INC

JAA80051-R.3741.A

作成承認印	配布許可印
ニコン映像カンパニー 品質保証部 GM	サービス 計画課 M

AF-S DX Nikkor 16-85mm f/3.5-5.6G ED VR

JAA80051

REPAIR MANUAL

Nikon | NIKON CORPORATION
Tokyo, Japan

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※ Before Disassembly / Reassembly / Adjustment

This lens will require optical lens alignment after assembly, in case the 4th lens-group unit is removed.
At repair service facilities, therefore, where this alignment work can not be performed, do NOT remove the 4th lens-group unit.

This lens also has the VR (vibration-reduction) unit mounted in order to correct camera shake.
To keep the accuracy of this function for stabilizing the image, in case VR unit or the main PCB is replaced, be sure to make the VR adjustment by using the VR lens adjustment equipment (J15380).
Except for disassembling the above components, the VR adjustment is NOT necessary, but check VR operations by attaching this lens to the camera.
At repair service facilities where the "VR lens adjustment equipment" is not prepared, do NOT disassemble NOR repair the products of the above cases.

Caution:

- **When disassembling/(re)assembling, be sure to use the conductive mat (J5033) and wrist strap (J5033-5) for static protection of electrical parts.**
- **When disassembling, make sure to memorize the processing state of wires, screws to be fixed and their types, etc.**
- **Because prototypes are used for "1. Disassembly" and "2. Assembly/Adjustment", they may differ from the actual products in forms, etc.**
- **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.

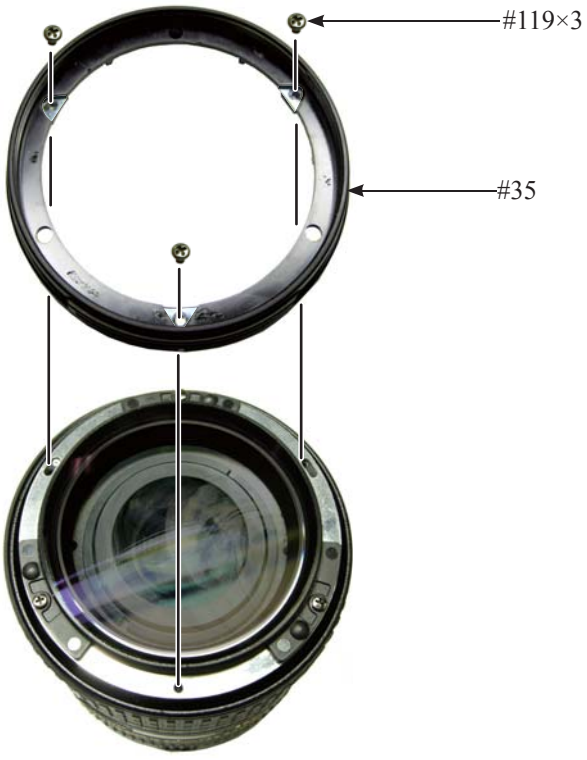
1.Disassembly

Protection sheet

・Peel off the protection sheet (#60) by inserting tweezers from the outside into the cutout of attaching face as below.

Filter ring

・Take out the three screws (#119) and remove the filter ring (#35).

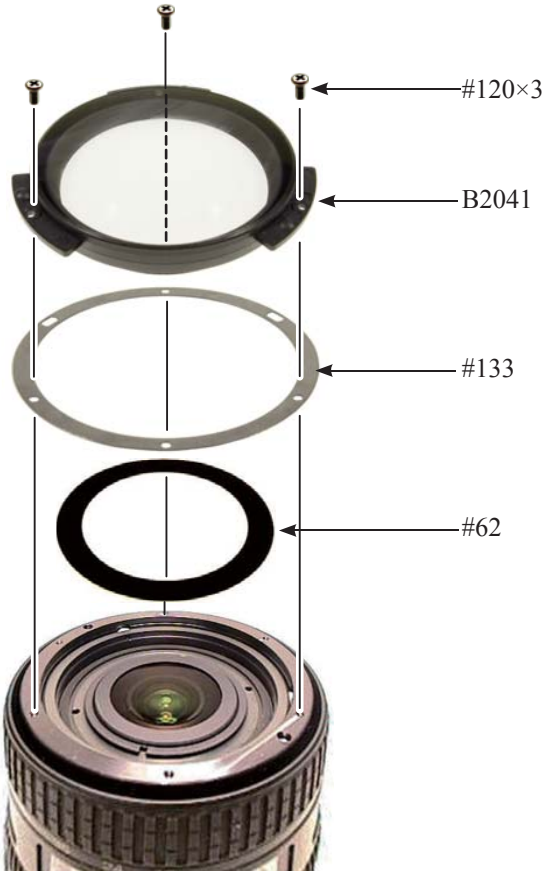


1st lens group unit

・Set the zoom ring to WIDE.

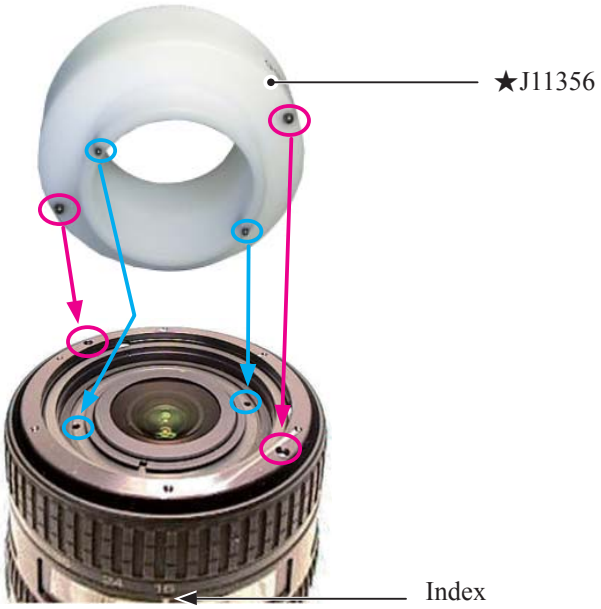
・Take out the three screws (#120) and remove the 1st lens-G unit (B2041) and washer (#133).

・Peel off the sheet (#62).



2nd lens group unit

- Set the zoom ring to WIDE-end.
- Set the focus index (#49) to "∞" position.
- Mount the fixing tool for 2nd lens-G (★ J11356) by fitting its protrusions in the holes of the 1st lens-G cam ring (#38) and the 2nd lens-G cam ring (#25).



- Insert the wrench for the 2nd lens-G (★ J11358) into the 2nd lens-group unit (B2043).

・Turn the wrench for 2nd lens-G (★J11358) counterclockwise, and remove the 2nd lens-group unit (B2043).

Name plate/Focus window

・Remove the rubber ring (#37).

・Remove the name plate (#75) and focus window (#76).

Caution: Remove the name plate (#75) and focus window (#76) ONLY when they must be replaced because of defects, etc.

VR name plate / Serial No.label

・Remove VR name plate (#69) and serial number label (#168 or #169).

Caution: Remove VR name plate (#69) and serial number label (#168 or #169) ONLY when they must be replaced because of defects, etc.

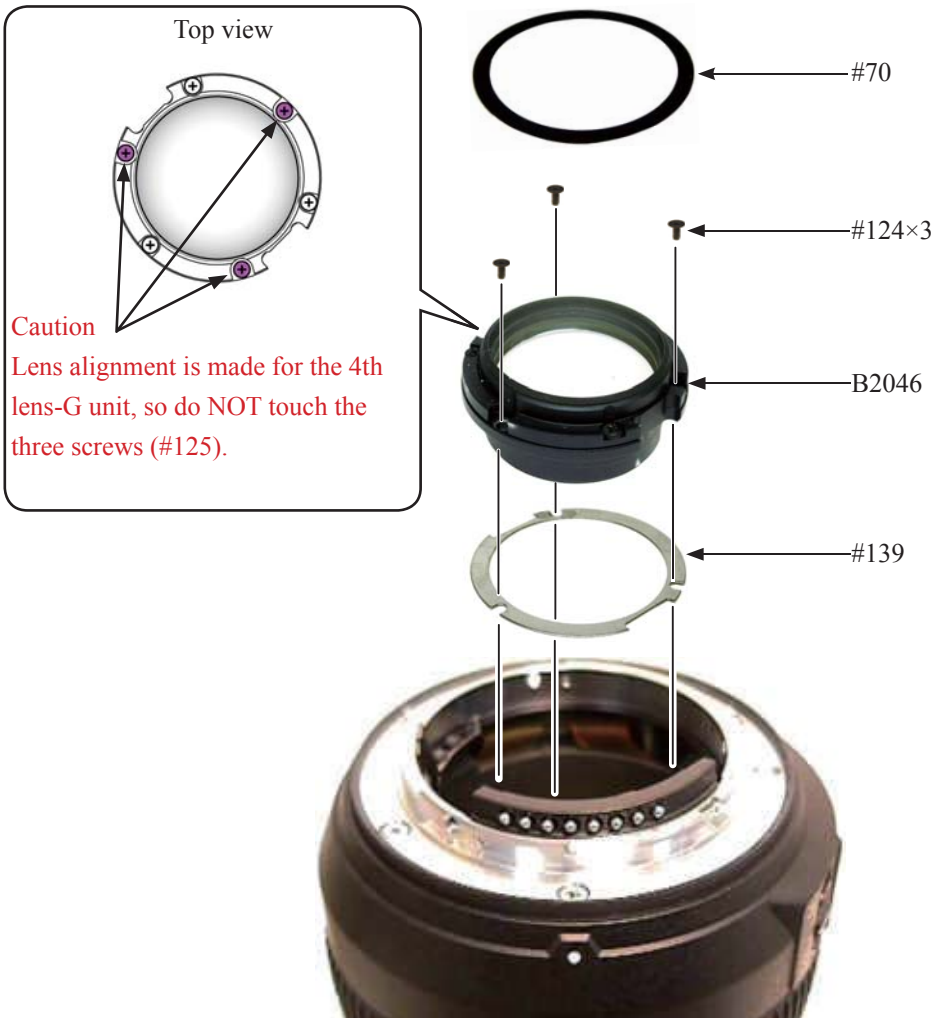
Rear cover ring

・Take out the three screws (#118) and remove the rear cover ring (#39).

4th lens-group unit

Caution: When the 4th lens-group unit is removed, the lens alignment work will be necessary after assembly. Therefore, at service facilities where the alignment work can not be performed, do NOT remove the 4th lens-group unit.

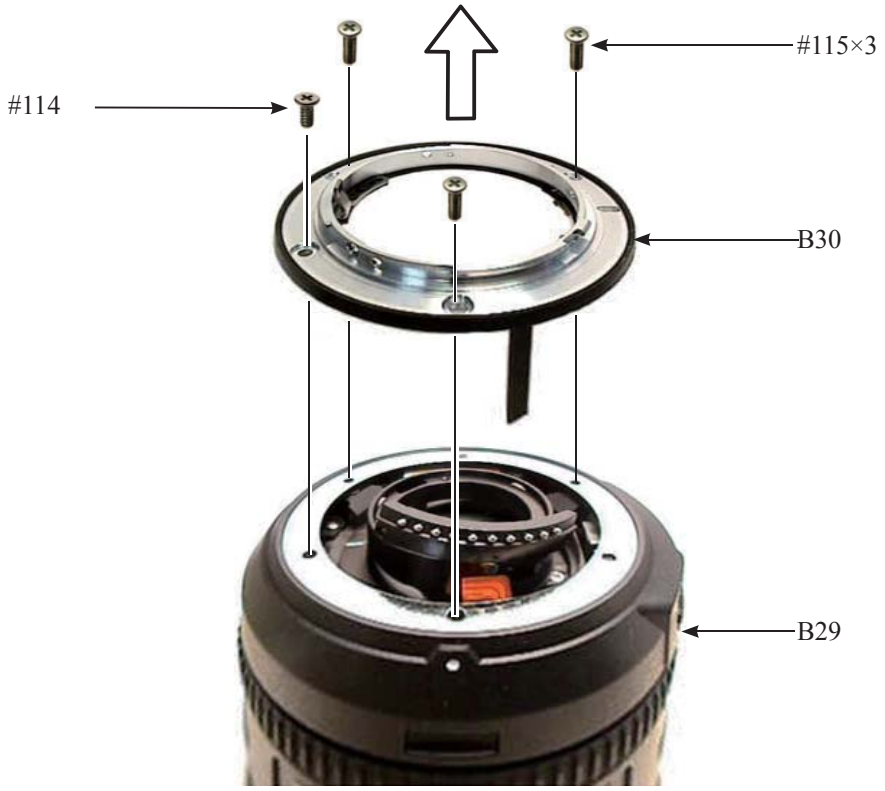
- Set the zoom ring to WIDE.
- Peel off the sheet (#70) from the 4th lens-G unit (B2046).
- Take out the three screws (#124), and remove the 4th lens group unit (B2046) and washer (#139).



- Take out the two screws (#117).

Bayonet mount unit

・Take out the three screws (#115) and the one screw (#114), and remove the bayonet mount unit (B30).



Caution:

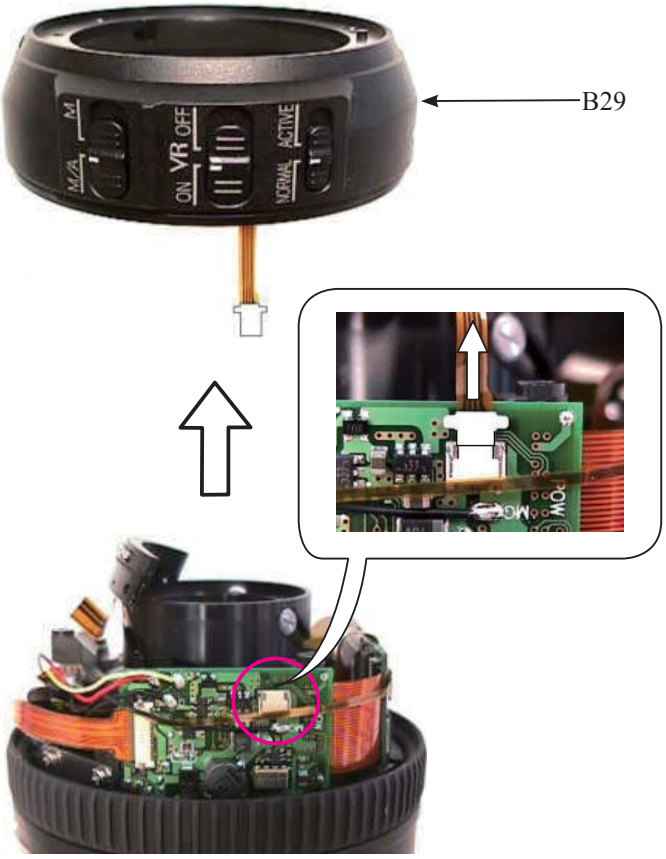
Do NOT remove the bayonet mount unit (B30) and the rear fixed tube unit (B29) together.

The main PCB is connected by the FPC of the rear fixed tube (B29), so do NOT pull the FPC by force. Otherwise the FPC will be damaged.

・Remove the washer (#79).

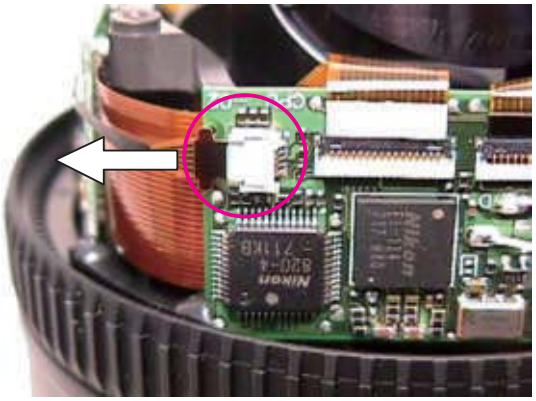
Rear fixed tube unit

・Disconnect the FPC of the rear fixed tube unit (B29) from the connector of the main PCB (B1001).
・Remove the rear fixed tube unit (B29).



Main PCB

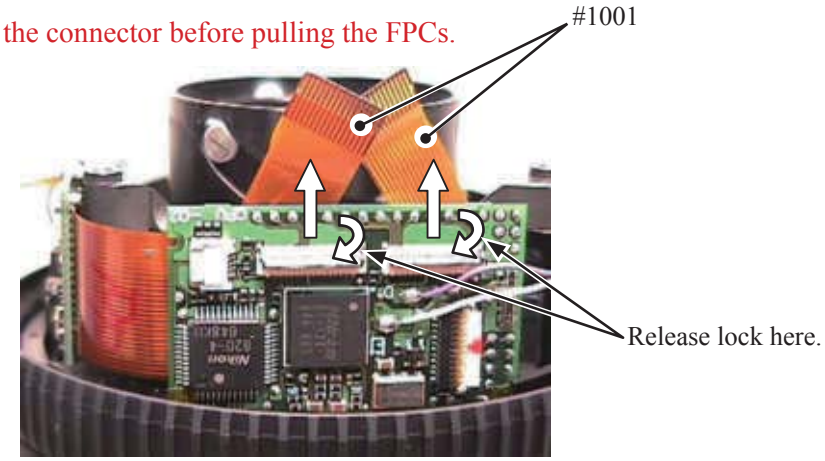
・Disconnect the FPC of GMR unit (#1011) from the connector of the main PCB (B1001).



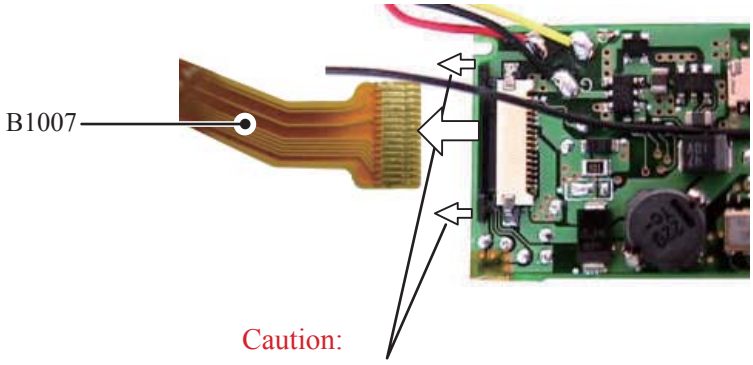
・Disconnect the connection-FPC (#1001) from the connector of the main PCB (B1001).

Caution:

Be sure to release the locks of the connector before pulling the FPCs.



・Disconnect the FPC of the contact unit (B1007) from the connector of the main PCB (B1001).



Caution:

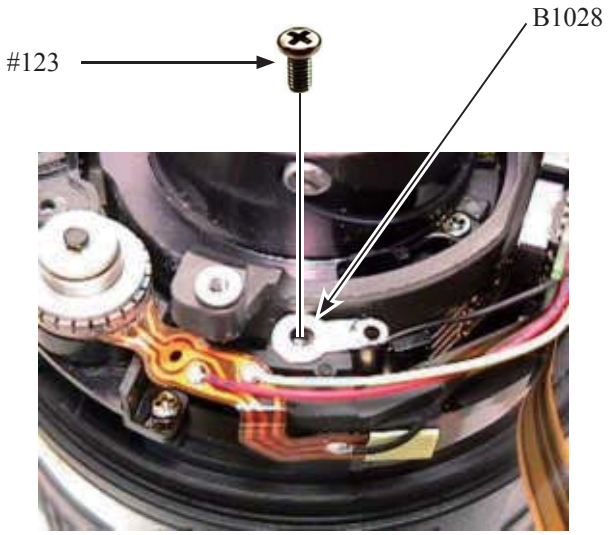
Be sure to release the locks of the connector before pulling the FPCs.

MF ring

・Remove MF ring (#26).

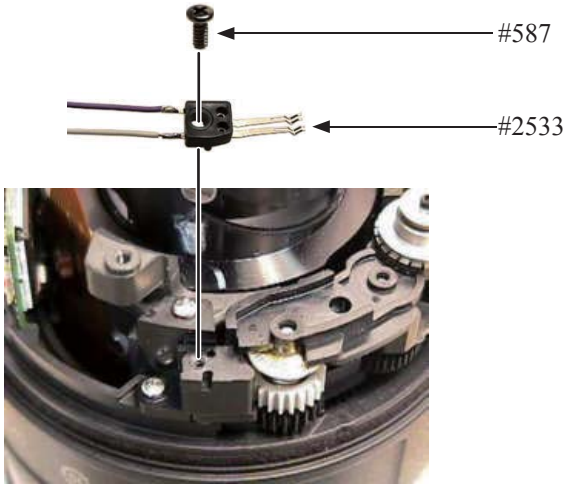
Lug plate unit

・Take out the screw (#123), and remove the lug plate unit (B1028).



MF brush unit

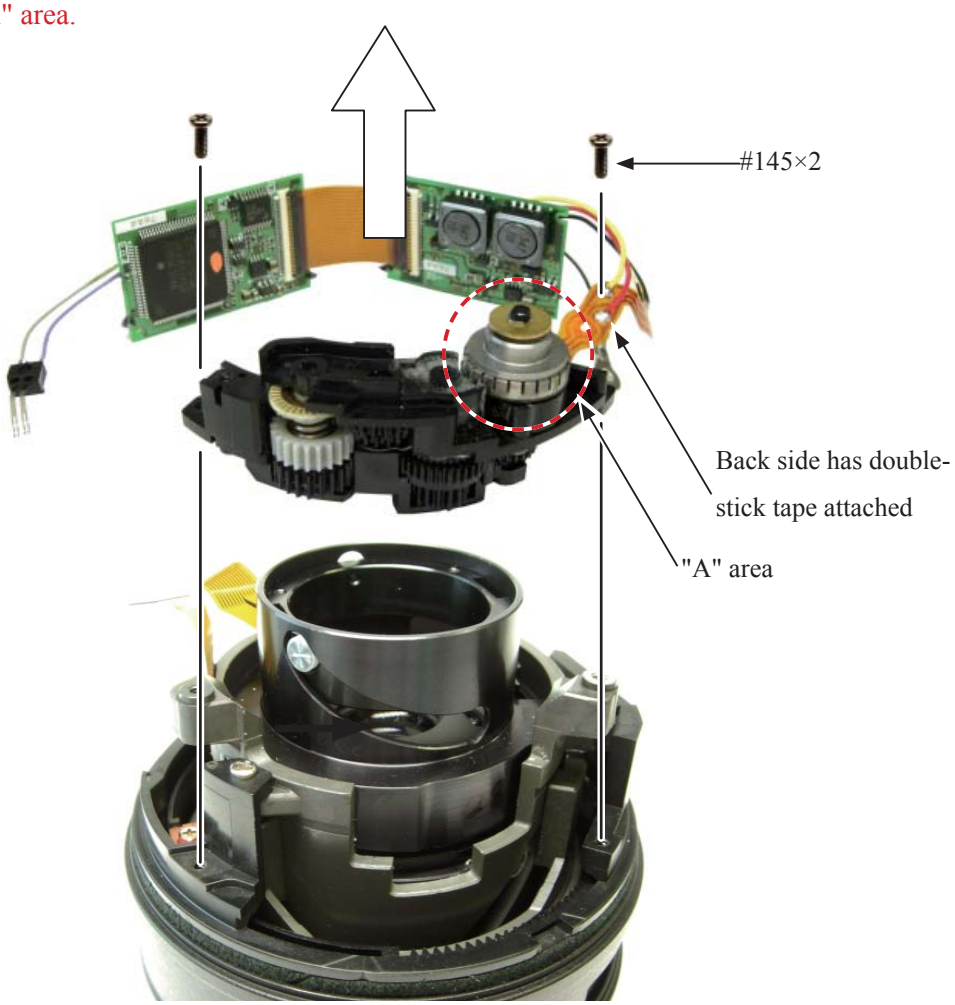
・Take out the screw (#587),and remove MF brush unit (#2533) from SWM unit.



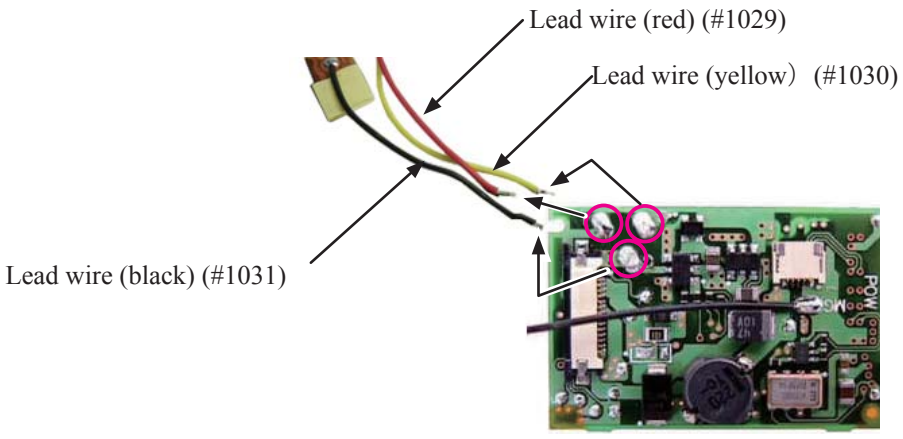
SWM unit

・Take out the two screws (#145), and remove SWM unit and main PCB (B1001).

Caution: Do NOT touch "A" area.



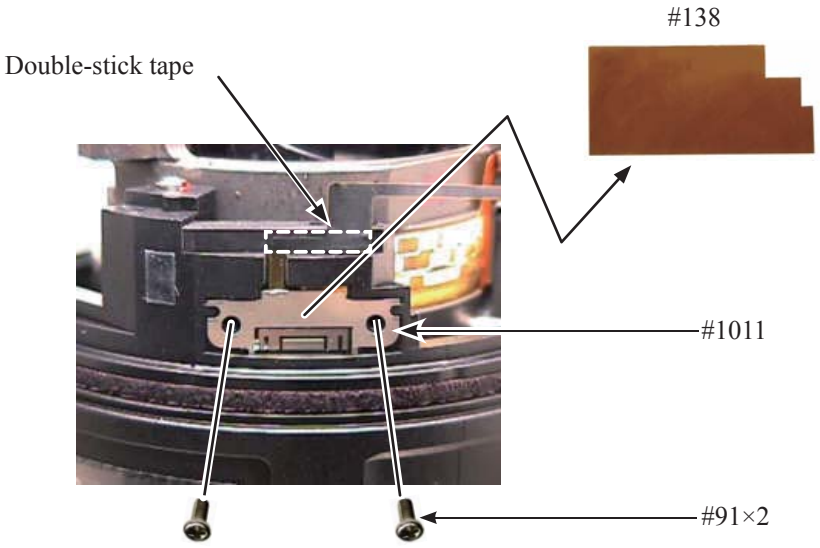
・Remove the three lead wires of SWM unit from the main PCB (B1001).



GMR sensor

・Peel off the tape (#138).

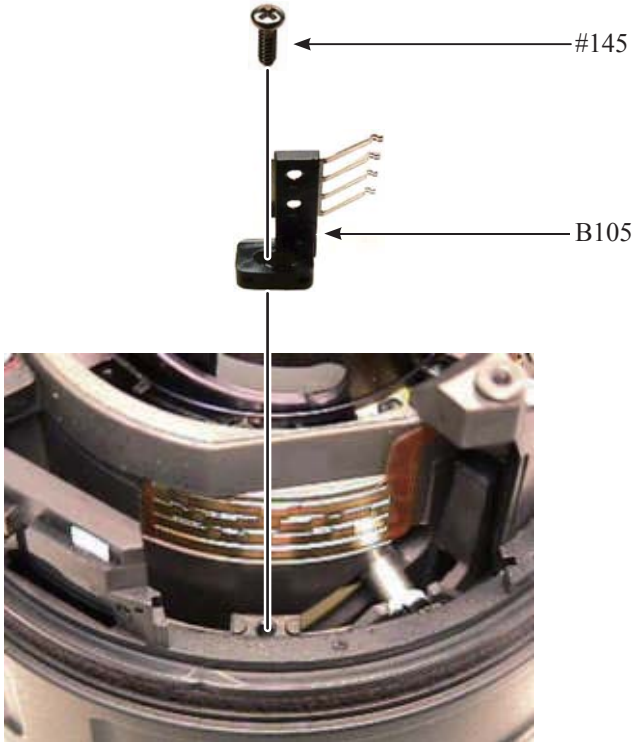
・Take out the two screws (#91). Remove the FPC from the double-stick tape and remove GMR sensor (#1011).



Focus brush

・Turn the focus brush in the direction of CLOSE.

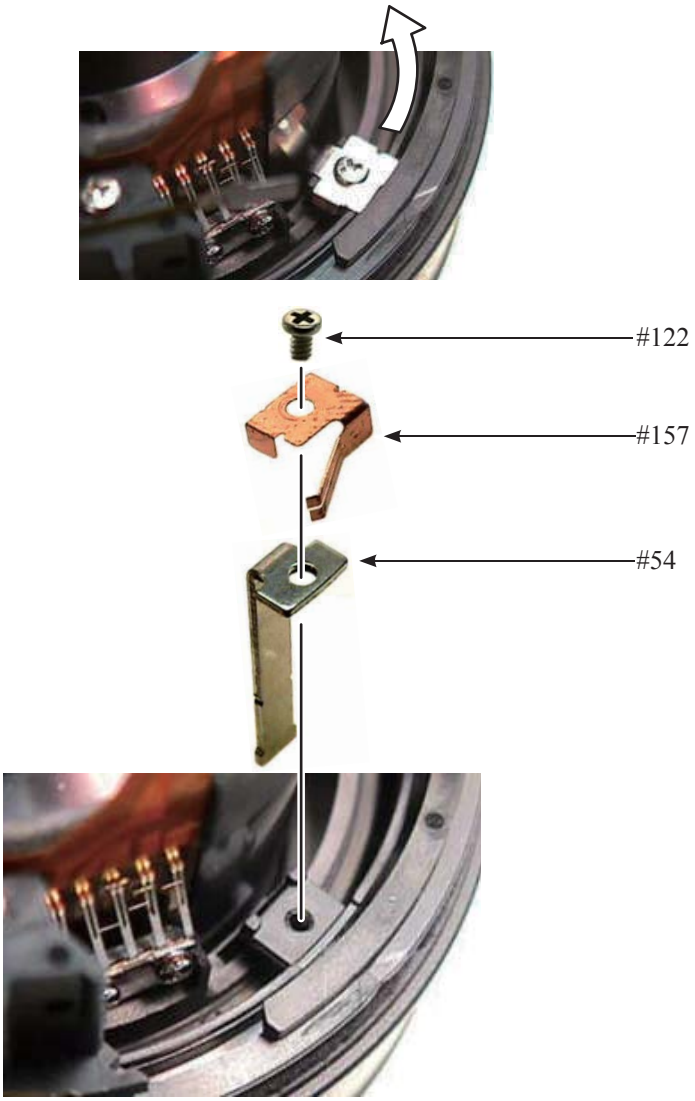
・Take out the screw (#145), and remove the focus brush (B105).



Focus key

・Move the key (#54) in the direction of the arrow.

・Take out the screw (#122), and remove the plate spring (#157) and focus key (#54).



Fixed ring unit

・Peel off the tape (#135).

Fixed ring unit (continued)

・Take out the two screws (#123),and remove △ (Revision) the zoom index ring ~~the fixed ring unit~~.

・Take out the screw (#144).

・Remove the zoom control key unit (B140) from the fixed ring unit.

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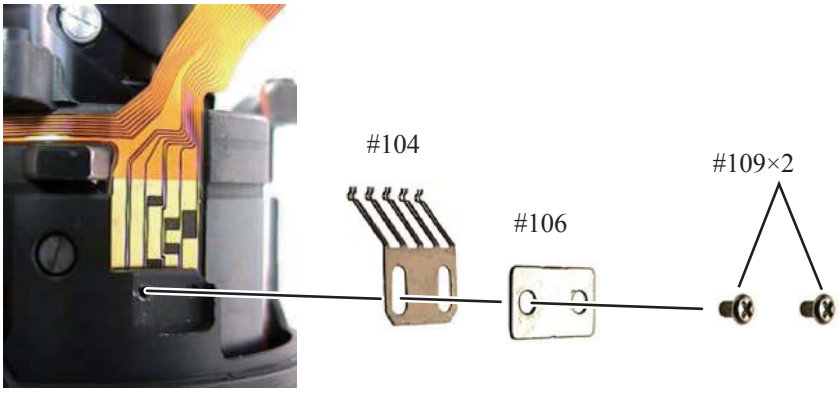
・Remove the zoom ring unit (B27) and gear unit (B40) from the fixed ring (#55).

Zoom brush

・Take out the two screws (#109), and remove the reinforcing plate (#106) and zoom brush (#104).



Cover ring unit

・Take out the three screws (#110).

Take out the screws carefully because sometimes the adjustment washer (#107) is put.

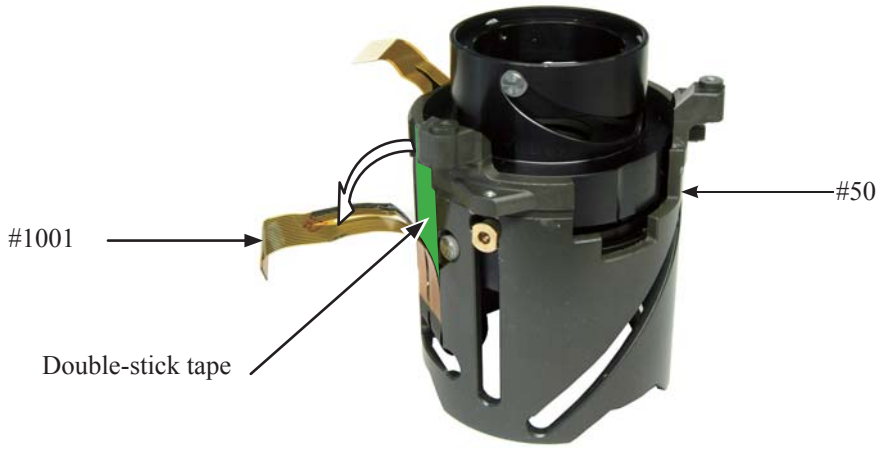
・Remove the cover ring unit (B36) and support ring unit (B101).

Fixed tube

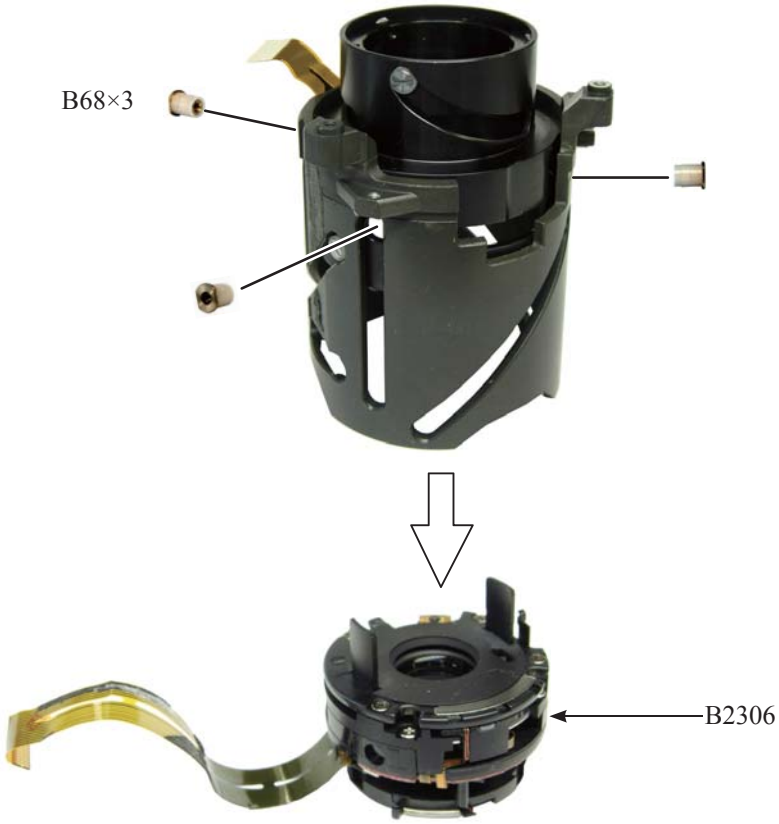
・Take out the three screws (#67), and remove the fixed tube (#50) from the 2nd lens-G straight ring (B52).

VR unit-assembly

・Remove the connection-FPC (#1001) from the double-stick tape adhered to the fixed tube (#50).



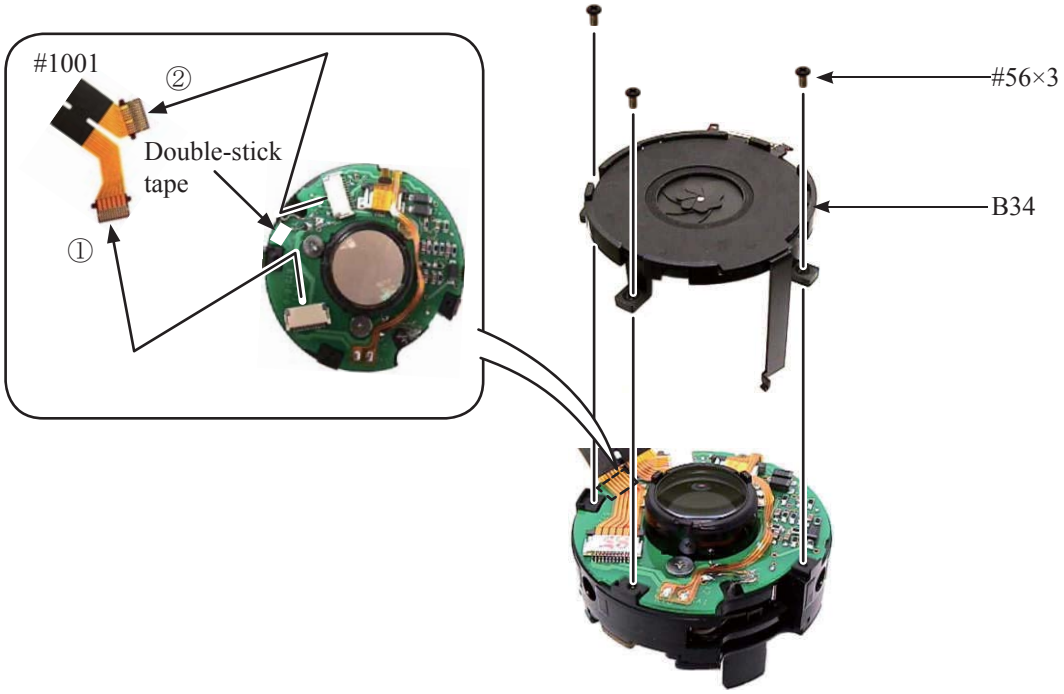
・Remove the three roller units (B68), and detach VR unit-assembly (B2306).



Aperture unit

・Take out the three screws (#56), and remove the aperture unit (B34).

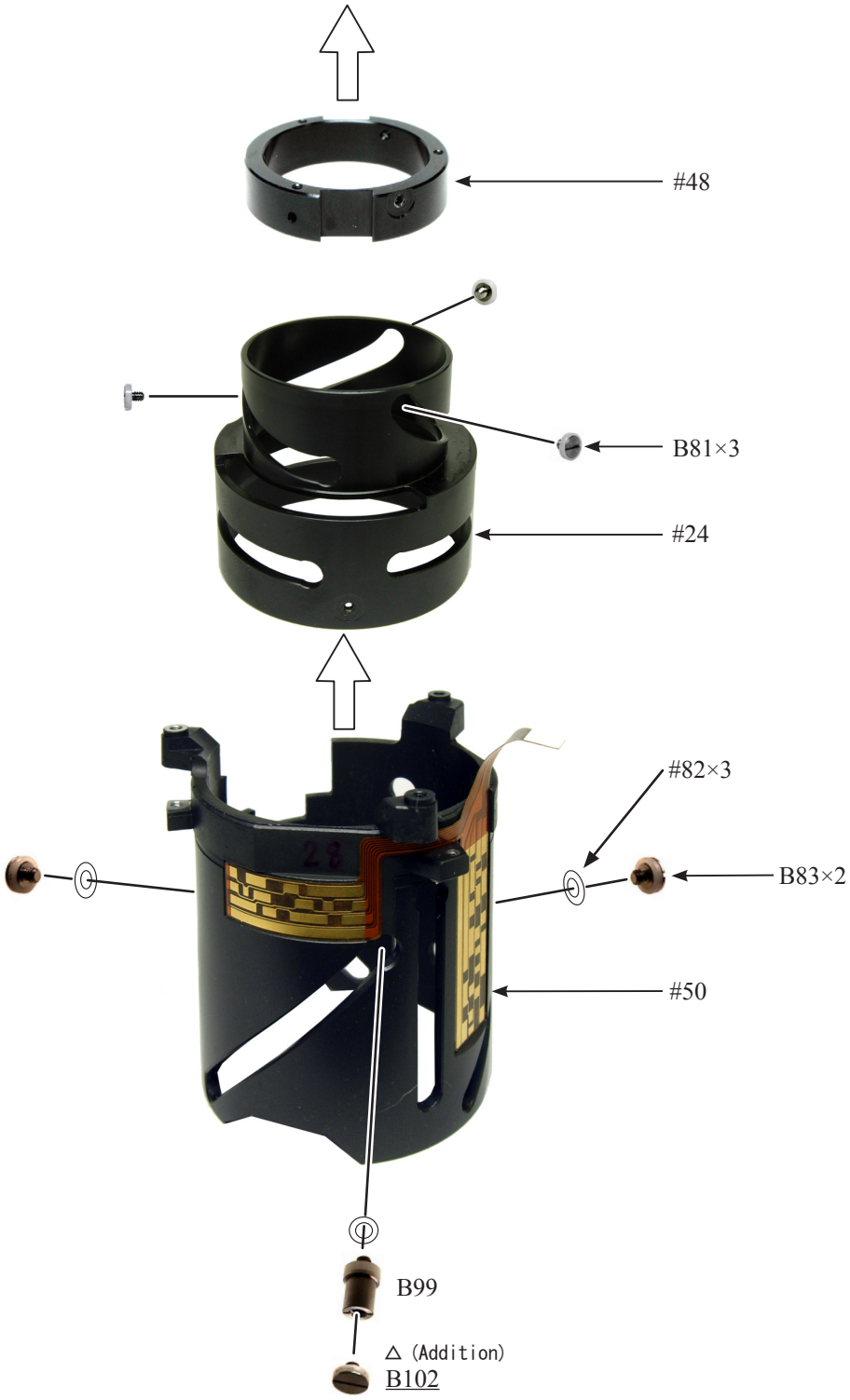
・Remove the connection-FPC (#1001) from the double-stick tape, and disconnect it from the connector of VR unit in numeric order from ① to ② .



4th lens-G sliding ring

・Remove the three roller units (B81), and remove the 4th lens-G sliding ring (#48) from the 3-4 lens-G cam ring (#24).

・Remove the two roller units (B83), roller unit (B99), △ (Addition) roller unit (B102) and three washers (#82), then remove the 3-4 lens-G cam ring (#24) from the fixed tube (#50).



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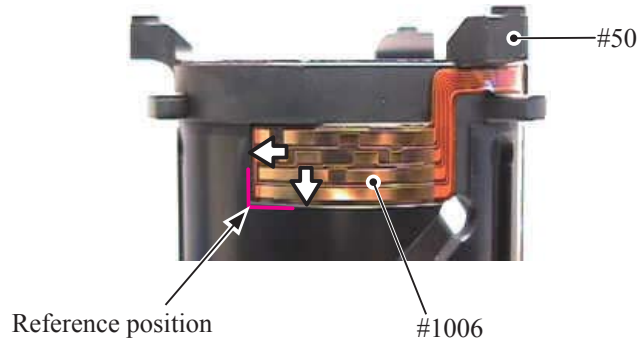
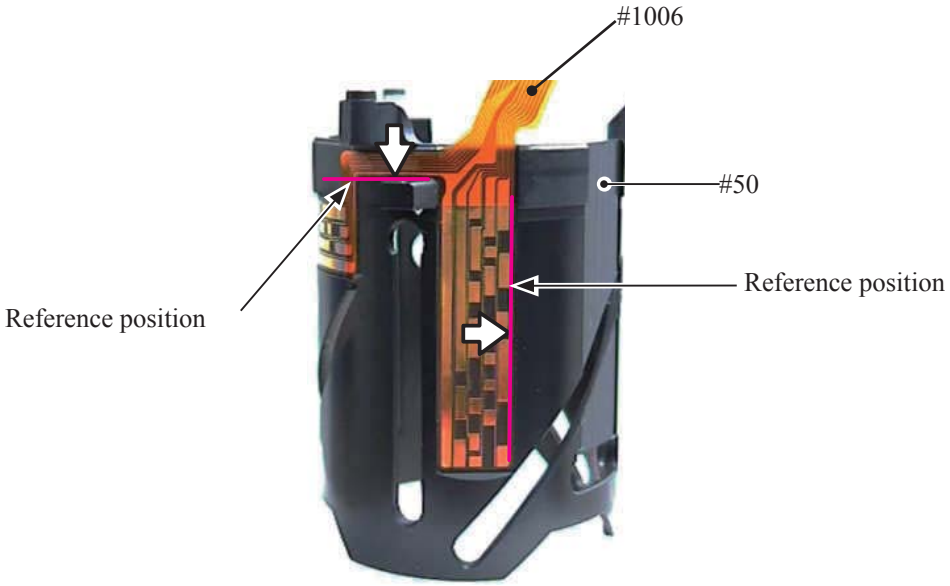
2. Assembly / Adjustment

Encoder FPC

・Place the encoder-FPC (#1006) on the fixed tube (#50) based on the below reference position, and attach it by pressing in the direction of the arrow for positioning.

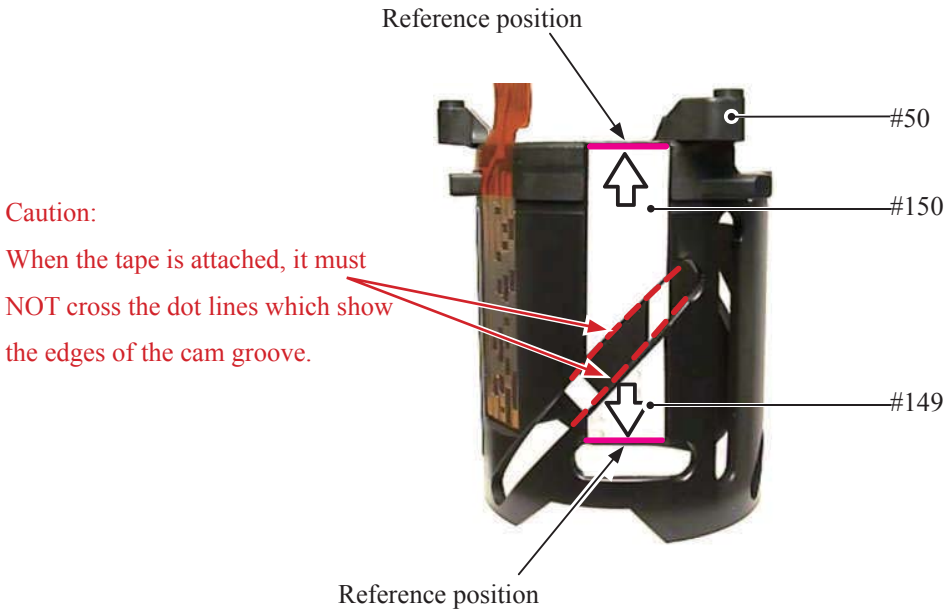


・Place the encoder-FPC (#1006) on the fixed tube (#50) based on the below reference position each, and attach it by pressing in the direction of the arrow for positioning.

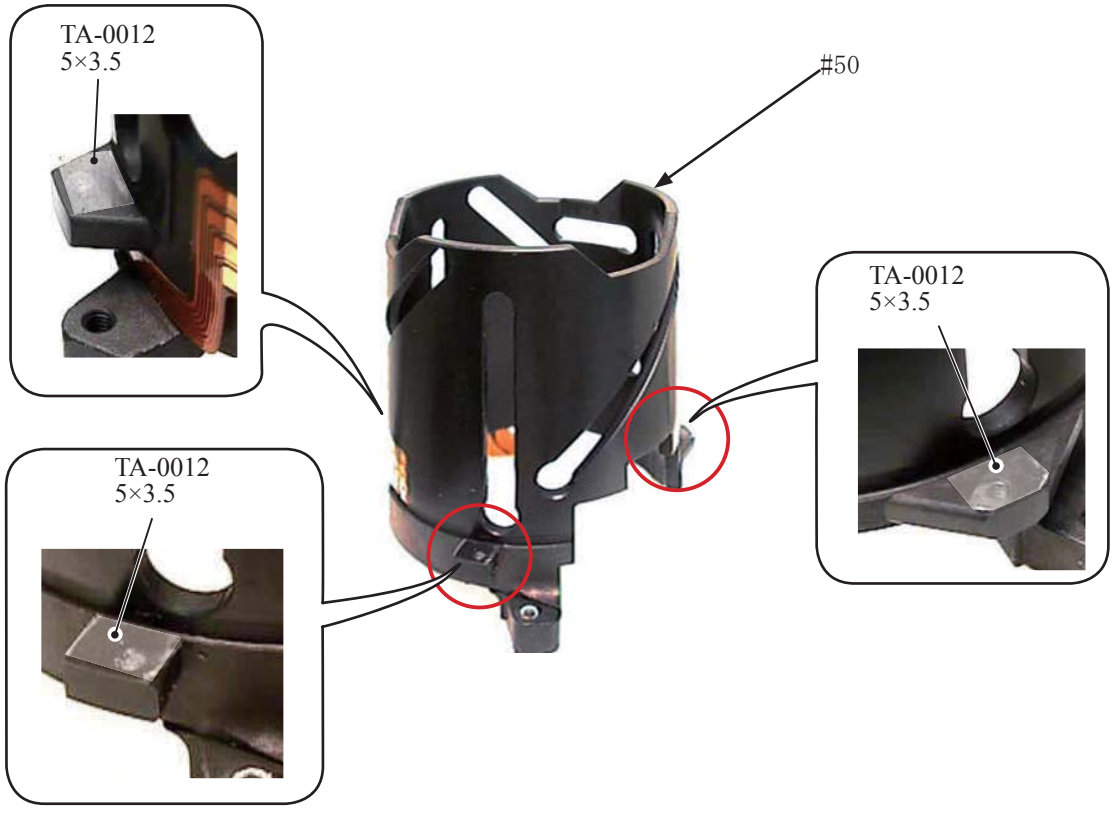


Tape

・Place the two pieces of the double-stick tape (#149 and #150) on the fixed tube (#50) based on the below reference position each, and attach it by pressing in the direction of the arrow for positioning.

