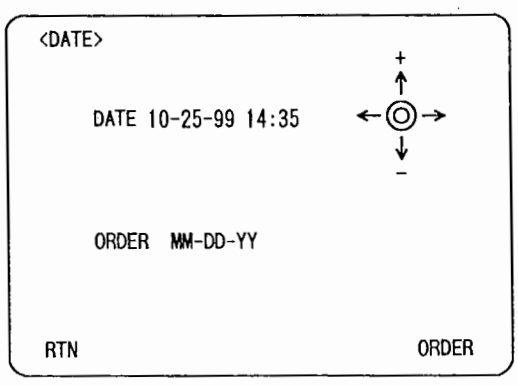
When the setting is completed, press the switch under [RTN].
Setting will be stored, and the display will return to
eye front image screen in non-mydriatic retinal photography mode.

(3) Date and Order (DATE)

Press the switch under [DATE] in SET 3 screen to enter <DATE> screen.

NOTE: While this screen is being displayed, the clock for "DATE" is stopped.
Be sure to check that the displayed time is correct before going out of this screen.

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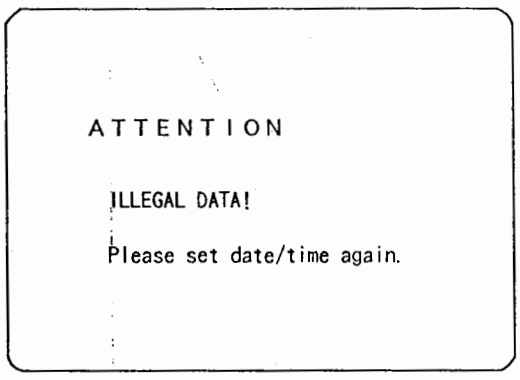
【<DATE> Screen】

1) Setting of Date and Time (DATE)

【How to change the setting】 ① Incline the fixation target control button to right or left to select the date or time to be changed. The selected item blinks.

② Incline the fixation target control button to forward or backward to change the number.

NOTE: If the setting is improper, e.g. a number more than 13 is set for month, message "ATTENTION ILLEGAL DATA! Please set date/time again." will be displayed for about three seconds when the button under [RTN] is pressed. Then, the display returns to <DATE >screen.
Set the date/time properly again.



2) Order of Date (ORDER)

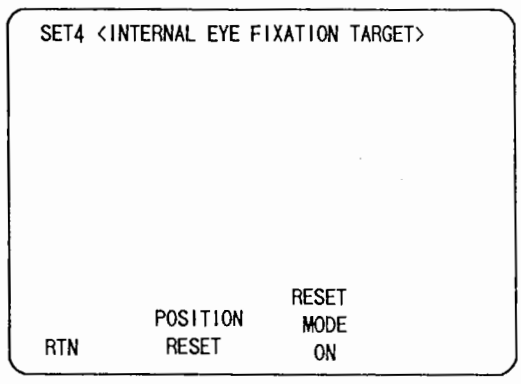
【How to change the setting】 Press the switch under [ORDER].

Each time the switch is pressed, the order changes as "MM (Month) – DD (Day) – YY (Year)" → "DD – MM – YY" → "YY – MM – DD" . . . Linked with this setting, the order of "DATE" changes simultaneously.

When all the settings are completed, press the switch under [RTN]. Clock starts to operate as from the date and time being displayed, and the display will return to eye front image screen in non-mydriatic retinal photography mode.

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5.5 SET 4 Screen (Settings Concerning Eye Fixation Target)



【SET 4 Screen】

NOTE: Eye fixation target will not be displayed in filter photography mode.

(1) Selection of Reset Mode (RESET MODE)

RESET MODE ON : Eye fixation target returns to the standard position after each photograph.
RESET MODE OFF : Eye fixation target does not move even after a photograph.

【How to change the setting】 Press the switch under [RESET MODE].

When the setting is completed, press the switch under [RTN].
Settings will be stored, and the display will return to
eye front image screen in non-mydriatic retinal photography mode.

(2) Resetting the Position of Eye Fixation Target (POSITION RESET)

You can reset the eye fixation target when you cannot find the initial position when RESET MODE is OFF.

Press the switch under [POSITION RESET].

The target returns to the initial position and the display will return to eye front image screen.

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6. Daily Inspection and Maintenance

⚠ CAUTION	For safety reasons, be sure to inspect the instrument daily before using it.

6.1 Inspection

In order to ensure that the instrument is used safely and normally, please be sure to inspect the instrument before use.
If any problem is found during the inspection, please take measures indicated in this chapter.
If problem still cannot be corrected, please contact Canon representative or distributor.

⚠ WARNING	The instrument must be repaired by a qualified engineer only. If it is not repaired properly, it may cause fire, electric shock, or accident.

