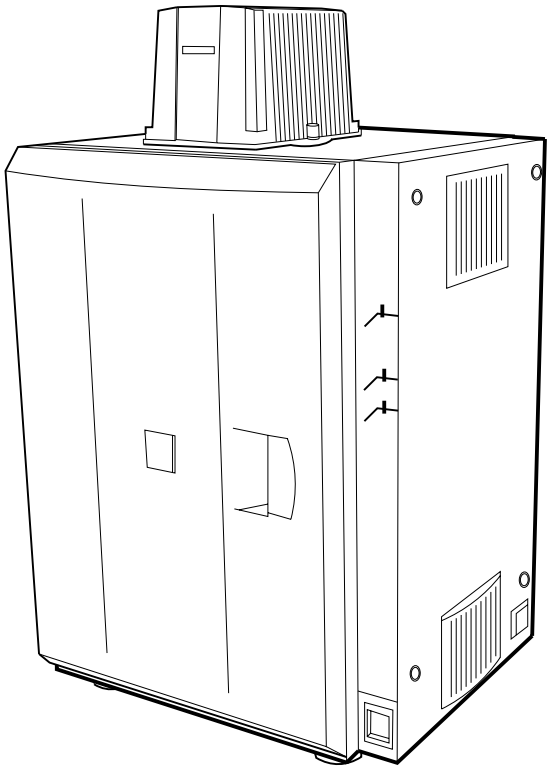
FUJIFILM

LUMINESCENT IMAGE ANALYZER

LAS-4000

Service Manual



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Chapter

A Introduction

B Installation

F Troubleshooting

G Technical Explanations

P After-Sale Service Parts List

NOTES

1) Reproduction of parts or all of the contents of this manual without permission is prohibited.
2) The contents of this manual are subject to change without notice.
3) This manual has been prepared with utmost care. However, if you have any questions of find errors, ommissions, etc., please contact us.

Chapter A. Introduction

This chapter provides an overview of the Luminescent Image Analyzer LAS-4000 System.

This is an image analysis system that detects chemiluminescence, bioluminescence, and fluorescent light with a cooled CCD camera that uses a 3.2 million pixel super CCD.

Chapter A. Introduction

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⚠ WARNING

Touching samples with your bare hands will result in severe physical damage.
Do not touch with your bare hands the parts that reagents are assumed to have attached to.

1 OVERVIEW

1.1 Scope of Applications

This manual explains installation and maintenance procedures for the LAS-4000 System.

(1) Devices this manual applies to:
FUJIFILM LAS-4000 Camera Head, Intelligent Dark Box, LED Unit and Image Reading Software.

(2) Reference manuals:
FUJIFILM LAS-4000 Operation Manual
FUJIFILM LAS-4000 Product Specifications
FUJIFILM LAS-4000 Installation Guide

1.2 Identification Labels

Labels and their locations on the equipment are shown in Figs. A.1, A.4 and A.5.

1.3 Precautions during Servicing

1.3.1 Maintenance

(1) This manual contains the repair procedures applicable in the field service. FUJIFILM Corporation shall not be responsible for any consequences of repairs attempted or actually completed by any unauthorized person other than our qualified technical service personnel to any part not covered in the repair procedures contained herein, or by any method other than those specified herein. Therefore, be sure to follow the instructions contained herein for proper maintenance.

(2) The field service for camera head and camera lens is limited to some mechanical parts. For any fault in the electronic circuit or any repair requiring optical alignment, return the faulty unit with the description of the fault to Life Science Products Div. of FUJIFILM Corporation. For all units except the camera head and camera lens, repairs and/or replacement are available in units of component part.

1.3.2 Optical Parts (Glass Material)

To maintain proper image quality, observe all cautions concerning optical parts.

(1) Never touch the optical parts Camera lens surface, camera head optical window, fluorescent filter, window material of the excitation light source) with your bare hands. Be sure to wear lint-free cotton gloves or other proper equipment.

(2) Use an air blower available on the market to blow off all dirt, dust, etc. If you mistakenly touch the lens glass or the like with your bare hands, use a lens cleaner solution that is available on the market and, with lens cleaning paper, gently wipe off the surfaces touched quickly. If touched surfaces are not cleaned, the sebum left on them will degenerate and become not only difficult to remove but a cause of mold as well.

(3) Remove the protective caps attached to the camera head and camera lens when unit installation work is completed, as a rule. Before removing units, make sure to first attach the caps. In keeping, customers should store these caps carefully.

(4) Do not unnecessarily loosen or securely tighten fixing screws or tie rings, or optical part performance will deteriorate severely.

(5) The glass used in the White-DIA tray is opal glass. Handle it with special care, though it is equivalent in strength to typical white sheet glass.

1.3.3 Optical Parts (Resin Material)

(1) Handle the calibration plate in a manner similar to glass optical parts and store it in a protective bag used for shipping, because scratches or dirt on the calibration plate reflect on the flat frame resulting in the damage of recorded image.

(2) If scratches or dirt on the calibration plate are conspicuous, replace with new one and remake the flat frame.

(3) The UV-DIA tray is made of PMMA (acrylic resin). Due to the nature of the material, it is not avoidable that the tray will be discolored or degraded by the UV irradiation over time. Replacement after about 1000 times of irradiation is recommended. The surface can be damaged very easily. Do not wipe with dry cloth.

1.3.4 LED
* With interlock released

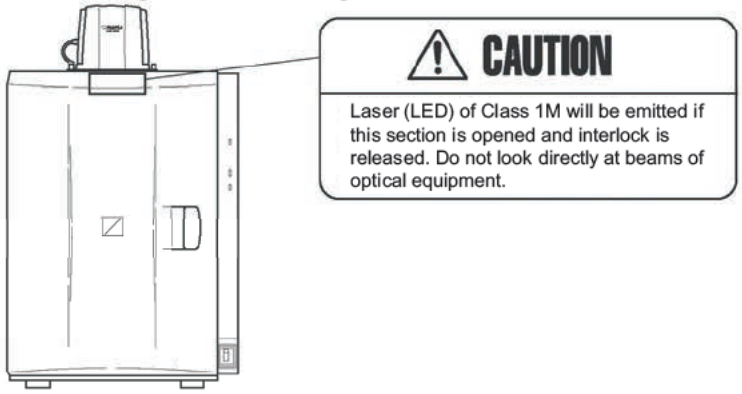
(1) LED emission safety
In the intelligent dark box ("IDX" hereafter), 204 LED at the maximum is used in the EPI illuminator unit (incident-light type) and 57 in the DIA illuminator unit (transmitted-light type), thus the dark box is considered as Class I light source. However, unlike with the laser, simply follow the instructions given in this Service Manual and there will be no hazards.

(2) General LED emission exposure cautions
The LED illumination used in the LAS-4000 should not be lit unnecessarily except for confirming connection. Do not attempt to stare at the glowing LED light source.

This product is classified as Class 1 Laser (LED) (IEC60825-1+A2:2001) Product.

Lasers (LEDs) used in this product

Blue incident light source	Wavelength	460nm	Class 1
Red incident light source	Wavelength	630nm	Class 1
Green incident light source	Wavelength	520nm	Class 1
Near-red incident light source	Wavelength	710nm	Class 1
Ultraviolet incident light source	Wavelength	365nm	Class 1M (⚠ Caution: Do not look directly at beams of optical equipment.)
White incident light source	Wavelength	470 - 740nm	Class 1
White transmitted light source	Wavelength	470 - 740nm	Class 1



⚠ **CAUTION** Use of controls or adjustments or performance of procedures other than those specified here in may result in hazardous radiation exposure.

1.3.5 UV light source
* With interlock released

(1) UV emission safety
The UV light source emits the UV ray of a maximum output of 10 mW (or less) at a central wavelength of 312 nm. Keep away from exposure to the UV ray. The UV ray can damage the eyes and skin (including ophthalmia (eye inflammation), impaired eyesight and early skin aging or canceration). It can also cause allergy or allergic reaction in the eyes and/or skin. Never attempt to stare at the light source. Use of any drug or cosmetics can increase the sensitivity to the UV radiation. If you have been taking any drug, you have a history of dermatopathy in the past, or you are assumed sensitive to the sunlight, consult a doctor before operating this system. When the light source is glowing with the door left open, remember to wear proper protective equipment (full-face protective mask, gloves, etc.).

