SAL135F28

(STF 2.8(T4.5)/135) (135mm F2.8 [T4.5] STF)

SERVICE MANUAL

Ver 1.2 2007.01
Revision History

How to use Acrobat Reader

US Model
Canadian Model
AEP Model
Chinese Model

Link

SPECIFICATIONS	DISASSEMBLY	ADJUSTMENTS
SERVICE NOTE	REPAIR PARTS LIST	

- About the Lens Test Projector and Finished Inspection JIG

LENS FOR DSLR CAMERA

SONY

2007A0800-1

Published by Kohda TEC

SPECIFICATIONS

- Depending on the lens mechanism, the focal length may change with any change of the shooting distance. The focal length assumes the lens is focused at infinity.

Equivalent 35mm-format focal length *1 (mm)
202.5
*1 The value for equivalent 35mm-format focal length is based on Digital Single Lens Reflex Cameras equipped with an APS-C sized image sensor.

Lens groups elements
6-8 *2
*2 Including apodization element (1-2).

Angle of view 1 *3
18°

Angle of view 2 *3
12°
*3 The value of angle of view 1 is based on 35mm-format cameras, and that of angle of view 2 is based on Digital Single Lens Reflex Cameras equipped with an APS-C sized image sensor.

Minimum focus (m (feet)) *4
0.87 (2.85)
*4 Minimum focus is the shortest distance from the image sensor to the subject.

Maximum magnification (×)
0.25

Minimum f-stop
f/31 [T/32]

Filter diameter (mm)
72

Dimensions (maximum diameter × height) (mm (in.))
Approx. 80 × 99 (3 1/8 × 3 7/8)

Mass (g (oz.))
Approx. 730 (25 3/4)

Included items
Lens (1), Front lens cap (1), Rear lens cap (1), Lens hood (1), Exclusive case (1), Set of printed documentation

Designs and specifications are subject to change without notice.

TABLE OF CONTENTS

1. SERVICE NOTE

1-1. Chemicals

Some chemicals used for servicing are highly volatile.
Their evaporation caused by improper management affects your health and environment, and wastes resources.
Manage the chemicals carefully as follows.

- Store chemicals sealed in a specific place to prevent from exposure to high temperature or direct sunlight.
- Avoid dividing chemicals into excessive numbers of small containers to reduce natural evaporation.
- Keep containers sealed to avoid natural evaporation when chemicals are not in use.
- Avoid using chemicals as much as possible. When using chemicals, divide only required amount to a small plate from the container and use up it.

1-2. Exterior Parts

Be careful to the following points for exterior parts used in this unit.

- Use a piece of cleaning paper or cleaning cloth for cleaning exterior parts. Avoid using chemicals.
  Even if you have to use chemicals to clean heavy dirt, don't use paint thinner, ketone, nor alcohol.
- Insert the specific screws vertically to the part when installing a exterior part.
  Be careful not to tighten screws too much.

1-3. Unleaded Solder

This unit uses unleaded solder.
Boards requiring use of unleaded solder are printed with the lead free mark (LF) indicating the solder contains no lead.
(**Caution:** Some printed circuit boards may not come printed with the lead free mark due to their particular size.)

 : LEAD FREE MARK
Be careful to the following points to solder or unsolder.

- Set the soldering iron tip temperature to 350 °C approximately.
  If cannot control temperature, solder/unsolder at high temperature for a short time.
  Caution: The printed pattern (copper foil) may peel away if the heated tip is applied for too long, so be careful!
  Unleaded solder is more viscous (sticky, less prone to flow) than ordinary solder so use caution not to let solder bridges occur such as on IC pins, etc.

- Be sure to control soldering iron tips used for unleaded solder and those for leaded solder so they are managed separately. Mixing unleaded solder and leaded solder will cause detachment phenomenon.

1-4. SAFETY CHECK-OUT

After correcting the original service problem, perform the following safety checks before releasing the set to the customer.

1. Check the area of your repair for unsoldered or poorly-soldered connections. Check the entire board surface for solder splashes and bridges.
2. Check the interboard wiring to ensure that no wires are “pinched” or contact high-wattage resistors.
3. Look for unauthorized replacement parts, particularly transistors, that were installed during a previous repair. Point them out to the customer and recommend their replacement.
4. Look for parts which, through functioning, show obvious signs of deterioration. Point them out to the customer and recommend their replacement.
5. Check the B+ voltage to see it is at the values specified.
6. Flexible Circuit Board Repairing
   - Keep the temperature of the soldering iron around 270 °C during repairing.
   - Do not touch the soldering iron on the same conductor of the circuit board (within 3 times).
   - Be careful not to apply force on the conductor when soldering or unsoldering.

CAUTION
Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type.

SAFETY-RELATED COMPONENT WARNING!!

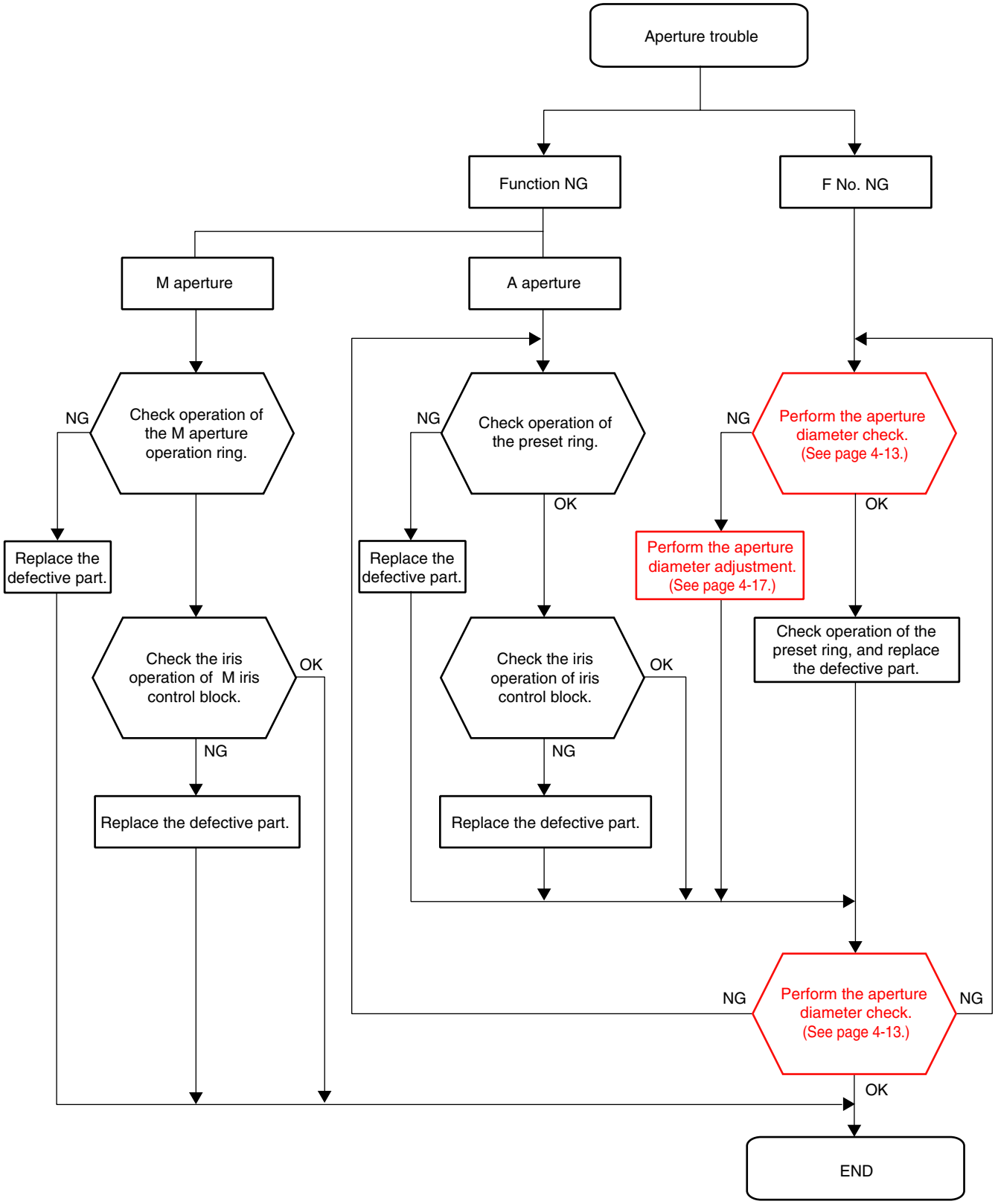
COMPONENTS IDENTIFIED BY MARK ⚠ OR DOTTED LINE WITH MARK ⚠ ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!

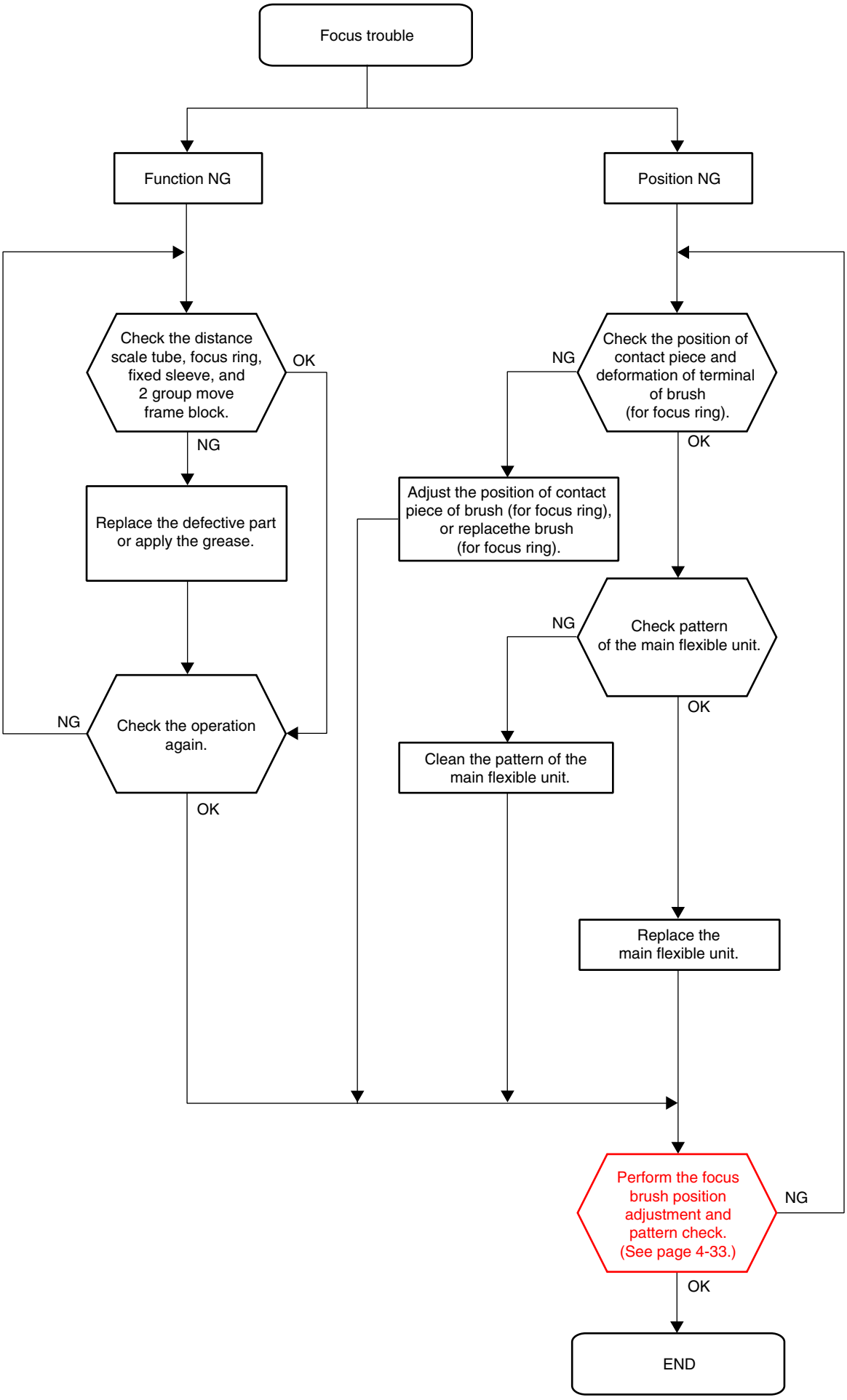
LES COMPOSANTS IDENTIFÉS PAR UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈSES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DANS LES SUPPÉMENTS PUBLIÉS PAR SONY.

1-5. TROUBLESHOOTING

1-5-1. Aperture Trouble



1-5-2. Focus Trouble

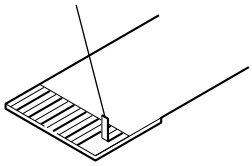


2. DISASSEMBLY

NOTE FOR REPAIR

- Make sure that the flat cable and flexible board are not cracked of bent at the terminal. Do not insert the cable insufficiently nor crookedly.
- When remove a connector, dont' pull at wire of connector. It is possible that a wire is snapped.
- When installing a connector, dont' press down at wire of connector. It is possible that a wire is snapped.
- Do not apply excessive load to the gilded flexible board.

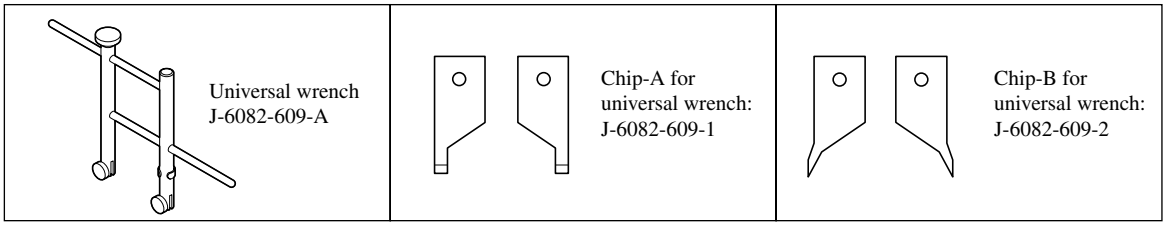
Cut and remove the part of gilt which comes off at the point. (Be careful or some pieces of gilt may be left inside)



UNIVERSAL WRENCH

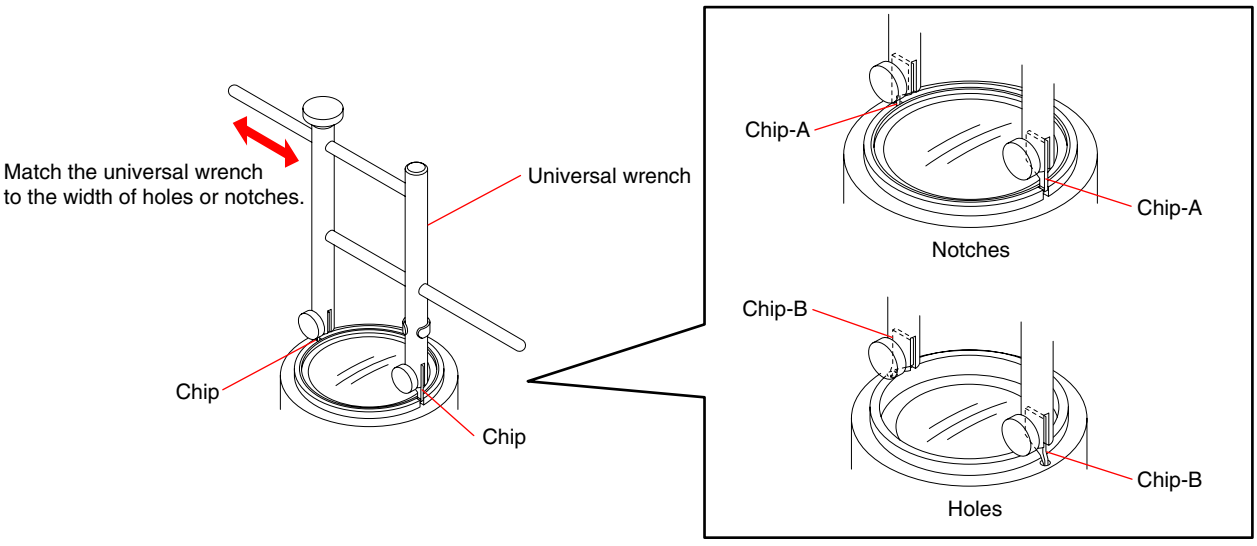
In case of the following notches or holes are located in the lens block, etc during disassembling/ assembling the lens, Use the universal wrench.

How to Use



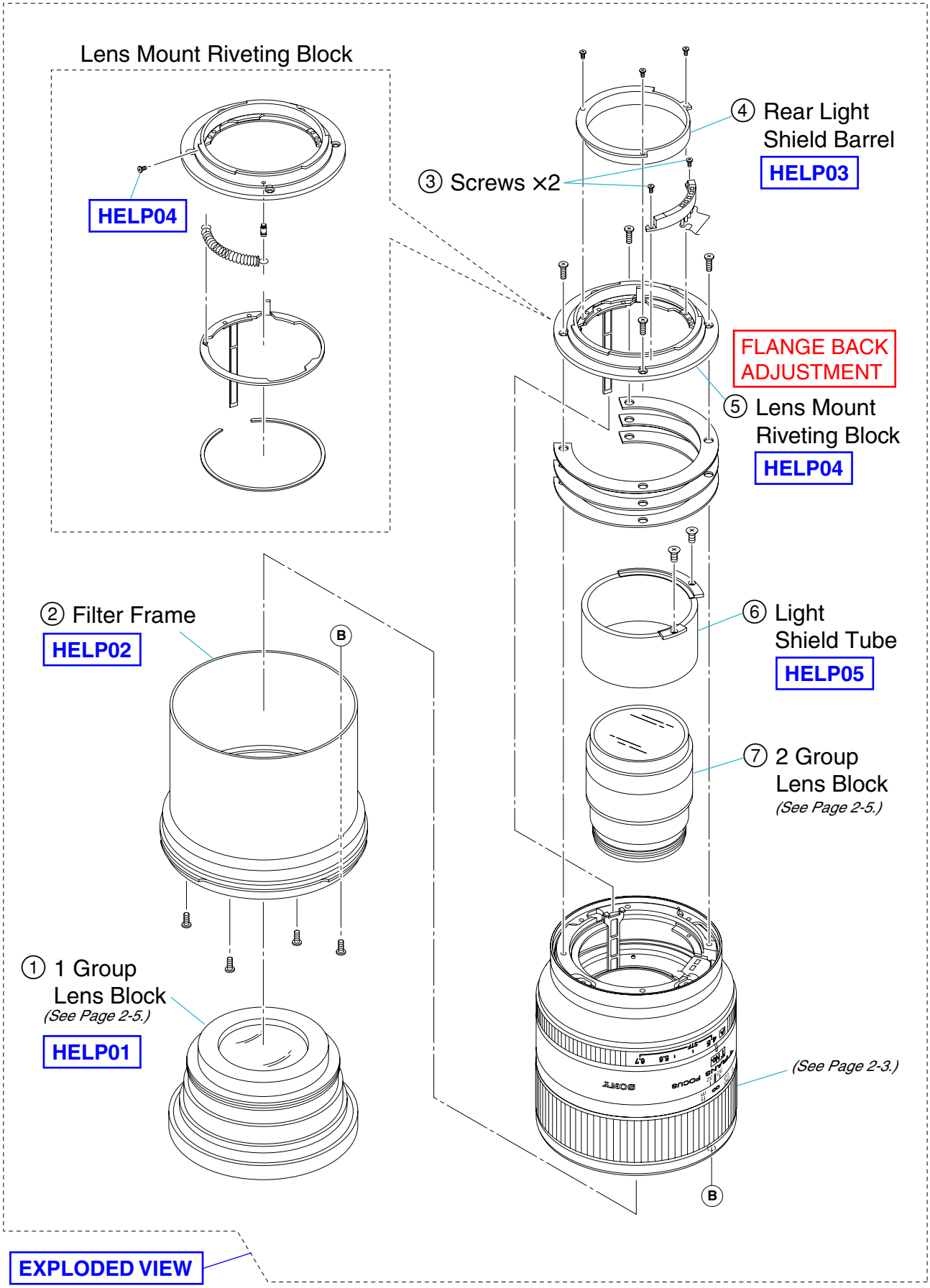
Attach the chip-A or chip-B to the universal wrench.
For the notches: chip-A
For the holes: chip-B

Match the universal wrench to the holes or notches of the lens block, etc.

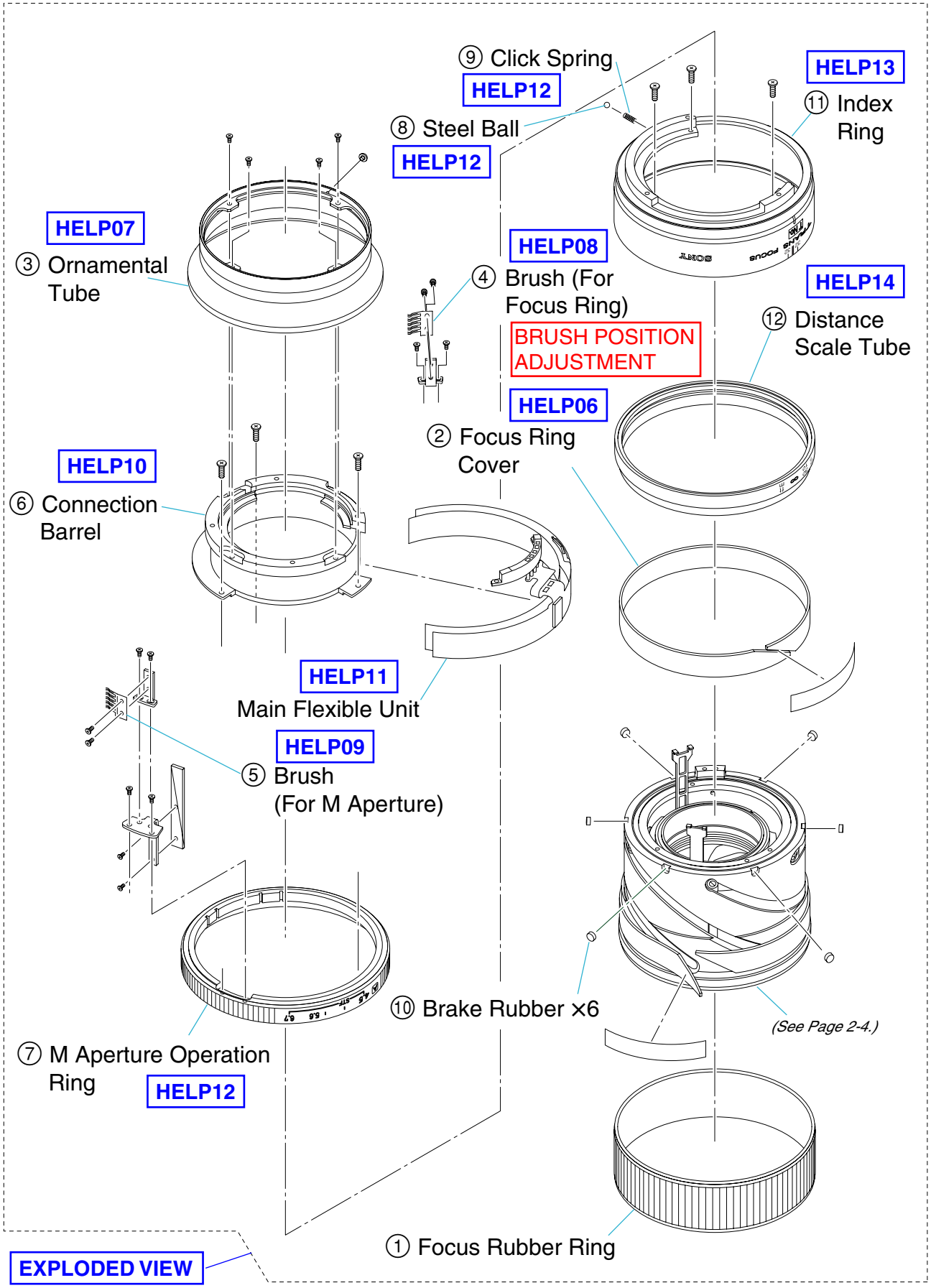


2-1. DISASSEMBLY

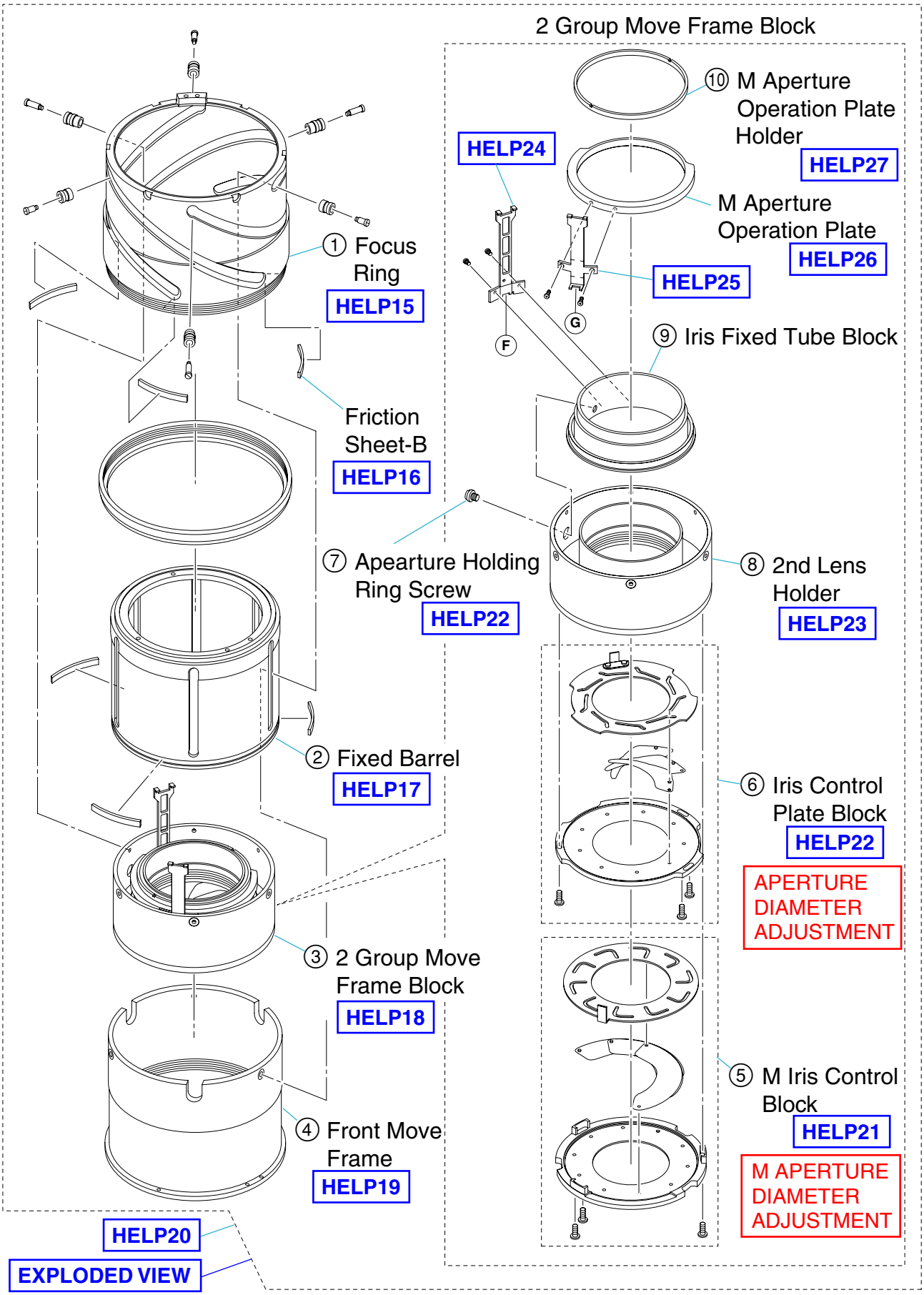
2-1-1. FILTER FRAME AND LENS MOUNT RIVETING BLOCK



