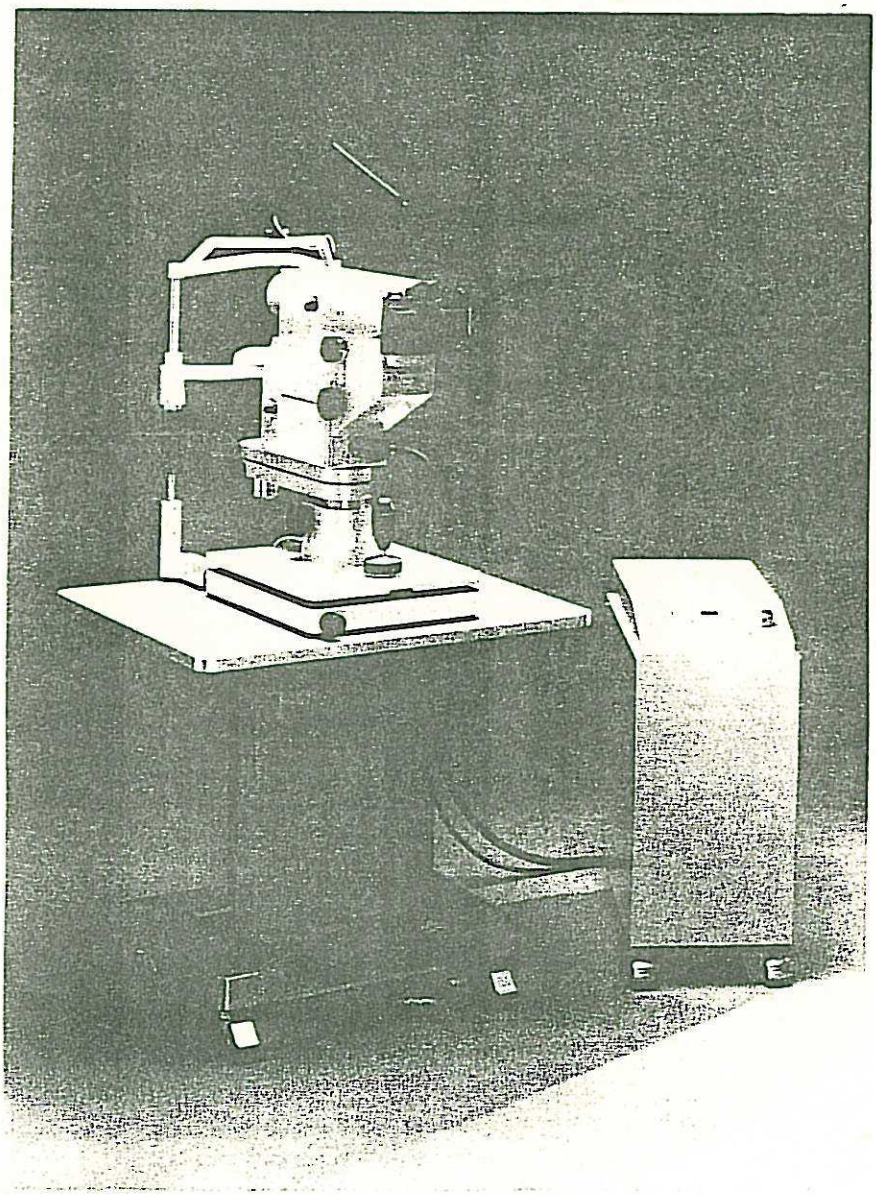
Canon 60° Zoom Fundus Camera

CF-60ZA

Operation Manual



EOMSPB-75027-UL

C O N T E N T S

EOMSPB-75027-UL

1. Introduction

With its picture angle widened up to 60 degrees and magnification cotinuously changeable from 1.7 times to 5 times by zooming, the Canon CF-60ZA makes an epoch-making contribution to fundus angiography. The adoption of multiple aspheric lenses as well as the uniquely developed focusing by split lines and working distance adjustment by bright dots produce photographs with high resolution and good illumination uniformity over the entire image field. Continuous magnification change from 20 to 60 degrees by zooming enables the ophthalmologist to detect, observe and photograph the slightest change in fundus condition over an enlarged image field. The wide picture angle of 60 degrees possible in one photograph is especially useful when fundus image analysis at various moments is required by means of fluorescein fundus angiography. The importance of this technique is increasingly recognized these days. CF-60ZA also produces detailed peripheral photographs much more easily than conventional fundus cameras.

2. Before Using CF-60ZA

Please read this operation manual carefully and familiarise yourself with the Canon 60° Zoom Fundus Camera CF-60ZA before using it. Keep CF-60ZA in good operating condition by giving it all necessary day-to-day maintenance care.

1. The Canon CF-60ZA like any other precision optical instrument, must be strictly protected from high temperature, high humidity, dust, etc. Always be sure to put the vinyl dust cover, which is furnished with the camera, on the camera when it is not in use.
2. Scratches, dust, finger prints and other foreign matter on the front surface of the objective lens or blur in the objective lens and camera optics will not only impair the camera's optical performance but also result in a white spot appearing on the developed photograph. Always be sure to replace the lens cap (which is also furnished with the camera) on the objective lens after photography. Also check the objective lens for cleanliness before taking photographs. Refer to 10-2 for objective lens cleaning instructions.
3. The camera optics and related mechanisms are precisely adjusted at shipment. Handle the camera carefully so that it remains in the optimum operating condition. Always be careful not to expose it to shock or other rough handling in transit or in service.

3. Specifications

CF-60ZA Main Unit

Type	:	Non-contact mydriatic type
Picture angle	:	Variable magnification from 60 degrees to 20 degrees by zooming
Magnification	:	1.7 to 5.0 times
Observation magnification	:	10 to 30 times
Image size	:	ø29mm(W) x 22mm(H) (on 35-mm film)
Required pupil diameter	:	ø6.5mm or more
Working distance	:	45mm (from objective lens surface to examinee's cornea surface)
Range of examinee's diopter compensation	:	Without compensating lens (in applicable range of split line method) -12 to +15 Dptr. With negative compensating lens: -30 to -7 Dptr. With positive compensating lens: +7 to +35 Dptr.
Range of examiner's diopter compensation	:	-4 to +2 Dptr. (using diopter range compensating ring on film camera)
Focusing	:	By aligning bright split lines (-12 to +15 Dptr. range) Focusing also performed by cross hairs

Working distance adjustment	:	Bright dots (60° to 50° range)
Data printing	:	Any one of the three is printable: hand-written data (on special plastic card), frame number (in four-digit figures on electromagnetic counter) or flourescein fundus angiography elapsed time.
Photographic camera	:	Specially adapted 35mm camera F-A
Film used	:	Commercial 35mm cartridge film for daylight loading with film speed ASA 25 to ASA 200. For fluorescein fundus angiography ASA 400 or more Polaroid color and black-and-white (with optional CF-PC and CF-PB)
Fluorescein fundus angiography	:	Photographing interval: As desired but at least 1 frame per sec. in case of automatic photographing. Filter: Exciter SE40 and barrier SB50 built in
Light source	:	For observation: 12V, 75W halogen lamp For flash: Max. 300W rating xenon-arc discharge lamp Intensity changeable in eight steps

Eye fixation lamp	:	External type
Working range	:	Vertical: 40mm Forward/backward: 40 mm in fine increments (using manipulation rod) Right/left: 40mm in fine increments +80mm in coarse increments (using manipulation rod) Face rest stand: Vertical: 50mm Forward/backward: 40mm Panning: 30° degrees on each side from center of examinee's cornea surface Tilting: Using optional CF-TU driven electrically 15 degrees up and 10 degrees down from center of examinee's cornea surface.
Dimensions	:	310(W) x 650(L) x 652(H)mm (max.) (12.2" x 25.6" x 25.7")
Weight	:	Approx. 26 kg (57.3 lbs) including film camera and motor drive

Power Control Unit CF-CU

Configuration	:	Vertical with caster wheels
Power source	:	AC 120V 60Hz 10A
Dimensions	:	255(W) x 510(L) x 587(H)mm (max.) (10.0" x 20.1" x 23.0")
Weight	:	Approx. 40 kg (88.2 lbs.)

Composition

CF-60ZA main unit (with lens cap and dust cap)	1
35mm film camera F-A (with dust cap)	2
Motor drive MZ	2
Silver oxide battery (6V for film camera)	2
Power control unit CF-CU	1
24-core cable, 2 meters long	1
5-core cable, 2 meters long	1
Dust cover	1
Spare lamp (split and halogen lamp)	1 each
Data card	5
Special photographing filter attachment	3
Cleaning kit	1 set

Optional Accessories

1. Tilting unit CF-TU
2. Polaroid color back unit CF-PC

   (2 frames per sheet. Only for 60 degree picture angle.)
3. Polaroid back unit CF-PB

   (1 frame per sheet. Only for 60 degree picture angle.)
4. Remote footswitch CR-FS
5. Spare film camera CF-FA
6. Data card CF-DC

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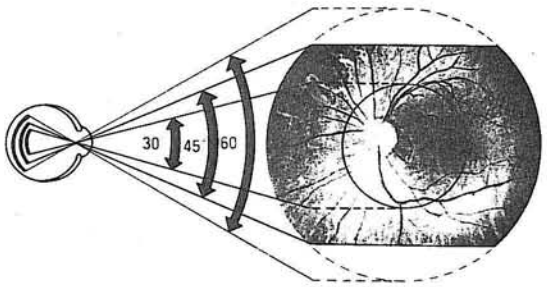
4. Features

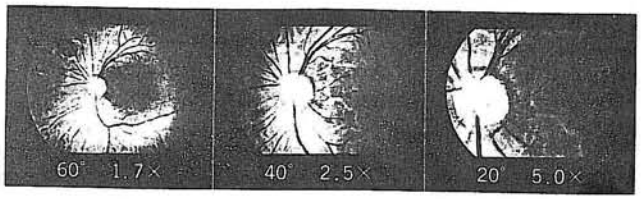
1. Wide Picture Angle of 60 Degrees

Photographs are taken at a wide angle of 60 degrees horizontally and 45 degrees vertically. The outstandingly wide angle of 60 degrees is an especially great advantage in fluorescein fundus angiography. A panoramic photographic image of fundus is obtainable with fewer shots.



