Canon

Service Manual

ENGLISH EDITION

CANON LENS
EF24mm 1:2.8
EF100-200mm 1:4.5A
ELECTRICAL DIAGRAMS

CY8-1200-048

EF24mm 1:2.8

REF. NO. C21-5301

REPAIR INSTRUCTIONS

Canon SERVICE MANUAL

REPAIR INSTRUCTIONS No.

Camera Technical Service Department, Canon Inc.

Date December 7, 1988

CANON LENS EF24mm f/2.8
Ref. No. C21-5301

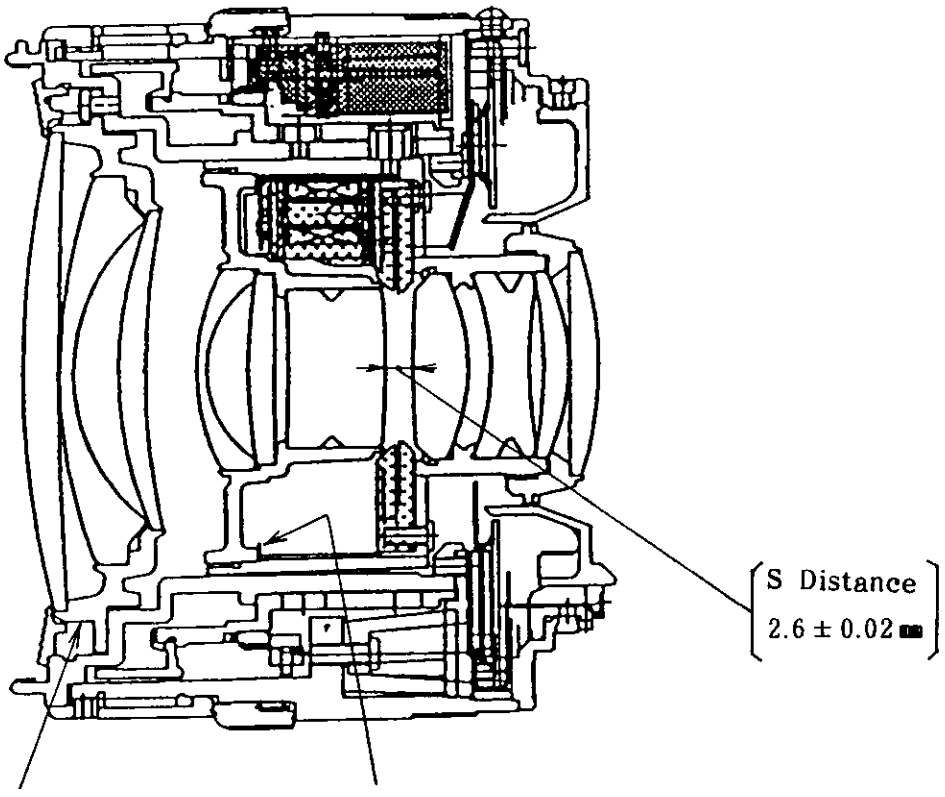
Special Optical Adjustments:

"S" Spacing	(Yes)	No
Centering.	Yes	(No)
Tilt	(Yes)	No

The distance "S" between G6 and G7 must be adjusted to 2.6 ± 0.02mm. See adjustments section II-1.

Optical tilt adjustment uses the lens projector to check resolution. See adjustment section II-2.

Alternate procedures, not requiring major tools, are included for the "S" distance and tilt adjustments.



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EF24mm f/2.8 Lens Expendables List

Part Number	Name	Remarks	Plastic Safe?
-ADHESIVES-			
CY9-8007-000	Aron Alpha	Instant Bond (Cyanoacrylate)	YES
CY9-8009-000	Arontite R	For staking screws	NO
CY9-8011-000	Screw-lock	For staking screws	YES
CY9-8076-000	Vinylole 2200	General Purpose	YES
- LUBRICANTS -			
CY9-8086-000	FF-10	Helicoid & cam (New)	YES
CY9-8087-000	Lozoid 6308/31-F	Manual focusing ring (New)	YES

Color Code

To save space on drawings, it has been necessary to uses a color code. The code is:

Color	Code	Color	Code	Color	Code
Black	BL	Blue	BU	Gold	GL
Brown	BR	Violet	V	Tan	T
Red	R	Purple	PR	Pink	PK
Orange	O	Gray	GY	Sky Blue	SB
Yellow	Y	White	W	Yellowish Green	YG
Green	GN	Silver	S		

I. INTRODUCTION EF24mm f/2.8

1. Design Introduction

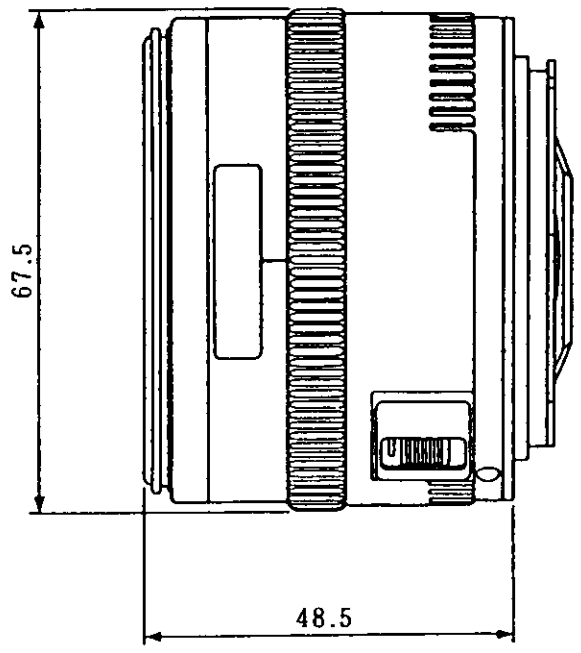
The EF24mm f/2.8 is the widest true wide angle lens in the EF series. It has a relatively large maximum aperture that is very difficult to achieve with zoom lenses, and optical performance to satisfy the discerning photographer. The focal length is quite short, but still easy to handle without the exaggerated effects of super wide lenses in the sub-20mm range. Experience with the FD series indicates that 24mm is one of the most desired focal lengths on the wide end of the scale.

2. Features

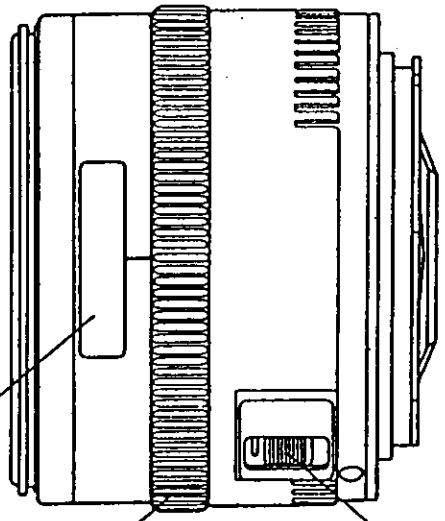
Rear group focusing gives the advantages of a floating element also. The image stays razor sharp throughout the focusing range, with image quality even better than the FD24mm f/2.8 unit focusing lens with a floating element.

In addition to the optical benefits, rear group focusing is fast (0.3 seconds) and quiet.

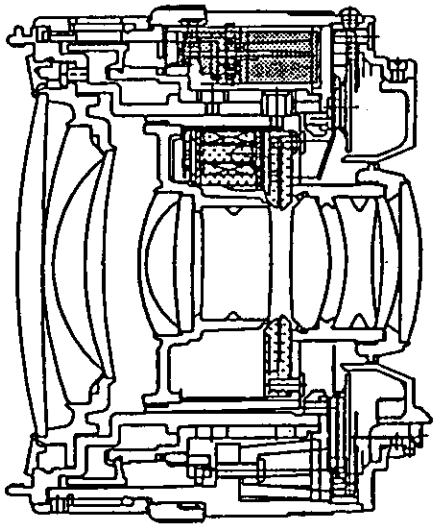
3. Illustrations



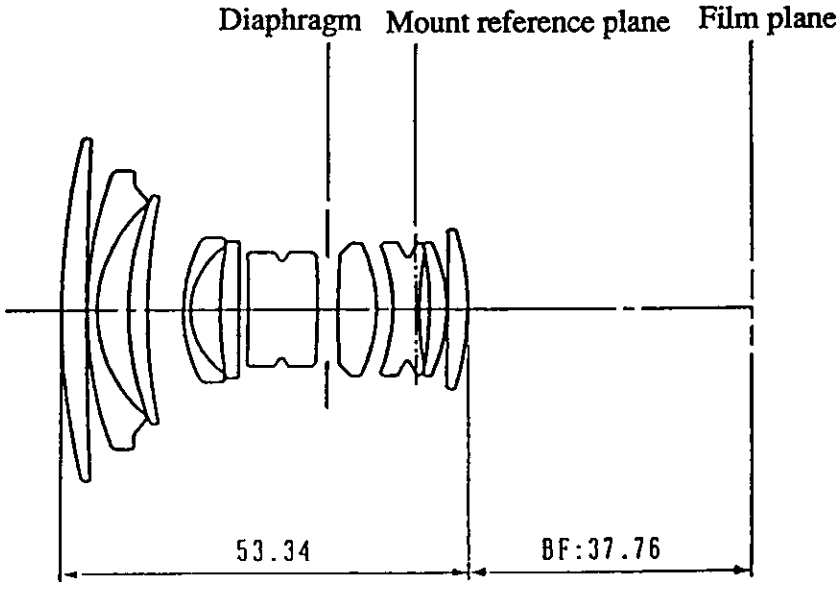
Appearance and nomenclature



Cross sectional view



Optical system



4. Specifications

Focal length, aperture: 24mm, f/2.8

Optical structure: 10 air-spaced elements

Angle of view (infinity):

Diagonally (43.2 mm)	84°
Vertically (24 mm)	53°
Horizontally (36 mm)	74°

Focusing: Autofocus with manual control possible

Extension system: AFD driven, cam-controlled rear element

Range & Speed: 0.25m to infinity; 0.3 seconds from infinity to closest focus, not including ranging)

Manual: Mechanically clutched focusing ring

Rotation angle, extension:

Condition	Rotation angle	Extension
0.25m toInfinity	72° 6'	4.2mm
Infinity overrun	None	None

Distance scale:

0.9	1.1	1.5	2	3	6	∞	ft (fluorescent green)
0.25	0.3	0.4	0.6	1	2		m (gray)

Maximum magnification, field of view

MinimumFocus	Magnification	Field of view (mm)
0.25 meters	0.155X	158 x 241mm

Mount

Type: Canon EF mount

Signal transfer: EOS system, with 5 signals as follows :

A) Lens condition
B) Lens type
C Photometry signal
D) Focal length
E) AF drive information

4. Specifications (cont.)

Aperture mechanism

Diaphragm control:	Pulse control using EMD
Aperture range:	f/2.8 - f/22 (no scale)
Diaphragm blades:	6
Depth-of-field scale:	f/11 and f/22
Infrared index:	Provided

Filter: 58mm, 0.75mm pitch, (One filter only)

Dimensions / weight: 67.5 mm diameter x 48.5 mm length / 270g

Related products

Hood: EW60 (reversible)
Lens cap: E-58
Lens cases: Soft case (ES-C9) holds lens with one filter attached, reversed hood and lens caps in place.
Hard Case (LH-B9), hood will not fit in case.
Rear lens cap Common to all EF lenses (new)

5. External Design

The lens is designed with flowing lines and a pebble-grain finish to complement the design of present and future EOS cameras.

6. Technical Details

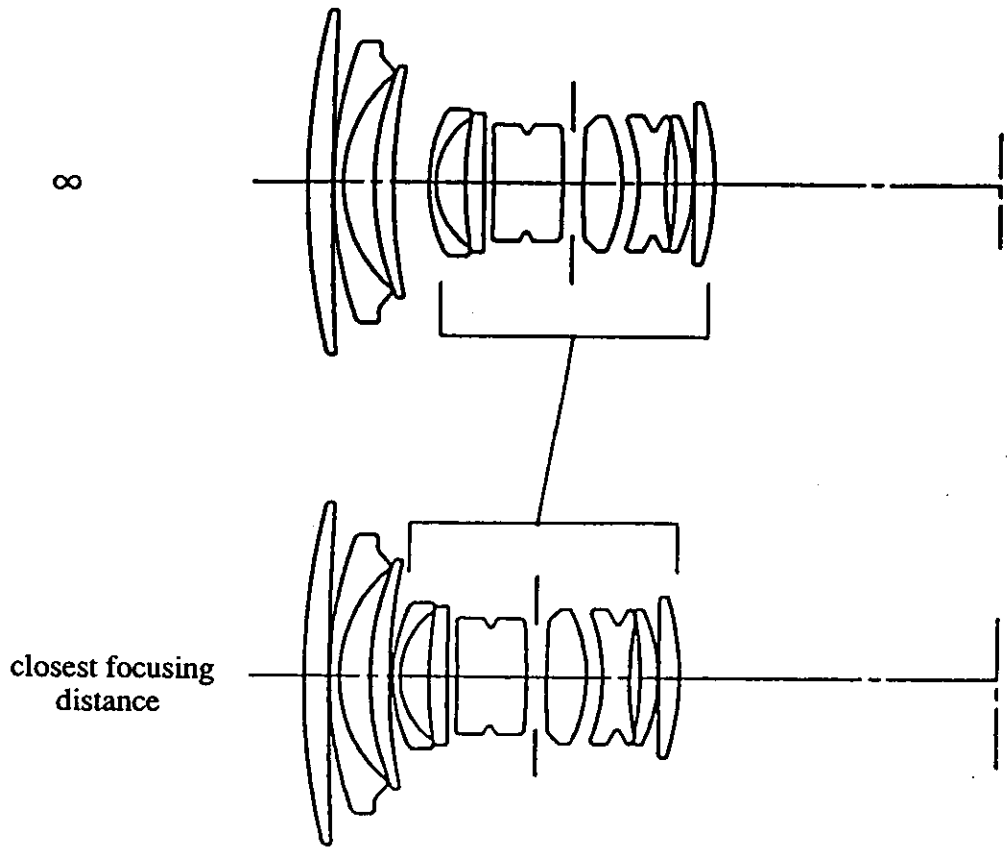
Cam Drive rear group focusing

Focusing of the rear group of elements uses a cam sleeve like a zoom lens rather than a heavy double helicoid. Since it focuses the smaller rear elements, it requires far less torque than if the entire lens, including the large, heavy front elements, were focused.

