

作成承認印

配布許可印



# AF-S Zoom-Nikkor 28-70mm f/2.8 D IF

## REPAIR MANUAL

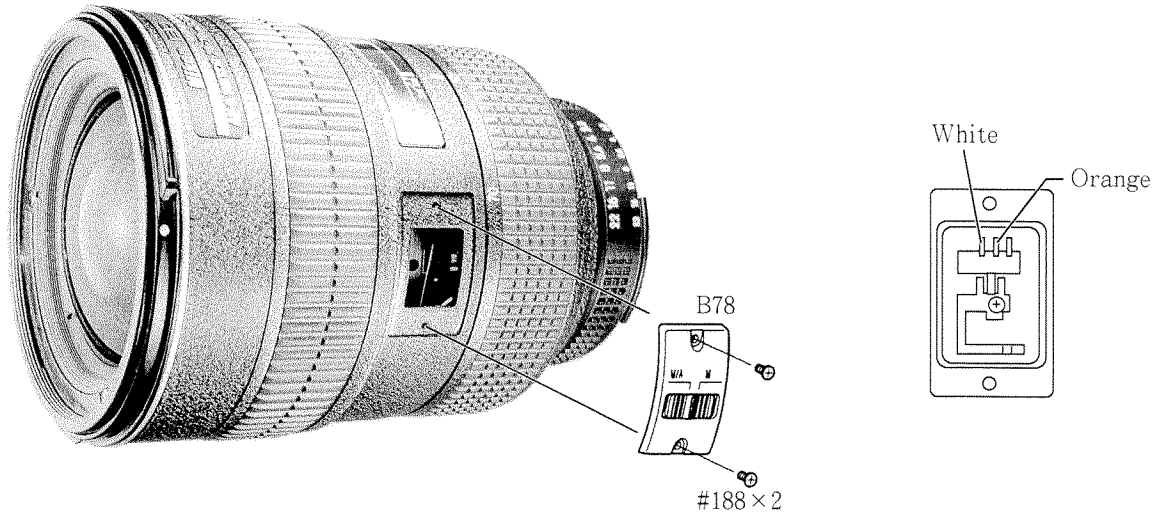
**Nikon** | NIKON CORPORATION  
Tokyo, Japan

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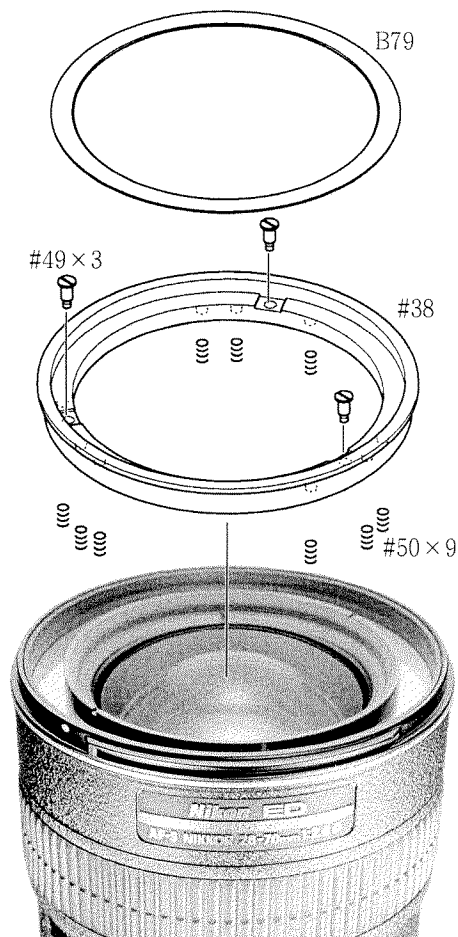
# DISASSEMBLING / ASSEMBLING / ADJUSTMENT

## 1. DISASSEMBLING

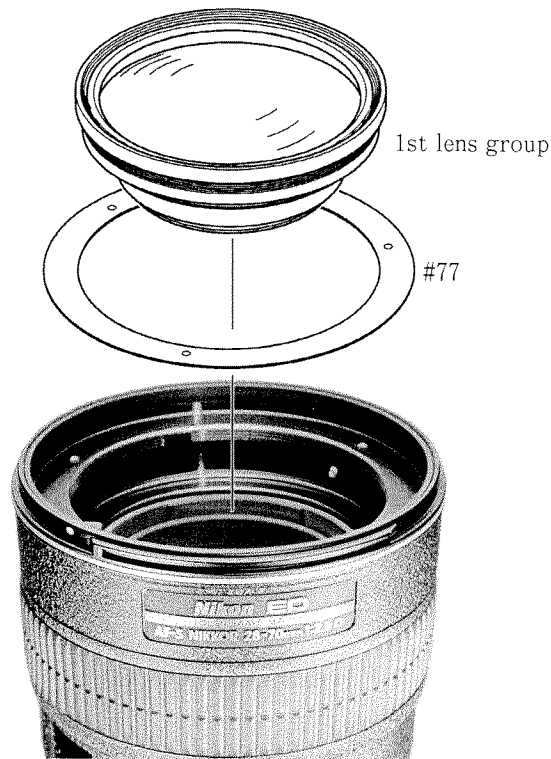
CHANGE-OVER SWITCH UNIT



FILTER RING #38



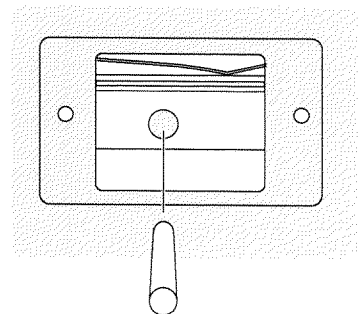
1st LENS GROUP



2nd LENS GROUP



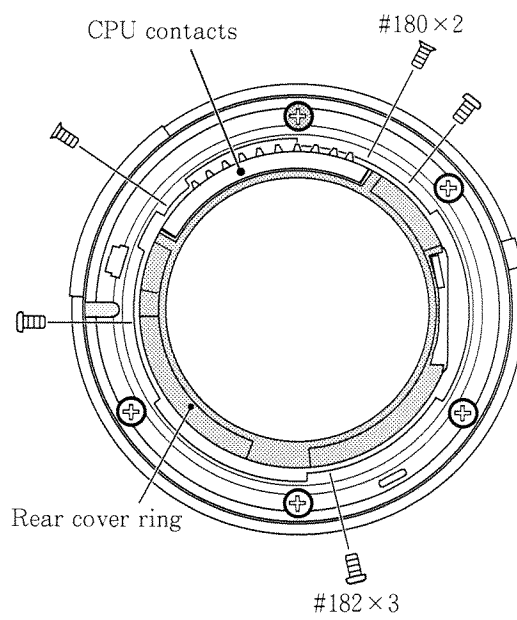
- ① Drive the zoom ring until it touches the limit of Wide position.
- ② Drive the focus ring in order to set the infinity mark, ∞, to meet the index.
- ③ As shown in the figure below, insert the φ2 pin to the designated position.
- ④ Remove the 2nd lens group.



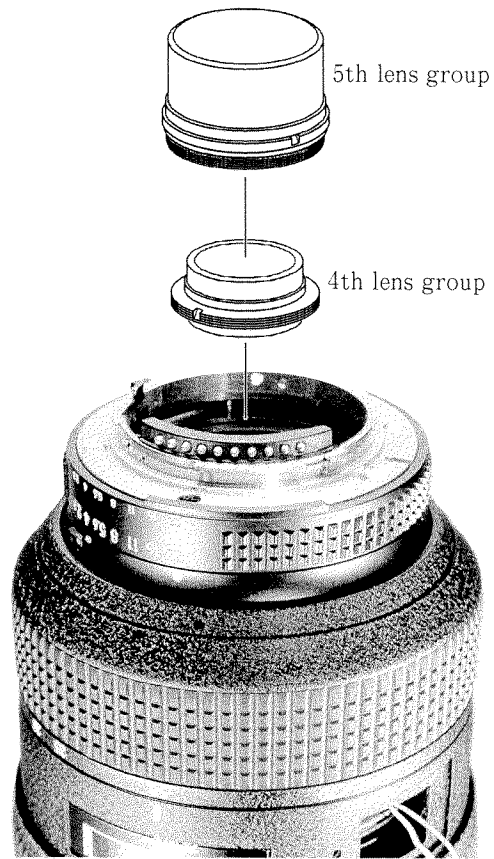
3rd LENS GROUP



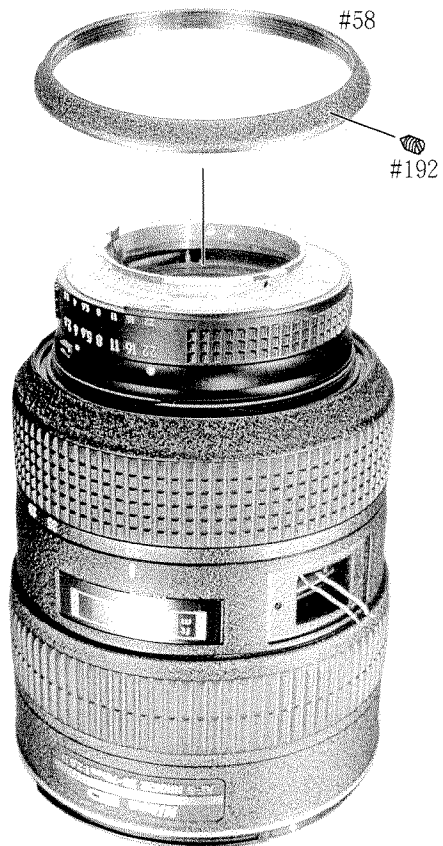
REAR COVER RING



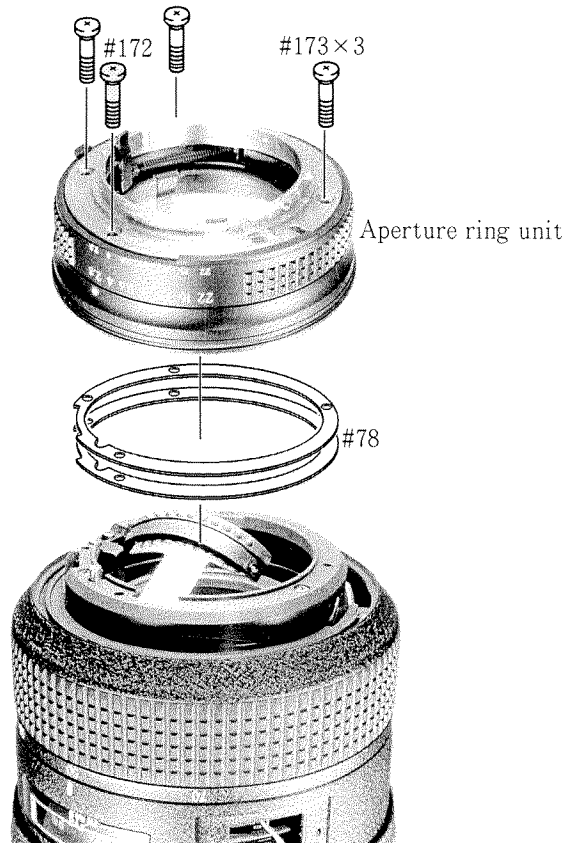
4th~5th LENS GROUP



RING #58



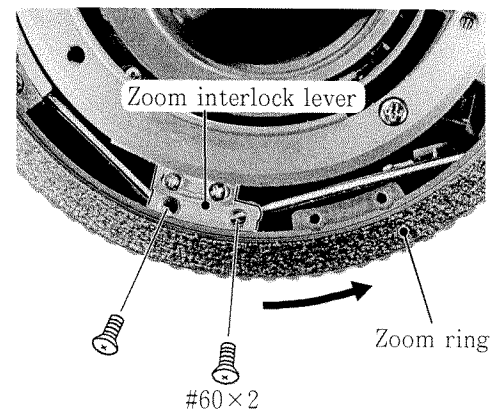
APERTURE RING UNIT



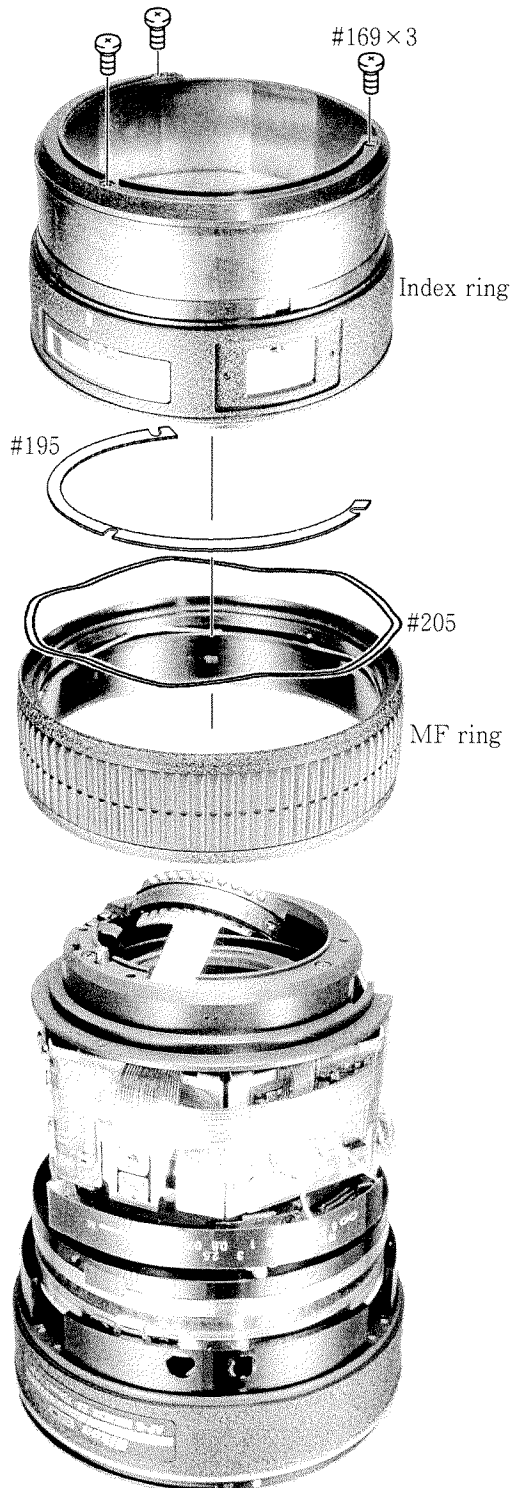
ZOOM RING



- ① Remove 2 pieces of the screw #60.
- ② As shown in the photo below, drive the zoom ring in the arrow direction.
- ③ Remove the zoom ring.
- ④ Remove the zoom interlock lever.