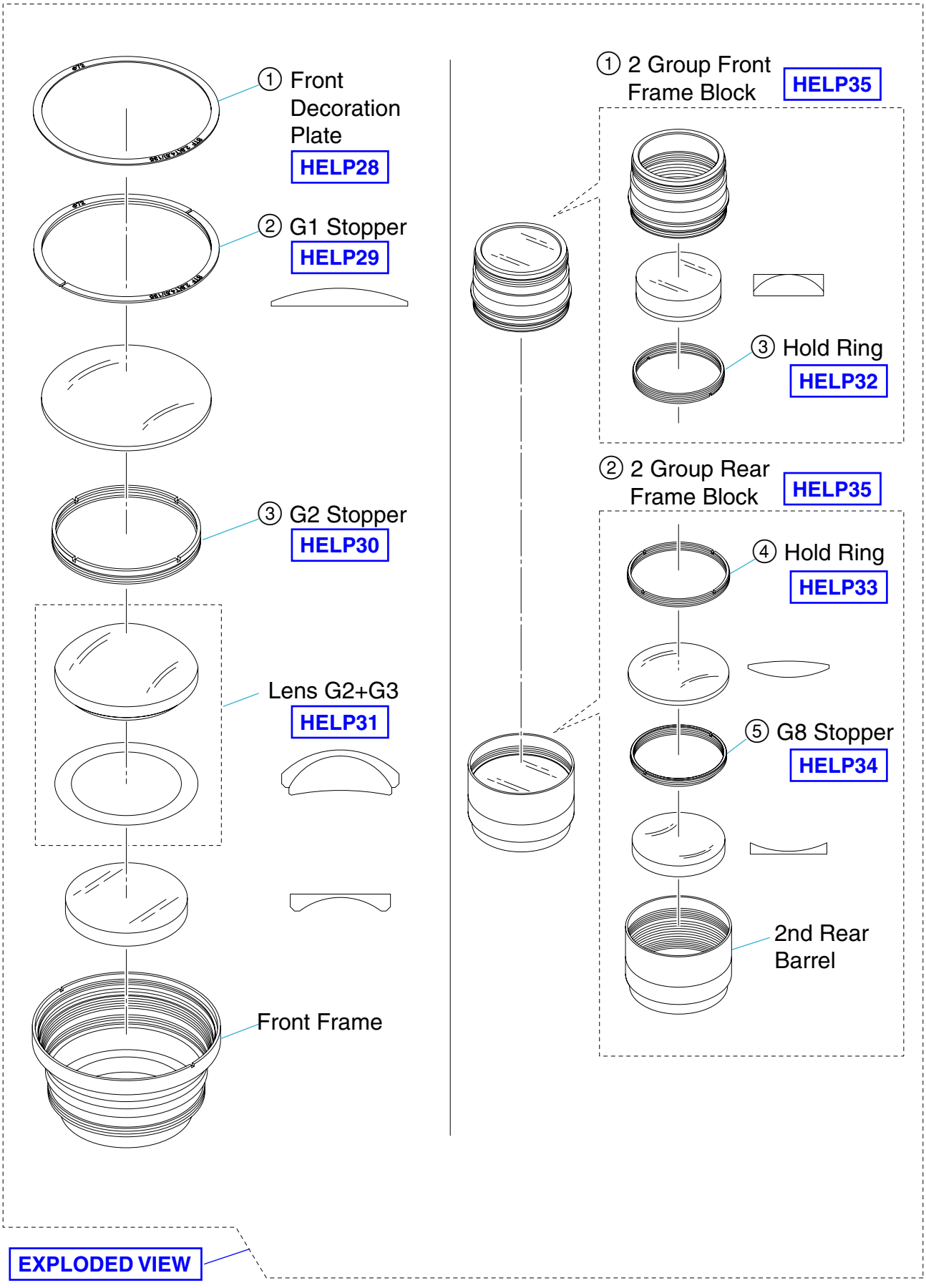
2-1-2. ORNAMENTAL TUBE, CONNECTION BARREL, MAIN FLEXIBLE UNIT AND INDEX RING



2-1-3. FOCUS RING, FIXED BARREL AND 2 GROUP MOVE FRAME BLOCK



2-1-4. 1 GROUP LENS BLOCK AND 2 GROUP LENS BLOCK



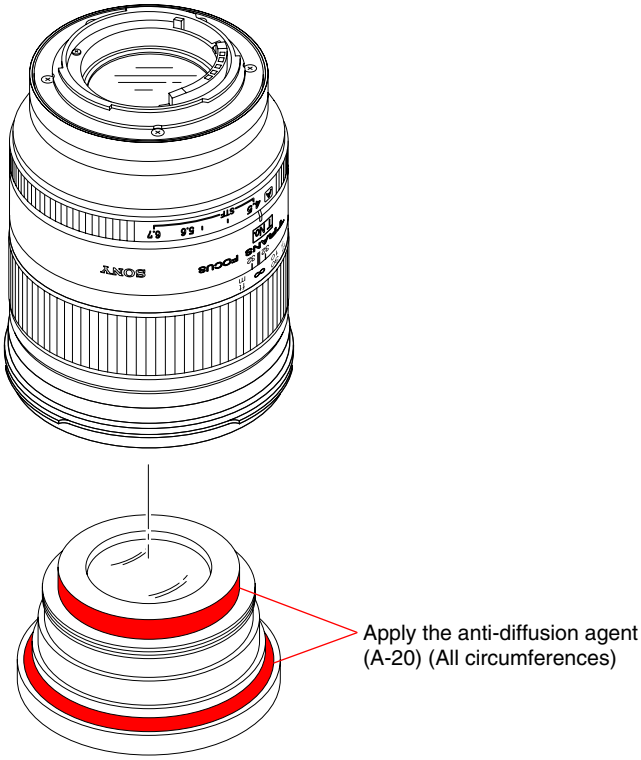
HELP

Note for assembling and grease applying positions are shown.

HELP01

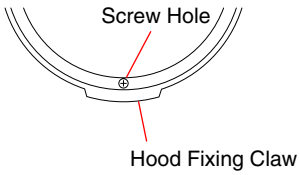
Anti-diffusion agent (A-20): J-6082-611-A

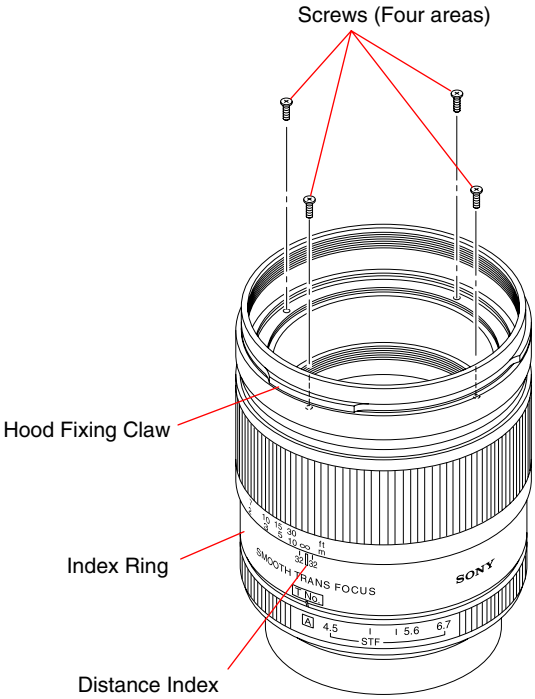
Apply the anti-diffusion agent (A-20) to the instruction portions of the 1 group lens block as shown in the figure.



HELP02

Attach the filter frame so that the hood fixing claw that the screw hole is at the center of it matches to the distance index on the index ring, and fix it with the four screws as shown in the figure.

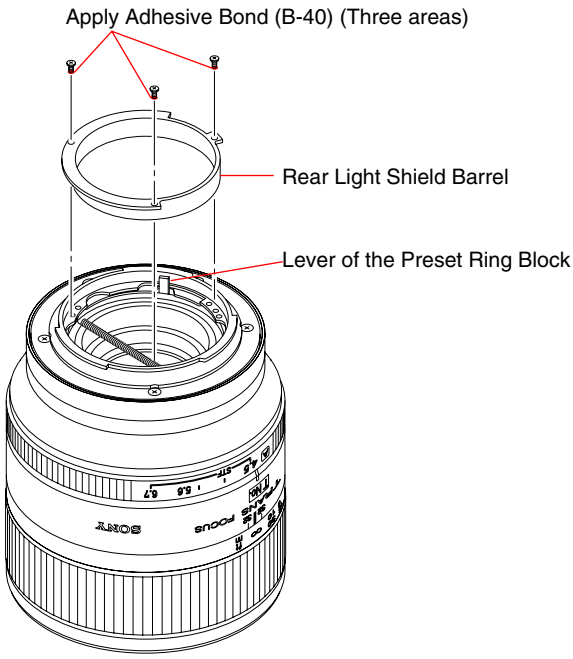




HELP03

Adhesive bond (B-40): J-6082-614-A

1. Attach the rear light shield barrel by pushing main spring towards outside of the rear light shield barrel. Apply the adhesive bond (B-40) to the three screws, and then fix the rear light shield barrel with these screws as shown in the figure.
2. Move the lever of the preset ring block, and check that the preset ring block moves smoothly.

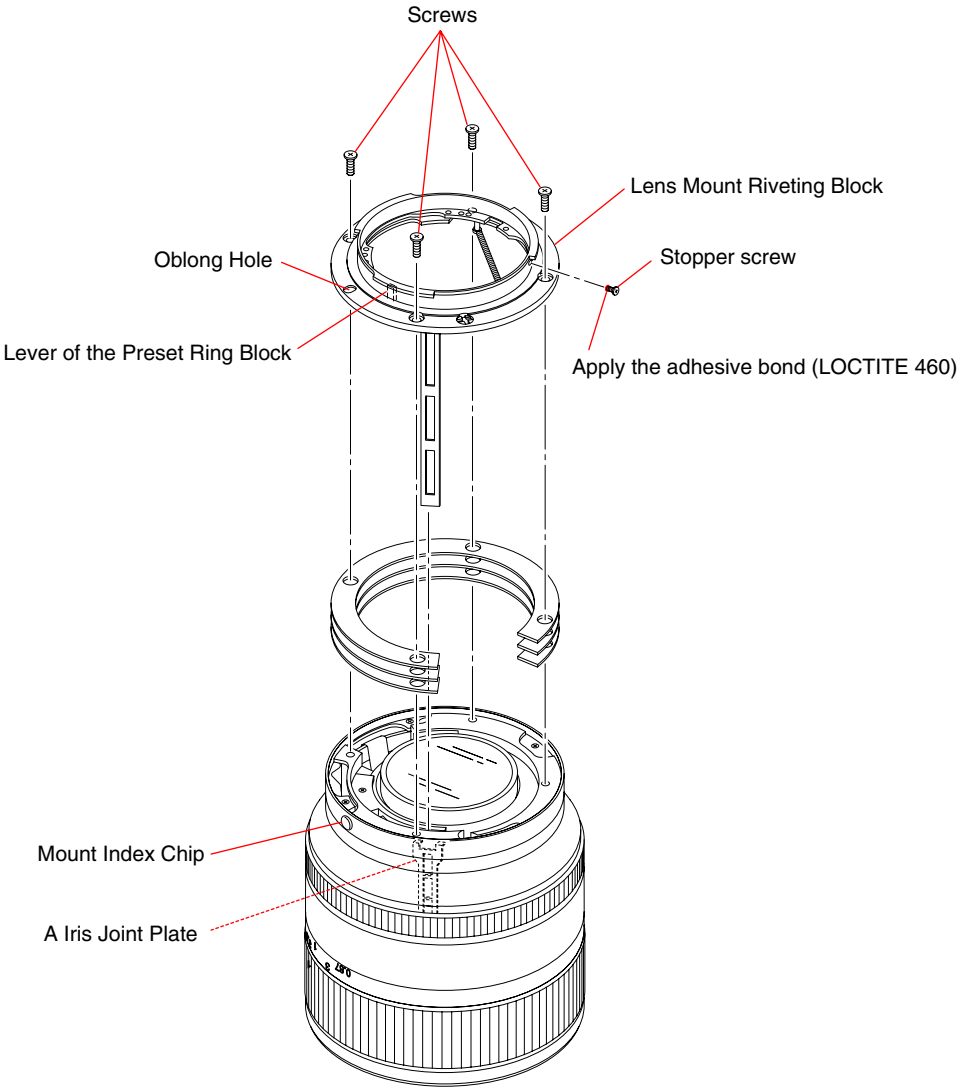


HELP04

Adhesive bond (LOCTITE 460)

Note: Use the adhesive bond (LOCTITE 460) or an equivalent article.
Do not use what becomes white after drying like quick-drying glue.

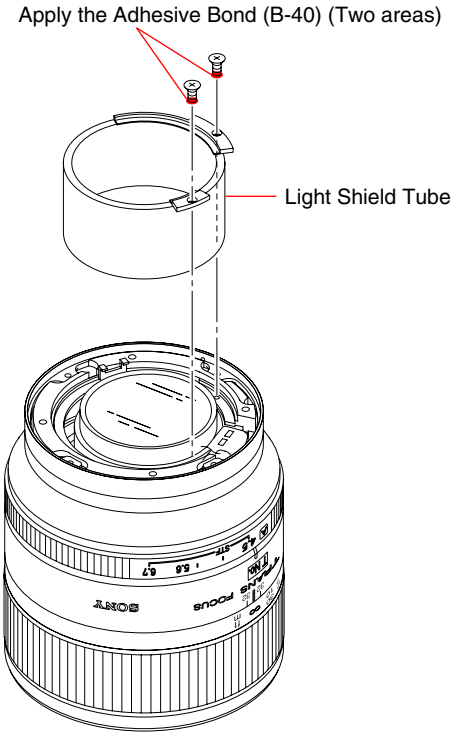
1. Apply adhesive bond (LOCTITE 460) to the tip of the stopper screw, and attach it to the lens mount riveting block.
2. Linking the lever of the preset ring block with the A iris joint plate, align the oblong hole of the lens mount riveting block with the mount index chip and tighten four screws shown in the figure.
3. Move the lever of the preset ring block, and check that the preset ring block moves smoothly, and the iris opens and closes smoothly.
4. Check that the focus ring rotates smoothly from near distance end to infinity position.



HELP05

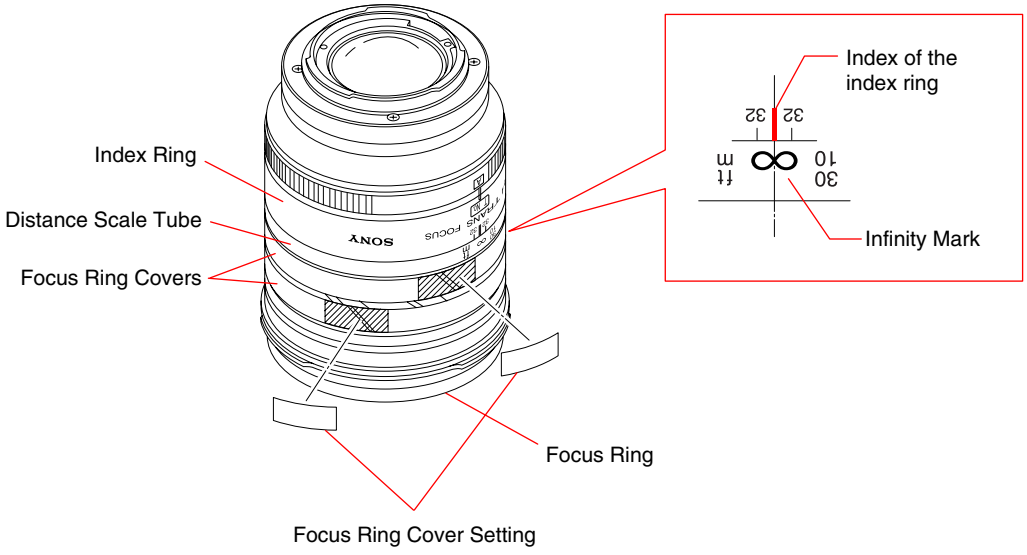
Adhesive bond (B-40): J-6082-614-A

Attach the light shield tube. Apply the adhesive bond (B-40) to the two screws, and then fix the light shield tube with these screws as shown in the figure.



HELP06

1. Set the focus ring to the infinity stop position.
2. Attach the distance scale tube, and align the center of the infinity mark and the index of the index ring.
3. Affix the focus ring covers, and paste the focus ring cover set tapes to cover seams (two areas).



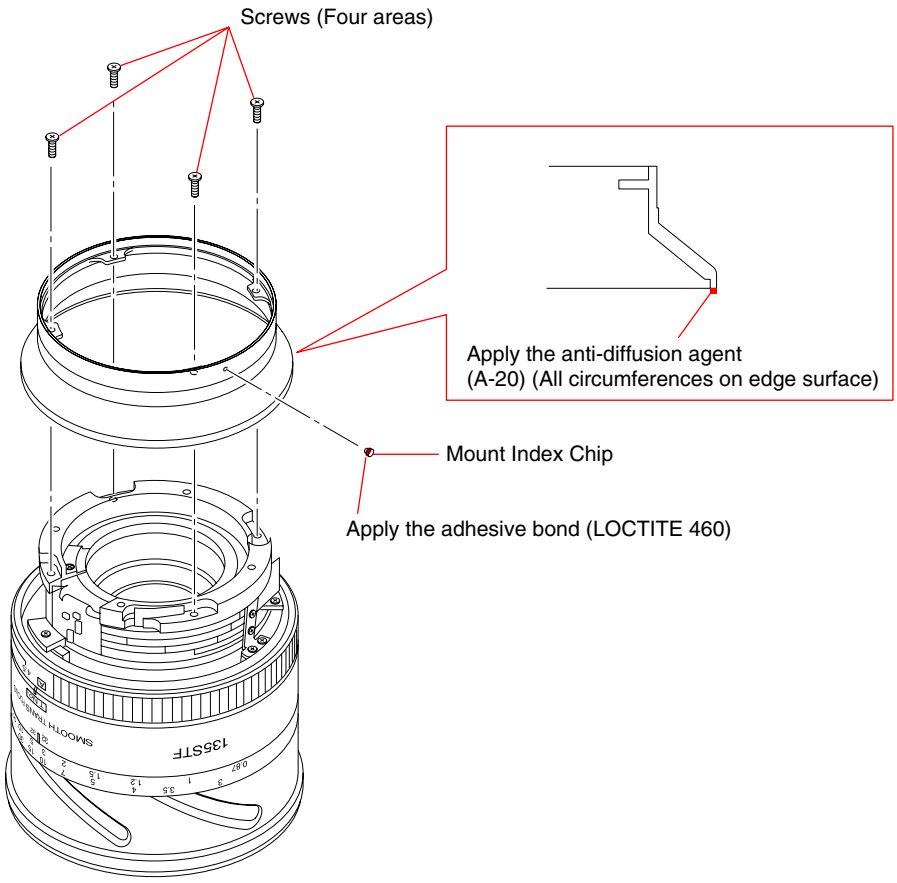
HELP07

Adhesive bond (LOCTITE 460)

Note: Use the adhesive bond (LOCTITE 460) or an equivalent article.
Do not use what becomes white after drying like quick-drying glue.

Anti-diffusion agent (A-20): J-6082-611-A

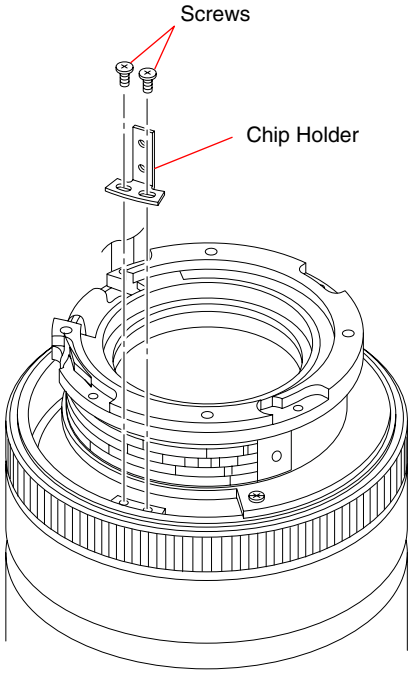
1. Apply the adhesive bond (LOCTITE 460) to the back side of the mount index chip, and attach it to the ornamental tube.
2. Apply the anti-diffusion agent (A-20) to the instruction portion of the ornamental tube as shown in the figure.
3. Attach the ornamental tube so that the mount index chip places at the position shown in the figure, and fix it with the four screws.



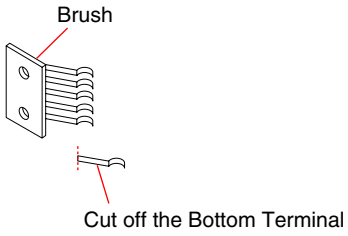
HELP08

Adhesive bond (B-10): J-6082-612-A

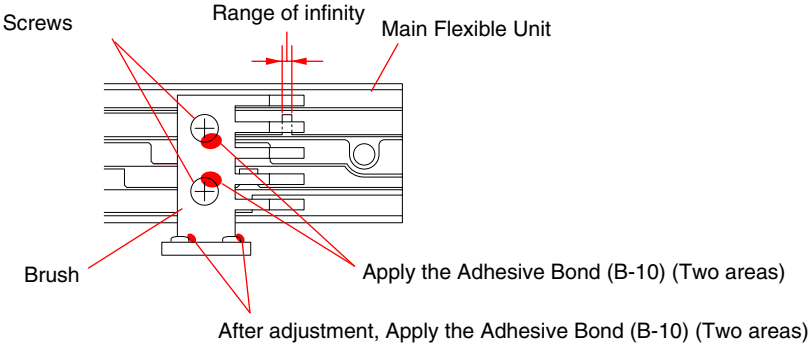
1. Attach the chip holder with the two screws as shown in the figure.



2. Cut off one of six terminals of the brush and makes it to five as shown in the figure.



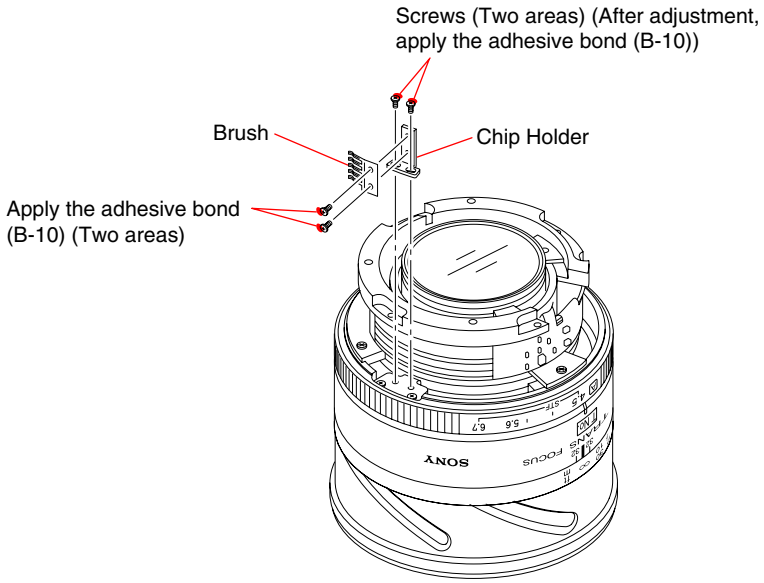
3. Set the focus ring to the infinity stop position.
4. Tighten the brush with the two screws as shown in the figure.
5. Apply the adhesive bond (B-10) to the two instruction portions as shown in the figure.
6. Loosen the two screws tightened in step 1.
7. Adjust the position of the chip holder so that the five terminals of the brush are surely contact with the main flexible unit, and also adjust the position to locate the second terminal from the top within the range of infinity, and tighten the two screws loosened in step 6.
8. Perform the “4-6-2. Focus Brush Position Adjustment/Pattern Check”.
9. After adjustment, apply the adhesive bond (B-10) to the two instruction portions as shown in the figure.



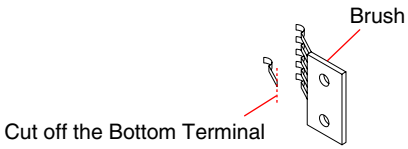
HELP09

Adhesive bond (B-10): J-6082-612-A

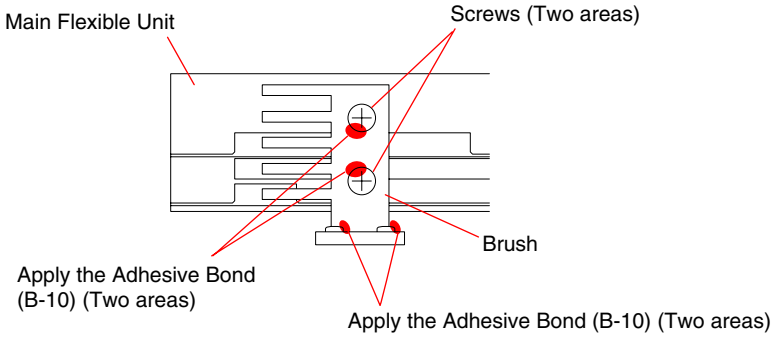
1. Attach the chip holdr to the M aperture connecting plate A with the two screws as shown in the figure.