Optical Performance

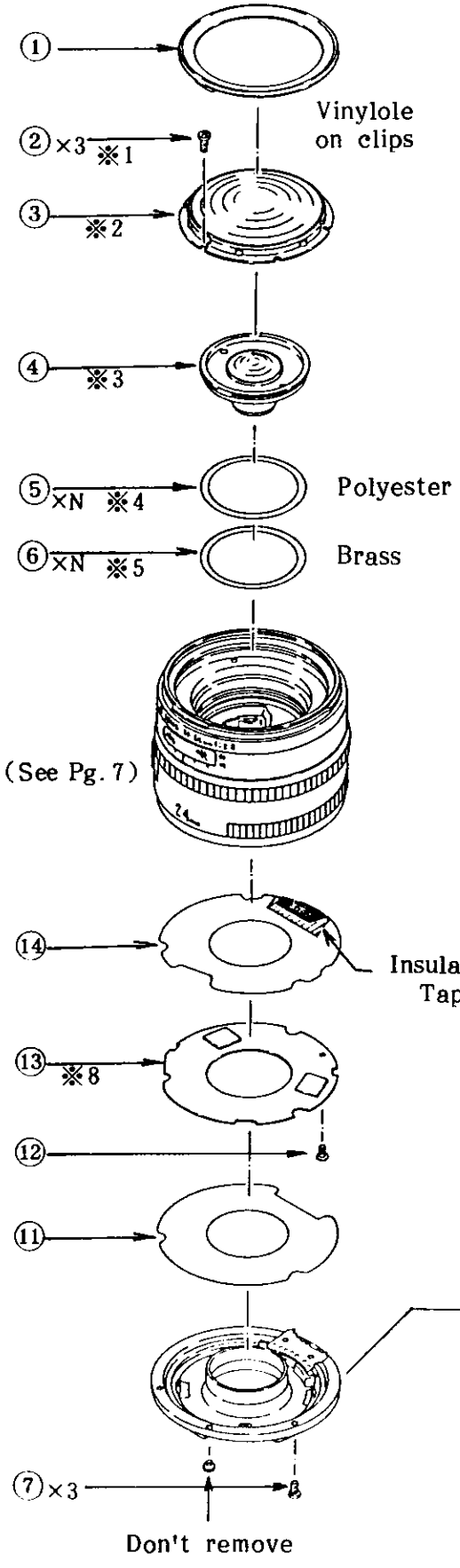
This lens does not use unit focusing with a floating element in the rear as the FD 24mm f/2.8 did, but it achieves the same, in fact better, effect by using rear element focusing.

Floating element design, where the spacing between internal elements is changed as the lens is focused at near distances, corrects aberrations that tend to increase as the subject distance decreases. In this design, the rear group only moves during focusing. This changes spacing between internal elements as the lens focuses thus achieving aberration correction like a floating element.



II. DISASSEMBLY & ASSEMBLY EF24mm f/2.8

1. Front Lens Unit, Main Flex Removal



※ 1 Tilt adjustment necessary if removed, see pg. 10.

※ 2 Tilt Adjustment: Adjust position for good overall sharpness, and especially good central sharpness.

※ 3 If replaced "S" distance must be adjusted, see pg. 9.

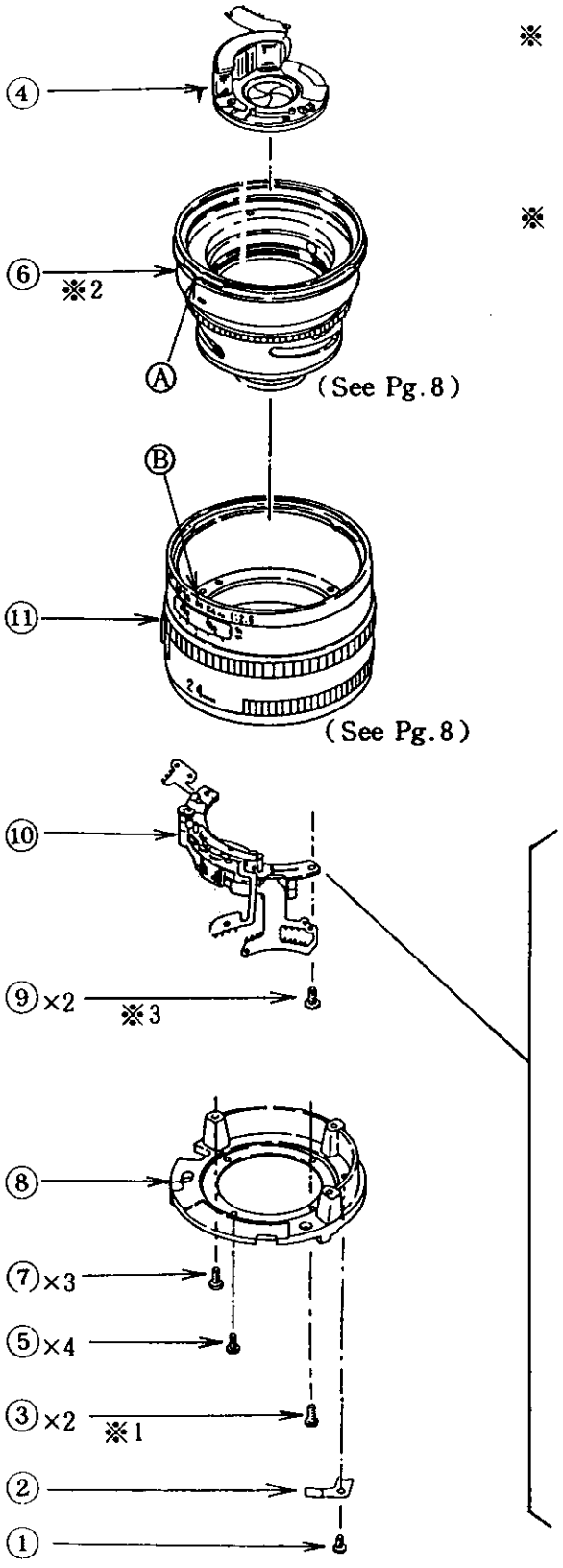
※ 4, 5 "S" distance adjusting parts. This adjustment corrects distortion.

※ 6 Install back cover last, after installing screws (7).

※ 7 Under-size mount used with washers to adjust focus (Service only parts), see pg. 11.

※ 8 Flex are held with double-stick tape. Loosen with Fronsolve AE. Tape is used to improve production line efficience. It need not be replaced after service.

2. EMD and AFD Unit Removal



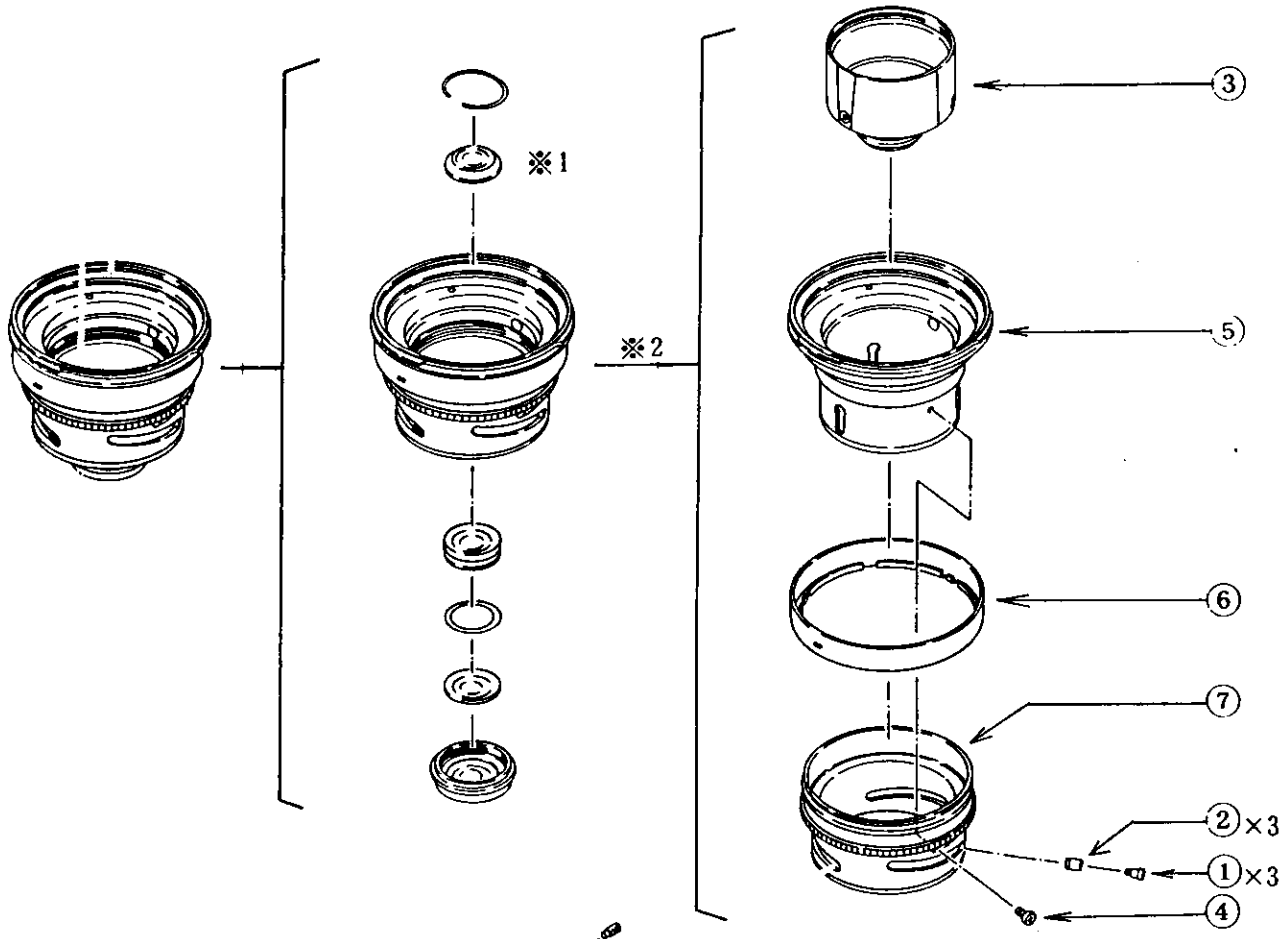
※ 1 Set lens to close focus to start.

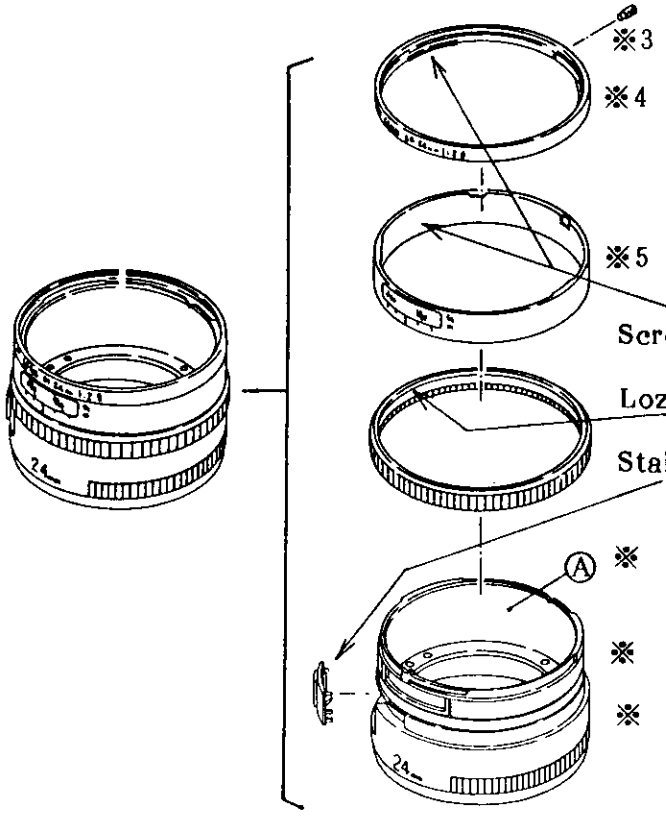
※ 2 Align notch (A) in 6 and rib (B) in 11 when assembling. (A) is located near the "EF" on 6, and (B) is located near the infinity mark on 11.

※ 3 If removed, AFD drive (backlash) adjustment is necessary.

To adjust, temporarly install screw 9 with the unit 10 pushed toward the outside. Install 5, 6, 7, and 8, and operate the manual focus to find the best position for 10, and then tighten 9.

3. Helicoid Disassembly & Manual Ring Removal





※ 1, 2 If parts are changed, "S" distance adjustment is necessary.

※ 2 Lube contact surfaces with a little FF-10.

※ 3 Setscrew must not intrude beyond the inner (A) surface.

※ 4 Turn CCW to remove from unit.

※ 4, 5 These parts are held firmly by bond. Loosen with Fronsolve AE before trying to remove.

1. S Distance Adjustment

This adjustment is necessary if the intermediate lens assembly (G4 - 6), lens G7, or the focusing unit is replaced.

Using a micrometer test stand, the distance between G6 R2 and G7 R1 is adjusted to 2.6 $\pm$ 0.02 musing washers.