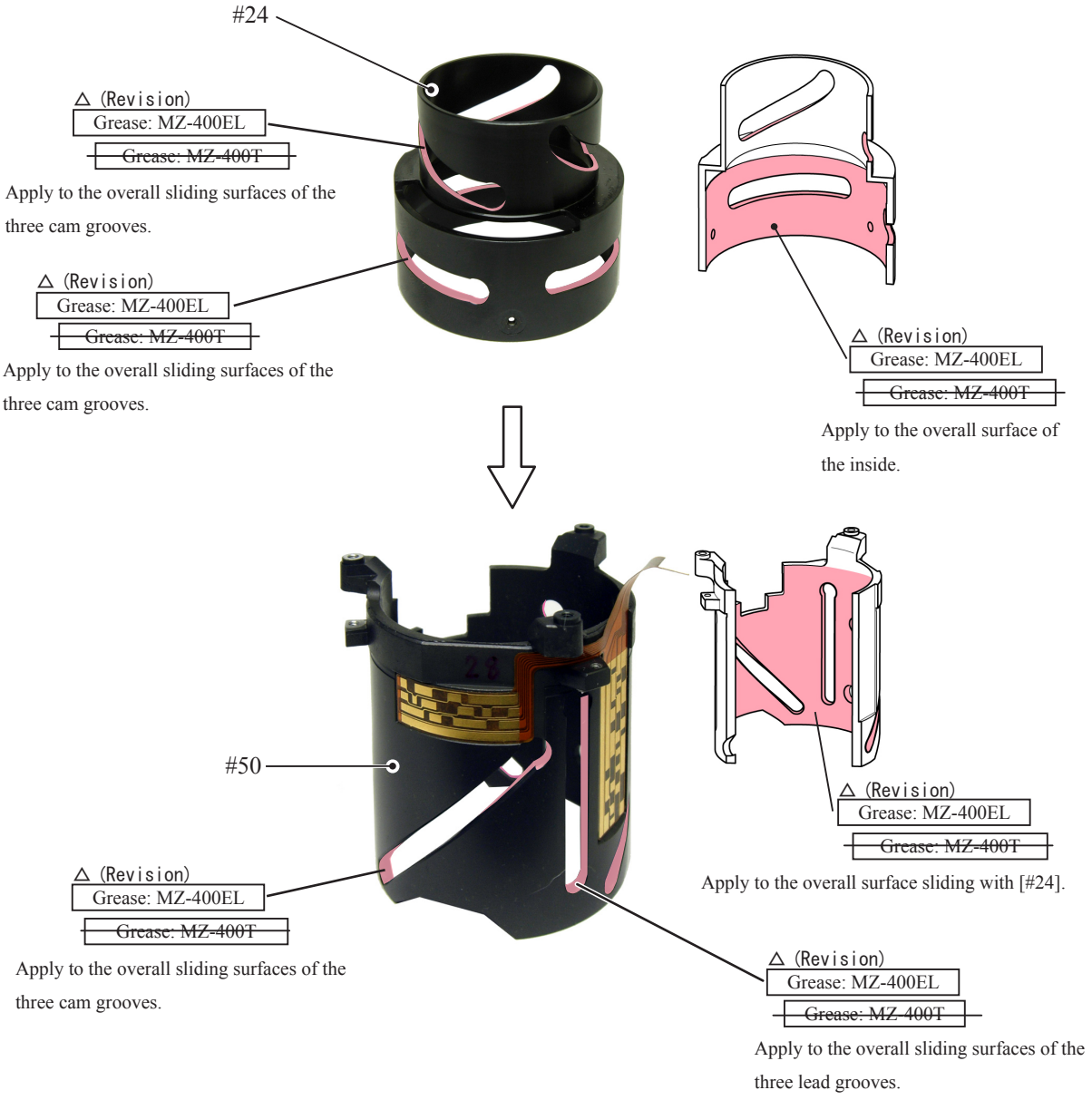


・Adhere the three pieces of the tape to cover the screw holes.



Fixed tube

・Assemble the 3-4 lens-G cam ring (#24) into the fixed tube (#50).



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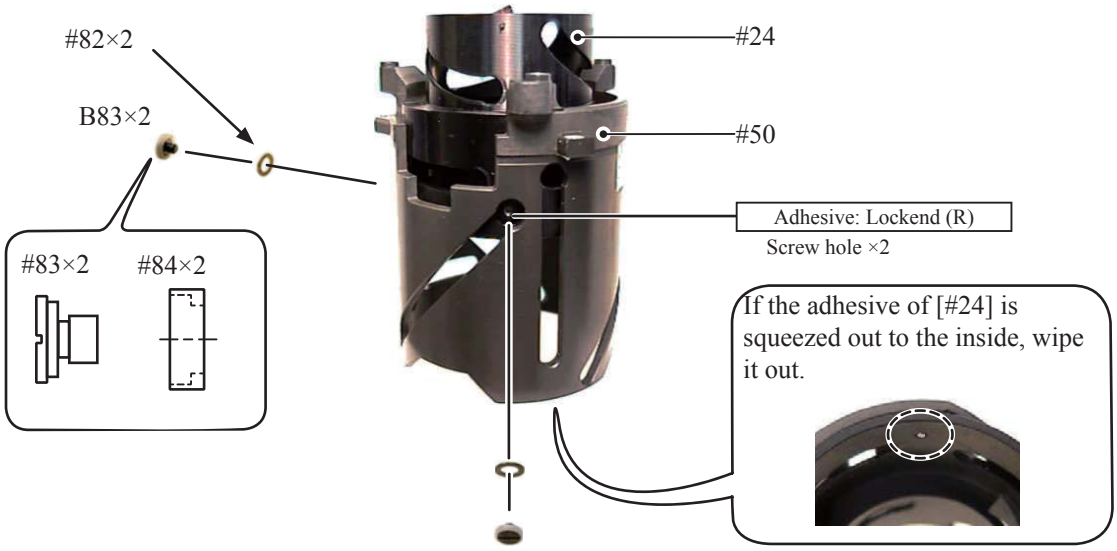
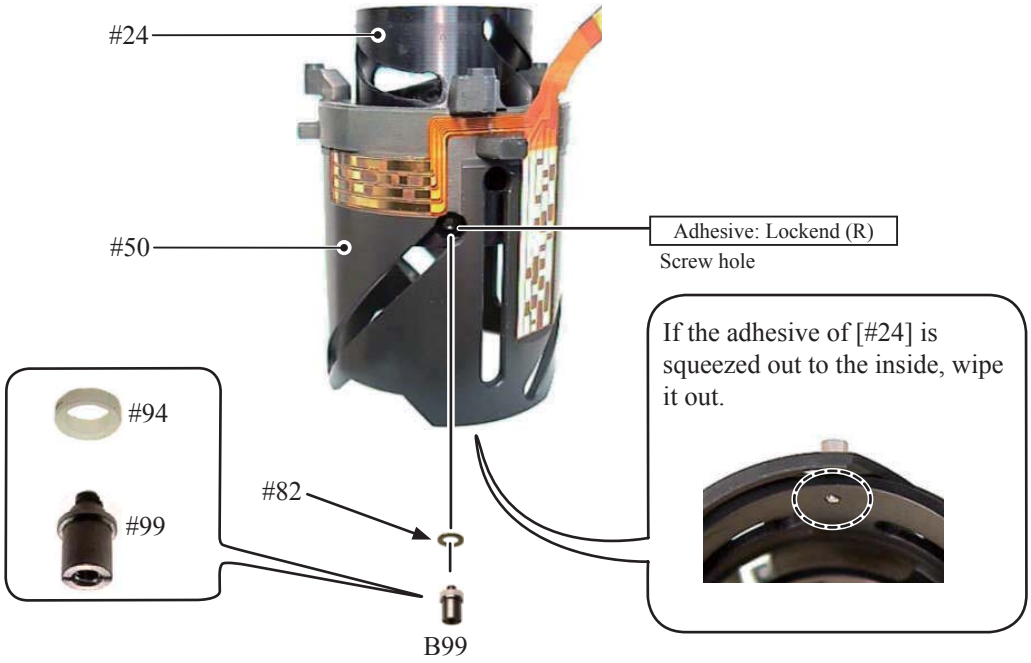
Roller unit

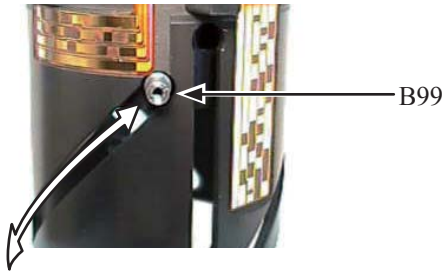
・Mount the 3-4 lens-G cam ring (#24) on the fixed tube (#50), and secure them with the two roller units (B83) and two washers (#82).



・Attach the roller unit (B99) and washer (#82) to the 3-4 lens-G ring (#24).

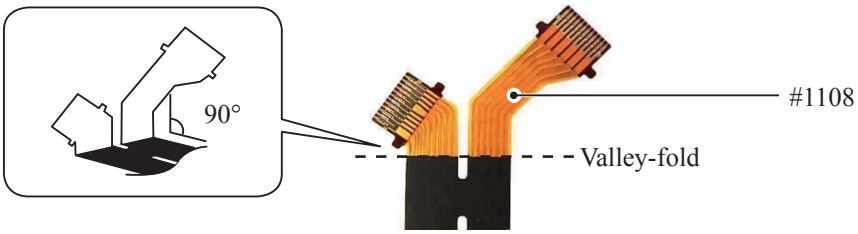


・Check the operations by sliding the roller unit (B99).



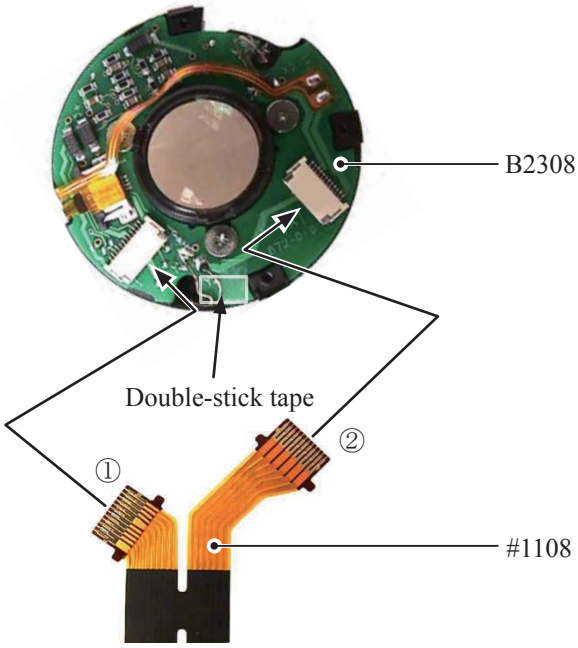
VR unit-assembly

・Make a valley-fold along the dotted line of the connection-FPC (#1108).

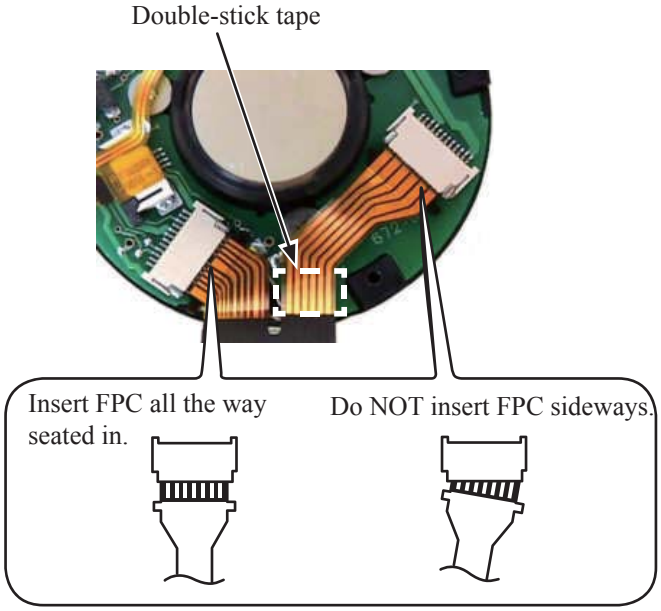


・Peel off the backing paper of the double-stick tape.

・Connect the connection-FPC (#1108) to the connector of VR unit-assembly (B2308) in numeric order from ① to ② .

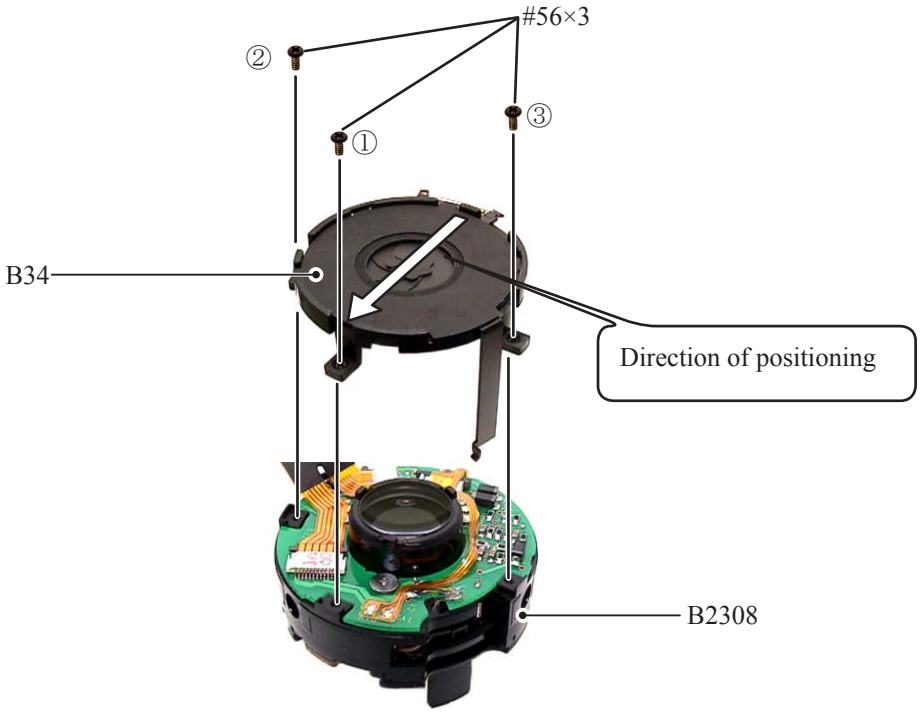


・Push the double-stick tape from above with the fingers to fixate the connection-FPC (#1108)

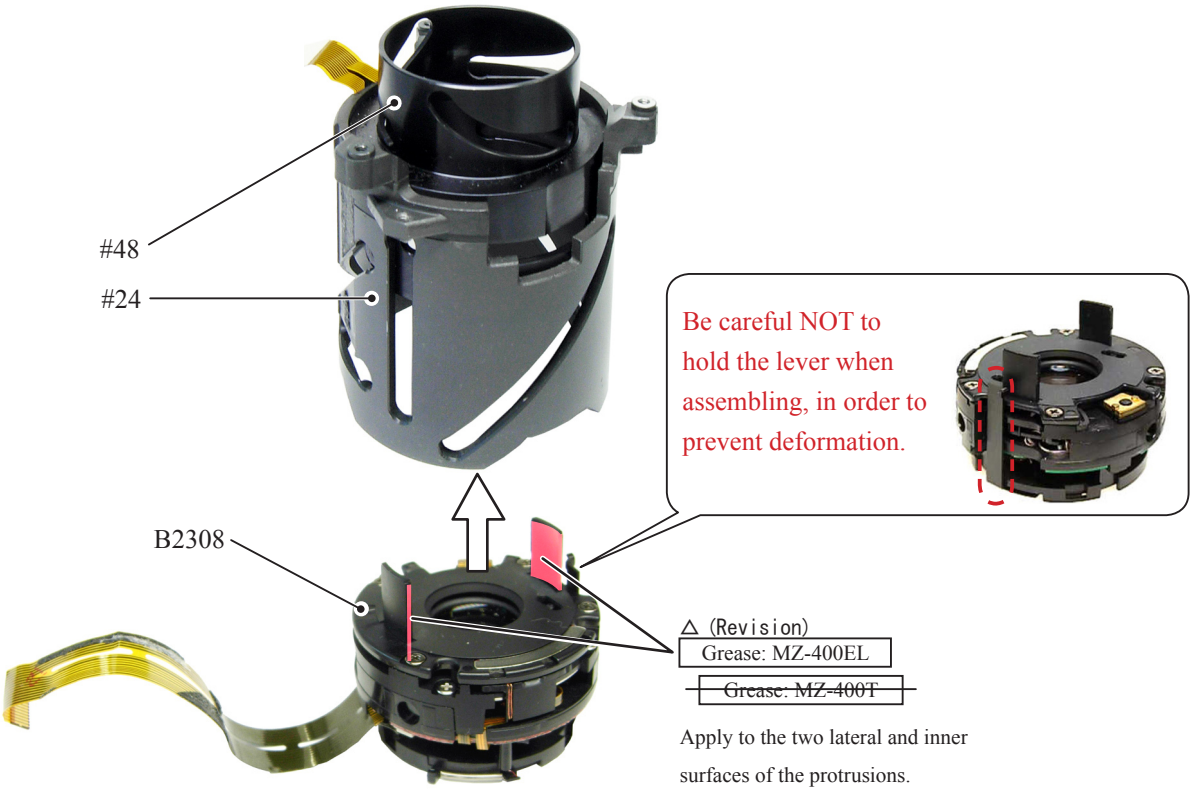


Aperture unit

・Position the aperture unit (B34) in the direction of the arrow, and tighten the three screws (#56) in numeric order ① , ② , and ③ .



・Assemble VR unit (B2308) into the 3-4 lens-G cam ring (#24).



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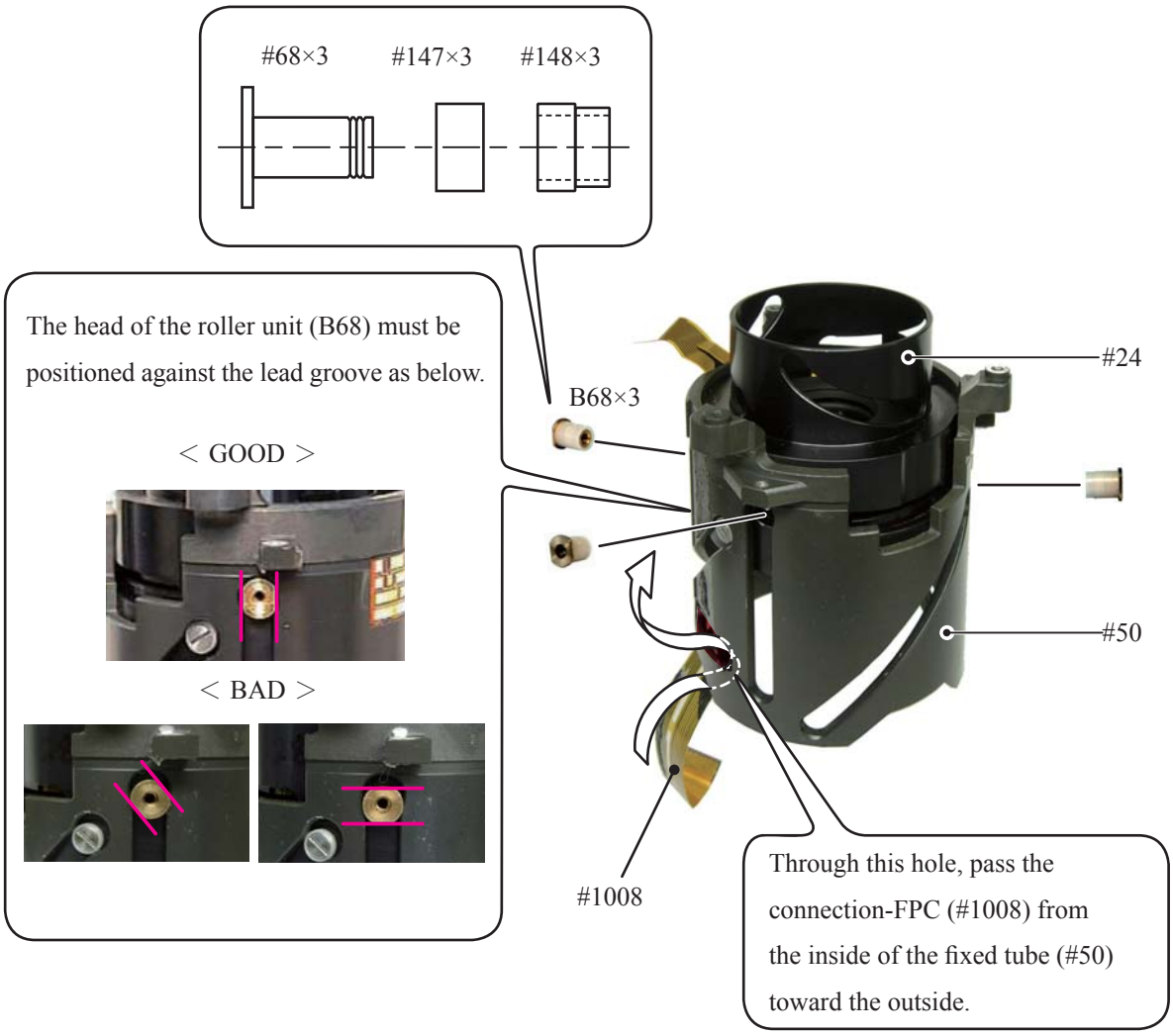
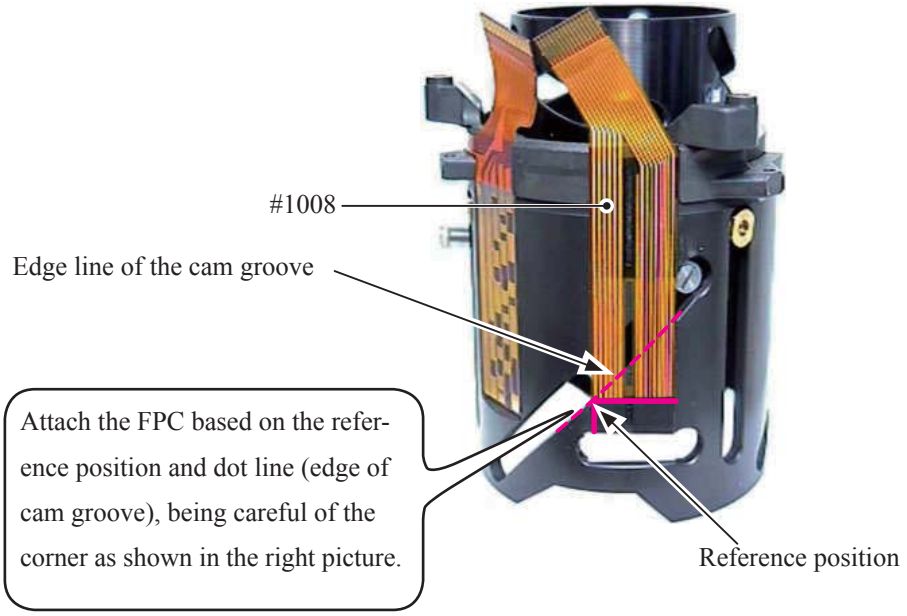
・Assemble the fixed tube (#50), 3-4 lens-G cam ring (#24), and VR unit-assembly (B2308) together by using the three roller units (B68).

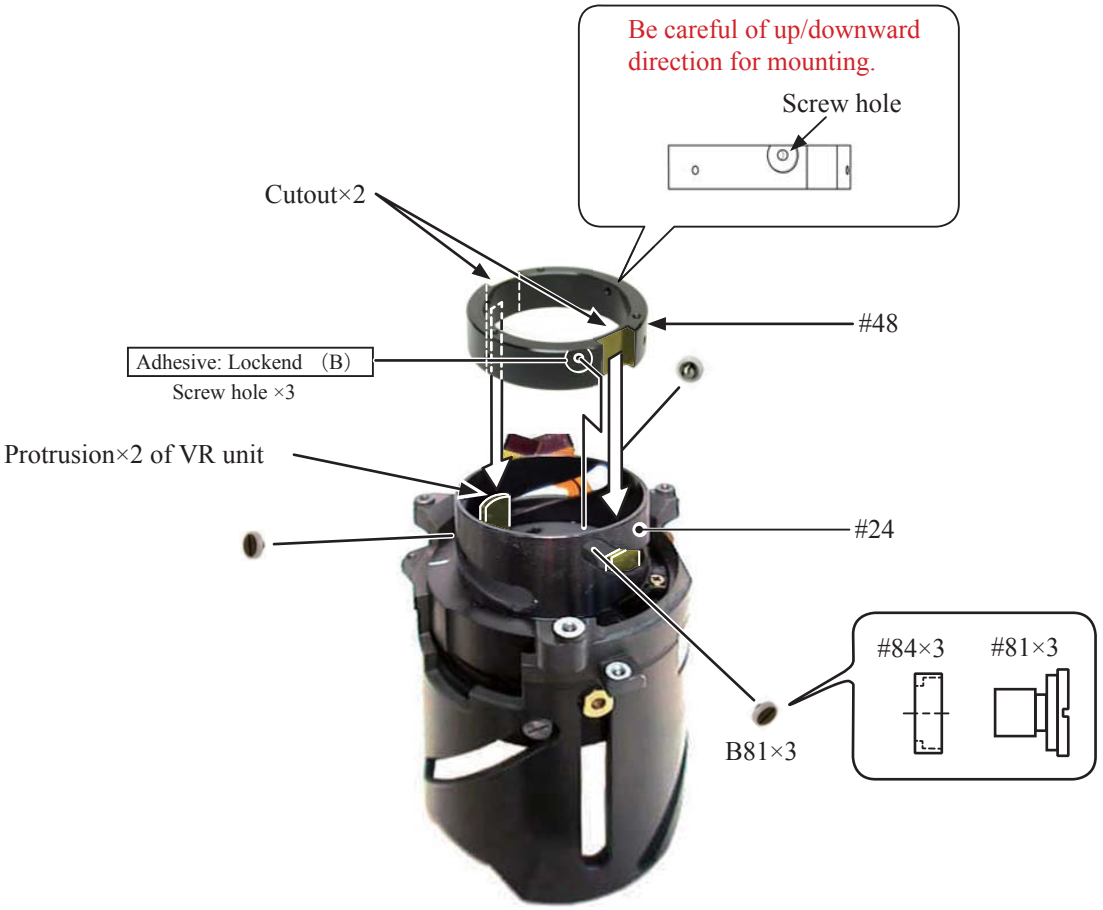


・Peel off the backing papers of the double-stick tapes (#149 and #150) and attach the connection-FPC (#1008).

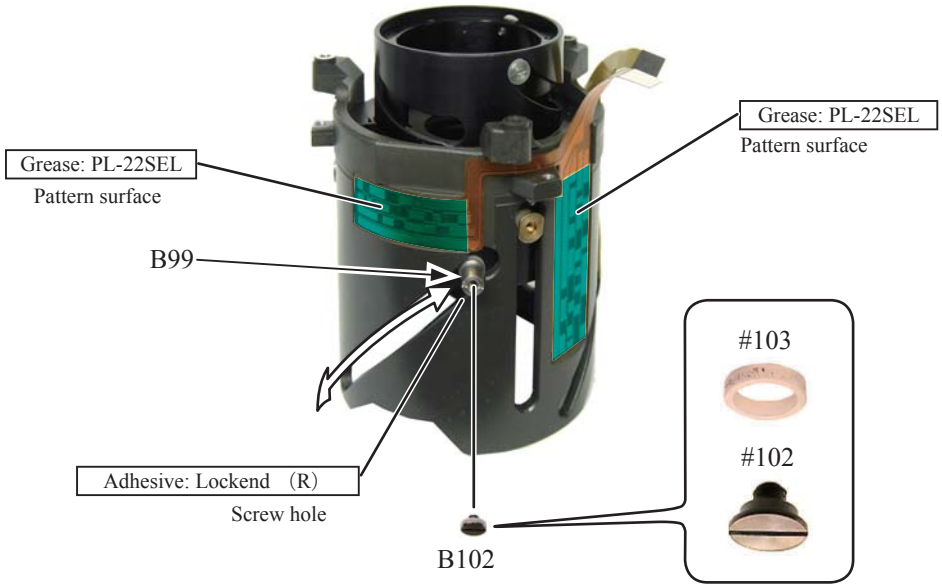


4th lens-G sliding ring

- Mount the 4th lens-G sliding ring (#48) by fitting its two cutouts with the two protrusions of VR unit.
- Attach the three roller units (B81) to the 4th lens-G sliding ring (#48) through the cam groove of the 3-4 lens-G cam ring (#24) and fasten them.

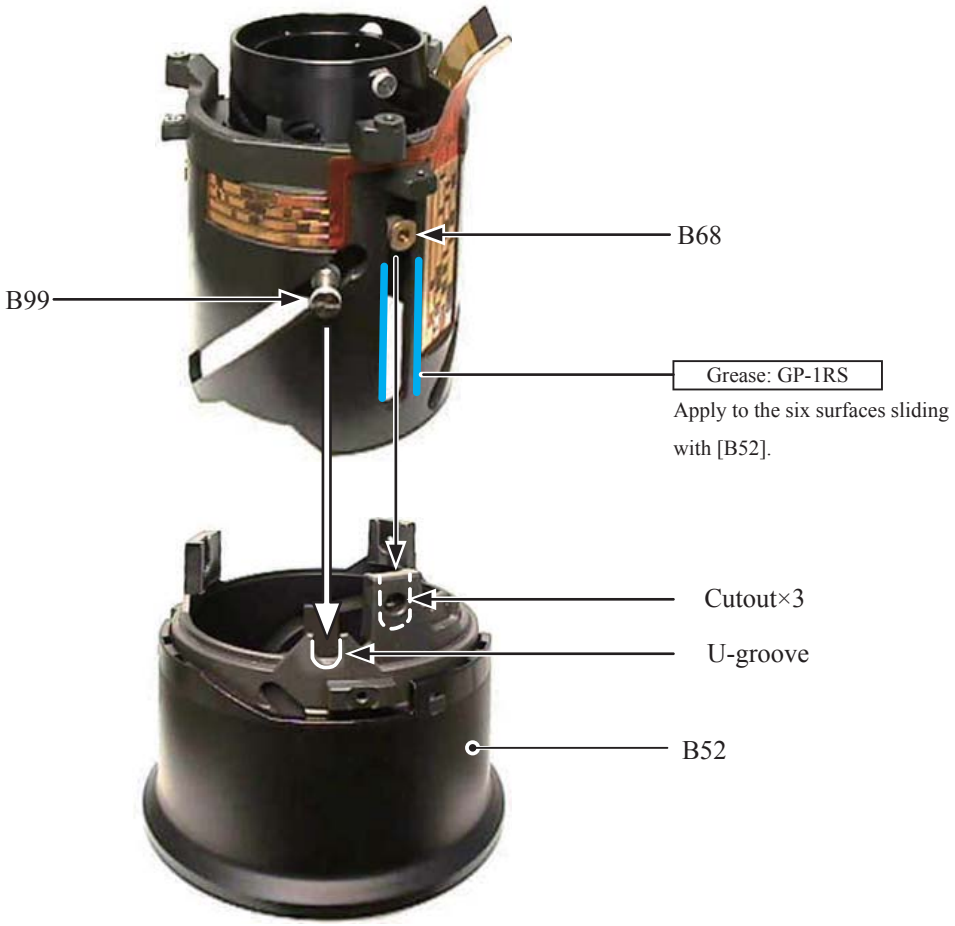


- Attach the roller unit (B102) to the roller unit (B99) and fasten it.
- Check operations by sliding the roller unit (B99).

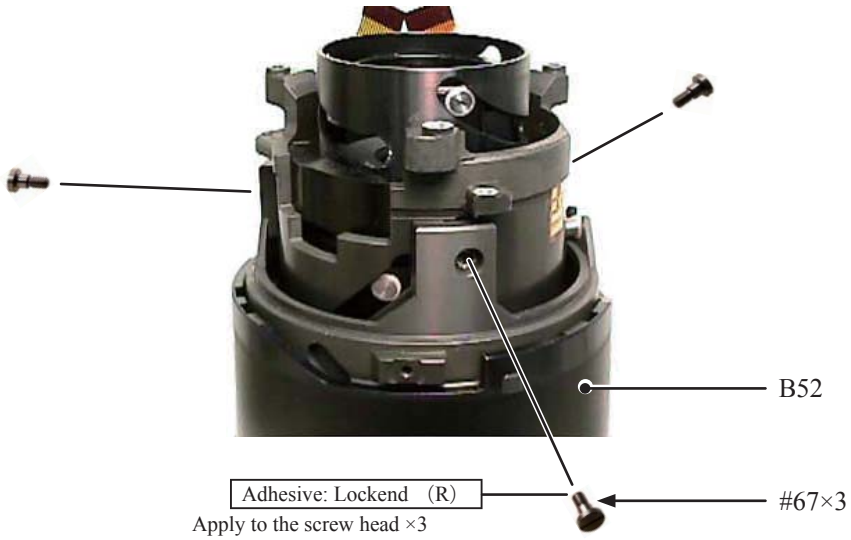


2nd lens-G straight ring

- Align the position of the roller unit (B99) with "U-groove" of the 2nd lens-G straight ring unit (B52).
- Align the three roller units (B68) with three cutouts of the 2nd lens-G straight ring unit (B52), and make assembly.

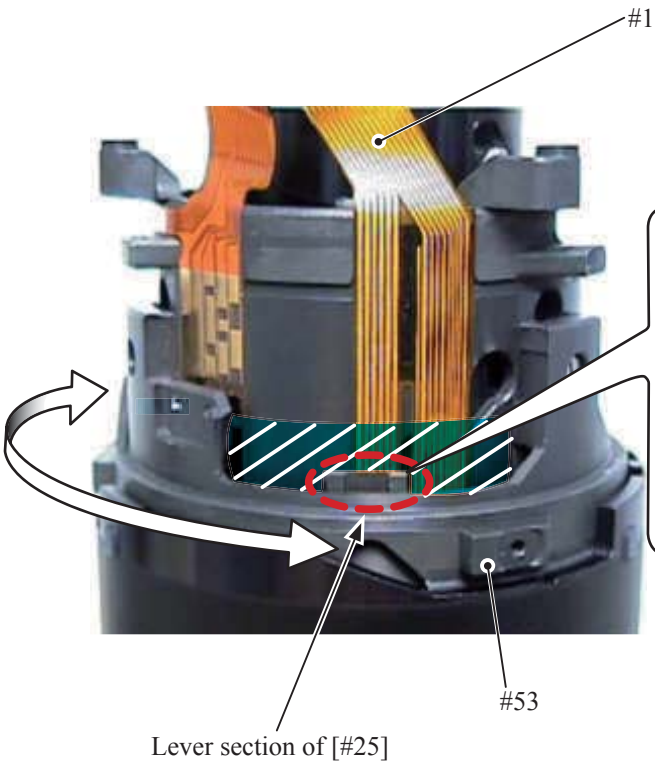


- Attach the three screws (#67) to the 2nd lens-G straight ring unit (B52) and fasten them.



Zoom operation check

・Rotate the 2nd lens-G turning-ring (#53), and check operations of the 2nd lens-G straight ring unit (B52).

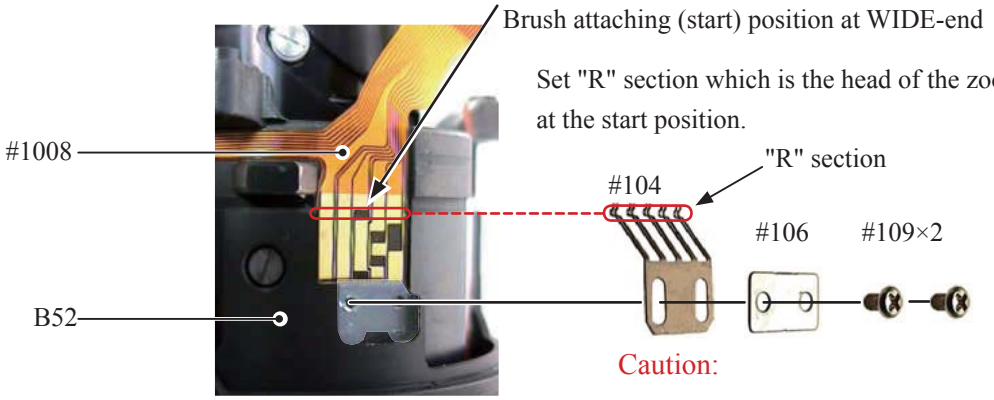


・During rotating the 2nd lens-G turning-ring (#53), the lever section of the 2nd lens-G cam ring (#25) must be positioned in the shaded portion.

・If the lever gets stuck with the connection-FPC (#1008), change the double-stick tape and re-attach the connection-FPC.

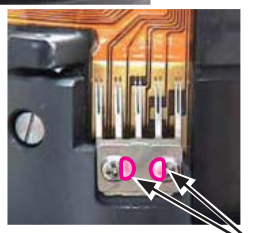
Zoom brush

- Set the zoom ring to WIDE.
- Attach the zoom brush (#104) and reinforcing plate (#106) to the 2nd lens-G straight ring unit (B52), and secure them with the two screws (#109).
- Activate zooming. Check the contacting condition on the overall pattern of the encoder-FPC (#1008) and the start position of the brush.
- After checking the brush start position, apply the adhesive to the head of the two screws (#109) and fasten them.



Caution:

- Do NOT deform the brush.
- Do NOT use a deformed brush.

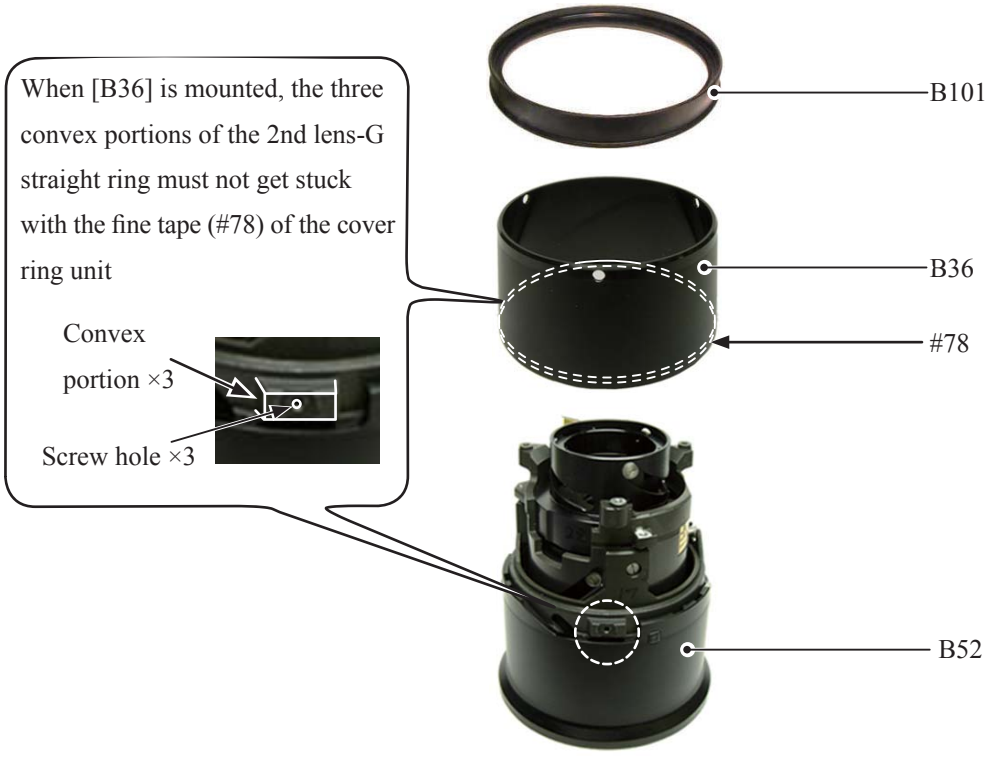


#109×2

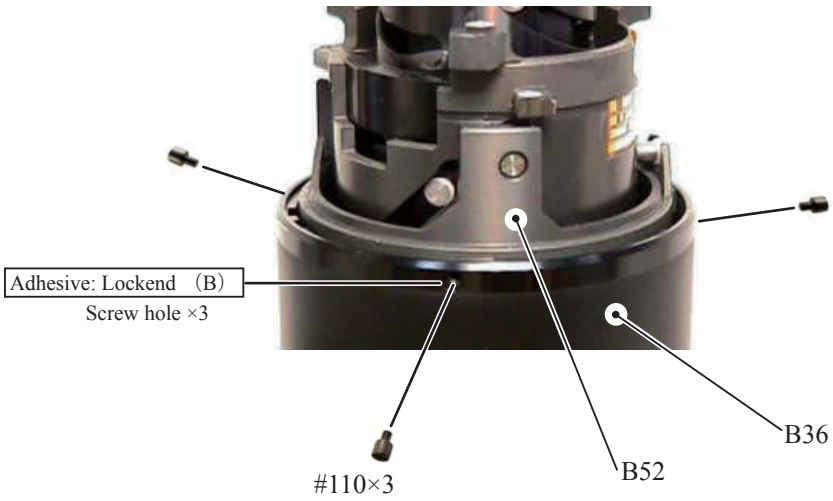
Adhesive: Screwlock

Cover ring unit

- Mount the cover ring unit (B36) with the holes facing upwards by fitting in the three screw holes of the 2nd lens-G straight ring unit (B52).
- Mount the support ring unit (B101).

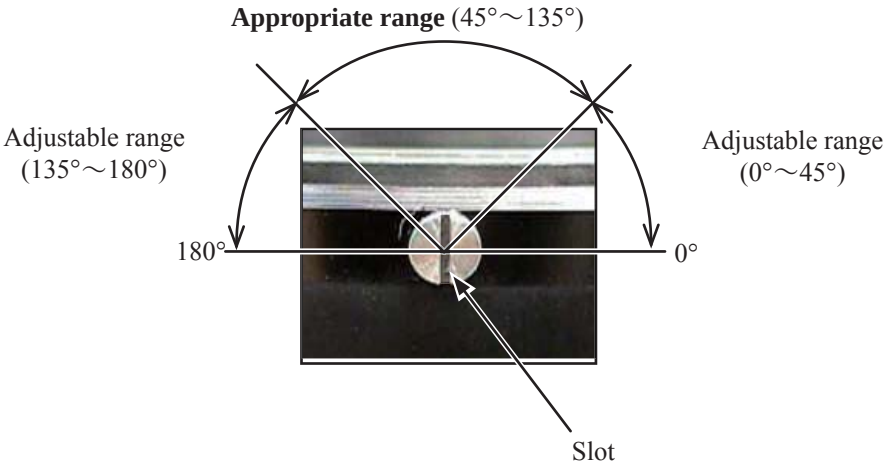


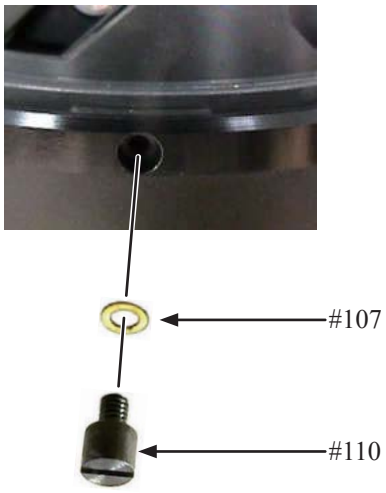
・Tighten the three screws (#110) and fix the cover ring unit (B36) and 2nd lens-G straight ring unit (B52).



・Confirm that after tightening the screw (#110), the slot's angle is within the appropriate range.

・If the slot's angle is wihin the adjustable range, adjust it by tightening the screw (#110) and washer (#107) together so as that it becomes in the appropriate range.

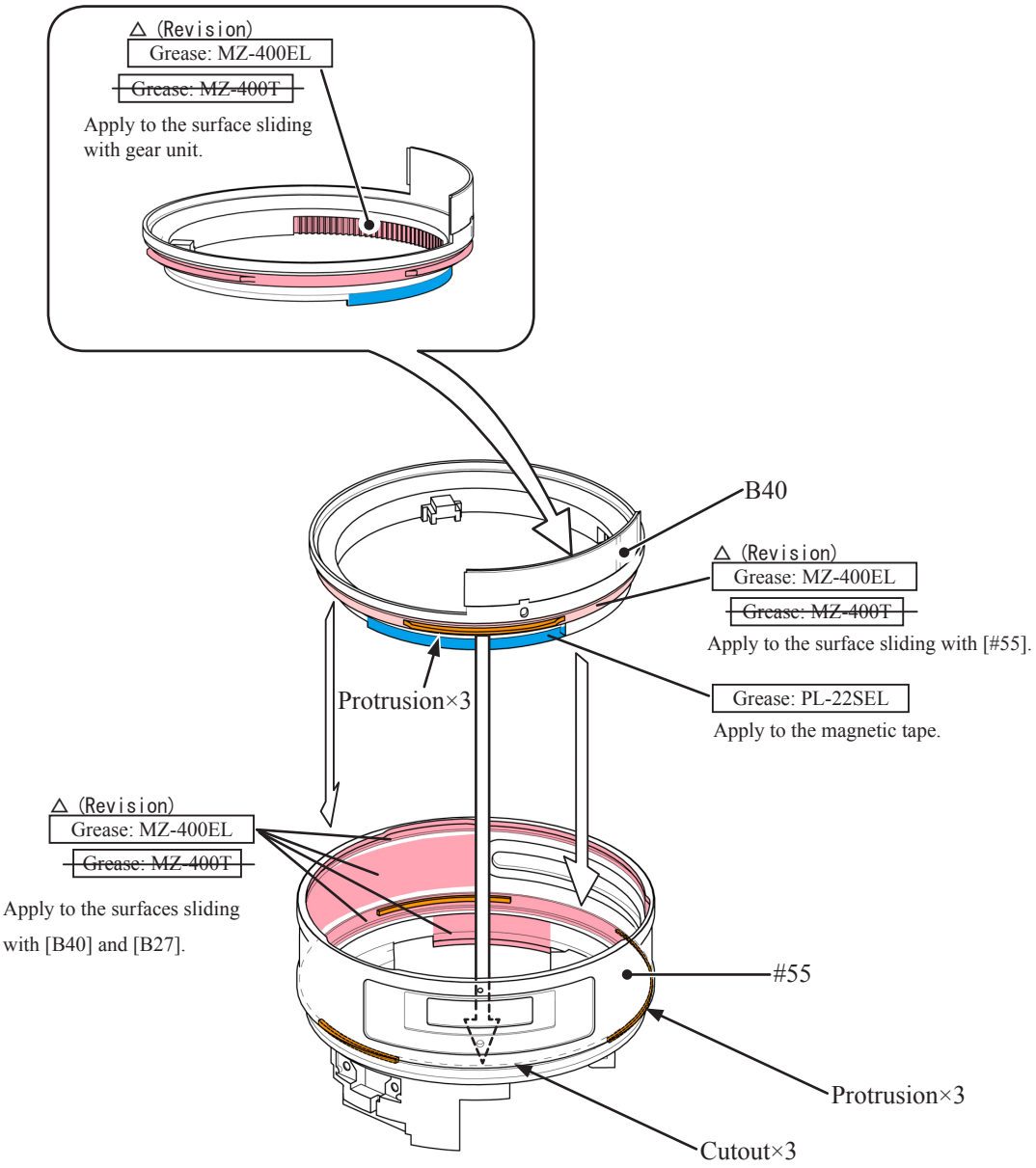




Gear unit

・Mount the gear unit (B40) by fitting the three protrusions with the three cutouts of the fixed tube (#55).

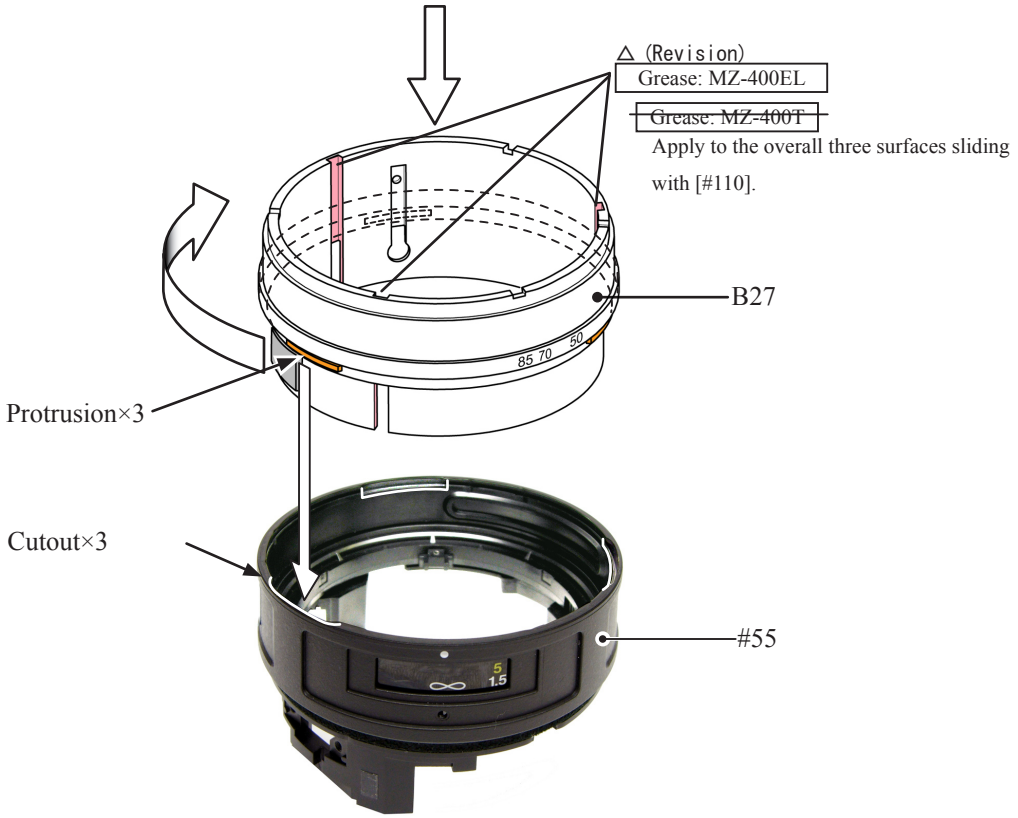
・Turn the gear unit (B40) from side to side, so that it is fixed in the fixed ring (#55).



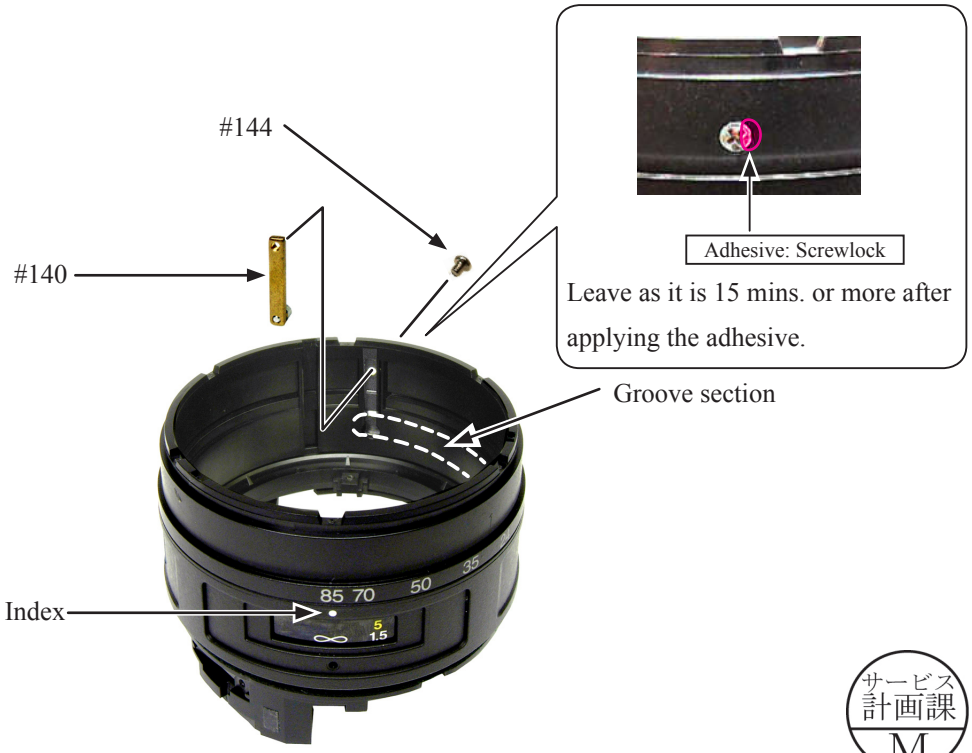
Zoom ring unit

・Mount the zoom ring unit (B27) by fitting its three protrusions with the three cutouts of the fixed ring (#55) and sit in the groove .

・Turn the zoom ring unit (B27) clockwise, and align "85" of zoom index with the index of the fixed ring (#55).



・Assemble the zoom control key (#140) by fitting its lower part in the groove section (white dotted area) of the fixed ring（#55), and secure it with the screw (#144).



