

作成承認印

配布許可印



AF-S VR DX Zoom Nikkor 18-200/3.5-5.6G ED

JAA79471 (MADE IN JAPAN)

JAA79451 (MADE IN THAILAND)

REPAIR MANUAL

Nikon | **NIKON CORPORATION**
Tokyo, Japan

Copyright © 2005 by Nikon Corporation.
All Rights Reserved.
無断転載を禁ず !!

Specifications

Type of lens:	G-type AF-S DX VR Zoom-Nikkor lens having built-in CPU and Nikon bayonet mount [Specially designed for use with the Nikon digital SLR cameras (Nikon DX format)]
Focal length:	18mm–200mm
Maximum aperture:	f/3.5–5.6
Lens construction:	16 elements in 12 groups (3 aspherical lens and 2 ED lens elements)
Picture angle:	76°– 8°
Focal length scale:	18, 24, 35, 50, 70, 135, 200mm
Distance information:	Output to camera body
Zoom control:	Manually via separate zoom ring
Focusing:	Nikon Internal Focusing (IF) system (utilizing an internal Silent Wave Motor);
Vibration reduction:	manually via separate focus ring
Shooting distance scale:	Lens-shift method using voice coil motors (VCMs)
Closest focus distance:	Graduated in meters and feet from 0.5m (3 ft.) to infinity (∞)
No. of diaphragm blades:	0.5m (1.6 ft.) at all zoom settings
Diaphragm:	7 pcs. (rounded)
Aperture range:	Fully automatic
Exposure measurement:	f/3.5 to f/22 (at 18mm), f/5.6 to f/36 (at 200mm)
Attachment size:	Via full-aperture method
Dimensions:	72mm (P = 0.75mm)
Weight:	Approx. 77mm dia. x 96.5mm extension from the camera's lens mount flange
	Approx. 560g (19.8 oz)

※ Before Disassembly / (Re)assembly / Adjustment

On this lens, the VR (vibration-reduction) unit is mounted to correct the picture blur.

In order to maintain the functional accuracy of the picture blur correction, if detaching the VR (vibration-reduction) unit and gyro base plate or if removing the main PCB unit, be sure to adjust the VR by using the VR lens adjustment equipment (J15380) .

However, if disassembling the parts except the above, the VR adjustment is NOT necessary.

At service agencies where the "VR lens adjustment equipment" is not prepared, do NEITHER disassemble NOR repair the products of the above case.

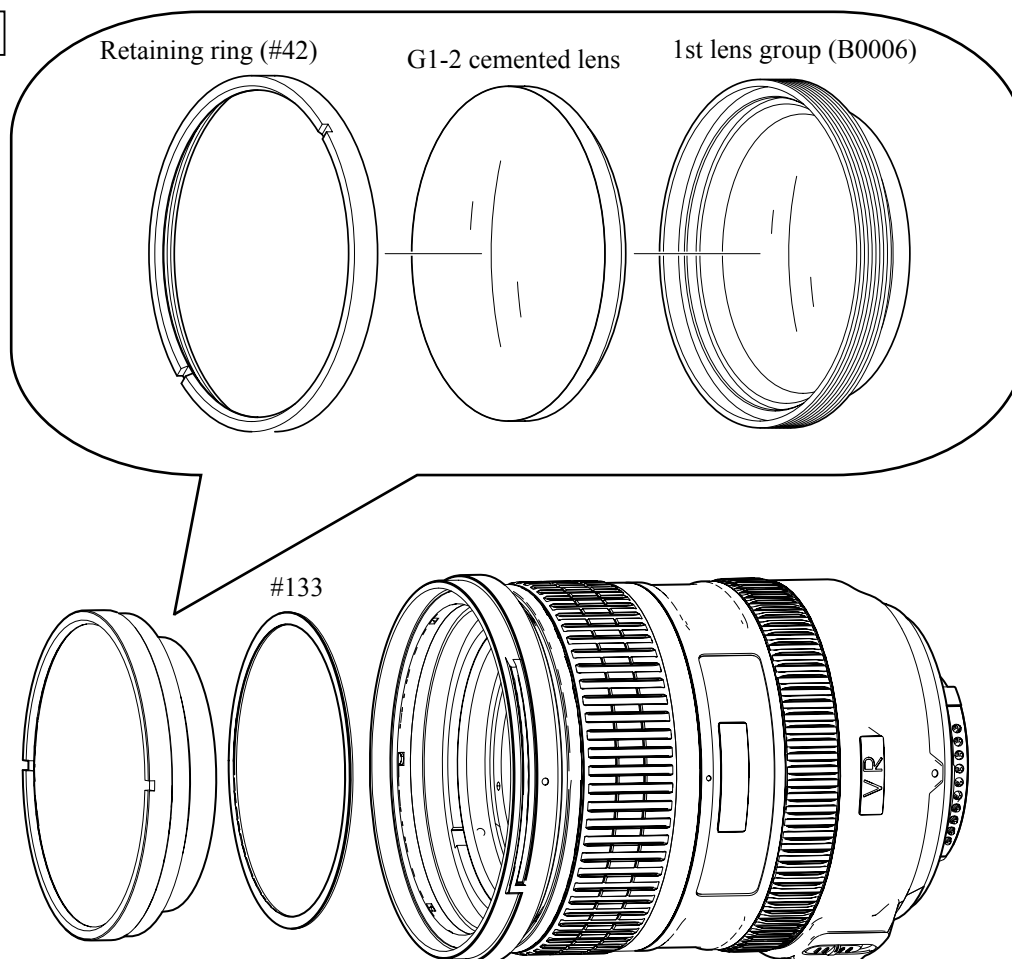
Caution:

- ① When disassembling, make sure to memorize the processing state of wires, screws to be fixed and their types, etc.
- ② Because prototypes are used for "Disassembly/(Re)assembly/Adjustment", they may differ from the actual products in forms, etc.
- ③ Because pictures are processed by a special method, they may differ from the actual ones in texture.

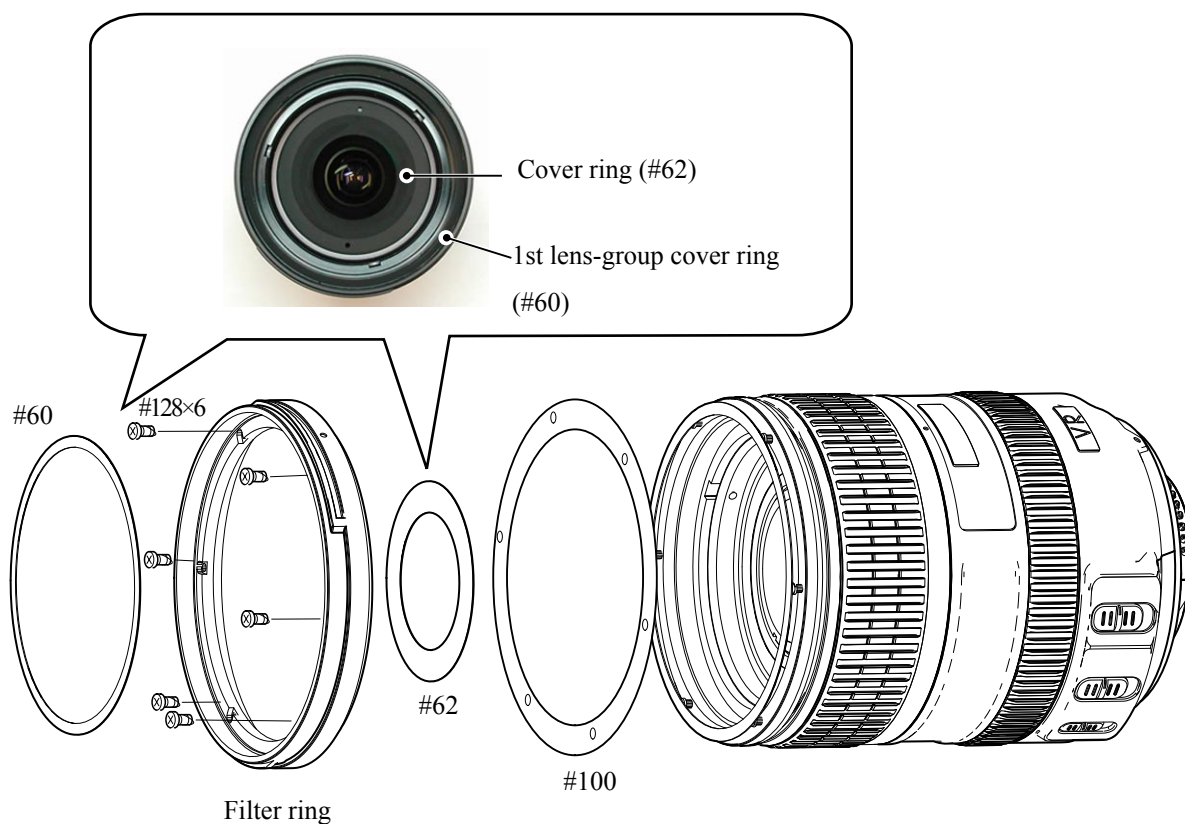
Points to notice for Lead-free solder products
▪ Lead-free solder is used for this product. ▪ For soldering work, the special solder and soldering iron are required. ▪ Do NOT mix up lead-free solder with traditional solder. ▪ Use the special soldering iron respectively for lead-free solder and lead solder. They cannot be used in common.

1. Disassembly

1st lens group



Filter ring



2nd lens group

★New Tool

- ① Set the lens zoom position to 18 mm , while the focus ring to "∞" position.
- ② Mount the 2nd lens-group retaining tool (★J11318) on the lens by aligning the indexes with each other.



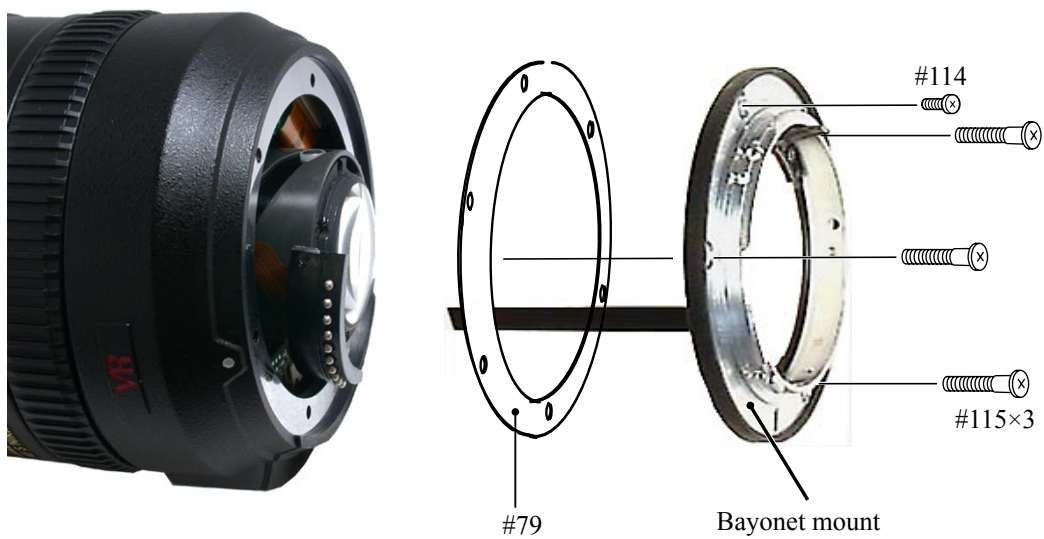
- ③ Remove the 2nd lens-group and the washer (#80) by using the wrench (★ J11317).



Rear cover ring

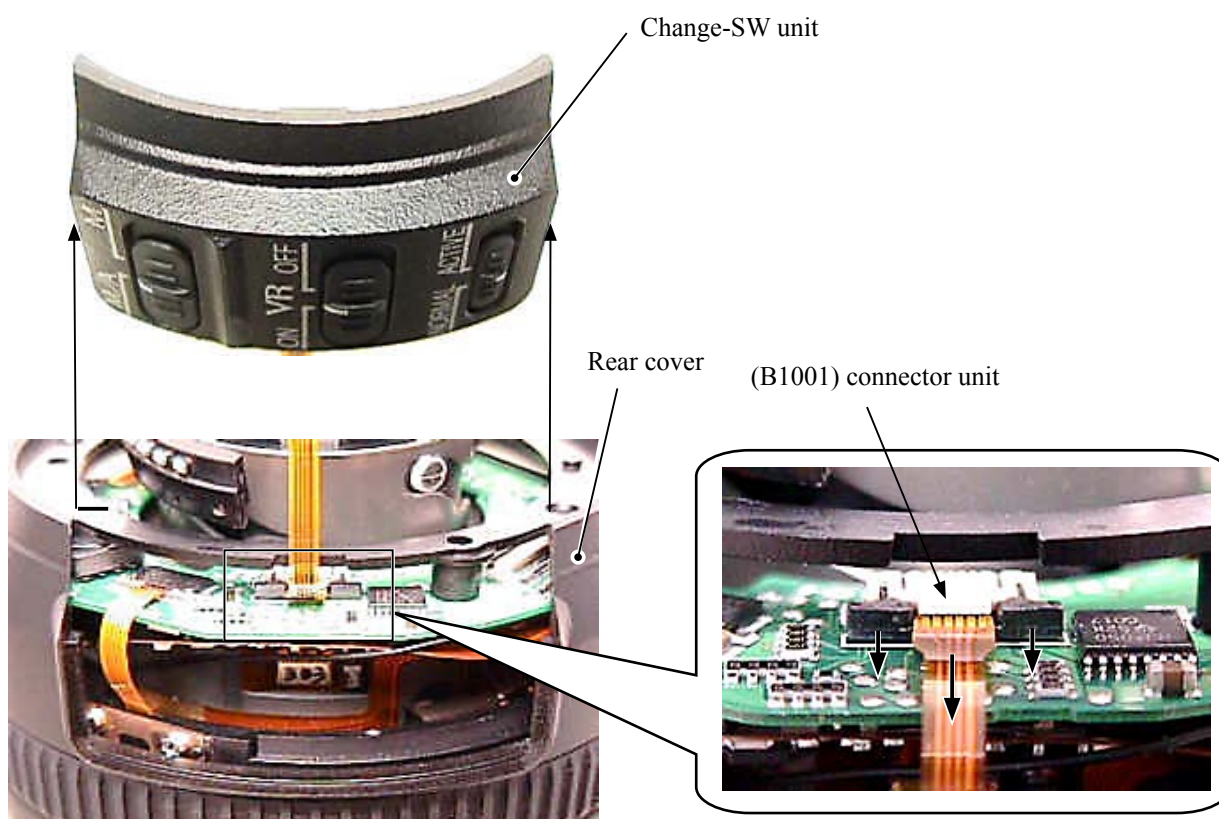


Bayonet mount



Change-SW unit

- While holding the rear cover by hand, remove the change-SW unit.



Rear cover



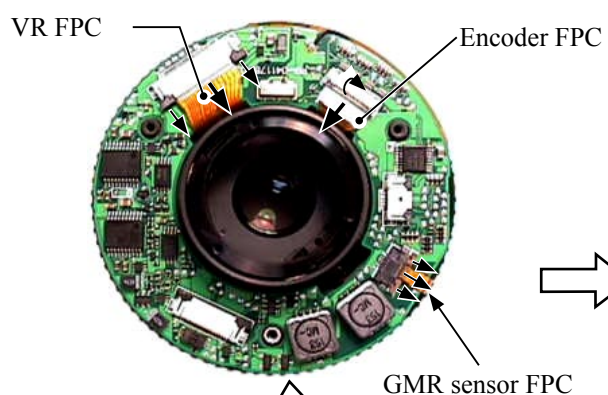
Contacts unit

- Remove the FPC of the contacts unit from the connector.

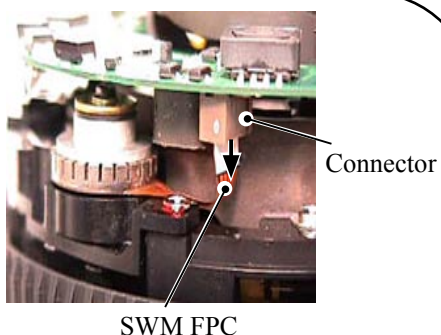
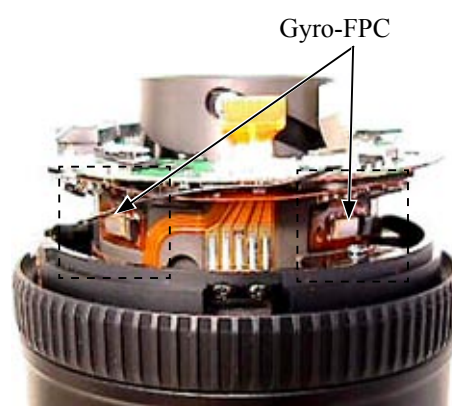


Main PCB unit

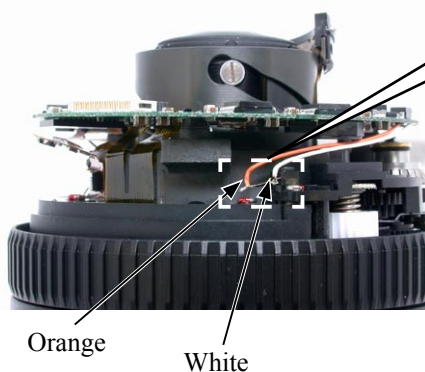
- Remove the VR FPC, encoder FPC, GMR sensor, and SWM-FPC from each connector.



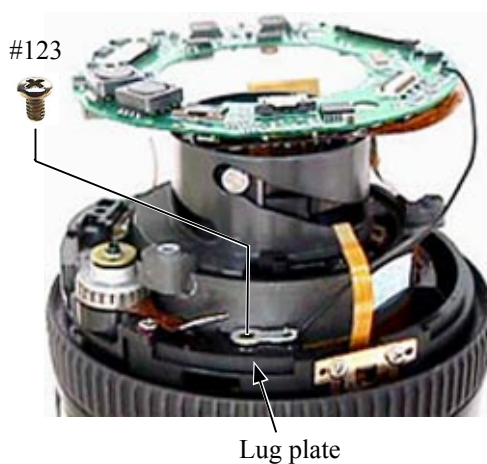
- Remove the gyro-FPC from the body.



- Remove the two wires from the SWM unit.



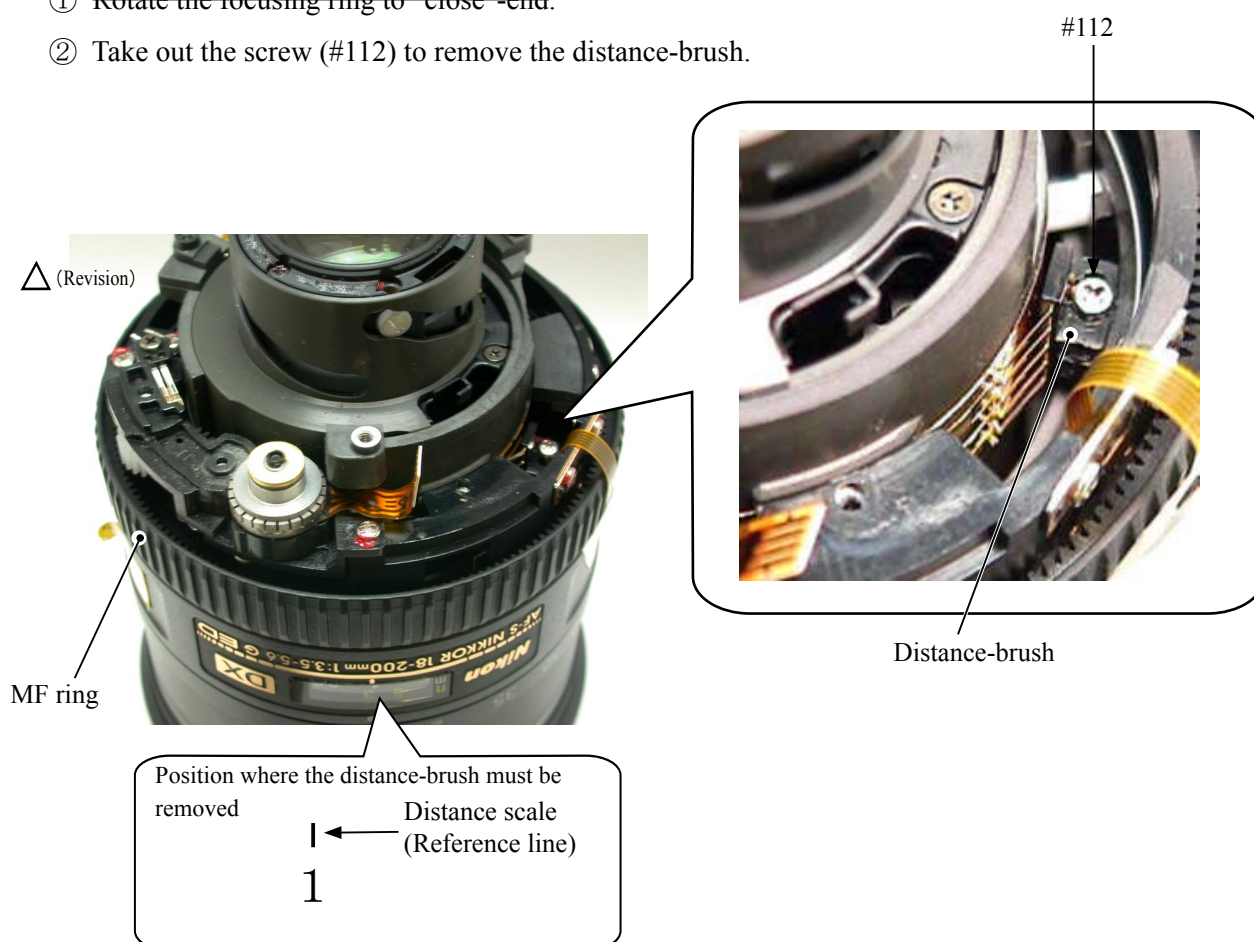
- Remove the main PCB unit by taking out the screw (#123) of lug plate.



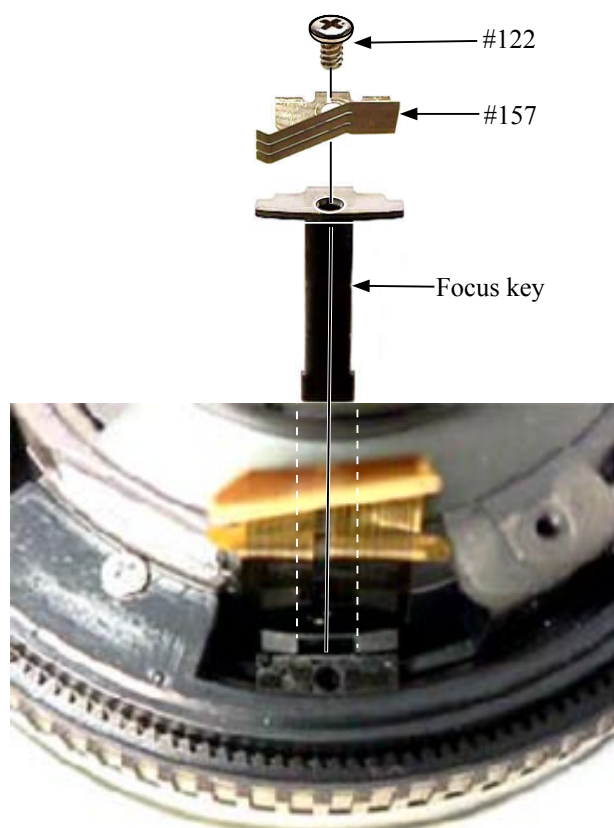
Distance-brush

△ (Revision) Rotate the MF ring, and set the distance scale to "1 m".

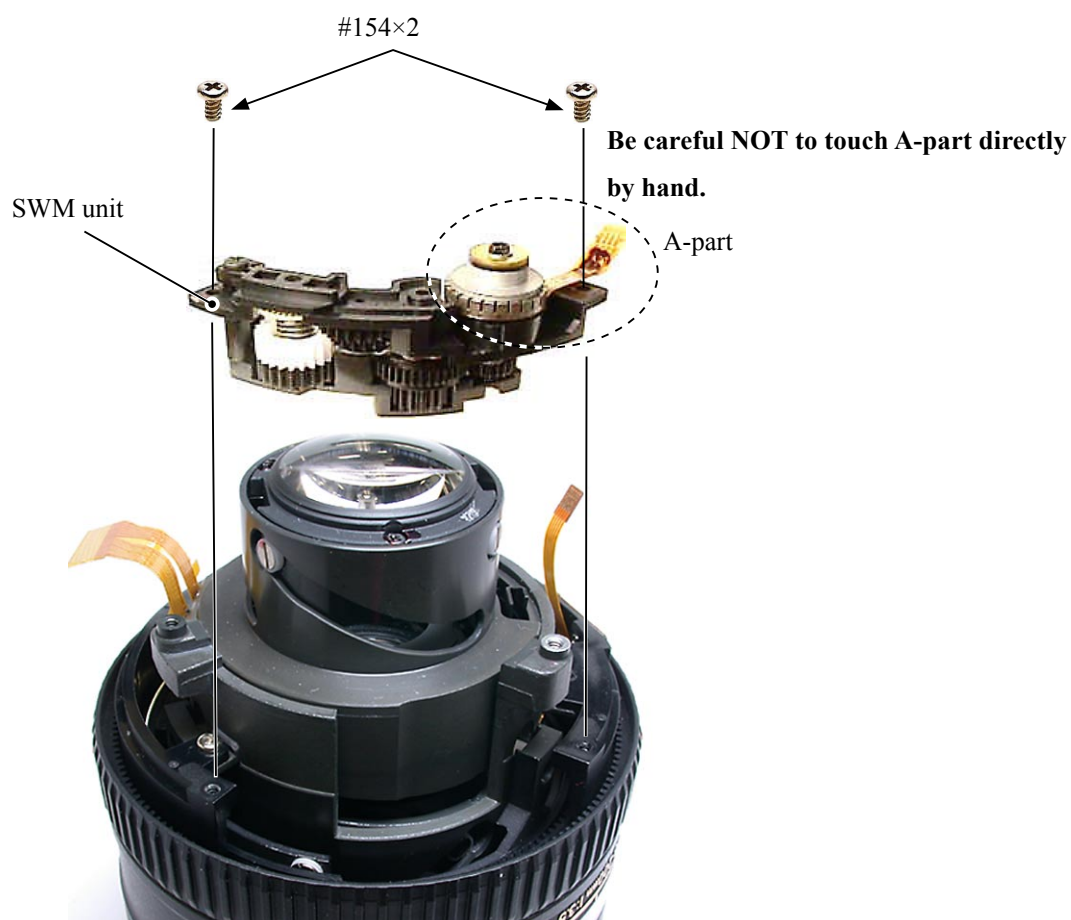
- ① Rotate the focusing ring to "close"-end.
- ② Take out the screw (#112) to remove the distance-brush.



Focus key



SWM unit



MF-ring, Rubber ring



Removal of Zoom index ring unit from Lens body

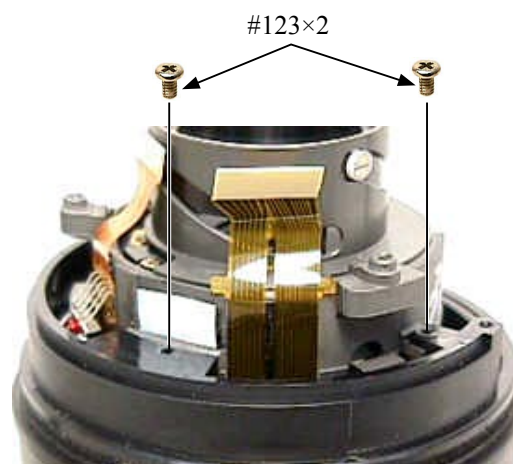
① Remove the polyester tape.



Polyester tape



② Take out two screws (#123).



③ Rotate the gear unit and set to "close"-side.

④ Remove the zoom index unit from the lens body.



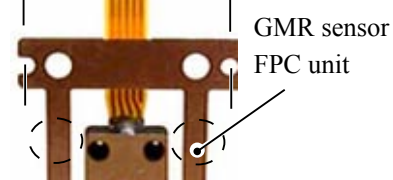
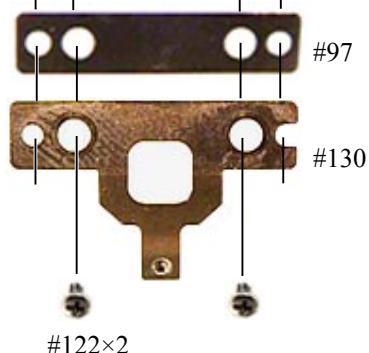
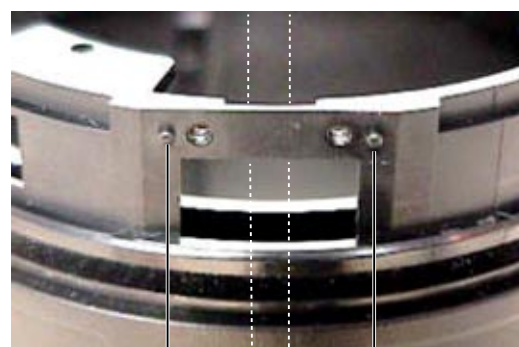
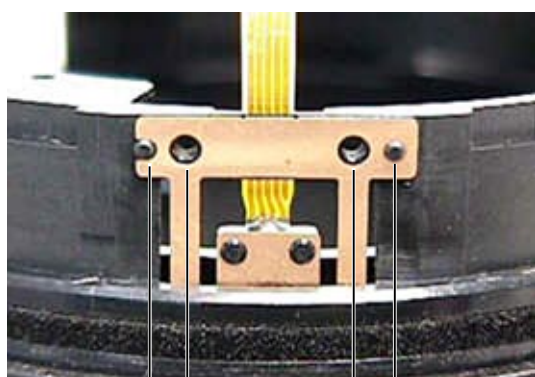
Gear unit

Zoom index ring unit



Lens body

GMR sensor FPC unit

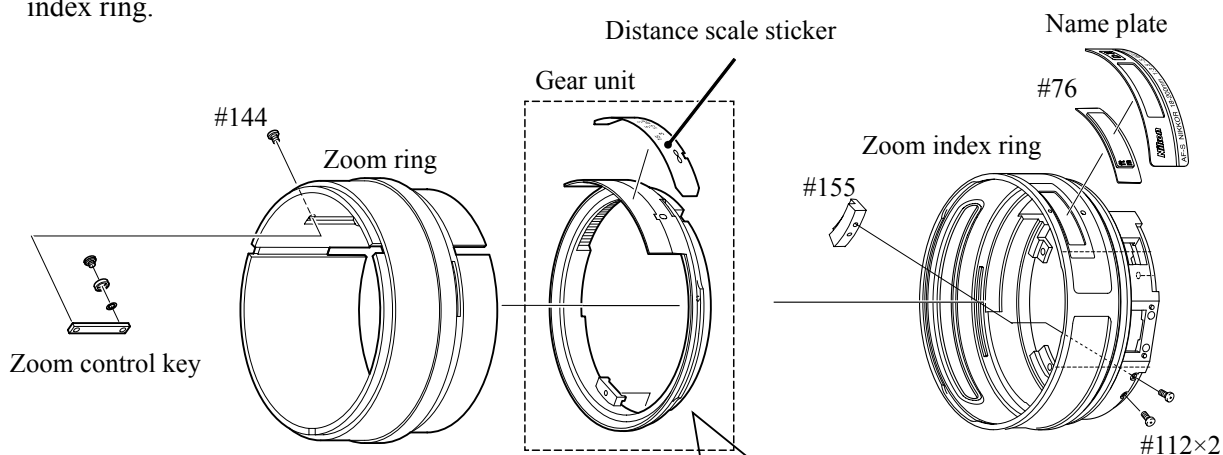


Caution:

When the GMR sensor FPC unit is removed, do NOT bend the area of dotted lines.

Zoom index ring

- ① Take out the screw (#144) and remove the lens zoom control key.
- ② Rotate the zoom ring by slightly exceeding its index "18-200", and remove the zoom ring from the zoom index ring.

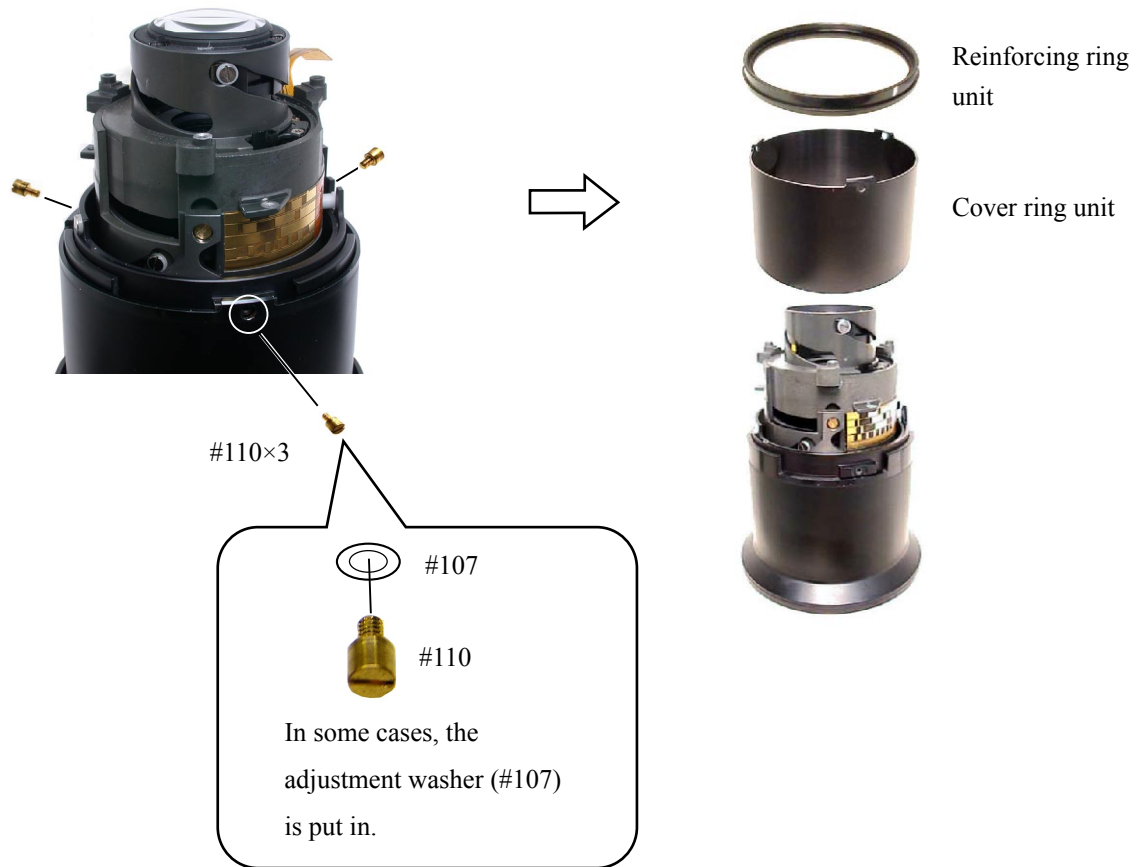


- ③ Rotate so that the edge of "∞" side of the distance scale sticker is aligned with the index of the zoom index ring, and remove the gear unit.
- ④ Take out two screws (#112), and remove the block (#155).



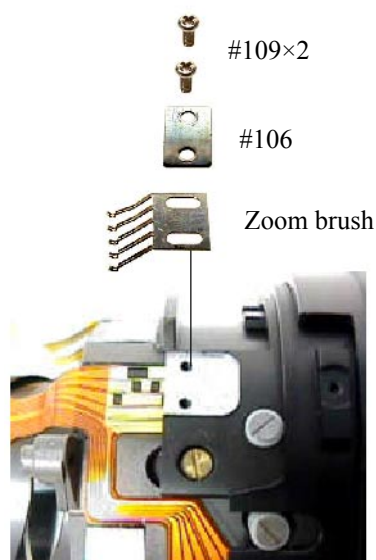
Cover ring unit

- Take out three screws (#110), and remove the reinforcing ring unit and cover ring unit.



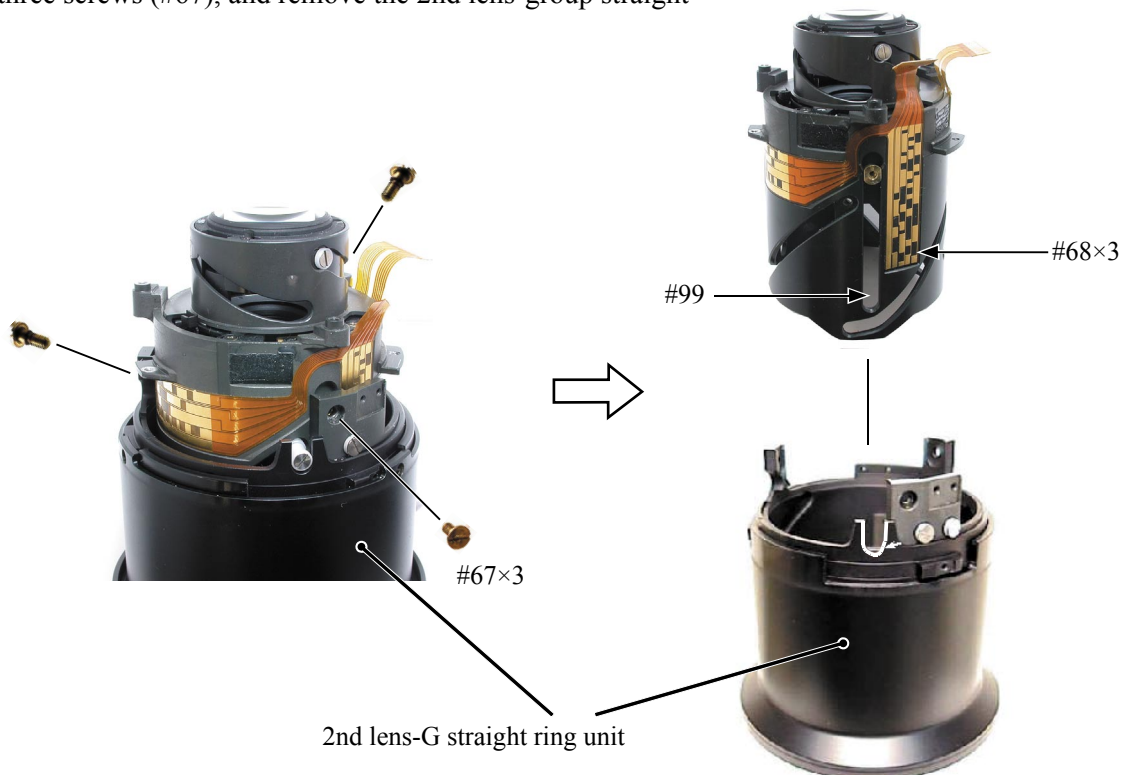
Zoom brush

- Take out two screws (#109) and remove the zoom brush.