If this distance is not properly adjusted, curvature of field increases lowering zonal resolution.

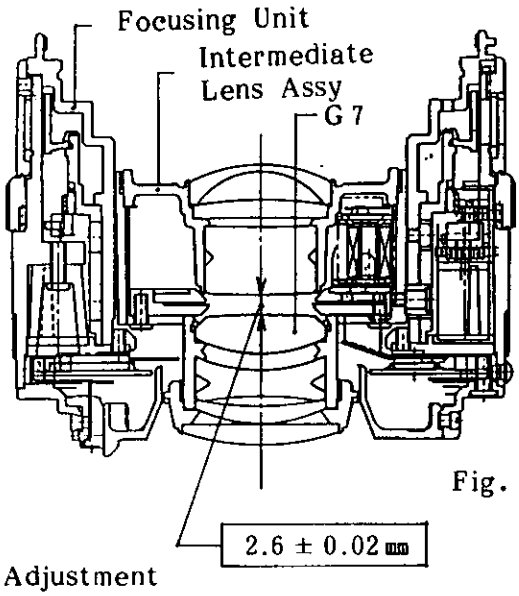


Fig. 1

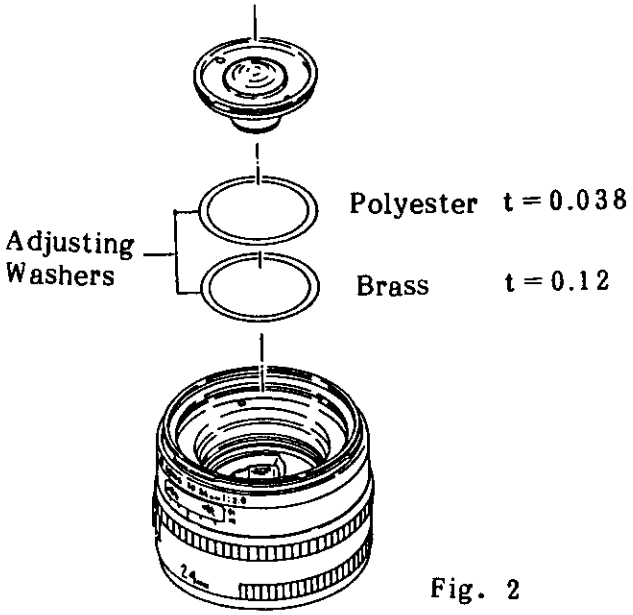


Fig. 2

Adjustment

1. Measure 'a' (Fig. 3)
2. Measure 'b' (Fig. 4)
3. Determine the washer thickness "x".

   x = 2.6 + a-b

4. Choose washers from those available to equal x $\pm$ 0.02mm.
5. Check projection resolution using the lens projector. If the S distance is greater than standard, curvature of field increases.

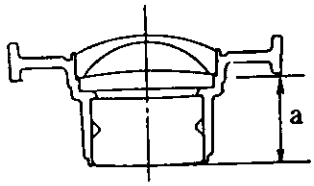


Fig. 3

[Alternate Method (If lens projector is not available)]

1. Use one each brass and polyester washer.
2. If resolution in the outer zones is below par for this type, send the lens to a service facility with the proper equipment.

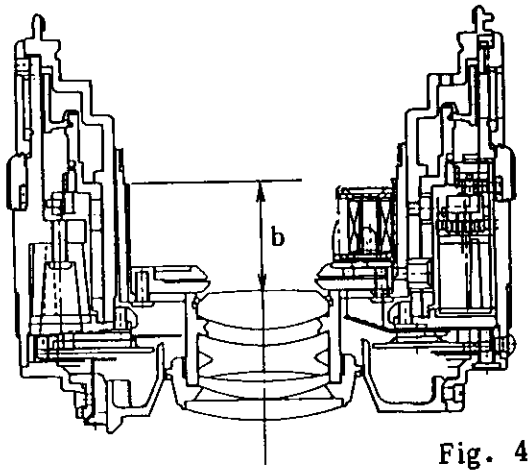


Fig. 4

2. Optical Tilt Adjustment

This adjustment is necessary if the front lens assembly is removed or if any of the optical components are repaced.

This adjustment should be performed using a lens projector, or if one is not available using the lens focus collimator and adjust so flare around the star image is concentric. If neither is available, see the alternate procedure.

If this adjustment is not correct, the focus will be uneven, central resolution will be low and flare will degrade the image considerably.

Table 1 : Resolution Chart

Image Height (mm)	0	4	8	12	16	20
S	100	100	100	*63	40	40
Axial						
M		100	63	40	40	40

*: 40 acceptable on adjacent diagonal.

Favor central resolution over even focus.

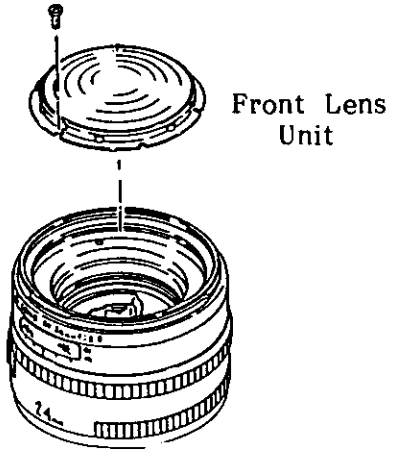


Fig. 5

Adjustment

1. Lightly tighten the screws, and adjust chart distance to 1.2 meters.
2. Wiggle the front lens until the best results are obtained and tighten the screws.

[Alternate Method (If lens projector or lens focus collimator is not available)]

1. Prepare three 0.20 to 0.24mm spacers. Spacers can be made from plastic or paper, such as a business card.
2. Lightly tighten the screws.
3. Insert the three spacer equidistant around the circumference (A), and tighten the screws.
4. If resolution is uneven or below par for this type, send the lens to a service facility with the proper equipment.

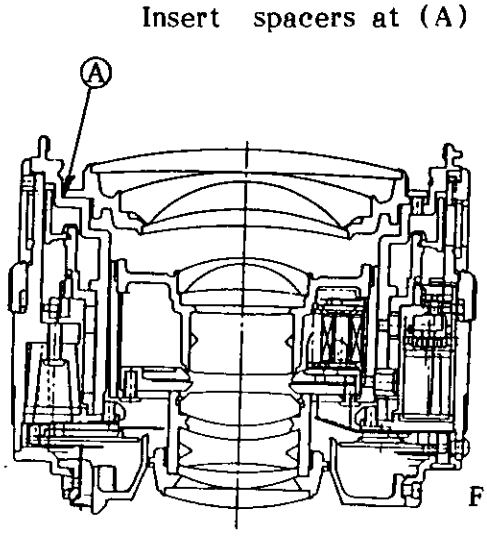


Fig. 6

3. Focus Adjustment

This adjustment is necessary if optical components have been replaced, or if the lens will not manually focus on infinity.

Using the lens focus collimator, test several known-good lenses to establish the center value on the focusing scale.

If the collamitor is not available, install a "B" screen in a correctly adjusted camera and use a magnifier on the eyepiece to check infinity focus.

If the lens is not adjusted correctly, it may not focus corerctly at infinity in autofocus.

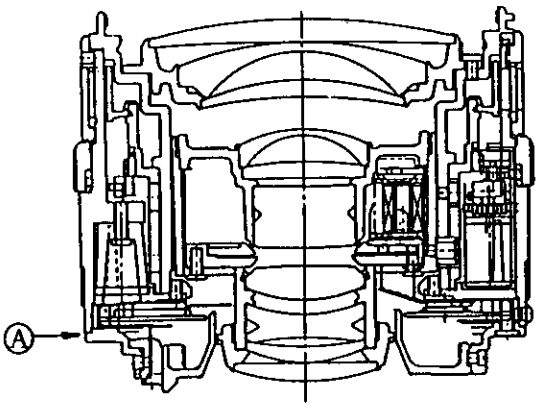
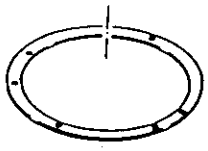


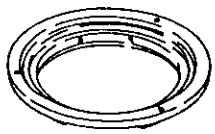
Fig. 7

Focus Washer (Special Service Part)



	A	SIZE
	0.02 mm	(002)
	0.05 mm	(005)

Lens Mount (Special undercut Service Part)



	A	SIZE
	1.7 mm	(170)
	1.8 mm	(180)
	1.9 mm	(190)
	2.0 mm	(200)
	2.1 mm	(210)

Fig. 8

Method

1. If the lens focuses past infinity (plus), focusing washers up to a combined thicknesses of 0.07mm can be used.

2. If the defocus is greater than 0.07mm plus, measure the lens mount thickness and install a slightly thicker mount, and focus washers if necessary, to bring the focus within limits.

3. If the defocus is minus, install a thinner lens mount, and washers if necessary,

Note: If washers with a combined thickness greater than 0.07mm are used, the gap (at "A" in the drawing) may become noticeable.

4. Pulse Adjustment

This adjustment is necessary if the main C.B., AFD unit, or R flex unit is changed.

Adjust using an oscilliscope to view the pulse with the lens in the AF search condition.

If not adjusted, AFD may work correctly at normal temperatures but fail at high or low temperatures.

Adjustment Method

1. Assemble the lens so the mount portion is electrically attached, but do not install the mount screws.
2. Temporarily attach leads to the pads marked [PULS CH] and [D-GND], and connect to the oscilliscope.
3. Attach the lens mount to a camera body. Since the main part of the lens is hanging by the flex, be careful not to tear the flex.
5. Set the lens to AF and the camera to ONE-SHOT, and press the shutter button (the AF will search continuously).
6. Adjust VR7 so the waveform is like figure (c).

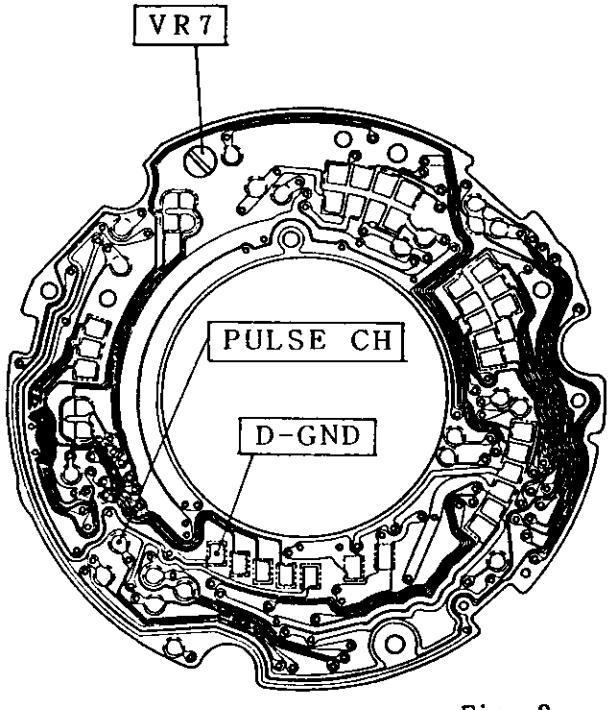


Fig. 9

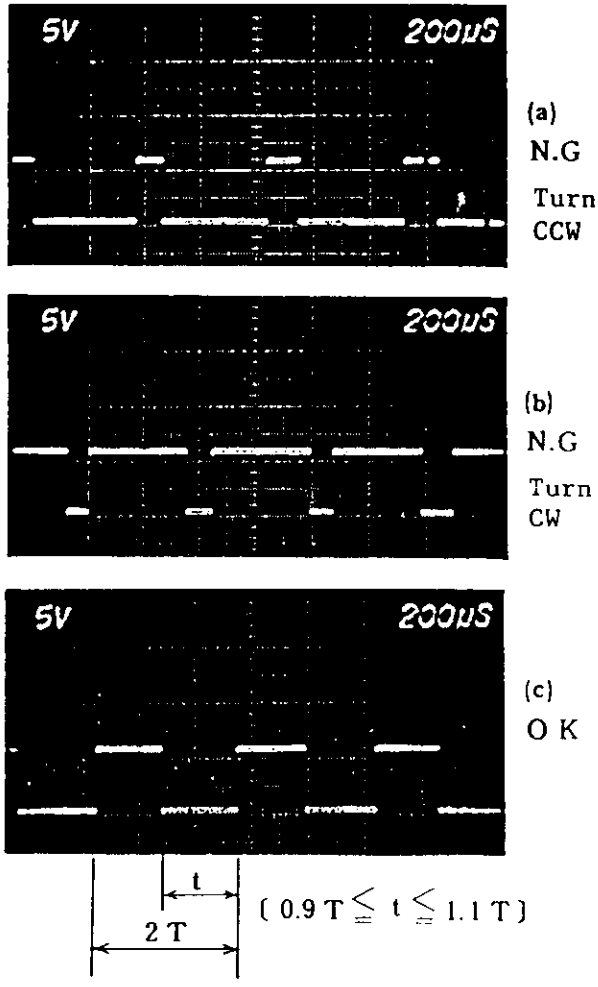


Fig. 10

5. "Best Focus Adjustment" Service Policy

This adjustment corrects the difference between the AF focus and the actual best focus.

The difference between the two focus points has been determined for each lens type and written into the ROM so that correction is made electronically. In addition to this type difference, there are individual lenses differences, which can be noticeable. At the factory, correction is written into the individual lens' ROM with a expensive, special tool. This is called the "Best Focus Adjustment". Because of the tooling cost involved, this adjustment is not normally a part of the service procedure. In its stead, an alternate procedure will be used.

If a customer complains of poor resolution wide open, use the following service procedure.

Photographic Test
Make actual photographic test at a distance of 1.2 meters with the AF-ADJ0 and AF-ADJ1 bridges in all four possible combinations. Make five or six negatives for each combination of a flat high contrast chart or equivalent at maximum aperture using an EOS 650 or 620 in AV mode. Examine the negatives closely to determine which combination is best.