2. Cut off one of six terminals of the brush and makes it to five as shown in the figure.



3. Tighten the brush with the two screws as shown in the figure.
4. Apply the adhesive bond (B-10) to the two instruction portions as shown in the figure.
5. Loosen the two screws tightened in step 1.
6. Adjust the position of the chip holder so that the terminals of the brush are surely contact with the three patterns of the main flexible unit, and tighten the two screws loosened in step 5.

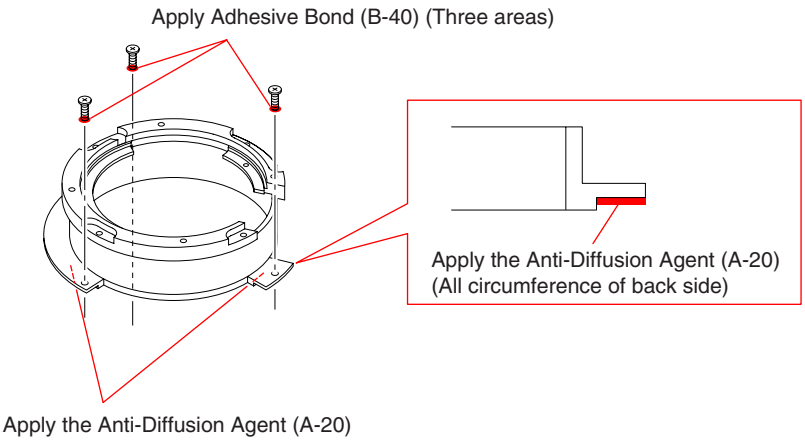


7. Apply the adhesive bond (B-10) to the two instruction portions as shown in the figure.

HELP10

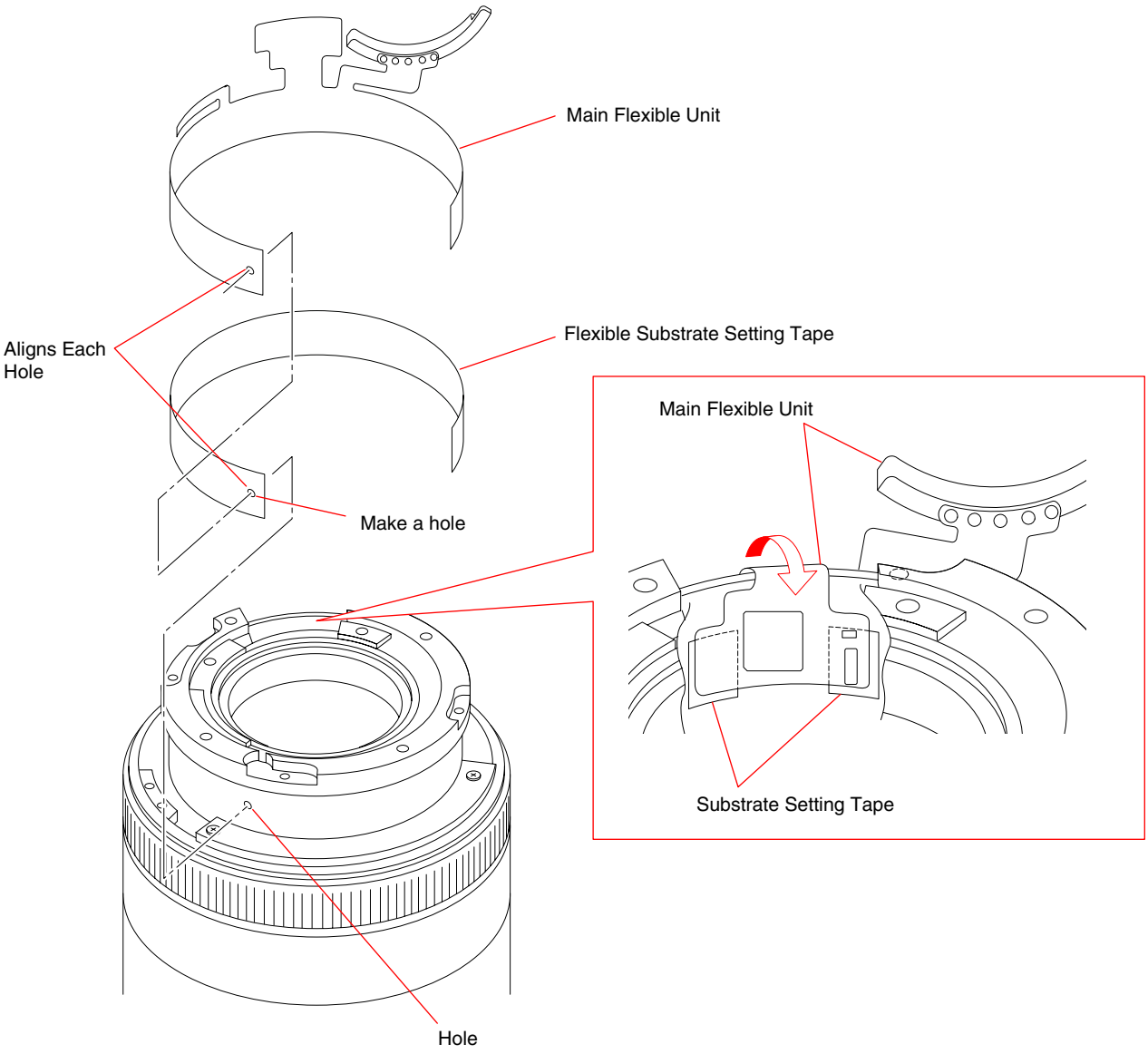
Anti-diffusion agent (A-20): J-6082-611-A
Adhesive bond (B-40): J6082-614-A

1. Apply the anti-diffusion agent (A-20) to the insutruction portions of the connection barrel as shown in the figure.
2. Attach the connection barrel, and apply the adhesive bond (B-40) to the three screws and tighten them as shown in the figure.



HELP11

1. Affix the flexible substrate setting tape to the connection barrel, and then open a hole as the instruction portion shows.
2. Affix the main flexible unit to the flexible substrate setting tape so that the instruction portion align.



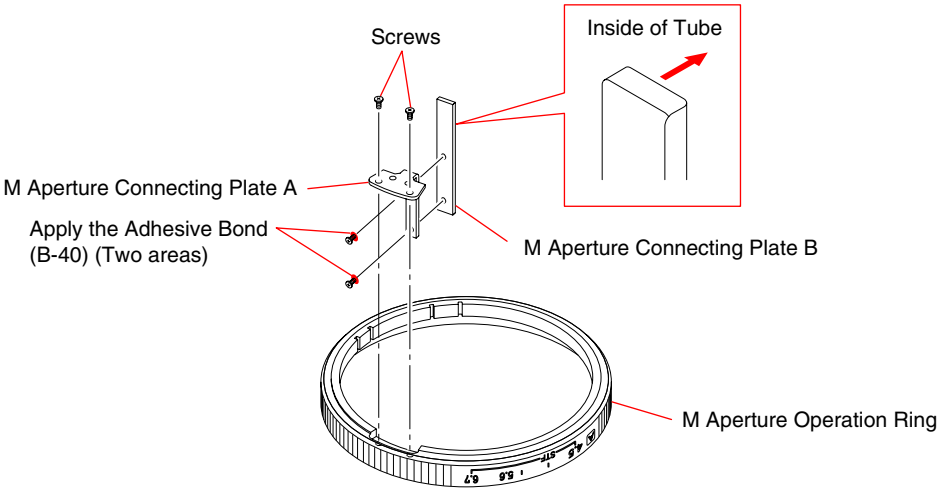
3. Fold the main flexible unit inside as shown in figure, and affix the flexible substrate setting tape (two areas).

HELP12

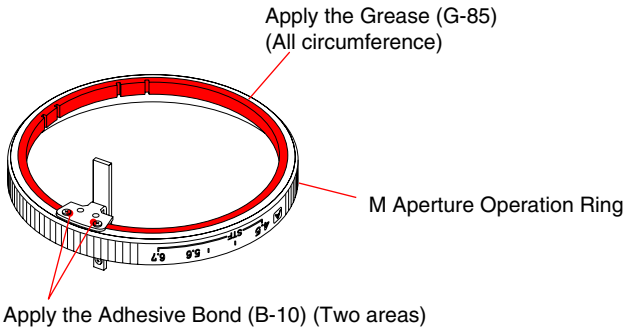
Adhesive bond (B-10): J-6082-612-A
Adhesive bond (B-40): J-6082-614-A
Grease (G-85): J-6082-626-A

1. Attach the M aperture connecting plate B to the M aperture connecting plate A, and apply the adhesive bond (B-40) to the two screws and tighten them as shown in the figure.
   Note: Be sure to attach the M aperture connecting plate B so that the rounded edge of it faces toward inside of the tube as shown in the figure.

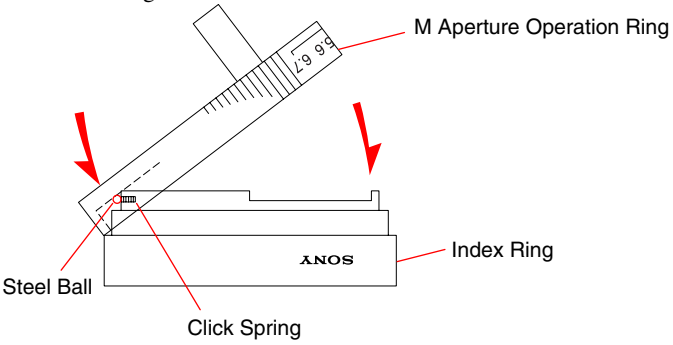
2. Attach the M aperture connecting plate A to the M aperture operation ring, and tighten them with the two screws as shown in the figure.



3. Apply the adhesive bond (B-10) to the two areas as shown in the figure.
4. Apply the grease (G-85) to the instruction portion of the M aperture operation ring as shown in the figure.



5. Set the click spring and steel ball to the index ring, and assemble the M aperture operation ring to the index ring from the direction shown in the figure.

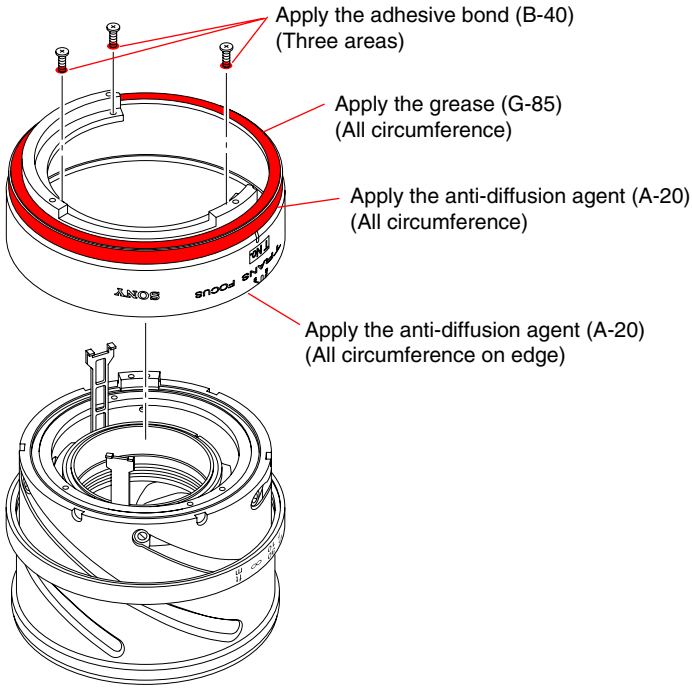


6. After assembling, check that the proper click exists when rotating the M aperture operation ring.

HELP13

Anti-diffusion agent (A-20): J-6082-611-A
Adhesive bond (B-40): J-6082-614-A
Grease (G-85): J-6082-626-A

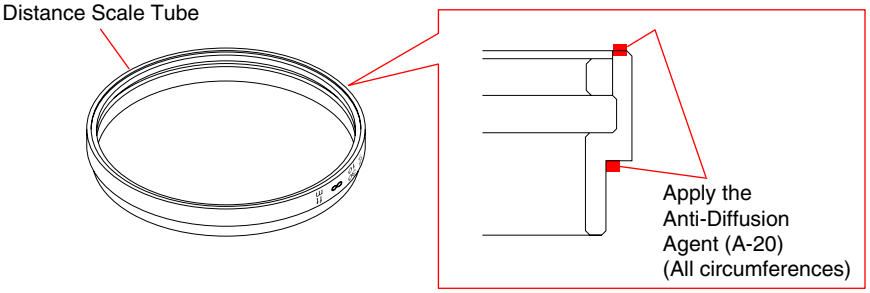
1. Apply the anti-diffusion agent (A-20) and the grease (G-85) to the instruction portions of the index ring as shown in the figure.
2. Attach the index ring. Apply the adhesive bond (B-40) to the three screws, and then fix the index ring with these screws as shown in the figure.



HELP14

Anti-diffusion agent (A-20): J-6082-611-A

Apply the anti-diffusion agent (A-20) to the instruction portions of the distance scale tube as shown in the figure.

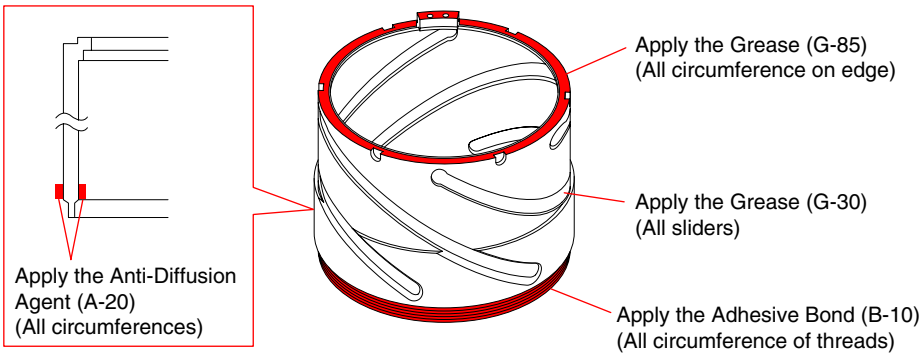


HELP15

Anti-diffusion agent (A-20): J-6082-611-A
Adhesive bond (B-10): J-6082-612-A
Grease (G-30): J-6082-620-A
Grease (G-85): J-6082-626-A

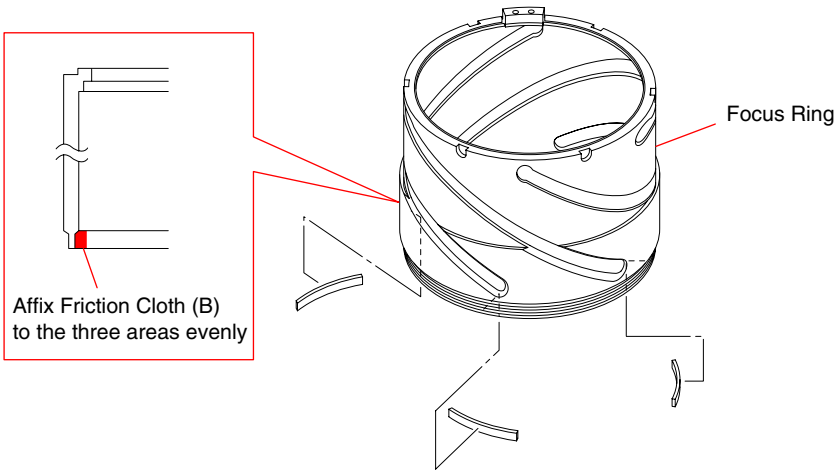
Apply the anti-diffusion agent (A-20), the grease (G-30 and G-85) and the adhesive bond (B-10) to the instruction portions of the focus ring.

Note: Apply the adhesive bond (B-10) so that it can not be visible from exterior.



HELP16

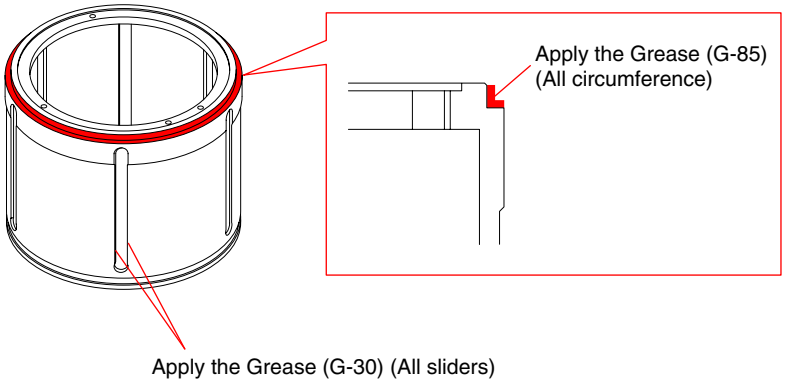
Affix the three friction cloth (B) to the instruction portions of the focus ring evenly.



HELP17

Grease (G-30): J-6082-620-A
Grease (G-85): J-6082-626-A

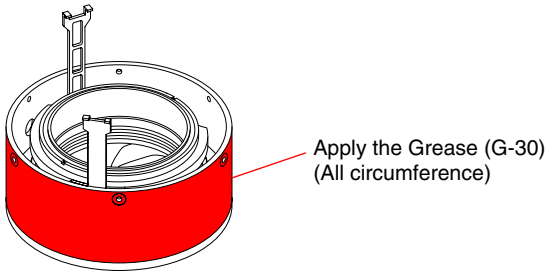
Apply the grease (G-30 and G-85) to the instruction portions of the fixed sleeve.



HELP18

Grease (G-30): J-6082-620-A

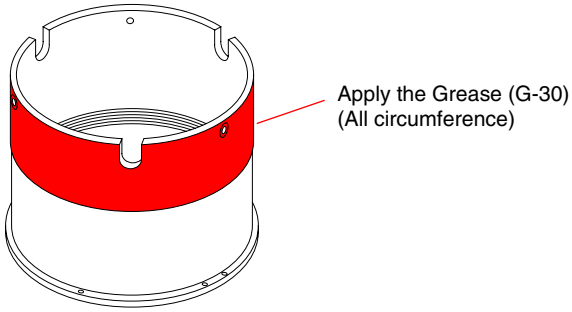
Apply the grease (G-30) to the instruction portion of the 2 group move frame block.



HELP19

Grease (G-30): J-6082-620-A

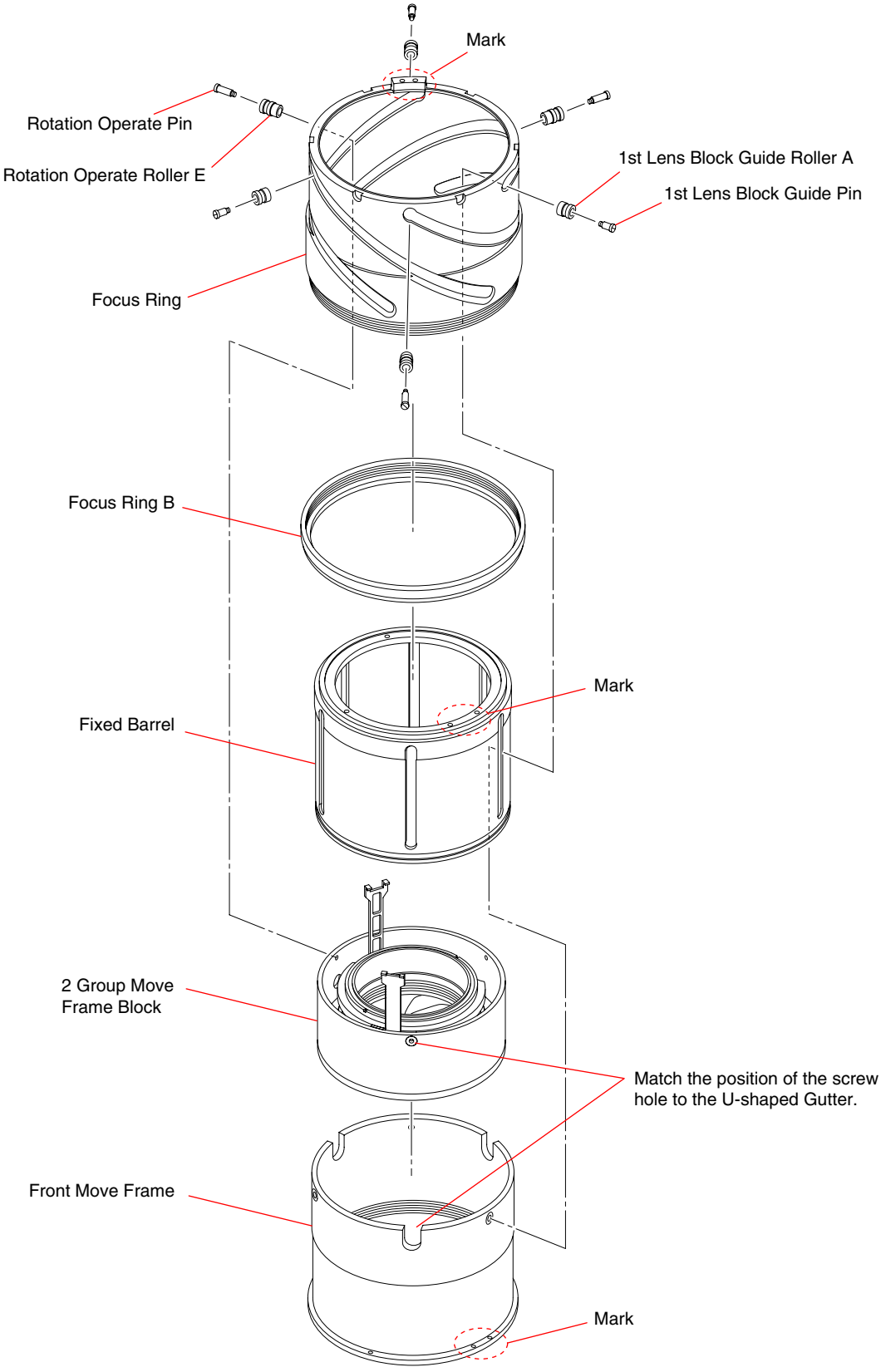
Apply the grease (G-30) to the instruction portion of the front move frame.



HELP20

Adhesive bond (B-40): J-6082-614-A

1. Attach the 2 group move frame block to the front move frame so that the position of the screw holes of the 2 group move frame block matches to the U-shaped gutter of the front move frame. (See the figure below)
2. Attach the focus ring to the focus ring B.
3. Assemble the front move frame, fixed sleeve, and the focus ring at the positions of the three marks as shown in the figure.

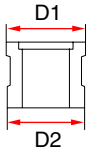


4. Assemble them with the 1st lens block guide roller A and 1st lens block guide pin of for each three, and the rotation opetate roller and the rotation opetate pin of for each three.

Note: • Select the 1st lens block guide roller A and the rotation opetate roller of a proper diameter from the following table.
• Apply the adhesive bond (B-40) to the 1st lens block guide pin and the rotation opetate pin, and then tighten.

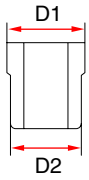
1 group guide roller

Part No.	Description	Diameter	
		D1	D2
2-688-993-01	1 group guide roller A	5.03	4.83
2-688-997-01	1 group guide roller E	5.02	4.82



Communication roller

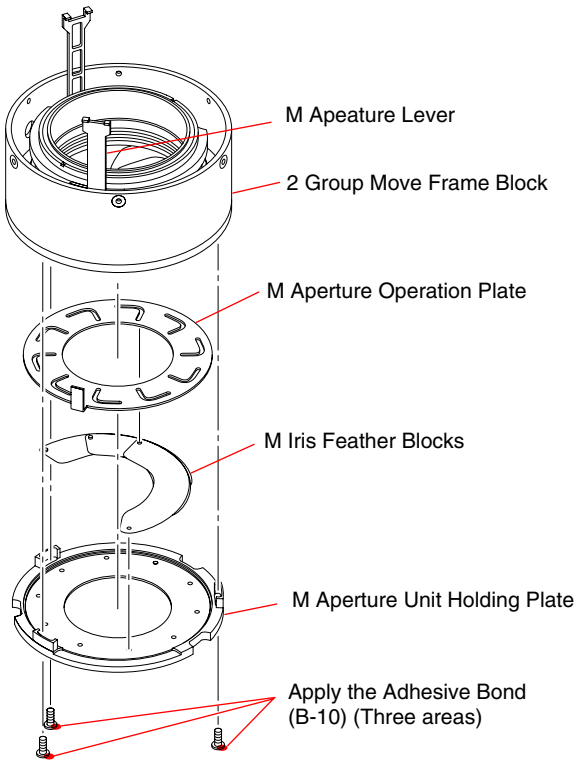
Part No.	Description	Diameter	
		D1	D2
2-689-003-01	Communication roller A	5.03	4.83
2-689-027-01	Communication roller E	5.02	4.82



HELP21

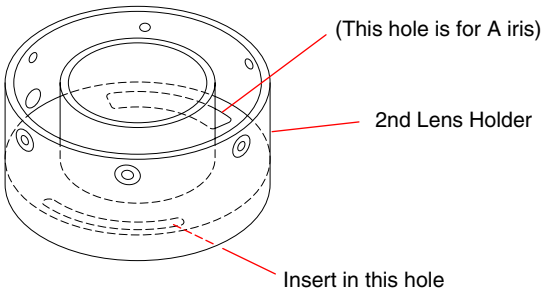
Adhesive bond (B-10): J-6082-612-A

1. Attach the ten M iris feather blocks to the M aperture unit holding.
   Note: Attach the M iris feather blocks in fully opening condition.
2. Attach the M aperture operation plate to the M aperture unit holding plate at the position shown in the figure.



3. Put the projection of the assembled the M diaphragm blade block into the notch of the M aperture lever, and tighten it with the three screws.

   Note: Insert A aperture operating plate into a hole on 2nd lens holder, as shown in the figure. Then attach M aperture unit holding plate to them.