☆ **It is recommended that a record of the inspection is kept by copying the check lists in sections 6.1.1 and 6.1.2, or making a separate check list.**

6.1.1 Before turning ON the Power

⚠ WARNING	For safety reasons, be sure to turn OFF the power switch when the following inspections are going to be performed. Otherwise, it may result in electric shock.

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	Inspection	Result			Remedy
		Date /	Date /	Date /	
Cable	① Check that cable is not damaged or cover of cable is not torn.	Good / Bad	Good / Bad	Good / Bad	Contact Canon or distributor if there is any problem.
	② Check that the power cable is inserted fully into the [AC IN] connector on the instrument and into the AC receptacle.	Good / Bad	Good / Bad	Good / Bad	Fully insert the cable.
Retinal Camera	③ Check that the cover or parts are not damaged and not loose.	Good / Bad	Good / Bad	Good / Bad	Tighten the lamp box screw if the lamp box cover is loose. Contact Canon or distributor if there is any other problem.
	④ Check the following movement: • Stage must slide smoothly when operation lever is pushed or pulled back and forth, to left and right. • Main unit must move up and down smoothly when height adjusting ring is turned. • Chin rest must move up and down smoothly when chin rest height adjusting ring is turned.	Good / Bad	Good / Bad	Good / Bad	Contact Canon or distributor if there is any problem.
	⑤ Disinfect the forehead rest.	Yes / No	Yes / No	Yes / No	☞ Section 6.3.2
	⑥ Check that there are enough sheets of chin rest paper on the chin rest.	Good / Bad	Good / Bad	Good / Bad	Obtain paper if not enough. ☞ Section 6.4.1
	⑦ Check that the monitor is clean.	Good / Bad	Good / Bad	Good / Bad	Clean the monitor. ☞ Section 6.3.3
Optional Unit (CR-RE, CR-PC DUAL, CR-PC2, CR-TA, CR-TAf)	⑧ Check that the optional unit is firmly attached to the retinal camera.	Good / Bad	Good / Bad	Good / Bad	Properly attach the unit. ☞ Respective operation manual
	⑨ Check that there is enough film left in the unit (CR-RE, CR-PC DUAL, CR-PC2).	Good / Bad	Good / Bad	Good / Bad	Obtain or replace film. ☞ Respective operation manual
	⑩ Check that the battery voltage of CR-RE is sufficient.	Good / Bad	Good / Bad	Good / Bad	Replace the battery if the voltage is low. ☞ CR-RE operation manual
	⑪ Check that the roller in the CR-PC DUAL / CR-PC2 is clean.	Good / Bad	Good / Bad	Good / Bad	Clean it if it is dirty. ☞ Respective operation manual

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6.1.2 After turning ON the Power

	Inspection	Result			Remedy
		Date /	Date /	Date /	
Retinal Camera	① Turn the [IR. FILTER] knob in counterclockwise direction. Check that there is no dust or dirt on objective lens. After the inspection, set the [IR. FILTER] knob to "IN".	Good / Bad	Good / Bad	Good / Bad	Clean the objective lens if it is dirty. ☞ Section 6.3.1 Contact Canon or distributor if it is scratched.
Images	② Check that characters such as film counter and data are displayed properly on the monitor.	Good / Bad	Good / Bad	Good / Bad	If nothing is displayed even when power lamp is lit, contact Canon or distributor.
	③ Press the switch under [FILTER] to check that you enter filter photography mode.	Good / Bad	Good / Bad	Good / Bad	Contact Canon or distributor if you don't.
	④ Press [ALIGNMENT] switch to check that the display on monitor changes.	Good / Bad	Good / Bad	Good / Bad	Contact Canon or distributor if display does not change.
	⑤ Have someone act as an examinee to check that the retinal image, split bars, fixation target mark and working distance dots are displayed properly. Also, turn focus knob to check that split bars can be aligned.	Good / Bad	Good / Bad	Good / Bad	If retinal image cannot be seen although eye front image can, replace the lamp for observation. ☞ Section 6.4.2 If split bars cannot be seen although positioning is proper, contact Canon or distributor.
	⑥ Place your hand or a sheet of paper in front of objective lens, and press the shutter release button to check that the strobe flashes.	Good / Bad	Good / Bad	Good / Bad	Contact Canon or distributor if message "SYSTEM ERROR" appears on the monitor.

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6.2 Before Calling a Service Person

Whenever a problem occurs or message appears on the monitor, take the countermeasures indicated below according to the cause.
If function is still not restored, turn off the power, and contact Canon representative or distributor.
In this case, please let us know the phenomenon or message that is displayed in detail.