Visual Test
Use the standard chart at a convenient distance. View through the viewfinder with a type B screen. Use a magnifier and change the pad combinations until the best combination is achieved. This test should be performed by a young person with excellent visual acuity.

Repair Actions:

1. Main Flex Replacement
   Check the AF ADJ0 through AF ADJ3 pads on the flex being replaced and bridge the pads on the new flex in the same way.

2. If front defocus, use plus correction. If rear defocus, use negative.

Best Focus Correction (Reference)

Correction	AF ADJ0 (2)	AF ADJ1 (3)
$-\frac{3}{4}$Fc	Open	Closed
$-\frac{1}{4}$Fc	Closed	Closed
$+\frac{1}{4}$Fc	Open	Open
$+\frac{3}{4}$Fc	Closed	Open

AF ADJ2 and 3 are not presently used. Put 2 in the same condition as 0, and 3 in the same condition as 1.

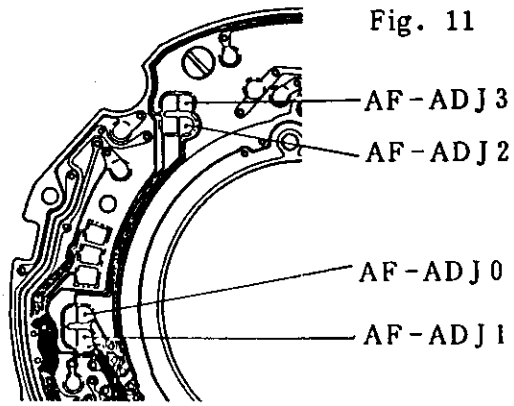


Fig. 11

EF100-200mm 1:4.5A

REF. NO. C21-9492

REPAIR INSTRUCTIONS

Canon SERVICE MANUAL

REPAIR INSTRUCTIONS No.

Camera Technical Service Department, Canon Inc.

Date December 7, 1988

CANON LENS EF 100-200mm f/4.5 A
Ref. No.: C21-9492

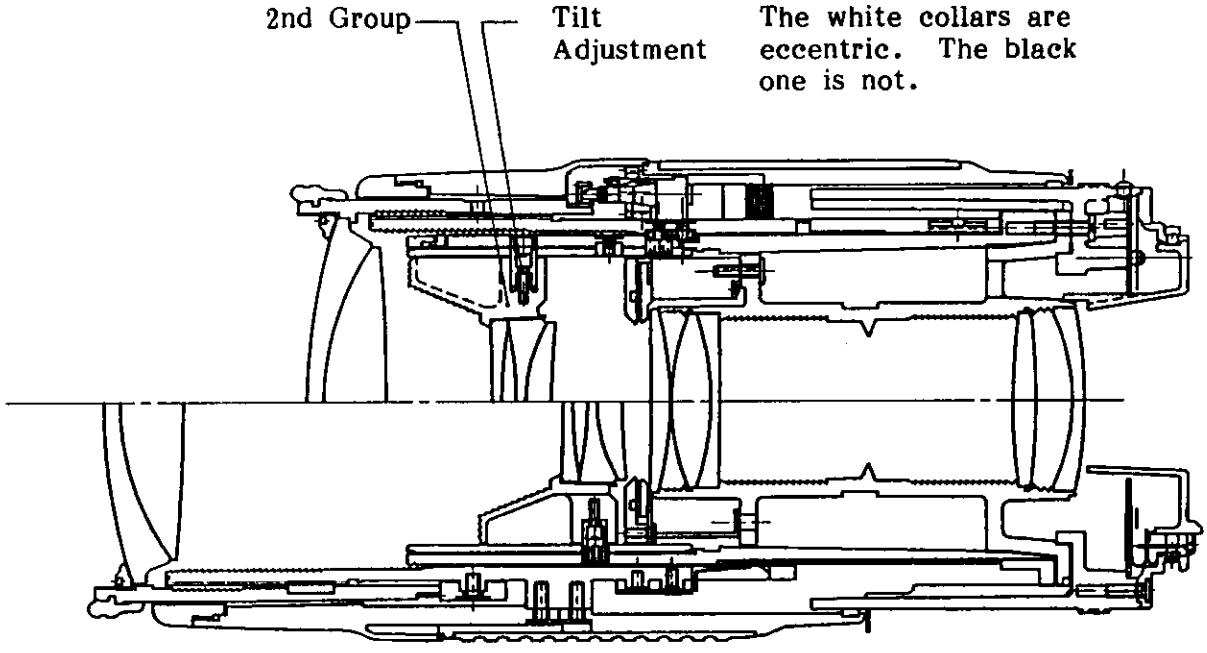
Special Optical Adjustments:

Centering.	Yes	(No)
Tilt	(Yes)	No

Basically, this lens is similar to the EF70-210mm f/4.0

Tilt adjustment is necessary if the second group (G3-G5) is distrubed.

Optical tilt correction requires a lens projection test unit, but an alternate procedure is included for facilities without one.



Tele focus (including tele/wide balance) is adjusted with the focus stopper. (Although this lens has no external focusing scale, it does focuse past infinity at normal temperatures, as most long lenses.)

Wide focus is adjusted with under-thickness lens mounts and focus washers.

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EF100-200mm f/4.5 Lens Expendables List

Part Number	Name	Remarks	Plastic Safe?
-ADHESIVES-			
CY4-9303-000	Double-faced tape	For AFD Flex, rubber ring, etc.	YES
CY9-8009-000	Arontite R	For staking screws	NO
CY9-8011-000	Screw-lock	For staking screws	YES
CY9-8076-000	Vinylole 2200	General Purpose	YES
CY9-8091-000	SO-820	Sticky, for dust rings, etc.	YES
- LUBRICANTS -			
CY9-8023-000	C-2	Zoom Helicoid mix (metal OK)	YES
CY9-8043-000	GE-C9	Zoom Helicoid mix (metal OK)	YES
CY9-8044-000	GE-X8	Zoom Helicoid mix (metal OK)	YES
CY9-8086-000	FF-10	Helicoid & cam	YES
CY9-8089-000	Electroil 190	Zoom Flex Contact Pattern	YES

Color Code

To save space on drawings, it has been necessary to uses a color code. The code is:

Color	Code	Color	Code	Color	Code
Black	BL	Blue	BU	Gold	GL
Brown	BR	Violet	V	Tan	T
Red	R	Purple	PR	Pink	PK
Orange	O	Gray	GY	Sky Blue	SB
Yellow	Y	White	W	Yellowish Green	YG
Green	GN	Silver	S		

I. INTRODUCTION: EF 100-200mm f/4.5 A

1. Introduction

The EF 100-200mm f/4.5 A is, like the EF 35-70mm f/3.5-4.5 A, a high quality, reasonably priced lens fully automatic focusing lens for users who do not need the manual focusing capacity designed for a wide spectrum of photographers. It is designed to take up where the 35-70 leaves off and cover the three most commonly used telephoto focal lengths: 100, 135, and 200mm. The trombone zooming (the only control) makes for quick accurate framing of subjects, making this lens the ideal single lens for all types of outdoor sports.

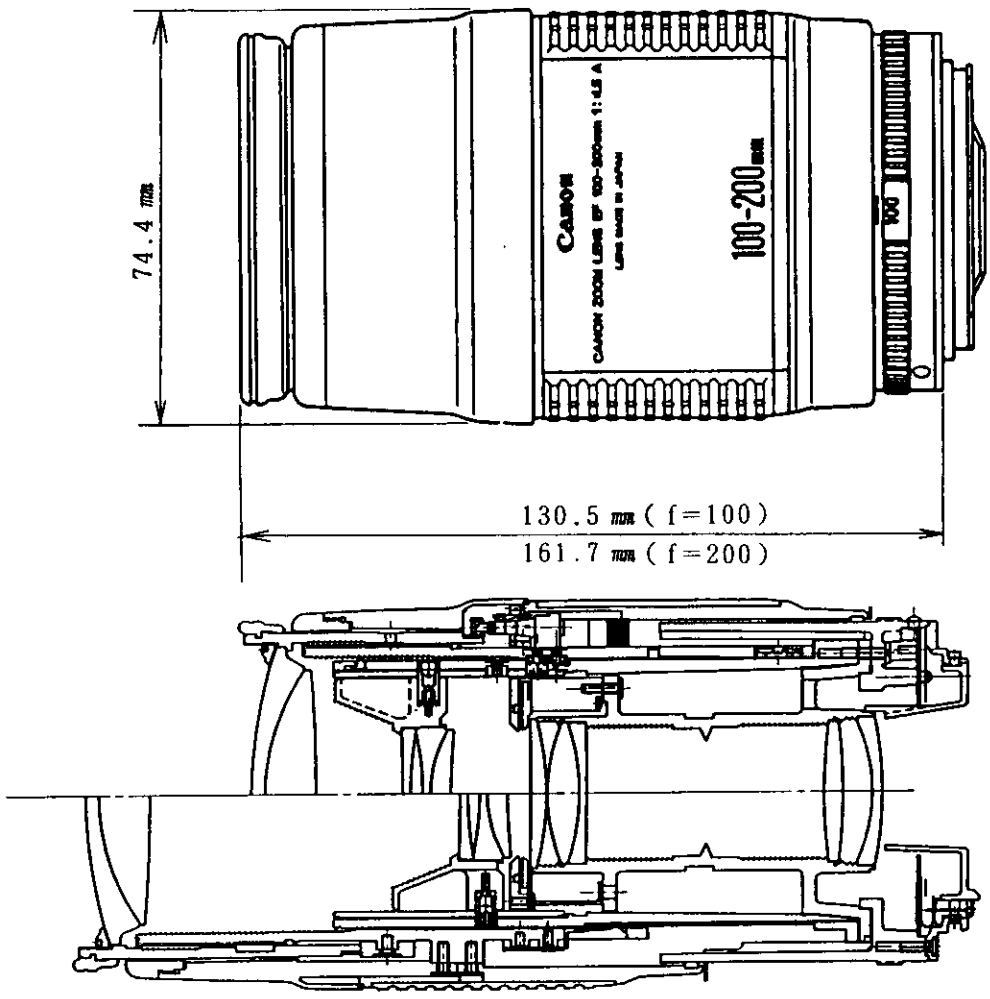
2. Features

Simple design, only one control (zoom), and automatic activation of AF when the lens is mounted.

Little variation of image quality from wide to tele.

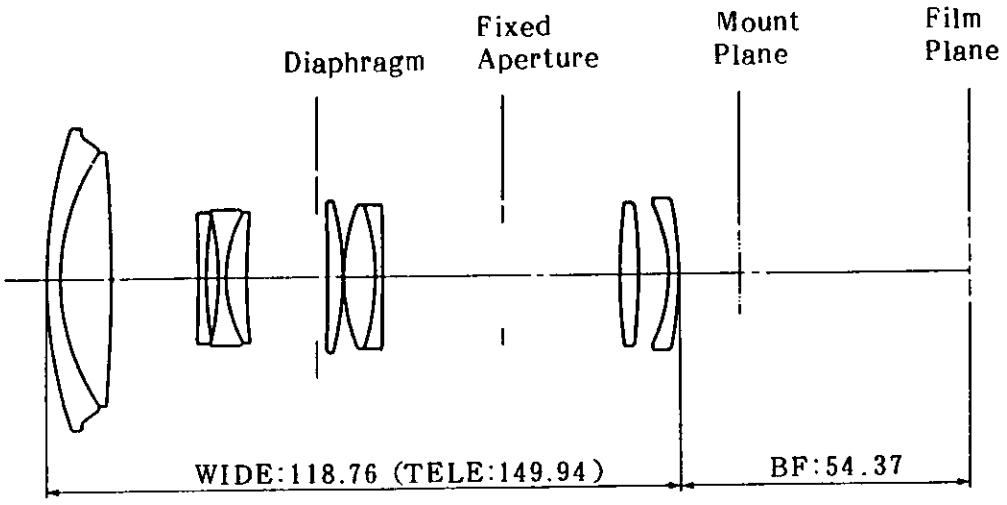
Excellent handling.

3. Illustrations (f=100mm, D=∟∞)



I. INTRODUCTION: EF 100-200mm f/4.5 A

Optical Schematic



1. SPECIFICATIONS

Focal length/aperture: 100 to 200mm , f/4.5

Optical structure: 7 groups, 10 elements (Super Spectra Coating)

Angle of view (at infinity):	Diagonally (43.2 mm)	12° to 24°
	Vertically (24 mm)	7° to 14°
	Horizontally (36 mm)	10° to 20°

Focusing:

System:	Autofocus only by AFD Motor
Focusing Element	Front Element, single helicoid
Range:	1.9m to infinity
Drive speed:	0.7 seconds (Actual operation between infinity and closest focus(3.0m), not including AF ranging)

Rotation angle, amount of extension

Condition	Rotation angle	Extension
1.9m to infinity	132.1°	12.1mm
Infinity overrun	3°	0.27mm

I. INTRODUCTION: EF 100-200mm f/4.5 A

Maximum magnification, field of view

Condition	Magnification (power)		Field of view (mm)	
	Wide	Tele	Wide	Tele
1.9m	0.061	0.126	394x588	188x278mm

Zoom

Type: 3 Group zoom, Trombone type

Extension: 31.18mm

Focal Length Marks: 100 135 & 200mm

Mount

Type: Canon EF mount

Signal transfer: EOS system, with 5 signals as follows :

A) Lens condition
B) Lens type
C) Photometry signal
D) Focal length
E) AF drive information

Aperture mechanism

Diaphragm control: Automatic only using EMD, no manual ring

Aperture range: f/4.5 - f/32 (not indicated on lens)

Diaphragm blades: 8

Filter: 58mm, 0.75mm pitch, (Usable: only one)

Dimensions & weight: 74.4 mm diameter x 130.5 mm length / 520g

Related products

Hood: ET-62 (Mounts after rubber ring removed from front of lens.)