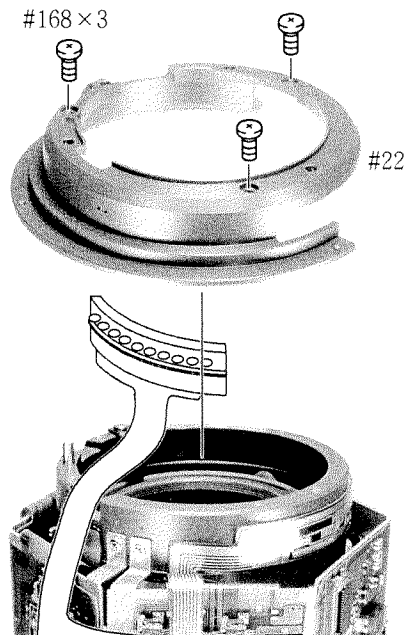


MF RING, INDEX RING

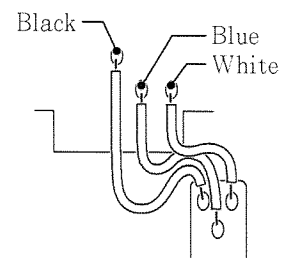
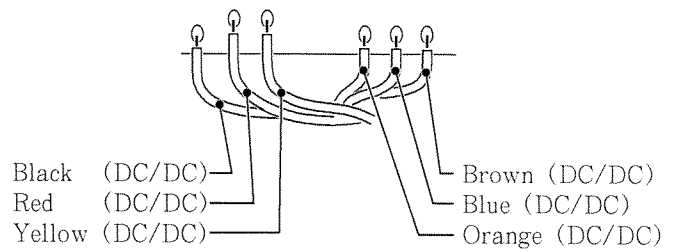
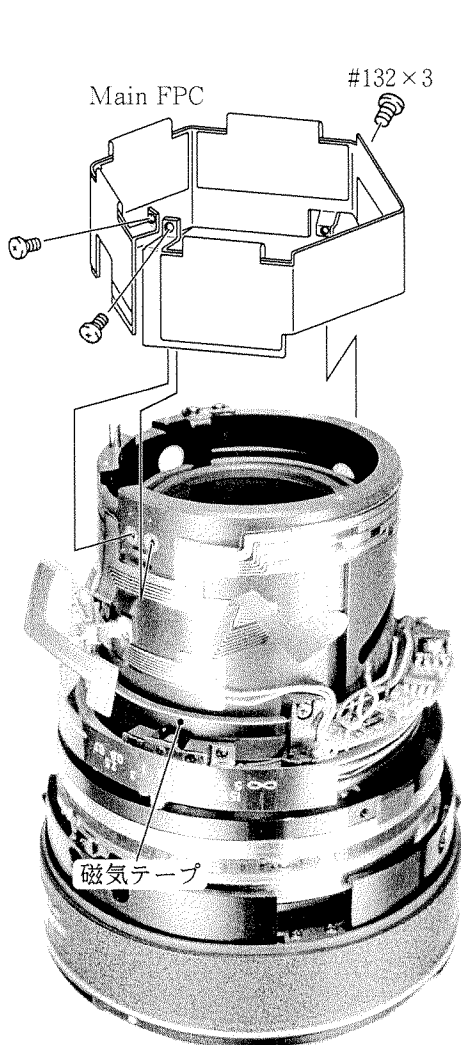


Note : For removing the MF ring or the index ring, due to almost no gap between the main FPC, the DC/DC converter and the focus index, be careful and avoid to damage or to deform these parts while removing.

RING #22



MAIN FPC



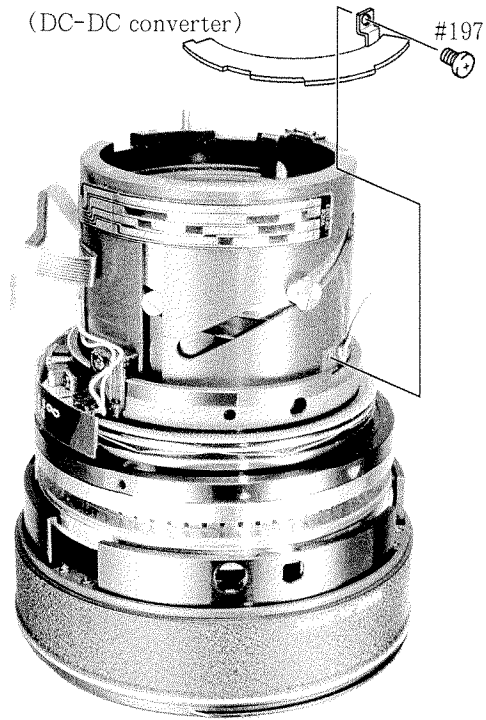
- Remove 4, four, connectors and the wiring described in the two drawings above.

**Note :** Due to a cause to damage the magnetic data, do not place any magnet near the magnetic tape.

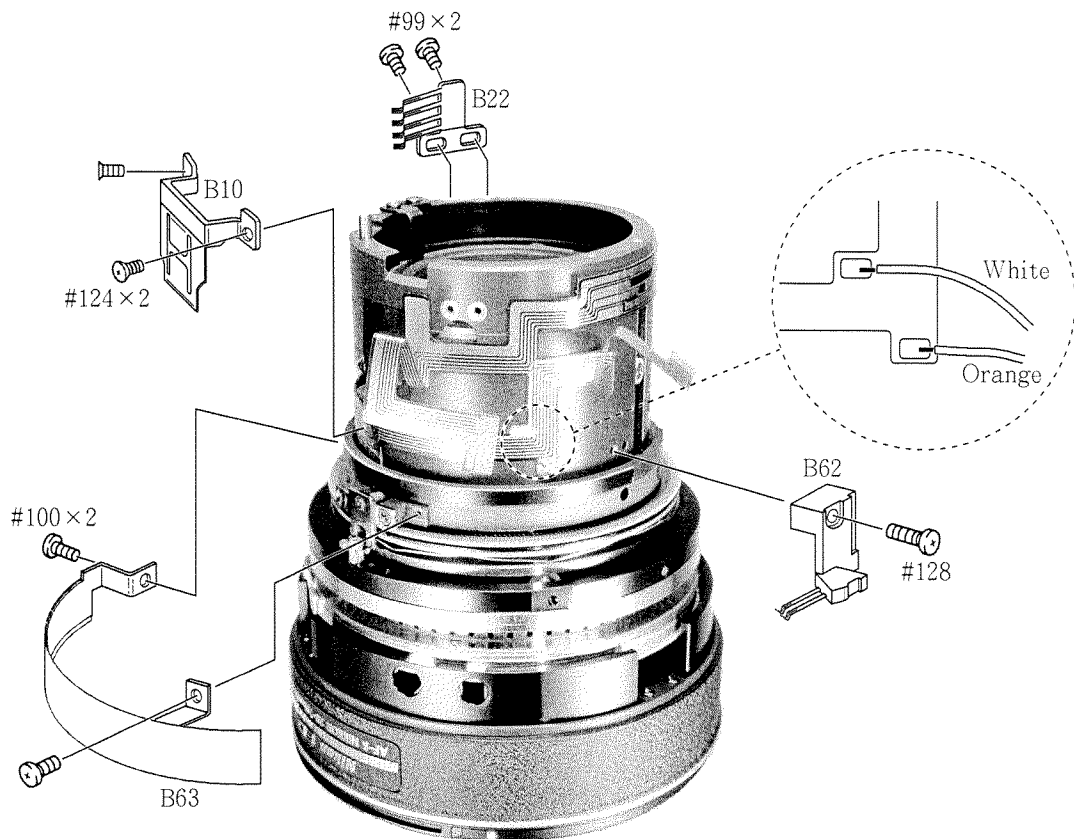
Do not set anything magnetic to touch the magnetic tape either.



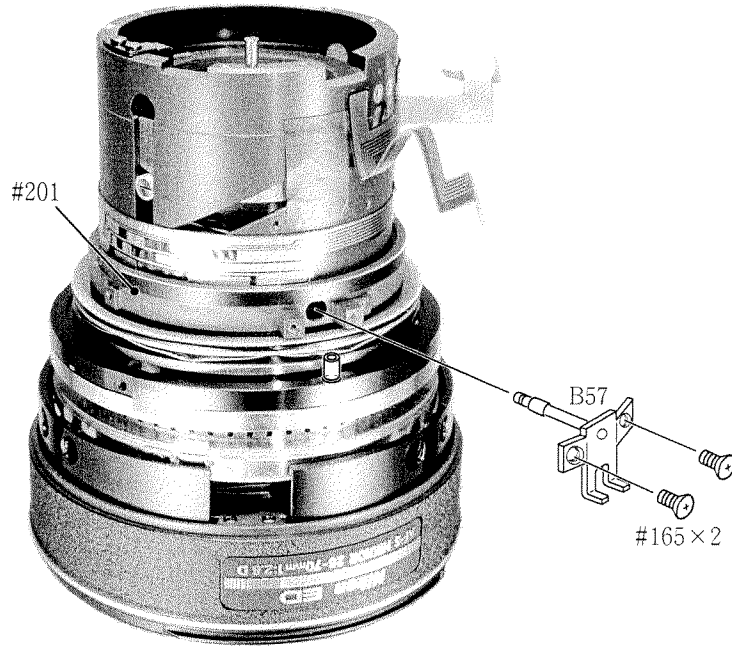
DC-DC CONVERTER



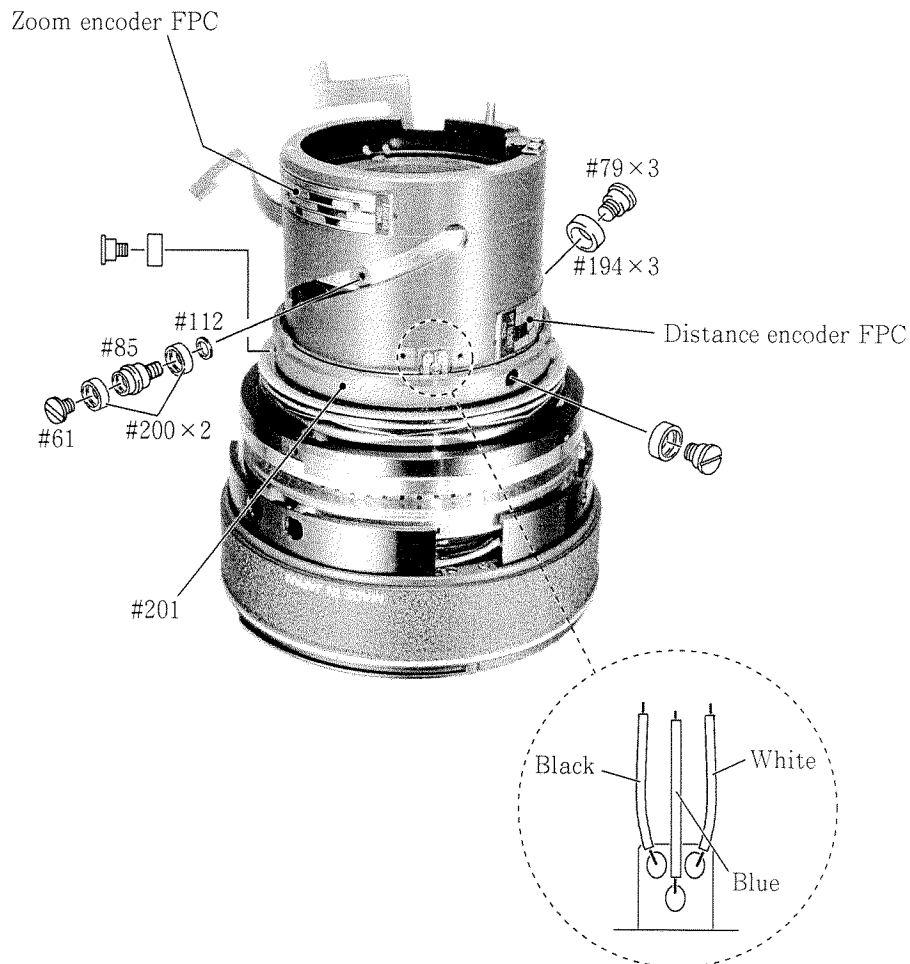
ROTATION DETECTION BRUSH, MR HEAD, FOCUS INDEX, DISTANCE ENCODER BRUSH



FOCUS INTERLOCK PIN

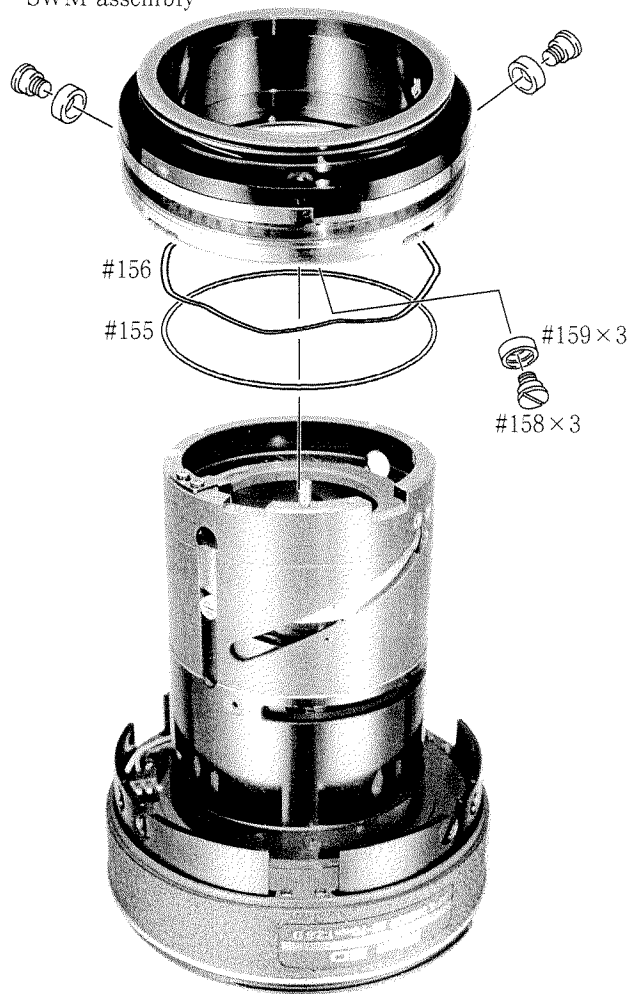


RING #201, ZOOM ENCODER FPC, DISTANCE ENCODER FPC

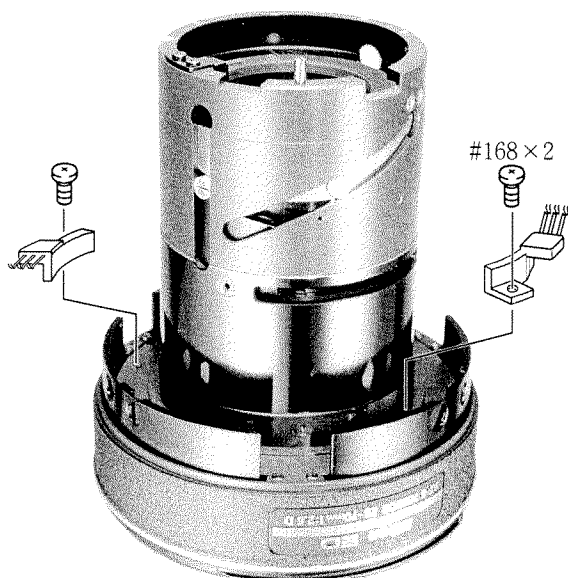


SWM ASSEMBLY

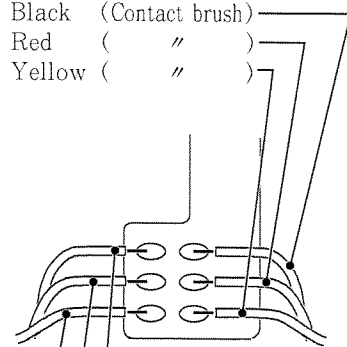
SWM assembly



CONTACT BRUSH

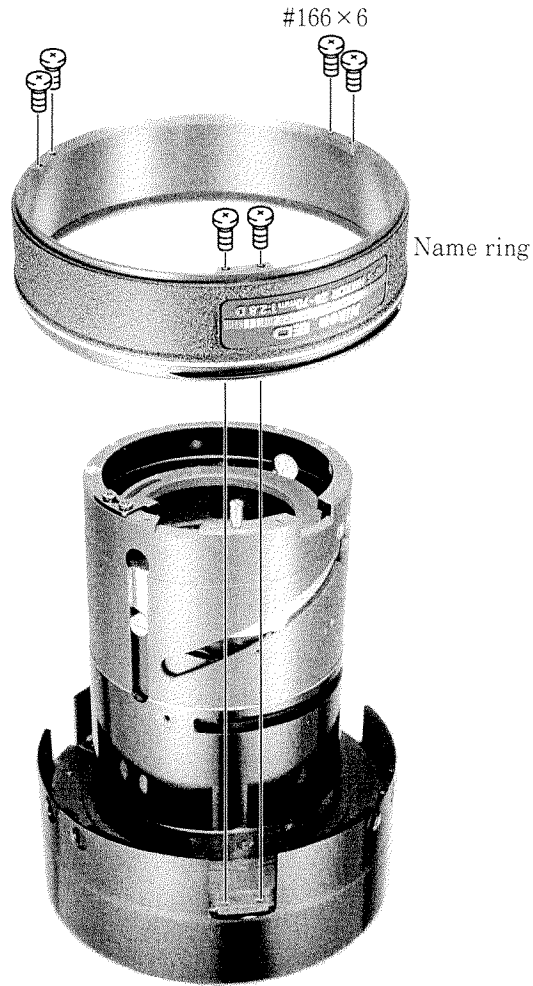


Black (Contact brush)  
Red ( " )  
Yellow ( " )

