Canon

# Service Manual

ENGLISH EDITION

## CANON LENS

## EF 50mm 1:1.0L (C21-6222)

## EF 85mm 1:1.2L (C21-7272)



CY8–1200–059

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# TECHNICAL INFORMATION

## EF 50mm f/1.0L

### Introduction

1. Development Brief

The EF 50mm f/1.0L lens is the world's first f/1.0 lens for an SLR camera. The lens was developed to meet the needs of professional photographers, and features high optical performance at maximum aperture and high-contrast image quality. It was designed to meet the requirements of those who place much importance on image quality, brightness, and blur effect with full aperture photography.

2. Features

- Low flare and high contrast despite the f/1.0 maximum aperture using two aspherical lenses.
- Floating element construction compensates for distance-sensitive aberration changes and provides quality images at all distances.
- Provides high performance by using glass with a high refractive index to correct curvature of field.
- Great color balance by using a new multi-layer coating developed exclusively for the high refractive index glass.
- The 50mm focal length and the ultra-large f/1.0 aperture give pleasant blur effects for objects not on the focal plane.
- USM (ultrasonic motor) provides quiet AF performance.
- Good manual focusing "feel" using electronic manual focusing ring.

3. SPECIFICATIONS

| | | | |
|---|---|---|---|
| 3-1 Format: | 24 x 36mm | | |
| 3-2 Focal length/aperture: | 50mm; 1:1.0 | | |
| 3-3 Optical structure: | 11 elements in 9 groups , with 2 aspherical surfaces; G3 R1, G8 R2 (Super Spectra Coating) | | |
| 3-4 Angle of view (at infinity): | Diagonally | (43.2 mm) | 46° |
| | Vertically | (24 mm) | 27° |
| | Horizontally | (36 mm) | 40° |

3-5 Focusing:

| | |
|---|---|
| System: | Autofocus: Ultrasonic motor (USM)<br>Manual: "Powered manual focus" using USM |
| Focusing Element | Double helicoid |
| Range: | 0.6m (MACRO); 1.0m to infinity |
| Drive speed: | 1.0 second (Actual operation between infinity and closest focus, not including AF ranging) |

Rotation angle, amount of extension

| Condition | Rotation angle | Extension |
|---|---|---|
| 0.6m to infinity | 196°07' | 11.44mm |
| 1.0m to infinity | 1°07' | 0.065mm |

Distance scale: 1 2.2 2.5 3 3.5 4 5 7 10 15 30 ft (green)

0.6 0.7 0.8 0.9 1 1.2 1.5 2 3 5 10 m (gray)

Maximum magnification, field of view

| Condition | Magnification (power) | Field of view (mm) |
|---|---|---|
| 0.6m | 0.11 | 228 x 342 |

3-6 Mount

| | |
|---|---|
| Type: | Canon EF mount |
| Signal transfer: | EOS system, with 5 signals as follows : |

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

3-7 Aperture mechanism

| | |
|---|---|
| Diaphragm control: | Automatic only using EMD, no manual ring |
| Aperture range: | f/1.0 (indicated on lens) - f/16 (not indicated on lens) |
| Diaphragm blades: | 8 |
| D-O-F Scale: | Provided (f/4 8 11 16) |
| IR Focusing Index: | Provided |

3-8 Filter: 72mm, 0.75mm pitch, (Usable: only one)

3-9 Dimensions & weight: 91.5mm diameter x 81.5mm length / 985g

3-10 Related products

| | |
|---|---|
| Hood: | ES-79 |
| Lens cap: | E-72 |
| Lens case: | LH-D12 (hard case)<br>(Lens stores with one filter and caps on) |
| Dust cap: | Common to all EF lenses |

4 Optical performance

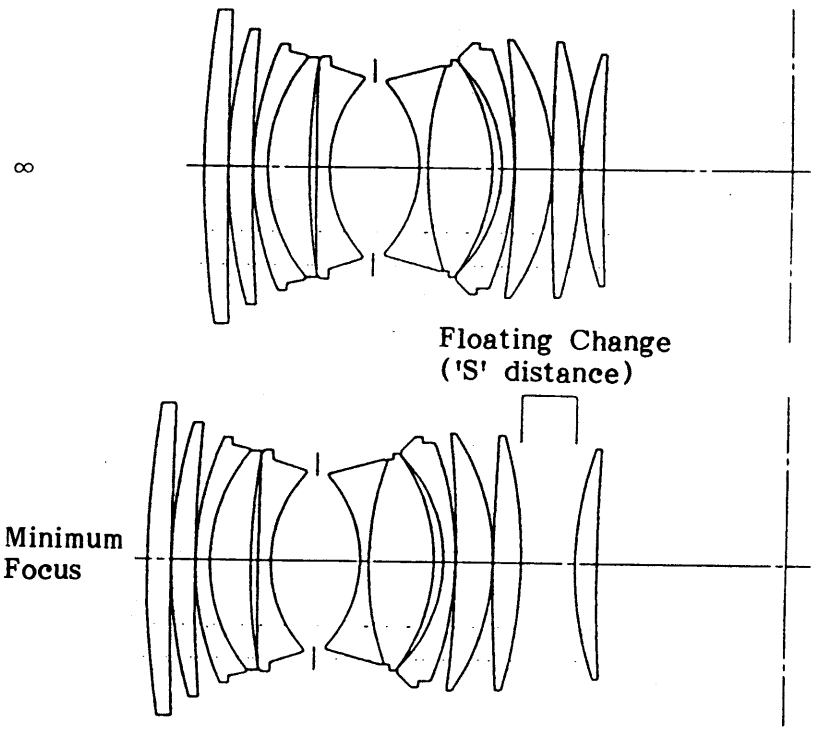
(1) Flare elimination and curvature of field reduction
Because Gauss Type lenses have strong concave surfaces on both sides of the diaphragm, flare caused by peripheral refraction can be a problem with ultra-large aperture lenses such as an f/1.0. With the EF 50mm f/1.0L, refraction of concave surface is divided between both aspherical lenses, thus the luminous flux is refracted slightly, to eliminate the flare. The curvature of field generated by the weakening of the refraction of the concave surfaces is compensated by optimal arrangement of the high refraction glass elements. Also, good color balance is achieved with the EF 50mm f/1.0L using a multi-layer coating developed exclusively for use on high index glass.

(2) Floating mechanism

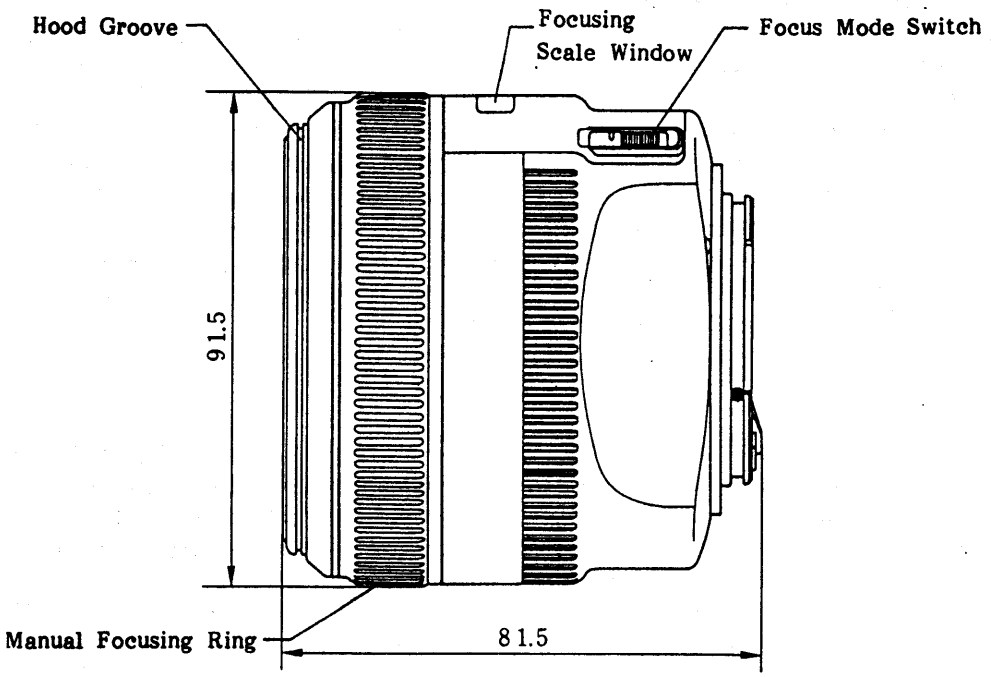
In a floating mechanism design, part of the focusing lenses remains fixed (or moves independently) during focusing, enabling the lens to compensate for aberration alterations with close-up shots and enabling good optical performance to be maintained throughout the entire shooting range. Although the aberration compensation operation differs depending on the lens, with ultra-large-aperture lenses such as the EF 50mm f/1.0L, high image quality is a must throughout the entire range (especially at close shooting distances).

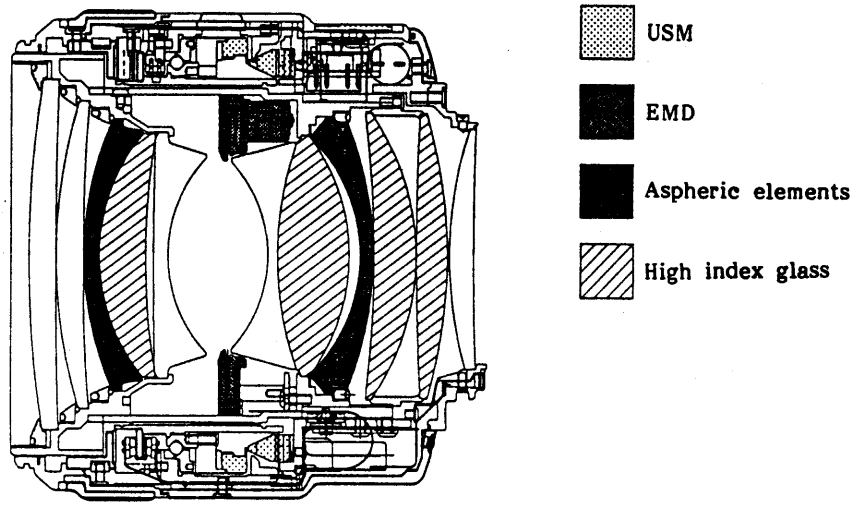
In the EF 50mm f/1.0L the rearmost element, a positive meniscus, is stationary during focusing while the front ten elements move. The EF 50mm f/1.0L attains high image quality throughout the entire shooting range - from infinity to the closest shooting distance - by using this floating mechanism to compensate for curvature of field at close shooting distance and for spherical aberration alterations which are caused by the ultra-large-aperture of the lens at medium and close focusing distances.

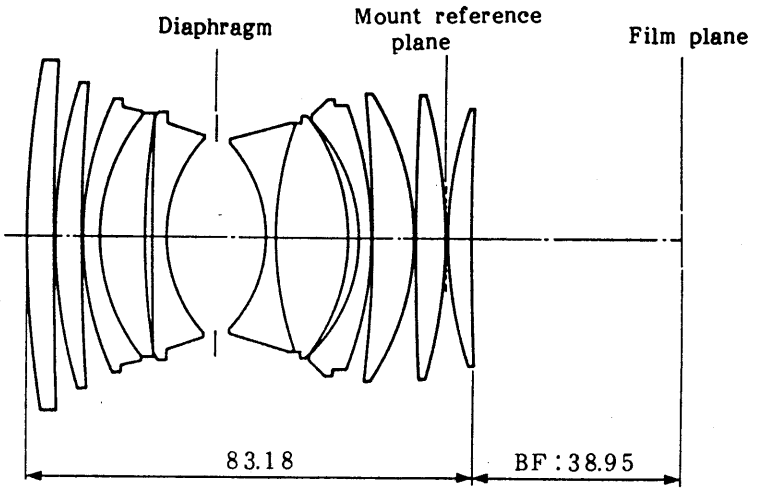
Floating Focusing



## 5. CONTROLS and OPTICAL SCHEMATIC



# TECHNICAL INFORMATION

## EF 85mm f/1.2L

### Introduction

1. Development Brief

The EF 85mm f/1.2L lens is an ultra-large aperture short telephoto lens developed to meet the needs of professional photographers by providing high contrast and superior optical performance especially at maximum aperture.

The 85mm focal length, while serving as a standard lens for many, does not cause the foreshortening effect of a 50mm in tight head shots, nor compress too much either. These features make it an ideal lens for applications such as portraiture and landscape photography.

The large f/1.2 aperture meets the needs of professionals in special fields such as commercial and fashion photography by providing high image quality, brightness, and pleasing out of focus blur.

2. Features

- Realizes low flare and high contrast despite the f/1.2 maximum aperture using an aspherical lens element.
- Employs floating mechanism to compensate for aberration alterations during focusing and to provide high image quality at all shooting distances.
- Designed to provide high performance by using glass with a high refractive index to compensate curvature of field.
- The 85mm focal length and the ultra-large f/1.2 aperture give a pleasing blur effect.
- USM (ultrasonic motor) provides superior AF performance with quiet operation.
- Superior manual focusing "feel" through the use of powered manual focusing.

## 3. SPECIFICATIONS

| | |
|---|---|
| 3-1 Format: | 24 x 36mm |
| 3-2 Focal length/aperture: | 85mm; 1:1.2 |
| 3-3 Optical structure: | 8 elements in 7 groups , including 1 aspherical lens; G3 1st surface (Super Spectra Coating) |

3-4 Angle of view (at infinity):

| | | |
|---|---|---|
| Diagonally | (43.2 mm) | 28°30' |
| Vertically | (24 mm) | 16°00' |
| Horizontally | (36 mm) | 24°00' |

3-5 Focusing:

System: Autofocus: Ultrasonic motor (USM)
Manual: "Powered manual focus" using USM

Focusing Element: Double helicoid

Range: 0.95m to infinity

Drive speed: 1.2 second (Actual operation between infinity and closest focus, not including AF ranging)

Rotation angle, amount of extension

| Condition | Rotation angle | Extension |
|---|---|---|
| 0.95m to infinity | 223°05' | 13.01mm |
| Infinity overrun | 3°05' | 0.18mm |

Distance scale

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.2 | 3.5 | 3.7 | 4 | 4.5 | 5 | 6 | 7 | 8 | 10 | 12 | 15 | 20 | 30 | ft (green) | |
| 0.95 | 1 | 1.1 | 1.2 | 1.3 | 1.5 | 1.7 | 2 | 2.5 | 3 | 4 | 5 | 7 | 10 | m (gray) | |

Maximum magnification, field of view

| Condition | Magnification (power) | Field of view (mm) |
|---|---|---|
| 0.95m | 0.11 | 226 x 339 |

3-6 Mount

| | |
|---|---|
| Type: | Canon EF mount |
| Signal transfer: | EOS system, with 5 signals as follows : |

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

3-7 Aperture mechanism

| | |
|---|---|
| Diaphragm control: | Automatic only using EMD, no manual ring |
| Aperture range: | f/1.2 (indicated on lens) - f/16 (not indicated on lens) |
| Diaphragm blades: | 8 |
| D-O-F Scale: | Provided (f/4 8 11 16) |
| IR Focusing Index: | Provided |
| 3-8 Filter: | 72mm, 0.75mm pitch, (Usable: only one) |
| 3-9 Dimensions & weight: | 91.5mm diameter x 84mm length / 1025g |

3-10 Related products

| | |
|---|---|
| Hood: | ES-79 |
| Lens cap: | E-72 |
| Lens case: | LH-D12 (hard case)<br>(Lens stores with one filter and caps on) |
| Dust cap: | Common to all EF lenses |

