Canon

Service Manual

ENGLISH EDITION

CANON LENS

EF500mm 1:4.5L
(C21-8352)

CY8-1200-089

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TECHNICAL INFORMATION

1. Development Objectives

The EF500mm f/4.5L has been developed to fill the gap between the EF400mm f/2.8L and the EF600mm f/4.0L to meet the imaging and operational needs of professional photographers, while being significantly lighter than the two super-telephoto lenses it fits between.

2. Features

- Uses the renowned optics of the FD500mm f/4.5L, acclaimed by pros for its super-sharp images. One fluorite and one UD glass element enable this lens to superbly compensate chromatic aberration (secondary spectrum) and obtain high image quality.
- By limiting the maximum aperture to f/4.5, a 500mm lens light enough for professionals to hand-hold is achieved.

  It weight about half (3kg) what the other two lenses do.
- Using nine diaphragm blades gives beautiful, near-circular blur in out-of-focus highlights.
- Built-in USM and inner focusing system give high-speed autofocus.
- Manual focusing possible using the electronic manual focusing ring. The ring is positioned to provide excellent balance for hand-held shooting.
- Use of the 1.4X or 2X extender gives 700mm f/6.7 or 1000mm f/9.5. (Manual focusing is necessary).

3. Specifications

1.	Format	24 x 36 mm
2.	Focal length / Aperture Ratio	500mm; 1:4.5
3.	Optical system construction	7 elements in 6 groups (G-2 is fluorite, G-4: UD glass. Super Spectra Coating).
4.	Angle of view (at ∞)	Diagonal (43.2mm) 5 ° Vertical (24mm) 2 ° 45' Horizontal (36mm) 4 °
5.	AF	
	Drive system	USM
	Drive speed	0.9 sec. (drive speed between ∞ and closest shooting distance)
	Manual focusing	Manual focusing ring. Rotation angle switch varies speed in three steps (1/2X, 1X, and 2X) according to rotation angle.
	Shooting distance range switch	Three zones selectable using shooting distance range switch. (Zone 1: 5m to ∞, Zone 2: 5m to 12m, Zone 3: 12m to ∞)
6.	Focus Adjustment	Inner focusing, rotating cam system

Shooting distance range: 5m to infinity

Rotation angle / Extension amount

Conditions	Rotation angle	Extension amount
5m to ∞	95°	29.19mm
∞ overrun	7°	1..97mm

Distance scale

17 20 25 30 40 50 70 100 200 ft (fluorescent green)
5 6 7 8 10 12 15 20 30 50 └——∞ m (metallic gray)

Maximum magnification and field of view

Conditions	Magnification	Field of view
5m	0.11X	220mm x 330mm

Focus preset

1 **Distance memory:** When the focus preset switch is turned OK, the lens position at that point is memorized.

2 **Read out:** When the |playback ring is turned left or right, the lens is moved to the memorized distance position.

3 **Signal beeper:** An electronic beeper beeps once when the lens position is memorized and beeps twice when the position is recalled. The beeper can be turned on/off by a switch.

7. Mount Type: Canon EF mount

Data communication function: EOS system, using the following five signals (no absolute distance data):

1. Lens condition 2. Lens type 3. Metering data
4. Focal length 5. AF drive data

8. Diaphragm mechanism / Diaphragm control system: Pulse control system using EMD (electromagnetic diaphragm) (Simultaneous control of AF lens drive possible.)

Aperture values / indication: Maximum aperture: f/4.5 (indicated on lens barrel); Minimum aperture: f/32 (no indication)

Number of diaphragm blades: Nine

Depth-of-field scale: Provided (f/16, 32)

Infrared focusing index: None

9. Filter diameter: Diameter = 48mm; P = 0.75mm; Rear drop-in gelatin filter holder

10. Dimensions / Weight: 130mm (diameter) x 390mm / 3,000g

11. Related products

Hood: ET-123B (Detachable - type exclusive - use hood, reverse mounting possible)

Lens cap: E-180B

Lens case	Purpose-built carrying case
Rear dust cap	Dust cap common to all EF lenses

12. Other

Tripod mounting	Three tripod sockets (1/4" x 20) mounted on a revolving trip[od ring and located for best balance.
Revolving tripod ring	360 ° mechanism with click stops every 90 ° from normal position. Can be locked in position by tightening the lock knob.

13. Specifications When Used with Extender or Extension Tube

Extenders		With 1.4X Extender	With 2X Extender
Focal length / Aperture ratio		700mm f/6.7	1000mm f/9.5
Angle of View	Diagonal	3 ° 32'	2 ° 29'
	Vertical	1 ° 58'	1 ° 23'
	Horizontal	2 ° 57'	2 ° 09'
Focusing		Manual focusing only	Manual focusing only
Aperture values *		Max.: f/6.7, Min.: f/45	Maximum: f/9.5, Minimum: f/64
Dimensions / Weight		ϕ 130 x 417.3mm / 3,100g.	ϕ 130 x 440.5mm / 3,140g.

*Aperture values: The minimum depends on the minimum aperture that can be set on the body.

Extension Tube	Focusing range:	Magnification
(EF 25)	3.59 to 10.31m	0.17 to 0.055X

4. Operational Precautions

Autofocusing in not possible when the lens maximum aperture is less than f/5.6, so the lens automatically switches to manual focus when using extenders.

5. Technical Description

1. External Design

The external design of this lens is in line with the design of the other telephoto "L" lenses.

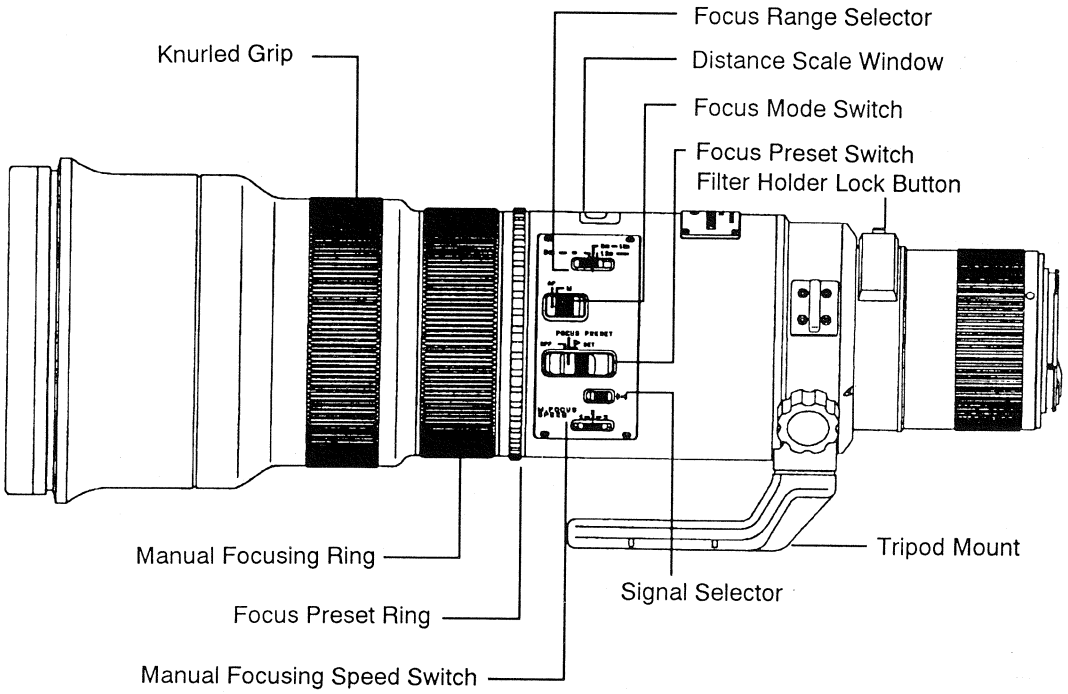
2. Optical Performance Description

The optical system of the EF500mm f/4.5L is essential the same as the FD500mm f/4.5L, with the same optical performance. (Performance with extenders is better than the FD lens since the EF extenders are designed to better match a narrower range of super-telephoto focal lengths than the FD extenders were).

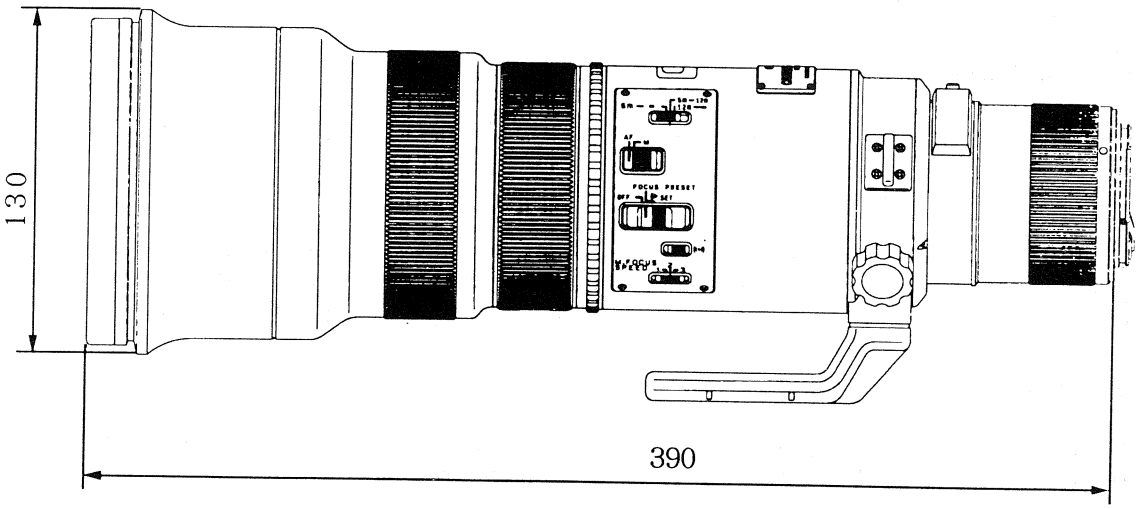
3. Weight Reduction

By holding the maximum aperture to f/4.5 and lightening the tripod socket without sacrificing any strength, the weight is about one half of the weight of other lenses in the series.

6. NOMENCLATURE and DIMENSIONS

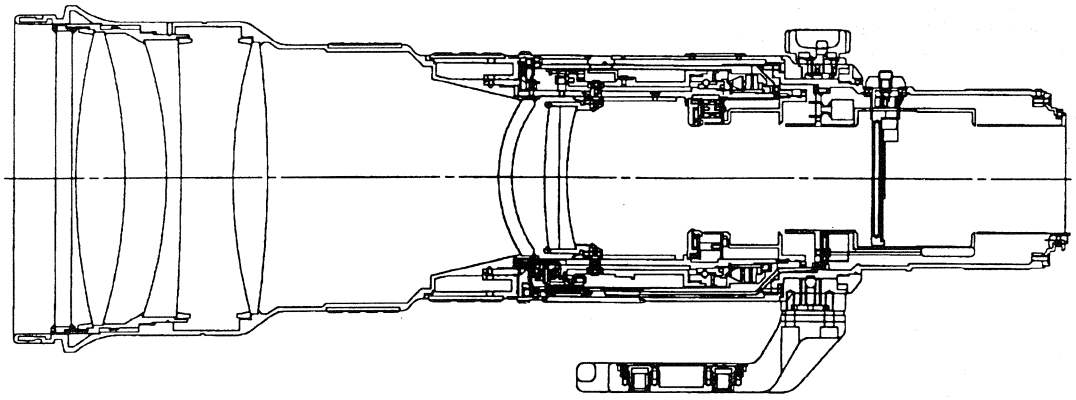


Dimensions (mm)

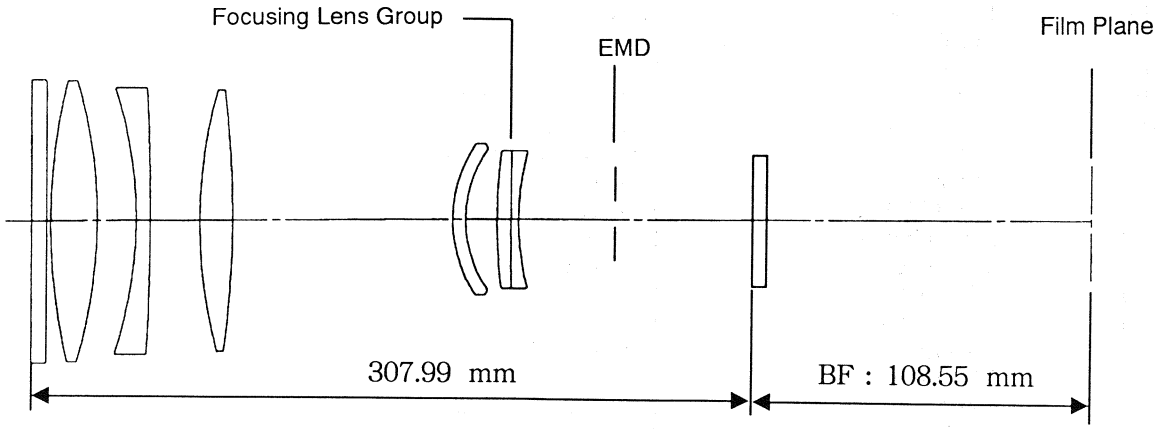


7. CROSS SECTION and OPTICAL SCHEMATIC

CROSS SECTION



OPTICAL SCHEMATIC



Electrical Explanation

Circuitry is basically the same as the EF200mm f/1.8L, EF300mm f/2.8L EF400mm f/2.8Lor EF600mm f/4.0L. The main differences are the programming (software) of IC1 (CPU).

Electronic Components

Nomenclature & Function

Symbol	Standard	Function or (IC Connection)
IC1	MN17481-AX76A	CPU
IC2	AN8329	EMD, USM control
IC3	MN12821	Voltage detect
OSC	C4CB-8M02	CPU Oscillator
TALY2	UN206	EMD drive
TALY3	UN206	EMD drive
C1	4.7μF	Noise filter
C2	4.7μF	Noise filter
C3	1.0μF	Filter capacitor
C4	1.0μF	Noise filter
C5	10nF	US on IC2
C6	220nF	Chattering prevention
C7	680pF	CF on IC2
C8	3.3nF	F on IC2
C9	220pF	C32 on IC2
C10	10nF	F32 on IC2
C11	100pF	Chatter prevention
C12	100pF	Chatter prevention
C13	1.0uF	Noise filter
C14	15nF	Noise filter
C15	15nF	Noise filter
C16	15nF	Noise filter
C17	1.0μF	Noise filter
C18	3.3μF	Noise filter
C19	N/A	Not used in EF500mm
D1	MA-157A	Tr4, Tr5 protection
D2	MA-157A	Tr6, Tr7 protection
ZD1	MA3075WA	Protector
ZD2	MA3075WA	Protector
ZD3	MA3075WA	Protector
ZD4	SB01-05CP	Protector
ZD5	SB01-05CP	Protector
ZD6	SB01-05CP	Protector
R1	10k Ohm	UAIN on IC2
R4	100k Ohm	FV on IC2
R5	8.2k Ohm	F on IC2, time constant
R6	10k Ohm	Noise Prevention
R7	2.4k Ohm	F32 on IC2, time constant
R10	16k Ohm	DAC on IC2
R11	2.4k Ohm	Tr5 base resistor
R12	2.4k Ohm	Tr7 base resistor
R13	6.8k Ohm	/LCLK stabilizer
Tr4	2SD1511R	USM drive
Tr5	2SB766AR	USM drive
Tr6	2SD1511R	USM drive
Tr7	2SB766AR	USM drive
Tr8	UN212Y	IC2 E1 power supply
VR2	20k Ohm	Inhibit voltage adjustment
VR3	4.0k Ohm	USM reference frequency adjustment
VR8	20k Ohm	PR1 output adjustment
VR9	20k Ohm	PR3 output adjustment