2nd lens-group straight ring unit

- Take out three screws (#67), and remove the 2nd lens-group straight ring unit.



Caution:

The 2nd lens-G straight ring unit must not be disassembled any further at service facilities, because if it is, special tools and several selected rollers become necessary for assembly.

4th lens group

Caution:

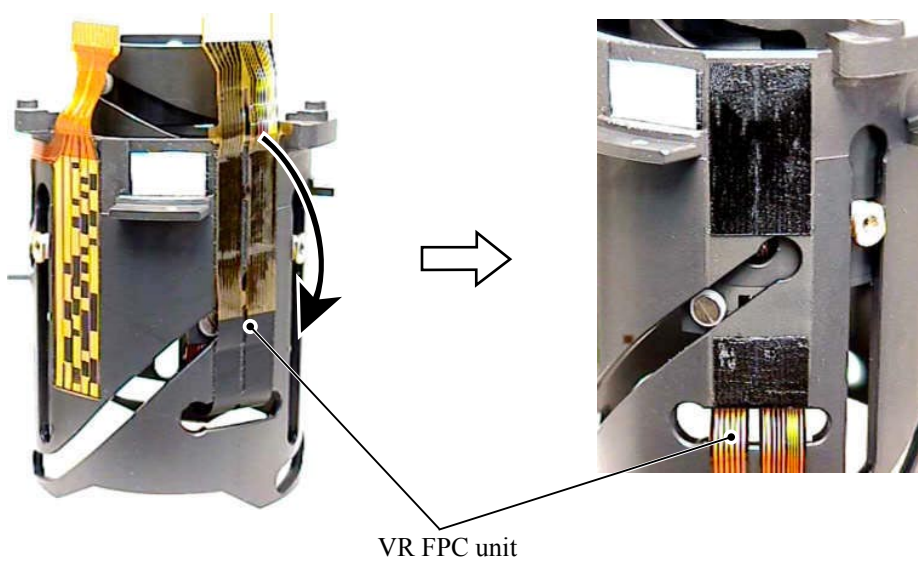
When the 4th lens group is removed, it becomes necessary to perform lens alignment work after assembly. At service facilities where the alignment work is impossible, do not remove the 4th lens group.

- Remove the 4th lens-G cover ring (#70).
- Take out three screws (#124), and remove the 4th lens group and washer (#13).
△ (Revision)
#139



Removal VR FPC unit

- Remove the VR FPC.

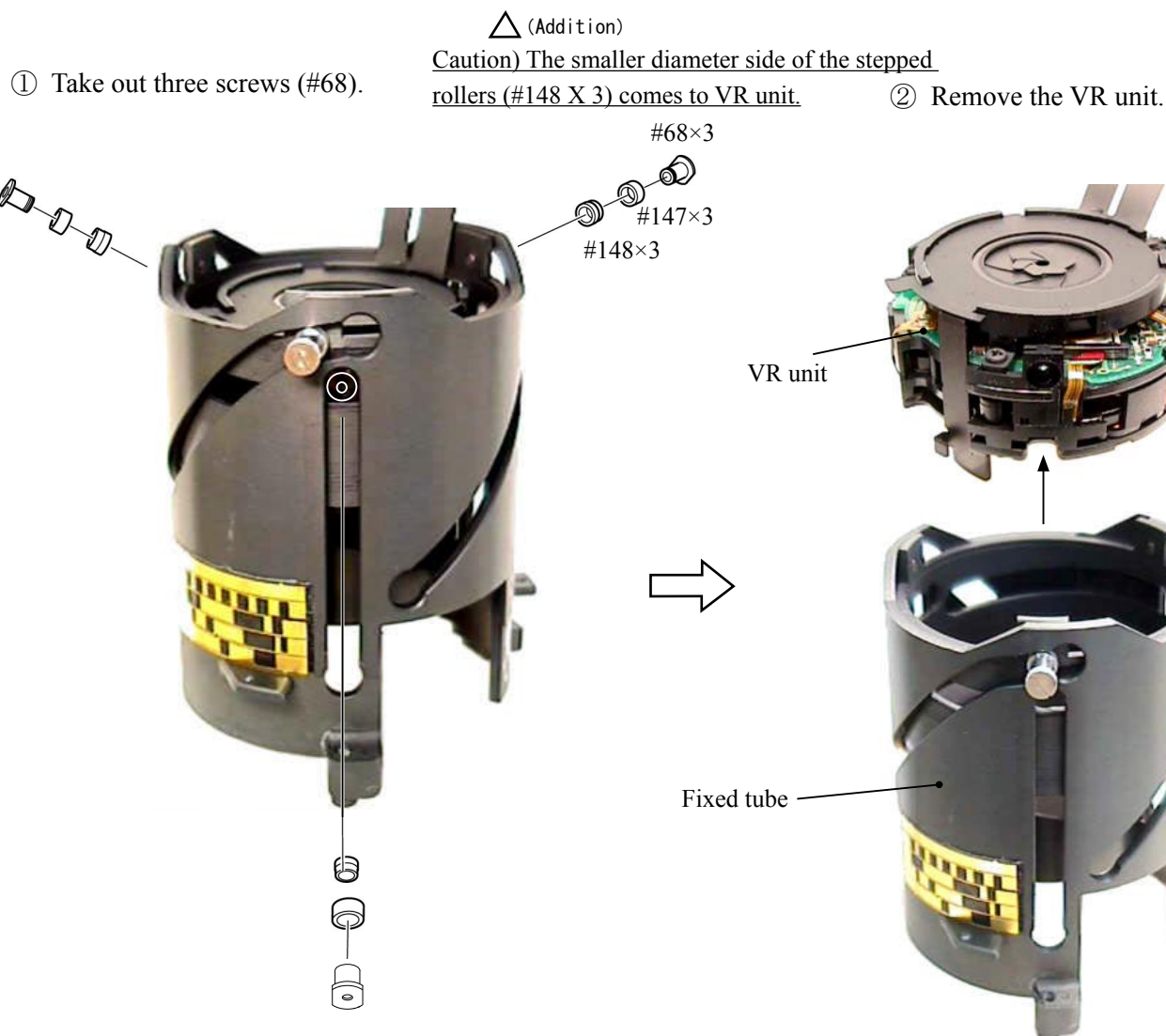


4th lens group sliding ring

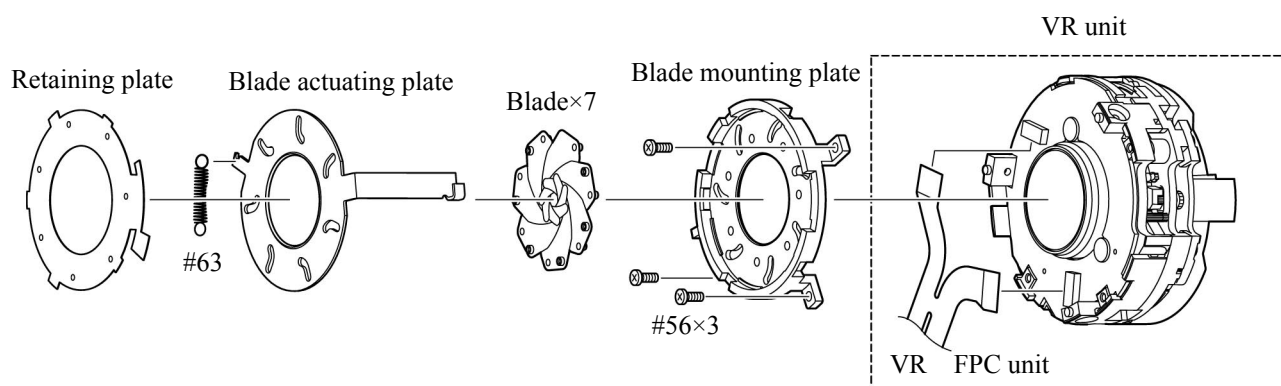
- Take out three screws (#81), and remove the 4th lens-G sliding ring.



Removal of VR unit

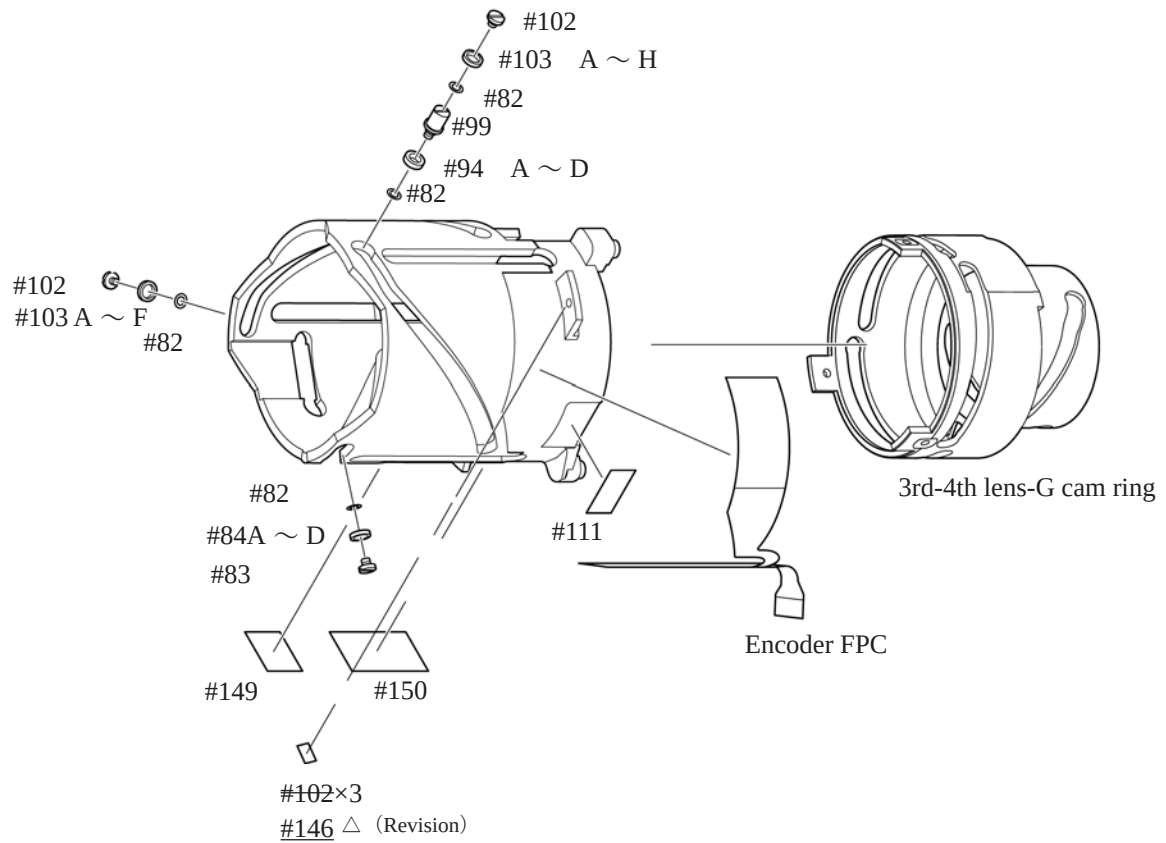


Aperture blade unit



3rd-4th lens group cam ring

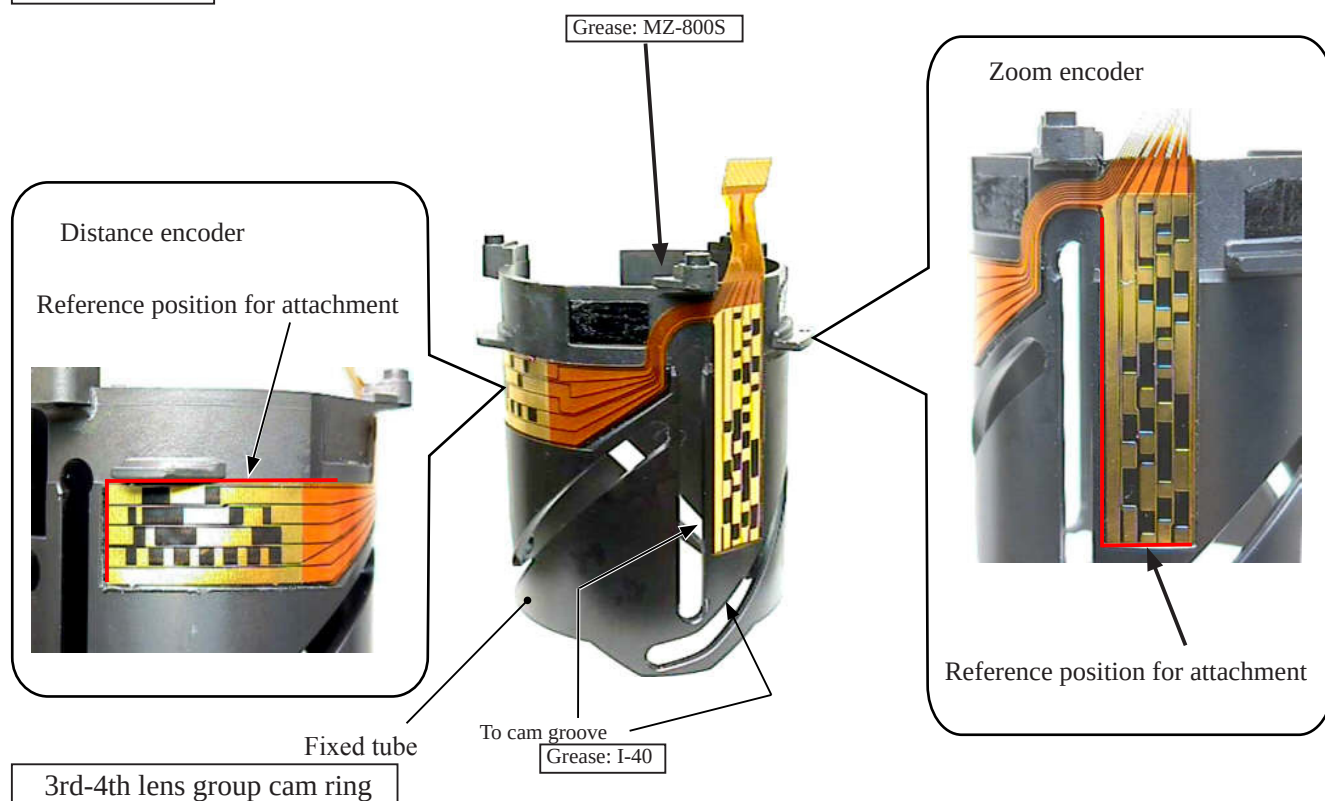
- ① Remove each roller.
- ② Remove 3rd-4th lens-G cam ring.



2. Assembly / Adjustment

Encoder FPC

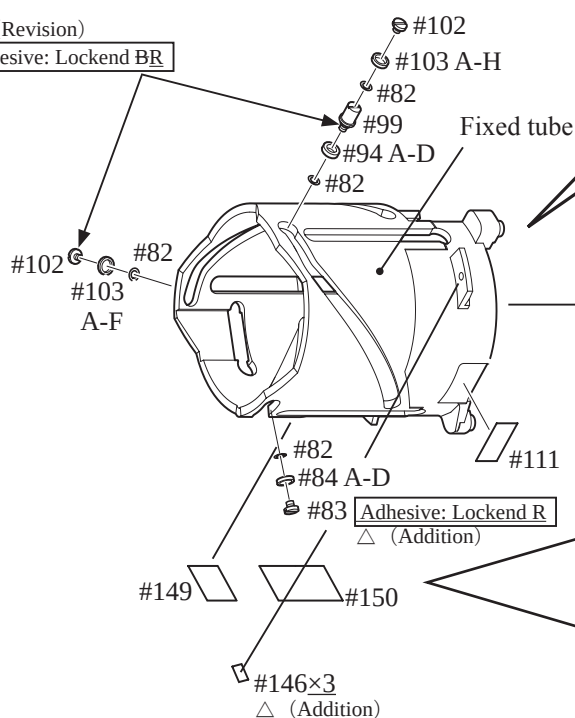
Apply to the overall surface of the inside.



- ① Align the concave portion of the 3rd-4th lens-group cam ring with the cutout of the fixed tube, and assemble them.
- ② Attach each roller that fits the grooves.
- ③ Attach each tape.

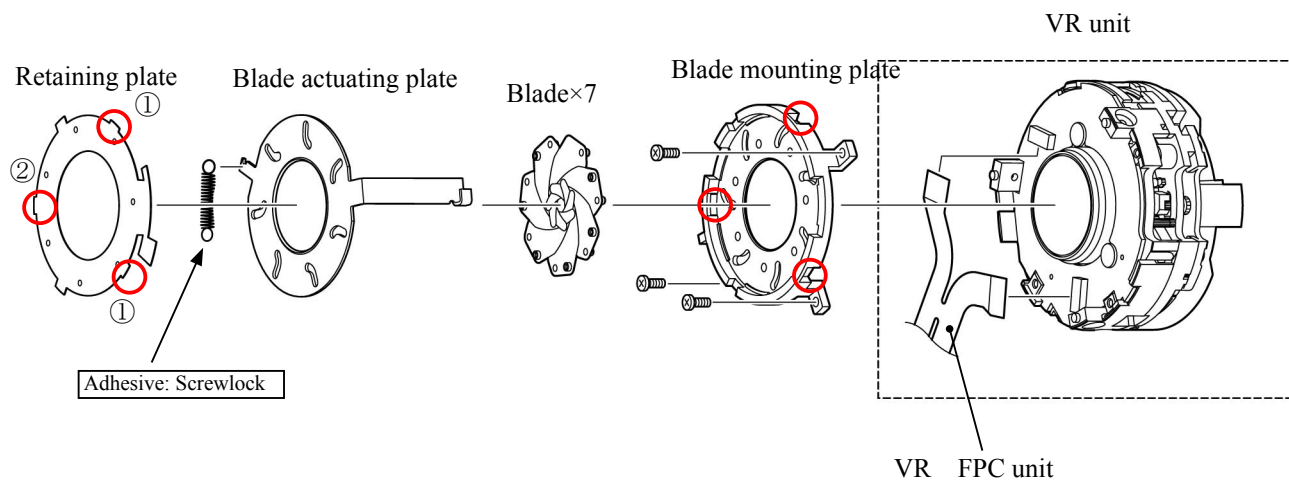
△ (Revision)

Adhesive: Lockend BR



Aperture blade unit

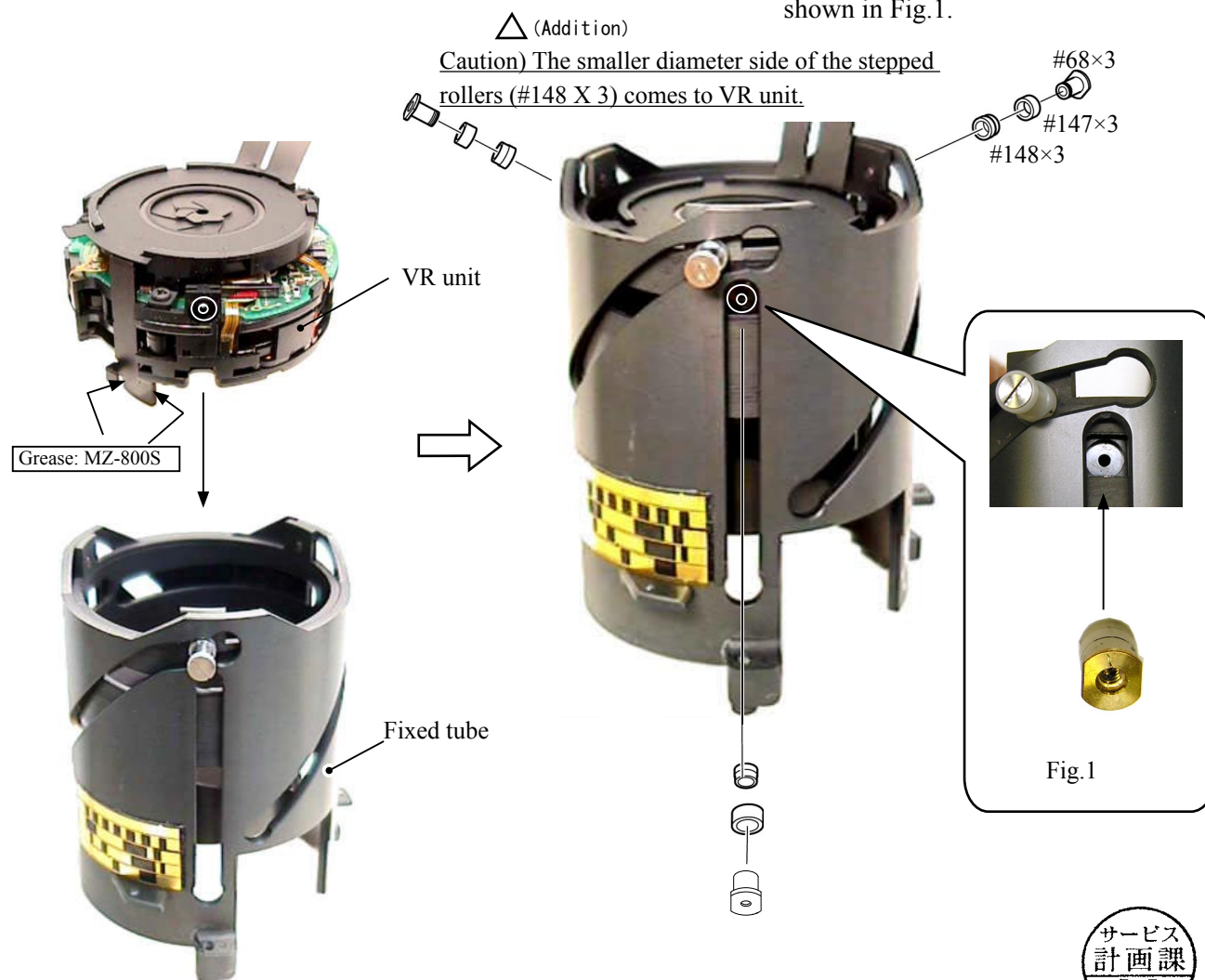
- Fit the three convex portions of the retaining plate into the three holes of the blade mounting plate in the order of ① and ②.



Installation of VR unit into Fixed tube

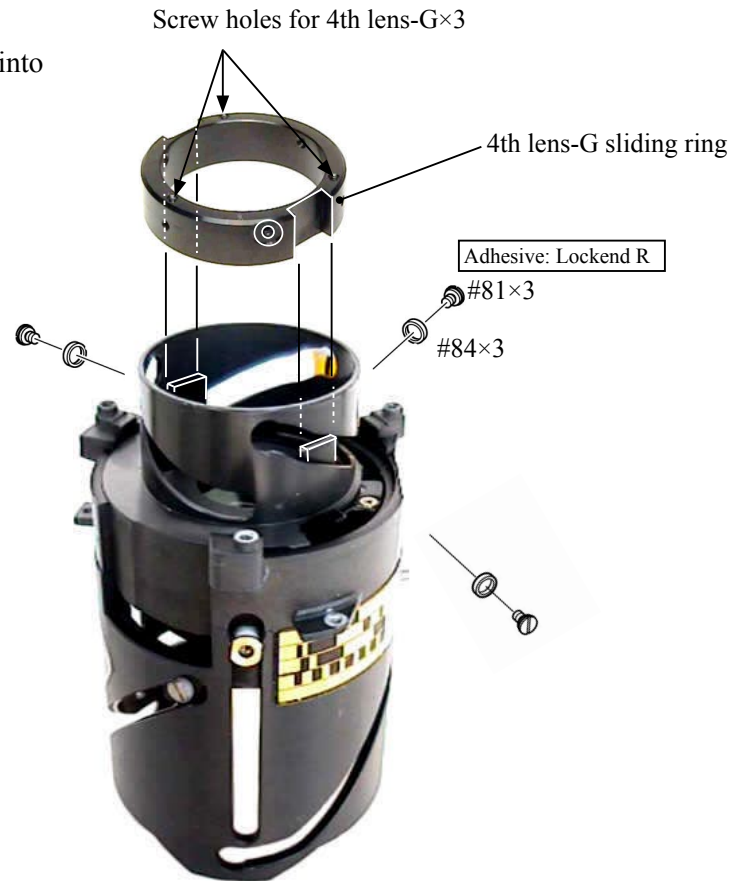
- Assemble the VR unit into the fixed tube.

- Insert the three nuts (#68) at the position shown in Fig.1.



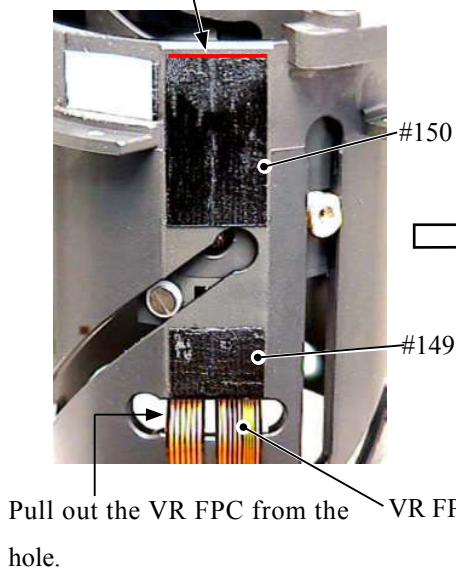
4th lens group sliding ring

- Assemble the 4th lens-group sliding ring into the fixed tube.
- Fix them with three screws (#81).

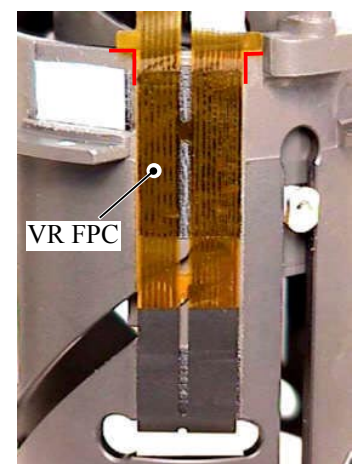


Installation of VR FPC unit

Reference plane for attaching VR FPC



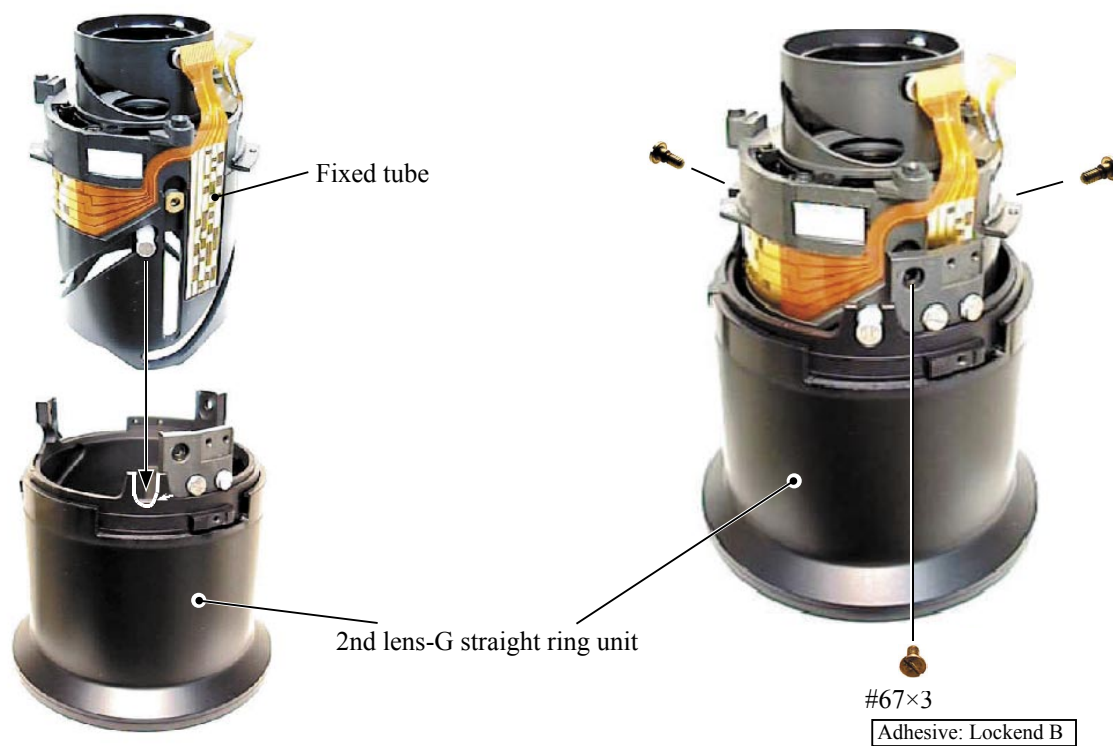
Position for attaching VR FPC unit.



Caution: Attach the FPC without any slacks.

2nd lens-group straight ring unit

- Assemble the fixed tube into the 2nd lens-group straight ring unit, and fix them with three screws (#67).



Zoom brush

- Attach the brush by turning the convex portion all the way to the direction of the arrow so that the brush is positioned as shown in "Fig.1".

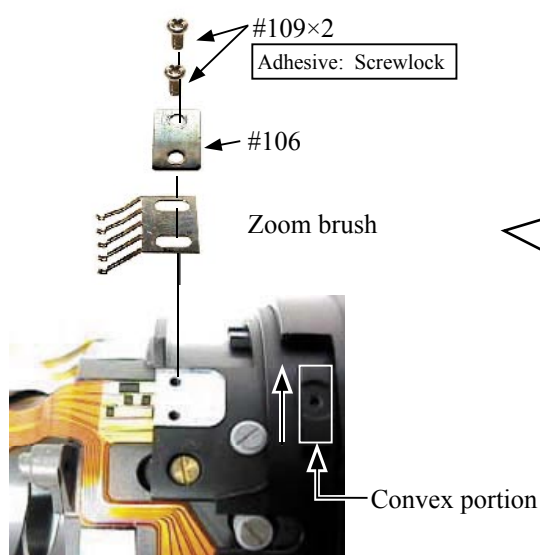
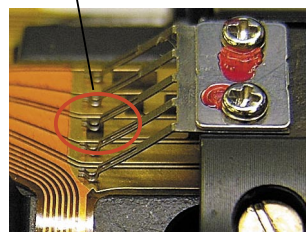


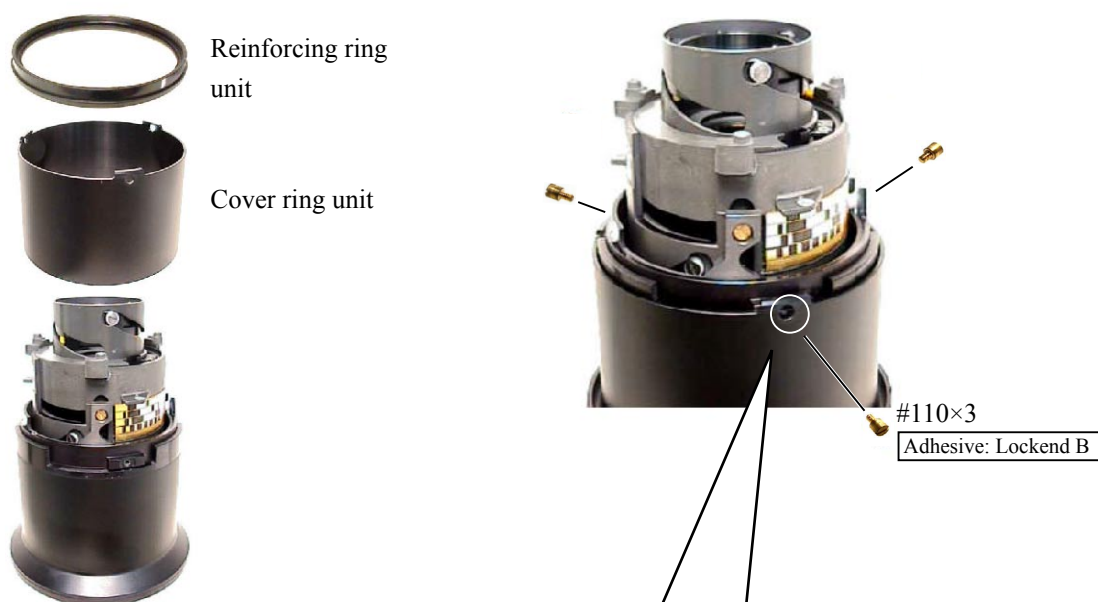
Fig.1

Aligned position of Zoom brush



Cover ring unit

- Assemble the reinforcing ring unit and the cover ring unit, and fix them with three screws (#110).



- When the three screws (#110) are attached, the vertical position of the screw slot is considered as 90°-direction. Then, if the screw stops where the slot is at an angle exceeding 45°, or in a horizontal position (See "NG"), put the washer (#107) and tighten the screw again.

△ (Addition)

Caution: In case of "NG", the screw slot touches and scrapes against the inner groove of the cover ring unit. This may cause a dirt or malfunction. (ref. Fig.1)

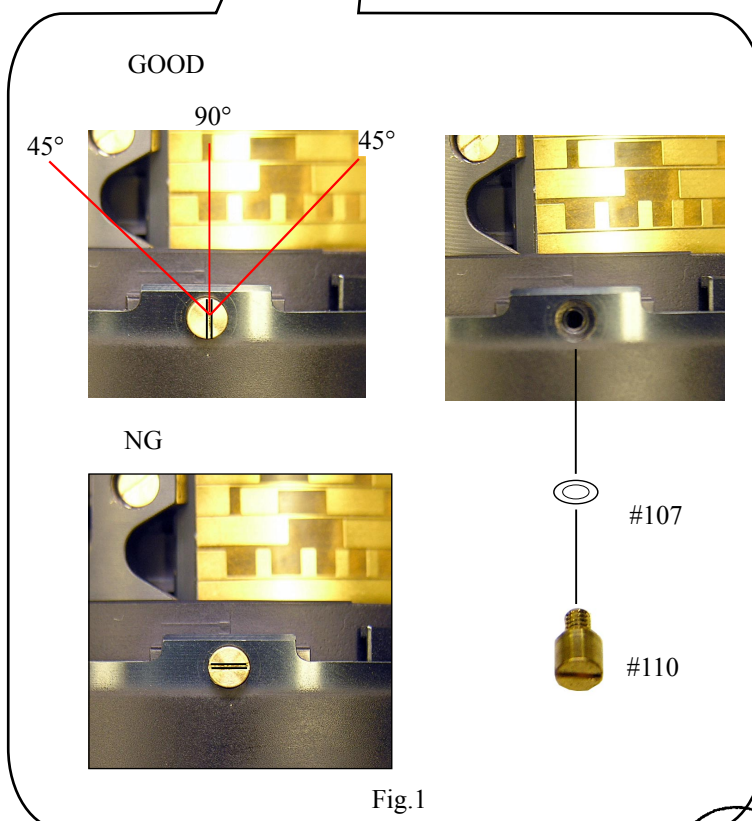
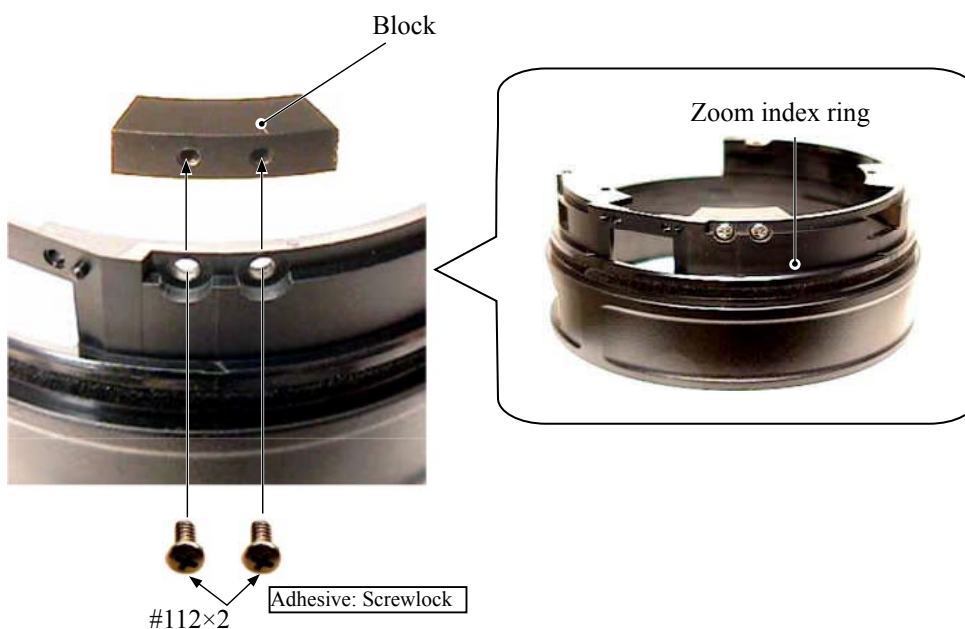


Fig.1

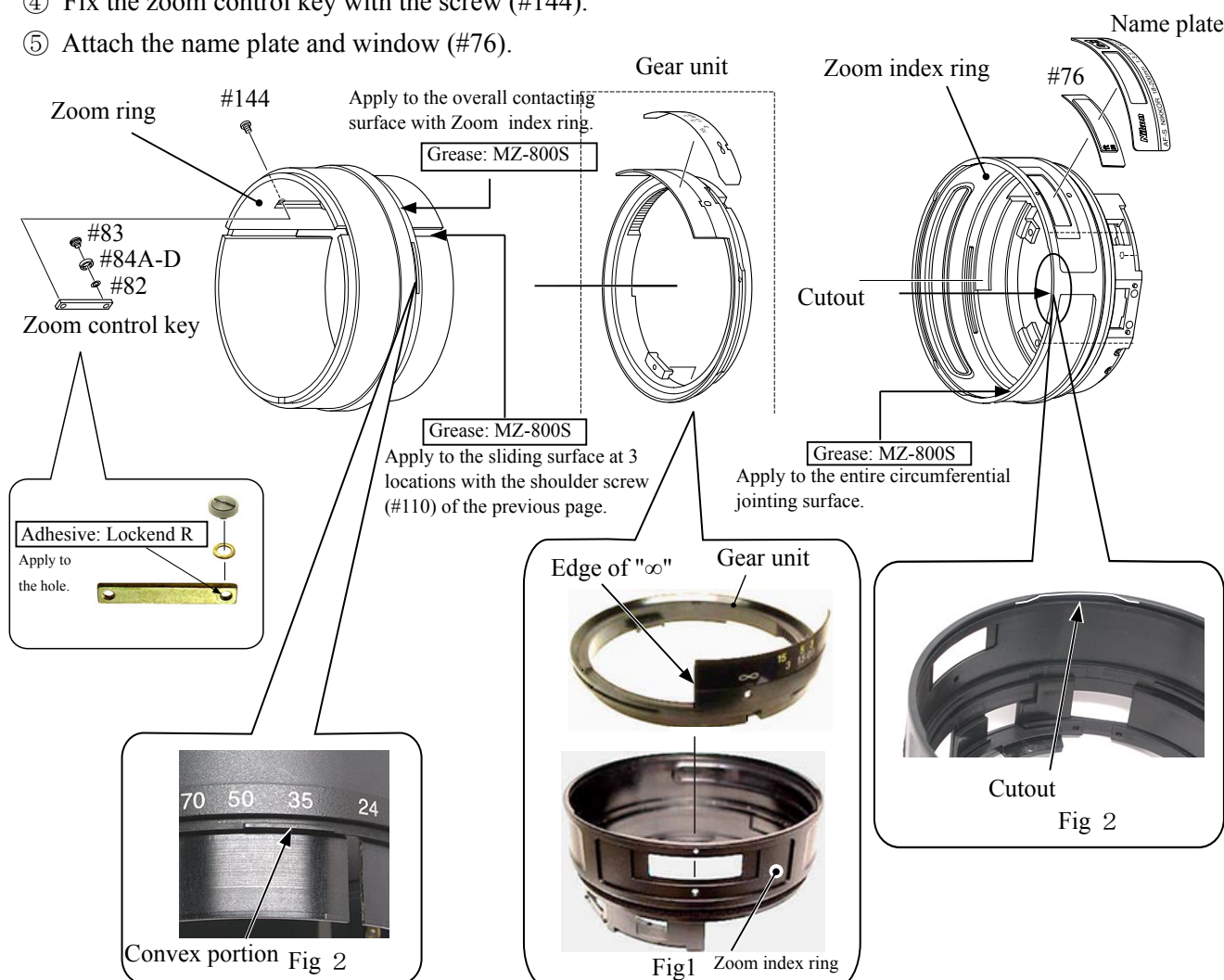


Zoom index ring

- ① Put the two screws (#112) into the block (#155).