6.2.1 If Problems Such as Following Occur

Problem	Cause	Remedy
Power lamp does not light even when [POWER] switch is turned ON.	Plug is disconnected.	Turn OFF the [POWER] switch and connect the cable properly again.
	Indoor breaker is "OFF".	Remove the cause of turning OFF the breaker. Then turn the breaker ON.
	Fuse has blown.	Replace the fuse. ☞ Section 6.4.3
	Cable is cut.	Contact Canon or distributor.
Retinal image cannot be seen even when amount of light is increased with [LAMP] knob.	Lamp box cover is not closed completely.	Close the cover and fully tighten the cover screw. ☞ Section 6.4.2
	Lamp for observation is burned out.	Replace the lamp. ☞ Section 6.4.2
Working distance dots are difficult to see.	Amount of light for observation is too high.	Reduce brightness using [LAMP] knob.
Working distance dots cannot be seen.	Positioning is improper.	Position properly with operation lever. ☞ (10) in section 4.1.2
Flare can be seen.	Positioning is improper.	Position properly with operation lever. ☞ (10) in section 4.1.2
Split bars are difficult to see.	Amount of light for observation is too high.	Reduce brightness using [LAMP] knob.
Split bars cannot be seen at all.	Dilation is insufficient.	Dilate the pupil by making the room darker. If the pupil is still small, set the [S.P] knob to ON. ☞ (3) in section 4.1.2
〔Continued on next page〕	Positioning is improper.	Position properly with operation lever. ☞ (3) in 4.1.2
	Eyebrow or eyelashes are covering the pupil.	Instruct the examinee to open his/her eye wider.

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Problem	Cause	Remedy
〔Continued from previous page〕 Split bars cannot be seen at all.	SPLIT is set to OFF in SET mode.	Set it to ON. ☞(1) in section 5.2
	Diopter compensating slider has been pulled out.	Push the slider in.
	Split lamp is burned out.	Contact Canon or distributor.
Picture is not good.	Dilation of pupil is insufficient.	Dilate the pupil by making the room darker. If pupil is still small, set [S.P] knob to ON. ☞(4) in section 4.1.2
	Positioning is improper.	Properly position the examinee's eye and the retinal camera. ☞Section 4.1.2
	Focusing is improper.	Focus on retinal image properly. ☞(8) in section 4.1.2
	Eyebrow or eyelashes are covering the pupil.	Instruct the examinee to open his/her eye wider.
	Examinee's eye is opaque.	You cannot take a good picture.
	The examinee blinked at the same time as the shutter release button was pressed.	Take a picture again.
	Settings (flash intensity compensation, diopter compensating slider, [S.P] knob) are incorrect.	Check and set correctly.
	Objective lens is dirty.	Clean it. ☞Section 6.3.1
	Roller in CR-PC DUAL / CR-PC2 is dirty.	Clean it. ☞Respective operation manual
	Examinee is wearing contact lens.	Have him/her take it off.
Image recorded with external image recorder is completely black or white.	Power of TV camera is not ON.	Turn it ON.
	The examinee blinked at the same time as the shutter release button was pressed.	Take a picture again.
	Setting of external image recorder is not correct.	Check and correct the setting.
	Interface cable is not connected properly.	Connect the cable properly again. ☞Operation manual of CR-TA/CR-TAf

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6.2.2 If Message such as Following Appears on the Monitor

Contact Canon or distributor if message does not disappear even after taking the remedy.
In this case, please let us know the message that is displayed.

*Display on film counter

Warning Display		Cause	Remedy
Message	*		
	00	35mm film is not loaded.	Load a new film. ☞ CR-RE operation manual
		Back cover of the CR-RE is open.	Close it.
CHECK FILTER		Exciter or barrier filter is in the optical path in non-mydriatic retinal photography mode because either filter holder is being pulled out.	Push in the EX filter holder of the retinal camera and/or BA filter holder of the CR-TAf.
WARNING ATTACH FILM UNIT		Optional unit is not attached.	Attach the required unit.
WARNING CHECK FILM UNIT		Winding or rewinding of 35 mm film has failed.	Reload the film. ☞ CR-RE operation manual
	00	35mm film that has already been rewound is still in the camera.	Remove the old cartridge and load a new film. ☞ CR-RE operation manual
		Polaroid film is not loaded.	Load a new pack of film. ☞ CR-PC DUAL/CR-PC2 operation manual
		Polaroid film cover is not removed.	Remove the cover. ☞ CR-PC DUAL/CR-PC2 operation manual
	10	Polaroid film is not loaded.	Load a new pack of film. ☞ CR-PC DUAL/CR-PC2 operation manual
WARNING CHECK LAMP BOX		Cover of lamp box is not closed completely.	Close the cover and fully tighten the cover screw. ☞ Section 6.4.2
WARNING DATA BACKUP FAILURE [xx] 〈PRESS NEXT BUTTON〉		Backup battery is weak.	Press the switch under [NEXT] to restore the function for a mean while. However, data stored in the instrument may have to be set again. Ask for replacement of battery and setting immediately.