(2) General UV emission exposure cautions
The UV illumination used in LAS-4000 should not be lit unnecessarily, except for confirming connection. To check the lighting condition of the illumination, proceed as follows: Install the frame with the excitation filter as in the original condition, place a correcting or resin plate tightly on the excitation filter, wear proper protective equipment, turn ON the illumination and then check the illumination in a short period of time through the resin plate.

1.3.6 Precision Part (Shutter)

Because the LAS-4000 mechanical shutter has been made extremely thin, it is easy to break. Therefore keep your fingers and other foreign materials away from the opening in the mechanical shutter.

1.3.7 Electrically-powered components (lifter unit and rotary unit)

(1) Never put any material or hands below the lifting table while the system is energized.

(2) Keep away from the filter turret while the system is energized.

1.3.8 Other General Precautions

The general precautions to observe during service work are listed below. Always observe the important precautions described in this service manual for individual work.

(1) To avoid hazards and part destruction, be sure to disconnect the AC cable from the plug receptacle, when installing or removing units and cables.

(2) Wipe outside dirt off using a dry soft cloth. For dirt that is hard to remove, wipe it off with a cloth slightly dampened with neutral detergent and then wipe it again with a dry cloth. Do not use organic solvents, such as alcohol, benzene and/or thinner, because they may deteriorate the outside and/or peel off the paint.

(3) To prevent careless damage to the transmitted-light unit and tray glass, remove the transmitted-light unit and trays from the dark box before performing camera head and camera lens installation and removal work.

(4) If you will be handling parts to which fluorescent samples and/or fluorescent dyes have adhered, make sure to wear rubber gloves.

(5) To clean the dark box interior, use a non-fluorescent cleanser for biochemical use. If a neutral cleanser for household use is used, the cleanser residue could produce fluorescence at time of fluorescent image recording.

(6) Before starting work, take accurate note of the customer's system setting conditions and make sure to thoroughly restore them when recovering the system.

(7) The component parts of this system will be industrial wastes. Dispose of them in accordance with applicable national and/or local laws and regulations.

(8) After delivery, leave the service parts for an adequate period of time until they become stabilized to room temperature before unpacking and installation to eliminate possible dew condensation.

(9) Be cautious when tightening screws near the harness not to catch the harness with the screws.

2 SYSTEM COMPONENTS

2.1 Components

2.1.1 Image Input Unit LAS-4000 Full System

No.	Item	Q'ty	Remarks
1	Camera Head	1	with 2 dedicated screws
2	F mount adapter	1	Optional
3	Intelligent Dark Box	1	
4	High-sensitivity lens (VRF43LMD)	1	
5	Wide viewing angle lens (Sigma 24mm F1.8 recommended, Nikkor 24mm F2.8)	1	
6	Transmitted UV light unit	1	
7	Transmitted white light unit	1	
8	EPI tray	1	
9	White-DIA tray	1	
10	UV-DIA tray	1	
11	NP tray	1	
12	AC POWER cable	1	Enclosed in the product package for Japan and for North America
13	USB cable	1	
14	Filter changer	1	with lens hood
15	Calibration plate (2 models)	2	One each for EPI and DIA * The calibration plate for EPI (green and red) is attached to the green incident-light unit and the red incident-light unit.
16	Optical filter	7	Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785 * Y515-Di is enclosed for the blue incident light source. * 575DF20 is enclosed for the green incident light source. * L41 is enclosed for the UV incident light source. * R670 is enclosed for the red incident light source. * 605DF40 is enclosed for the UV transmitted light source. * IR785 is enclosed for the near-red incident light source.
17	Operation Manual	1	
18	Reading software "Image Reader" (Mac/Win)	1	CD-R
19	Blue incident-light unit	1	Optional
20	Green incident-light unit	1	Optional
21	Red incident-light unit	1	Optional
22	Near-red incident light unit	1	Optional
23	UV incident light unit	1	Optional
24	Calibration plate	1	Optional For EPI (green and red) * The calibration plate for EPI (green and red) is attached to the green incident-light unit and the red incident-light unit.
25	Optical filter	7	Optional Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785

(For models used in Japan)

2.1.2 Analyzing Unit

No.	Item	Q'ty	Remarks
1	Analyzing Computer	1	(Macintosh/ IBM PC compatible)

* Use a PC attached with IEC/UL60950 mark (when used outside Japan).

2.2 Functions

(1) Various types of biochemical image recording or image analysis using the analysis software, focusing on nucleic acid and protein analysis, can be conducted using a chemical luminescence substrate or a fluorescent luminescence substrate.

(2) Provides dynamic range of up to 4 orders on one screen and linearity in all areas. With this special feature, quantification measurement can be done from images.

(3) With the combination of a high-sensitivity CCD camera and large-aperture lens, the chemical luminescence method provides detection capability equivalent or superior to that of the conventional X-ray film method, in a short exposure time.

(4) With the excitation by blue, green, Red IR, and UVLED light sources, fluorescent-stained gels, membranes, etc., can be read at high sensitivity.

(5) Digitizing with transmitted- and incident-light using white light source can be conducted.

(6) Reading of dye-stained gels using UV light source can be conducted.

2.3 Specifications

2.3.1 Performance Characteristics

(1)	Camera head:	3,200,000-pixel cooling CCD camera and 2,048 x 1,536-pixel on-chip micro lens are used.
(2)	Cooling temperature:	-30°C (28°C or less of room temperature)
(3)	Reading noise:	30e- (rms) or less (at -30°C)
(4)	Dark current noise:	0.03 e-/pixel-sec or less (at -30°C)
(5)	Number of gradations:	At the time of image recording: 16 bits At time of focalization: 8 bits
(6)	Time of exposure:	1/100 sec - 30 hr
(7)	Focusing:	Approx. 5 frames/sec
(8)	Shading correction:	Software system
(9)	Reading Size:	11.5cm x 7.5cm - 21cm x 14cm (URF43LMD) 24cm x 16cm - 25cm x 25cm (Sigma 24mm F1.8, Nikkor 24mm F2.8)
(10)	Dynamic range:	3.6 orders
(11)	Maximum image capacity:	12MB (full-size images)

2.3.2 External Dimensions and Weight

Name		Dimensions (Width x Depth x Height)	Weight
Image input unit	Camera head	180mm X 250mm X 170mm	3.4 kg
	Camera lens	180mm X 210mm X 170mm	4.8 kg
	Intelligent Dark Box	510mm X 480mm X 730mm	49 kg
	Filter changer (including three types of filters)		
	Transmitted UV light unit	322mm X 313mm X 87mm	3.2 kg
	Tray		
	Total weight after installation (excluding the Analyzing Unit)		57.2 kg

2.3.3 Power Requirements

(1)	Input voltage	100 - 240 V ~
(2)	Allowable variation in voltage	±10%
(3)	Phase	Single (with 3P grounding pole)
(4)	Power frequency	50-60 Hz
(5)	Rated current	3.0-1.5 A

2.3.4 Physical Environment

(1) Operating Environment
Temperature: 15 to 28°C (ΔT < 10°C/h)
Humidity: 30 to 70%RH (no dew condensation, ΔRH < 30%/h)

(2) Non-operating Environment
Temperature: -10 to 60°C
Humidity: 20 to 95% RH (no dew condensation)

(3) Transit/Storage Environment
Temperature: -25 to 70°C
Humidity: 5 to 100% RH (no dew condensation)

(4)	Atmospheric pressure	860 - 1,060 hPa
(5)	Place of use	Indoors
(6)	Operating maximum altitude	2000 m or less
(7)	Overvoltage category	Category II
(8)	Applicable pollution rating	Pollution Degree 2

2.3.5 ⚠ AC power cable

- Japan
  Use the cable included in the product package.
- North America
  Use the cable included in the product package.
- Other countries
  No AC power cable is included in the product package.
  Use a proper power cable that complies with the local laws and regulations.