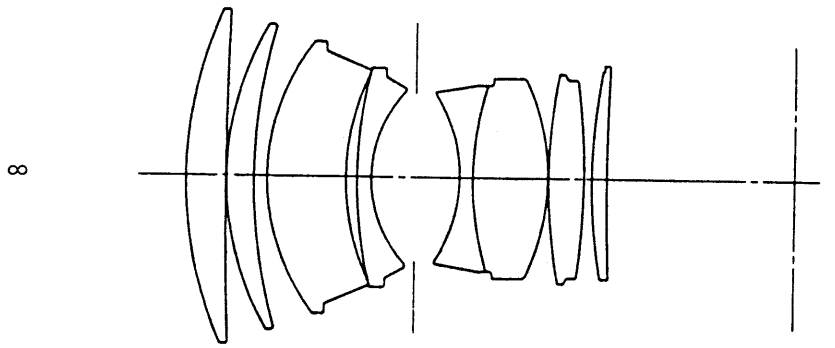
4 Optical performance

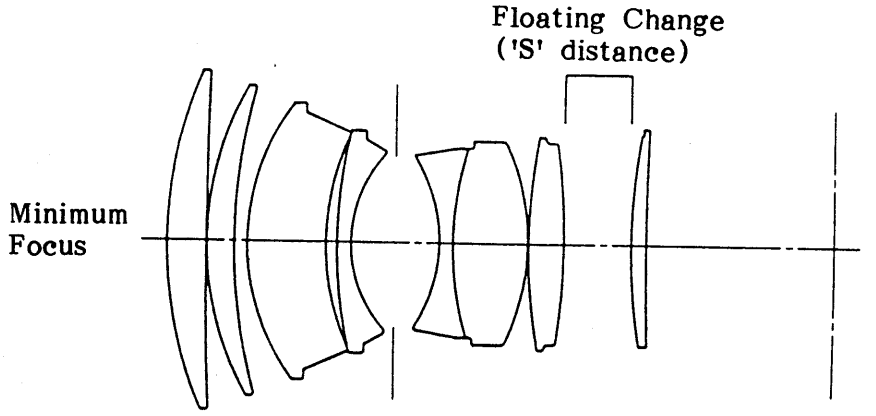
(1) Flare elimination and curvature of field compensation
Because Gauss Type lenses have strong concave surfaces on both sides of the diaphragm, flare caused by peripheral refraction can be a problem with ultra-large aperture lenses. With the EF 85mm f/1.2L, flare is reduced by allotting part of the function of the two strong concave surfaces to the aspherical surface of the G-3 lens element. The curvature of field generated by the weakening of the refraction of the concave surfaces is compensated by optimal arrangement of the high refraction glass elements.

(2) Floating mechanism

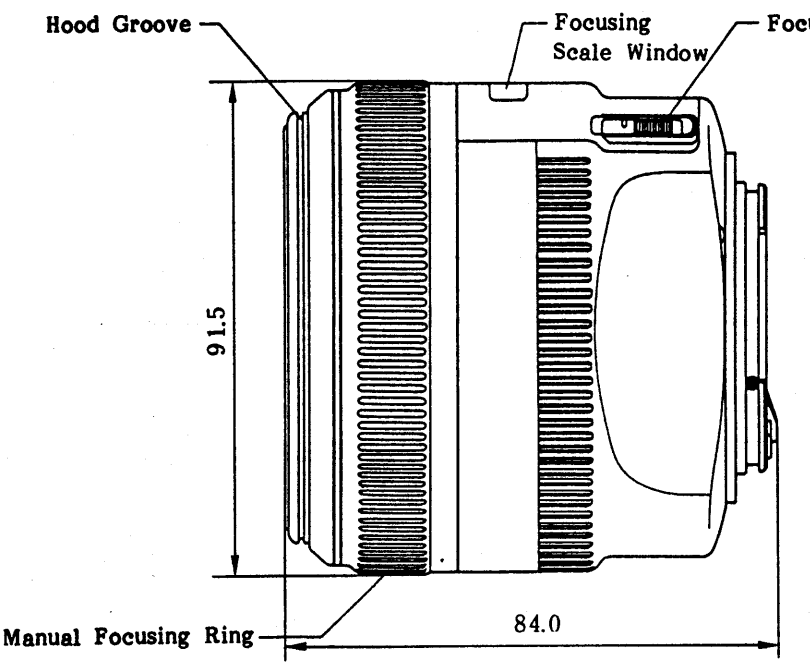
The EF 85mm f/1.2L the rearmost element, a positive meniscus, is stationary during focusing while the front seven elements (in six groups) move. The EF 85mm f/1.2L attains high image quality throughout the entire shooting range - from infinity to the closest shooting distance - by using this floating mechanism to compensate for curvature of field at close shooting distance and for spherical aberration alterations which are caused by the ultra-large-aperture of the lens at medium and close focusing distances.

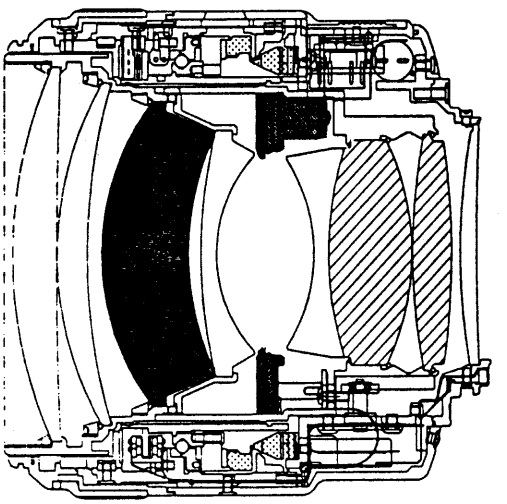
Floating Focusing

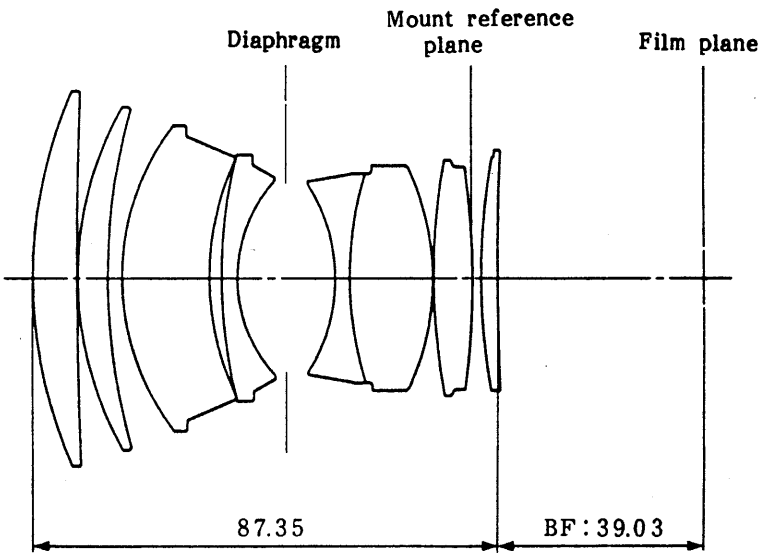


## 5. CONTROLS and OPTICAL SCHEMATIC



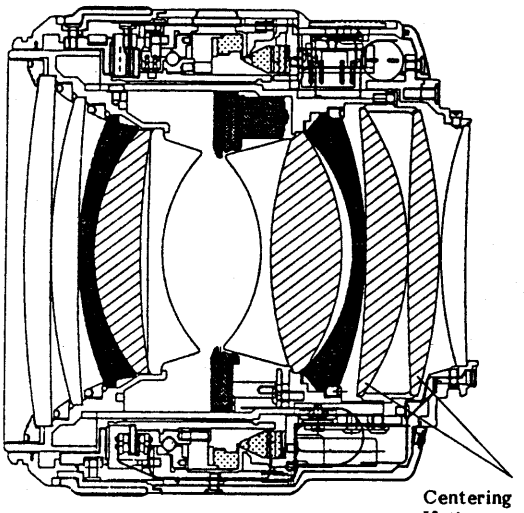



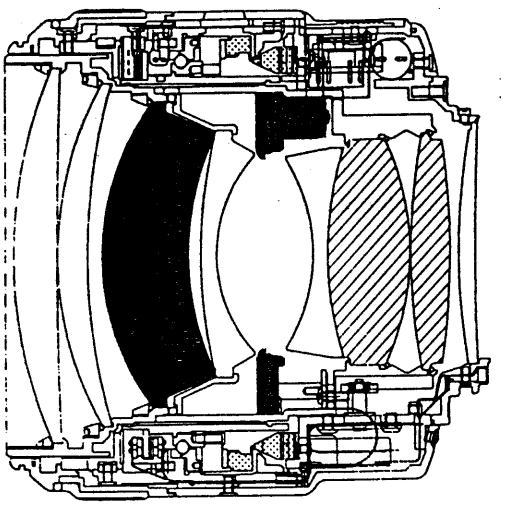
# REPAIR INSTRUCTIONS

| Special Optical Adjustments: | EF50mm f/1.0L | EF85mm f/1.2L |
|---|---|---|
| Centering | (Yes) No | Yes (No) |
| Tilt | Yes (No) | Yes (No) |

EF50mm f/1.0L



EF85mm f/1.2L



Centering Adjustment Lenses:
If the screws holding these elements are disturbed, the centering adjustment is necessary.

<!!> Set to closest focus and stop down before starting disassembly.

| Part No. | Name | Remarks | Plastic Safe? |
|---|---|---|---|
| - ADHESIVES - | | | |
| CY4-9102 | Acetate cloth tape | For holding flex | Yes |
| CY4-9303 | Double-faced tape | For holding flex | Yes |
| CY4-9403 | Insulating tape | For main flex | Yes |
| CY9-8002 | Bond G-103 | For manual focus rubber ring | Yes |
| CY9-8008 | Arontite L | For staking screws in metal | No |
| CY9-8009 | Arontite R | For staking mount stopper screws | No |
| CY9-8011 | Screw-lock | For staking screws in plastic, etc. | Yes |
| CY9-8091 | SO-820 | For front lens unit | Yes |
| - LUBRICANTS - | | | |
| CY9-8044 | GE-X8 | Cam and Guide Barrel grooves, helicoid | Yes |
| CY9-8086 | FF-10 | USM Helicoid | Yes |
| CY9-8089 | Elt-oil 190* | Zoom Flex Contact Pattern | Yes |

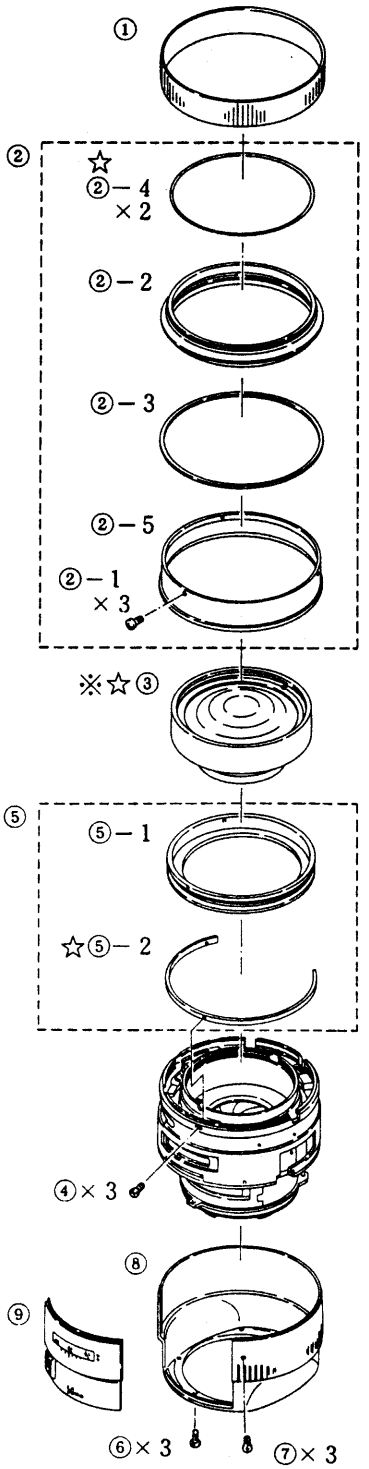
*: Previously labeled Electroil 190

# DISASSEMBLY & ASSEMBLY

## 1. External Parts Disassembly (Front)

※ DISASSEMBLY

☆ ASSEMBLY




The openings in the dust shield washers (2)-4 should be placed opposite (180°) from each other.

Bond (3) with SO-820 after installation.

Coat (5)-2 with Elt-oil 190.

<!!> IMPORTANT <!!>

Before trying to remove (3), run plenty of solvent (Fronsolve, Alcohol, etc.) in and allow it to soften the bond.

a. The lens must be set to minimum focus to apply the solvent.
b. If the bond is not loosened prior to removing (3), the guide collars in the USM focusing mechanism may be deformed.

## 2. Main Flex and EMD Removal

※ DISASSEMBLY

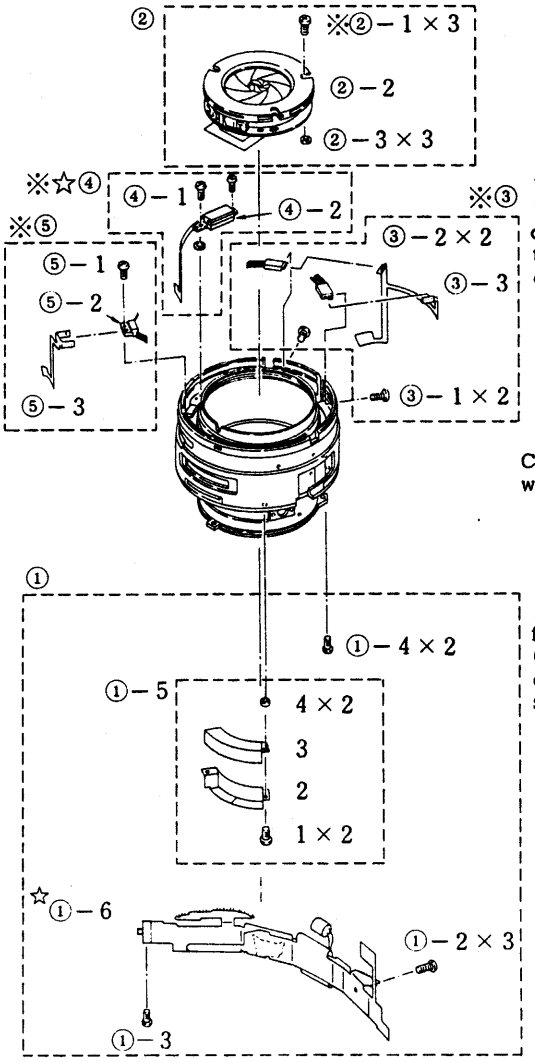
☆ ASSEMBLY

The diaphragm must be stopped down to remove screw (2)-1.

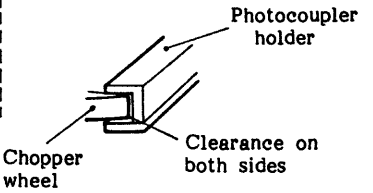
If (3) is disturbed, the manual focus brush position must be adjusted.

If (4) is disturbed, the photocoupler phase must be adjusted.

If (5) is distrubed, the infinity switch position must be adjusted.




When (4) is reinstalled, use washers to insure that the chopper wheel runs in the center of the photocoupler channel.