Lens cap: E-58

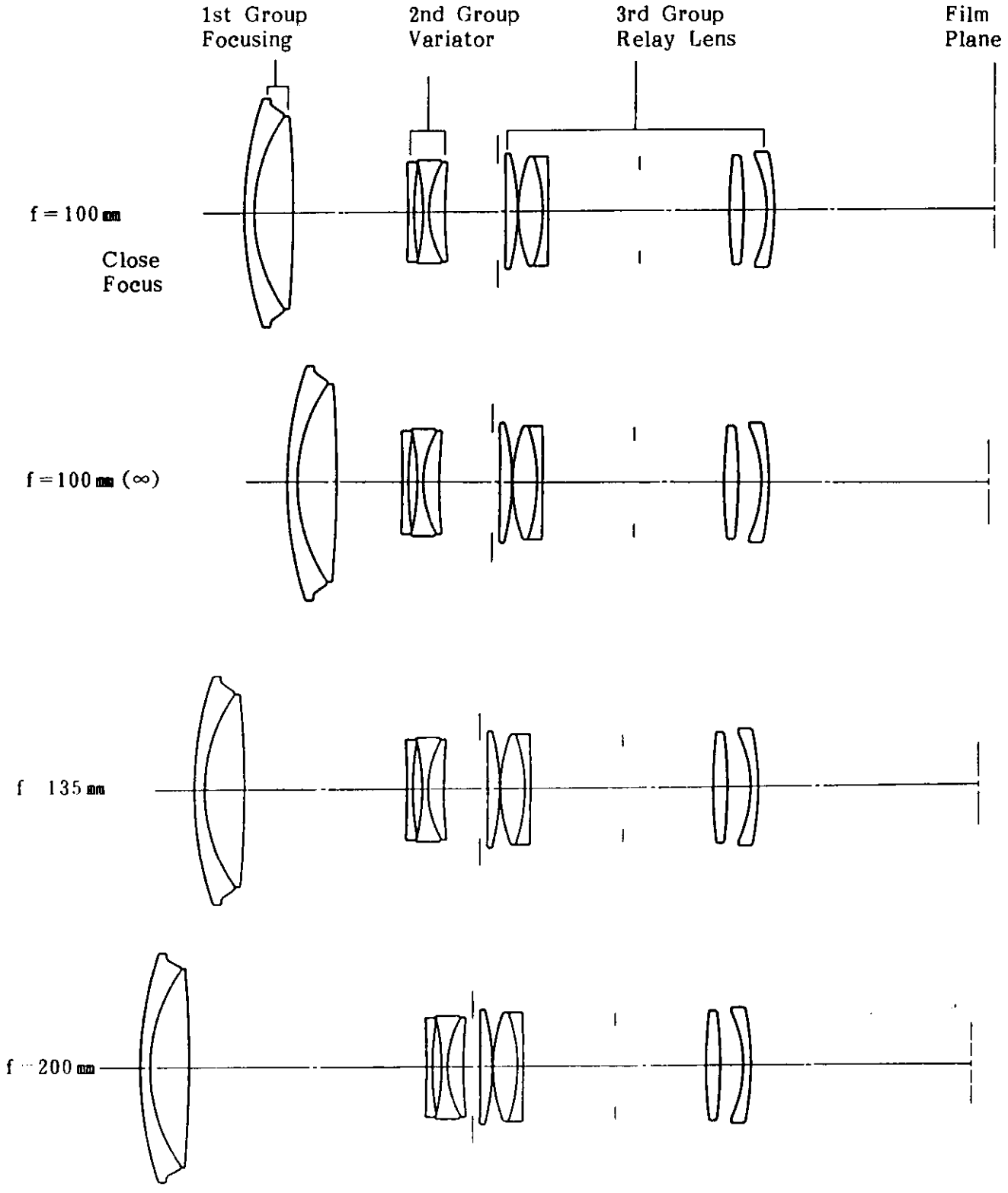
Lens case: ES-C17 (soft case)
(Lens stores with caps on, hood reversed.)

LH-C19 (hard case)
(Lens stores with caps on, without hood.)

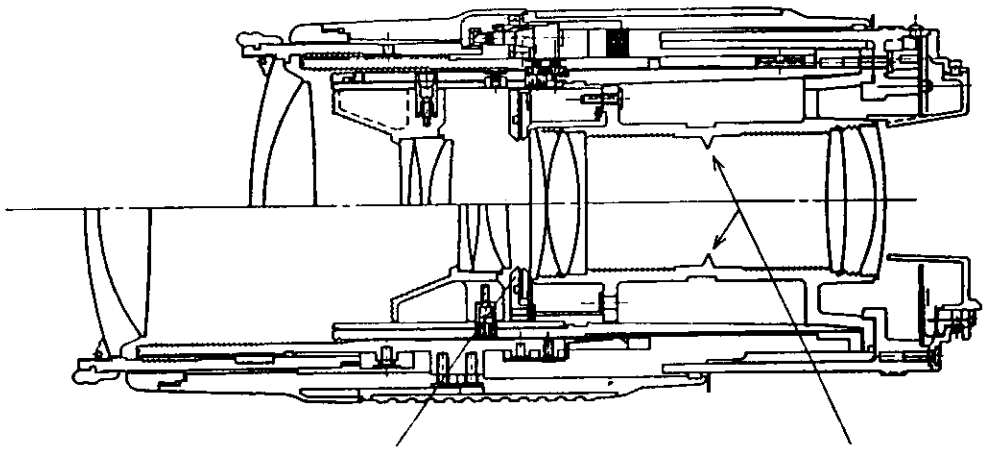
Dust cap: Common to all EF lenses

5. Optical Performance

Because of its simple construction, relatively small maximum aperture, and short zoom ratio, aberration changes during zooming are quite moderate.



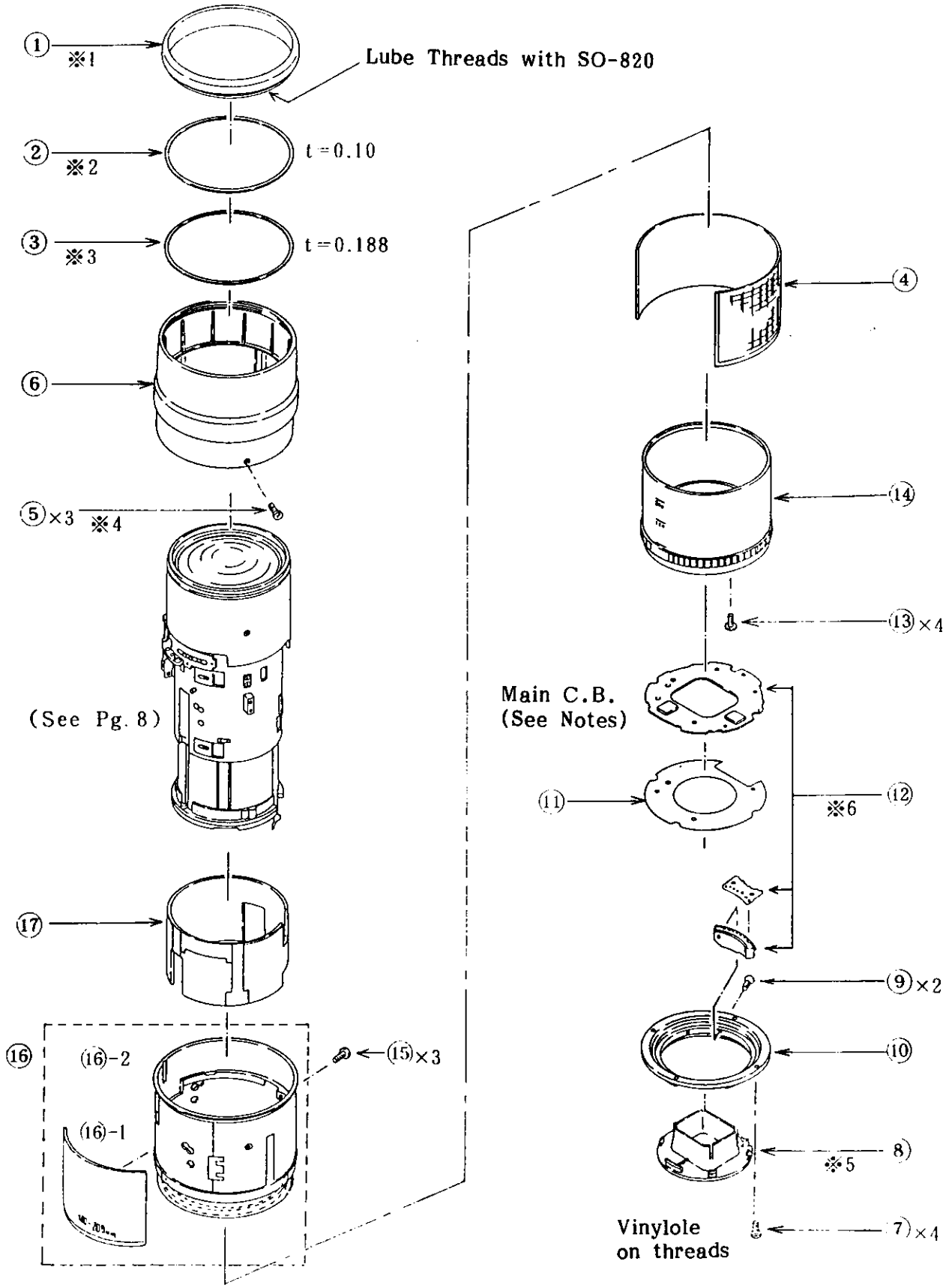
The flare stop incorporated into the relay lens reduces flare to a low level.



EMD Unit

Flare Stop
(Fixed aperture)

1. Initial Disassembly



1. Initial Disassembly

※ 1 Wrap rubber or chamois around ring and unscrew carefully to prevent warping.

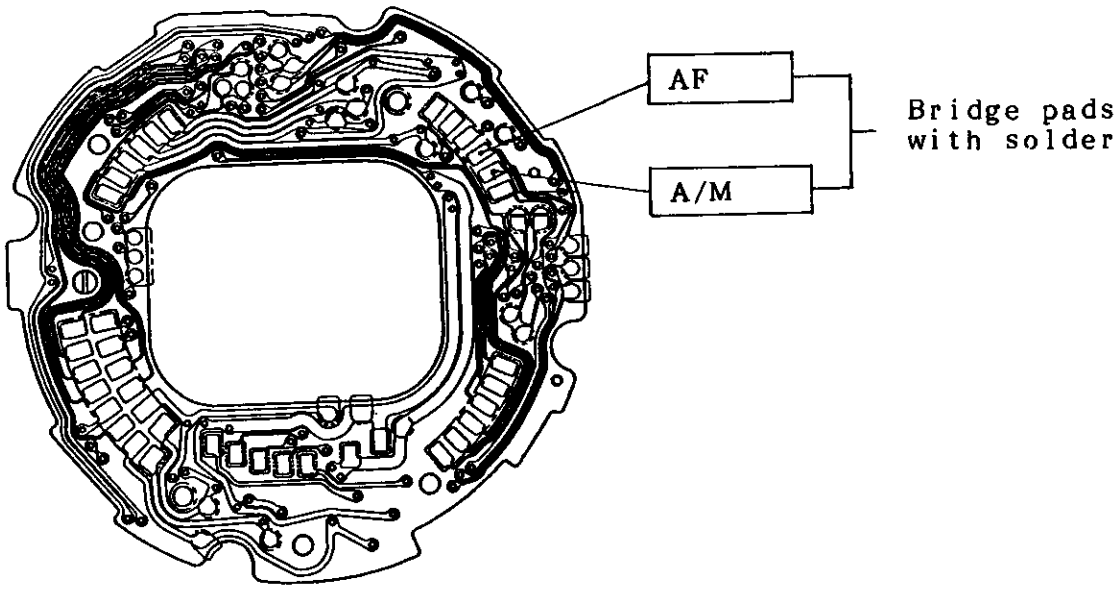
※ 2, 3 Put thicker dust shield in first and stagger the slits.

※ 4 Remove screws through access holes in (16)-2.