2. Epoch-Making Magnification Selection by Zooming

Continuous magnification change from 1.7 times to 5.0 times is possible with 35mm film and any magnification in this range can be easily set. Better image quality and easier operation than the conventional extender method are offered. Also, no time is required for magnification change and the images seen in the view finder do not disappear.



3. Special Optical System Featuring Multiple Aspheric Lenses

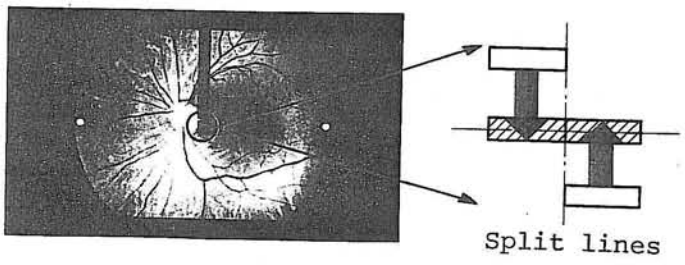
The aberration of both illumination optics and imaging optics is minimized by the adoption of high-precision, multiple aspheric lenses, so that photographs with high resolution and good illumination uniformity over the entire image field are obtained.

4. Panning and Tilting Capability

Detailed peripheral photographs can be taken when the optional tilting unit with tilting capability is added to the panning capability of this camera.

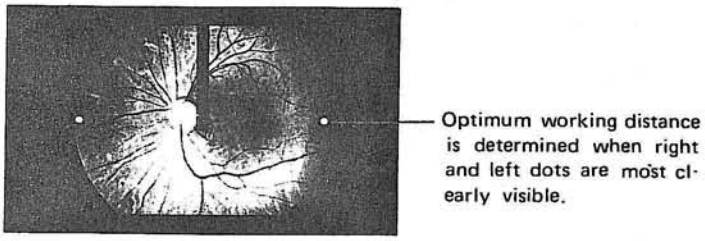
5. Focus Adjustment by Split Lines

Highly accurate focus adjustment is guaranteed by simply aligning the split lines seen through the viewfinder irrespective of the examiner's diopter range. The conventional cross hair method of focus adjustment is also possible instead of the split line method.



6. Working Distance Adjustment by Bright Dots

The optimum working distance is easily determined by observing the bright dots seen through the viewfinder. Easily diagnosable photographs are always assured.



7. Data Printing

Any one of the following three can be printed on a photograph as it is taken:

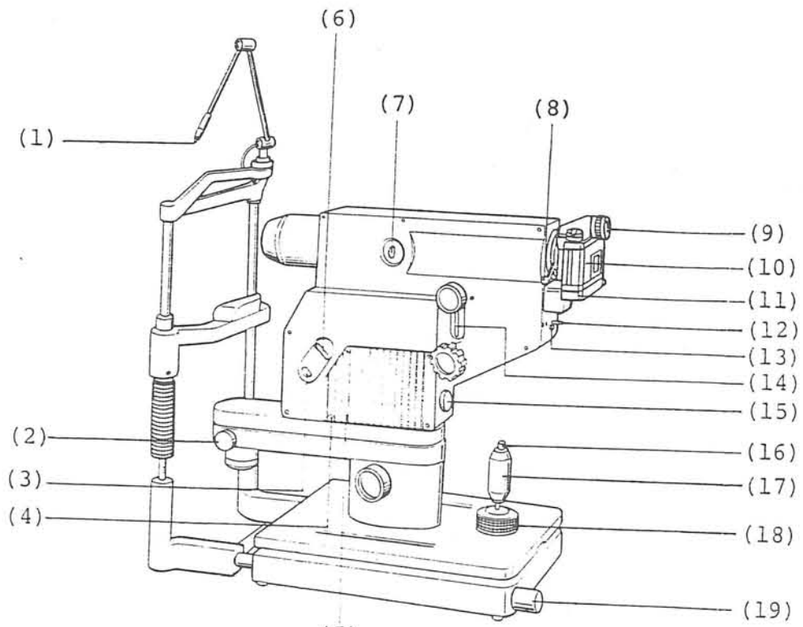
(1) examinee data written on a special plastic card, (2) a photograph number or (3) fluorescein fundus angiography duration (in 0.1 sec. increments) .

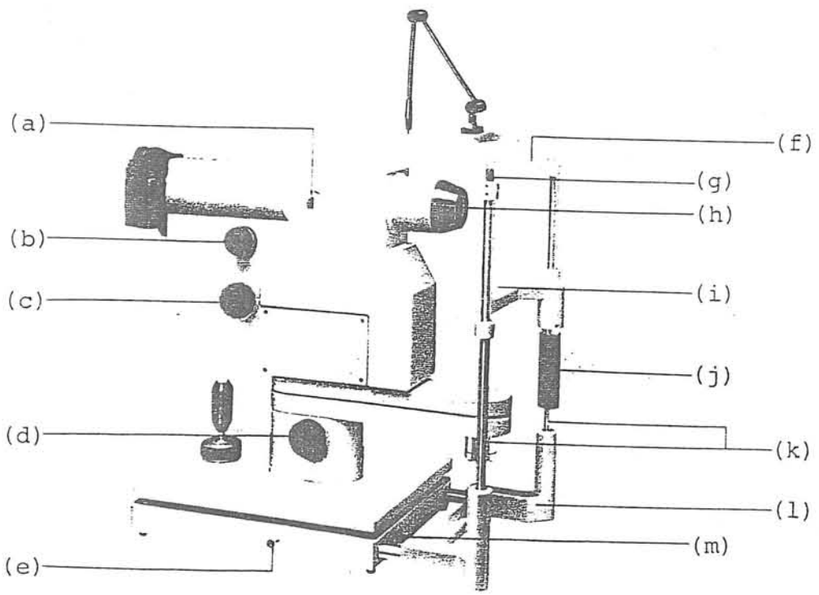
8. Polaroid Photography

Polaroid color and black-and-white photography with a picture angle of 60 degrees is possible using the optional accessories, CF-PC and CF-PB, respectively. Easily diagnosable clear images of the eye fundus are obtained in both color and black-and-white within seconds after photography.

5. Nomenclature

CF-60ZA Main Unit

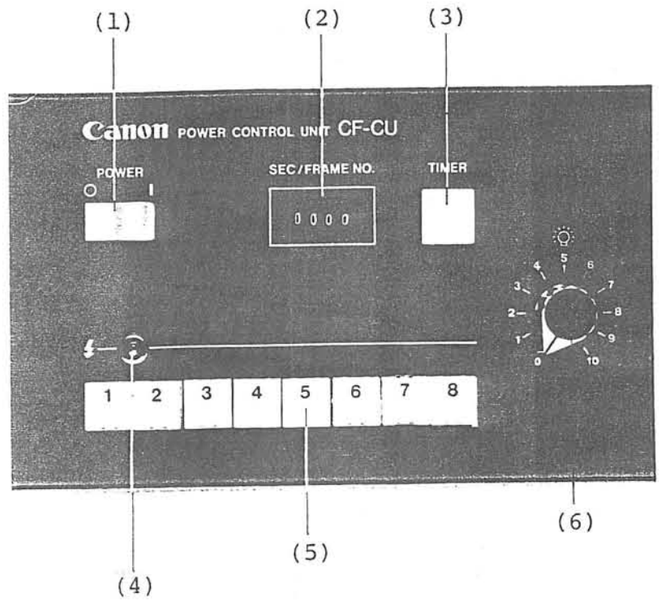


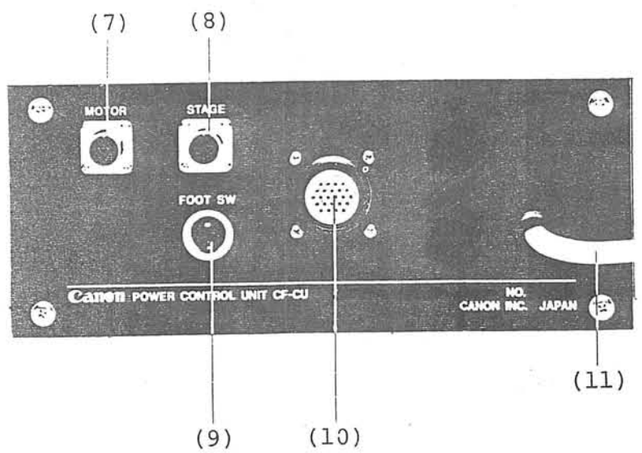


(1) Eye fixation lamp
(2) Right/left steer fixing knob
(3) Exciter filter for fluorescein fundus angiography
(4) Lamp house cover setscrew
(5) Lamp house cover
(6) Insertion slot for special photographing filter attachment
(7) Barrier filter for fluorescein fundus angiography
(8) Film camera mounting lever
(9) Viewfinder
(10) Film camera
(11) Motor drive
(12) Split switch
(13) 0 (Zero) reset button
(14) Data card insertion slot
(15) 24-core connector (to CF-CU)
(16) Shutter release button
(17) Main unit manipulation rod
(18) Manipulation rod clamp
(19) Face rest stand forward/backward adjustment knob

(a) Diopter range compensation knob
(b) Zooming knob
(c) Focusing knob
(d) Main unit height adjustment knob
(e) 5-core connector (to CF-CU)
(f) Forehead rest
(g) Eye fixation lamp connector (circular)
(h) Objective lens
(i) Chin rest
(j) Chin rest height adjustment grip
(k) Pole
(l) Face rest base
(m) Eye fixation lamp receptacle (aquare)