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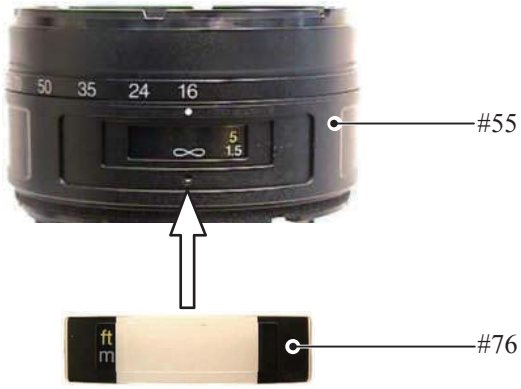
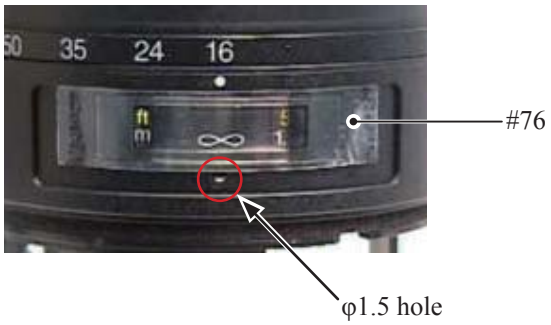
Zoom ring unit (continued)

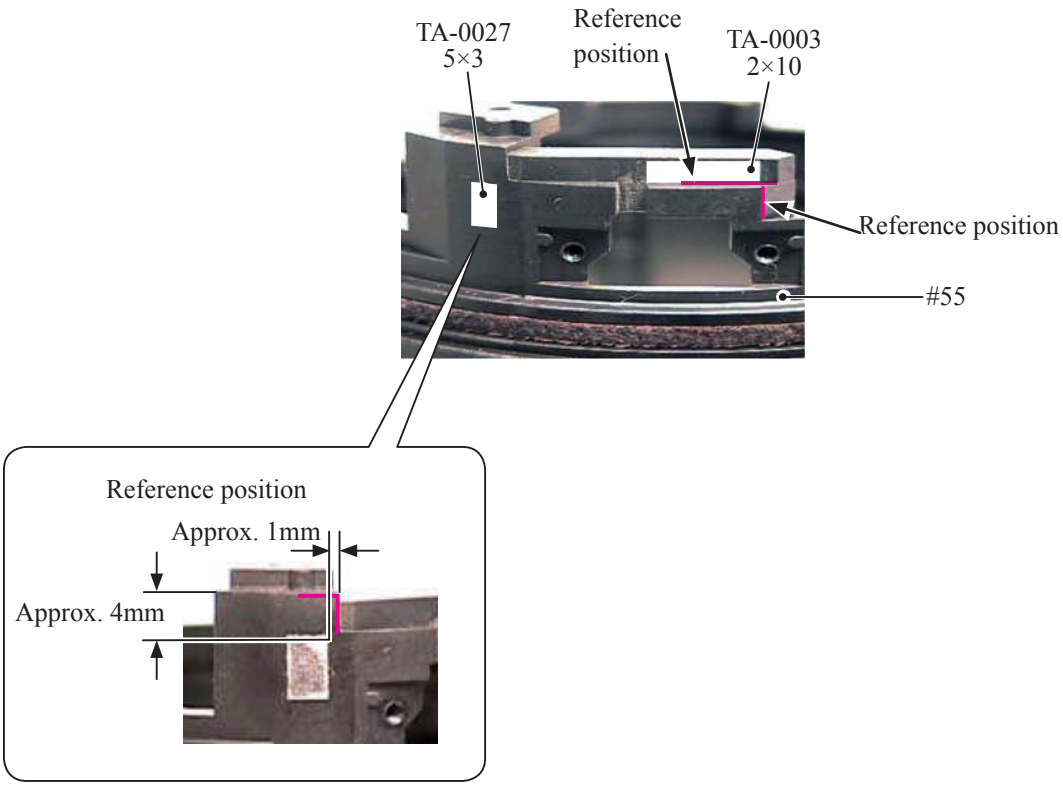
・Attach the focus window (#76) to the fixed ring (#55).



・Attach the polyester tape (approx. 10×50 mm) on the focus window (#76) so as not to block [1.5 mm across] hole.

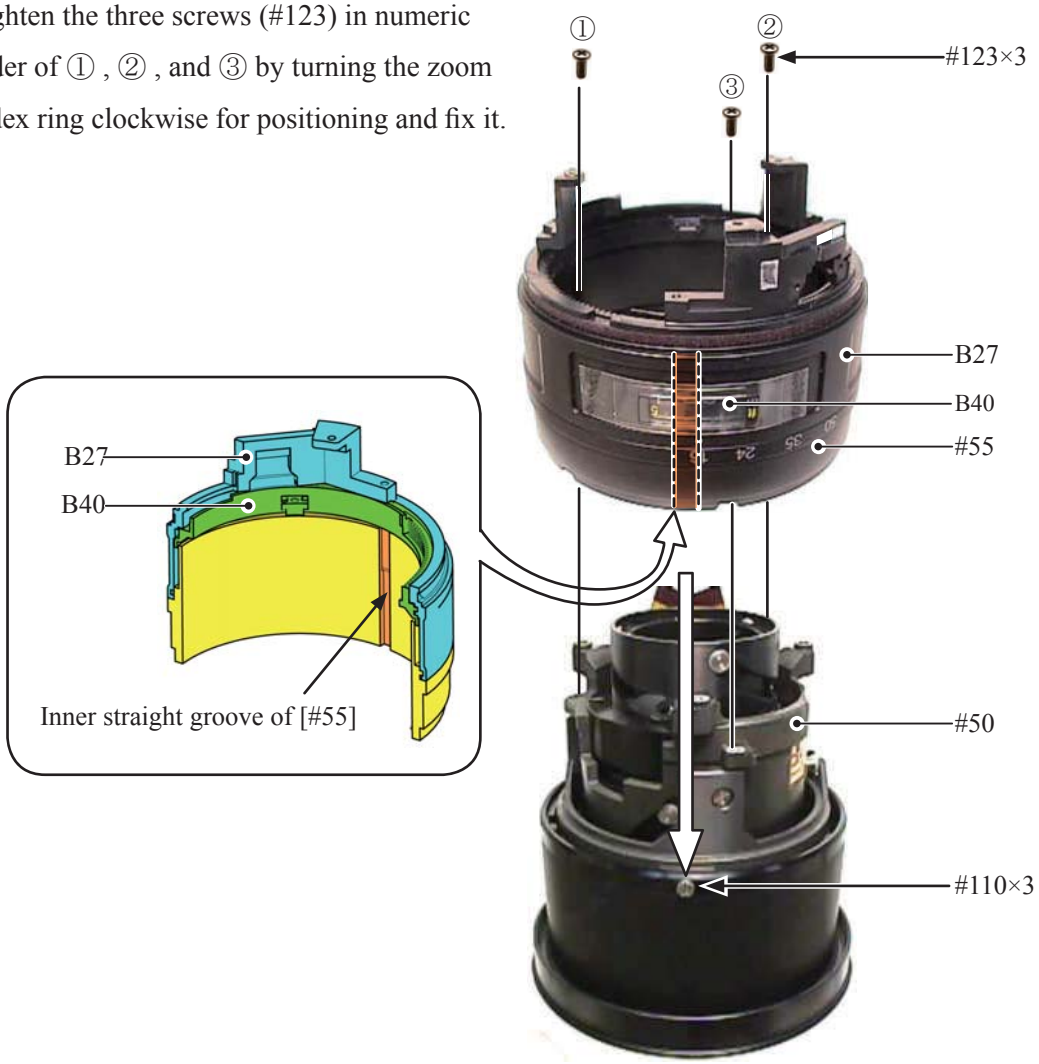


・Attach the double-stick tape on the fixed ring (#55) based on the reference position.

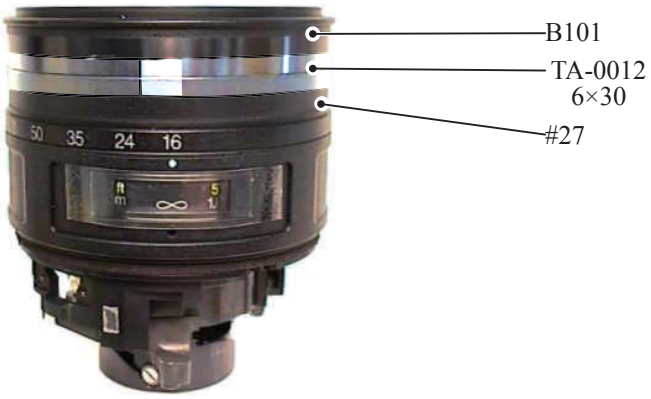


Zoom ring unit (continued)

- Set the fixed tube (#50) to WIDE.
- Set the zoom ring unit (B27) to WIDE.
- Set the gear unit (B40) to "∞" (infinity).
- Align the positions of the three screws (#110) with the three inner straight grooves of the fixed ring (#55), and mount the zoom ring unit.
- Tighten the three screws (#123) in numeric order of ① , ② , and ③ by turning the zoom index ring clockwise for positioning and fix it.

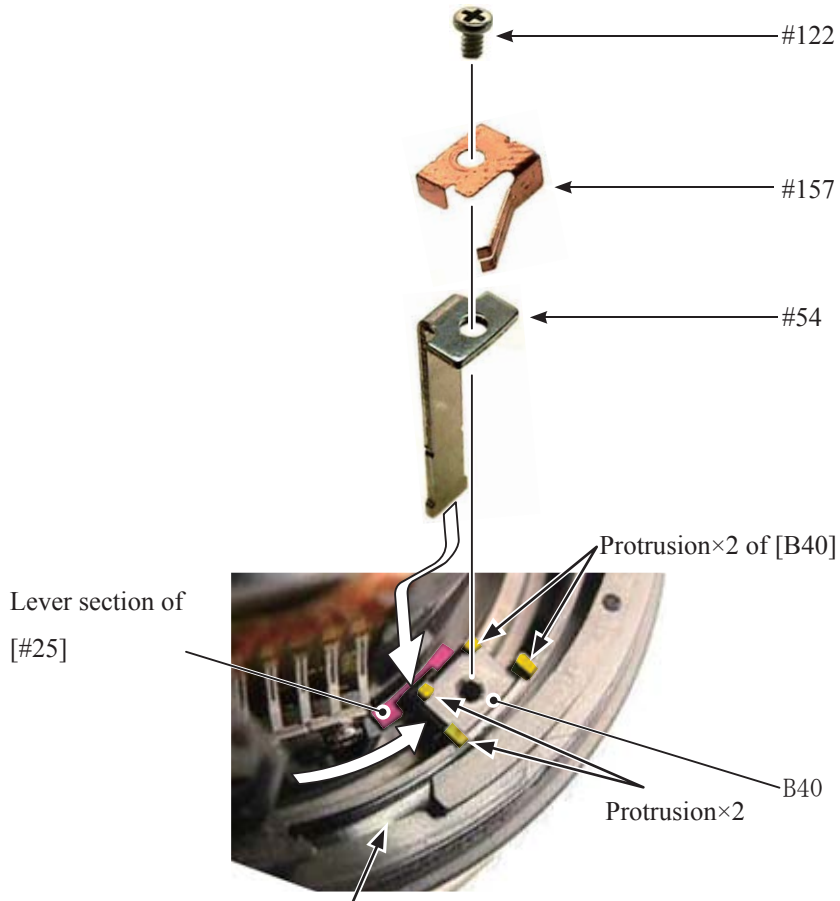


- Wrap the tape around the support ring unit (B101) and zoom ring (#27) to fix them.

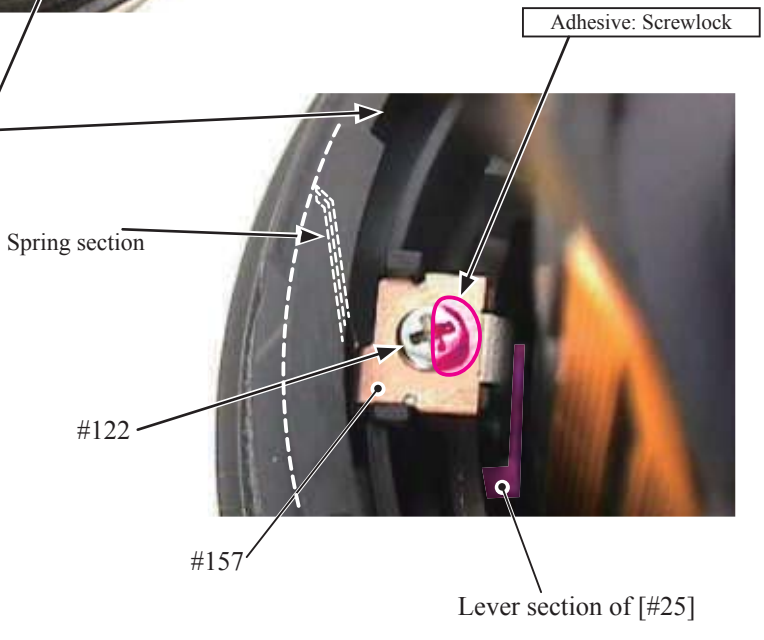


Focus key

- Insert the focus key (#54) into the groove of the lever section of the 2nd lens-G cam ring (#25).
- Turn the gear unit (B40) to "∞" (infinity).
- Fit the head of the focus key (#54) with the four protrusions of the gear unit (B40).
- Place the plate spring (#157) on the focus key (#54).
- Secure the focus key (#54) and plate spring (#157) with the screw (#122).
- Apply the adhesive to the head of the screw (#122) and fix it.

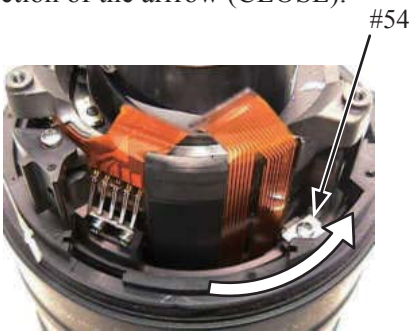


Insert the lower part (spring section) of the plate spring (#157) into the cutout of the zoom ring unit (B27) first, then move [#157] to be inside the groove as shown in the right picture.



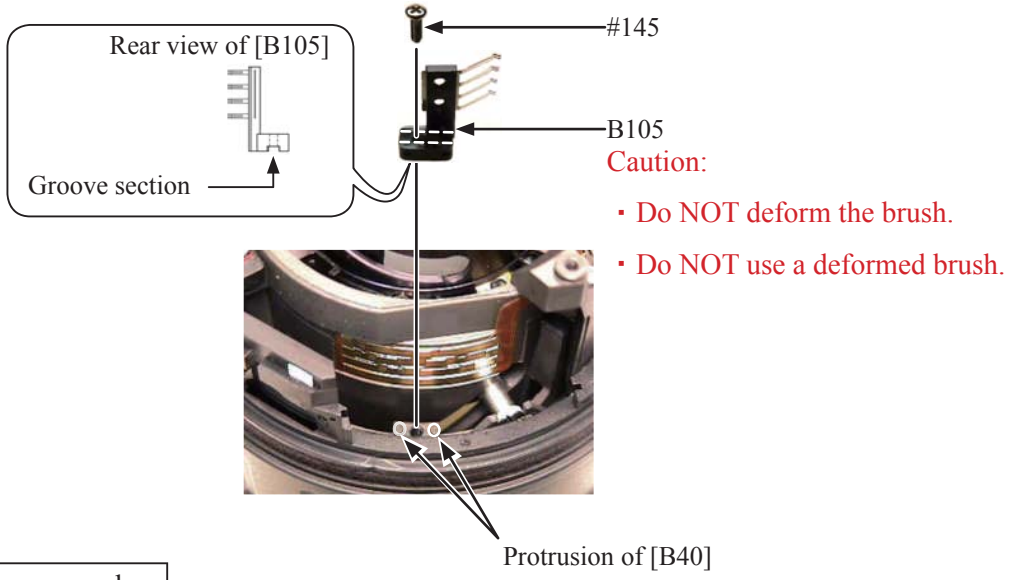
Focus brush

・Move the focus key (#54) in the direction of the arrrow (CLOSE).



・Put the focus brush (B105) by fitting the protrusion of the gear unit (B40) in the groove section of [B105].

・Tighten the screw (#145).



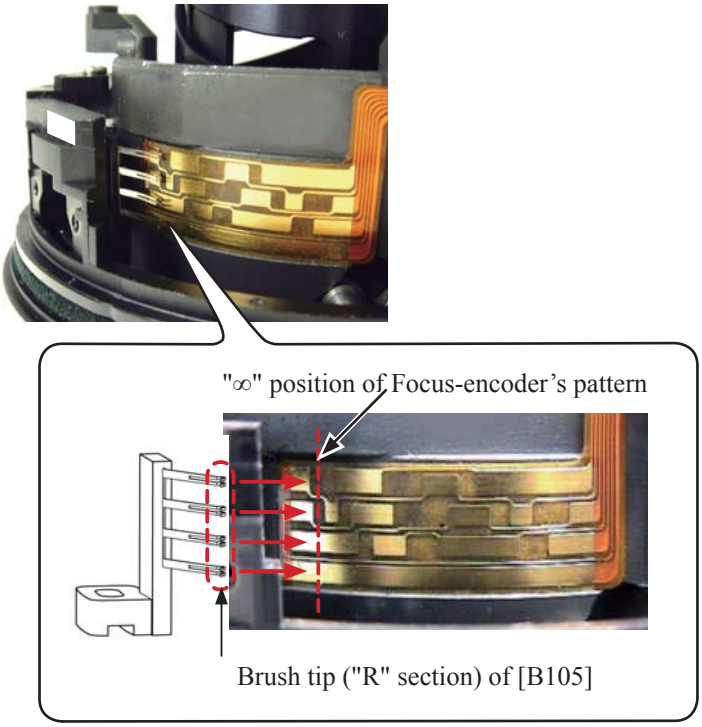
Positioning of Focus encoder

・Move the focus key (#54) and align "∞" position of the focus index (#49) with the below index.

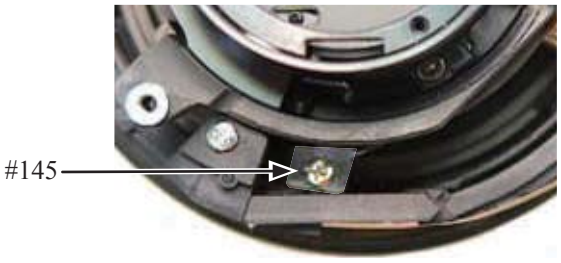
・Insert the reference pin (J11349) into "φ1.5 hole" of the fixed ring (#55) and fix the focus index.

・Set the zoom ring (#27) to WIDE.

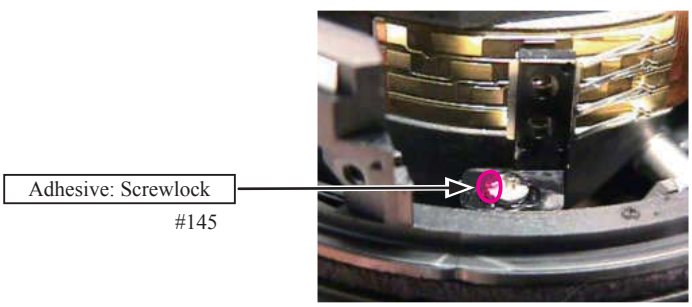
・Match "∞" position of the focus encoder's pattern with the brush tip ("R" section) of the focus brush (B105) as below.



・Tighten the screw (#145).

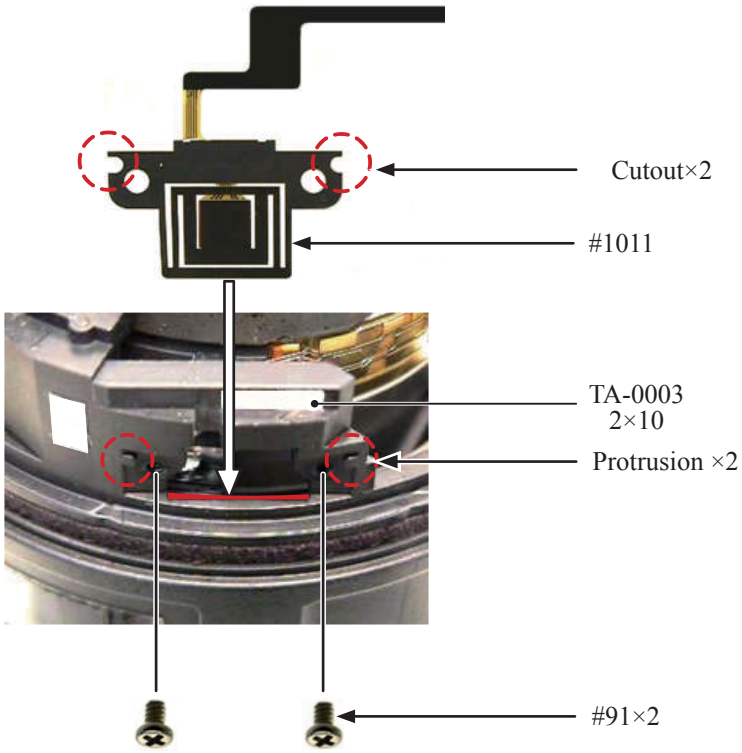


・Set the focus brush (B105) to CLOSE-end, and apply the adhesive to the head of the screw (#145).



GMR sensor

- Insert the edge of GMR sensor (#1011) into the gap of the fixed ring (#55) and fit the two cutouts of GMR sensor with the two protrusions of the fixed ring (#55).
- Tighten the two screws (#91).
- Attach the double-stick tape (TA-0003) on the FPC of GMR sensor.



Inspection and Adjustment of GMR output waveform

● When GMR unit is disassembled and replaced, be sure to make inspection and adjustment.

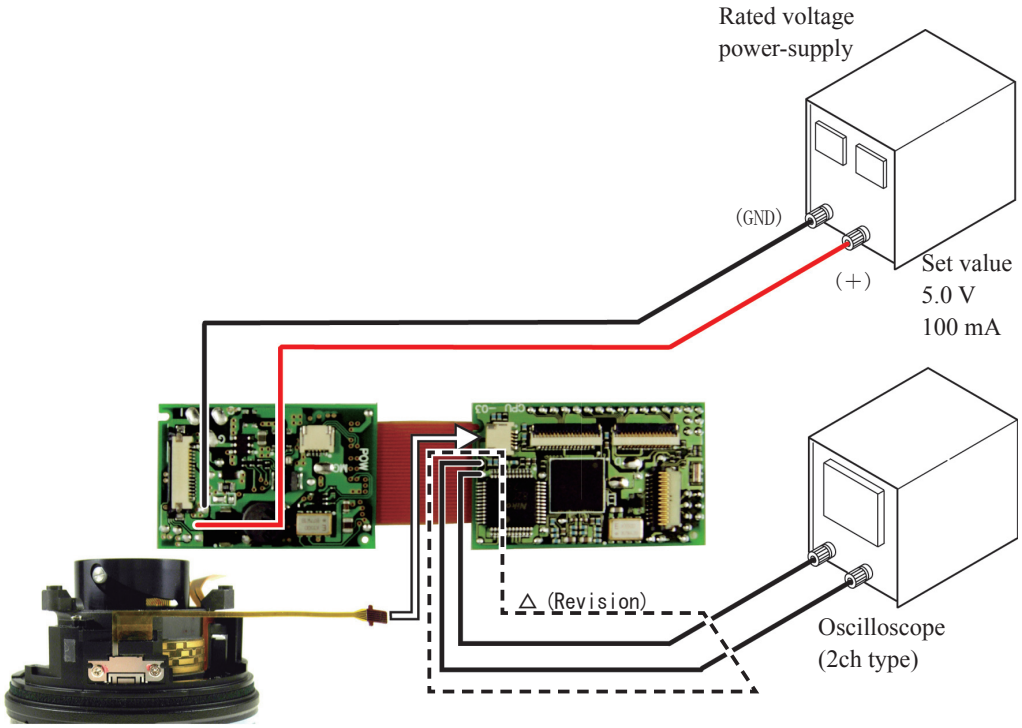
1. Device:
   - Single-output rated voltage power-supply　　1 unit: 5V 100mA
   - Oscilloscope　　1 unit
   - GMR output inspection tool　　1 unit　Self-made tool (ref. T3)

Caution:

If there are problems with conduction between the contacts of the GMR output inspection 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
   - Connect the fixed tube, which has GMR unit assembled, to each measuring instrument.

(Refer to T3 for wiring on Main PCB.)



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3. How to inspect and adjust:

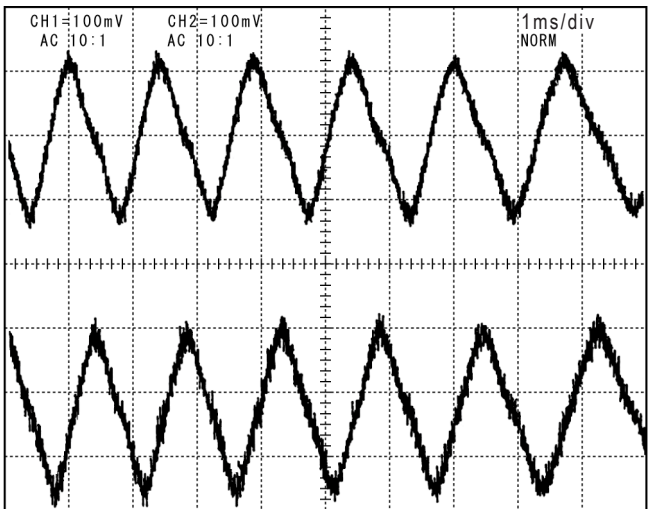
・Confirm that the electric current and voltage of the connected rated voltage power-supply are set values, then turn it ON.

・Set the oscilloscope, and turn the focus turning-tube with hand.

・In case large waveform-noise 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.



● Oscilloscope setting

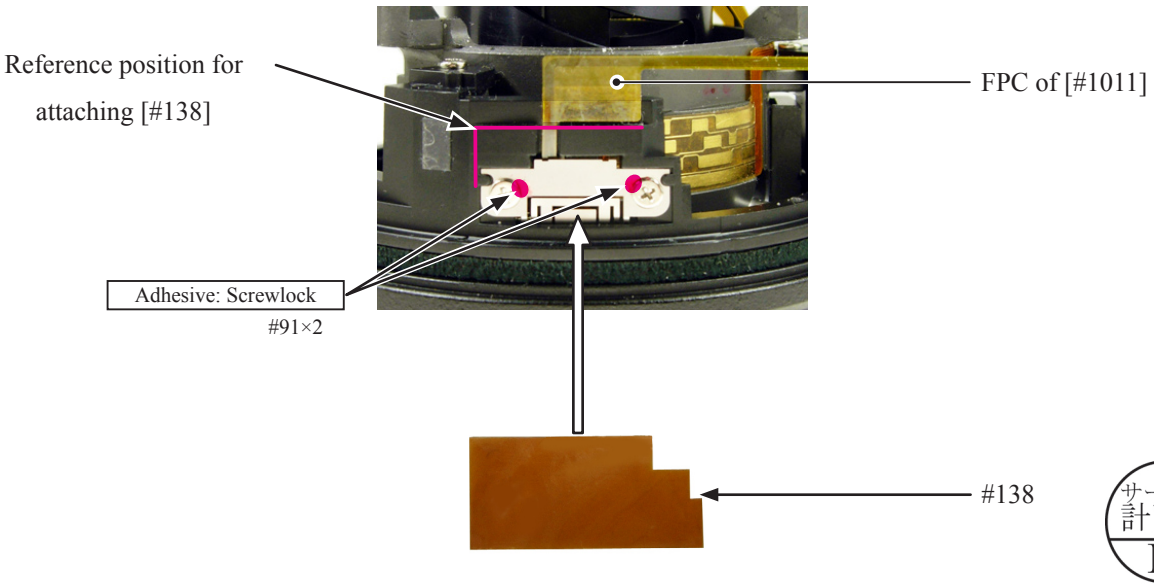
V/Div (ch1)	: 100 mV
V/Div (ch2)	: 100 mV
Coupling	: AC
Time/Div △ (Revision)	: ~~20ms/div~~ 1ms/div
Trigger Mode	: NORMAL
Trigger Coupling	: AC
Trigger Source :	: CH1
Trigger Position	: + 4 div
Trigger Type	: EDGE
Trigger Level	: 0V
INPUT (ch1)	: AC
INPUT (ch2)	: AC

Standard: Amplitude of all pulses/waveforms is 150mV or more.

Note: Check the waveform by rotating the focus turning-tube all the way around back and forth.

・If there is no problem with the waveform of GMR sensor, apply the adhesive to the head of the two screws (#91) to fix.

・Attach the tape (#138) on the GMR sensor.



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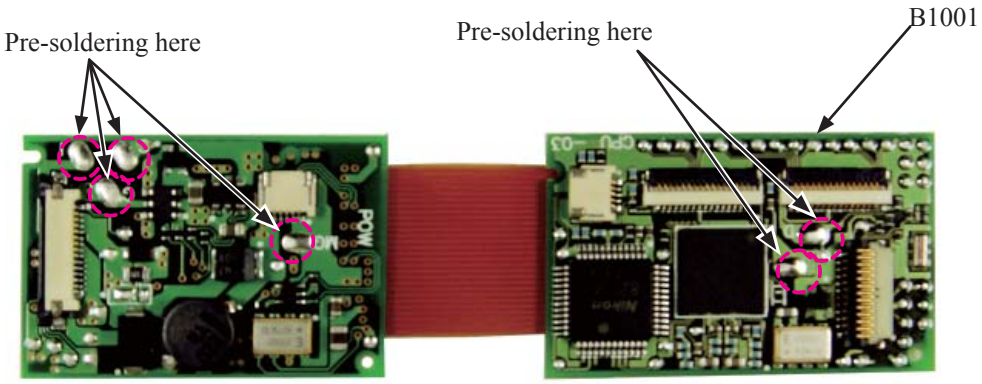
Main PCB

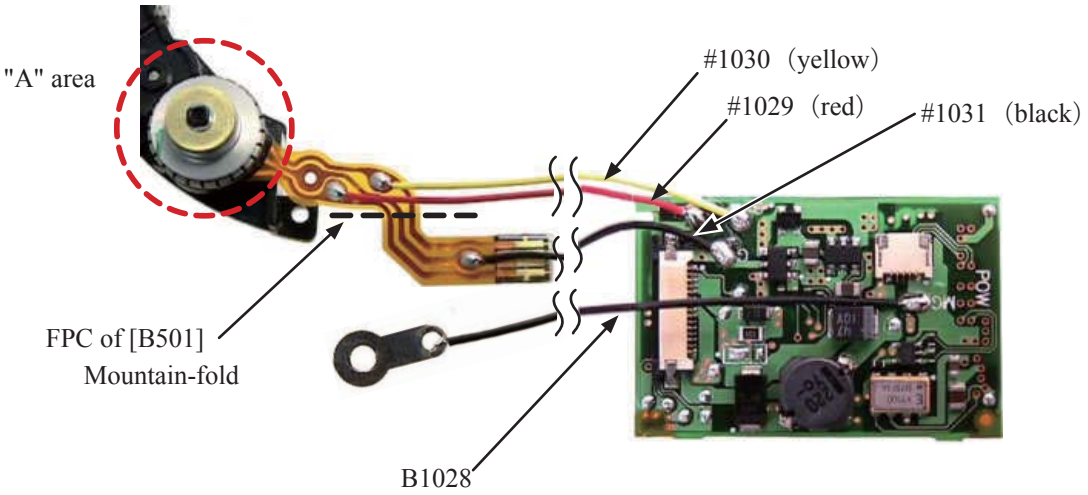
・Make six pre-solderings on the main PCB (B1001).



・Make a fold on the FPC of SWM unit (B501) as below.

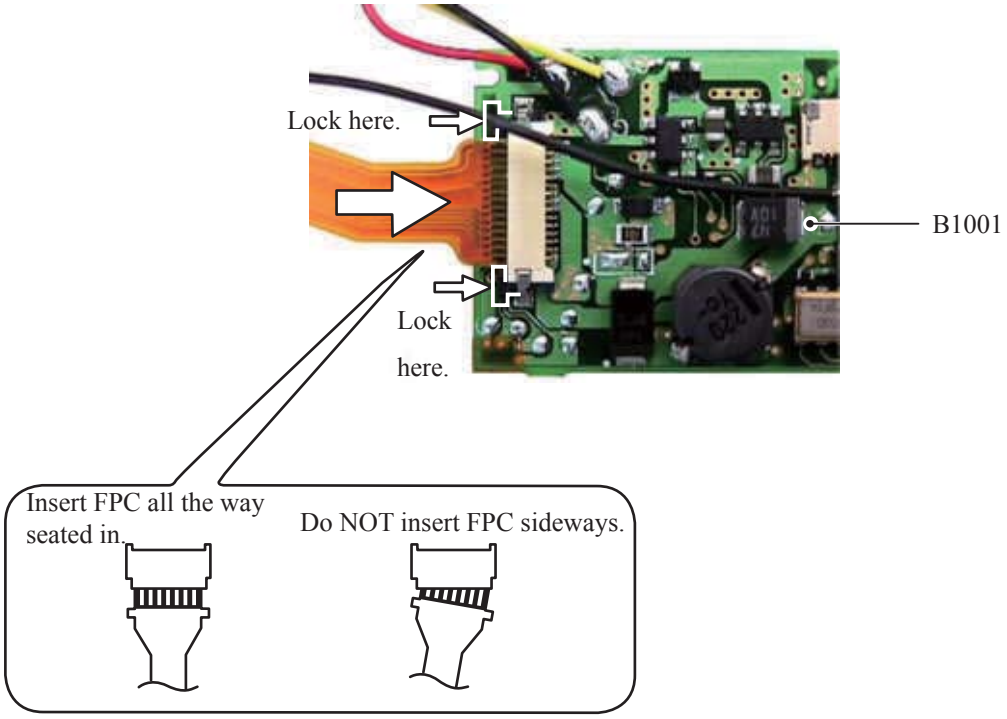
・Solder the three lead wires of SWM unit and the lead wire of the lug plate unit (B1028) on the main PCB.

Caution: Do NOT touch "A" area.

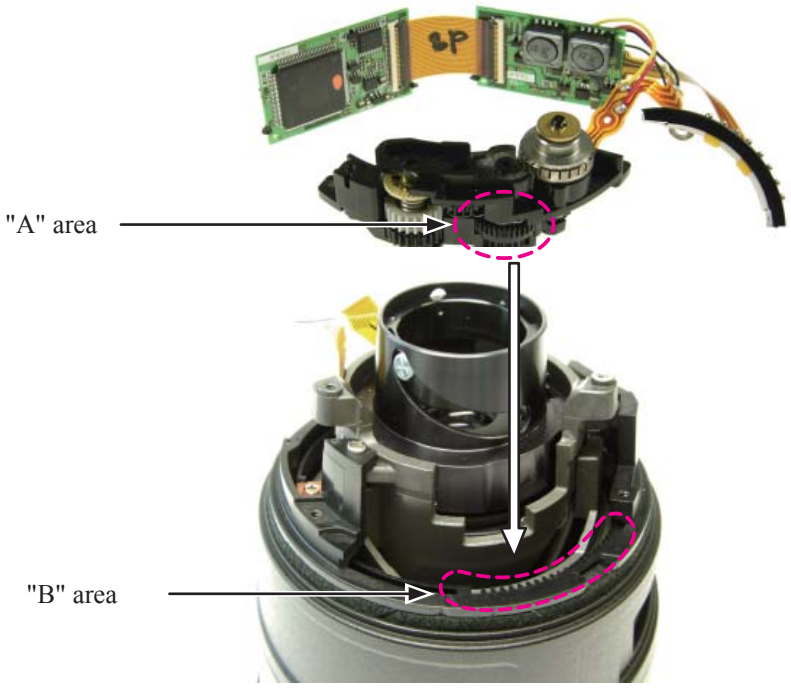


・Connect the FPC of the contact unit to the connector of the main PCB (B1001).

Caution: After connecting the FPC, be sure to lock the connector.

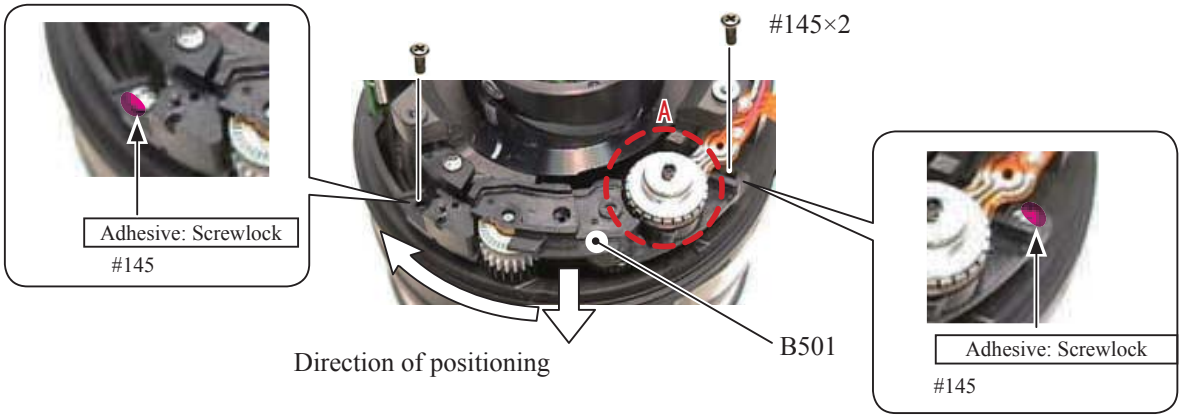


・Assemble SWM unit and gear unit by fitting "A" area with "B" area.

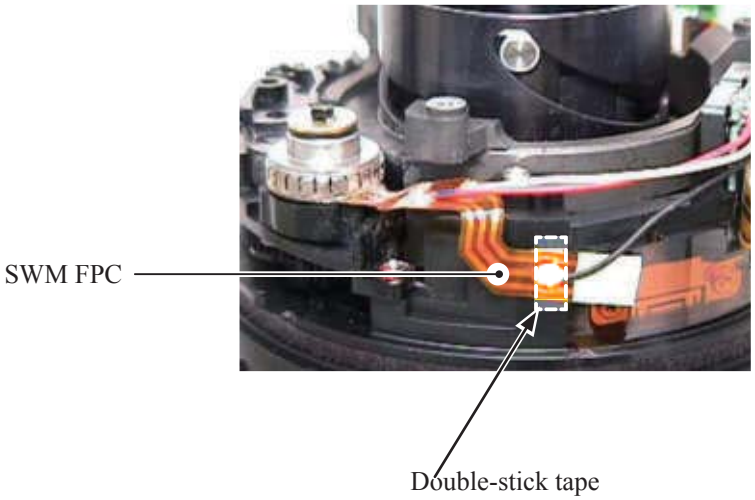


- Push SWM unit (B501) toward outside by turning clockwise for positioning, and tighten the two screws (#145).
- Apply the adhesive to the head of the screw (#145).

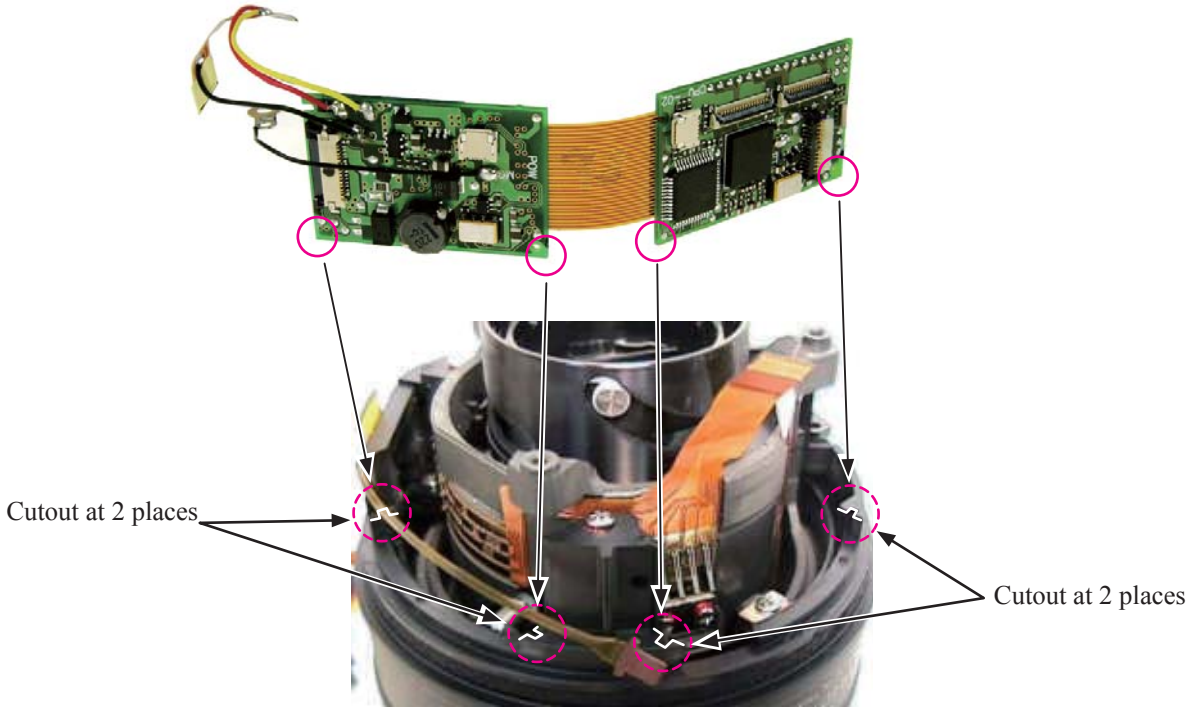
  Caution: Do NOT touch "A" area.



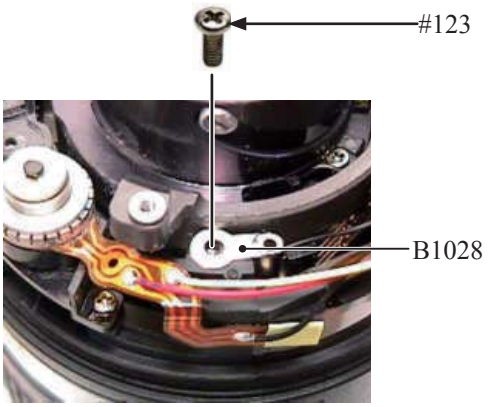
- Peel off the backing paper of the double-stick tape, and attach the SWM-FPC by pressing it with a finger.



・Being careful NOT to touch the GMR-FPC, mount the main PCB (#1001) on the fixed ring (#55) by fitting with four cutouts.

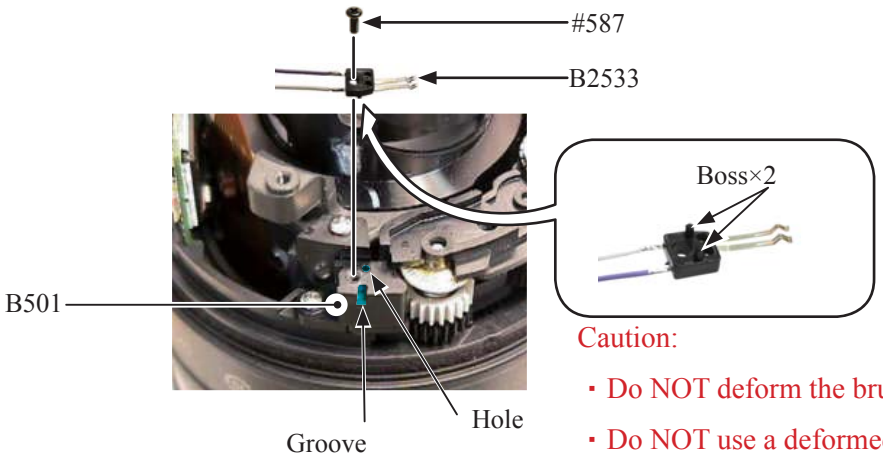


・Take out the screw (#123) and attach the lug plate unit (B1028) and tighten the screw again.



MF brush

・Attach the MF brush (B2533) to SWM unit (B501) by fitting the two bosses of [B2533] in the hole and groove of [B501], and tighten the screw (#587).

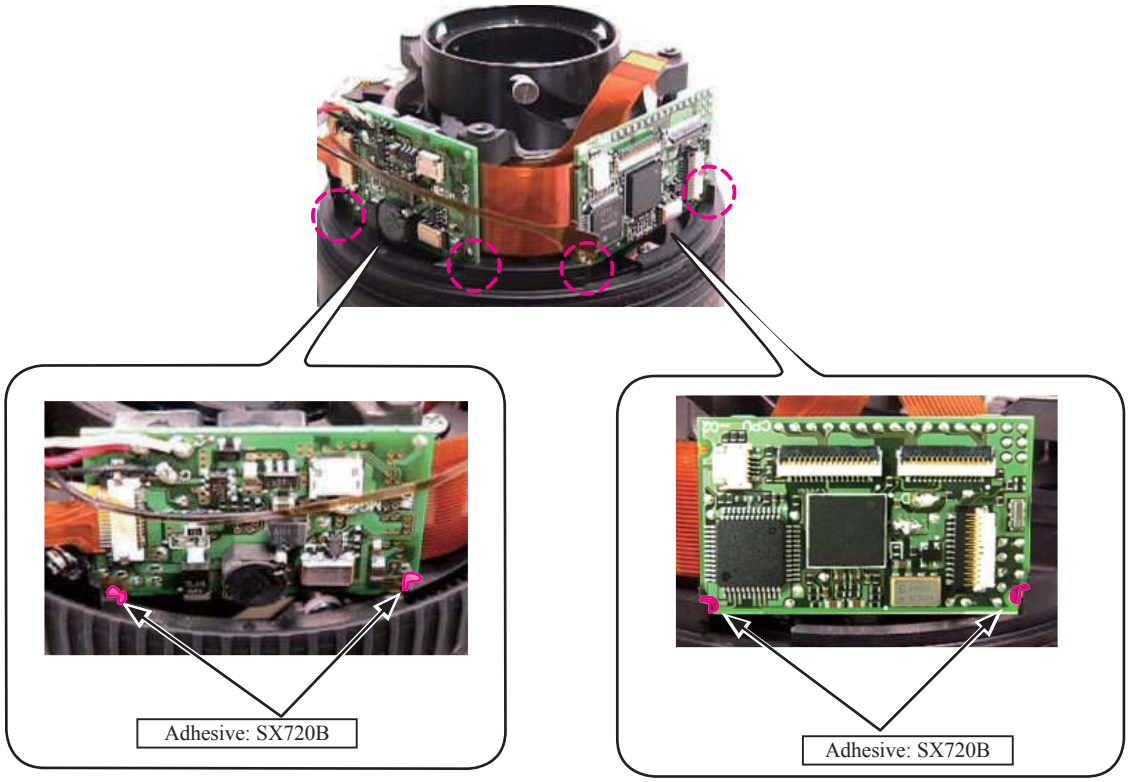


Caution:

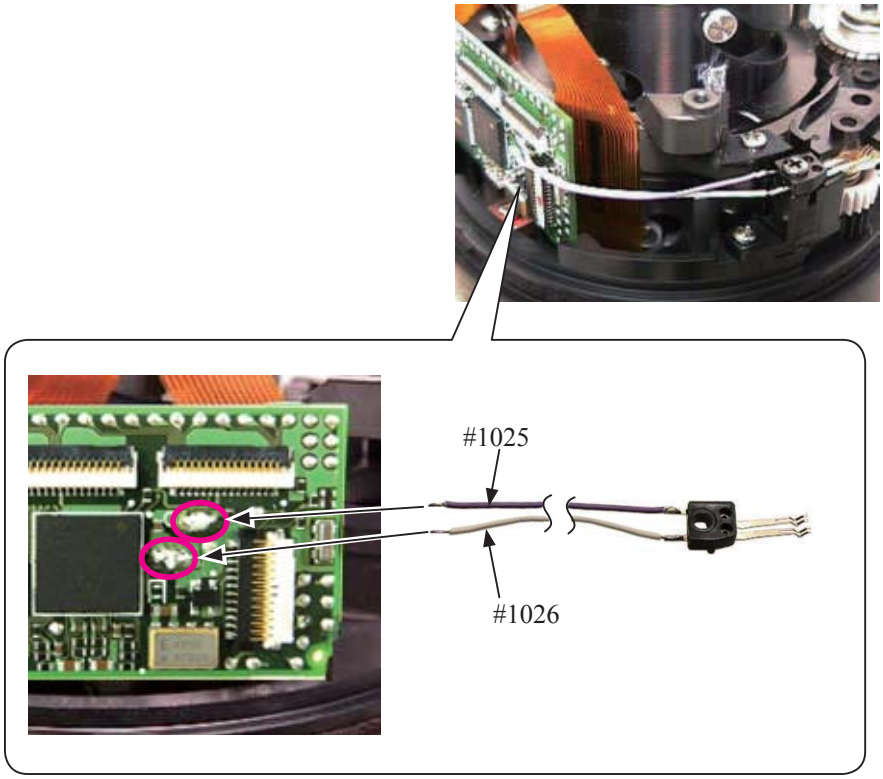
・Do NOT deform the brush.

・Do NOT use a deformed brush.

・Apply the adhesive to the below locations, and fix the main PCB (#1001).

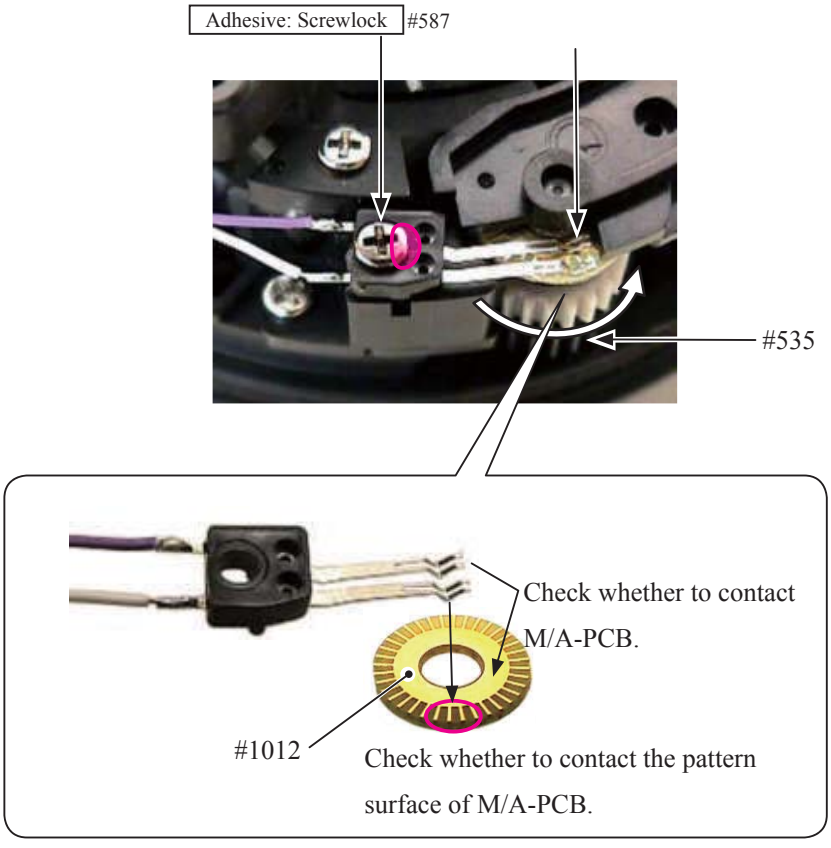


・Solder the lead wire (pink: #1025) of MF brush (B2533) and the lead wire (white: #1026) on the main PCB (#1001).