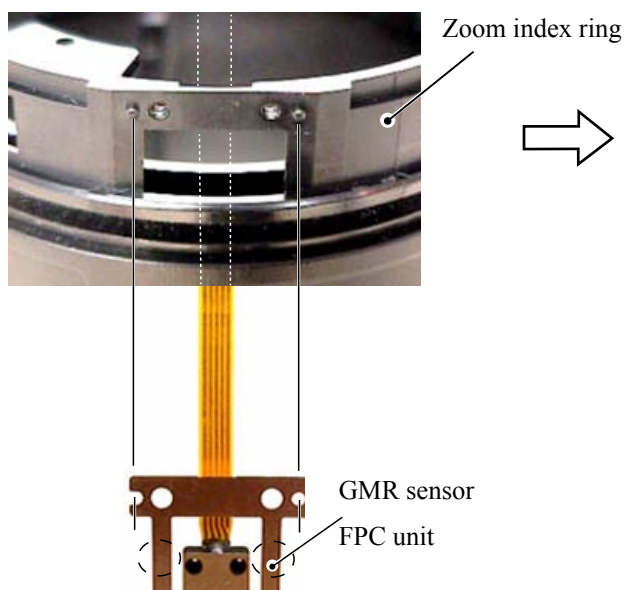


- ② Align the edge of "∞" of the distance scale sticker with the index of the zoom index ring, and assemble the gear unit. Then, turn the gear unit clockwise and align the "∞" mark with the index. (Fig1)
- ③ Align the cutout of the zoom index ring with the convex portion of the zoom ring, and assemble them. (Fig2)
- ④ Fix the zoom control key with the screw (#144).
- ⑤ Attach the name plate and window (#76).



GMR sensor FPC unit

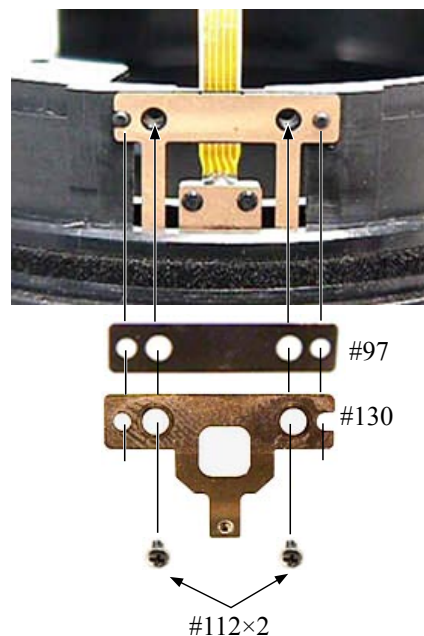
- ① Pass the FPC of the GMR sensor FPC unit through the hole to assemble.



Caution:

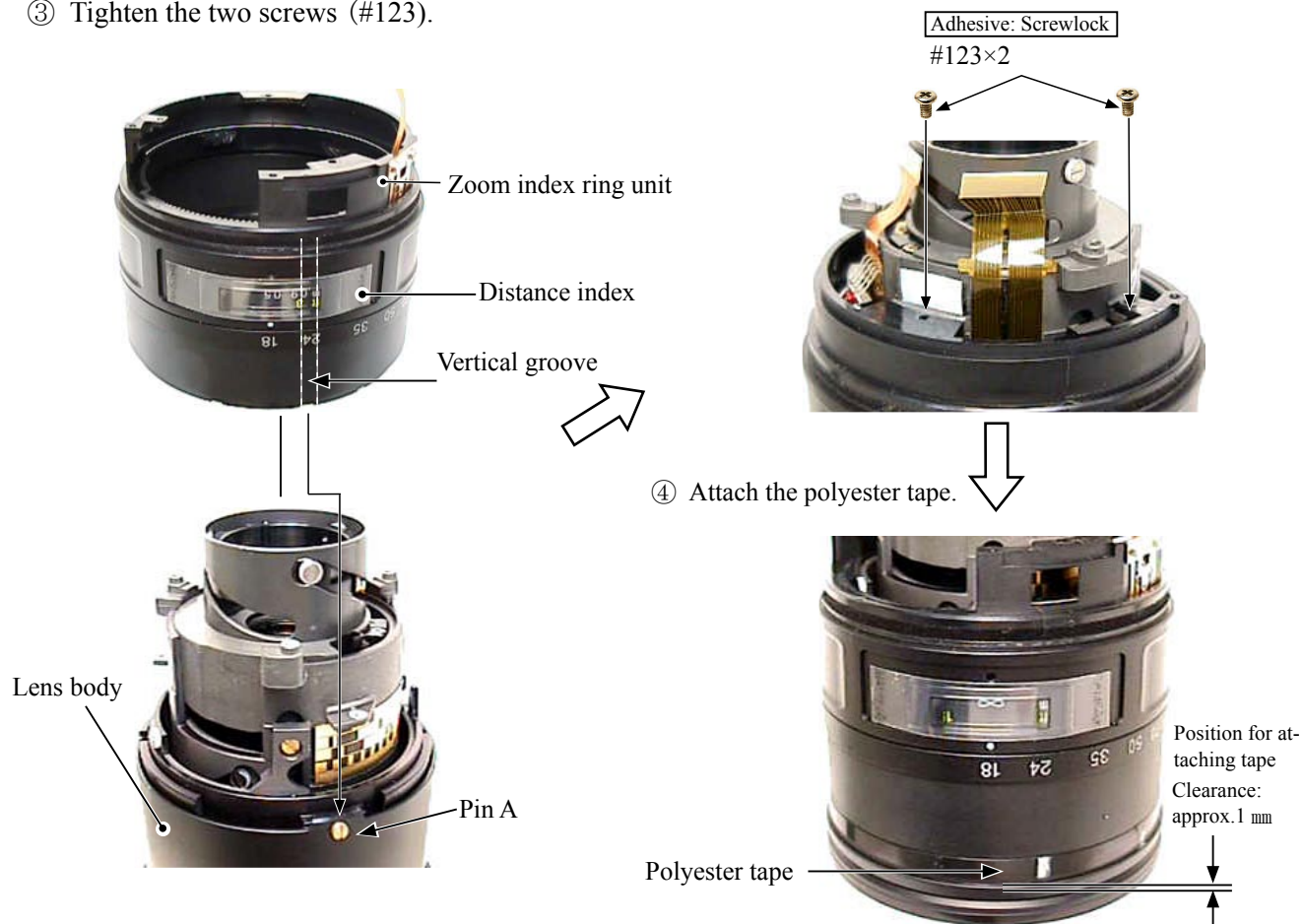
When the GMR sensor FPC unit is mounted, do NOT bend the area of dotted lines.

- ② Attach the retaining plate (#97) and the plate spring (#130), then fix them with two screws (#112).



Installation of Zoom index ring unit in Lens body

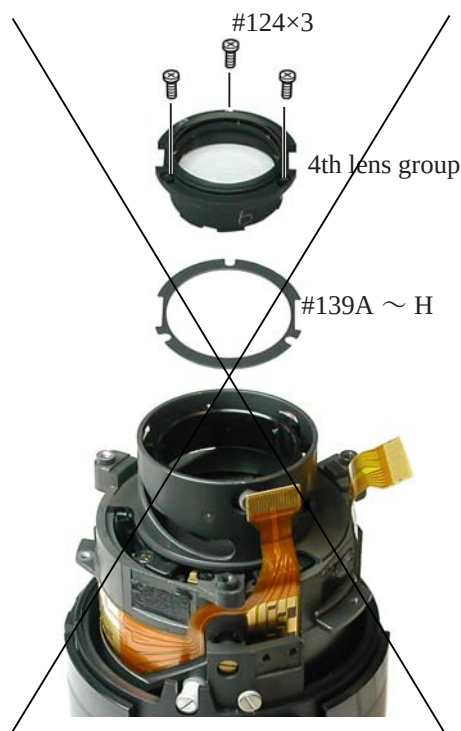
- ① Align the vertical groove of the zoom index ring unit with the pin "A" of the lens body, and assemble them.
- ② Set the zoom ring to the wide-position, while the distance index to "close"-side.
- ③ Tighten the two screws (#123).



4th lens group

△ (Moved to page A16-1)

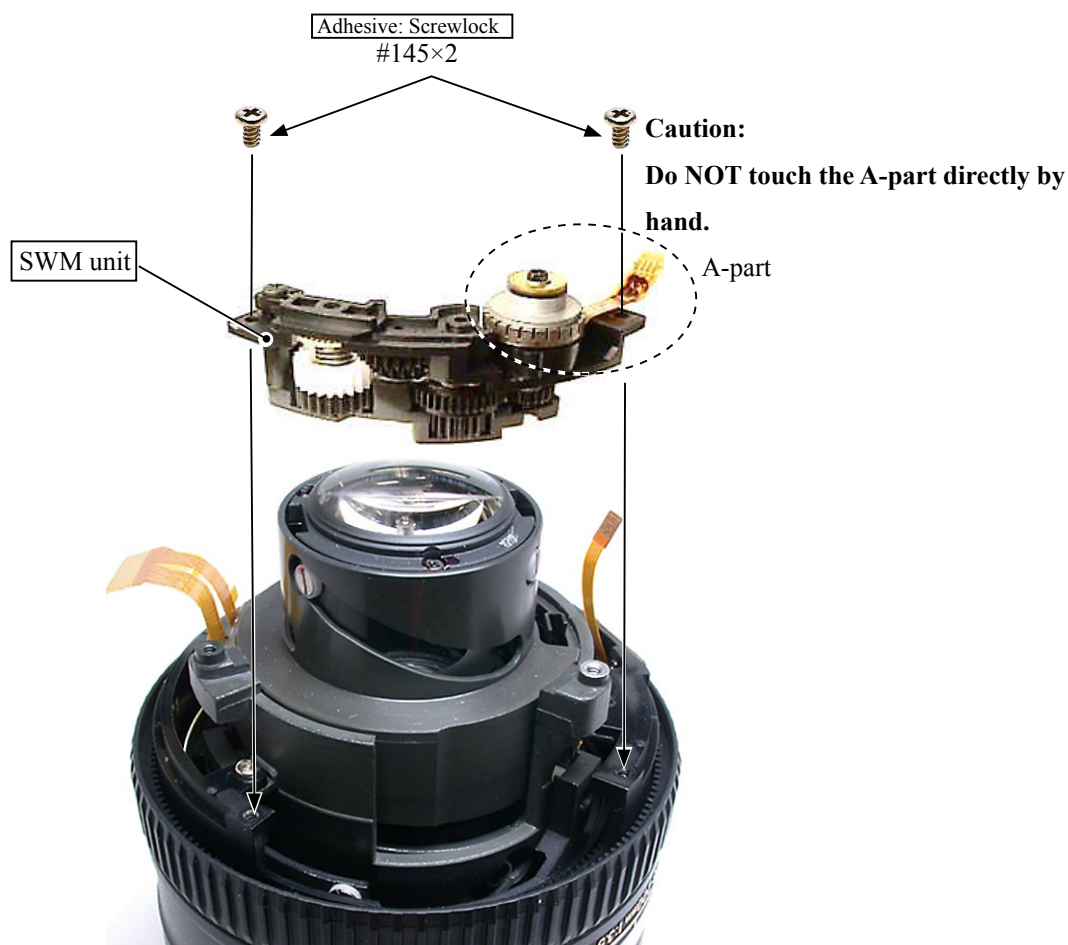
- Fit the two cutouts and three screw holes of the washer (#139) in the 4th lens-group sliding frame.
- Fit the two cutouts and three screw holes of the 4th lens-group in the 4th lens-group sliding frame, then fix them with three screws (#124):

**MF ring**

- Assemble the MF-ring into the zoom ring.

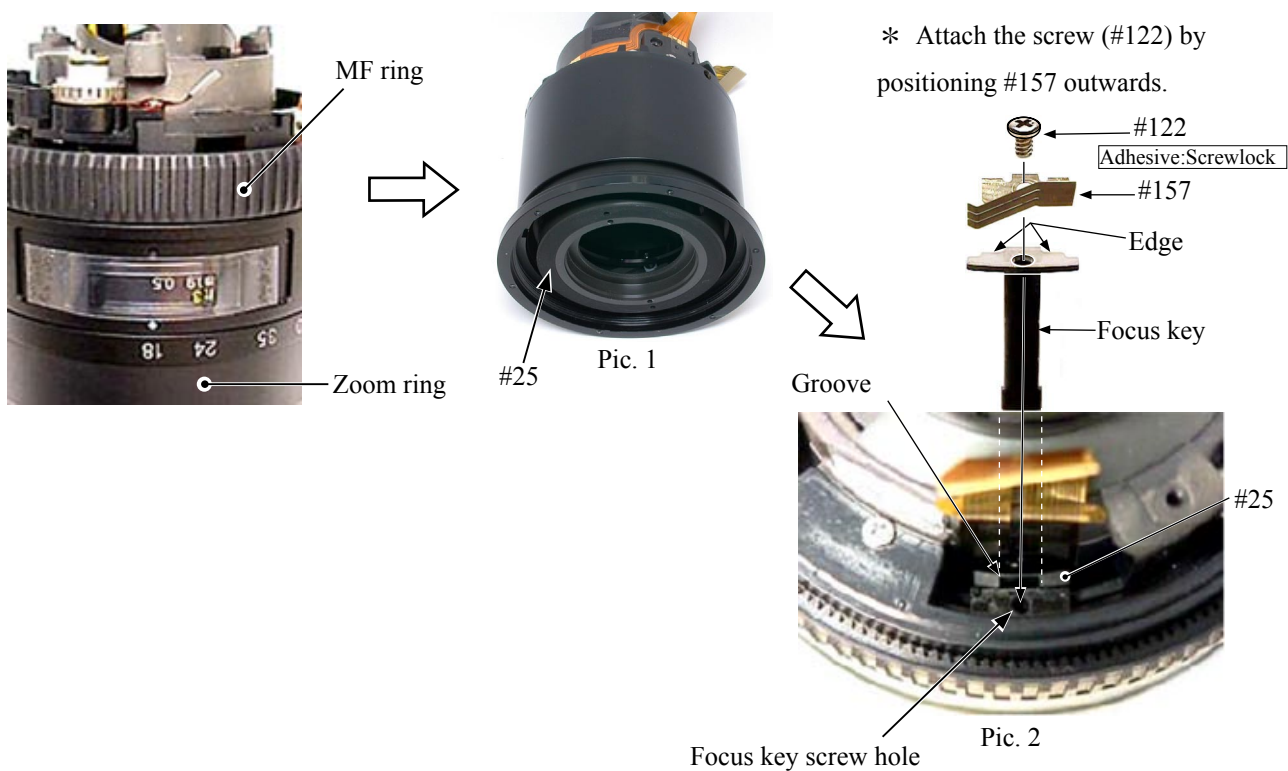


SWM unit



Focus key

- ① Set the MF ring to "close"-side, while the zoom ring to "wide"-side.
- ② Rotate #25 (See "Pic.1") by hand so that the groove of #25 is set at the position of "Pic. 2".
- ③ Put the focus key and the plate spring (#157) in the groove of #25, and fix them with the screw (#122).



Inspection and adjustment of output waveform of MR encoder

- When the MR head is disassembled and replaced, be sure to make an adjustment.

1. Device:

- Single-output rated voltage power-supply 1 unit: 5V 100mA
- Oscilloscope 1 unit
- Self-made tool 1 unit

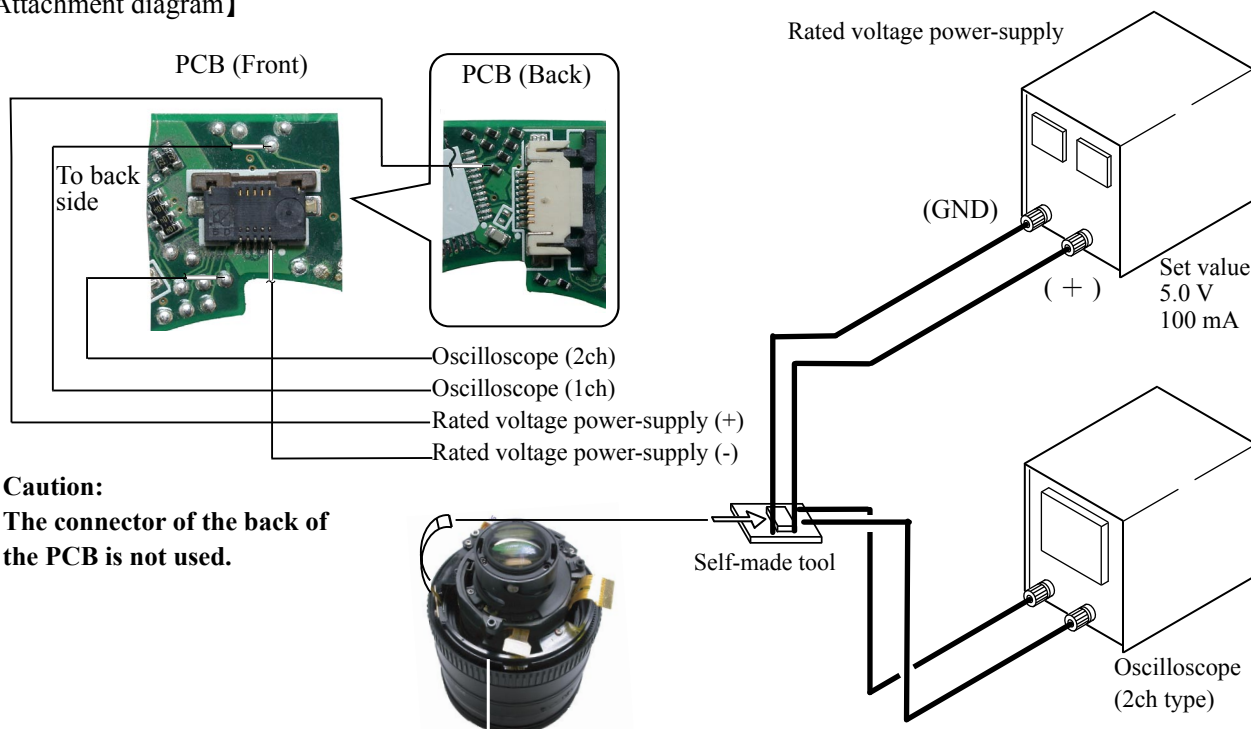
Caution:

If there is a problem with continuity between the contacts of the self-made tool and the relay FPC, the contacting surface of the relay FPC may be dirty, eroded, or oxidized. So polish the contacts and connect them.

2. Preparation of the lens for measurement

- Assemble the MR-head-attached zoom index ring unit, the SWM, and the MF ring into the lens body. Then connect the assembled lens to each measuring machines as follows:

• 【Attachment diagram】



Caution:

The connector of the back of the PCB is not used.

• How to inspect and adjust:

- ① Confirm that the electric current and voltage of the connected rated voltage power-supply are set values, then turn it ON.
- ② Set the oscilloscope, and turn the MR ring.

Note: The waveform varies according to the rotational speed of the focus ring. So change "Time/Div" setting accordingly.

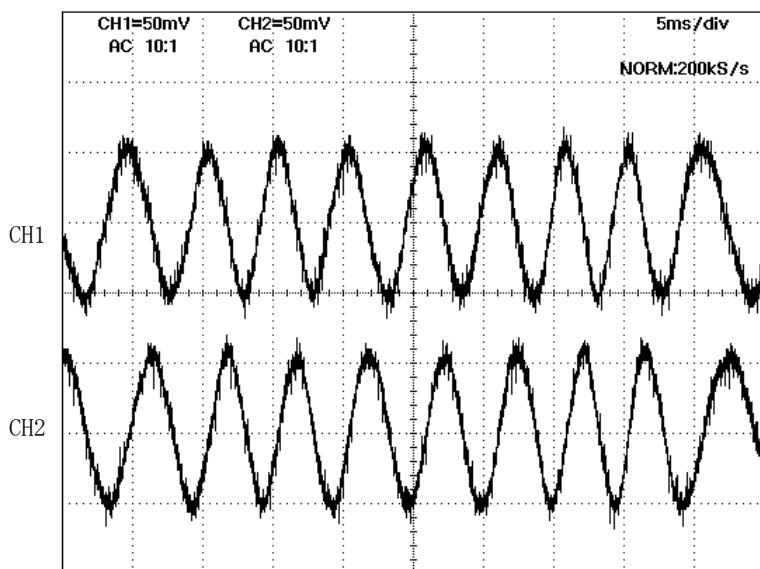


Fig.1

● Oscilloscope setting

V/Div (ch1)	: 50 mV
V/Div (ch2)	: 50 mV
Coupling	: AC
Time/Div	: 5 m Sec
Trigger Mode	: NORMAL
Trigger Coupling	: AC

Amplitude

**Standard: Amplitude of all pulses/
waveforms is 80mV or more.**

**Note: Check the waveform by moving the
focus ring back and forth from the
infinity-end to the close-end positions
entirely.**

- ③ In case large waveform-noise (as shown in Fig. 1) is detected, use the FILTER function.

How to set FILTER function (e.g. DL1540 manufactured by YOKOGAWA)

1. Press the FILTER button.
2. Select “Smooth” of the menu on screen and turn it ON.

- ④ In case the amplitude is small, disassemble up to the stage of the GMR sensor FPC unit. Then if the deformation is detected in the MR head, correct the deform of the MR head. On the other hand, if such correction is impossible or no deformation is detected, replace the GMR sensor FPC unit. (Fig.2)

**Note: When adjustments are made, prevent the
magnetic surface and MR head from touching the
magnetized driver bit. Otherwise, the magnetic
data may be damaged.**

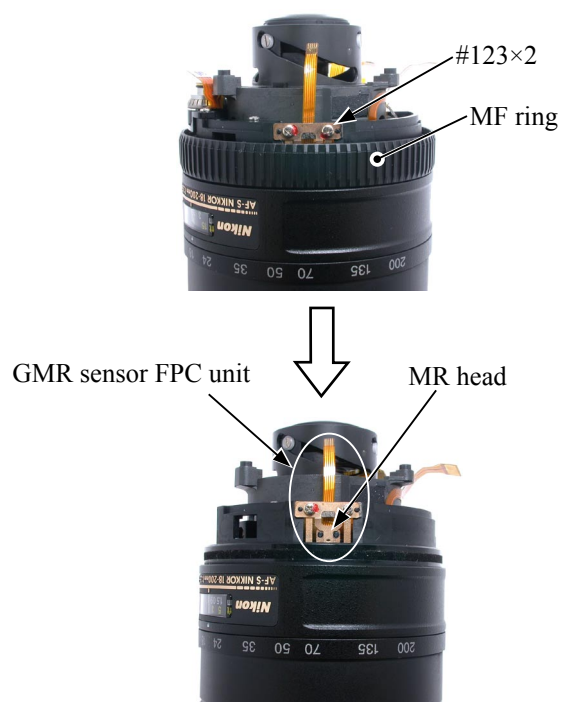


Fig.2

< Ref. >

- As shown in Fig. 1, if the amplitude of only either CH1 or CH2 is small, one of the 2 screws (#218) may be loosened, so check for it. If this is not the case, the MR head may malfunction, so replace the GMR sensor FPC unit and make a readjustment.

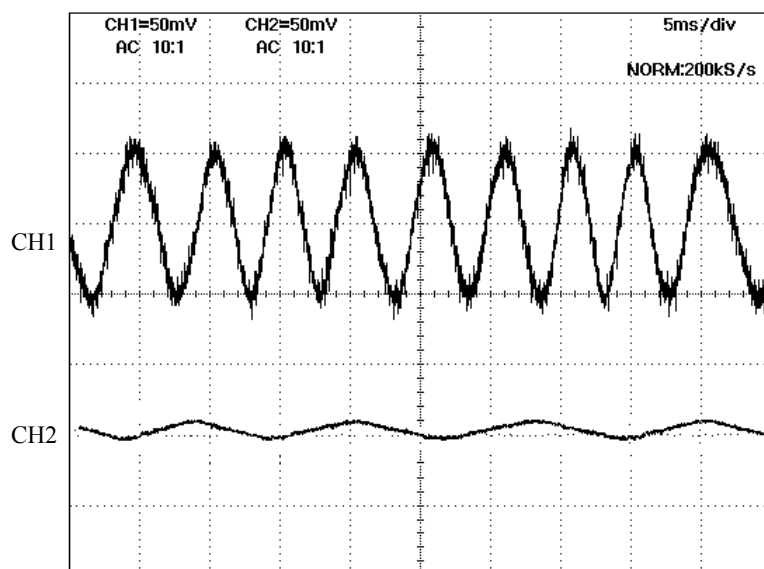


Fig.1

- As shown in Fig. 2, if the amplitude partially drops between the infinity and the close-distance, the magnetic data of the tape may be damaged. So replace the main fixed tube unit and make a readjustment. Replacing only the magnetic surface is impossible.

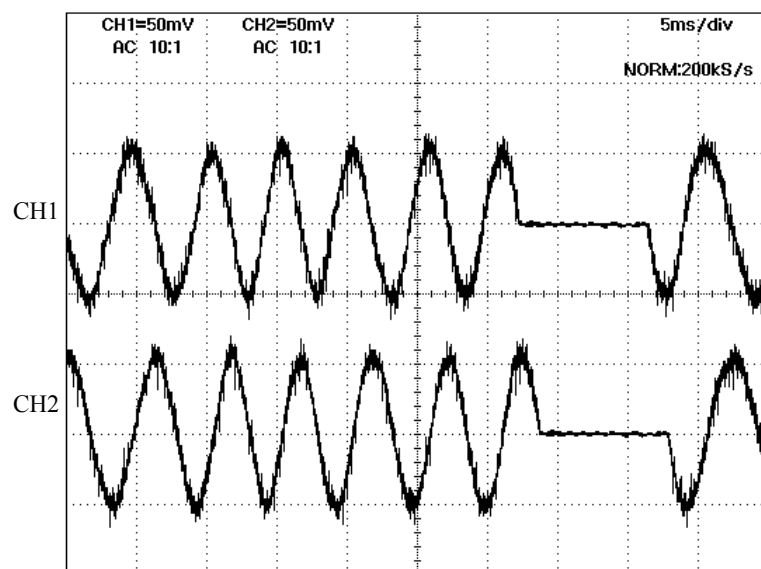


Fig.2

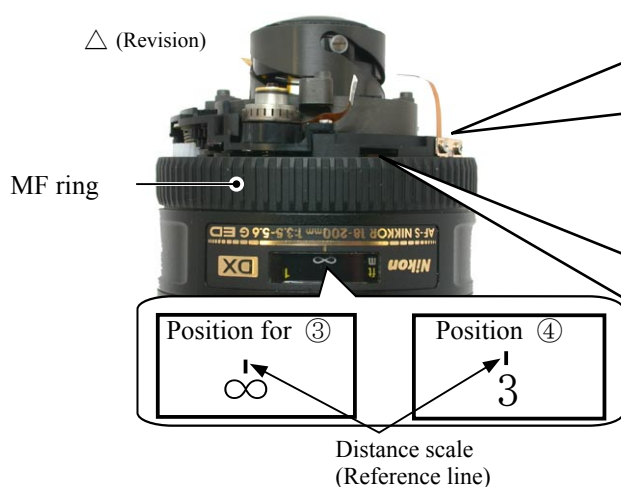


- ⑤ Turn off the rated voltage power-supply.

Distance-brush

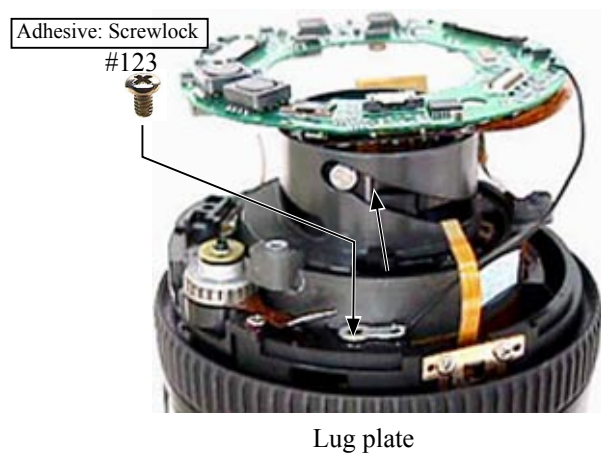
△ (Revision) and set the distance scale to "1 m".

- ① Rotate the MF-ring to "close"-end.
- ② Attach the distance-brush with the screw (#112) temporarily.
- △ (Revision)
- ③ Rotate the MF-ring and set the distance scale to the center of "∞". Check if the distance-brush comes to the reference position or not. (ref. Fig.1)
- ④ If not, loose the screw (#112) and adjust the position. (The screw (#112) cannot be seen, so rotate the MF-ring and set the distance scale to "3 m".)
- ⑤ After the adjustment, fix the screw (#112) with the screwlock.



Main PCB unit

- ① Fix the lug plate with the screw (#123).



△ (Revision)

Position for Distance-brush

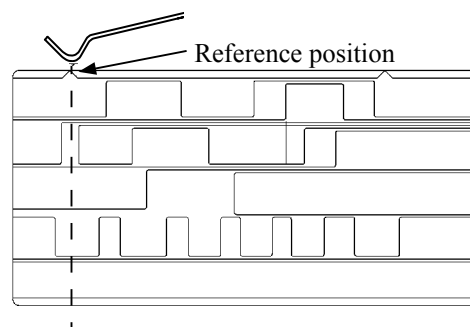
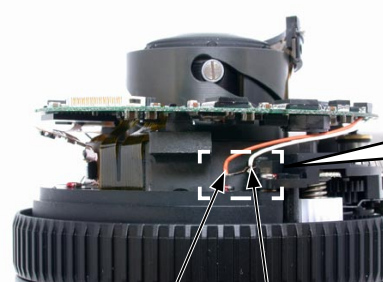


Fig.1

- ② Solder the two wires on the SWM unit.



Adhesive: Screwlock

#112

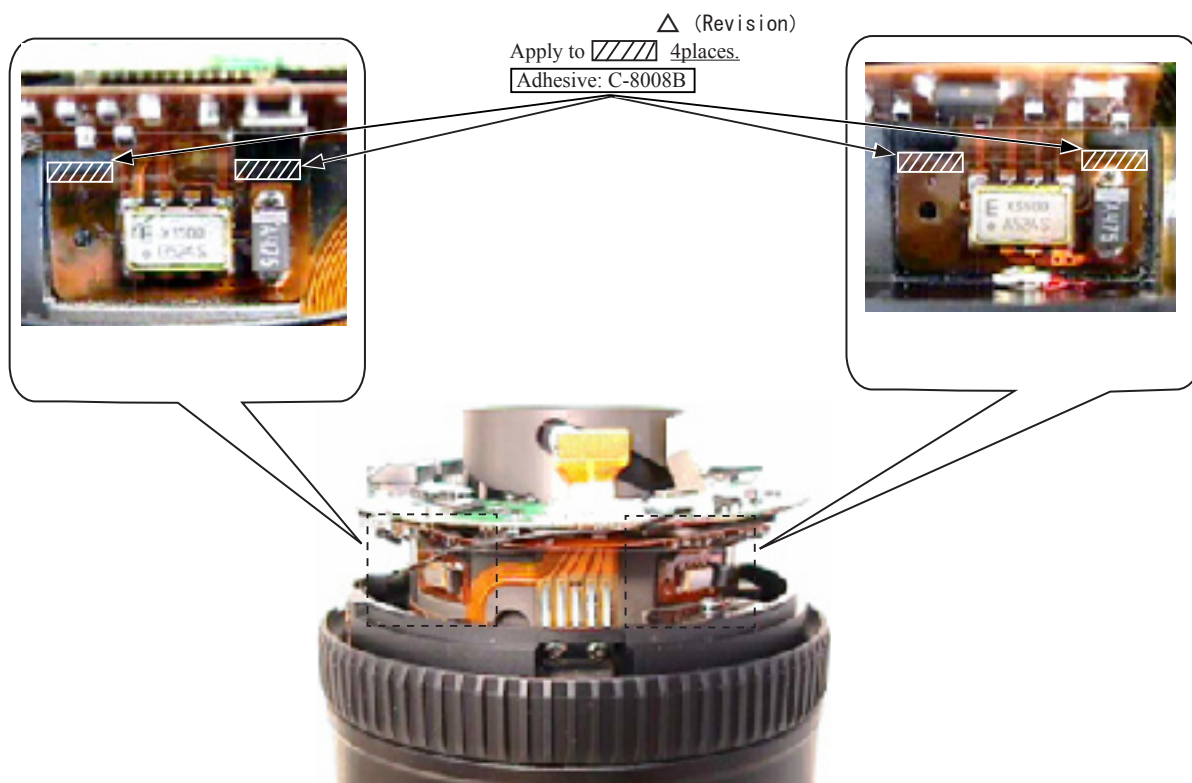
△ (Revision)



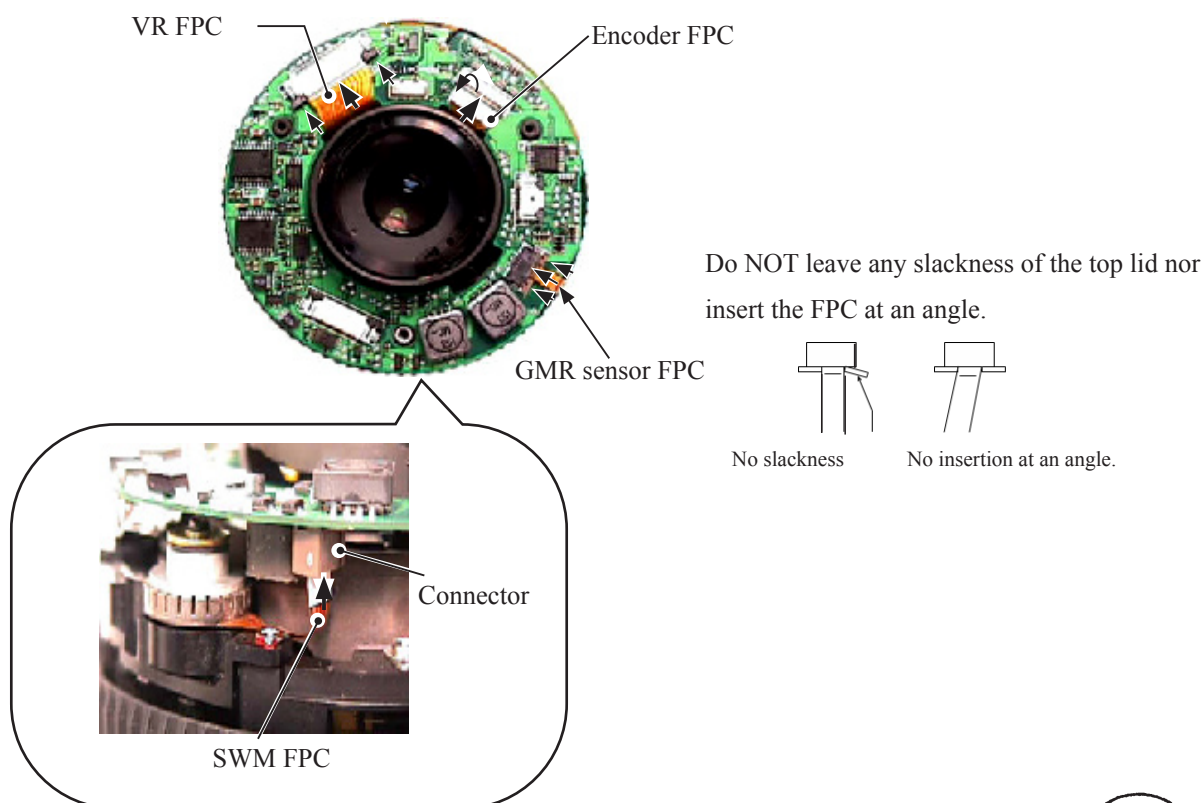
Position for ①

Distance scale (Reference line)

③ Attach the gyro-FPC.



④ Insert each FPC in the main PCB.



Contacts unit



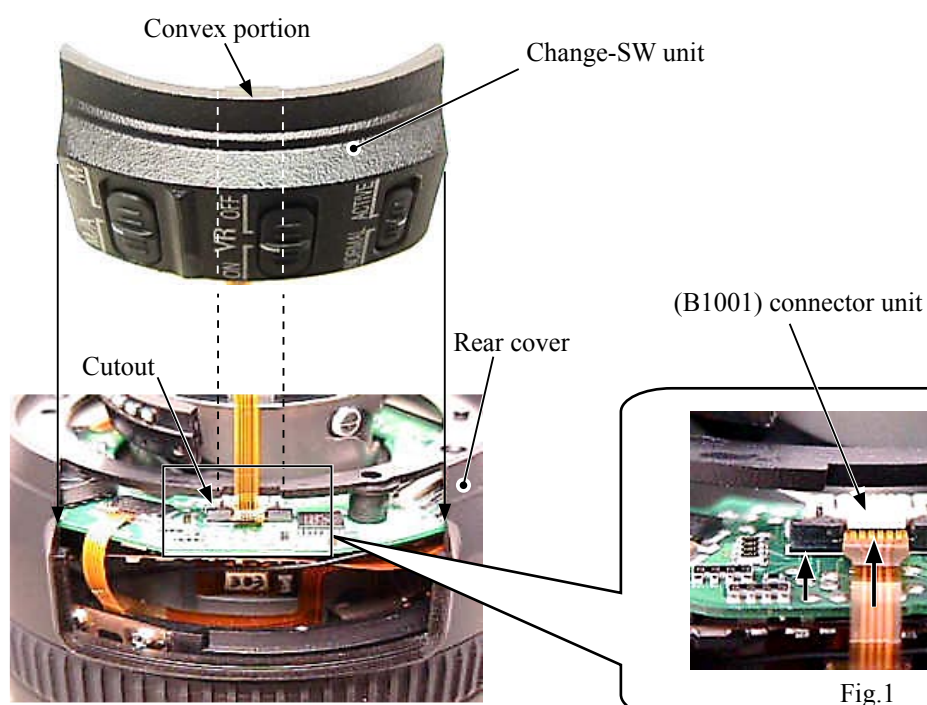
Rear cover

- Align the indexes of the rear cover and the lens body with each other, and assemble them.