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Warning Display		Cause	Remedy
Message	*		
WARNING CHECK RECORDER		Interface cable is not connected properly.	• Connect the cable properly again. ☞ Operation manual of CR-TA/CR-TAf • If the word "CLEAR" is displayed in the lower right side of the monitor of the retinal camera, press the switch under it.
		• External image recorder is busy. • Picture was taken when external image recorder was not ready.	Message will disappear after external image recorder becomes ready.
ERROR FILM UNIT ERROR		Contacts on optional unit are dirty.	Clean the contacts and attach the unit again.
		Optional unit is not attached properly.	Turn OFF the power. Remove the unit and attach it properly again. Turn ON the power.
		Communication error between the retinal camera and TV adapter.	Turn OFF the power of each instrument, and turn it ON again.
ERROR SYSTEM ERROR [XX] Please restart the power.		Problem inside the instrument.	Turn OFF the power and turn it ON again after about 10 seconds.

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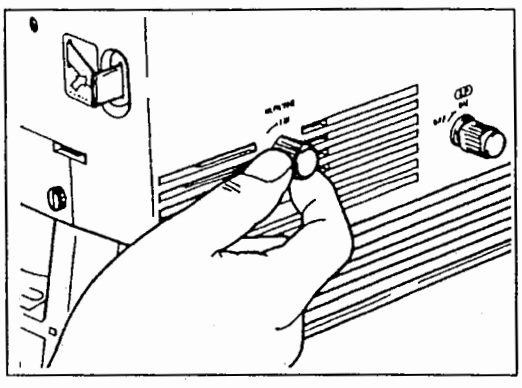
6.3 Cleaning and Disinfection

6.3.1 Objective Lens

Clean the objective lens by the following procedure when it is dirty.

(1) Turn ON the power.

(2) Turn the [IR. FILTER] knob in counterclockwise direction until it stops.



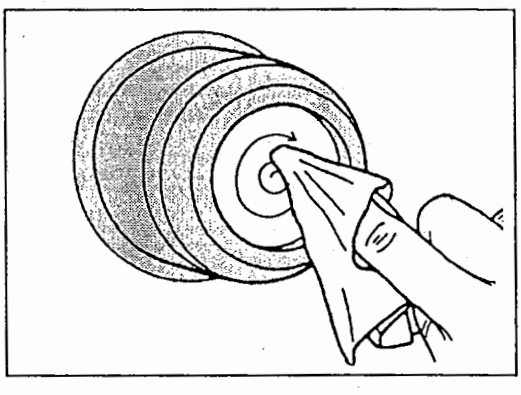
(3) Look into the objective lens to find any dust or stains.

(4) Remove the brush from the blower. Blow off the dust from the objective lens with the blower.

NOTE: Do not wipe the objective lens when dust or dirt is on the lens. Otherwise, the lens will be scratched.

(5) When the lens is stained by fingerprints or grease, wipe the surface lightly with clean gauze or lens cleaning paper soaked in a mixed solution of 2 parts of absolute alcohol to 8 parts of ether.

NOTE: Do not wipe the objective lens with disinfecting alcohol, lens cleaner for glasses, or cleaning paper containing silicone as the surface may be damaged or stained. Also, if the glass is soaked excessively with solution, the surface will be stained.



(6) Change the paper and wipe the lens several times until there is no solution left on the surface.

(7) After cleaning is completed, set the [IR. FILTER] knob to "IN", and turn OFF the power.

6.3.2 Forehead Rest

⚠ WARNING	Wipe the forehead rest with ethanol or glutaraldehyde solution to disinfect it each time a different examinee uses it, in order to prevent infection. Please consult a specialist for the procedure for disinfection. If you are using disinfectant other than those specified above, or if you are mixing another disinfectant with ethanol, please also consult a specialist, because they may harm the forehead rest.

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6.3.3 Cover and Monitor

Clean the cover and monitor by the following procedure if they are dirty.

⚠ WARNING	When the instrument is going to be cleaned, be sure to turn OFF the power switch and unplug the power cable from the AC outlet. Never use alcohol, benzine, thinner or any other flammable cleaning agents. Otherwise, fire or electric shock may result.

(1) Wipe the cover and monitor with a piece of soft cloth soaked in neutral detergent diluted in water and wrung dry.
NOTE: Please follow the instructions attached to the neutral detergent when using it.

(2) Wipe the cover and monitor with a piece of cloth soaked in water and wrung dry whenever neutral detergent has been used.

6.4 Replacement

Please refer to "6.5 Expendable • Replacement Parts List" for ordering parts.