IC Pin Explanation

1. IC1 (MPU)

Pin	Symbol	I/O	A/D	Voltage	Function
1	D1	I/O	D	0-VDD	Parallel communications port
2	D2	I/O	D	0-VDD	Parallel communications port
3	D3	I/O	D	0-VDD	Parallel communications port
4	$\overline{AD}$	O	D	0-VDD	Address / Data switching signal
5	$\overline{WR}$	O	D	0-VDD	Read / Write switching signal
6	$\overline{SYNC}$	O	D	0-VDD	Synchronizing signal
7	P2	I	D	0-VDD	Photo Interrupter PR2 signal (from IC2)
8	P1	I	D	0-VDD	Photo Interruptor PR1 signal (from IC2)
9	$\overline{RST}$	I	D		CPU reset signal
17	AFADJ0	I	D	0-VDD	Best focus compensation. CPU contains
18	AFADJ1	I	D	0-VDD	several best focus compensations.
21	H-SPEED	I	D	0-VDD	Manual focusing speed SW -high speed
22	L-SPEED	I	D	0-VDD	Manual focusing speed SW -low speed
23	INF	I	D	0-VDD	Detect focusing position infinity limit
24	NEAR	I	D	0-VDD	Detect focusing position near limit
25	EXT0	I	D	0-VDD	Detect extender
26	EXT1	I	D	0-VDD	Detect extender
29	Z2	I	D	0-VDD	Detect focusing position
30	Z3	O	D	0-VDD	Detect focusing position
33	COM1	O	D	VDD	Common pin
34	COM2	O	D		Focus mode SW - autofocus
35	COM3	O	D		Focus mode SW - manual
36	COM8	I	D		Focus preset SW -common
39	MUTE	I	D	0-VDD	Beeper mute
40	AF/MANU	I	D		Focus mode SW - common
41	FP-SET	I	D		Focus preset SW - memory set
42	FP-PLAY	I	D		Focus preset SW - setmemory position
43	PZ0	I	D		Range limit sensor SW - infinity
44	PZ1	I	D		Range limit sensor SW - near
45	$\overline{P3}$	I	D		Max. aperture sensor input
46	ENC0	I	D		Detect E0 brush signal
47	ENC1	O	D		Detect E0 brush signal
49	COM4	O	D		Detect E0 brush signal
49	COM5	O	D		Detect E0 brush signal
50	COM6	O	D		Detect E0 brush signal
51	COM7	O	D		Detect E0 brush signal
52	COM9	O	D		Range limit sensor - common
53	BZ	O	D		Beeper
55	$\overline{LCLK}$	I/O	D	0-VDD	Communication clock pulse
56	DLC	O	D	0-VDD	Lens to camera data line
57	DCL	I	D	0-VDD	Camera to lens data line
58	GND	V	-	0	MPU power supply device ground
59	OSC2	V	-	8MHz	Oscillator crystal
60	OSC1	V	-	8MHz	Oscillator crystal
61	VDD	V	-	5.5	MPU power supply
62	E1ON	O	D	0-5.5	Power switch for IC2. When "low", Tr8 goes on and E1 is applied to IC2.
63	PSM	O	D	0-VDD	Pulse to IC2 to control EMD.
64	DO	I/O	D	0-VDD	Parallel communications port

Notes: I/O = Input / Output; A/D = Analog / Digital;
V = Voltage(neither input nor output)

IC2 (Control IC)

Pin	Symbol	I/O	A/D	Voltage	Function
1	VBAT	V	-	6.0	Battery input from camera
2	SM4	O	D	0-VBAT	Control pin for the EMD transistor array. "High" turns on the transistor.
3	SM1	O	D	0-VBAT	Control pin for the EMD transistor array. "Low" turns on the transistor.
4	SM2	O	D	0-VBAT	Same as pin 3, SM1
5	SM3	O	D	0-VBAT	Same as pin 2, SM4
6	SM8	O	D	0-VBAT	Same as pin 2, SM4
7	SM5	O	D	0-VBAT	Same as pin 3, SM1
8	SM6	O	D	0-VBAT	Same as pin 3, SM1
9	SM7	O	D	0-VBAT	Same as pin 2, SM4
11	UBOUT	O	A	0-VBAT	USM "B" phase drive signal
12	US	I	A	-	USM "S" phase input
13	U-GND	V	-	0	USM device ground
14	UAIN	I	A	-	Input USM "A" phase
15	UAOUT	O	A	0-VB	USM "A" phase drive signal
16	VB	V	-	0-29	Input DC/DC output voltage (V_B)
17	KVC	V	-	2.0	Check IC
18	A-GND	V	-	0	Analog device ground
19	INH	V	-	2.5	Adjust inhibit voltage
20	Cf	I/O	A	-	USM reference frequency oscillator cap.
21	L_R	O	A	-	Adjust USM reference frequency
22	fv	O	A	-	Connected to USM oscillator resistor
23	F	I/O	A	-	Connected to USM osc. R/C network
24	LED3	I	A	-	Connected to max. aperture sensor LED
25	/P3	O	D	0-E1	Max. aperture sensor output to CPU
26	PR3	I	A	-	Maximum aperture sensor input to IC2
27	PR3 ADJ	I	A	-	PR3 threshold level adjustment
28	VC1	V	-	1.25	Check C-IC reference voltage
29	C32	I/O	A	-	Connected to USM oscillator capacitor
30	F32	I/O	A	-	Connected to USM osc. R/C network
31	PR1ADJ	I	A	-	Threshold level adjustment
32	PR2ADJ	I	A	-	Threshold level adjustment
33	DAC	O	A	-	Reads voltage of Cf capacitor
34	LED1	I	A	-	Connected to photo interrupter LED1,2
35	PR2	I	A	-	Input from focusing photo interrupter2
36	PR1	I	A	-	Input from focusing photo interrupter1
37	GND1	V	-	0	Digital device ground
38	P1	O	D	0-E1	Output photo interrupter signal PR1
39	P2	O	D	0-E1	Output photo interrupter signal PR2
40	/SYNC	I	D	0-E1	Input synchronizing signal
41	/WR	I	D	0-E1	Input write / read changeover signal
42	/AD	I	D	0-E1	Input address / data changeover signal
43	D3	I	D	0-E1	Parallel 4-bit communications port
44	D2	I	D	0-E1	Parallel 4-bit communications port
45	D1	I	D	0-E1	Parallel 4-bit communications port
46	D0	I	D	0-E1	Parallel 4-bit communications port
47	PSM	I	D	0-E1	EMD control pulse from the lens CPU
48	E1	V	-	5.5	Power supply, controlled from CPU

IC3 (Reset)

Pin	Symbol	I/O	A/D	Voltage	Function
1	RESET	O	D	0-VDD	CPU reset by voltage from pin2, VDD
2	VDD	-	V	VDD	Power Supply
3	DGND	-	V	0	Digital Ground

Circuit Explanation

Lens mounted on camera

1. When the lens is mounted, VDD is applied through the mount pins to the lens MPU activating the clock oscillator (OSC). The MPU is reset by C3 and voltage sensor IC3. After a series of initial communications, the MPU goes into HALT mode.

2. When the camera and lens communicate, the lens MPU applies a low to the E1ON pin turning Tr8 on thus applying E1 to the C-IC.

3. The camera requests lens data from the lens through DCL line.

4. The lens sends the data through DLC line. With this data, camera determines if diaphragm fully open. If it is not fully open, the camera sends diaphragm (EMD) drive command to the lens.

5. When the lens receives the EMD drive command, current flows through SM1-SM8 terminals of C-IC turning the transistor array ICs (TALY2, TALY3) on to drive EMD.

6. When the diaphragm is fully open, the max. aperture sensor PR3 sends the $\overline{P3}$ signal to the MPU.

7. As in steps (3) and (4), the camera again request and the lens sends the diaphragm open data.

8. After the MPU determines the diaphragm is still not fully open, the camera decides that the diaphragm is inoperative and initiates the BC warning signal when SW2 is closed.

9. If the camera determines the diaphragm is not fully open, the camera decides that the diaphragm is inoperative and initiates the BC warning signal when SW2 is closed.

Switches operated

When the Focus mode Switch (SW3), Focus preset switch (SW5), Playback switch (SW6) or Manual focusing sensor switch (SW8, 9) is operated, lens MPU turns DLC to "low" regardless of $\overline{LCLK}$, and sends communication request (WAKE UP) activating camera DC/DC converter. After this, procedure in the same as above from step 2.

Camera SW1 on

10. When the camera SW1 is turned on, the camera DC/DC converter is activated, and lens MPU receives VDD, lens DC/DC converter and VBAT (for the DC/DC converter). At this time, the lens MPU applies a low to the E1ON pin turning Tr8 on which supplies E1 to the C-IC.

Focusing (USM) Drive

11. When the drive signal comes from the camera, the lens MPU starts the USM Drive sequence.

12. If the camera send both the drive command and focus data, the MPU drives the USM with this data; but, if the command is received without data, the MPU uses the previous focusing data.

13. The lens MPU sends the $\overline{SYNC}$, $\overline{WR}$, and $\overline{AD}$ signals on exclusive lines and focusing direction data on the 4-bit data lines D0 through D3. Also the LED on data is sent.

14. When C-IC receives the focus direction signal, it issues out-of-phase square wave signals UAOUT and UBOUT signals which cause Tr arrays Tr4-5 and Tr6-7 to generate out-of-phase signals.

15. The outputs of the Tr arrays are applied to the USM through coils as sine waves.

16. As the USM turns, light from LEDs 1 and 2 is "chopped" so pulses are felt by PR1 and PR2, received by C-IC and sent to the MPU by lines P1 and P2. These pulses contain both position and direction data.

17. The pulses are counted by the MPU and focusing continues until the correct focus is reached.

18. When it is reached, the USM stop signal is sent to stop the focusing.

Diaphragm (EMD) drive

19. When the lens gets EMD drive signal from the camera MPU, the lens sends a "busy" ($\overline{LCLK}$ = L) signal.

20. When the drive command and amount data are simultaneously received, the diaphragm is stopped down in accordance with the data.

21. The MPU sends the aperture drive command to C-IC via the $\overline{SYNC}$, $\overline{WR}$, $\overline{AD}$ and D0-D3 lines, instructing C-IC to drive the diaphragm.

22. The CPU sends the amount data at the clock rate on the PSM line to the C-IC.

23. The C-IC uses this data to send an 8-bit signal over lines SM1-SM8 which energize the Tr arrays TALY2 and TALY3. The output of the Tr arrays establish the current directions in coils LA and LB to stop down the diaphragm.

24. After the last pulse is sent from the MPU to the C-IC, the busy signal is removed from the $\overline{LCLK}$ line.

25. The camera sends the diaphragm stop signal through DCL to the lens MPU which sends it on over the $\overline{SYNC}$, $\overline{WR}$, $\overline{AD}$ and D0-D3 lines to remove the power from SM1 through SM8.

< > = 500/4.5L ONLY

SW 1	回転速度切換えSW	Manual Focusing Speed SW
SW 2	フォーカスSW	Focus SW
SW 3	フォーカスモード切換えSW	Focus Mode SW
SW 4	信号音SW	Beeper SW
SW 5	フォーカスプリセットSW	Focus Preset SW
SW 6	再生SW	Recall SW
SW 7	撮影距離範囲切換えSW	Range Limit Sensor SW
SW 8	手動フォーカスリング回転検出SW	Manual Focusing Sensor SW
SW 9	手動フォーカスリング回転検出SW	Manual Focusing Sensor SW

MEMO

REPAIR INSTRUCTIONS

Precautions

For Disassembly / Assembly

Threaded parts are staked during assembly. When disassembling them be careful not to mar the screw heads or spanner points.

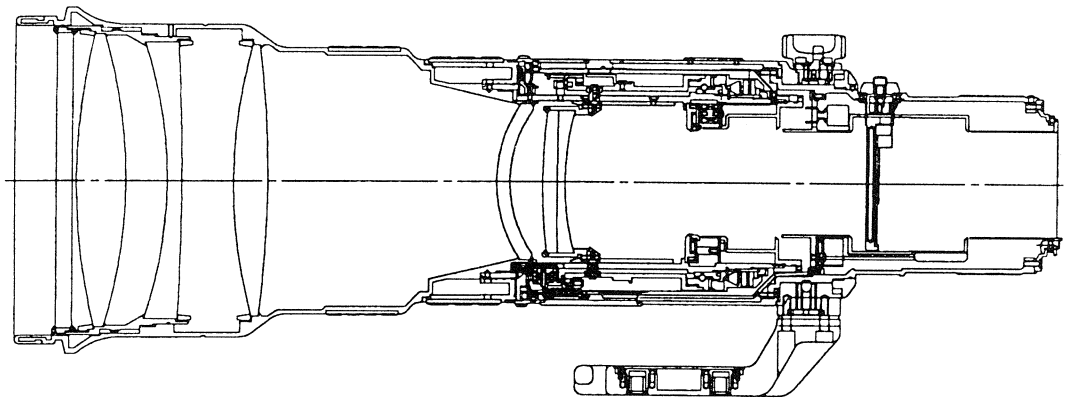
Some interior portions of certain external parts are coated with oil retardant. Try not to touch these parts. The retardant loses its efficiency if touched, and must be renewed.

For Adjustment

Special Optical Adjustment:	Centering:	No
	Tilt:	No

If optical components are disassembled or changed, perform the focus adjustments and the focus compensation.

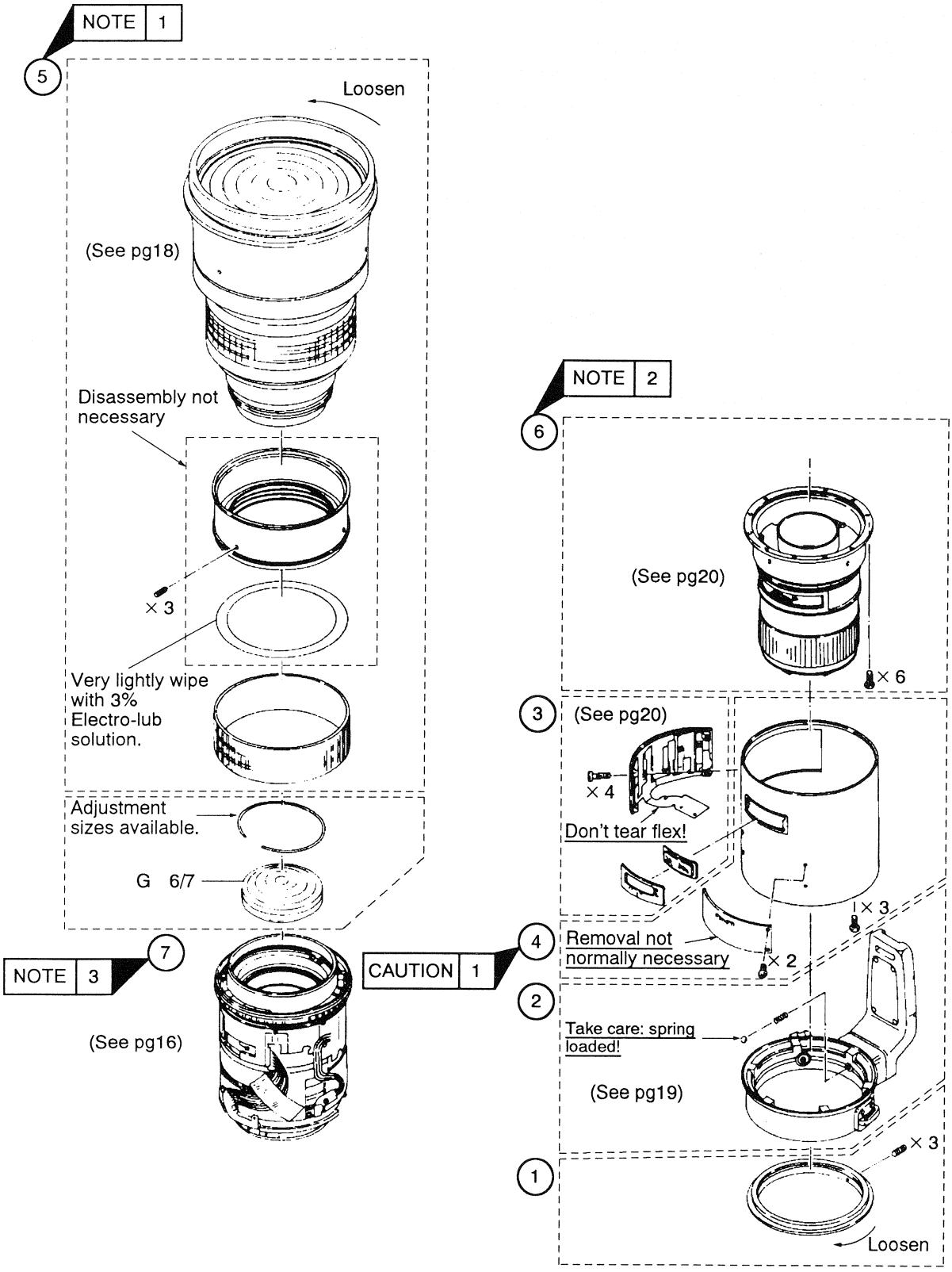
When the main flex is replaced, the pulse adjustment must be done and the focus adjusting pads and the USM frequency checked.