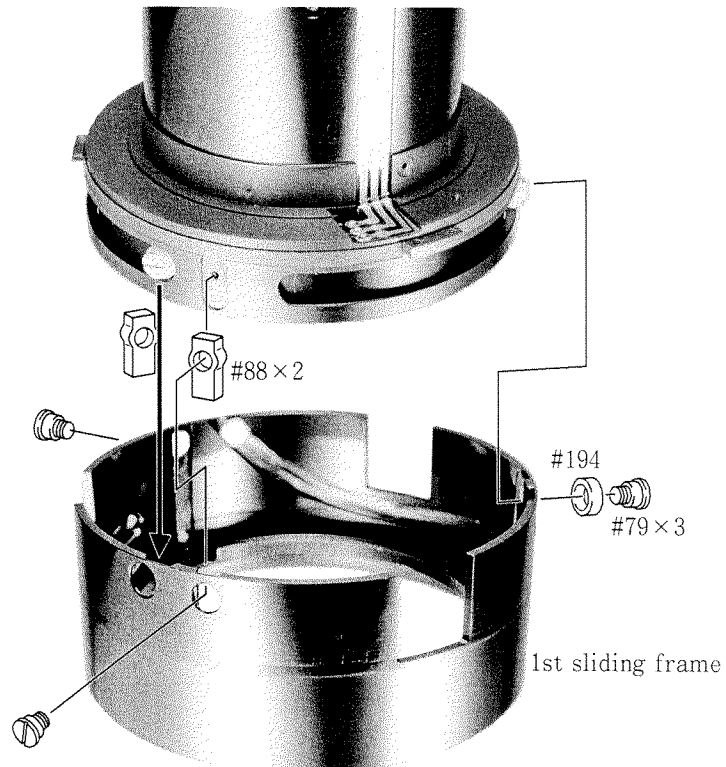


Black (Contact brush)  
Red ( " )  
Yellow ( " )

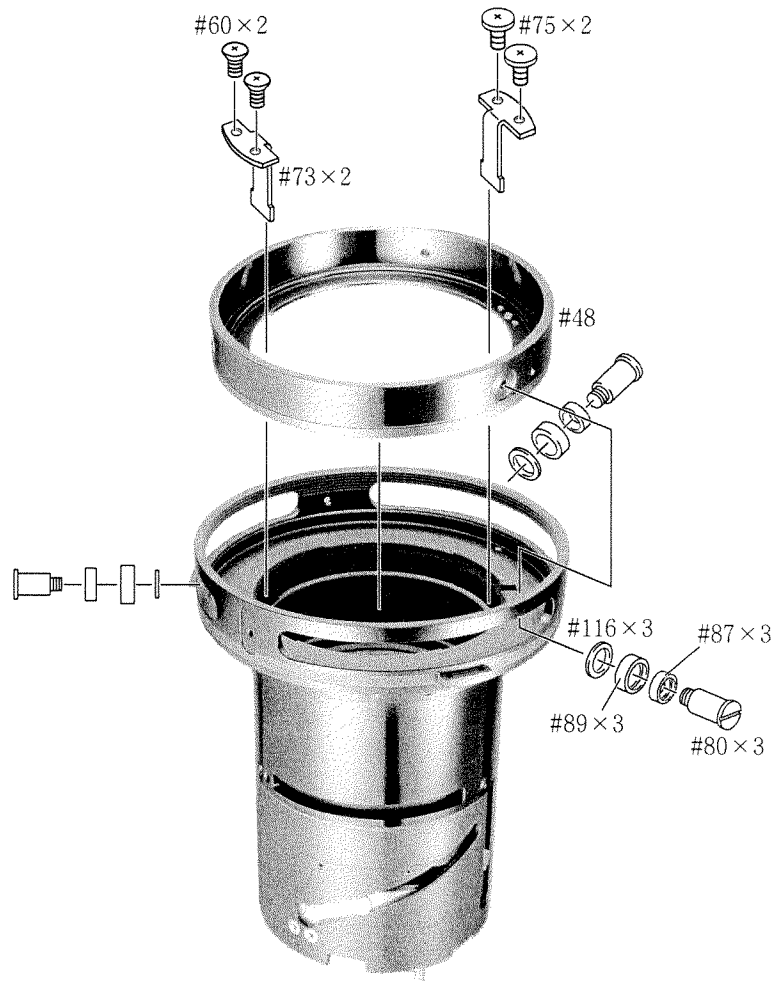
NAME RING



1st SLIDING FRAME



RING #48



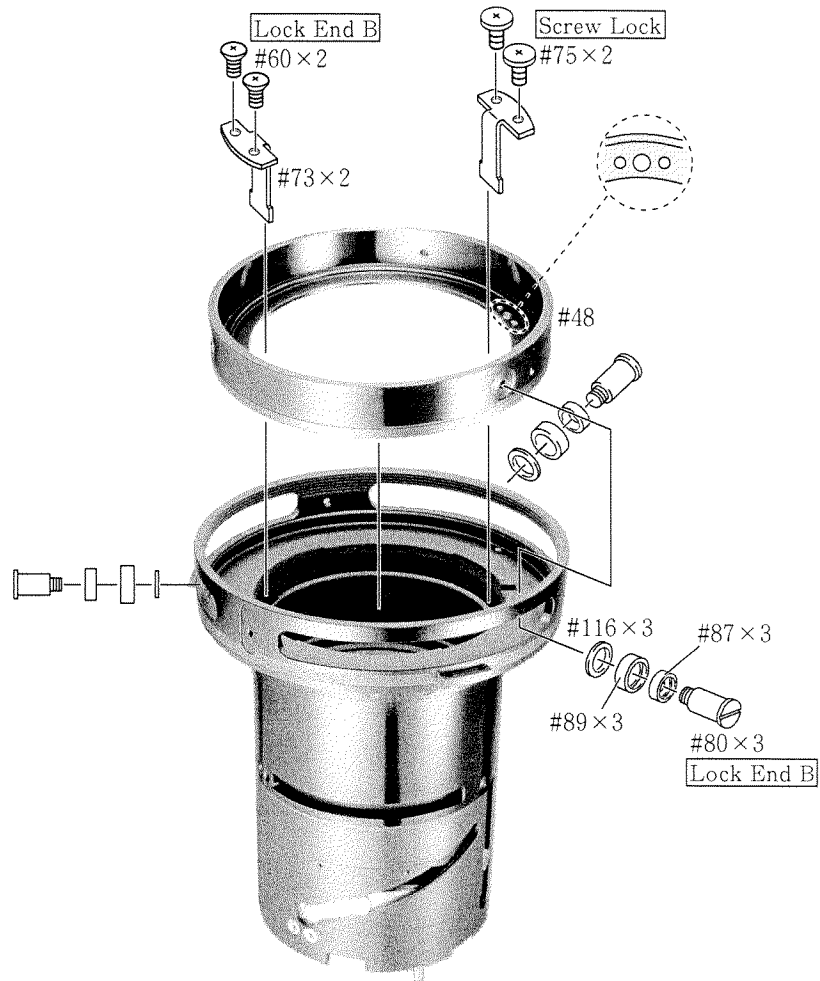
**Note :** Although the sliding frame unit is composed of each 2nd, 3rd, 5th sliding frame and the cam ring which includes the aperture blade housing, due to the torque accuracy adjusted by the dedicated device, they are just designed as the assembled unit alone.

Accordingly, if once disassembling it, its accuracy can not be guaranteed.

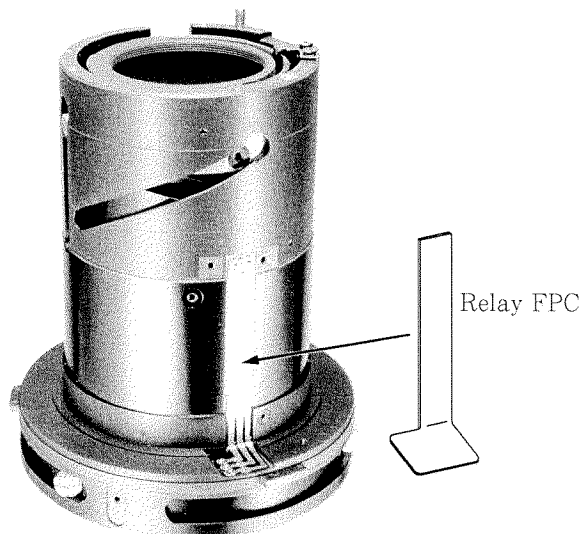
In this accord, do not disassemble it.

## 2. ASSEMBLING / ADJUSTMENT

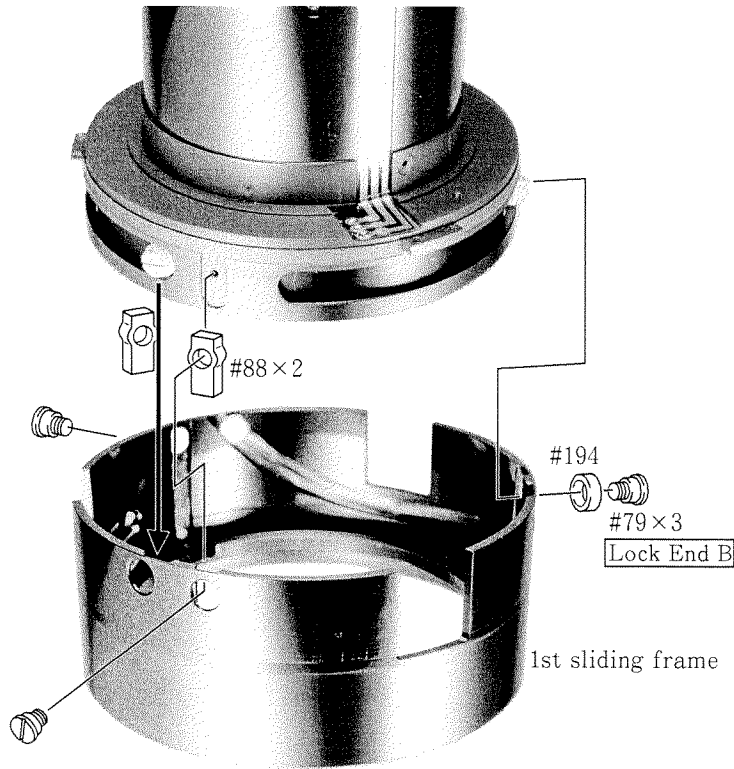
RING #48



RELAY FPC

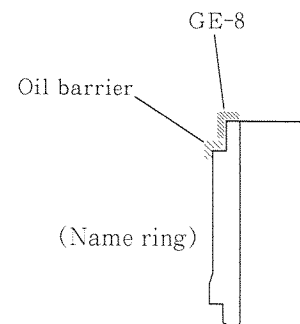
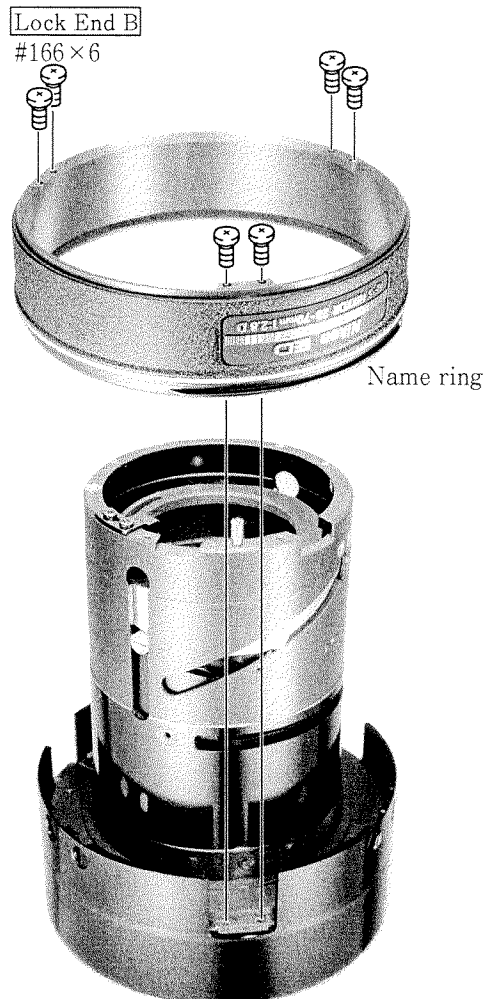


1st SLIDING FRAME

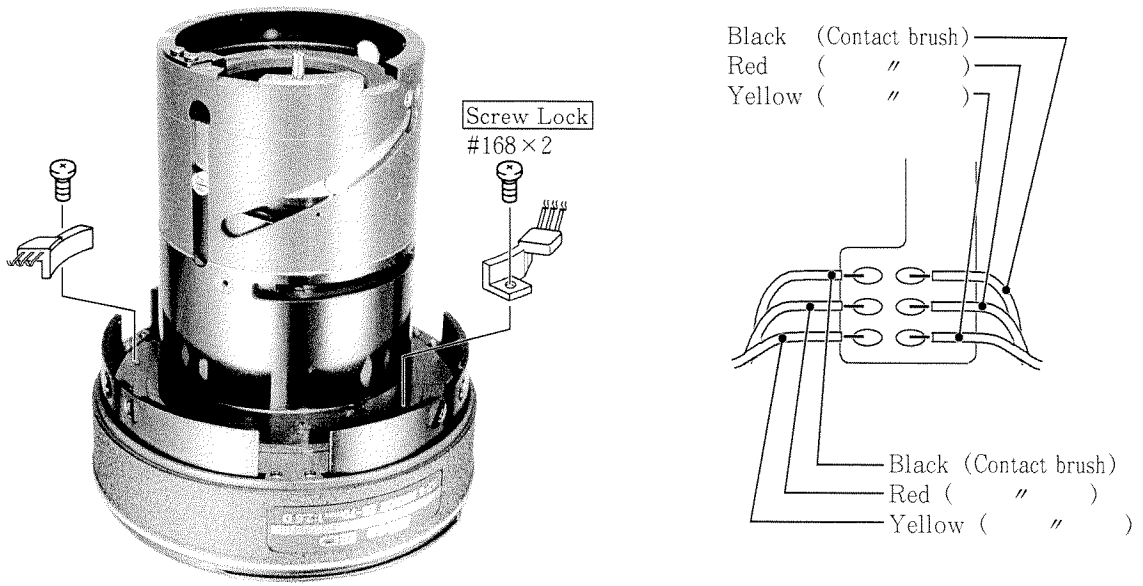


- Apply the grease G92KA to each three cam grooves and three straight grooves on the 1st sliding frame.