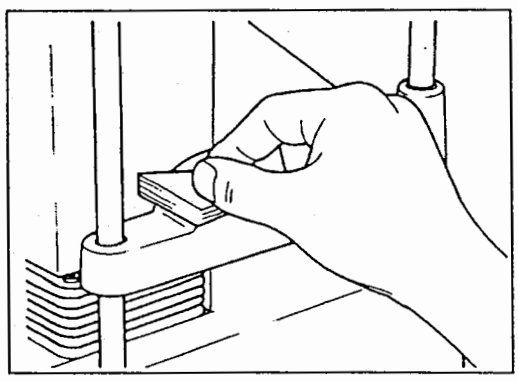
6.4.1 Chin Rest Paper

NOTE: When chin rest paper is not going to be used, disinfect the chin rest in the same way as disinfecting the forehead rest each time the examinee changes.

(1) Pull out the two pins on the chin rest.

(2) Insert the pins into the holes on the chin rest paper.
Maximum of 100 sheets of paper can be attached.

(3) Replace them in the chin rest.
NOTE: Insert the pins straight into the holes.



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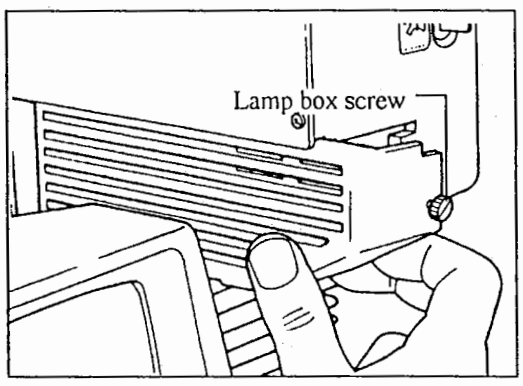
6.4.2 Lamp for Observation

Replace the lamp by the following procedure when the lamp is burned out.

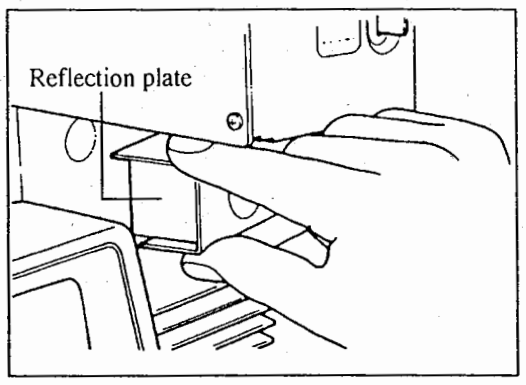
⚠ WARNING	When the lamp is going to be replaced, be sure to turn OFF the power switch, unplug the power cable from the AC outlet, and wait until the lamp has cooled before replacing it. Otherwise, you may get an electric shock or be burned.

(1) Turn the height adjusting ring to raise the head of the retinal camera to its maximum height.

(2) Turn the lamp box screw in counterclockwise direction to loosen it.
Pull and remove the lamp box cover.

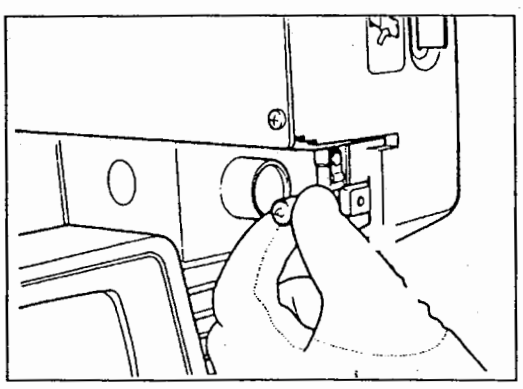


(3) Remove the reflection plate from the left side.
The notches on the main unit and the reflection plate will be disengaged.



(4) After confirming that the lamp is cool, pull it straight out.

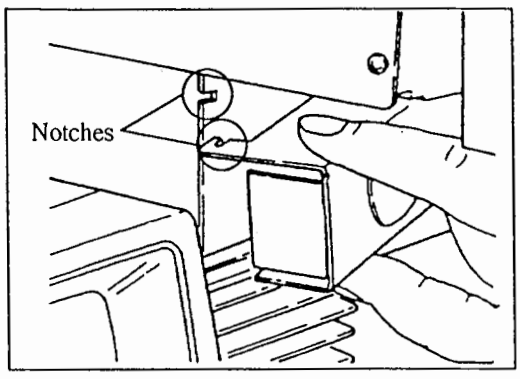
(5) Wear gloves or hold the new lamp with the plastic bag in which the lamp was contained to prevent staining of the new lamp. Fully push in the new lamp.



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(6) Align the two holes on the reflection plate with the two positioning pins in the main unit.