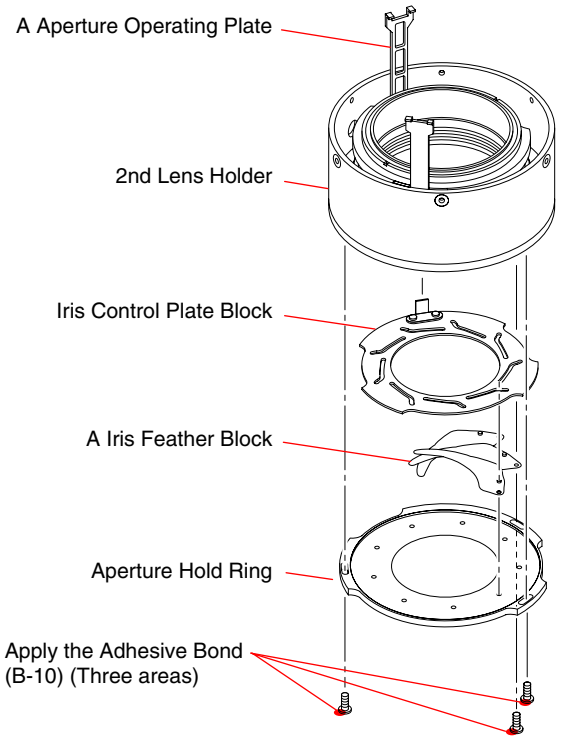


4. Perform the “4-2-3. M Aperture Diameter Adjustment”.
5. Apply the adhesive bond (B-10) to the head of the screws.

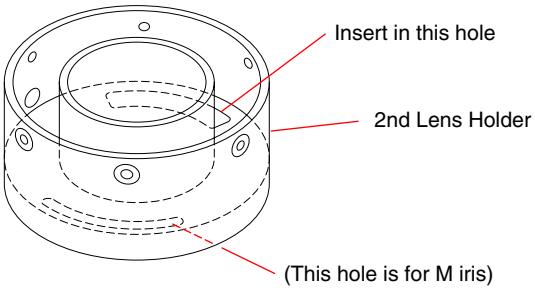
HELP22

Adhesive bond (B-10): J-6082-612-A

1. Attach the nine A iris feather blocks to the apeture hold ring.
   Note: Attach the A iris feather blocks in fully opening condition.
2. Attach the A iris control plate to the aperture hold ring at the position shown in the figure.



3. Put the projection of the assembled A iris feather block into the notch of the A aperture operating plate, and tighten it with the three screws.
   Note: Insert A aperture operating plate into a hole on 2nd lens holder, as shown in the figure. And then attach A iris retainer plate to them.

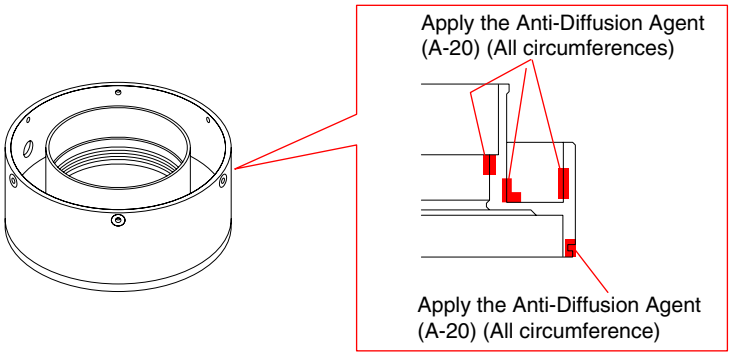


4. Perform the “4-2-2. Aperture Diameter Adjustment”.
5. Apply the adhesive bond (B-10) to the head of the screws.

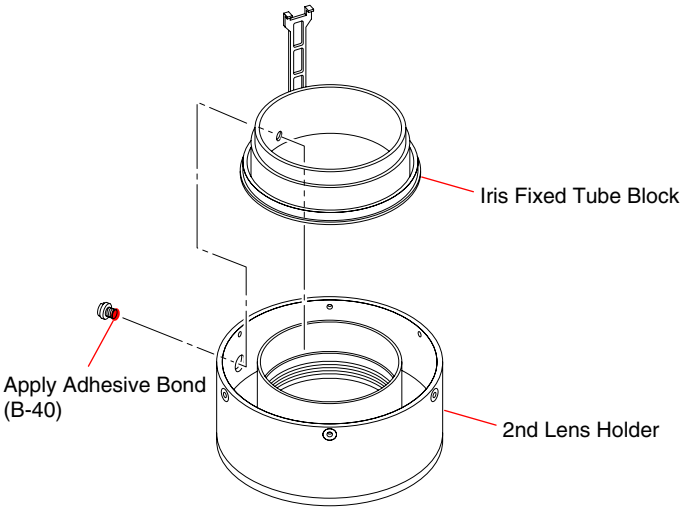
HELP23

Anti-diffusion agent (A-20): J-6082-611-A
Adhesive bond (B-40): J-6082-614-A

1. Apply the anti-diffusion agent (A-20) to the instruction portions of the 2nd lens holder as shown in the figure.



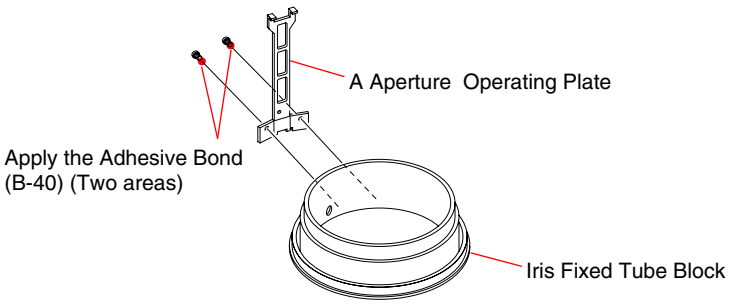
2. Attach the iris fixed tube block to the 2nd lens holder, and apply the adhesive bond (B-40) to the iris fixed tube block screw and tighten it to the iris fixed tube block through the hole of the 2nd lens holder.



HELP24

Adhesive bond (B-40): J-6082-614-A

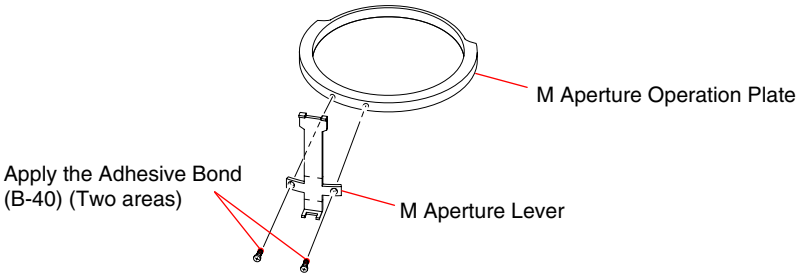
Attach the A aperture operating plate to the iris fixed tube block, and apply the adhesive bond (B-40) to the two screws and tighten them as shown in the figure.



HELP25

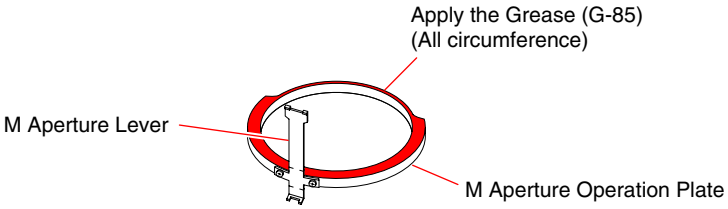
Adhesive bond (B-40): J-6082-614-A

Attach the M aperture lever to the M aperture operating plate, and apply the adhesive bond (B-40) to the two screws and tighten them as shown in the figure.



HELP26

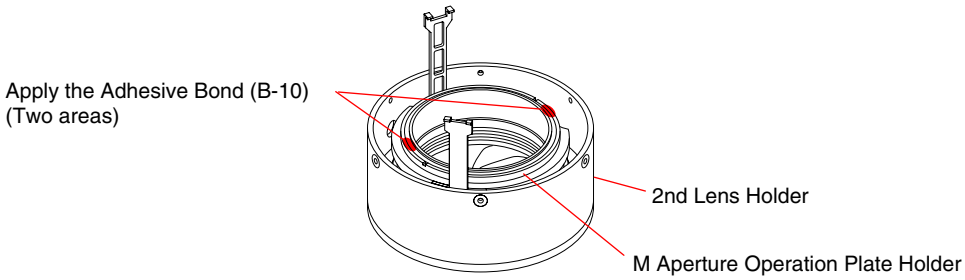
Grease (G-85): J-6082-626-A
Apply the grease (G-85) to the instruction portion of the M aperture operating plate.



HELP27

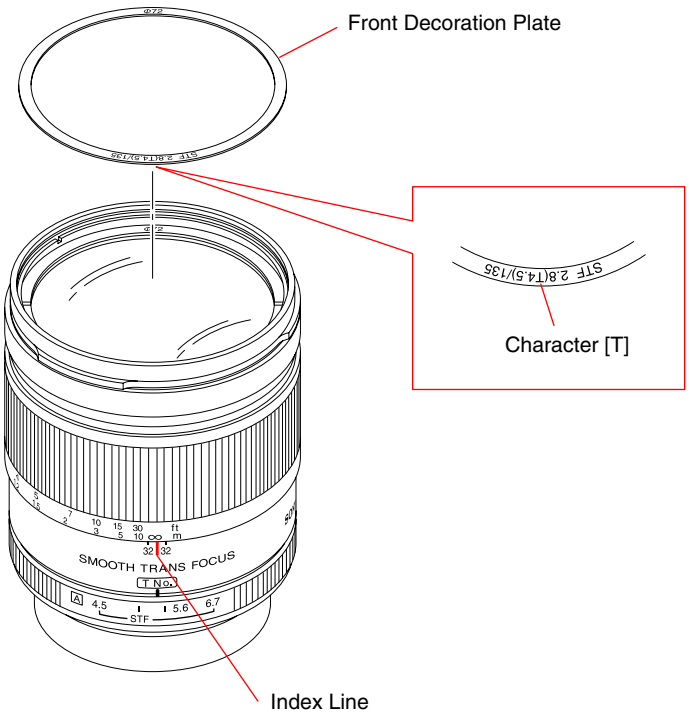
Adhesive bond (B-10): J-6082-612-A

1. Tighten the M aperture operation plate holder as far as that rotation of the M aperture operation plate becomes duller.
2. Loosen the M aperture opretaion plate holder as far as that the M aperture opretaion plate rotates smoothly.
3. Apply the adhesive bond (B-10) in the width of 5 mm to the two instruction portions of the M aperture operation plate holder.
   Note: After applying the bond (B-10), confirm that the M aperture operation plate rotates correctly.



HELP28

Affix the front decoration plate, aligning its character [T] with the index line.

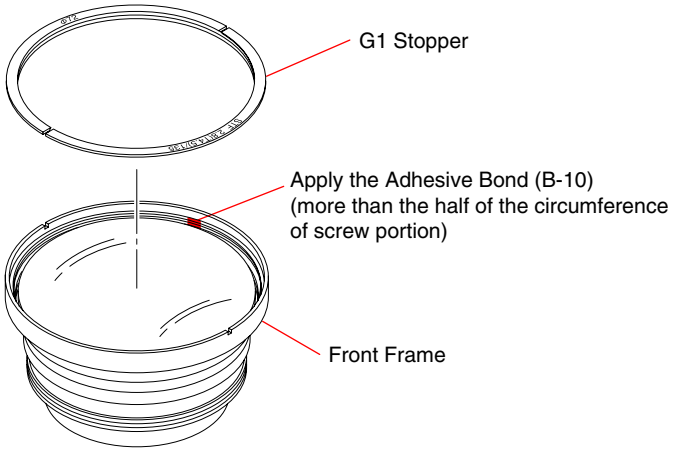


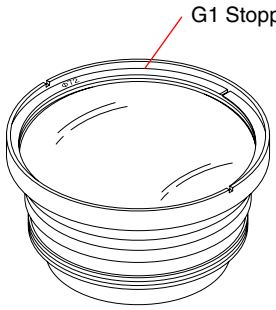
HELP29

Adhesive bond (B-10): J-6082-612-A

1. Attach the G1 stopper.
   Note: Please tighten surely universal wrench.
   Please do not damage the lens.

2. Apply the adhesive bond (B-10) more than the half of the circumference of screw portion of front frame.
   Note: Apply the adhesive bond so that it can not be visible from exterior.



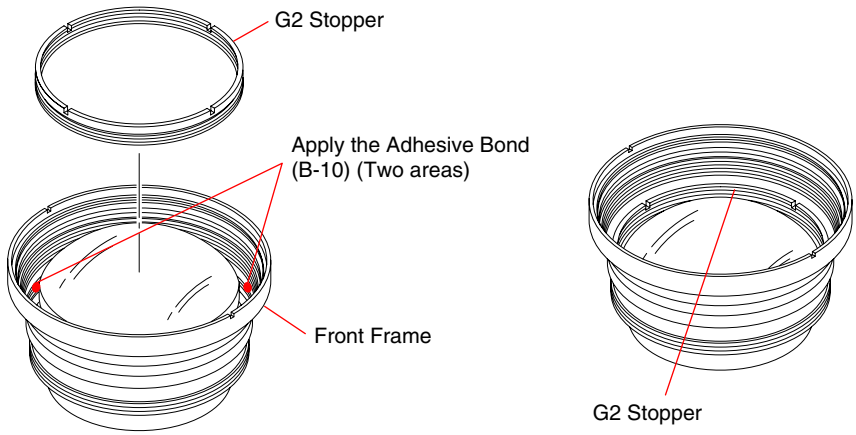


HELP30

Adhesive bond (B-10): J-6082-612-A

1. Apply the adhesive bond (B-10) in the width of 10 mm to the two instruction portions of the front frame as shown in the figure.
2. Attach the G2 stopper.

Note: Apply the adhesive bond so that it can not be visible from exterior.



HELP31

Be sure to replace the lens (G2+G3) and station adjustment washer as a set.
Different combination may cause the flange back adjustment not available.
When replacing the lens (G2+G3) with the service parts, check enclosed insert for its compensation value. Then select the suitable station adjustment washer according to the Table-1 below.

Note: Never separate the lens (G2+G3) and insert. The compensation value is not written on the parts.

Compensation value of lens

Compensation value of lens (G2+G3)	Combination of station adjustment washer
+0.05 to +0.03	Curver field adjustment washer C
+0.02 to -0.02	Curver field adjustment washer A x 2
–0.03 to –0.05	Curver field adjustment washer B x 2 and Curver field adjustment washer C

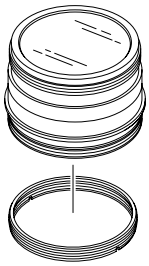
Curver field adjustment washer

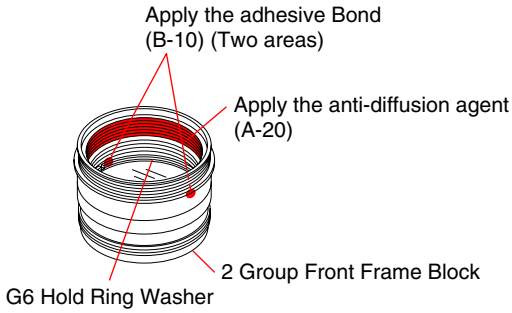
Part No.	Description	Thickness (mm)
2-688-957-01	Curver field adjustment washer A	0.192
2-688-958-01	Curver field adjustment washer B	0.105
2-688-959-01	Curver field adjustment washer C	0.255

HELP32

Anti-diffusion agent (A-20): J-6082-611-A
Adhesive bond (B-10): J-6082-612-A

1. Attach the G6 hold ring washer.
2. Apply the adhesive bond (B-10) in the width of 5 mm to the two instruction portions of the G6 hold ring washer as shown in the figure.
3. Apply the anti-diffusion agent (A-20) to the instruction portion of the 2 group front frame block as shown in the figure.

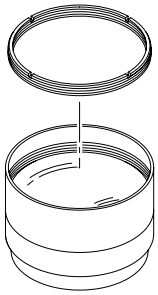


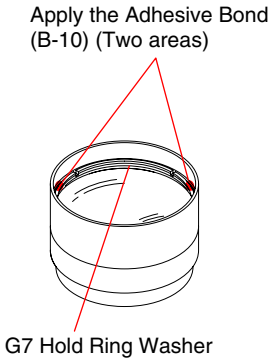


HELP33

Adhesive bond (B-10): J-6082-612-A

1. Attach the G7 hold ring washer.
2. Apply the adhesive bond (B-10) in the width of 5 mm to the two instruction portions of the G7 hold ring washer as shown in the figure.

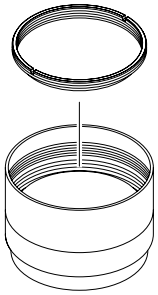


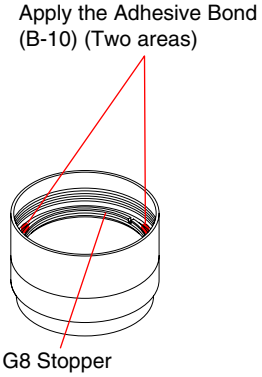


HELP34

Adhesive bond (B-10): J-6082-612-A

1. Attach the G8 stopper.
2. Apply the adhesive bond (B-10) in the width of 5 mm to the two instruction portions of the G8 stopper as shown in the figure.

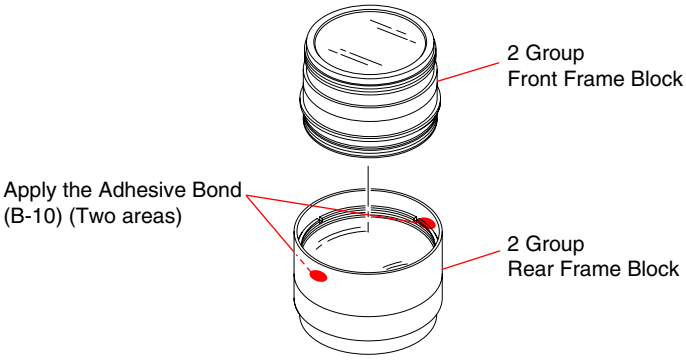




HELP35

Adhesive bond (B-10): J-6082-612-A

1. Apply adhesive bond (B-10) in the width of 5 mm to the two instruction portions of the 2 group rear frame block as shown in the figure.
2. Screw the 2 group front frame block.



3. REPAIR PARTS LIST

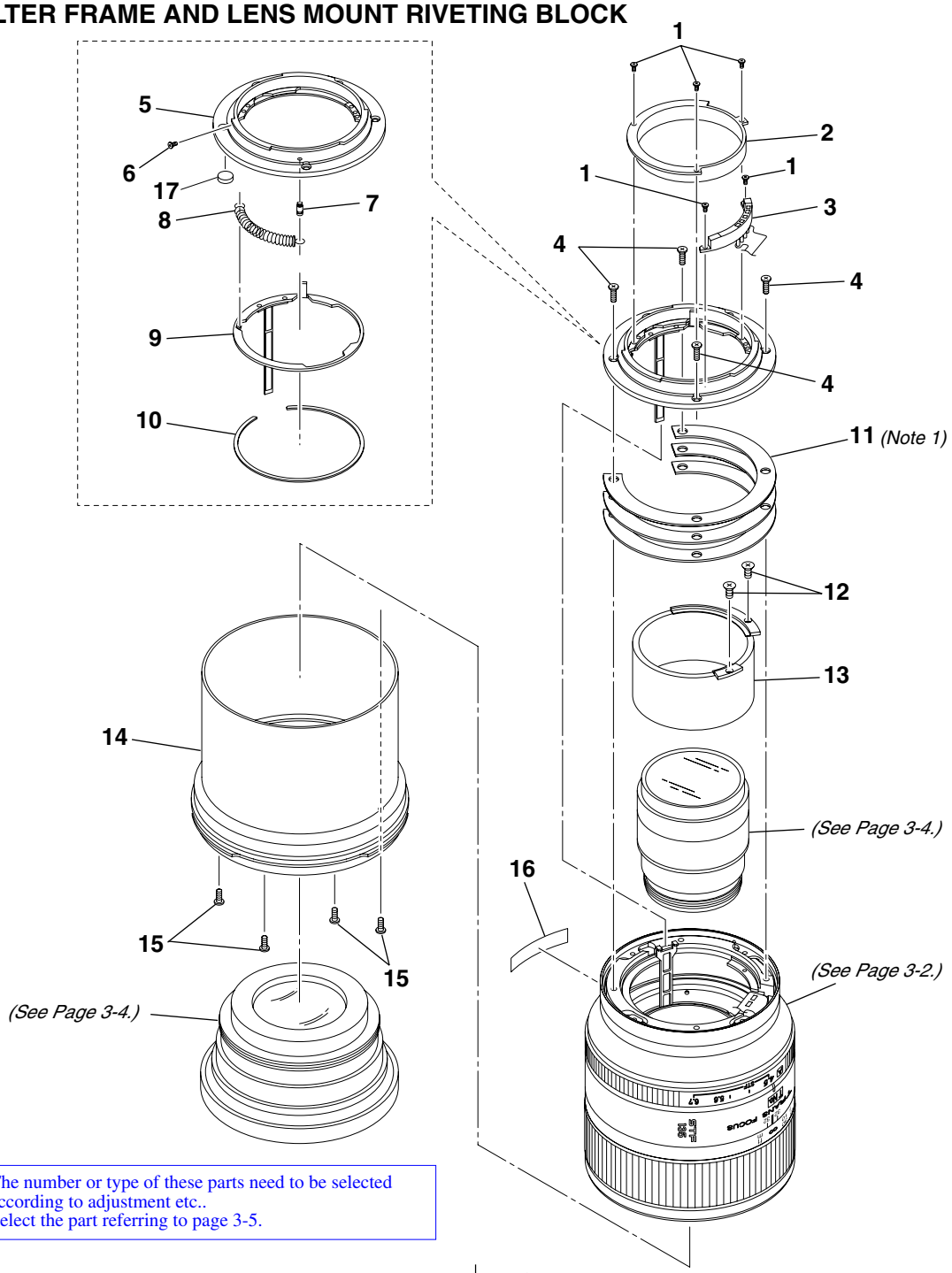
DISASSEMBLY

NOTE:

- -XX and -X mean standardized parts, so they may have some difference from the original one.
- Items marked "*" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The mechanical parts with no reference number in the exploded views are not supplied.

3-1. EXPLODED VIEWS

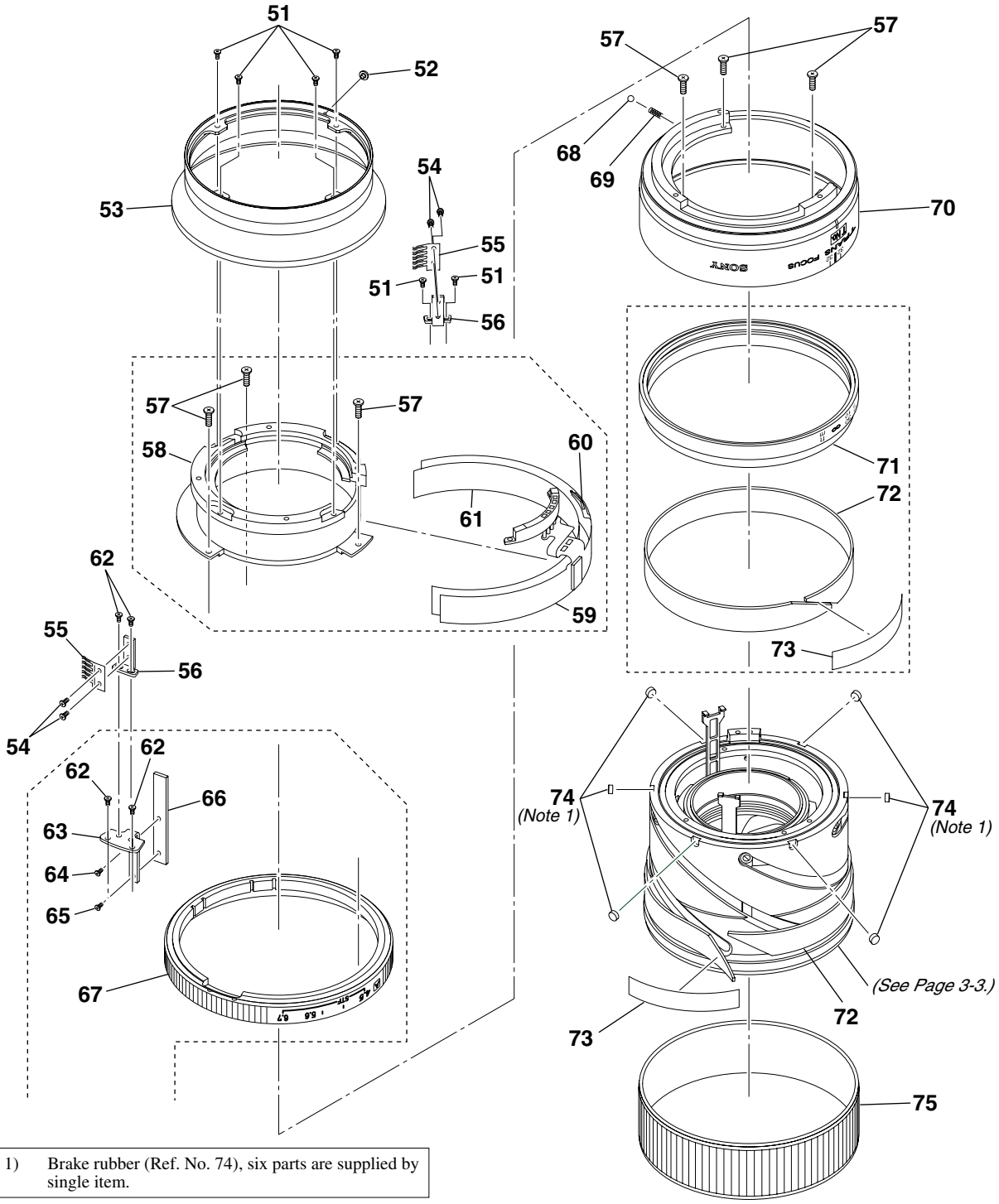
3-1-1. FILTER FRAME AND LENS MOUNT RIVETING BLOCK



(Note 1) The number or type of these parts need to be selected according to adjustment etc..
Select the part referring to page 3-5.