<Cable specifications required for LAS-4000>

Power voltage: 100 - 120 V
Plug/connector: AC125 V
Cable: SJT3x16AWG 60°C
Power cord length: Maximum 3m

Power voltage: 200 - 240 V
Plug/connector: AC250 V 10 A
Cable: CENELEC OC3x1.0 mm^2 70°C
Power cord length: Maximum 3m

3 INSTALLATION CONDITIONS

3.1 Layout Conditions

3.1.1 Installation spaces

The following spaces must be secured for maintenance and inspection of the LAS-4000:

Operation side	600 mm
Right side	600 mm
Left side	600 mm
Opposite to operation side	200 mm
Upper	1000 mm

3.1.2 Other conditions

(1) Take the flow of works and necessary ancillary facilities into consideration, and determine the layout in the installation site properly.
(2) Carry out the necessary construction, electrical facility and air conditioning facility works in advance.
(3) No heat-generating object must be on the left of the LAS-4000, since the rear side panel has an air inlet fan, even if the environmental conditions are met. Select a proper installation position.
(4) Do not install the LAS-4000 near a window in order to avoid the direct sunlight. Equip each window with a blind.
(5) Do not put obstructions near the receptacle so that the power cable can be easily unplugged from the receptacle in case of emergency.

3.2 Installation Conditions

3.2.1 Table rigidity

Install the LAS-4000 on a horizontal floor that withstands 981 N/m^2 (100 kg f/m^2) or more.

3.2.2 Table vibrations

(1) Vibrations and shocks (Operating)
Vibrations 0.03 G (5 to 60 Hz)
Shocks 1 G
(2) Vibrations and shocks (Non-operating)
Vibrations 0.4 G (5 to 60 Hz)
Shocks 2 G

3.2.3 Tools used

Screw driver (plus)
Screw driver (minus)
Nipper

3.3 Environmental Conditions

3.3.1 Temperature and humidity conditions (Operating)

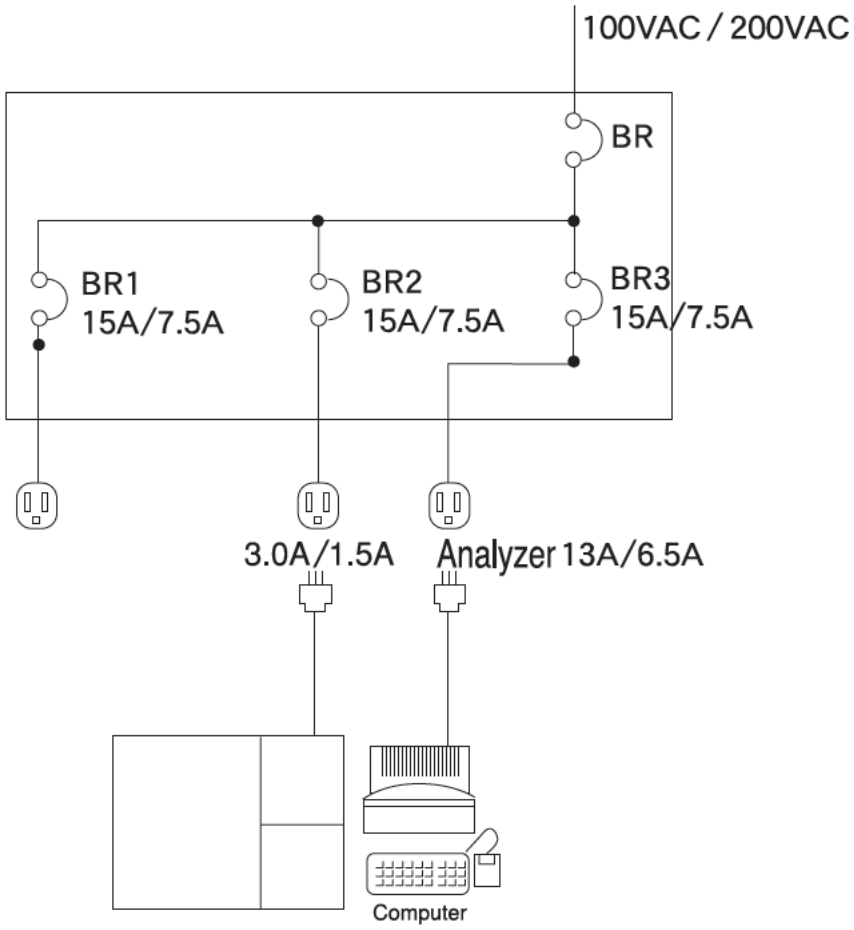
(1) Temperature 15 to 28°C
(2) Humidity 30 to 70% RH (No dew condensation)
Take appropriate countermeasures to improve the facilities if these conditions are not met.

3.3.2 Conditions of installation site

(1) Avoid a place subject to remarkable temperature changes.
(2) Avoid a place near a heat-generating object such as a heater.
(3) Avoid a place subject to water leak or submergence.
(4) Avoid a place subject to exposure to corrosive gas.
(5) Avoid a dusty or dirty place.
(6) Avoid a place to which vibrations or shocks are always applied
(7) Avoid a place exposed to the direct sunlight
(8) Do not install on an unstable surface.
(9) Install in a well ventilated area.

3.4 Power Supply Facilities

(1) Input Voltage 100 - 240 V~
(2) Phases Single phase
(3) Frequency 50 / 60 Hz
(4) Power consumption • 3.0 - 1.5 A
• PC System 13 A (100 VAC) / 6.5 A (200 VAC)
(5) Grounding D grounding. It is necessary to connect the AC cable of this equipment with a 2P + E type AC outlet for the safety of human bodies, external noises protection and stable operation. The AC outlet requires D grounding according to the electrical facility engineering standards.
(6) Connection example



3.5 Transportation Route

(1) Secure a route of carrying in the LAS-4000 (including an entrance, corridor before the entrance, corners of the corridor and elevator) with consideration of the outside dimensions and weight shown in 2.3.2.

(2) Entrance size
500 mm wide (Equipment width: 480 mm) x 1200 mm high or more
(The entrance width must have 20 mm or more allowance. Otherwise, it is impossible to carry in the equipment due to inclination, etc.)
Check the following:
Is it necessary to remove the door? May it be removed easily? Is it necessary to expand the entrance? May it be expanded easily? (Partitions, structure, etc.)

(3) Securing the passage
(a) Is the equipment installed on a floor other than the first floor?
(b) Is an elevator available?
Elevator size and capacity (It is possible to carry the equipment unless the elevator is extremely small.)
(c) Is a crane used to carry the equipment?
To what floor?
How about the window size?
May the window be removed easily?
Is the window free from eaves or other obstacles above it?
Aren't there electric wires or other obstacles?
Isn't the atmosphere dusty?
(d) Is there a large bump?
How high the bump is?
How about the shape of the bump?
(e) Isn't there a slope?
What gradient does the slope have? (How high in mm per the horizontal length in mm?)
(f) Isn't there a narrow part halfway?
Use a paper pattern or the like to make sure that the passage is wide enough.
(g) Is it possible t park the truck aside the entrance?
(h) Is it necessary to take special countermeasures for carrying in the equipment?

IMPORTANT List up all objects that may be obstacles when carrying in the equipment.

3.6 Precautions for Unloading, Unpacking and Carrying-In

(1) Do not apply any force to the front panel of the unit.
(2) The unit incorporates precision optical parts. Be very careful not to apply any shocks to them.
(3) The UV transmitted light source incorporates a fluorescent lamp. Be very careful not to apply any shocks to it.