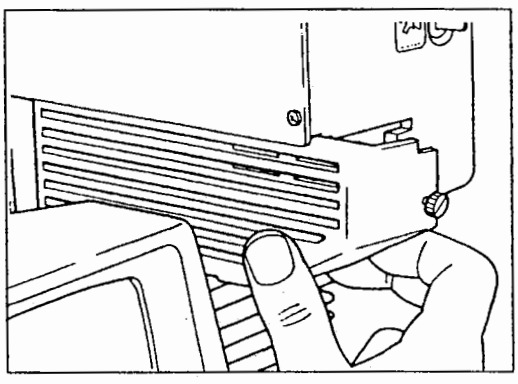
(7) Engage the notches on the reflection plate and main unit, and push in the reflection plate.



(8) Attach the lamp box cover by sliding the cover along the groove on the main unit.

(9) Tighten the lamp box screw by turning it in clockwise direction.

NOTE: For safety, lamp does not light when lamp box cover is not attached properly. Be sure to check that it is firmly attached.



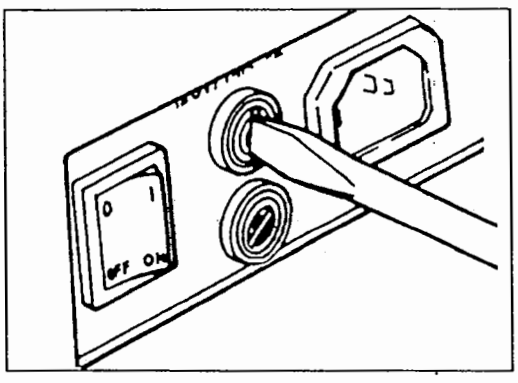
6.4.3 Fuse

Replace the fuse when it is blown.
Be sure to use 125V, 4A fuse (slow blow type).

⚠ WARNING	When the fuse is going to be replaced, be sure to turn OFF the power switch and unplug the power cable from the AC outlet before replacing it. Be sure to replace the fuse with the specified type only. Otherwise, fire or electric shock may result.

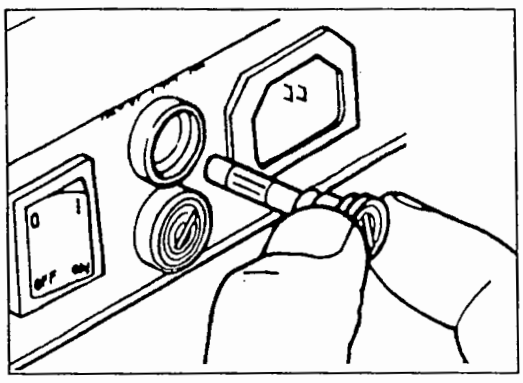
NOTE: If the fuse blows again immediately after replacement, contact Canon representative or distributor.

(1) Loosen the cap of fuse holder by using a minus screwdriver.



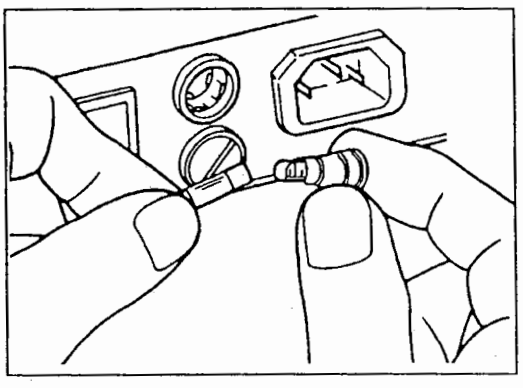
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(2) Pull the cap.
Cap will be removed with the fuse.



(3) Remove the old fuse and replace with a new one.

(4) Insert the cap with the new fuse into the holder.
Turn the cap fully in clockwise direction while pressing it with the screwdriver.



6.5 Expendable • Replacement Parts List

Please contact Canon representative or distributor for purchasing the following parts.

Name	Reference Number	Note
Lamp for observation	BH3 – 3277	Halogen lamp Rating: 12V, 50W
Fuse	VD7 – 0044 – 001	Slow blow type Rating: 125V, 4A
Chin rest paper	BA3 – 0151	500 sheets / set
Data card (for 35mm photography)	BA3 – 0150	100 pieces / set
Lithium battery (for 35 mm film camera)	– – – – – – –	2CR5 6V Please purchase it at a camera store.

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7. Installation

7.1 Installation

⚠ WARNING	Only operate the instrument with the type of power supply indicated on the rating plate. Otherwise, it may result in fire or electric shock.
⚠ WARNING	Be sure to turn OFF the power switch before connecting or disconnecting the power cable. Also, do not handle it with wet hands. Otherwise, you may get an electric shock that may result in death or serious injury.
⚠ WARNING	Do not connect the instrument with anything other than specified. Otherwise, it may result in fire or electric shock.
⚠ WARNING	The instrument is shipped with a grounding type (three-core) power cable. To reduce the risk of electric shock, always plug the cable into a grounded power outlet.