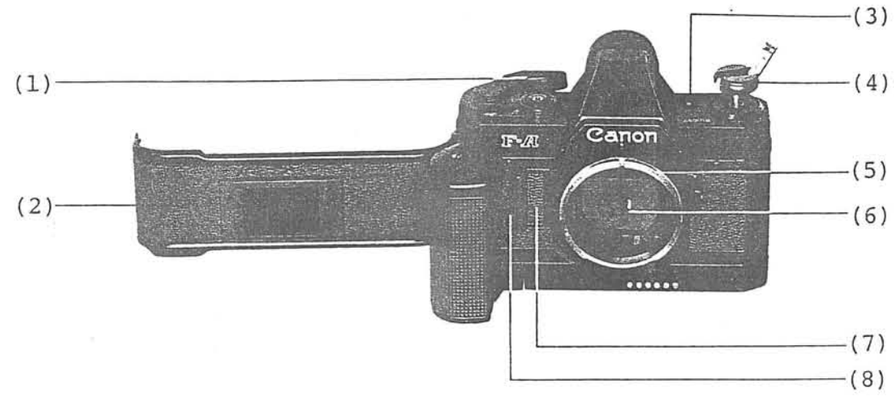
Power Control Unit CF-CU



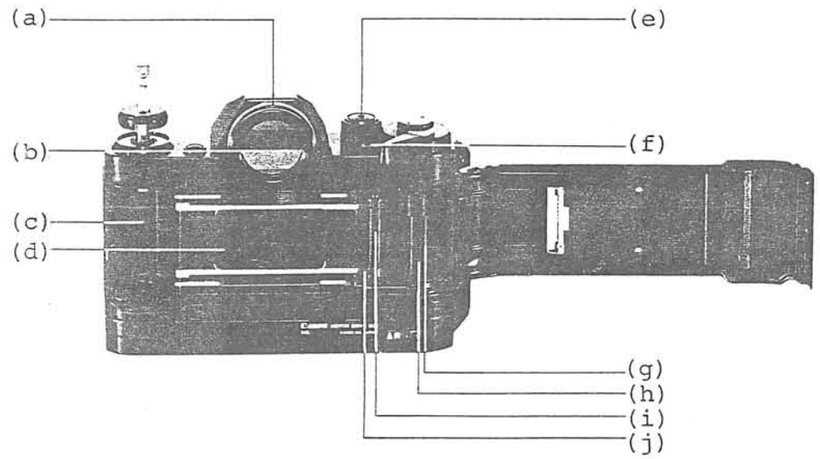


(1) POWER switch
(2) Counter (in number of exposed frames or elapsed time)
(3) TIMER switch
(4) Charge-up lamp
(5) Flash intensity selector switches
(6) Illumination intensity control knob
(7) 4-core connector (to optional tilting unit)
(8) 5-core connector (to CF-60ZA)
(9) Remote foot switch terminal (for photographing)
(10) 24-core connector (to CF-60ZA)
(11) Power cord

Film Camera F-A

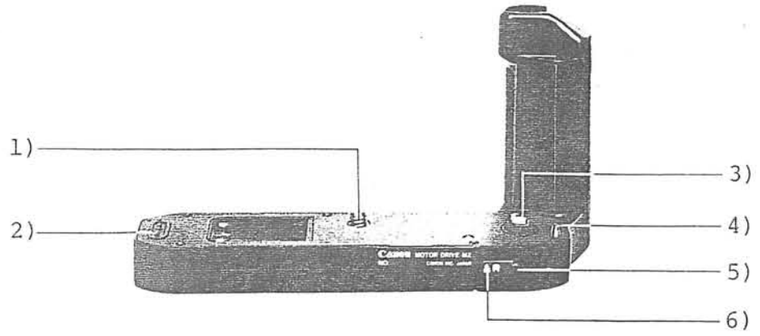


(1) Film lever
(2) Back cover
(3) Battery check button
(4) Rewind crank (also back cover release key)
(5) Mount
(6) Mirror
(7) Battery chamber cover
(8) Battery chamber cover protrusion



(a) Diopter range compensation ring
(b) Viewfinder
(c) Cartridge compartment
(d) Aperture mask
(e) Shutter release button
(f) Frame counter
(g) Take-up spool
(h) Film insertion slot
(i) Film sprocket
(j) Film sprocket teeth

Motor Drive MZ



1) Motor drive mounting screw
2) Motor drive contact
3) Film advance coupler
4) Guide pin
5) Film rewind lever lock button
6) Film rewind lever

6. Main Unit Composition

The main unit components --- eye fixation lamp, face rest stand, CF-60ZA fundus camera, stage section and film camera (with motor drive) --- are delivered in separate packages. Except in cases where it is impractical, assembly should be done by a Canon dealer or representative, and not attempted by the user. They must assembled as follows:

6-1. Assembly

1. Loosen the right/left steer fixing knob by turning it counterclockwise and move the camera unit mount of the stage section right or left before placing the camera unit on it.
2. Align the four holes in the camera unit mount to their counterparts on the bottom of the camera unit, and insert the screws into the holes from beneath the camera unit mount. Fully tighten the four screws.
3. Insert the two protrusions on the stage base into the two holes in the face rest base and screw them together from beneath the face rest base.
4. Secure the eye fixation lamp to the top of the face rest stand using two screws.

* Main unit assembly may start with any of the above procedures.

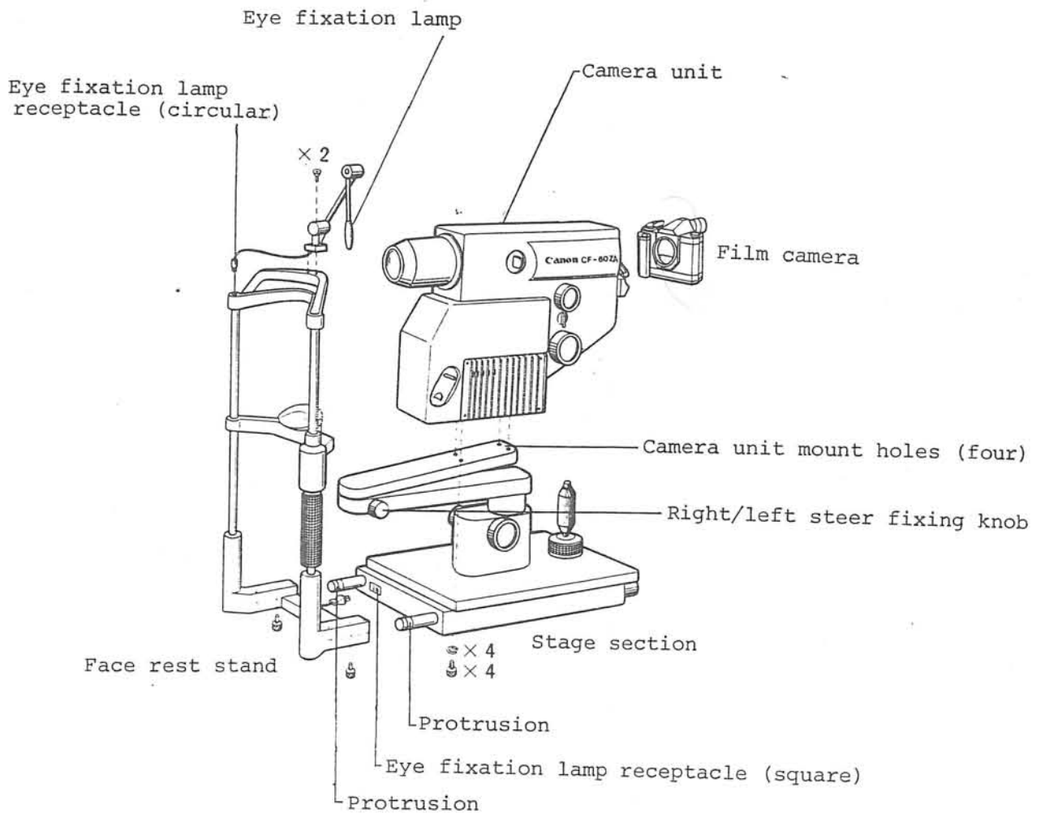


Fig. 1

° There are two receptacles provided for the eye fixation lamp cord, one on the top of the face rest stand and the other in the stage section. A plug is inserted into each of them as illustrated in figs. 2 and 3.

° Refer to 8-1 for mounting the film camera to the fundus camera, and 7-2 for connecting the fundus camera to the power control unit.

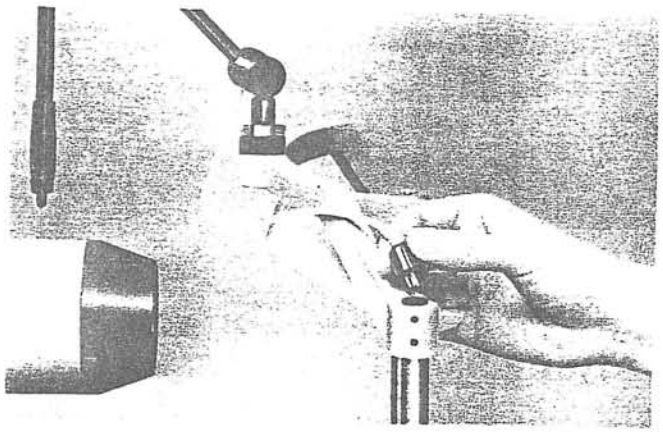


Fig. 2

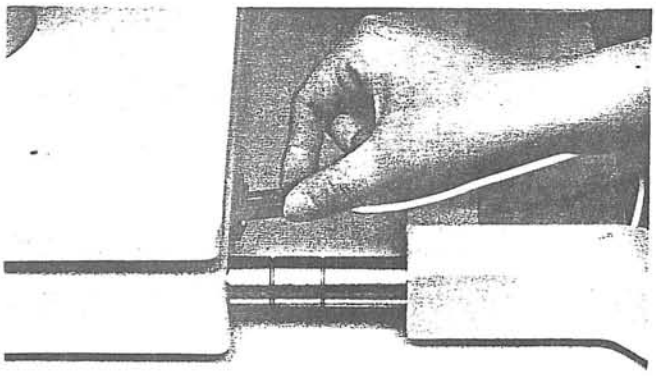


Fig. 3

7. Installation

Except in cases where it is impractical, unit installation and cable connections should be done by a Canon dealer or representative, and not attemped by the user. If the situation arises that the user must perform these works himself, please read the following instructions in relocating the equipment or in making cable connections for relocation.