Expendables

Part No.	Name	Remarks	Plastic Safe?
-Adhesives-			
CY4-9102-000	Acetate cloth tape	Holding leads and flex, replaces double-stick tape	Yes
CY9-8002-000	Bond G103	General purpose bond	No
CY9-8008-000	Arontite L	For staking screws	No
CY9-8011-000	Screw-lock	For staking screws	Yes
-Lubricants-			
CY9-8044-000	GE-X8	Zoom helicoid mix (Metal OK)	Yes
CY9-8045-000	GE-C4	Helicoid & cam (Metal OK)	
CY9-8067-000	MoS_2 grease	Tripod socked ring knob, G1 and Front lens unit threads	No
CY9-8039-000	Electro-lub 2GX	Focusing Pattern (Dilute to 3% solution in Ethyl Alcohol and apply sparingly)	
-Miscellaneous-			
CY9-8078-000	Lacquer(light gray)	Touch-up paint	N/A
CY9-8090-000	NF-33	Moisture barrier	Yes

[DISASSEMBLY & ASSEMBLY]
EXTERNAL DISASSEMBLY



EXTERNAL DISASSEMBLY

Main Points

- Check lead dress before disassembly and route in the manner when assembling.
- When applying tape, make sure the lead wires lie flat and don't bunch up.

Disassembly Notes

1	Tripod Ring Assembly Collar	3 screws
2	Tripod Ring	
3	Switch Panel	4 screws
	Indicator Window	Comb connector
4	Indicator sleeve	3 screws
5	Front Lens Unit	3 screws
	Rubber Focusing Ring	(Use (0.9mm Allen wrench)
	Manual Focusing Ring	
6	EMD & Fixed Barrel	6 screws, lead wire
7	G6/7 Assembly Ring	
	G6/7 Lens	

■ Note 1

● Front Lens Unit Removal

Peel back the rubber focusing ring to gain access to the front lens unit screws. (Considerable force is necessary to unscrew the front lens unit.)

■ Note 2

● Main Flex Wiring

All of the leads are covered by tape. Remove the tape and unsolder the leads from either end.

* The VBAT and P – GND leads from the contact block and DC – DC Convertor are heavier gage than the other leads.

* The leads for coils A and B are interchangeable.

Assembly Notes

■ CAUTION 1

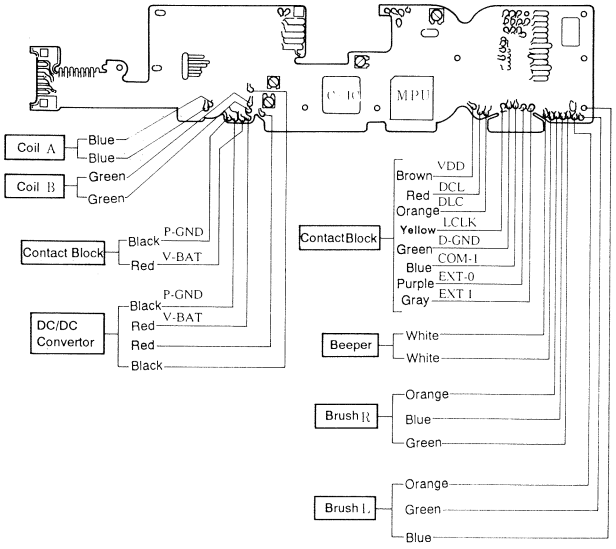
● Reassembly

Don't pinch any of the leads or tape when reassembling the lens.

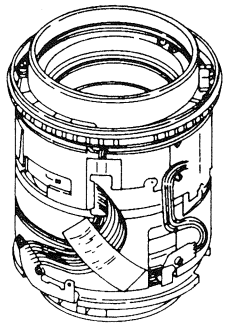
■ Note 3

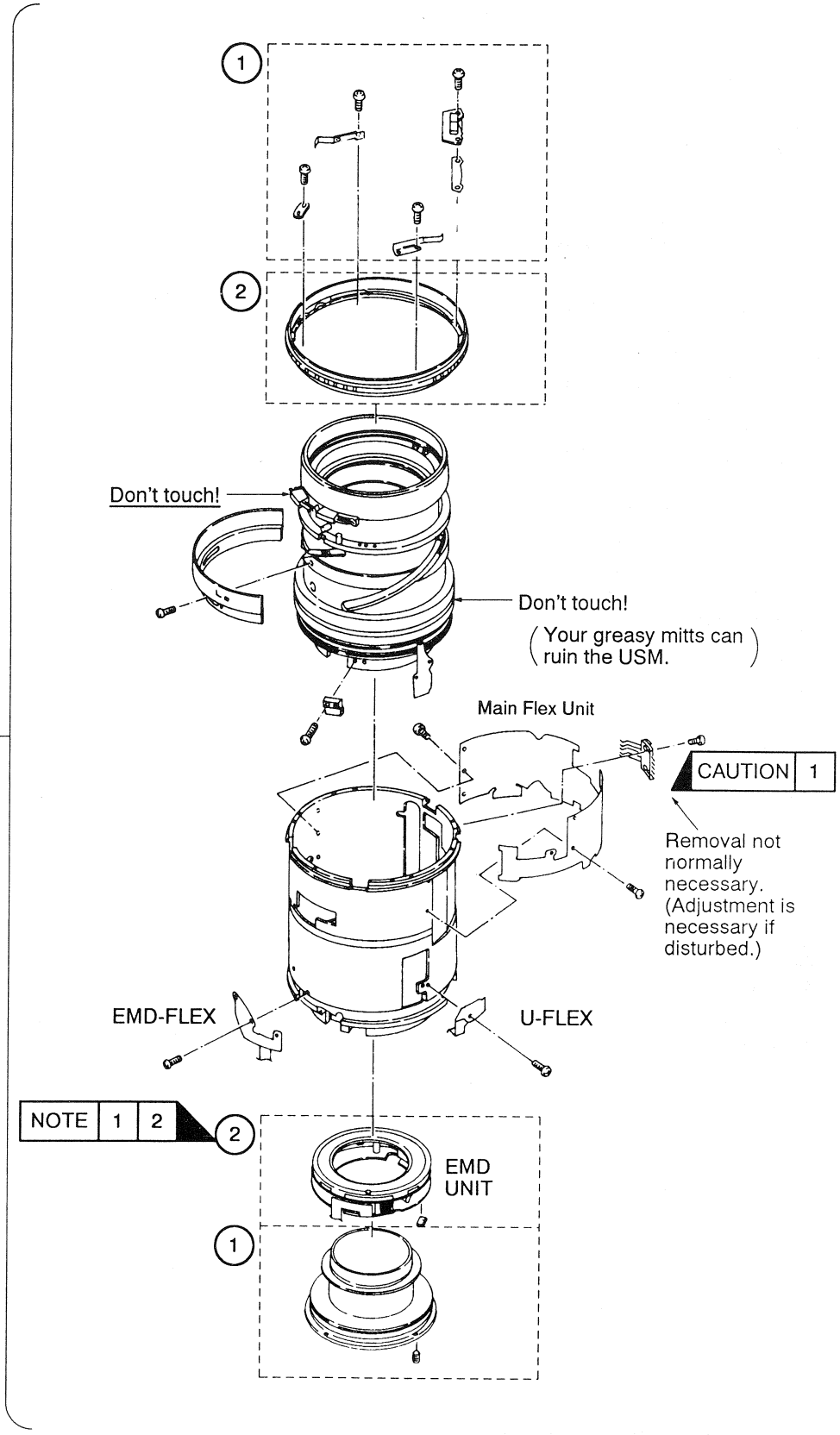
● G6/7 Reinstallation

After reinstalling G6/7 and its assembly ring, lightly tap the lens on the workbench. If the ring dislodges, chose a different sized ring.



USM, EMD & Main Flex Removal





USM, EMD & MAIN FLEX UNIT REMOVAL

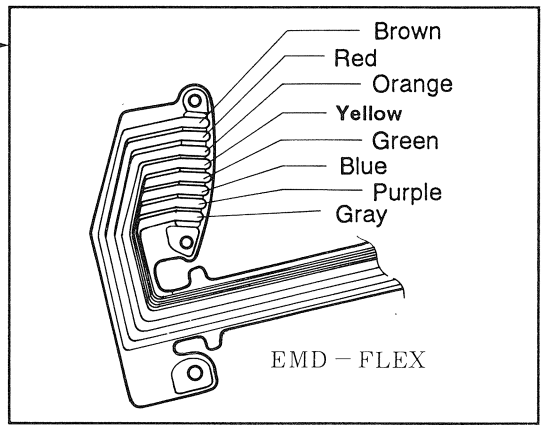
Main Points

- The USM Unit is not field-servicable. Do not disassemble.
- Lift the focus brush of the pattern when removing the main flex.

● EMD Unit Removal Order

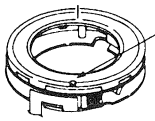
	8 leads(see NOTE 1), 2 screws	2 screw
1	EMD Unit Leads	1 screw
2	EMD Unit	

■ **Note 1**



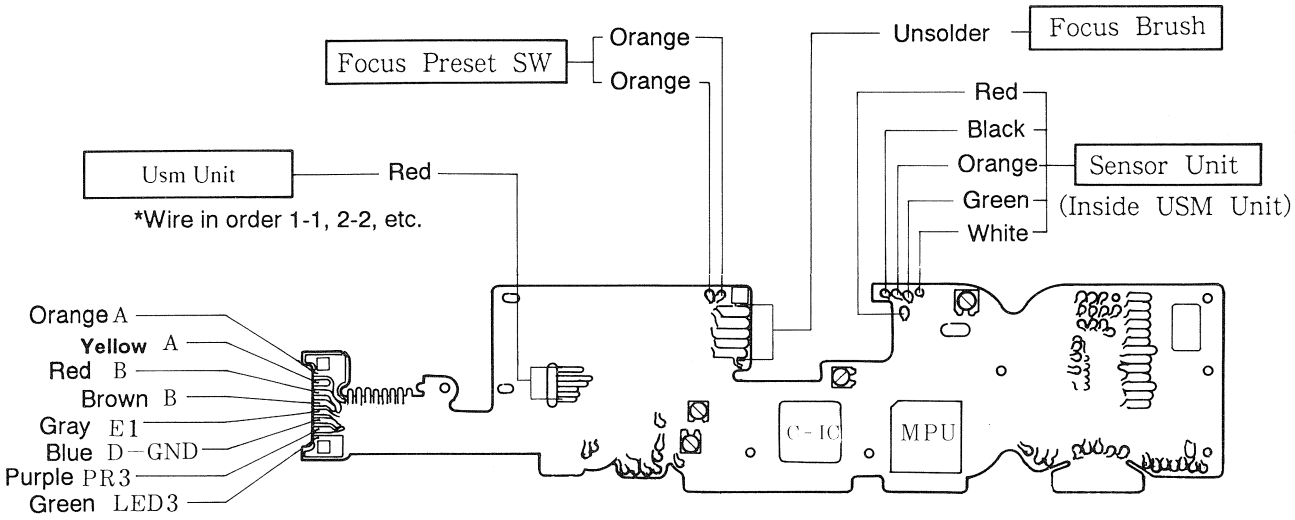
● EMD Unit Installation

■ **Note 2**



Make sure this pin fits into the hole properly.

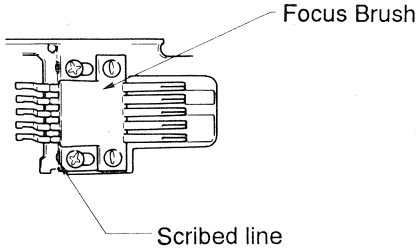
● Main Flex Removal



■ **CAUTION 1**

● Focus Brush Replacement

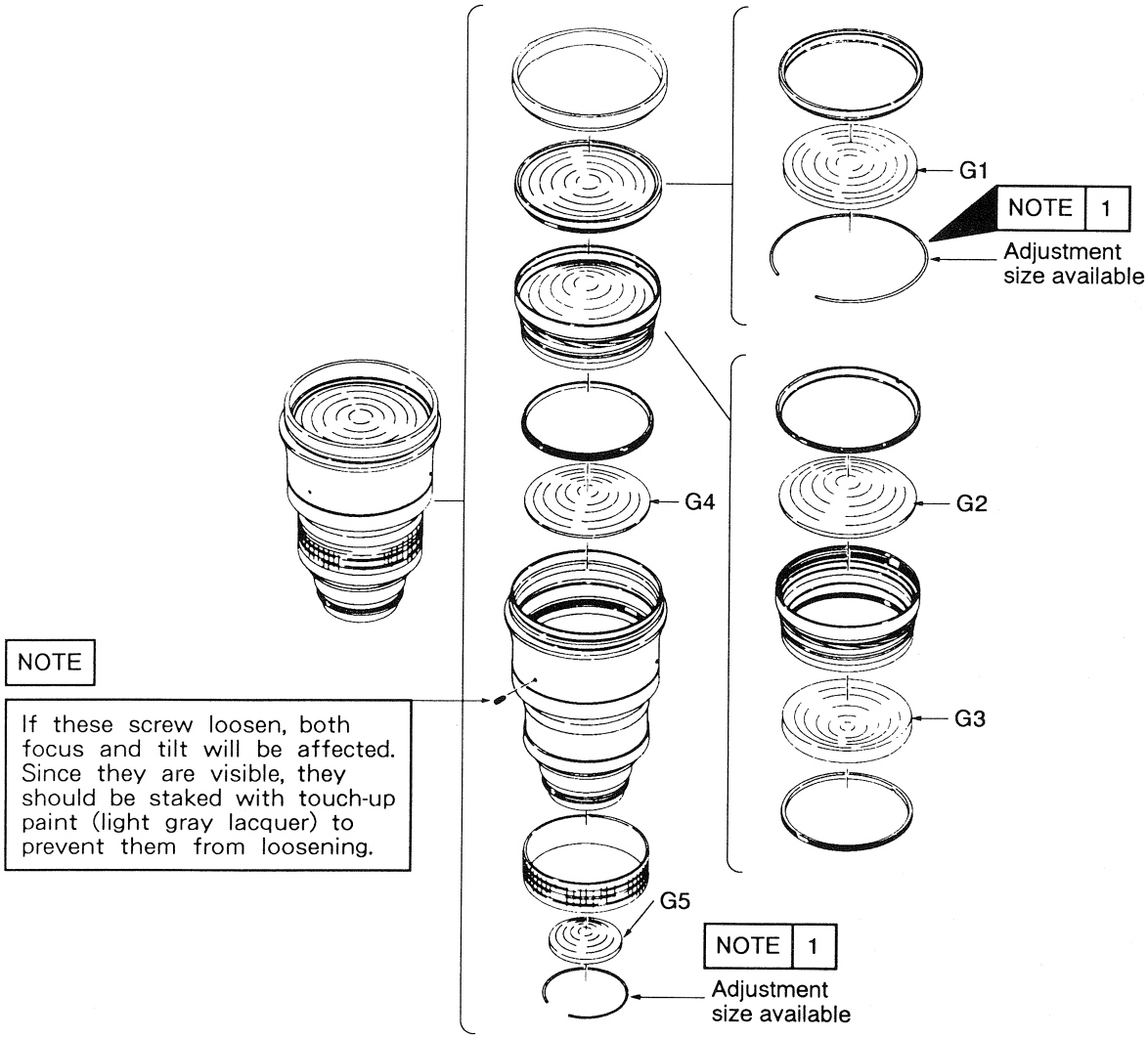
The focus brush position affects the infinity focus adjustment. Before removing the brush, mark its position to facilitate adjustment.