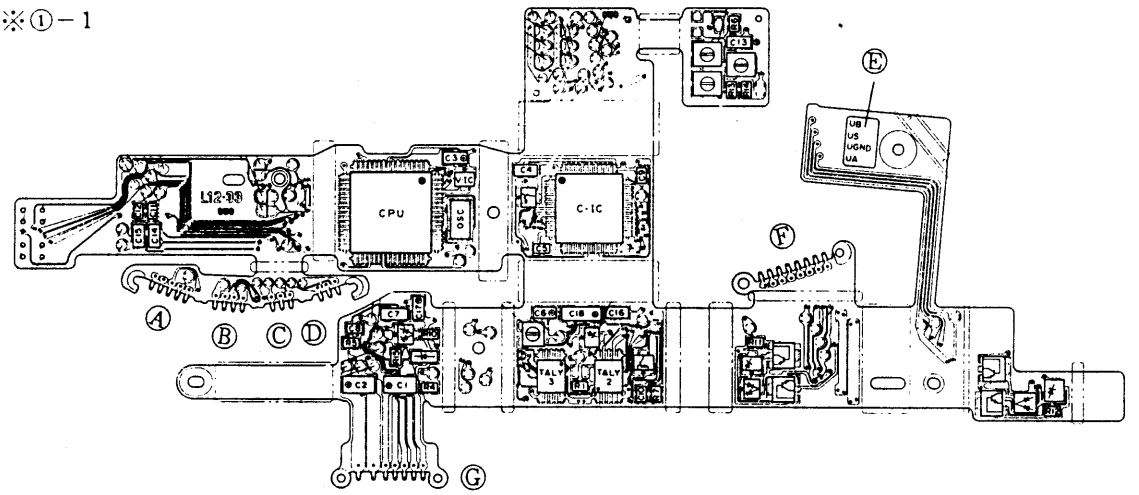



Apply Acetate cloth tape to the folded part of the main flex (1)-6 and to the portion which contacts the barrel to prevent short circuits.

Unsolder seven connections (A - G) from (1)-1.

(The DC-DC convertor need not be disconnected to remove the flex.

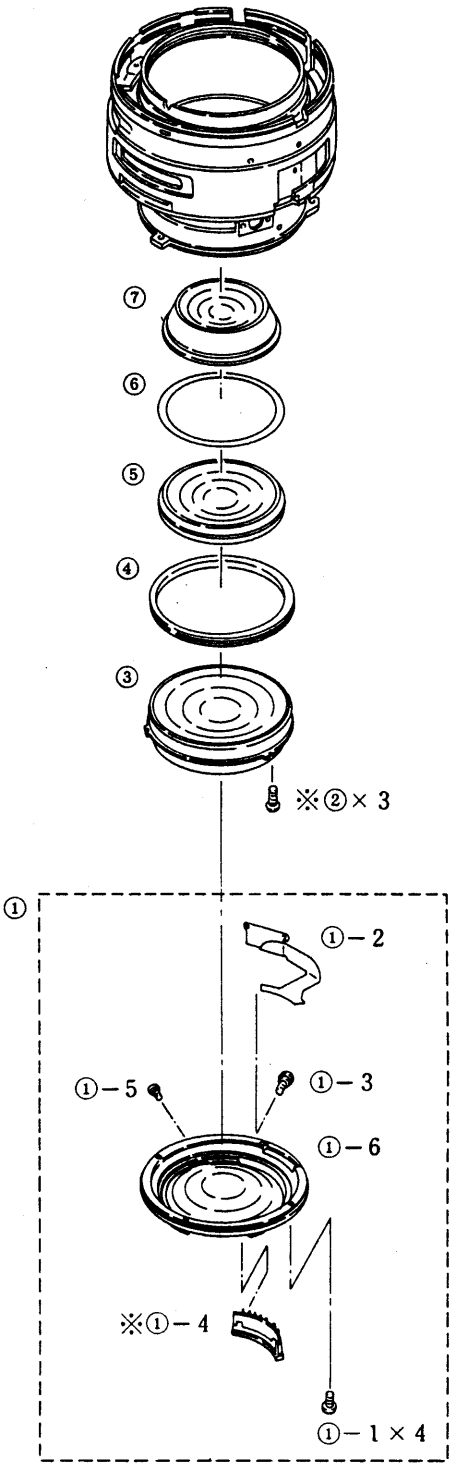
※①－1



## 3. Mount End Disassembly

※ DISASSEMBLY

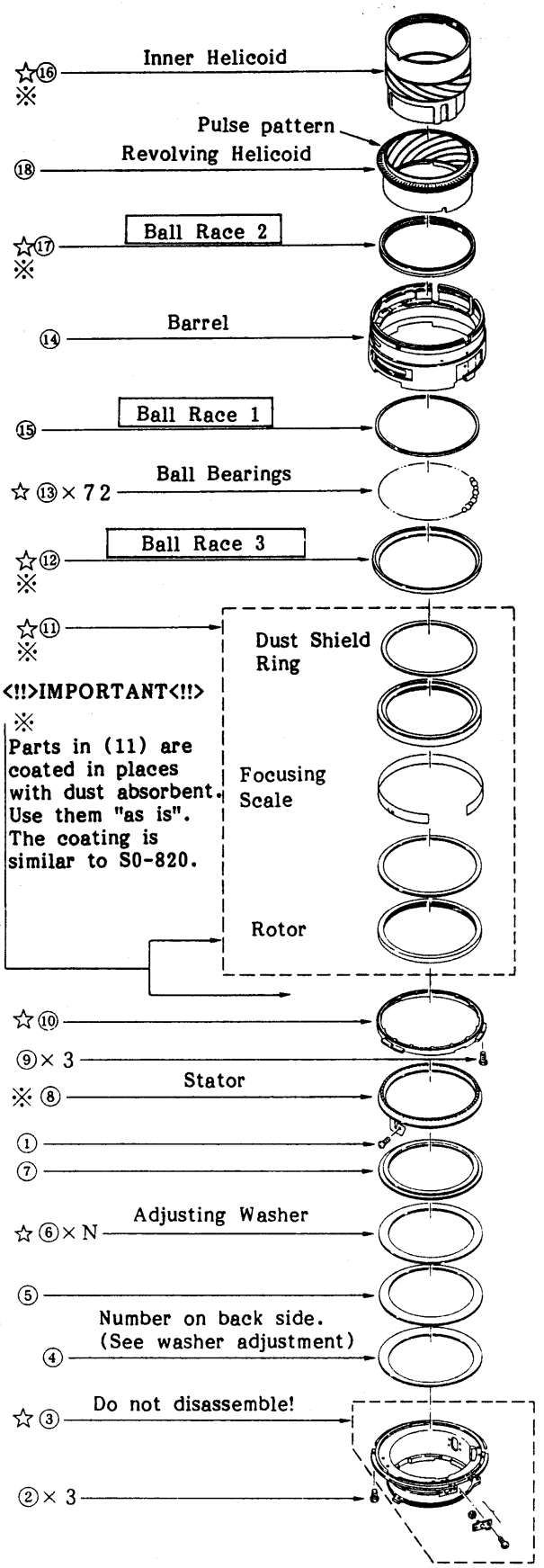
(2) & (3) N/A to EF85mm f/1.2L, and (4) & (6) are C Rings.

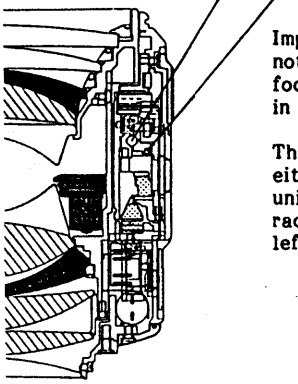



If screws (2) are disturbed, the optical centering adjustment be performed. (EF 50mm f/1.0L only)

Push outward on the contacts (1)-4 to remove.

## 4. USM Focusing Unit Disassembly




Impact damage can cause noticeable roughness in focusing by leaving dents in the races.

This can be corrected either by replacing the unit, or by replacing the races (boxed in the view at left).

### DISASSEMBLY NOTES

To remove (8), turn the barrel upside-down and let gravity do its work. Take care to not mar the staror pattern with scratches, finger prints or dust. Hold it by the edges and lay it upside-down on a clean surface. This applies to the rotor also.

To remove (11), use a length of thin pliable plastic, such a Delrin. Stick it through the scale window in the barrel and press (11) out.

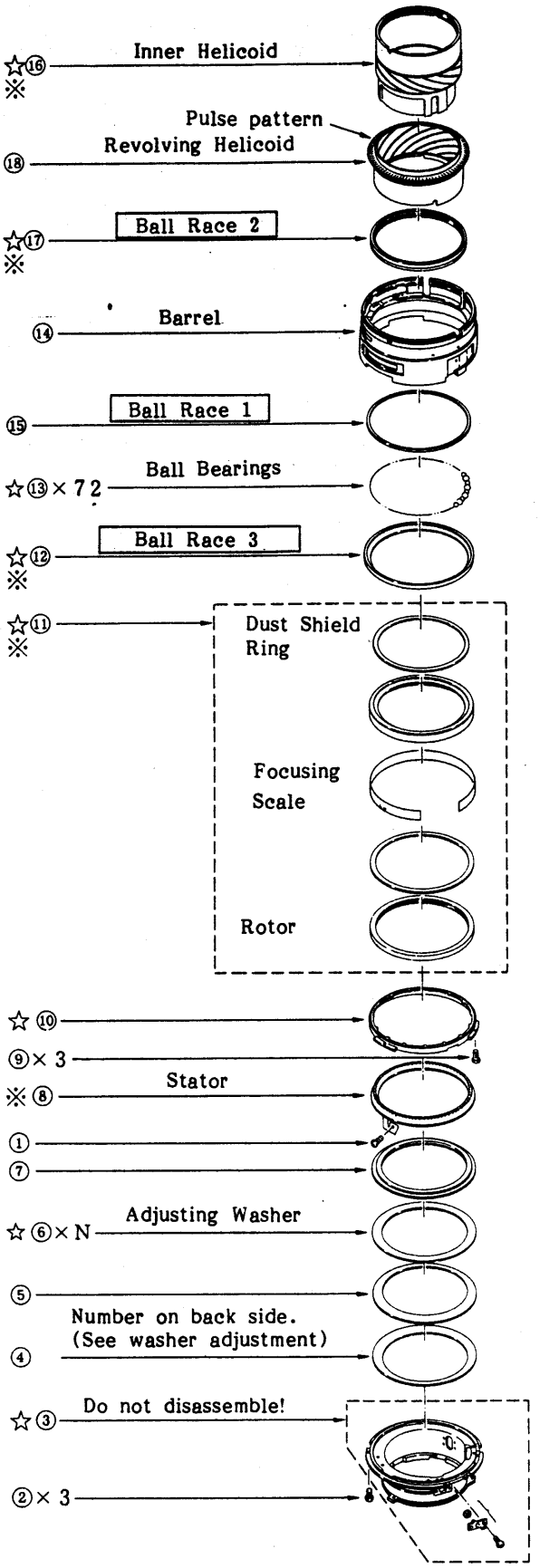
When removing (12) take care with the bearing balls. (For instance, match the inner helicoid up to the barrel and place lens upside-down on the workbench). Carefully remove each ball individually to prevent any of them from contacting the pulse pattern. After the bearing balls are removed, (16), (17), and (18) will come out as a unit when the barrel is lifted.

Before removing (16) mark its relative position with (18).

Brush a light coat of FF-10 onto the helicoid threads and the inner helicoid guide roller grooves.

DO NOT touch the pulse pattern when removing (17). (The threads are staked with Screw-lock. Run in some solvent before unscrewing it.

## 4. USM Focusing Unit Disassembly (cont.)




### ASSEMBLY NOTES

When installing (17) apply a little screw-lock to the threads and tighten it firmly. (If not tightened firmly, it is likely to loosen due to the ultrasonic vibration. On the side which functions as the ball race, and on the other two ball races, apply a small amount of EF-10.

When installing (16), it should protrude about 5mm from (18) to facilitate installing the bearing balls.

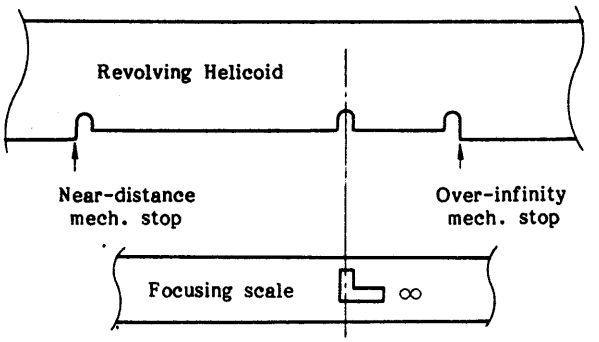
When installing the bearing balls (13) fix the inner helicoid and and set the revolving helicoid to make installing the balls easier. Install large and small balls alternately. (The larger balls are shiny; the small balls are not.)

Tighten (12) until it is just snug, then back off about 10°, or about 7mm on the circumference.

(This should give the required 0.01 to 0.02mm of thrust play. Play should be minimized commensurate with smooth operation.)

Manually check the helicoid for smoothness and apply about 10mm of screw-lock on opposite sides.

When installing (11), align the normal temperature infinity mark on the focusing scale with the notch in the revolving helicoid.



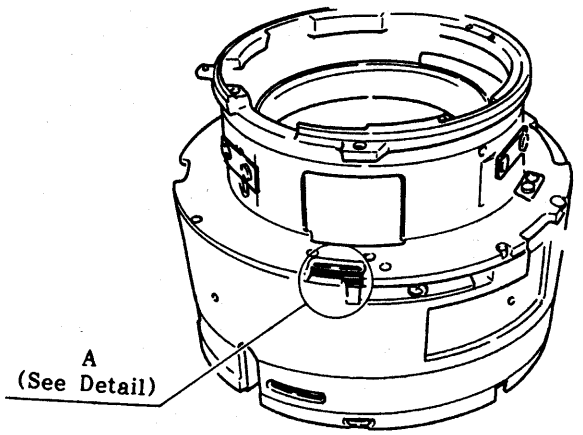

The ears on (10) must fit into the slots on (8).

Adjusting Washers (6):

Due to production variations of Ball Race 2 and assembly procedure, the pressure with the USM drive can vary slightly when the ball race parts are replaced. Service facilities with a 20X tool scope should adjust as outlined on the next page (This adjustment maintains the proper pressure (1.4kg) between the stator and rotor. Differences in the cupped washers (4) and (5) are compensated with the adjusting washer). Any change will probably be within ±0.05mm.

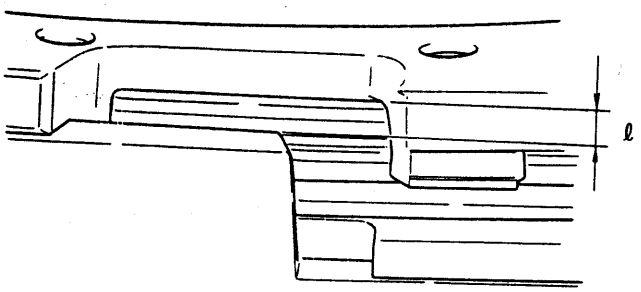
When installing (3), take care not to pinch (4) through (7) between (3) and (14). Take up any radial play away from the side with the scale window.

## USM Focusing Unit Washer Selection and Installation

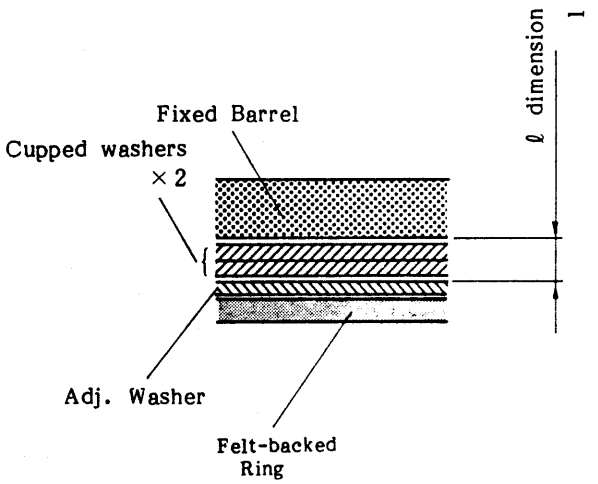



Helicoud and USM Unit

1. Before installing the fixed barrel (3), read the number printed on the cupped washers. This is l'.
2. Atach the fixed barrel and measure the "l" distance with the 20X tool scope.
3. If $|\ell - \ell'| < 0.05$mm, further adjustment is not necessary.
4. If $|\ell - \ell'| \geq 0.05$mm select a washer to bring it within tolerance.
5. Install the selected washer and recheck.