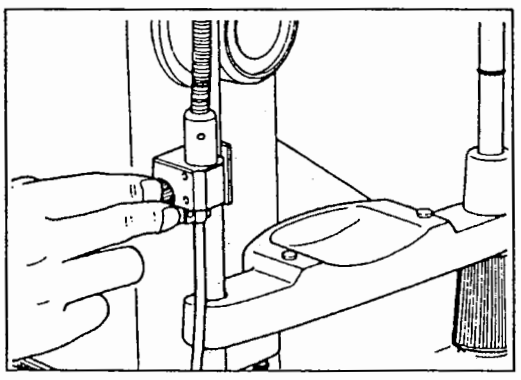
NOTES: *1. Do not install the instrument in a location with the conditions listed on page (2).*
2. Install the retinal camera in a room that can be darkened to the point where a newspaper can barely be read.
3. The instrument is internally set for the CR-PC DUAL when it is shipped from Canon. Contact Canon representative or distributor if you are using the CR-PC2.
4. See the respective operation manual for the procedure for installing the dual angle TV adapter and external image recorder.

(1) Place the retinal camera on a firm table.

(2) Turn OFF the [POWER] switch.

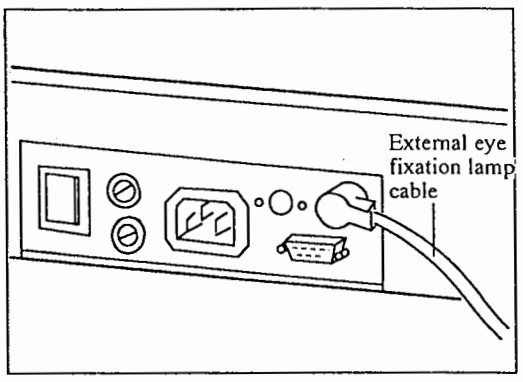
(3) Attach the optional unit. ☞ Operation manual of respective unit

(4) Put the external eye fixation lamp on the face rest pole, and tighten the fixation screw.



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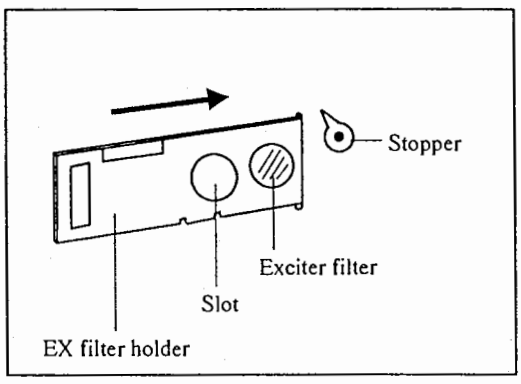
(5) Connect the connector of the external eye fixation lamp to the connector on the retinal camera with the cable laid out on the right side.



(6) Raise the stopper on the side of the slot on the retinal camera, and fully insert the filter holder. Then, lower the stopper.

NOTE: Be sure not to scratch or put fingerprints or stains on the filter. If the filter is stained, clean it in the same way as cleaning the objective lens. ☞ *Section 6.3.1*

(7) Connect power supply cable to the [AC IN] connector of the main unit.



(8) Ensure that the [POWER] switch of the instrument is turned OFF, and connect power supply cable to an AC outlet.

7.2 Precautions when Moving the Instrument

This is a procedure for moving the instrument only for a short distance by carrying it.

⚠ WARNING	When the instrument is going to be moved, be sure to turn OFF the power switch, unplug the power cable from the AC outlet, and disconnect other cables. Otherwise, the cable may be damaged, which may result in fire or electric shock. Also, when the instrument is going to be carried, be sure to tighten the stage holding knob, support the bottom of the instrument and hold it horizontally. Do not hold it by the face rest or other parts as they may come off and result in injury.
⚠ WARNING	Do not hit or drop the instrument. The instrument may be damaged if it receives a strong jolt, which may result in fire or electric shock if the instrument is used without it being repaired.

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(1) Turn OFF the [POWER] switch.

(2) Fully push in the EX filter holder.

(3) Remove the external eye fixation lamp.

(4) Disconnect the power supply cable from the main unit and AC outlet.

(5) Disconnect all other cables.

(6) Tighten the stage holding knob.

(7) Support the instrument by holding the sides at the base.

NOTE: When the instrument is going to be transported by automobile, etc. or for a long distance, it must be protected against vibration and shocks. Contact Canon representative or distributor for advice on the procedure for packing it. However, in such cases, do not tighten the stage holding knob.