FRONT LENS UNIT DISASSEMBLY

Main Points

- If any of the option are disturbed, the focus adjustment must be performed.
- The assembly collay is staked with Screw-lock. Run some alcohol in to loosen before removing.
- The assembly collars may deform slightly when tightened. Tighten them once, then tap the lens lightly so the spring back to circular, and tighten again.



■ Note 1

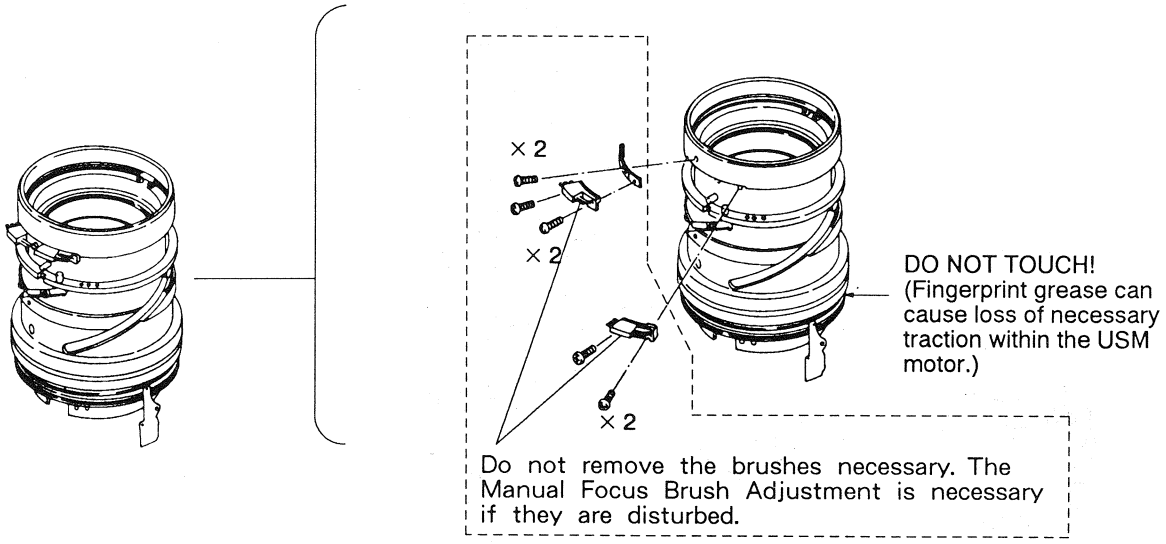
- After installing the assembly rings, tap the lens lightly. If the ring comes loose, use a different size. Apply Screw-lock completely around the rings.

LIMIT BRUSHES (L,R) & TRIPOD RING DISASSEMBLY

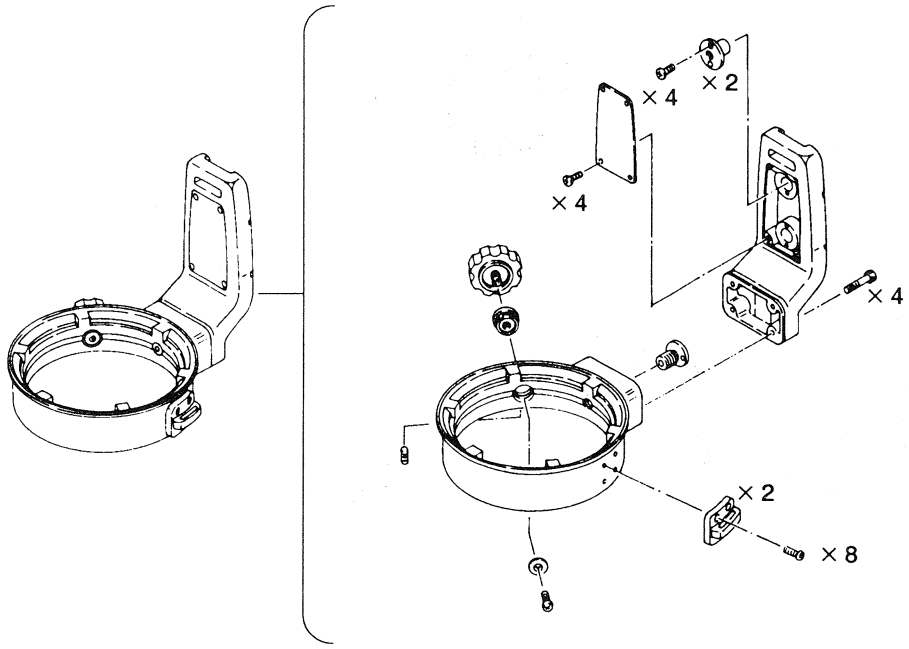
Main Points

- All the screws are staked with Arontite L. Take care not to strip the screw heads when loosening them.

Limit Brush Removal



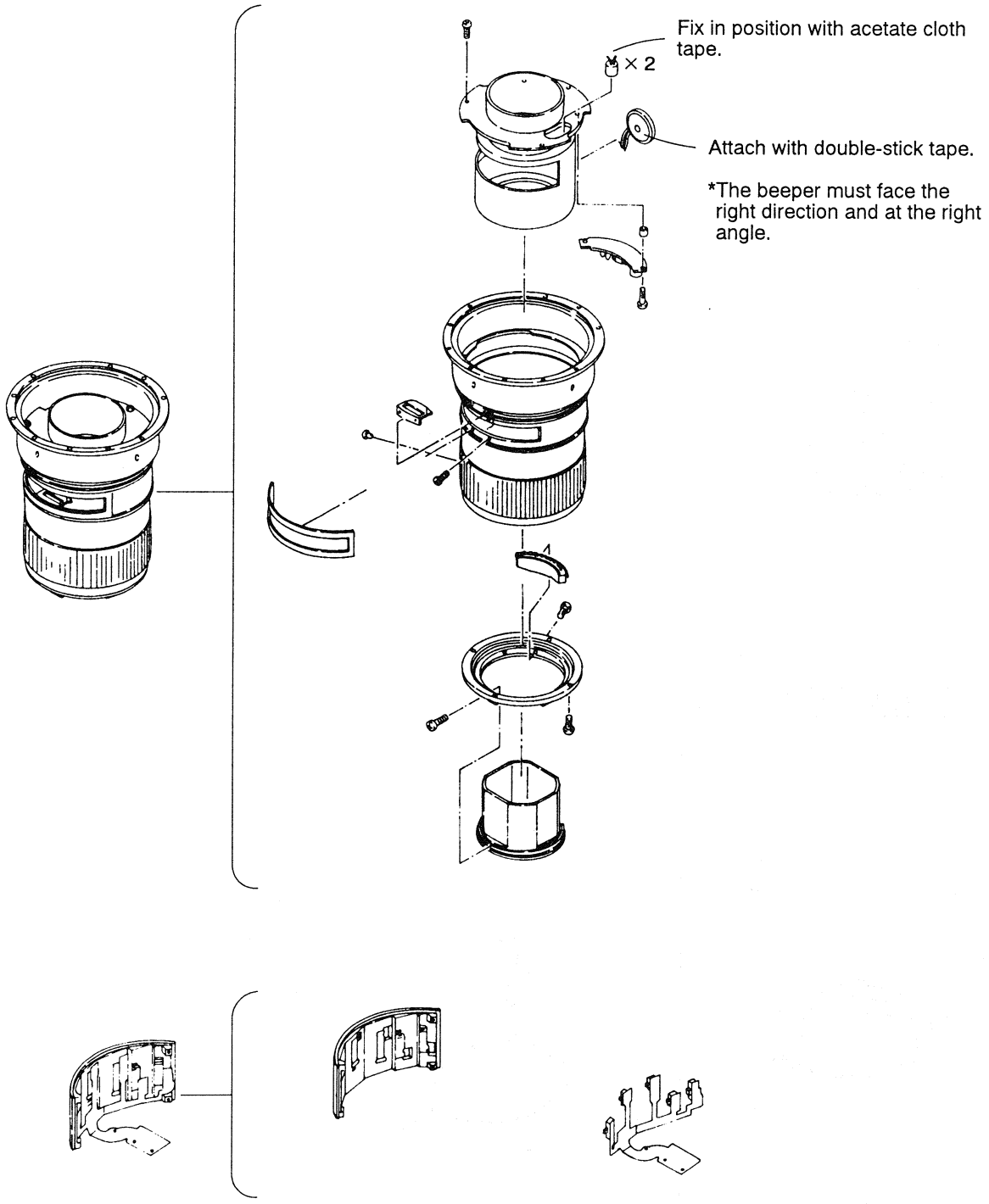
Tripob Socket Unit Disassembly



DC/CD CONVERTOR REMOVAL

Main Points

- Be careful of correct lead dress.



Adjustments

Manual Focus Brush Position Adjustment

This adjustment is necessary if the Brush L or R is replaced or erratic manual focusing occurs.

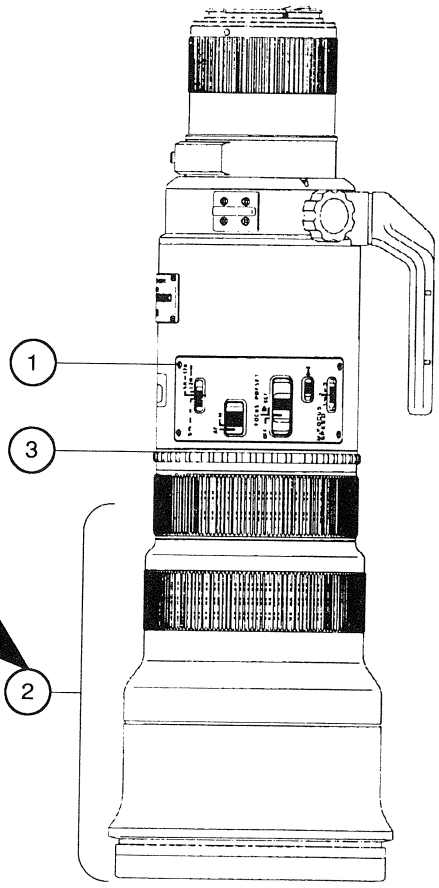
Purpose — Adjust the phase for manual focus ring operation.

Tools — Dual trace oscilloscope, EOS camera

Standard — 90° ± 45°

1. Remove (1) and (3).

1	SW panel	4 Screws Comb connector
2	Front lens unit Manual focus ring unit	3 screws Use a 0.9mm Allen wrench (See pg. [X])
3	Click Spring Focus preset ring	Screws (See pg. [X])

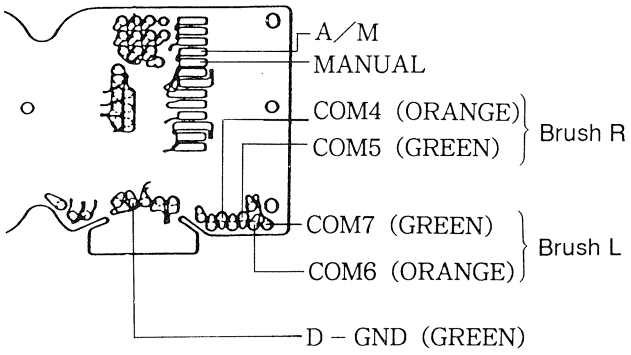


Note 1

Assemble the Manual Focus Ring Unit (2) after removing the Focus Preset Ring (3).

2. Attach test leads to the main flex at COM4 through COM7 and D-GND.

3. Short the A/M and MANUAL pads once to set manual focus, attach a camera.



1 NOTE

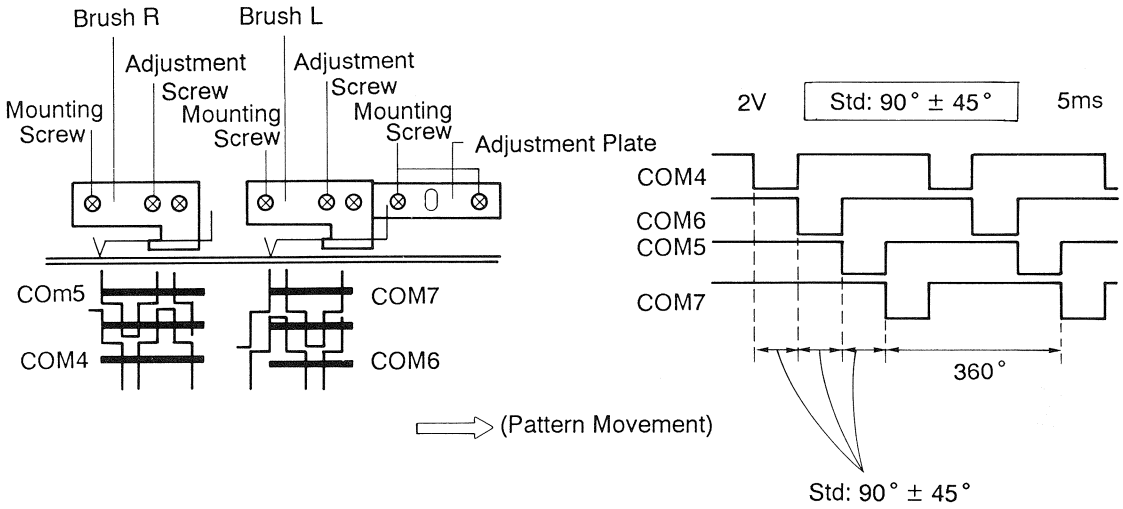
Adjustment

Adjust at the screw on Brush R first then the adjusting base under Brush L.

1. Attach COM4 test lead to CH1 and COM5 test lead to CH2 of a dual-trace scope. Turn the manual ring slowly while monitoring the scope. Adjust the screw on Brush R (SW8) until the pulses are 180° out of phase. Disconnect the leads.

2. Attach the COM6 and COM7 test leads and adjust Brush L (SW9) the same way.

3. Attach the COM4 and COM6 test leads. Turn the manual ring slowly while monitoring the scope. Adjust the adjusting base under Brush L so the pulses are 90° out of phase. This completes the adjustment.



4. After adjustment apply screw-lock on the fixing screws, the adjusting screws and the adjusting base.

5. Very lightly wipe the focusing pattern with a 3% solution of Electro-lub 2GX.

Pulse Adjustment

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

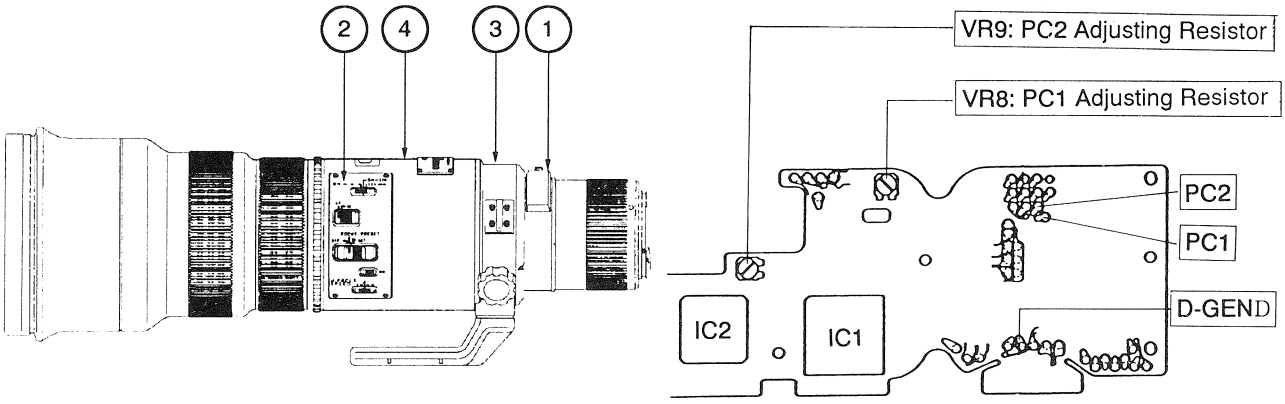
Purpose — To adjust the duty cycle for maximum power output

Tools — Oscilloscope, EOS camera

Standard — "T" and "t" times should be equal, within 10%.
$0.9T \leq t \leq 1.1T$

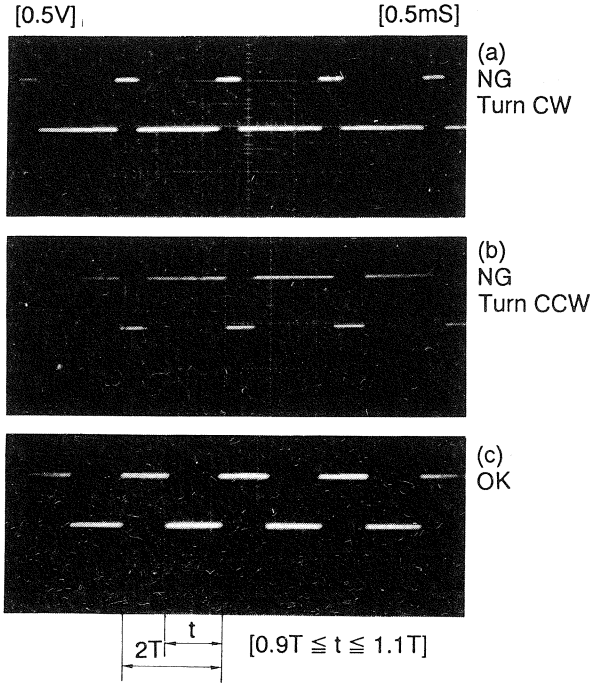
Preparation

1. Remove (1) - (3).
2. Attach test leads to the main flex at PC1, PC2 and D-GND.



Adjustment

1. Attach the PC1 lead and D-GND lead to the oscilloscope.
2. Press the shutter button, and adjust VR8 so the waveform matches the one shown in (C).
3. Next, repeat with the PC2 lead adjusting VR9.