Detail A




Detail A detail

## Mechanical and Optical Adjustments (excluding minor "SIZE" adjustments)

| Adjustment | Objective | Test Equipment | Location | Page |
|---|---|---|---|---|
| Optical Centering | Lens Axis Alignment | 800mm Lens Focus Collimator(800LFC) | Lens G9,10 | 18 |
| Focus (Wide) | Infinity Focus Setting | 800LFC or 600mm Collimator& Camera | Lens mount & Focus Washers | 19 |
| * Focus Limit | Set limits | ——— | Limit SW | 20 |
| * Manual Focus Phase | True manual focus position reading | Oscilloscope | Brush "L" | 21 |
| * Photosensor position | | Oscilloscope | Photosensor unit | 23 |

## Electrical Adjustments

| Adjustment | Objective | Test Equipment | Location | Page |
|---|---|---|---|---|
| Pulse | Optimize USM Drive Pulse Output | Oscilloscope & Camera | VR8, VR9 | 22 |
| Best Focus | Align sensor focus with lens focus | ——— | AF ADJ0 - 5 | 25 |
| † USM Reference Frequency | Set USM reference frequency | Frequency Counter | (VR3) | 24 |

* USM Unit Adjustments: The service parts are pre-adjusted.

† Main Flex Adjustment: The service parts are pre-adjusted.

## 1. OPTICAL CENTERING EF50mm f/1.0L only

This adjustment is necessary if lens elements G9 or G10 are disturbed. (Disturbing the front elements has almost no effect on centering). The 800mm lens focus collimator is required.

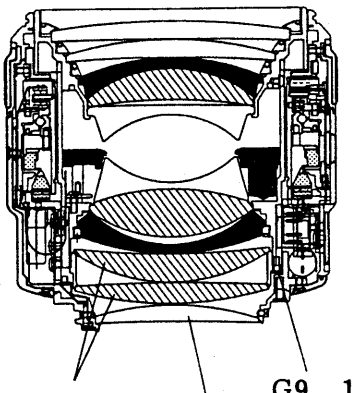
Purpose: To align the optical axes of the lens elements.

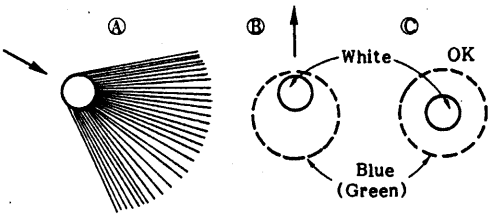
Equipment: 800mm Lens Focus Collimator, [Lens Projector (Resolution check)]

Preparation: Remove the lens mount, which includes the rear lens element G-11 (4 screws), the contact assembly cover (2 screws) and lightly tighten the three screws holding the G9, 10 cell. Reinstall the lens mount.

Adjustment:

1. Mount the lens on the 800LFC. Adjust the focus for slight blue (green) flare around the white center of the star image.
2. If the image appears as (A) or (B), adjust G9,10 in the direction of the arrow so the image is as (C).
3. Reassemble and check again. Repeat as necessary.




Example (A): Bad de-centering

Example (B): Slight de-centering

STANDARD:

If centering is correct resolution will be good, but we recommend checking resolution as a final check.

Resolution Table

| Image Height (mm) | 0 | 4 | 8 | 12 | 16 | 20 |
|---|---|---|---|---|---|---|
| S | 100 | 100 | 63 | 63 | 63 | 63* |
| 50@1.0 | | | | | | |
| M | | 100 | 63 | 63 | 25* | 25* |
| S | 100 | 100 | 100 | 100 | 100 | 63 |
| 50@4.0 | | | | | | |
| M | | 100 | 63 | 63 | 40 | 25* |
| S | 100 | 100 | 63 | 40 | 40 | 63 |
| 85@1.2 | | | | | | |
| M | | 100 | 63 | 63 | 63 | 40 |

1 step down in two directions acceptable.

## 2. FOCUS ADJUSTMENT

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

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

Purpose: To adjust infinity focus

Tools: 800mm Lens Focus Collimator, or shop-standard camera body with B screen and magnifier and 600mm collimator, or photographic infinity target.

Standard:

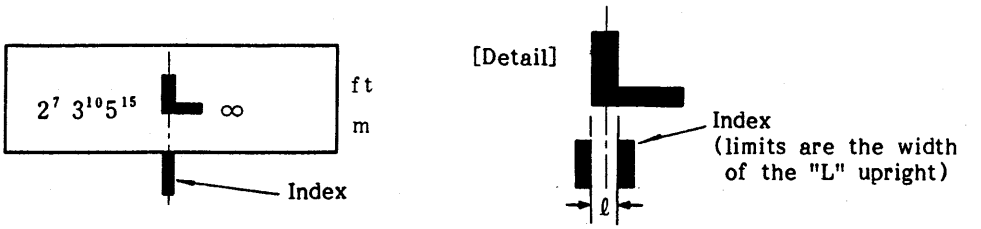


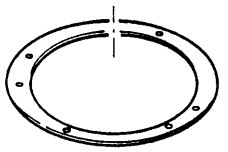

Fig. 6

Adjustment:

At the factory, the lens mounts are shaved to give the correct FFD; but this is impossible in the field. Special thin service mounts and focus washers are used. Do not use washers exceeding a total thickness of 0.07mm (Using more may cause a visible gap.)

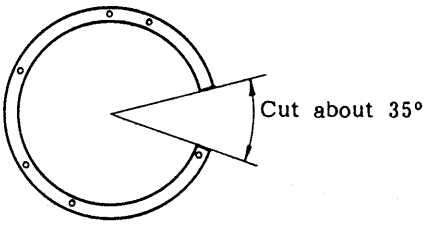
Due to the extreme size of the rear element, the washer must be trimmed as shown to clear the contact assembly.

CY1-2178-000 XXX
Service Focus Washers

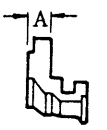


Service Use Only.

| | A | SIZE |
|---|---|---|
| ¼A | 0.02mm | (002) |
| | 0.05mm | (005) |




CY1-2326-000 XXX (85mm f/1.2L)
CY1-2227-000 XXX (50mm f/1.0L)
Service Lens Mounts




| A | SIZE | A | SIZE |
|---|---|---|---|
| 3.2mm | (320) | 3.7mm | (370) |
| 3.3mm | (330) | mm | ( ) |
| 3.4mm | (340) | mm | ( ) |
| 3.5mm | (350) | mm | ( ) |
| 3.6mm | (360) | | |

## 3. INFINITY FOCUS STOPPER ADJUSTMENT

The USM / Helicoid Unit stocked as a service unit is pre-adjusted, but can be disassembled to replace the ball races. The purpose of the adjustment is to align the focusing index with the end of the infinity "L" where the lens stops when focused past infinity.

Purpose: To adjust the maximum over-travel of the focusing at infinity.

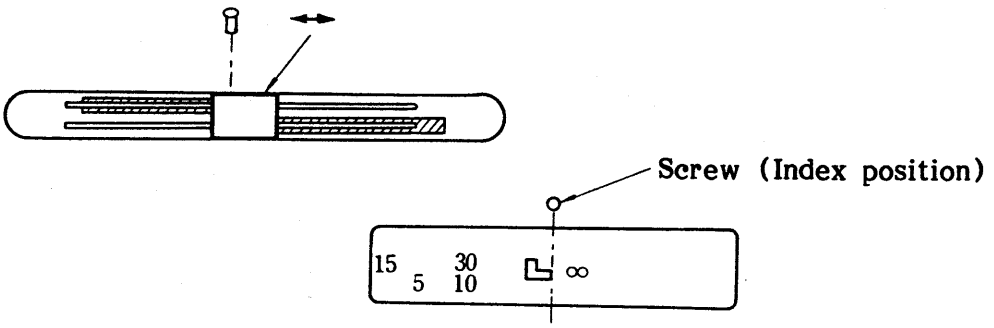
Preparation:

1. Assemble the lens except for external parts, and remove the manual focus ring (5) in External Parts Disassembly.
2. Connect the lens to the camera body.

Adjustment:

1. Loosen the limit switch screws a little. Press the camera SW-1 so the lens searches.

2. Adjust the limit switch position so that the lens stops at the point illustrated.



## 4. MANUAL FOCUS BRUSH POSITION ADJUSTMENT

The USM/Helicoid unit is pre-adjusted, but if it is disassembled, the manual focus may operate in the wrong direction or work erratically. If so, perform this adjustment.

Purpose: To insure proper manual focusing.

Tools: Dual channel Oscilloscope

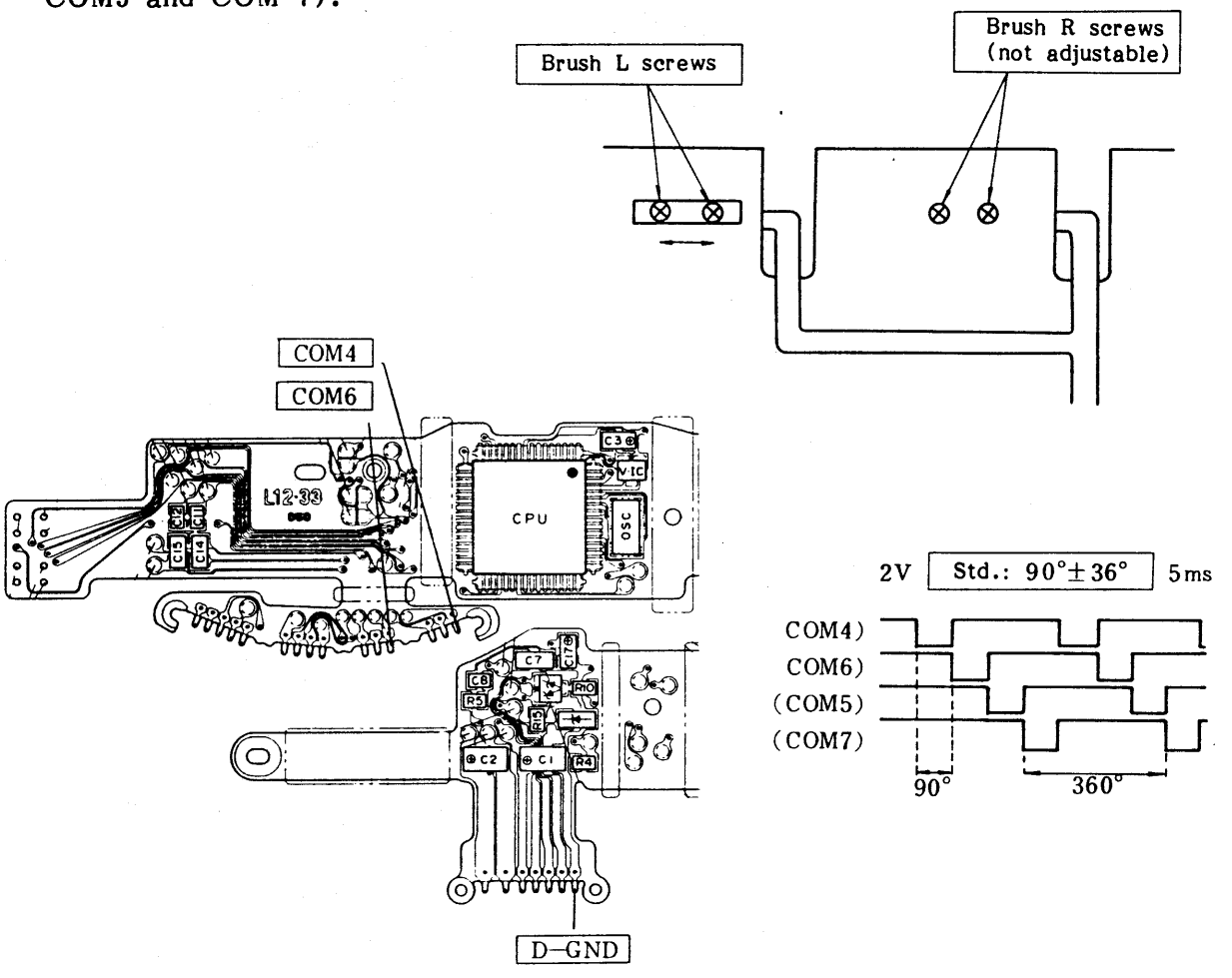
Standard: 90±36°

Preparation:

1. Remove external covers (8) and (9) on the External Covers Disassembly page.
2. Solder test leads to the main flex as shown.
3. Attach the lens to a camera.

Adjustment:

Attach test leads from COM4 and COM6 to the two channels and D-GND to both channel grounds. While watching the scope, turn the manual ring toward infinity. With the Brush L brush only lightly tightened, adjust until the phases are within the limits shown. (Brush R, which need not be adjusted can be checked in the same manner by connection leads to COM5 and COM 7).



## 5. PULSE ADJUSTMENT

Adjust if main flex unit or USM/Helicoid unit is changed, or if operation is erratic at extreme temperatures. 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

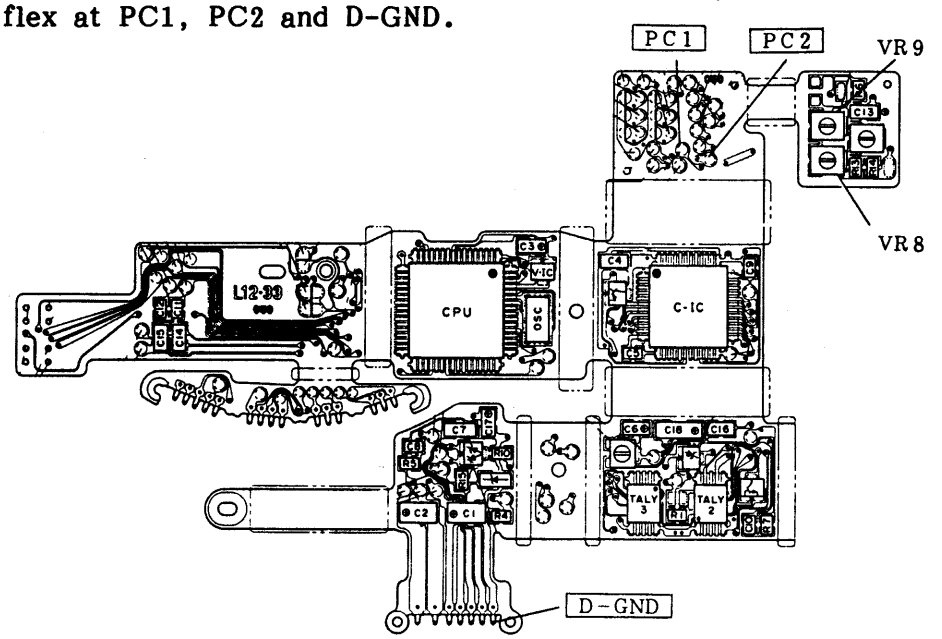
Equipment: Oscilloscope, EOS camera

Standard: On(T) and off(t) times should be equal, within 10%.

