Canon

Service Manual

ENGLISH EDITION

CANON ZOOM LENS

EF 35-105mm1:3.5-4.5

EF 35-70mm 1:3.5-4.5

EF 70-210mm1:4.0

ELECTRICAL DIAGRAMS

CY8-2023-002-200

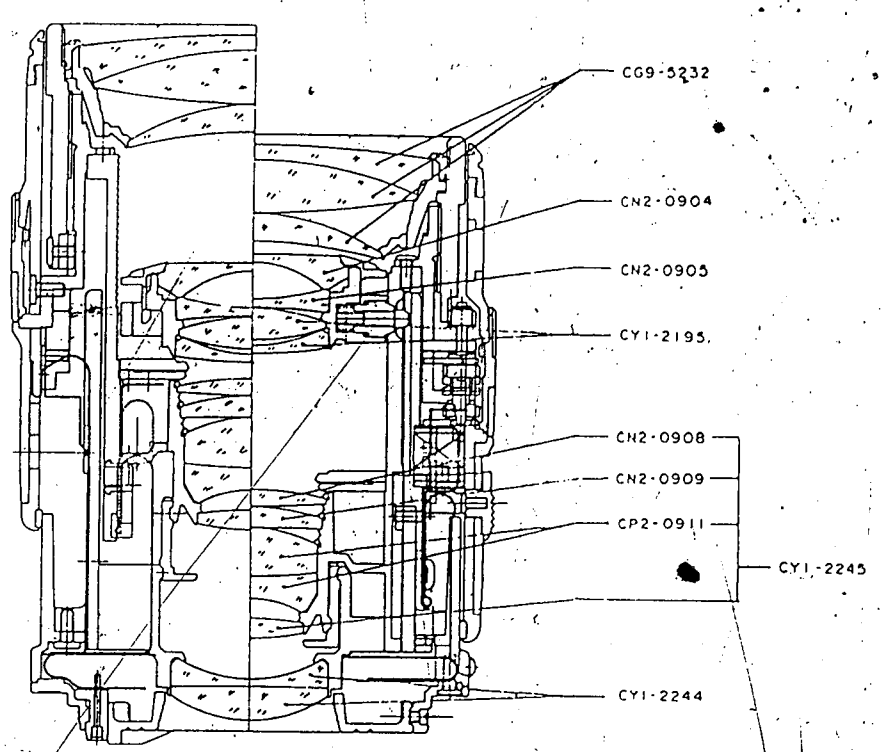
P A R T S L I S T

REF. NO. C21-9401 EF35-105/3.5-4.5

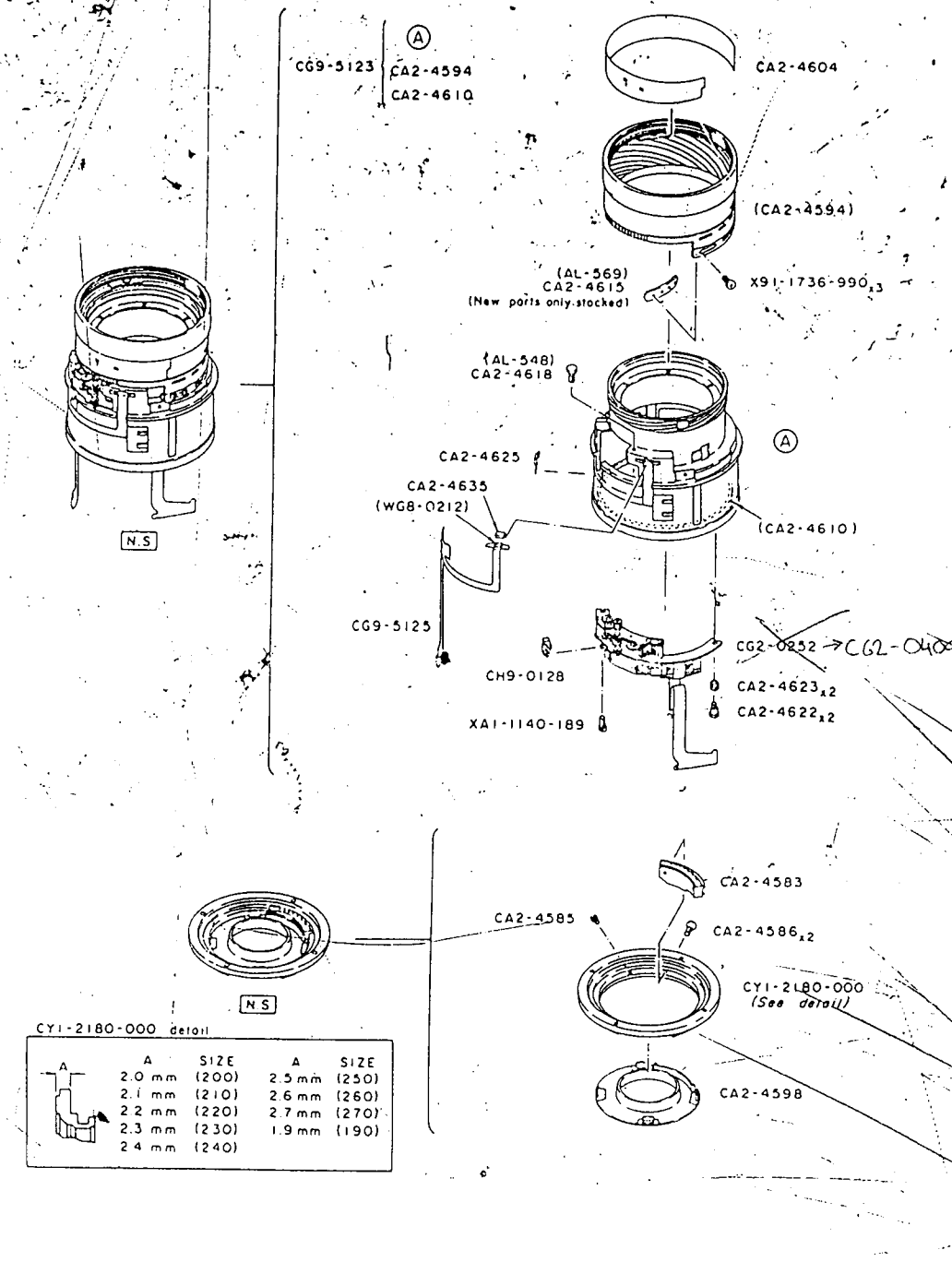
NEW	PART NO.	CLASS	QTY	DESCRIPTION		PAGE
	CG9-5131-000	D	1	BARREL, FIXED	目盛窓リングユニット	1
	CG9-5279-000	E	1	PANEL, A-M SWITCH	スイッチカバーユニット	1
	CG9-5232-000	D	1	FRONT LENS UNIT	前玉枠ユニット	1
	CH1-0644-000	E	1	FLEX, ZOOMING	Z-FLEX	2
	CH9-0128-000	E	1	SWITCH, A-M	A-M スライドSW	3
	CN2-0904-000	E	1	LENS, G4	レンズG4	2
	CN2-0905-000	E	1	LENS, G5	レンズG5	2
	CN2-0908-000	E	1	LENS, G8	レンズG8	2
	CN2-0909-000	E	1	LENS, G9	レンズG9	2
	CP2-0911-000	E	1	LENS, G10/11	レンズG10/11	2
	CS1-5868-000	D	3	SPRING, COIL	コイルバネ	2
	CS1-5869-000	D	3	SPRING, COIL	コイルバネ	2
	CY1-2178-000(xxx)	E	1	WASHER, MOUNT	マウント調節ワッシャー	1
	CY1-2180-000(xxx)	C	1	MOUNT, LENS	レンズマウント	3
	CY1-2195-000	E	1	LENS/BARREL	G6/G7 鏡筒	2
	CY1-2244-000	E	1	BARREL, LENS G13/14	本体ユニット	2
	CY1-2245-000	E	1	BARREL; LENS G8-G12	直進筒ユニット	2
	WG8-0212-000	E	1	PHOTO REFLECTOR	フォトリフレクター	3
	XA1-1140-189		1	SCREW, CROSS-RECESS, PH		3
	XA1-6170-307		2	SCREW, CROSS-RECESS, PH		2
	XA1-7170-409		3	SCREW, CROSS-RECESS, PH		1
	XA3-6200-509		3	SCREW, CROSS-RECESS, PH		1
	XA4-4200-456		4	SCREW, CROSS-RECESS, PH		1
	X91-1736-990		3	SCREW, CROSS-RECESS, PH		3
	X91-1737-870		3	SCREW, CROSS-RECESS, PH		2
	X91-1737-910		1	SCREW, CROSS-RECESS, PH		1
	X91-2036-030		3	SCREW, CROSS-RECESS, PH		1