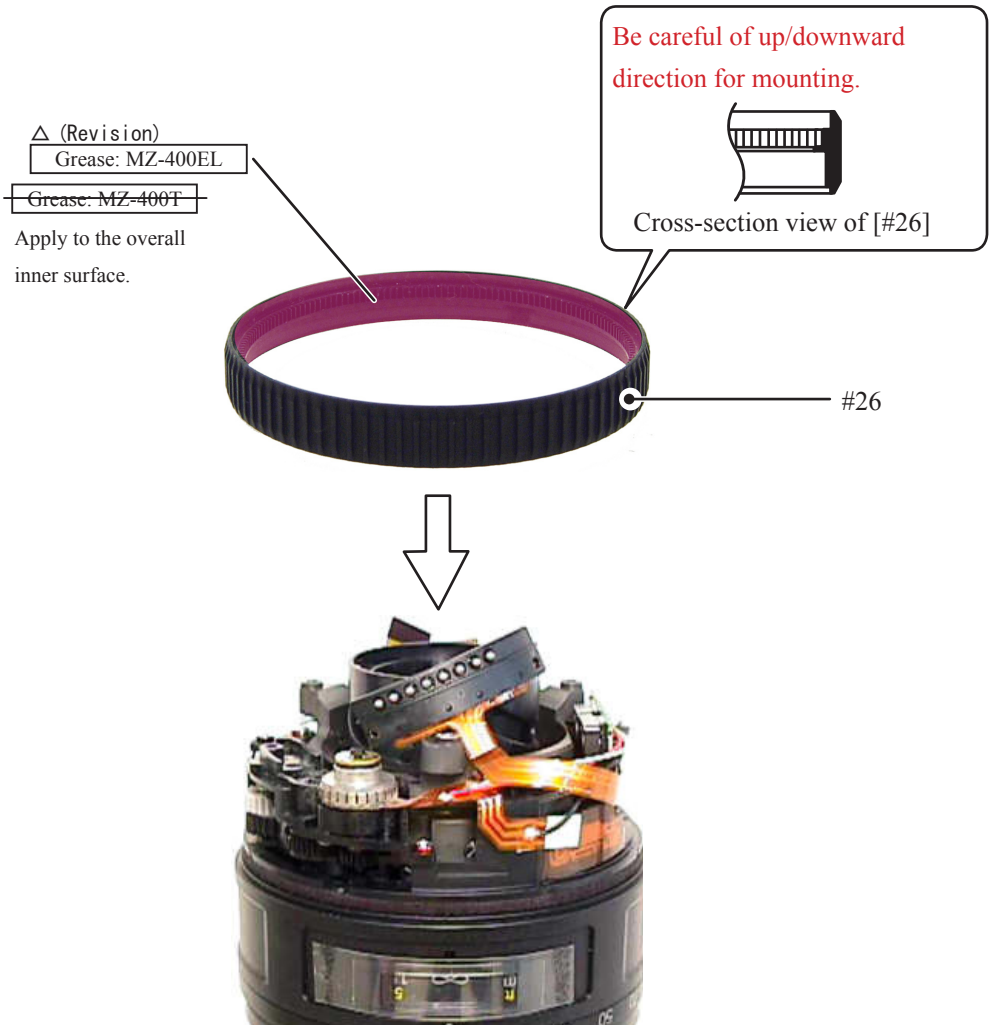
・Turn MF gear (#535) and confirm the contacting condition between MF brush (B2533) and M/A-PCB (#1012).

・Apply the adhesive to the head of the screw (#587) to fix.

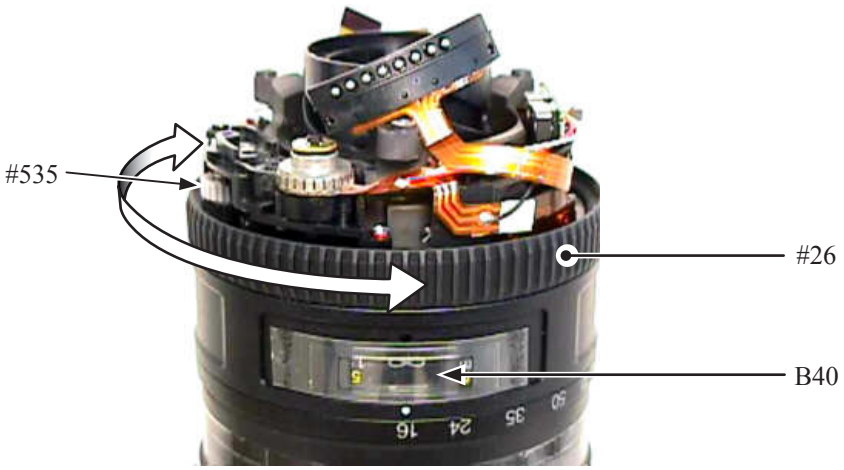


MF ring

・Mount MF ring (#26).



・Turn MF ring (#26) and check whether MF gear (#535) and gear unit (B40) move subsequently.



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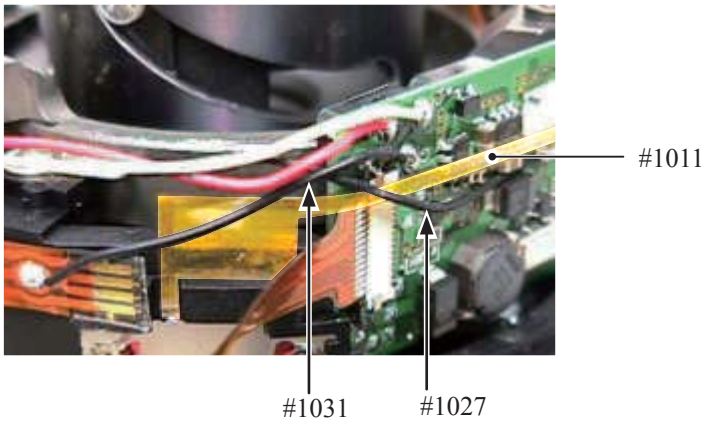
GMR FPC

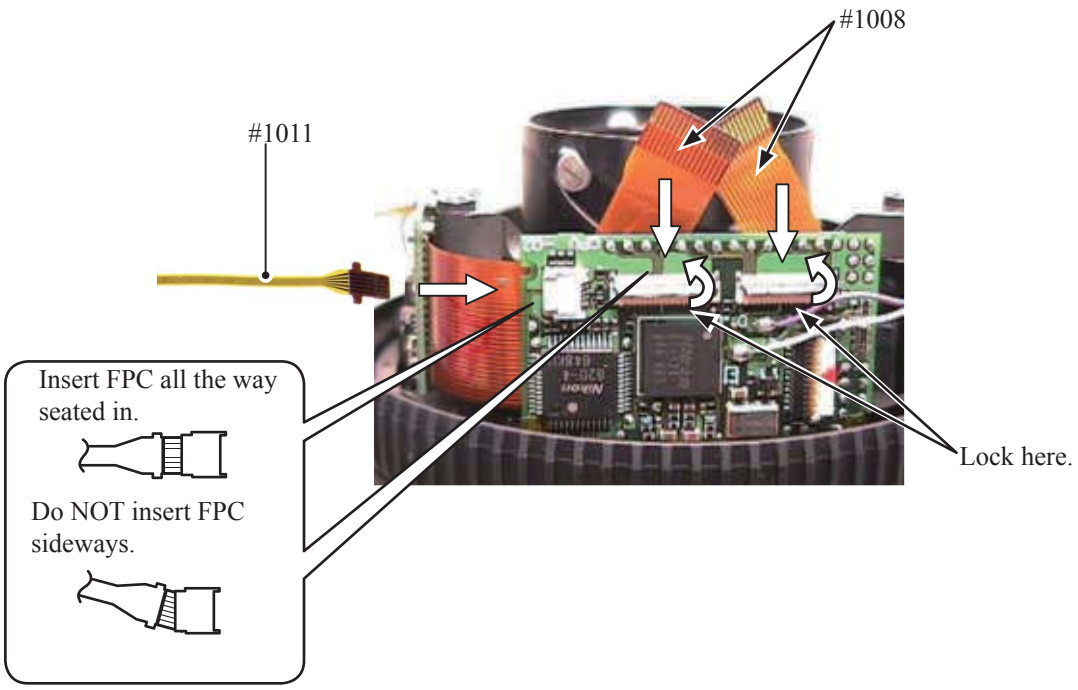
・Pass the GMR-FPC (#1011) under the lead wire (#1027) of the lug plate unit and the lead wire (#1031) of SMW-FPC.



・Connect the GMR-FPC (#1011) to the connector of the main PCB.

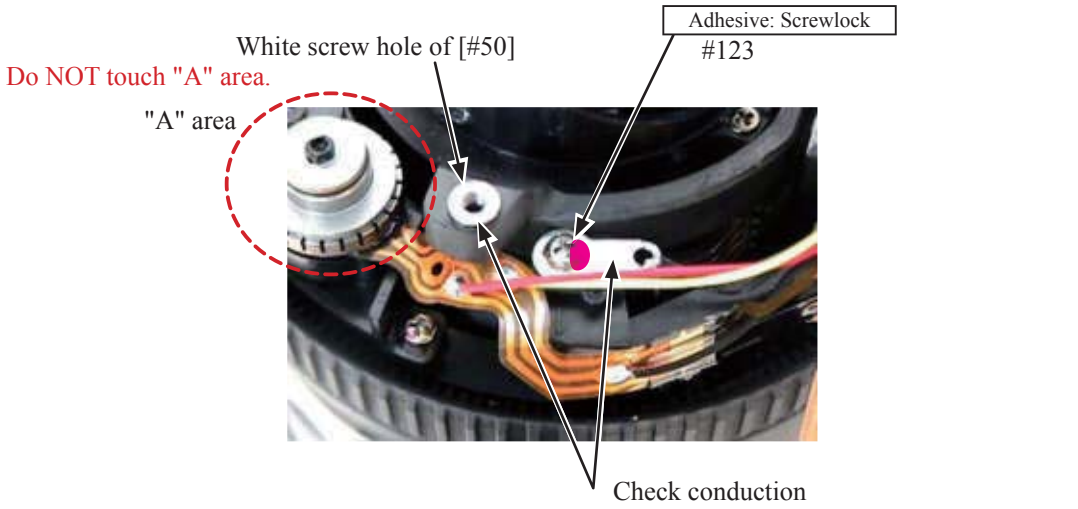
・Connect the connection-FPCs (#1008) to the connectors of the main PCB.

Caution: After connecting the connection-FPCs (#1008), be sure to lock the connectors.

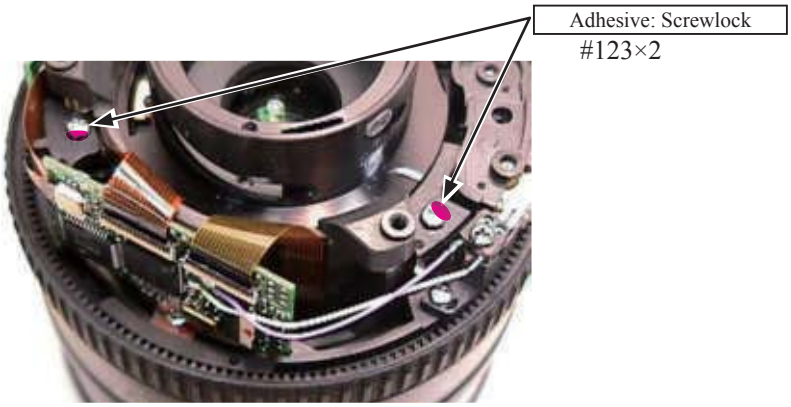


・Check conduction between the white screw hole of the fixed tube (#50) and the screw (#123) that attaches the lug plate unit (B1028).

・Apply the head of the three screws (#123) to fix.



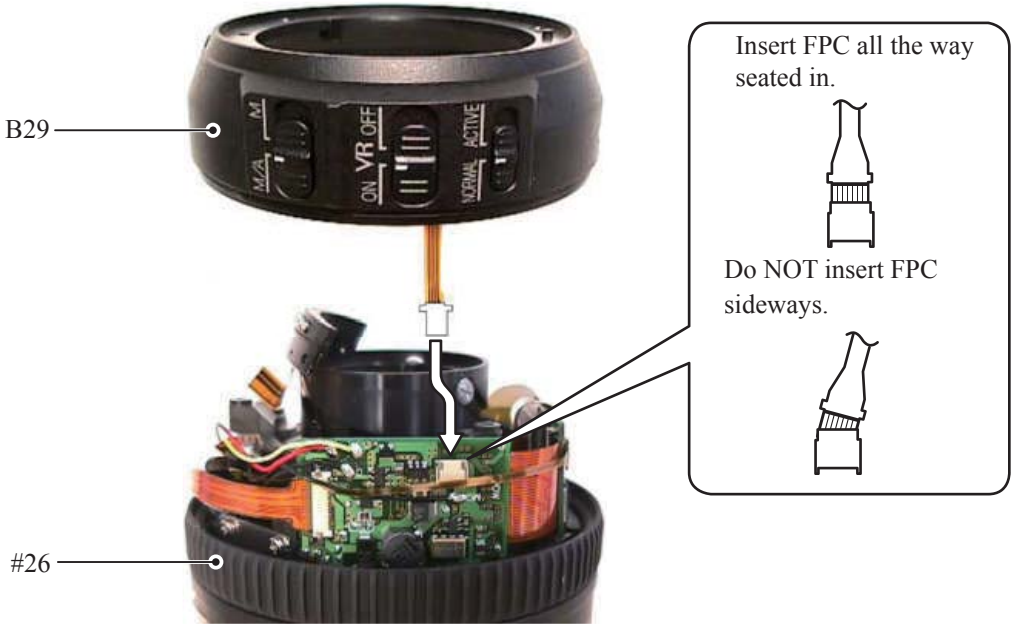
Value read by tester − Internal resistance value≦0.5Ω



Fixed ring unit

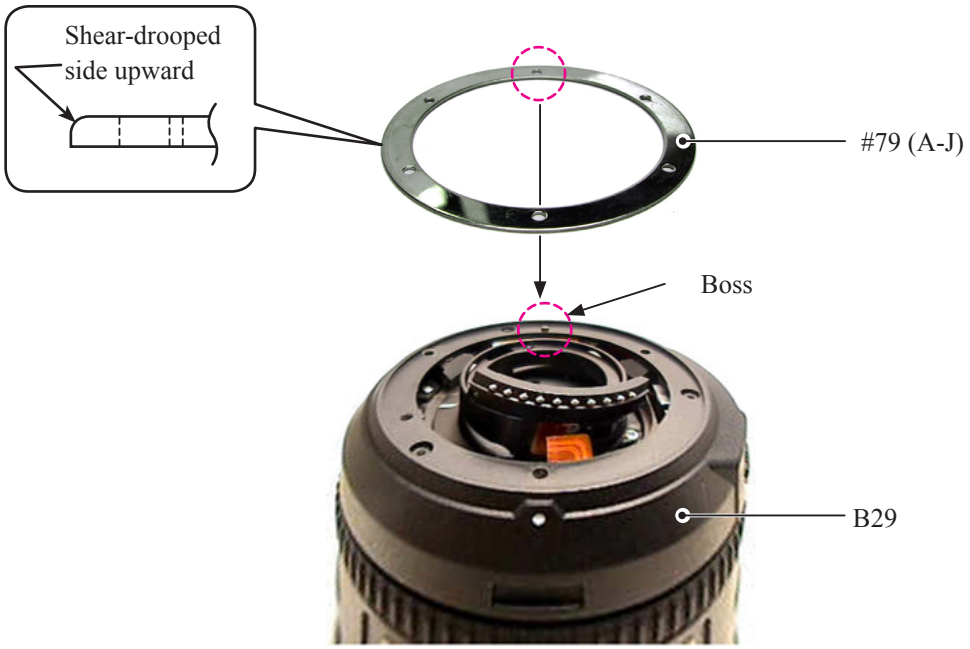
・Connect the FPC of the fixed ring to the connector of the main PCB (B1001).

・Mount the fixed ring unit (B29) on MF ring (#26).

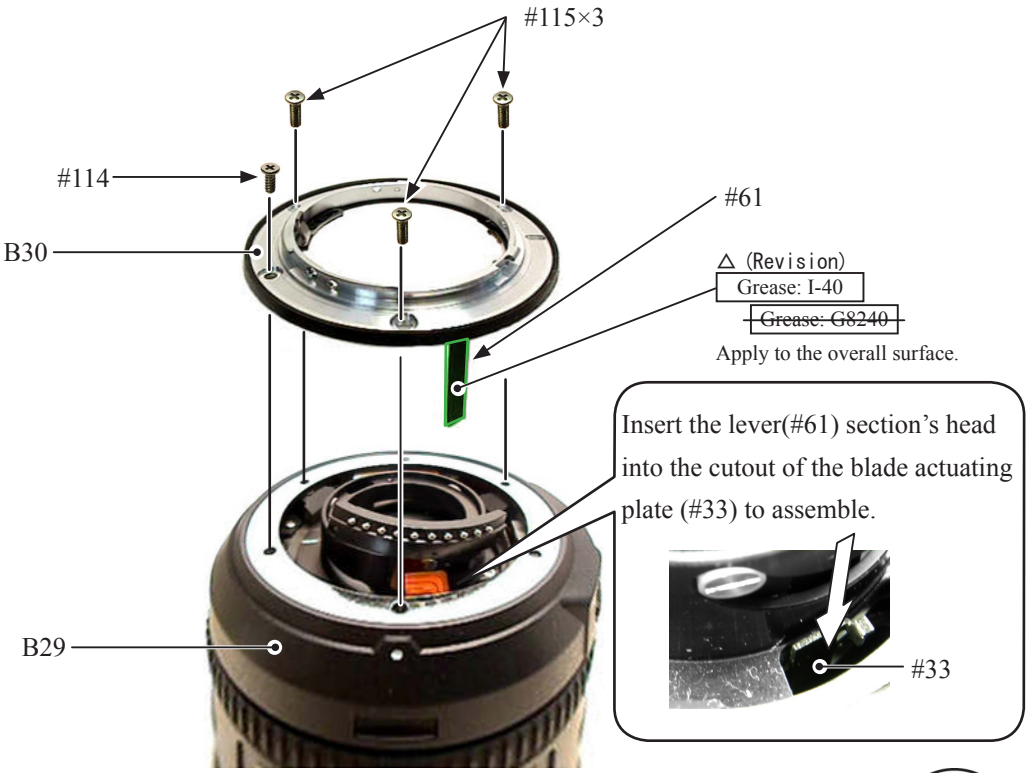


Bayonet mount unit

・Put the washer (#79) on the rear cover unit (B29) by fitting the boss in the hole.
・If more than one washer is used, put a thicker washer on the other(s).



・Mount the bayonet mount unit (B30) on the rear cover unit (B29).
・Tighten the three screws (#115) and one screw (#114).

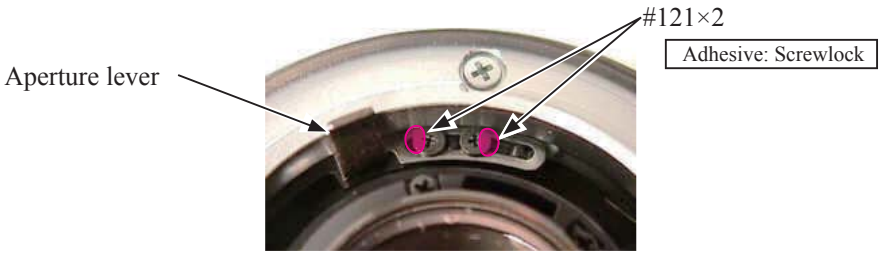


サービス計画課
M

Aperture lever adjustment

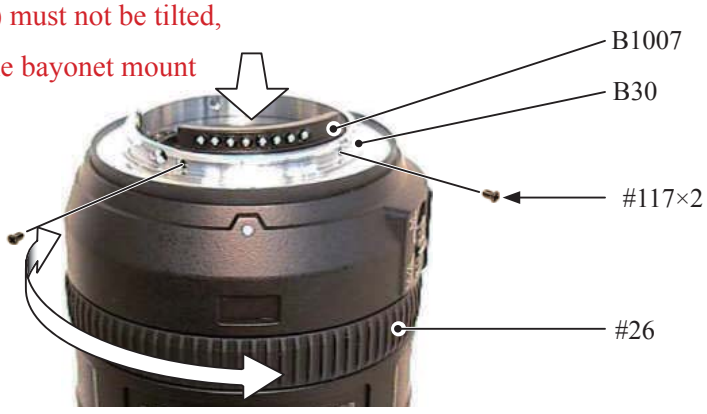
- Set the zoom ring to TELE-end.
- When the lock pin of [J18004-1] is put into the lock hole of the bayonet, confirm that the aperture blades become fully open.

- If the aperture blades open quickly or slowly, adjust the position of the aperture lever with the two screws (#121).
- When the position of the aperture lever is adjusted, apply the adhesive to the head of the two screws (#121) to fix.



- Set the zoom ring to TELE.
- Place the contact unit (B1007) on the bayonet mount unit (B30) by pressing in the direction (clockwise) for positioning.
- Tighten the two screws (#117).
- Turn MF ring (#26) and check operations.

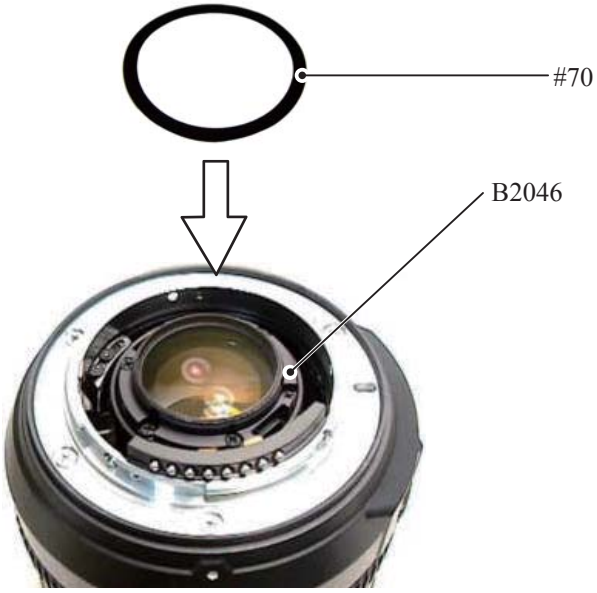
Caution: Contact unit (B1007) must not be tilted, slackened, nor gapped from the bayonet mount (B30).



4th lens group unit

- Mount the 4th lens-G unit (B2046) by fitting in the cutouts two each of the washer (#139) and the 4th lens-G sliding ring (#48).
- Secure the 4th lens-G unit (B2046) with the three screws (#124).
- Note that when the 4th lens group is removed, lens alignment work will be necessary.

- Adhere the sheet (#70) on the 4th lens-G unit (B2046).



Rubber ring

・Mount the rubber ring (#37).

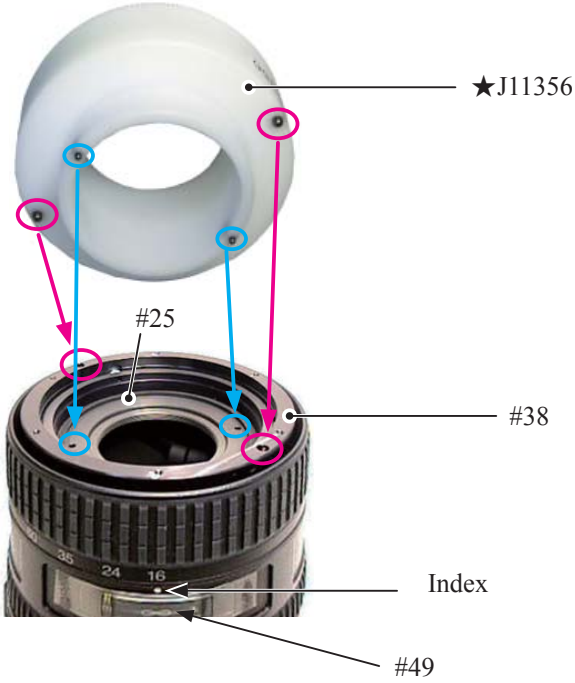
・Turn over the rubber ring (#37) and apply the adhesive as below.

2nd lens group unit

・Set the zoom ring to WIDE-end.

・Align "∞" position of the focus index (#49) with the below index.

・Mount the fixing tool for the 2nd lens-G (★ J11356) by fitting its protrusions in the holes of the 1st lens-G cam ring (#38) and the 2nd lens-G cam ring (#25).



・Turn clockwise the wrench for the 2nd lens-G (★ 11358), into which the 2nd lens-G unit (B2043) and the washer (#80) are assembled, and fix them into the 2nd lens-G cam ring (#25).

・Set the zoom ring to WIDE, and adhere the sheet (#62).

NOTE:

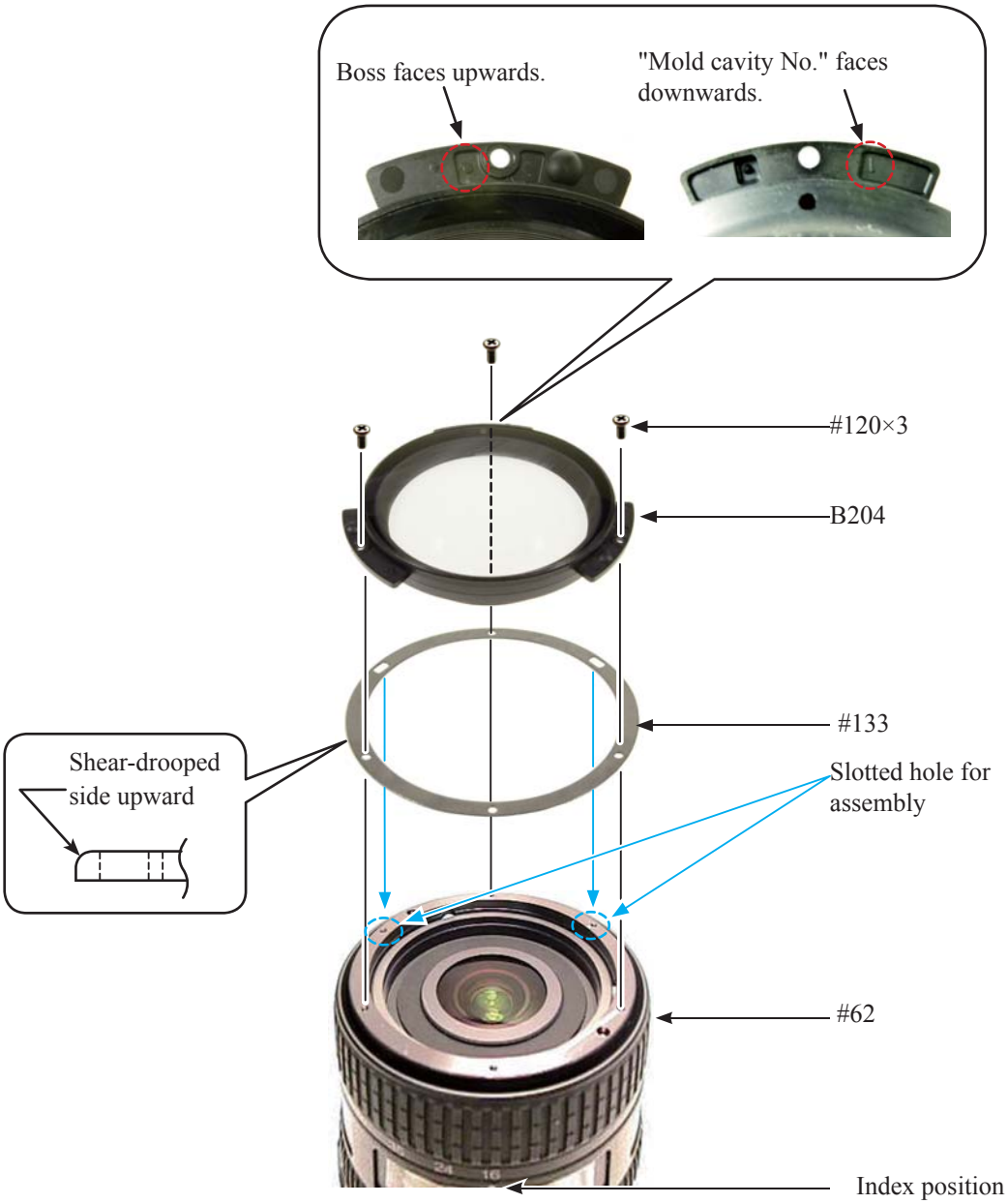
If dust/dirt is attached to the lens surface of the 2nd lens-G(B2043), blow them away with a blower as much as possible.

If impossible, dip a wiping cloth (Savina Minimax) a little in ethanol, and wipe the surface lightly.

1st lens group unit

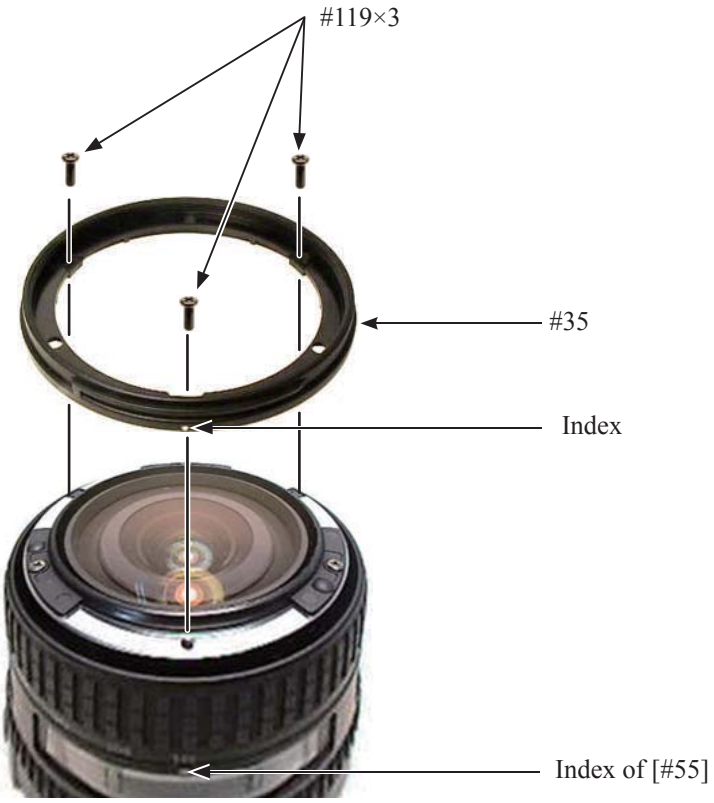
- Set the zoom ring to WIDE.
- Mount the 1st lens-G unit (B204) by placing the boss ("Mold cavity no.) halfway around from the index.
- Secure the 1st lens-G unit (B204) with the three screws (#120) by turning clockwise from the index.

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



Filter ring

- Align the index of the filter ring (#35) with the index of the fixed ring (#55).
- Tighten the three screws (#119).

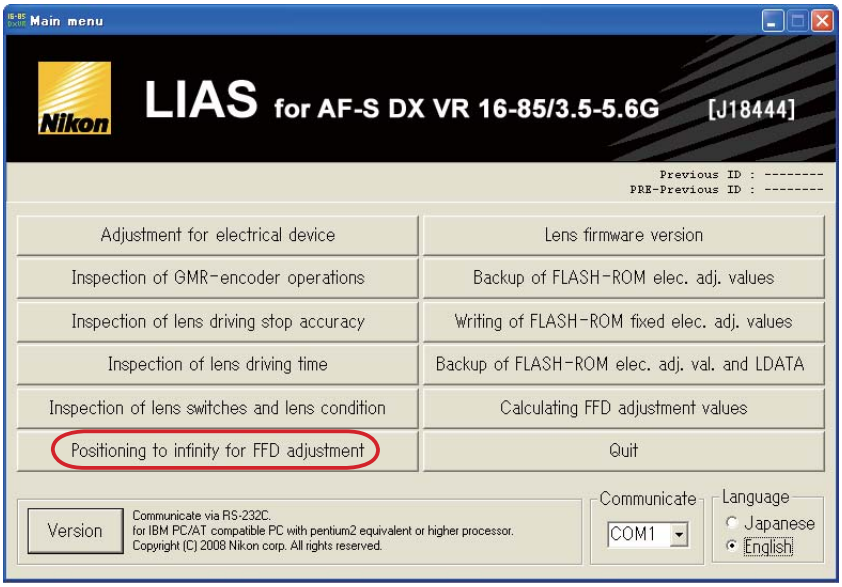


Adjustment of Focus movement (T, W)

★ : New tool

・Start up the adjustment software (★ J18444).

・Perform "Positioning to infinity for FFD adjustment" on the main menu for performing "∞" positioning.

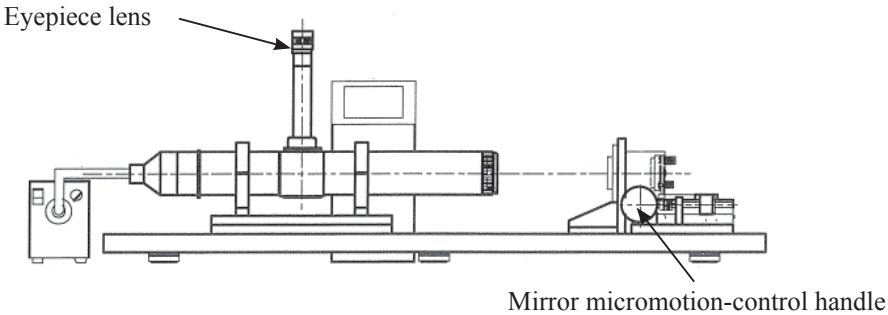


・Being careful NOT to move the filter ring, mount the lens on the horizontal-type collimator.

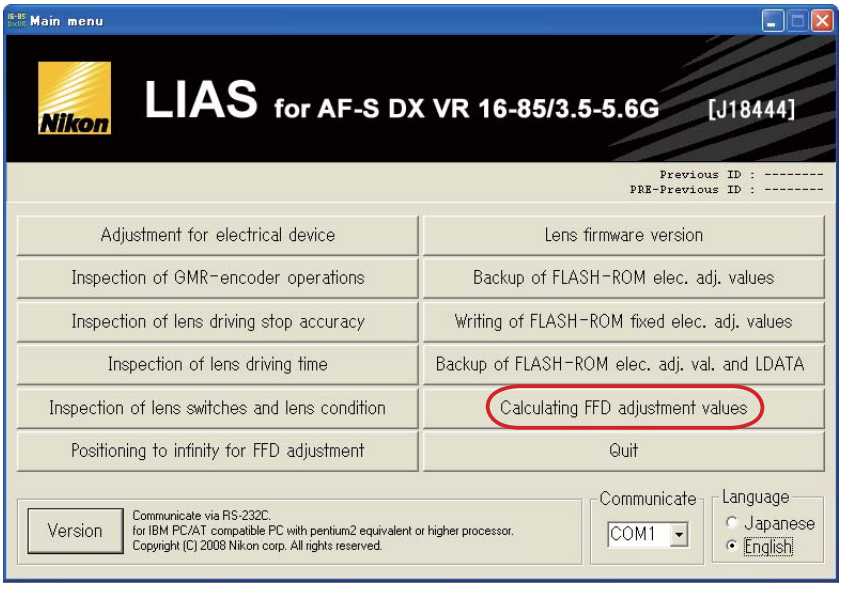
・Looking through the eyepiece of the horizontal-type collimator, rotate the mirror micromotion-control handle to adjust focus, then measure focus position at WIDE (16 mm), MIDDLE (35 mm), and TELE (85 mm).

The focus position to be measured is the numeric number of the boundary line at the moment when the color of cross lines change from green to orange.

＜ Horizontal-type collimator ＞



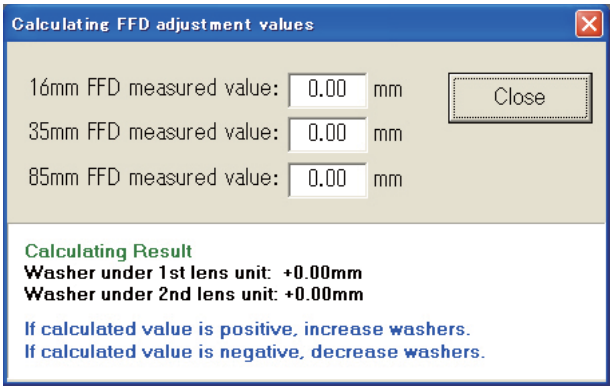
・Click "Calculating FFD adjustment values" on the main menu.



・Input the focus positions which were measured by the horizontal-type collimator at WIDE (16 mm), MIDDLE (35 mm), and TELE (85 mm) into the below fields.

・Calculate the adjustment amounts of (1) the washer (#133) which is under the 1st lens group and (2) the washer (#80) which is under the 2nd lens group.

・Adjust thickness by increasing/decreasing washers. If the result is positive, increase the thickness, while it is negative, decrease the thickness. (ref. Page A36, A38)



Adjustment of F.F.D (Back focus)

★ : New tool

・Start up the adjustment software (★ J18444).

・Perform "Positioning to infinity for FFD adjustment" on the main menu for performing "∞" positioning.

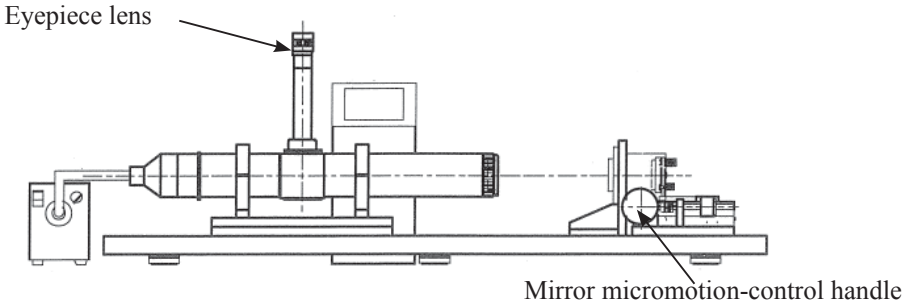
・Being careful NOT to move the filter ring, mount the lens on the horizontal-type collimator.

・Looking through the eyepiece of the horizontal-type collimator, rotate the mirror micromotion-control handle to adjust focus, then measure focus position at WIDE or TELE.

The focus position to be measured is the numeric number of the boundary line at the moment when the color of cross lines change from green to orange.

In case the measured value is out of standard, follow the below procedure.

＜ Horizontal-type collimator ＞



Focal length (f)	Standard (mm)
16 mm	0.01 ～ +0.19
35 mm	0.01 ～ +0.19
85 mm	-0.09 ～ +0.21

・Remove the bayonet mount unit (B30).

・Adjust thickness by increasing/decreasing washers (#79) by a difference from the standard value.

If the difference is positive, increase the thickness, while it is negative, decrease the thickness. (ref. Page A32).

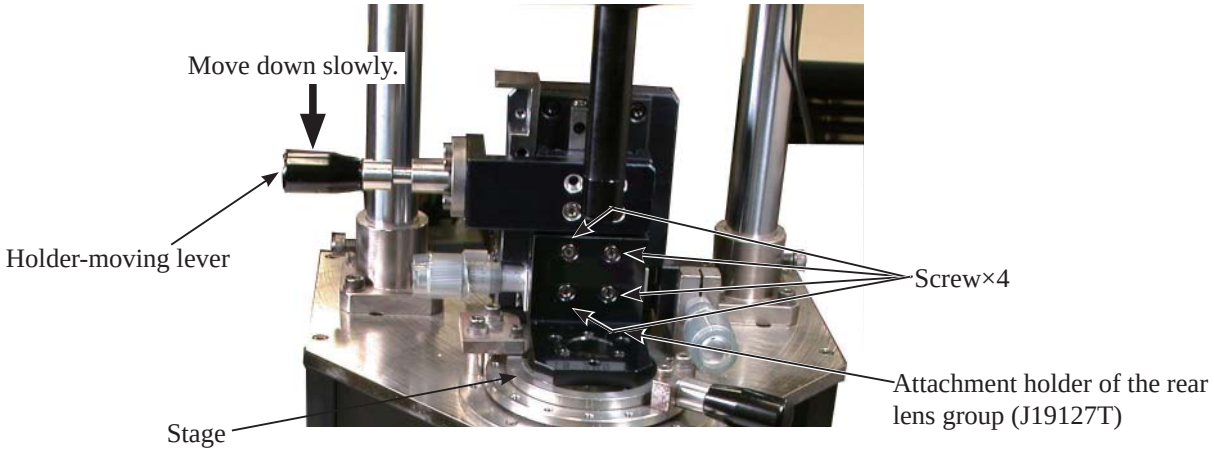
Lens Alignment

Caution: This adjustment is required when the 4th lens group is removed.

(1) Preparation of Lens optical alignment equipment

・Fix the attachment holder of the rear lens group (J19127T) on the lens equipment.

How to Fix: Move down the holder-moving lever slowly so that the attachment holder of the rear lens group (J19127T) touches the stage.Then tighten four screws to fix it.



・Create the center positioning tool.

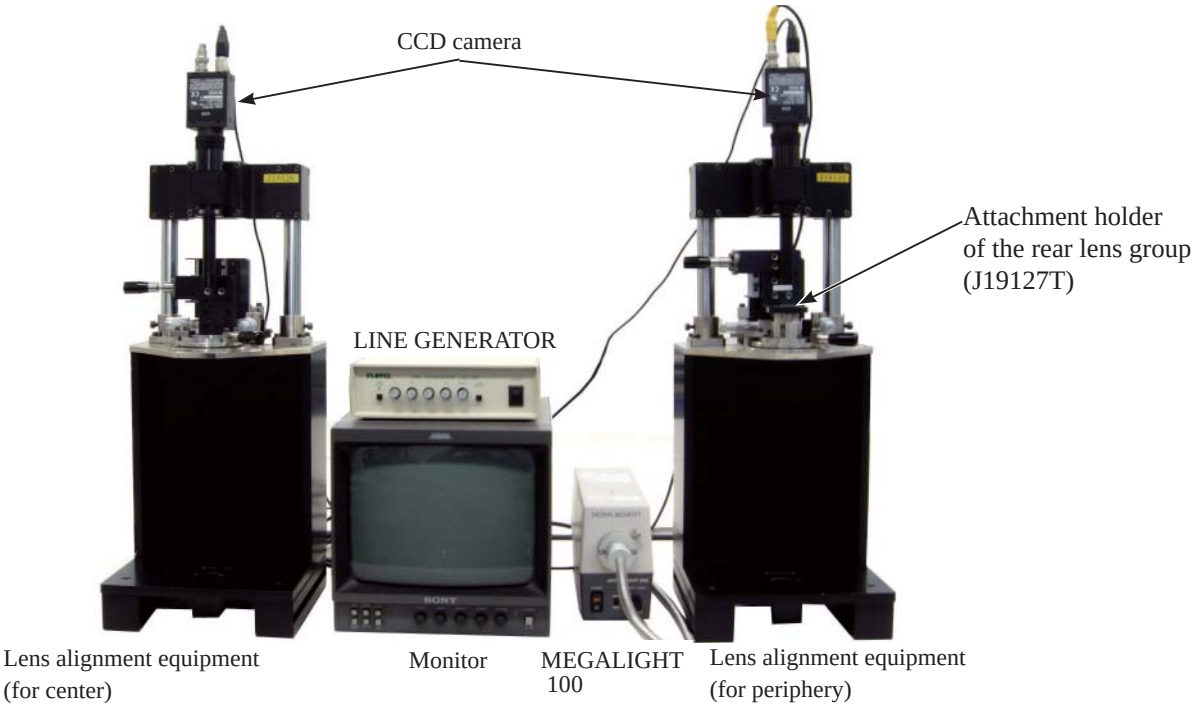
Refer to [Create positioning tool of Rear lens-group holder for lens alignment] (Page A57) for how to create.

・Create cardboards with which "Lens alignment chart" and "Viewers" are fit.

Refer to [Create Setting board of "Lens alignment chart" and "Viewer"] (Page from A58 to A60) for how to create.

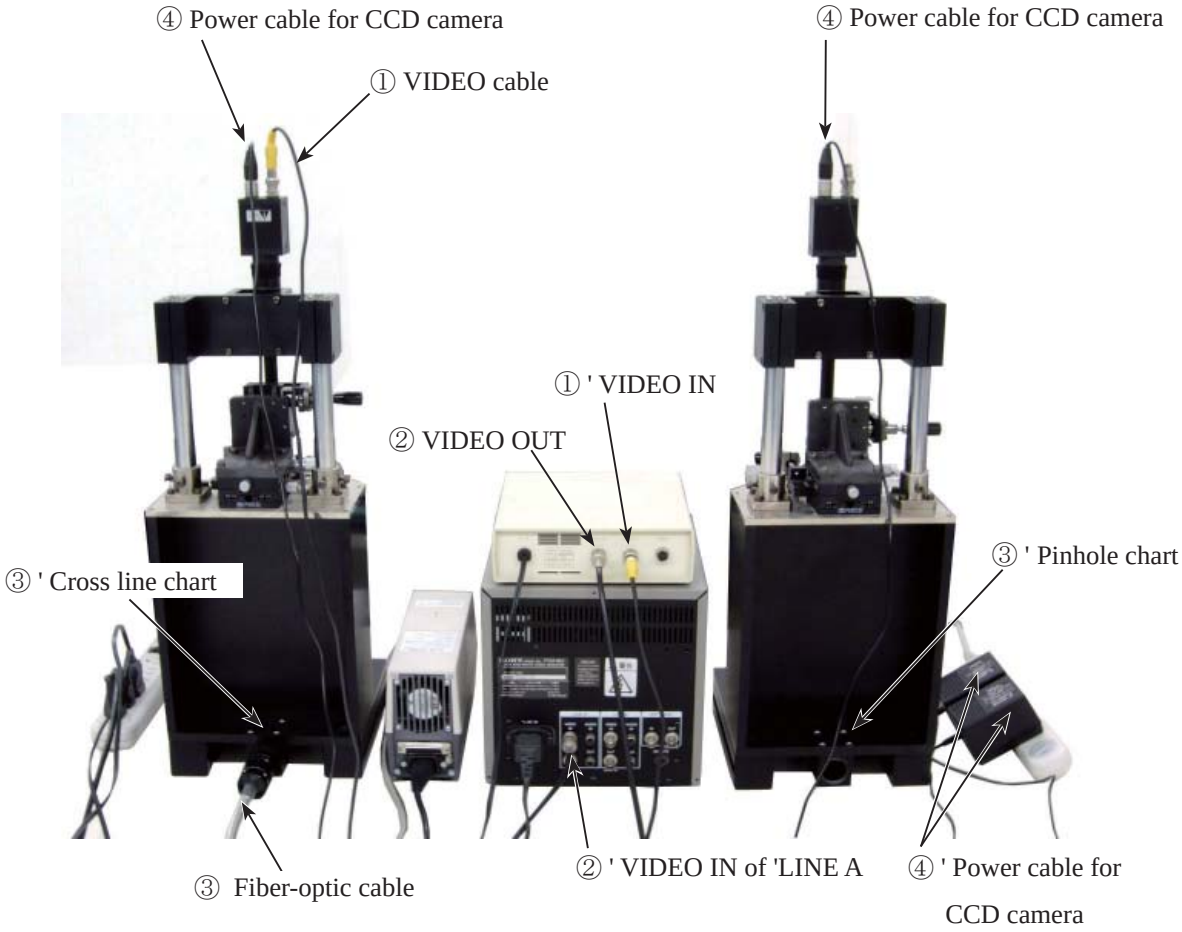
【Create Setting board of "Lens alignment chart" and "Viewer"】

< Lens optical alignment equipment >



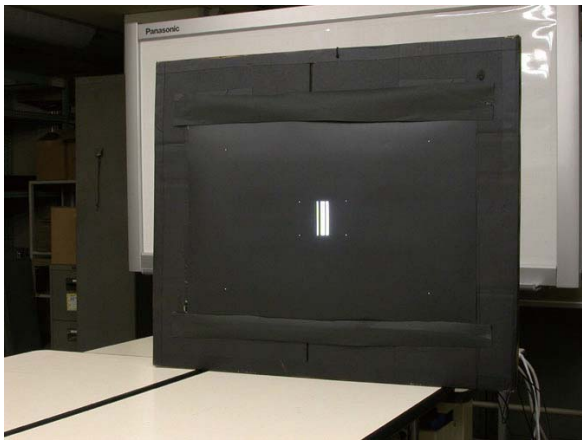
<Back view of Lens optical alignment equipment>

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



< Chart shooting equipment for 4th lens-group alignment >

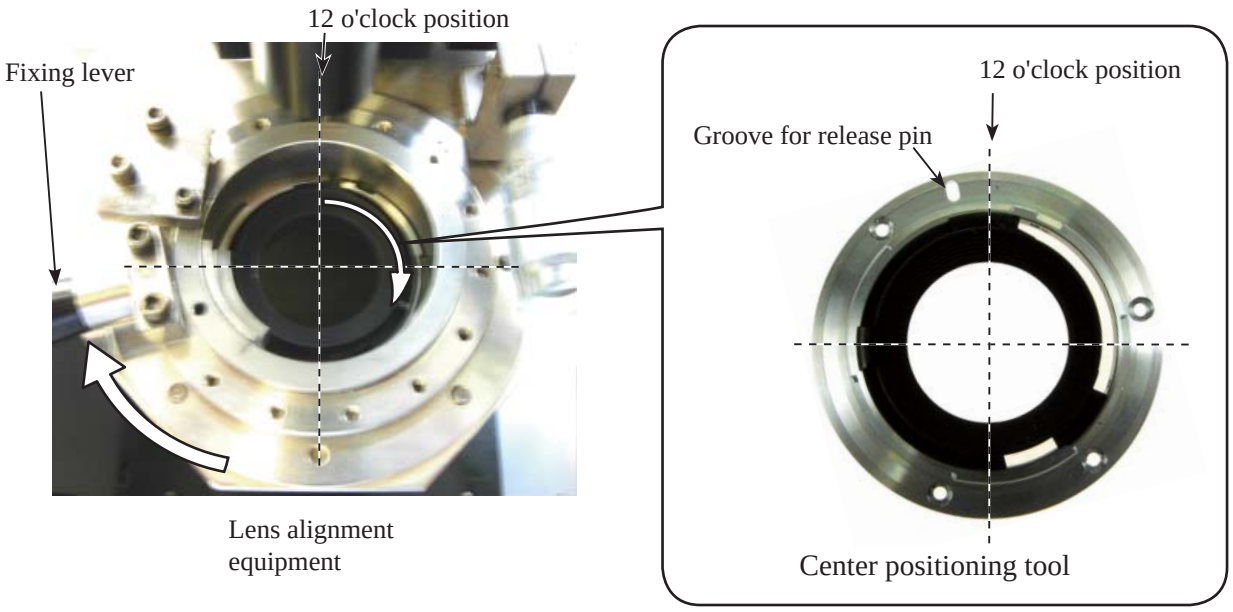
Slide rail for lens alignment equipment



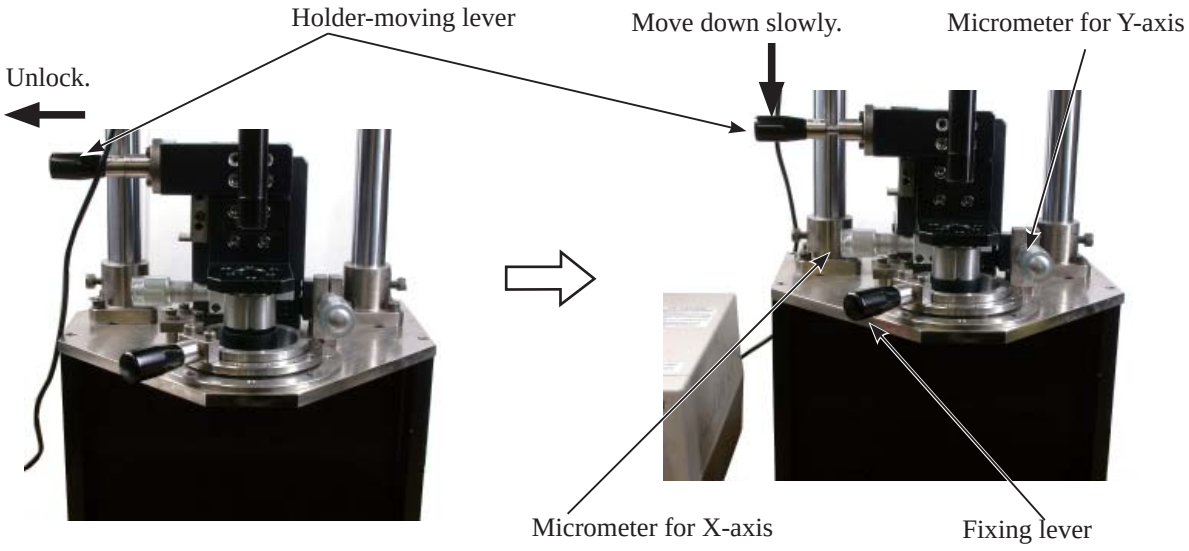
The chart is embeddied in cardboards.