3.7 Check List

No.	Items	Check
1	Installation space	☐
2	Table rigidity	☐
3	Floor levelness	☐
4	Vibrations of the floor	☐
5	Environmental conditions	☐
6	AC power facilities	☐
7	Carrying-in route	☐

4 PART NAMES

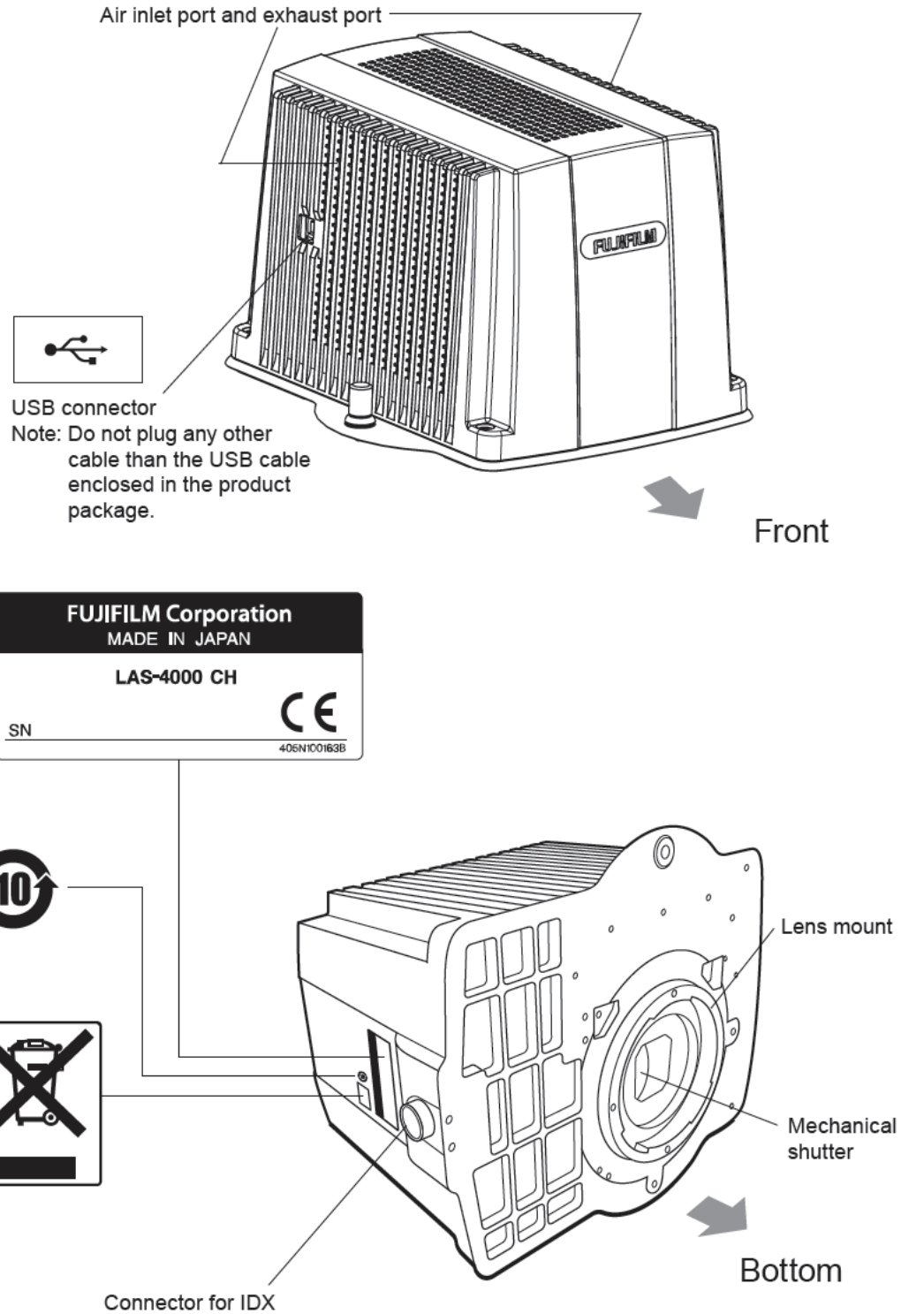


Fig. A.1 Camera head