CANON LENS EF 35-105 mm 1:3.5-4.5

REF. NO. C21-9401



CANON LENS EF 35-105 mm 1:3.5-4.5

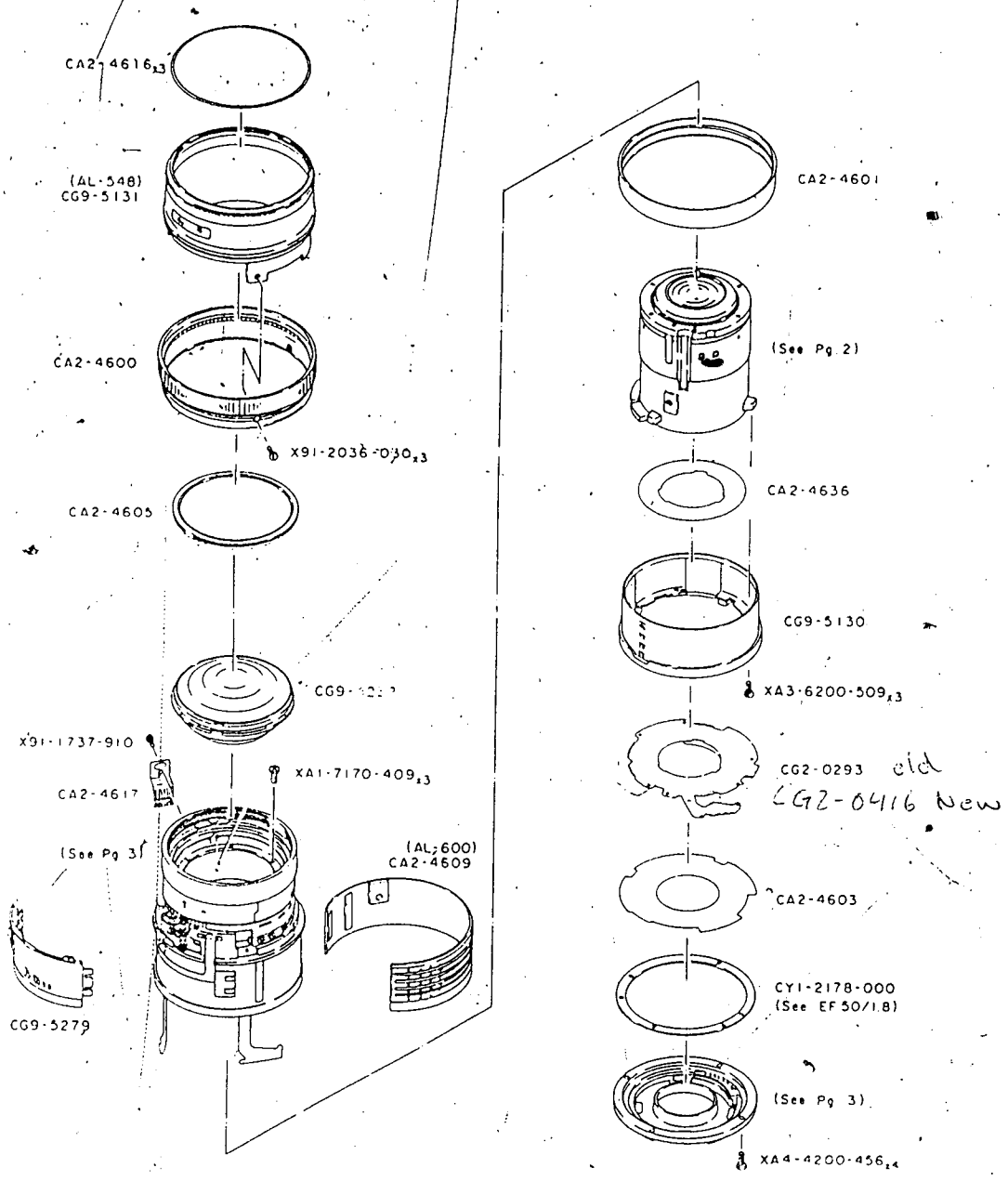


PARTS LIST

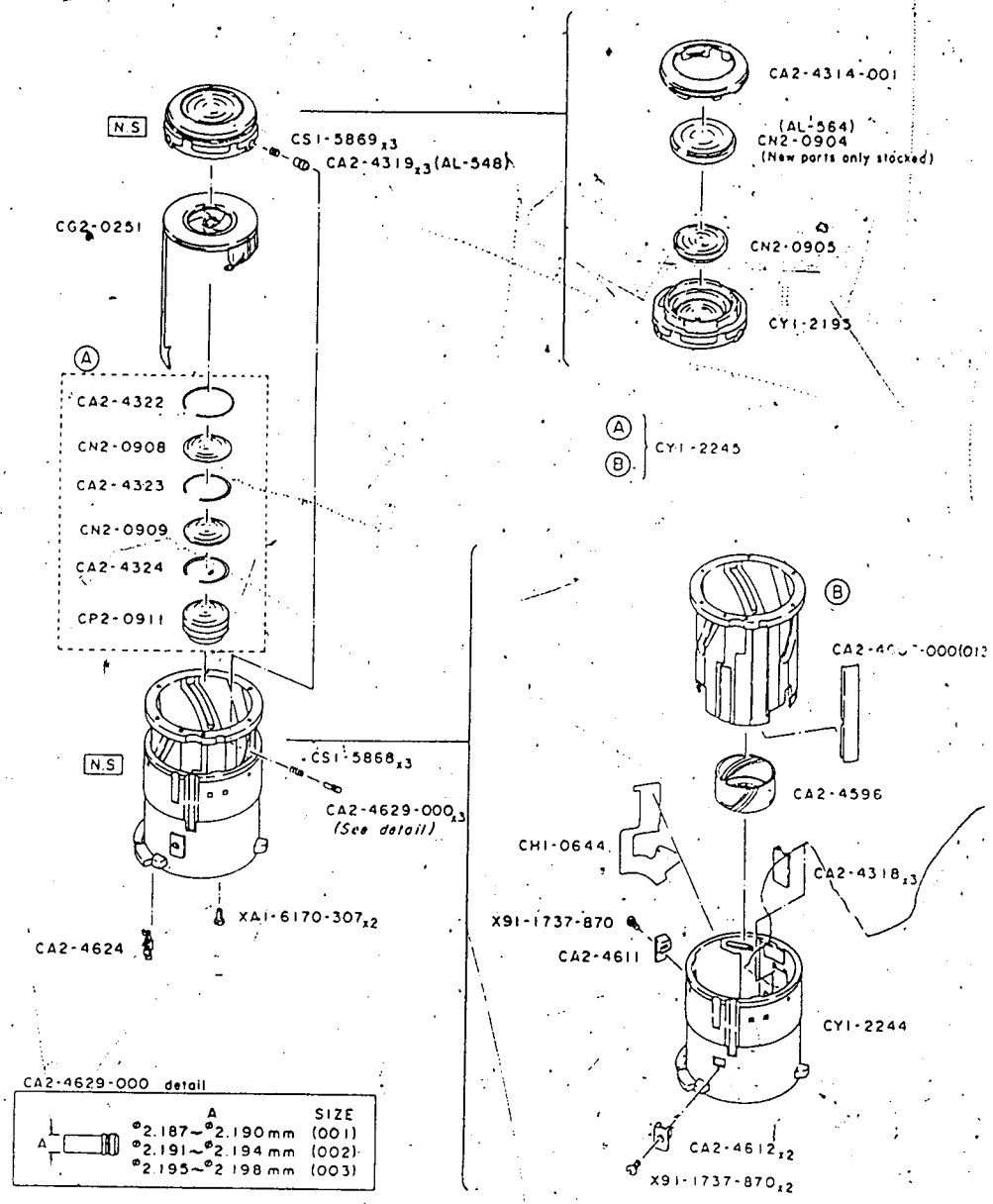
REF. NO. C21-9401 EF35-105/3.5-4.5

NEW	PART NO.	CLASS	QTY	DESCRIPTION		PAGE
	CA2-4314-001	E	1	COLLAR, ASSY	G4押えリング	2
	CA2-4318-000	E	3	PLATE, FRICTION	板バネ	2
	CA2-4319-000	D	3	COLLAR, ZOOMING	2群コロ	2
	CA2-4322-000	E	1	RING, SNAP	Cリング	2
	CA2-4323-000	E	1	RING, SNAP	Cリング	2
	CA2-4324-000	E	1	RING, SNAP	Cリング	2
	CA2-4583-000	D	1	CONTACT ASSY	接点ブロック	3
	CA2-4585-000	E	1	SCREW, MOUNT STOPPER	マウントストッパービス	3
	CA2-4586-000	E	2	SCREW,	接点ブロック止ビス	3
	CA2-4594-000	D	1	RING, FRONT	前枠	3
	CA2-4596-000	E	1	STOPPER, FLARE	移動絞り環	2
	CA2-4598-000	D	1	COVER, BACK	裏蓋	3
	CA2-4600-000	E	1	RING, NAMUAL FOCUS	マニュアルリング	1
	CA2-4601-000	D	1	COLLAR, ASSEMBLY	飾り環	1
	CA2-4603-000	E	1	RING, SHIELD	絶縁シート	1
	CA2-4604-000	D	1	SCALE, FOCUSING	距離目盛板	3
	CA2-4605-000	E	1	COLLAR, SSEMBLY	化粧リング	1
	CA2-4607-000(013)	E	1	SPRING, PLATE	スベリ板	2
	CA2-4609-000	C	1	RUBBER, ZOOMING	ズーム操作ゴム	1
	CA2-4610-000	E	1	CLOTH, FRICTION	テレンプ	2
	CA2-4611-000	E	1	STOPPER, ZOOMING(1)	ズームストッパー1	2
	CA2-4612-000	E	1	STOPPER, ZOOMING(2)	ズームストッパー2	2
	CA2-4615-000	E	1	STOPPER, FOCUSING	距離ストッパー板	3