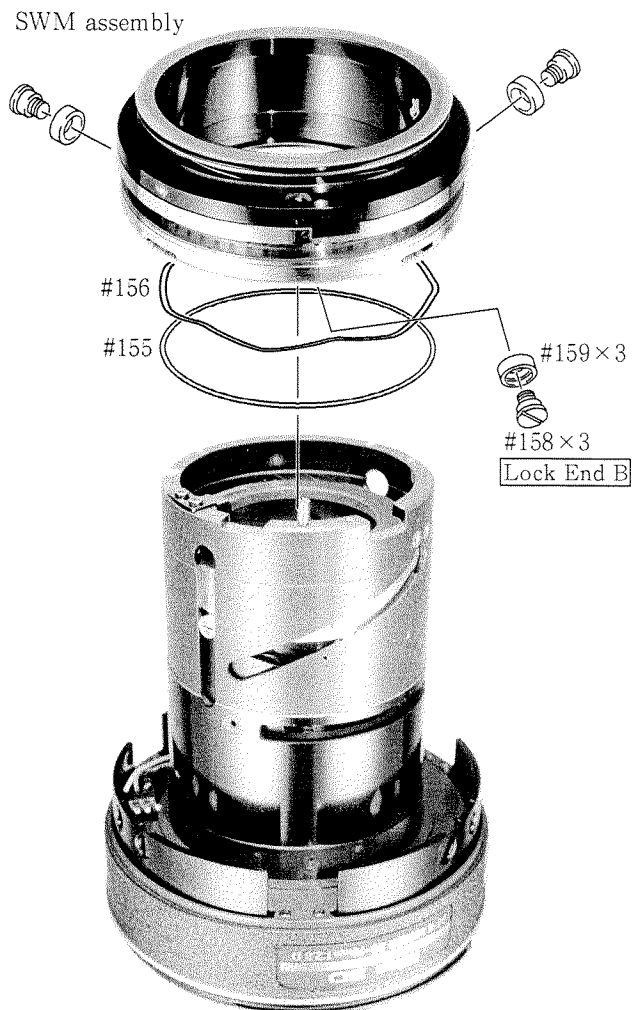
NAME RING



CONTACT BRUSH

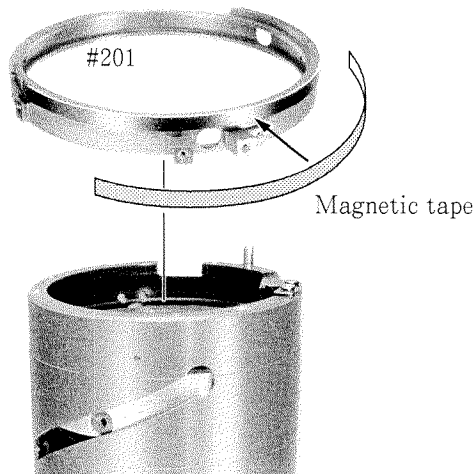


SWM ASSEMBLY





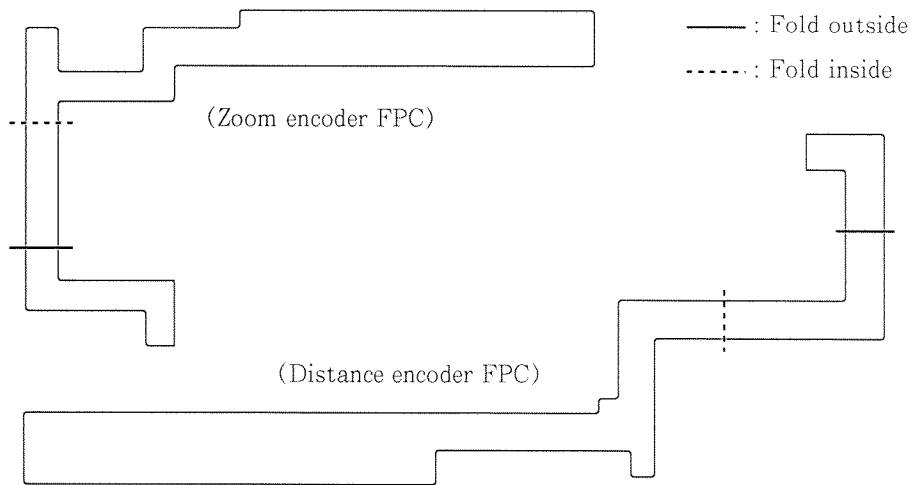
RING #201, ZOOM ENCODER FPC, DISTANCE ENCODER FPC



① Attach the magnetic tape around the ring #201 and fix them together.

**Note :** Due to a cause to damage the magnetic data, do not place any magnet near the magnetic tape.

Do not set anything magnetic to touch the magnetic tape either.

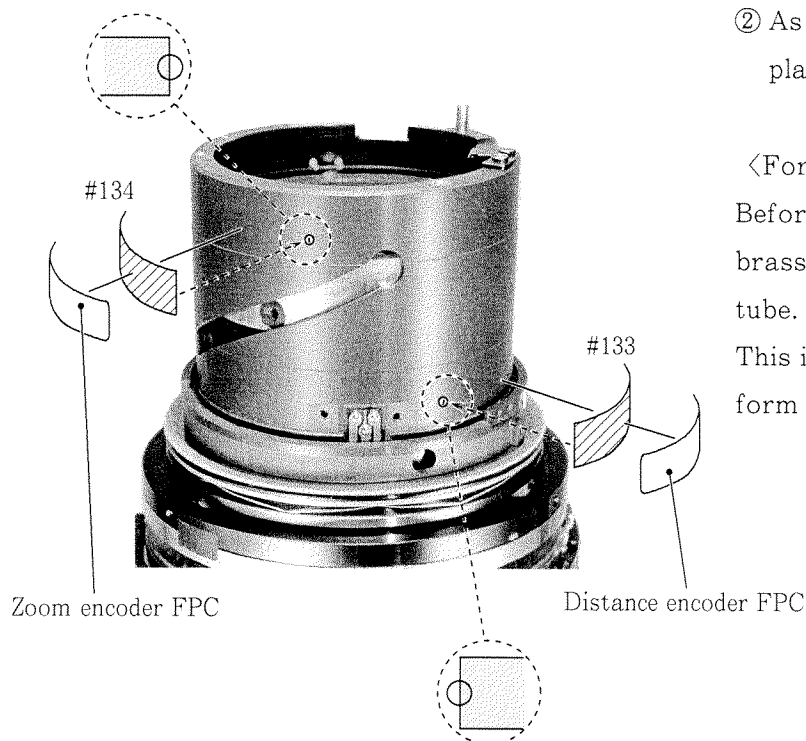


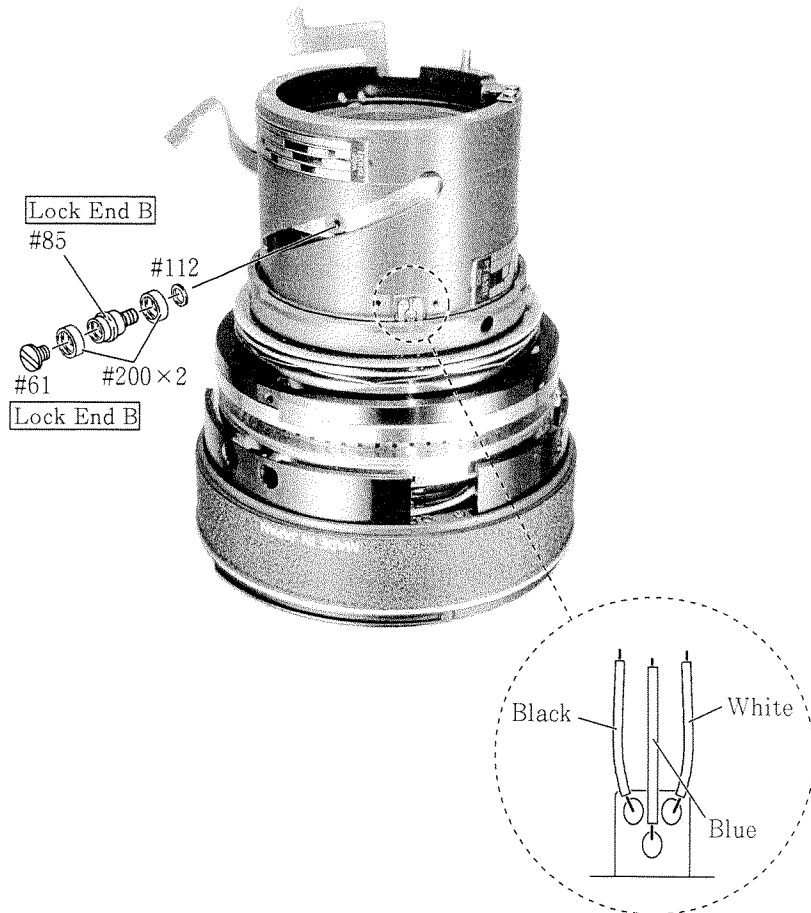
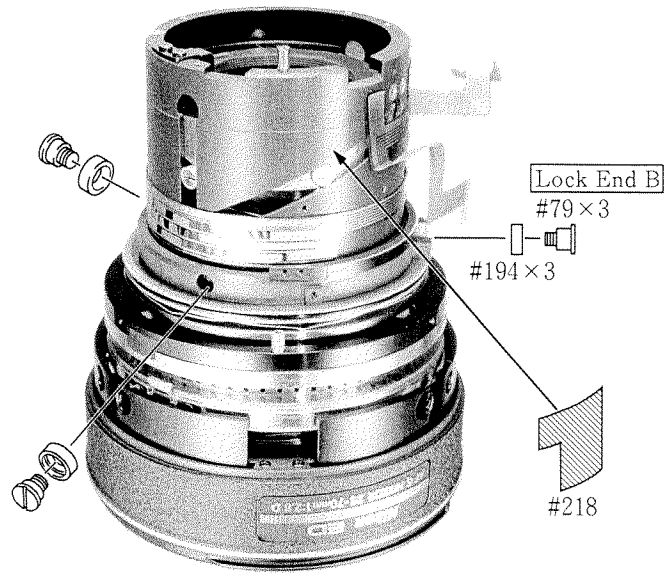
② As shown in the left, attach the brass plates #133, #134 and each FPC.

<For your reference>

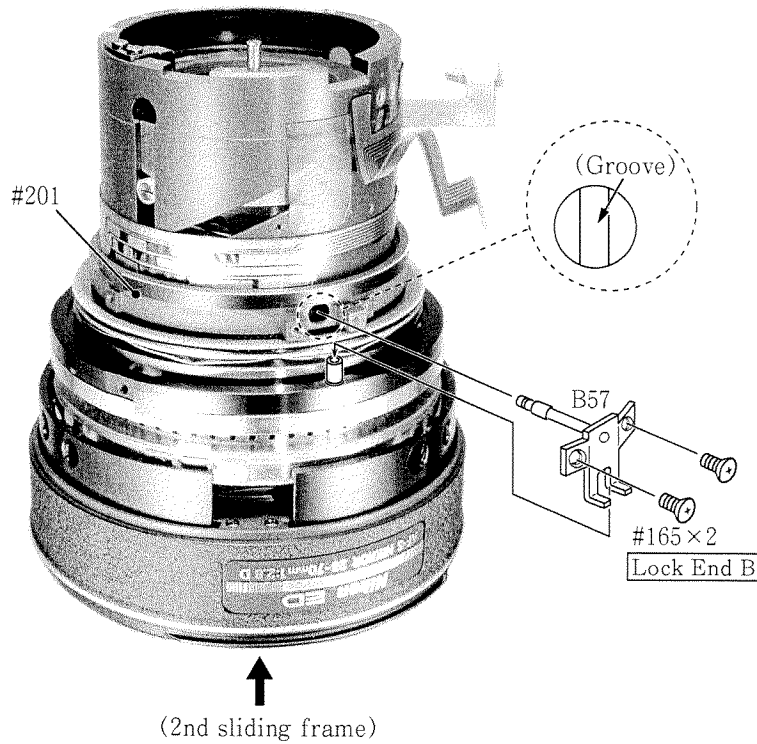
Before attaching them, be sure to wind the brass plates #133 and #134 round any thin tube.

This is to get them be familiar with such a form and to prevent against peel-off.





FOCUS INTERLOCK PIN

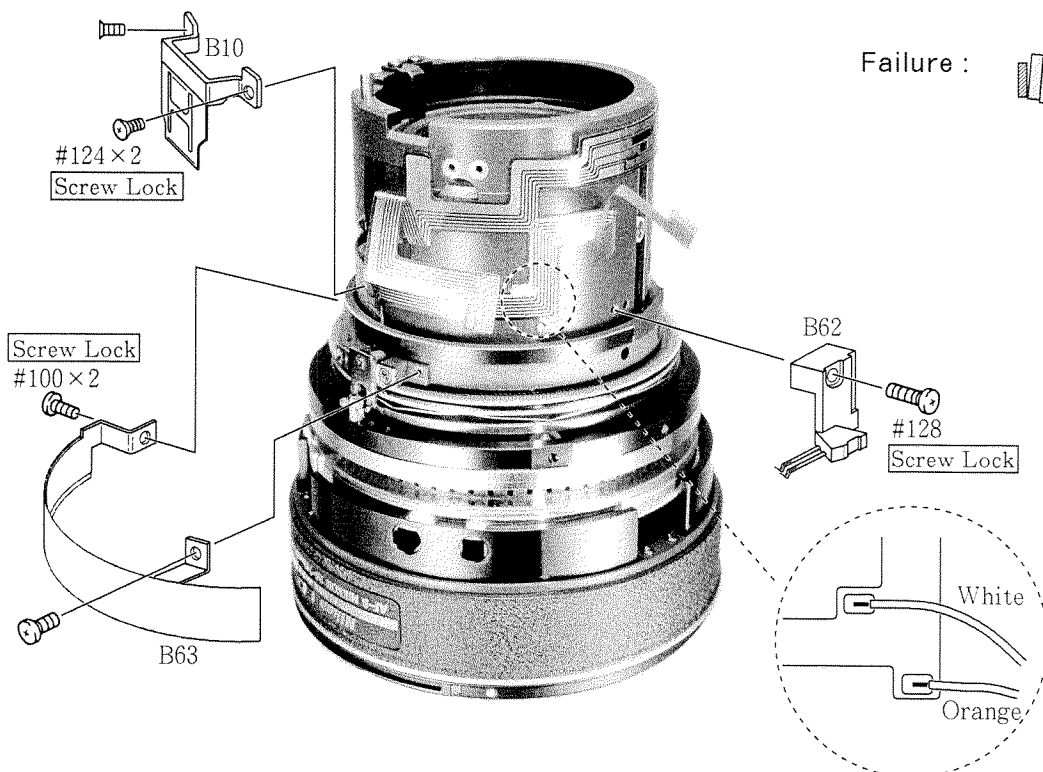
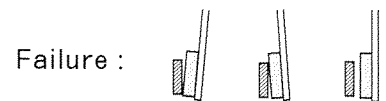
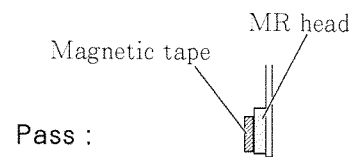


- ① Drive the ring #201 and then place it to the designated position as shown in the left photo.
- ② Drive the 2nd sliding frame and then place B57's hole just on the groove.
- ③ Mount and fix the focus interlock pin B57 on it.

ROTATION DETECTION BRUSH, MR HEAD, FOCUS INDEX

**Note :** For attaching the MR head, be sure to apply the magnetic tape on to the MR head in place as described in the right figure.

Then, do not peel off the protection tape attached on the MR head.



INSPECTION AND ADJUSTMENT FOR THE WAVEFORM OUTPUT FROM MR ENCODER

- In case of replacing the MR tape or the MR head, be sure to conduct adjustment.