$0.9T \leq t \leq 1.1T$

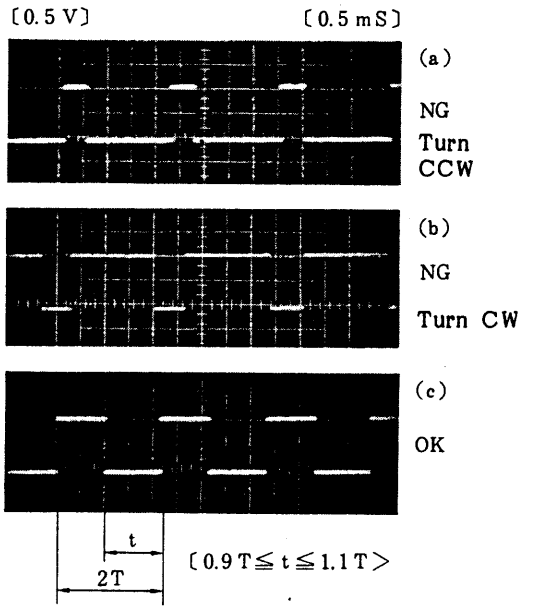
Preparation:

Remove external covers (8) and (9), mount on a camera, and 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.



## 6. PHOTO SENSOR PHASING

[Perform AFTER Pulse Adjustment]

Adjust if USM/Helicoid unit or pulse sensor unit is disturbed.

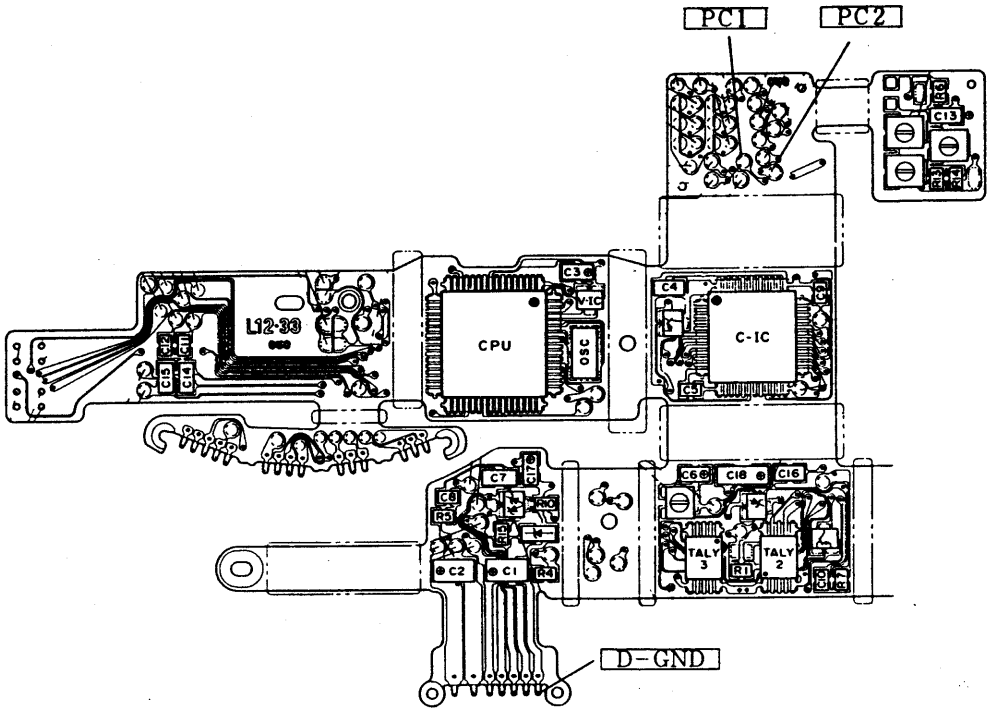
Purpose: To read USM movement as accurately as possible

Equipment: Dual trace oscilloscope

Standard: 90±36°

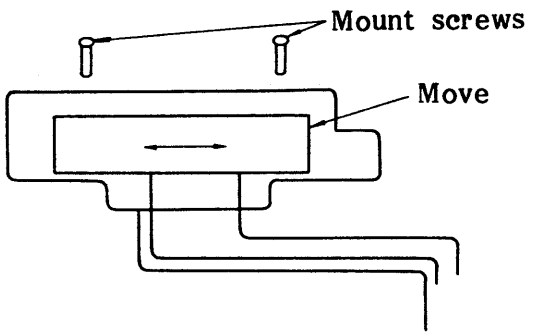
Preparation:

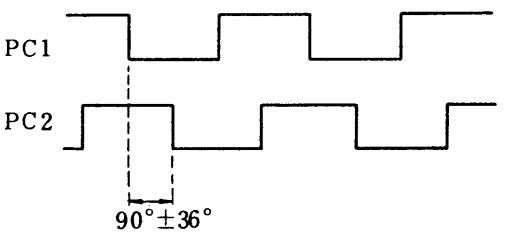
1. Remove external covers (8) and (9) on the External Covers Disassembly page.
2. Solder test leads to the main flex as shown.




Adjustment:

Attach test leads PC1 and PC2 and common to DGND and connect to the channels of the dual-trace scope. Turn the manual ring slowly from near toward infinity while monitoring the scope. Adjust the photosensor unit position so the pulses are phased as indicated.



## 7. USM REFERENCE FREQUENCY

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

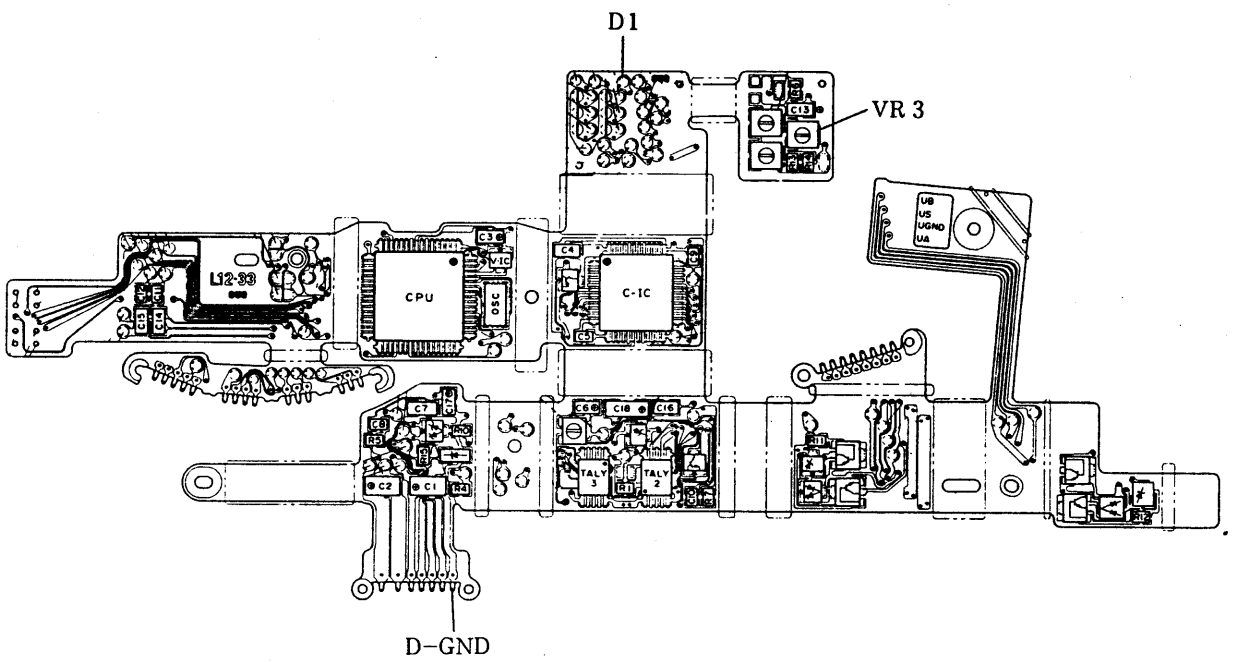
Standard: 29.6 ± 0.5kHz

Preparation:

1. Remove external covers (8) and (9).
2. Install the lens on an EOS with depth-of-field preview button. (The frequency is not stable during actual USM operation. It is stable and can be measured with the D-O-F button pressed.)

Adjustment:

1. Install test leads at D-1 and D-GND and connect them to the frequency counter.
2. Mount the lens on an EOS, press the D-O-F button, and read the frequency.
3. It should be 29.6 ± 0.5kHz. If not, adjust VR3.



## 8. BEST FOCUS ADJUSTMENT

Purpose: To align the autofocus point 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 a expensive tool. This tool is much too costly for field use so service will use the following procedures instead.

1. Only when the Main Flex is replaced, check the AF ADJ0 through AF ADJ5 pads on the flex being replaced and bridge the new flex in the same way.

2. For customer complaints, determine the model of camera being used and adjust using one of the following two methods. (The EOS-1 is the first model having a vertical sensor as well as the horizontal sensor).

Horizontal vs Vertical Sensors:

All EOS's have horizontal sensors, but the EOS-1 also has a vertical sensor for lenses of f/2.8 and faster when the horizontal sensor cannot focus, so compensation data for the vertical sensor is necessary also.

Adjustment 1: If front defocus, increase plus correction. If rear defocus, increase negative correction.

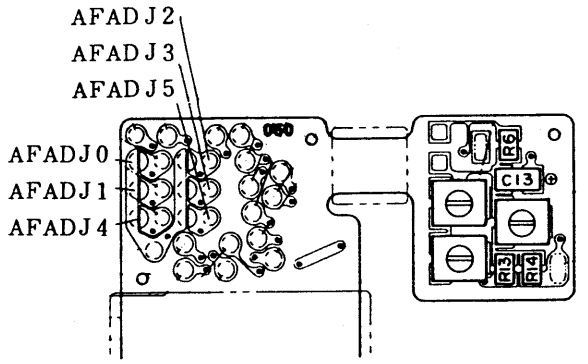
Adjustment 2. Make actual photographic test at with the AF-ADJ0, AF-ADJ1 and AF-ADJ4 bridges in all eight possible combinations. Make five or six negatives for each combination. Repeat for the vertical sensor pads. Examine the negatives closely to determine which combination is best.

Test Conditions:

Distance: 2.5m (EF50mm/1.0L); 4.3m (EF85/1.2L)
Target: Casual Resolution Chart* with AF Standard Bar Chart in center.
Aperture: Maximum aperture
Focusing: Return lens to infinity after each exposure and autofocus on bar chart.
Camera: EOS with Aperture Priority (AV) Mode

*: A "Casual Resolution Chart" is a flat chart made up of newsprint, photographs, etc. Most service facilities have such a chart.

Best Focus Correction




F: f/No.; $\delta$: circle of confusion

| Correction | Horiz. Sensor | | | Vert. Sensor | | |
|---|---|---|---|---|---|---|
| | AF-ADJ0 | AF-ADJ1 | AF-ADJ4 | AF-ADJ2 | AF-ADJ3 | AF-ADJ5 |
| $-7/4F\delta$ | 1 | 0 | 0 | 1 | 0 | 0 |
| $-5/4F\delta$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $-3/4F\delta$ | 1 | 0 | 1 | 1 | 0 | 1 |
| $-1/4F\delta$ | 0 | 0 | 1 | 0 | 0 | 1 |
| $+1/4F\delta$ | 1 | 1 | 1 | 1 | 1 | 1 |
| $+3/4F\delta$ | 0 | 1 | 1 | 0 | 1 | 1 |
| $+5/4F\delta$ | 1 | 1 | 0 | 1 | 1 | 0 |
| $+7/4F\delta$ | 0 | 1 | 0 | 0 | 1 | 0 |

## V. ELECTRONIC CIRCUIT

The electronics in this lens are basically the same as the EF 28-80mm f/2.8 - 4.0L. Its schematic diagram is included here for reference. Points of difference are indicated by circled numbers on the schematics which correspond to the entries below.

(1) There is no Zoom switch.

(2) The focus switch has four, instead of two contacts.
Pin 31 is divides the focusing range into three sections instead of two.
Pin 44 is the automatic AM/M switch.

(3) Best Focus Adjustment Pads are increased from tow to six.

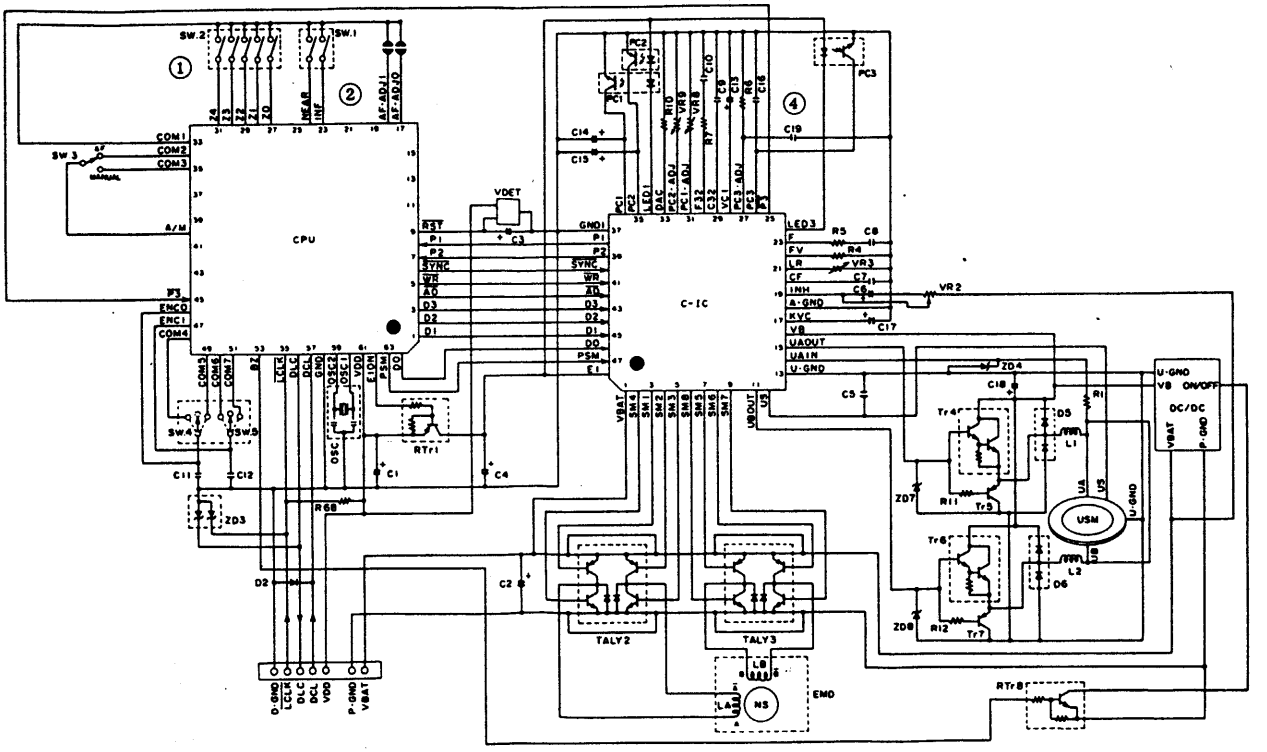
EOS-1 has both horizontal and vertical sensors. The EF28-80 f/2.8 - 4.0 actually has four, but this fact was hidden because the EOS-1 had not yet bee announced at the time. The fifth and sixth pads were added for these two lenses because of the very large maximum apertures.

(4) C19 noise filter capacitor is deleted.