7-1. Main Unit and Power Control Unit Installation

1. Install the main unit and power control unit in a place where the required power supply (voltage, power consumption and frequency) is obtainable.
2. The main unit must be installed on a special hydraulic table or a table whose surface is kept horizontal.
3. Two people should carry the main unit in moving it, one holding each end of the stage bottom.
   Be careful not to tilt the main unit while moving it. The main unit will slip in the tilted direction, if right/left steer fixing knob is not tightened firmly enough. Always try to move the main unit as horizontally as possible.

   Note: When carrying the main unit do not:

   - ° hold the film camera
   - ° hold the face rest poles
   - ° hold the objective lens
   - ° hold the knobs

4. The power control unit moves freely on caster wheels. Lock the caster wheels when it is installed in the desired place.
5. Determine the face rest position by terning the face rest forward/backward adjustment knob clockwise or counterclockwise as desired. (Fig. 4) The second line on the face rest protrusion indicates standard position. (Fig. 5)

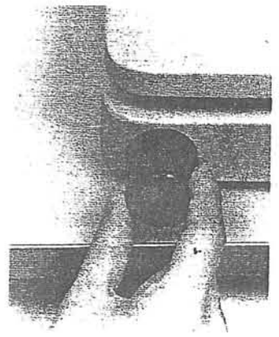


Fig. 4

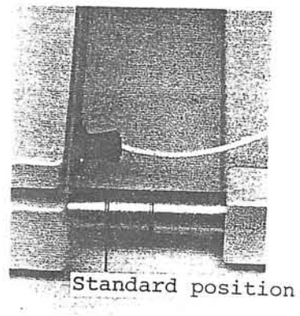


Fig. 5

7-2. Connecting Cables

1. Connect the main unit connector and the power control unit connector using the 24-core cable, after making sure of the pin configuration and key direction. (Fig. 6)
2. Connect the main unit connector and the power control unit connector using the 5-core cable, after making sure of the pin configuration and key direction. (Fig. 7)
3. Insert the power control unit power plug into the A.C. power supply receptacle.

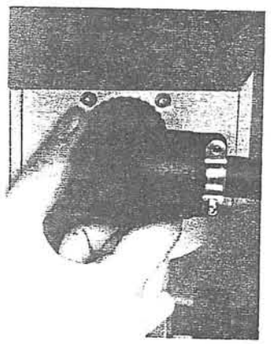


Fig. 6

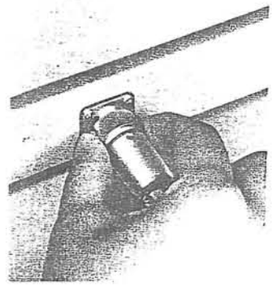


Fig. 7

NOTE: GROUNDING RELIABILITY CAN ONLY BE ACHIEVED WHEN THE EQUIPMENT IS CONNECTED TO AN EQUIVALENT RECEPTACLE MARKED "HOSPITAL GRADE".

8. Preparation for Photography

The film camera is electronically controlled, and does not operate without the required battery and voltage. In order to replace the battery or check the battery voltage, dismount the film camera from the main unit.

8-1. Mounting/dismounting Film Camera

[Mounting] (Fig. 8)

1. As the film camera is not loaded with the battery, put the battery in the camera before mounting it onto the main unit. Refer to 8-3. for film camera battery loading.
2. In order to provide electrical connections between the main unit and the film caemra, align the mount groove of the film camera with the positioning pin on the film camera mount of the main unit while the mount lever is raised. Press the film camera against the main unit and pull the lever down.

[Dismounting] (Fig. 9)

Hold the film camera with the right hand and pull the lever up with the left hand. This way the mount groove of the film camera is disengaged from the positioning pin. Pull the film camera forward.

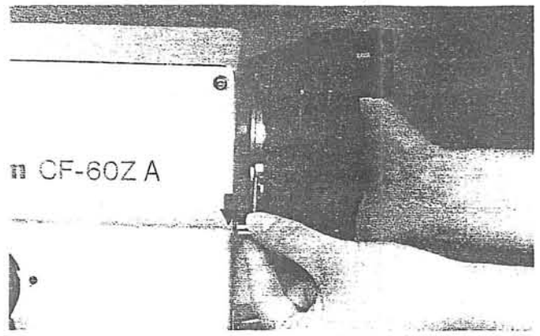


Fig. 8

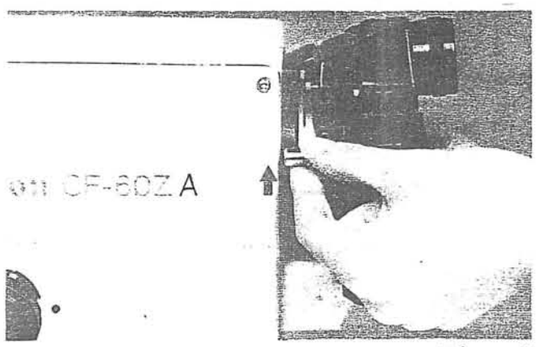


Fig. 9

Caution After Dismounting Film Camera

1. Dust or the like may get inside the main unit or the film camera, if it is dismounted for many hours. Always put the dust cap on the camera after dismounting it. Be careful also not to expose the film camera directly to sunshine.
2. The film camera dismounted from the main unit cannot be used for conventional photography. Even if the Canon's FD or New FD lens is attached and shutter release button is pressed, the reflex mirror breaks. The film camera must be used only for fundus photography.

8-2. Mounting/dismounting Motor Drive Unit

It is not necessary to remove the motor drive unit attached to the film camera unless it is broken. When removing it from the film camera, turn the set-screw on its bottom counterclockwise using a screw-driver or a coin. (Fig. 10)

When reattaching, match the sections of the film camera and motor drive as shown in fig. 11 and tighten the setscrew firmly with a screwdriver or a coin.

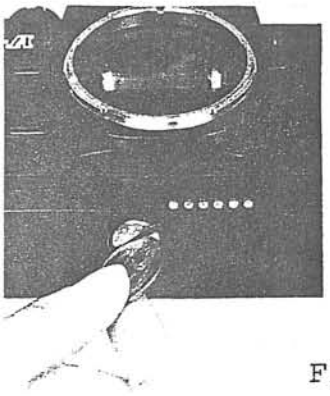


Fig. 10

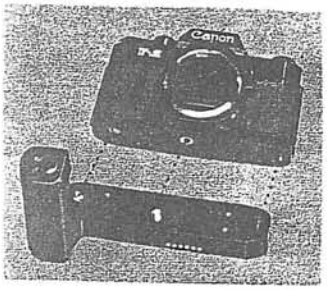


Fig. 11

8-3. Battery Replacement

1. Remove the film camera from the main unit according to "8-1, Mounting/dismounting film camera". Push the camera battery chamber cover protrusion using a thin, pointed rod such as a pincette to the right when facing camera front. The cover opens. (Fig. 12)
2. Insert a new battery while pressing the contact on the bottom of the battery chamber with the battery. Be sure not to confuse ⊕ and ⊖ markings. (Fig. 13)
3. To remove the used battery, pull it out by pressing it downward with the fingers. (Fig. 14)

Notes:

(1) The battery discharges quickly if the ⊕ and ⊖ poles are reversed.

(2) If a battery soiled by sweat or fingerprints is inserted, it causes contact failure.

(3) Remove the battery when the film camera is not in use for a long time.

Acceptable Battery Makers:

Silver oxide batteries: Those satisfying the JIS4G-13 requirements
Eveready (UCAR) No. 544
Mallory PX28

Alkali manganese battery: Eveready No. 537

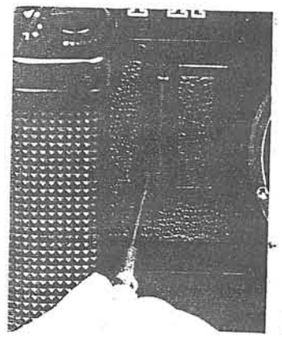


Fig. 12

Fig. 13

Fig. 14

8-4. Battery Check

Check the battery when it is not in use for a long time or when it is used more frequently than usual.

1. Remove the film camera from the main unit as is the case with battery replacement. Look through the viewfinder while holding the film camera to the light and press the battery check button on the top of the film camera. (Fig. 15) A pointer is seen on the left-hand side of the viewfinder as in fig. 16.
2. Adequate voltage supply is assured when the pointer swings upward away from the check point. The distance between the pointer and the check point decreases as voltage drops. (Fig. 16)
3. The shutter release button of the film camera functions if the pointer remains stationary on the check point or falls below it. But voltage supply is running out and the battery must be replaced.

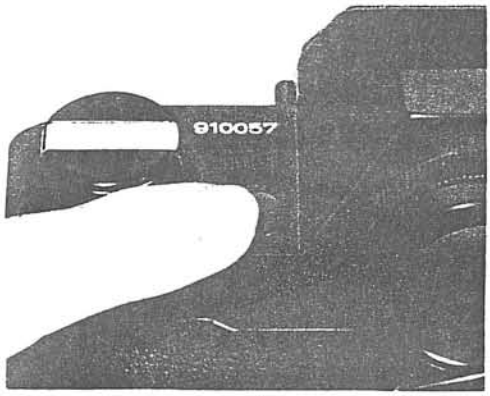


Fig. 15

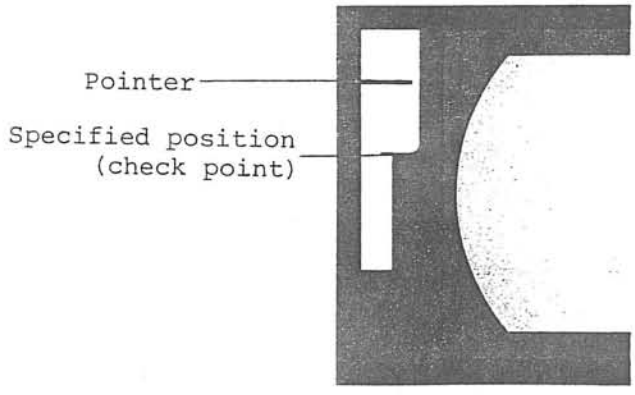


Fig. 16

8-5. Film Loading

Film loading can be performed whether the film camera is mounted to the main unit or not. Use commercially available 35-mm color cartridge film which has a film speed of ASA 25 - 200. For fluorescein fundus angiography black-and-white film with a film speed of ASA 400 or more is used. Load film as follows: (Fig. 17)

1. Pull the rewind crank all the way up. (Fig. 18)
   The back cover of the film camera opens.
2. Fully open the back cover and insert the film cartridge into the cartridge compartment. (Fig. 19)
3. Push the rewind crank down so that its fork is inserted into the cartridge. (Fig. 20)
   If the rewind crank cannot be pushed down completely, turn the crank slightly to the right or left while pressing it down.
4. Pull the film out a little from the cartridge and insert about 2 perforations of the end of the leader into the film insertion slit on the take-up spool.