USM Reference Frequency Adjustment

The USM / Helicoid Unit supplied as a service part is pre-adjusted at the factory. This adjustment is included for reference.

If compared to lenses of the same model, focusing speed is too high, too slow, or makes unusual noises, especially at extreme temperatures, check and adjust as necessary.

Purpose — To set the reference frequency for the ultrasonic focusing motor.

Equipment — Frequency Counter, EOS Camera with depth - of - field preview, except EOS 620

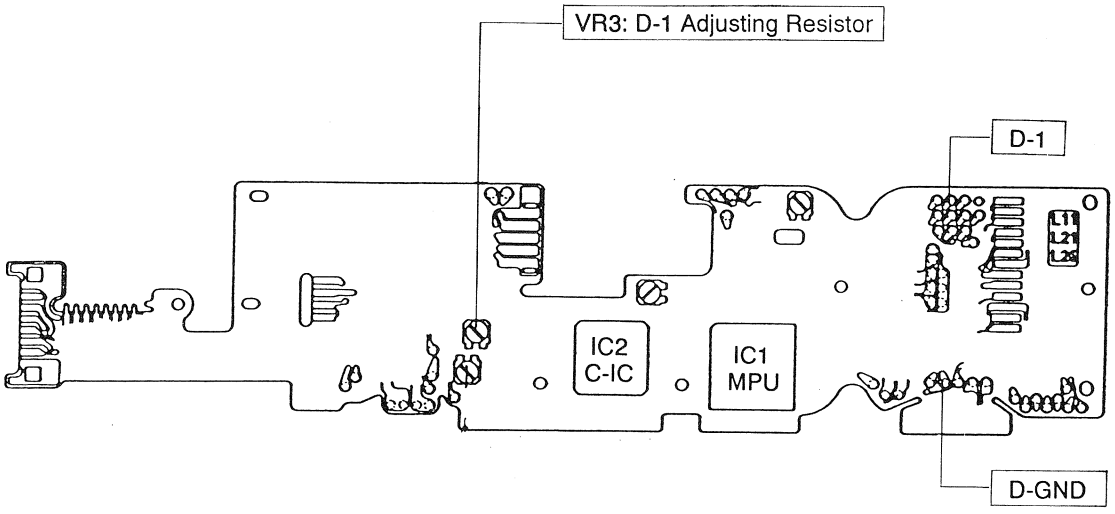
Standard — 29.6 ± 0.05kHz

Preparation — Disassembly is the same as the Pulse Adjustment (See pg. [21]).

Adjustment

1. Install test leads at D-1 and D-GND and connect to them to the frequency counter.
2. Mount the lens on a camera, press the D-O-F button, and read the frequency.

   If you adjust with EOS 620 camera, press the EL button instead of the D-O-F button.
3. It should be with in the limits shown in the standard. If not, adjust VR3.



Focus Adjustment

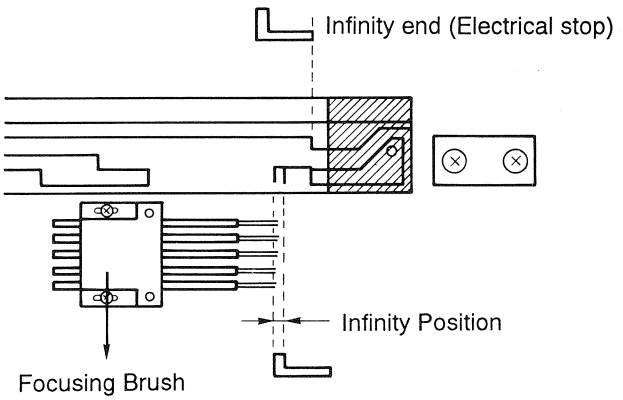
This adjustment is necessary if the optics have been disturbed, or if the index doesn't align properly when manually focusing at infinity.

When the lens is focused on an infinity target: the bottom contact of the focus brush is on the "infinity" position of the contact flex, and; the edge of the 2mm hole is flush with the edge of the notch in the barrel, the lens is correctly adjusted for infinity focus.

Purpose To adjust infinity focus.

1. Focus Stopper Adjustment (Electrical Stop Position)

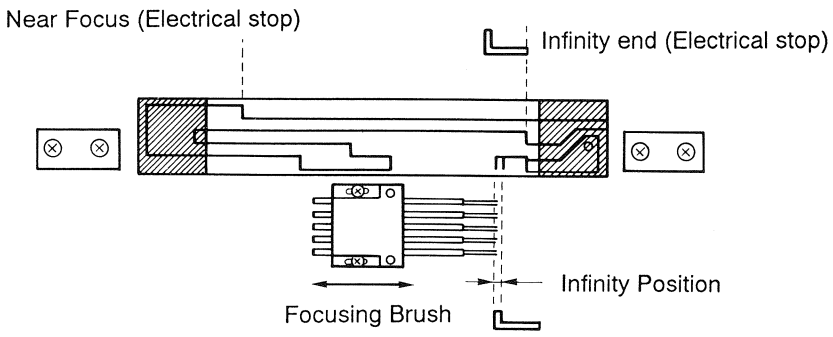
Standard



Adjustment

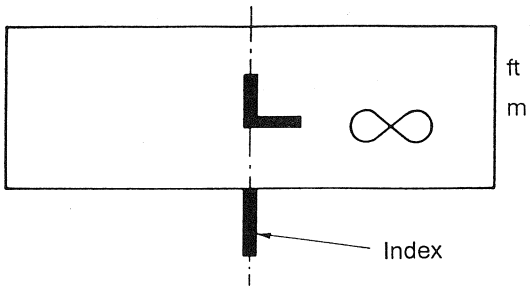
1. Manually focus on an infinity target, as distant as conditions allow ($100f^2$ is theoretically correct, but practically impossible in most situations).

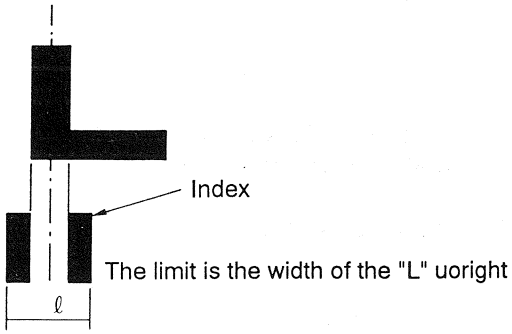
2. Set the focus brush so the bottom contact fall within the width of the infinity pattern. (Note: In the focusing brush is shown below the focusing pattern for clarity.)



2. Focusing Scale

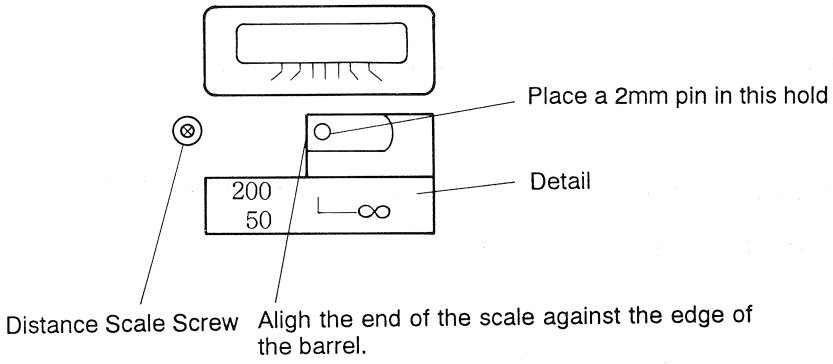
Standard





Adjustment

To align the upright of the infinity "L" mark with the index when it is installed later, place a 2mm diameter pin in the hole at the end of the scale and place it hard against the edge of the barrel. Tighten and stake the screw heads with screw-lock.



Reference

Resolution Chart

Image height	0 mm	4 mm	8 mm	12 mm	16 mm	20 mm
S	100	100	100	100	100	100
M		100	100	100	100	100

Focus Compensation

Purpose

To align the autofocus points as close as possible to the lenses actual best focus point.

Notes

At the factory, this correction is written into each individual lens' ROM with an expensive tool. This tool is much too costly for field use so service will use the following procedures instead.

1. If the Main Flex is replaced, check the AF ADJ0 through AF ADJ3 pads on the flex being replaced and bridge the new flex in the same way.
2. For other repairs, make no changes to the pads.
3. For customer complaints, determine the model of camera being used and adjust using one of the following two methods.

Adjustment 1

If front defocus, increase plus correction. If rear defocus, increase negative correction.

Adjustment 2

Make actual photographic test at with the pads in all four possible combinations. Make five or six negatives for each combination. Examine the negatives closely to determine which combinations is best.

Test Conditions:

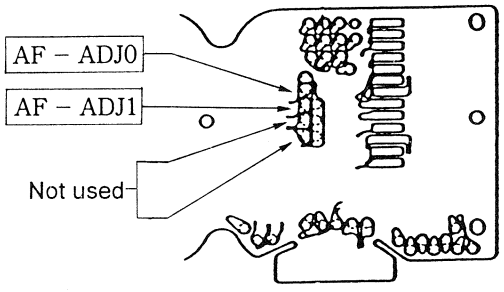
Distance: 15m

Target: Casual Resolution Chart with the AF standard bar chart in center.

Aperture: Maximum

Focusing: Return lens to infinity after each exposure and autofocus on bar chart.

Camera: EOS with Aperture Priority (AV) Mode



Correction	AF – ADJ0	AF – ADJ1
– 3/4F δ	1	0
– 1/4F δ	0	0
+ 1/4F δ	1	1
+ 3/4F δ	0	1

F: Maximum aperture
δ : Minimum Circle of confusion

0: Closed
1: Open

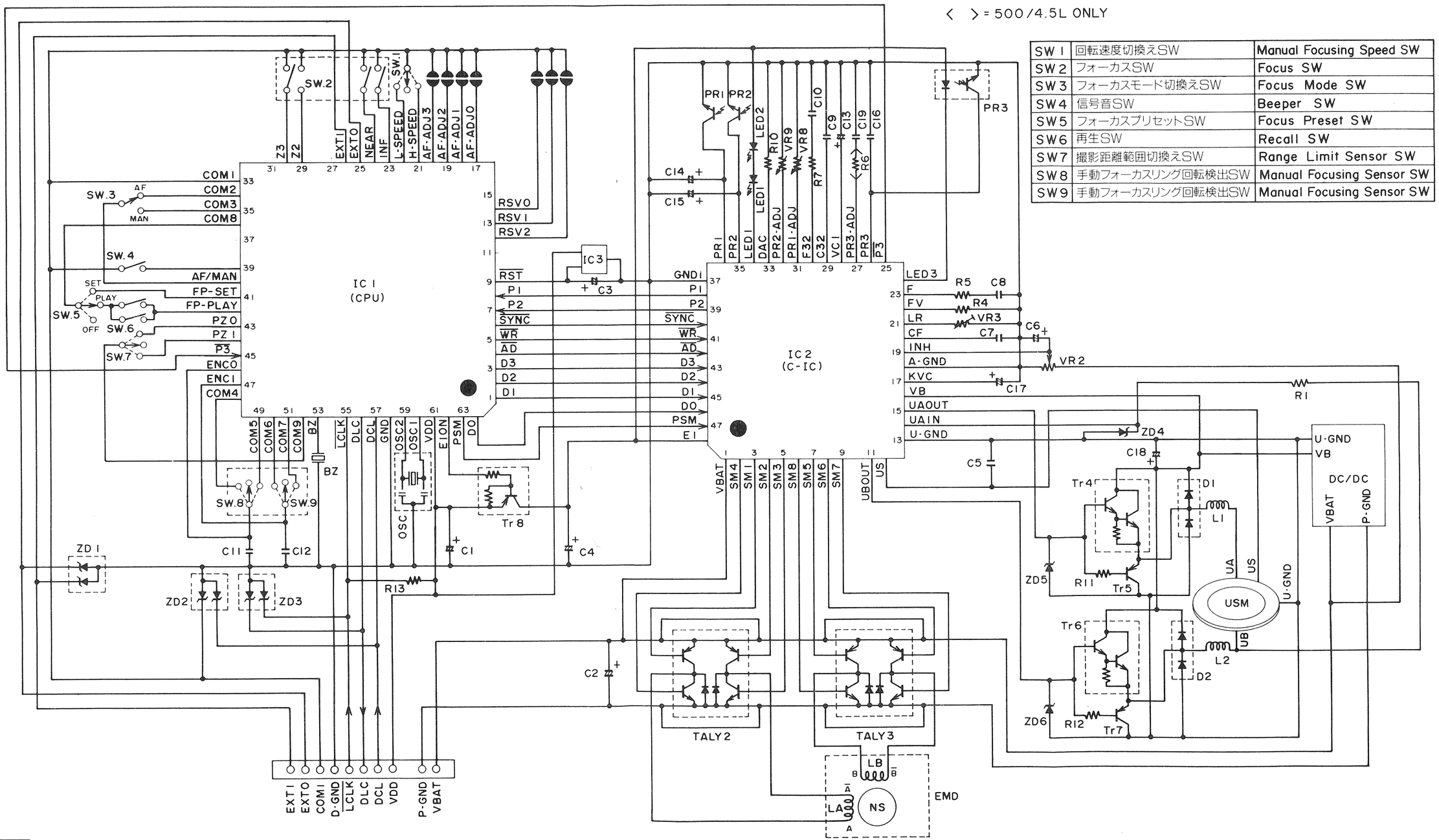
CANON LENS EF200mm 1:1.8L　EF500mm 1:4.5L
EF300mm 1:2.8L (NEW)
EF600mm 1:4.0L
EF400mm 1:2.8L

REF. NO. C21-8272
C21-8252
C21-8292
C21-8282
C21-8352

SCHEMATIC DIAGRAM

< > = 500/4.5L ONLY

SW1	回転速度切換えSW	Manual Focusing Speed SW
SW2	フォーカスSW	Focus SW
SW3	フォーカスモード切換えSW	Focus Mode SW
SW4	信号音SW	Beeper SW
SW5	フォーカスプリセットSW	Focus Preset SW
SW6	再生SW	Recall SW
SW7	撮影距離範囲切換えSW	Range Limit Sensor SW
SW8	手動フォーカスリング回転検出SW	Manual Focusing Sensor SW
SW9	手動フォーカスリング回転検出SW	Manual Focusing Sensor SW