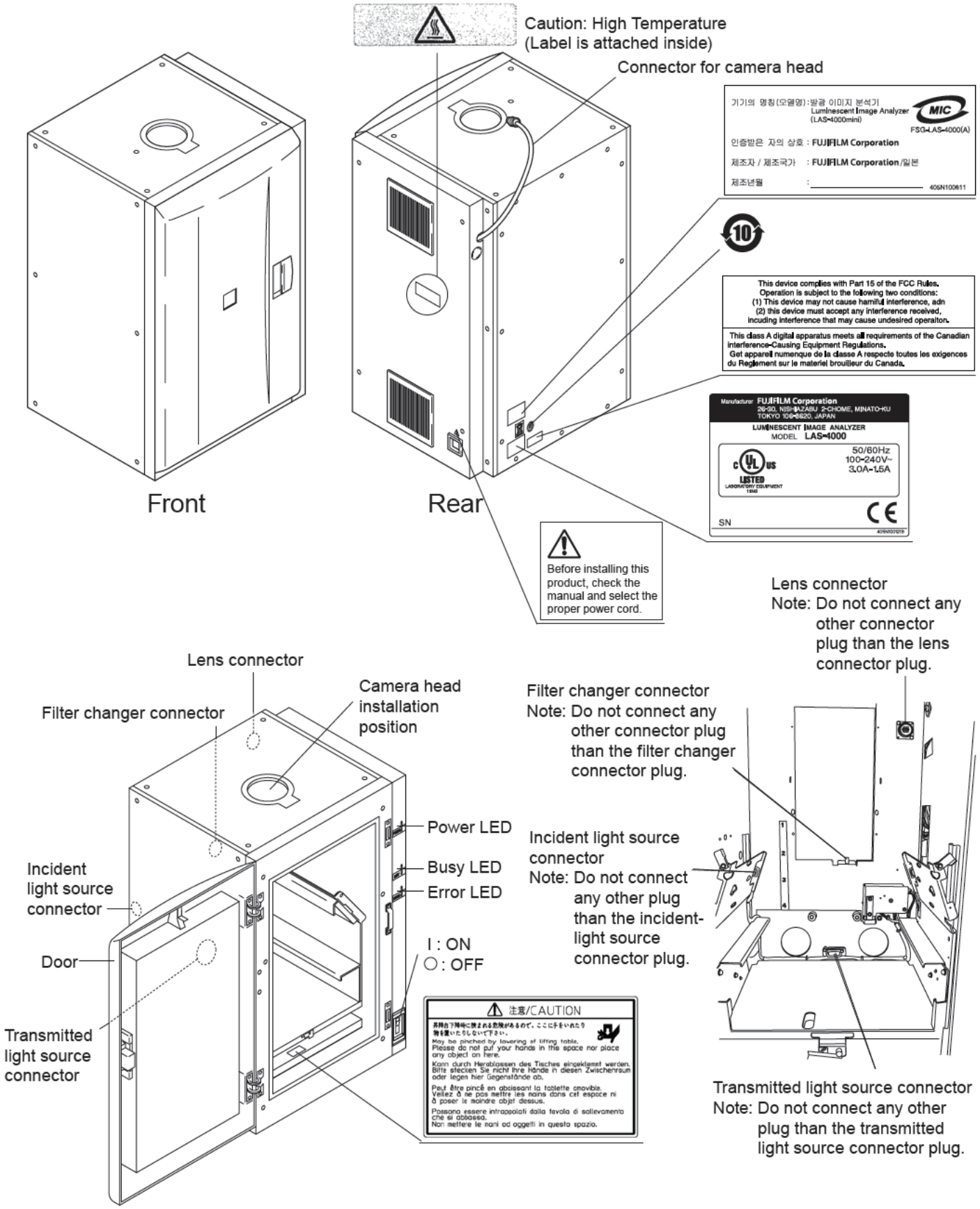


Fig. A.2 Intelligent dark box

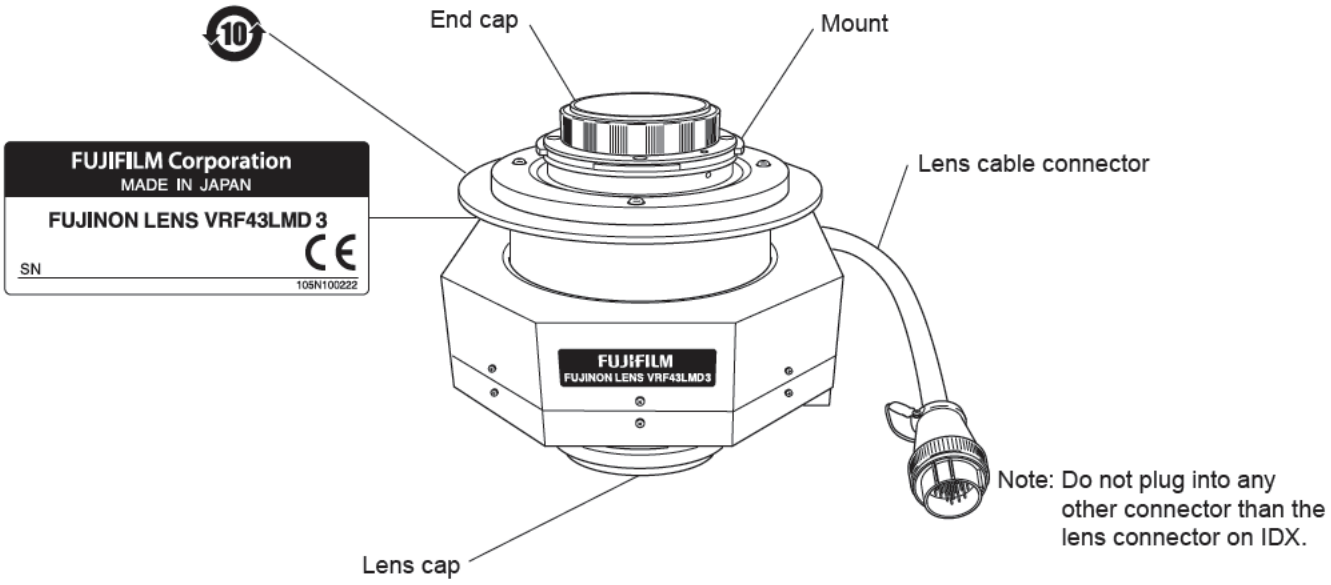


Fig.A.3 Camera lens unit

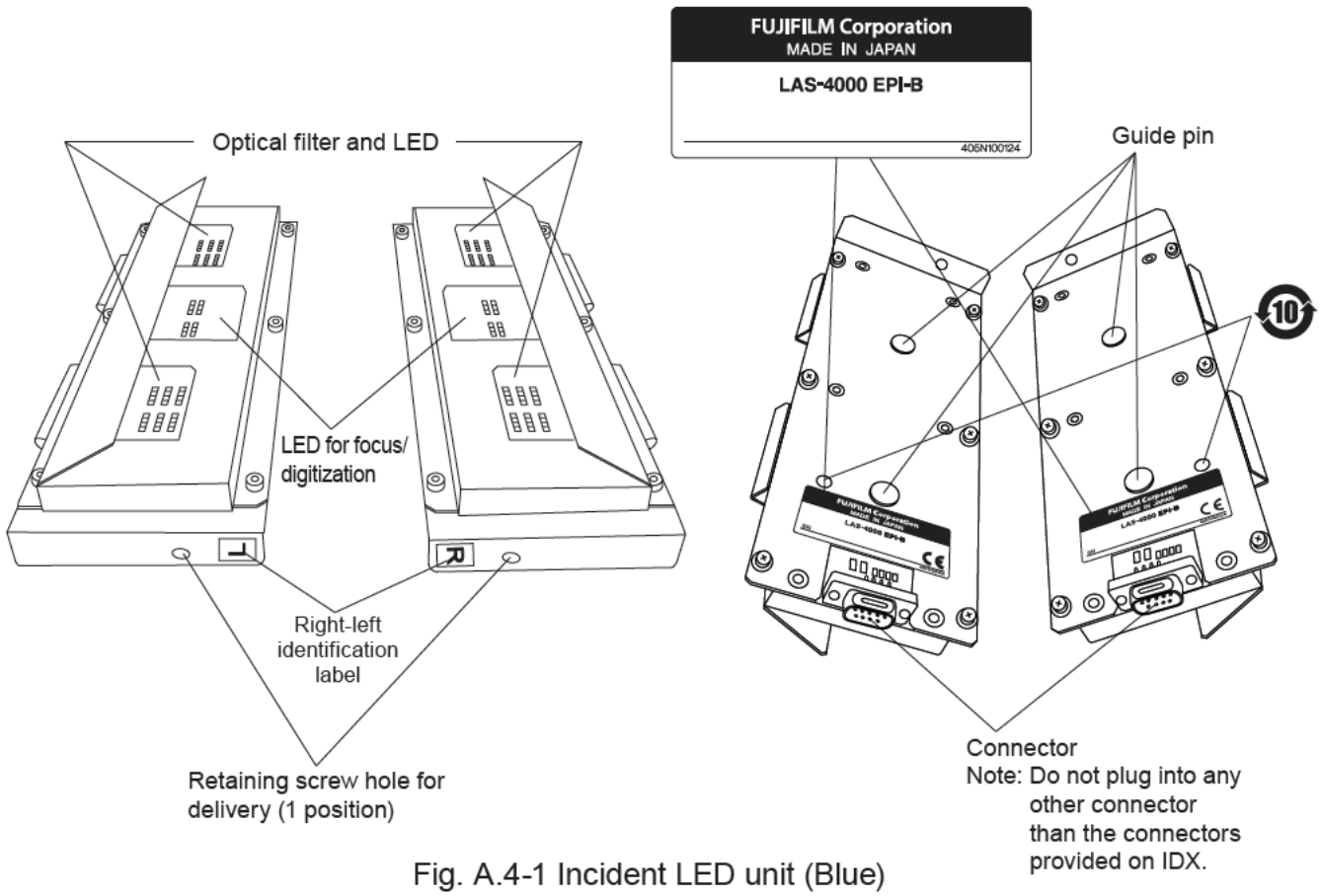


Fig. A.4-1 Incident LED unit (Blue)

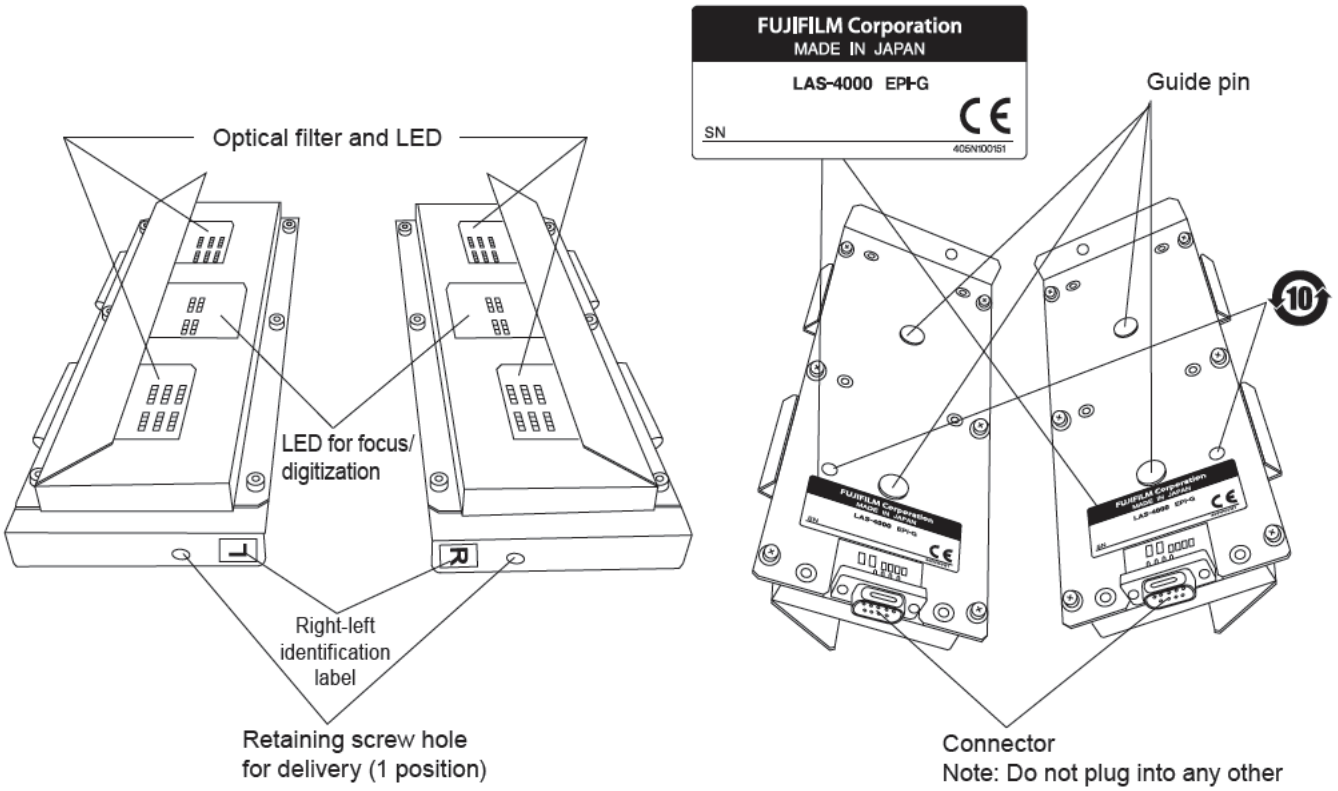


Fig. A.4-2 Incident LED unit (Green)