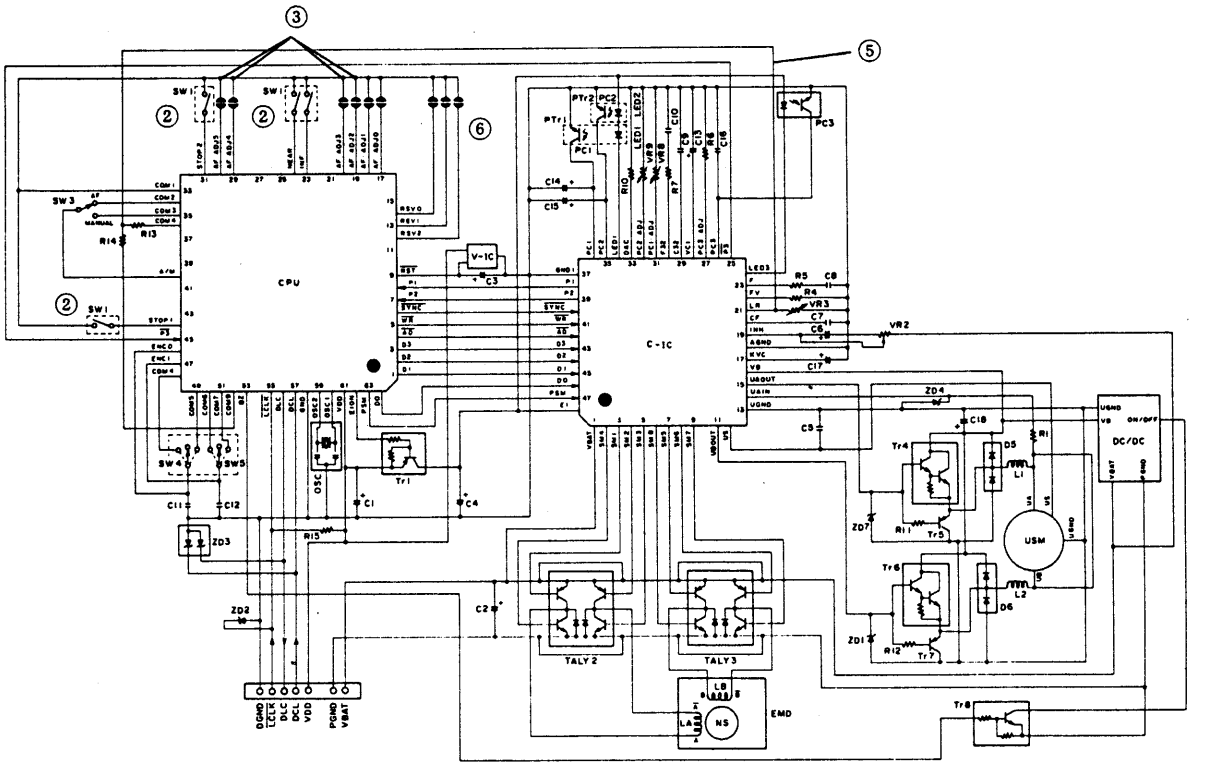
(5) R13, R14, and LR line added. LR line runs from C-IC p21 to CPU p36 (COM4) and CPU p52 (COM9). This addition reduces the frequency control for USM drive from 50HZ steps to 12.5Hz steps to smoothen the focusing feel.

(6) RSV0, 1, and 2 Added: Actually these pads for adjusting USM speed are included in the EF 28-80mm, but since they are a factory adjustment only, they were not included on the service schematic.

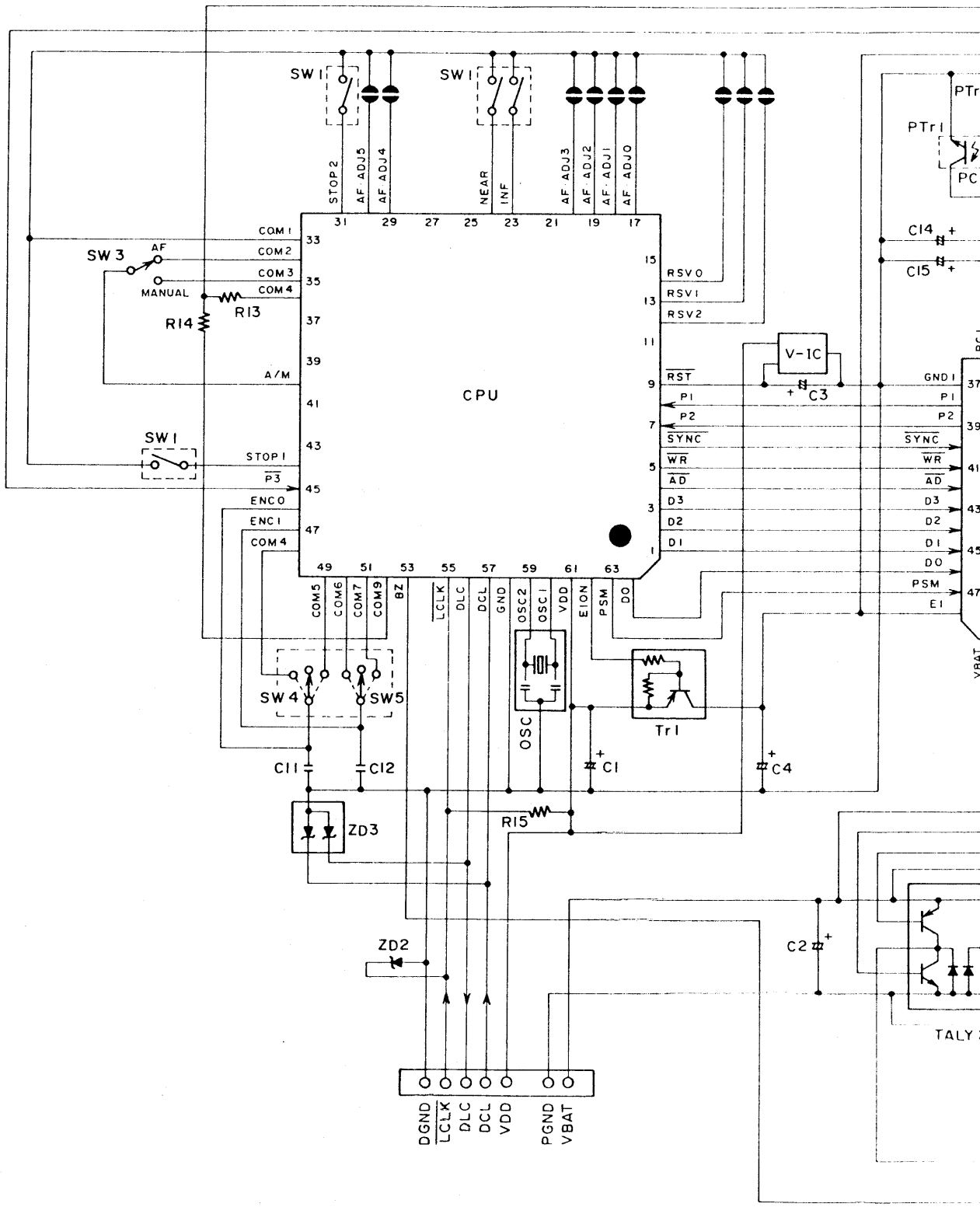
EF28－80／2.8－4.0 L




EF50／1.0 L
EF85／1.2 L



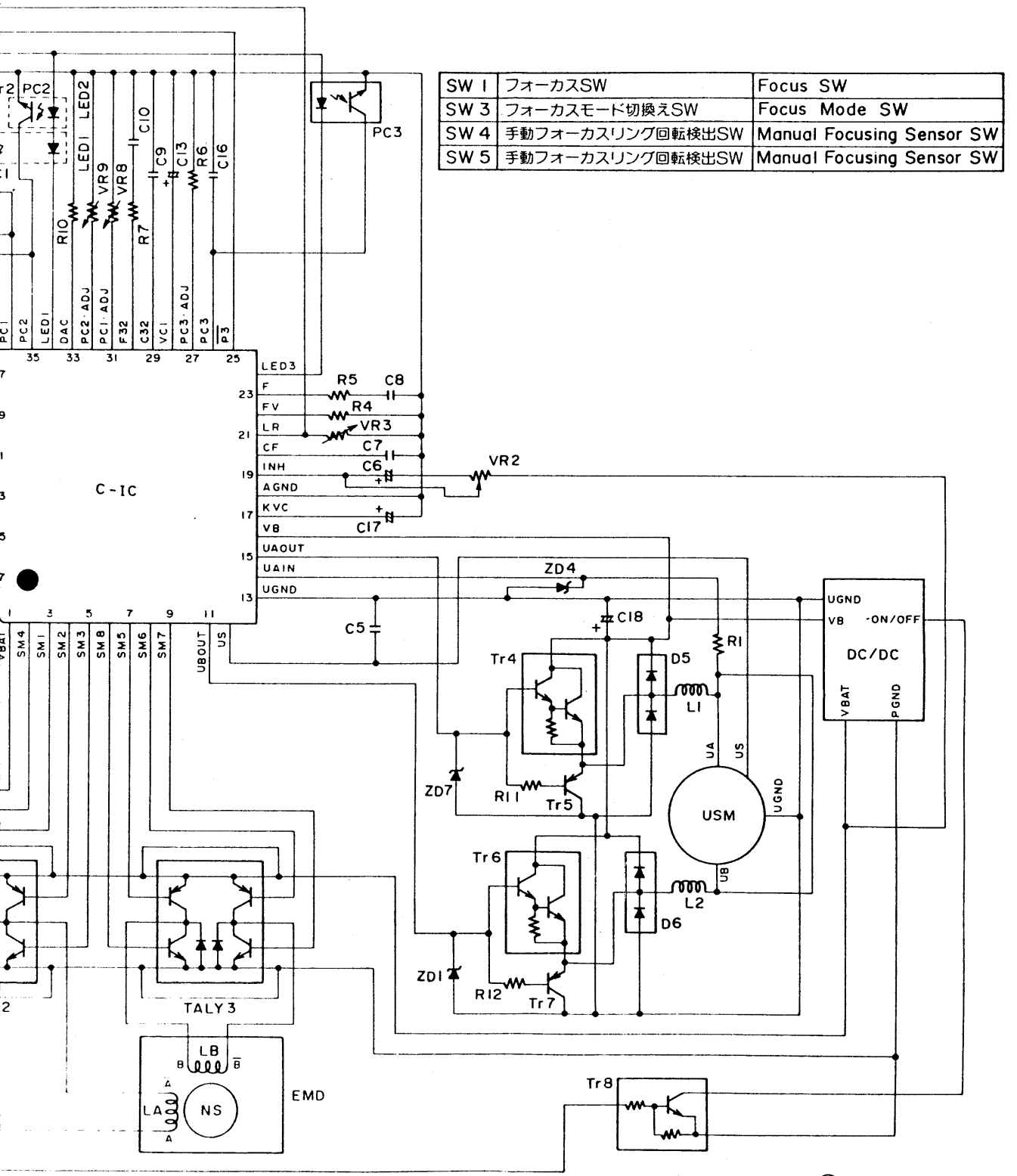
# SCHEMATIC DIAGRAM



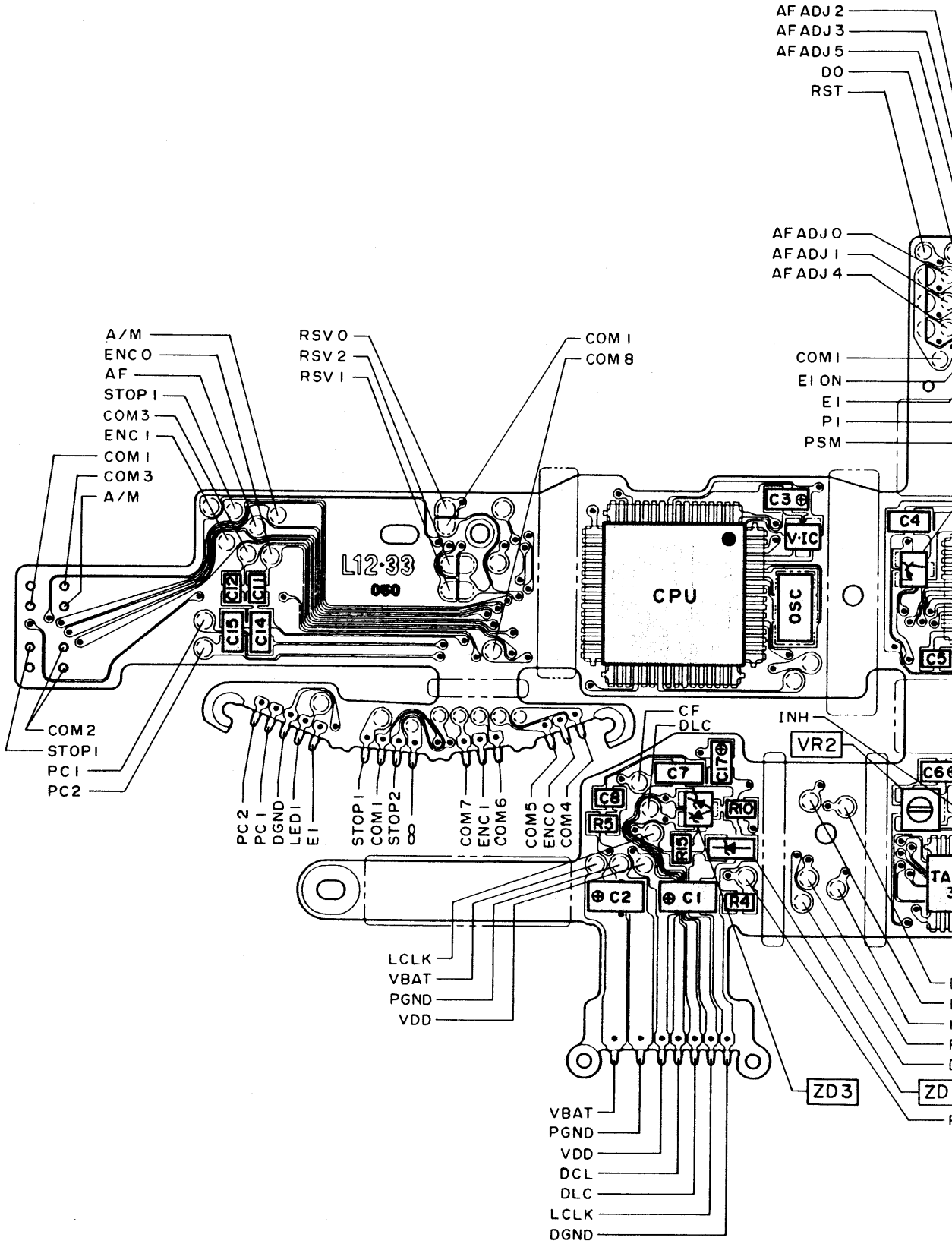

01 AUG, 1989

EF 50mm 1:1.0L
EF 85mm 1:1.2L
REF. NO. C21-6222
C21-7272

| | | |
|---|---|---|
| SW 1 | 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 | 手動フォーカスリング回転検出SW | Manual Focusing Sensor SW |
| SW 5 | 手動フォーカスリング回転検出SW | Manual Focusing Sensor SW |