Ref. No.	Part No.	Description
1	2-691-301-01	SCREW, M1.4 P1 M1.4X2.0
2	2-688-920-01	REAR LIGHT SHIELD BARREL
3	A-1205-581-A	FLEXIBLE UNIT, MAIN
4	2-688-979-01	SCREW, M2.0X5.0 P1
5	A-1209-784-A	BLOCK, LENS MOUNT RIVETING
6	2-684-244-01	STOPPER SCREW
7	2-688-965-01	SPRING HOOK
8	2-688-972-01	MAIN SPRING
9	A-1196-554-A	BLOCK, PRESET RING
10	2-684-234-01	PRESET RING HOLDING PLATE
11	Selection parts	BACK ADJUSTMENT WASHER A-E
12	2-687-692-01	SCREW, M1.6X2.5
13	2-688-946-01	LIGHT SHIELD TUBE
14	2-688-917-01	FRAME (FILTER FRAME)
15	2-684-105-01	SCREW, TAPPING, M1.6X3.5
16	2-695-853-01	LABEL, MODEL NAME
17	2-688-963-01	COUPLER STOPPER

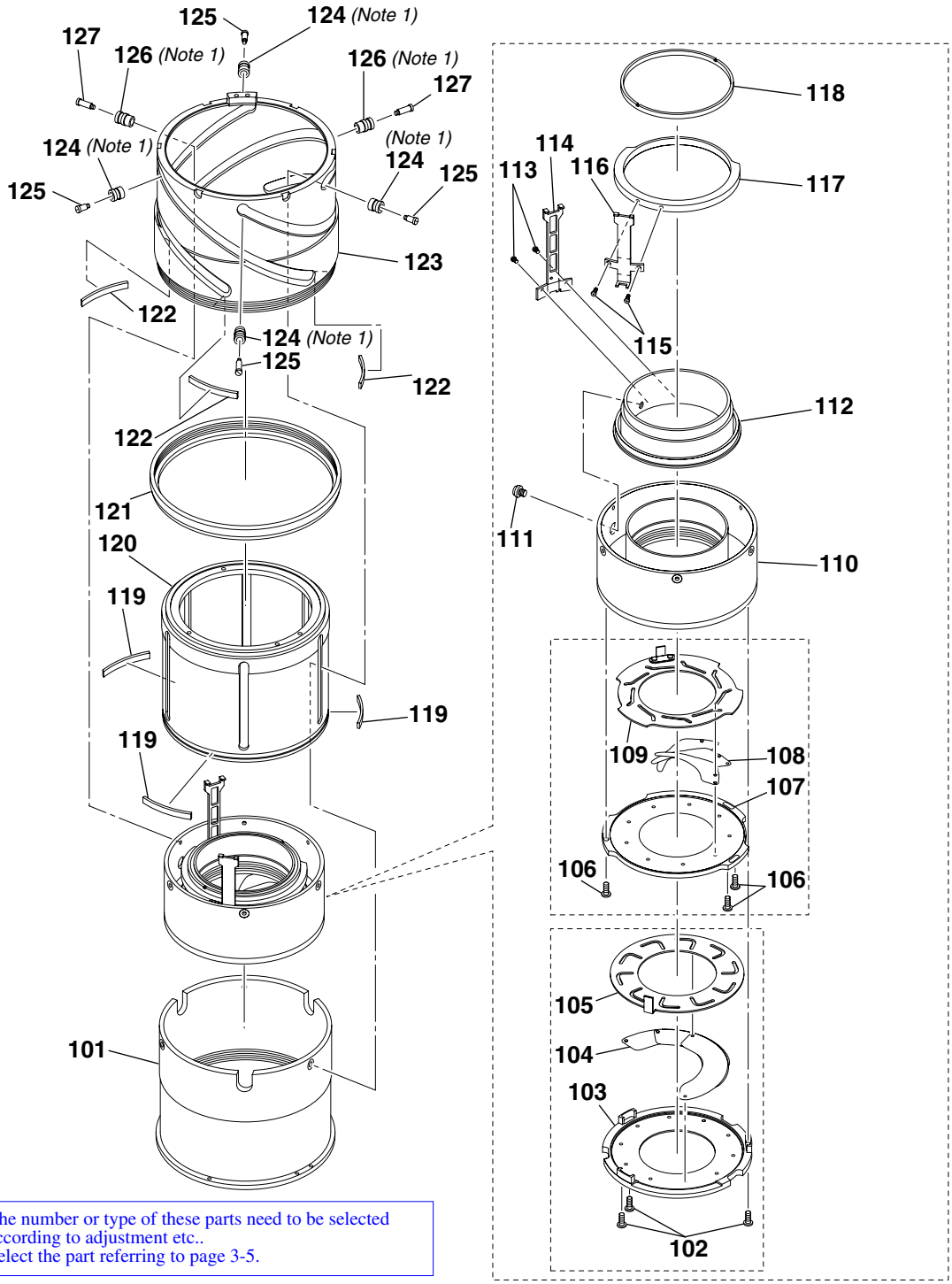
3-1-2. ORNAMENTAL TUBE, CONNECTION BARREL, MAIN FLEXIBLE UNIT AND INDEX RING



(Note 1) Brake rubber (Ref. No. 74), six parts are supplied by single item.

Ref. No.	Part No.	Description
51	2-688-977-01	SCREW, M1.4 P3 M1.6X3.0
52	2-683-692-01	CHIP (MOUNT INDEX)
53	2-688-939-01	TUBE, ORNAMENTAL
54	2-684-209-01	SCREW, M1.4X1.5 P1
55	2-688-975-01	BRUSH
56	2-688-956-01	CHIP HOLDER
57	2-688-980-01	SCREW, M2.0X5.0 P1
58	2-688-919-01	CONNECTION BARREL
59	A-1205-581-A	FLEXIBLE UNIT, MAIN
60	2-688-970-01	GROUND SPRING
61	2-688-991-01	FLEXIBLE SUBSTRATE SETTING TAPE
62	2-687-688-01	SCREW, M1.4 P1 M1.6X2.0
63	2-688-951-01	M APERTURE CONNECTING PLATE A
64	2-688-981-01	SCREW, M1.6X1.8
65	2-684-182-01	SCREW, M1.6X1.8 P2
66	2-688-952-01	M APERTURE CONNECTING PLATE B
67	2-688-937-01	M APERTURE OPERATION RING
68	2-684-171-01	STEEL BALL
69	2-688-987-01	CLICK SPRING
70	2-688-935-01	INDEX RING
71	2-688-938-01	TUBE, DISTANCE SCALE
72	2-688-960-01	FOCUS RING COVER
73	2-688-900-01	FOCUS RING COVER SETTING TAPE
74	2-688-990-01	BRAKE RUBBER
75	2-688-940-01	FOCUS RUBBER RING

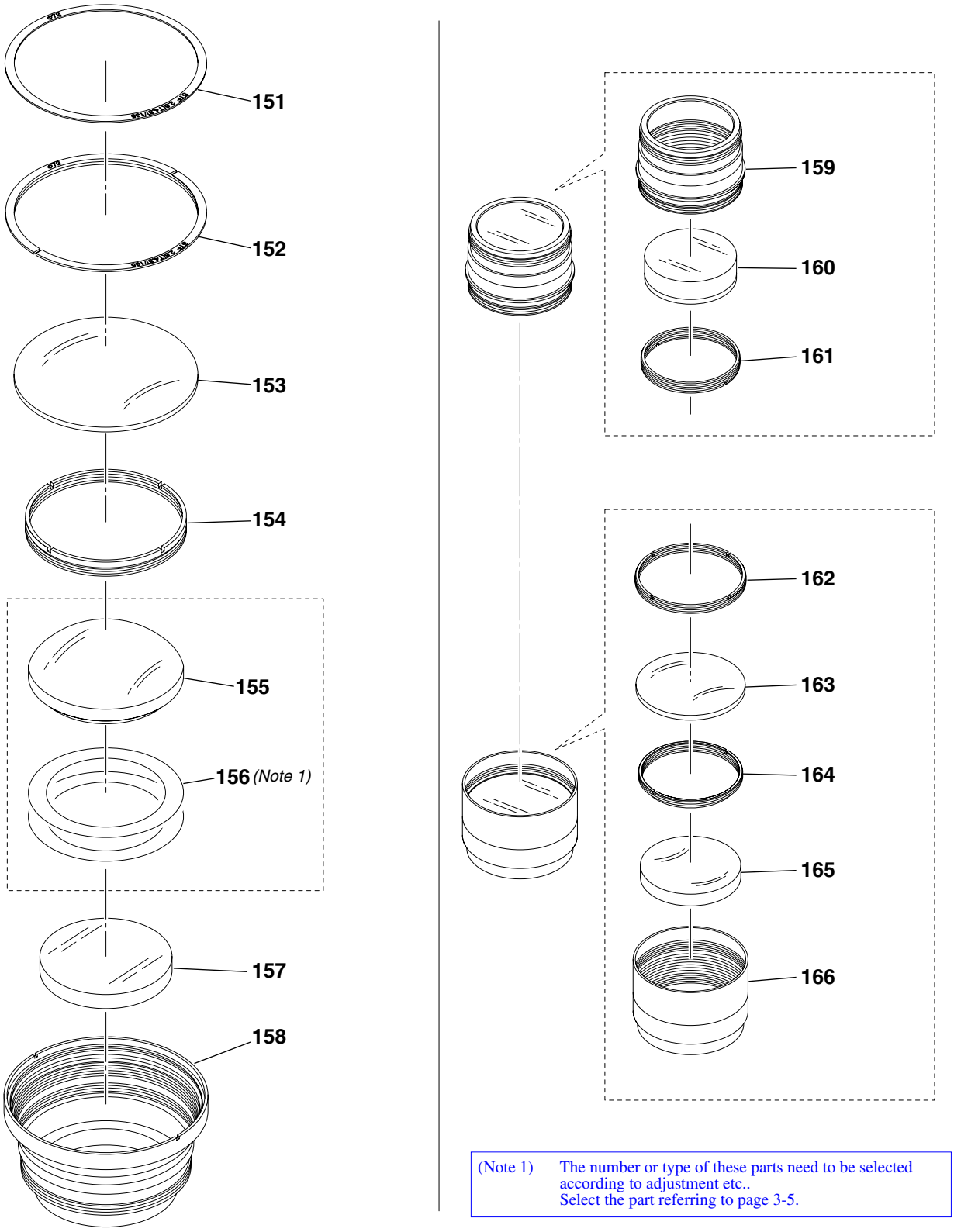
3-1-3. FOCUS RING, FIXED BARREL AND 2 GROUP MOVE FRAME BLOCK



(Note 1) The number or type of these parts need to be selected according to adjustment etc..
Select the part referring to page 3-5.

Ref. No.	Part No.	Description
101	2-688-916-01	FRONT MOVING FRAME
102	2-688-978-01	SCREW, M1.4 P3 M1.6X6.5
103	2-688-908-01	M APERTURE UNIT HOLDING PLATE
104	A-1206-605-A	BLOCK, M IRIS FEATHER
105	2-688-909-01	M APERTURE OPERATION PLATE
106	2-684-105-01	SCREW, TAPPING M1.6X3.5
107	2-688-906-01	APERTURE HOLD RING
108	A-1206-606-A	BLOCK, A IRIS FEATHER
109	A-1206-607-A	BLOCK, IRIS CONTROL PLATE
110	2-688-905-01	2ND LENS HOLDER
111	2-688-964-01	APERTURE HOLDING RING SCREW
112	A-1209-780-A	BLOCK, IRIS FIXED TUBE
113	2-687-688-01	SCREW, M1.4 P1 M1.6X2.0
114	2-688-954-01	A APERTURE OPERATING PLATE
115	2-688-977-01	SCREW, M1.4 P3 M1.6X3.0
116	2-688-950-01	M APERTURE LEVER
117	2-688-913-01	M APERTURE OPERATION PLATE
118	2-688-914-01	M APERTURE OPERATION PLATE HOLDER
119	2-688-988-01	FRICTION SHEET A
120	2-688-915-01	FIXED BARREL
121	2-688-936-01	FOCUS RING B
122	2-688-989-01	FRICTION SHEET-B
123	2-688-918-01	FOCUS RING
124	Selection parts	1ST LENS BLOCK GUIDE ROLLER A, E (Note 1)
125	2-688-992-01	1ST LENS BLOCK GUIDE PIN
126	Selection parts	ROTATION OPERATE ROLLER A, E
127	2-689-002-01	ROTATION OPERATE PIN

3-1-4. 1 GROUP LENS BLOCK AND 2 GROUP LENS BLOCK



(Note 1) The number or type of these parts need to be selected according to adjustment etc..
Select the part referring to page 3-5.

Ref. No.	Part No.	Description
151	2-888-236-01	FRONT DECORATION PLATE
152	2-688-934-01	G1 STOPPER
153	2-688-923-01	LENS (G1)
154	2-688-903-01	G2 STOPPER
155	A-1196-556-A	LENS (G2+3)
156	Selection parts	CURVER FIELD ADJUSTMENT WASHER A-C (Note 1)
157	2-688-926-01	LENS (G4)
158	2-688-901-01	FRONT FRAME

Ref. No.	Part No.	Description
159	2-688-902-01	2ND LENS BARREL
160	A-1196-557-A	LENS (G5+6)
161	2-688-932-01	WASHER (G6 HOLD RING)
162	2-688-933-01	WASHER (G7 HOLD RING)
163	2-688-929-01	LENS (G7)
164	2-688-904-01	G8 STOPPER
165	2-688-930-01	LENS (G8)
166	2-688-931-01	HOLDER (2ND REAR BARREL)

3-1-5. SELECTION PARTS

Ref. No.11

These washers are provided for flange back adjustment.
Change the thickness (t) according to result of adjustment.

Part No.	Description
2-688-527-01	BACK ADJUSTMENT WASHER A (t=0.05mm)
2-688-528-01	BACK ADJUSTMENT WASHER B (t=0.07mm)
2-688-529-01	BACK ADJUSTMENT WASHER C (t=0.10mm)
2-688-530-01	BACK ADJUSTMENT WASHER D (t=0.20mm)
2-688-531-01	BACK ADJUSTMENT WASHER E (t=0.50mm)

Ref. No.124

Select the type of part according to the operation load of the associated parts.

Part No.	Description
2-688-993-01	1ST LENS BLOCK GUIDE ROLLER A (D1=5.03mm, D2=4.83mm)
2-688-997-01	1ST LENS BLOCK GUIDE ROLLER E (D1=5.02mm, D2=4.82mm)

Ref. No.126

Select the type of part according to the operation load of the associated parts.

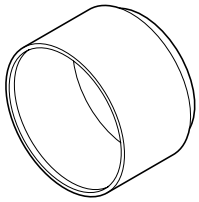
Part No.	Description
2-689-003-01	ROTATION OPERATE ROLLER A (D1=5.03mm, D2=4.83mm)
2-689-027-01	ROTATION OPERATE ROLLER E (D1=5.02mm, D2=4.82mm)

Ref. No.156

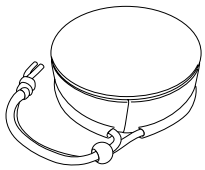
Part No.	Description
2-688-957-01	CURVER FIELD ADJUSTMENT WASHER A (t=0.192mm)
2-688-958-01	CURVER FIELD ADJUSTMENT WASHER B (t=0.105mm)
2-688-959-01	CURVER FIELD ADJUSTMENT WASHER C (t=0.255mm)

3-2. SUPPLIED ACCESSORIES

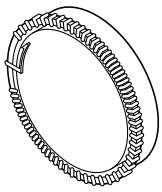
Checking supplied accessories.



Lens Hood (SH0014)
2-687-336-01



Front Lens Cap
2-687-234-01



Rear Lens Cap
2-683-615-01

Exclusive case
2-694-834-01

Other accessories

2-685-150-11 MANUAL, INSTRUCTION (ENGLISH) (US, CND, AEP)
2-685-150-21 MANUAL, INSTRUCTION (FRENCH) (US, CND, AEP)
2-685-150-31 MANUAL, INSTRUCTION (GERMAN) (AEP)
2-685-150-41 MANUAL, INSTRUCTION (SPANISH) (AEP)
2-685-150-51 MANUAL, INSTRUCTION (DUTCH) (AEP)

2-685-150-61 MANUAL, INSTRUCTION (SWEDISH) (AEP)
2-685-150-71 MANUAL, INSTRUCTION (ITALIAN) (AEP)
2-685-150-81 MANUAL, INSTRUCTION (PORTUGUESE) (AEP)
2-685-150-91 MANUAL, INSTRUCTION (RUSSIAN) (AEP)
2-685-151-11 MANUAL, INSTRUCTION (ARABIC) (AEP)

2-685-151-21 MANUAL, INSTRUCTION (TRADITIONAL CHINESE) (AEP)
2-685-151-31 MANUAL, INSTRUCTION (SIMPLIFIED CHINESE) (AEP, CH)
2-685-151-41 MANUAL, INSTRUCTION (KOREAN) (AEP)

- Abbreviation
  CND : Canadian model
  CH : Chinese model

4. ADJUSTMENTS

Note: After the service repair, perform the adjustments referring to this section.

4-1. PREPARATIONS

4-1-1. List of Service Tools and Equipments

- Variable Transformer (Output voltage: AC 100 V) (Note 3)
- Camera DSLR-A100
- Compact Flash (CF) Card (For image saving)
- Screen (Art paper)
- Tape Measure
- Plane Mirror (For SLRs)
- Lens Adjustment Program (ActuatorChecker VerX.X.X.X.zip)
- PC Card Setup File (InstaCal.zip)
- Adhesive bond (B-10): J-6082-612-A
- Color Calculator 2

  Note: Color Calculator 2 is downloadable from the ESI homepage.

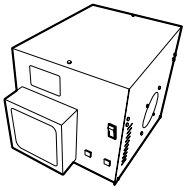
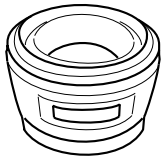
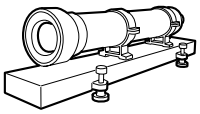
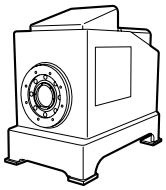
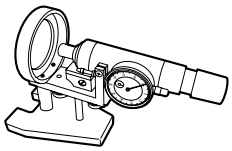
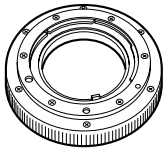
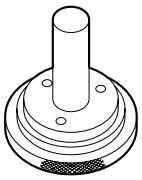
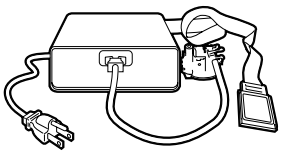
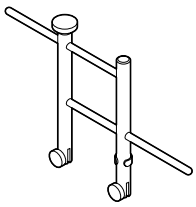
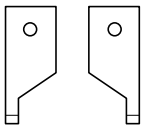
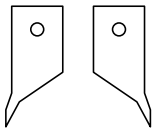
J-1  Personal computer (Note 1)	J-2  Luminance box J-6082-581-A	J-3  AE master lens J-6082-597-A
J-4  1000 mm Collimator 110V: J-6082-604-A 240V: J-6082-604-B (Note 2)	J-5  Lens test projector J-6082-605-A (Note 3)	J-6  Flange back tester J-6082-606-A
J-7  A-mount attachment J-6082-607-A	J-8  Flange back gauge (43.50mm) J-6082-608-A	J-9  Finished Inspection JIG J-6082-645-A (Note 4)
J-10  Universal wrench J-6082-609-A	J-11  Chip-A for universal wrench: J-6082-609-1	J-12  Chip-B for universal wrench: J-6082-609-2

Fig. 4-1-1

Note 1: Personal Computer (PC)
(Color Calculator 2 installed)

OS:	Windows XP
MEMORY:	40 M Byte or more recommended
Hard disk free area:	15 M Byte or more recommended
USB terminal:	Standard equipment
Graphics:	32,000 colors or more recommended VGA monitor

Note 2: Attach the chart to the 1000 mm collimator as shown in Fig. 4-1-2.

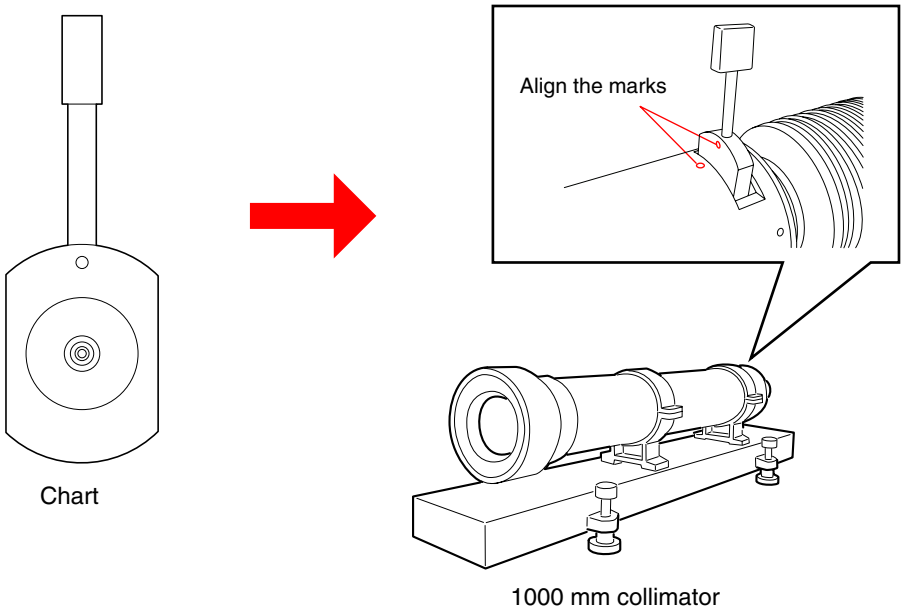


Fig. 4-1-2

Note 3: Connect the variable transformer (Output voltage: **AC 100 V**) to the lens test projector.
Note 4: Finished Inspection JIG is **AC 100 V** only.

4-1-2. Lens Adjustment Program (ActuatorChecker)

The lens adjustment program is required for the following check/adjustment.
4-2. APERTURE DIAMETER CHECK/ADJUSTMENT AND PATTERN CHECK
4-5. LENS ROM CHECK
4-6. FOCUS BRUSH POSITION ADJUSTMENT AND PATTERN CHECK
Prepare/start the lens adjustment program with the following steps.

Equipment used

- Personal Computer
- Lens Adjustment Program (ActuatorChecker VerX.X.X.X.zip)
- PC Card Setup File (InstaCal.zip)

Note 1: Lap top PC with PC card slot on which Windows XP runs
Note 2: Obtain the PC card setup file (InstaCal.zip) from the ESI homepage.
Note 3: Obtain the lens adjustment program (ActuatorChecker Ver. x.x.x.x.zip) from the ESI homepage.

1. Download of PC card setup file (InstaCal.exe)

1) Create the “MCC”folder in the C drive.

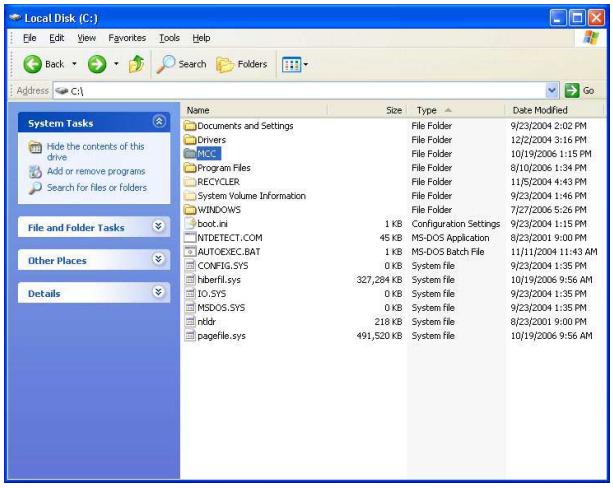


Fig.4-1-3

2) Download the file from Service Fixture and Software of ESI homepage, and save it in “C:\MCC”.
3) Double-click the downloaded file “InstaCal.exe”to extract it.
4) The window to specify the extract destination folder appears. Click [Browse...].

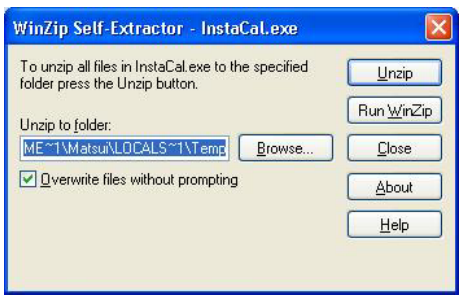


Fig.4-1-4

5) Specify “C:\MCC” for the extract destination folder.

Fig.4-1-5

6) The window returns to the menu to specify the extract destination folder. Click Unzip.

Fig.4-1-6

7) When the window below appears, click OK.

Fig.4-1-7

8) Return to the menu to specify the extract destination folder. Then, click Close to close the window.

2. Setup of PC Card

1) Double-click “InstaCal.exe” in “C:\MCC” folder to begin the installation.

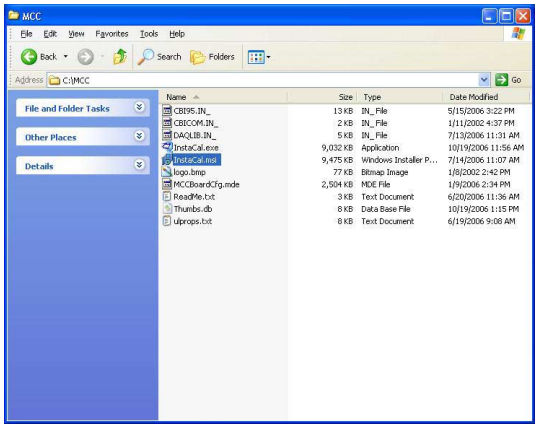


Fig.4-1-8

2) The menu to begin the installation appears. Click Next>.

Fig.4-1-9

3) Specify the install destination folder. As the default is used for it, click Next>.

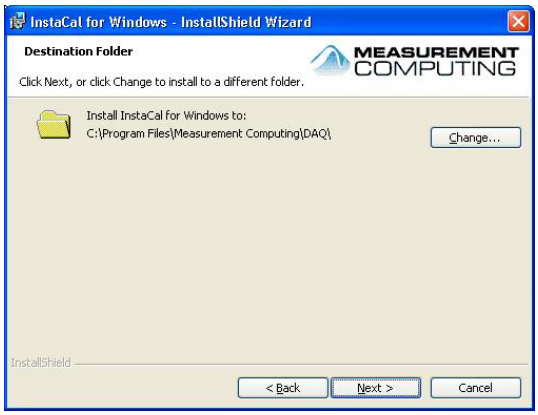


Fig.4-1-10

4) The menu to tell that the wizard is ready to install appears. Click Install.

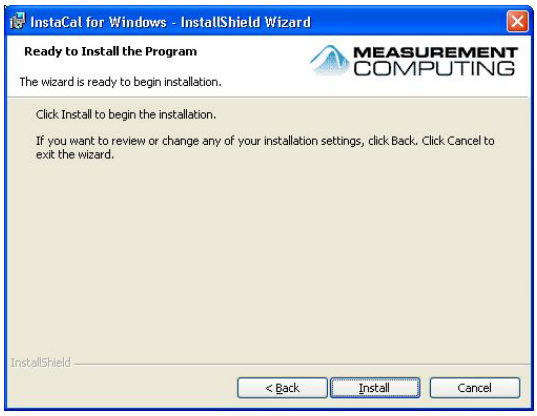


Fig.4-1-11

5) The installation is completed. Click Finish.