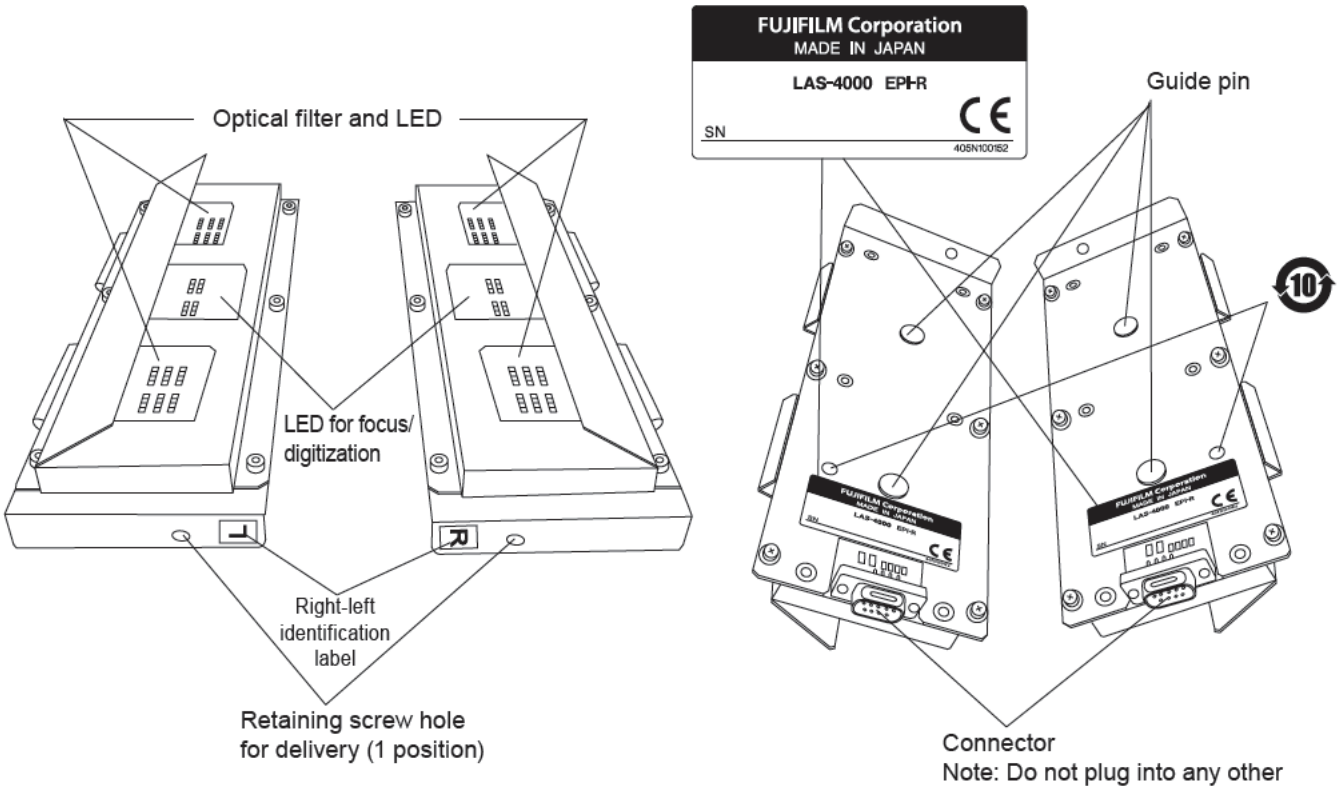


Fig. A.4-3 Incident LED unit (Red)

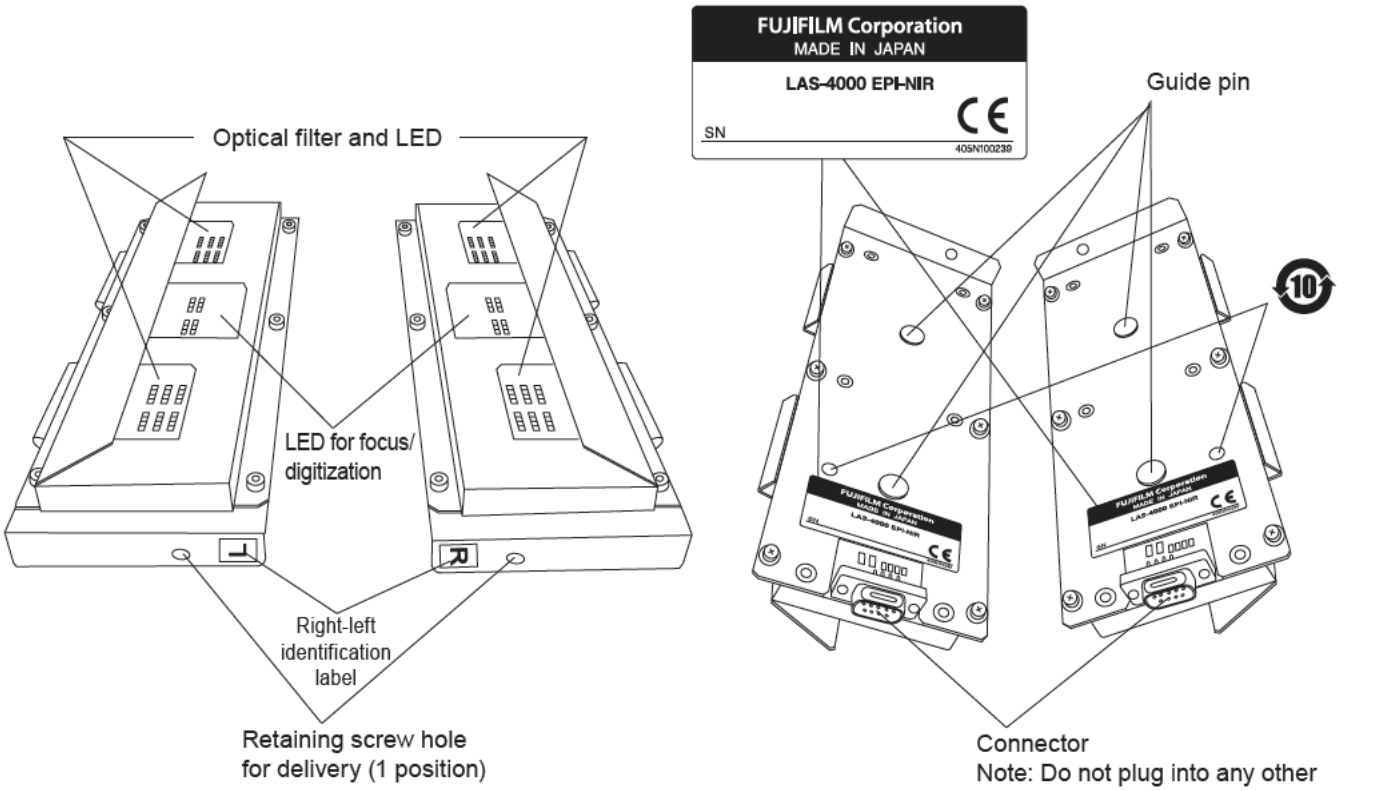


Fig. A.4-4 Incident LED unit (NIR)