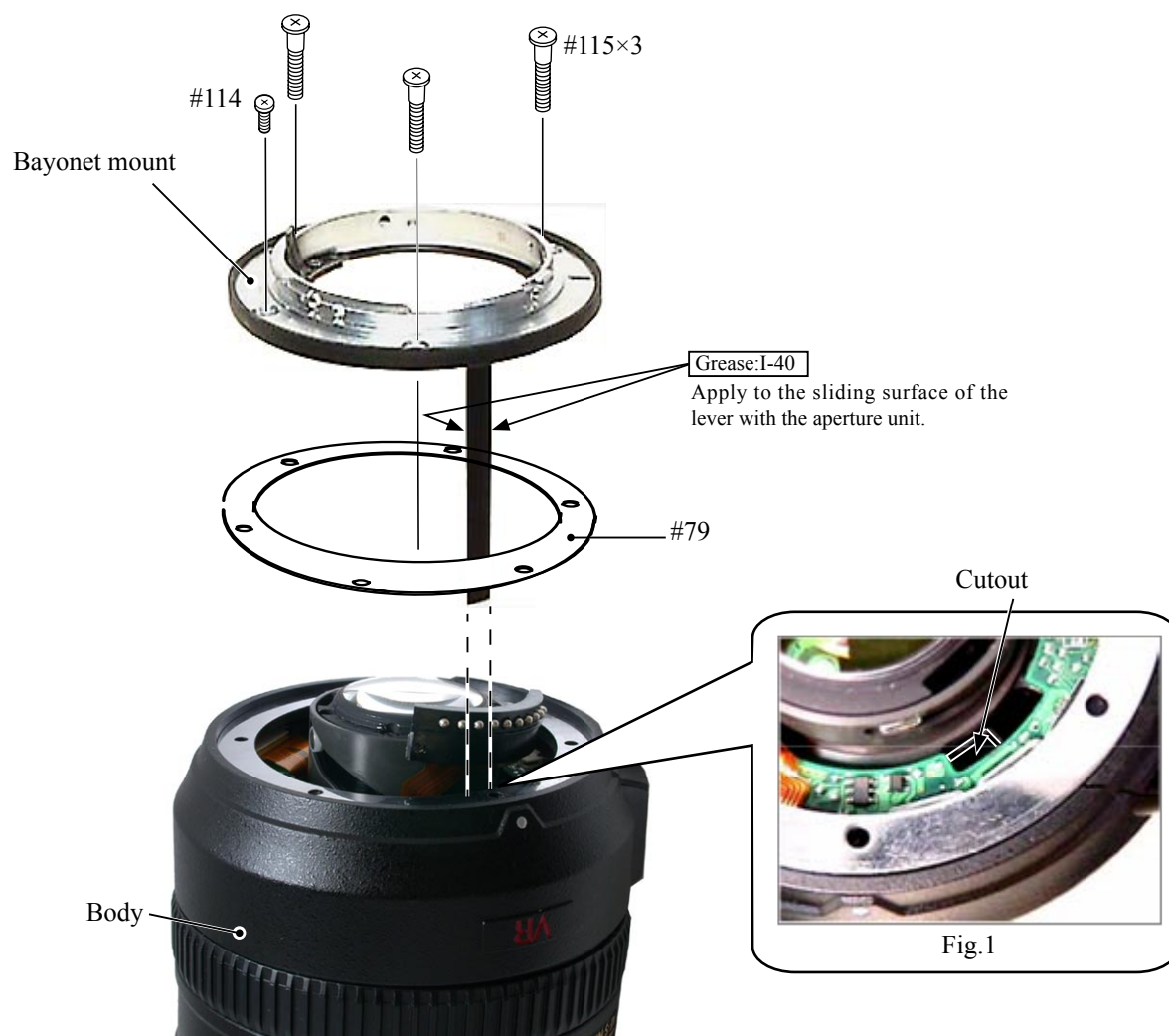
Change-SW unit

- Insert the FPC of the change-SW unit in the connector. (Fig.1)
- Assemble the switch unit into the rear cover.

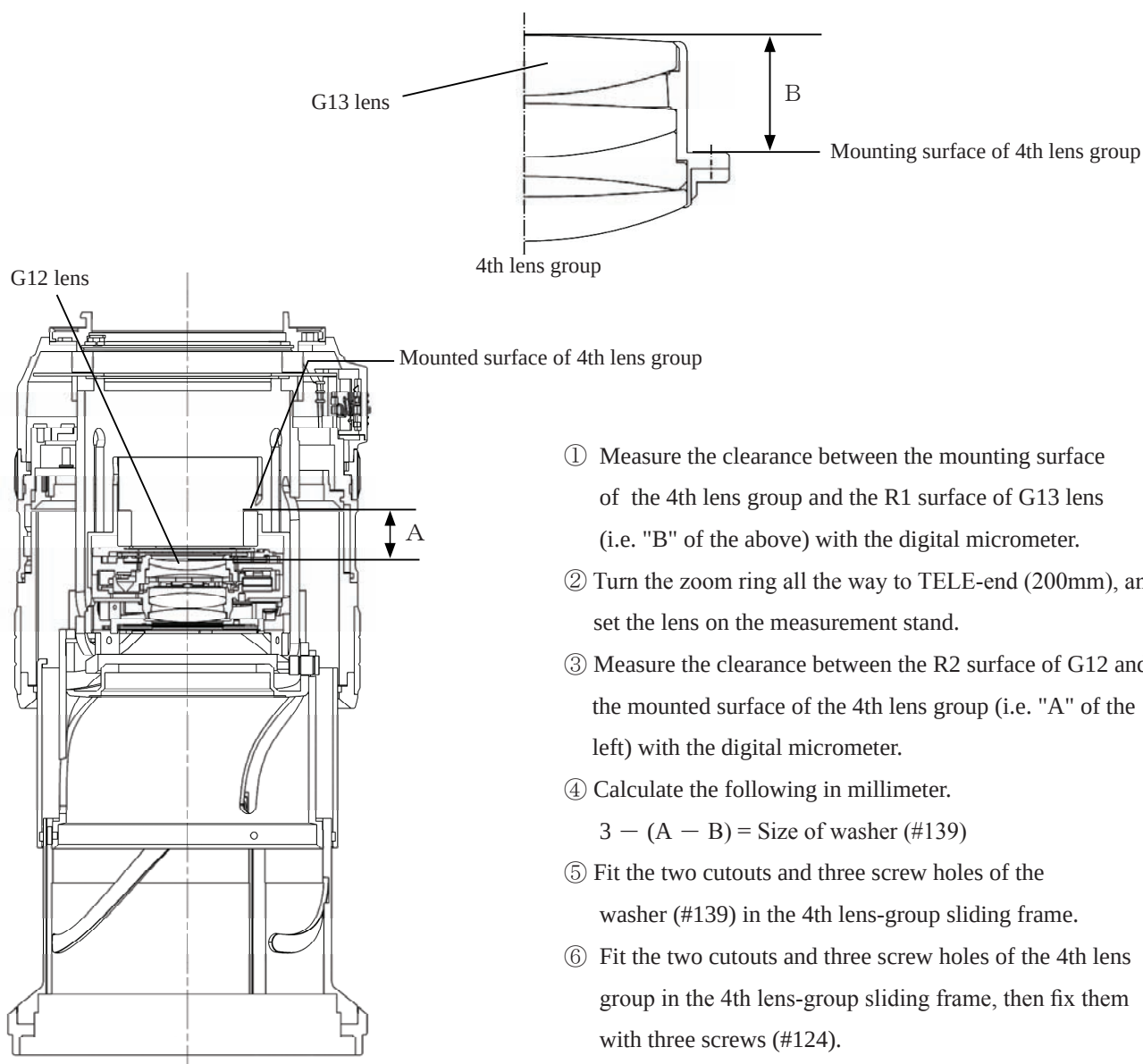


Bayonet mount

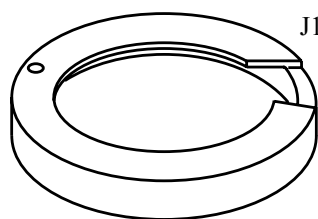
- ① Put the washer (#79) on the body.
- ② Insert the lever part of the bayonet mount in the cutout of the body, and mount the bayonet mount. (Fig.1)
△ (Addition)
- ③ Fix the bayonet mount with three screws (#115, #114).



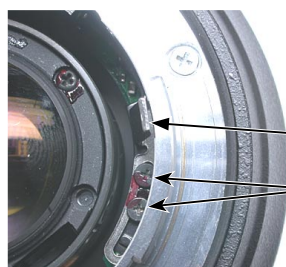
Clearance adjustment between 3rd lens group and 4th lens group



Position adjustment of Aperture lever



J18004-1



- Set the zoom to "Tele".
(at the position where the 2nd and 3rd lens are pushed in.)
- Mount the tool (J18004-1), and check the aperture diameter.

Standard: Full aperture

- In case the result is out of standard, loosen the two adjustable screws (#121) of the aperture lever and make an adjustment by moving #23.
- After the adjustment, fix the two screws (#121) with Screwlock.

#23

#121x2

Adhesive: Screwlock

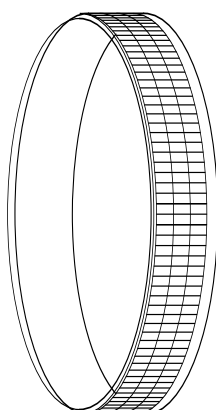
Rear cover ring

- Fix the contacts unit with two screws (#117).
- Fix the rear cover ring with three screw (#118).



Rubber ring

Rubber ring



2nd lens group

- ① Set the lens zoom position to "18 mm ", while the focusing ring to "∞" position.
- ② Align the index of the 2nd lens-group retaining tool (★ J11318) with the index of lens, and assemble them.

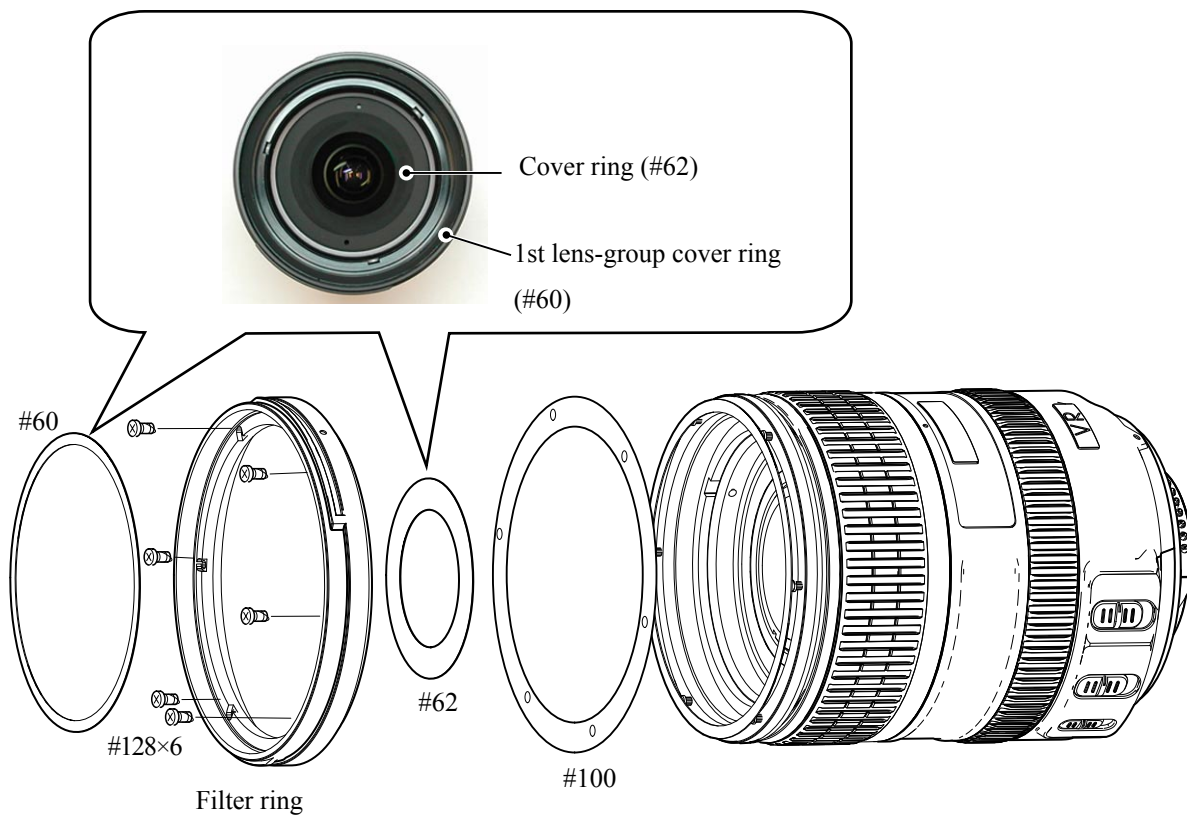


- ③ Assemble the 2nd lens group and washer (#80) by using the wrench (J11317).



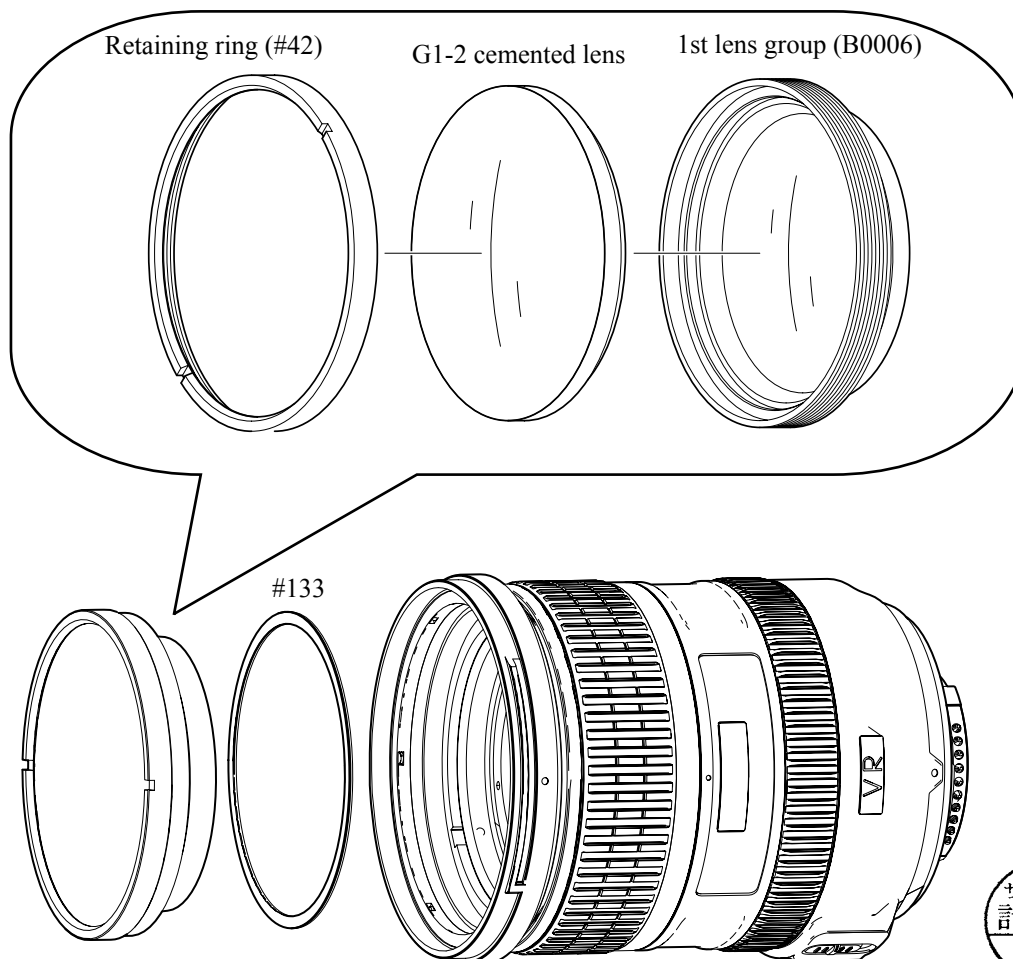
Filter ring

△ (Revision)



1st lens group

△ (Revision)



Adjustment (Division) of Focus movement (T, W)

1. Align (∞)-mark of the focus ring with the index.
2. Fix the aperture lever so that the aperture becomes full.
3. Read each value of WIDE, MIDDLE and TELE sides.
4. Calculate as follows:

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

$$(C - B) \div 4 = E$$

A = Value at MIDDLE (70 mm)

B = Value at WIDE side

C = Value at TELE side

D = Adjustment amount (mm) of the washer (#80) of the 2nd lens group

E = Adjustment amount (mm) of the washer (#133) of the 1st lens group

5. Adjust the washer (#80) by increasing/decreasing by the above value of D. If D is plus, increase the thickness of it, while it is minus, decrease the thickness of it.
6. Adjust the washer (#133) by increasing/decreasing by the above value of E. If E is plus, increase the thickness of it, while it is minus, decrease the thickness of it.

Note: When the washers (#80 and #133) are put, place a thin washer between thick washers.

Adjustment of F.F.D (Back focus)

1. Align (∞)-mark of the focus ring with the index.
2. Fix the aperture lever so that the aperture becomes wide open.
3. Read the value of Wide or Tele side.
4. Remove the bayonet mount.
5. Adjust the washer (#79) by increasing/decreasing by the difference from the standard value. If the difference is plus, increase the thickness of it, while it is minus, decrease the thickness of it. (ref. Page A16) "

△ (Addition) When Horizontal-type collimator used

Focal length (f)	Standard (mm)
18 mm	+0.06 ~ +0.12
35 mm	-0.01 ~ +0.16
70 mm	-0.07 ~ +0.16
200 mm	-0.24 ~ +0.16

Caution: ~~If the vertical-type collimator is used, to compensate a difference from the horizontal-type collimator, consider "+0.09 (+9 scale)" as "0", and make a measurement.~~

△ (Revision) **If a vertical-type collimator is used, make a measurement by using the below as standard.**

△ (Addition) When Vertical-type collimator used

Focal length (f)	Standard (mm)
<u>18 mm</u>	<u>+0.15 ~ +0.21</u>
<u>35 mm</u>	<u>+0.17 ~ +0.34</u>
<u>70 mm</u>	<u>+0.14 ~ +0.37</u>
<u>200 mm</u>	<u>+0.21 ~ +0.61</u>



Preparation for inspection & adjustment of main PCB

- In case of replacing the main PCB, SWM unit or MR encoder unit, be sure to make the necessary adjustments as follows:

1. Adjustments

- Adjust the MR duty
- Adjust the driving frequency and motor control (including Focus preset adjustment)

2. Equipment and tools to be required

- Single output rated voltage power supply: 1 unit (6.0V 3.0A)
- Oscilloscope: 1 unit For adjusting the MR duty, the driving frequency and motor control
- AF-I communication box (J15306-1): 1 unit
- AF-I communication adapter (J15307): 1 unit
- When the main PCB is replaced, be sure to perform “3. READING AND REWRITING OF EEPROM DATA” then “3. WRITING OF THE FIXED VALUES”.

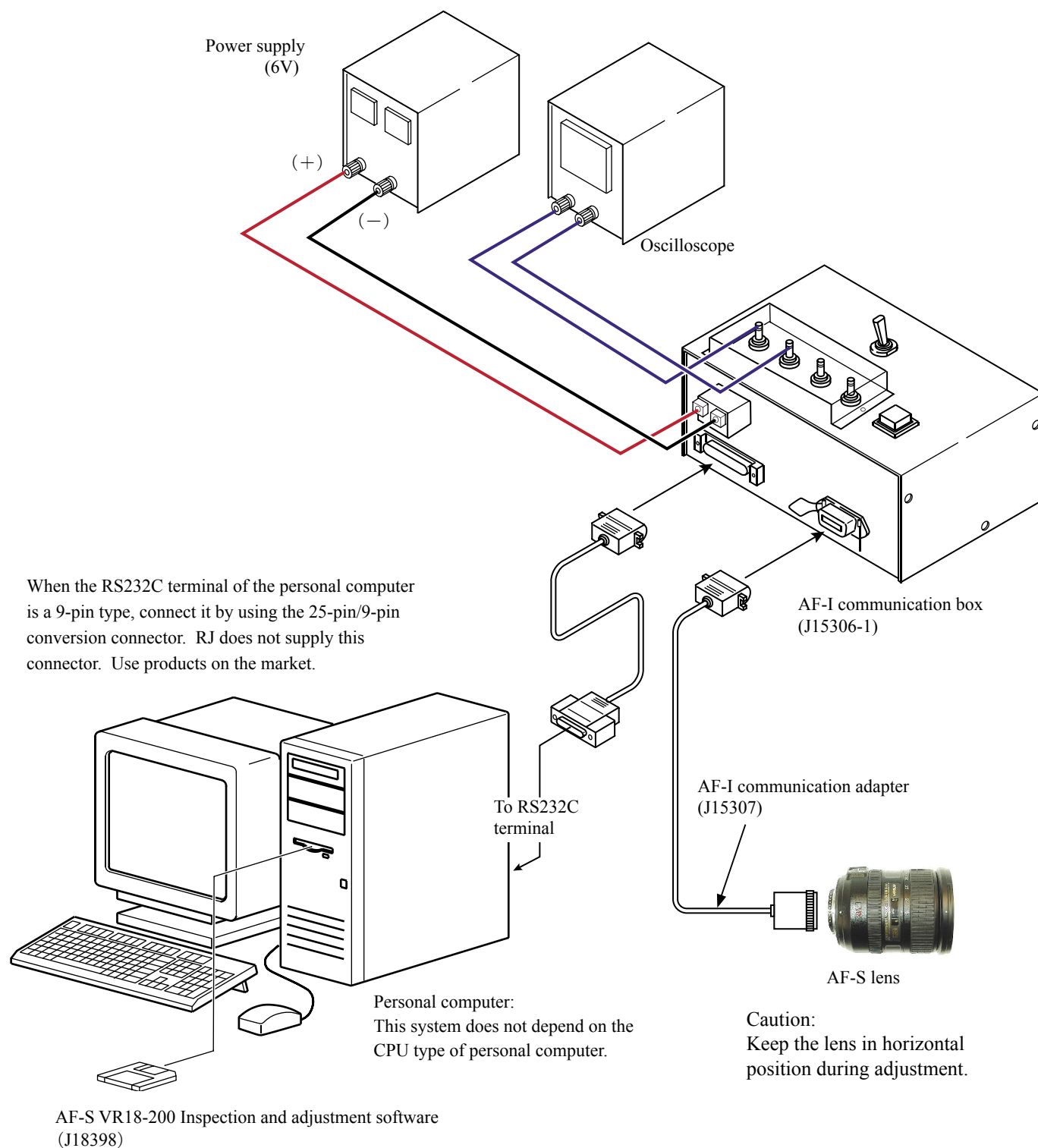
AF-S VR 18-200 inspection and adjustment program (J18398)

The below hardware requirements are necessary for installing the program on a computer.
Ensure them before installation.

PC	IBM PC/AT compatible
OS	Windows XP Home Edition, Windows XP Professional, Windows 2000, Windows Millennium Edition (Me), Windows 98 Second Edition (SE), Windows 98,
CPU	Pentium II 266MHz ~ Pentium IV 2GHz
RAM (Memory)	32MB or more
HD	6 MB-or-more free space is necessary when installation
Monitor resolution	800×600 or more pixels
Interface	Serial interface ※ USB interface cannot be used.

As long as the above requirements are met, either desktop or notebook PC is available.

【System configuration】

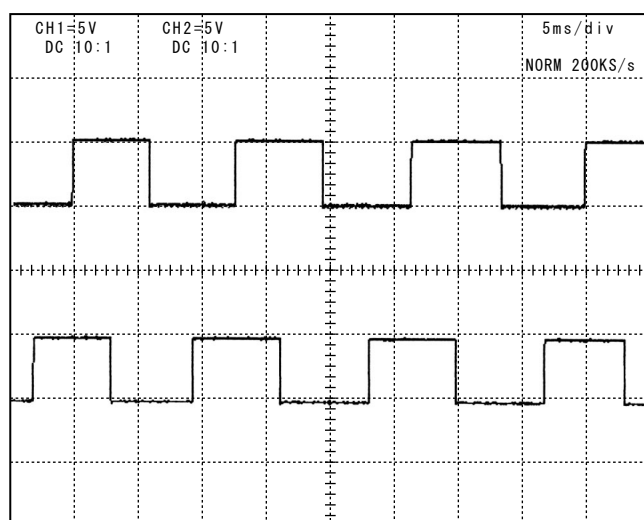


Adjustment of MR duty

- In case of replacing the main PCB, SWM unit and MR encoder unit, be sure to make adjustments.
- In case of replacing the main PCB, be sure to perform [READING AND REWRITING OF EEPROM DATA.] then [3.WRITING THE FIXED VALUES.]

How to adjust

- ① Make sure that the electric current and voltage of the connected rated voltage power supply are set to the set values, which are instructed on the PC screen. Then, turn the rated voltage power supply ON.
- ② Select "1. MR DUTY ADJUSTMENT" in the menu of the AF-S VR18-200 inspection program.
- ③ The confirmation screen for writing the fixed values in EEPROM appears. Select the appropriate item.
- ④ Following the instruction on the screen, rotate the MF ring slowly by hand in the direction from the infinity to the close distance position. Make sure that the waveform on the oscilloscope has duty 50% and stop the MF ring at the close distance-end.



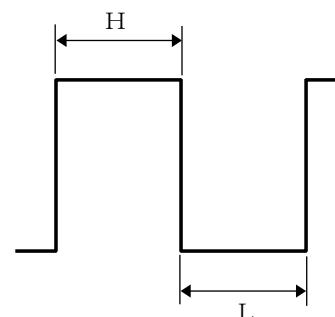
● Setting of oscilloscope

V/Div (CH1)	: 5V
V/Div (CH2)	: 5V
Coupling	: DC
Time/Div	: 5 m Sec
Trigger Mode	: NORMAL
Trigger Coupling	: DC
Trigger Source	: CH 1
Trigger Position	: - 4 div
Trigger Type	: EDGE
Trigger Level	: 2.5 V

- ⑤ Following the instruction on the screen, rotate the MF ring slowly by hand in the direction from the close distance to the infinity position. Make sure that the waveform on the oscilloscope has duty 50% and stop the MF ring at the infinity-end.

Note : In case the waveform from infinity to close distance position or vice versa does not have duty 50%, repeat "INSPECTION AND ADJUSTMENT OF THE MR ENCODER OUTPUT WAVEFORM" on Page A5.

Standard H : L = 100 : 150 ~ 150 : 100 (50% ±10.0%)



Adjustment of Driving frequency and Motor control

- In case of replacing the main PCB, SWM unit and MR encoder unit, be sure to make adjustments.
 - ① The method of connection of the rated voltage power supply and measuring tools is the same as "ADJUSTMENT OF MR DUTY".
 - ② Make sure that the electric current and voltage of the rated voltage power supply are set to the set values on the PC screen.
 - ③ Turn the rated voltage power supply ON.
 - ④ Select "2. ADJUSTMENT FOR DRIVING FREQUENCY & MOTOR CONTROL" in the menu of the AF-S VR18-200 inspection program. The lens automatically starts the driving of scanning.

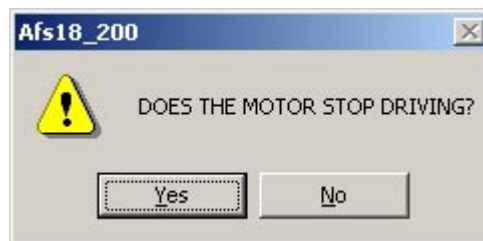


Fig.1

- ⑤ When the above Fig.1 is displayed, if the motor driving stops, select "Yes" to complete the adjustment. In case the motor does not stop driving, select "No " to make adjustments again. In case the motor does not stop driving even after the readjustments, adjust the MR duty again and repeat "ADJUSTMENT FOR DRIVING FREQUENCY & MOTOR CONTROL". If the adjustment is not successful in spite of the above, the SWM unit, fix-tube unit, or MR head unit may be defective.

Inspection of Lens operations

Check the lens operations by using a personal computer after assembling.

○ Check by personal computer

● Check by the following considerations:

1. MR encoder operations

- Drive the scanning of lens and check the total number of pulses.
- In case the MR head of the MR encoder and the magnetic tape are misaligned, the number of pulses becomes out of standard.

2. Lens-servo stop accuracy

- Check the number of overrun/underrun pulses (deviation of the stop position from the target position) per the specified lens driving.
- In case the irregularity of mechanical operations does not take place in the focus ring driving unit, the underrun tends to occur if it is heavy in the cam ring rotation of the MR encoder, while the overrun tends to occur if it is light in its rotation of the MR encoder.

3. Lens-servo time

- Check the servo time (from starting and stopping the servo) when driving the specified lens by using the oscilloscope.
- In case the irregularity of mechanical operations does not take place in the focus ring driving unit, the servo-time tends to be long if it is heavy in the cam ring rotation of the MR encoder, while the servo-time tends to be short if it is light in its rotation of the MR encoder.

4. Switches and lenses

- Check the ON/OFF operations of switches and the operating condition of the distance encoder.

● After inspections

1. When the MR encoder operations are not up to the standard:

Readjust the MR duty. (ref. Page A23.)

In case the pulse is not up to the standard, adjust the output waveform of the MR encoder again. (ref. Page A10.)

In case the pulse meets the standard, replace the ~~cam ring~~ ^{△ (Revision)} unit.
gear

2. When the lens-servo stop accuracy is not up to the standard:

Check the output waveform of the MR encoder. If it is normal, replace the ~~fix-tube~~ ^{△ (Revision)} unit.
gear

3. When the lens-servo time is not up to the standard:

Readjust the driving frequency and motor control.

In case the lens-servo time is not up to the standard even after the readjustment, replace the ~~fix-tube~~ ^{△ (Revision)} unit.
gear

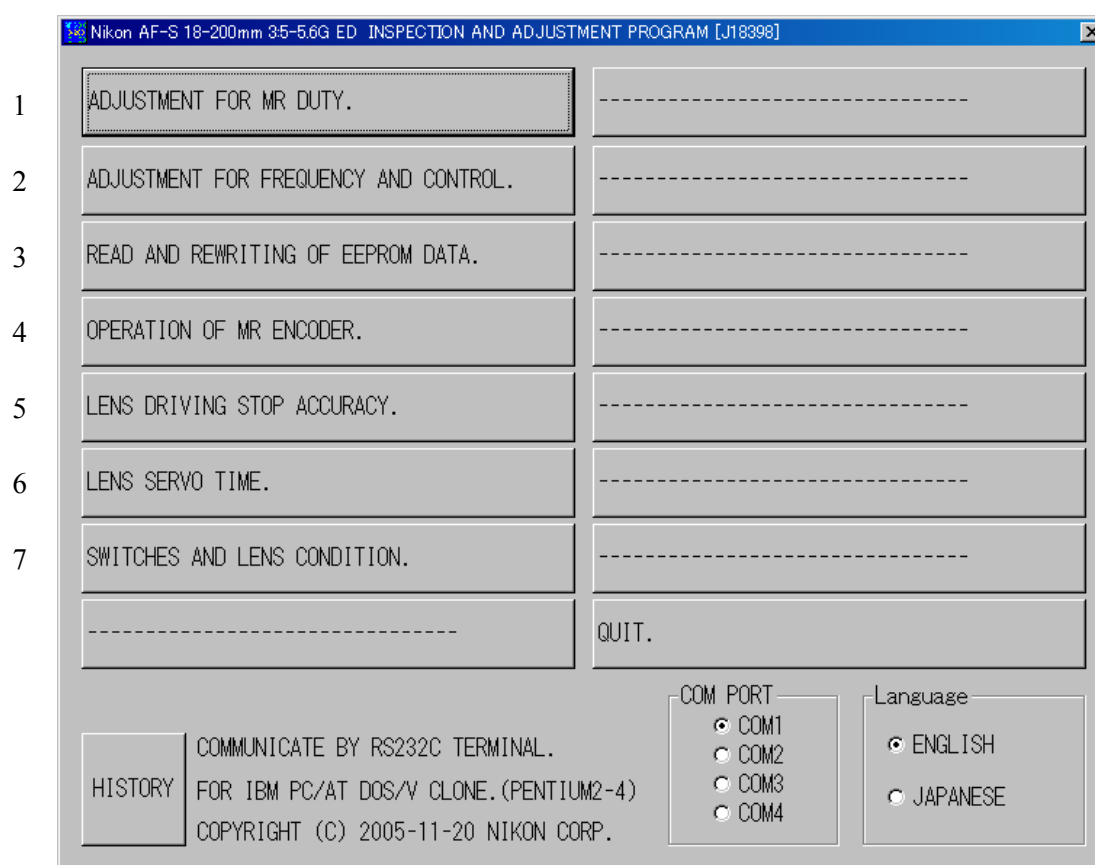
4. When switches do not work properly:

Check the wiring state of the troubled switch or replace it.



●AF-S VR18-200 inspection program

(1) Menu screen



• Menu items

The items 1 and 2 are used for adjustments.

The item 3 is used for reading and writing EEPROM DATA.

The items 4~7 are used for inspections.

• Selection items

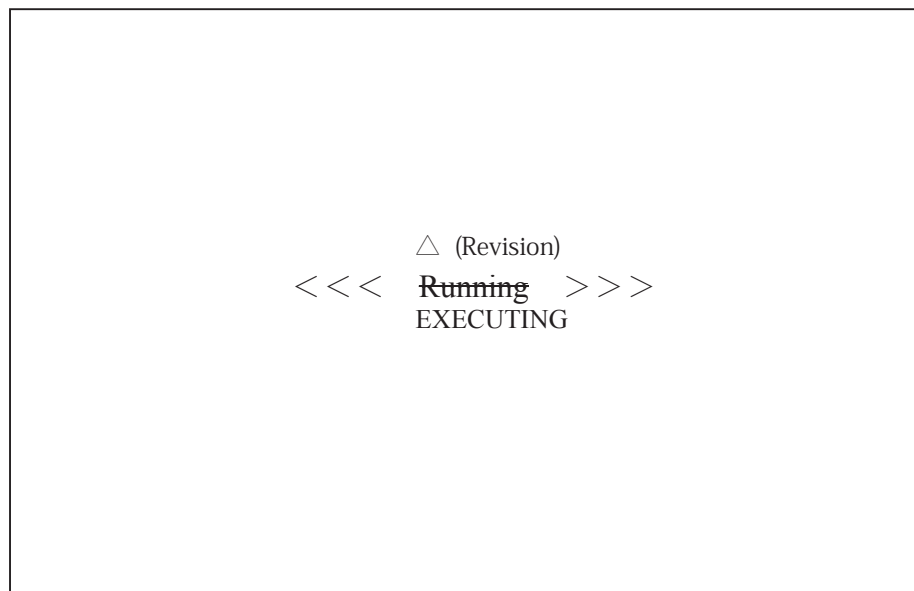
After selecting items screens appear, such as the lens selection, the focal length selection, the voltage setting, the inspection mode start.

The screens depend on the items. Follow the instructions of the personal computer.

• Initial driving

Drive scanning several times and stop at infinity-end.

(2) Inspection of MR encoder operations

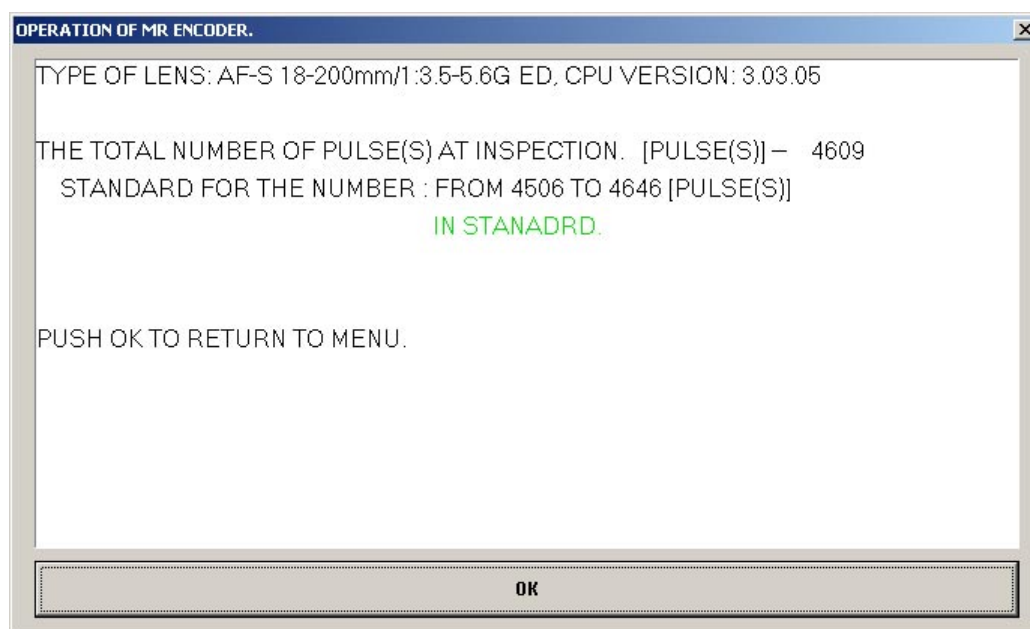


Caution : If the MF ring is rotated while the lens scanning is driven, the pulse shows an abnormal value.
Do NOT touch the MF ring during operations.

When the inspection ends, the result of the next page appears.

The difference in pulse before and after the inspection must be within the standard.

< Standard > Total pulses : 4576 ± 70 PULSE(S)



(3) Inspection of lens-servo stop accuracy

- ① Make this inspection on both focal length 18mm (W) and 200mm (T).
- ② If the lens stops while inspecting the lens-servo stop accuracy, select "3. ADJUST DELAY-TIME" of the below Fig.2, and input a figure between 0-1000 for the delay time (msec: millisecond) which prevents stopping the lens.

Note:

The value of "ADJUST DELAY-TIME" is set by the adjustment software. So, if the lens does not stop during the inspection of "LENS DRIVING STOP ACCURACY", any value can be input without problem.