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8. Service Information

(1) Repair

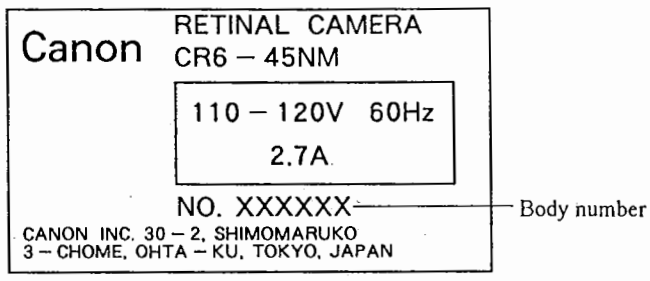
If problem cannot be solved even after taking the measures indicated in sections 6.1 and 6.2, contact Canon representative or distributor for repair.

Please refer to the rating plate and let us have the following information:

Name of the instrument: CR6-45NMf

Body number: 6-digit number indicated on the rating plate.

Phenomenon: In detail.



Rating Plate

(2) Limit for Supplying Performance Parts for Repair

Performance parts* of this product will be stocked for eight years after discontinuation of production, to allow for repair.

* Parts required to maintain the functioning of the product

(3) Expendable Parts Replaced by Service Person

Following parts are apt to become worn out or to deteriorate due to the characteristics of the material or structure.

These parts cannot be replaced by the user.

If these parts are found to be worn out or to have deteriorated during daily inspection or use, contact Canon representative or distributor for repair.

- Backup battery for data
- Strobe tube
- Split lamp
- Cathod-ray tube in the monitor
- LCD for displaying eye fixation target
- LCD for printing data

(4) Disposal of the Instrument

⚠ CAUTION	This instrument incorporates a lithium battery, which may pollute the environment if the instrument is abandoned. Please ask a professional waste disposal company to handle disposal, or contact Canon representative or distributor before disposing of the instrument.

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9. Specifications

Purpose	Color photography / fluorescein angiography of human retina
Type	Non-mydriatic / mydriatic type
Optional unit	35 mm film camera CR-RE Dual Polaroid back unit CR-PC DUAL Polaroid back unit CR-PC2 External image recorder (Dual angle TV adapter CR-TA / CR-TAf for CCD camera is required)
Angle of view	45 degrees (37 degrees when S.P knob is turned ON)
Image magnification	1.8 × on 35 mm film
Image size on film	ϕ 22 mm (CR-RE) ϕ 72 mm (CR-PC DUAL) ϕ 74 mm (CR-PC2)
Minimum diameter of pupil required	4 mm (3.7 mm when S.P knob is set to ON)
Working distance	45 mm (from front of objective lens to surface of cornea)
Examinee's diopter compensation range	Without compensation lens: -12D to +15D With "−" compensation lens: -7D to -33D With "+" compensation lens: +11D to +35D
Working distance adjustment	Performed by aligning split pupil images (during eye front image observation) and by using working distance dots (during retinal image observation)
Focusing	Performed by aligning split bars
Camera, monitor	Built-in CCD camera, 5 inch TV monitor
Environmental requirements	Use: Temperature: 10℃ to 35℃ Humidity: 30%RH to 80%RH Storage and transportation: Temperature: -30℃ to 50℃ Humidity: 10 %RH to 95 %RH Atmospheric pressure: 61.3 kPa to 101.3 kPa

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Power supply	110 − 120 V AC ± 10%, 60 Hz
Power consumption	Less than 300 VA
Dimensions	324 (W) × 496 (L) × max. 590 (H) mm
Mass	Approximately 24 kg

NOTE: According to the International System of Units, 1D is $1m^{-1}$.

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10. Components

CR6-45NMf main unit	1
Fluorescent filter set	1
EX filter holder (with exciter filter)	1
BA filter holder (with barrier filter) for the CR-TAf	1
External eye fixation lamp	1
Power supply cable	1
Chin rest paper	100
Caps (For objective lens and camera mount)	1 of each
Dust cover	1
Blower brush	1

Retinal photography with the CR6-45NMf must be performed with our 35 mm Film Camera *CR-RE*, with the Dual Polaroid Back Unit *CR-PC DUAL* or with the Polaroid Back Unit *CR-PC2*.
Also, there is a Dual Angle TV Adapter *CR-TA / CR-TAf* for attaching CCD camera when external image recorder is connected. The *CR-TAf* must be used for performing filter photography.
Choose either one according to the purpose of use.

Options

35mm Film Camera CR-RE

Dual Polaroid Back Unit CR-PC DUAL

Polaroid Back Unit CR-PC2

Dual Angle TV Adapter CR-TA

Interface Cable for Video Printer (for CR-TA)

Dual Angle TV Adapter CR-TAf

Data Card (100 pieces)

Chin Rest Paper (500 sheets)

Motorized Table CO-MT

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