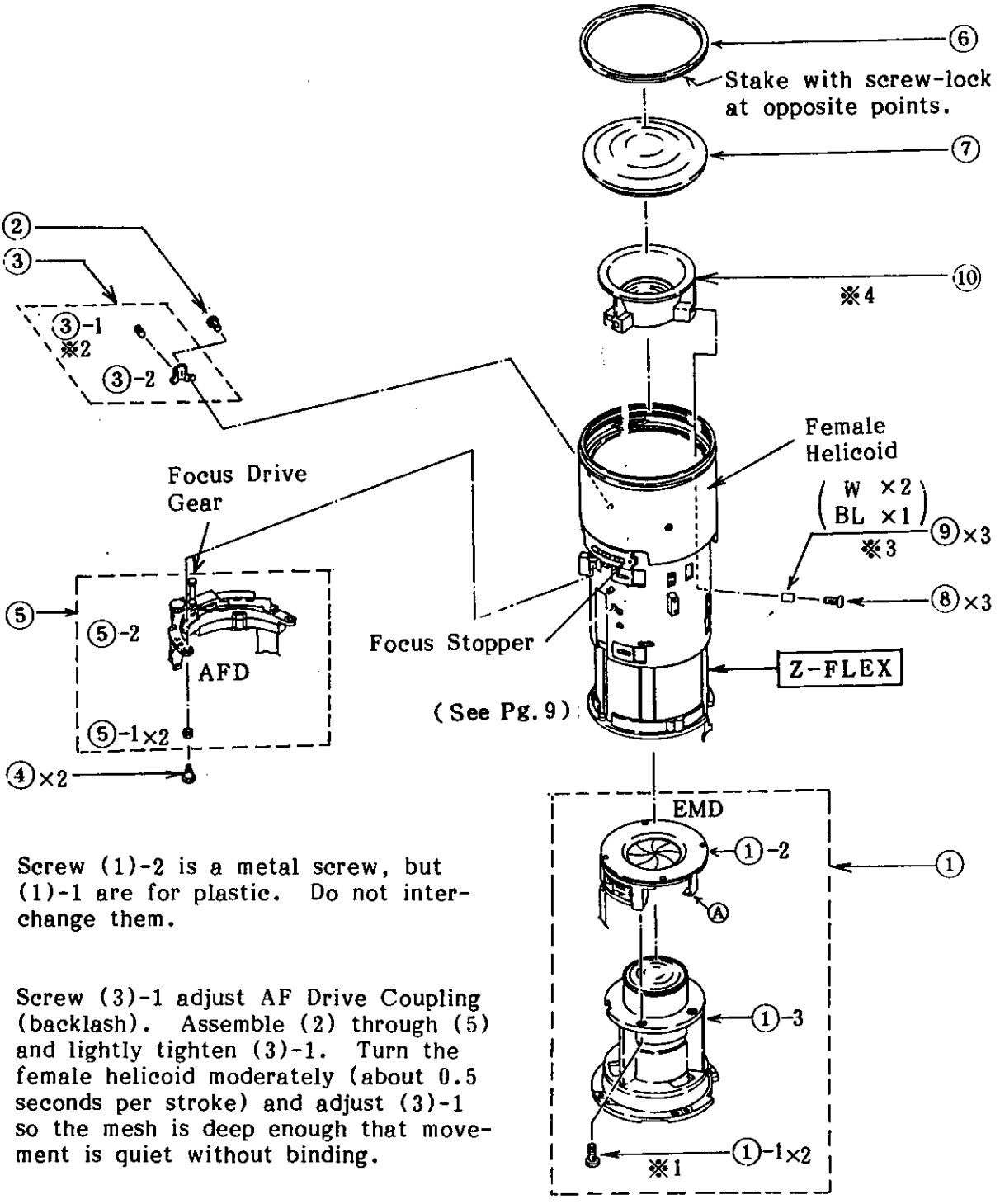
※ 5 Unlike earlier models using all flexible circuit boards, this lens uses a rigid main C.B. Lift (10) from opposite the contact assembly enough to place your thumbs inside and push the back cover off. Since (10) cannot be moved nearly as far as earlier models, be careful not to damage the connecting flex or the solder connections.

The back cover can be reinstalled after (10) is fixed in place.

※ 6 Be sure to bridge the AF and A/M solder pads. If not the circuit will be in the manual focus mode, which this lens does not have.



2. EMD and AFD Unit Removal



※ 1 Screw (1)-2 is a metal screw, but (1)-1 are for plastic. Do not interchange them.

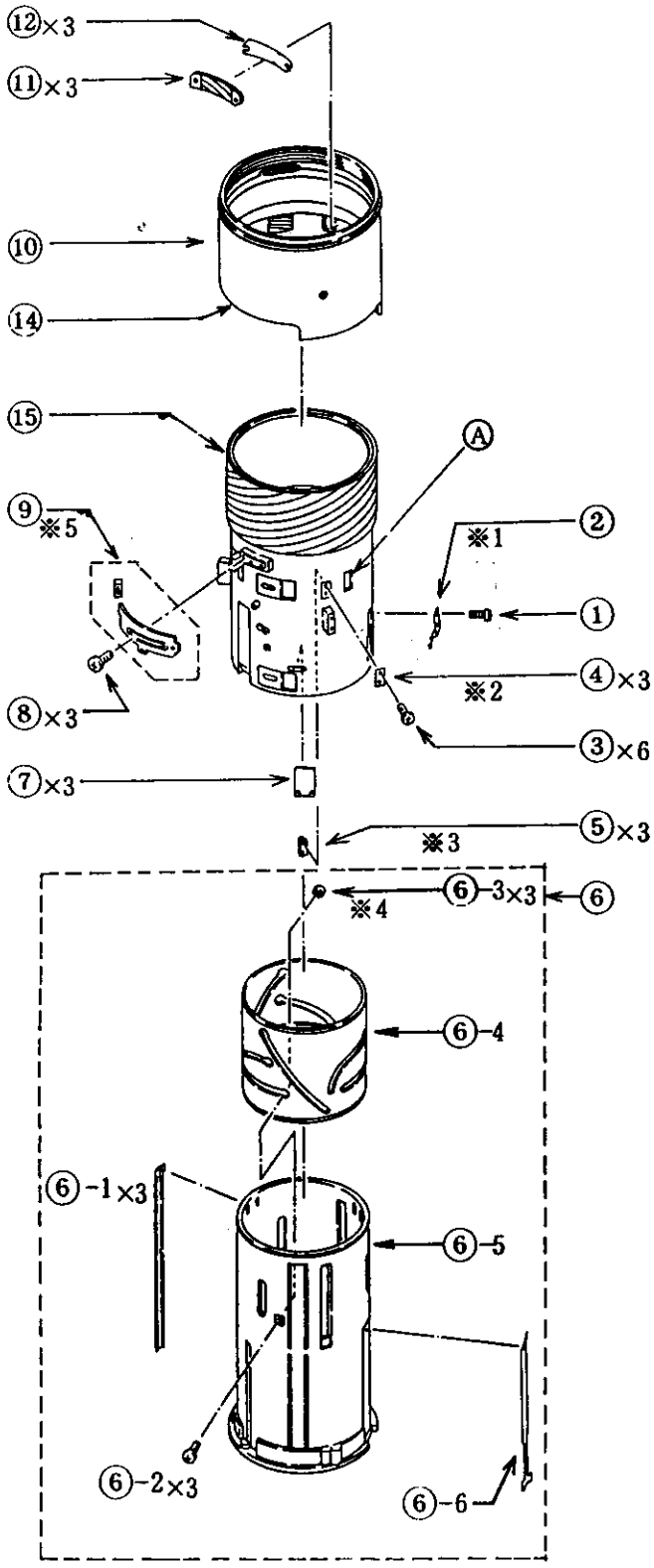
※ 2 Screw (3)-1 adjust AF Drive Coupling (backlash). Assemble (2) through (5) and lightly tighten (3)-1. Turn the female helicoid moderately (about 0.5 seconds per stroke) and adjust (3)-1 so the mesh is deep enough that movement is quiet without binding.

※ 3 Use one of the white eccentric collars below the focus stopper, and the other above the Z flex. These positions will change if (10) must be adjusted to improve resolution.

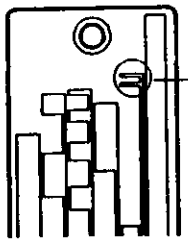
For facilities without projectors, see page 10 for alternate procedures.

※ 4 The hole for the black concentric collar has a central pin, which the eccentric collar holes have not.

3. Zooming / Focusing Unit Disassembly



※ 1 Set the lens to "tele" and adjust so the zoom brush contacts are aligned within the circled mark.



Brush contacts must fall between theses patterns.

(6)-6 Detail

※ 2 This part is a reinforcing washer used when necessary to give good zooming feel. It is not installed in all units at the factory. We recommend that it be installed during reassembly after repair.

※ 3 Turn (6) to the right slightly and remove (5) through access hole (A) in (15).

※ 4 Install (5) with the slot facing INWARD. It couples with a rib in (6)-5 to prevent it from turning.

※ 5 See focusing adjustments on page 11 for positioning procedures.

Lubrication

Helicoid:	FF-10 (rub in and wipe off access)
Cam grooves & working surfaces	C-10 GE-C9 GE-X8 1.5 : 1 : 1 part (Normal mixture)

This mixture usually works best, but it can be adjusted if necessary. C-10 is the heaviest and GE-X8 is the lightest.

1. Optical Tilt Adjustment

This adjustment is necessary if the 2nd lens group (G3 - 5) is removed or if any of the optical components are replaced.

This adjustment should be performed using a lens projector. If one is not available, see the alternate procedure except for specific resolution or uneven focus claims which should be sent to a fully equipped facility.

ADJUSTMENT

1. Assemble the lens except for the grip rubber (4) and screws (15) on page 6.
2. Set the lens to 200mm.
3. Move the zooming ring back to gain access to the eccentric collars.
4. Turn the white eccentric collars to adjust for good, even resolution. Check mainly at the 16mm position in all quadrants.

ALTERNATE PROCEDURE

1. Look at the white eccentric collars through a magnifier to determine the eccentric radial and the "central radial" perpendicular to the eccentric radial.
2. Install the collars with the central radial aligned with the optical axis.

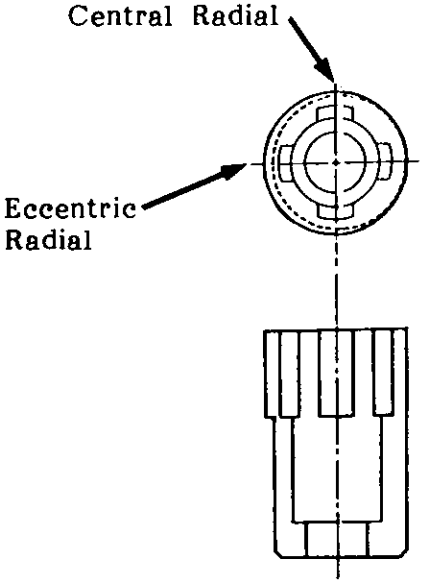


Table 1 : Resolution Chart

Image Height (mm)	0	4	8	12	16	20
S	100	100	63	63	40	40
100mm						
M		100	63	40	40	25
S	100	63	63	63	40	40
135mm						
M		63	63	40	40**	25
S	100	100	63	63	40	25
200mm						
M		100*	63	40	40**	16

** Two adjacent quadrants may be one step lower.
* One quadrant may be one step lower.

2. Focus Adjustment

This adjustment is necessary if optical components have been disturbed.

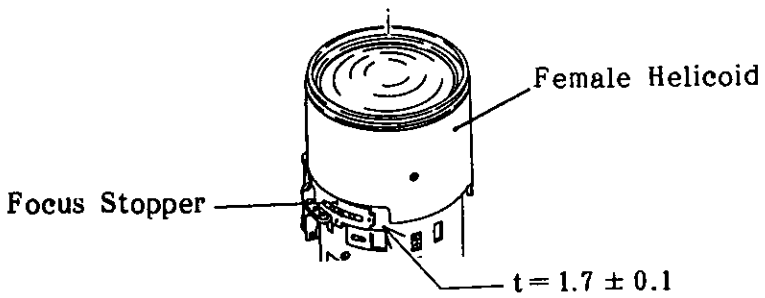
This lens has no manual focus. Tele focus is adjusted by turning the front element.

Adjust on a body with split-image screen and a magnifier. When correctly focused on photographic infinity, there should be a slight amount of overrun (about 3°) to allow infinity focus in cold temperatures.

TELE Adjustment

1. Assemble lens except for parts (1) through (6) on page 6.

2. Place a locally manufactured 1.7mm spacer gage between the focus stopper and the edge of the female helicoid. Loosen the focus stopper screws and adjust the helicoid to focus on a object at photographic infinity.



WIDE Adjustment

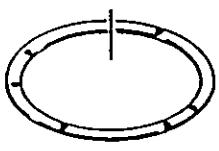
This adjustment is made by varying the thickness of the lens mount and focus washers.

1. To change the mount and/or washers parts (7) through (10) must be removed.

2. Using the 1.7mm spacer gage as in the tele adjustment, adjust the lens mount / washer thickness for best focus.

Note: If washers with a combined thickness greater than 0.07mm are used, the gap between the mount and lens body may become noticeable.

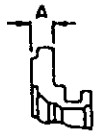
Focus Washer (Special Service Part)



Service Use Only.

	A	SIZE
t / t A	0.02 mm	(002)
	0.05 mm	(005)

Lens Mount (Special undercut Service Part)



A	SIZE	A	SIZE
2.0 mm	(200)	2.5 mm	(250)
2.1 mm	(210)	2.6 mm	(260)
2.2 mm	(220)	2.7 mm	(270)
2.3 mm	(230)	1.9 mm	(190)
2.4 mm	(240)		

3. Pulse Adjustment

This adjustment is necessary if the main C.B. or AFD unit is changed.

Adjust, viewing the pulse on an oscilloscope, with lens in AF search mode.

If not adjusted, AFD may work correctly at normal temperatures but fail at high or low temperatures.

Adjustment Method

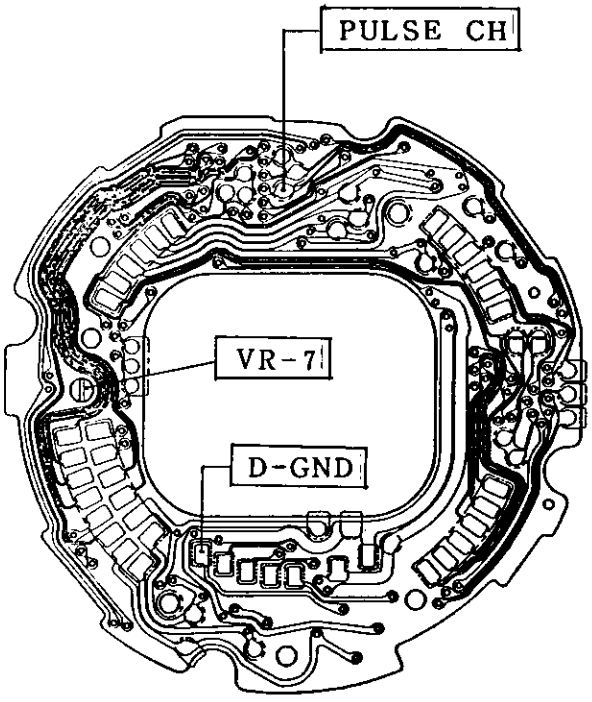
1. Assemble the lens except for parts (7), (8), and (11) on page 6.