However, the larger the value of "ADJUST DELAY-TIME" gets, the longer the inspection time becomes.

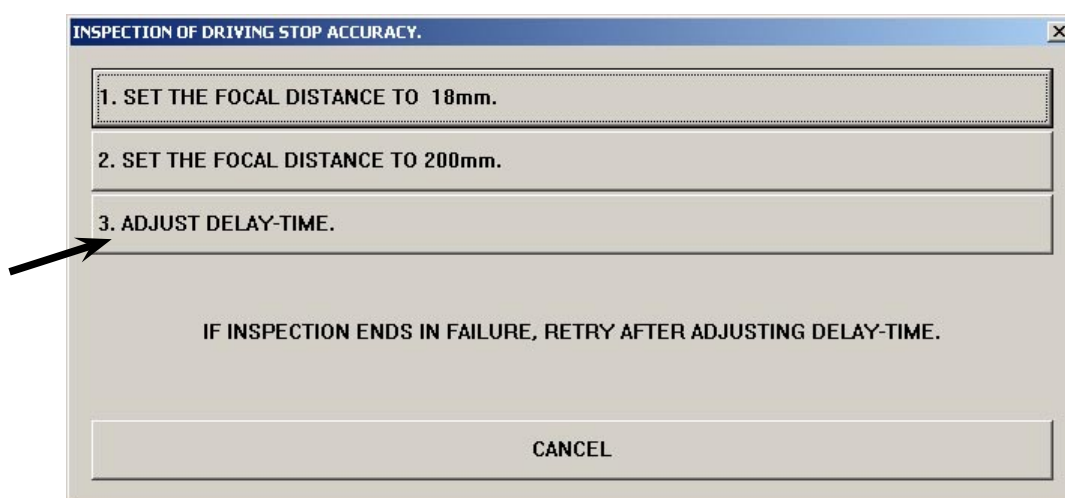
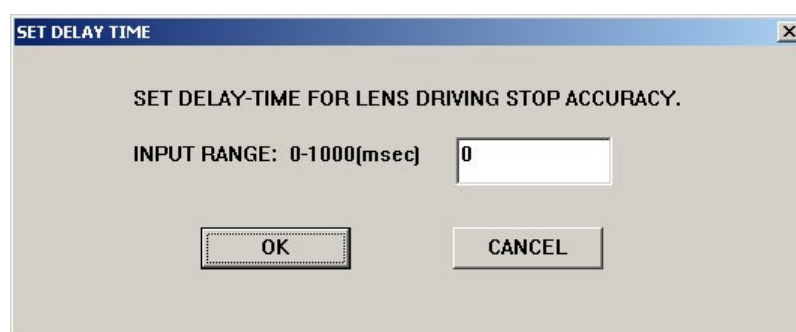
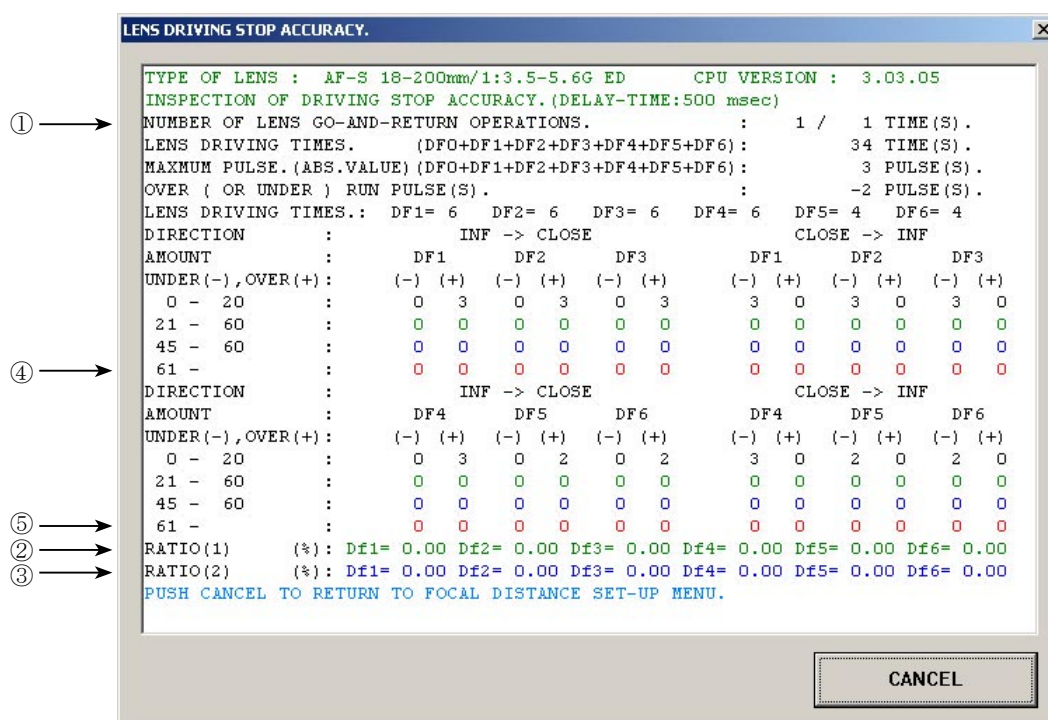


Fig.2





Caution : If the MF ring is rotated while the lens scanning is driven, the pulse shows an abnormal value. Do NOT touch the MF ring during operations.

During the lens driving, the above screen is displayed.

The number of overrun/underrun pulses must be within the standards after the lens back-and forth driving 1-motion ("1/1TIME (S)." in [1] of the display).

Standard RATIO (1) is 40% or less for Df1~Df6.

② of the screen

[Occurrence ratio of (W) 21-60/(T) 5-12 pulses]

RATIO (2) is 20% or less for Df1~Df6.

③ of the screen

[Occurrence ratio of (W) 45-60/(T) 9-12 pulses]

Occurrence of (W) 61/(T)13 or more pulses is zero for Df1~Df6. ④ and ⑤ of the screen

[Only one occurrence indicates defective.]

※ "Df1~Df6" shows the lens driving amount.

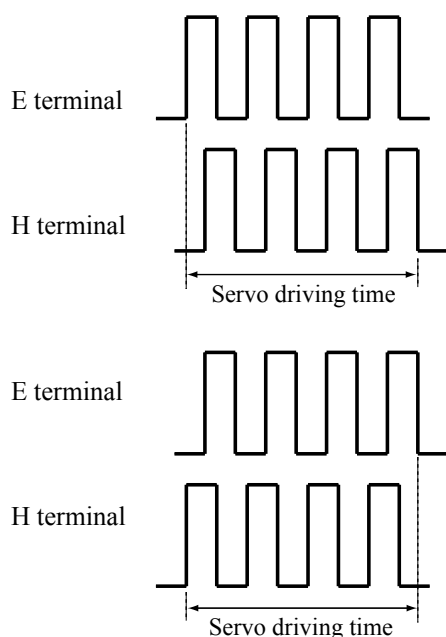
(4) Inspection of lens-servo time

Make this inspection on both focal length 18mm (W) and 200mm (T).

INSPECTION OF LENS SERVO TIME.	
SERVO AMOUNT.	STANDARD.
1. [Df1]	128ms OR LESS.
2. [Df2]	155ms OR LESS.
3. [Df3]	182ms OR LESS.
4. [Df4]	218ms OR LESS.
5. [Df5]	263ms OR LESS.
6. [Df6]	287ms OR LESS.
7. DRIVING TO INFINITY.	
8. DRIVING TO CLOSE.	
9. RETURNING TO FOCAL DISTANCE SET-UP MENU.	

Select the servo driving amount respectively. Each lens-servo drive time must be within the standard.

Caution : If the MF ring is rotated during inspections, the waveform shows an abnormal value. Do NOT touch the MF ring during inspections.

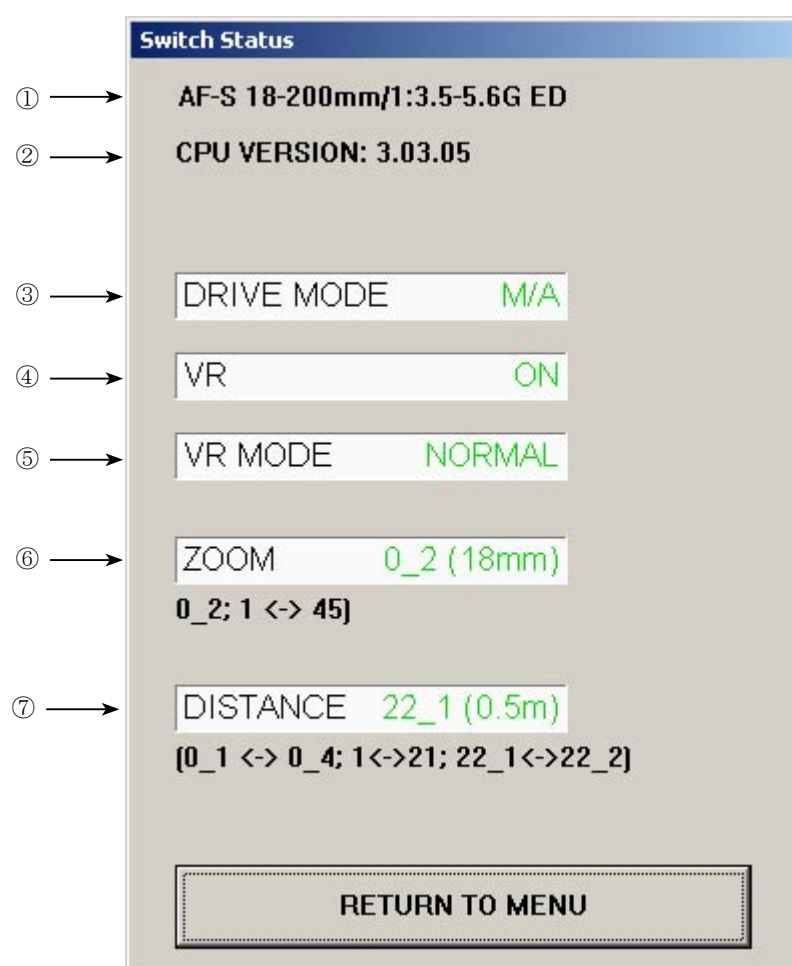


●Oscilloscope setting

V/Div	: 5V
Coupling	: DC
Time/Div	: 20 m Sec
Trigger Mode	: SGL (S)
Trigger Coupling	: DC
Trigger Source	: CH1

※ The waveforms of E and H terminals have the forms for going up for start and going down for start.

(5) Inspection of switches and lens conditions



- ① Type of lens
- ② Version of CPU in the lens
- ③ Status of Focus mode-change SW
- ④ Status of Vibration reduction SW
- ⑤ Status of Vibration reduction mode-change SW
- ⑥ Position of the zoom encoder
(Value changes by turning the zoom ring)
- ⑦ Signals of the distance encoder
(Value changes by turning the MF ring)

Necessary adjustment when replacing parts

Adjustments Parts to be replaced	Adjustment for MR duty (Necessary to write fixed value); driving frequency; motor control	Inspection & adjustment for MR encoder operations; lens-servo stop accuracy; lens-servo time; switches; lens condition	VR adjustment
Main PCB unit	○	○	○
SWM unit	○	○	
GMR sensor FPC unit	○	○	
Zoom index ring unit	○	○	
2nd lens-group straight ring unit	○	○	
Encoder FPC	△ (Revision) ⊖	○	
VR unit		○	○
Gyro FPC		○	○



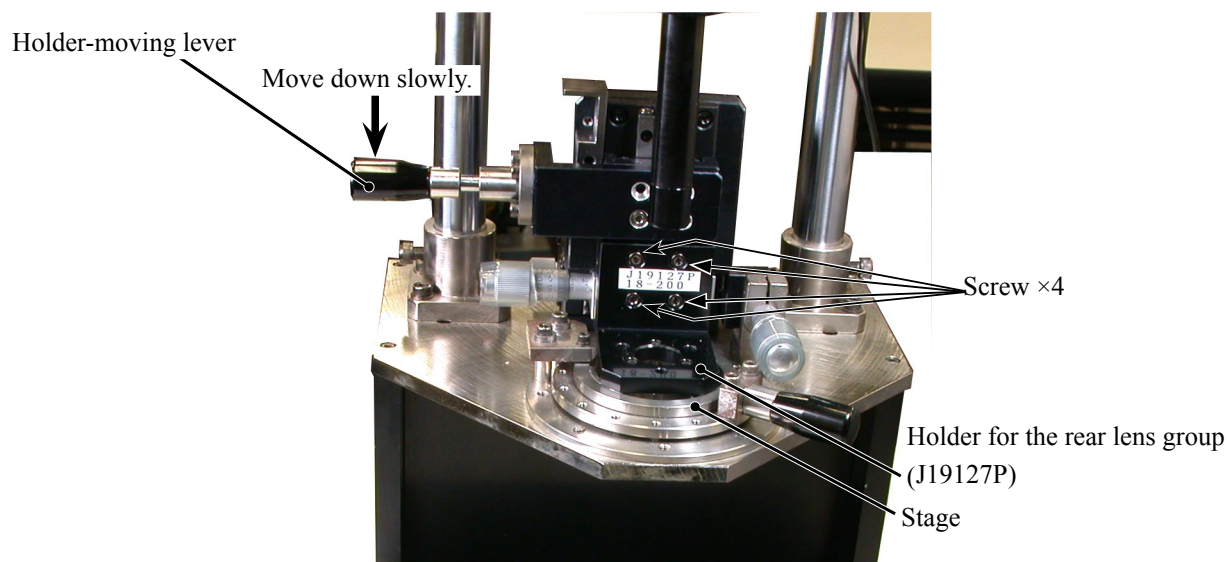
Lens Alignment

Note: This adjustment is required when the rear lens group (4th lens group) is removed.

(1) Preparation of Lens optical alignment equipment

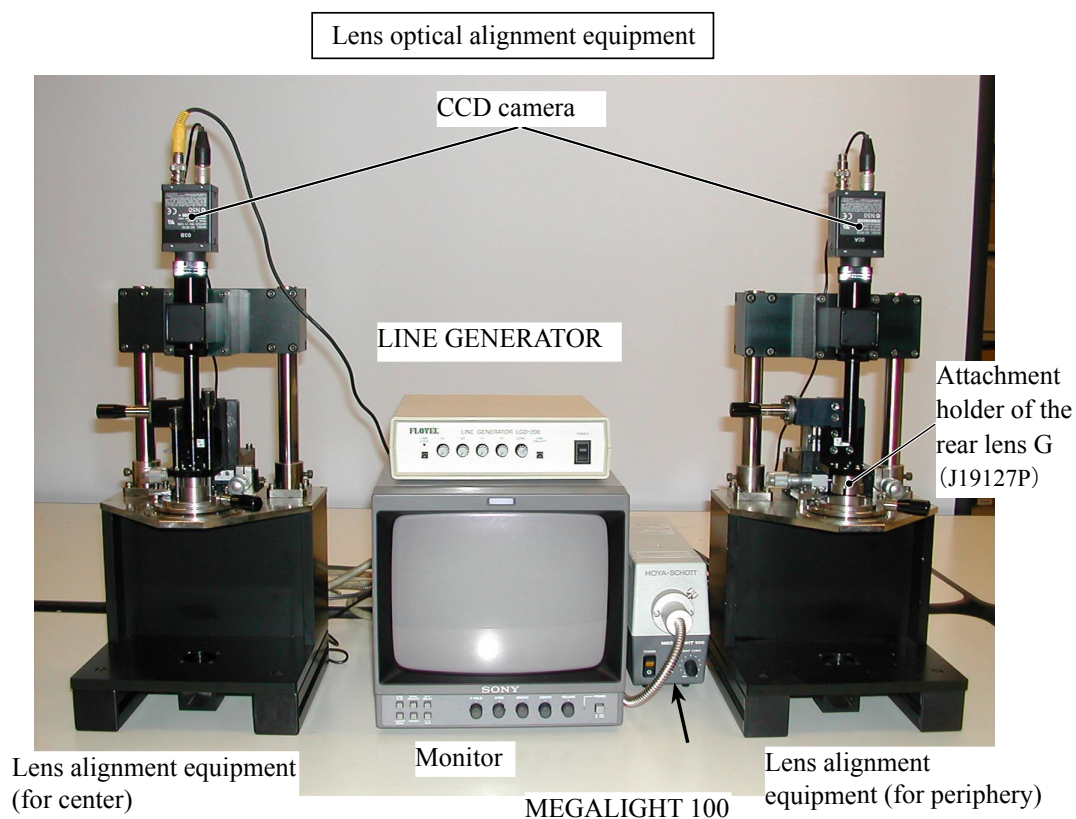
- Fix the attachment holder of the rear lens group (J19127P) in the lens equipment.

How to fix: Move down the holder-moving lever slowly so that the holder touches the stage. Then tighten four screws to fix it.



- Create the center positioning tool (ref. Page A48, 49 for how to create it).
- Create cardboards in which "Lens alignment chart" and "Viewers" are fit. (ref. Page A50, 51 for how to create them.)

※ As for AF-S VR18-200/3.5-5.6G, the below equipment (left) for center is NOT used.



Back view of Lens optical alignment equipment

- Connect each cable to the appropriate equipment with the same number. (e.g. Connect up ① to ①)

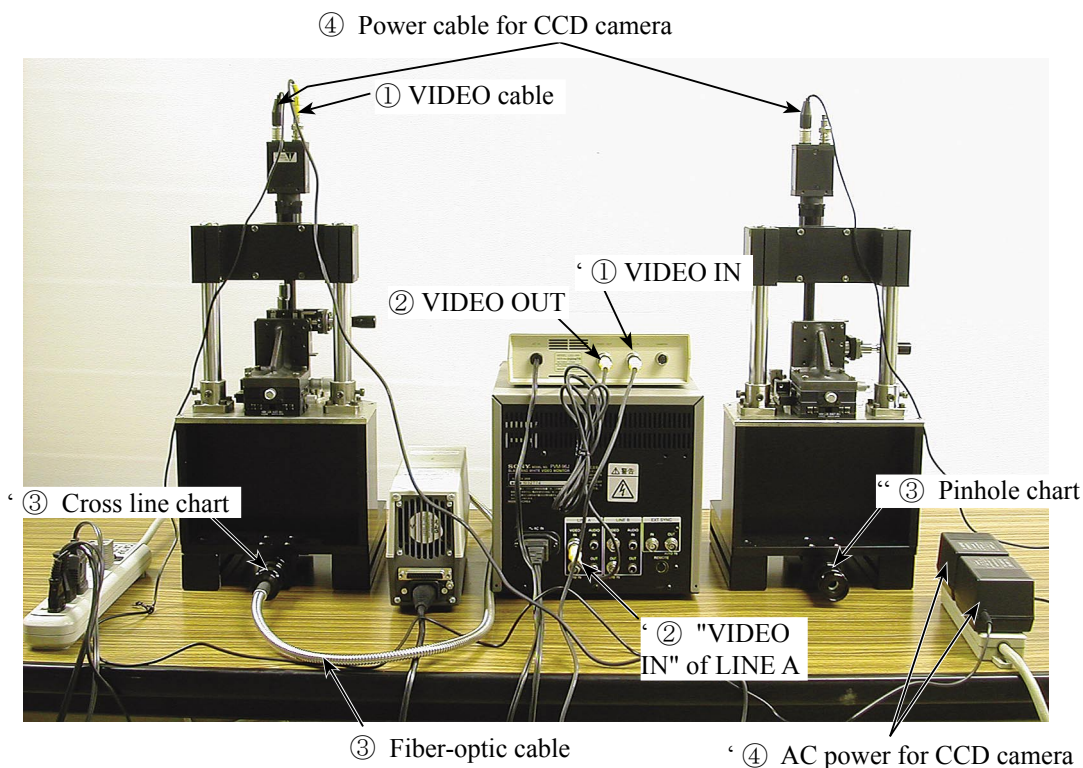
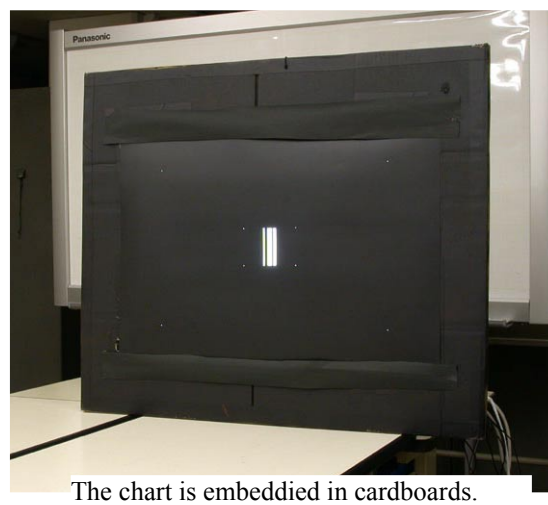
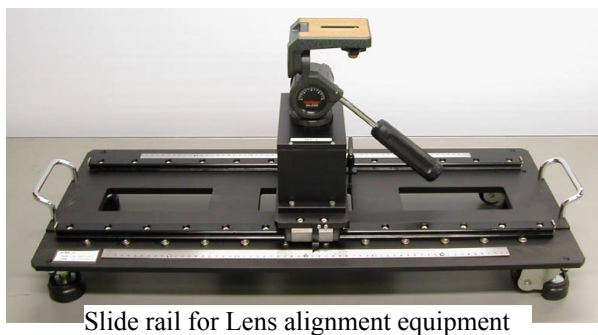


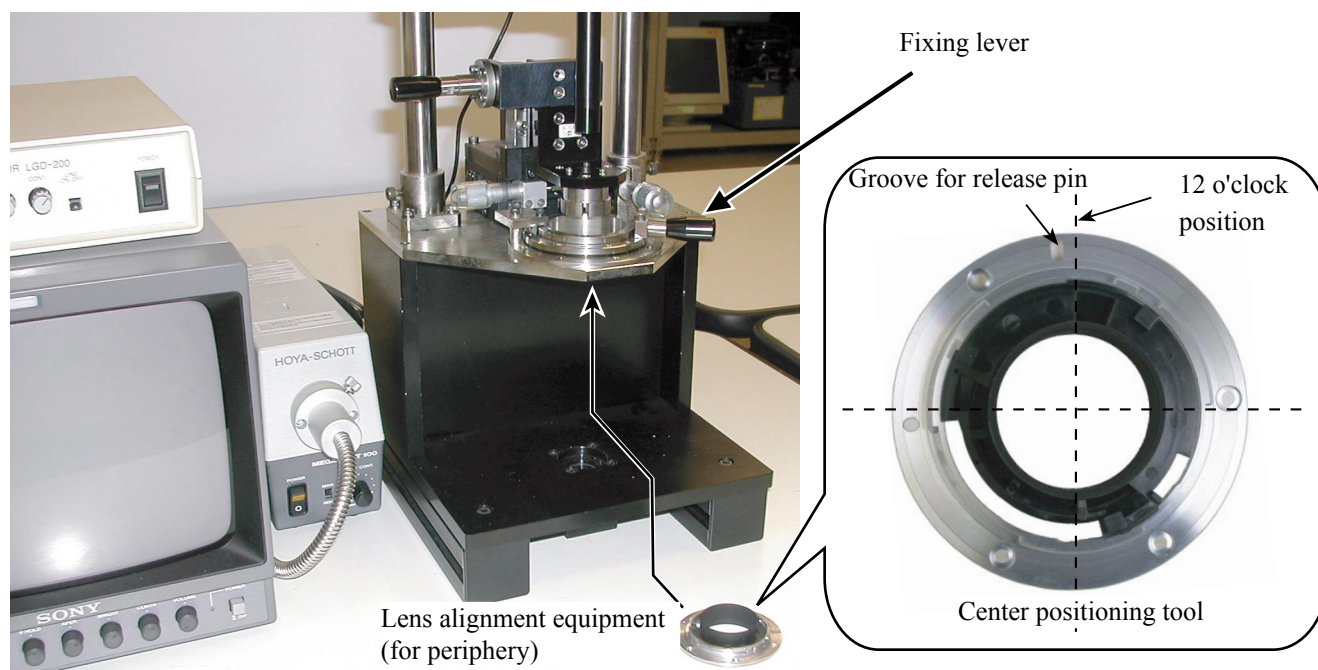
Chart shooting equipment for 3rd lens-group alignment



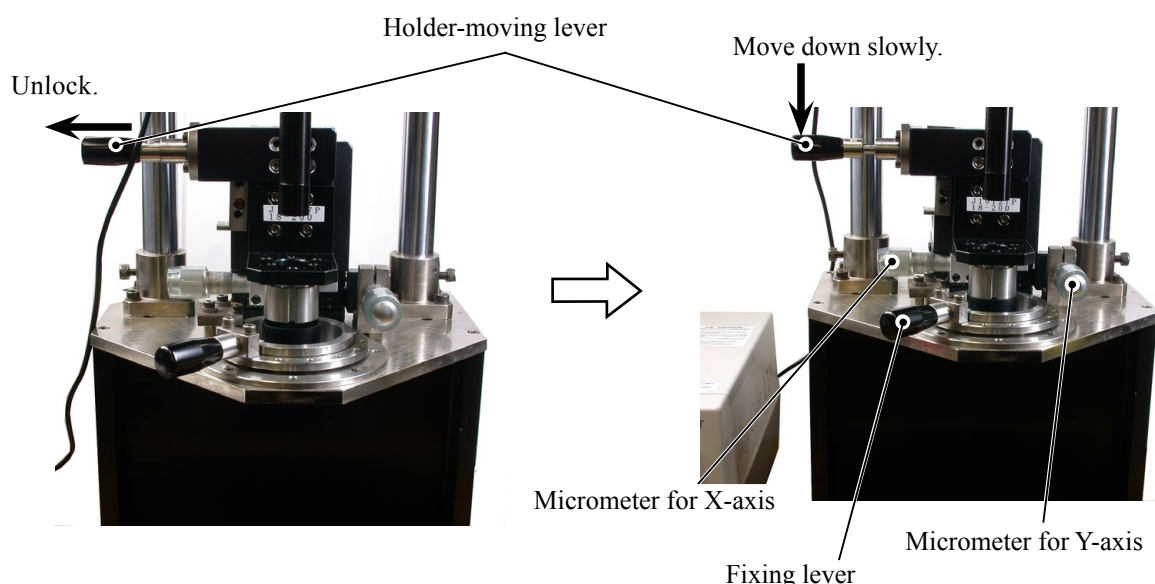
(2) Temporary positioning of the rear lens group

- ① Mount the (self-made) center positioning tool on the lens alignment equipment (for periphery) by setting the groove in place slightly to the left (in a counterclockwise direction) from the below 12 o'clock position.

Then turn the tool clockwise all the way to the right, and move the lever to the left to fix it.



- ② Unlock the holder-moving lever, and move the holder down slowly by the lever.

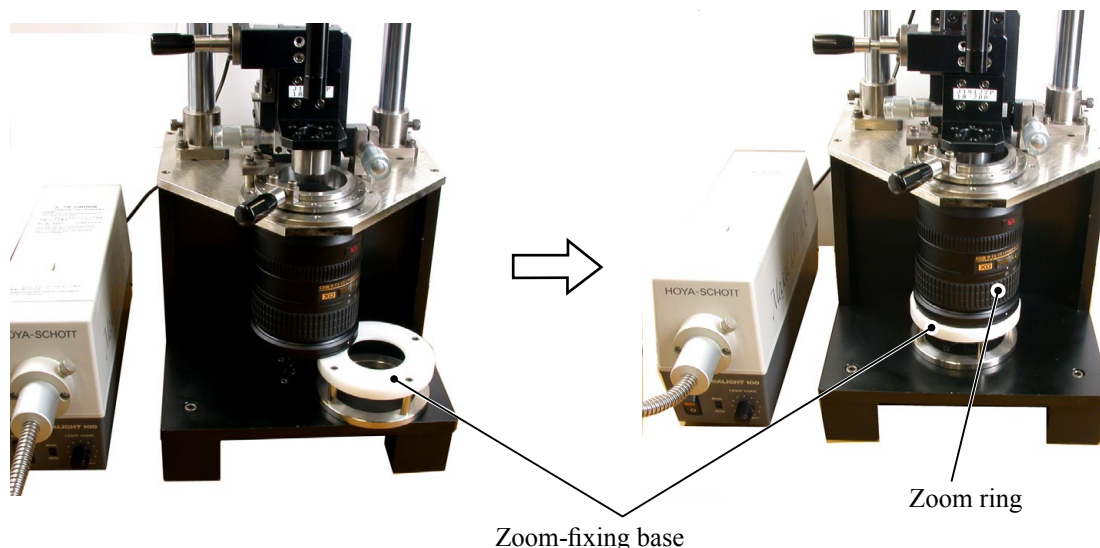


- ③ Adjust the holder's position by rotating the micrometers for X-axis or Y-axis so that the holder does not touch the protection ring of the center positioning tool.

Note) Without this alignment, the rear lens may be damaged by the holder.

- ④ Move the holder-moving lever of the alignment equipment upwards, and remove the center positioning tool from the equipment by moving the fixing lever rightwards.

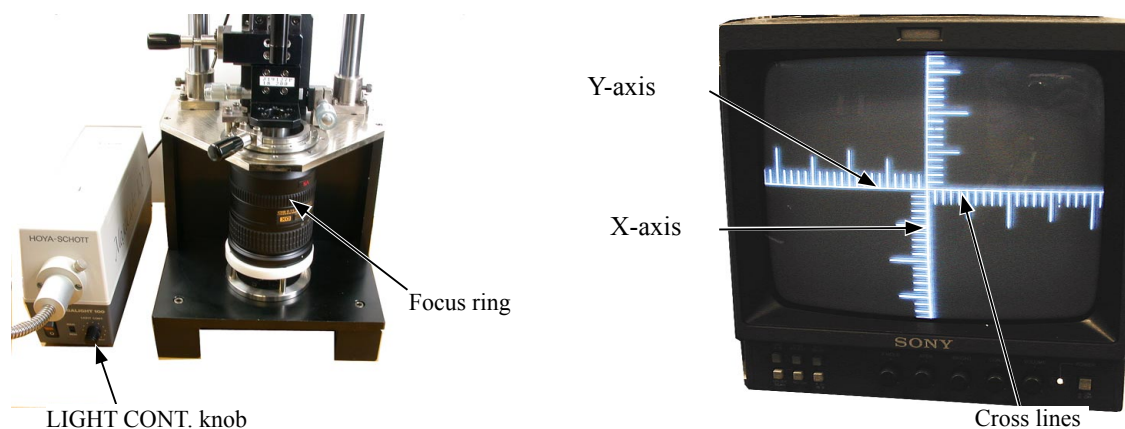
- ⑤ With the three screws of the rear lens chamber of the lens being loose, mount the lens to be examined on the equipment (for periphery alignment). (ref. ① for how to attach it.)
- ⑥ Set the lens to WIDE-end. Place the zoom-fixing base, then turn the zoom ring towards TELE until the lens touches the zoom fixing base.



- ⑦ Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to ON. Adjust the cross lines by rotating the "LIGHT CONT." knob of "MEGALIGHT 100" and rotating the focus ring from "infinity"-end so that the calibration of the cross lines can be seen clearly.

Caution:

Almost at WIDE-end, the edge of the lens touches the zoom-fixing base. However, rotate lightly the zoom ring further and the slightly changed the position of the cross lines must be standard.



Note) In case the cross lines are tilted, adjust them by turning the chart, which is screwed in the rear tube of the equipment.

- ⑧ Unlock the holder-moving lever, and move the holder down slowly by the lever.

Caution:

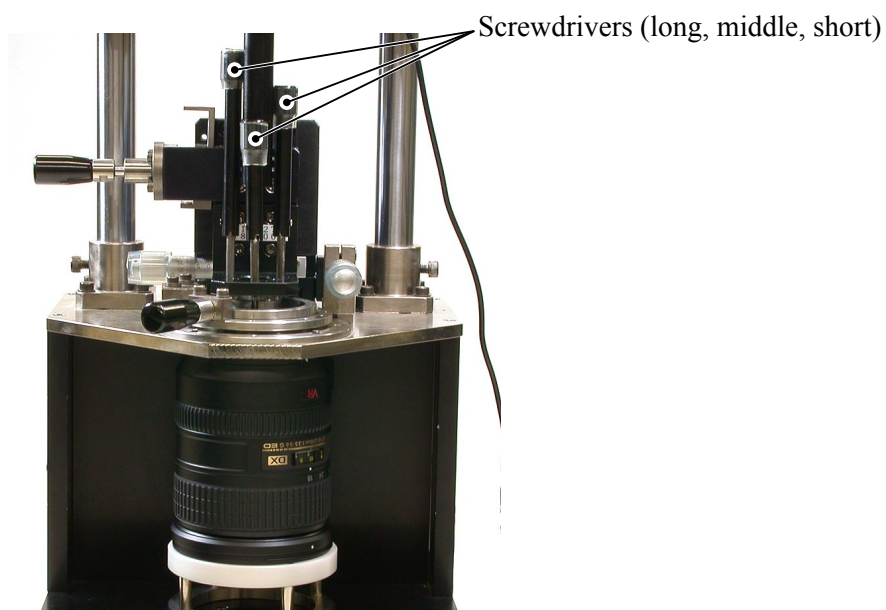
Move the holder down so that a load is not put on the lens body (especially the three rollers that support the 4th lens group).

- ⑨ Rotate the knobs of the micrometer (X and Y-axes) so that the intersection point of the cross lines (calibrated) comes in the center of the Monitor.

Caution: If X-axis and Y-axis are unable to move, do not forcibly rotate the knobs.

- ⑩ When the cross lines come to the center position, insert the three alignment screwdrivers (long, middle, short) in the loosened screw holes of the rear lens chamber, and tighten the screws.

Note) Because the screws cannot be seen, when inserting the alignment screwdrivers, put them straight down in the screw holes so that the screws can be easily found.



- ⑪ Remove the three alignment screwdrivers from the rear lens-G holder.

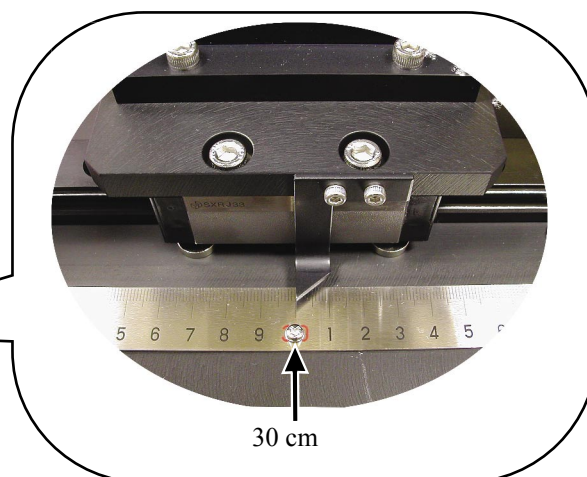
Caution:

If the alignment driver remains inserted in the rear lens-G holder and the holder-moving lever is moved up, the root portion of the screwdriver (long) touches the equipment.

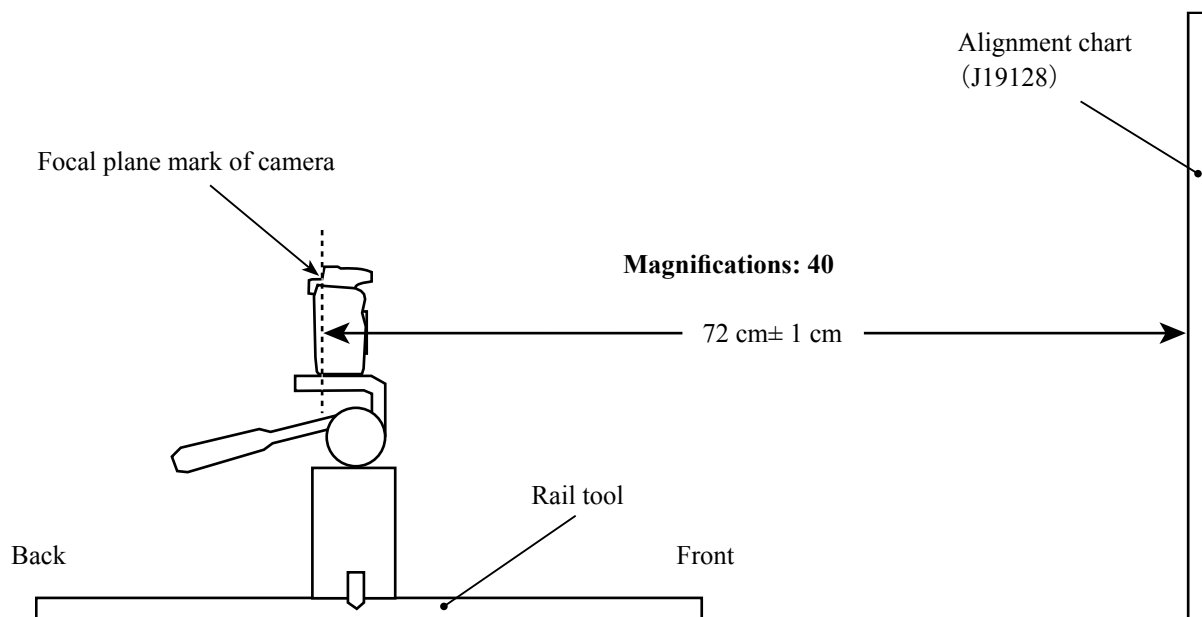
- ⑫ Move the holder-moving lever up slowly to lock the holder, and remove the lens from the equipment (for periphery).

(3) Chart shooting for the rear lens group alignment

- ① Prepare a camera (D100). Set the shutter speed to "M1/60" and the focus mode to "S". On the shooting menu, set "Image Quality" mode to "RAW", "WB" to "Preset" and "ISO" to "200".
- ② Set up the camera (D100) on a tripod on the slide rail. Set the indication pointer of the tripod to 30 cm.



- ③ Set the alignment chart (J19128) as shown below.

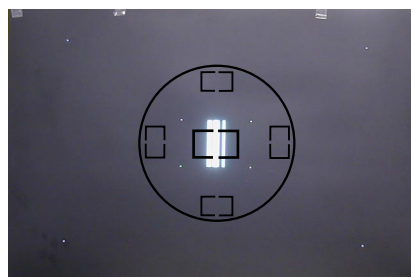


- ④ Turn the power of viewers (5 pcs.) to ON.