Note: To refer to the "readme" file, check the "Show the readme file" and click Finish.

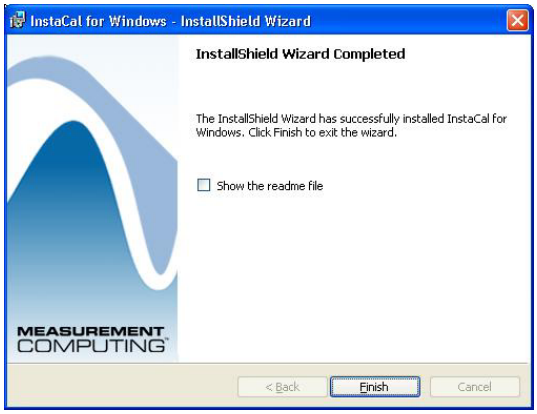


Fig.4-1-12

6) To make the configuration installed effective, the window to prompt the restart appears. Click "Yes" to restart the PC.

Note: If a device is connected without restarting, the program may not work properly.

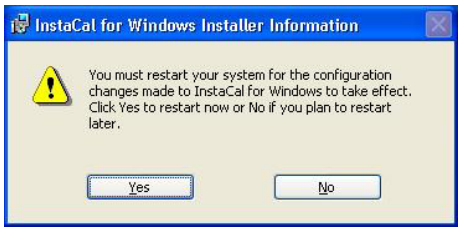


Fig.4-1-13

7) After restarting the PC, insert the PC-CARD-DIO48 in the PC card slot.

8) The software installation window appears.
Click “Install the software automatically. (Recommended)”.

Fig.4-1-14

9) The software is detected and installed. When the window below appears, click Finish to terminate the installation.

Fig.4-1-15

3. Confirmation of PC card setting

1) Select “All programs” - “MeasumentComputing” - “InstaCal” from the startup menu, and start up the software.

Note: Depending on the Windows setting, the window below may differ.

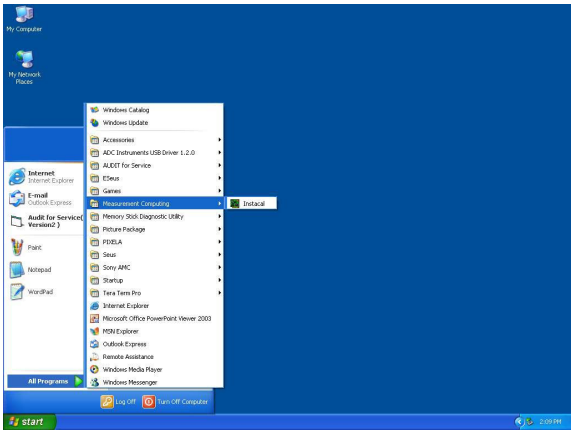


Fig.4-1-16

2) When “PC-CARD-DIO48” is detected, the window below appears. Confirm that the PC-CARD-DIO48” is checked.

Note: Depending on the slot inserted, the slot No. differs.

Fig.4-1-17

3) Confirm that “PC-CARD-DIO48” is recognized as “Board#0”.

Note: If not recognized as “Board#0”, the program does not work properly.

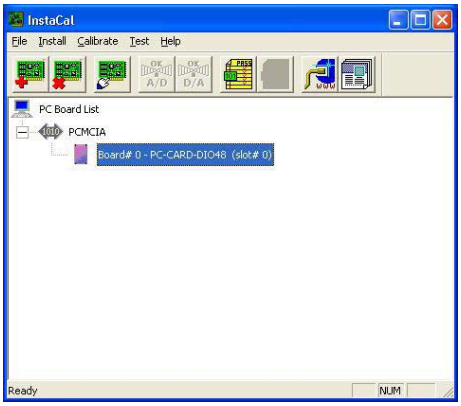


Fig.4-1-18

4) Click “File” - “Exit” to terminate “InstaCal”.

4. Startup of Lens Adjustment Program (ActuatorChecker.exe)

1) Download the file “ActuatorChecker VerX.X.X.X.zip” from Service Fixture and Software of ESI homepage, save and extract it.
2) Start up “ActuatorChecker.exe” from an arbitrary folder.
3) If “PC-CARD-DIO48” is properly installed, the window below appears.

Note: The version of “ActuatorCheker” might be updated.

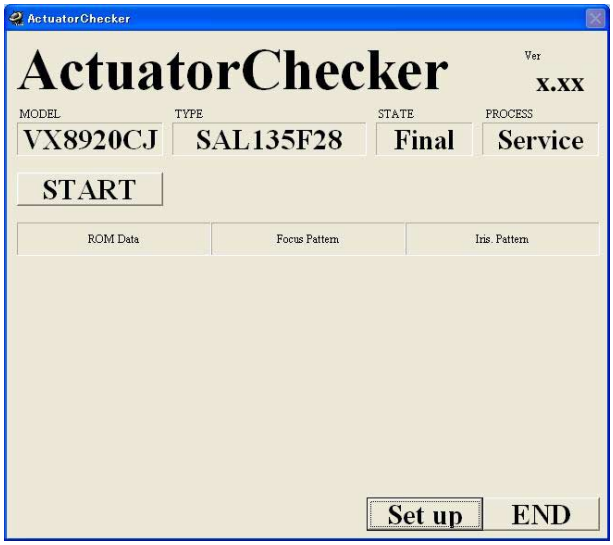


Fig.4-1-19

4-1-3. Connection of Finished Inspection JIG and Lens Adjustment Program (ActuatorChecker.exe)

Note: Confirm “4-1-2. Lens Adjustment Program (ActuatorChecker)” has been completed before this procedure is executed.

Equipment

- Personal Computer
- USB cord with connector
- Finished Inspection JIG (AC 100 V only)
- Lens Adjustment Program (ActuatorChecker)

1. Connect equipment and checking lens as shown Fig.4-1-20.

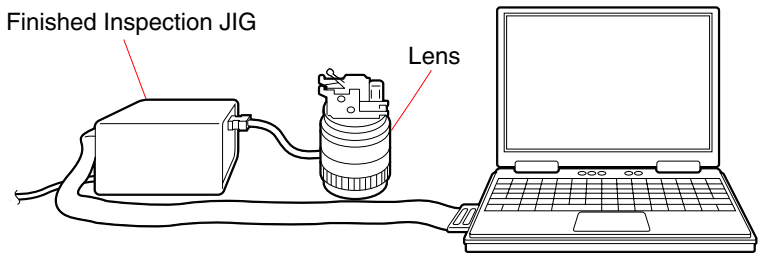


Fig.4-1-20

2. Turn on the finished inspection JIG.
3. Turn on the personal computer.
4. Start up “ActuatorChecker.exe” from an arbitrary folder, conform that start up program normally.
   Note: Turn off the finished inspection jig after use.

4-1-4. Initial Setting of “ActuatorChecker”

1. Start up “ActuatorChecker.exe”.

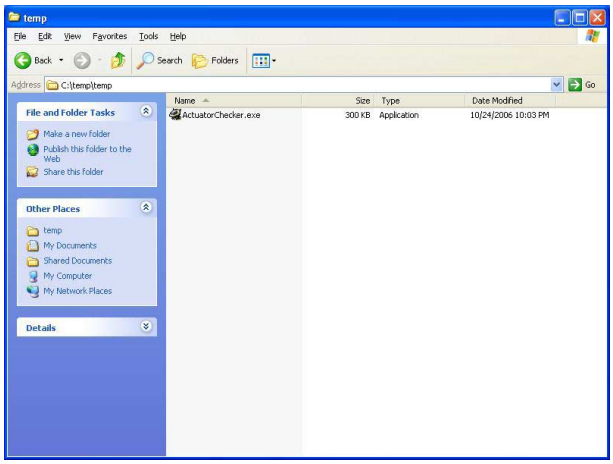


Fig.4-1-21

2. Depending on the initial startup or setting made at the previous startup, the window differs.When the English window appears, click the Set up button.

   Note: When any button is clicked, the Serial window appears. The window to enter the lens serial number appears.

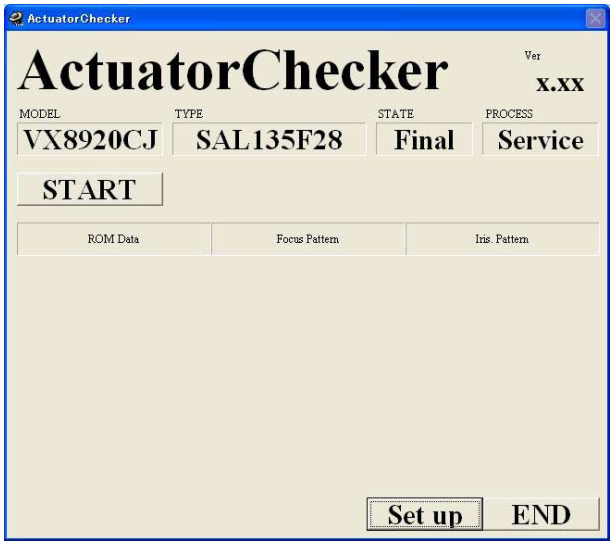


Fig.4-1-22

3. Set the following contents in the SETUP window.
   - MODEL Model to be adjustment this time
   - Language English
   - State FINAL
   - PROCESS SERVICE
4. Confirm that all of the items are set, and click [OK].

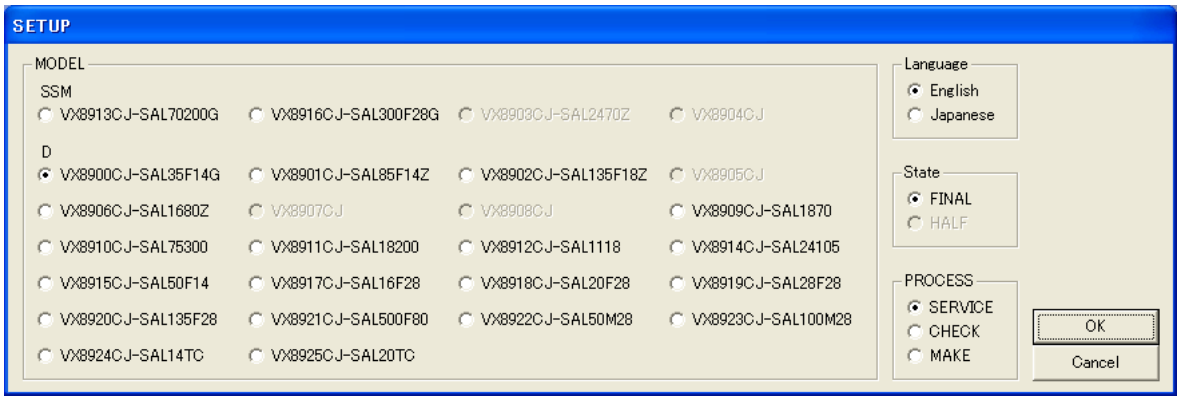


Fig.4-1-23

4-1-5. About Inspection Procedure of Lens Adjustment Program (ActuatorChecker)

The inspection method has the method of executing the method of inspecting the corresponding model as everything continues and the inspection of each item one by one.
Click [START] from the start up window when you inspect the corresponding model as everything continues.
The procedure for executing the inspection of each item one by one has been described in this manual.

4-2. APERTURE DIAMETER CHECK/ADJUSTMENT AND PATTERN CHECK

The checked lens has the two types of aperture, one is the automatic preset diaphragm and the other is the stepless aperture (manual diaphragm).
Then perform the aperture diameter check/adjustment for automatic preset diaphragm, and M aperture diameter adjustment for stepless aperture respectively.

4-2-1. Aperture Diameter Check

Equipment

- Luminance Box
- Camera DSLR-A100
- AE Master Lens
- Compact Flash (CF) Card (For image saving)
- Personal Computer (PC)
  (Color Calculator 2 installed)

1. Preparations

1) Install the CF card to the camera.
2) Set the stepless aperture (M aperture) of the checked lens to the fully open state (set the index of the stepless aperture to “A”), and check that the M iris blades do not remain in aperture.

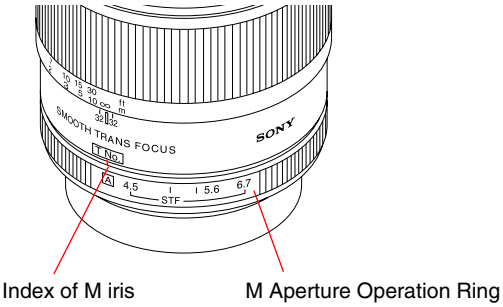


Fig.4-2-1

3) Set the equipments, camera and master lens as shown in Fig.4-2-2.

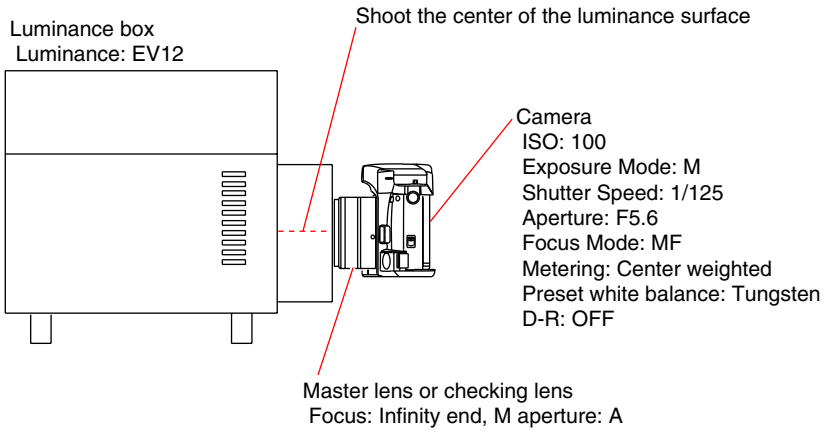


Fig.4-2-2

4) Shoot the images under the following conditions and save them.

Note: Shoot the center of the luminance surface three times with the master lens and checking lens.

Setting of Luminance box:

Luminance:	EV12

Setting of Lens:

Focus:	Infinity end
Maperture:	A

Setting of Camera:

ISO:	100
Exposure Mode:	M
shutter Speed:	1/125
Aperture:	F5.6
Focus Mode:	MF
Metering:	Center weighted
Preset white balance:	Tungsten
D-R:	OFF

2. Checking of Image

Note: Check the image of both master lens and checking lens.

1) Start the Color Calculator 2.

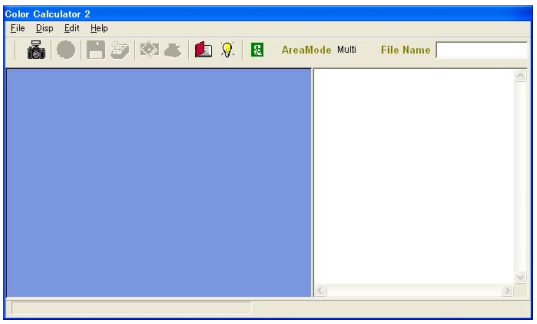


Fig.4-2-3

2) Read the image from the file menu.

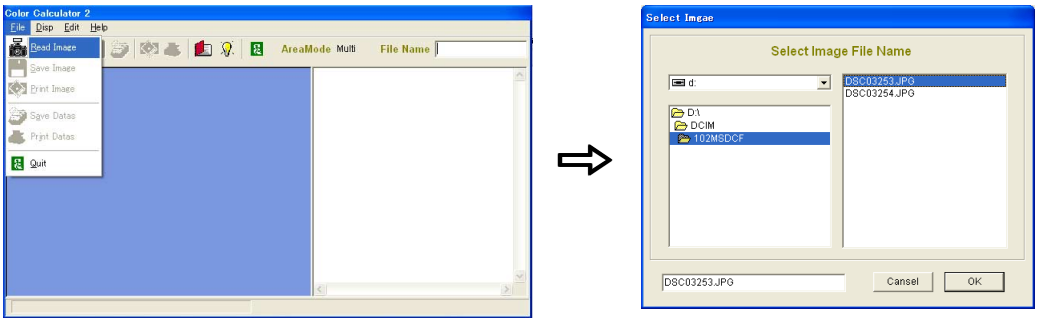


Fig.4-2-4

3) Set the Color Calculator 2 as follows.
Measured value display (Display menu): RGB+L*a*b*
Measuring method (Display menu): Center Single Area

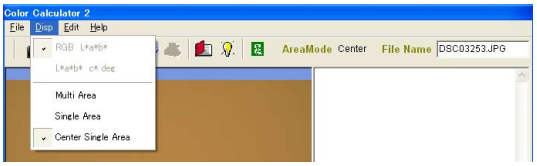


Fig.4-2-5

Color space (Edit menu): sRGB

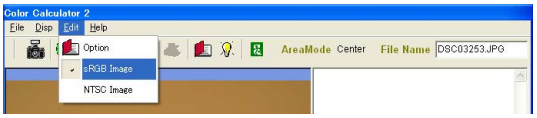


Fig.4-2-6

Area size for calculate (Edit menu →Option): 256×256 Pixels

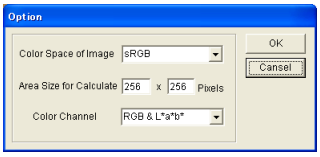


Fig.4-2-7

4) Click the calculate button to measure the image.

5) After measuring, check the “G” values.

Average “G” value of the three images shoot with master lens: (a)

Average “G” value of the three images shoot with checking lens: (b)

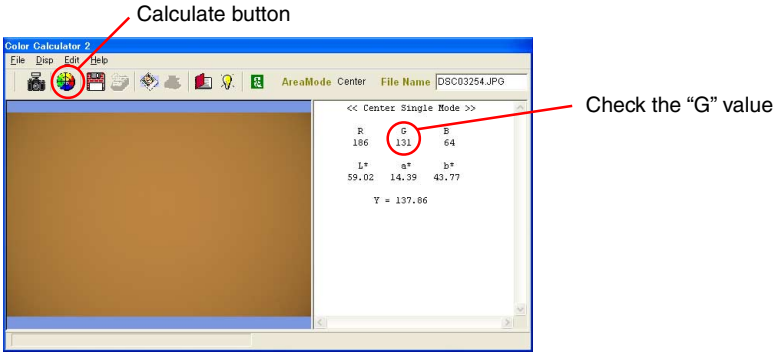


Fig.4-2-8

3. Checking Method

1) Calculate aperture error using the following formula, and check that the aperture error is within the specification.

Aperture error = Average “G” value of master lens (a) - Average “G” value of checking lens (b)

Specification

Aperture error = –20 to +5

2) When the aperture error is out of specification, perform “4-2-2. Aperture Diameter Adjustment”.
If the specification is met, perform the “4-2-3. M Aperture Diameter Adjustment”.

4-2-2. Aperture Diameter Adjustment

Equipment

- Adhesive bond (B-10)

Adjustment Method

1) Remove the 1 group lens block.

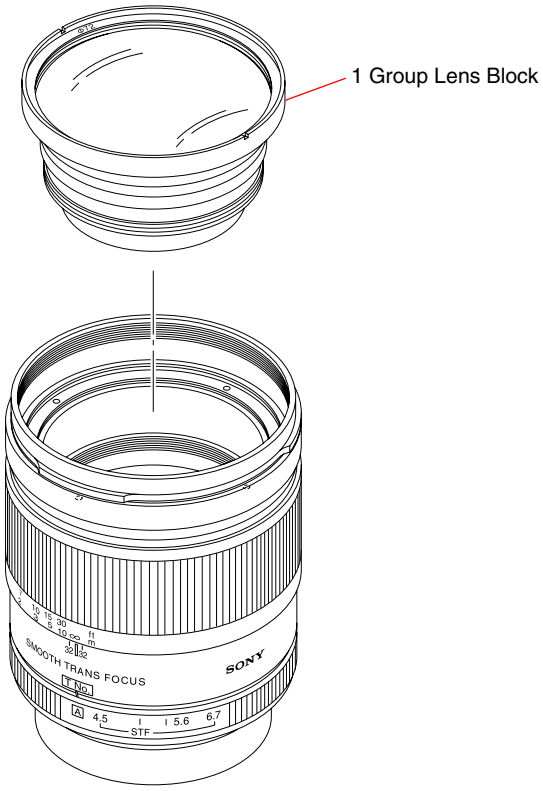


Fig.4-2-9

2) Set the stepless aperture (M aperture) of the checked lens to the fully open state (set the index of the stepless aperture to “A”), and check that the M iris feathers do not remain in aperture.
3) Remove the adhesive bond of the three screws fixing the iris retainer tube.

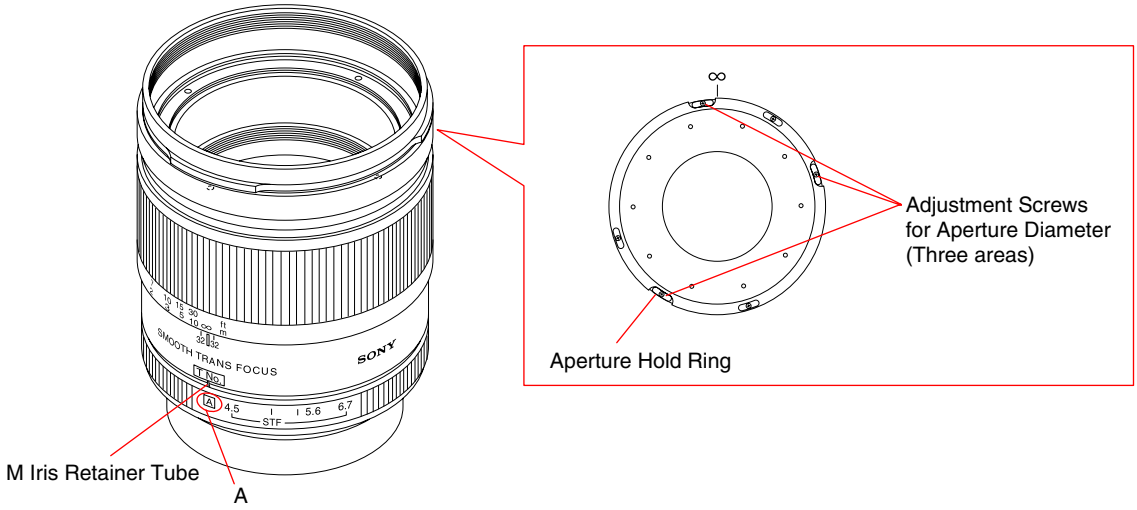


Fig.4-2-10

4) Move the preset lever to set the preset ring block at the open aperture position.

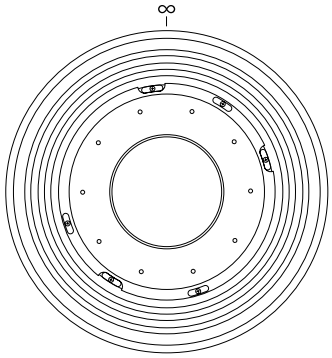


Fig.4-2-11

5) Turn the aperture hold ring to adjust the position where the A iris feathers block are hidden into the edge completely.

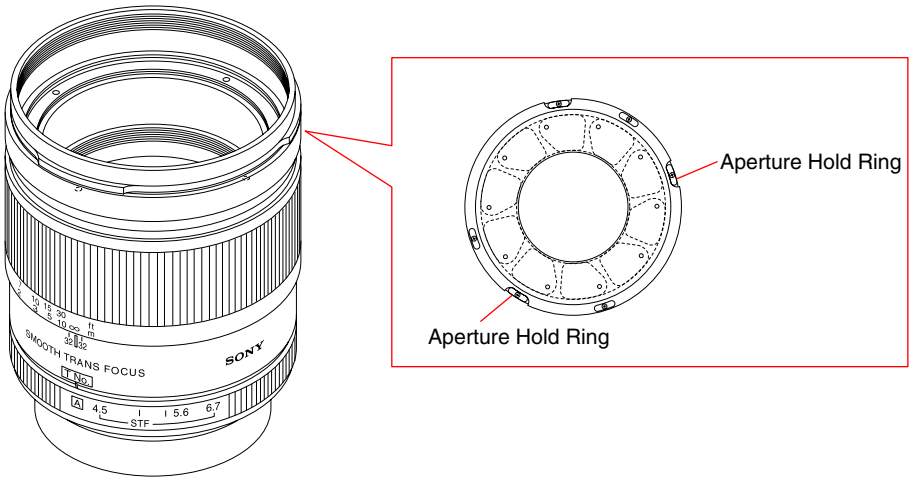


Fig.4-2-12

6) After the adjustment is completed, apply the adhesive bond (B-10) to the head of the three screws as shown in the Fig.4-2-13.

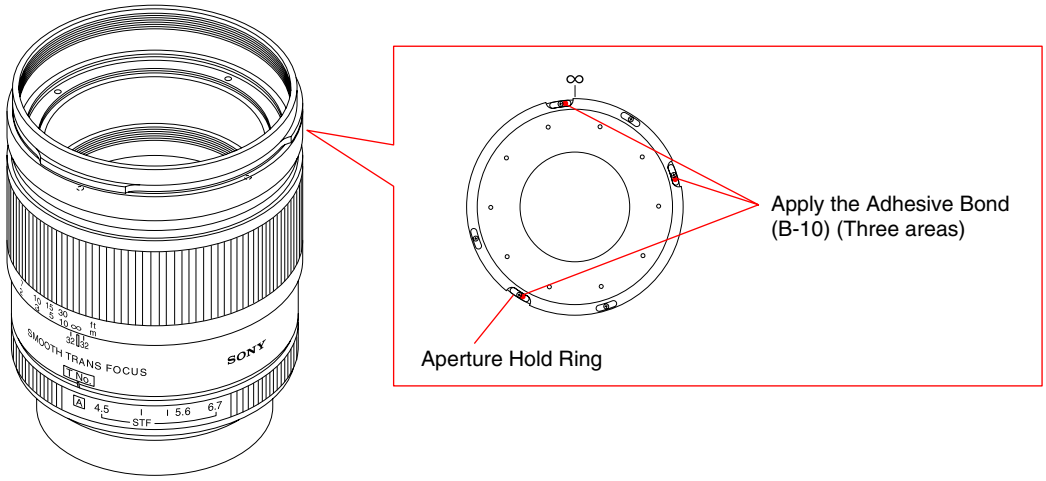


Fig.4-2-13

7) Assemble the lens completely.

8) Perform “4-2-1. Aperture Diameter Check”, and repeat “4-2-1. Aperture Diameter Check” and “4-2-2. Aperture Diameter Adjustment” until the aperture error is within the specification.