1. Equipment and tools to be required

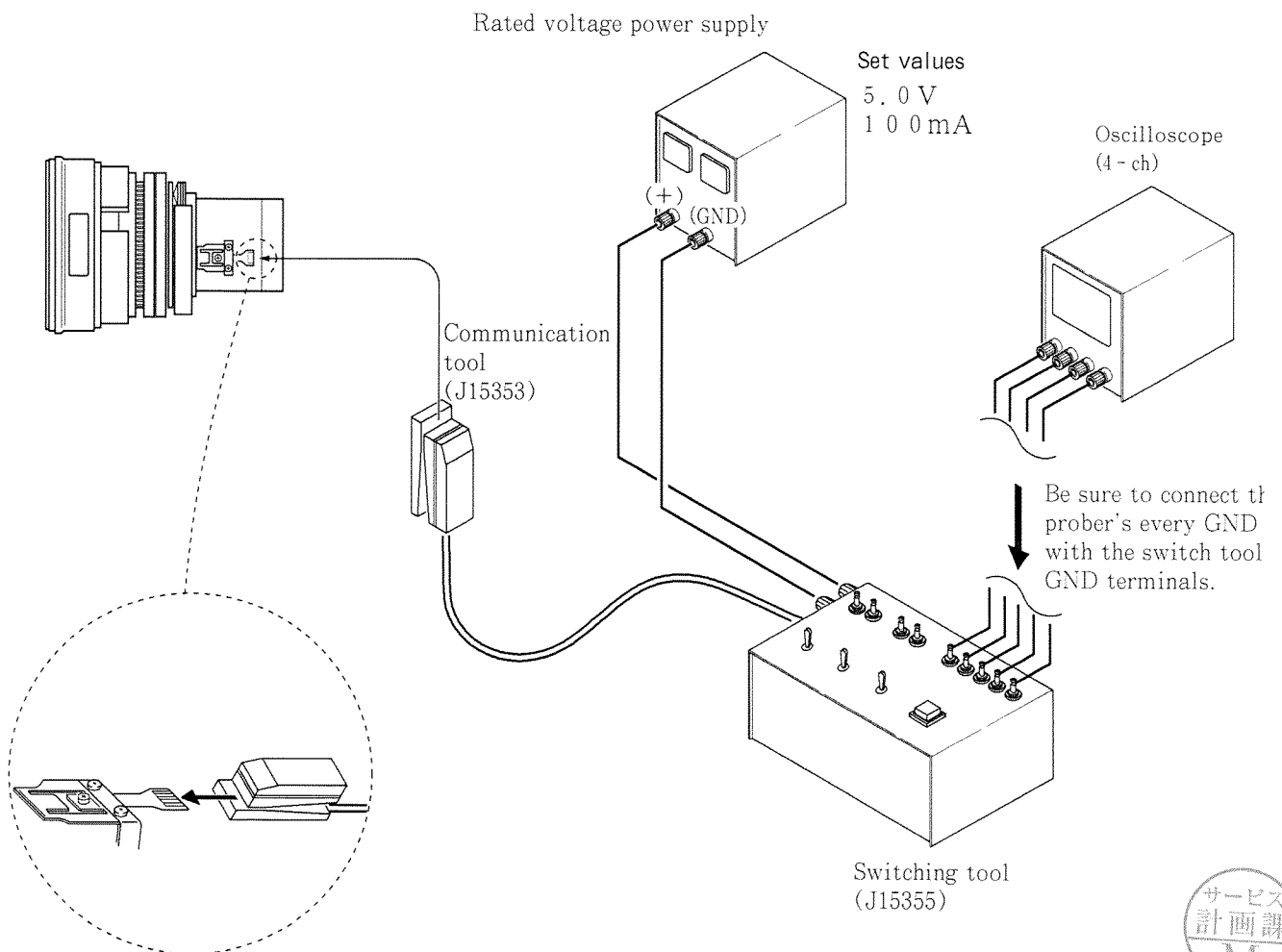
- Rated voltage power supply for single output : Q'ty 1 With 5.0 V and 100 mA, applicable for the switch tool
- Oscilloscope : 1
- Communications tool J15352 : 1
- Switch tool J15355 : 1

**Note :** In case of any trouble in conduction between the communications tool and the relay FPC, there may be corrosion or oxidation on the contact surface of relay FPC.

In this accord, be sure to polish the contact surface prior to getting connected with the communications tool.

2. Preparation of the lens applicable for measurement

- As shown in the figure below, connect the rated voltage power supply with the measuring tool and the communications tool.



### 3. How to conduct inspection and adjustment

- ① Turn off the switch tool's switch 1 and 2. Then, turn the switch 3 on.
- ② Check whether or not both current and voltage from the connected rated voltage power supply are set values.

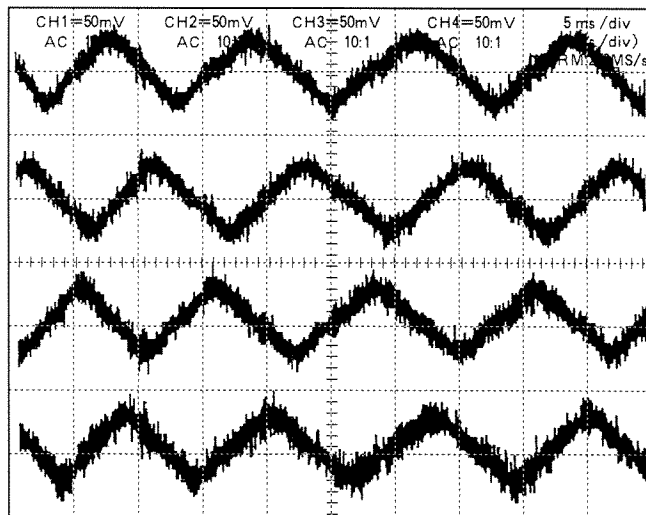
If they are to meet the set values, turn the main switch on.

- ③ Set the oscilloscope.

Then, hold the SWM unit and drive the focus ring.

- ④ Stop the waveform from the oscilloscope by 'START / STOP' key and check it.

**Note :** Since the shape of waveform varies according to the driving speed of focus ring, particularly and properly set Time / Div.



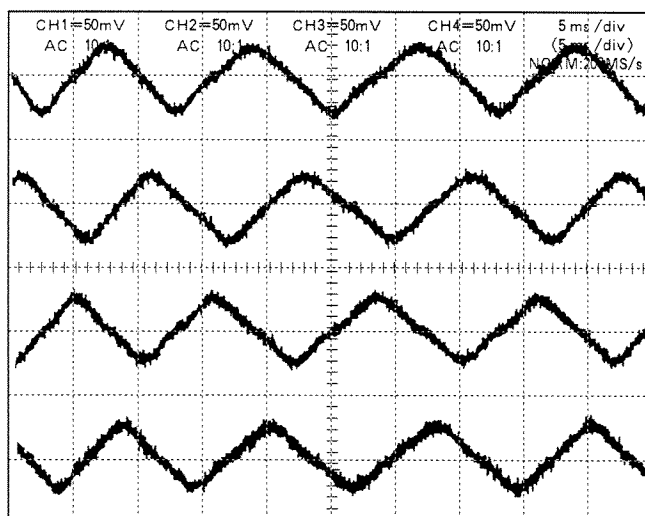
#### ● Setting of oscilloscope

V/Div (CH 1)	: 5 0 mV
V/Div (CH 2)	: 5 0 mV
V/Div (CH 3)	: 5 0 mV
V/Div (CH 4)	: 5 0 mV
Coupling	: AC
Time/Div	: 5 ms (reference)

- ⑤ In the case of detecting any wider waveform noise, use the filter function.

How to set the filter function in the employment case of Yokogawa-manufactured DL1540

1. Press the filter button.
2. Select 'Smooth' in the menu on PC screen.

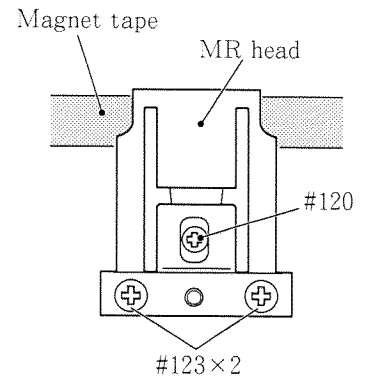


amplitude **Criteria :** The amplitude of every pulse / waveform should be more than 40 mV.

**Precaution :** Check the waveform by letting the focus ring to travel from the infinity-end position to the nearest distance and vice versa.



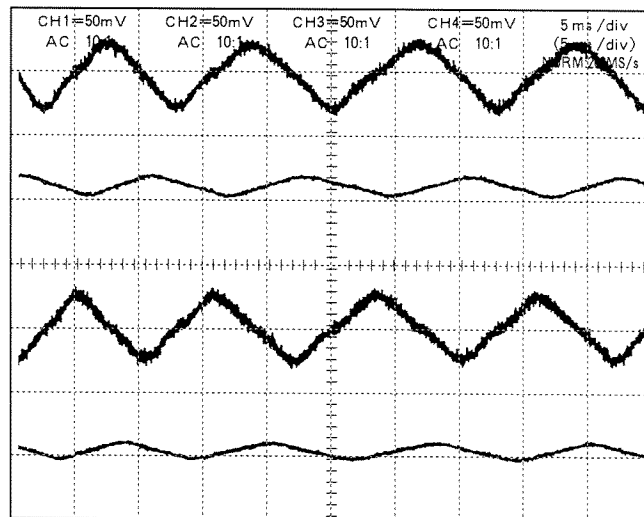
- ⑥ In the case of narrow amplitude, remove the communications tool.  
Then, in order to adjust the position of MR head as shown in the right figure, loosen two pieces of the screw #123 and drive the eccentric screw #120.



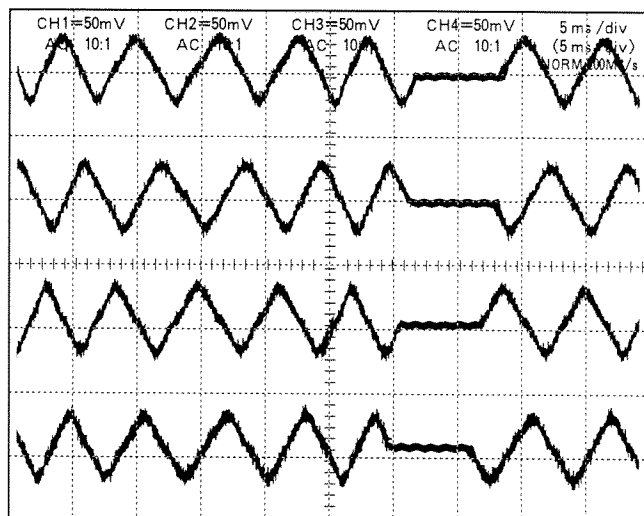
**Precaution :** Due to a cause to damage the magnetic data, during adjustment, avoid that the magnet tape and the MR head touch the magnetism-maintained driver bit.

《Reference》

- In case the amplitude of either 'CH 1 and 3 phases' or 'CH 2 and 4 phases' combination seems smaller, either of the two screws may loosen.  
Then, check the screws.  
Or, in case the both screws are enough tightened, the MR head may be troubled.  
Then, be sure to replace the MR head unit B10 and adjust it again.



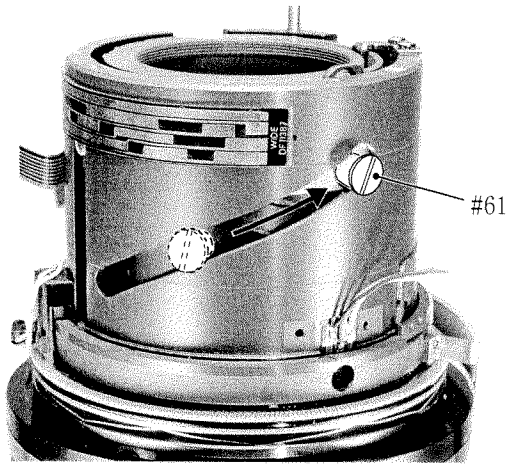
- In case of a presence of partial drop in the amplitude between the infinity and the closest distance, the magnetic data in magnetic tape may be damaged.  
Then, replace the magnetic tape and adjust it again.



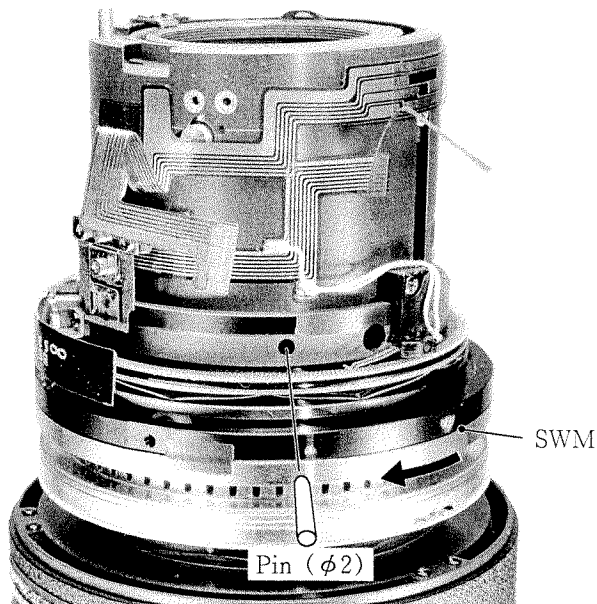
- ⑦ Turn the rated voltage power supply off.



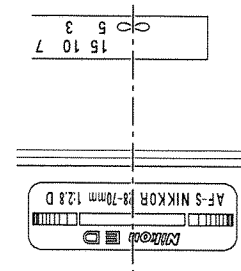
ADJUSTMENT OF ENCODER BRUSH POSITION



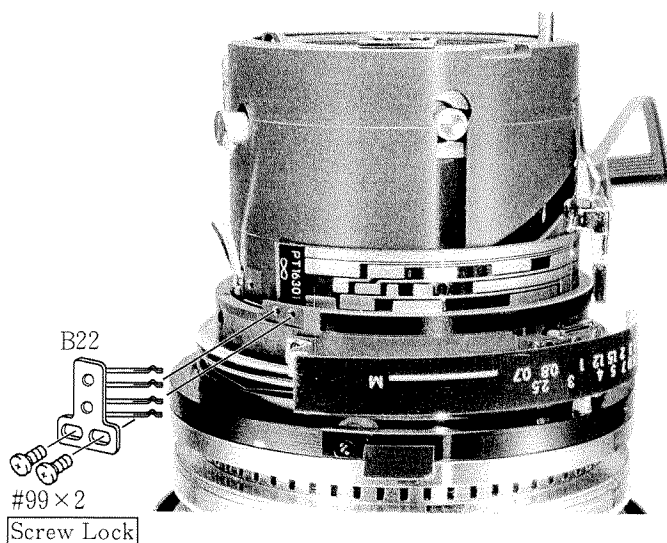
① Pick up #61 and then bring it to the top end position as shown in the left photo.



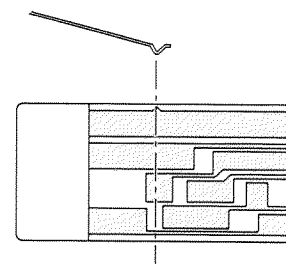
② Drive the SWM in the arrow direction and then set the focus index' infinity mark to meet the index position which is on the center of the name plate.



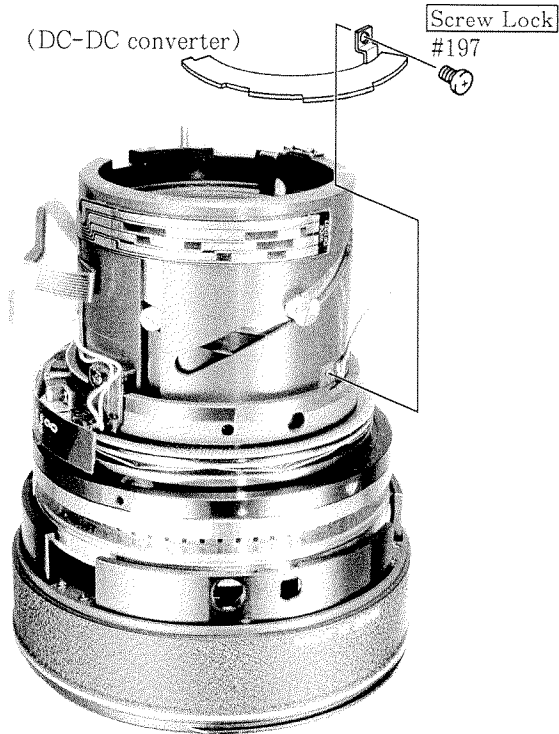
③ As shown in the left photo, insert the φ2 pin to the designated hole and fix the SWM.