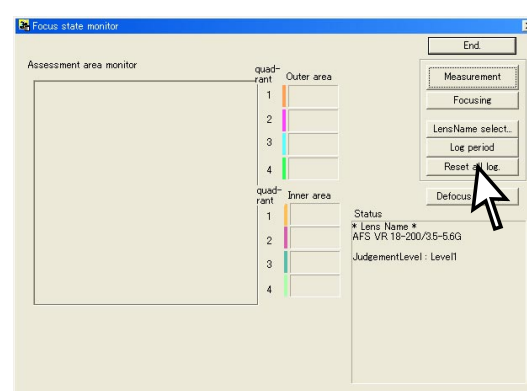
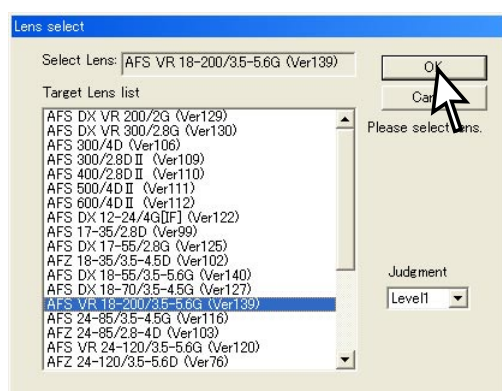
(Note: If the batteries of viewers are exhausted with decreased brightness, the shooting data cannot be obtained correctly.)



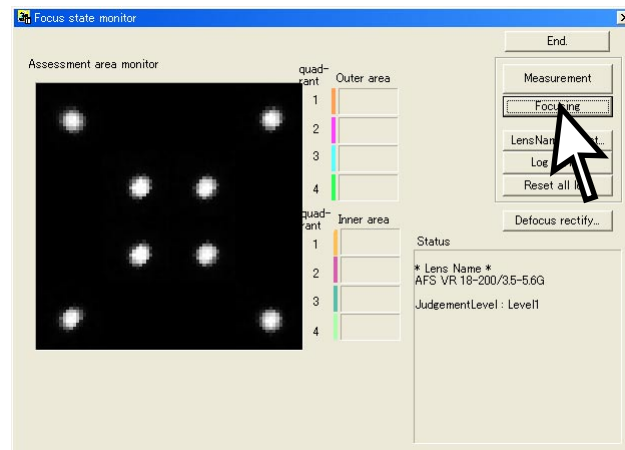
- ⑤ Fit the lens to be examined in the camera (D100). Set the zoom to WIDE (18 mm) and Focusing at infinity. ^{△ (Addition)}
- ⑥ By looking through the viewfinder, adjust the height and tilt to make the chart fill the entire finder field frame.
- ⑦ Adjust the tilt of the slide rail to make the three chart lines position in the center of the viewfinder, when the tripod is slid all the way to the front and back.



- ⑧ Connect the PC and camera via USB cable. (Camera setting: Mass Storage)
- ⑨ Start the adjustment software (LWM.exe).
- ⑩ "Lens Select" window opens. Select "AFS VR 18-200/3.5-5.6G", then click "OK" button.
- ⑪ Click the "Reset all log" button.

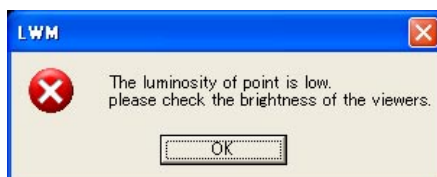


- ⑫ Set the indication pointer of the tripod to 30 cm.
- ⑬ Darken the room.
- ⑭ Click "Focusing" button. AF is activated to focus and the shutter is released.



- ⑮ Set the focus mode of the camera (D100) to "M".
- ⑯ Slide the tripod to the front by 15 ± 0.1 cm.
- ⑰ Click the "measurement" button of the adjustment software.
- ⑱ When the shutter of the camera is released, slide the tripod to the back by 5 ± 0.1 cm and make a remeasurement.
- ⑲ Again, slide the tripod to the back by 5 ± 0.1 cm and make a remeasurement.
Repeat this operation four more times, totalling in seven measurements.
(The total sliding distance is 30 cm.)

Note 1: When the below warning is given, there may be some defects in the brightness of the viewers and/or parallelism of the chart and camera, etc. So correct the above and make a remeasurement.



Note 2: When the below warning is given, recheck that the Quality mode of the camera is set to RAW.



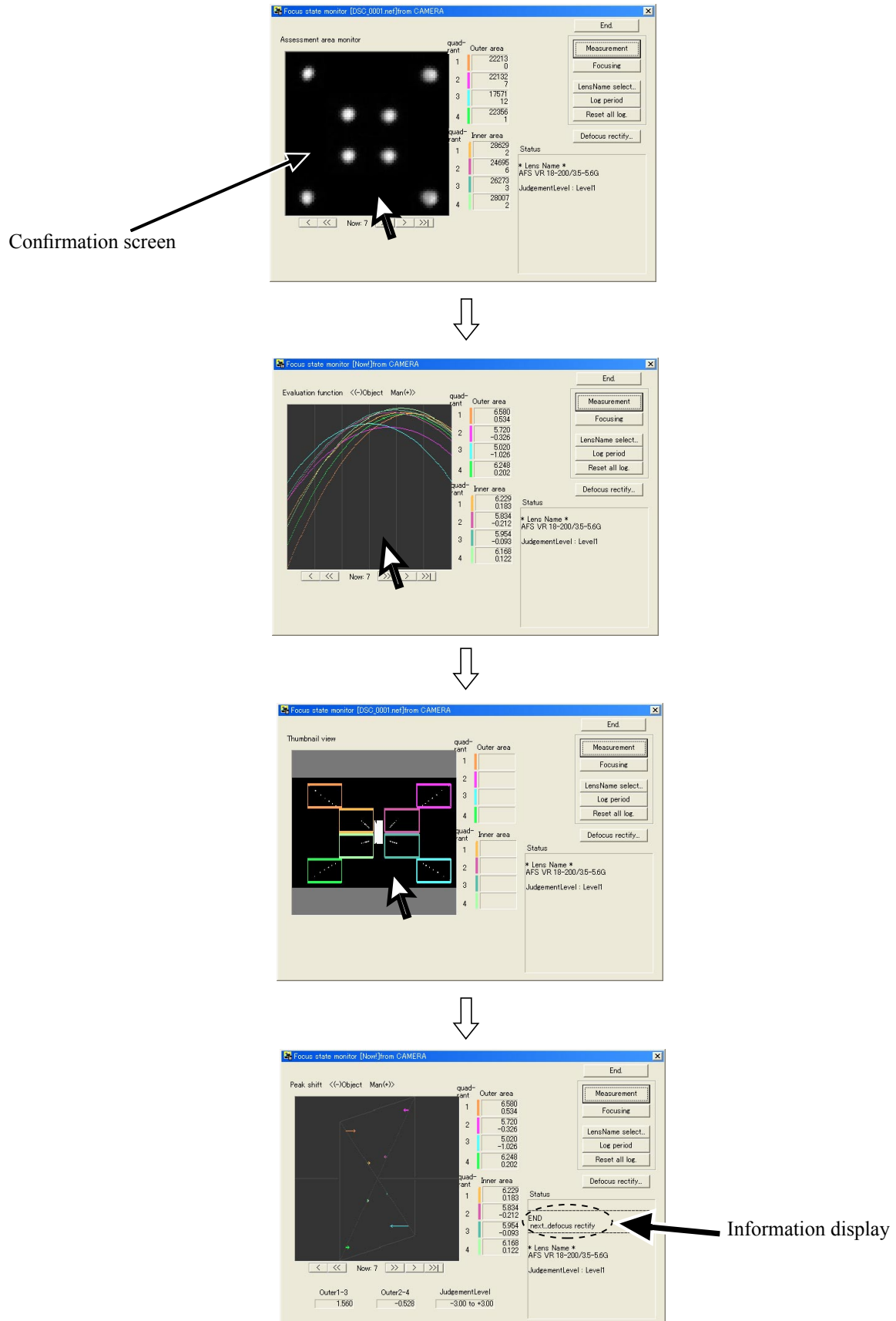
Note 3: When the below warning is given, recheck that the zoom ring of the lens is set to TELE-end.



- ② After the seven measurements, point the cursor to the confirmation screen of the software. Click it three times, and

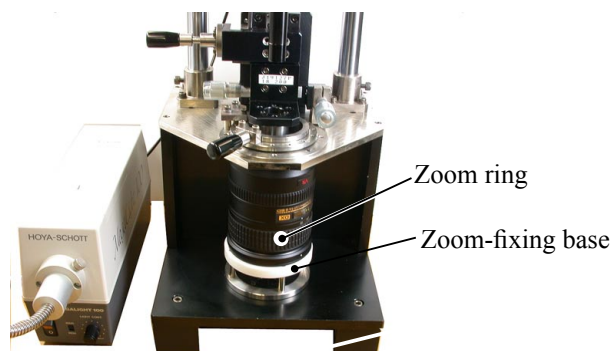
if "END" is displayed on the Information, the lens optical alignment is completed.

If "END" is NOT displayed (Adjust peripheral alignment by J19125 With below value), go to the next “(4) rear lens group alignment” to readjust.



(4) Rear lens group alignment

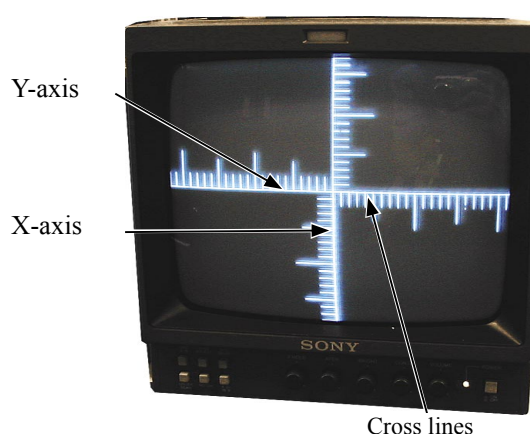
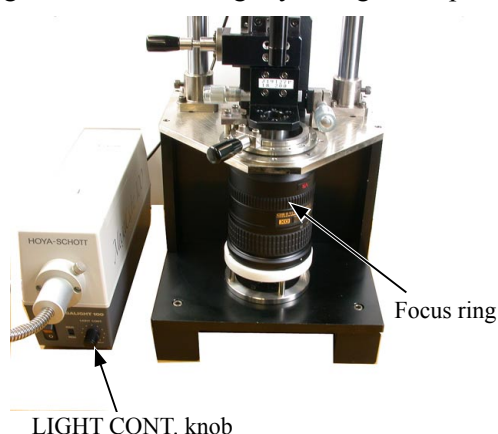
- ① Mount the lens on the equipment (for center). (ref. ① of (2) for how to fit in it.)
- ② Set the lens to WIDE-end. Put the zoom-fixing base, and rotate the zoom ring towards TELE until the lens touches the zoom-fixing base.



- ③ Adjust the cross lines by rotating the "LIGHT CONT." knob of "MEGALIGHT 100" and rotating the focus ring from "infinity"-end so that the calibration of the cross lines can be seen clearly.

Caution:

Almost at WIDE-end, the edge of the lens touches the zoom-fixing base. However, rotate lightly the zoom ring further and the slightly changed the position of the cross lines must be standard.



Note) In case the cross lines are tilted, adjust them by turning the chart, which is screwed in the rear tube of the equipment.

- ④ Unlock the holder-moving lever, and move the holder down slowly by the lever.

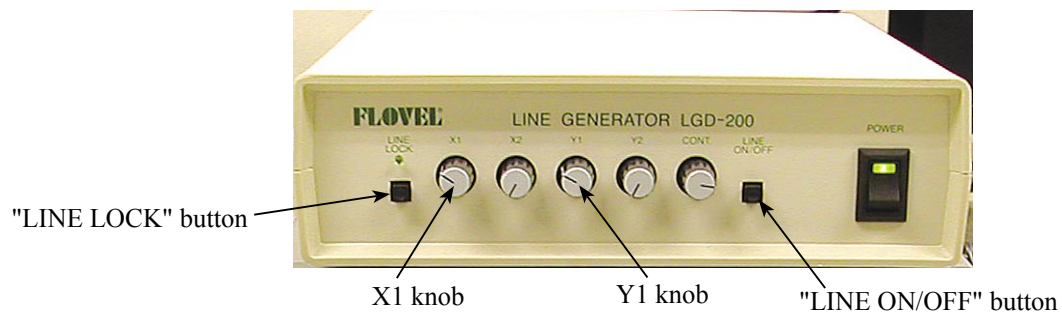
Caution:

Move the holder down so that a load is not put on the lens body (especially the three rollers that support the 4th lens group).

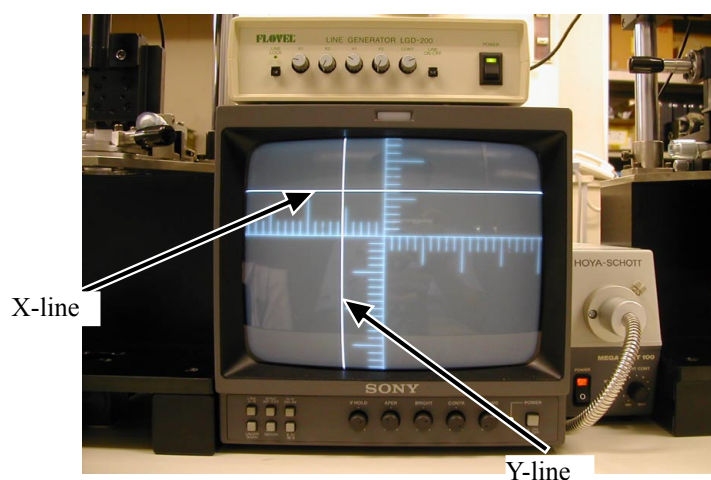
Also, adjust so that the cross lines remain unmoving, when the knobs of the micrometer (X and Y axes) are rotated and the holder is moved up and down.

- ⑤ Press the "LINE ON/OFF" button of LINE GENERATOR. Turn the knobs of "X1" and "Y1" until X- and Y-lines are displayed on the monitor.

Move these X- and Y-lines so that they coincide with the cross lines of the CCD camera. Then press "LINE LOCK" button to fix these X- and Y-lines.

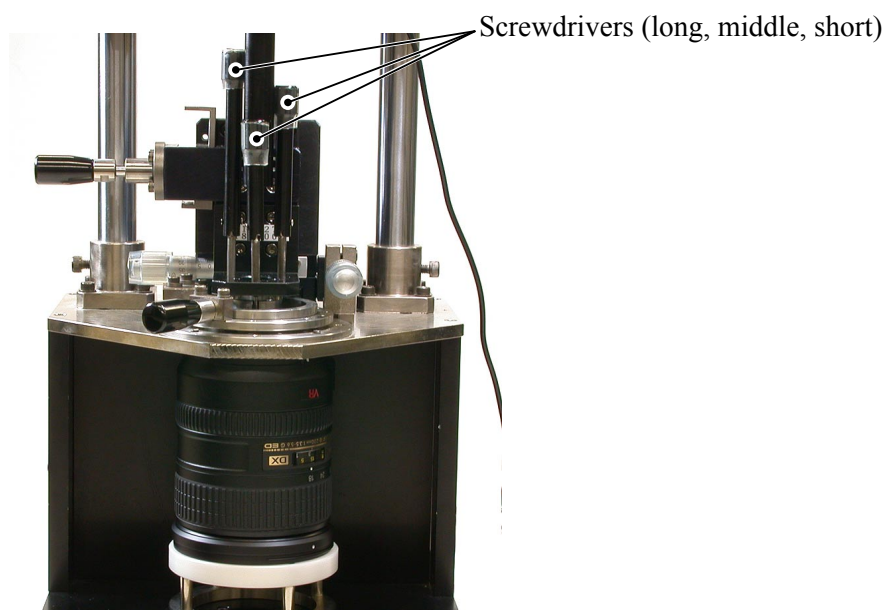


LINE GENERATOR



- ⑥ Insert the three alignment screwdrivers (long, middle, short) in the loosened screw holes of the rear lens chamber, and loosen the screws.

Note) Because the screws cannot be seen, when inserting the alignment screwdrivers, put them straight down in the screw holes so that the screws can be easily found.

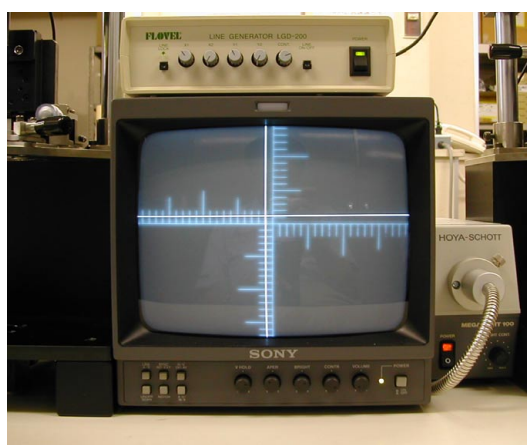


- ⑦ Rotate the knobs of the micrometer (X and Y axes), and shift the cross lines by the scales that were results of the chart shooting of the rear lens group alignment.

(e.g. Refer to "Pic.1" for the case of <X directions:+1, Y directions:-1>)

Caution:

When the knobs of the micrometer (X and Y axes) are rotated and the cross lines are unable to move, do not forcibly rotate them.



Pic. 1

- ⑧ After completing the above shifting of the cross lines, tighten three screws of the rear lens-G chamber with the alignment screwdriver.

Caution: The intersection point of the cross lines is misaligned when the holder is moved up. So adjust considering this misalignment.

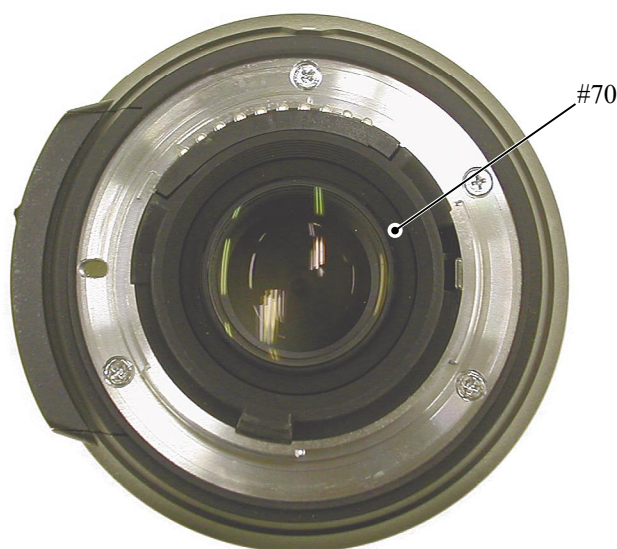
- ⑨ Remove the alignment screwdrivers (long, middle, short) from the rear lens-G holder.

If the alignment driver remains inserted in the rear lens-G holder and the holder-moving lever is moved up, the root portion of the screwdriver (long) touches the equipment.

- ⑩ Move the holder-moving lever up to lock the holder.
- ⑪ Check that a shift length caused by the cross lines and the X/Y lines is equal to the scales (1 = 1 scale of the calibrated cross lines) of the results of "Chart shooting of the rear lens group alignment". (ref. Pic.1)
Note: After fixing the three screws of the rear lens-G chamber, if a shift length is different from the results of the chart shooting, repeat the procedure from ④ to ⑧ until they become equal.
- ⑫ Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to OFF. Remove the lens from the equipment (for periphery).
Then go back to "(3) Chart shooting of the rear lens group alignment" and repeat the procedure (3) and (4) until the result becomes "END".

4th lens-group cover ring

- Attach the 4th lens-G cover ring (#70).



How to create positioning tool of Rear lens-group holder for lens alignment
(AF-S DX 18-200/3.5-5.6G)

1: Summary

1-1: This is a positioning tool of the rear lens group holder for lens alignment, in order to secure the position for attaching the rear lens group temporarily.

2: Preparation

2-1: The following is used:

- * Rear cover ring (JAA78451- Part no. :1K631-423) X 1 pc.
- * Bayonet mount (JAA78071- Part no.: 1K404-157) X 1 pc.
- * Mount rotation stopper screw (JAA78071- Part no.: 1K120-012) X 1 pc.

3-1: Put the bayonet mount as shown in Fig. 1.

Put with the groove, in which the lock pin of camera body enters, just upward.



Fig. 1

3-2: Mount the reversed rear cover ring on the position of Fig. 1, and attach them as shown in Fig. 2.

Put with the groove, in which the lock pin of camera body enters, just upward.

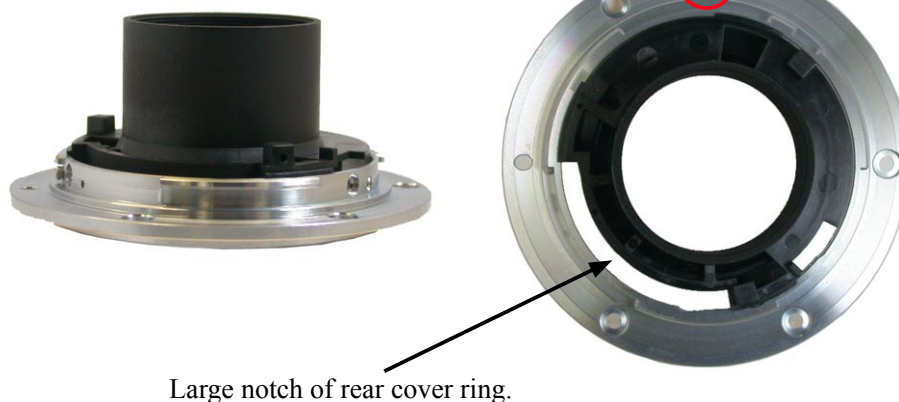


Fig. 2

3-3: Turn the rear cover ring clockwise, which was attached to the bayonet mount. Then stop at the position as shown in Fig.3-1.

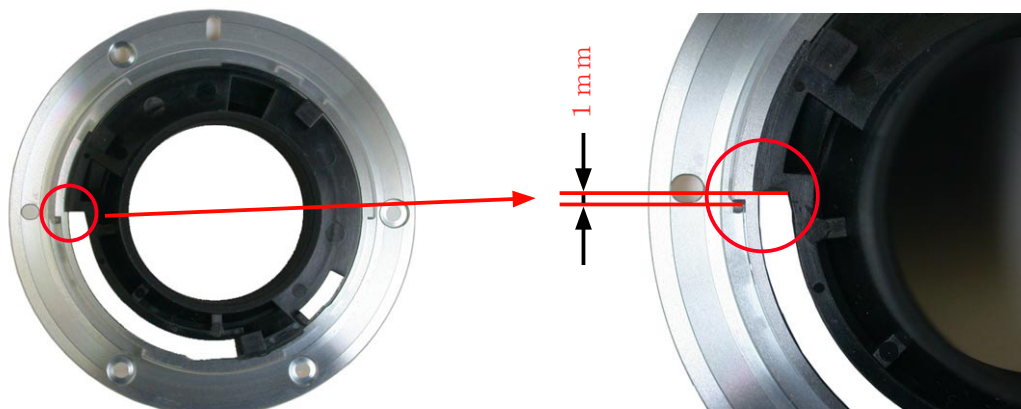


Fig. 3

Fig. 3-1

3-4: Fix the following three locations of the rear cover ring with the instant glue.

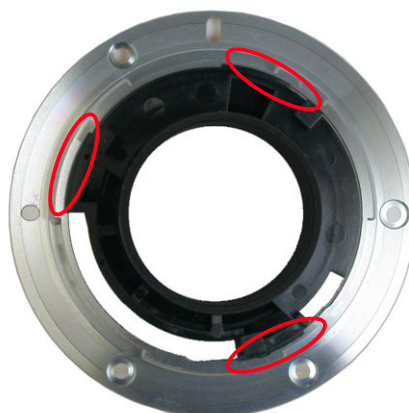
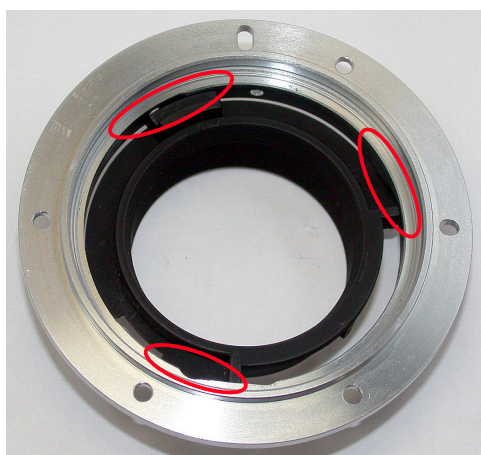


Fig. 4

3-5: Turn the bayonet mount over. Reinforce the following three locations with the adhesive to attach the bayonet mount and rear cover ring firmly.



3-6: Attach the mount rotation stopper screw at the appropriate position.

How to create Setting board of "Lens alignment chart" and "Viewer"

1. Summary

1-1: In order to get necessary data for lens alignment, this board is created to use for setting a special chart and light viewers (for chart illumination), while taking pictures of the special chart with a digital camera.

2. Preparation

2-1: Prepare a board (760 x 880 x 20 mm) or 2 package cardboard boxes (size 2.33).

(Note) Because you have to cut out the shape to embed light viewers, choose package cardboard boxes (size 2.33) or material which can be easily cut. — ref. Fig. 1

3. Procedure (In this document, 2 package cardboards are used)

3-1: As for the 1st flattened cardboard box (size 2.33), check the positions for embedding the light viewers, and cut out the shape at 5 locations (shaded parts/size 154 x 245 mm) as shown below. — ref. Fig. 2

(Note) Cutting the shape slightly smaller than the actual size of viewers makes it easier to fit the positions of viewers tightly.

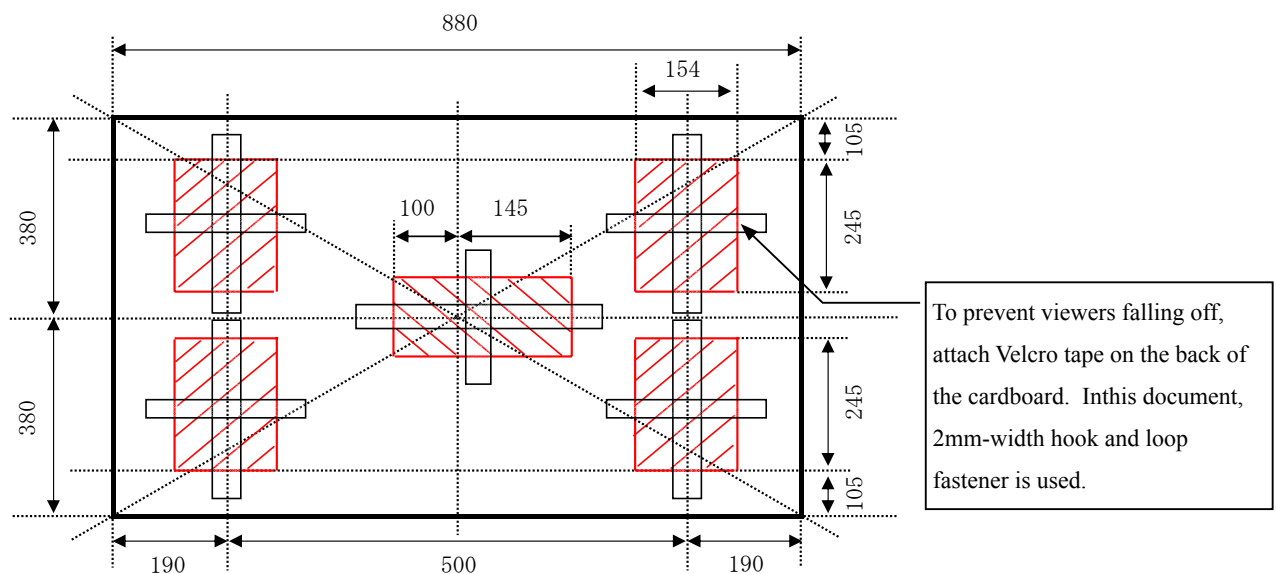
3-2: Put the 2nd flattened cardboard box (size 2.33) and the above cut-out 1st cardboard together as one, and fix them by taping at 4 sides. — ref. Fig. 3

3-3: Then as for the 2nd flattened cardboard box, cut out the shape again by matching the cut-out size of 3-1 for each viewer. — ref. Fig. 4

3-4: Reinforce the edges of cut-out parts with tape.

(Note) To prevent viewers falling off, secure them with tape around the edges. — ref. Fig. 5

3.5: **Blacken around the setting board (with black spray, etc).**



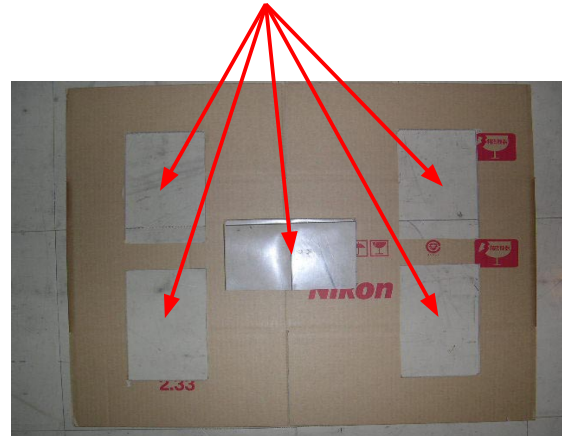
4. Prevent Viewers from falling off (In this document, 2-mm width Velcro tape is used.)

4-1: As shown above, when viewers are embedded, secure them with square pieces of Velcro tape (hook and loop fastener) on the back of the cardboard to prevent viewers falling off.

(Fig. 1- Prepare two package cardboard boxes, and flatten them as below.)



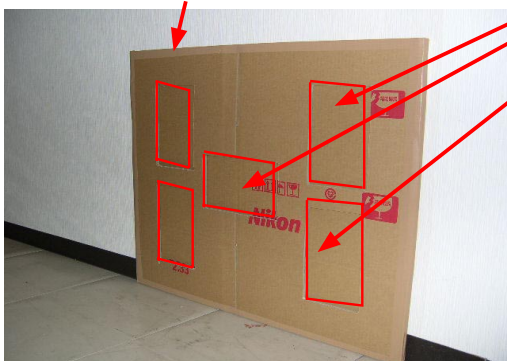
(Fig. 2 - As for the 1st flattened cardboard box, cut out the <154 x 245 mm sized> shape at 5 locations.)



(Fig. 3- Package cardboard boxes)

Put the 2nd flattened cardboard box and the 1st cut-out cardboard together as one as shown below.

Fix them by taping at 4 sides.



(Fig. 4- As for the 2nd flattened cardboard box, cut out the shape in the same way as Fig.2. All cardboards are cut out as below.

Cut out by matching the size of the 1st cutting.



(Fig. 5- Light viewers are embedded.)



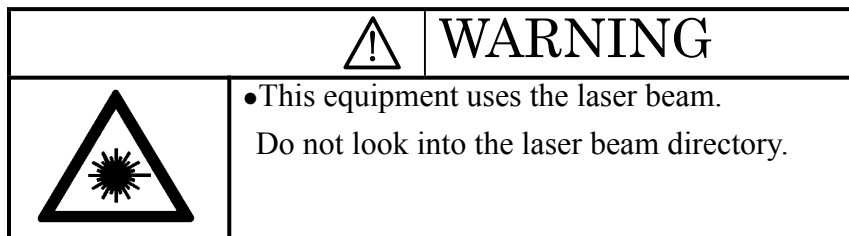
To prevent viewers falling off, secure the viewers with tape around the edges.

(Fig. 6- Setting board is blackened with the chart being attached.)



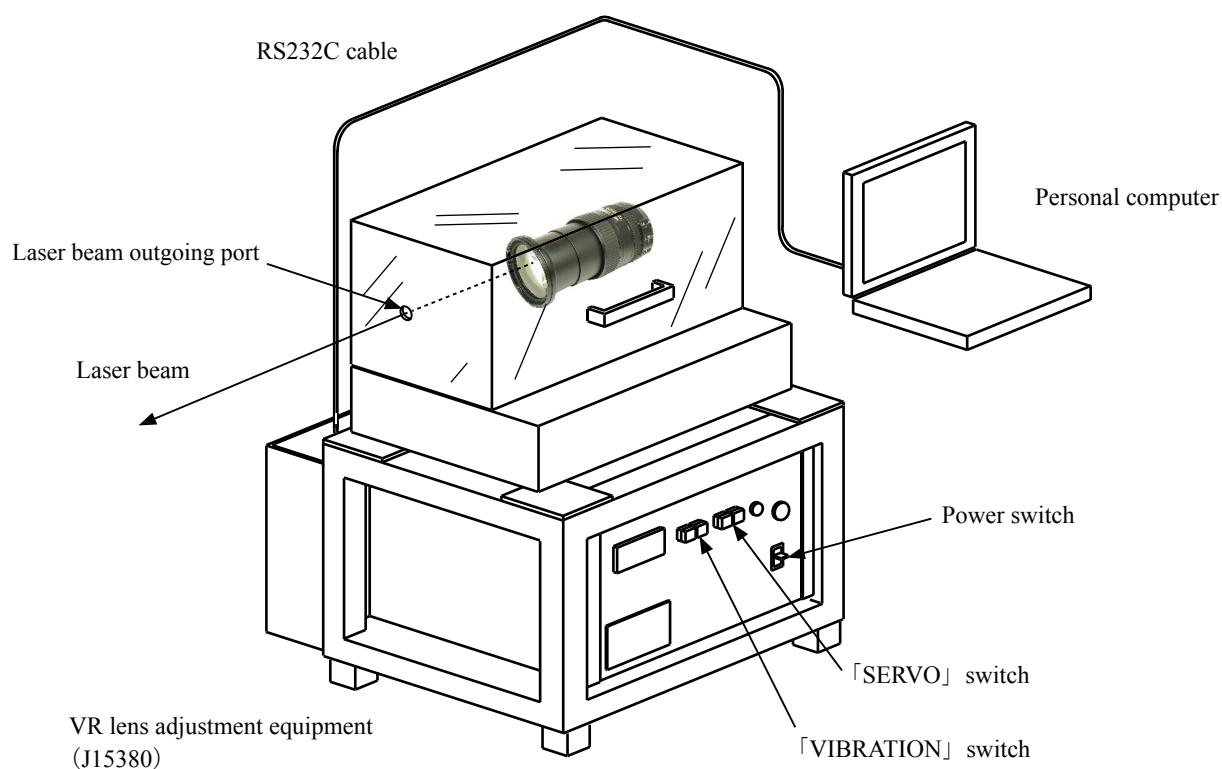
VR ADJUSTMENT

When performing the VR adjustment, please refer to the [Instruction Manual] attached to the VR lens adjustment equipment (J15380).



Preparation for the VR adjustment

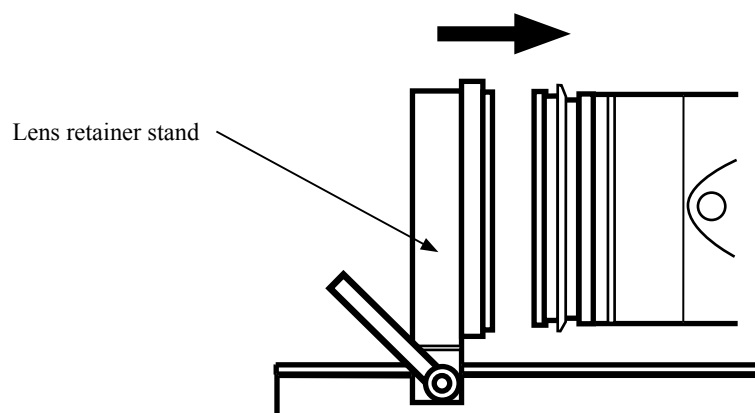
- ① Set up the VR lens adjustment equipment (J15380) as shown in Figure below.
- ② Connect the personal computer to the equipment and run the personal computer.
- ③ Mount the lens on the equipment. Set the focus ring to the infinity position and the zoom ring to TELE side.
Please refer to the next page for the procedure to mount the lens.



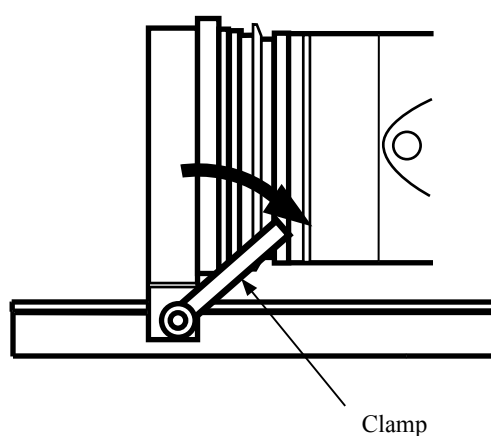
Notes: The distance from the laser beam outgoing port to the radiation face should be about 5m apart.
Do not intercept the optical path of the laser beam.

Procedure to mount the lens

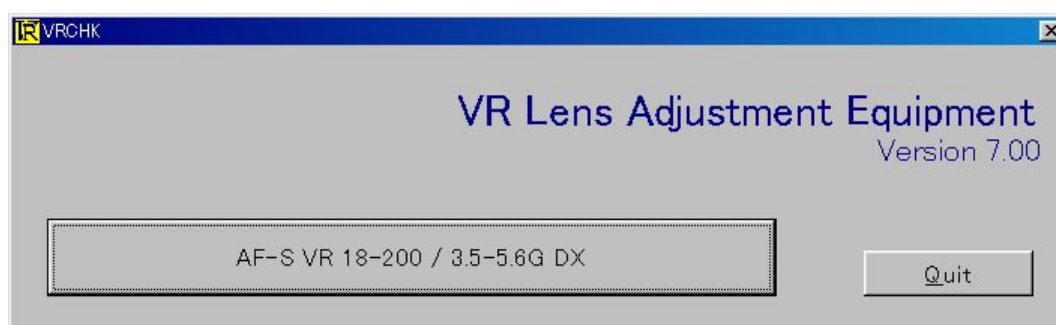
- 1 . Attach the lens to the equipment and move the lens retainer stand in the direction of the arrow.



- 2 . Move the lens retainer stand to the position shown in Figure below and fix it by tightening the clamp.



- ④ Turn on the VR lens adjustment equipment (J15380) and run the adjustment software.
- ⑤ Move the cursor to [AF-S VR 18-200/3.5-5.6G] in the Lens Selection window and click it.



- ※ If the below message appears, set the zoom ring again by referring to the pre-page [Procedure to mount the lens] and click the [OK] button.
The focus ring is automatically set.

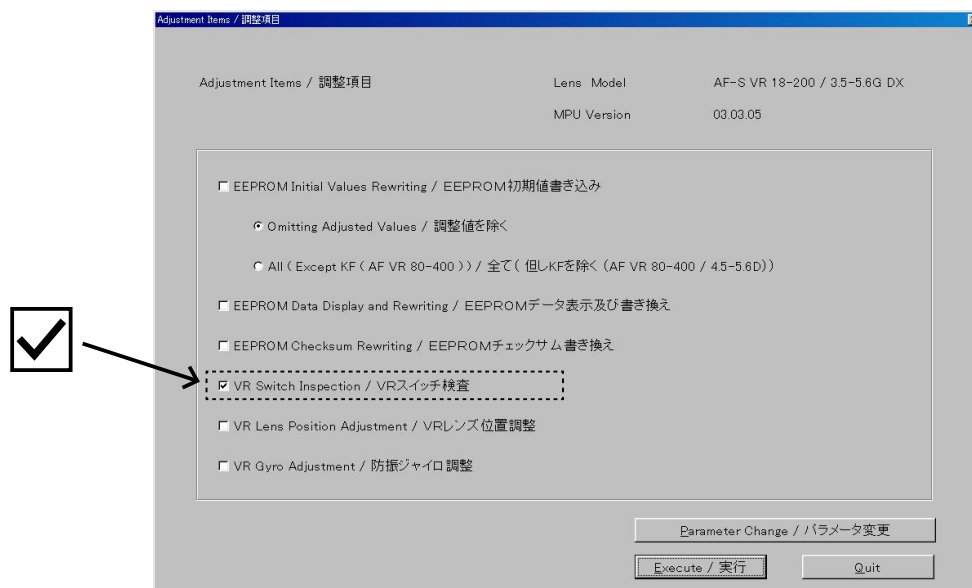


Notes : Do not change the lens settings (zoom ring) until the adjustment is finished and it goes back to the Lens Selection window.