4-2-3. M Aperture Diameter Adjustment

Equipment

- Adhesive bond (B-10)

1. Adjustment Method

1) Remove the adhesive bond of the three screws fixing the M iris retainer plate.

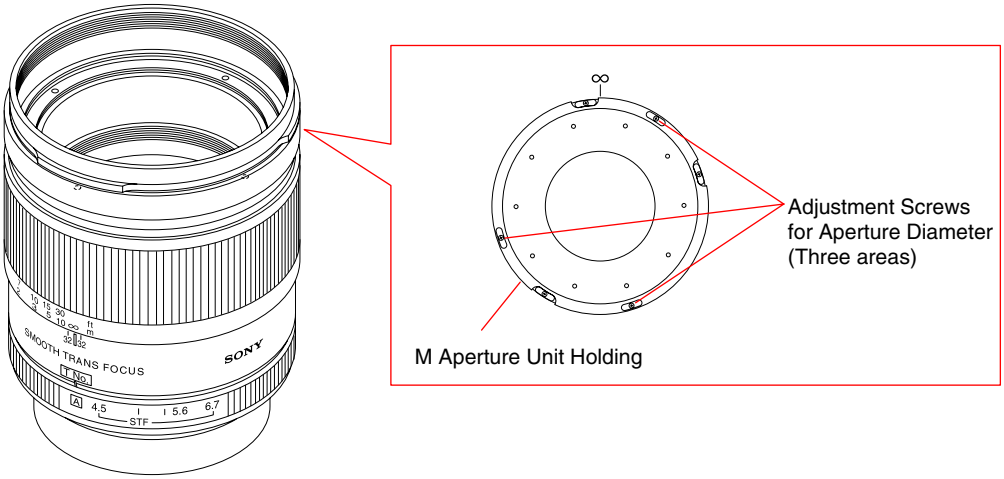


Fig.4-2-14

2) Set M iris indicated portion as shown in figure.

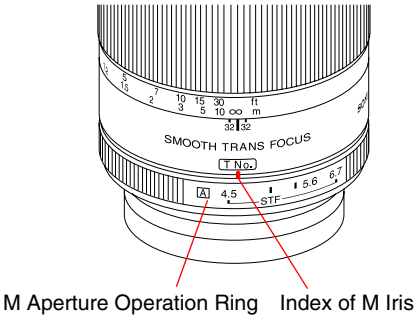


Fig.4-2-15

3) Turn the M aperture unit holding plate to adjust the position where the M diaphragm blades are hidden into the edge completely.

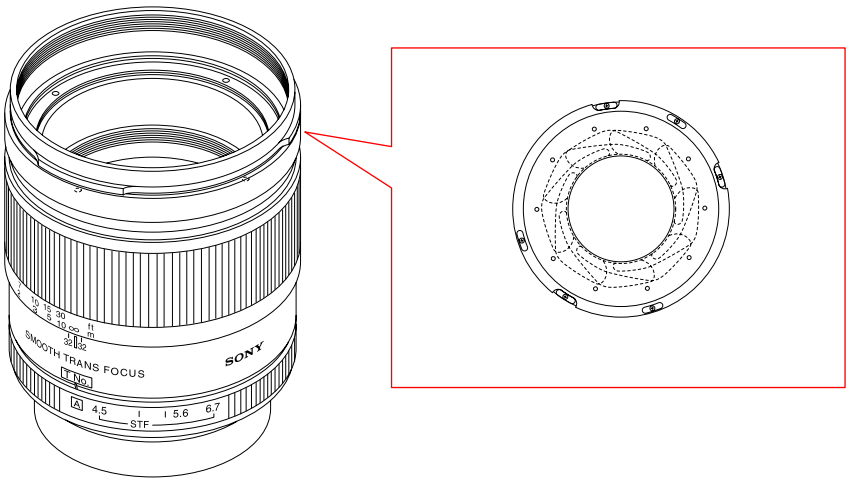


Fig.4-2-16

4) After the adjustment is completed, apply the adhesive bond (B-10) to the head of the three screws as shown in the Fig.4-2-17.

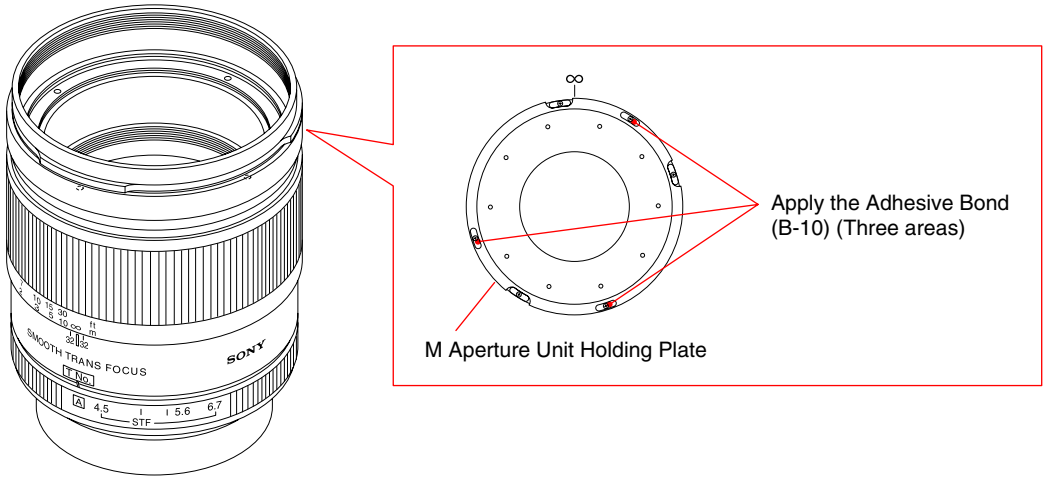


Fig.4-2-17

5) Assemble the lens completely.

4-2-4. Aperture Diameter Brush Pattern Check (Iris Pattern)

Equipment

- Personal Computer
- Finished Inspection JIG (AC 100 V only)
- Lens Adjustment Program (ActuatorChecker)

1. Preparations

1) Connected to equipment with checking lens. (Refer to Section 4-1-3.)
2) Start up of "ActuatorChecker".
3) Click Set up, and perform the initial setting. (Refer to Section 4-1-4.)

2. Checking Method

1) Click the Iris Pattern.

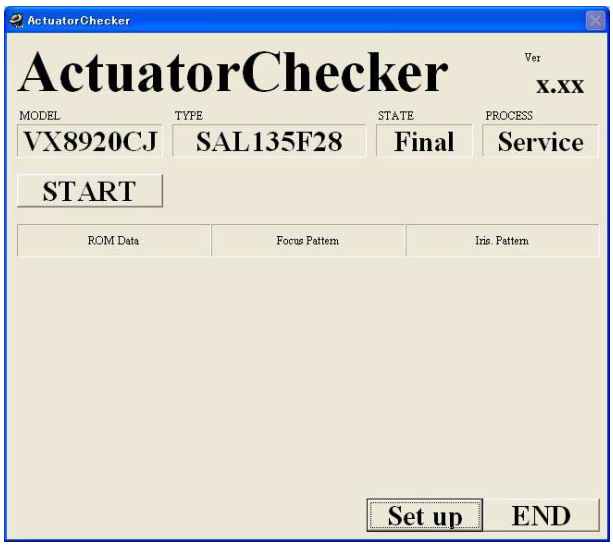


Fig.4-2-18

2) The Serial window appears. Input the lens serial number.

Note: When OK is clicked without inputting the serial number, the date executed is displayed on the completion window of each item.

Fig.4-2-19

3) The message "Move IRIS to [A]. Then push [ENTER]." is displayed on the pop-up window.
Set the iris to the A position and press down the ENTER key.

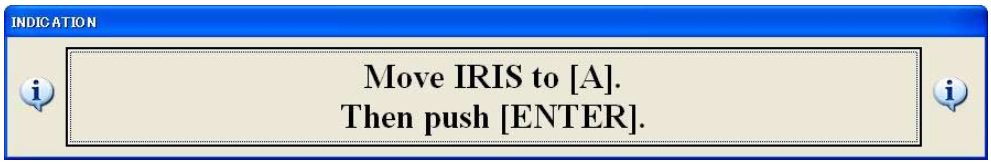


Fig.4-2-20

4) When the M aperture (fully open) position check finishes normally, the message “Move IRIS to [6.7] from [A] at about 5sec.” is displayed on the pop-up window.
Set the iris to the 6.7 and press down the ENTER key.

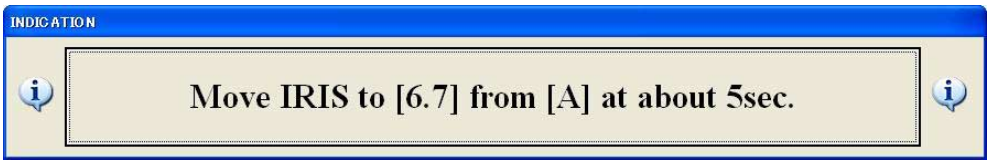


Fig.4-2-21

5) When the M aperture (minimum aperture) position check finishes normally, the message “Reverse IRIS to [A] from [6.7] at about 5sec.” is displayed on the pop-up window.
Set the iris to the [A] position and press down the ENTER key.

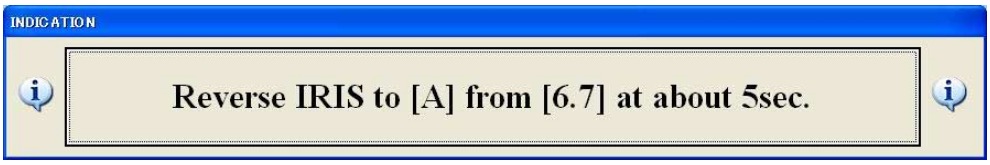


Fig.4-2-22

6) When the infinity position check finishes normally, “OK” is displayed on the pop-up window, and press the ENTER key to return to the initial window.

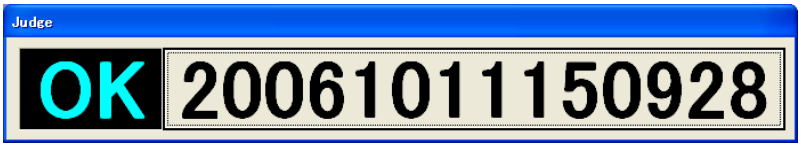


Fig.4-2-23

3. In case of error display in the Iris Pattern (A position first try)

1) When the error display and the NG display appear to the pop-up window, press the ENTER key to return to the initial window, and perform “2. Checking Method”again.

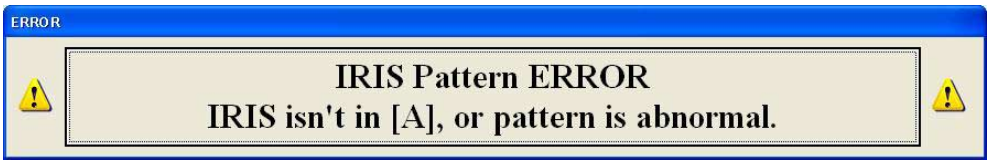


Fig.4-2-24

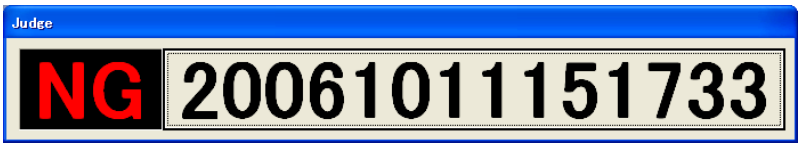


Fig.4-2-25

2) Although the aperture is positioned at the A position, if “NG” appears, confirm or perform the following.
- Cleaning of flexible pattern or the brush.
- Replacing the brush.
- Replacing the main flexible unit.

3) Perform “2. Checking Method”again, repeat the inspection until “OK” appears on the pop-up window.

4. In case of error display in the Iris Pattern (6.7 position or A position (second try))

1) When the error display and the NG display appear to the pop-up window, perform the work with caution so that setting the aperture to the 6.7 position or A position (second try) can be done in more than 5 seconds and no more than 20 seconds.

- When the iris pattern error

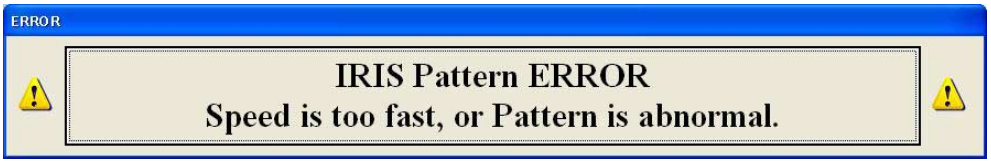


Fig.4-2-26

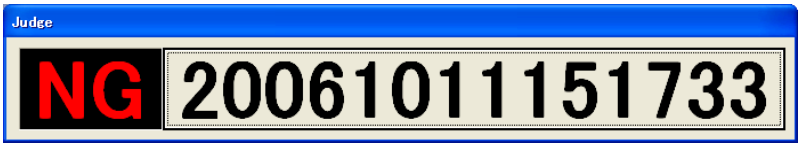


Fig.4-2-27

- When the aperture does not reach the 6.7 position or A position seconds.

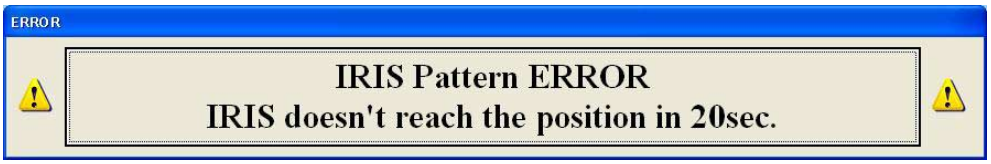


Fig.4-2-28

2) Although the aperture is positioned at the A position or 6.7 position, if “NG” appears, confirm or perform the following.

- Cleaning of flexible pattern or the brush.
- Replacing the brush.
- Rotating operation error of the focus ring (rotation speed is not suitable at a regulated speed.).

3) Perform “2. Checking Method”again, repeat the inspection until “OK” appears on the pop-up window.

4-3. PROJECTIVE RESOLVING POWER CHECK

Equipment

- Lens Test Projector and Variable Transformer (Output voltage: AC 100 V)

  Note: Connect the variable transformer (Output voltage: AC 100 V) to the lens test projector.

- A-mount Attachment
- Screen (Art paper)
- Tape Measure
- Plane Mirror (For SLRs)

1. Preparations

Note: • Check the projective resolving power of the checking lens at the following focal-length and distance.

Focal-length f (mm)	distance (m)
135	5.4

Table 4-3-1

- Set the stepless aperture of the checked lens to "A".

1) Perform the following steps (1) to (3), and incorporate the internal lenses of the lens test projector according to the checking focal-length.
   (1) Open the lid of the lens test projector.
   (2) Pull up and turn the fixed levers on the right and left sides of the lens test projector.
   (3) Remove or insert the lens.

   Note: Be sure to have the right position and direction of the lens.

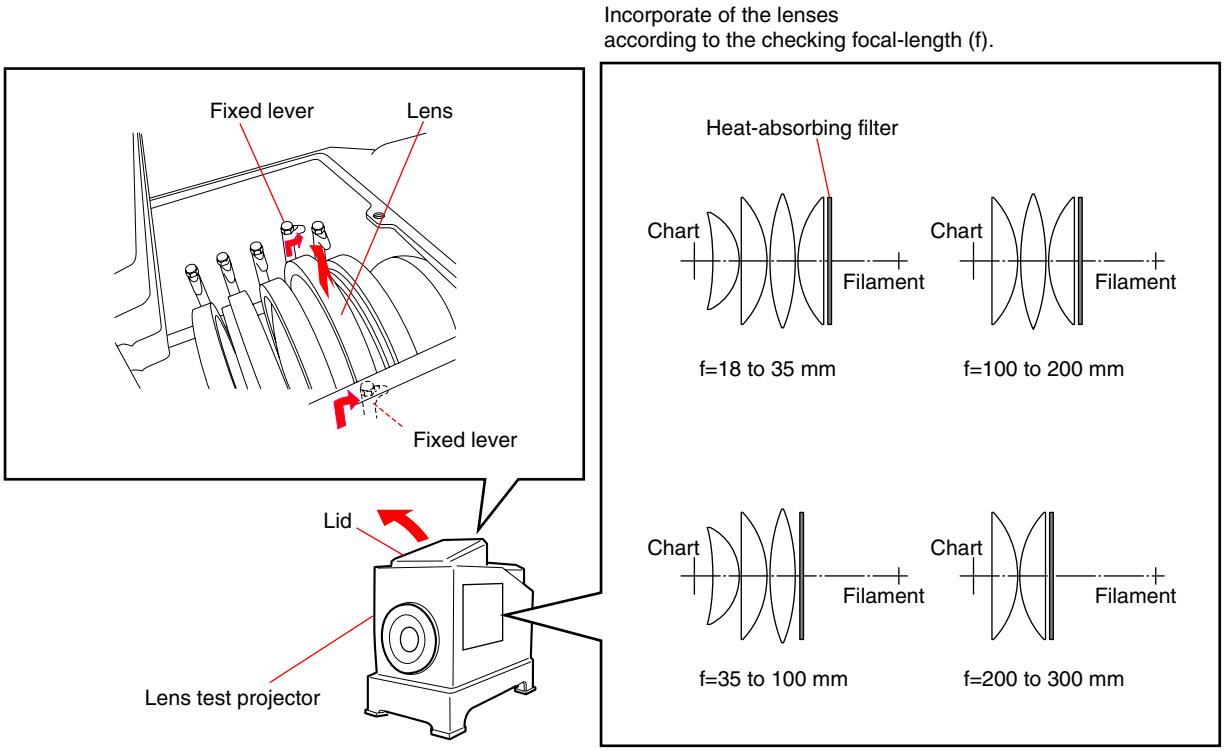


Fig.4-3-1

2) Attach the checking lens to the lens test projector, and set the equipments as shown in Fig.4-3-2.
3) Turn the fan switch of the lens test projector to ON, then turn the lamp switch to ON.

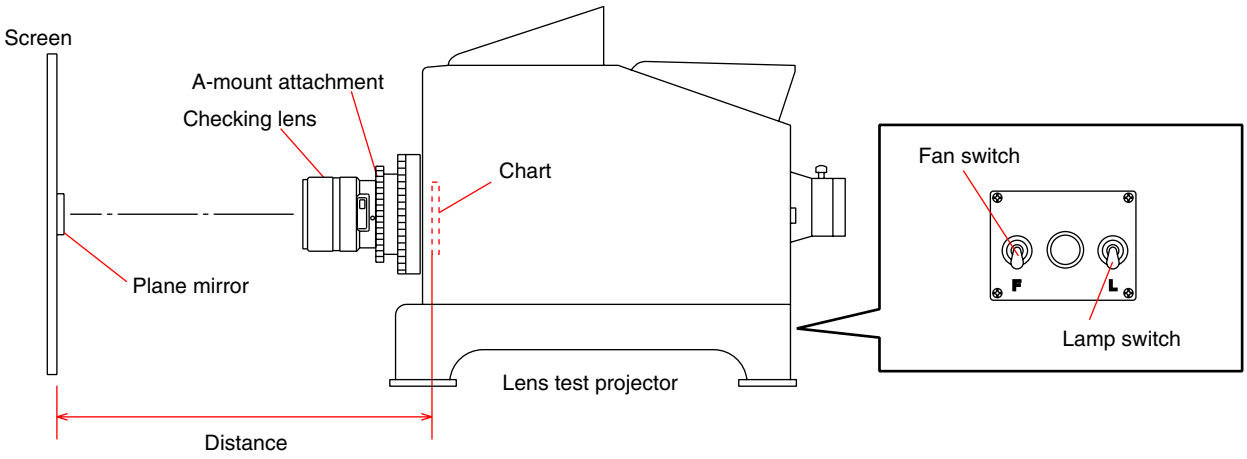


Fig.4-3-2

4) Turn the distance scale tube of the checking lens until the chart image projected on the screen is the sharpest at the center (y'=0).
5) Set the plane mirror to the center of the projected image (y'= 0), and adjust the projector position so that the mirror reflects the light to the center of the lens.

2. Checking Method

1) Turn the distance scale tube of the checking lens until the chart image projected on the screen is the sharpest at the center (y'=0).
2) Read the number of the smallest pitched lines at the center (y'= 0).

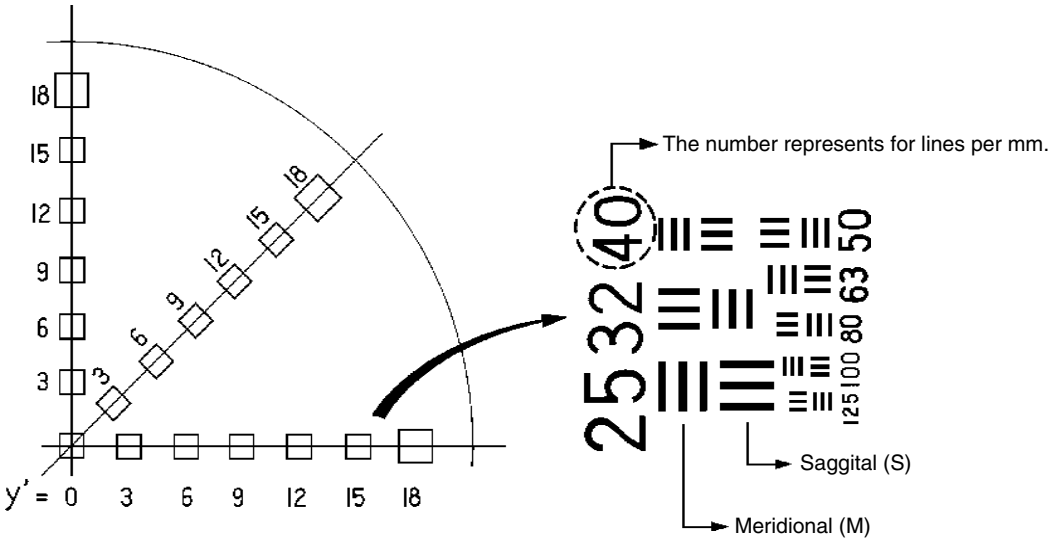


Fig.4-3-3

3) Turn the mount rotation ring of lens test projector until the projected image at a certain peripheral point (y'= 15) on the screen appears the most unsharp.
Read the number of the smallest pitched lines (both saggital and meridional: 3 lines) at the peripheral point.

Note: When reading the number of the smallest pitched lines, be careful of the spurious resolution.
Spurious resolution is the reversed image of 2 or 4 lines which appears on screen when focus is beyond maximum revolving power.
Do not confuse spurious resolution for the smallest pitched lines.

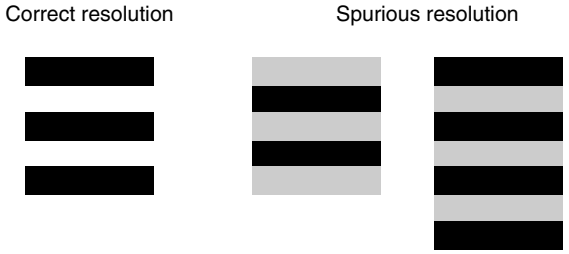


Fig.4-3-4

4) Read the number of the smallest pitched lines for both saggital (S) and meridional (M) at the peripheral point (y'= 18) on the screen in the same way of step 3).
5) Check that the all readings (y'= 0, saggital (S) and meridional (M) at y'= 15 and y'= 18) is within the specification of the Table 4-3-2.
When the specification is not satisfied, perform the following procedure.
   • Replace the 1 group lens block, or the 2 group front frame block or 2 group rear frame block of the 2 group lens block.

Specification

Focal-length f (mm)	distance (m)	Number of the smallest pitched lines				
		Center (y'=0)	y'= 15		y'= 18	
		(Lines per mm)	S	M	S	M
135	5.4	125 or greater	50 or greater	50 or greater	50 or greater	50 or greater

Table 4-3-2

6) After the checking is completed, turn the lamp switch of the lens test projector to OFF and cool the inside of the lens test projector, then turn the fan switch to OFF.

4-4. FLANGE BACK (f'F) CHECK/ADJUSTMENT

4-4-1. Flange Back (f'F) Check

Equipment

- 1000 mm Collimator
- Flange Back Tester
- A-mount Attachment
- Flange Back Gauge (43.50mm)

1. Preparations

1) Set the equipments as shown in the Fig.4-4-1.

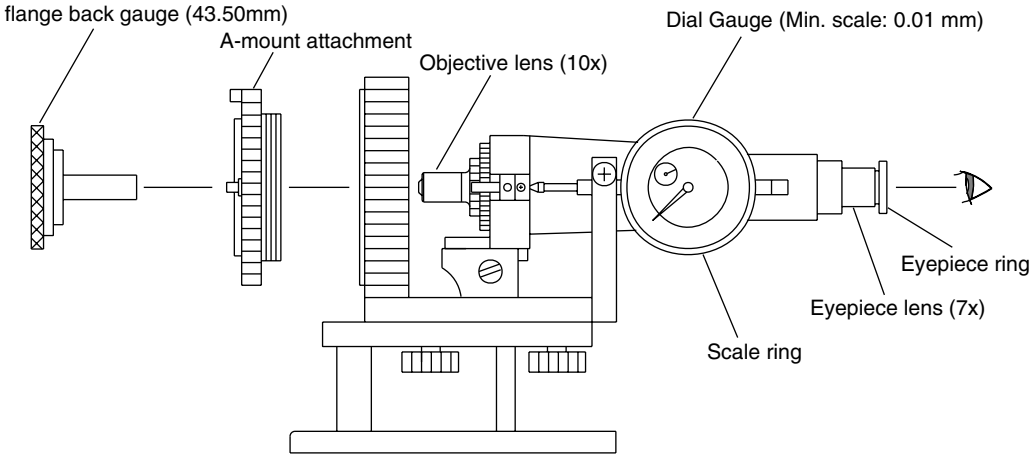


Fig.4-4-1

2) Looking through the eyepiece lens, turn the eyepiece ring of the flange back tester so that cross line or scale in the view is the sharpest.
3) Attach the flange back gauge (43.50mm) securely to the A-mount attachment and hold them together.
4) Turn the focusing knob of the flange back tester so that fine scratches on the flange back gauge (43.50mm) is the sharpest.
Note: Turn the knob in the direction of the arrow of Fig.4-4-2 for correct reading.