(2) Center positioning of rear lens-group holder

・Mount the (self-made) center positioning tool on the lens alignment equipment (for center) 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.



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



・Adjust the attachment holder (J19127T) position by rotating the micrometers for X-axis or Y-axis so that the center of the attachment holder coincides with that of the rear cover ring of the (self-made) center positioning tool.

Caution: Without this alignment, the 4th lens may be damaged by the attachment holder.

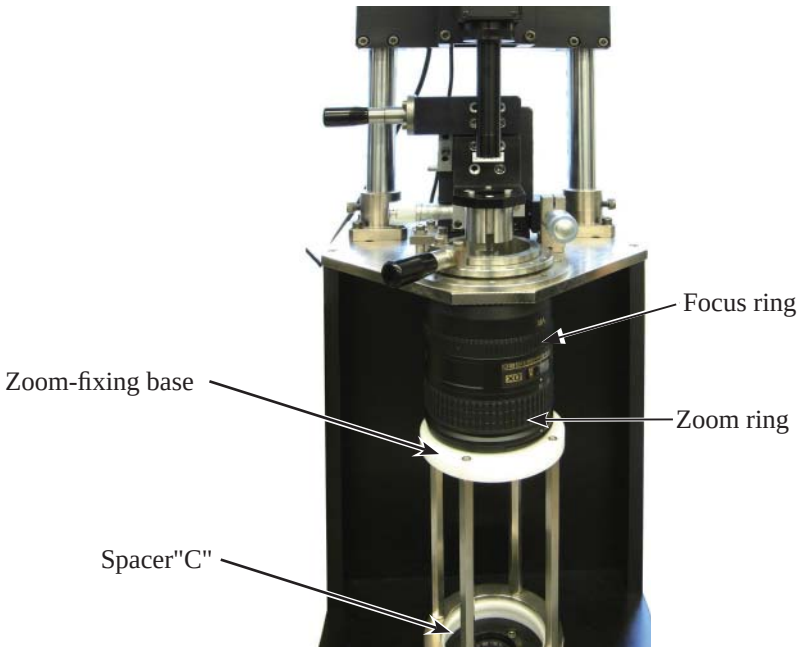
・Move the holder-moving lever of the alignment equipment upwards, and remove the (self-made) center positioning tool from the equipment by moving the fixing lever rightwards.

(3) Temporary positioning of the 4th lens group

・Mount the lens on the lens alignment equipment (for center). Set the focus ring to "infinity-end".
Refer to [(2) Center positioning of rear lens-group holder] (Page A45) for how to mount the lens.

・Set the Zoom ring to "16 mm".

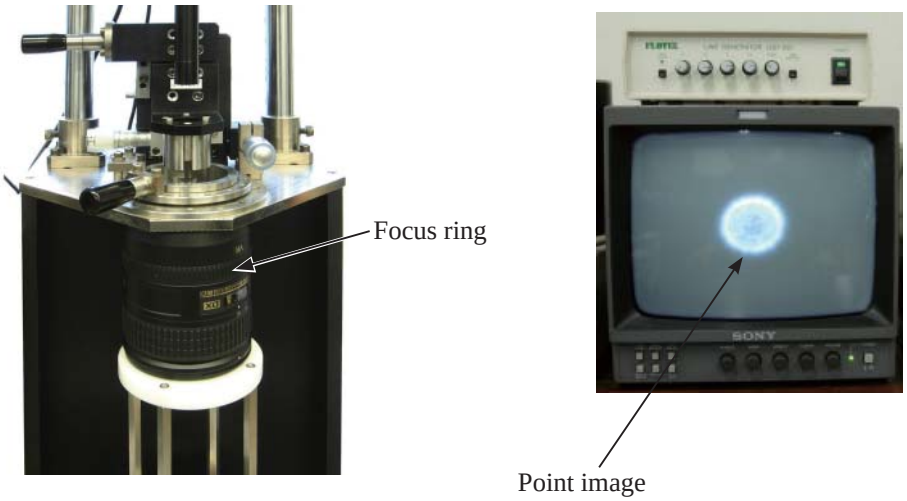
・Place the zoom-fixing base with the spacer"C", then turn the zoom ring towards TELE until the lens touches the zoom fixing base.



・Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to ON.

・Rotate the "LIGHT CONT."knob of "MEGALIGHT 100" and adjust brightness.

・Rotate the focus ring. Adjust the shape of point image so that the point image on the monitor is like bellow.



・Check the point image on the monitor.
In case the shape is like "Fig.1", remove the lens from the alignment equipment.
In case the point image is like "Fig.2" or "Fig.3", go to the next procedure, and perform "adjustment of 4th lens group point image".

< 4th lens group point image >

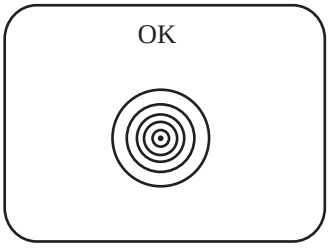


Fig.1

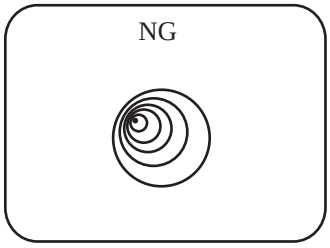


Fig.2

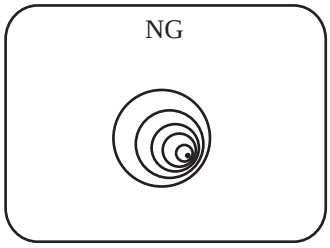
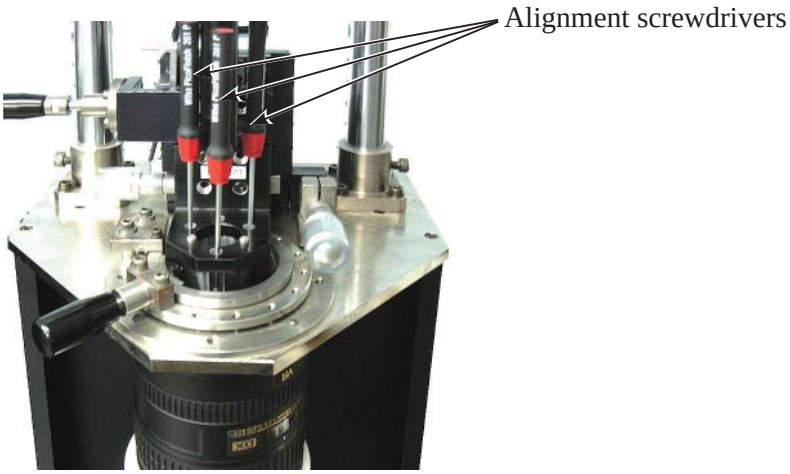


Fig.3

・Unlock the holder-moving lever, and move the holder down slowly by the lever.
Caution: Be careful NOT to damage the 4th lens group by the attachment holder (J19127T).

・Insert the three alignment screwdrivers in the screw holes of the 4th lens unit, and loosen the screws.
Caution: When inserting the alignment screwdrivers, move the holder-moving lever up to lock the holder. Then put them straight down in the screw holes so that the screws can be easily found. After inserting the alignment screwdrivers, unlock the holder-moving lever and move the holder down slowly by the lever.



・Rotate the micrometer (X-axis and Y-axis) so that the point image on the monitor is like "Fig.1".

・When the point image becomes like the above "Fig.1", tighten the three (loosened) screws of the 4th lens-G unit with the below three alignment screwdrivers.

・Remove the three alignment screwdrivers from the attachment holder (J19127T).

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

(4) Chart shooting for the rear lens group alignment

・Prepare a camera (D200). Set the shutter speed to "M1/60", aperture to "full open", and the focus mode to "S". On the shooting menu, set "Image Quality" mode to "RAW", "WB" to "Preset" and "ISO" to "200".

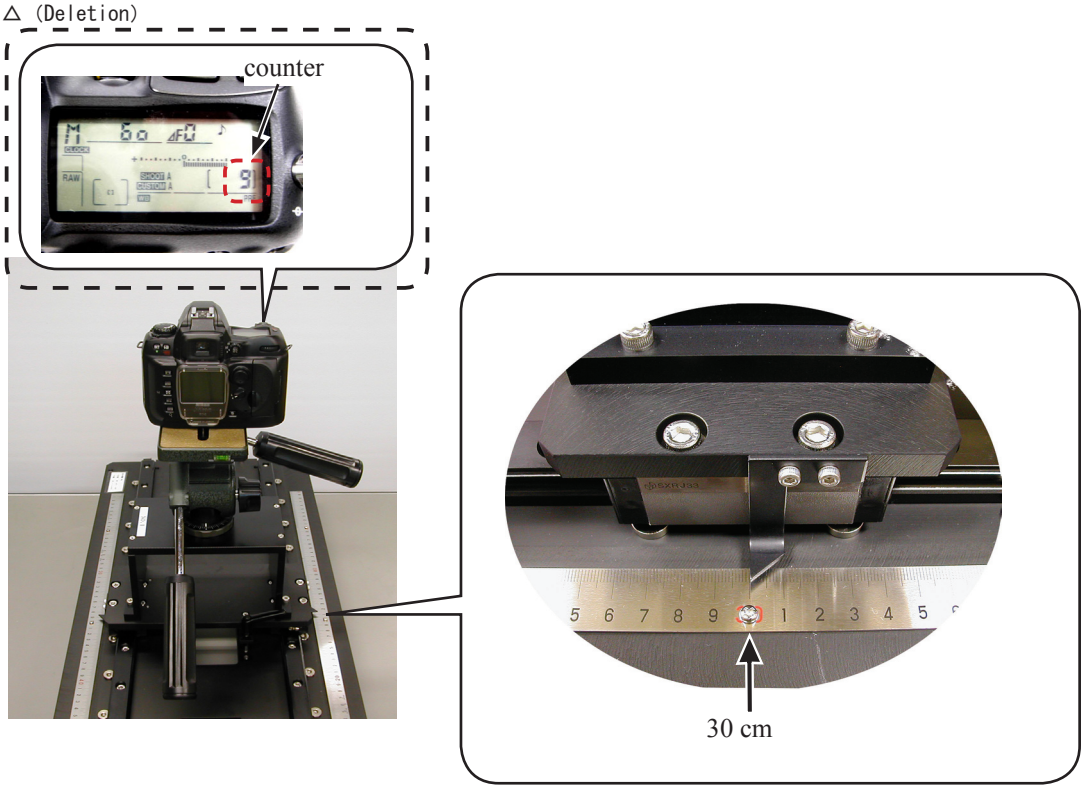
・Set the VR mode of the lens to "OFF".

~~・Insert CF card into the camera~~ △ (Deletion)

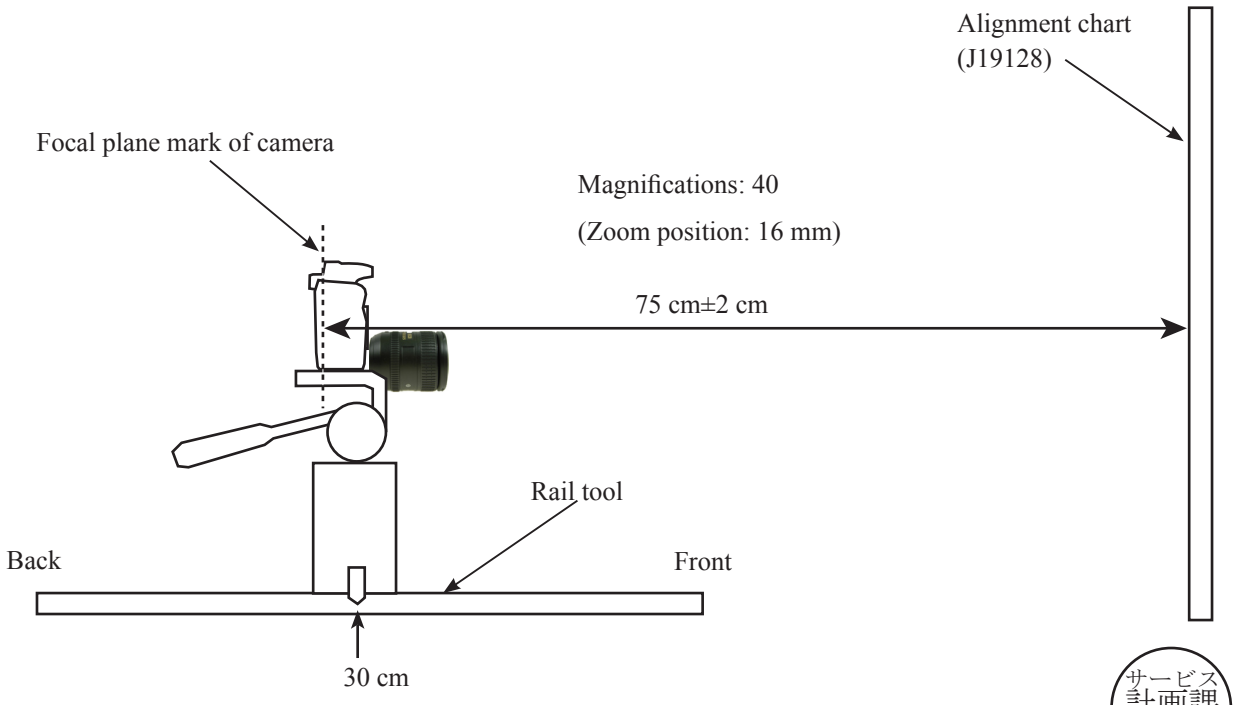
~~・Check that the counter shows "2" or more.~~ △ (Deletion)

・Set up the camera (D200) on a tripod on the slide rail. Set the indication pointer of the tripod to 30 cm.

△ (Deletion)



・Set the alignment chart (J19128) as shown below.

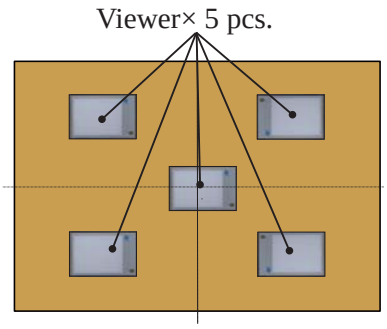


サービス計画課 M

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

Caution: If the batteries of viewers are exhausted causing decreased brightness, the shooting data cannot be obtained correctly.

Front



Back

・Attach the suspected lens to the camera (D200). Set the A/M change SW to "M", the zoom ring to "24 mm", and the focus ring to "infinity".

・Set the A/M change SW to "M/A".

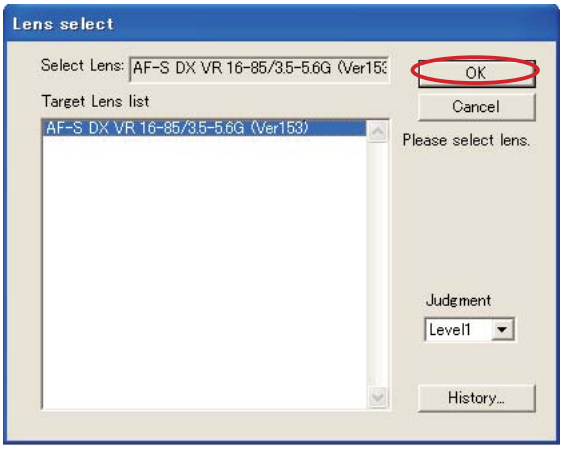
・By looking through the viewfinder, adjust the height and tilt to make the chart fill the entire finder field frame.

・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.

・Connect the PC and camera via USB cable (Camera setting for USB: PTP).

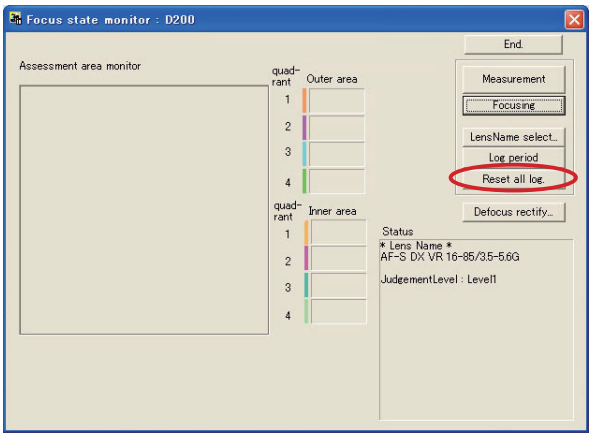
・Start the adjustment software (LWM_AFSDXVR16_85.exe).

・Click "OK".

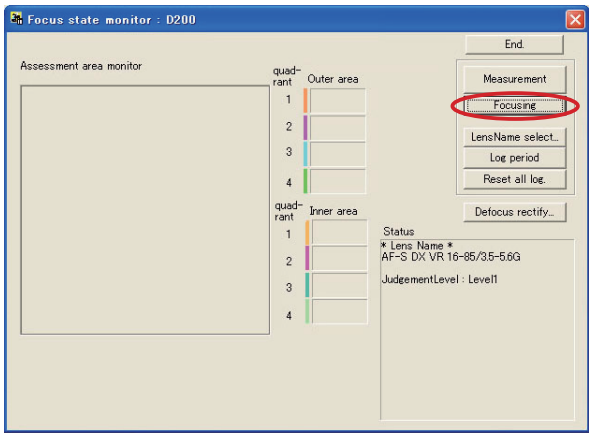


※ If this software is used for the first time, the selection screen of reading data will appear. This does not appear after the 2nd-time usage. Select "FD_AUTO.dll" and click "Open".

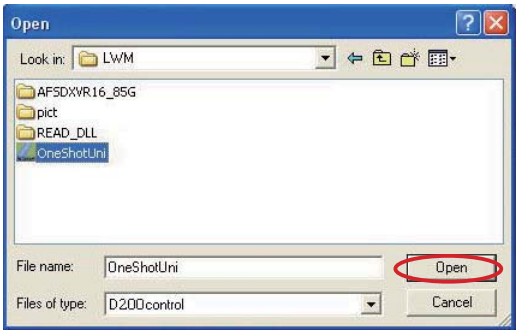
・Click "Reset all Log".



・After darken the room, click "Focusing". AF is activated to focus and the shutter is released.

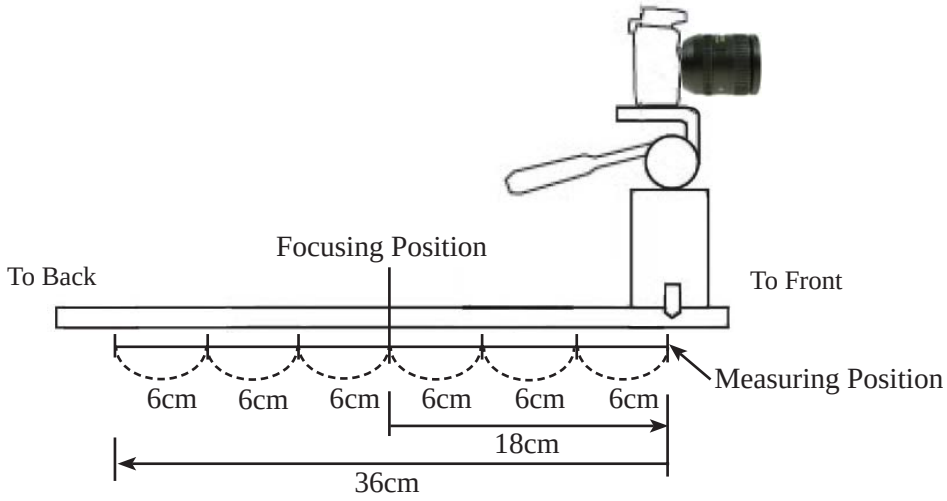


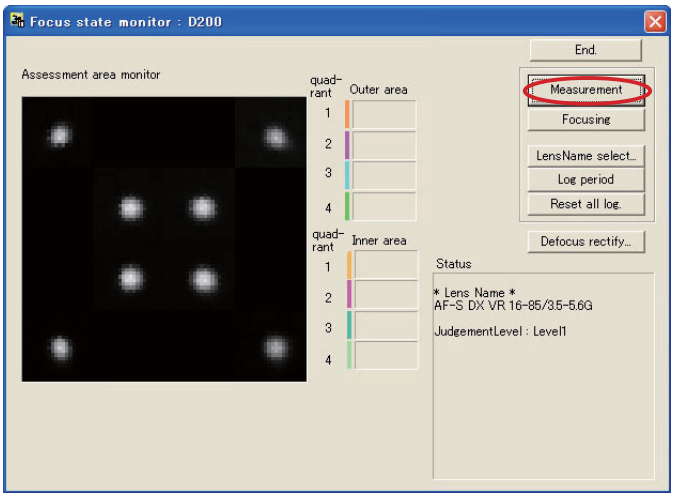
※ If this software is used for the first time, the software selection screen will appear. This does not appear after the 2nd-time usage.Select "OneShotUni" and click "Open".



・Set the A/M change SW to "M".

・Slide the tripod to the front by 18±0.1 cm. Click "Measurement".

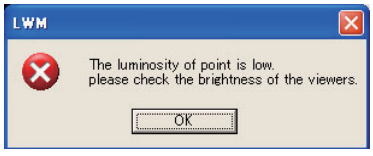




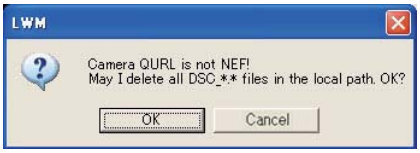
・When the shutter of the camera is released, slide the tripod to the back by 6±0.1 cm and click "Measurement" again.

・Repeat this procedure (of sliding the tripod in increments of 6±0.1 cm and clicking "Measurement" at 7 measuring positions). The total sliding distance is 36 cm. (ref. Illustration of previous page)

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.

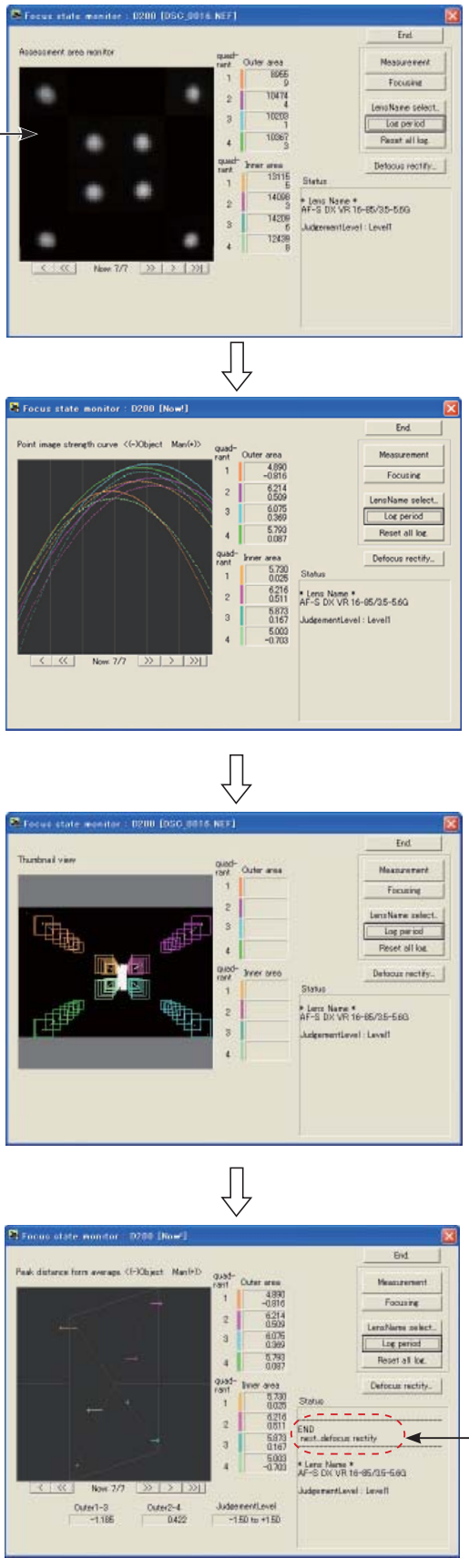


・After the seven measurements, point the cursor to the confirmation screen of the software. Click it three times.

If "Information" displays "END", the lens optical alignment is completed.

If "Information" displays other than "END", go to the next "(5) 4th lens group alignment" (Page A53) to readjust.

Confirmation screen



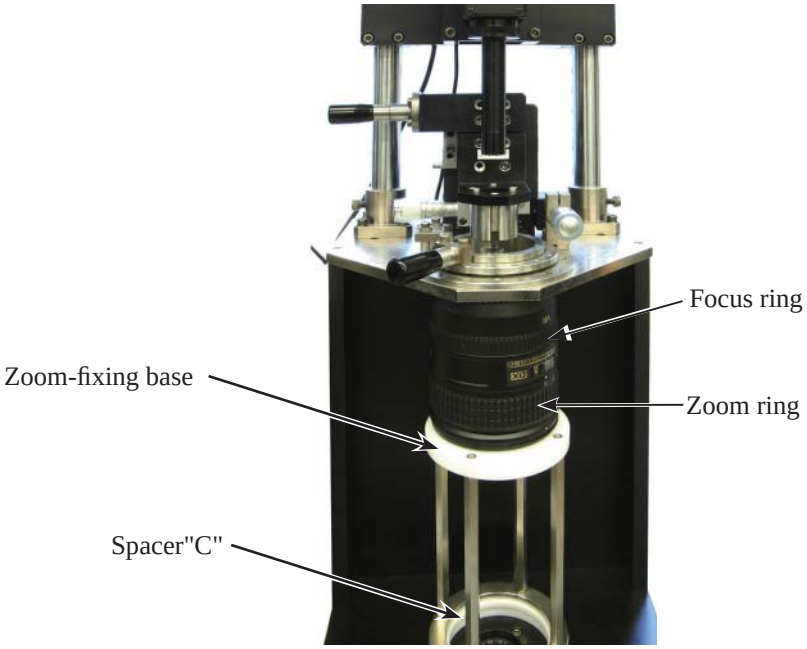
(5) 4th lens group alignment

・Mount the lens on the equipment (for periphery).

Refer to [(2) Center positioning of rear lens-group holder] (Page A45) for how to mount the lens.

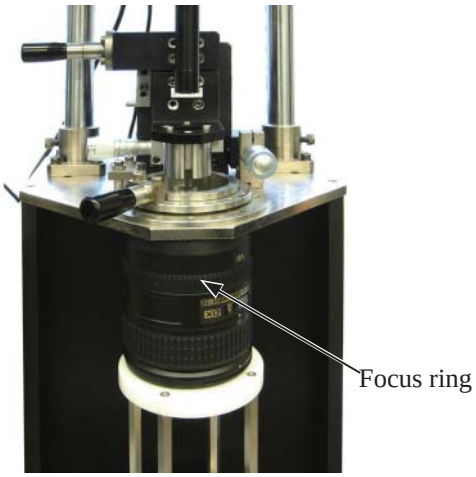
・Set the zoom ring to "16 mm"

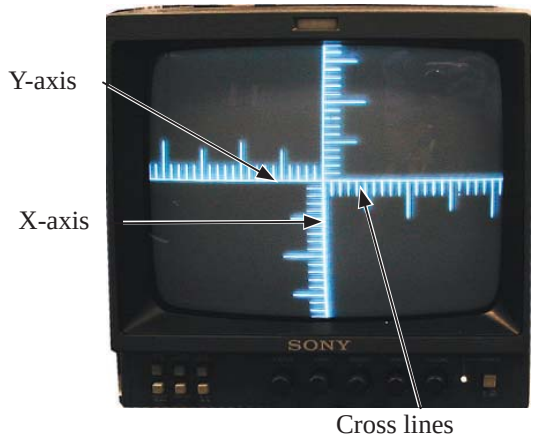
・Place the zoom-fixing base with the spacer"C", then turn the zoom ring towards TELE until the lens touches the zoom fixing base..



・Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to ON.

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





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

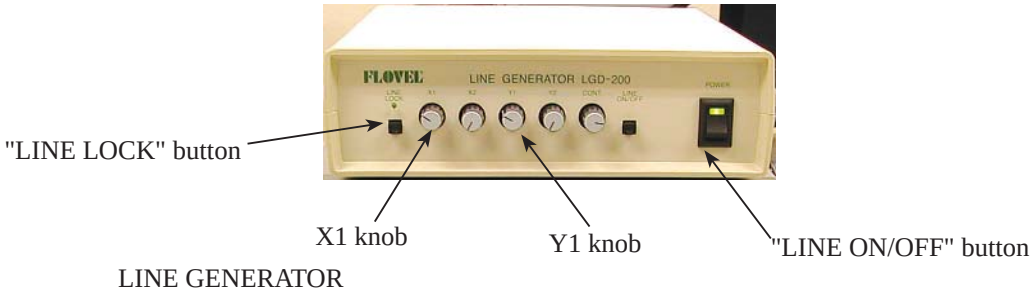
・Unlock the holder-moving lever, and move the holder down slowly by the lever.

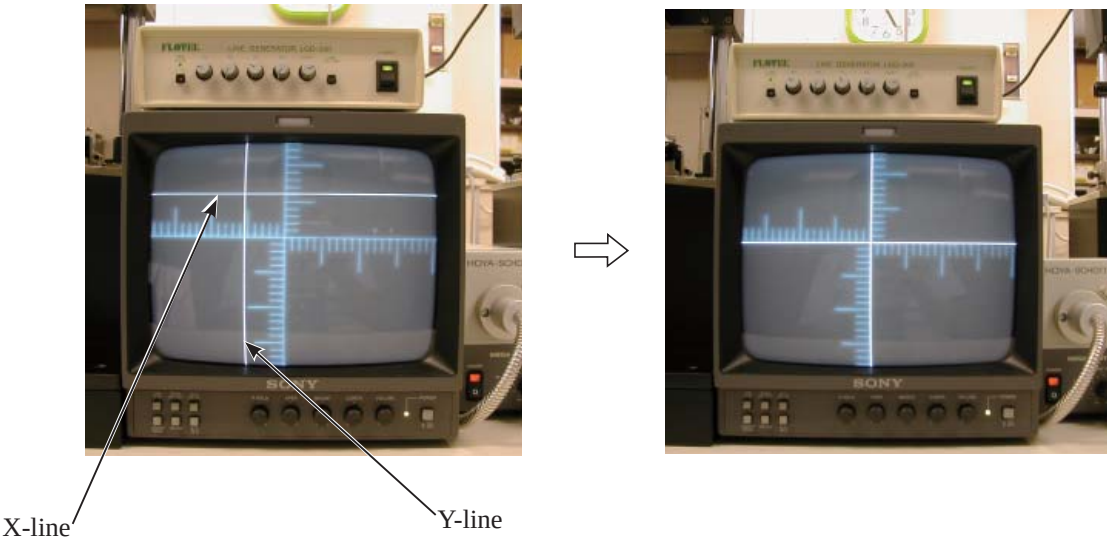
Caution: Be careful NOT to damage the 4th lens group by the attachment holder (J19127P).

・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.

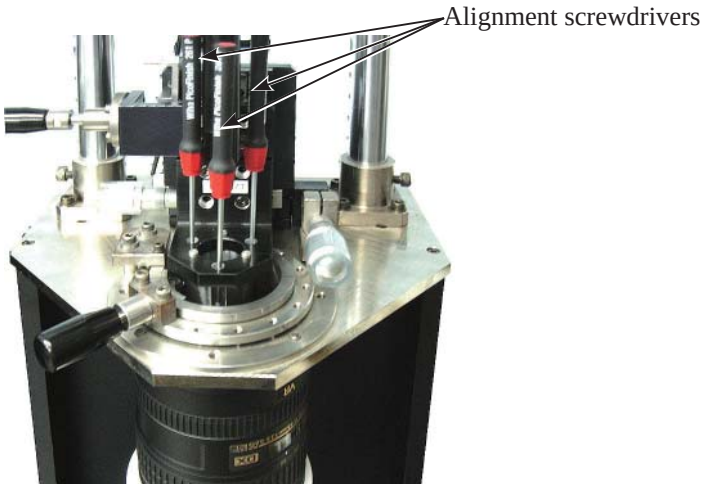
Then press "LINE LOCK" button to fix these X- and Y-lines.





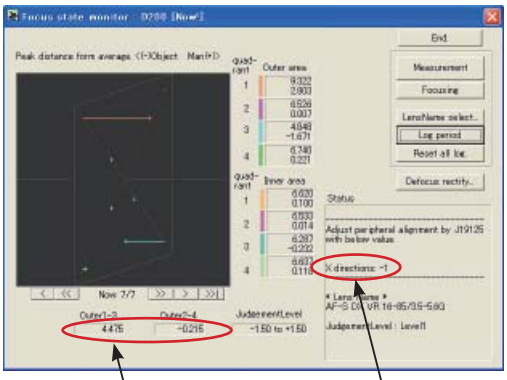
・Insert the three alignment screwdrivers in the screw holes of the 4th lens unit, and loosen the screws.

Caution: When inserting the alignment screwdrivers, move the holder-moving lever up to lock the holder. Then put them straight down in the screw holes so that the screws can be easily found. After inserting the three alignment screwdrivers, unlock the holder-moving lever, and move the holder down slowly by the lever.



・Rotate the knobs of the micrometer (X and Y axes), and shift the calibrated cross lines based on the result (values) of the chart shooting of the rear lens group alignment.

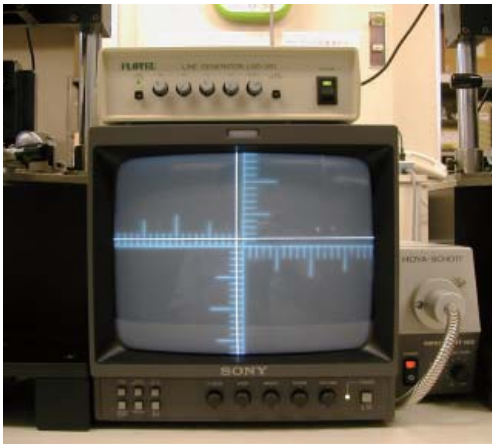
Caution: When the knobs of the micrometer (X and Y axes) are rotated but the calibrated cross lines are unable to move, do not forcedly rotate them.



Result (values)

If more accuracy is preferable even if "END" is displayed, adjust by using the value of "Outer 1-3" as the adjustment amount for "X-axis", while the value of "Outer 2-4" as the adjustment amount for "Y-axis".

< e.g. (X directions:+1, Y directions:-1) >



・After completing the above shift, tighten three screws of the 4th lens unit with the alignment screwdrivers.

・Remove the alignment screwdrivers from the attachment holder (J19127T).

・Move the holder-moving lever up to lock the holder.

・Check that shift amounts (caused by differences between the calibrated cross lines and the X/Y lines) are equal to the result (values) (1= 1 scale amount of the calibrated cross lines) of "Chart shooting of the rear lens group alignment".

Caution: After fixing the three screws of the 4th lens unit, if the shift amounts are different from the result of the chart shooting, repeat the rear lens group alignment until they become equal.

・Turn each power of the monitor, LINE GENERATOR, and MEGALIGHT 100 to OFF.
Remove the lens from the equipment (for periphery).

・Go back to [(4) Chart shooting for the rear lens group alignment] (Page A48).
Repeat this procedure of [(4) Chart shooting for the rear lens group alignment] (Page A48) and [(5) 4th lens group alignment] (Page A53) until the result become "END".

【Create positioning tool of Rear lens-group holder for lens alignment】

1.Summery

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

The following devices are used:

*Rear cover ring (#39. :1K631-959) ×1

*Bayonet mount unit (1C999-645) ×1

For use, remove the other components than the bayonet mount section from the bayonet mount unit of RP.

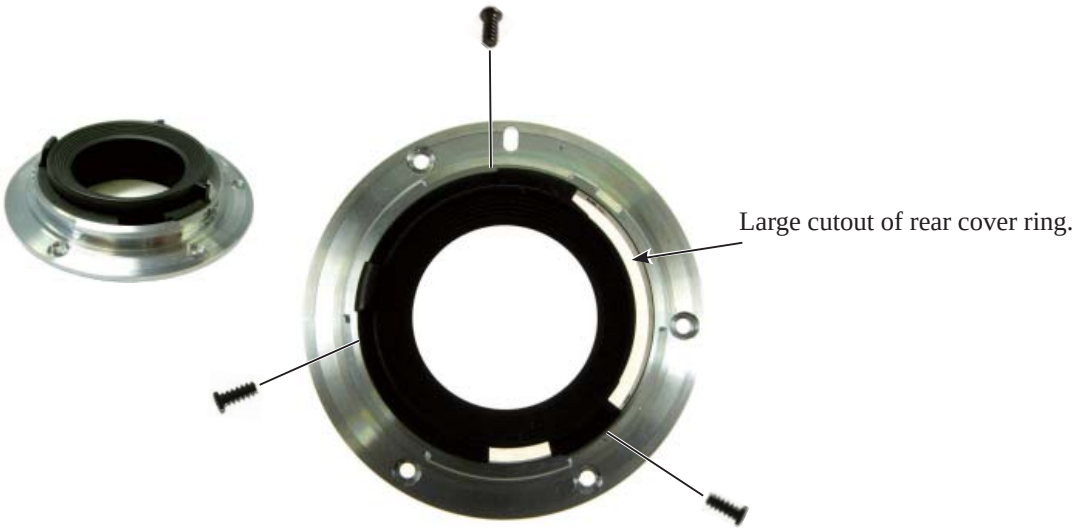
*Screw (#118. :1K010-002-1) ×3

3.Procedure

・Put the bayonet mount as below.

Put with the groove, in which the lock pin of camera body enters, facing upwards.

・Mount the rear cover ring on the bayonet mount, and fix them with three screws.



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

1. Summary

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

2. Preparation

Device

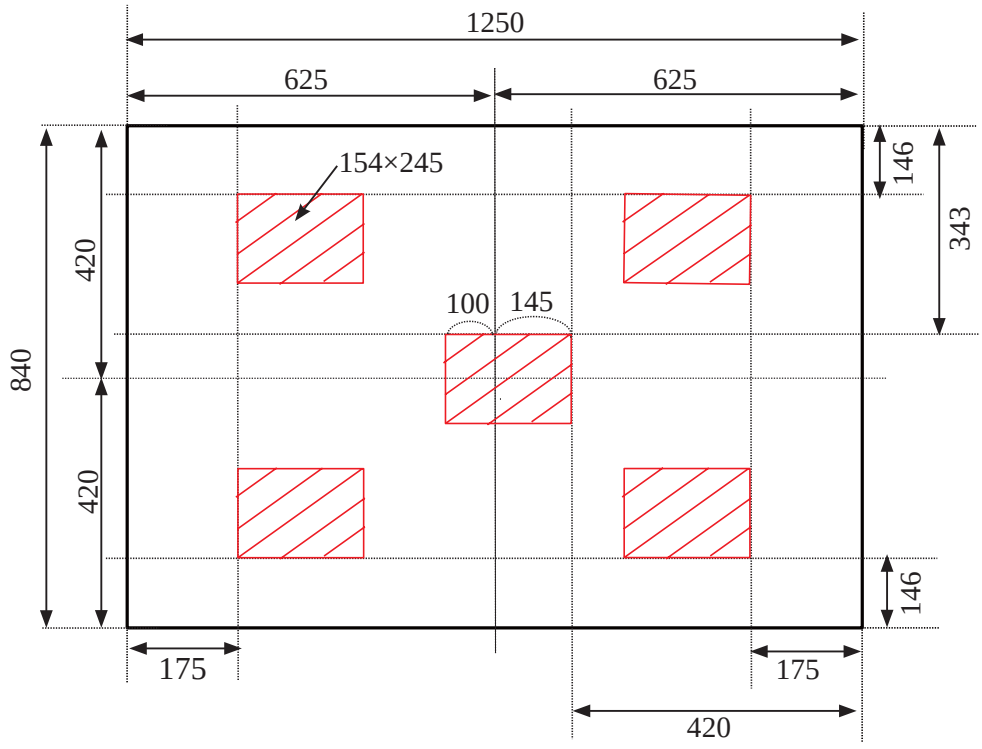
- Light viewer (for J19134): J19128A
  (Size: 154×245mm) 5 pcs.
- Lens alignment chart (for D3): J19128
  Size: 840×1250mm) 1 pc.
- Board or cardboard box
  (Size: 840×1250×20mm) 1 pc.

(Note) Because it is necessary to cut out for fitting the light viewers, choose cardboard boxes or material which can be easily cut.

3. Procedure(In this document, 2 cardboard boxes (840×1250×10mm) are used.)

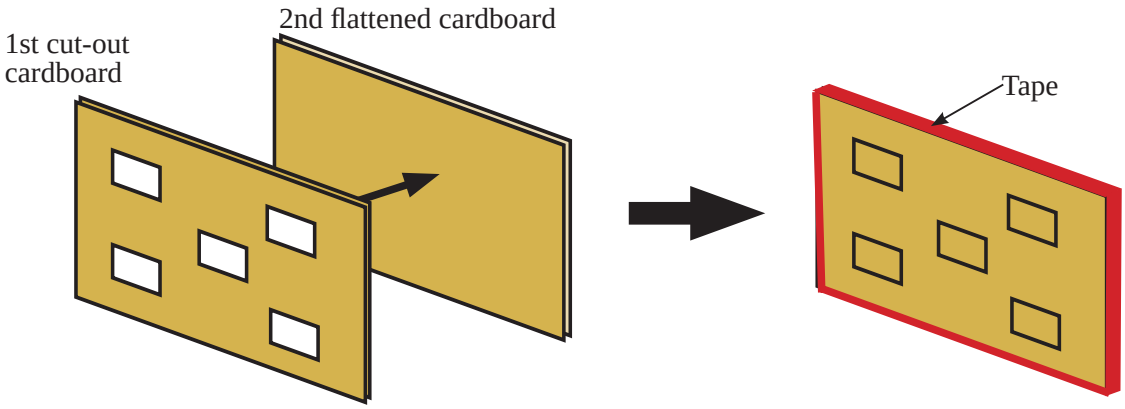
① As for the 1st flattened cardboard box, check the positions which the light viewers fit in, and cut out the shape at 5 locations (shaded parts/size 154 x 245 mm) as shown below.

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

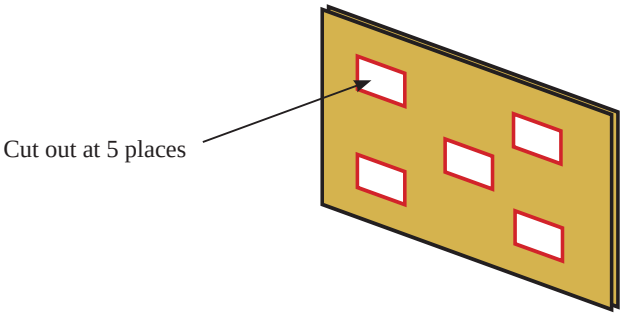


Dimensioned drawing

② Put the 1st cut-out cardboard (①) and the 2nd flattened cardboard together as one, and fix them by taping at four sides.

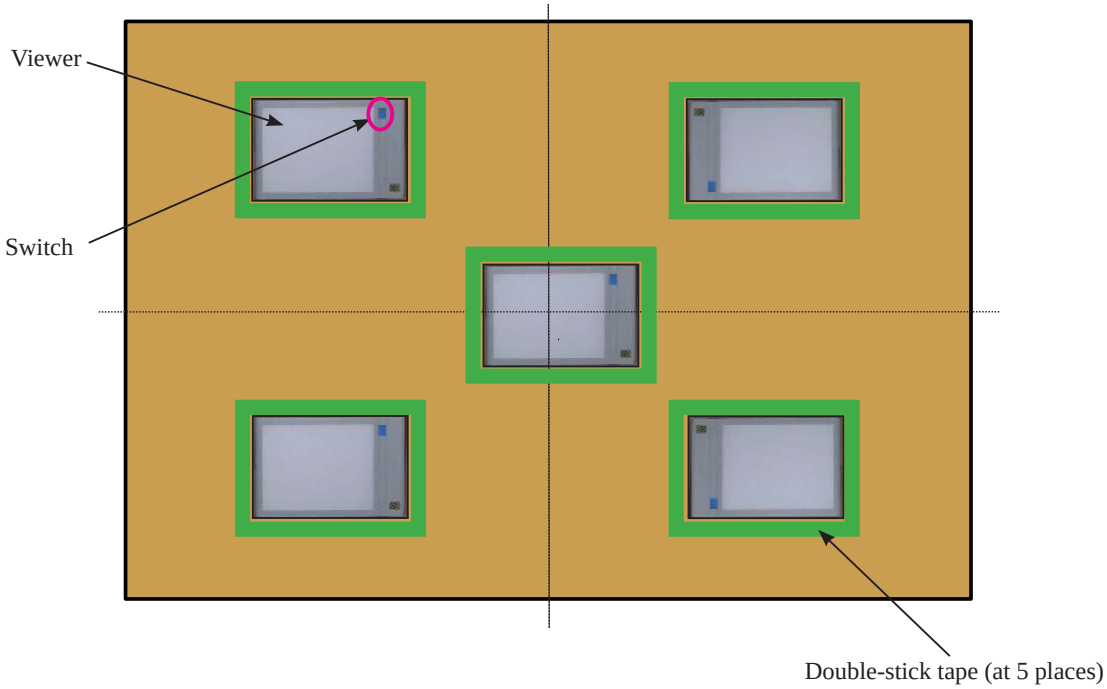


③ As for the above cardboards (②), cut out the same shape again as the cut-out size (ref. ①) from the 2nd flattened cardboard for each viewer at five places.



④ Fit the viewers in the created boards so that each viewer's switch is positioned as below.

⑤ Reinforce the edges of cut-out parts with double-stick tape.

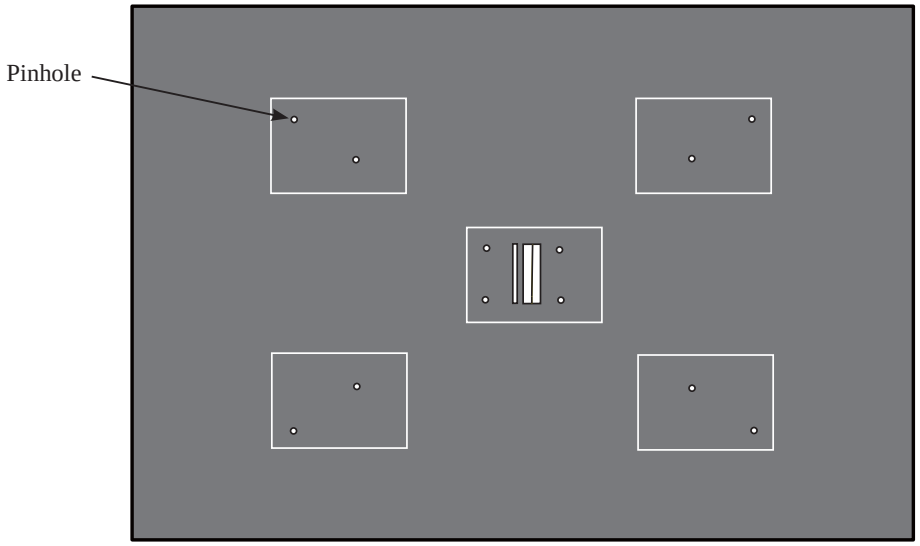


⑥ Light up the viewers. Set and attach the alignment chart (J19134) so that all the pinholes are located on the viewer.

If the setting board is larger than the alignment chart, blacken the area around the setting board with black spray, etc, after attaching the chart.

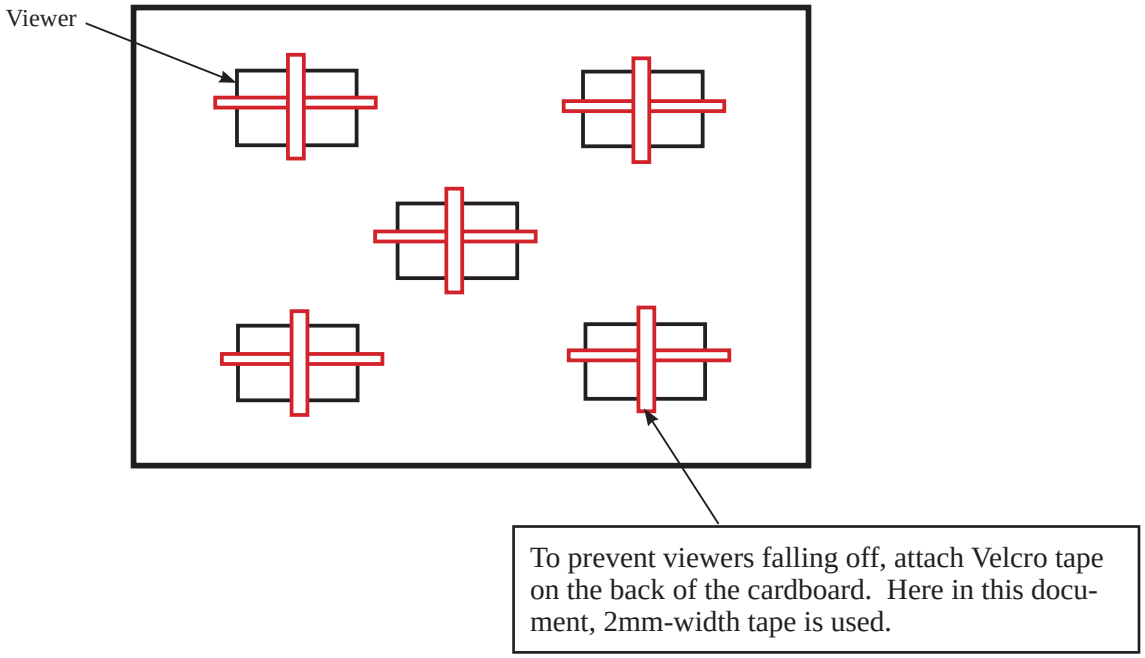
Caution:

To prevent the chart from being slackened around the pinholes, secure the chart by adhering the double-stick tape around the pinholes.



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

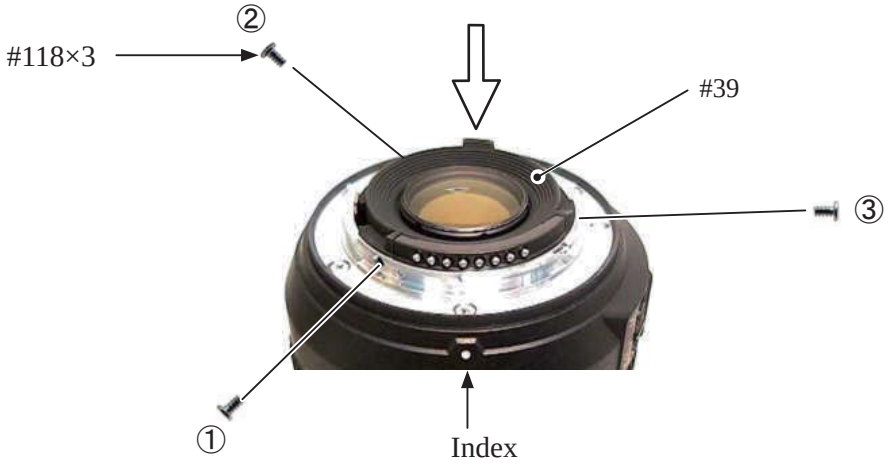
After viewers are put in position, secure them with Velcro tape (hook and loop fastener) on the back of the cardboard to prevent viewers falling off.