	CA2-4616-000	E	3	WASHER, DUST SHIELD	防視板	1
	CA2-4617-000	E	1	CONTACT, ZOOMING	ズームブラシ	1
	CA2-4618-000	E	1	SCREW, AFD UNIT	バックラッシュ調整ビス	3
	CA2-4622-000	E	2	SCREW, AFD UNIT	AFD 止ビス	3
	CA2-4623-000	E	2	RING, RUBBER	防振ゴム	3
	CA2-4624-000	E	1	HOLDER, EMD-FLEX	フレキ押えE	2
	CA2-4625-000	E	1	STOPPER, AFD FLEX	フレキ押えC	3
	CA2-4629-000(xxx)	E	3	PIN, ZOOMING	2群コロー2	3
	CA2-4635-000	E	1	CUSHION	モルトプレン	3
	CA2-4636-000	E	1	WASHER, DUST SHIELD	防塵シート	1
	CG2-0251-000	D	1	POWER DIAPHRAGM UNIT	EMD 絞りユニット	2
	CG2-0252-000	D	1	AF DRIVE UNIT	AFD ギアユニット	3
	CG2-0293-000	D	1	MAIN FLEX UNIT	メインフレキユニット	1
	CG9-5123-000	E	1	HELICOID, FOCUSING	ヘリコイドユニット	3
	CG9-5125-000	E	1	CONNECTING FLEX ASSY	C-FLEXユニット	3
	CG9-5130-000	E	1	BARREL, FIXED	固定筒ユニット	1

CANON LENS EF 35-105 mm 1:3.5-4.5



CANON LENS EF 35-105 mm 1:3.5-4.5



Canon SERVICE MANUAL

REPAIR INSTRUCTIONS

No. CY8-1223-108-300

Camera Technical Service Department, Canon Inc.

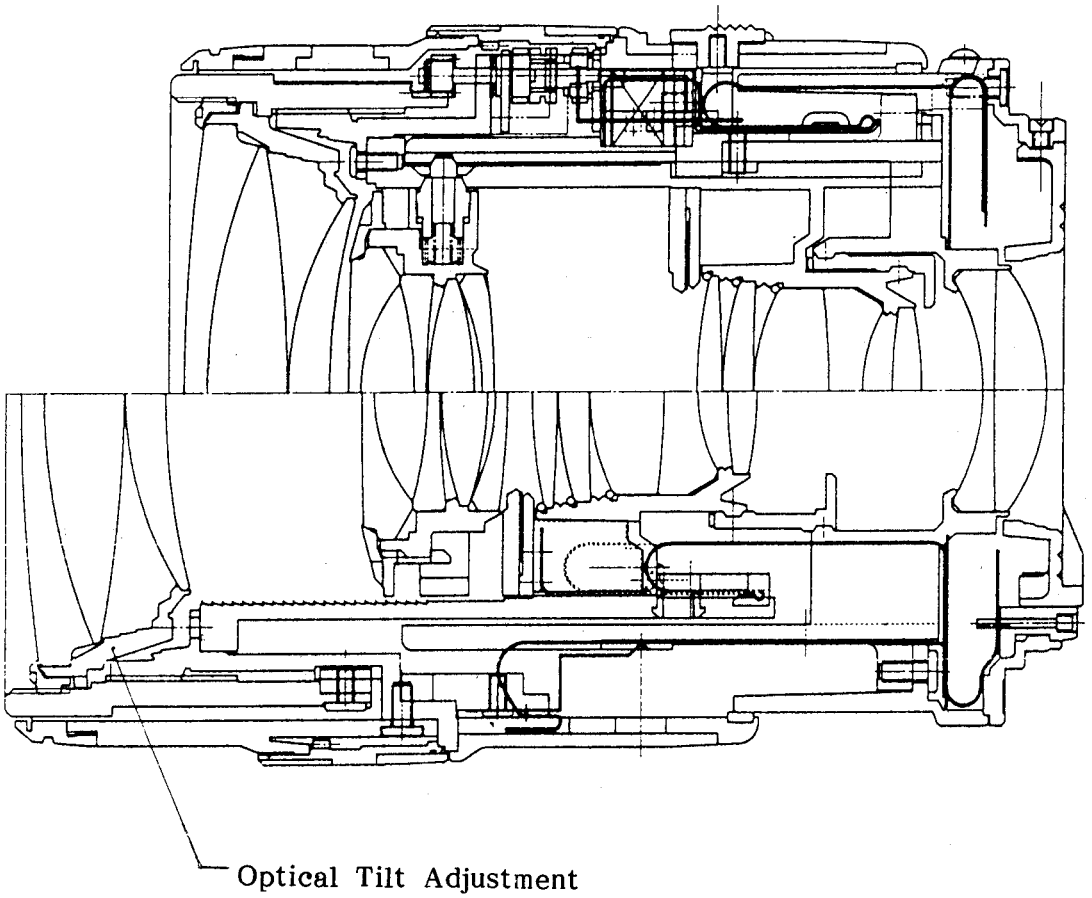
Date 1987, 2, 4

CANON LENS EF35-105mm 1:3.5-4.5
Ref. No. C21-9401

Special Optical Adjustments:

Centering.	Yes	(No)
Tilt	(Yes)	No

Optical tilt adjustment requires the lens projector and EF mount adaptor. If not available, there are special service procedures.