Note: Do not touch the aperture mask on the film rail. If it is pressed, the mask will be deformed. (Fig. 21)

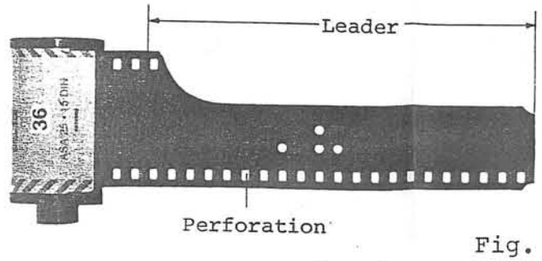


Fig. 17


Fig. 18


Fig. 19

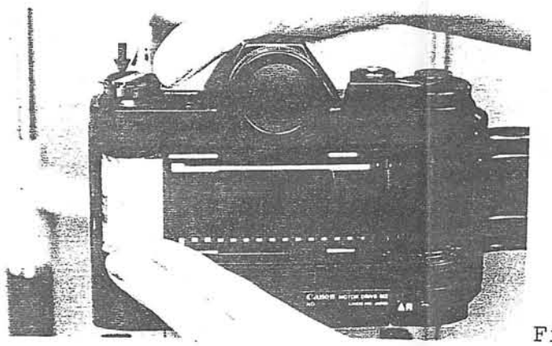


Fig. 20

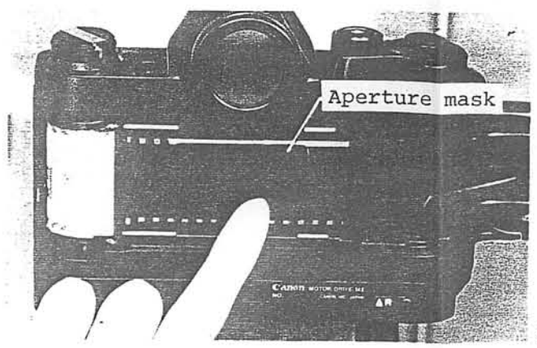


Fig. 21

5. Engage the take-up spool teeth and the film sprocket teeth with film perforations while moving the film lever to the right, thus advancing the film by one frame. (Fig. 22)

6. Check that the film is taut and that the cartridge is not loose in its compartment. If the film is not taut, get rid of film slack by quietly turning the rewind crank clockwise until the slack is taken-up . (Fig. 23)

7. Check that the film advances correctly by moving the film lever to the right. Close the back cover by pressing it against the film camera. (Fig. 24) The two will automatically lock together.

Note: When the film is loaded correctly, the rewind crank turns counterclockwise every time the film lever is advanced. If it does not move, the film is not loaded correctly. Film slack may not be removed or film perforations may not be engaged with the take-up spool teeth or film sprocket teeth. Rewind and reload the film from the beginning.

8. Advance the film lever to the right and press the shutter release button until the frame counter points to a position between 0 and 2 which shows the first frame is ready for exposure. (Fig. 25)

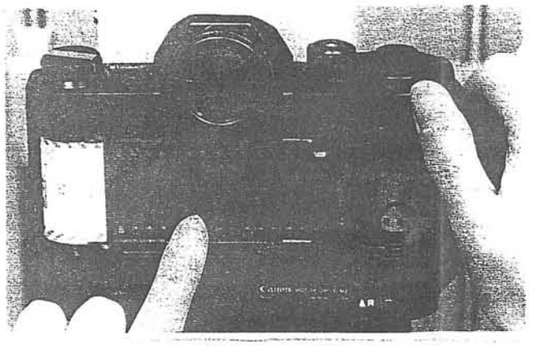


Fig. 22

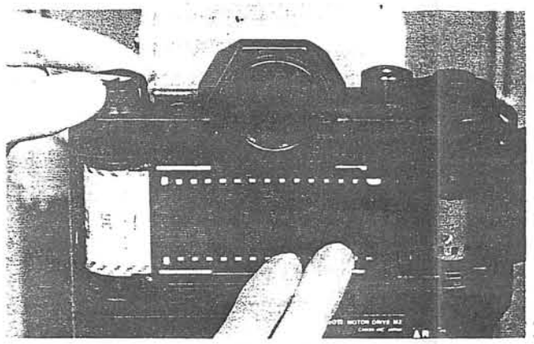


Fig. 23

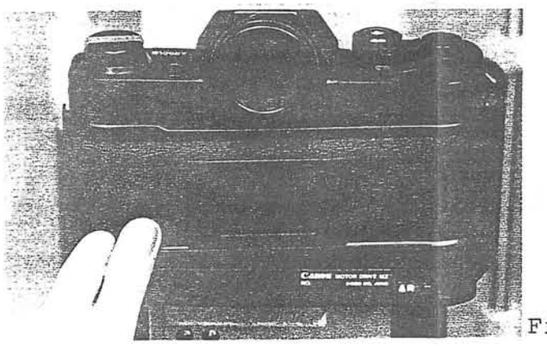


Fig. 24

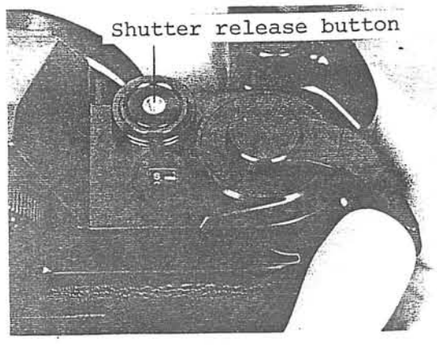


Fig. 25

8-6. Data Printing

Any one of the following three --- a set of data handwritten on the data card (special plastic card), photo number or duration of fluorescein fundus angiography --- is printable on the film simultaneously when it is exposed. (Fig. 26)

1. Hand-written data printing

Write in pencil data required for examinee identification --- date of examination, examinee's name, age, sex, etc. --- inside the 28 mm x 9 mm frame of the data card, and insert it into the data card slit on the main unit with the data surface facing toward the examiner. (Fig. 27) Data is printed on the film as the shutter release button is pressed. (Fig. 28)

Note: Do not insert the data card when printing the photo number or the elapsed time in the manner described below.

2. Photo number printing

The photo number can be printed in a four-digit figure in ascending order, when the data card is not inserted into the data card slit and when the TIMER switch on the power control unit is not pressed. (Fig. 29)

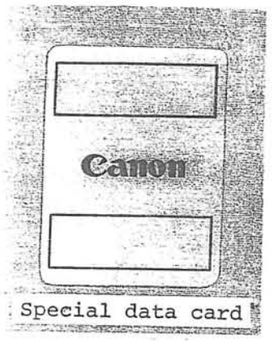


Fig. 26

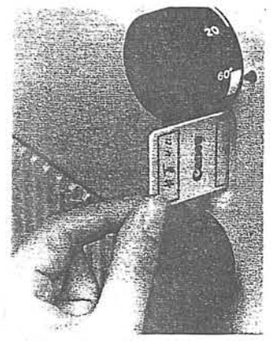


Fig. 27

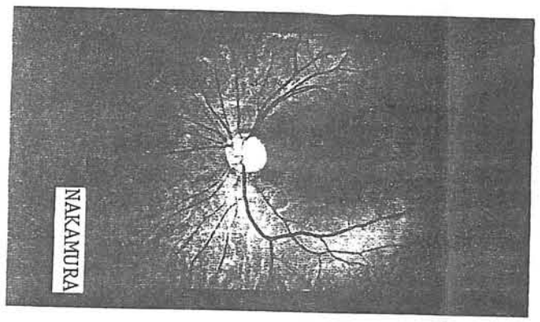


Fig. 28

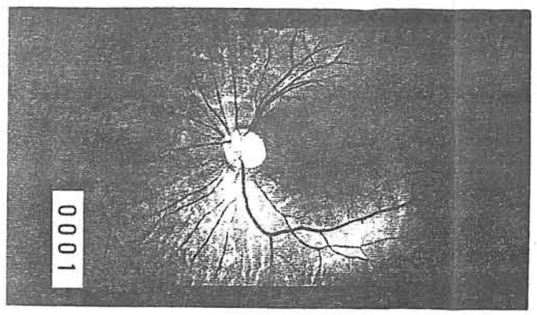


Fig. 29

The photo number is 0000 when the 0 (zero) reset button on the main unit is pressed. It increases by one every time a new frame is exposed. The current photo number is displayed on the power control unit counter.

3. Elapsed time printing during fluorescein fundus angiography

This is possible when the data card is not inserted into the data card slit. Time is printed in 0.1 sec. increments by pressing the TIMER switch on the power control unit. Note that the counter on the power control unit displays the time in 1 sec. increments. (Fig. 30)

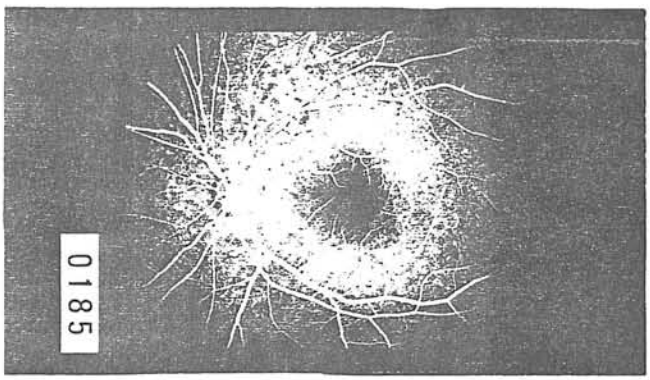


Fig. 30

9. Photography

The standard procedure is described below. The examiner is advised to use the most comfortable method during actual photography. Continuous photography using an unloaded film camera should be avoided.