Rear cover ring

・Mount the rear cover ring (#39) on the bayonet mount unit (B30).

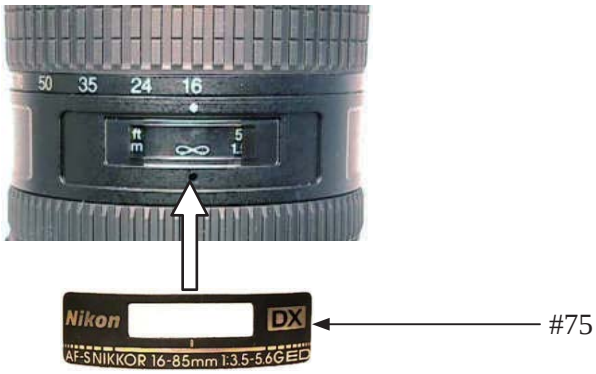
・While pressing the rear cover ring (#39) from above, tighten the three screws (#118) in numeric order (①, ② , and ③).



・Adhere the sheet (#60) on the filter ring.

Name plate

・Peel off the tape that attaches the window (#76) temporarily. Peel off the backing paper of the name plate (#68) and attach [#68].



・Peel off the backing paper of VR name plate (#69) and attach [#69].

・Peel off the backing paper of the serial number label (#168 or #169), and attach [#168 or #169].

Preparation for Inspection & Adjustment

★ : New tool

● In case of replacing the main PCB unit or SWM unit, etc, be sure to make the adjustments by using the adjustment software (★ J18444).

Required device:

・Single output rated voltage power supply: 1 unit (6.0V 3.0A)

・Oscilloscope: 1 unit For inspecting lens driving time

・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 "Writing of FLASH-ROM fixed elec. adj. values".

AF-S DX 16-85/3.5-5.6G VR Inspection and adjustment program (★ J18444)

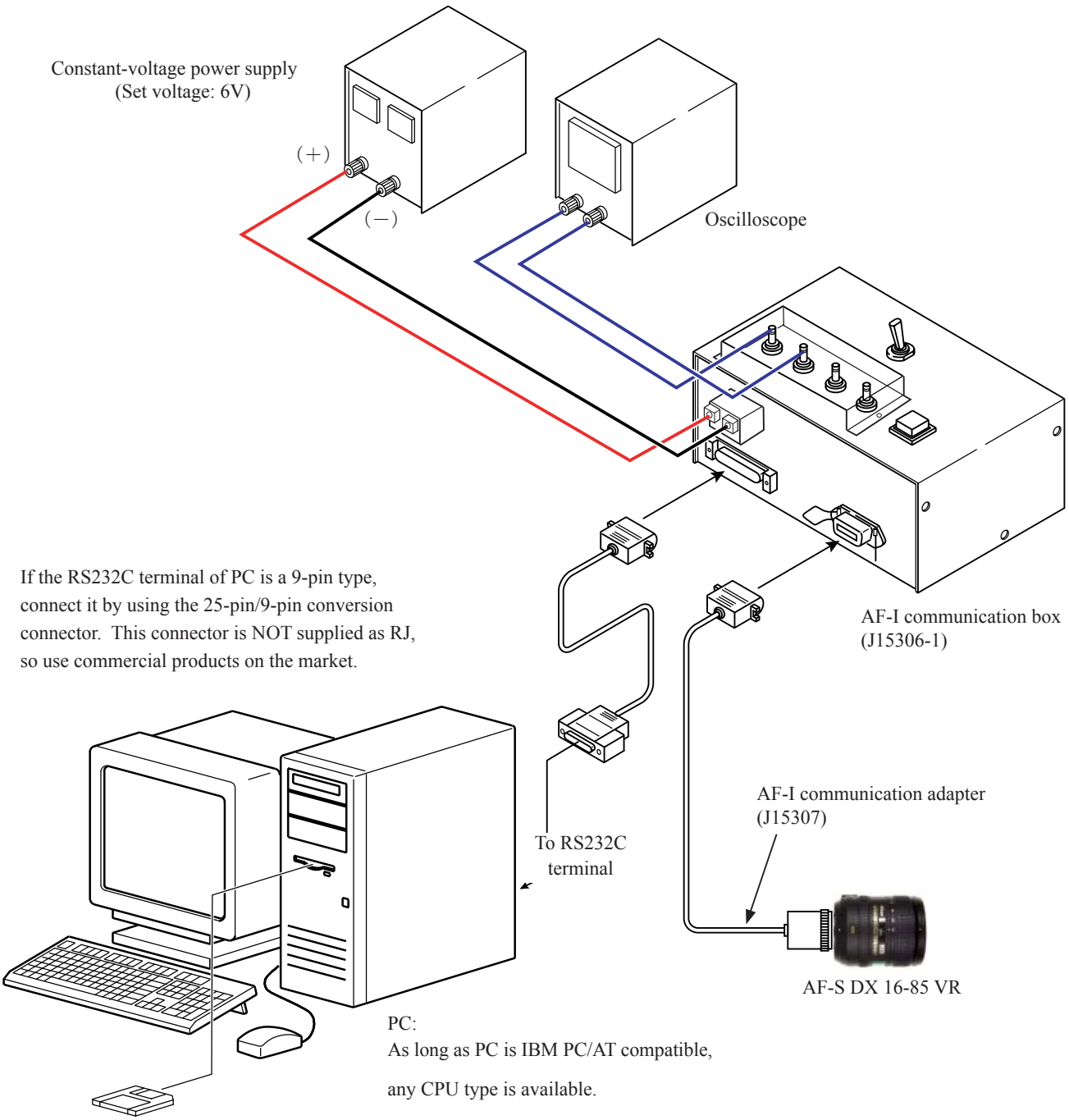
The below hardware requirements are necessary for installing the program on a computer.
Ensure them before installation.

PC	IBM PC/AT compatible
OS	Windows XP Home Edition, Windows XP Professional, Windows 2000
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】

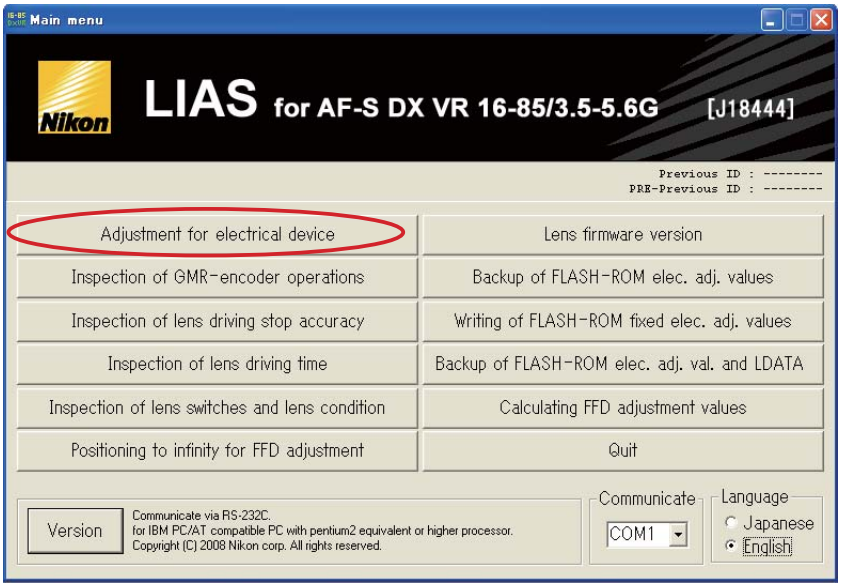
★ : New tool



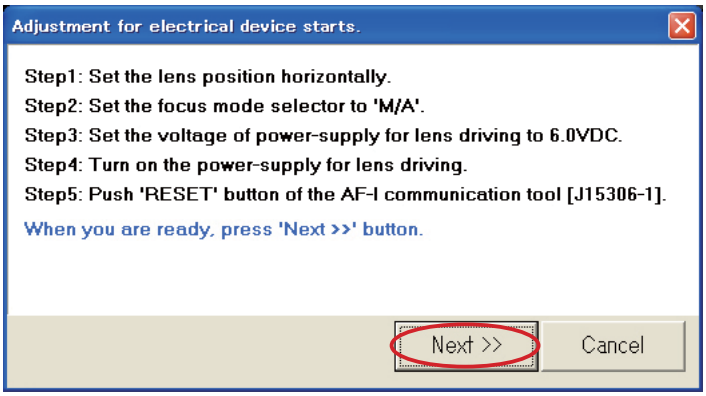
Adjustment for electrical device

● When the main PCB unit or SWM unit is replaced, be sure to make this adjustment.

・Click "Adjustment for electrical device" on the main menu.

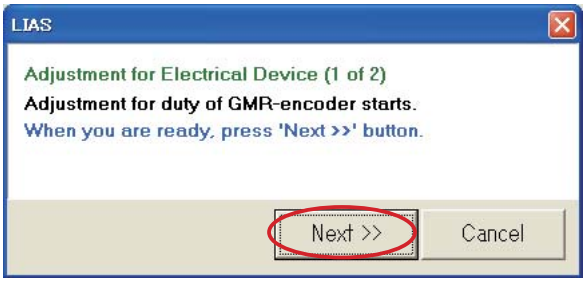


・Follow the instructions on the screen for preparation. Then click "Next".

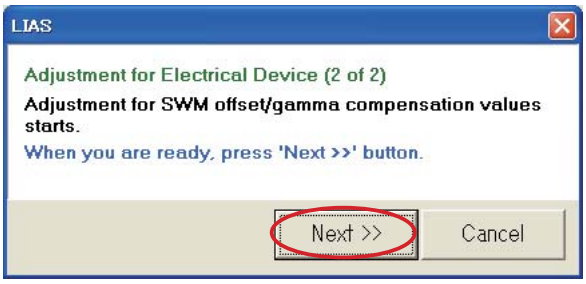


・Click "Yes" if the main PCB was replaced, while click "No" if it was NOT replaced.
Clicking "Yes" goes on to "Writing of FLASH-ROM elec.adj.values" (on Page A83).

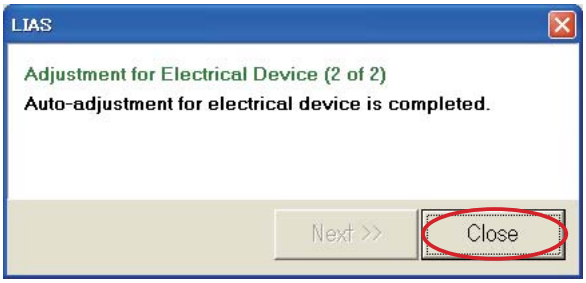
・Click "Next".



・Click "Next".

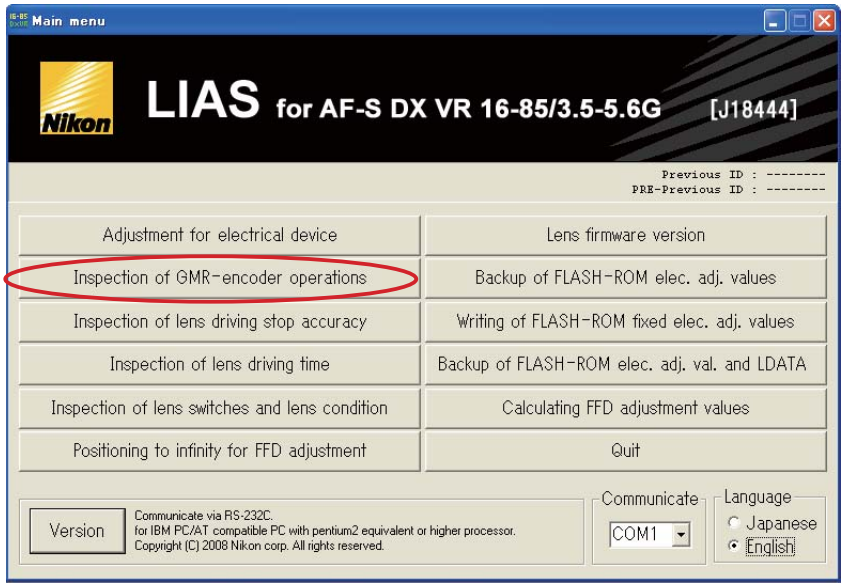


・When adjustment is completed, click “Close” to end the procedure.

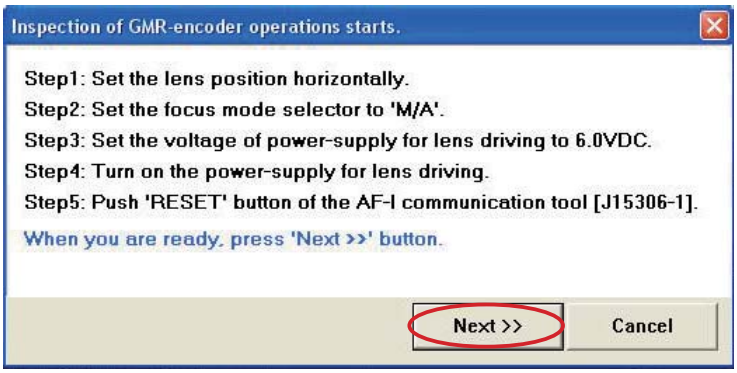


Inspection of GMR-encoder operations

・Click "Inspection of GMR-encoder operations" on the main menu.

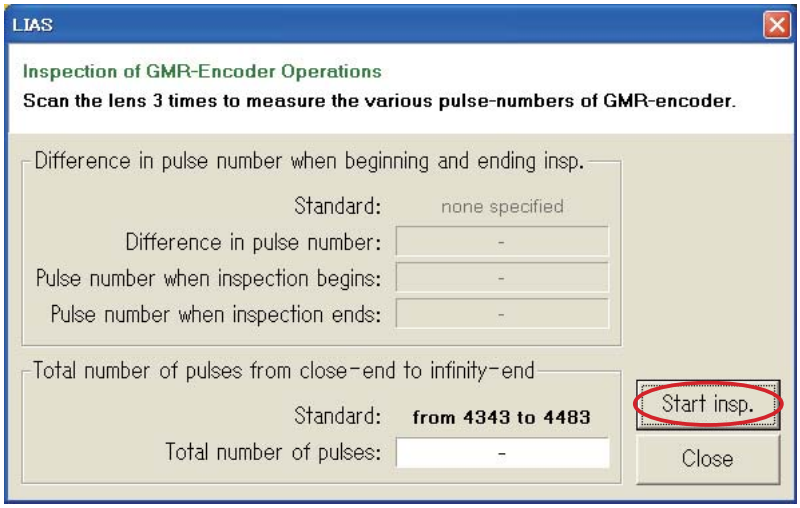


・Follow the instructions on the screen. When prepared, click "Next".

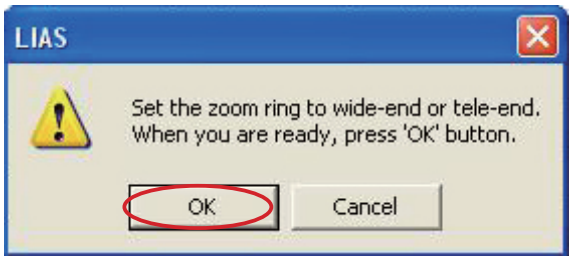


・Click "Start insp.".

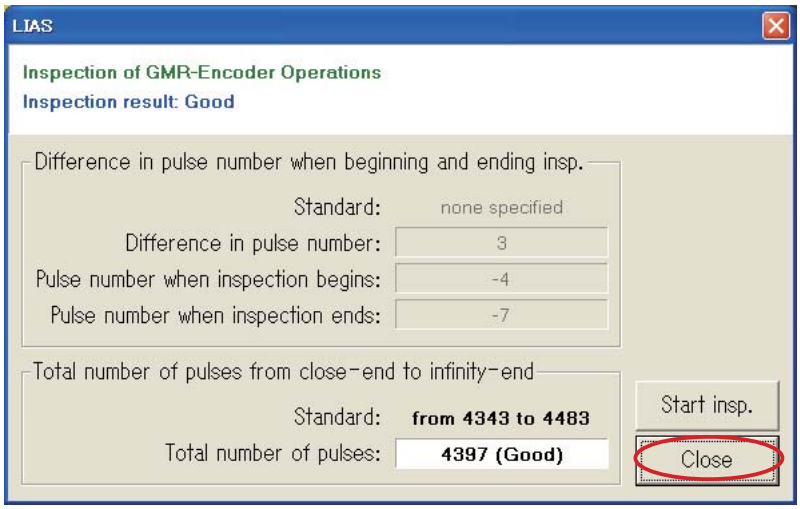
Caution：If the zoom ring is rotated while the lens scanning is driven, the pulse shows an abnormal value.
Do NOT touch the zoom ring during operations.



・Set the zoom ring to WIDE-end or TELE-end, and click "OK".



・If "Inspection result" shows "Good", click "Close".



< Standard > Total pulses : 4343 - 4483 PULSE(S)

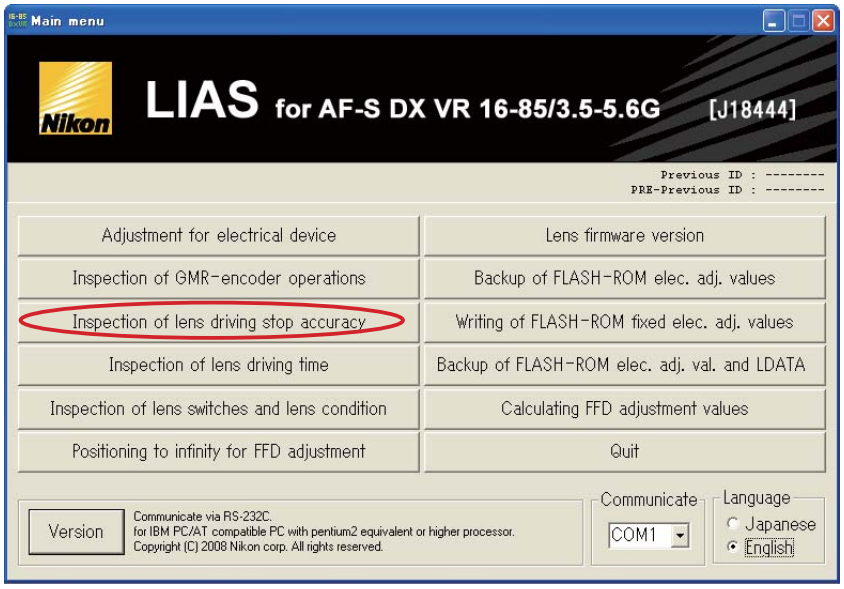
Inspection of lens driving stop accuracy

● Make the inspections by focal length 16mm (W) or 85m (T) at the following five lens positions.

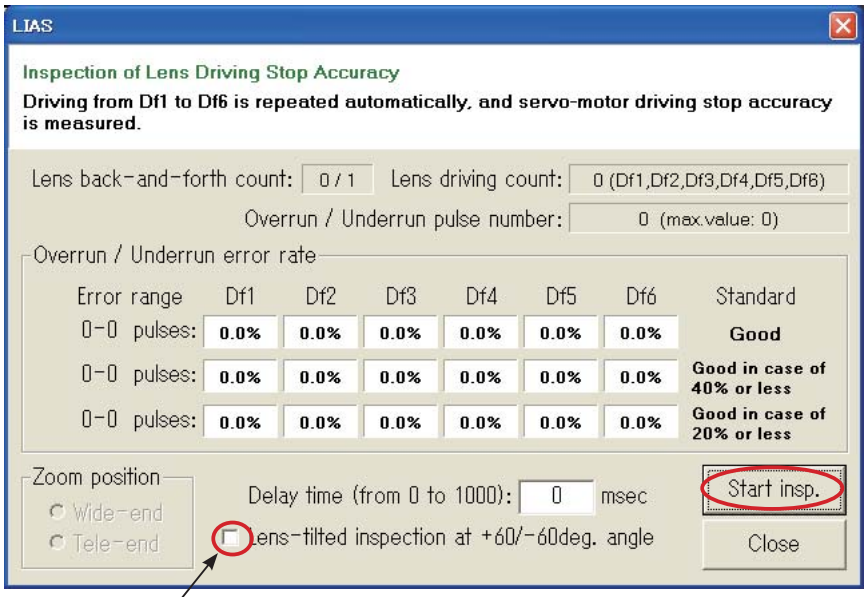
(Lens position in inspecting)

Lens position	Index position
Horizontal lens position	Index facing (1) up / (2) right / (3) left
(4) Front lens group 60° angle upward	
(5) Front lens group 60° angle downward	

・Click "Inspection of lens driving stop accuracy" on the main menu.

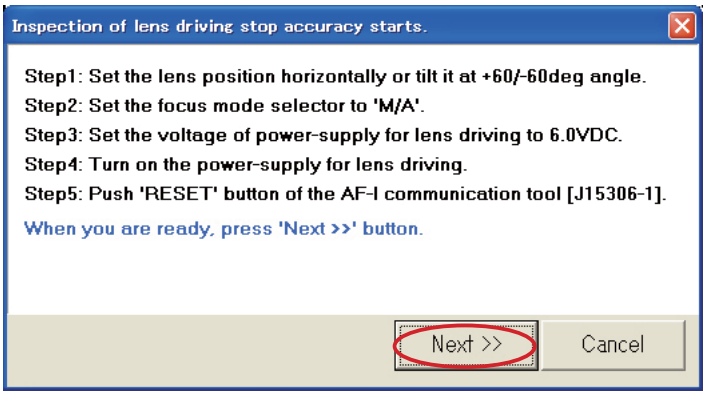


・Click "Start insp.".



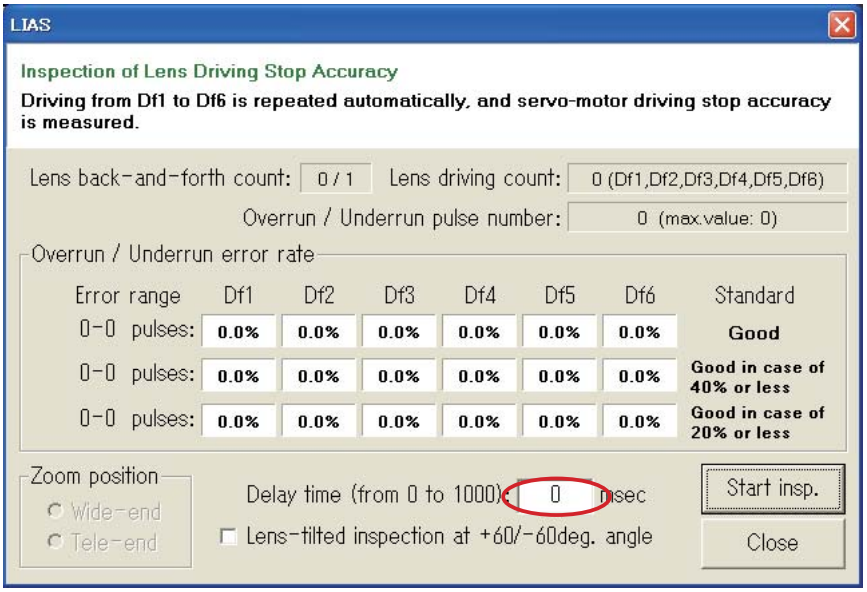
Tick here when measuring with the front lens group facing 60° angle up/downward.

・Follow the instructions on the screen. When prepared, click "Next".

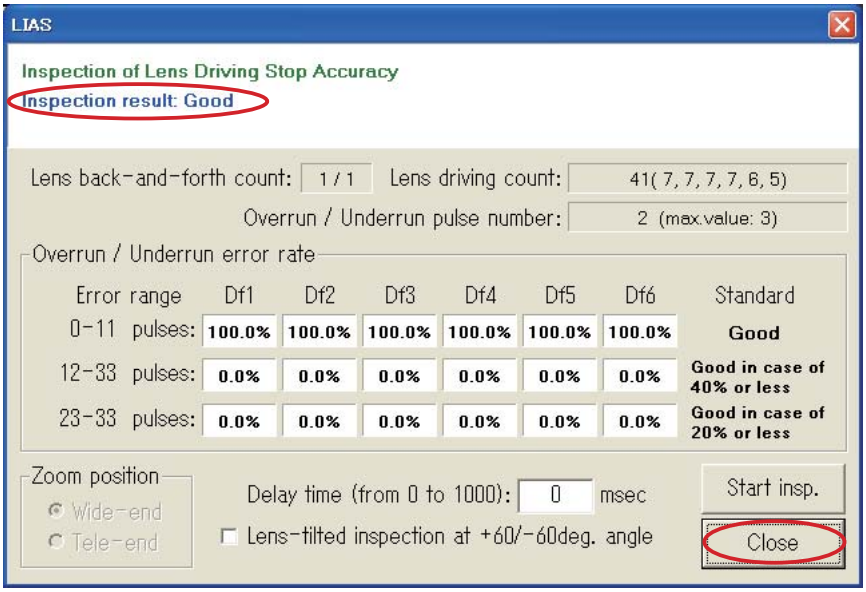


・If the lens stops, input a numeric number into "Delay time (from 0 to 1000 msec.) so that the lens does NOT stop.

Caution: The value of "Delay time" is set by the adjustment software. So, as far as 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 "Delay time" gets, the longer the inspection time becomes.



・If "Inspection result" shows "Good", click "Close" to end the procedure.



The number of overrun/underrun pulses must be within the following standards after the lens back-and-forth driving 1-motion.

Lens position	Error range of Df1 - Df6 (No. of occurrence)	Error pulse occurrence ratio: Judgment
Horizontal	0 ～ 11	GOOD
Horizontal	12 ～ 33	GOOD if 40% or less
Horizontal	23 ～ 33	GOOD if 20% or less
±60°	0 ～ 11	GOOD
±60°	12 ～ 33	GOOD if 40% or less
±60°	23 ～ 33	GOOD if 20% or less

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

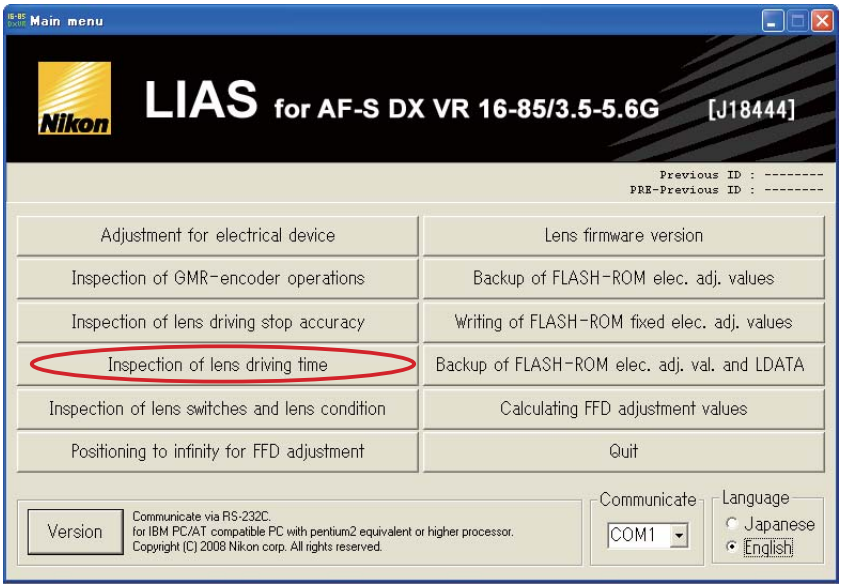
Inspection of lens driving time

● Make inspections by focal length 16mm (W) or 85m (T) at the following five lens positions.

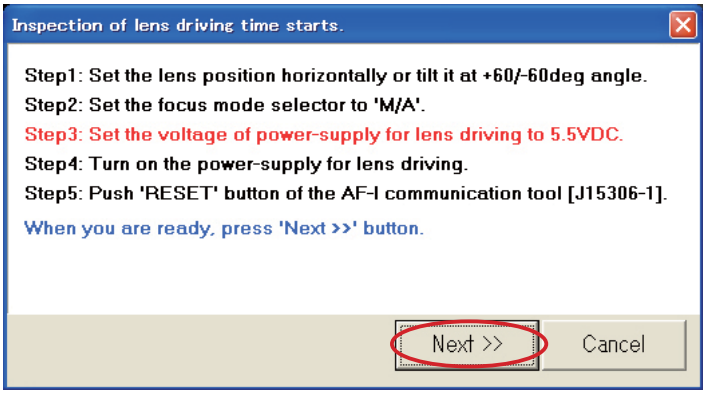
(Lens position in inspecting)

Lens position	Index position
Horizontal lens position	Index facing (1) up / (2) right / (3) left
(4) Front lens group 60° angle upward	
(5) Front lens group 60° angle downward	

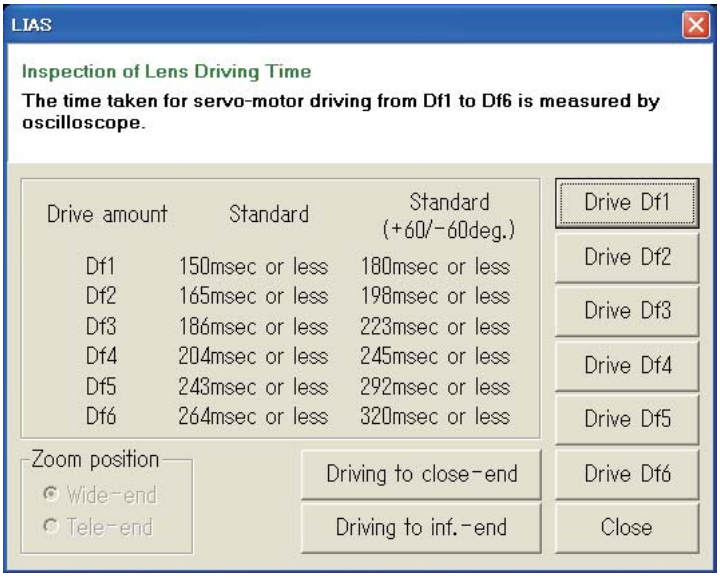
・Click "Inspection of lens driving time" on the main menu.

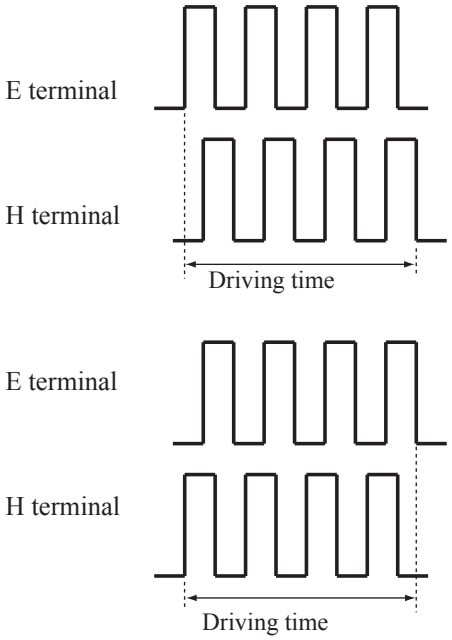


・Follow the instructions on the screen. When prepared, click "Next".



・ Select the driving amount respectively. Each lens driving time must be within the standard.





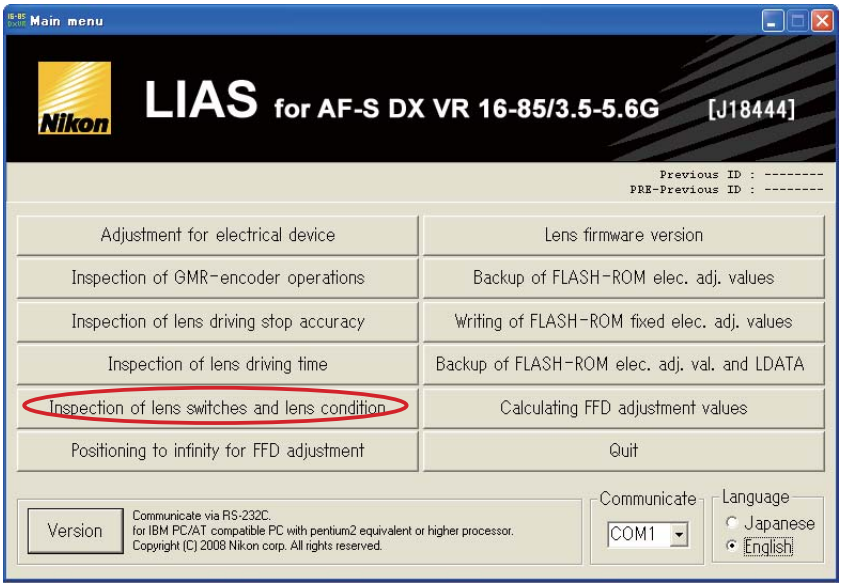
●Oscilloscope setting

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

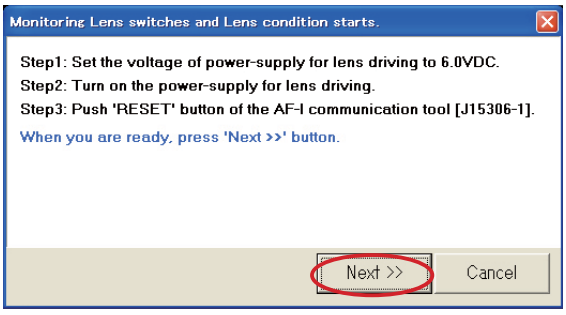
※ There are two types in shape of waveforms of E and H terminals:
Waveform (1) starts and goes up (2) starts and goes down.

Inspection of Lens switches and Lens conditions

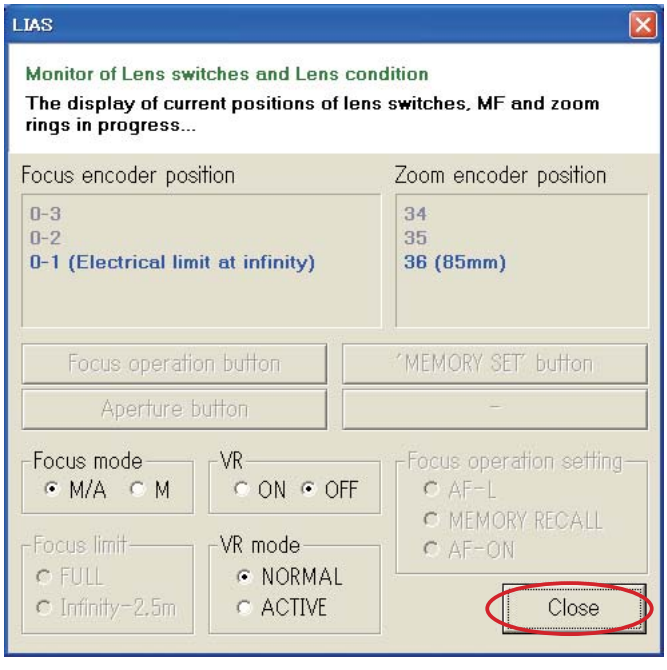
・Click "Inspection of lens switches and lens condition" on the main menu.



・Follow the instructions on the screen. When prepared, click "Next".

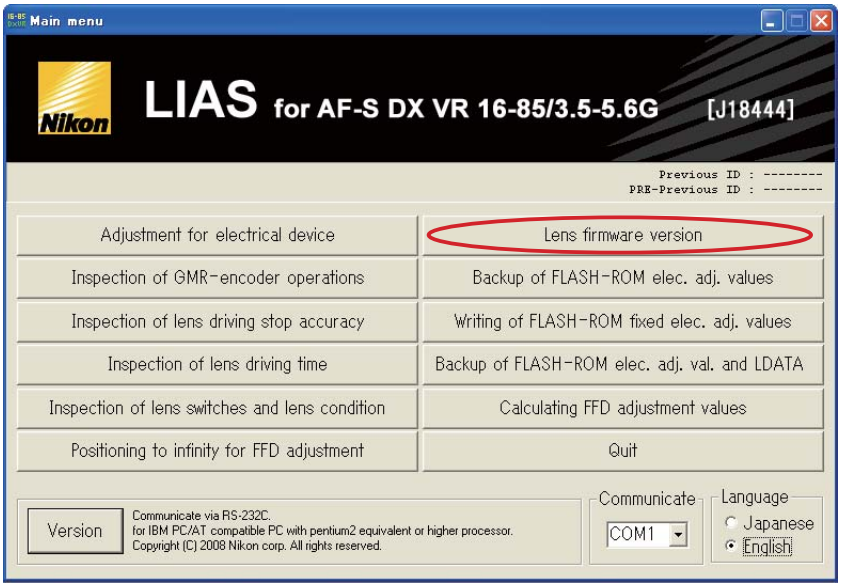


・If there is no problem with each check item, click "Close" to end the procedure.

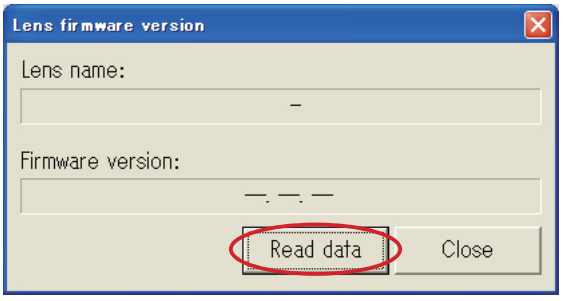


Lens firmware version

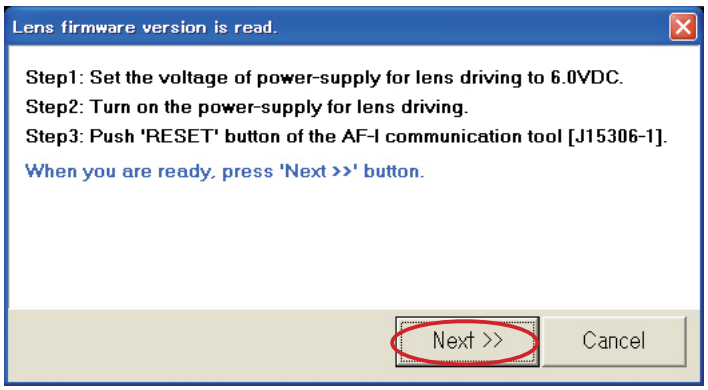
・Click "Lens firmware version" on the main menu.



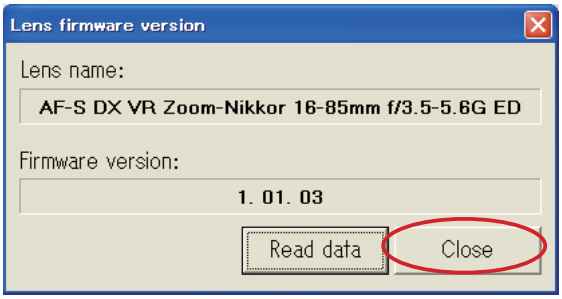
・Click "Read data".



・Follow the instructions on the screen. When prepared, click "Next".



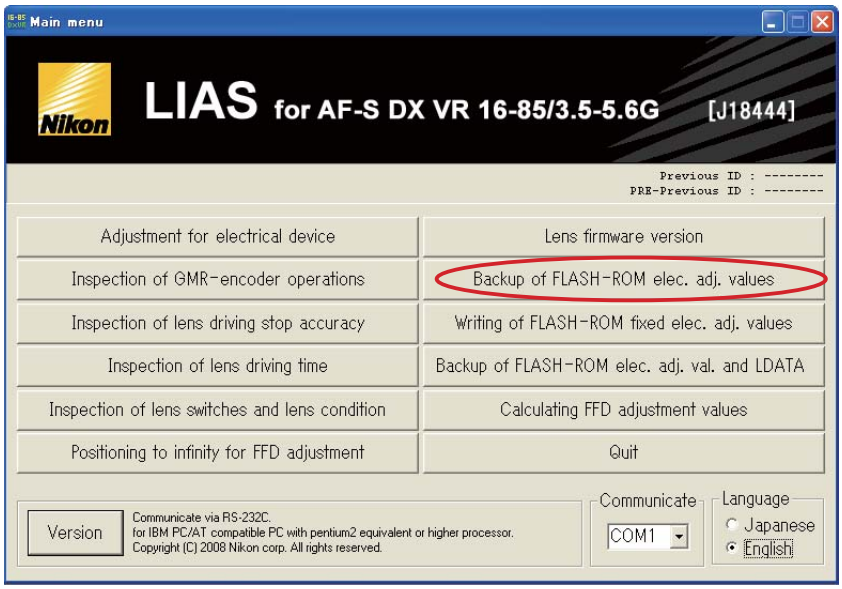
・Confirm that there is no mistake in the lens name and firmware version. Then click "Close" to end the procedure.



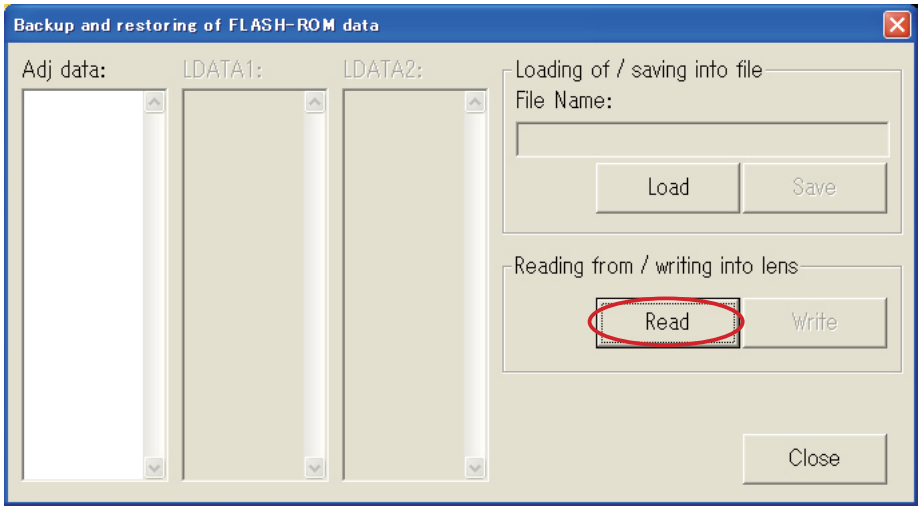
Backup of FLASH-ROM electrical adjustment values

How to back up:

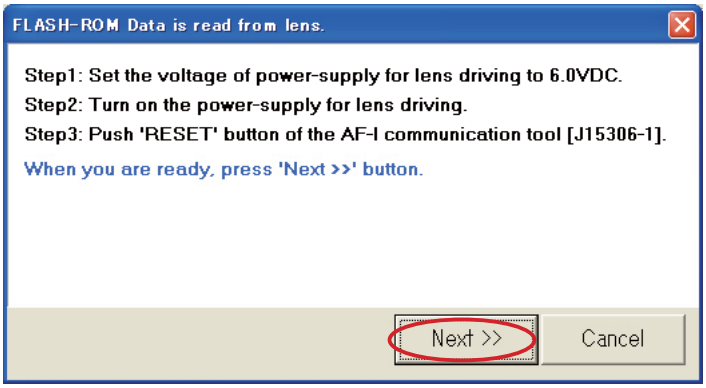
・Click "Backup of FLASH-ROM elec. adj. values" on the main menu.



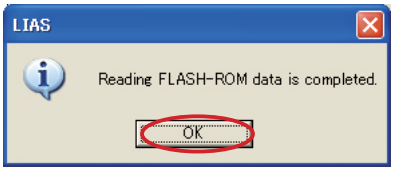
・Click "Read" of "Reading from/Writing into lens".



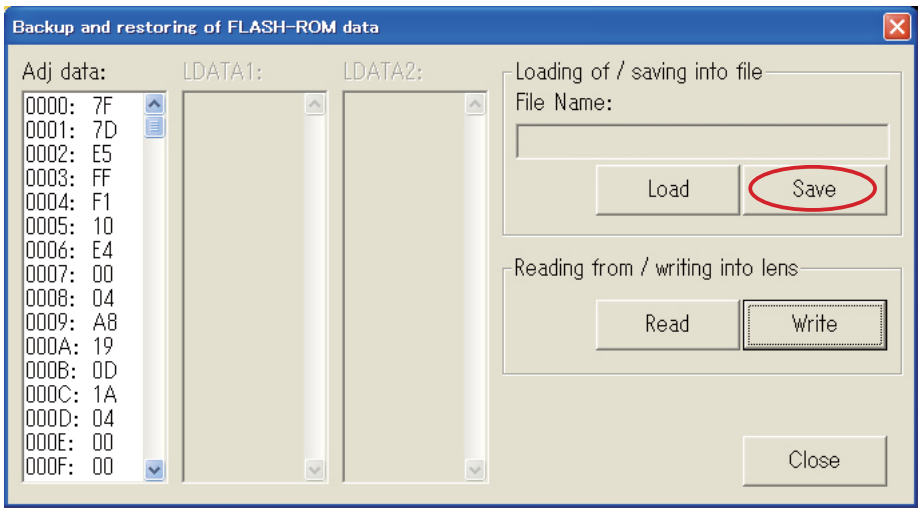
・Follow the instructions on the screen. When prepared, click "Next".



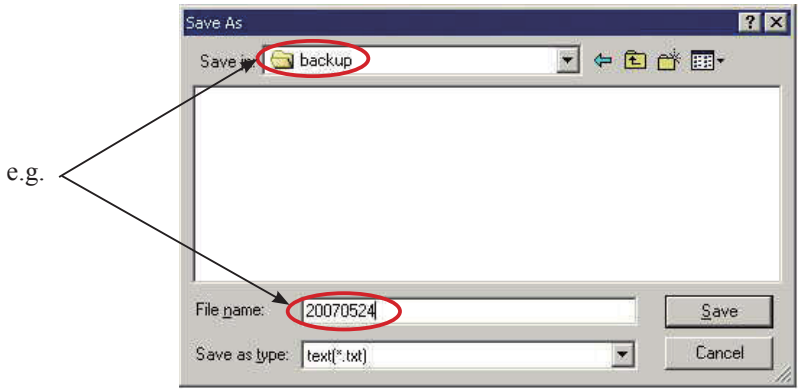
・When reading FLASH-ROM data is completed, click "OK".



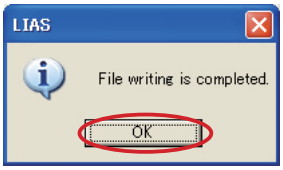
・Click "Save" of "Loading of/Saving into file".



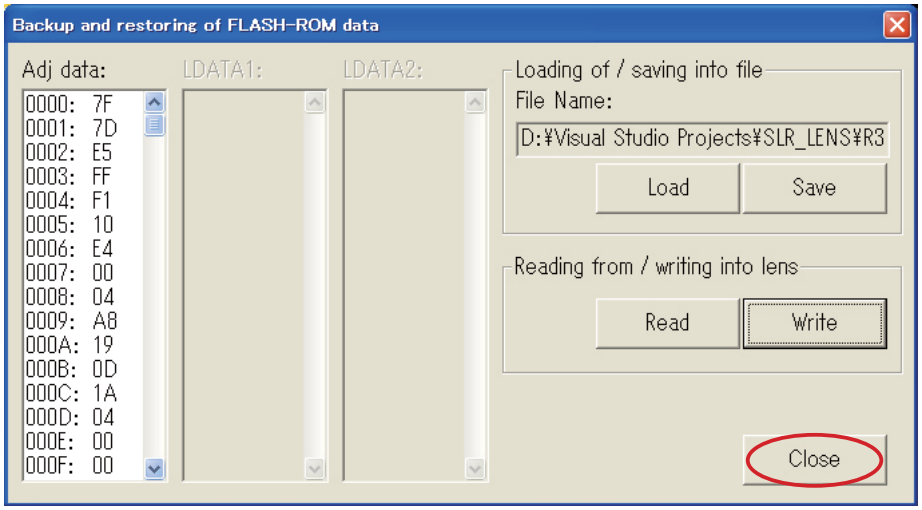
・Type the file name in any folder, and click "Save".



・Click "OK".

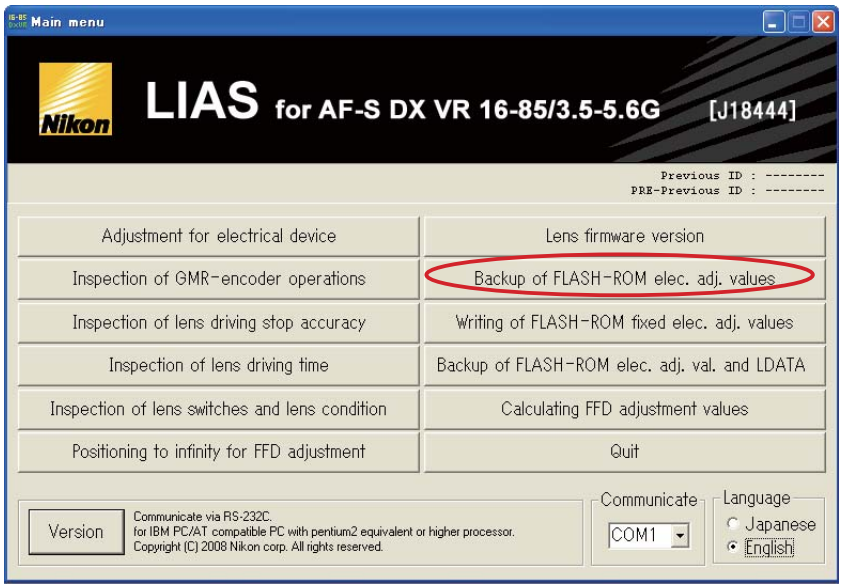


・ Click "Close" to end the procedure.

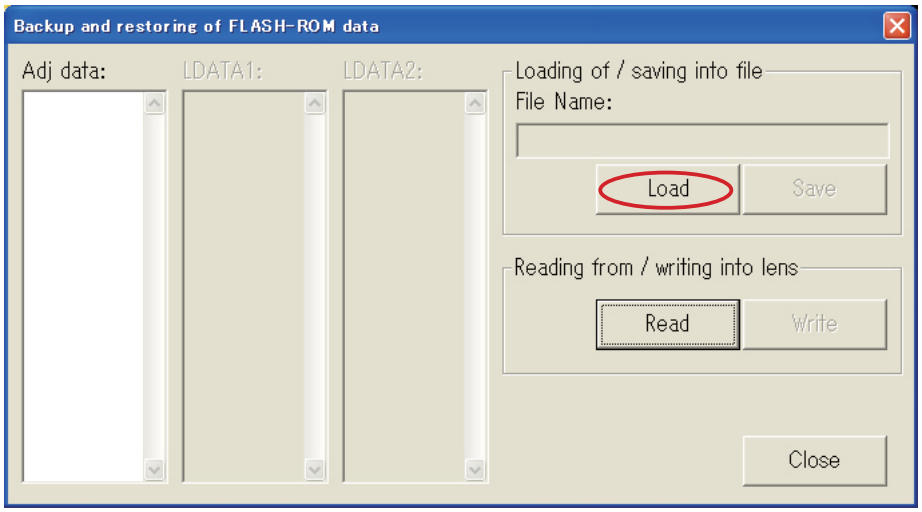


How to restore:

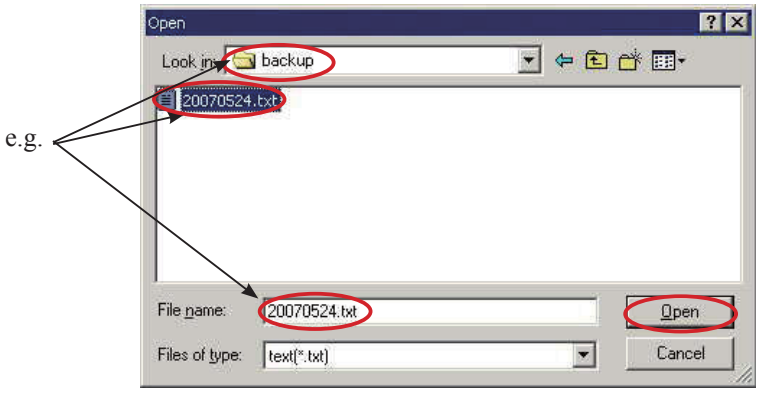
・Click "Backup of FLASH-ROM elec. adj. values" on the main menu.