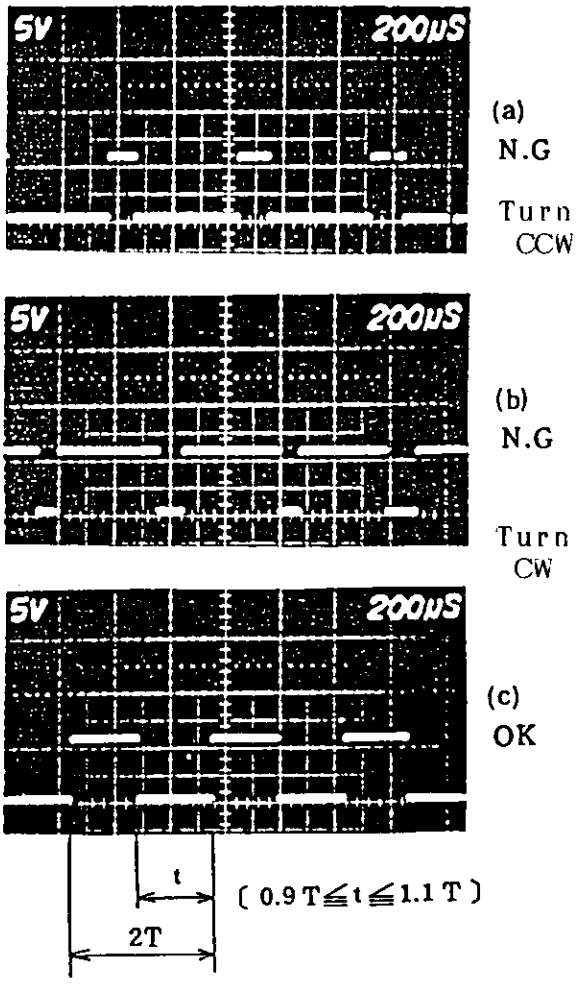
2. Temporarily attach leads to the pads marked [PULS CH] and [D-GND], and connect to the oscilloscope.

3. Attach the lens mount to a camera body. Since the main part of the lens is hanging by the flex, be careful not to tear the flex.

5. Set the lens to AF and the camera to ONE-SHOT, and press the shutter button (the AF will search continuously).

6. Adjust VR7 so the waveform is like figure (c).





4. "Best Focus Adjustment" Service Policy

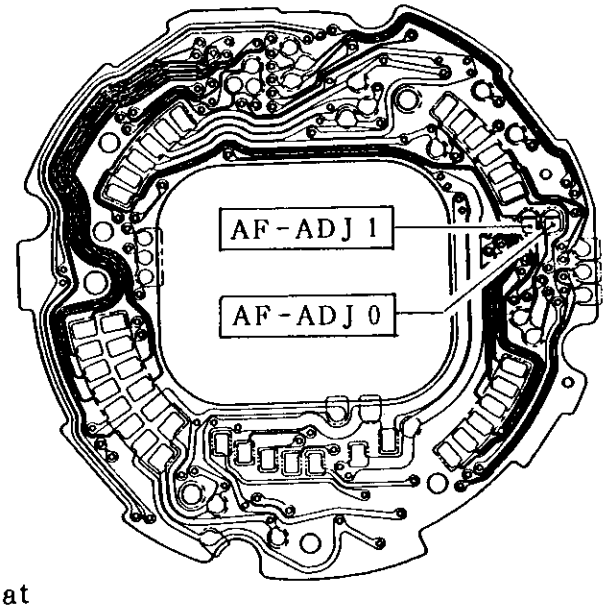
This adjustment corrects the difference between the AF focus and the actual best focus. There is always some discrepancy between the AF focus point and the actual best focus point of interchangeable lenses due to the inherent differences between the different lens types. This difference is determined for each lens type and written into the ROM.

There are also individual lenses differences, which can be noticeable. At the factory, correction is written into each lens' ROM with a special tool. This is called the "Best Focus Adjustment". Because of the tooling cost, this adjustment is not a part of the service procedure. In its stead, the following actions will be taken.

Service Actions:

1. Main Flex Replacement
   Check the AF ADJ0 and AF ADJ1 pads on the flex being replaced and bridge the pads on the new flex in the same way.

2. If front defocus, use plus correction.
   If rear defocus, use negative.



Best Focus Correction (Reference)

Correction	AF ADJ0	AF ADJ1
$-\frac{3}{4}$Fc	Open	Closed
$-\frac{1}{4}$Fc	Closed	Closed
$+\frac{1}{4}$Fc	Open	Open
$+\frac{3}{4}$Fc	Closed	Open

F: f/No. c: circle of confusion

3. Customer Complaints
   If a customer complains of soft focus at full aperture, you can adjust as follows:

   Photographic Test
   Make actual photographic test with the lens set to 200mm at a distance of 10 meters with the AF-ADJ0 and AF-ADJ1 bridges in all four possible combinations. Make five or six negatives for each combination of a flat high contrast chart or equivalent at maximum aperture using an EOS 650 / 620 in aperture priority mode. Examine the negatives closely to determine which combination is best.

   Visual Test
   Use the standard chart at a convenient distance. View through the viewfinder with a type B screen. Use a magnifier and change the pad combinations until the best combination is achieved. This test should be performed by a young person with excellent visual acuity.

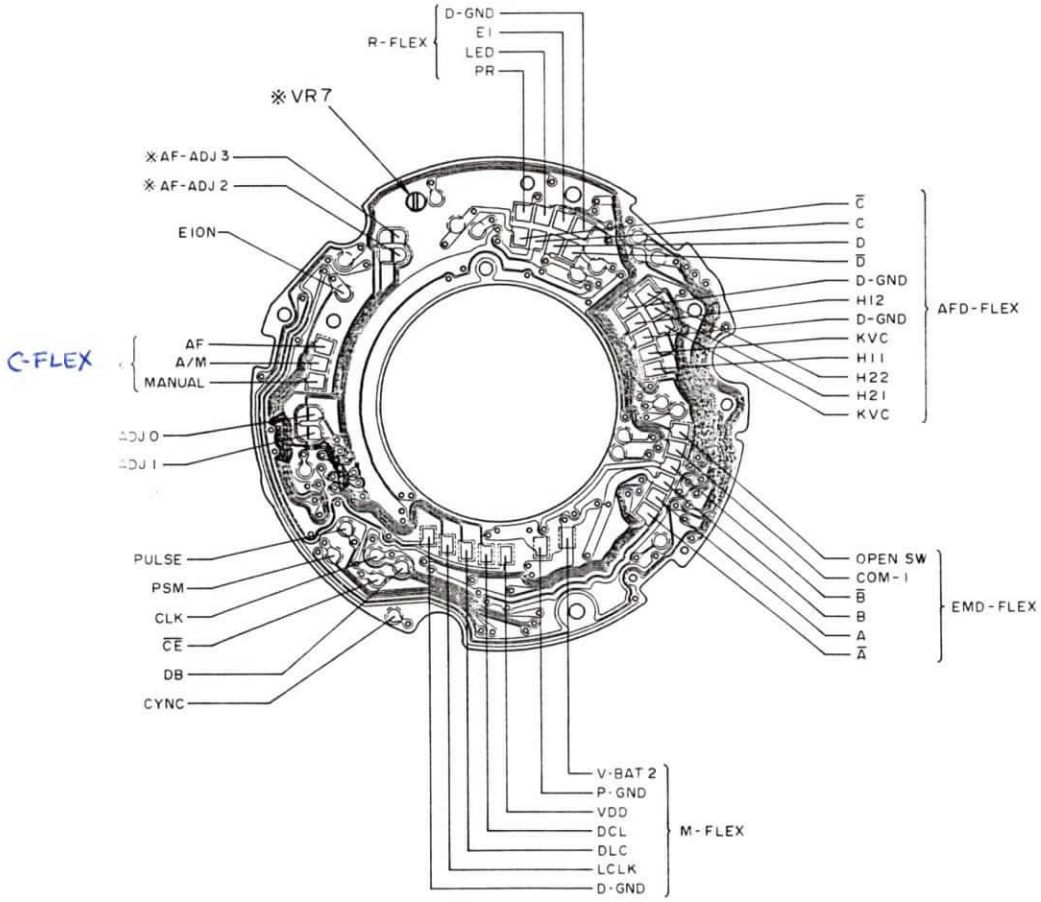
ELECTRICAL DIAGRAMS

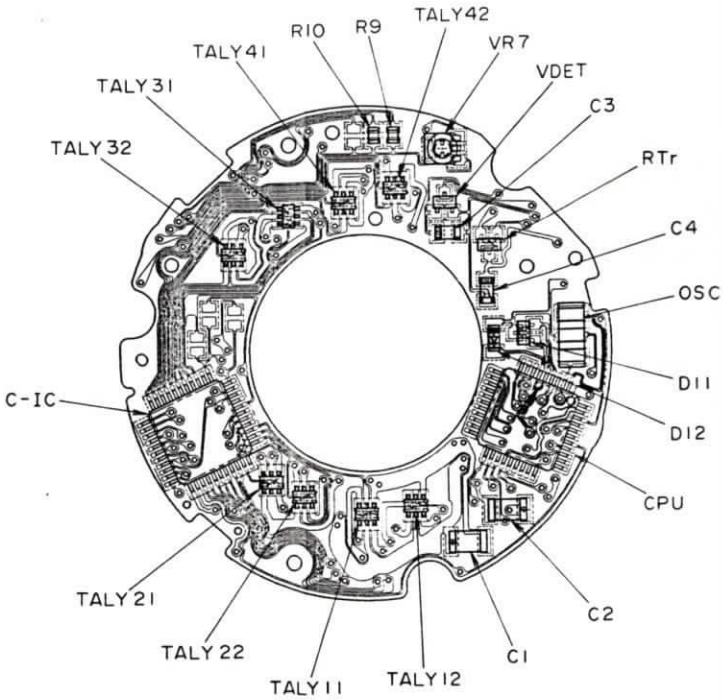
EF24mm 1:2.8

EF100-200mm 1:4.5A

CANON LENS EF 24 mm 1:2.8

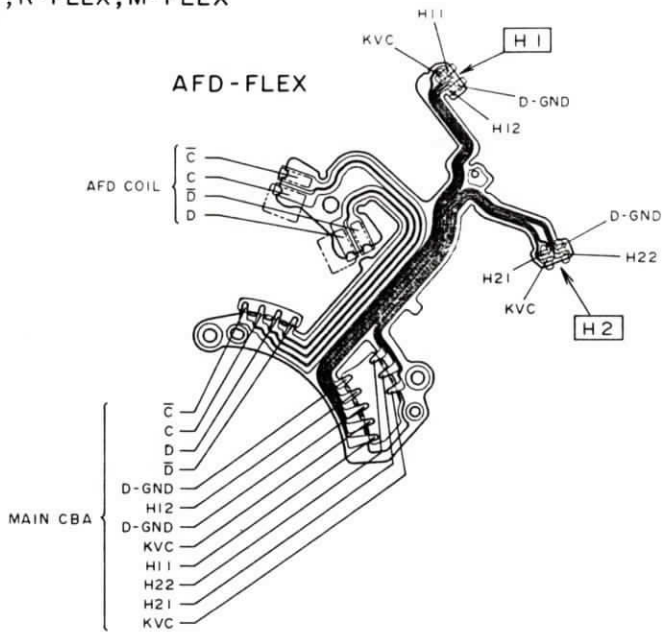
PCB. DIAGRAM
MAIN CBA

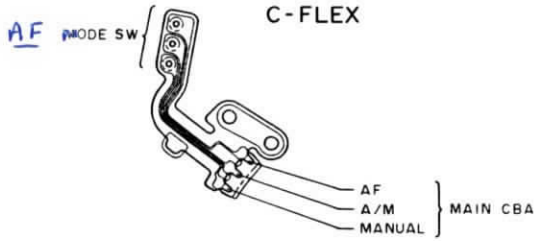


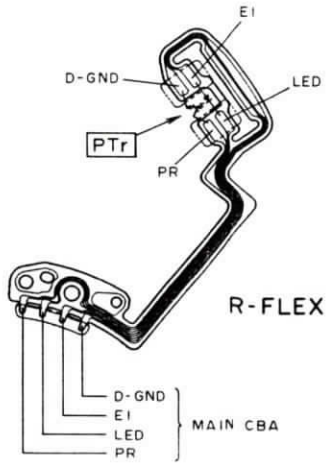


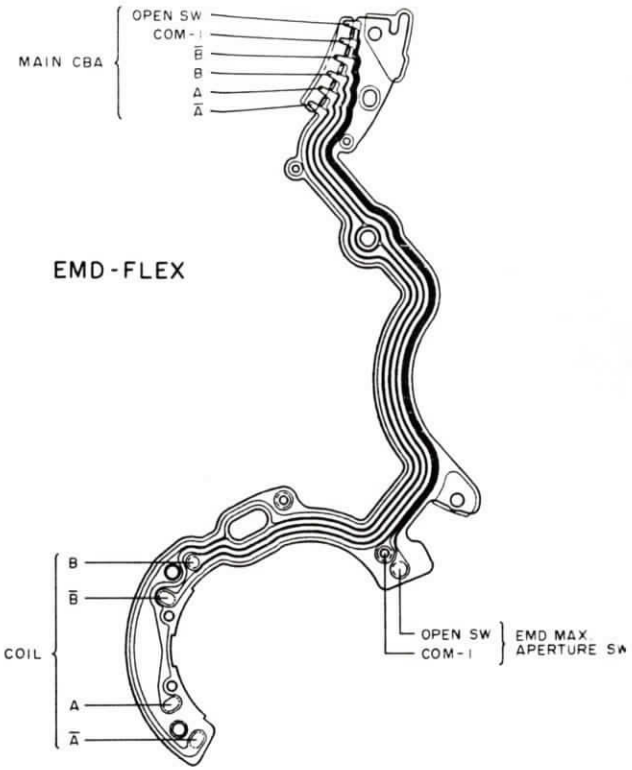
CANON LENS EF 24 mm 1:2.8

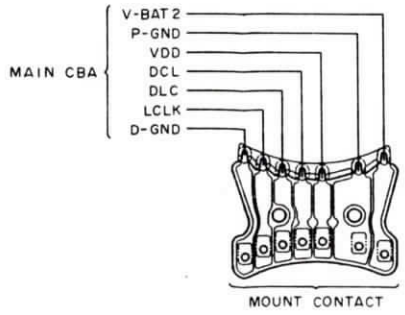
PCB DIAGRAM
AFD FLEX, EMD-FLEX
C-FLEX, R-FLEX, M-FLEX