9-1. 35-mm Color Photography

1. Turn on the POWER switch on the power control unit by pressing it on the I side.(Fig. 31) The charge-up lamp on the power control unit lights. This lamp lights when flash intensity selector switches are pressed, and when each charge up is completed.
2. Make diopter compensation. Cross hairs are seen through the viewfinder of the film camera. Turn the diopter compensation ring on the film camera until the cross hairs are most clearly visible. The compensation range is from -4 to +2 Dptr. (Figs. 32, 33)

   Be sure to make correct diopter compensation. If it is omitted, premature eye fatigue will result during observation or focusing problems will occur as focus adjustment using the bright split lines fails (the examinee requiring diopter compensation outside the -12 to +15 range).

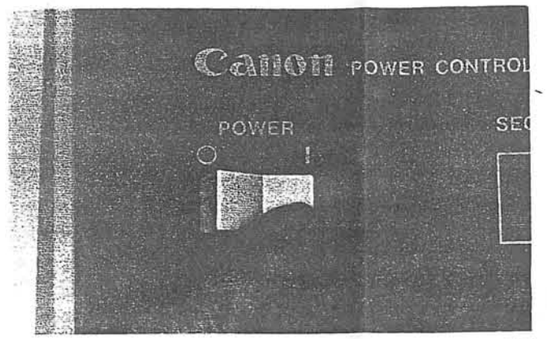


Fig. 31

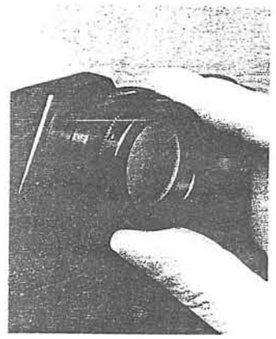


Fig. 32

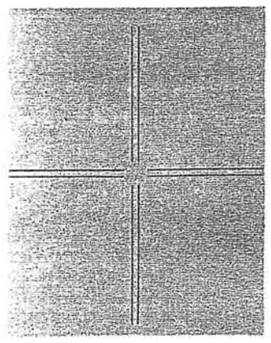


Fig. 33

3. Press the 0 (zero) reset button (Fig. 34)
   The photo number 0000 is printed on the film and at the same time the counter of the power control unit is reset to 0 (zero).
4. Have an examinee administered with mydriatic eye drops sufficiently in advance sit in front of the main unit. Place the examinee's chin and forehead on the chin rest and the forehead rest. Adjust the chin rest height adjustment grip until the center of the examinee's pupil is aligned with the center of the objective lens. (Fig. 35)
5. Select the eye to be photographed. The main unit and the stage slide right and left as required, by keeping the manipulation rod turned counterclockwise while holding it in an almost vertical position. (Fig. 36)

Note: When the grip on the rod is loosened, the horizontal rough adjustment mechanism is fixed.

6. Turn the main unit height adjustment knob until the illuminating light is aligned to the eye to be examined. (Fig. 37)
7. Turn the manipulation rod clamp counterclockwise to loosen it. (Fig. 38) The manipulation rod moves freely. The amount of drag on rod motion

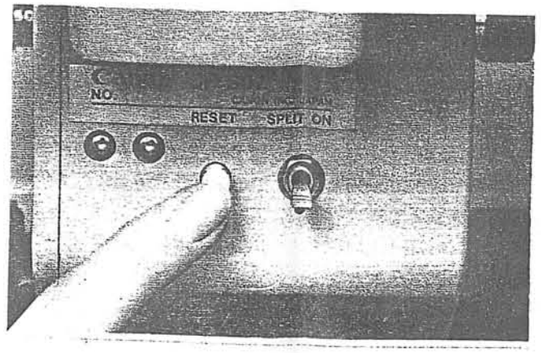


Fig. 34

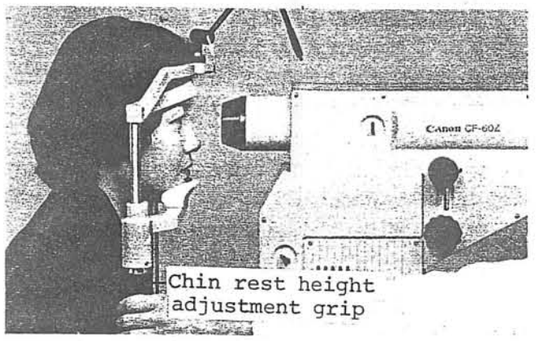


Fig. 35

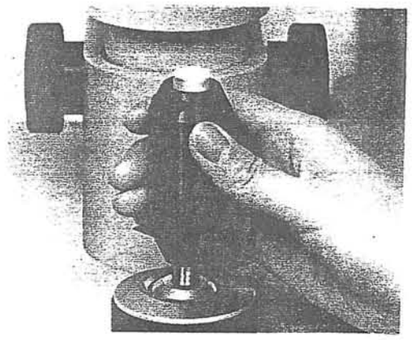


Fig. 36

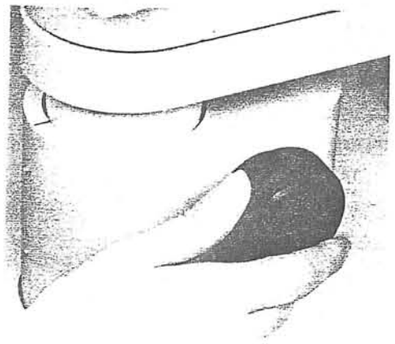


Fig. 37

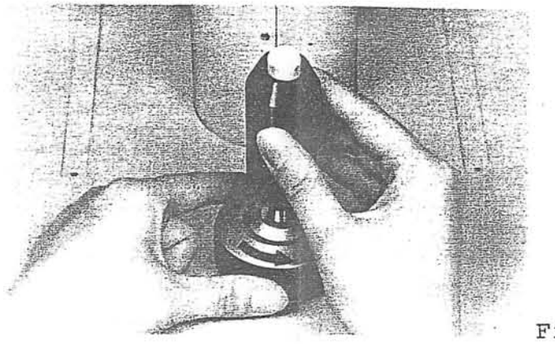


Fig. 38

is proportional to the amount of clamp tightness. When the rod is tipped forward or backward, the camera unit and the stage section also move forward or backward. If it is tipped right or left, they also move right or left.

8. Look through the viewfinder of the photographic camera and turn the illumination intensity control knob on the power control unit until the image in the field of view is visible most clearly (where the knob setting is usually 2 or 3). Intensity increases as the knob is turned clockwise. (Fig. 39)

   Note: Too intensive light may blur the bright split lines or dots.

9. Move the eye fixation lamp until it is almost directly in front of the examinee, and determine the position of the eye to be examined. (Fig. 40)

   Note: Moving the eye fixation lamp more than necessary may cause its cord to break under excessive strain.

10. Perform the above operation while zooming the camera through the picture angle range of 50 to 60 degrees by turning the zooming knob. The bright dots are seen on the right and left sides of the eye fundus image.

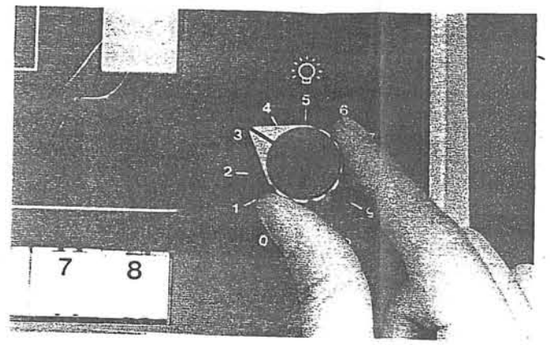


Fig. 39

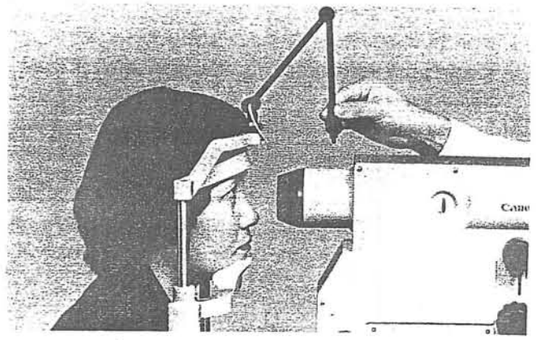


Fig. 40

Tip the manipulation rod forward and backward until the dots are most clearly visible. When they are most clearly visible, the fundus camera and the examinee's eye are at an optimum distance. (Fig. 41) As the camera is moved vertically and horizontally for photographing, the dot positions change correspondingly. Note that no bright dot appears when the picture angle is less than 50 degrees. (Fig. 41)

11. Focus on the fundus image. Turn the focusing knob until the two bright split lines seen through the viewfinder are aligned. (Fig. 42) When the bright split lines are not used for focusing, set the split switch OFF. (Fig. 43) The bright split lines and the dark column both disappear from the field of view of the viewfinder.