If the setting position changes in the middle of the adjustment, the correct adjustment value cannot be obtained

VIBRATION REDUCTION MODE SW INSPECTION

- ① Move the cursor to a box in front of the [VR Mode Switch Inspection] and click to mark the check marking.
- ② Move the cursor to the Execute button and click it.

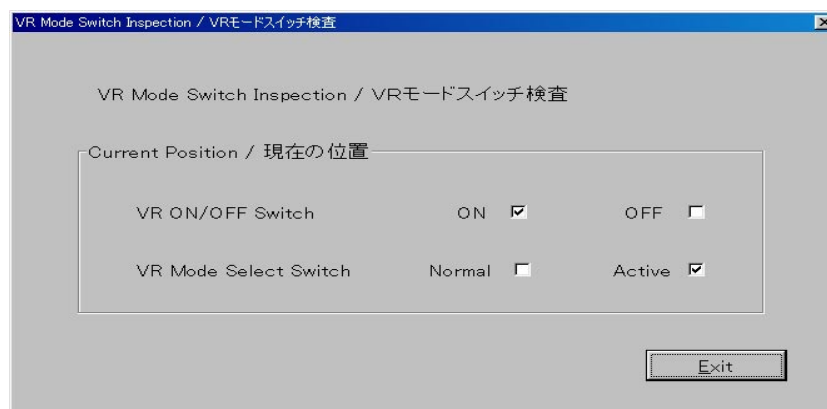


- ③ VR Mode Switch Inspection window is shown.



- ④ The position of VR mode switch is indicated.

By turning the VR mode switch, the current position is shown in the real time.



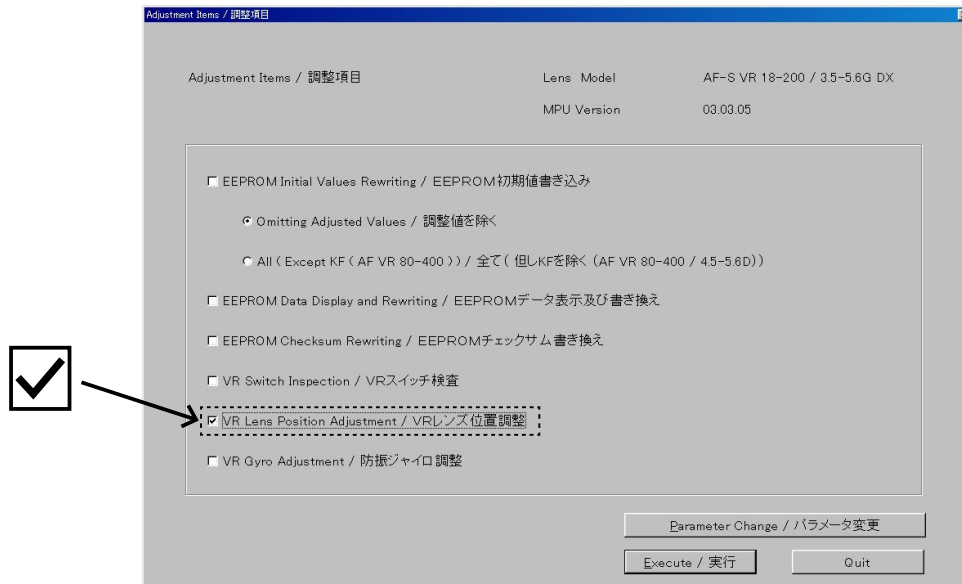
VR mode switch



- ⑤ When finishing the VR mode switch, move the cursor to the [Exit] button and click it to evacuate from the inspection window.

VR LENS POSITION ADJUSTMENT

- ① Move the cursor to a box in front of the [VR Lens Position Adjustment] and click it to mark the check marking.
- ② Move the cursor to the Execute button and click it.



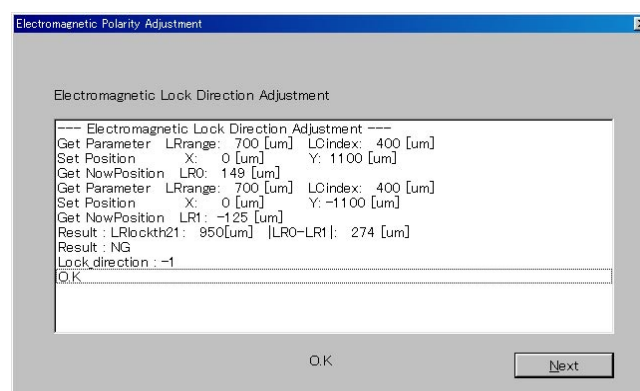
- ③ The message like a picture on the left is shown.
Set the VR mode switch of the lens to ON (Full or Release), and then move the cursor to the OK button and click it.

• VCM Polarity Adjustment (Controlled automatically)

Detect the polarity of the VCM (Voice Coil Motor) and write it in EEPROM as the compensation value.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



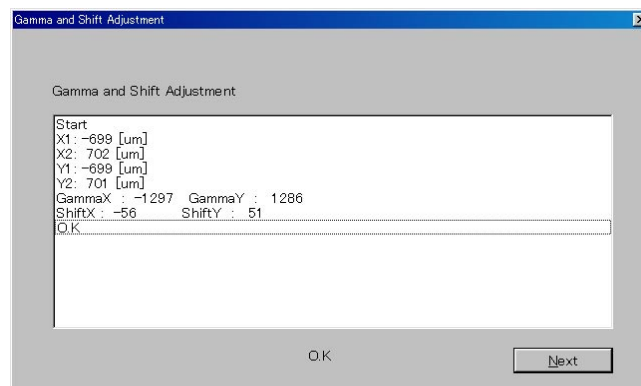
When [OK] is shown on the window, move the cursor to the Next button and click it.

• Gamma and Shift Adjustment (Controlled automatically)

Adjust the inclination and control center position on the basis of the position sensor output in the VR unit.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



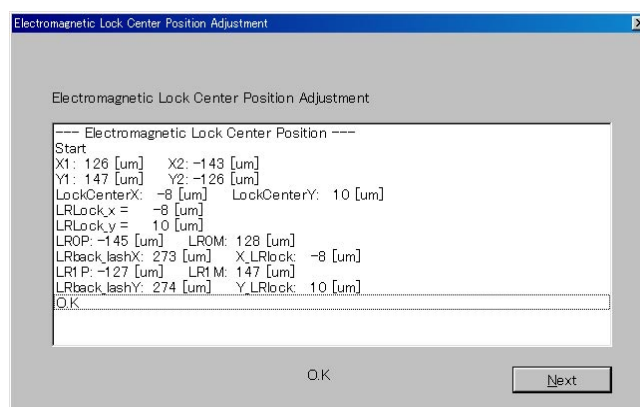
When [OK] is shown on the window, move the cursor to the Next button and click it.

• Electromagnetic Lock Center Position Adjustment (Controlled automatically)

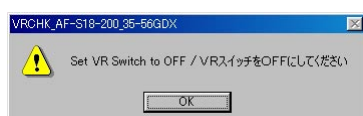
Adjust the electromagnetic lock center position.

In-between times, the message to confirm the lens position of angle (0 or 90degrees) appears.

So, set the lens to the position and click the [OK] button.



When [OK] is shown on the window, move the cursor to the Next button and click it.



- When the message that says rewriting the checksum is finished is shown, click the [OK] button.

Then set the VR mode to OFF according to the message and click the OK button to evacuate from the adjustment window.

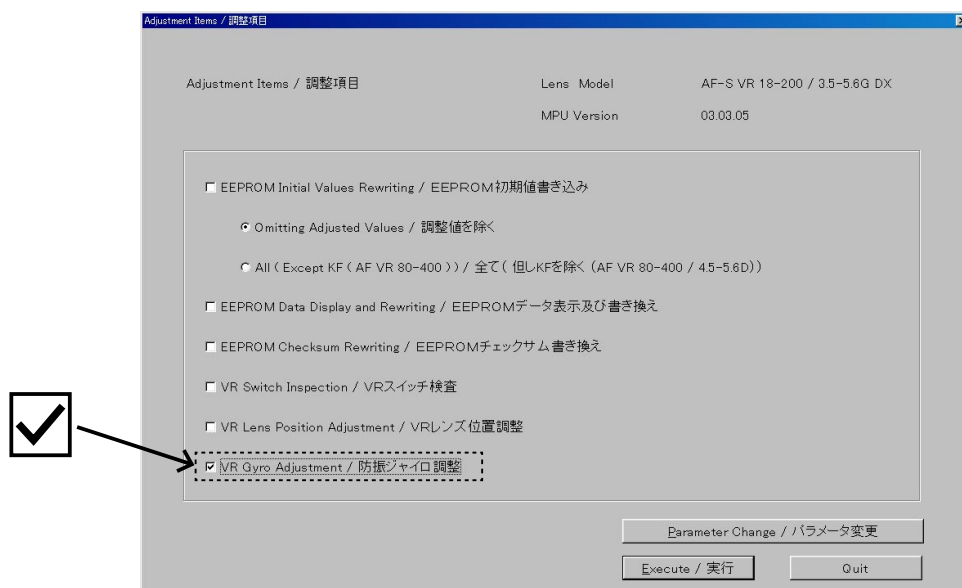
Notes :

If [NG] is shown in the middle of the adjustment, click the Next button. This makes it possible to evacuate from the inspection mode and to go back to the Lens Selection window after rewriting the checksum value. Then adjust it again.

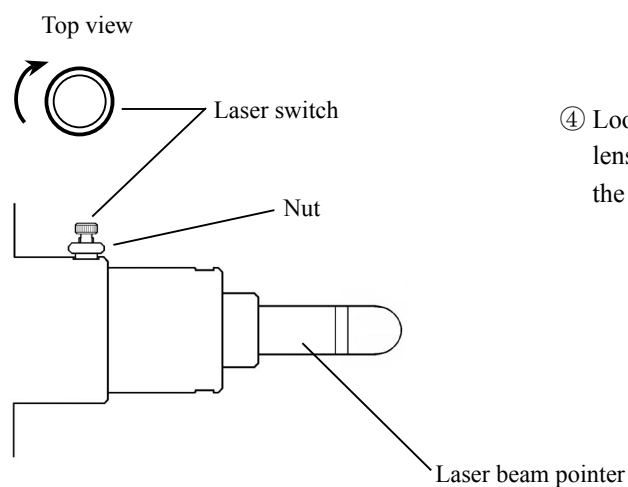
If it becomes be [NG] even performing the adjustment a few times, the VR unit, the gyro PCB or the main FPC might be defective.

VR GYRO ADJUSTMENT

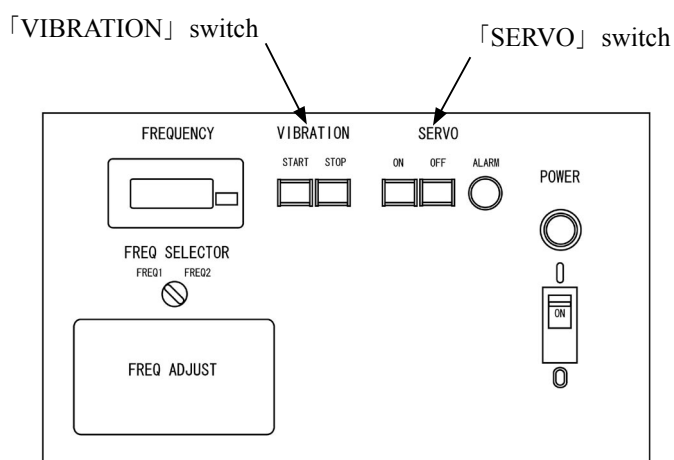
- ① Move the cursor to a box in front of [VR Gyro Adjustment] and click it to mark the check marking.
- ② Move the cursor to the Execute button and click it.



- ③ The message like a picture on the left is shown. Set it to the Telephoto settings.

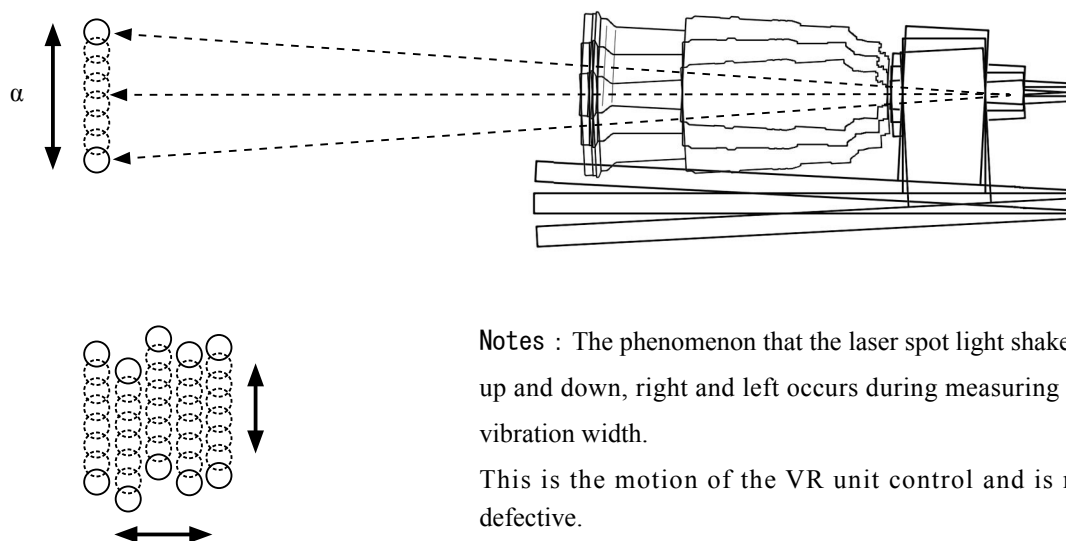


- ④ Loosen the nut of the laser switch of the VR lens adjustment equipment (J15380) and rotate the screw in an arrow direction to give the laser.



- ⑤ Press the SERVO [ON] button and the VIBRATION [START] button of the VR lensadjustment equipment (J15380).

- ⑥ With the equipment starts to vibrate, measure the length of the vibration width α of the laser beam.



Notes : The phenomenon that the laser spot light shakes up and down, right and left occurs during measuring the vibration width.

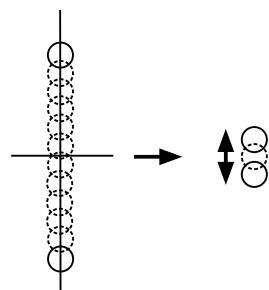
This is the motion of the VR unit control and is not defective.



- ⑦ Move the cursor to the Next button in the message box on the screen and click it.

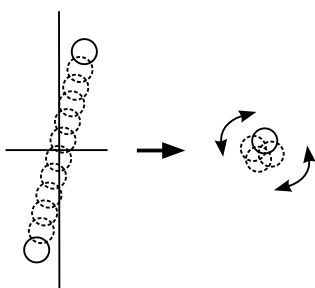
Vibration reduction function starts to perform and the vibration width of the laser beam becomes be narrow.

• Angle Difference Adjustment

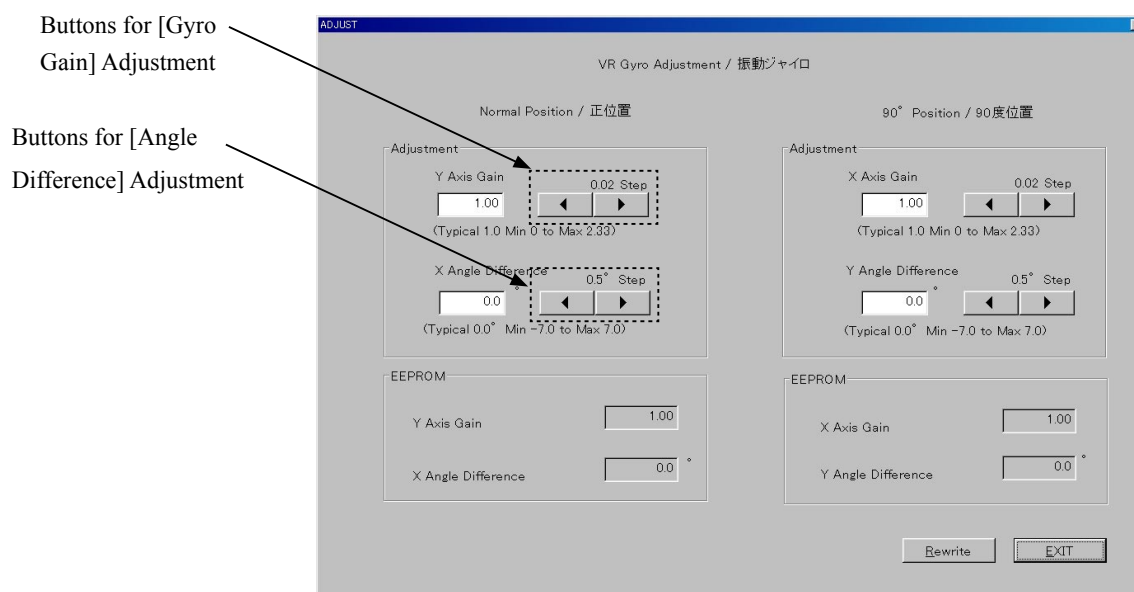


If there is angle difference, the laser beam source becomes be whether if it rotates round even performing the Gyro Gain Adjustment.

If it is possible to confirm the angle difference, adjust it by the buttons for the angle difference adjustment.

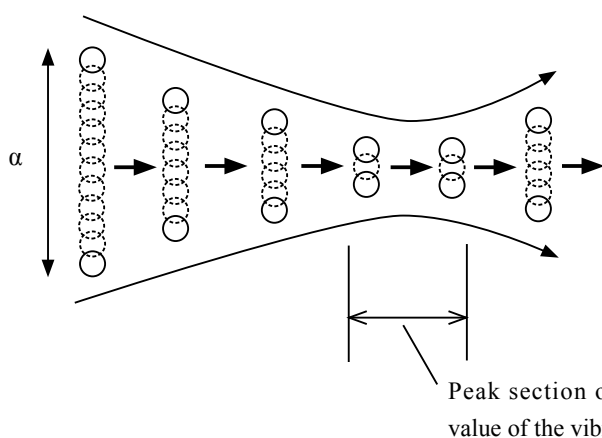


Notes : After operating the adjustment button, wait for a few seconds until a vibration motion is stabilized.



• Gyro Gain Adjustment

Adjust the vibration width by the button for Gyro Gain Adjustment so that the length of the vibration width becomes be less than 1/5 of the measured laser vibration width a.

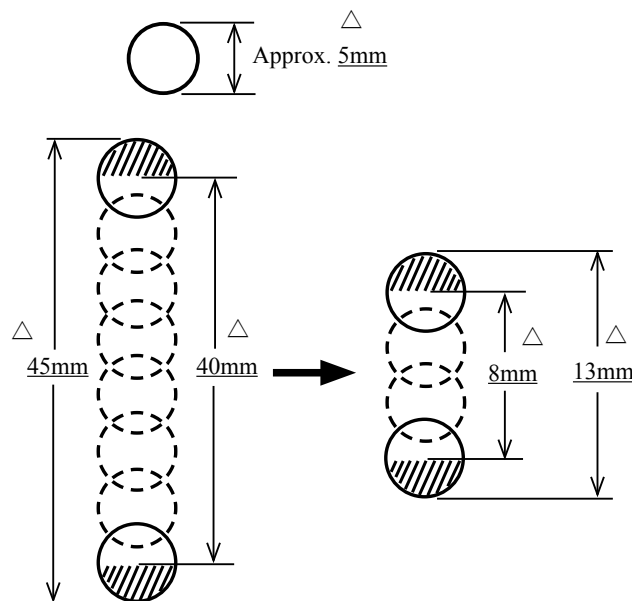


Standard: Less than 1/5 of the vibration width a

Notes : The laser beam vibrates widely again after it passes the peak section of the minimum value.

《Reference》

- The laser spot beam is irradiated about $\triangle$ 5 mm in diameter at 5 m ahead.



① To adjust the vibration width at the center of the laser spot beam, measure the whole vibration width first.

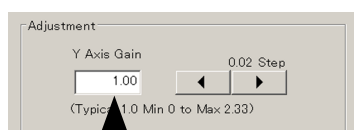
② Subtract the radius of the laser spot (oblique lined part) from the top and bottom of the measured vibration width.

Example) $\triangle$
When the whole vibration width is [About 45mm],
the center vibration width becomes be
 $45 - (2.5 + 2.5) = 40 \text{ mm.}$

$\triangle$
Standard after the gyro gain adjustment
 $40 \times 1/5 = 8 \text{ mm (Center vibration width)}$
Whole vibration width becomes be
 $8 + (2.5 + 2.5) = 13 \text{ mm.}$

- How to obtain the minimum value of the vibration width

- ① Measure the vibration width while changing the adjustment value that is set every 0.02Step as shown below.
- ② The peak section of the minimum vibration width can be obtained by the actual measured value.
- ③ Take the center of the peak section as the adjustment value.



Gyro Gain Adjustment Value	Vibration width Actual measured value	
.	.	
.	.	
0.90	<u>15.5 mm</u>	$\triangle$
0.92	<u>14.5 mm</u>	$\triangle$
0.94	<u>14.0 mm</u>	$\triangle$
0.96	<u>13.5 mm</u>	$\triangle$
0.98	<u>13.0 mm</u>	$\triangle$
1.00	<u>13.0 mm</u>	$\triangle$
1.02	<u>13.0 mm</u>	$\triangle$
1.04	<u>13.5 mm</u>	$\triangle$
1.06	<u>14.0 mm</u>	$\triangle$
1.08	<u>14.5 mm</u>	$\triangle$
1.10	<u>15.0 mm</u>	$\triangle$
.	.	
.	.	

Notes : When measuring the vibration width, read it in unit of 0.5mm.

△(Addition)

- Press VIBRATION "STOP" button of VR lens adjustment equipment (J15380) to stop the vibration.

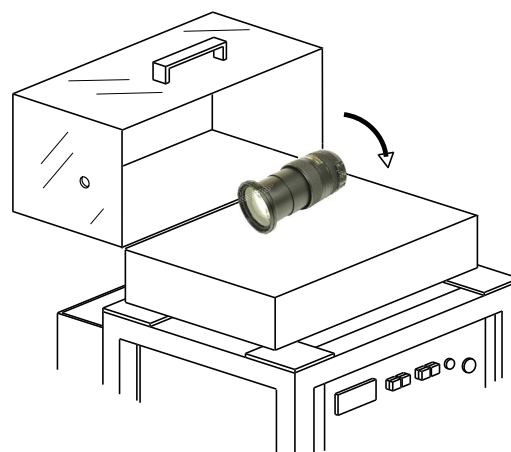
△(Addition)

- Turn the lens through 90 ° towards the arrow direction. Press VIBRATION "START" button of [J15380] to start the vibration.

△(Revision)

- Adjust the angle difference and the gyro gain at an angle of 90 °.
- ~~Rotate the lens 90 ° in an arrow direction and then adjust the angle difference and the gyro gain~~

Note: Adjust the lens at an angle of 90 ° position by using "Buttons for the adjustment at 90 ° position" as shown below.



Buttons for adjustment
at 90 ° position

- After the adjustment, click the [Rewrite] button to write the adjustment value in EEPROM in the lens.
- Then, click the [EXIT] button to evacuate from the adjustment mode.

Notes : If clicking [EXIT] button after not clicking the [Rewrite] button, the adjustment value is not stored and the adjustment is not influenced.

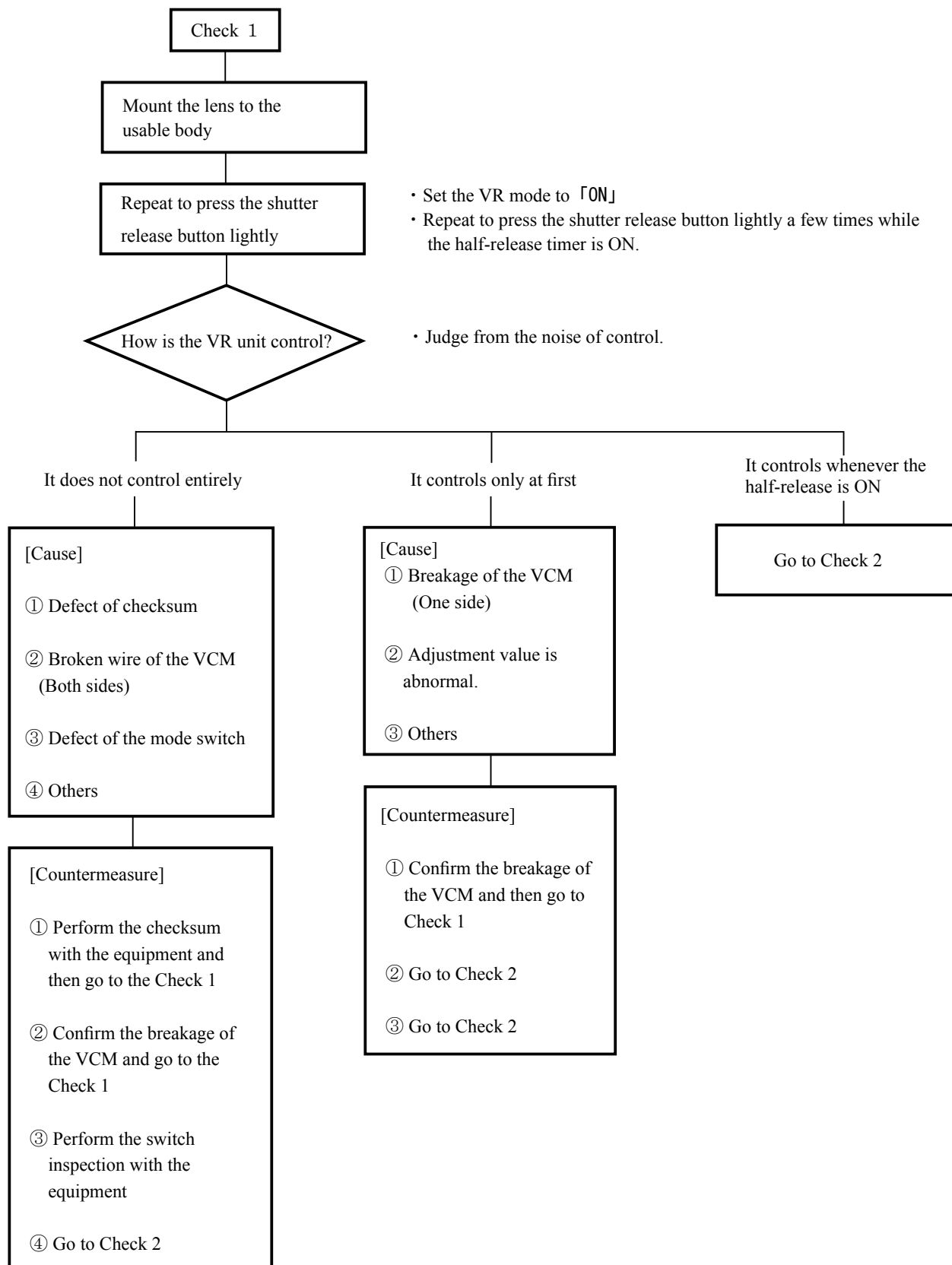
- Click the [Quit] button at the Adjustment Items window to go back to the Lens Selection window.

Notes : Do not remove the lens or turn OFF the VR lens adjustment equipment until it goes back to the Lens Selection window. The trouble that the adjustment value is not stored correctly, etc. occurs since the communication is cut off.

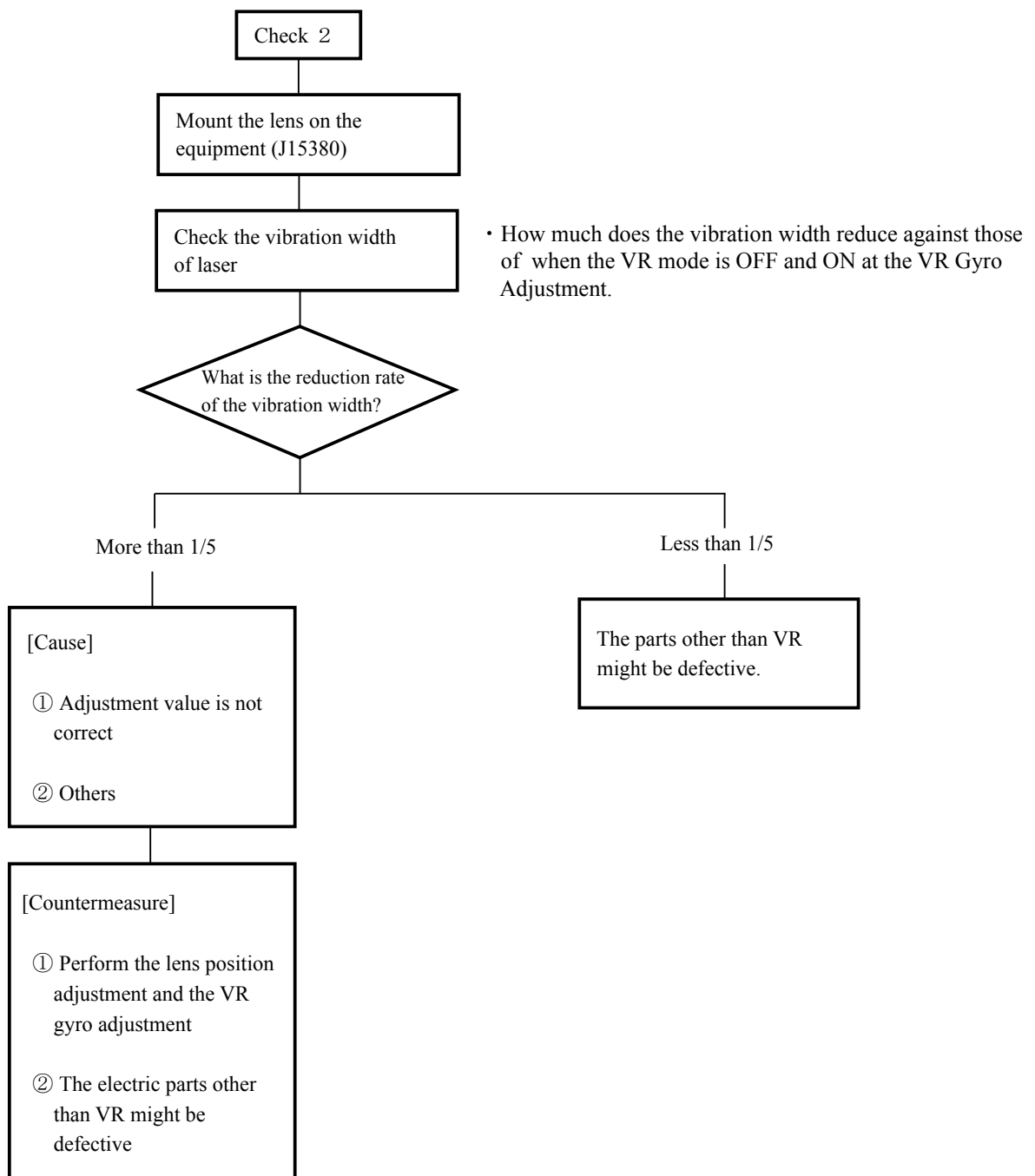


STANDARD TO JUDGE THE VR PERFORMANCE

Please refer to the following chart before performing the VR adjustment for the product of which VR is defective with the equipment.



Go on the next page [Check 2]



Aberration compensation data writing adjustment

- This adjustment uses the software which calculates the aberration compensation data according to the feature of lens aberration and writes in EEPROM of the lens, in order to improve the accuracy of autofocus.

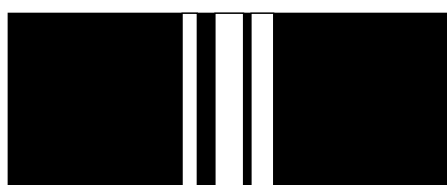
Note: This adjustment is necessary when the main PCB and/or each lens part (glass, lens chamber) is replaced or when each lens part is disassembled. Be sure to make this adjustment after completing inspecting and adjusting the main PCB.

(1) Preparation

- Test chart (Self-made tool: ref. Procedure for how to create it.)
- Tripod
- D100
- Personal computer
- USB cable (UC-E4)
- Adjustment software (LWM.exe : used for the lens optical alignment.)

(2) Procedure for how to create Test chart

- Photocopy the next page and cut out 1 target chart and 5 resolution charts.



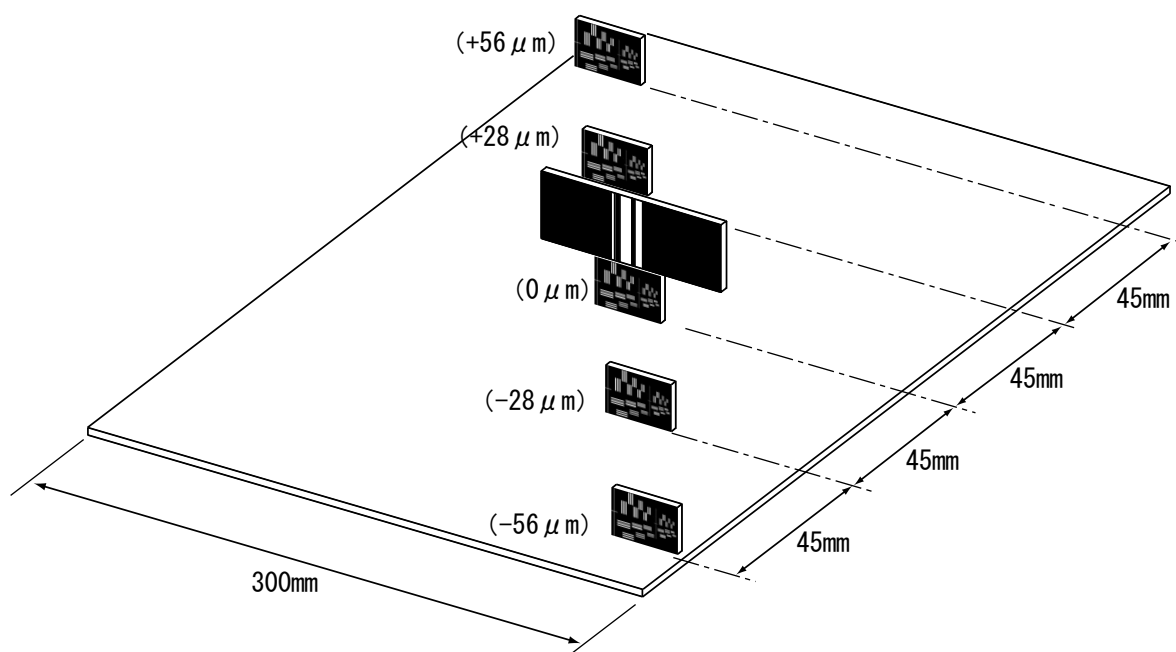
(Target chart)



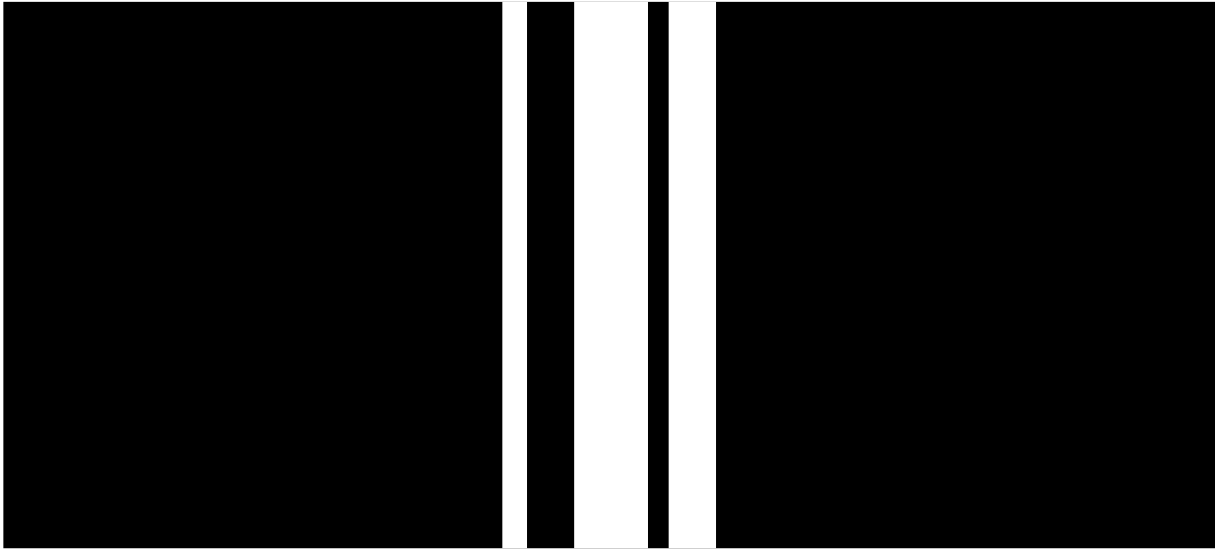
(Resolution chart)

- As shown below, put each chart in position at the specified spacings.

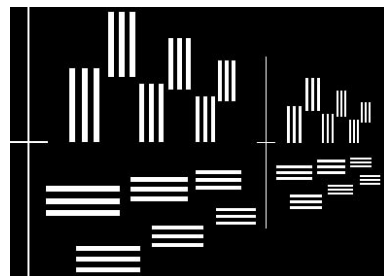
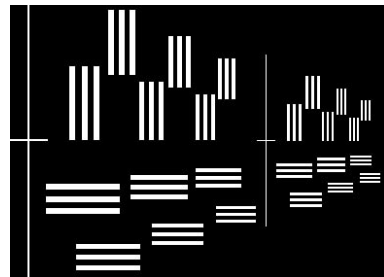
Note: Only in the center, put the target chart on the central resolution chart.