This lens makes extensive use of double faced tape. Always replace the tape when parts using tape are separated, especially flexible circuit boards.

TABLE OF CONTENTS

NOTICE: For general information about this lens, see sections I, II, III, and IV of the EF50mm f/1.8 repair guide.

EF35-105mm f/3.5-4.5 Lens Expendables List

-ADHESIVES-

Part Number	Name	Remarks	Plastic Safe?
CY4-9301-000	Double faced tape	Always use new tape (New)	YES
CY9-8005-000	Cemedine Hi-Super	Heavy duty	Yes
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
CY9-8015-000	Water-soluble bond	Light duty,	YES
CY9-8076-000	Vinylole 2200	General Purpose	YES

- LUBRICANTS -

Part Number	Name	Remarks	Plastic Safe?
CY9-8045-000	GE-C4	Helicoid & cam (metal OK)	YES
CY9-8082-000	GC-X5	Helicoid & cam (metal OK)	YES
CY9-8086-000	FF-10	Helicoid & cam (New)	YES
CY9-8087-000	Lozoid 6308/31-F	Manual focusing ring (New)	YES

I. Specifications

This lens incorporates the optics of the FD35-105 mm f/3.5-4.5, and has been developed for the EOS series to fill the need of a certain group of users for a second generation standard zoom ranking above the 35-70 mm lens. Providing high performance in a compact package, the optics have been improved to allow macro photography over the full zoom range.

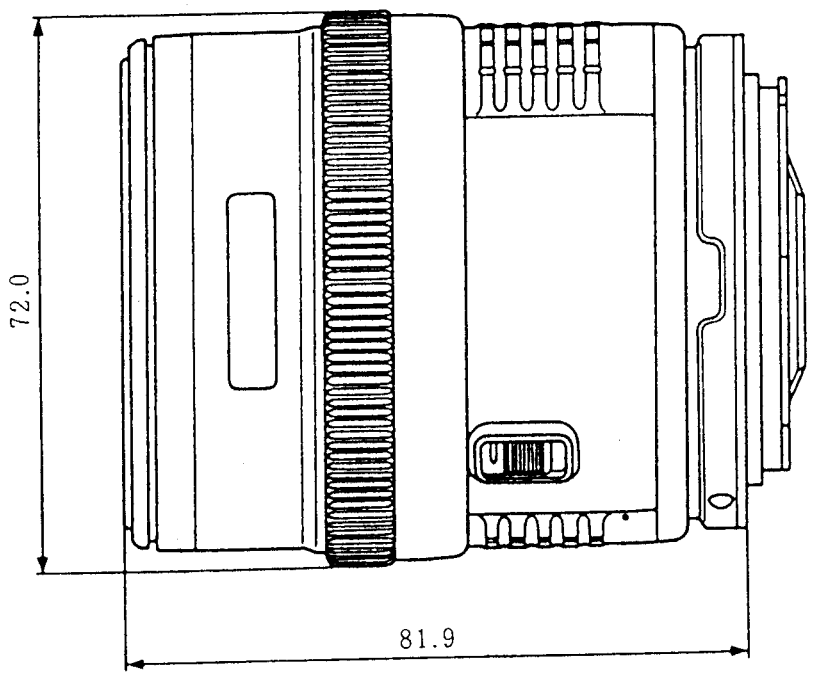
Features

Shortest of any Canon lens with similar specifications.

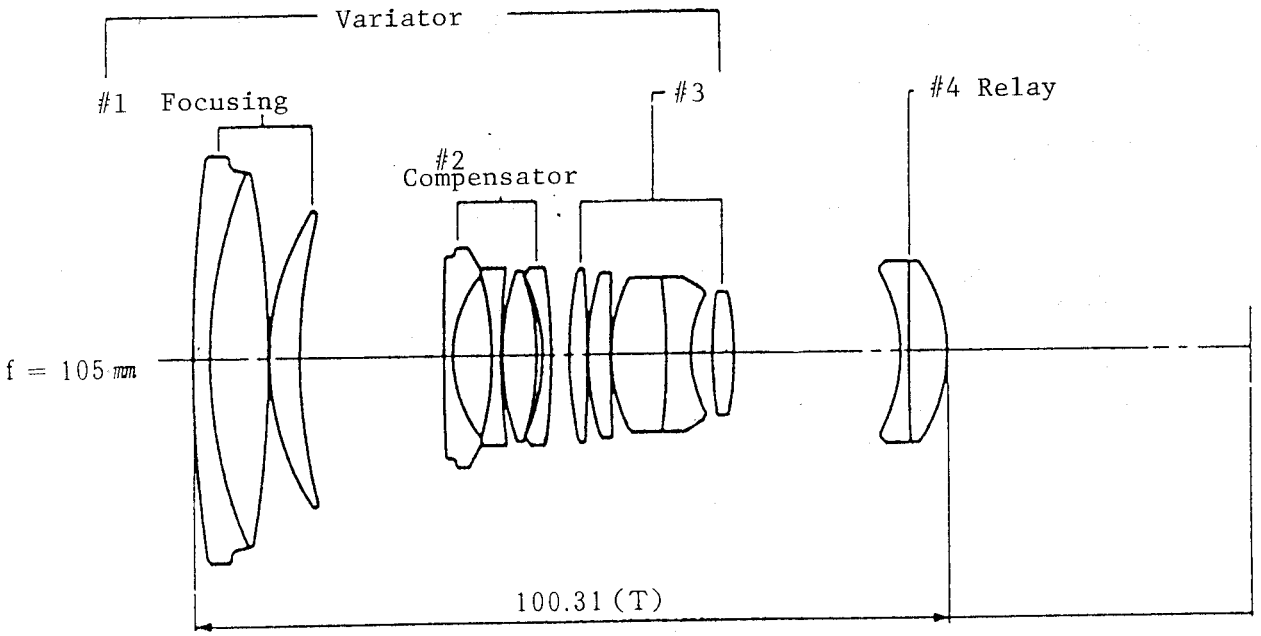
Uses a molded glass aspherical lens for greater compactness and image sharpness.

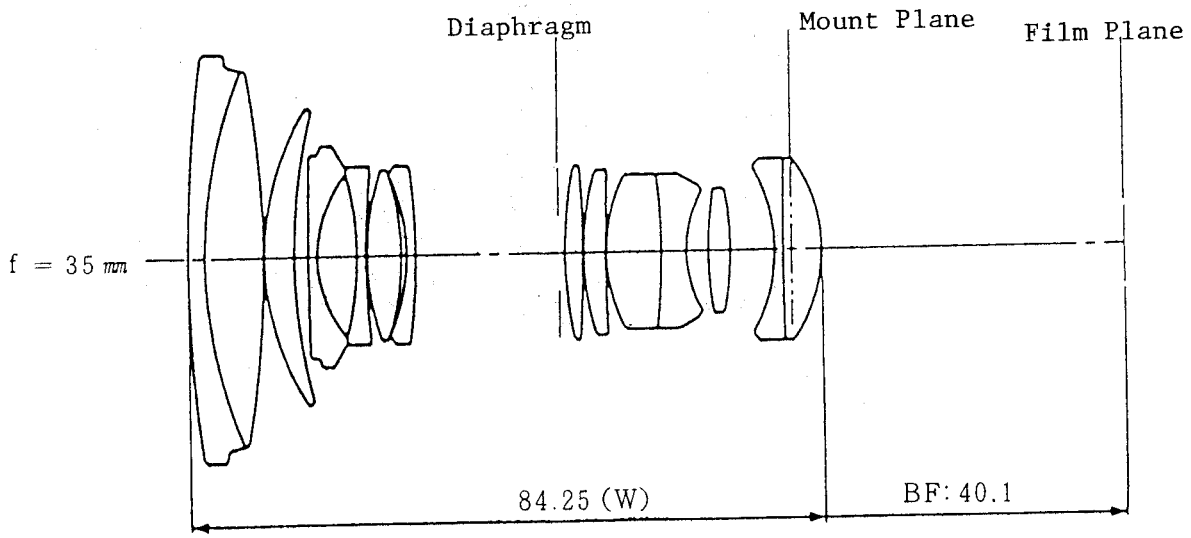
Full-range "macro" mechanism (Maximum photographic magnification of 0.16X with macro close-focus at 0.85 m.)