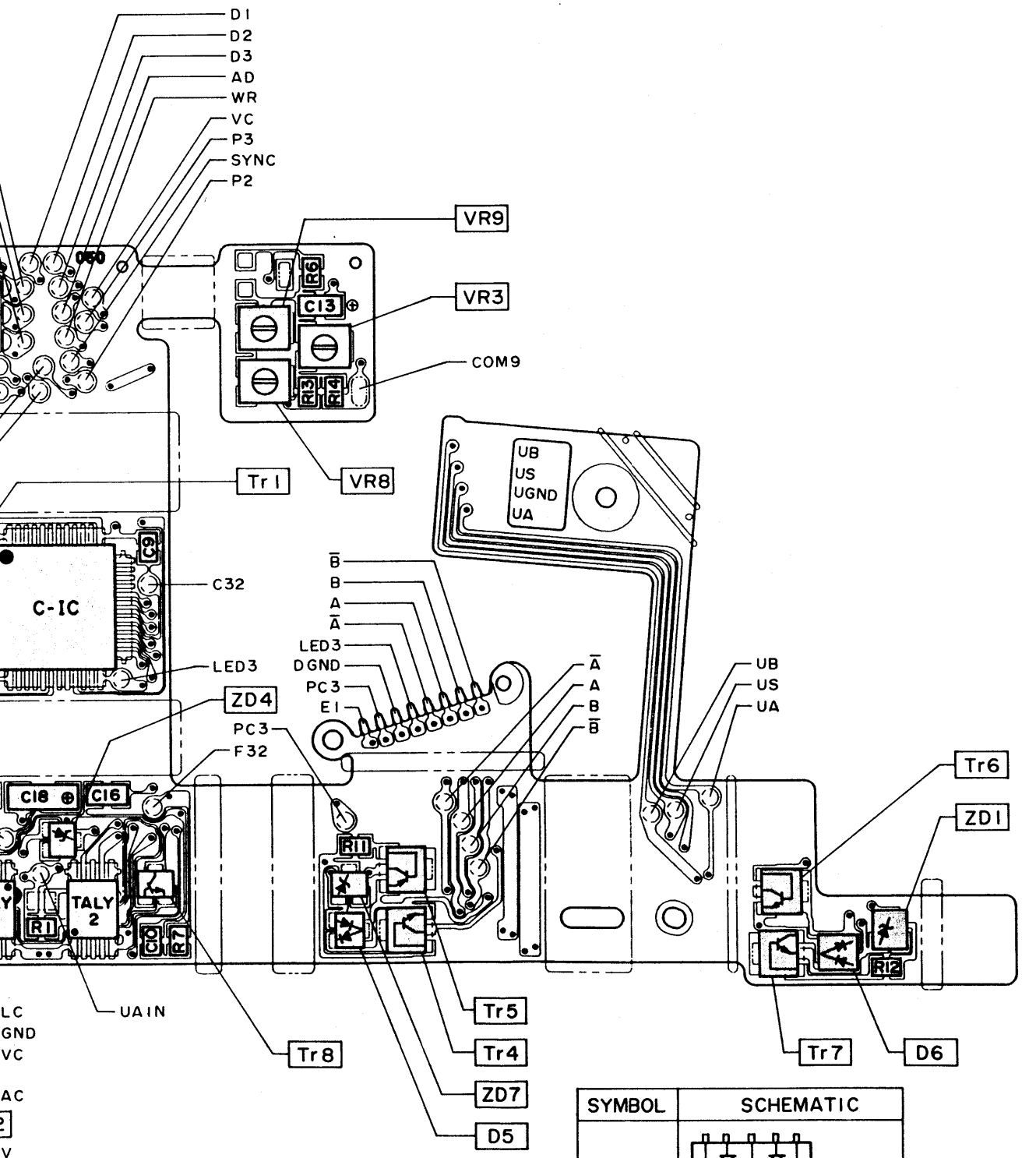


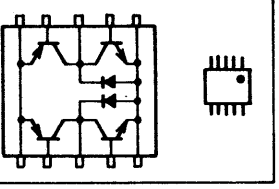
# P.C.B. DIAGRAM
# (MAIN FLEX)



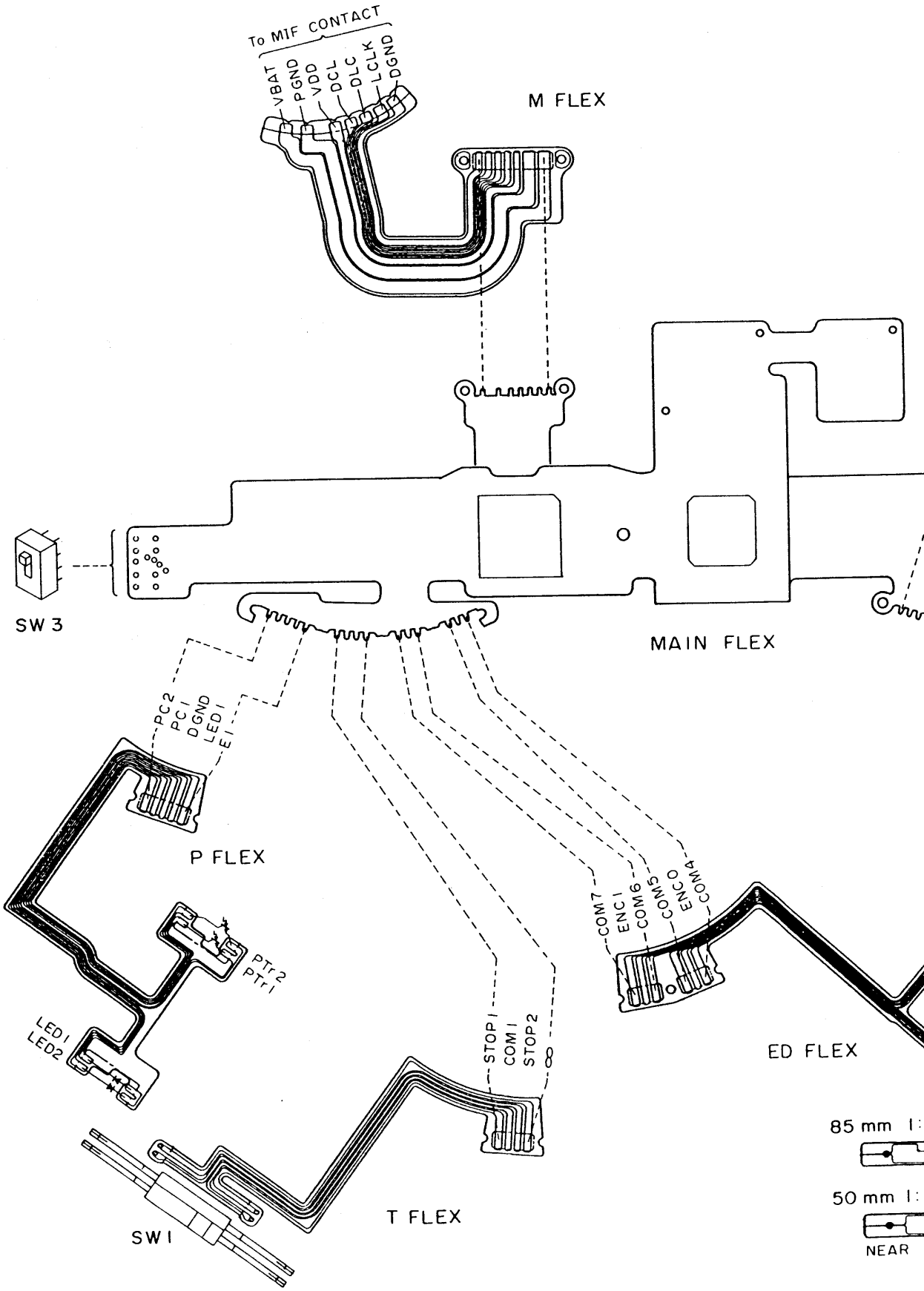

01 AUG, 1989

EF 50mm 1:1.0L
EF 85mm 1:1.2L
REF. NO. C21-6222
C21-7272



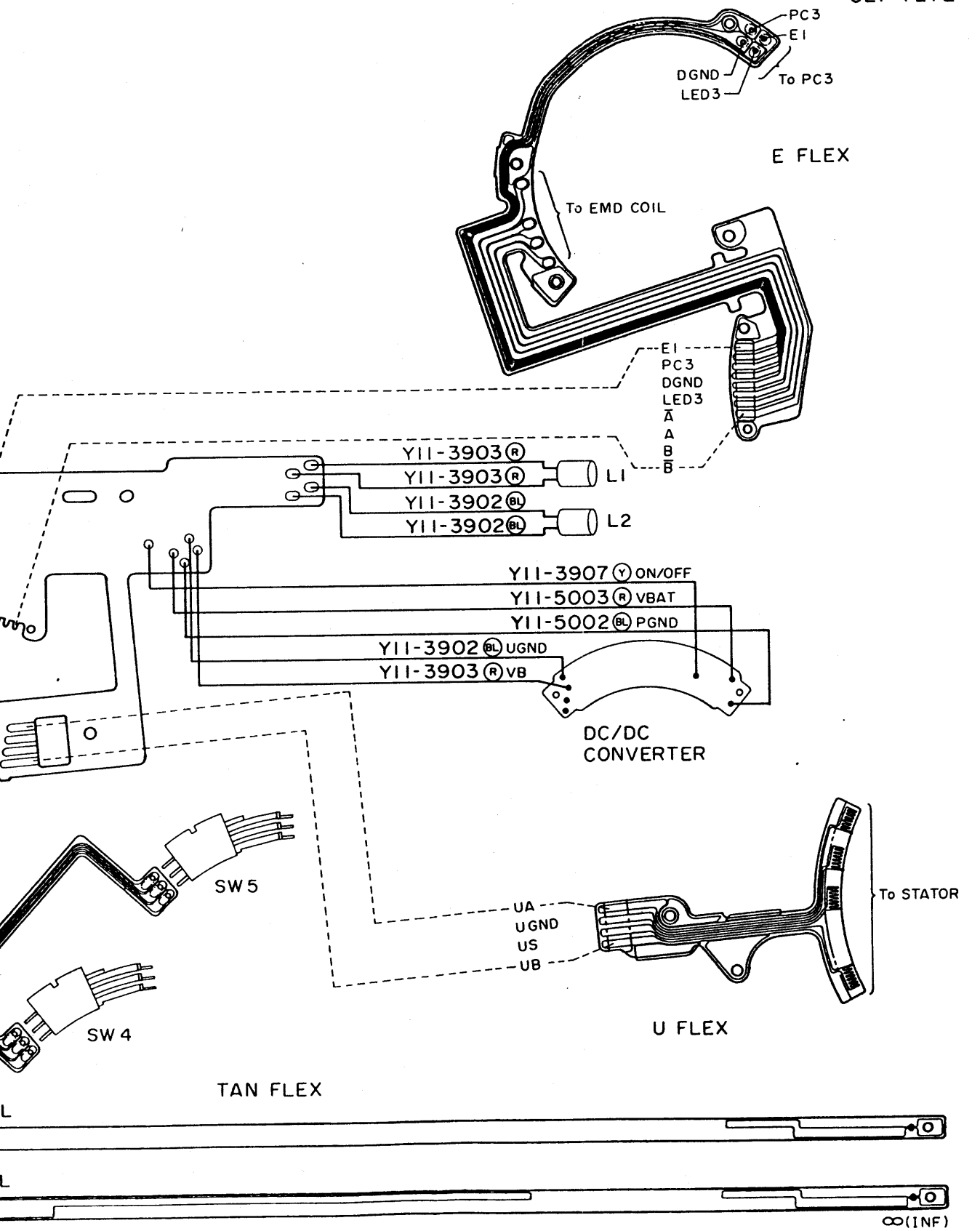

| SYMBOL | SCHEMATIC |
|---|---|
| TALY2<br>TALY3 |  |

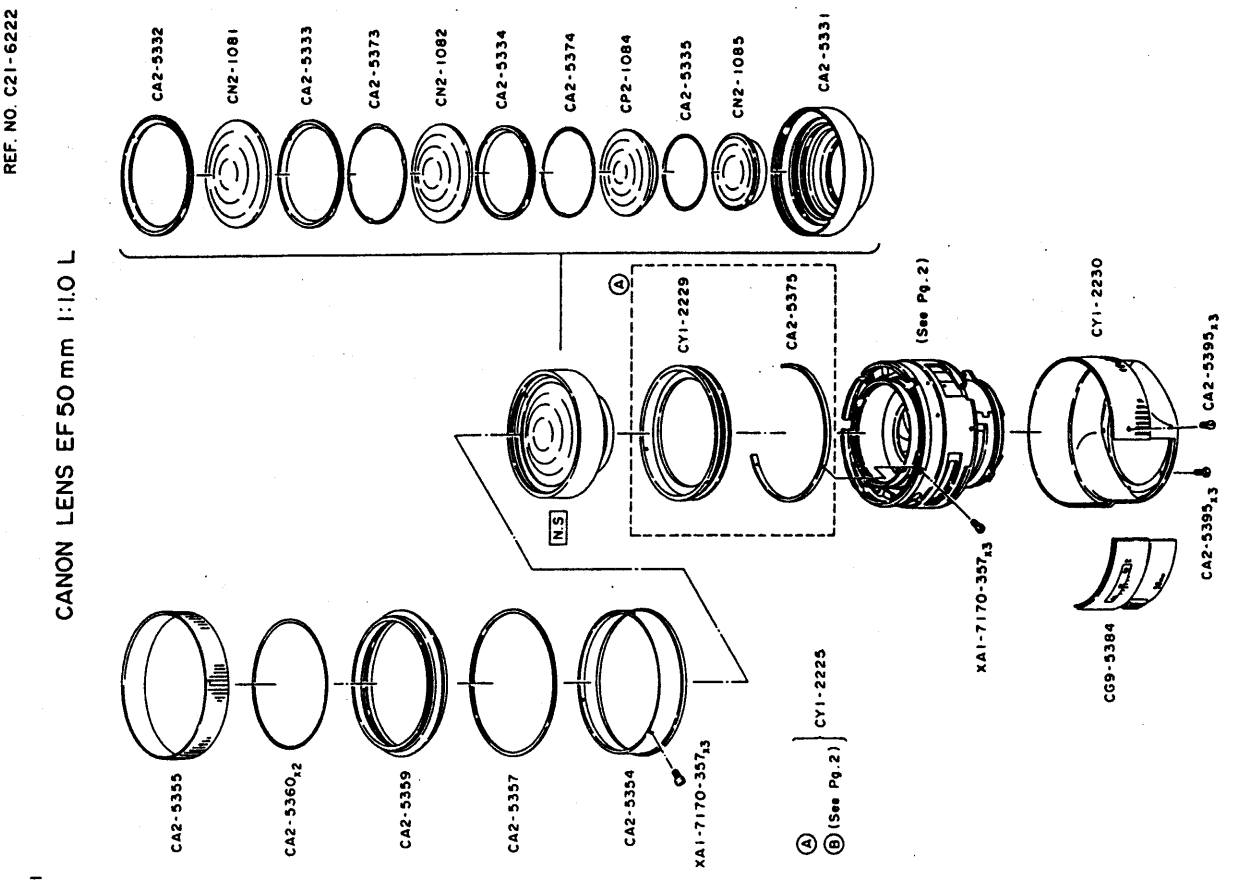
# WIRING DIAGRAM



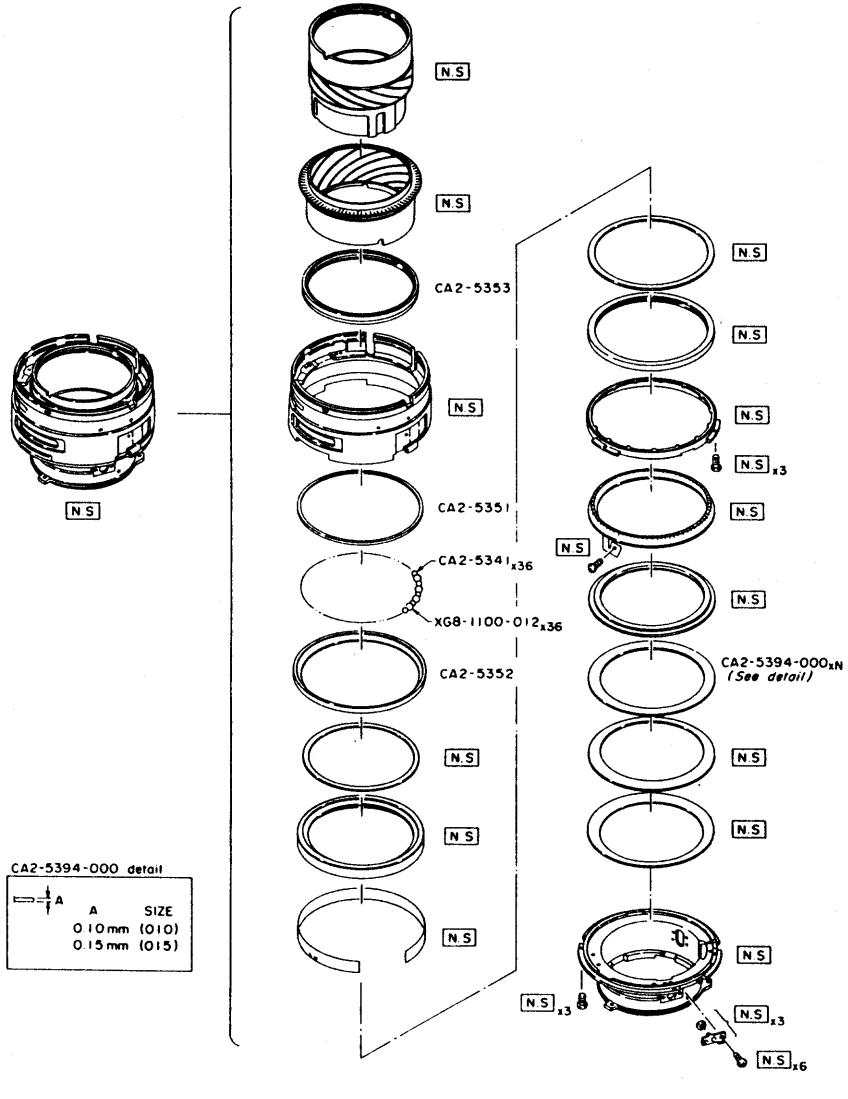

01 AUG, 1989

EF 50 mm 1:1.0L
EF 85 mm 1:1.2L
REF. NO. C21-6222
C21-7272




REF. NO. C21-6222
CANON LENS EF 50 mm 1:1.0 L
CA2-5332
CN2-1081
CA2-5333
CA2-5373
CN2-1082
CA2-5334
CA2-5374
CP2-1084
CA2-5335
CN2-1085
CA2-5331
CY1-2229
CA2-5375
(See Pg.2)
CY1-2230
CA2-5395 x3
CA2-5395 x3
XA1-7170-357 x3
CG9-5384
N.S
CA2-5355
CA2-5360 x2
CA2-5359
CA2-5357
CA2-5354
XA1-7170-357 x3
CY1-2225
(See Pg.2)