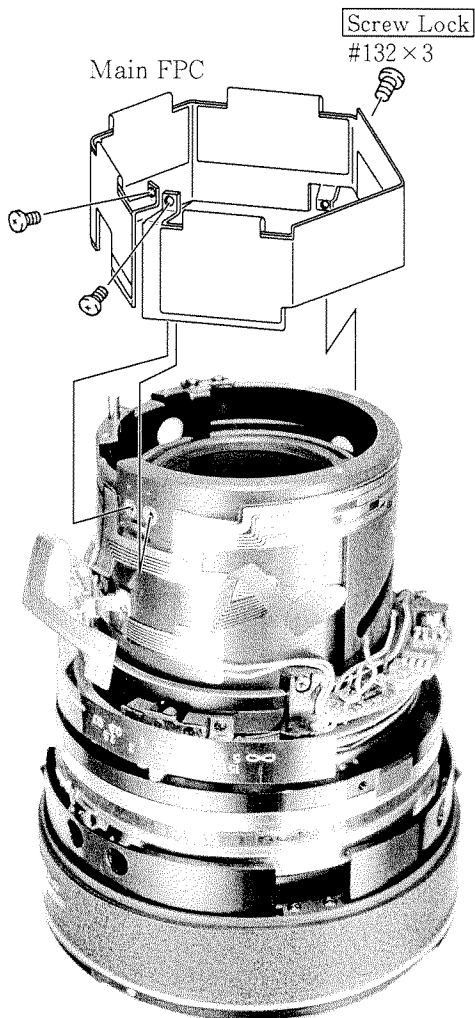
④ As shown in the figure below, in order to mount and fix B22, place the brush whose tip can touch the line.



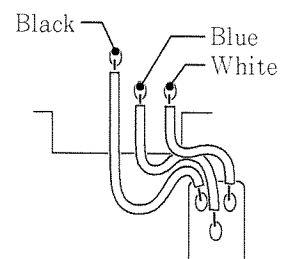
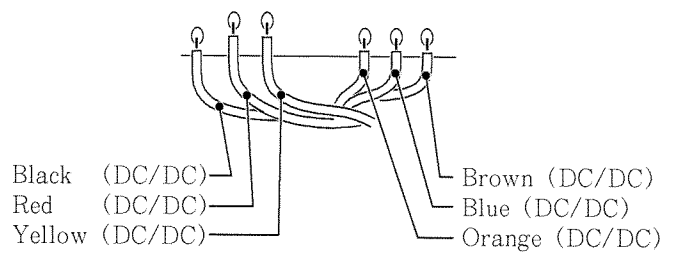
DC-DC CONVERTER



MAIN FPC

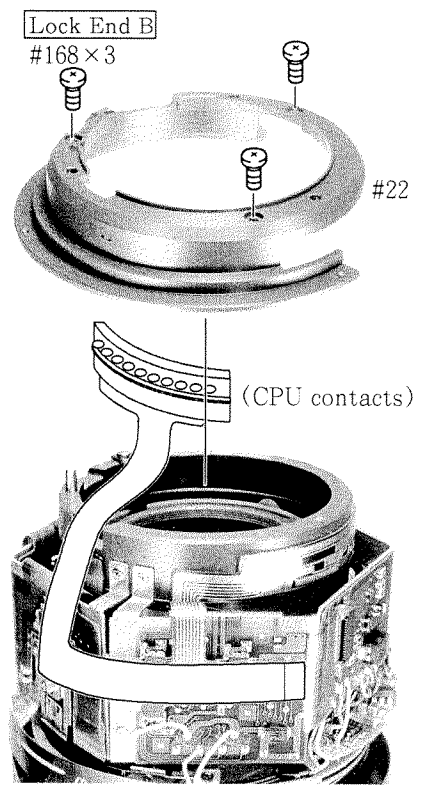


**Note :** Due to a strictly controlled condition in the dimension for attachment position between the main FPC and the FPC plate, they are designed as an assembled unit alone. Then, be sure to avoid re-attaching it after once peeling it off.

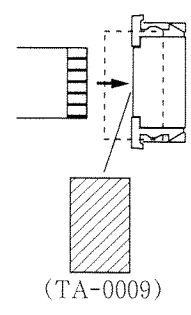




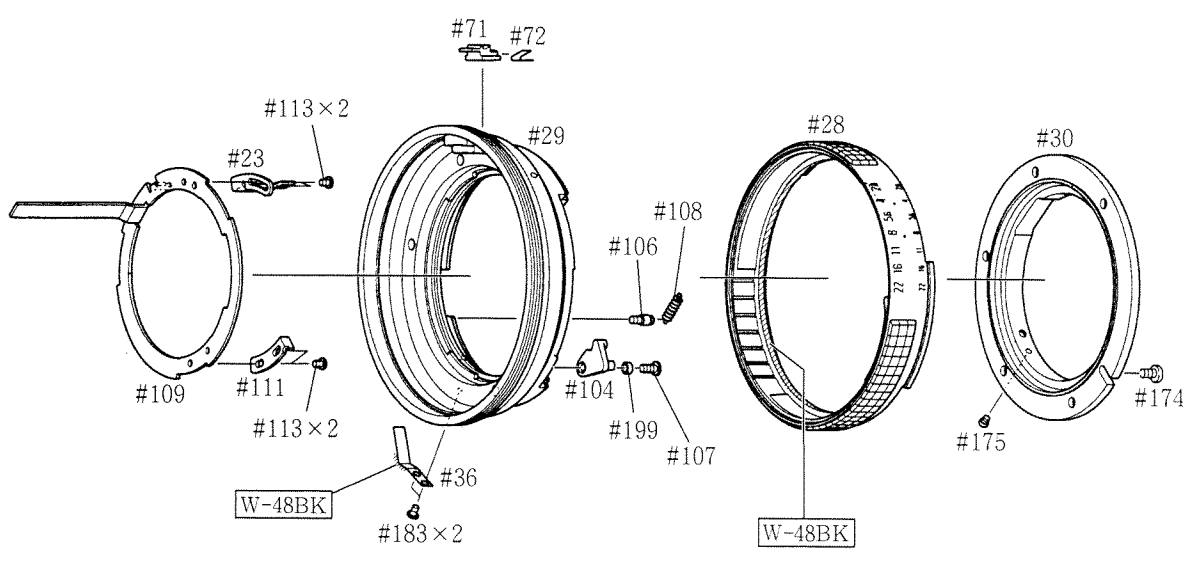
RING #22



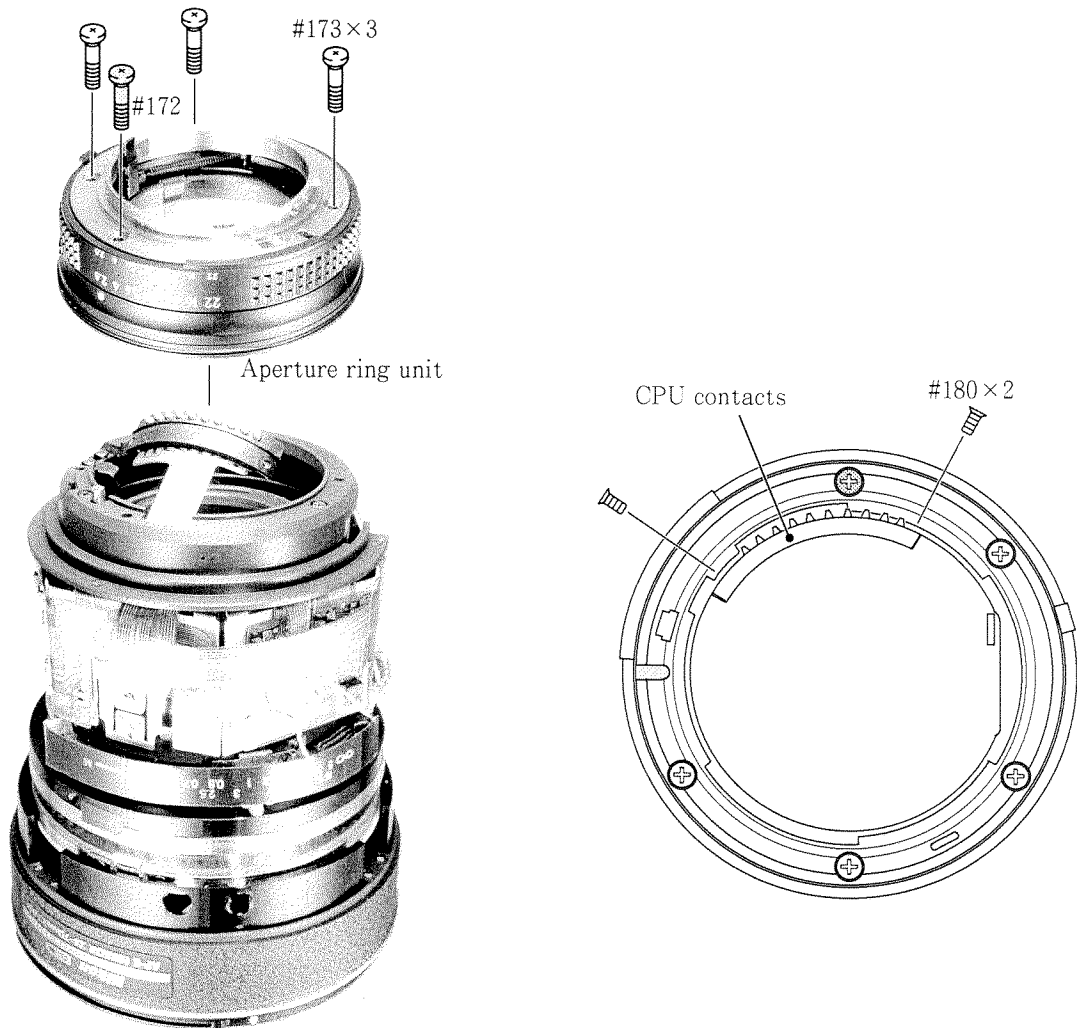
• As shown in the left figure, connect the FPC's four connectors with each appropriate position. Then, as described in the figure below, attach the protection tape on each connector.



APERTURE RING, BAYONET MOUNT GROUP



PREPARATION FOR ADJUSTMENT OF THE MAIN FPC



① As shown in the photo above, mount and fix the aperture ring unit.

⚠ (Addition)

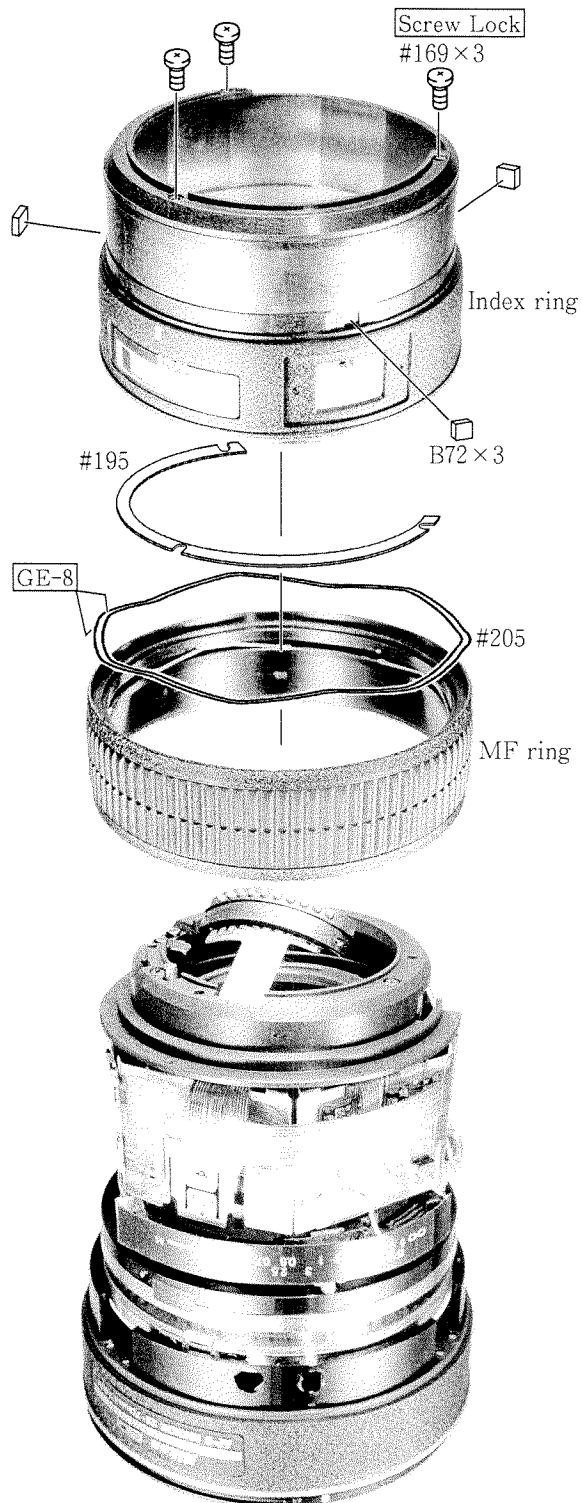
② Refer to the page L25 to L34-1 in the repair manual for AF-S 80-200/2.8D (JAA 76551) and then adjust the main FPC.

The following is the tolerance for criteria.

The numerical value of scanning speed :  $2.8 \pm 0.3 \text{ sec}$  ( $10 \pm 1 \text{ rpm}$ )

③ After adjustment, remove the aperture ring unit.

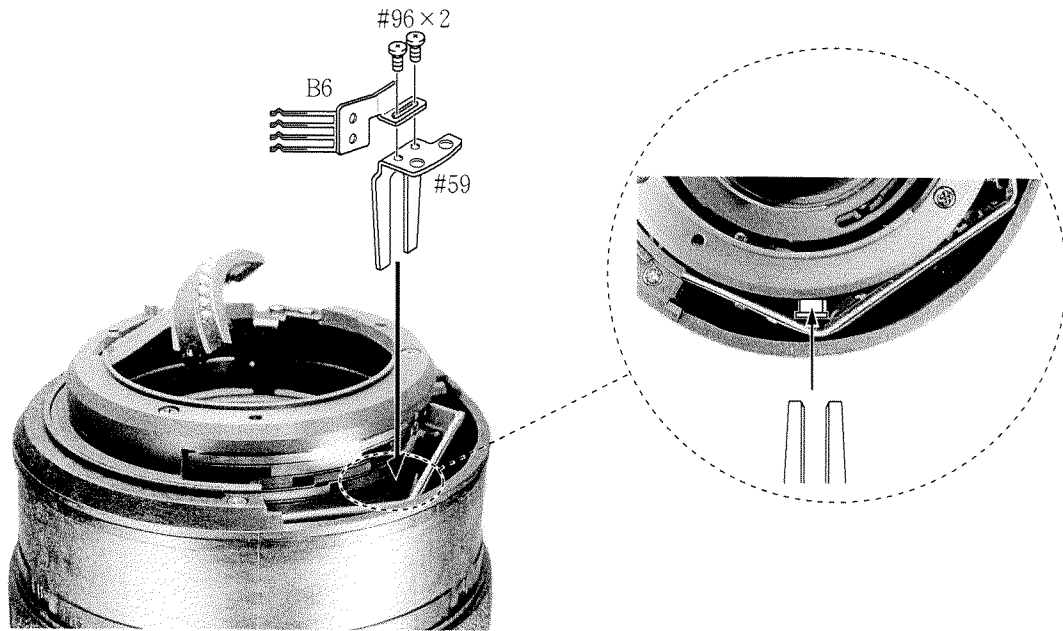
MF RING, INDEX RING



Note :

- ① Due to necessity of the device dedicated for adjusting the accuracy in the spring pressure and in the tightening torque of ring, the MF ring is designed just as an assembled unit.
- ② Due to almost no gap between the main FPC, the DC/DC converter and the focus index while mounting and fixing the MF ring or the index ring, be careful and avoid to damage or to deform these parts with each other.