12. If no bright split lines are seen through the viewfinder or if only one of them is seen through the viewfinder, the likely causes include: 1) inadequate dilation of the pupil; 2) misalignment between the fundus camera optical axis and the center of the pupil; and 3) eyelashes or eyelid obstructing lighting. (Fig. 44)

13. When the split lines cannot be aligned while the split switch is set to ON and the focusing knob is

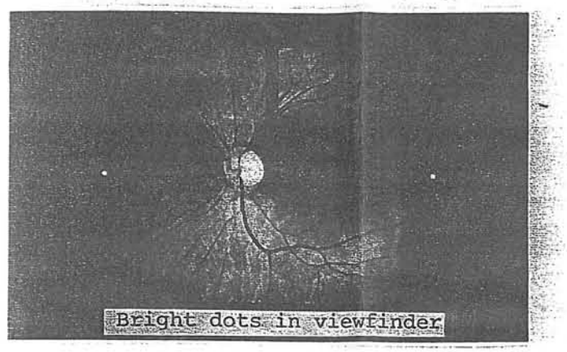


Fig. 41

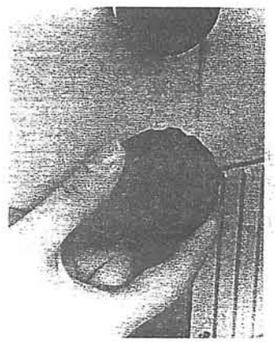


Fig. 42

Fig. 43

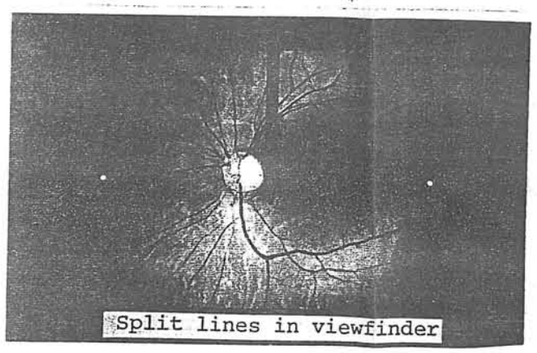


Fig. 44

turned all the way, the examinee's required diopter compensation is outside the -12 to +15 Dptr. range. Pull out the diopter range compensation knob. (Fig. 45) The bright split lines cease to be seen through the viewfinder. Focusing must be made by turning the focusing knob until the cross hairs and the fundus image are seen most clearly through the viewfinder at the same time.

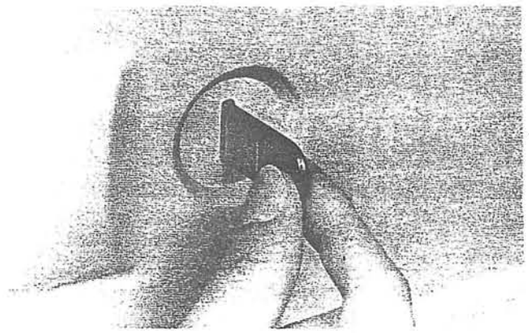


Fig. 45

14. Set the required picture angle by turning the zooming knob. The flash and illumination intensities are regulated automatically according to the amount of zooming. (Fig. 46)

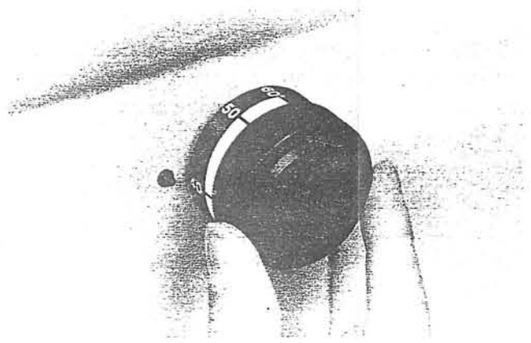


Fig. 46

15. Set flash intensity using the flash intensity selector switch. (Fig. 47) Although flash intensity actually required depends very much on film developing conditions and condition of the examinee's eye, the following table makes an acceptable guide.

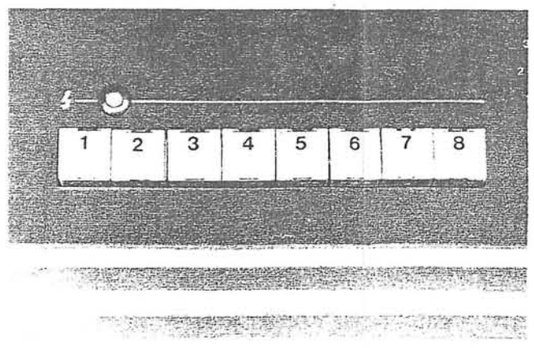


Fig. 47

Intensity selector switch / Film used	1	2	3	4	5	6	7	8
Fluorescein fundus angiography film (for 60° picture angle alone)								●
Polaroid color (for 60° picture angle alone)								●
Polaroid black-and-white (for 60° picture angle alone)				●				
ASA 200	●	○						
ASA 160	○	●	○					
ASA 100			○	●	○			
ASA 64					○	●	○	
ASA 50 - 25						○	●	○

● shows standard intensity

16. Press the shutter release button. (Fig. 48)
One frame is photographed each time the shutter release button is pressed. The film automatically advances one frame and stops.
The photo number is printed on the film simultaneously when it is exposed, provided that the data card is not inserted in the data card slit. The same number is displayed on the counter of the power control unit.

17. To photograph other parts of the examinee's eye, move the eye fixation lamp and the main unit as required. To move the main unit right or left, loosen the right/left steer fixing knob by turning it counterclockwise. The drag on the camera motion depends on the amount of knob tightness. (Fig. 48)

18. Continue photographing by repeating steps 3 through 17.

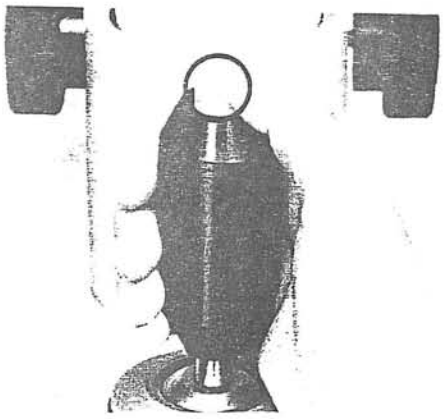


Fig. 43

9-2. Fluorescein Fundus Angiography

Fundus camera operation is essentially the same as 35-mm color photography except that the exciter filter (for illumination) and the barrier filter (for flash) must be inserted. These filters are built in the fundus camera, and inserted into camera optics by pulling their respective knobs. They are disengaged if the knobs are pressed. (Figs. 49, 50)

Follow the steps below for fluorescein fundus angiography.

1. Perform 9-1, 35-mm color photography steps 1 through 13. Note that the illumination intensity control knob must be set to 7 or 8 when fluorescein fundus angiography is performed.
2. Press switch number 8 of the flash intensity selector switch on the power control unit. (Fig. 51)
3. Press the TIMER switch on the power control unit at the same time as the examinee is given an intravenous injection of the fluorescein contact medium. (Fig. 52)

   The timer in the main unit registers elapsed time in increments of 0.1 seconds, while the counter of the power control unit shows time in increments of seconds.

Note: Never press the 0 (zero) reset button while the timer is in operation.

Exciter filter insertion

Fig. 49

Barrier filter insertion

Fig. 50

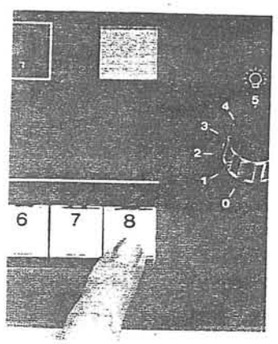


Fig. 51

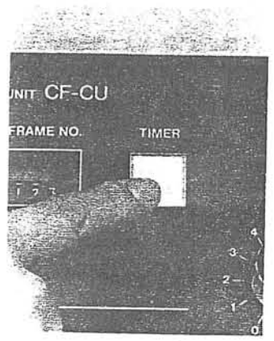


Fig. 52

4. Keep on pressing the shutter release button for serial photography. (Fig. 48) Elapsed time is printed on the film in 0.1 second increments. For one-shot photography release the shutter release button immediately after pressing it.

9-3. Special Photographing Filter

The filter size is ø30 x 2±0.5mm.

If the filter (e.g. sheet filter) is too thin (less than 1.5mm) sandwich it together with transparent glass in such a way as to bring it within the allowable limits. If the special filter is not used, in its place in the main unit be sure to insert a transparent glass filter (for compensating for optical path length).

[Placing filter into filter attachment] (Fig. 53)

Place the filter into the special photographing filter attachment by using the following procedures.

1. In order to place a filter in the attachment, remove the 4 setscrews in the filter holder and slide the two sides of the holder out from the center so as to make a space into which the filter can be placed.

Special photographing filter attachment

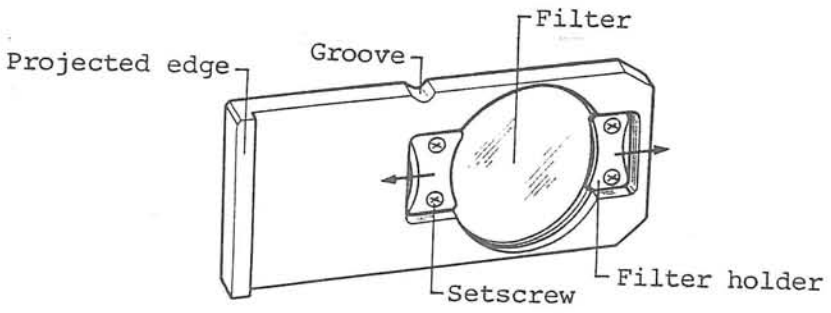


Fig. 53

2. Insert the filter and slide the two sides of the holder back to their original positions, thus setting the filter in place.
3. Secure the filter by replacing the 4 setscrews.

NOTE: Be careful not to touch or leave any finger-prints on the filter or transparent glass.

[Filter attachment insertion into main unit]

Insert the special photographing filter attachment into the main unit by using the following procedures. (Refer to the Nomenclature on page 11.)

1. Hold the filter attachment by the projected edge, making sure that the groove side is up.
2. Insert the attachment into its slot in the main unit sliding it along its track until it locks into place.
3. To remove the attachment, grasp the projected edge and gently pull it out.

9-4. Confirmation of Completion of Photography

When the film counter of the film camera shows the end of exposable film (registering 36 for a 36-exposure film and 20 for its 20-exposure counterpart), the film advance mechanism automatically stops. (Fig. 54)

This applies to both 35-mm color and fluorescein fundus angiography. Reload the camera with new film for additional photography.

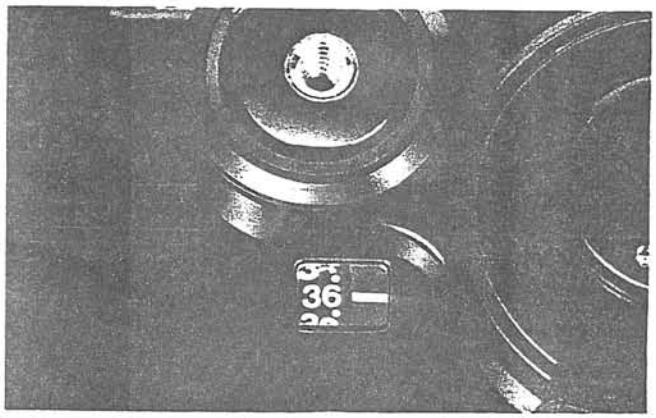


Fig. 54

9-5. Film Rewinding (35-mm color and fluorescein fundus photographs)

Always rewind the film into the cartridge after the photographing process is completed. If the back cover of the film camera is opened before rewinding the film, all the film wound around the take-up spool is spoiled. The exposed portion of the film wound around the spool is shielded from light by only the back cover. Rewind the film as follows.