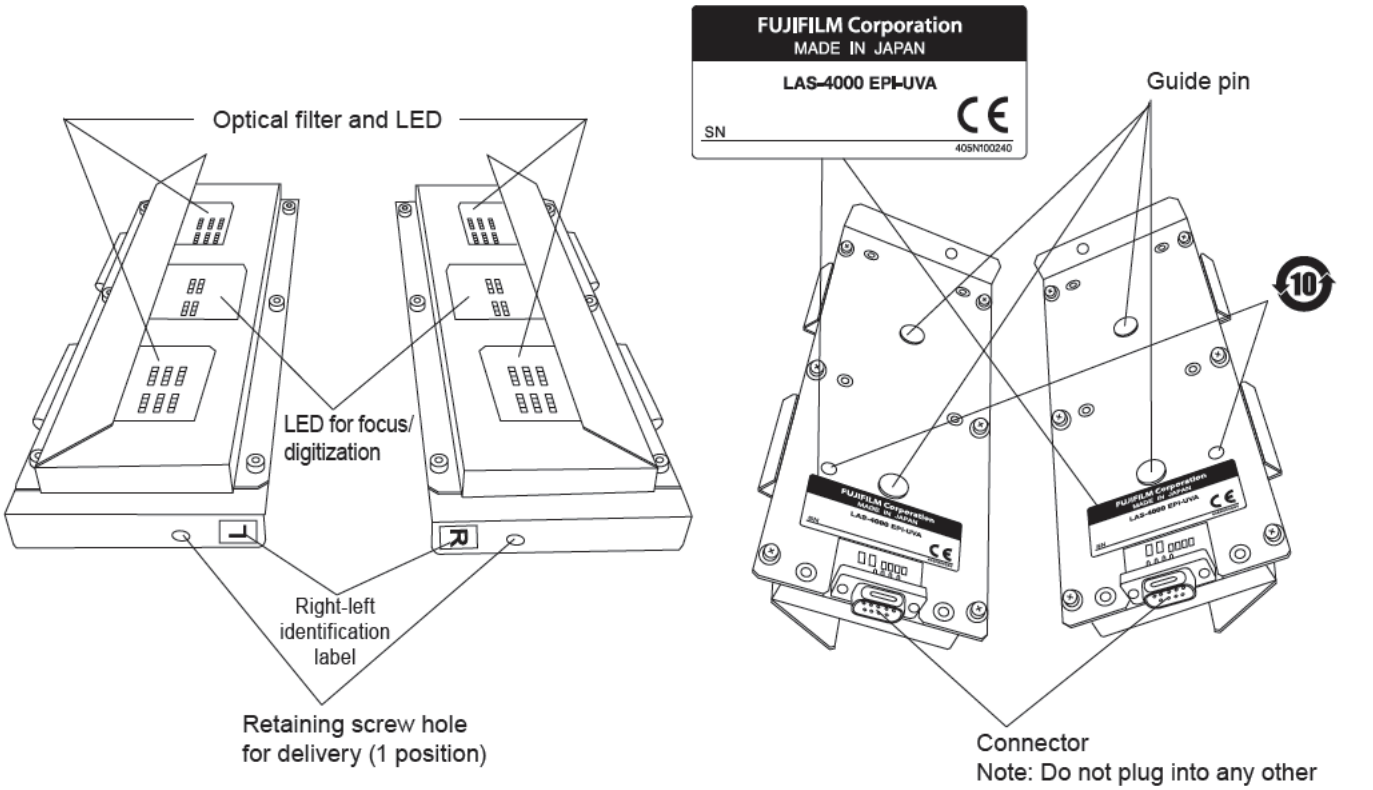


Fig. A.4-5 Incident LED unit (UV)