EF 35-105mm f/3.5-4.5



Optical Schematic





1. Format: 24 x 36 mm

2. Focal length, aperture: 35 - 105mm , f/3.5-4.5

3. Optical structure: 11 groups, 14 elements

4. Angle of view (at infinity):

	35mm	105mm
Diagonally (43.2 mm)	63°	23.5°
Vertically (24 mm)	38°	13°
Horizontally (36 mm)	54°	19.33°

5. Autofocus (AF)

5-1 Drive system: AFD

5-2 Drive speed: 0.40 seconds (Actual operation between infinity and 0.5m, not including AF operation)

5-3 Manual: Mechanically clutched focusing ring

6. Focusing:

6-1 Extension system: Single helicoid

6-2 "Macro" Range: Full range macro 0.85m to 1.2m

6-3 Rotation angle & amount of extension

Condition	Rotationangle	Extension
0.85m toinfinity	196.02°	4.57mm
1.2m to infinity	126.1°	7.08mm
Infinity overrun	None	None

6-4 Distance scale:

M	4	5	7	10	20	ft (fluorescent green)
	1.2	1.5	2	3	7	m (Gray)

6-5 Maximum magnification, field of view

	Magnification (power)		Field of view (mm)	
Condition	Wide	Tele	Wide	Tele
Normal Range	0.036	0.103	660 x 990mm	223 x 336mm
'Macro'	0.055	0.160	419 x 629mm	144 x 216mm

7. Zoom

7-1 Type 3 component, 4 group mechanical compensating

7-2 Extension: 16.06mm

7-3 Focal Length Markings: 35 50 70mm105mm

8. Mount

8-1 Type: New Canon mount

8-2 Signal transfer function: EOS system, with 5 signals as follows :

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

9. Aperture mechanism

9-1 Diaphragm control: Pulse control using EMD

9-2 Aperture range: f/3.5 (f/4.5) - f/22(f/29)

9-3 Number of diaphragm blades: 5

9-4 Depth-of-field scale: Not provided

9-5 Infrared index: Provided

10. Filter thread: 58mm, 0.75mm pitch

11. Dimensions& weight: 73.2mm diameter x 81.9mm length / 400g

12. Related products

12-1 Hood: SW-68B (new)

12-2 Lens cap: E-58 (new)

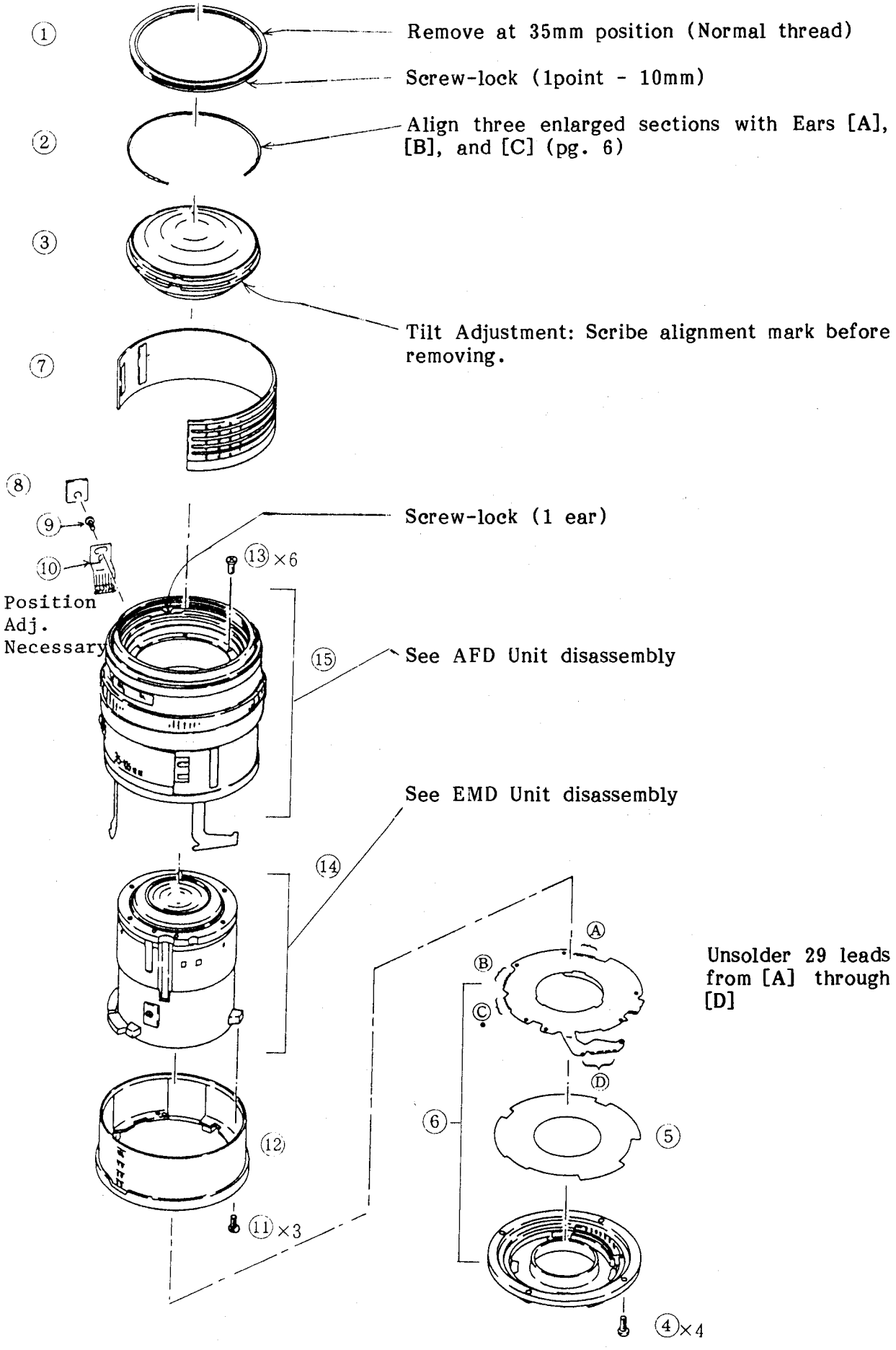
12-3 Lens case: M (new soft case),LHP-C13

12-4 Dust cap: Common to all EF lenses (new)

13. Other: Maximum number of filters usable: One

II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

1. EMD Unit, AFD Unit Removal



II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

1. EMD Unit, AFD Unit Removal

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1. Front Lens Unit (3) Removal

1.1 Before removing the unit, check the relative position of Ears [A], [B], and [C] and tapers [A], [B]. and [C].

1.2 Mark Ear [A] and taper [A]; and ear [A] and the front lens element (with a glass marker).

1.3 Align the ears with the slots and remove and remove the lens unit.

(If the relative positions are not marked, the tilt adjustment is necessary.)