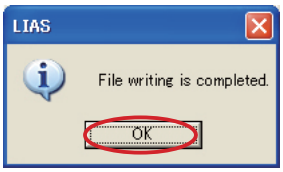
・Click "Load" of "Loading of/Saving into file".



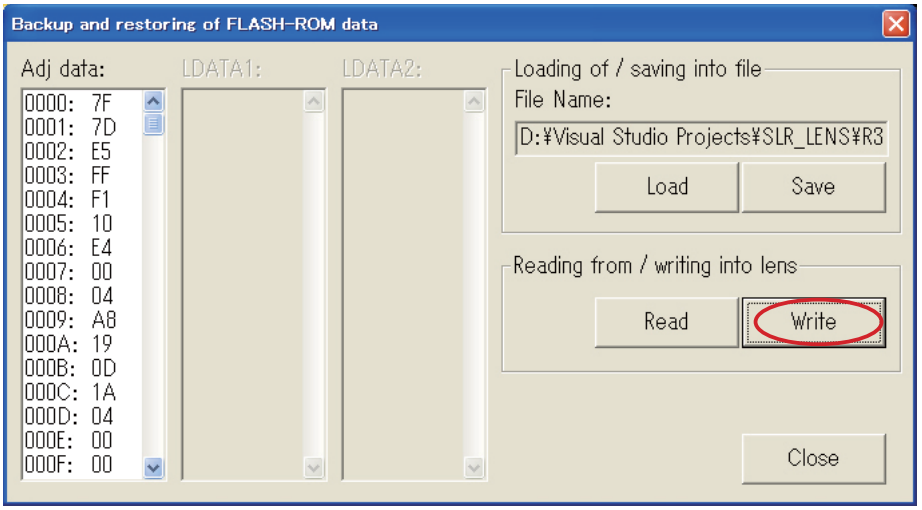
・Select the file name in the folder that was saved as backup, and click "Open" button.



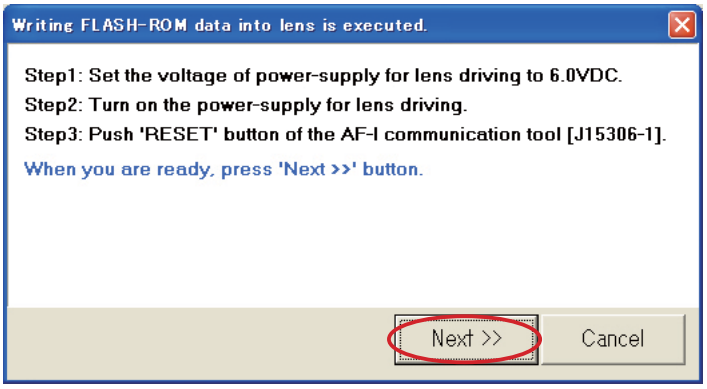
・When reading FLASH-ROM data is completed, click "OK" button.



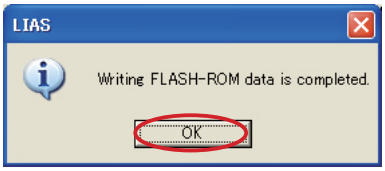
・Click "Write" of "Reading from/writing into lens".



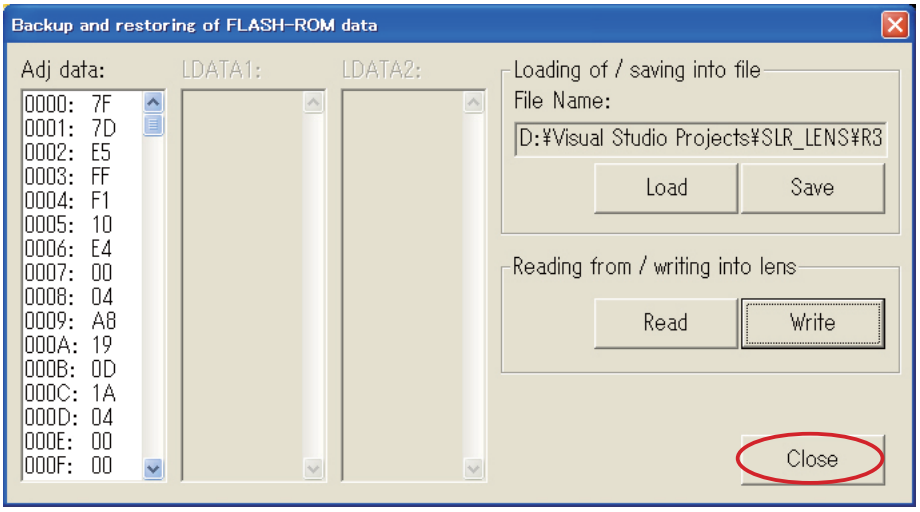
・Follow the instructions on the screen. When prepared, click "Next".



・When writing FLASH-ROM data is completed, click "OK".

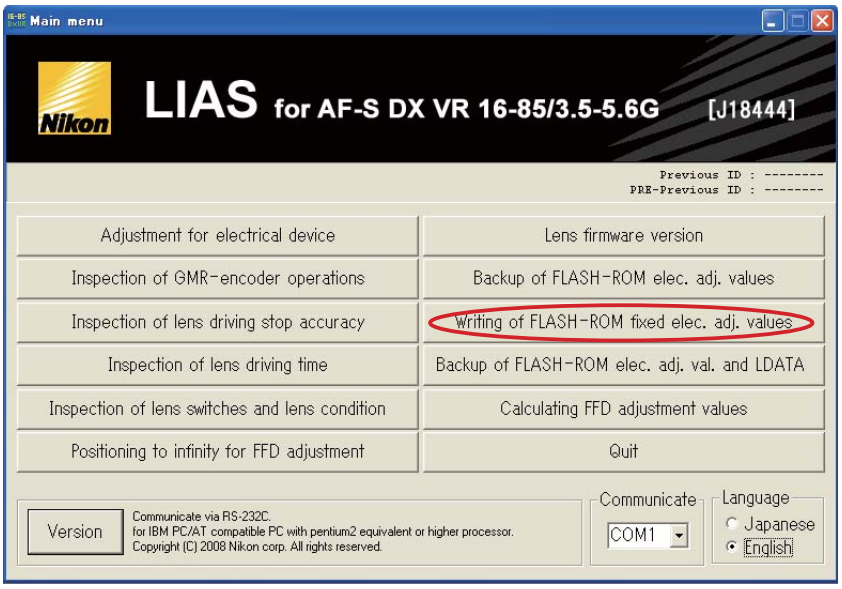


・Click "Close" to end the procedure.

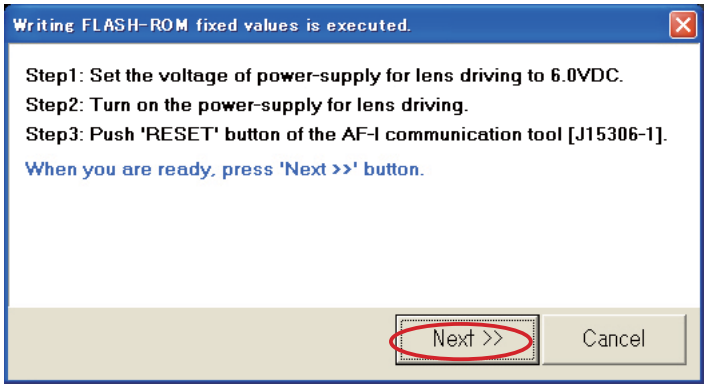


Writing of FLASH-ROM fixed electrical adjustment value

・Click "Writing of FLASH-ROM fixed elec. adj. values" on the main menu.



・Follow the instructions on the screen. When prepared, click "Next".

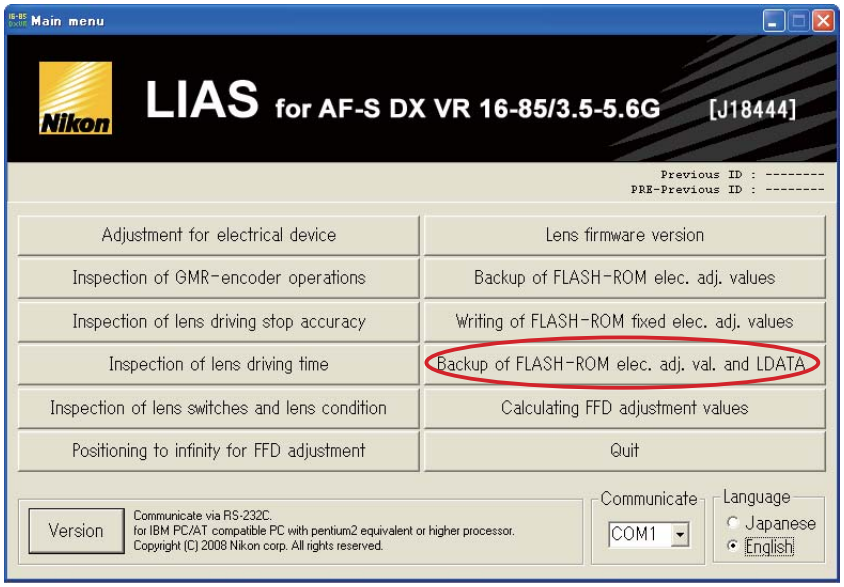


・When writing FLASH-ROM data is completed, click "OK" button.

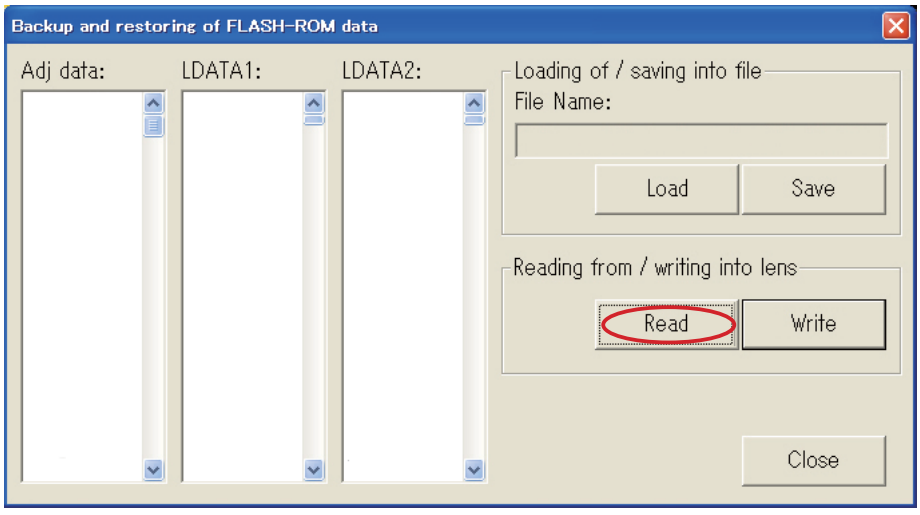
Backup of FLASH-ROM electrical adjustment value and LDATA

How to back up:

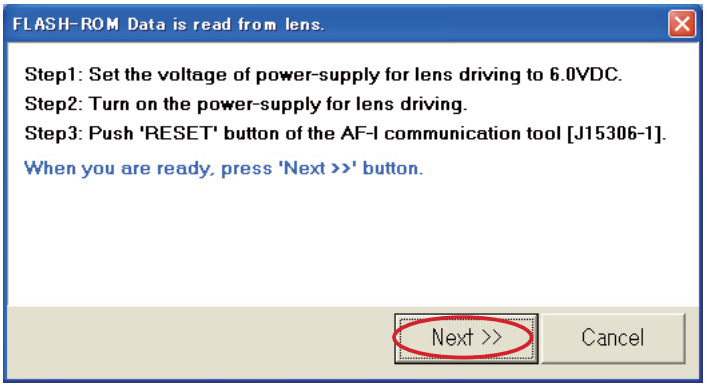
・Click "Backup of FLASH-ROM elec. adj. val. and LDATA" on the main menu.



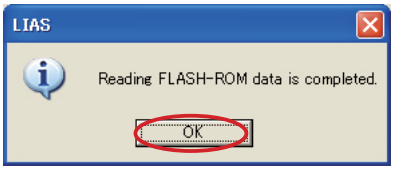
・Click "Read" of "Reading from/Writing into lens".



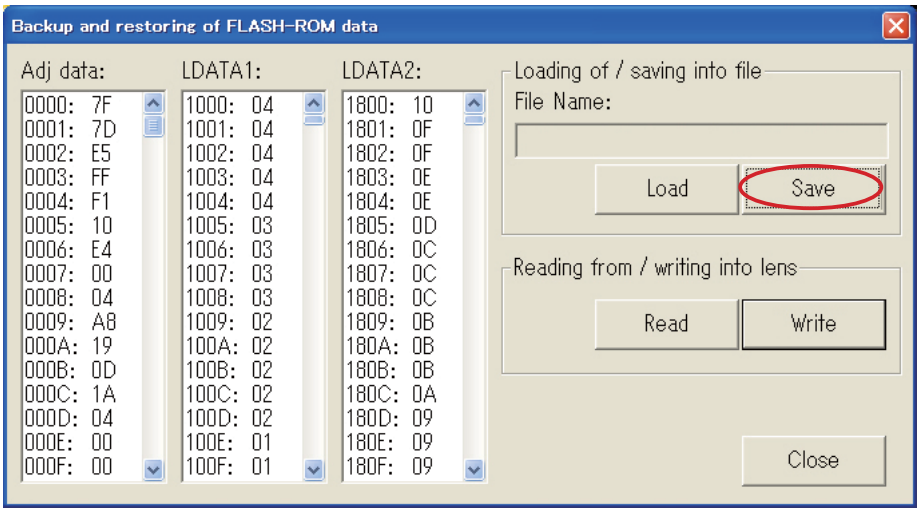
・Follow the instructions on the screen. When prepared, click "Next".



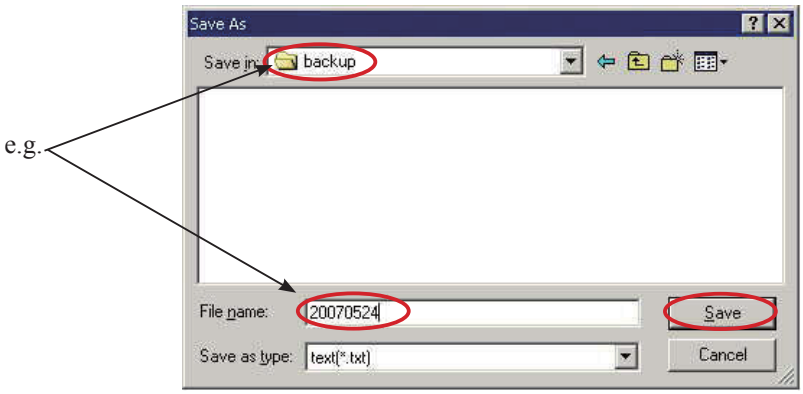
・When reading FLASH-ROM data is completed, click "OK".



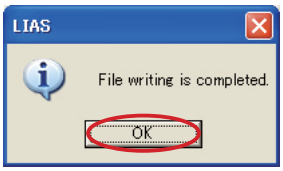
・Click "Save" of "Loading of/Saving into file".



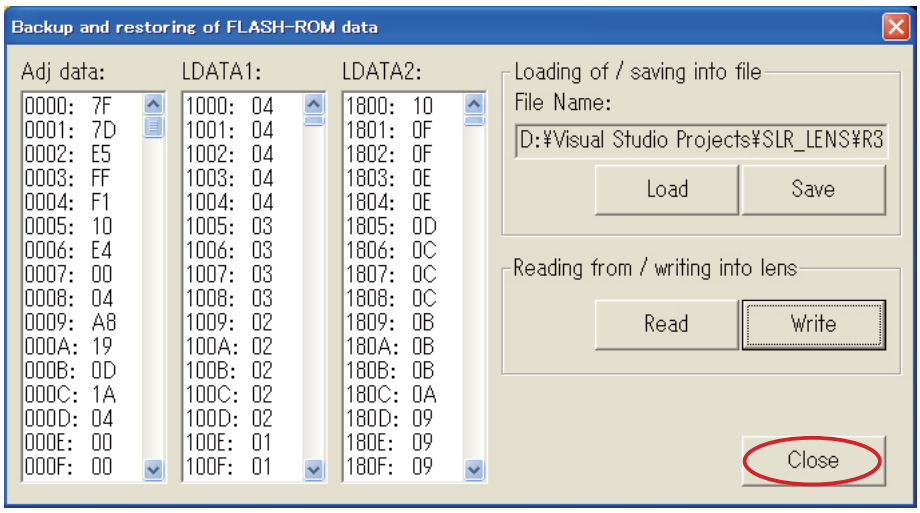
・Type the file name in any folder, and click "Save".



・Click "OK".

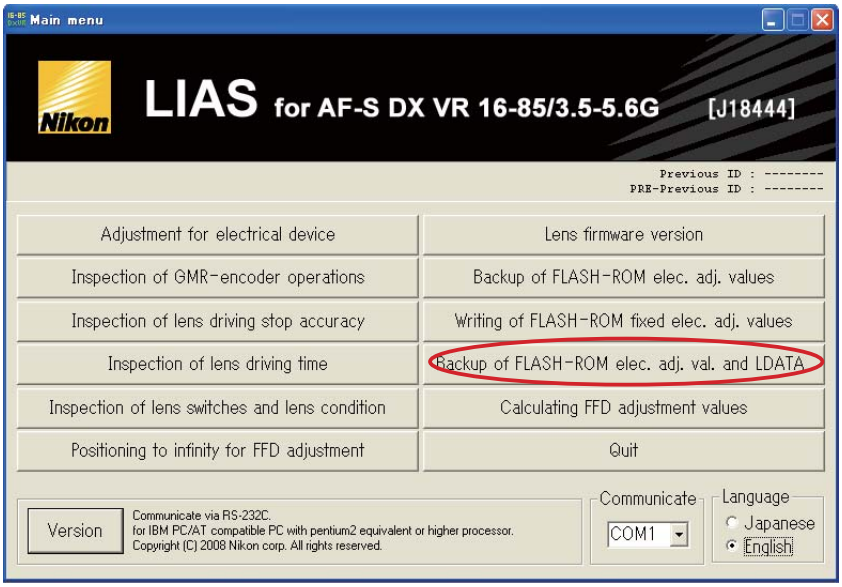


・Click "Close" to end the procedure.

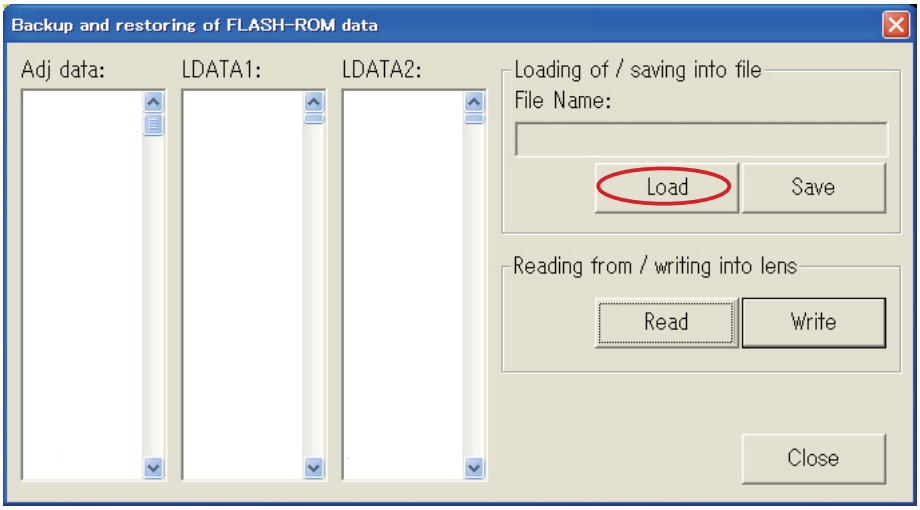


How to restore:

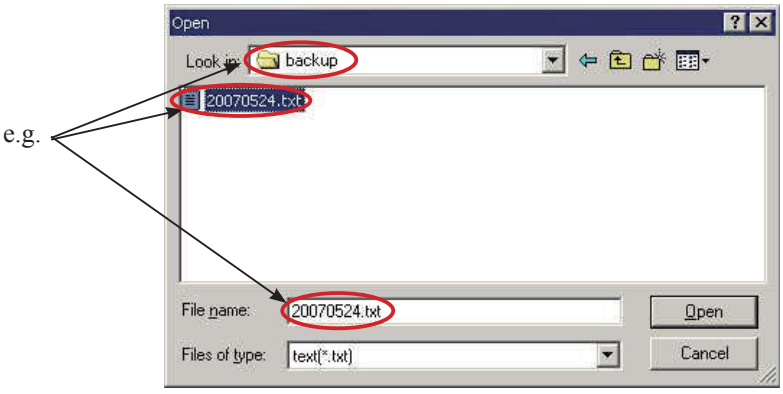
・Click "Backup of FLASH-ROM elec. adj. val. and LDATA" on the main menu.



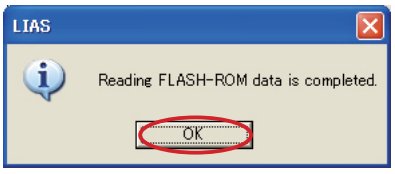
・Click "Load" of "Loading of/Saving into file".



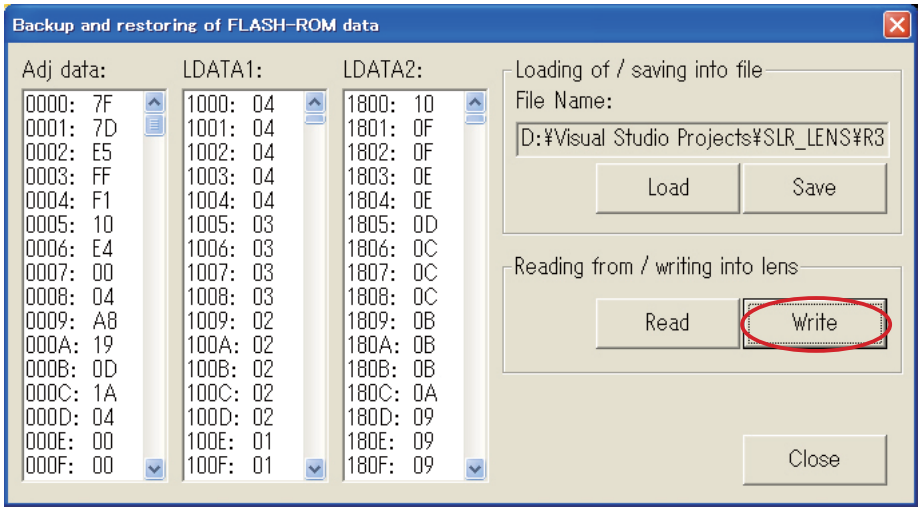
・Select the file name in the folder that was saved as backup, and click "Open".



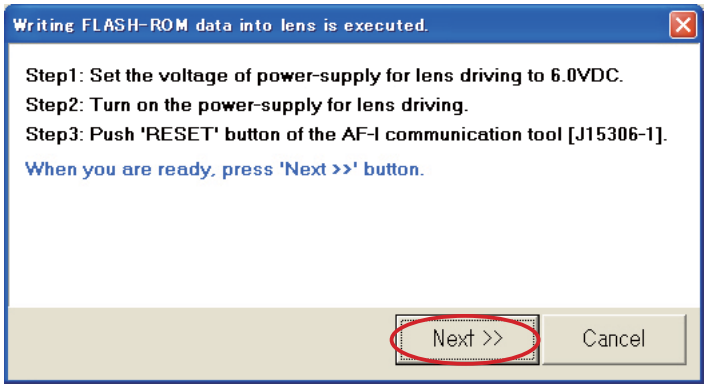
・When reading FLASH-ROM data is completed, click "OK".



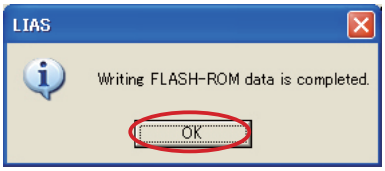
・Click "Write" of "Reading from/Writing into lens"



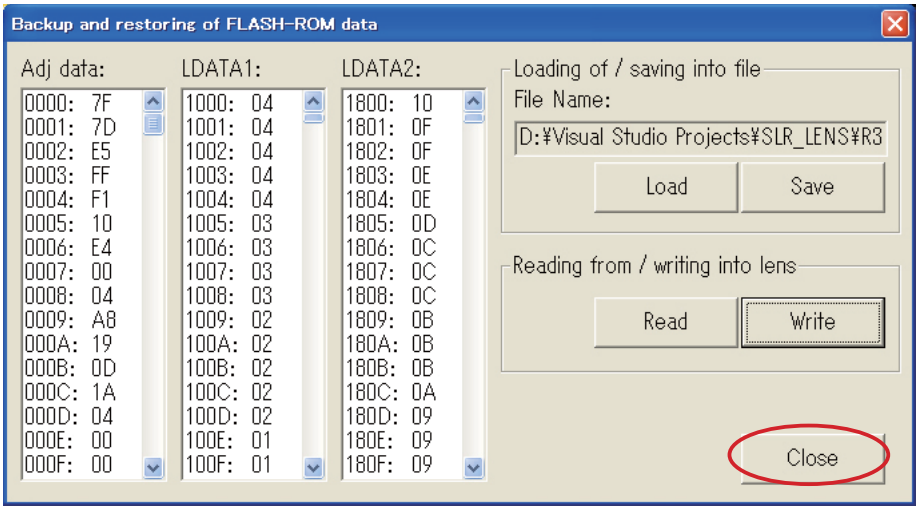
・Follow the instructions on the screen for preparation. Then click "Next".



・When writing FLASH-ROM data is completed, click "OK".



・Click "Close" to end the procedure.



Necessary adjustment when replacing parts

Parts to be replaced \ Adjustments	Adjustment for electrical device	Lens alignment (incl. inspection of aberration compensation)	VR adjustment
Main PCB unit	○	Adjustment of aberration compensation	○
SWM unit	○		
Fixed tube unit (VR unit)			○
4th lens group		○	

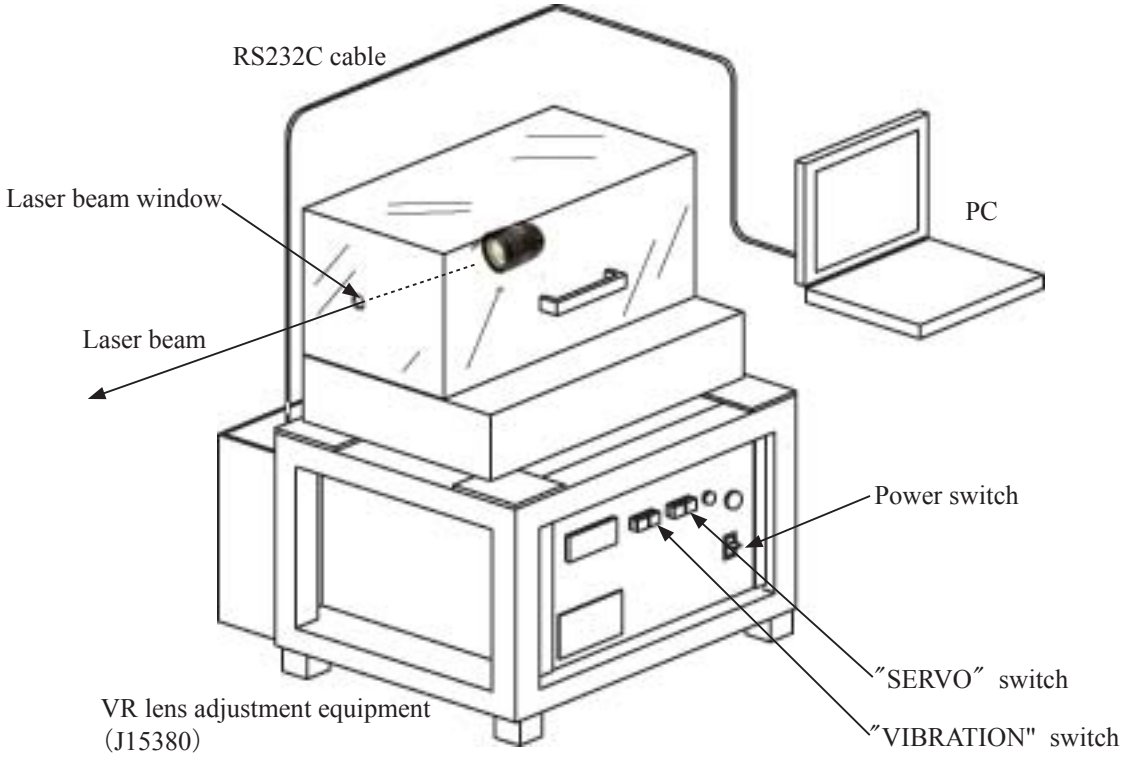
VR adjustment

When making the VR adjustment, refer to the "Instruction Manual" that is attached to the VR lens adjustment equipment (J15380).

⚠ WARNING	
	●This equipment uses the laser beam. Do not look at the laser beam directly or through the laser beam window.

● Setup of VR lens adjustment equipment (J15380)

1. Set up the VR lens adjustment equipment (J15380) as shown below.



Notes: Keep the approx. 5-m distance from the laser beam window to the radiated surface.
Do not block the light path of the laser beam.

2. Connect the PC to the equipment (J15380) and start the PC.

3. Mount the lens on the equipment (J15380).
Refer to "Procedure for mounting Lens" on Page A94 for details.

● Startup of VR adjustment software

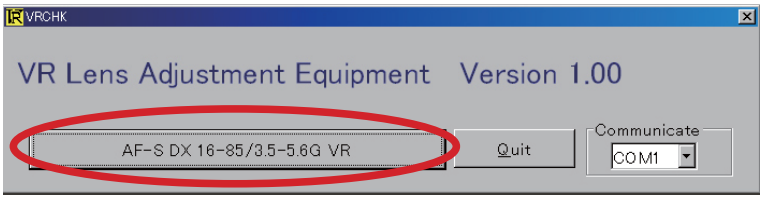
1. Turn the VR lens adjustment equipment (J15380) ON.

2. Mount the lens on the equipment (J15380).

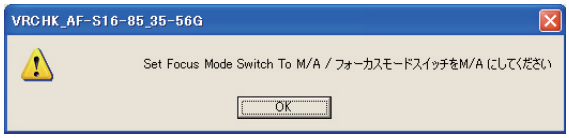
3. Set VR mode switch to "ON", A/M change switch to "M/A".

4. Start the VR adjustment software.(★ J18446)

5. Click "AF-S DX 16-85/3.5-5.6G VR" on the Lens selection screen.



6. If the following messages appear, follow the instructions on the screen and click "OK".

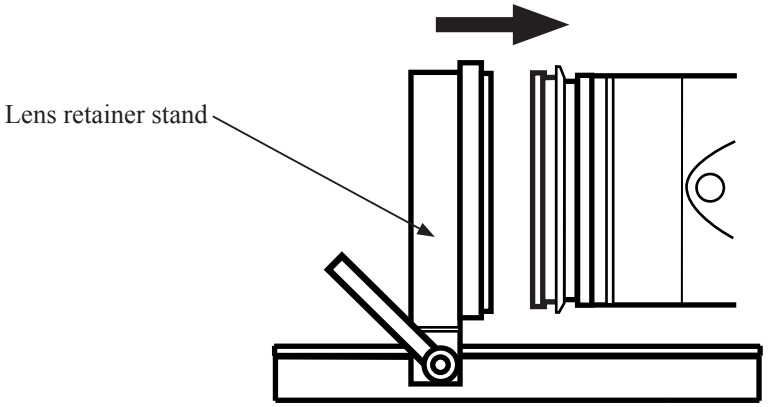


Note: Do not change the lens settings until the adjustment is completed and the screen goes back to the Lens selection screen.
Otherwise, the correct adjustment value cannot be obtained, caused by a change of the setting position.

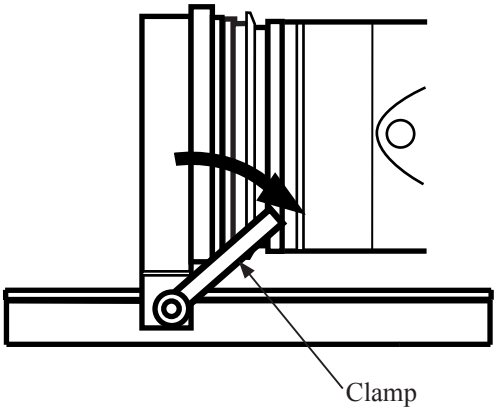
7. Fix the lens with the lens retainer stand.
Refer to "Procedure for mounting Lens" on Page 94.

● **Procedure for mounting Lens**

1. Mount the lens on the VR lens adjustment equipment (J15380) and move the lens retainer stand in the direction of the arrow.



2. When the lens retainer stand is positioned as shown below, fix it by tightening the clamp.

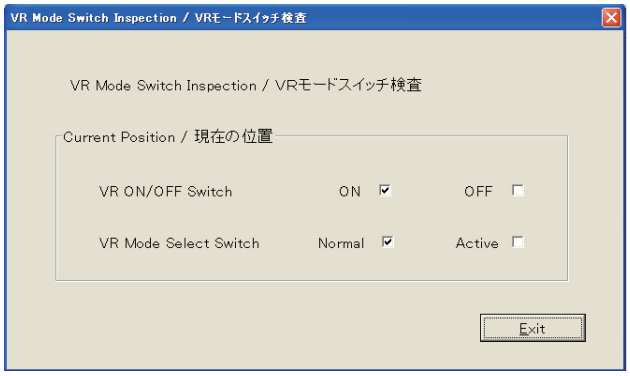


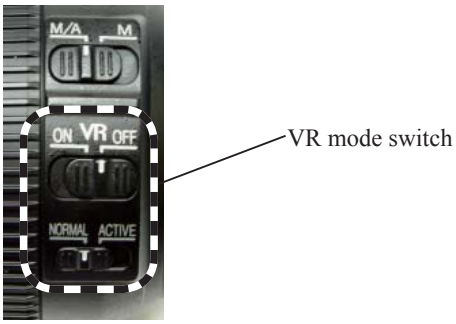
VR mode switch inspection

1. Tick "VR Switch Inspection" as below, and click "Execute".

2. The position of the VR mode switch is indicated.

   Selecting the VR mode switch indicates the current position.





3. When the VR mode switch inspection is completed, click "Exit" to end the procedure.

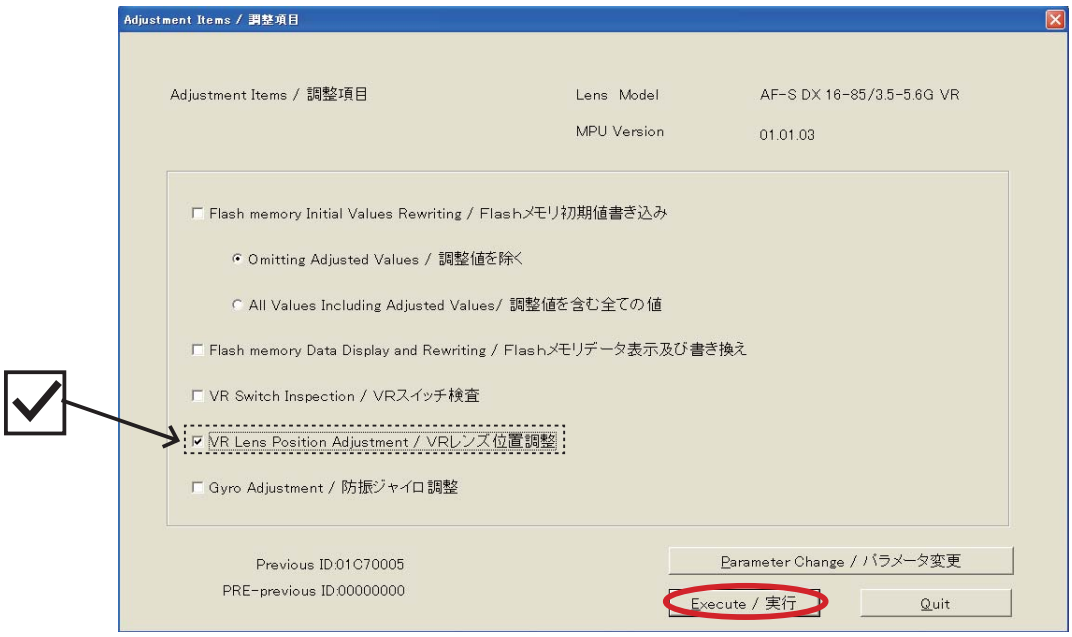
VR lens position adjustment

Caution:

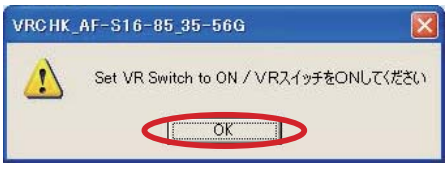
If "NG" appears during each adjustment, click "Next" to exit from the inspection mode. After updating FLASH-ROM, go back to the Lens selection screen and make the adjustment again.

However, if "NG" appears even after adjusting a few times, VR unit, main FPC, etc, may be defective.

1. Tick "VR Lens Position Adjustment" as below, and click "Execute".



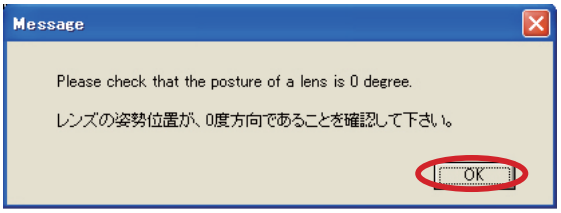
2. When the following message appears, set the VR switch to ON and click "OK".



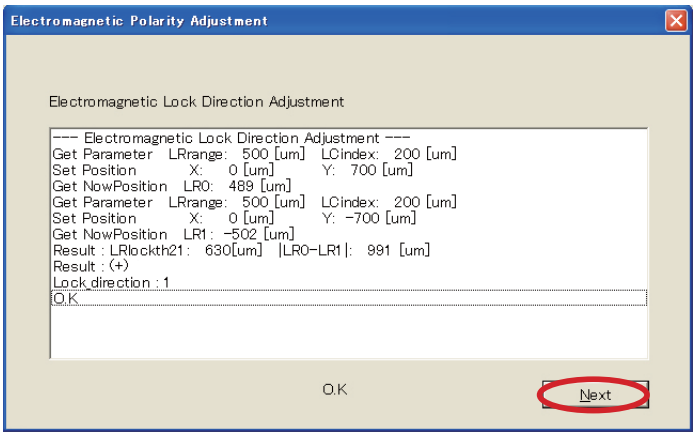
3. When the message window appears, confirm that the angle of the lens position is "0° angle" and click "OK".

   Clicking "OK" starts "VCM polarity adjustment (auto control)".

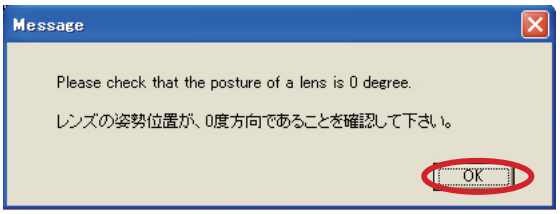
   This "VCM polarity adjustment (auto control)" detects the polarity of the VCM (Voice Coil Motor) and writes it in FLASH-ROM as the compensation value.



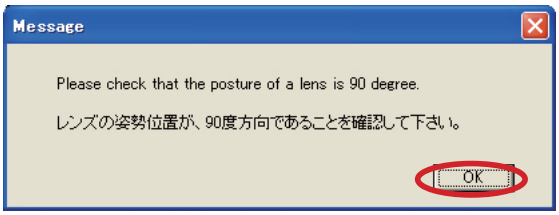
4. If the result is "OK", click "Next".



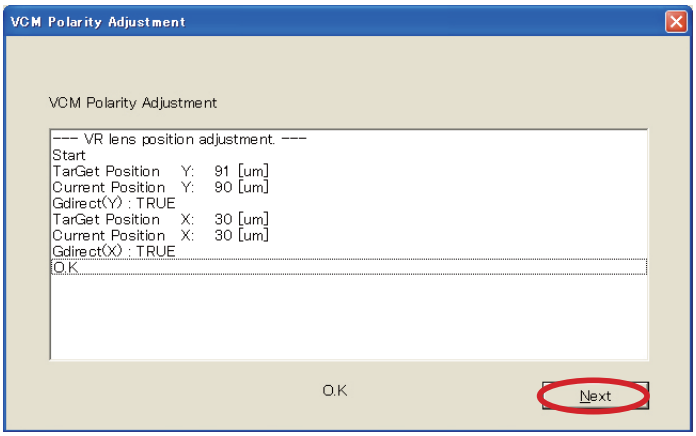
5. When the message window appears, confirm that the lens position is "0° angle" and click "OK".
   Clicking "OK" starts "Hall element-driven current adjustment".



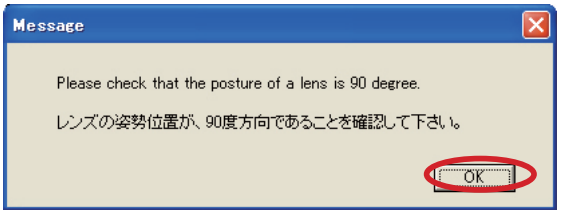
6. When the message window appears, confirm that the lens position is "90° angle" and click "OK".



7. If the result is "OK", click "Next".

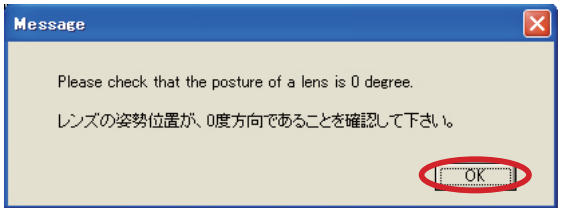


8. When the message window appears, confirm that the lens position is "90° angle" and click "OK".

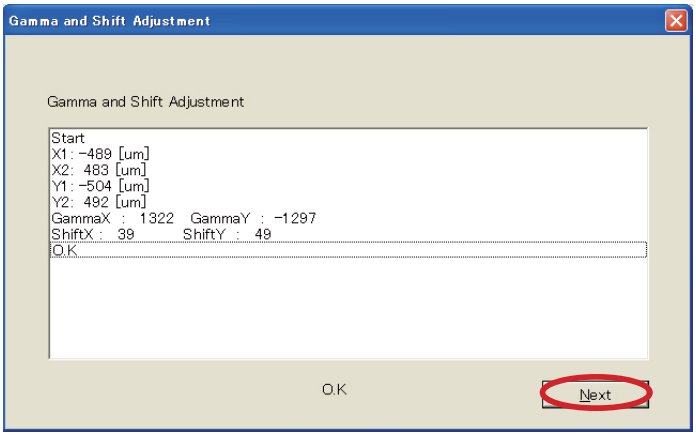


9. When the message window appears, confirm that the angle of the lens position is "0° angle" and click "OK".

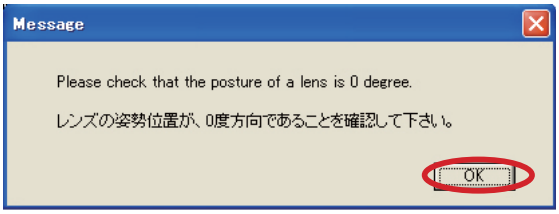
   Clicking "OK" starts "Gamma and Shift adjustment (Auto control)".



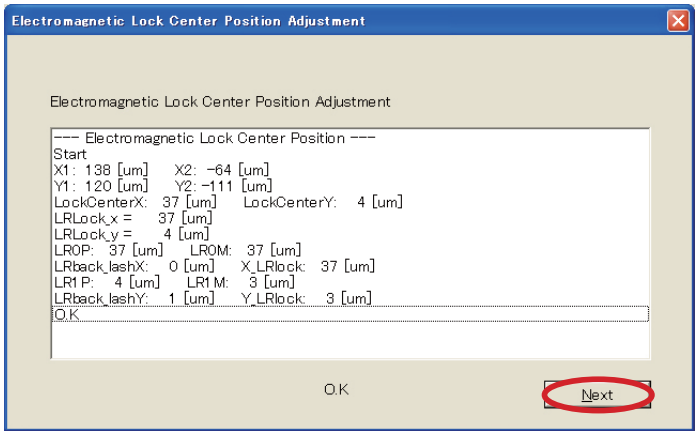
10. If the result is "OK", click "Next".



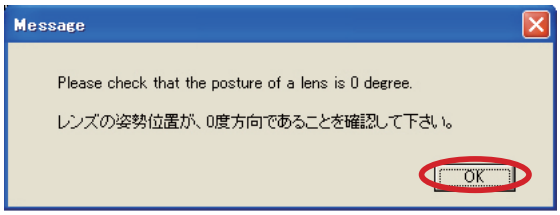
11. When the message window appears, confirm that the lens position is "0° angle" and click "OK".
Clicking "OK" starts "Electromagnetic lock center position adjustment (Auto control)".
This "electromagnetic lock center position adjustment" adjusts the center position at the time of electromagnetic lock.



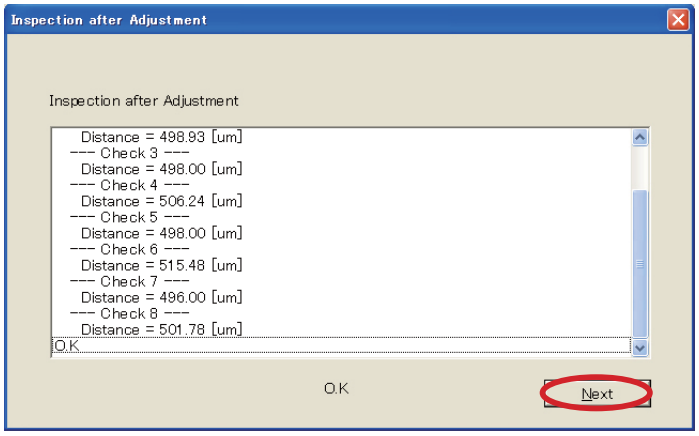
12. If the result is "OK", click "Next".



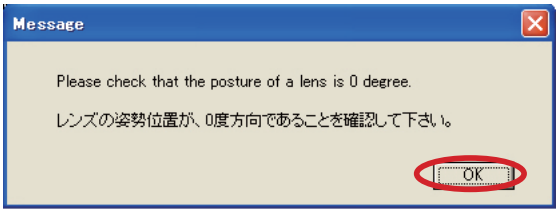
13. When the message window appears, confirm that the lens position is "0° angle" and click "OK".
    Clicking "OK" starts the "after-adjustment inspection".



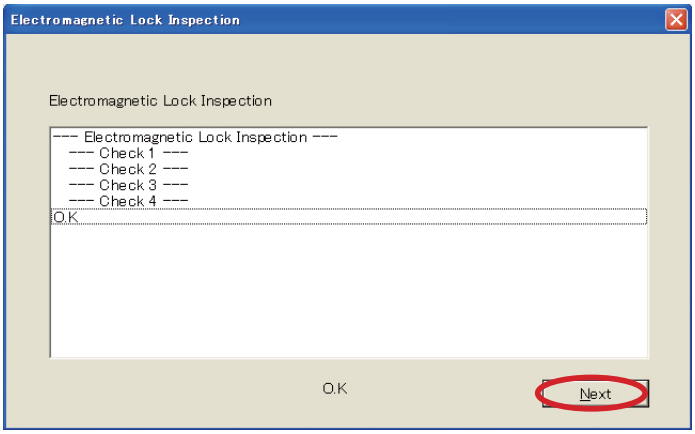
14. When the inspection result is "OK", click "Next".



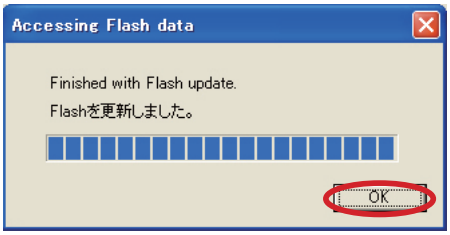
15. When the message window appears, confirm that the lens position is "0° angle" and click "OK".
    Clicking "OK" starts the "electromagnetic lock inspection".



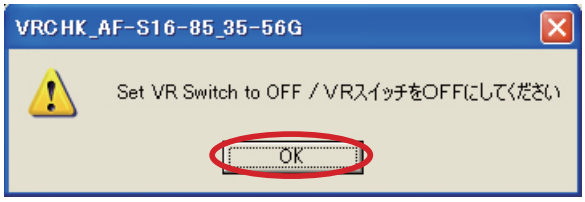
16. When the inspection result is "OK", click "Next".



17. When the message that shows updating FLASH-ROM is finished" appears, click "OK".

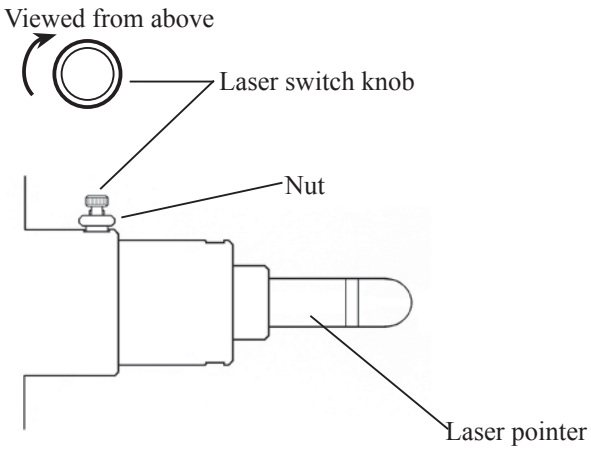


18. When the following message appears, turn the VR switch of the lens to OFF and click "OK".



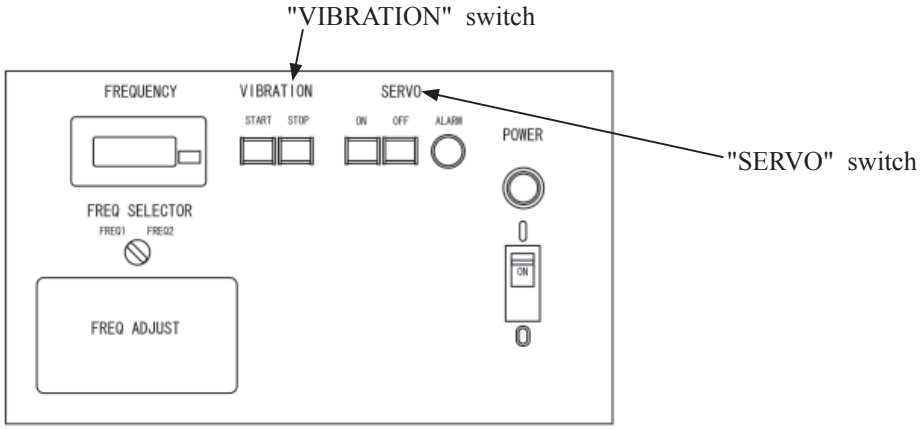
Gyro Adjustment

1. Loosen the laser switch nut of the VR lens adjustment equipment (J15380), and rotate the knob in the direction of the arrow to radiate the laser beam.

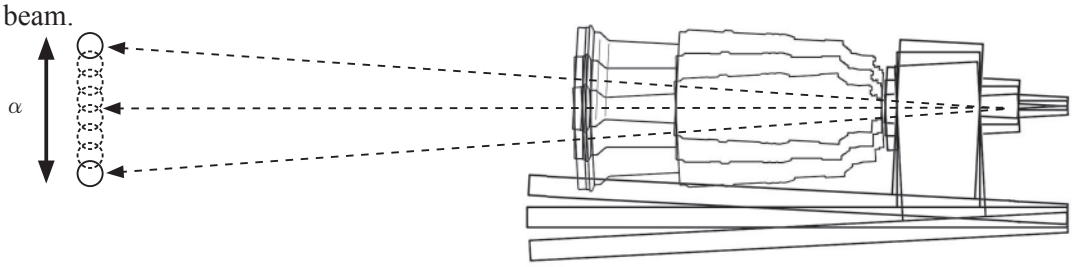


2. Tick "Gyro Adjustment" as below and click "Execute".

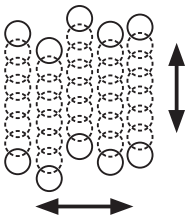
3. Press "ON" button for "SERVO" switch and press "START" for "VIBRATION" switch of the VR lens adjustment equipment (J15380).