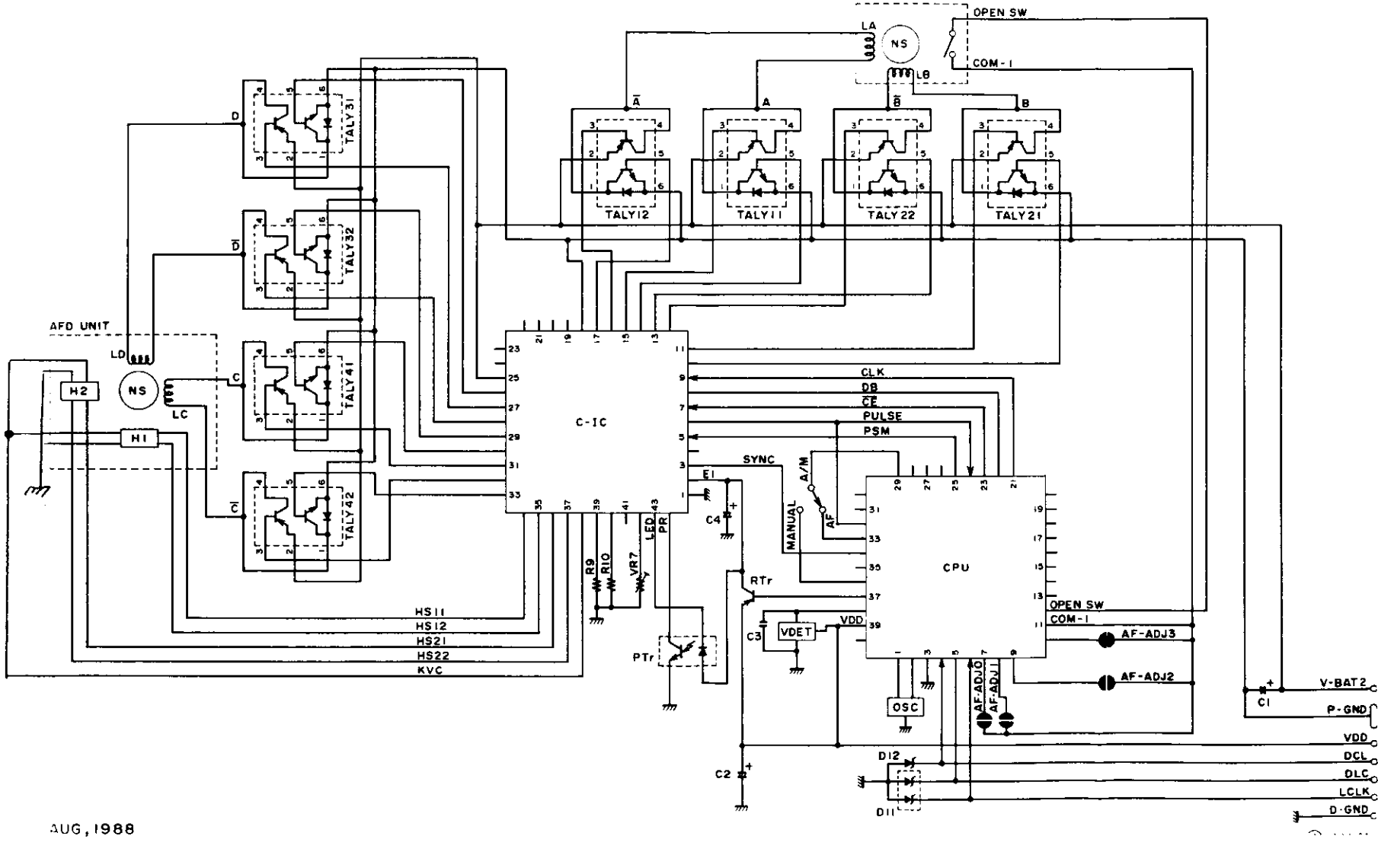






CANON LENS EF 24 mm 1:2.8

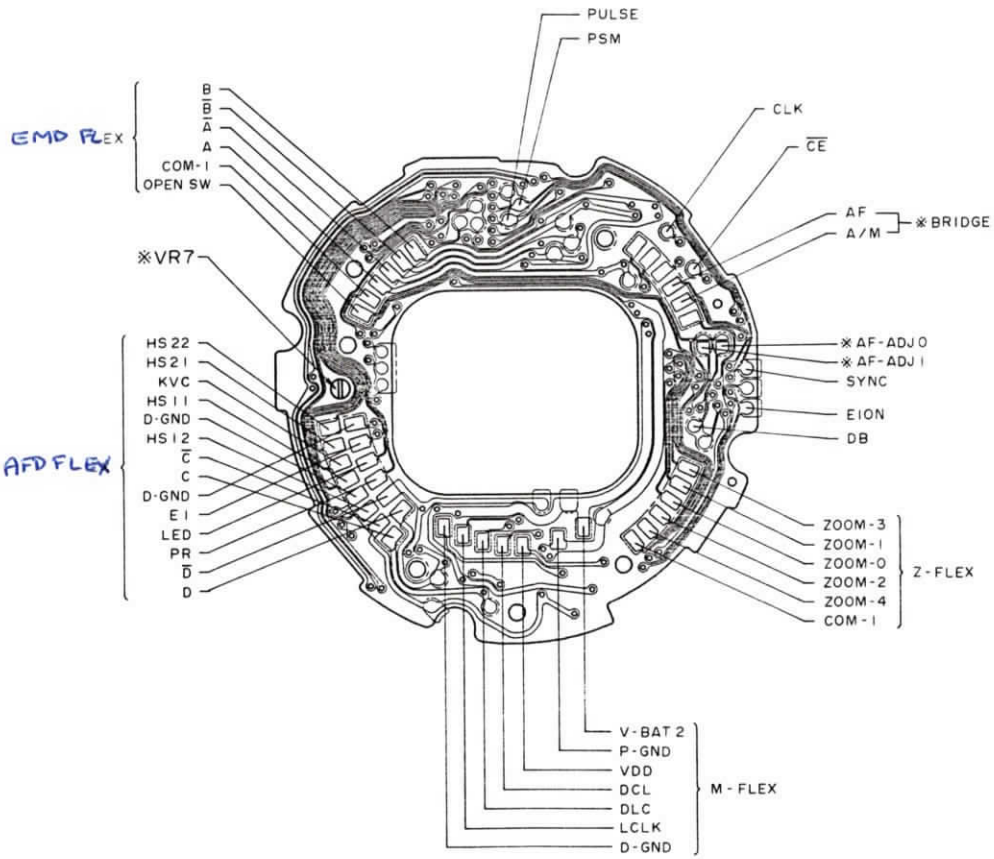
HEMATIC DIAGRAM

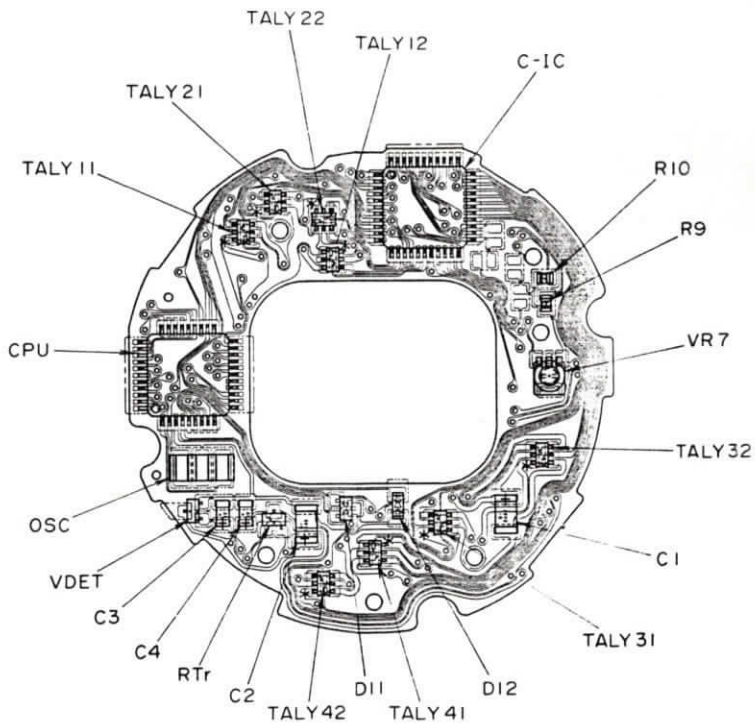


AUG, 1988

CANON LENS EF 100-200 mm 1:4.5 A

PCB DIAGRAM
MAIN CBA

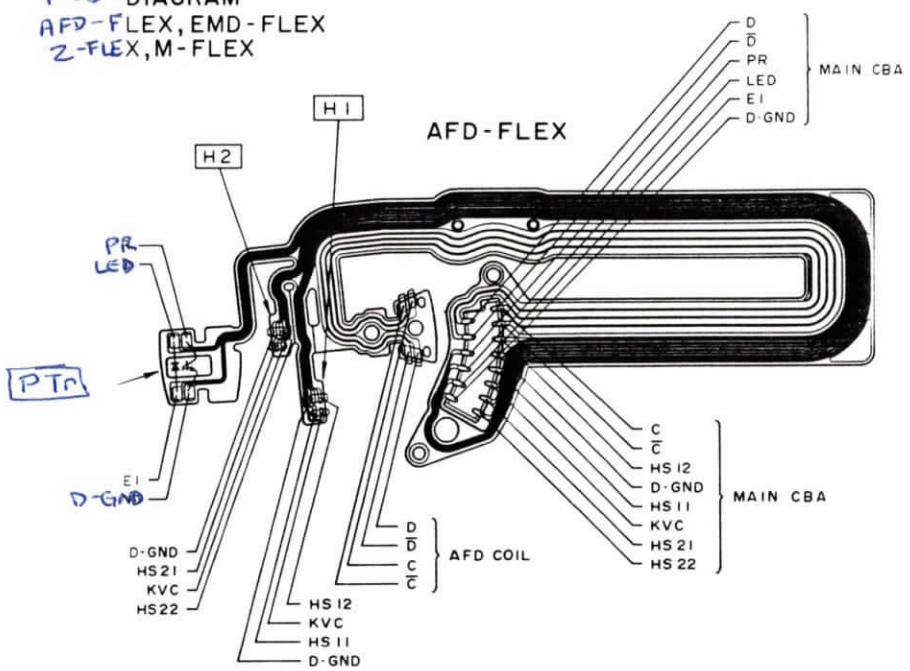




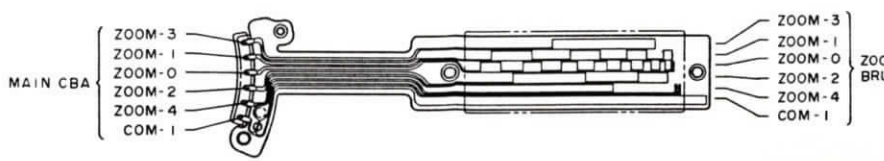
CANON LENS EF100-200 mm 1:4.5 A

PCB DIAGRAM
AFD-FLEX, EMD-FLEX
Z-FLEX, M-FLEX

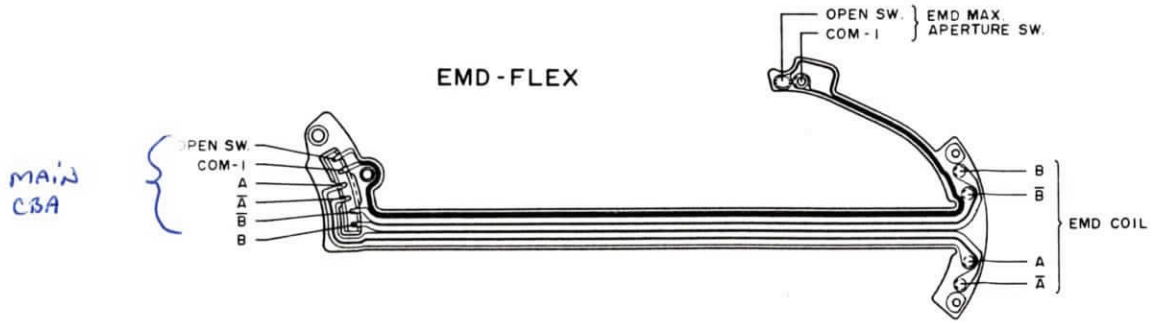
AFD-FLEX



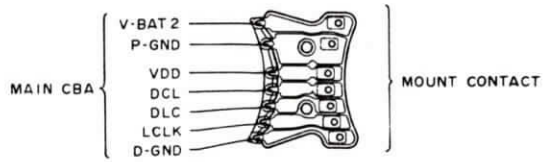
Z-FLEX



EMD-FLEX



M-FLEX



1988

CANON LENS EF100-200mm 1:4.5A

HEMATIC DIAGRAM