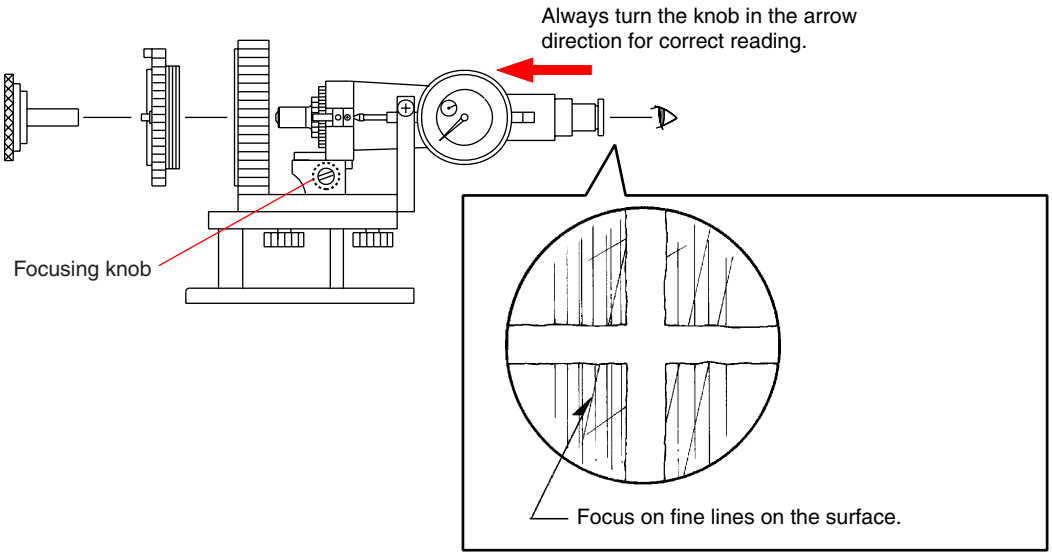


Fig.4-4-2

5) Turn the scale ring of the dial gauge until the long pointer indicates "0".
Note: This position is the flange back (f'F) = 43.5 mm.
Memorize the position of short-pointer.

2. Checking Method

1) Attach the checking lens to the flange back tester, and set the 1000 mm collimator.

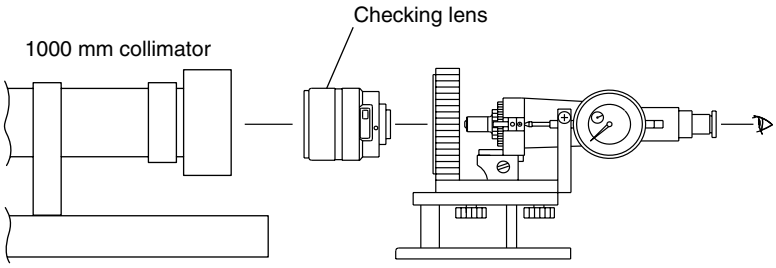


Fig.4-4-3

2) Set the distance scale tube of the checking lens to infinity end position and also set the stepless aperture to “A” while looking through the microscope, and align the optical axis to the center of the chart image accurately.
3) Turn the focusing knob of the tester until the chart image is the sharpest (red and green color areas are equal on the chart *).
   *: Position in which the color of collimator chart changes from green into red and come into focus.
   Also check the optical axis aligns with the chart center. (Refer to Fig.4-4-4.)

Note: Figure shows example. The cause depends on individual lens.

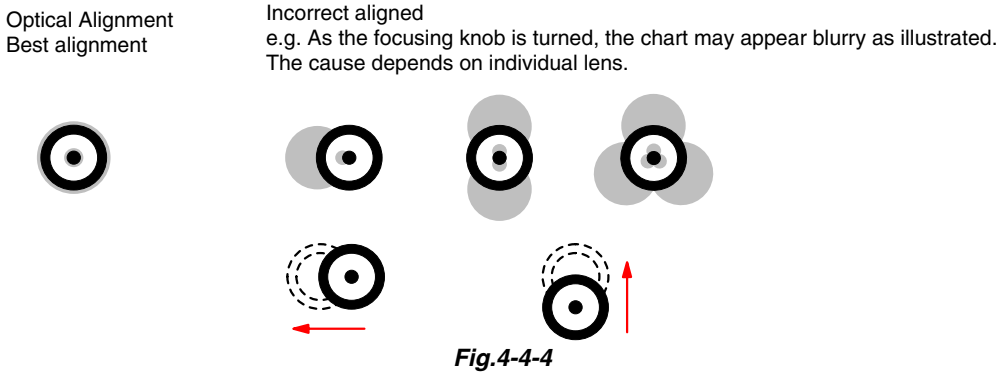


Fig.4-4-4

4) Calculate the flange back (f’F) of the checking lens using the following formula, and check that the specification of the Table 4-4-1 is satisfied.

Flange back (f’F) of the checking lens = (Flange back gauge) + (Number of short-pointer revolution) + (Reading of long-pointer)

Specification

Focal-length f (mm)	f’F (mm) (Infinity position)
135	44.56 to 44.66

Table 4-4-1

5) When the flange back (f’F) of the checking lens is out of specification of the Table 4-4-1, perform “4-4-2. Flange Back (f’F) Adjustment”.

4-4-2. Flange Back (f'F) Adjustment

Equipment

- 1000 mm Collimator
- Flange Back Tester
- A-mount Attachment
- Flange Back Gauge (43.50mm)
- Adhesive bond (B-10)

Adjusting Method

1) Perform "4-4-1. Flange Back (f'F) Check", and check that the flange back (f'F) of the checking lens is out of specification of the Table 4-4-1.
2) Set the distance scale tube of the checking lens to infinity end position.
3) Turn the focusing knob of the flange back tester until the chart image is the sharpest while looking through the microscope.
4) Calculate the shift amount (x) using the following formula.

Shift amount (x) = Measured value (f'F) at infinity end position - 44.61 mm

x = Shift amount that should be adjusted by the back adjustment washer

5) Select the thickness of the back washer according to the result of step 4). (Refer to Table-4-4-2.)

Note: Be sure to measure the thickness of the back adjustment washer by micrometer or vernier caliper.

- When the shift-amount is a negative value: Decrease the back adjustment washer thickness by the amount of shift amount (x).
- When the shift-amount is a positive value: Increase the back adjustment washer thickness by the amount of shift amount (x).

Back washer

Part No.	Description	Thickness (mm)
2-688-527-01	Back adjustment washer A	0.05
2-688-528-01	Back adjustment washer B	0.07
2-688-529-01	Back adjustment washer C	0.1
2-688-530-01	Back adjustment washer D	0.2
2-688-531-01	Back adjustment washer E	0.5

Table 4-4-2

6) Assemble the back adjustment washer, and perform the “4-4-1. Flange Back (f’F) Check” again.

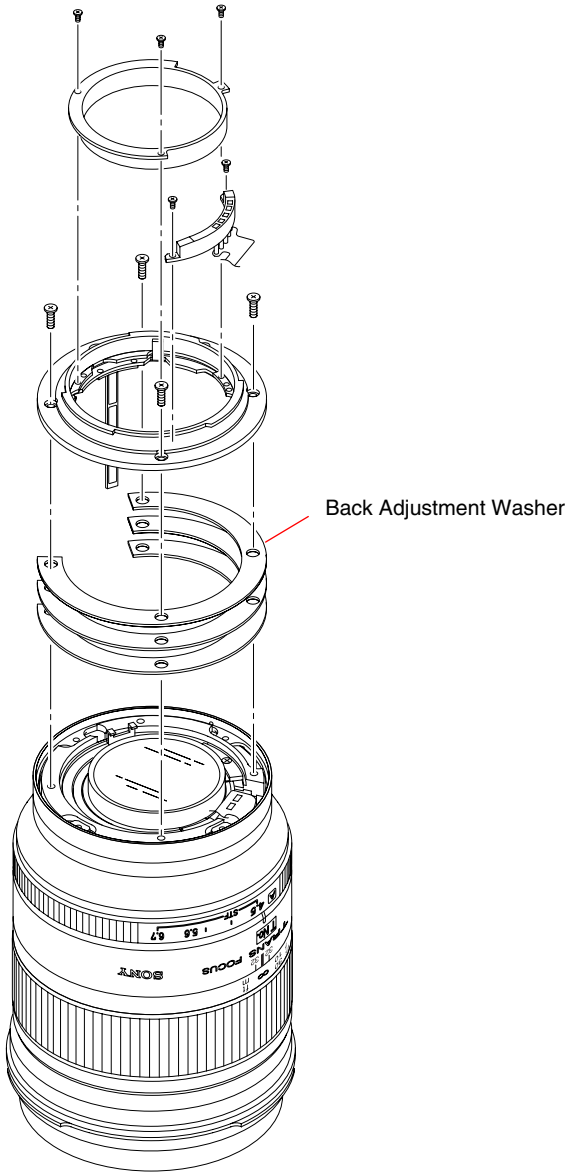


Fig.4-4-5

4-5. LENS ROM CHECK

Equipment

- Personal Computer
- Finished Inspection JIG (AC 100 V only)
- Lens Adjustment Program (ActuatorChecker)

1. Preparations

1) Connected to equipment with checking lens. (Refer to Section 4-1-3.)
2) Start up of "ActuatorChecker.exe".
3) Click [Set up], and perform the initial setting. (Refer to Section 4-1-4.)

2. Checking Method

1) Click [ROM Data].

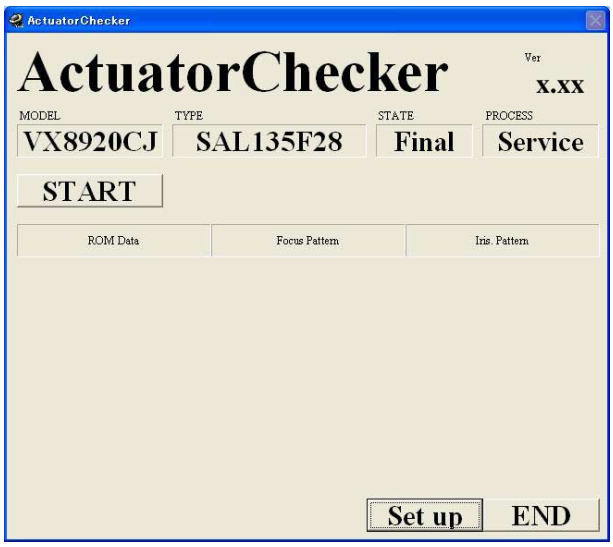


Fig.4-5-1

2) The Serial window appears. Input the lens serial number.

Note: When [OK] is clicked without inputting the serial number, the date executed is displayed on the completion window of each item.

Fig.4-5-2

3) The message “Move FOCUS to Infinity position, IRIS to [A]. Then push [ENTER].” is displayed on the pop-up window.
Set the focus to the infinity position, iris to A position and press down the ENTER key.

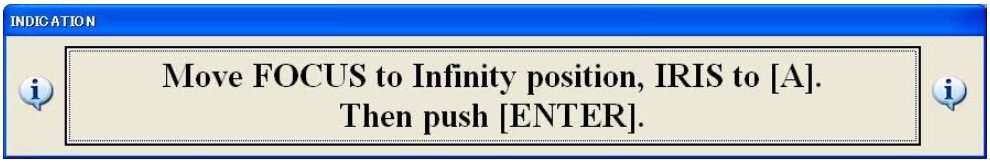


Fig.4-5-3

4) When “OK” is displayed on the pop-up window, press the ENTER key to return to the initial window.

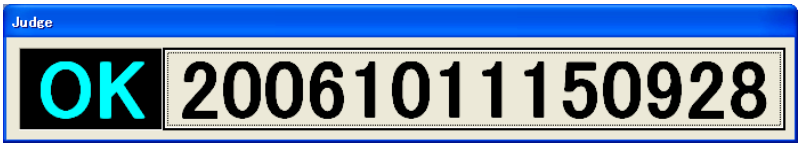


Fig.4-5-4

3. In case of error display in the ROM Data

1) When the error display and the NG display appear to the pop up window, press the ENTER key to return to the initial window, and perform “2. Checking Method” again.

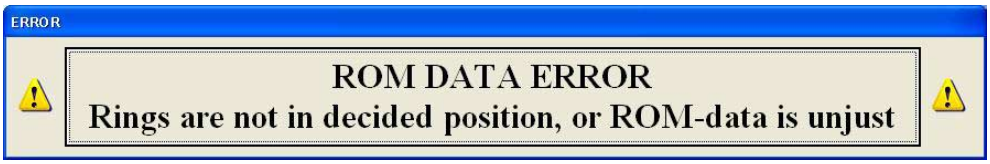


Fig.4-5-5

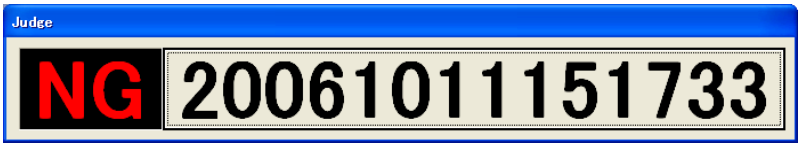


Fig.4-5-6

2) Although the focus is positioned at the infinity position, if the “NG” appears, confirm or perform the following.
- Cleaning of flexible pattern or the brush.
- Replacing the brush.
- Replacing the main flexible unit.

3) Perform “2. Checking Method” again, repeat the inspection until “OK” appears on the pop-up window.

4-6. FOCUS BRUSH POSITION ADJUSTMENT AND PATTERN CHECK

4-6-1. Focus Brush Position Adjustment and Pattern Check

Focus Brush Position Adjustment

1) Remove the rear light interception sleeve, lens mount riveting block and ornamental tube.
2) Set the focus ring to the infinite end.
3) Check the conduction between first pattern and second pattern from top as shown in figure 4.
   - When the brush comes to the area circled where no pattern exists, no conduction occurs. (Adjusted)
   - When the brush comes to the area circled where the pattern exists, the conduction occurs. (Not adjusted)

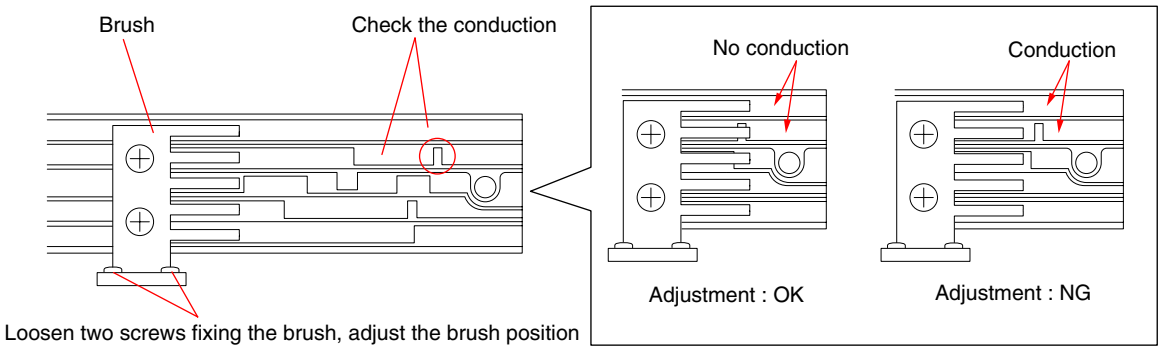


Fig. 4-6-1

4) If not adjusted in step 3), loosen two screws fixing the brush (For focus ring), and adjust the brush position, perform step 2) and 3) again.
5) After adjustment, perform the [2 Focus Brush Position Check] and [3 Pattern Check].

4-6-2. Focus Pattern Check (Focus Pattern)

Equipment

- Personal Computer
- Finished Inspection JIG (AC 100 V only)
- Lens Adjustment Program (ActuatorChecker)

1. Preparations

1) Connected to equipment with checking lens. (Refer to Section 4-1-3.)
2) Start up of "ActuatorChecker.exe".
3) Click [Set up], and perform the initial setting. (Refer to Section 4-1-4.)

2. Checking Method

1) Click the [Focus Pattern].

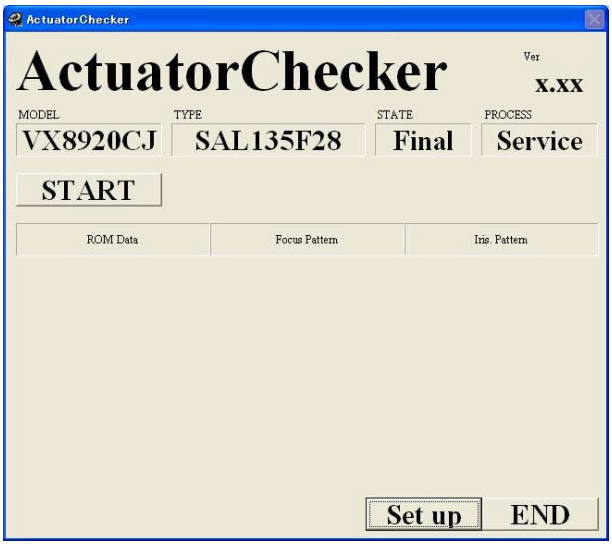


Fig.4-6-2

2) The Serial window appears. Input the lens serial number.

Note: When [OK] is clicked without inputting the serial number, the date executed is displayed on the completion window of each item.

Fig.4-6-3

3) The message "Move FOCUS to Infinity position. Then push [ENTER]." is displayed on the pop-up window.
Set the focus to the Infinity position and press down the ENTER key.

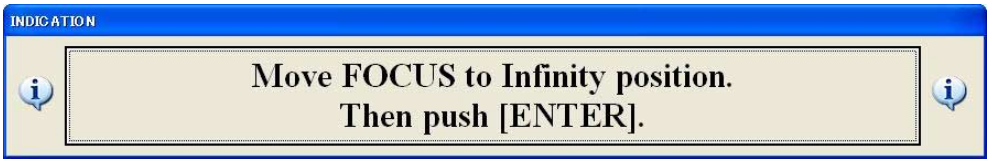


Fig.4-6-4

4) When the Infinity position check finishes normally, the message “Move FOCUS to Near position at about 5sec.” is displayed on the pop-up window.
Set the focus to the near position and press down the ENTER key.

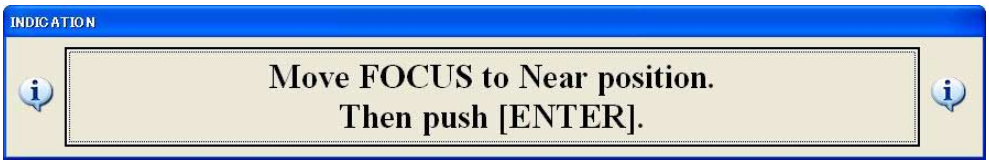


Fig.4-6-5

5) When the near position check finishes normally, the message “Reverse FOCUS to infinity position at about 5sec.” is displayed on the pop-up window.
Set the focus to the infinitly position and press down the ENTER key.

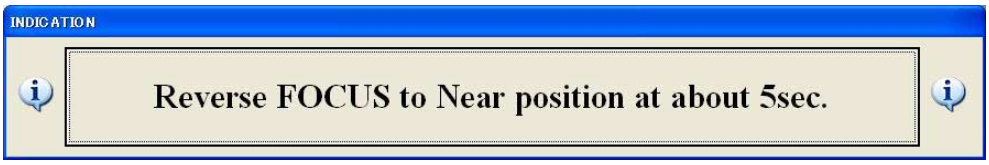


Fig.4-6-6

6) When the infinity position check finishes normally, “OK” is displayed on the pop-up window, and press the ENTER key to return to the initial window.

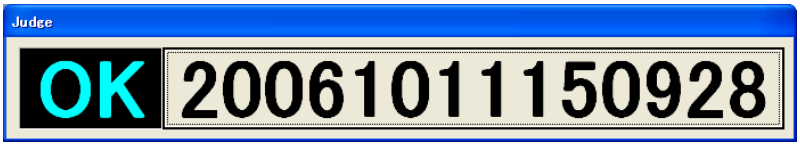


Fig.4-6-7

3. In case of error display in the Focus Pattern (infinity position first try)

1) When the error display and the NG display appear to the pop-up window, press the ENTER key to return to the initial window, and perform “2. Checking Method”again.

Fig.4-6-8

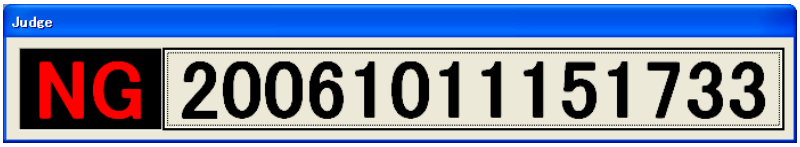


Fig.4-6-9

2) Although the focus is positioned at the infinity position, if “NG” appears, confirm or perform the following.
- Cleaning of flexible pattern or the brush.
- Replacing the brush.
- Replacing the main flexible unit.

3) Perform “2. Checking Method”again, repeat the inspection until “OK” appears on the pop-up window.

4. In case of error display in the Focus Pattern (near position or infinity position (second try))

1) When the error display and the NG display appear to the pop-up window, perform the work with caution so that setting the focus to the near position or infinity position can be done in more than 5 seconds and no more than 20 seconds.

- When the focus pattern error

Fig.4-6-10

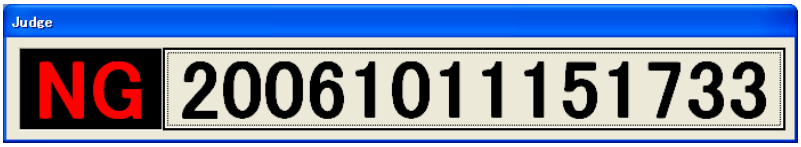


Fig.4-6-11

- When the focus does not reach the near position or infinity position seconds.

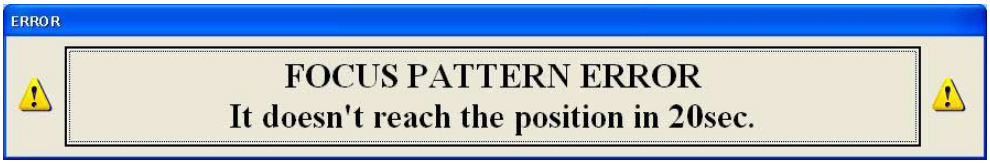


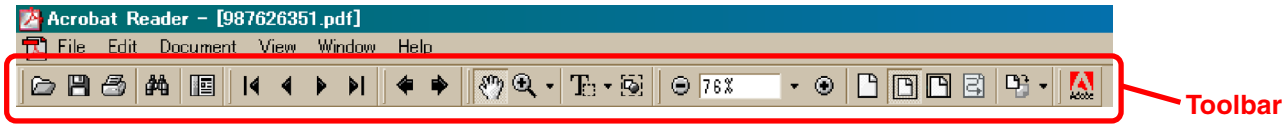
Fig.4-6-12

2) Although the focus is positioned at the infinity position or near position, if “NG” appears, confirm or perform the following.

- Cleaning of flexible pattern or the brush.
- Replacing the brush.
- Rotating operation error of the focus ring (rotation speed is not suitable at a regulated speed.).

3) Perform “2. Checking Method”again, repeat the inspection until “OK” appears on the pop-up window.

[Description of main button functions on toolbar of the Adobe Acrobat Reader Ver5.0 (for Windows)]



Printing a text

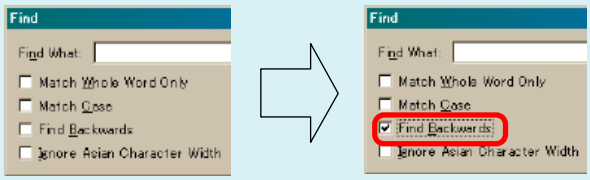
1. Click the Print button .
2. Specify a printer, print range, number of copies, and other options, and then click [OK].

Application of printing:
To set a range to be printed within a page, select the graphic selection tool and drag on the page to enclose a range to be printed, and then click the Print button.

Finding a text

1. Click the Find button .
2. Enter a character string to be found into a text box, and click the [Find]. (Specify the find options as necessary)

Application to the Service Manual:
To execute "find" from current page toward the previous pages, select the check box "Find Backward" and then click the "Find".



3. Open the find dialog box again, and click the [Find Again] and you can find the matched character strings displayed next. (Character strings entered previously are displayed as they are in the text box.)

Application to the Service Manual:
The parts on the drawing pages (block diagrams, circuit diagrams, printed circuit boards) and parts list pages in a text can be found using this find function. For example, find a Ref. No. of IC on the block diagram, and click the [Find Again] continuously, so that you can move to the Ref. No. of IC on the circuit diagram or printed circuit board diagram successively.
Note: The find function may not be applied to the Service Manual depending on the date of issue.

Switching a page

- To move to the first page, click the .
- To move to the last page, click the .
- To move to the previous page, click the .
- To move to the next page, click the .

Reversing the screens displayed once

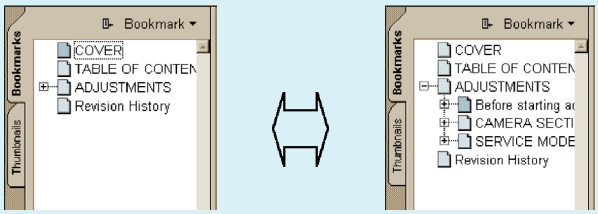
- To reverse the previous screens (operation) one by one, click the .
- To advance the reversed screens (operation) one by one, click the .

Application to the Service Manual:
This function allows you to go and back between circuit diagram and printed circuit board diagram, and accordingly it will be convenient for the voltage check.

Moving with link

1. Select either palm tool , zoom tool , text selection tool , or graphic selection tool .
2. Place the pointer in the position in a text where the link exists (such as a button on cover and the table of contents page, or blue characters on the removal flowchart page or drawing page), and the pointer will change to the forefinger form .
3. Then, click the link. (You will go to the link destination.)

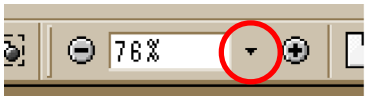
Moving with bookmark:
Click an item (text) on the bookmark pallet. and you can move to the link destination. Also, clicking can display the hidden items.
(To go back to original state, click)



Zooming or rotating the screen display

"Zoom in/out"

- Click the triangle button in the zoom control box to select the display magnification. Or, you may click or for zooming in or out.



"Rotate"

- Click rotate tool , and the page then rotates 90 degrees each.

Application to the Service Manual:
The printed circuit board diagram you see now can be changed to the same direction as the set.

Revision History

Ver.	Date	History	Contents	S.M. Rev. issued
1.0	2006.10	Official Release	—	—
1.1	2006.11	Correction-1 (C1)	• Correction of Repair Parts S.M Correction : HELP 20-4, Page 3-3, 3-5	Yes
1.2	2007.01	Revised-1	• Change of Repair Parts (Section 1-5, Section 2, Section 3) • Change of List of Service Tools and Equlipments (Section 4) • Change of HELP27, HELP30	Yes