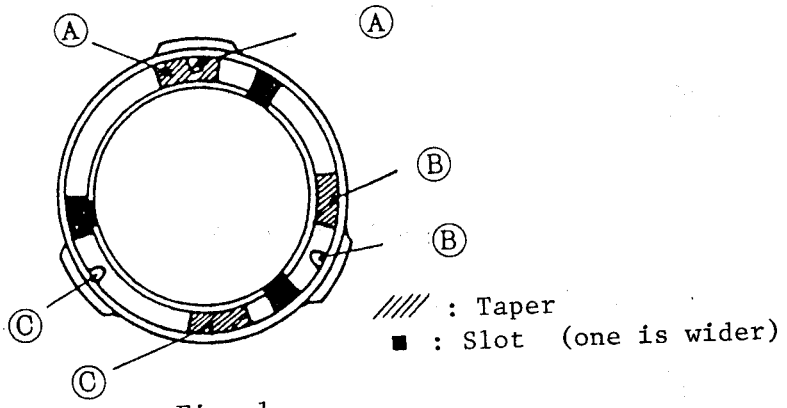


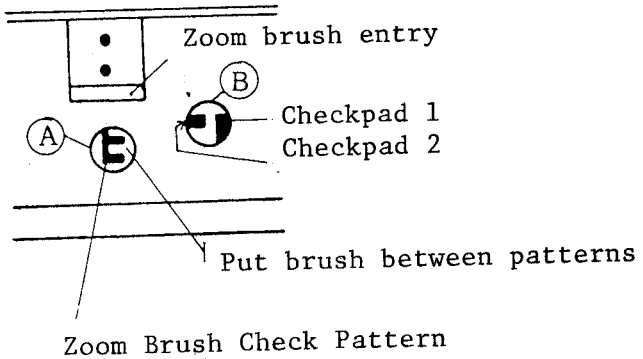
Fig. 1

2. Zoom Brush (10) Position (Fig. 2)

2.1 When the lens is set at tele, a pattern can be seen through holes "A" and "B" as shown in figure 2.

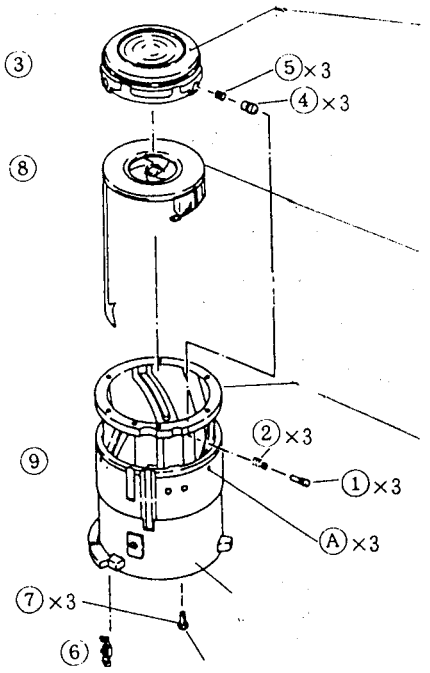
2.2 Install the zoom brush and position it so the brush is between, but not touching, the pattern seen through "A". Check resistance across check pads 1 and 2. Against the tele stop, the reading should be infinity. Zooming slightly toward wide, it should change to near zero ohms. During zooming, check that the brush does not leave the pattern.

Fig 2



II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

1. EMD Unit Removal



Assembly collar

Scribe mark on (3) and (9). If optical centering is poor, install in the best of the three possible positions. Poor centering is rare.

Water-soluble bond (10mm, 1 place)

Guide sleeve

①×3 Adjusting sizes

A	SIZE
φ2.187~φ2.190mm	(001)
φ2.191~φ2.194mm	(002)
φ2.195~φ2.198mm	(003)

Start with smallest size and work up to a smooth fit without much play which returns well by spring (2) pressure. Excessive play

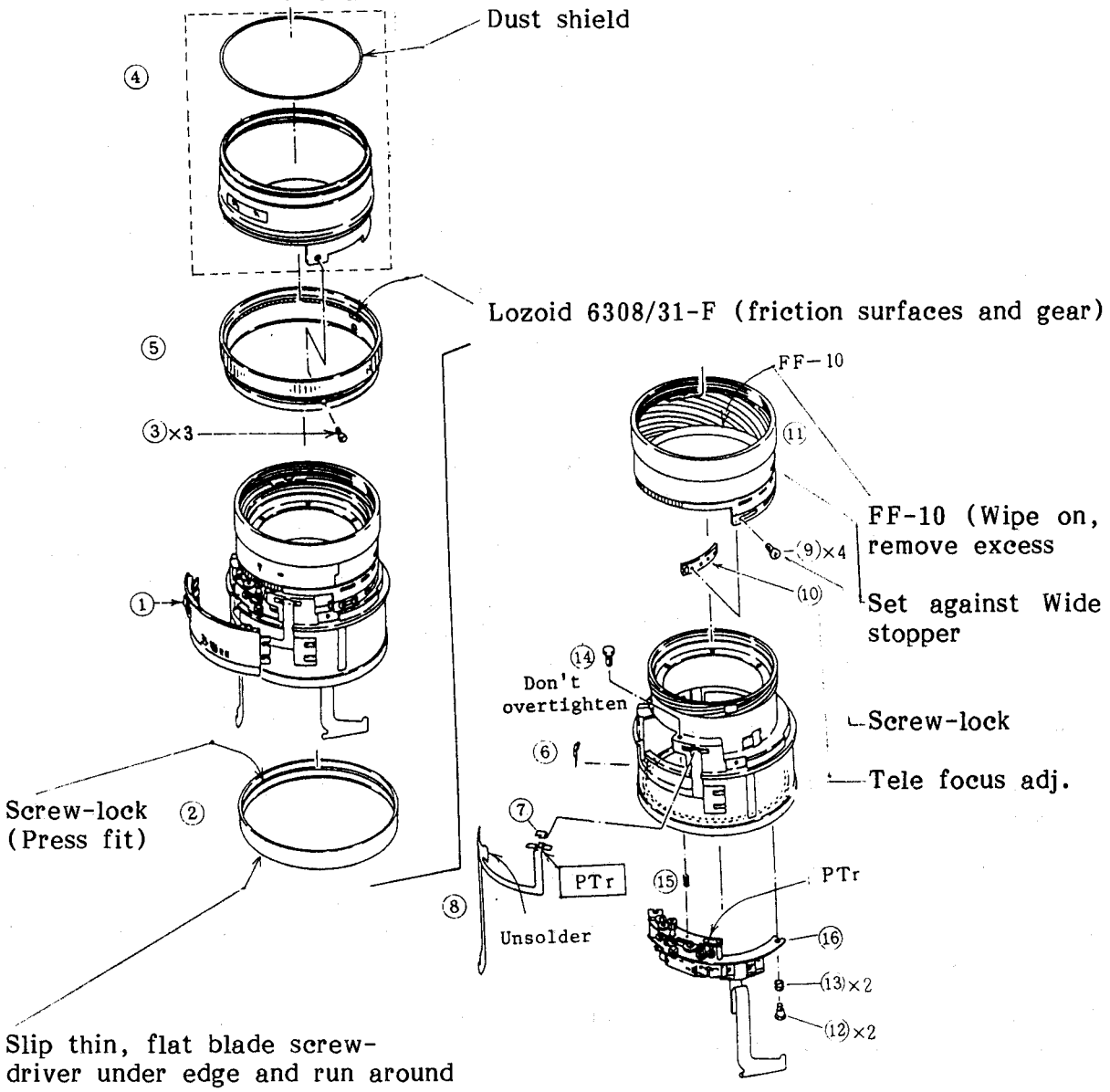
Compensator Unit (3) Removal

1. Turn the assembly collar to the left until it stops (approx. 10°). This allows pins (4) to seat more deeply allowing pins (1) to be removed easily.
2. Set the zoom ring to the tele position.
3. In turn, push on the pins 1 through [A] and lift (3) so the pin is free of the hole.
4. Lift (3) a bit more and the pins (1) and springs (2) will pop out. Be careful not to loose them.
5. Scribe mark on (3) and (9).
6. Lift (3) a bit more and the pins (4) and springs (5) will pop out, and (3) can be removed. Be careful not to loose them.

Assembly Collar: Before disassembly, turn to the left. After assembly, turn to the right. This prevents the pins from disengaging during a shock accident.

II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

1. AFD Unit Removal



Fix **(6)** and **(7)** with instant bond and **(14)** with Cemedine Hi-super

II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

3. AFD Unit Removal

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1. AFD Unit mounting screw (14) tightening

The purpose of this gear is to prevent changes in the mesh of the focusing gear and the coupling gear of the AFD unit. If it is tightened too tightly, it lifts the AFD unit out of position and deforms the baseplate causing roughness in the autofocus, increased current consumption and noisy operation.

To prevent this, put the lens in manual focus and find the smoothest operating point. Just snug the screw down and stake with Cemedine Hi-Super.