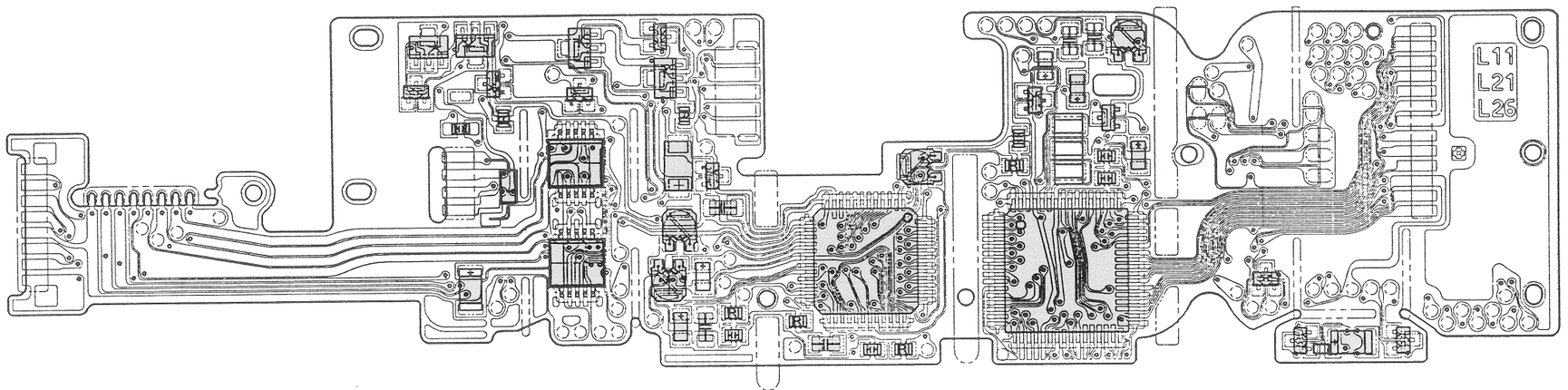


03 JAN, 1992

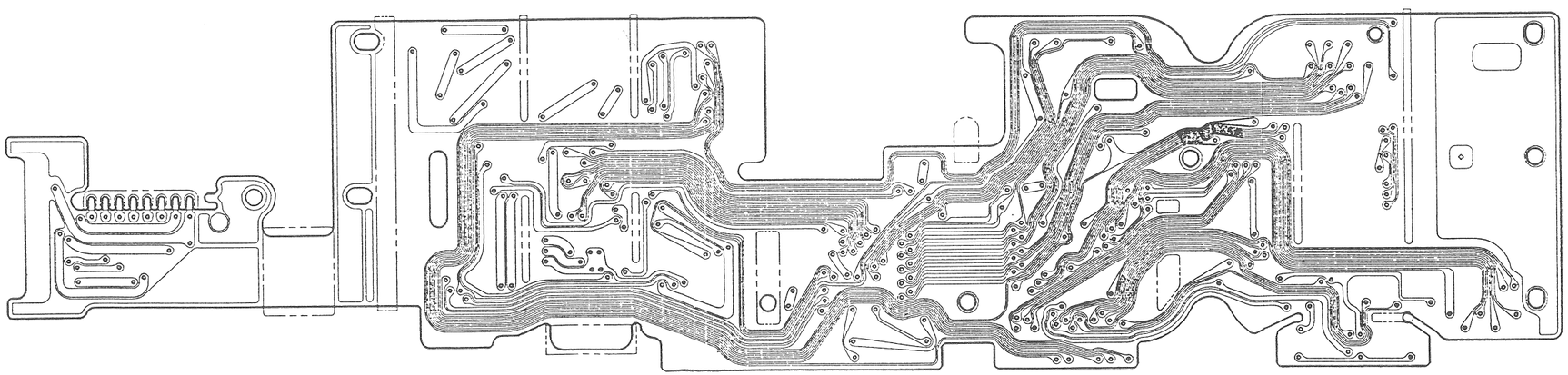
REF. NO. C21-8272
C21-8252
C21-8292
C21-8282
C21-8352

CANON LENS EF200 mm 1:1.8L
EF300 mm 1:2.8L (NEW)
EF600 mm 1:4.0L
EF400 mm 1:2.8L
EF500 mm 1:4.5L

P.C.B. DIAGRAM
(MAIN FLEX)



(Thru View)

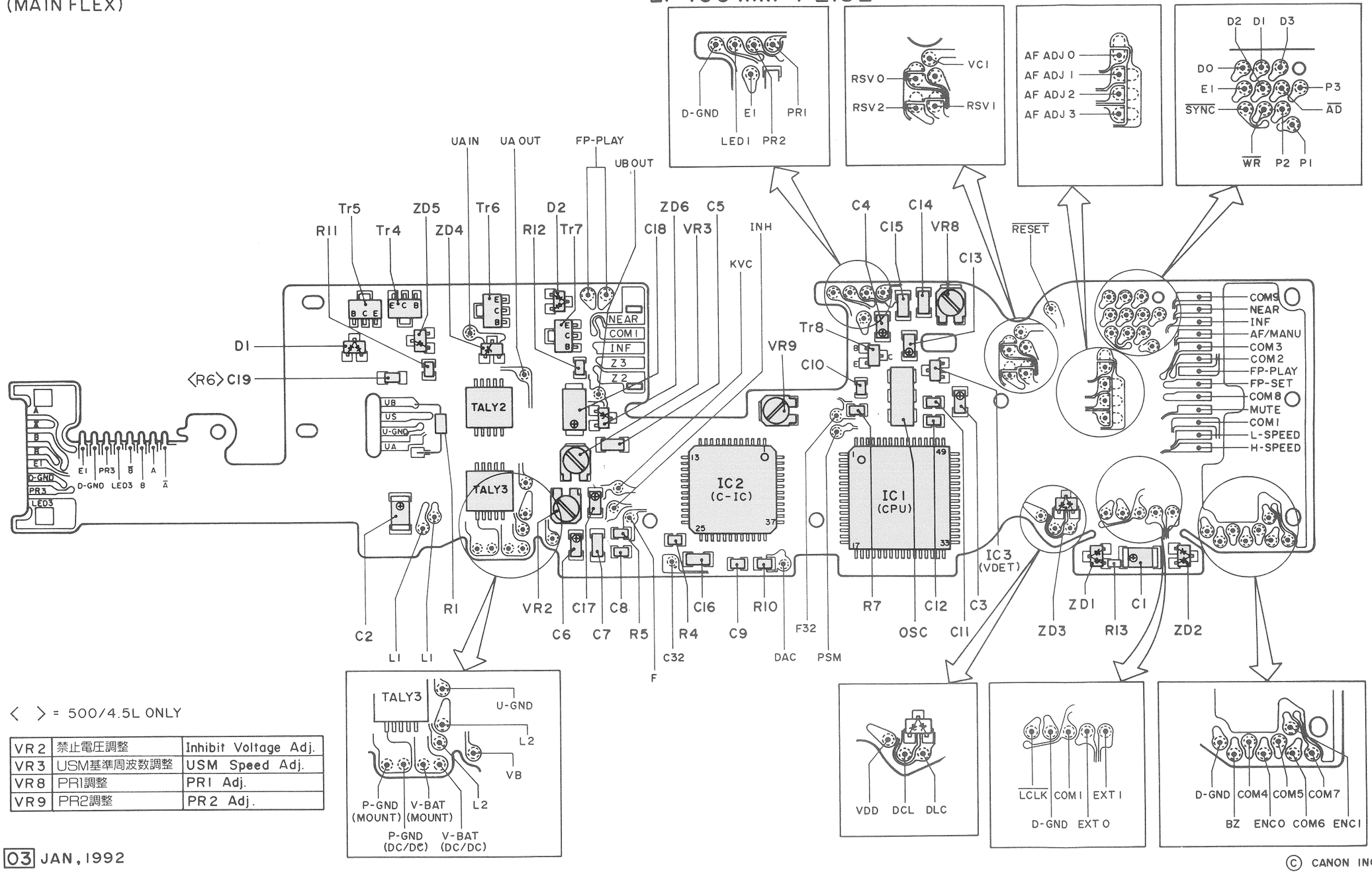


03 JAN, 1992

REF. NO. C21-8272
C21-8252
C21-8292
C21-8282
C21-8352

CANON LENS EF200mm 1:1.8L EF500mm 1:4.5L
EF300mm 1:2.8L (NEW)
EF600mm 1:4.0L
EF400mm 1:2.8L

P.C.B. DIAGRAM
(MAIN FLEX)



< > = 500/4.5L ONLY

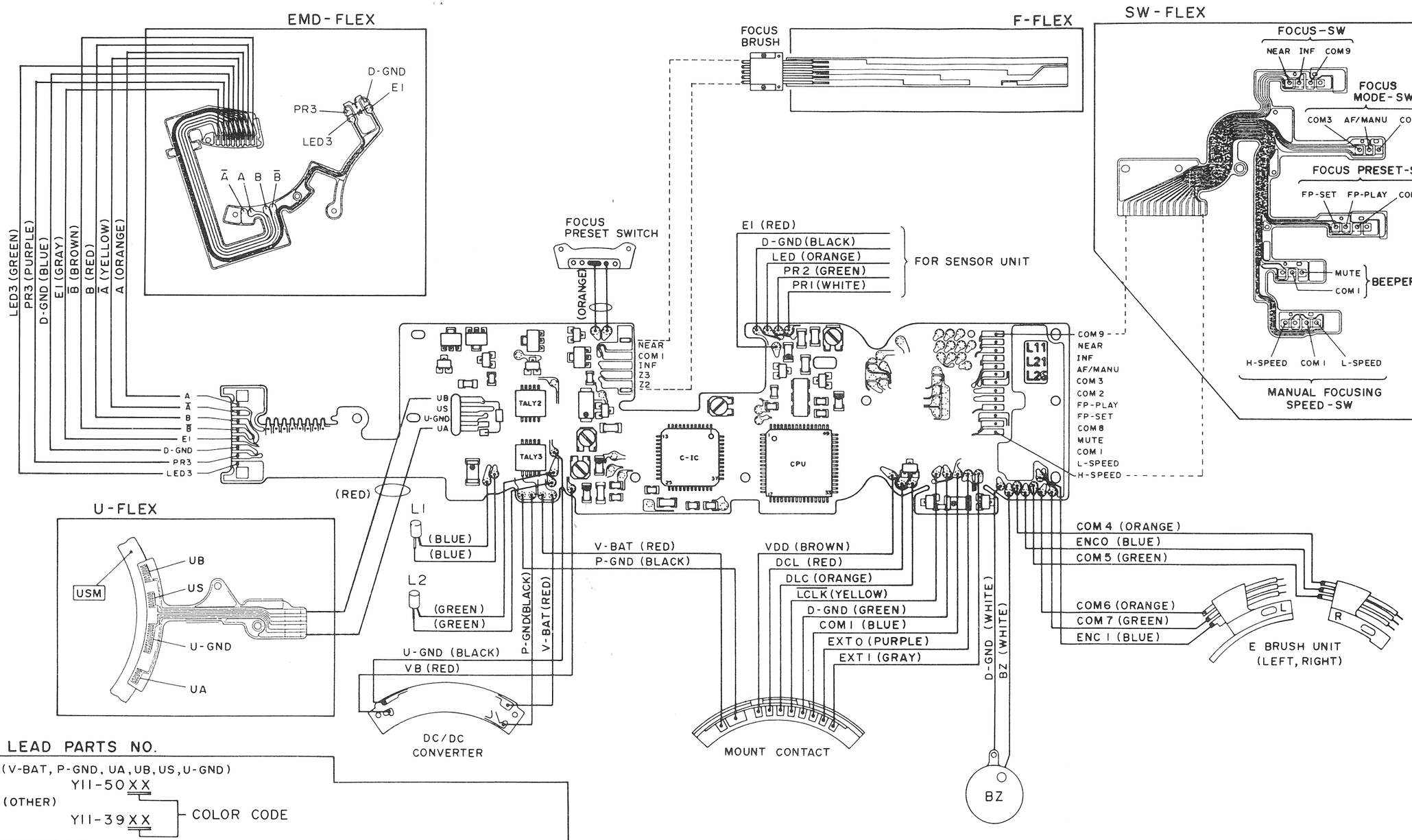
VR2	禁止電圧調整	Inhibit Voltage Adj.
VR3	USM基準周波数調整	USM Speed Adj.
VR8	PR1調整	PR1 Adj.
VR9	PR2調整	PR2 Adj.

03 JAN, 1992

REF. NO. C21-8352

CANON LENS EF 500 mm 1:4.5L

WIRING & P.C.B. DIAGRAM



LEAD PARTS NO.