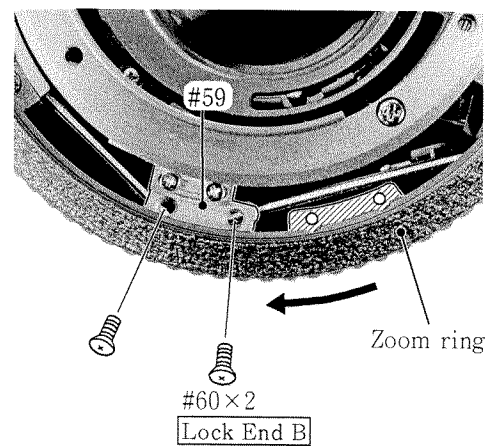
ZOOM INTERLOCK LEVER



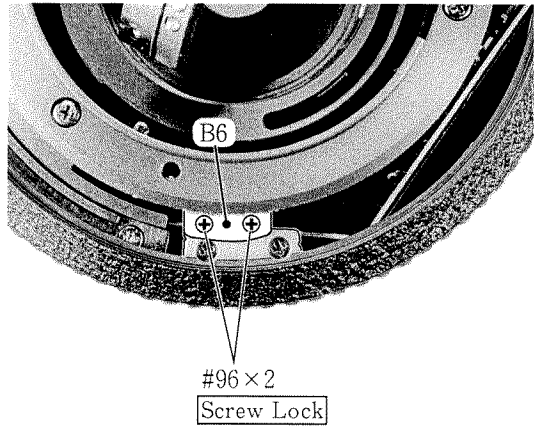
ZOOM RING



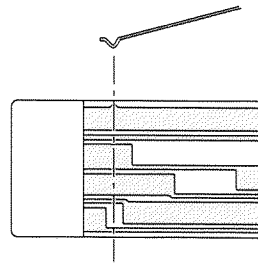
- ① Mount and fix the zoom ring.
- ② Raise the zoom interlock lever #59.  
Then, as shown in the photo below, drive the zoom ring in the arrow direction and set the diagonal-lined area to beneath #59.
- ③ Using 2 pieces of the screw #60, fix the #59.



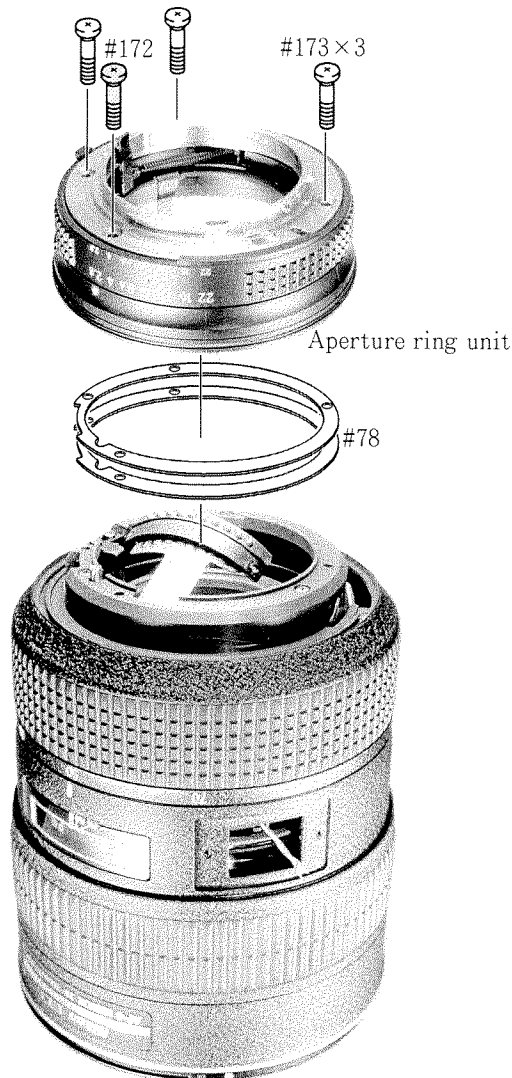
ADJUSTMENT OF ZOOM ENCODER BRUSH POSITION



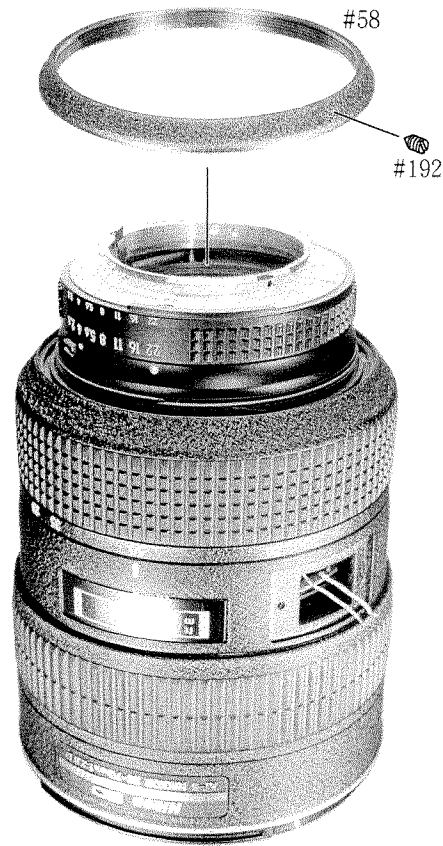
- ① Drive the zoom ring until it touches the end of Tele position.
- ② In order to set the brush tip to touch the line as shown below, loose 2 pieces of the screw #96 and shift B6 for adjustment.
- ③ Drive the zoom ring a few times and then confirm the position of brush.
- ④ Fix 2 pieces of the screw #96 by the Screw Lock.



APERTURE RING UNIT



RING #58



APERTURE DIAMETER ADJUSTMENT

① Unfasten screws #113×2 and move part #111 to adjust the aperture diameter.

**Note :** Make sure that the aperture diameter differs when the zoom ring is set to 70mm and to 28mm.

- Aperture lever should be within the allowable range when the aperture lever is snapped by your finger.

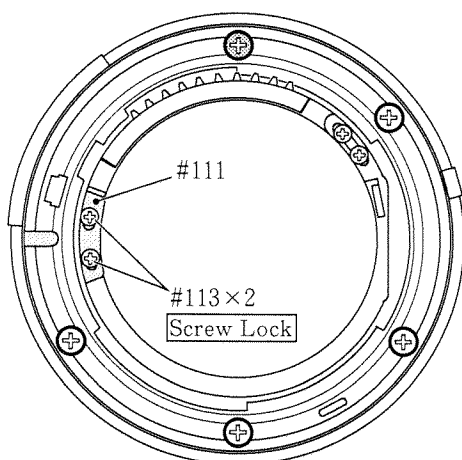
② After adjustment, secure screws #113×2 using Screw Lock.

When the zoom ring is set to 70 mm :

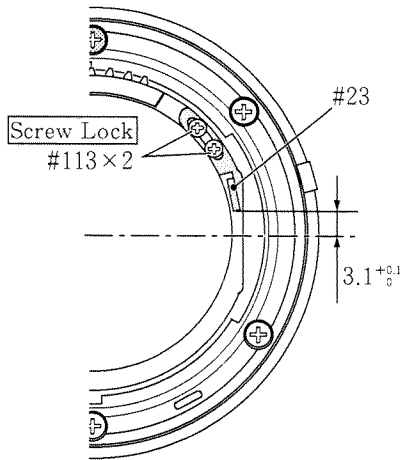
Aperture setting	Inscribed circle diameter (mm)	Tolerance (mm)
2.8	24.68	26.03 ~ 23.46
4	17.41	18.80 ~ 16.12
5.6	12.37	13.90 ~ 11.03
8	8.67	9.73 ~ 7.72
11	6.18	7.21 ~ 5.30
16	4.32	5.04 ~ 3.70
22	3.04	3.55 ~ 2.61

When the zoom ring is set to 28 mm :

Aperture setting	Inscribed circle diameter (mm)	Tolerance (mm)
2.8	19.97	21.07 ~ 18.98
4	14.27	15.41 ~ 13.21
5.6	9.91	11.12 ~ 8.83
8	7.07	7.94 ~ 6.30
11	4.98	5.81 ~ 4.27
16	3.49	4.07 ~ 2.99
22	2.47	2.88 ~ 2.12

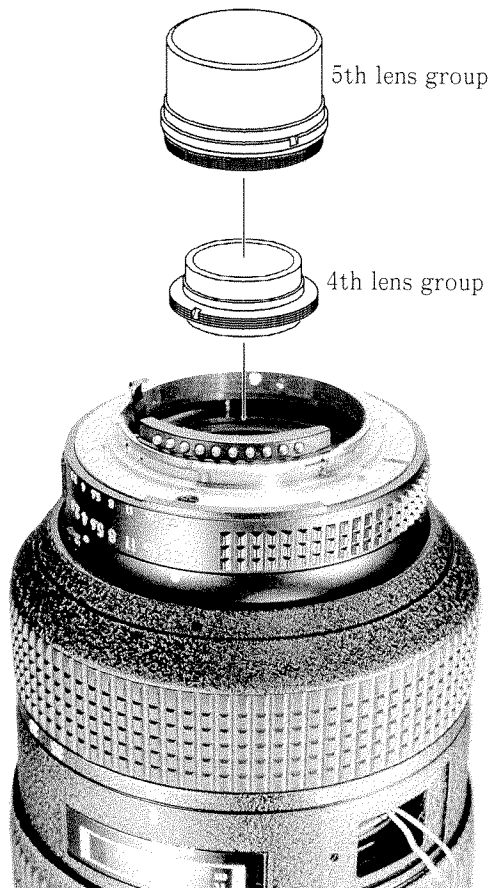


APERTURE LEVER POSITION ADJUSTMENT



Unfasten screws #113×2 to adjust the position of the aperture lever #23 so that it comes into the rated value of  $3.1^{+0.1}$  to bring the aperture diameter within rated value at full aperture. After adjustment, fix screws #113×2 using Screw Lock.

4th~5th LENS GROUP



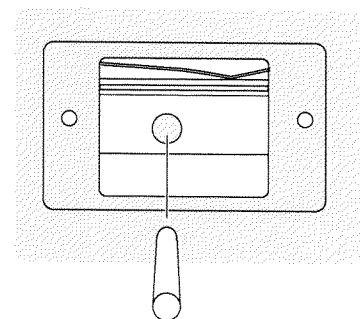
3rd LENS GROUP



2nd LENS GROUP

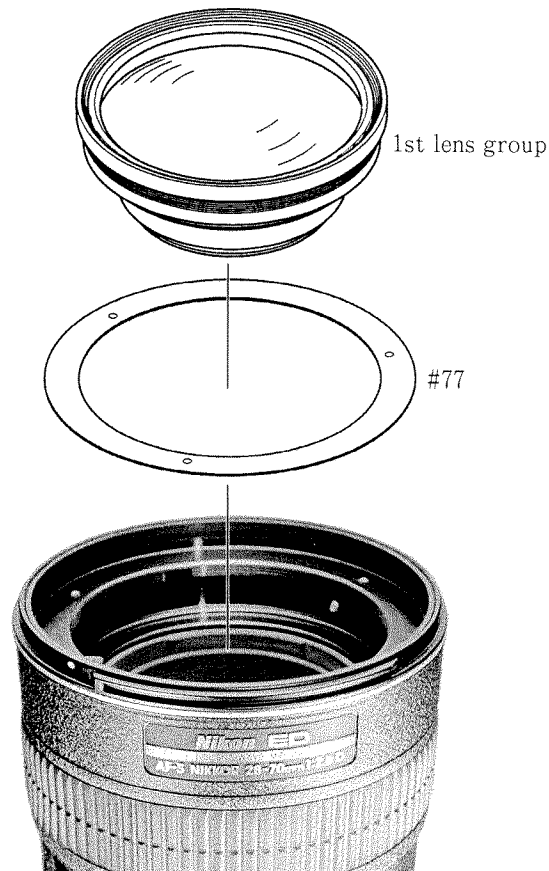


- ① Drive the zoom ring until it touches the limit of Wide position.
- ② Drive the index ring and then set the infinity mark to meet the index.
- ③ As shown in the figure below, insert the  $\phi 2$  pin to the designated position and then fix the 2nd group sliding frame.
- ④ Mount and fix the 2nd lens group.





1st LENS GROUP



ADJUSTMENT AT BOTH ENDS OF FOCAL LENGTH

1. Align the  $\infty$  mark on focus ring to index. Set aperture to full aperture.
2. Read the value on both Wide and Tele sides respectively.
3. Calculate the following equation.

$$(A - B) \div 3 = C$$

A = Value of Tele side (mm)

B = Value of Wide side (mm)

C = Amount (mm) of adjustment of 1st lens group washer #77

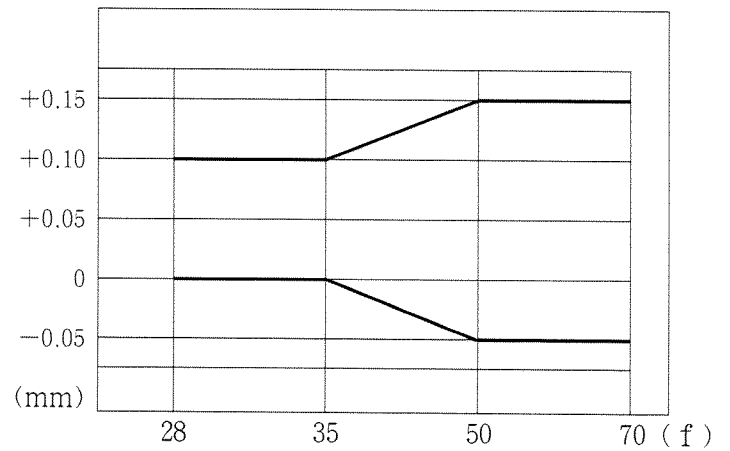
4. Adjust the thickness of washer #77 by the value C calculated from the above equation. If the value C is positive, thicken the washer by the value, and if negative, thin the washer.

**Note :** Insert thin washer between thick washers when mounting washer #77.

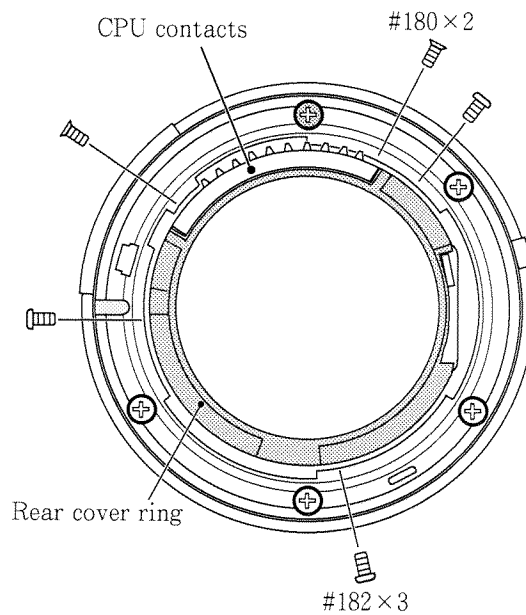
ADJUSTMENT OF BACK FOCUS

1. Align the  $\infty$  mark on focus ring to index. Set aperture to full aperture.
2. Readout values at either Wide or Tele side.
3. Remove the aperture ring unit.
4. If the value is above the standard, increase the thickness of the washer, otherwise decrease it.  
(Refer to page L25.)