# CANON LENS EF 50 mm 1:1.0 L



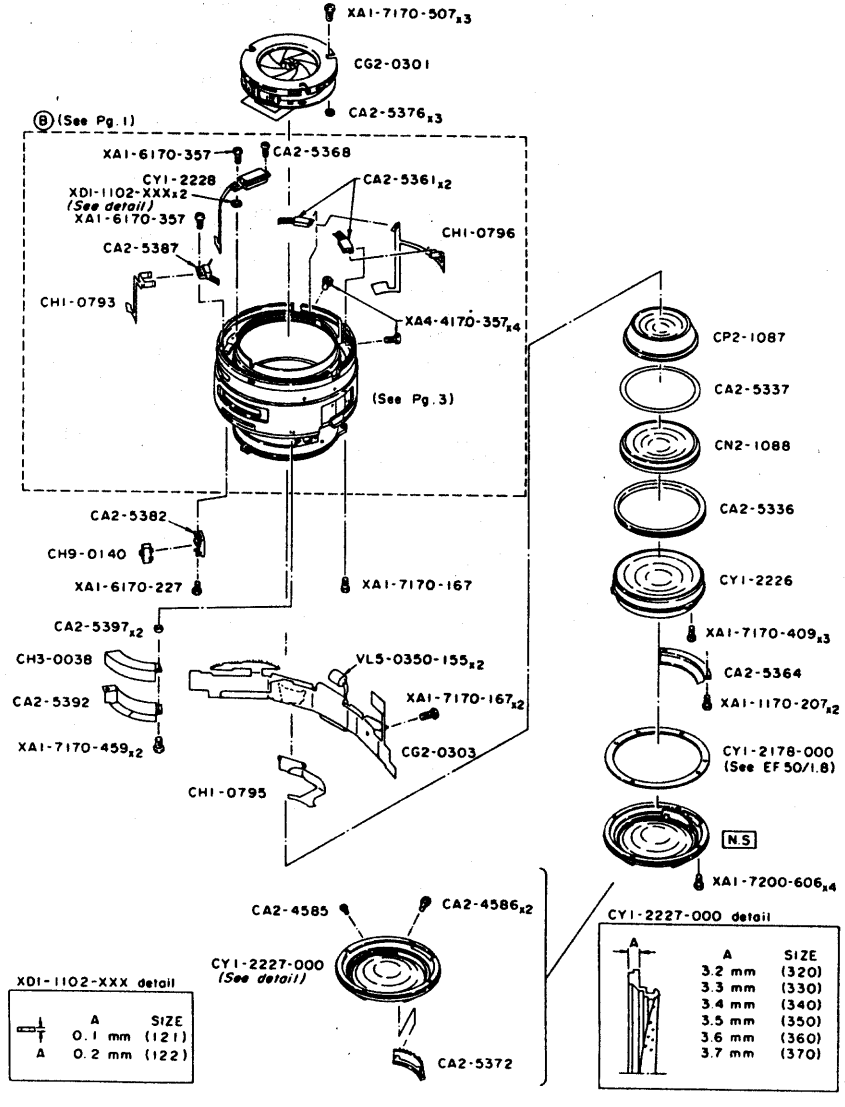

CA2-5394-000 detail

| A | SIZE |
|---|---|
| 0.10 mm | (010) |
| 0.15 mm | (015) |





# CANON LENS EF 50 mm 1:1.0 L



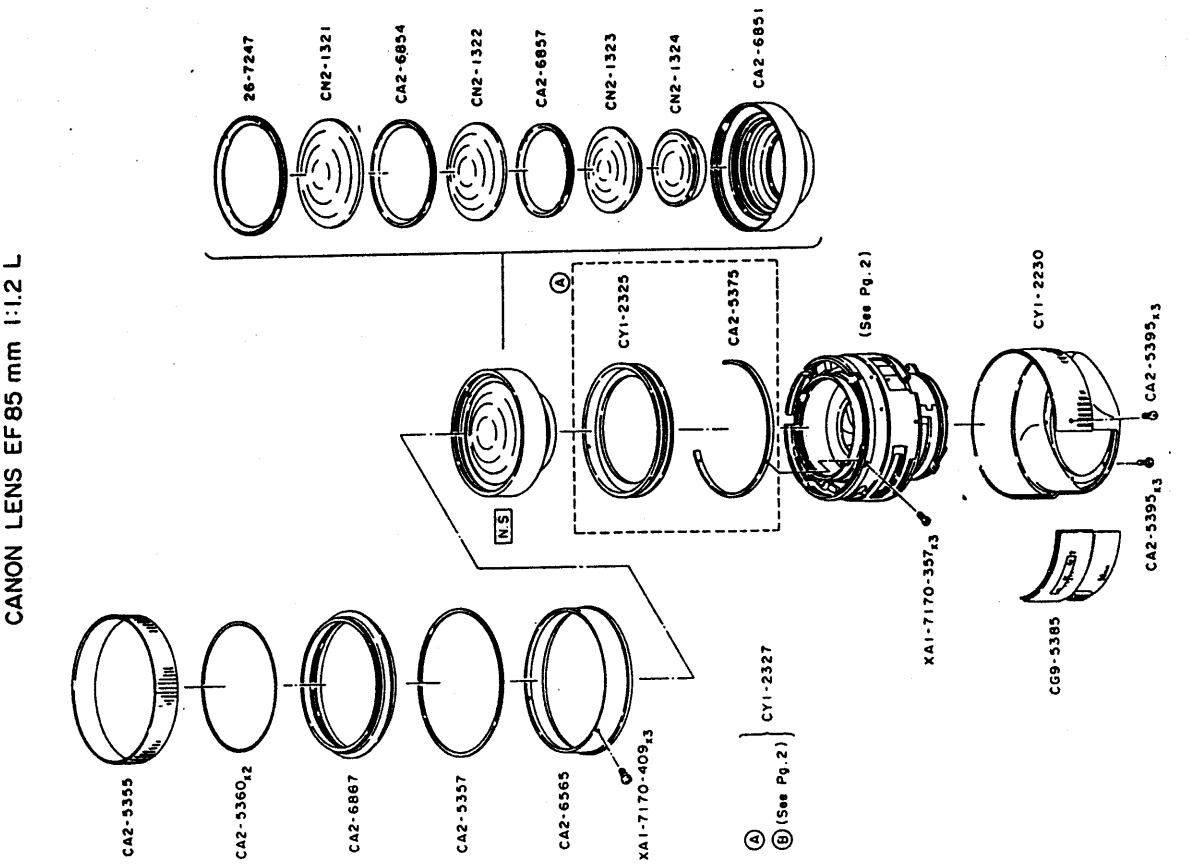

XD1-1102-XXX detail

| A | SIZE |
|---|---|
| A | 0.1 mm (121) |
| | 0.2 mm (122) |

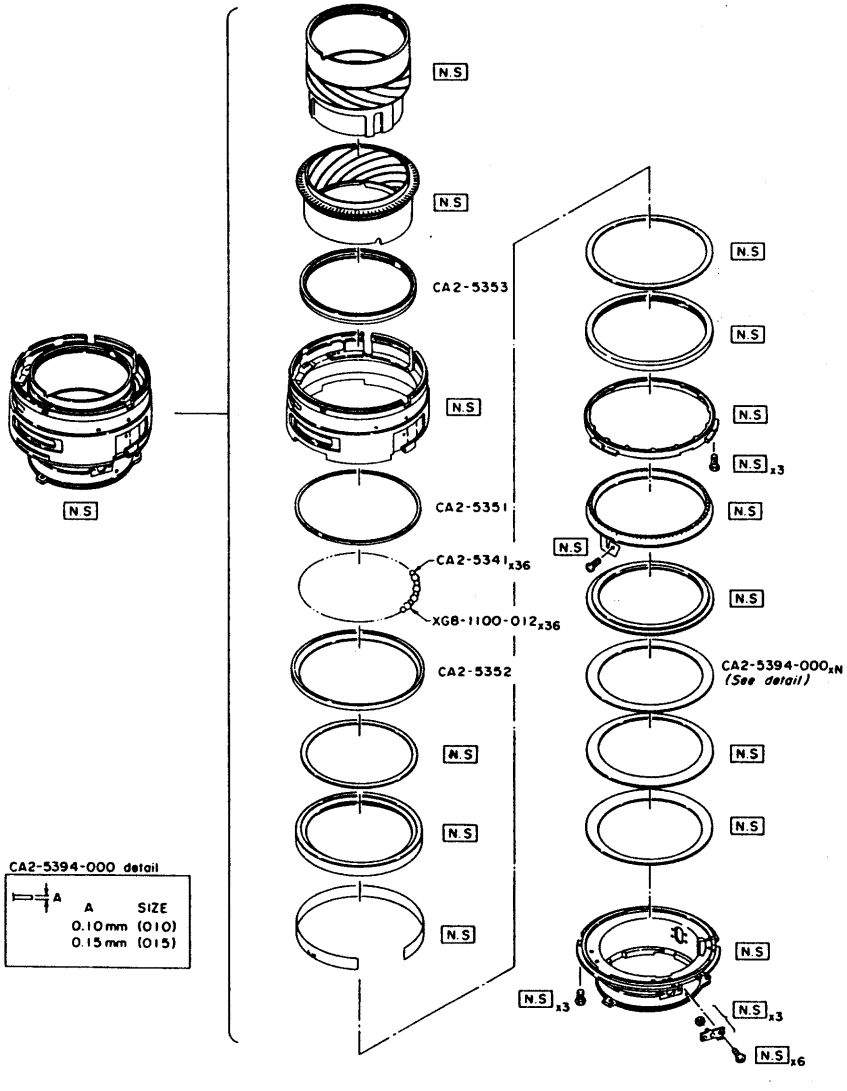
CY1-2227-000 detail

| A | SIZE |
|---|---|
| 3.2 mm | (320) |
| 3.3 mm | (330) |
| 3.4 mm | (340) |
| 3.5 mm | (350) |
| 3.6 mm | (360) |
| 3.7 mm | (370) |

# PARTS CATALOG ILLUSTRATIONS (EF85mm f/1.2L)



# CANON LENS EF 85 mm 1:1.2 L



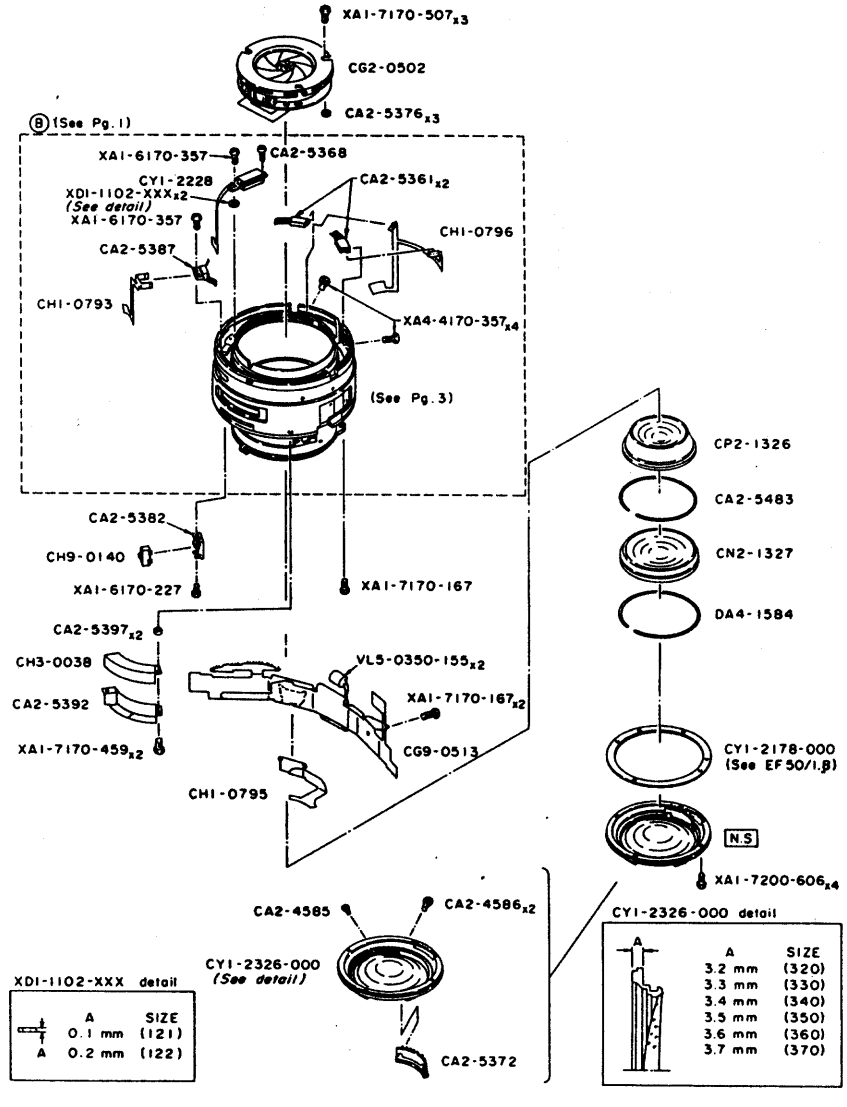

CA2-5394-000 detail

| A | SIZE |
|---|---|
| 0.10 mm | (010) |
| 0.15 mm | (015) |





# CANON LENS EF 85 mm 1:1.2 L




XD1-1102-XXX detail

| A | SIZE |
|---|---|
| A 0.1 mm | (121) |
| A 0.2 mm | (122) |

CY1-2326-000 detail

| A | SIZE |
|---|---|
| 3.2 mm | (320) |
| 3.3 mm | (330) |
| 3.4 mm | (340) |
| 3.5 mm | (350) |
| 3.6 mm | (360) |
| 3.7 mm | (370) |