(V-BAT, P-GND, UA, UB, US, U-GND)
Y11-50XX

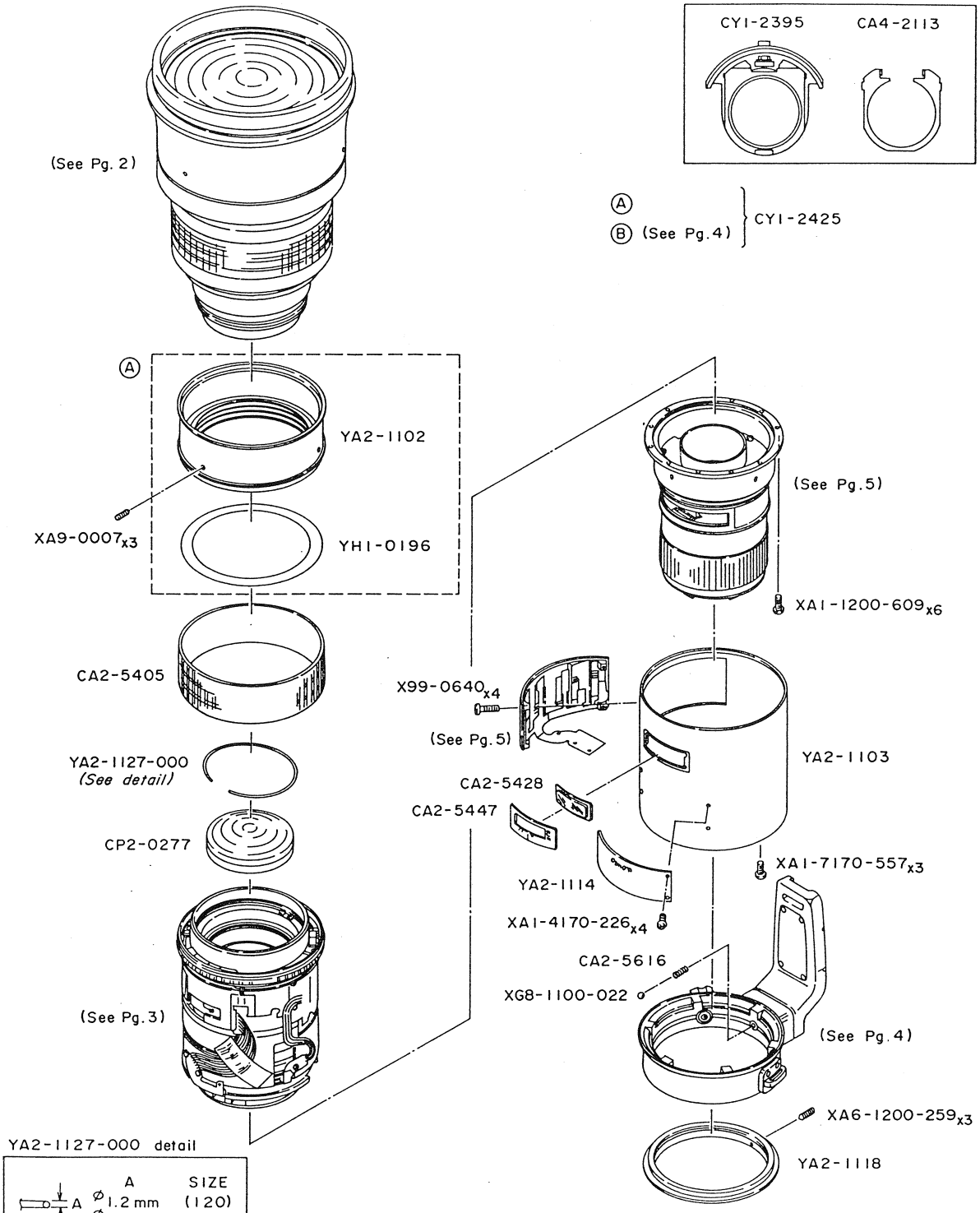
(OTHER)
Y11-39XX — COLOR CODE

COLOR	WHITE	BLACK	RED	ORANGE	YELLOW	GREEN	BLUE	PURPLE	BROWN	GRAY
COLOR CODE	01	02	03	06	07	09	11	12	13	14

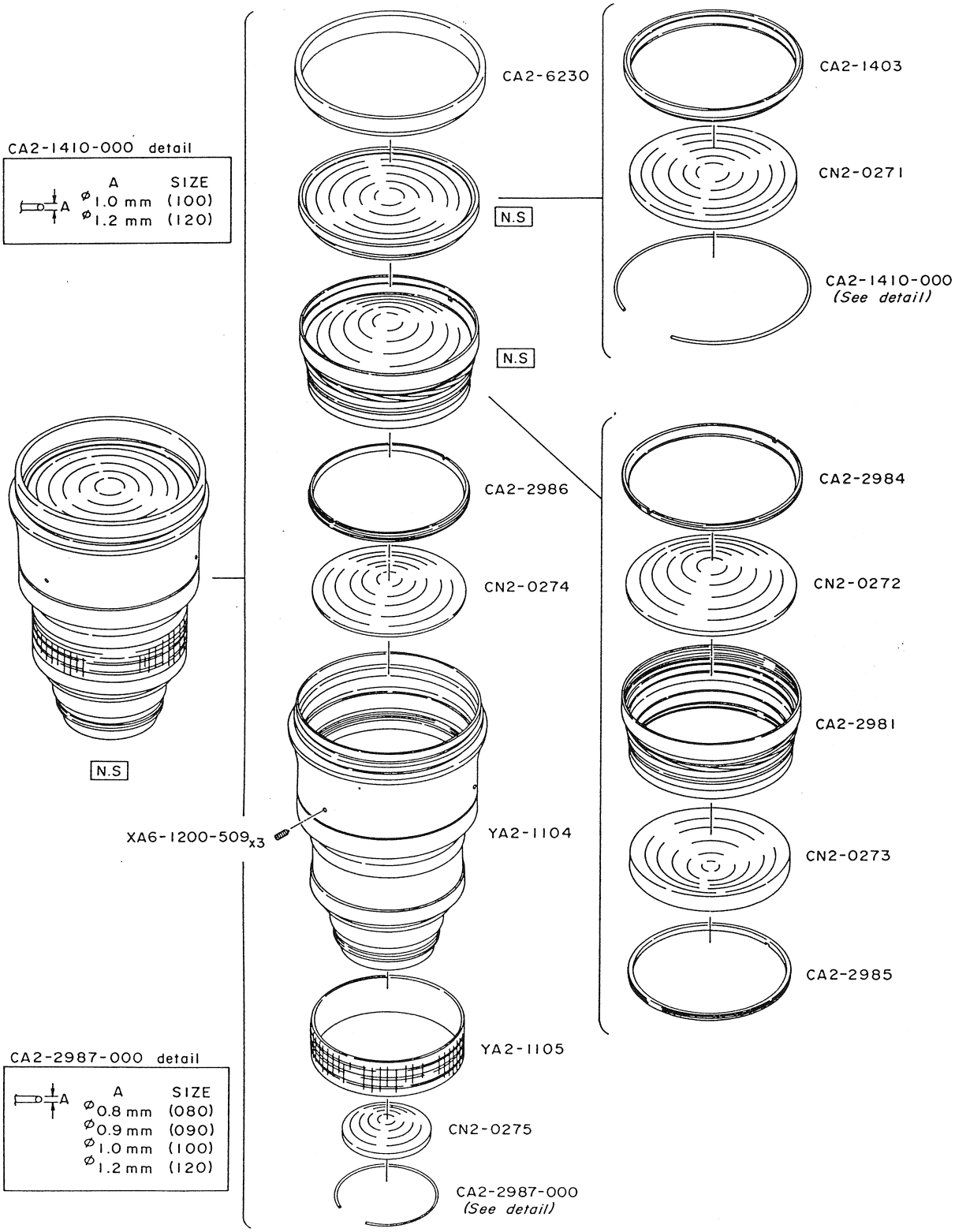
01 JAN, 1992

PARTS CATALOG

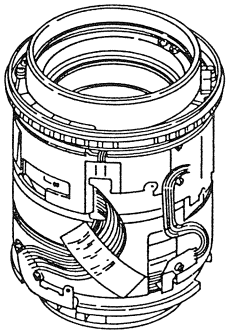
CANON LENS EF 500 mm 1:4.5L



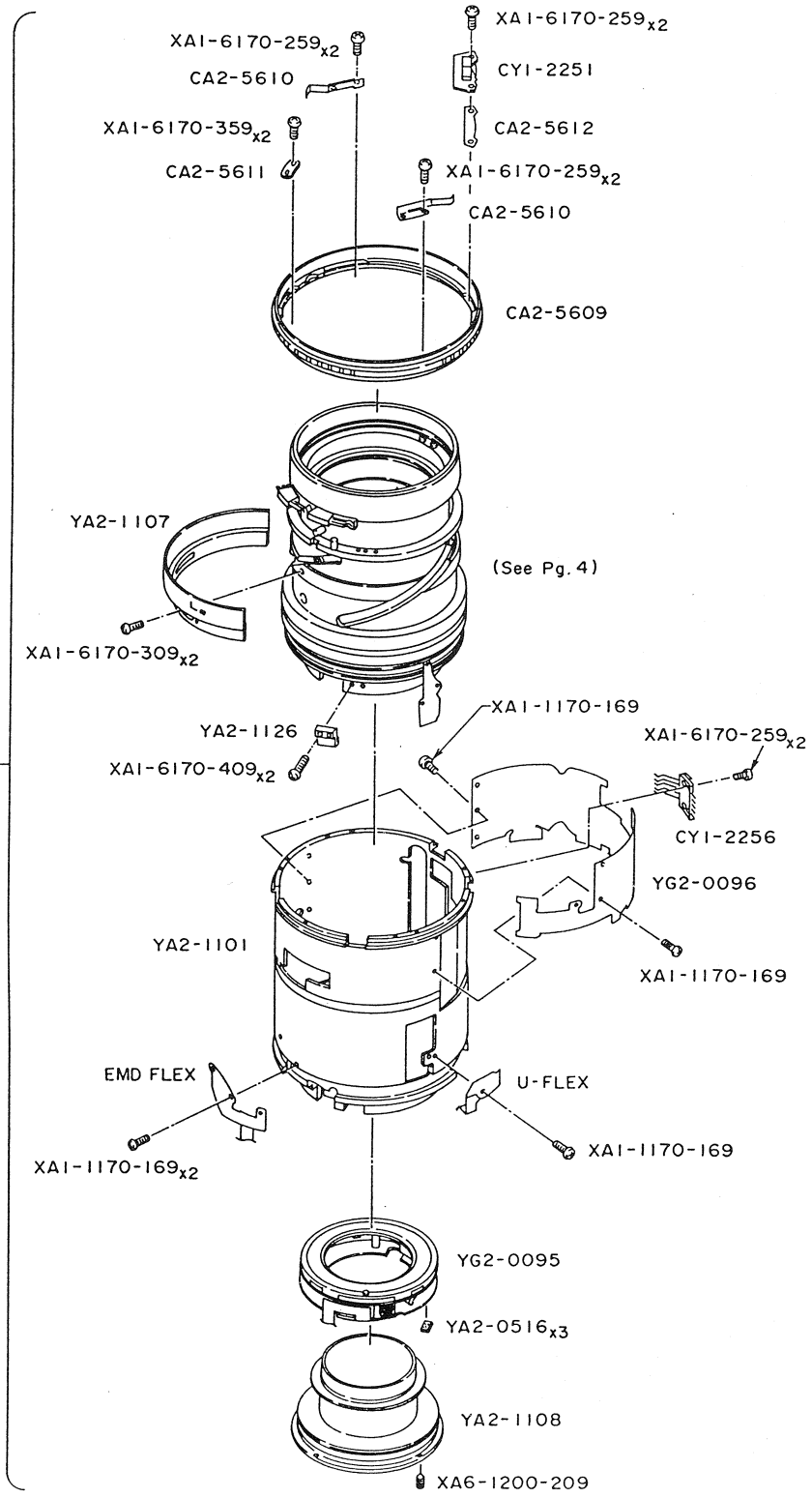
CANON LENS EF 500 mm 1:4.5L



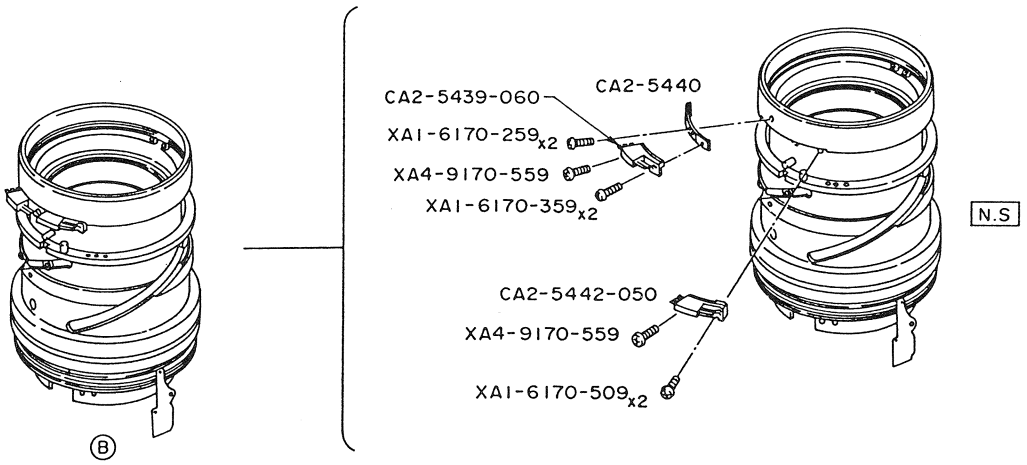
CANON LENS EF 500 mm 1:4.5L



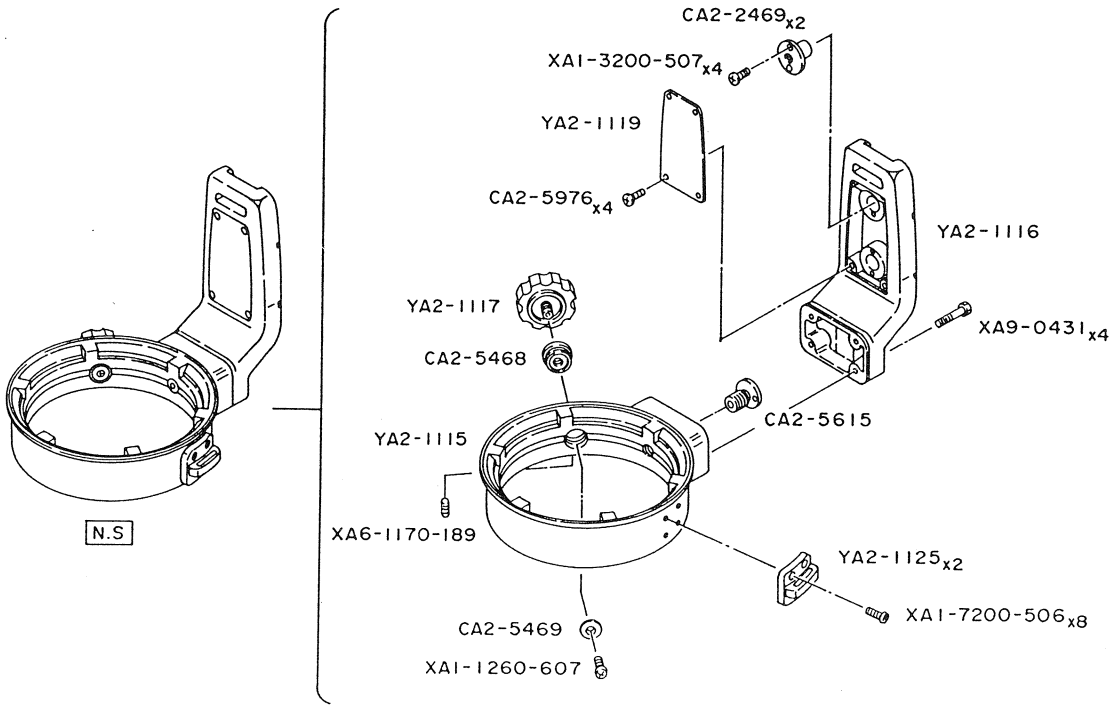
N.S



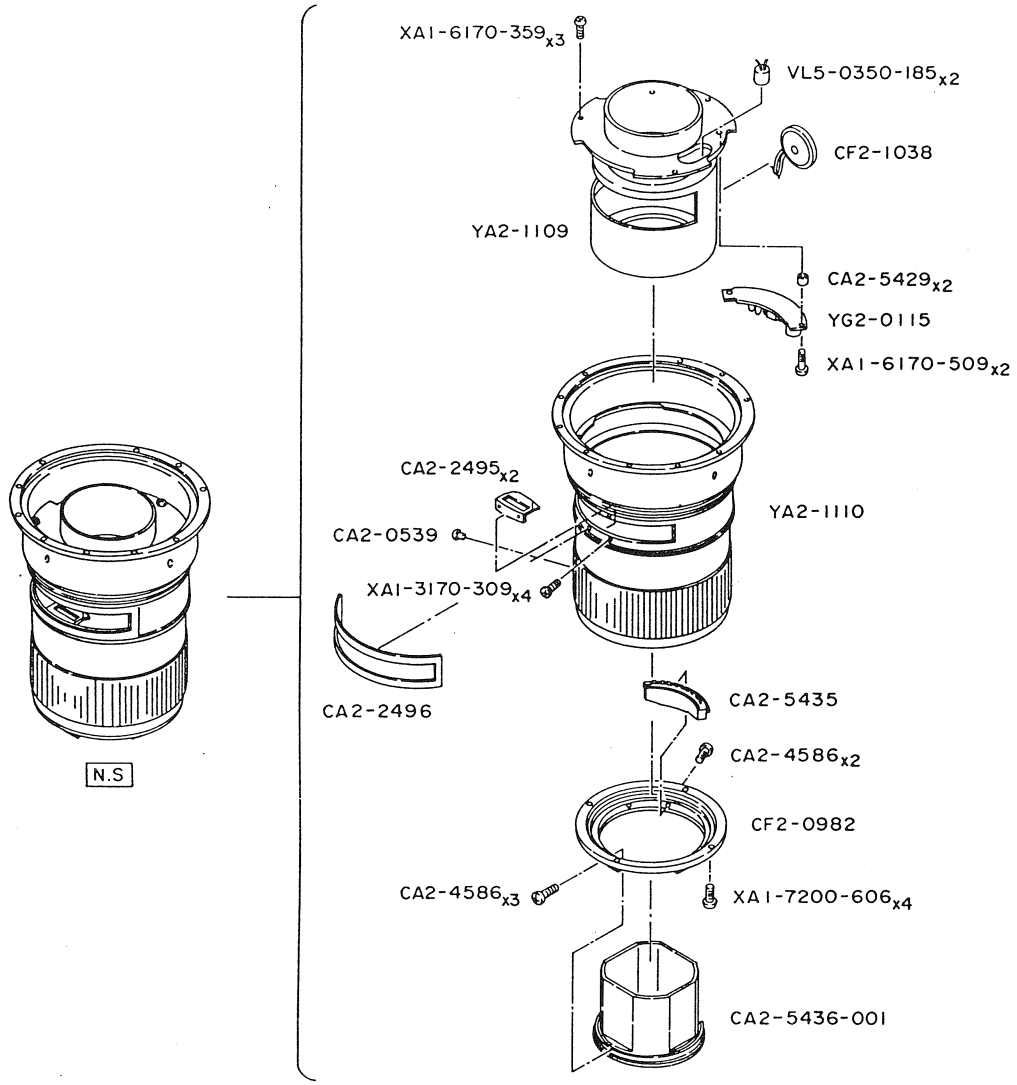
CANON LENS EF 500 mm 1:4.5L

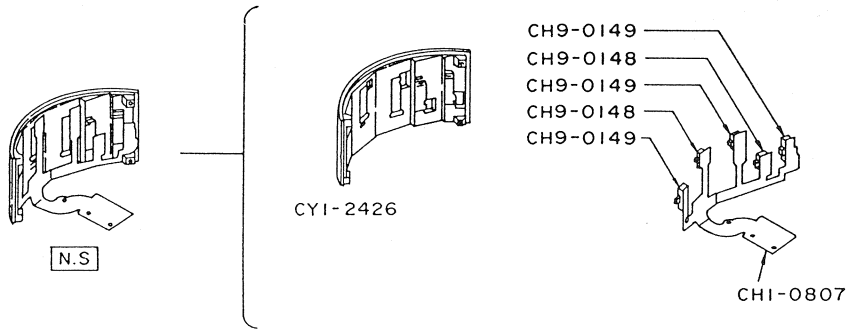


Ⓐ (See Pg. 1)
Ⓑ
} CY1-2425



CANON LENS EF 500 mm 1:4.5L





P A R T S　L I S T

EF500mm1：4.5L
REF.NO.C21－8352

NEW	PARTS NO.	CLASS	QTY	DESCRIPTION		PAGE
	CA2-0539-000	E	1	RED MOUNTING INDEX	固定指標	5
	CA2-1403-000	E	1	BARREL, LENS	G1金物	2
	CA2-1410-000(XXX)	E	1	RING, SNAP	G1押さえリング	2
	CA2-2469-000	D	2	SOCKET, TRIPOD	三脚ネジ	4
	CA2-2495-000	D	2	GUIDE, FILTER	フィルターガイド	5
	CA2-2496-000	C	1	SEAL, RUBBER	フィルターゴム	5
	CA2-2981-000	E	1	BARREL, FRONT LENS	前群鏡筒	2
	CA2-2984-000	E	1	COLLAR, ASSEMBLY	G2押さえ環	2
	CA2-2985-000	E	1	COLLAR, ASSEMBLY	G3押さえ環	2
	CA2-2986-000	E	1	COLLAR, ASSEMBLY	G4押さえ環	2
	CA2-2987-000(XXX)	E	1	RING, SNAP	G5押さえ環	2
	CA2-4586-000	E	5	SCREW		5
	CA2-5405-000	D	1	RING, RUBBER	フォーカスゴム	1
	CA2-5428-000	E	1	WINDOW, DEPTH OF FIELD	距離窓	1
	CA2-5429-000	E	2	SPACER	DC／DCスペーサー	5
	CA2-5435-000	D	1	CONTACT ASS'Y	接点ブロック	5
*	CA2-5436-001	D	1	COVER, BACK	裏蓋	5
	CA2-5439-060	E	1	CONTACT L	Eブラシ　L	4
	CA2-5440-000	E	1	ADJUST BASE, E BRUSH	ブラシ調整台	4
	CA2-5442-050	E	1	CONTACT R	Eブラシ　R	4
	CA2-5447-000	D	1	SCALE, DEPTH OF FIELD	カバー	1
	CA2-5468-000	E	1	NUT, LOCK	三脚座ロックナット座	4
	CA2-5469-000	E	1	WASHER	三脚座ロックナット抜け止め	4
	CA2-5609-000	D	1	RING, FOCUS PRESET	フォーカスプリセットリング	3
	CA2-5610-000	E	2	SPRING, PLATE	中央バネ	3
	CA2-5611-000	E	1	STOPPER, F.P. RING	中央ストッパー	3
	CA2-5612-000	E	1	SPACER	SW受け台	3
	CA2-5615-000	E	1	HOLDER, BALL	クリックホルダ	4
	CA2-5616-000	E	1	SPRING, COIL	クリックバネ	1
	CA2-5976-000	D	4	SCREW	三脚座足蓋ビス	4
	CA2-6230-000	E	1	PROTECTOR	ガードゴム	2
	CA4-2113-000	D	1	HOLDER, GELATIN	ゼラチン押さえ板	1
*	CF2-0982-000	D	1	MOUNT, LENS	マウントカシメ	5
	CF2-1038-000	E	1	BEEPER	ブザー	5
	CH1-0807-000	E	1	SW-FLEX	SW-FLX	5
	CH9-0148-000	E	2	SWITCH, SLIDE	スライドスイッチ	5
	CH9-0149-000	E	3	SWITCH, SLIDE	スライドスイッチ	5
	CN2-0271-000	C	1	LENS, G1	G1レンズ	2
	CN2-0272-000	E	1	LENS, G2	G2レンズ	2
	CN2-0273-000	E	1	LENS, G3	G3レンズ	2

P A R T S L I S T

EF500mm1：4.5L
REF.NO.C21−8352

NEW	PARTS NO.	CLASS	QTY	DESCRIPTION		PAGE
	CN2-0274-000	E	1	LENS, G4	G4レンズ	2
	CN2-0275-000	E	1	LENS, G5	G5レンズ	2
	CP2-0277-000	E	1	LENS, G6/7	G6／7レンズ	1
	CY1-2251-000	E	1	PRESET SWITCH UNIT	ﾌｫｰｶｽﾌﾟﾘｾｯﾄSWﾕﾆｯﾄ	3
	CY1-2256-000	D	1	FOCUSING CONTACT UNIT	フォーカスブラシユニット	3
	CY1-2395-000	D	1	FILTER HOLDER UNIT	ゼラチンホルダーユニット	1
*	CY1-2425-000	D	1	FOCUSING UNIT	ヘリコイド／USMユニット	1
*	CY1-2426-000	D	1	SWITCH PANEL UNIT	スイッチパネルユニット	5
	VL5-0350-185	E	2	COIL	コイル	5