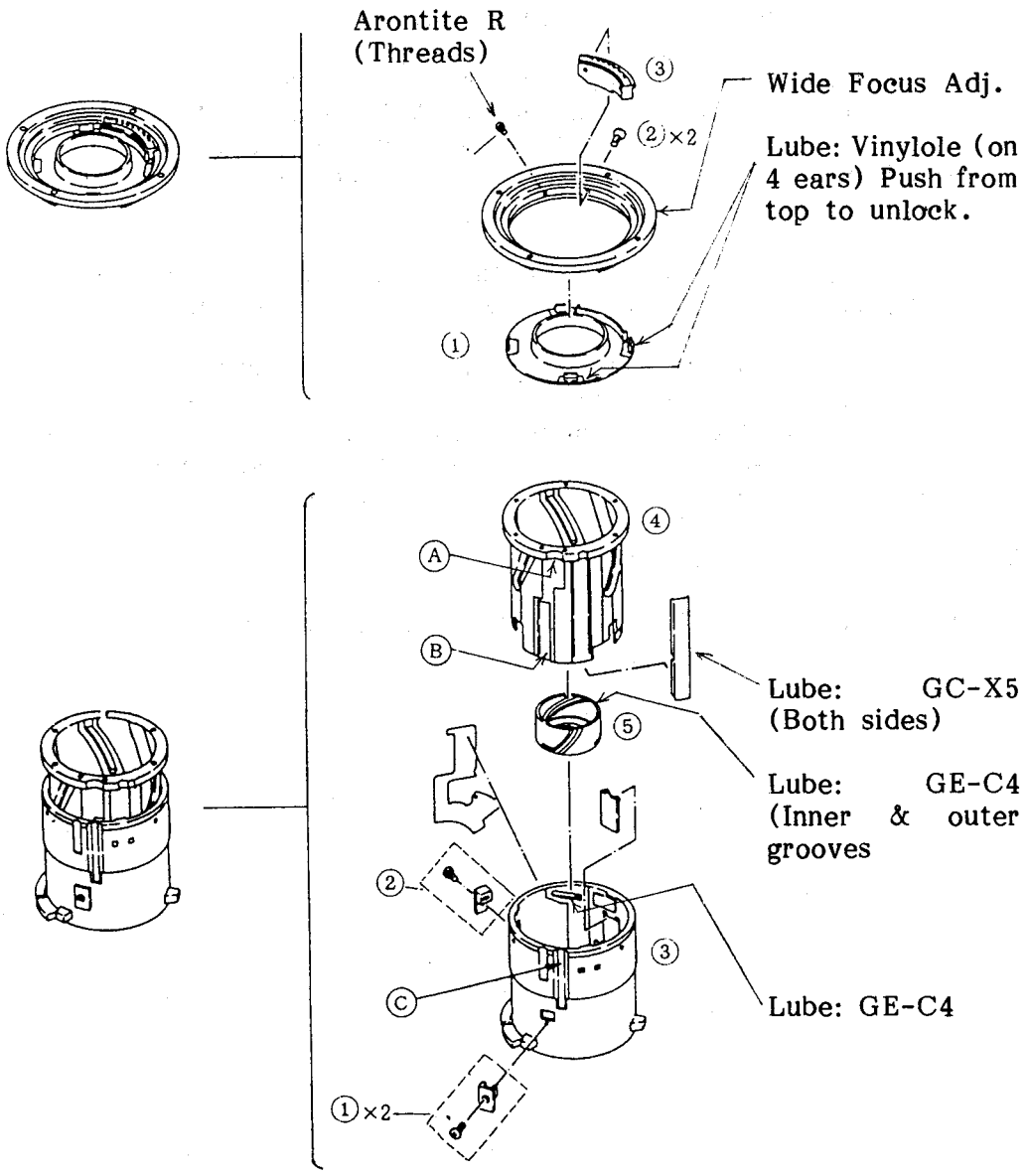
As a final check, with the lens assembled except for (7) (pg. 5) and (1) (pg. 8), check that the autofocus operates smoothly and silently. Mount the lens on the standard body, set the LVPS to 5V and check the AF oscilloscope waveform, operational noise, and stop-to-stop speed. Make an average of several good units for comparison.

2. C-Flex (8) Installation

Check that the PTr is correctly mounted on the AFD unit before installing foam and gluing in place.

II. DISASSEMBLY & ASSEMBLY EF35-105mm f/3.5-4.5

4. Mount & HelicoidDisassembly



Assembly of (3), (4), & (5)

1. Lay the parts on the side in order.
2. Set (4) and (5) to the point just before they decouple.
3. Align (B) and (C) and push together until they stop.
4. Align (A) and (C) and push (3) home.

III. ADJUSTMENTS EF35-105mm f/3.5-4.5

1. Optical Centering(Tilt Adjustment)

STANDARD:

Table 1 : Resolution Chart

Image Height (mm)	0	4	8	12	16	20
S	100	100	63	63	40	20
35mm						
M		100	63	40	40	25
S	100	100	63	63	40	40
70mm						
M		100	63	40	40	25
S	100	100	63	63	40	40
105mm						
M		63	63	40	40	25

Tools: Lens Projector

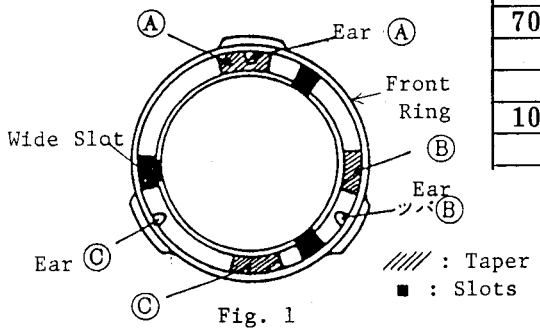


Fig. 1

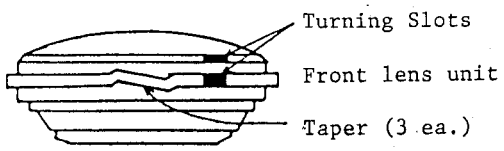


Fig. 2 [Center of tapers equal 0 tilt]

Check Method (Ref: Pg. 5)

Remove the front lens assembly collar, and use the lens projector.
Note: For facilities without lens projectors, see the service note.

1. Set the lens projector five meters from the screen and the lenses focal length to maximum (105mm).

2. If tilt is present, as indicated by different resolution figures on opposite radials, adjust using the three ears and the three tapered areas on the circumference of the front lens unit. The lens must resolve at least 40 lines per millimeter in the 16mm zone.

   Note: With the three ears and three tapers, there are a total of nine combinations in one revolution of the lens unit.

Service Note

Mark the relative position of the ear and taper that are in contact before the lens is removed and reinstall in the same position.
(Record also the relationship of the (A) ear and taper with the larger disassembly slot.)

If optical parts, other than the front lens unit, are removed, center the ear on the taper.

For claims specifically about irregular sharpness, send the lens to a fully equipped service facility.

III. ADJUSTMENTS EF35-105mm f/3.5-4.5

2. Focus Adjustment

Standard: ± 0.03mm

Two different methods can be used to adjust EF lenses for correct focus. Both adjustments are carried out with the lens in manual focusing mode.

A. 800mm Lens Focus Collimator Method
Install the EOS lens mount adaptor on the collimator and check several lenses from stock to establish an average. Adjust repaired lenses to that average.

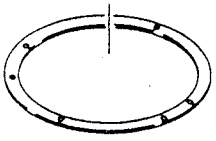
B. Camera Method
Use a known-good camera with a type B screen (split-image) and a magnifier. Check infinity focus on a collimator or with an actual target at least $100f^2$ distant.

1. Adjustment Method

1.1 Wide Adjustment

At the factory, the mount is shaved to adjust the focus, but this is impossible in the field. Special service mounts and focus washers are used. If the lens focuses past infinity (plus), focusing washers up to a combined thicknesses of 0.07mm can be used. If the defocus is greater than 0.07mm plus, or minus, measure the lens mount thickness and choose the appropriate undercut lens mount and focus washers to bring the focus within limits.