4. When the VR lens adjustment equipment (J15380) starts to vibrate, measure the vibration width (α) of the laser beam.



Notes:During the above measurement, laser spot light swings from side to side and up and down. This phenomenon is caused by operations of the VR unit control so NOT defective.

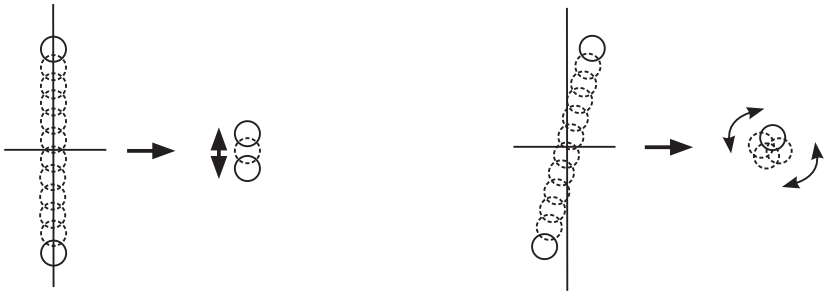


5. Click "Next" on the message window.
The vibration reduction function starts and the vibration width of the laser beam becomes narrow.

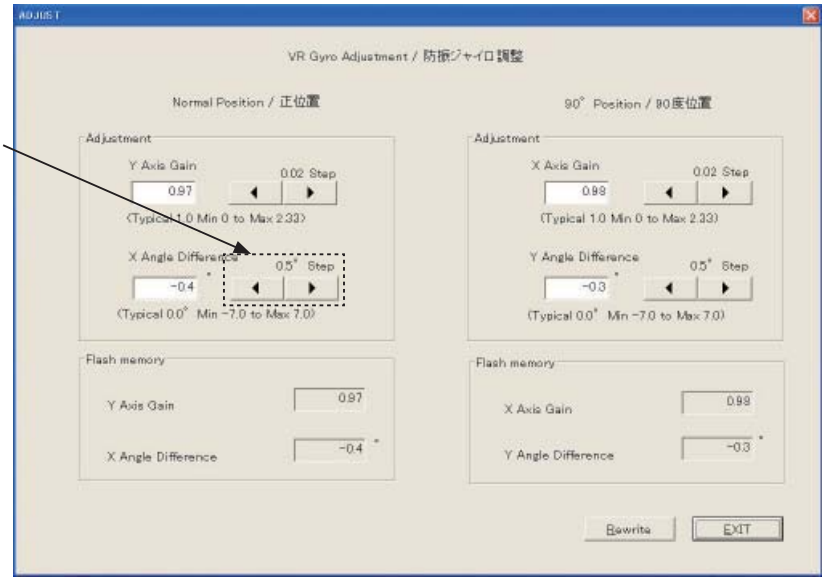
6. If the angle is deviated, the laser beam source looks like turning around even after making the Gyro-gain adjustment.

So if such deviation is detected, adjust and correct it by the adjustment buttons.

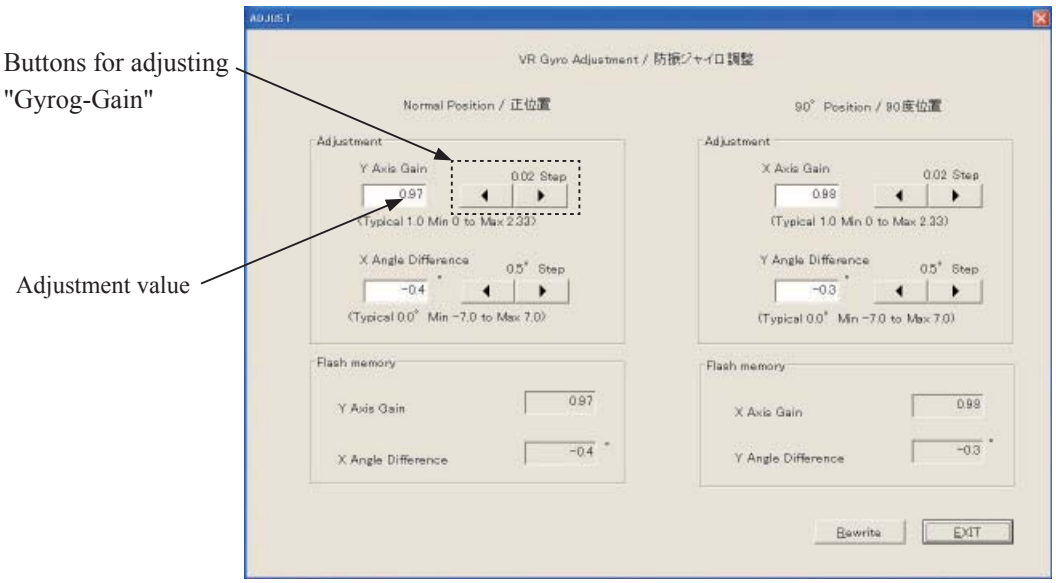
Note: After using the adjustment buttons, wait for a few seconds until the vibration movement stabilizes.



Buttons for adjusting "Angle deviation"

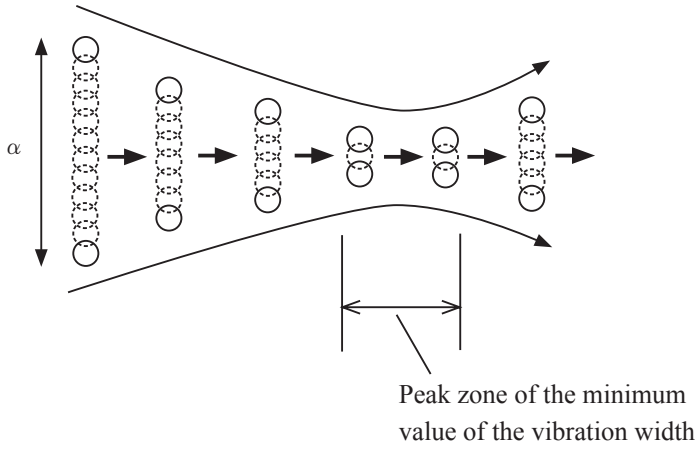


7. Adjust the vibration width by the buttons for Gyro-gain adjustment so that the measured vibration width at the center (α′) of the laser beam becomes 1/8 or less of the maximum width.
   For how to calculate the adjusted center width (α′), refer to the procedure on the next page.



Standard:
Center vibration width (α′): One-fifth (1/8) or less of the maximum vibration width

Note: The laser beam vibrates widely again after passing the peak section of the minimum value.

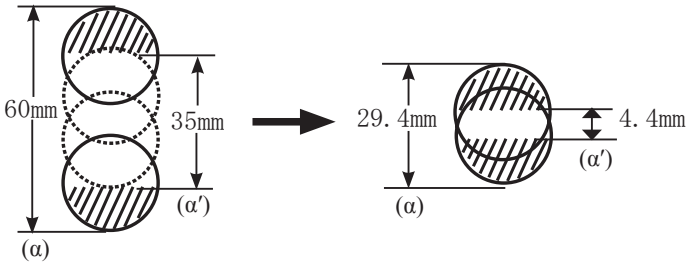


How to calculate the adjusted center width (α′)

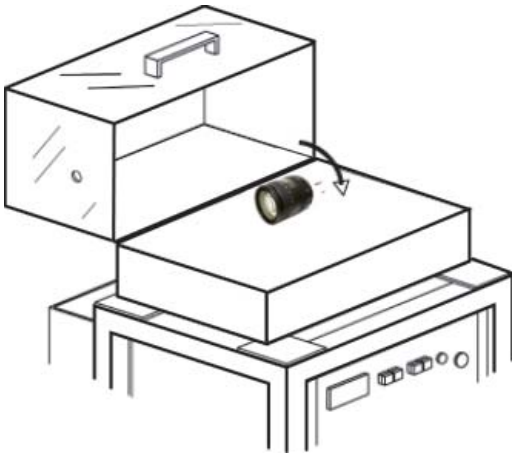
For adjusting the center vibration width of the laser beam, calculate as follows:
Measure the whole vibration width (α) as in Procedure "4." (Page A103). Then, subtract the top and bottom radial parts (shaded areas) of the laser spots from it and work out the center vibration width (α′).

e.g.)
The diameter of the laser spot beam radiated 5-m away is approx. 25 mm .

When the whole vibration width is "approx. 60 mm", the center vibration width is 60 - (12.5 + 12.5) = 35 mm. The standard value after the gyro-gain adjustment is 35×1/8 = 4.4 mm (center vibration width), so the whole vibration width is 4.4+ (12.5+12.5) = 29.4 mm.

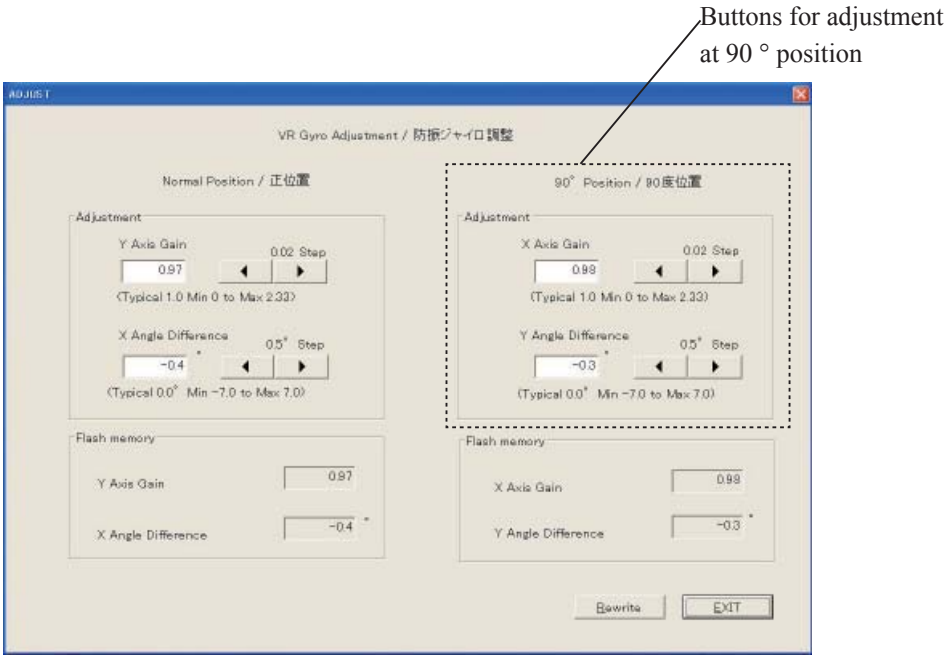


8. Press "STOP" button of VIBRATION switch of the VR adjustment equipment (J15380) to stop vibrations.
9. Rotate the lens through 90° in the direction indicated by the arrow, then press "START" button of VIBRATION switch of the VR adjustment equipment (J15380) to start vibrations.



10. At the 90° position, adjust the angle deviation and make gyro-gain adjustment.

Note: When adjusting the lens at the 90 ° angle position, use the buttons for the adjustment at 90 ° position as below.



11. After the adjustment, click "Rewrite" button to write the adjustment value in FLASH-ROM of the lens.
12. When writing is completed, click "EXIT".

Note:

If clicking "EXIT" button without clicking "Rewrite" button, the adjustment value is not recorded and the adjustment details are not written.

13. When the message window appears, switch off the laser and stop the vibration. Then, click "OK".

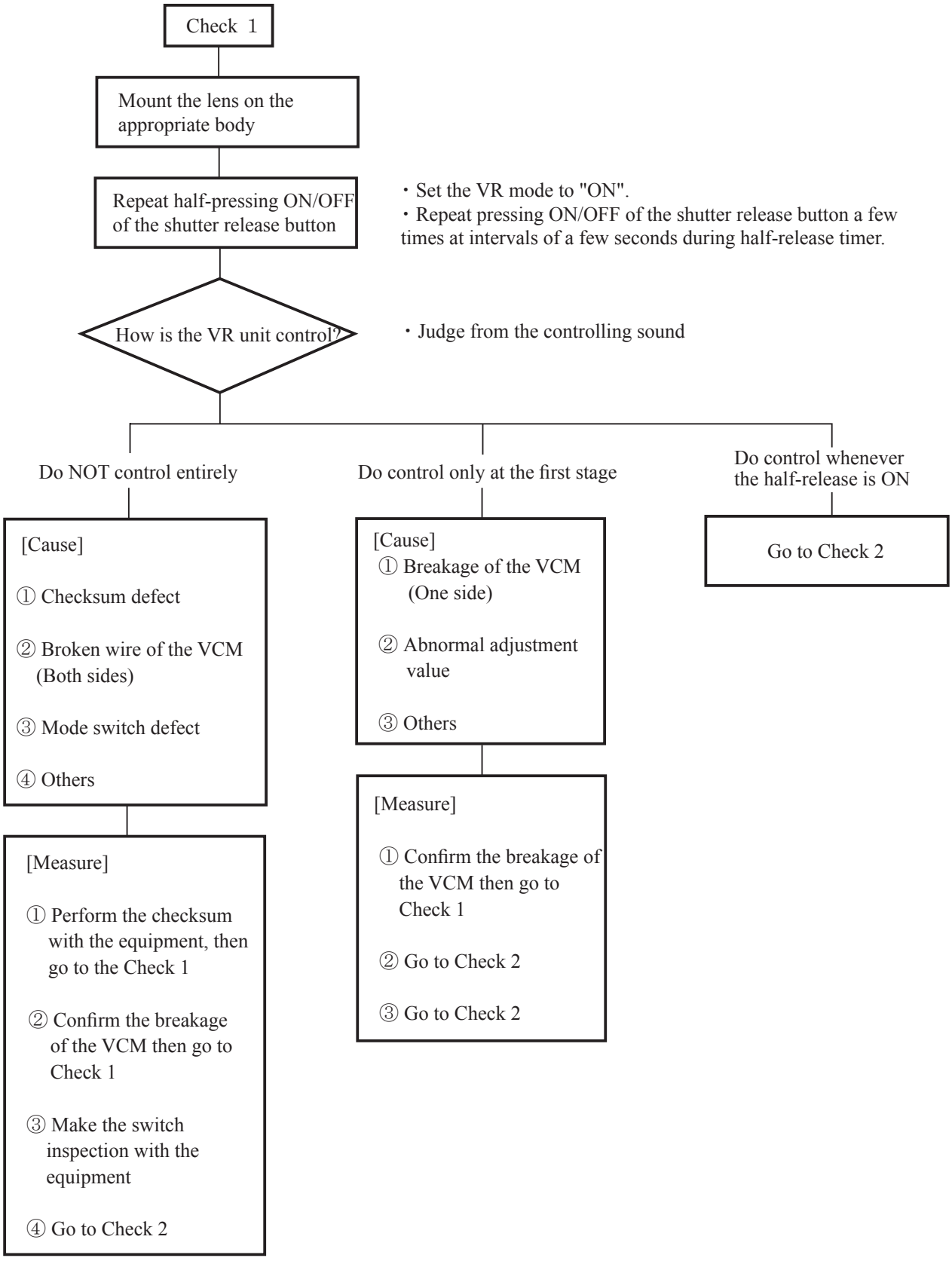
14. Click "Quit" on the adjustment-items screen to go back to the Lens selection screen.

Note:

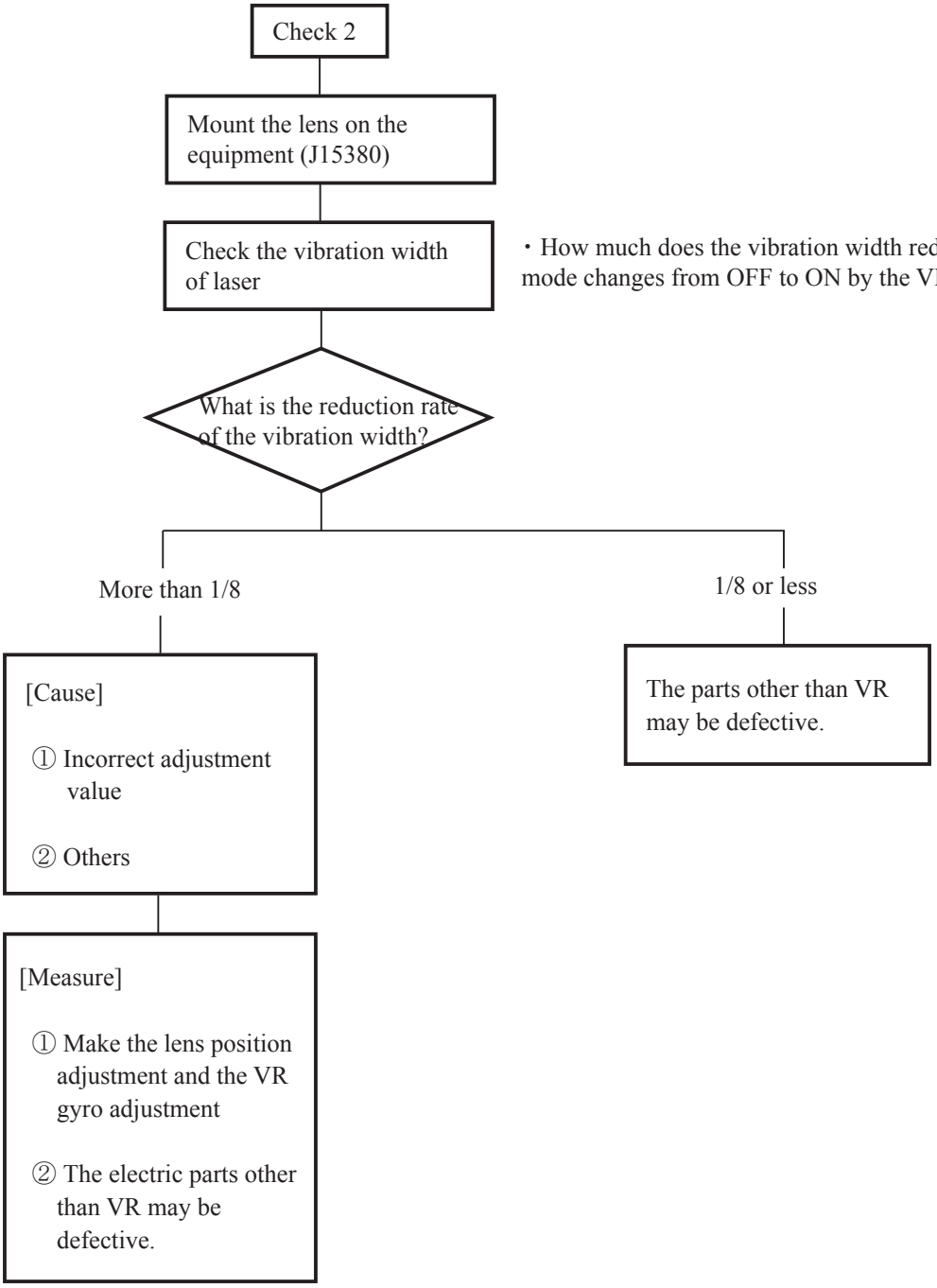
Do NOT remove the lens or turn OFF the VR lens adjustment equipment until going back to the Lens selection screen. Otherwise, troubles will occur such as incorrect recording of the adjustment value due to blocked communications, etc.

Criteria for VR performance

Before making the VR adjustment for defective products by using the equipment, refer to the following.



Go on to the next page "Check 2"


Check 2
Mount the lens on the equipment (J15380)
Check the vibration width of laser
・How much does the vibration width reduce, when the VR mode changes from OFF to ON by the VR-gyro adjustment?
What is the reduction rate of the vibration width?
More than 1/8
1/8 or less
[Cause]
① Incorrect adjustment value
② Others
The parts other than VR may be defective.
[Measure]
① Make the lens position adjustment and the VR gyro adjustment
② The electric parts other than VR may be defective.

Aberration compensation data-writing adjustment

★ : New tool

- This adjustment is made by the software which calculates the aberration compensation data according to the aberration feature of lens and writes in the Flash-ROM of the lens, in order to improve the accuracy of autofocus.

Note: This adjustment is required 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.

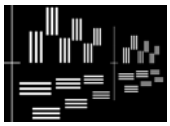
Preparation

- Test chart (Self-made tool: ref. Procedure for how to create it.)
- Tripod
- D200, D2X, or D3
- PC
- USB cable (UC-E4)
- Adjustment software （★ J18445 LWM_AFSDXVR16_85G.exe : used for the lens optical alignment.)

Procedure for how to create test chart

- Photocopy the next page and cut out one target chart and five resolution charts.

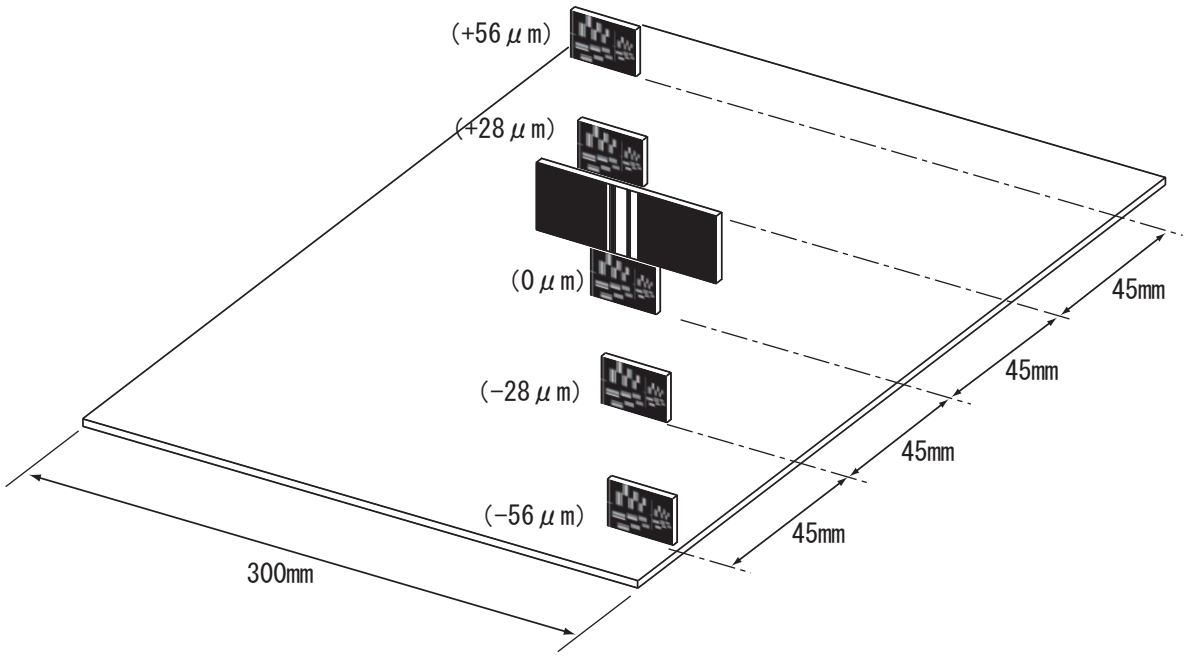
(Target chart)



(Resolution chart)

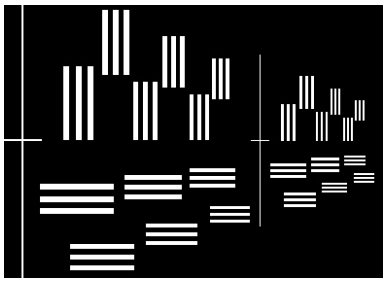
- As shown below, put each chart in position at the specified spacings.

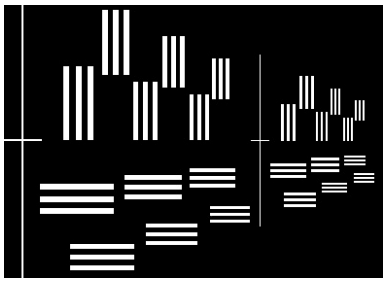
Caution: Only in the center, put the target chart on the central resolution chart.

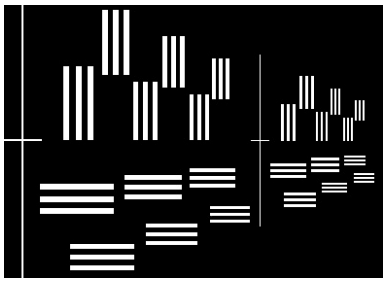


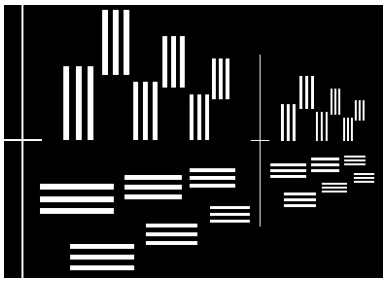
(Target chart)

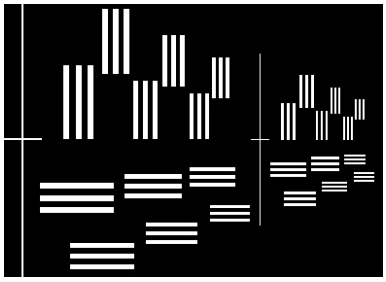
(Resolution chart)









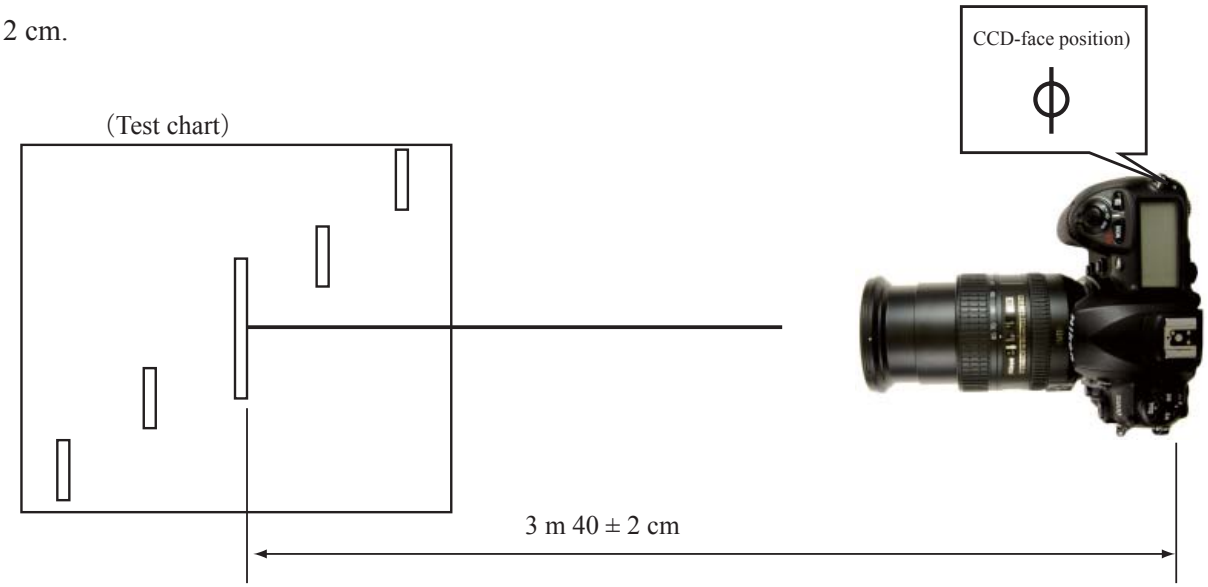


Writing aberration compensation data

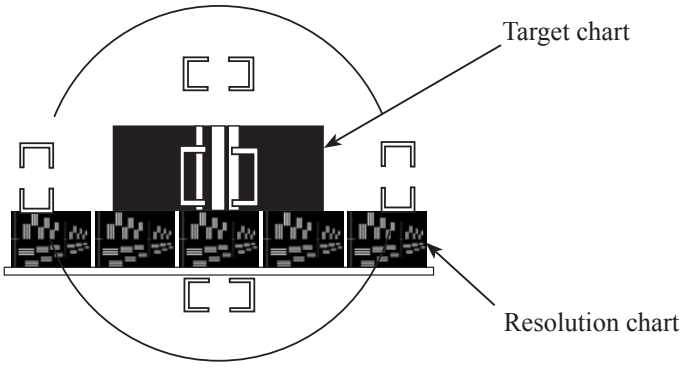
(1) Prepare a camera (D200, D2X or D3). Set the "Exposure mode" to "A", the aperture to full and "Focus mode" to "S".

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 (D200, D2X or D3), to which the suspected lens is attached, on the tripod. Set the focal length to 85 mm, and the distance between the test chart and camera (CCD face or CMOS face) to 3 m 40 ± 2 cm.



(3) Set the center of the focus area coming in the target chart as below in viewfinder.

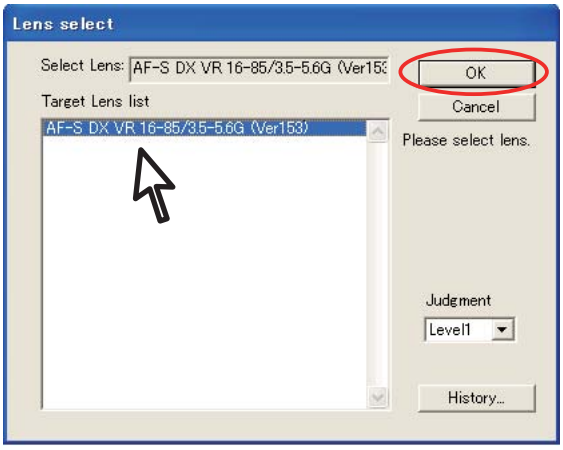


(In viewfinder)

(4) Connect the PC and camera via USB cable. (Camera setting for USB: PTP)

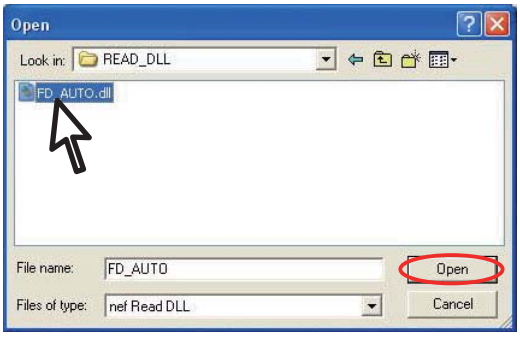
(5) Start the adjustment software (LWM_AFSDXVR16_85G.exe).

(6) Select "AF-S DXVR 16-85/3.5-5.6G" on the "Lens select" screen. Click "OK".

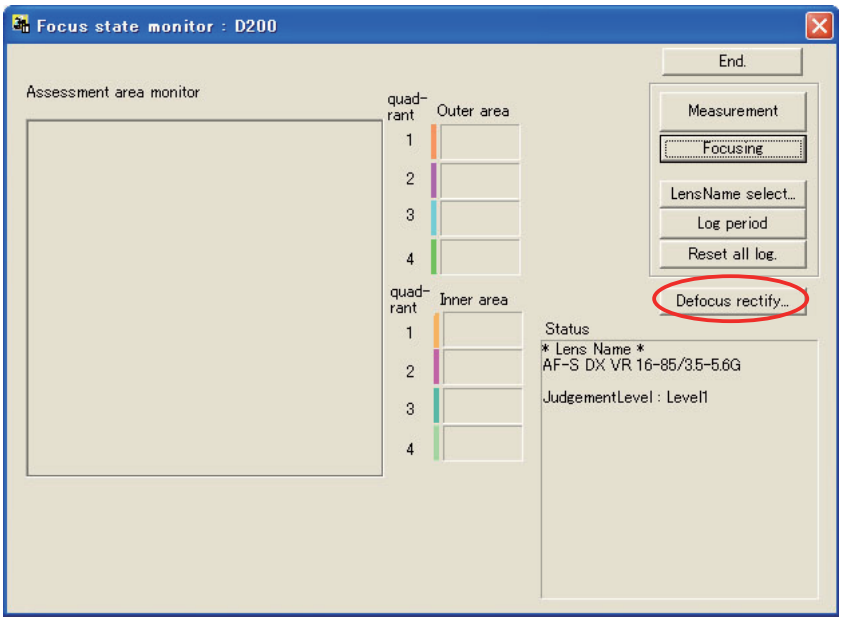


※ If this software is used for the first time, the selection screen of reading data will appear. This does not appear after the 2nd-time usage.)

Select "FD_AUTO.dll" and click "Open".



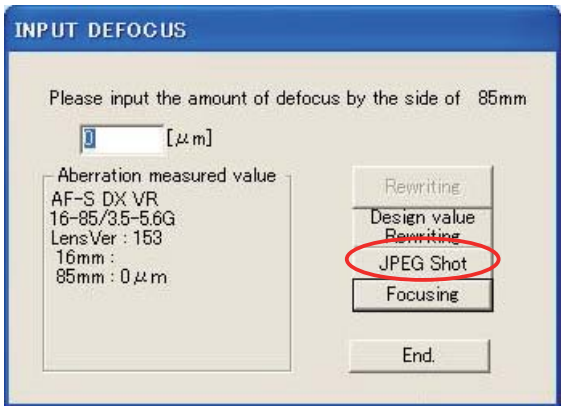
(7) Click "Defocus rectify...".



Caution:

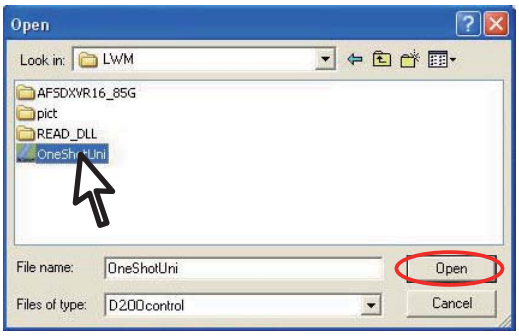
Unless the focal length is set to 85 mm or 16mm, the following window will appear and the procedure will be blocked.

(8) Click "JPEG Shot".



※ If this software is used for the first time, the software selection screen will appear. This does not appear after the 2nd-time usage.)

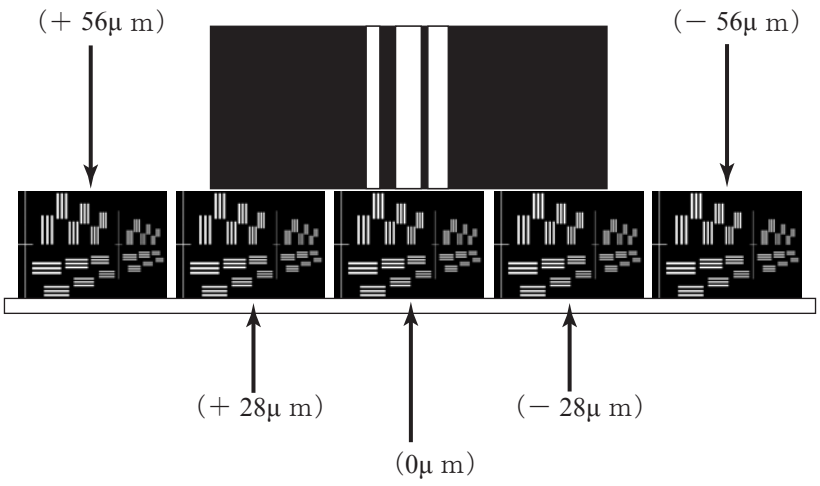
Select "OneShotUni" and click "Open". (In case of D2X)



(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 five resolution charts.

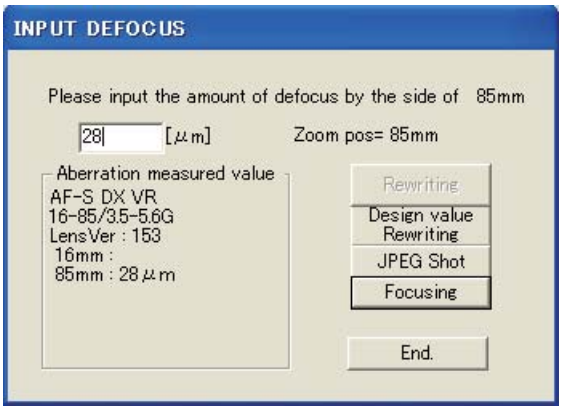
Caution:

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 data of the focus position into the entry field.

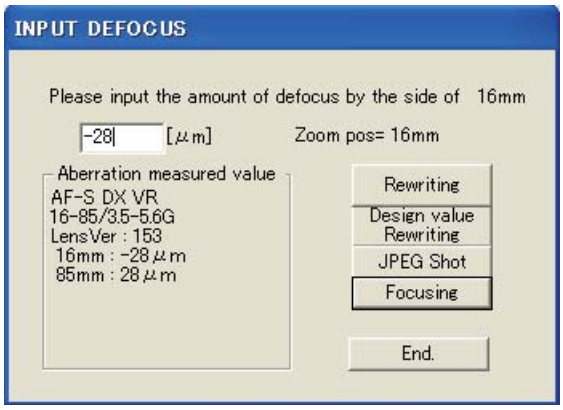
e.g. The following means " ＋ 28μm (rear focus side)"-position is in focus.



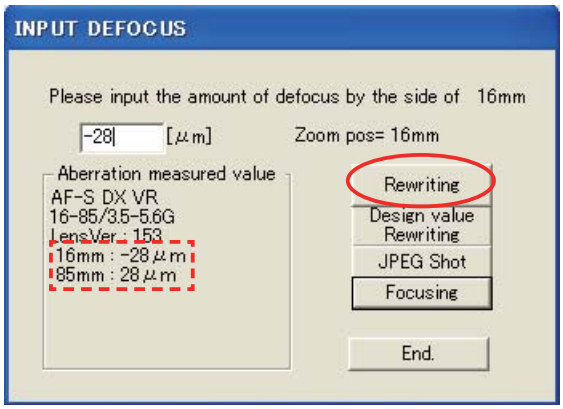
(11) Set the focal length of the suspected lens to 16 mm, and the distance between the test chart and camera (CCD face or CMOS face) to 64 cm ±2 cm.

(12) Perform the procedure from (8) of A111 page to (10). Input the value data of the focus position into the entry field.

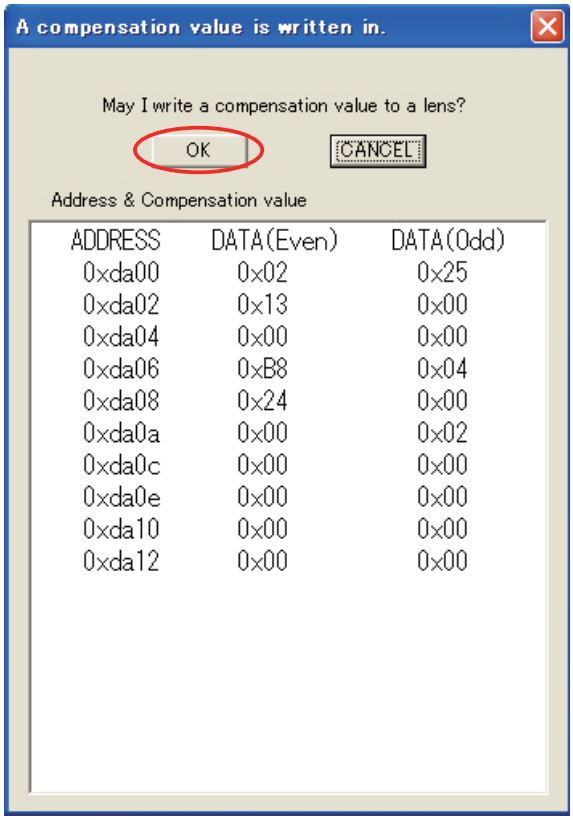
e.g. The following means " － 28μm (front focus side)"-position is in focus.



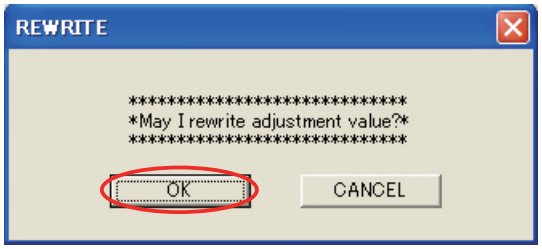
(13) Check that the values of all the focal lengths are displayed within the dotted red circle. Then click "Rewriting".



(14) When the following screen appears, click "OK".

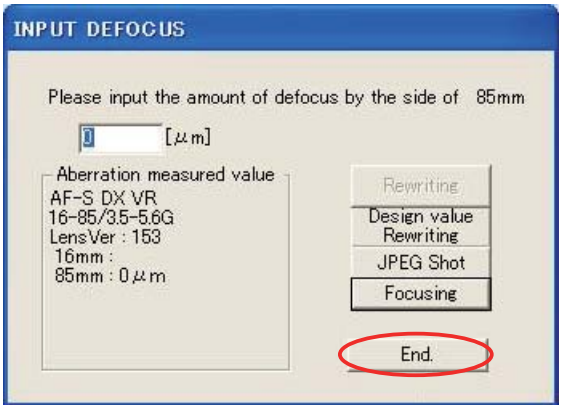


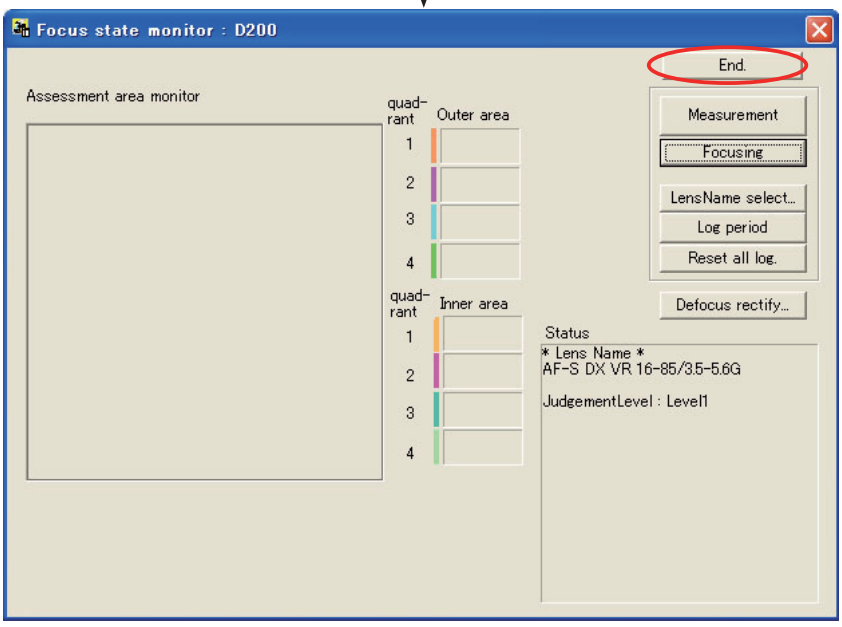
(15) Click "OK".



(16) Click "OK" .

(17) Click "End" to end the adjustment software.





(18) Turn the camera OFF and turn it ON again.

Note: Unless the camera turns off once, the value that was written in Flash-ROM is not reflected.

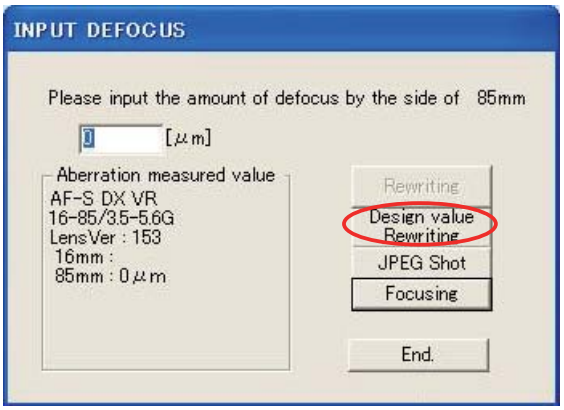
(19) Then reboot the adjustment software.

(20) After rebooting the adjustment software, perform the procedure from (2) to (12) again. Check that "0μm"-position is in focus by AF.

Note:It is also possible to take WIDE-side shooting at the procedure of (11) **, and then to take TELE-side shooting at the procedure of** (2).

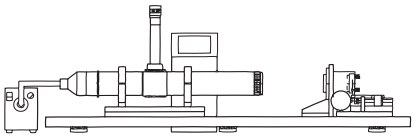
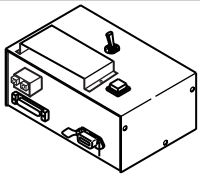
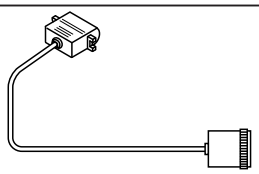
(21) If "0μm"-position is not in focus, repeat the procedure from (2) to (20).

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



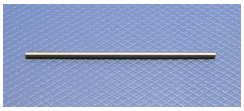
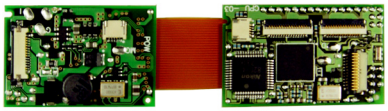
工具編 TOOLS

★：NEW TOOL

	RJ 番号 RJ No.	名称 NAME OF TOOL	備考 OTHERS
	J15430 	横型焦点面検査器 AT-500H BACK FOCUS COLLIMATER	
	J9001-5N-1 	安定化電源５Ａ DC REGULATED POWER SUPPLY 5A	
	工具設定なし RJNo.is not available 	鉛フリーはんだコテ LEAD FREE SOLDERING IRON	
	J5400 	鉛フリー糸はんだ RMA02(M705) 0.5MMX500G ECO SOLDER RMA02(M705) 0.5MMX500G	
	工具設定なし RJNo.is not available	パーソナルコンピュータ PERSONAL COMPUTER	
	工具設定なし RJNo.is not available 	オシロスコープ OSCILLOSCOPE	
★	J18444 	AF-S DXVR16-85/3.5-5.6G 点検・調整ソフト Adj.SOFT for AF-S DX 16-85/3.5-5.6G VR	
★	J18446 	ＶＲ調整ソフト VR-Adj.SOFT for AF-S DXVR 16-85/3.5-5.6G	
★	J18445 	調芯装置用調整ソフト（ＬＷＭ） Adj.SOFT(LWM) for AF-S DXVR 16-85/3.5-5.6G	
	J18004-1 	Ｊ１８００４用基準ゲージ STANDARD GAUGE FOR J18004	
	J15306-1 	ＡＦ－Ｉ通信ボックス AF-I LENS COMMUNICATION BOX(CE)	
	J15380	ＶＲレンズ調整装置 INSPECTION TOOL FOR VR LENS	
	J15307 	ＡＦ－Ｉ通信アダプター COMMUNICATION ADAPTER FOR AF-I	
★	J19127T 	AF-S 16-85 用ホルダー ATTACHMENT HOLDER FOR AF-S 16-85	

J11326 	X タイプスリムピンセット X-TYPE SLIM TWEEZERS	
~~OS-30MEL~~ △ (Deletion) 	~~ドライサーフ　OS-30MEL~~ ~~DRY SERF OS-30MEL(OIL BARRIER)~~ △ (Deletion)	
PL-22SEL	ドライサーフ　PL-22SEL DRY SERF PL-22SEL(OIL BARRIER)	
~~MZ-800SEL~~ MZ-400EL △ (Revision)	△ (Revision) ドライサーフ　~~MZ-800SEL~~　MZ-400EL DRY SERF ~~MZ-800SEL~~　MZ-400EL(OIL BARRIER) △ (Revision)	
GP-1RS △ (Addition)	グリース　GP-1RS △ (Addition) GREASE GP-1RS △ (Addition)	
I-40	ＡＦレンズ用グリース（Ｉ－４０） GREASE FOR AF LENS	
EDB0011 	ネジロック（赤）1401C SCREW LOCK 1401C	
L-241 	ロックタイト＃２４１（青） LOCTITE #241 (50ml)	
SX720B 	セメダイン　SX720B（200g 入り） CEMEDINE SX720B(NET. 200G)	
TA-0003		両面接着テープ Double Stick Tape
TA-0012 		ポリエステル フィルム Polyester Film
TA-0027		両面接着テープ Double Stick Tape
J5033 	導電マット CONDUCTIVE MAT	
J5033-5 	リストストラップ WRIST STRAP	
M300S	ザヴィーナ ミニマックス SAVINA MINI MAX	

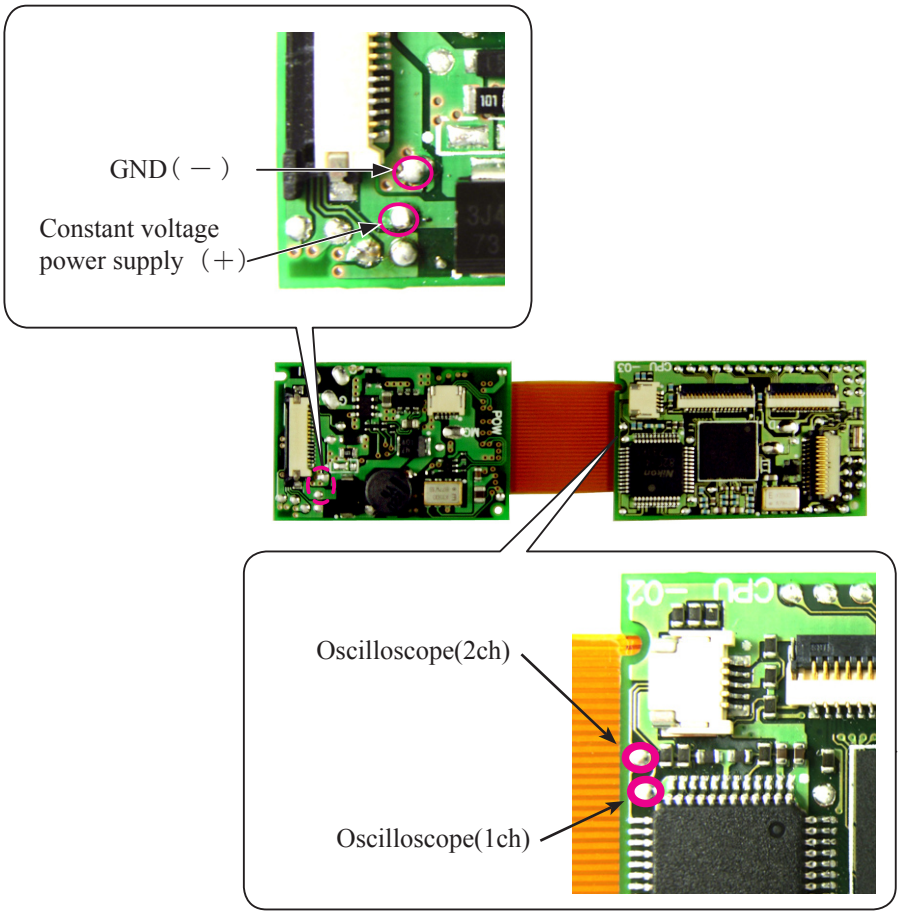
サービス計画課
M

★	J11356 	AF-S DX16-85/3.5-5.6G 2群固定工具 ~~WRENCH~~ FOR 2G AF-S DX16-85/3.5-5.6G FIXING TOOL △ (Revision)	
★	J11358 	AF-S DX16-85/3.5-5.6G 2群回螺器 WRENCH FOR 2G AF-S DX16-85/3.5-5.6G	
	J11349 	AF-S 24-70/2.8G 4群ガイドピン 4G LENS GUIDE PIN FOR AF-S 24-70/2.8G	AF-S 24-70/2.8G
★	自作工具 	自作工具 SELF-MADE TOOL	1S020-552

How to create Self-made tool

● For inspection and adjustment of output waveform of MR endcoder, creating a self-made tool by using the main PCB(1S020-552) is necessary as follows:

Solder the each wire on the soldering pattern of the main PCB at the below four places.



サービス計画課 M