	XA1-1170-169		5	SCREW, CROSS-RECESS, PH		3
	XA1-1200-609		6	SCREW, PH2X6		1
*	XA1-1260-607		1	SCREW, PH2.6X6		4
	XA1-3170-309		4	SCREW, CROSS-RECESS, FCH		5
	XA1-3200-507		4	SCREW, FTH2X5 (S)		4
	XA1-4170-226		4	SCREW		1
	XA1-6170-259		10	SCREW, CROSS-RECESS, PH		3, 4
	XA1-6170-309		2	SCREW, CROSS-RECESS, PH		3
	XA1-6170-359		7	SCREW, CROSS-RECESS, PH		3, 4, 5
	XA1-6170-409		2	SCREW, CROSS-RECESS, PH		3
	XA1-6170-509		4	SCREW, CROSS-RECESS, PH		4, 5
*	XA1-7170-557		3	SCREW, CROSS-RECESS, PH		1
	XA1-7200-506		8	SCREW, CROSS-RECESS, PH		4
	XA1-7200-606		4	SCREW, CROSS-RECESS, PH		5
	XA4-9170-559		2	SCREW, CROSS-RECESS, PH		4
	XA6-1170-189		1	SETSCREW, SLOTTED, HLCP		4
	XA6-1200-209		1	SETSCREW, SLOTTED, HLCP		3
	XA6-1200-259		3	SETSCREW, SLOTTED, HLCP		1
*	XA6-1200-509		3	SETSCREW, SLOTTED, HLCP		2
	XA9-0007-000		3	SETSCREW, SLOTTED, HLCP		1
	XA9-0431-000		4	SCREW		4
	XG8-1100-022		1	BALL, STEEL		1
	X99-0640-000		4	SCREW, CROSS-RECESS, PH		1
	YA2-0516-000	E	3	RUBBER, FRICTION	基板押さえ	3
*	YA2-1101-000	E	1	SLEEVE	継筒	3
*	YA2-1102-000	E	1	RING, M-FOCUS	マニュアルリング	1
*	YA2-1103-000	D	1	SLEEVE, INDICATOR	外筒	1
*	YA2-1104-000	D	1	BARREL, FRONT LENS	前群継筒	2
*	YA2-1105-000	D	1	RING, RUBBER	前群ゴム	2
*	YA2-1107-000	E	1	SCALE, FOCUSING	距離目盛板	3
*	YA2-1108-000	E	1	SLEEVE, LIGHT SHIELD	EMD遮光筒	3

P A R T S　L I S T

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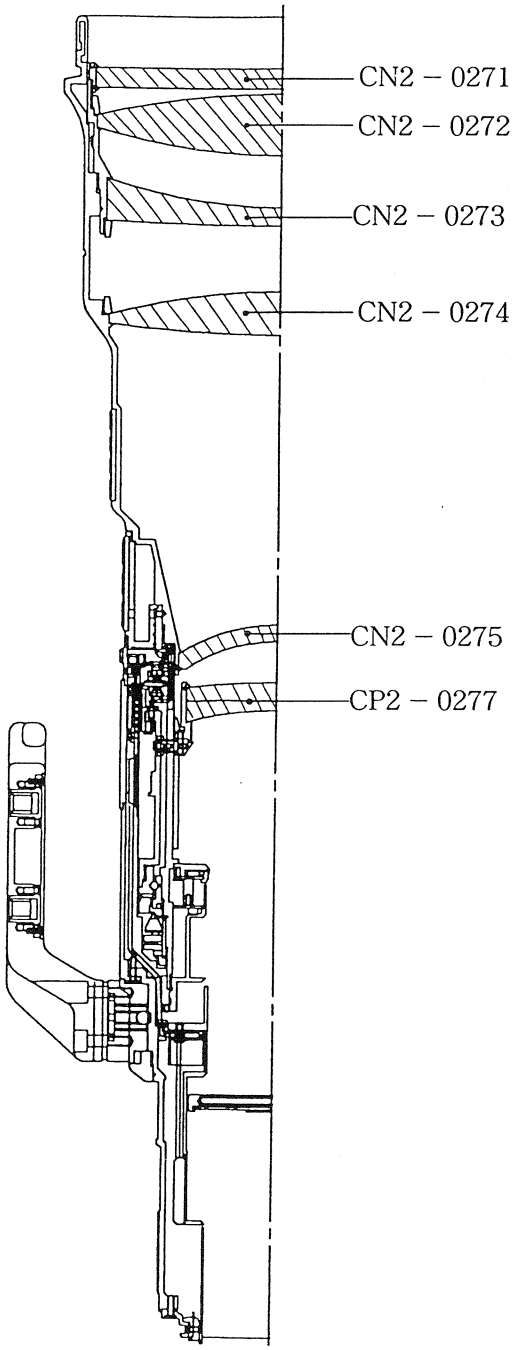
ＲＥＦ.ＮＯ.Ｃ２１－８３５２

NEW	PARTS NO.	CLASS	QTY	DESCRIPTION		PAGE
*	YA2-1109-000	E	1	SLEEVE, IRIS	固定筒絞り	5
*	YA2-1110-000	D	1	BARREL, FIXED	固定筒	5
*	YA2-1114-000	D	1	PLATE, NAME	銘板	1
*	YA2-1115-000	D	1	RING, TRIPOD	三脚座本体	4
*	YA2-1116-000	D	1	BASE, TRIPOD	三脚座足	4
*	YA2-1117-000	D	1	KNOB	三脚座ロックツマミ	4
*	YA2-1118-000	E	1	COLLAR, ASSEMBLY	三脚座取付けリング	1
*	YA2-1119-000	E	1	PLATE, COVER	三脚座足カバー	4
*	YA2-1125-000	D	2	LUG, STRAP	ストラップ金具	4
*	YA2-1126-000	E	1	STOPPER	本体廻り止め	3
*	YA2-1127-000(XXX)	E	1	RING, SNAP	Ｇ６／７押さえリング	1
*	YG2-0095-000	D	1	POWER DIAPHRAGM UNIT	ＥＭＤユニット	3
*	YG2-0096-000	D	1	MAIN FLEX CBA	メインフレキユニット	3
	YG2-0115-000	D	1	CONVERTER, DC/DC	ＤＣ／ＤＣコンバーター	5
*	YH1-0196-000	D	1	CONTACT BOARD, M-FOCUS		1

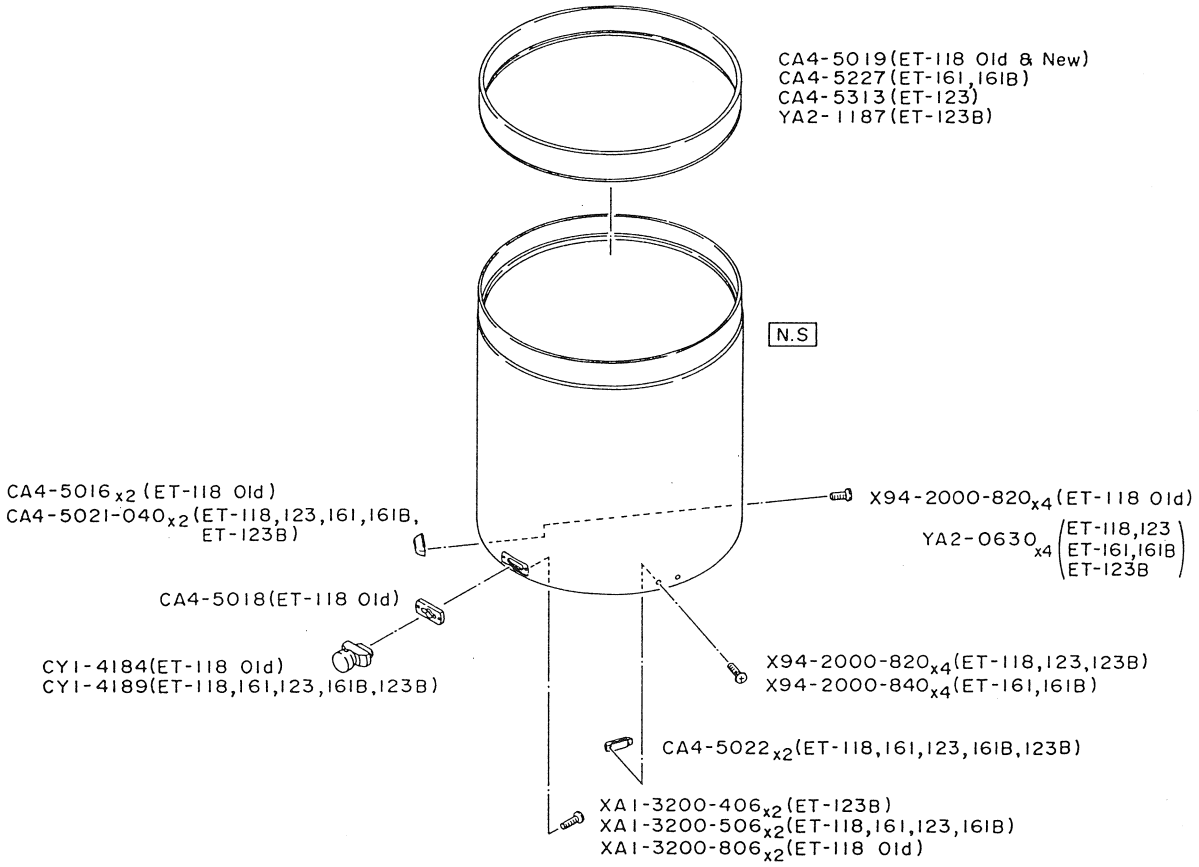
CANON LENS EF 500 mm 1 : 4.5L



REF. NO. C44-8121
C44-8131
C44-8141
C44-8151
C44-8161

CANON LENS HOOD

ET-118 FOR EF 300 mm 1:2.8L (OLD & NEW)
ET-161 FOR EF 600 mm 1:4.0L
ET-123 FOR EF 200 mm 1:1.8L
ET-161B FOR EF 400 mm 1:2.8L
ET-123B FOR EF 500 mm 1:4.5L



PART NO.	DESCRIPTION	ET-118(Old)	ET-118(New)	ET-161	ET-123	ET-161B	ET-123B
CA4-5016-000	TAB,HOOD	O					
CA4-5018-000	SPACER	O					
CA4-5019-000	PROTECTOR	O	O				
CA4-5021-040	TAB-1,HOOD		O	O	O	O	O
CA4-5022-000	TAB-2,HOOD		O	O	O	O	O
CA4-5227-000	PROTECTOR			O		O	
CA4-5313-000	PROTECTOR				O		
CY1-4184-000	LOCK UNIT	O					
CY1-4189-000	LOCK UNIT		O	O	O	O	O
XA1-3200-406	SCREW						O
XA1-3200-506	SCREW		O	O	O	O	
XA1-3200-806	SCREW	O					
X94-2000-820	SCREW	O	O		O		O
X94-2000-840	SCREW			O		O	
YA2-0630-000	SCREW		O	O	O	O	O
YA2-1187-000	PROTECTOR						O