1. Push the rewind lever (R) of the film camera up in the direction of the arrow while pressing rewind lever lock button on the motor drive. (Fig. 55)
2. To rewind the film into the cartridge, flip up the film rewind crank and turn it in the direction of the arrow marked on the crank. (Fig. 56)

Note: Be sure to pull up only the film rewind crank. If the entire film rewind crank assembly on the top of the camera is pulled up, the film rewind crank fork is disengaged from the cartridge shaft and the film is not rewound. In this case, re-engage the crank fork and the cartridge shaft by pressing the rewind crank while turning it clockwise or counterclockwise, and resume rewinding.

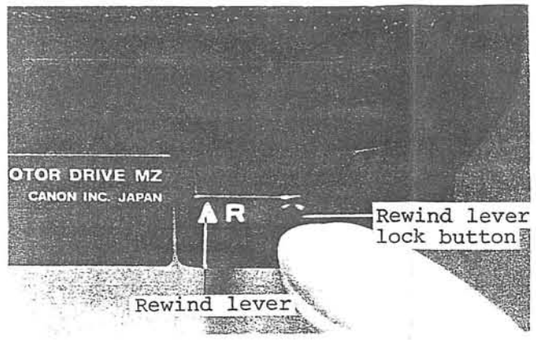


Fig. 55

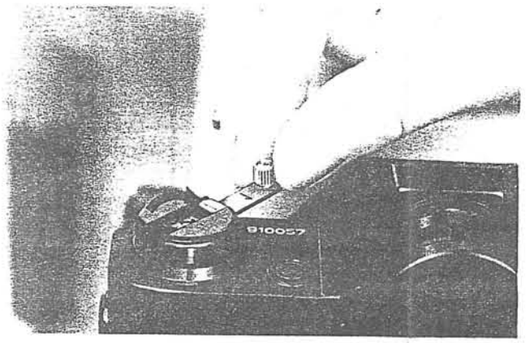


Fig. 56

3. Stop rewinding the film when the rewind crank starts rotating with a perceptible loss of resistance. Watch the film counter of the film camera during rewinding and stop rewinding when letter S appears on the counter. In this way the film leader is not rewound into the cartridge. (Fig. 57)

Note: Film loading failure cannot be corrected by reloading the film, if its leader is rewound into the cartridge.

4. Pull the rewind crank assembly all the way up, open the back cover and remove the cartridge (into which the exposed film is rewound). (Figs. 58, 59)
Close the back cover when the film camera is not immediately reloaded with a new cartridge of film.

When the film must be rewound with the back cover left open in order to cope with trouble in the film camera (for instance, incorrect film loading), the rewind lever (R) must remain pushed up until rewinding is over.

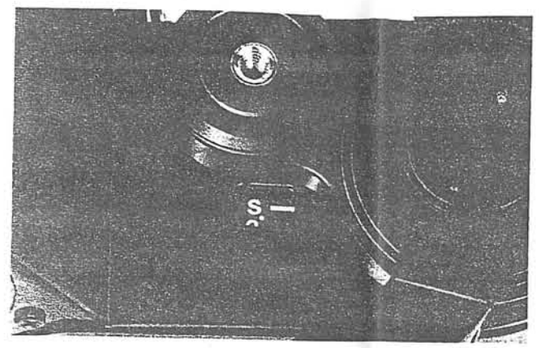


Fig. 57

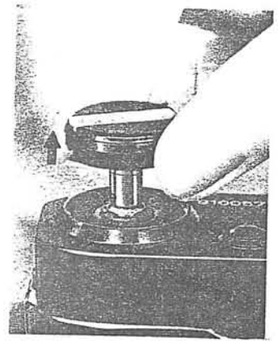


Fig. 58


Fig. 59

9-6. Polaroid Photography

The optional Polaroid color back unit CF-PC produces two ø53mm(W) x 40mm(H) photographs on one sheet of Polacolor film. (Fig. 62) With the Polaroid back unit CF-PB, another optional item, one ø83mm(W) x 62mm(H) photograph is obtainable on a single sheet of Polaroid black-and-white film. (Fig. 63) These Polaroid back units are compatible with the picture angle of 60 degrees only. For details in terms of hardware, operation and processing of the exposed film, refer to their respective operation manuals.

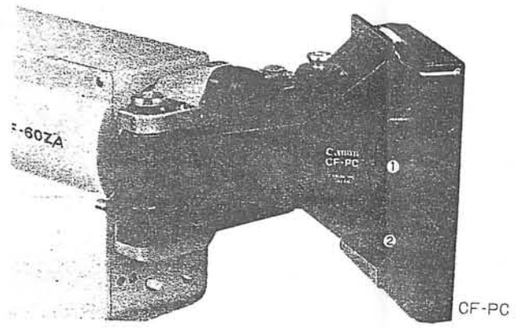


Fig. 60

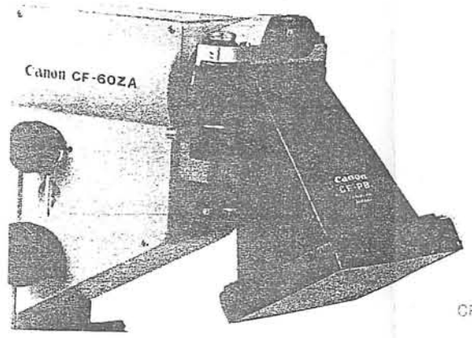


Fig. 61

Examples of photographs taken with CF-PC and CF-PB

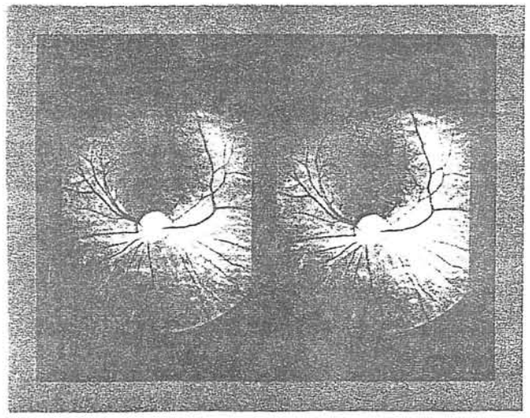


Fig. 62

CF-PC
Film size: 85mm x 108mm
Exposed area: 72mm x 95mm
Size of image photographed: ø53mm x 40mm each

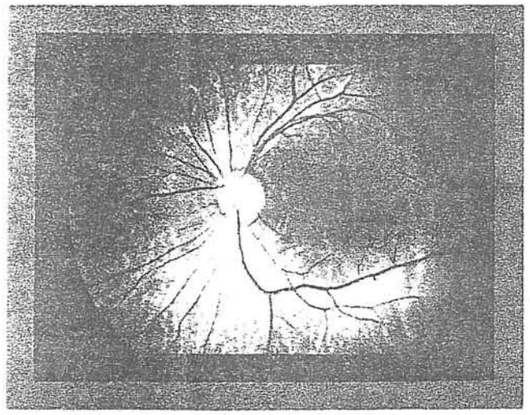


Fig. 63

CF-PB
Film size: 85mm x 108mm
Exposed area: 72mm x 95mm
Size of image photographed: ø83mm x 62mm

10. Others

10-1. Camera Handling in Cold Places

In operating the CF-60ZA system in the winter or cold places, quick heating of the room in which it is installed may cause the objective lens and other optics inside the camera to collect moisture. After starting heating wait 40 minutes or so until moisture is removed from the optical system, and then begin photography. Do not try to wipe away moisture from the lens or other surfaces. Uneven cleaning or scratches may result. Wait until moisture disappears naturally.

10-2. Objective Lens Cleaning

Prepare a mixed solution of absolute alcohol and ether at a ratio of 2:8. Use a clean piece of gauze (washed and dried), commercial lens cleaning paper, blowers, brushes, etc. for cleaning the objective lens.
A blower/brush combination is furnished with CF-60ZA.

1. Cleaning solution preparation

   An absolute alcohol/ether solution is recommended for cleaning the objective lens. Usually two parts of absolute alcohol and eight parts of ether are mixed, although the ratio depends on the weather and room conditions (especially humidity and temperature). When only absolute alcohol or ether

is available, either will do. But prepare this solution whenever possible, because of its superior cleaning effects.

Note: Never use sterilizing alcohol. It contains water and damages the lens surface permanently.

2. Cleaning dust and other solid deposits

Blow off dust and other solid deposits from the objective lens surface using the blower, or brush them away using a soft brush. Be sure that the brush itself contains no dust, etc. in the first place. Do not touch the brush with uncovered fingers. A brush stained with grease does more harm to the lens surface than not cleaning it.

3. Cleaning finger prints and greasy stains

First clean dust or the like off of the lens surface using a blower or a brush. Wiping the lens surface with gauze wet in absolute alcohol/ether solution or a piece of lens cleaning paper if dust and other solid deposits are not cleaned off may produce scratches in the lens surface.

° Wrap a clean piece of gauze or lens cleaning paper around the tip of the pointing finger, wet it only slightly in the solution, and wipe the lens surface lightly in a spiral from the center.

Be careful to remove the gauze or the paper lightly from the lens surface when wiping is over.

° When finger prints or greasy stains remain, use that part of the gauze or the paper which was not directly touched by finger for repeated wiping in the manner stated above.

Never try to rub off finger prints or greasy stains using the gauze or the lens cleaning paper wet in the cleaning solution. The lens surface may be scratched. The gauze or the paper excessively wet in the cleaning solution may result in uneven cleaning.

10-3. Service Information

For information on maintenance, overhaul, accident-in-use, etc., contact

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