(Target chart)

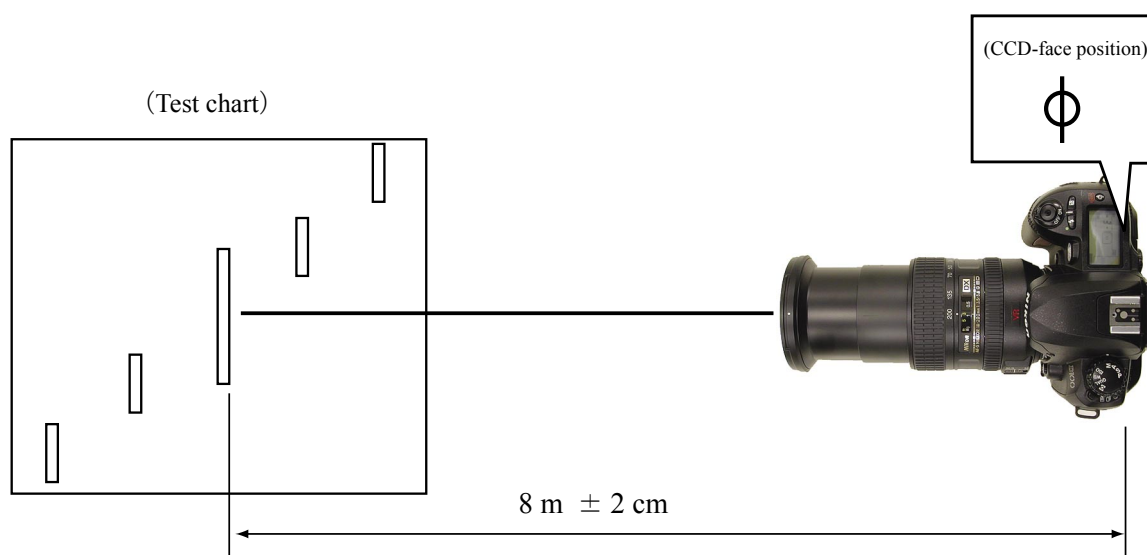


(Resolution chart)

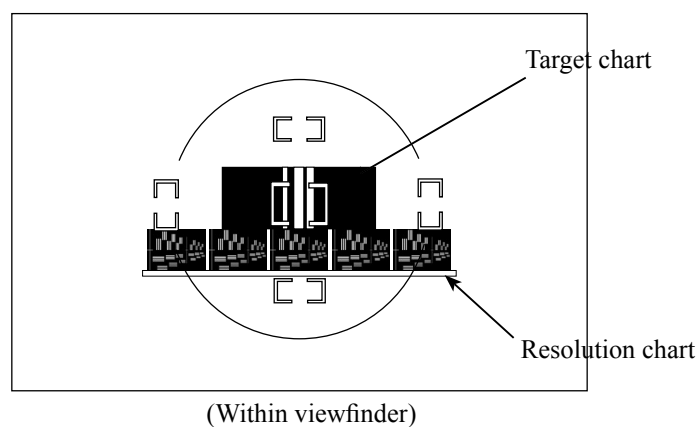


(3) Writing aberration compensation data

- ① Prepare a camera (D100). Set the "Exposure mode" to "A" for full aperture and "Focus mode" to "S".
On the shooting menu, set the "Image quality mode" to "FINE", "Image size" to "L", "WB" to "Preset", and "ISO" to "200".
- ② Set up the camera (D100), in which the lens to be inspected is fit, on the tripod. Set the focal length to 200 mm, and the distance between the test chart and camera (CCD face) to $8\text{ m} \pm 2\text{ cm}$.

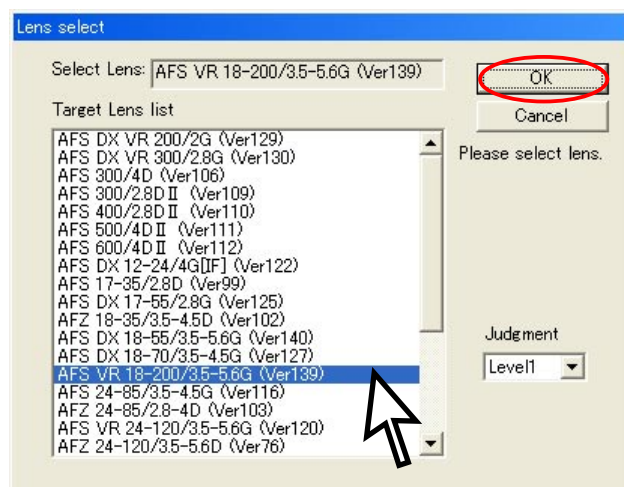


- ③ As shown below, set the center of the focus area on the chart within viewfinder.

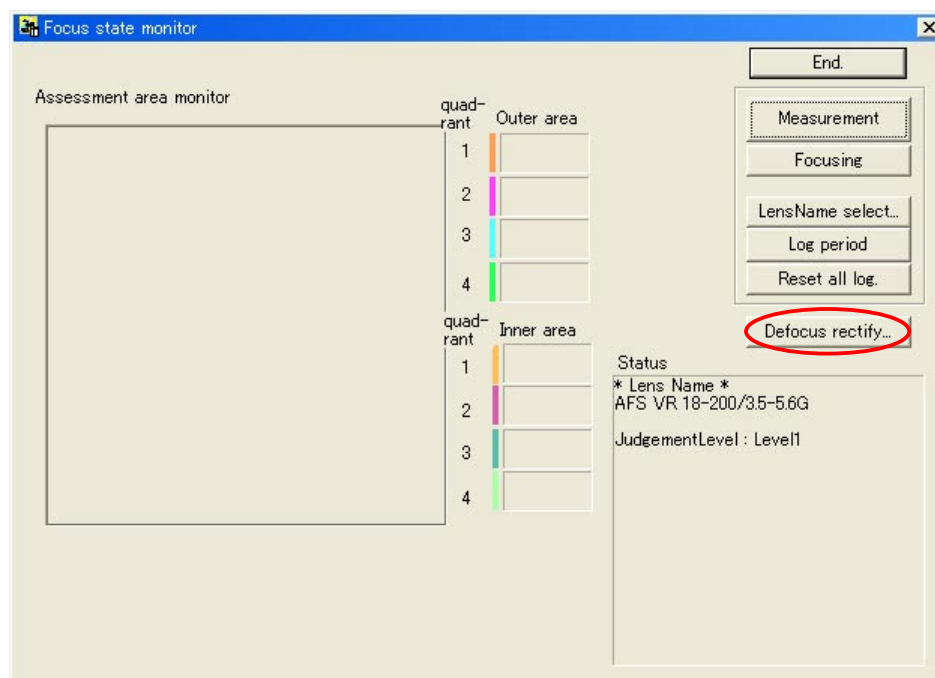


- ④ Connect the PC and camera via USB cable. (Camera setting: Mass storage)
- ⑤ Start the adjustment software (LWM.exe).

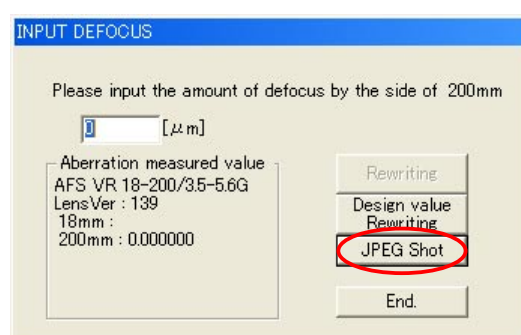
- ⑥ Confirm that "AF-S VR 18-200/3.5-5.6G" is selected on "Lens select" screen. Click "OK".



- ⑦ Click the "Defocus rectify..." button.



- ⑧ Click the "JPEG Shot" button.

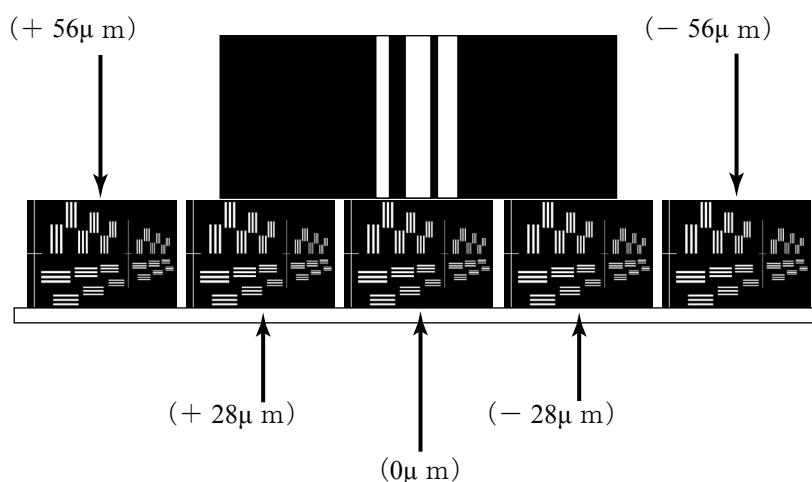


- ⑨ The shutter is released after the AF operation. The shot image is automatically displayed on the PC screen.

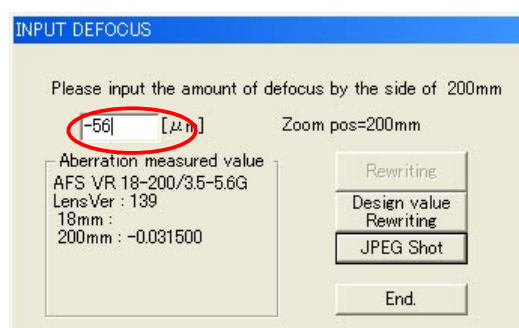
Scale the image to 100% and check which chart is in focus of the 5 resolution charts.

Caution:

Because this lens has a deep focal depth even if the aperture is fully open, when looking for the center of focus, compare two distant charts between which there are two or more charts.



- ⑩ Input the value of the focused position into the entry field.
e.g. The below is the case when " $-56\mu\text{m}$ " of the front focus side is in focus.



- ⑪ Set the focal length of the lens to 18 mm, and the distance between the test chart and camera (CCD face) to 72 ± 2 cm.

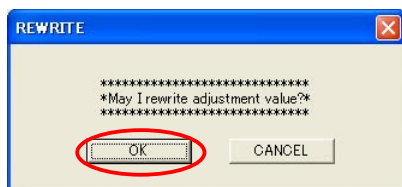
- ⑫ Perform the operations from ⑧ to ⑩ of the previous page.

- ⑬ Check that the values of all the focal lengths are displayed within the dotted red circle. Then click on "Rewriting".

- ⑭ When "A compensation value is written in." is displayed, click "OK".

ADDRESS	DATA(Even)	DATA(Odd)
0x002	0x16	0x12
0x004	0x06	0x05
0x006	0x04	0x03
0x008	0x01	0x00
0x00a	0x82	0x87
0x00c	0x89	0x16
0x00e	0x12	0x07
0x0010	0x06	0x05
0x0012	0x04	0x03
0x0014	0x01	0x00
0x0016	0x84	0x85
0x0018	0x16	0x12
0x001a	0x07	0x07
0x001c	0x06	0x05
0x001e	0x04	0x04
0x0020	0x03	0x00
0x0022	0x81	0x16

- ⑮ The reconfirmation screen is displayed. Click "OK".

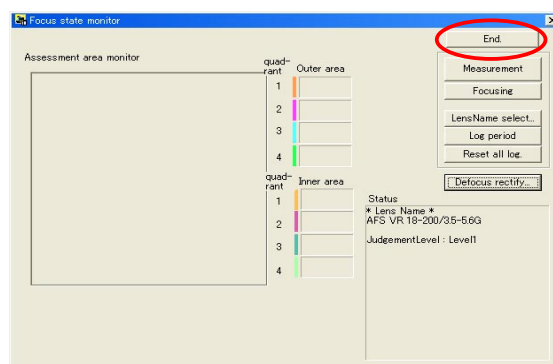
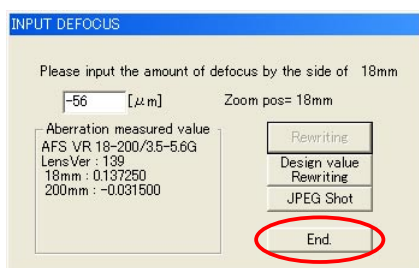
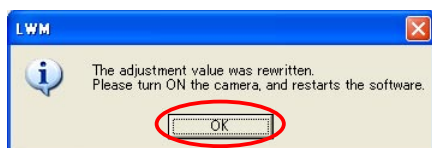


- ⑯ An hourglass is displayed on the screen, and writing starts.

The below screen is displayed after a few seconds. Turn camera OFF and turn it ON again.

Click "OK", and the adjustment software restarts.

Note: Unless the camera is turned off once, the value that was written in EEPROM is not reflected.

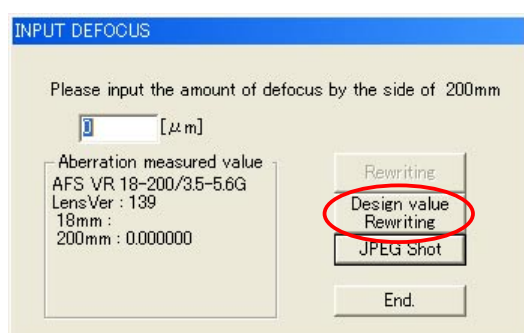


- ⑰ When the adjustment software restarts, perform the operations from ② to ⑫ again. Check that "0μm" of the AF position is in focus.

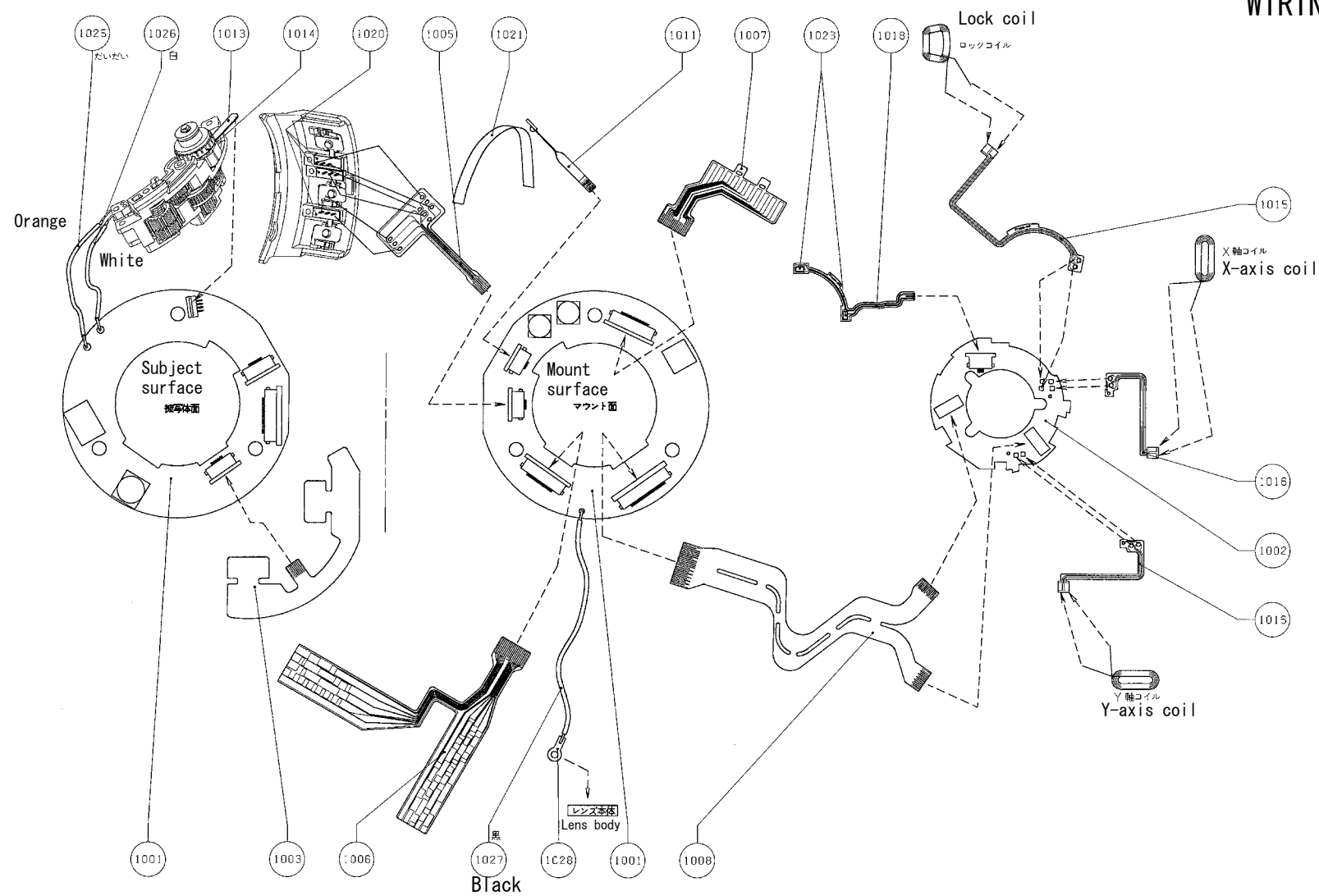
(It is also possible, after Wide-side shooting of ⑫, to take the Tele-side shooting of ②.)

If "0μm" is not in focus, repeat the operations from ② to ⑰.

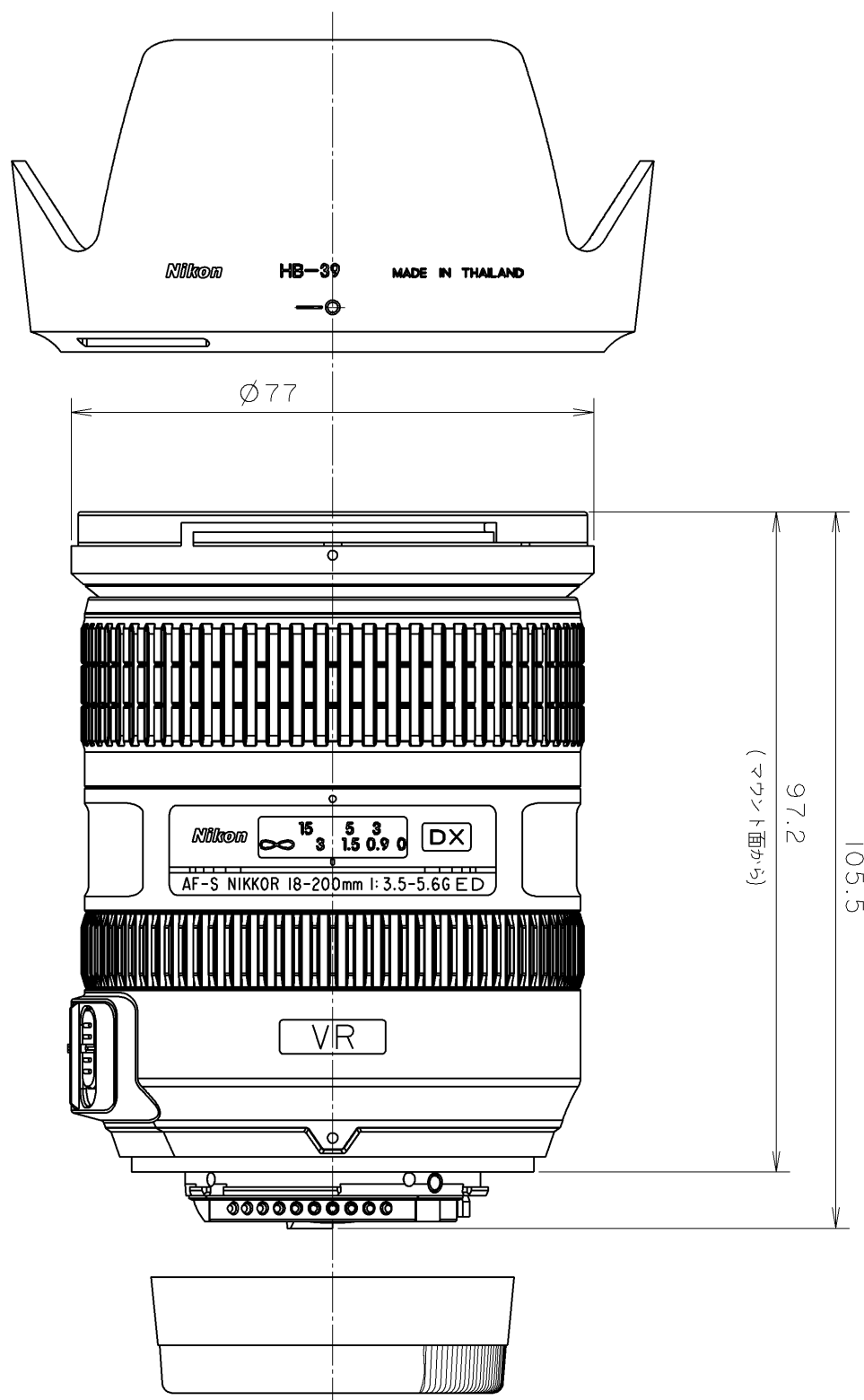
If it is not still in focus even after repetition, the written value in EEPROM may be abnormal. So click "Design value Rewriting" to write the initial value, then proceed with the operations.



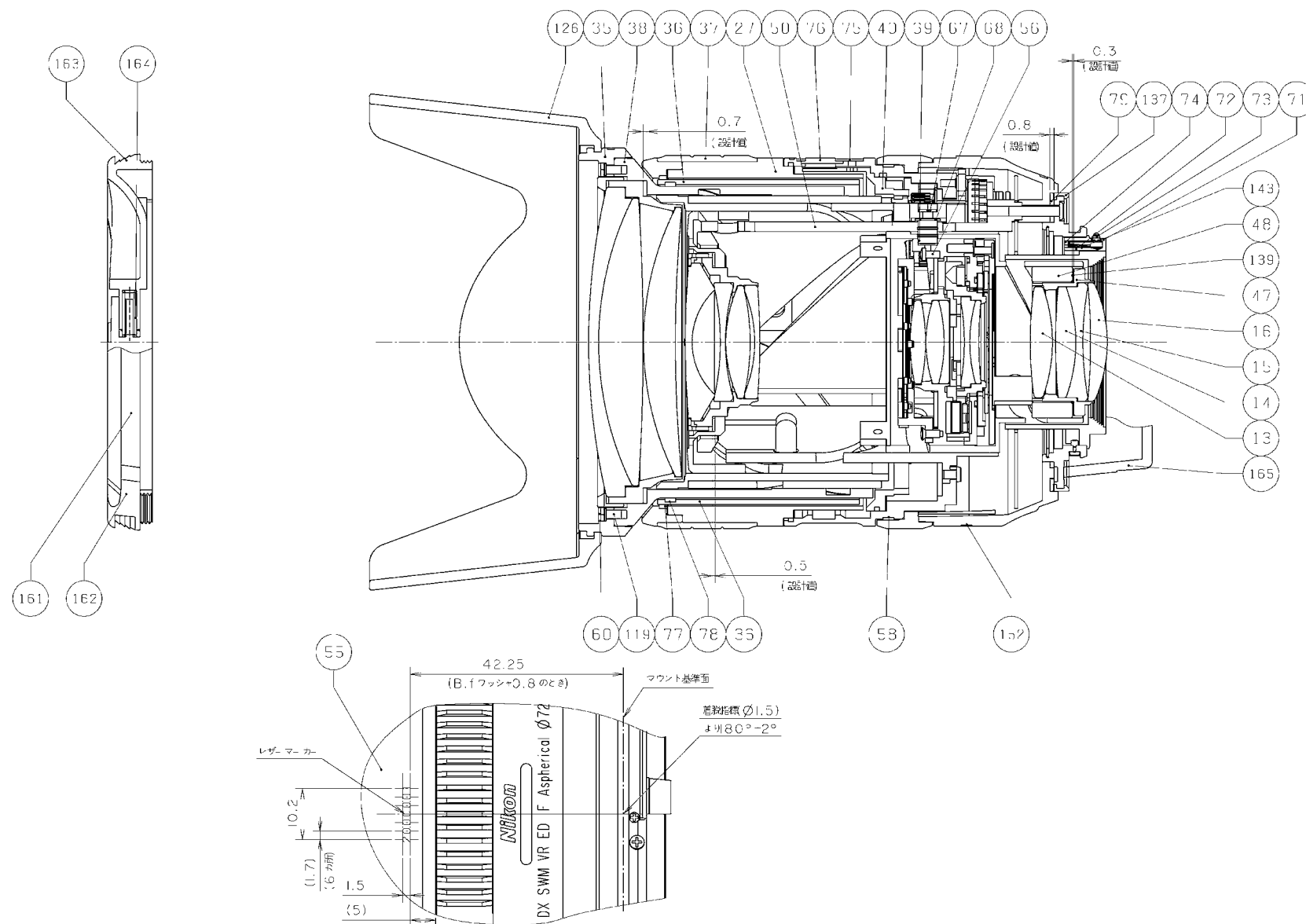
実体配線図
WIRING

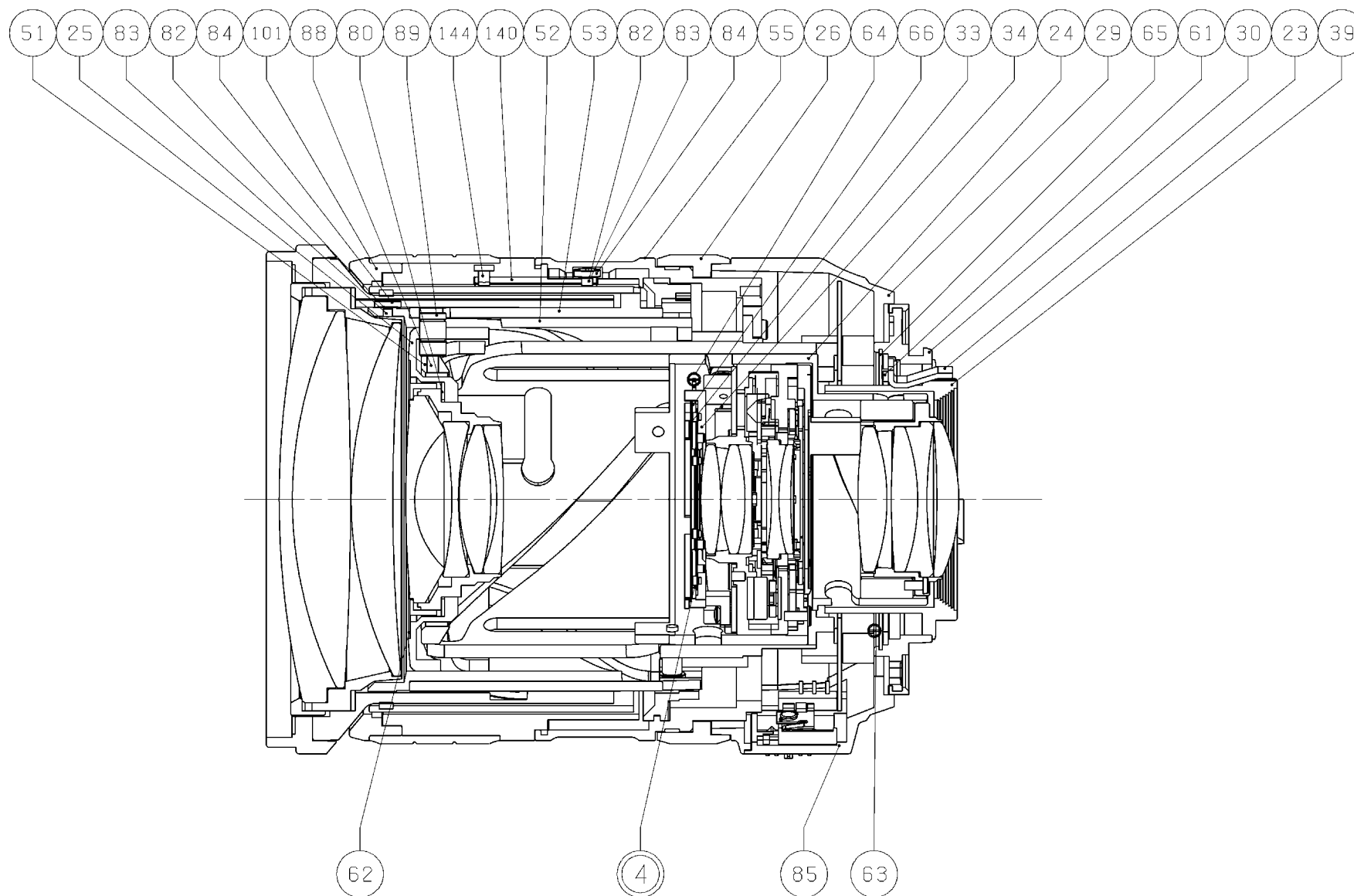


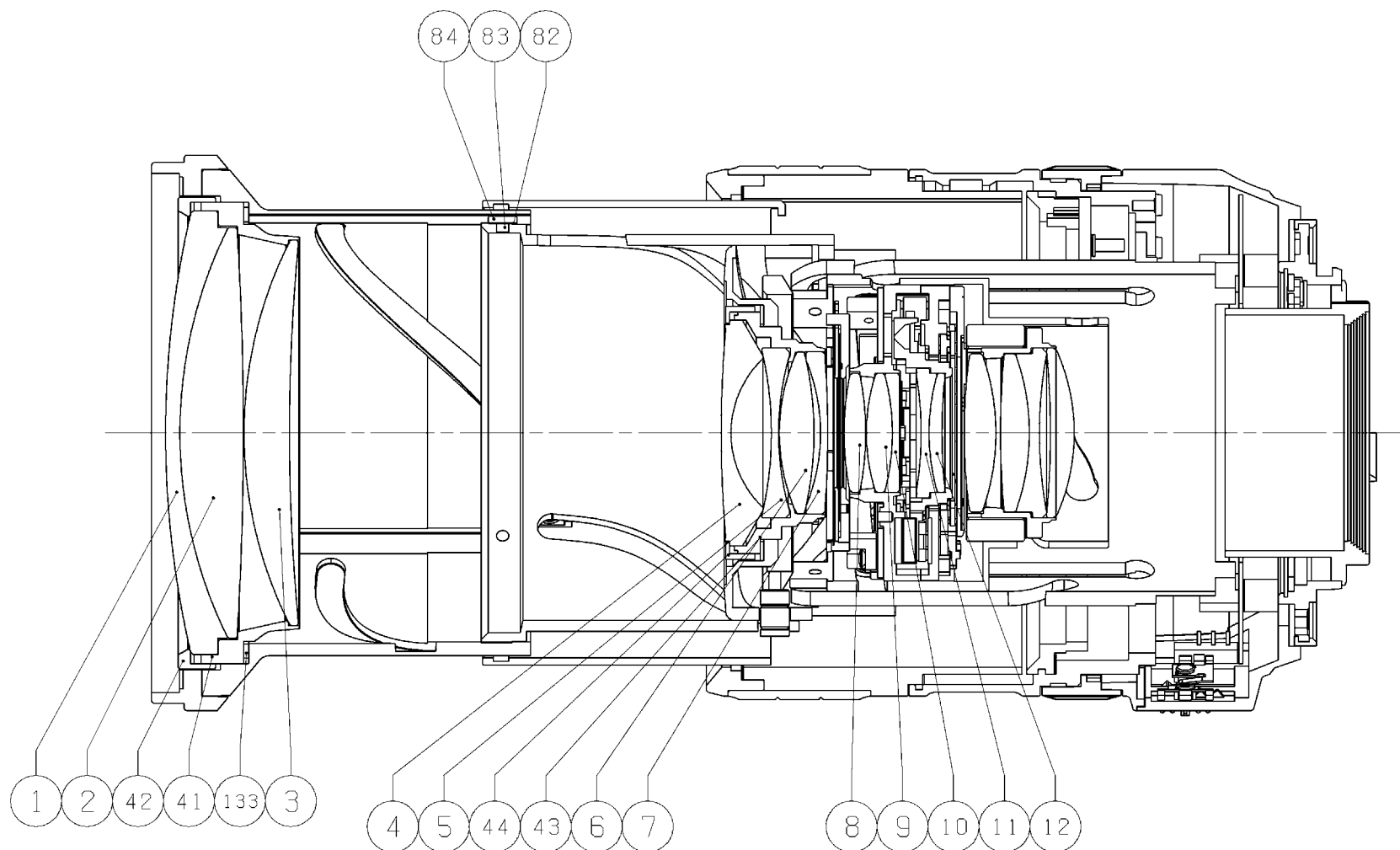
外観図 Sketch Drawings



組立図 Structure of the Lens

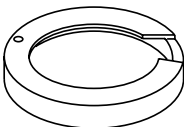
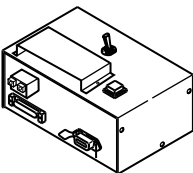
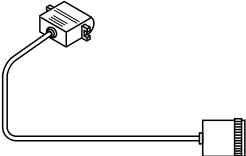
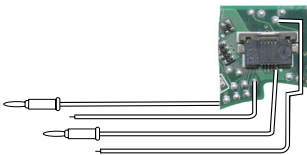




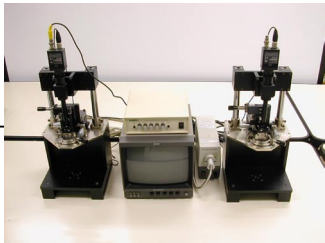


工具編 TOOLS

★ : NEW TOOL

RJ 番号 RJ No.	名称 NAME OF TOOL	備考 OTHERS
J19002 	縦型焦点面検査器 LT-500S BACK FOCUS COLLIMATER LT-500S	
J9001-5N	安定化電源 5 A DC REGULATED POWER SUPPLY 5A	
J18028 	F 用レンズ受け台 LENS ADAPTER FOR FOCUS TESTER	
★ J18398 	AF-S VR 18-200 点検・調整ソフト ADJ.FD FOR AF-S VR18-200 (IBM 3.5)	
J18004-1 	J 1 8 0 0 4 用基準ゲージ STANDARD GAUGE FOR J18004	
J15306-1 	A F - I 通信ボックス AF-I LENS COMMUNICATION BOX(CE)	
J15307 	A F - I 通信アダプター COMMUNICATION ADAPTER FOR AF-I	
★ 自作工具 	自作工具 SELF-MADE TOOL	
★ J11317 	2 群回螺器 WRENCH FOR 2G AF-SVR18-200	
★ J11318 	2 群押さえ工具 RETAINING TOOL FOR 2G AF-SVR18-200	
★ J18399 	VR 調整ソフト (AF-S 18-200VR) VR ADJ.FD FOR AF-S 18-200VR	

△
(Addition)
★

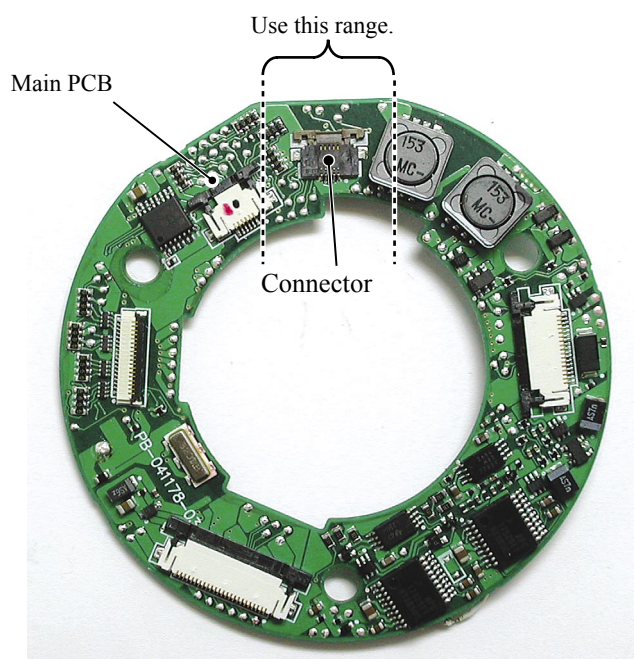
RJ 番号 RJ No.	名称 NAME OF TOOL	備考 OTHERS
△ (Revise) J18379 J18401 	△ (追加) AFS18-200 調芯装置用調整ソフト (LWM) △ (Addition) AFS18-200ADJ.FD (LWM)FOR LENS ALIGNMENT	△ (Revise) Ver.1.1.0.7 or later Ver.1.1.0.8
工具設定なし RJNo. is not available 	鉛フリーはんだコテ LEAD FREE SOLDERING IRON	
J5400 	鉛フリー系はんだ RMA02(M705) 0.5MMX500G ECO SOLDER RMA02(M705) 0.5MMX500G	
J19125 	周辺用調芯装置 (モニター、光源付き) LENS ALIGNMENT EGNIP FOR PERIPHERY	
J19126 	センター用調芯装置 LENS ALIGNMENT EGNIP FOR CENTER	
★ J19127P 	18-200 用ホルダー ATTACHMENT FOR HOLDER 18-200	
J19128 	調芯装置用チャート LENS ALIGNMENT CHART	
J19128A 	ライトビューワー (J19128 用) LIGHT VIEWER (J19128)	
J19129 	調芯装置用スライドレール LENZ ALIGNMENT EQUIP.SLIDE RAIL	
工具設定なし RJNo.is not available	オシロスコープ OSCILLOSCOP	
I-40	A F レンズ用グリース (I - 4 0) GREASE FOR AF LENS	
EDB0011	ネジ ロック (赤) 1401C SCREW LOCK 1401C	
C-8008B	セメダイン (黒) CEMEDAIN 8008(BLACK)	
MZ-800S	ドライサーフ MZ - 8 0 0 S DRY SURF MZ-800S	



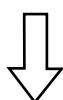
Making of Self-made Tool

- To inspect and adjust the output waveform of MR encoder, it is necessary to make a self-made tool by using the main PCB (IS020-426) of repair parts. (If there is a defective main PCB after replacements/repairs, use the defective one.)

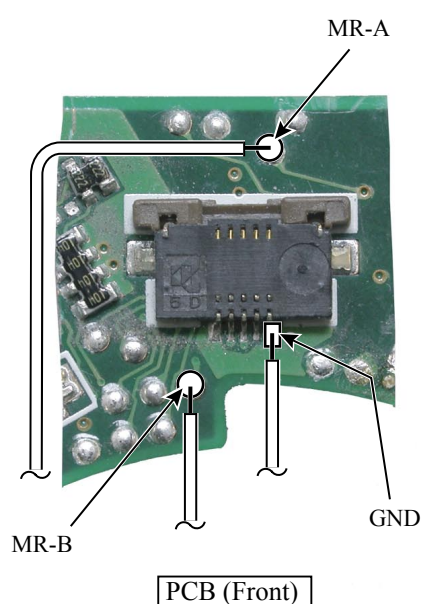
Make a self-made tool according to the following procedure.



- ① Remove the mounted parts/elements (condenser, transistor, IC, etc.) from the both faces of the PCB within the range of the dotted lines. (See the left.) Do not remove the connector. (The parts/elements are not always needed to be removed, if they are not affected by the next cutoff or soldering.)
- ② Cut off the PCB along the dotted lines.



- ③ Solder the three wires on the pattern of the front-side PCB.



- ④ Solder the one wire on the pattern of the back-side PCB.