Service Focus Washers (Fig. 1)



Service Use Only.

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

Service Lens Mount (Fig. 2)

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)		

1.2 Tele Adjustment

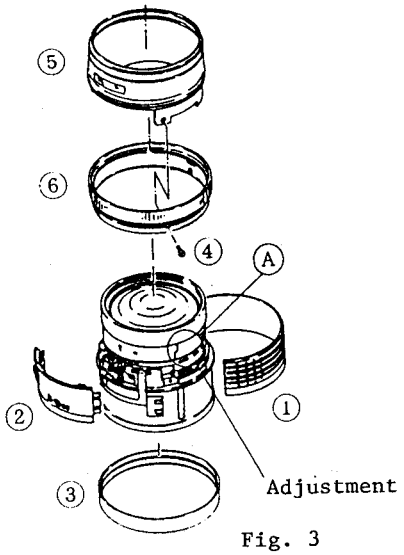


Fig. 3

1. Remove (1) through (6)

2. Loosen the focus stopper screws, and adjust the focus stopper for best tele focus.
(If, after adjustment, the index does not align with the middle of the infinity mark (± 0.4mm at normal temperatures), reposition the distance scale. It is attached with double faced tape. (Fig. 4).

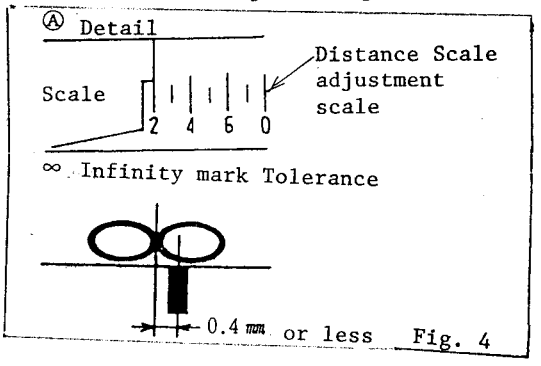


Fig. 4

VII. ADJUSTMENTS EF35-105mm f/3.5-4.5

2. Pulse Adjustment

STANDARD: $0.9T \leq t \leq 1.1T$

Adjust if main flex unit, AFD unit, or the phototransistor unit is changed. If not adjusted, AFD may work correctly at normal temperatures but fail at high or low temperatures.

Adjustment Method

1. Assemble the lens up to the point where the mount portion is attached to the rest of the lens.
2. Temporarily attach leads to the pads marked [PULS CH] and [D-GND] in figure 1.
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 it.
4. Attach the leads (step 2) to the oscilloscope probe.
5. Set the lens in the AF mode and the camera in the ONE-SHOT mode, and press the shutter button. (The AF will search continuously because the lens is not in place.)
6. Adjust VR7 so the waveform is like figure 2 (C).

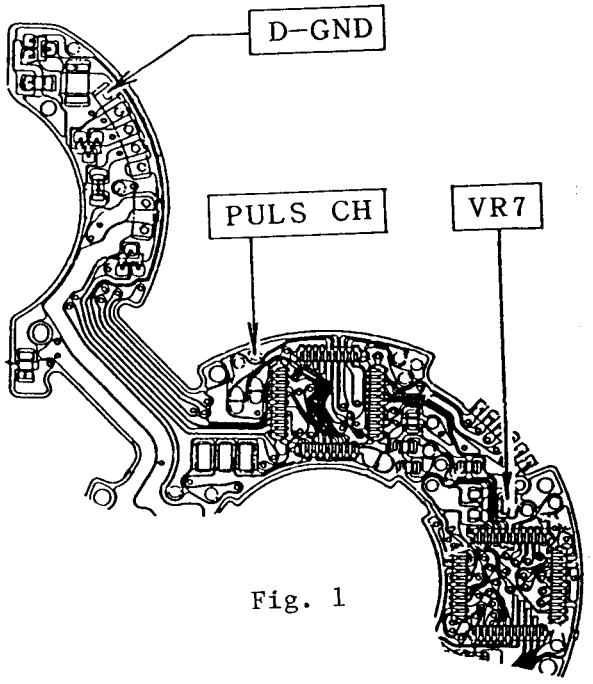


Fig. 1

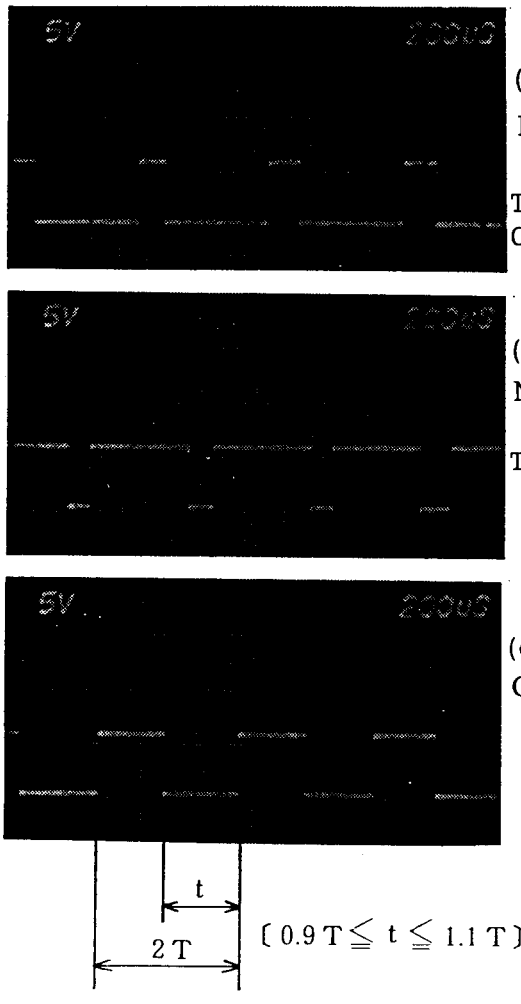


Fig. 2

III. ADJUSTMENTS EF35-105mm f/3.5-4.5

3. "Best Focus Adjustment"Service Policy

STANDARD: $\pm \frac{1}{4}Fc$ Fig. = f/number
c = 0.035mm (Canon circle of confusion)

REF: AF Focus Point Limits: The difference in the best focus point and the actual point where the lens focuses must be within $\pm \frac{1}{4}Fc$.]

There is bound to be some discrepancy between the focus point determined by the autofocus system and the actual best focus point of the interchangeable lenses due to the inherent differences between the different lens types.

In the EOS system, the difference between the AF focus and the optical best focus has been determined for each lens type and the information written into the lenses Read Only Memory (ROM) so that correction for the difference at maximum aperture is made electronically.

In actuality, in addition to this type difference, there is a difference between individual lenses within each type, which can be noticeable if not corrected, 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 will not be 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 lens element G5(CN2-0755) or doublet G10/11 (CP2-0761)is changed, open both pads.

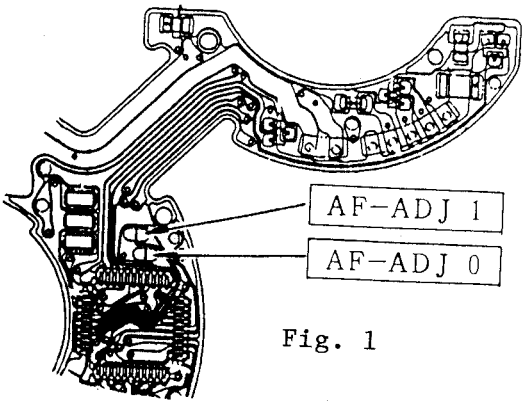
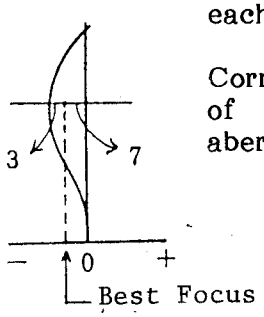


Fig. 1

Best Focus Correction (Reference)

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



Correction varies with each individual lens.

Correction is set at 70% of maximum spherical aberration.