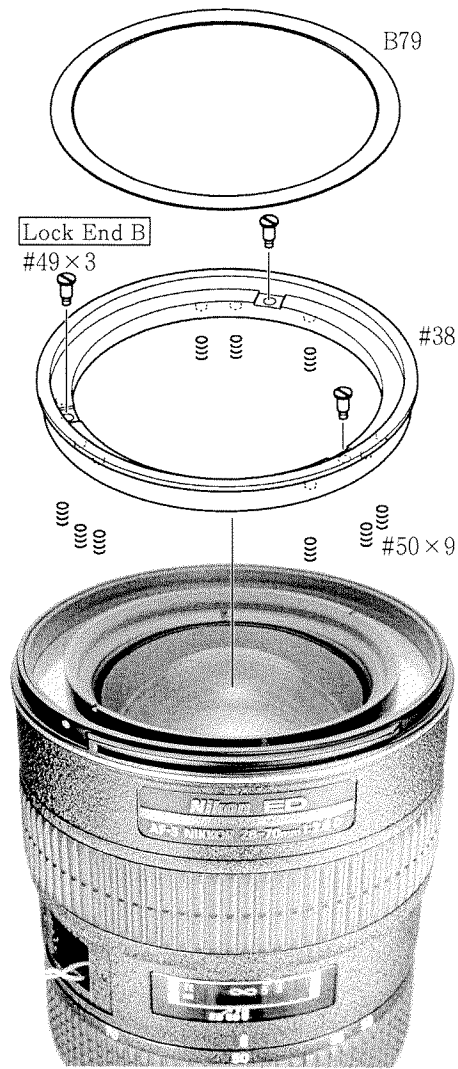
Focal length ( f )	Standard (mm)
28 mm	0 ~ +0.10
35 mm	0 ~ +0.10
50 mm	-0.05 ~ +0.15
70 mm	-0.05 ~ +0.15



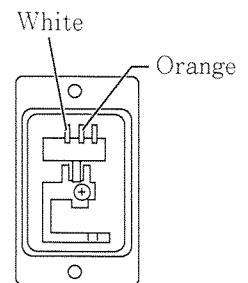
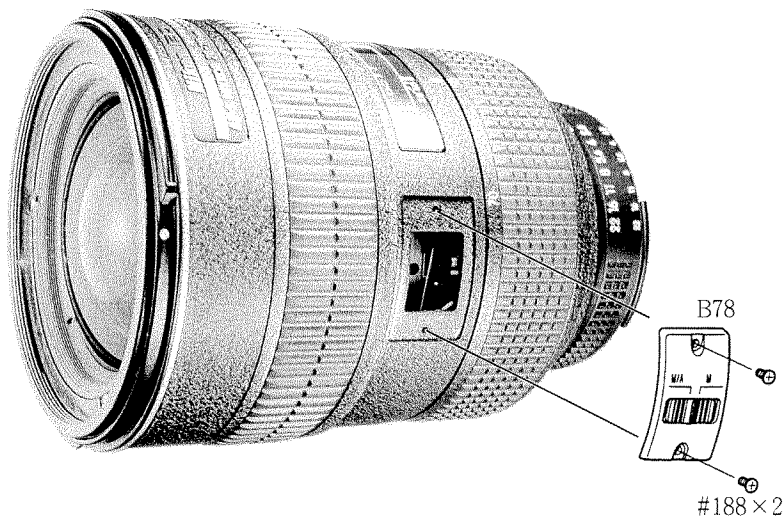
REAR COVER RING



FILTER RING #38



CHANGE-OVER SWITCH UNIT



LENS OPERATION CHECK

Refer to the page L38 to L47 in the repair manual for AF-S 80-200/2.8D (JAA 76551) and check the operational conditions.

In addition, what is displayed on PC screen is slightly different from the statements in check list. The followings are the tolerances for standards.

⚠ (Addition) (2) Image of "operation of MR encoder"

```

TYPE OF LENS : AF-S NIKKOR 28-70mm/2.8D          CPU VERSION : 5.02.00
OPERATION OF MR ENCODER.

POSITION WHEN CHECK BEGINS. [PULSE (S)]  -----  -4
POSITION WHEN CHECK IS ENDED. [PULSE (S)] -----  -2
PULSE NUMBER DEFFERENCE BEFORE / AFTER CHECK. [PULSE (S)] ---  2
STANDARD FOR DIFFERENCE IN THE NUMBER : FROM -10 TO 10 [PULSE (S)]
                                                    IN STANDARD.

*****
THE TOTAL NUMBER OF PULSE (S) AT INSPECTION. [PULSE (S)] ---  4420
STANDARD FOR THE NUMBER : FROM 4390 TO 4580 [PLUSE (S)]
                                                    IN STANDARD.

PUSH ESC KEY TO RETURN TO MENY.EP.
    
```

(3) Image of "lens driving stop accuracy"

Standards : Displayed on PC screen

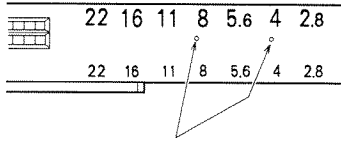
RATIO (1) is 40% or less for Df1~Df6  
(Occurrence ratio of 13 ~36 pulses)

RATIO (2) is 10% or less for Df1~Df6  
(Occurrence ratio of 24 ~36 pulses)

Occurrence of 37 or more pulses is zero for Df1 ~Df6

(It is malfunction if there is only one occurrence.)

MOUNTING THE COUPLING CLAW



Use these tow concaves.

- ① Remove the aperture ring #28.
- ② Make holes ( $\phi 1.1$ ) at the two concaves of the aperture ring.
- ③ Mount the coupling claw.

Coupling claw	1K406-029	× 1
Screw	1K010-002-1	× 2

- ④ Assemble the components.

# TOOLS

## 1. Measuring instruments (Main)

Tool No.	Name	Remarks
J 1 5 3 0 6	AF-I Communication box	The tool used for AF-I is used again.
J 1 5 3 0 7	AF-I Communication adapter	The tool used for AF-I is used again.
J 1 8 2 9 7 A	AF-S zoom lens inspection and adjustment software	NEC 5 inch
J 1 8 2 9 7 B	AF-S zoom lens inspection and adjustment software	NEC 3. 5 inch
J 1 8 2 9 7 C	AF-S zoom lens inspection and adjustment software	IBM 5 inch
J 1 8 2 9 7 D	AF-S zoom lens inspection and adjustment software	IBM 3. 5 inch
J 1 5 3 3 4	H8 D/A converter (F/V converter)	For adjusting the scanning speed
J 1 5 3 5 2	Communications tool	Used for inspection and adjustment for output from the MR encoder
J 1 5 3 5 3	Communications tool	For adjusting the Main FPC
J 1 5 3 5 5	Switching tool	For adjusting the Main FPC

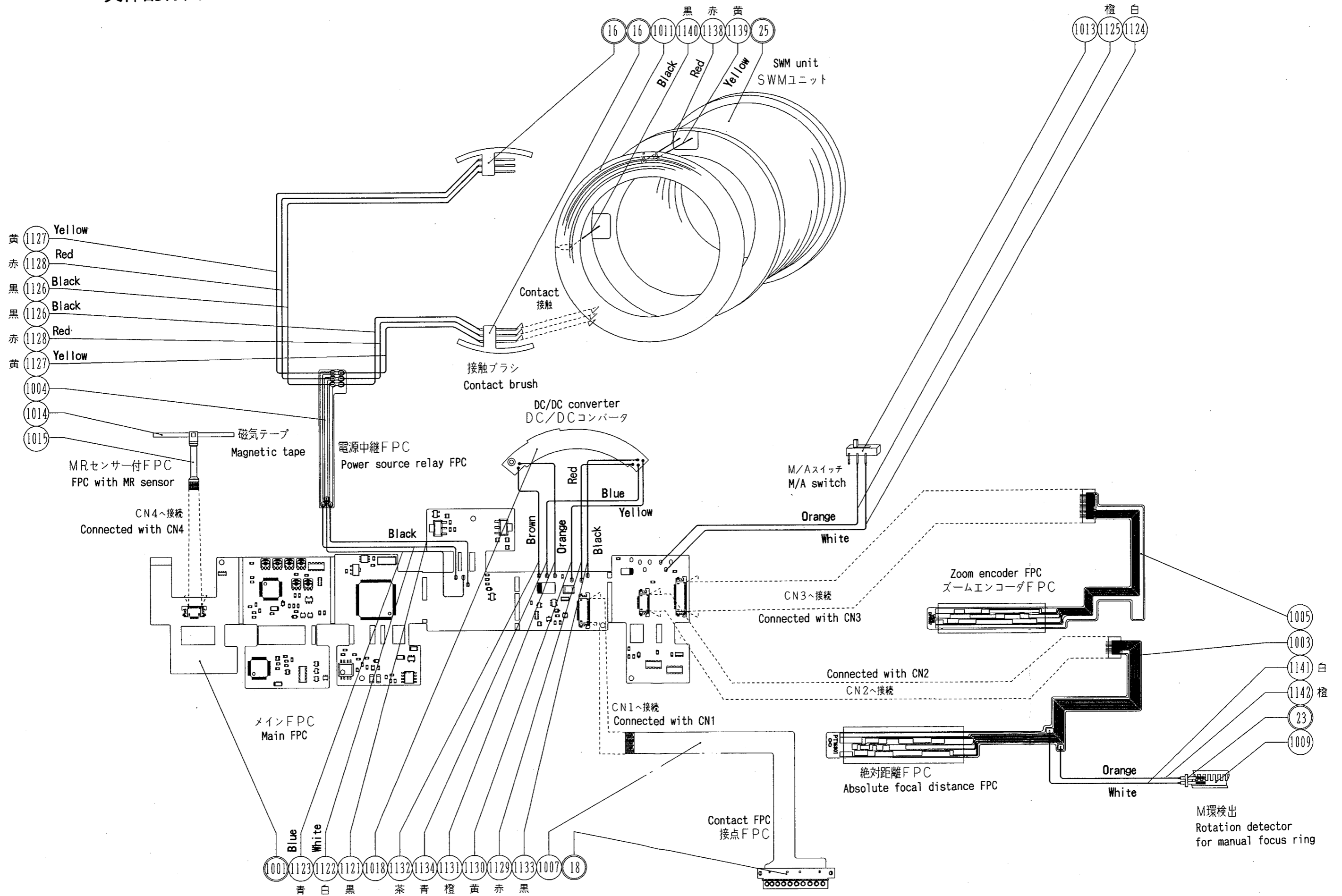
△  
(Addition)

## 2. Wrench

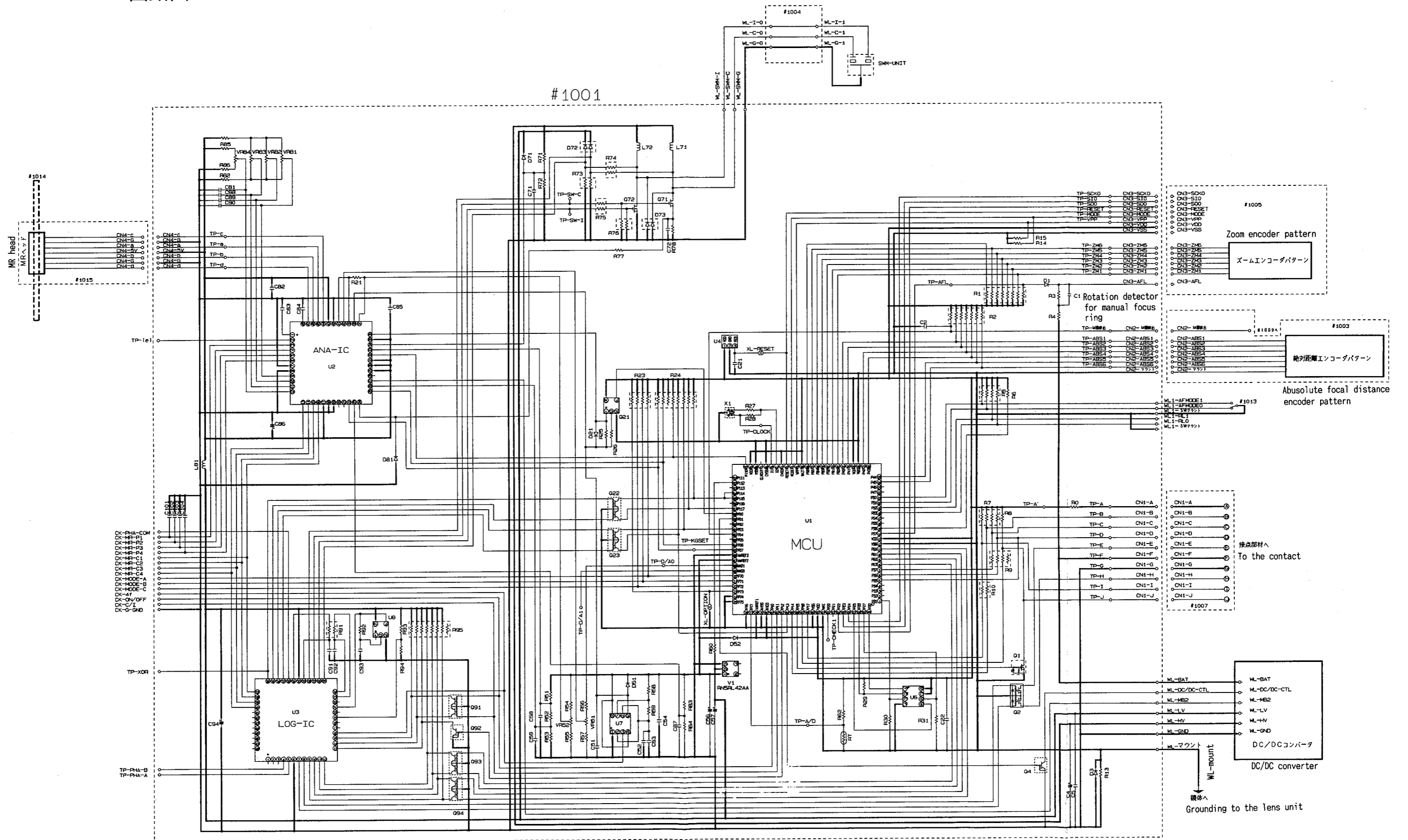
Tool No.	Name	Remarks
J 1 1 2 5 2	Wrench	For attaching and detaching the ring #58
J 1 1 2 5 3	Wrench	For attaching and detaching the 2nd lens group
J 1 1 2 5 4	Wrench	For attaching and detaching the 3rd lens group
J 1 1 2 5 5	Wrench	For attaching and detaching the 4th lens group
J 1 1 2 5 6	Wrench	For attaching and detaching the 5th lens group



実体配線図 WIRING FIGURE



回路図 CIRCUIT DIAGRAM





AF-S 28-70/2.8D

EEPROM

1999-03-30

address	contents	CPU ver.			others
		5.03.03			
0	optional set value	0			
1	unused	—			
2	data for manufacturing processes	—			
3	value for control and adjust for motor	—			
4	data for controlling the lens	0			
5	“	0			
6	“	7 3			
7	“	2 5 0			
8	“	0			
9	“	0			
1 0	“	0			
1 1	“	0			
1 2	“	1			
1 3	unused	—			
∧	∧	∧			
2 6	unused	—			
2 7	checksum data	—			
2 8	aberration compensation data	—			
∧	∧	∧			
1 2 7	aberration compensation data	—			

- Each 'value' explained here means the fixed value and the default value.  
Of them, there are some changes according to the lens operational condition(s).
- The sign of 「-」 in the table above means a value which changes in accordance with the lens operational condition(s).