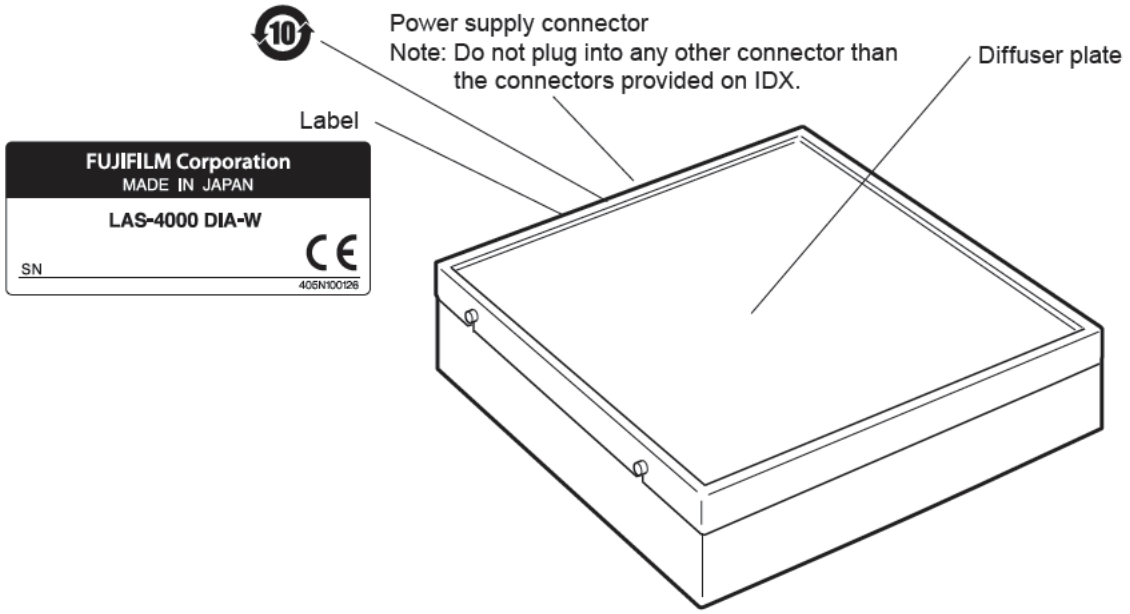


Fig. A.4-6 Transmitted white LED unit

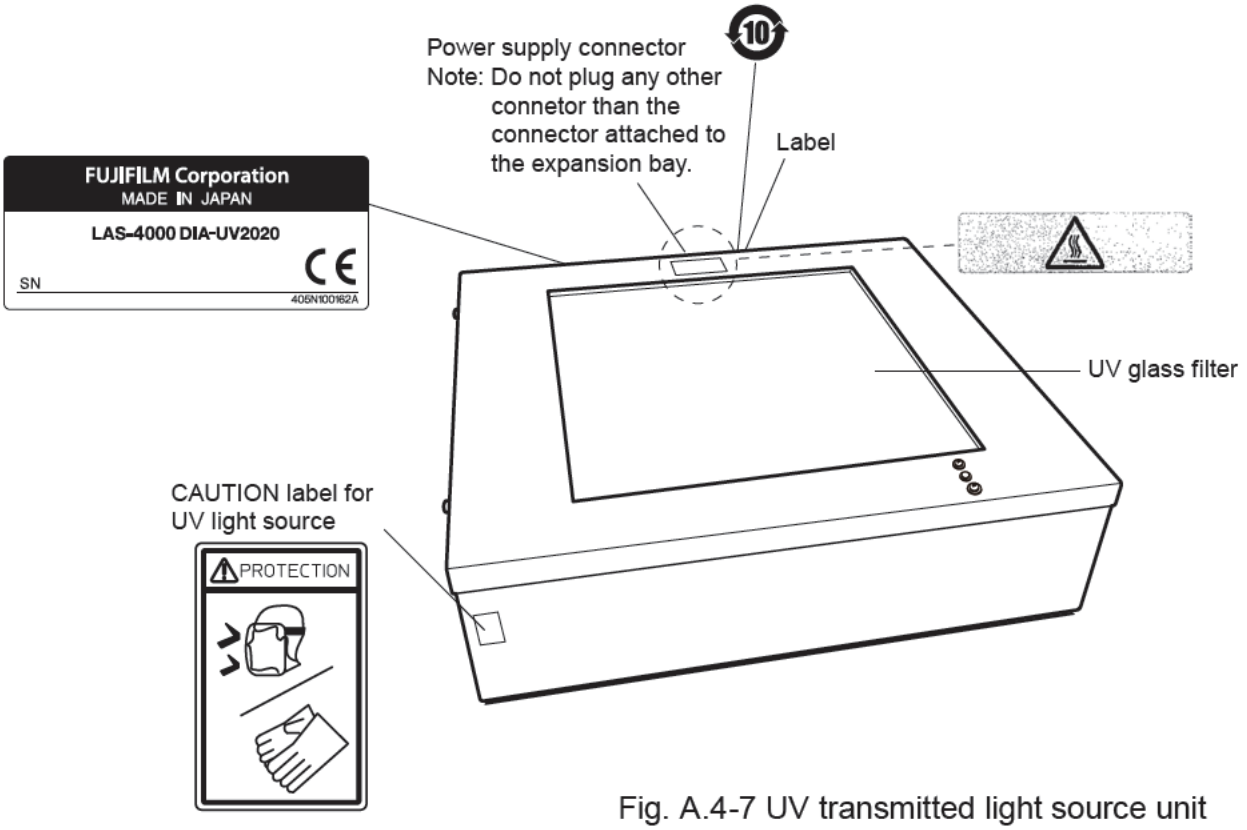


Fig. A.4-7 UV transmitted light source unit

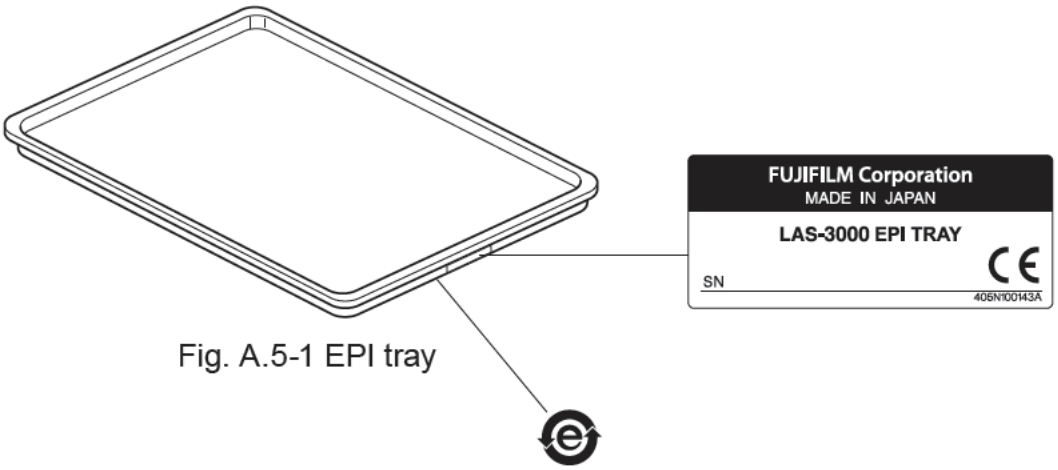


Fig. A.5-1 EPI tray

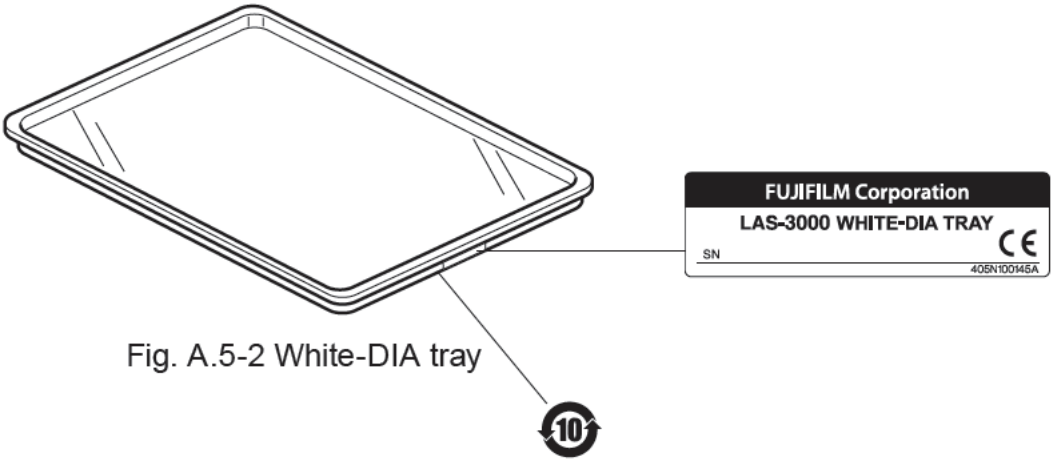


Fig. A.5-2 White-DIA tray

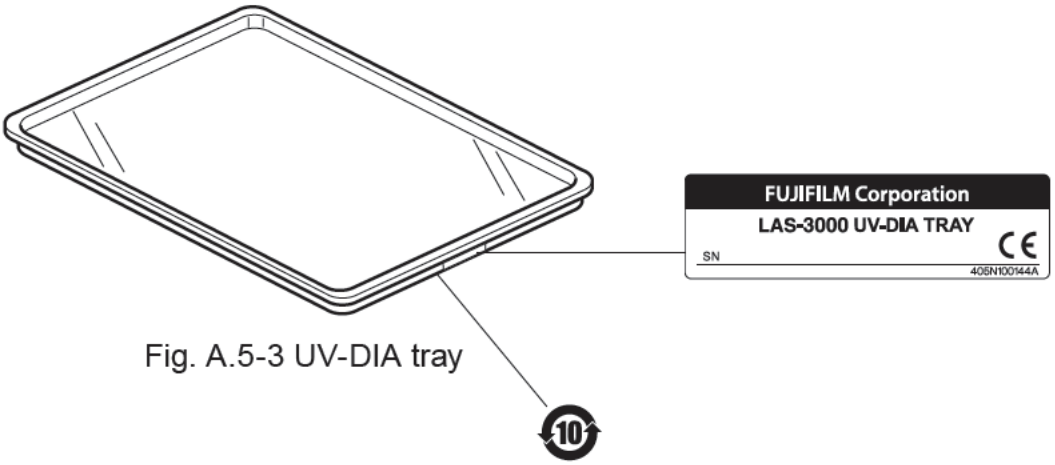


Fig. A.5-3 UV-DIA tray

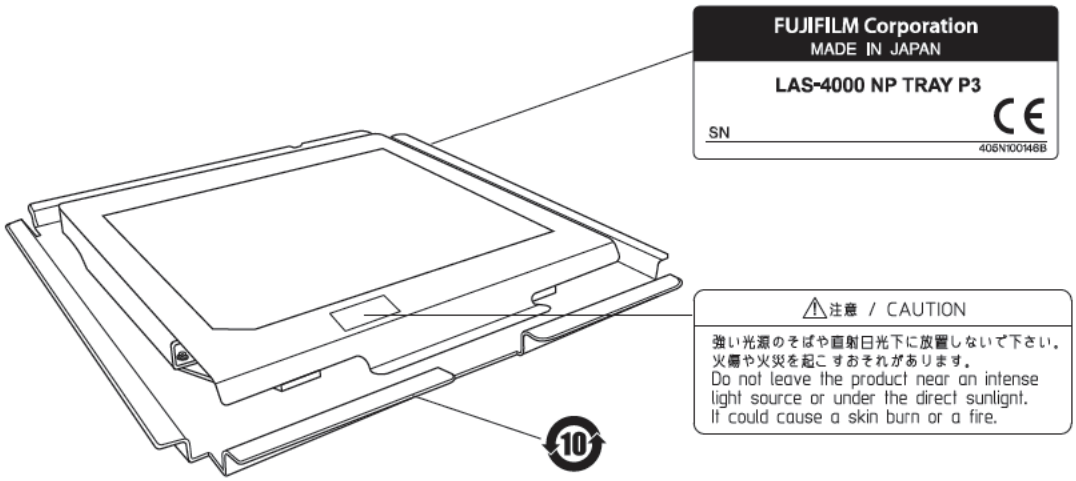


Fig. A.5-4 NP tray

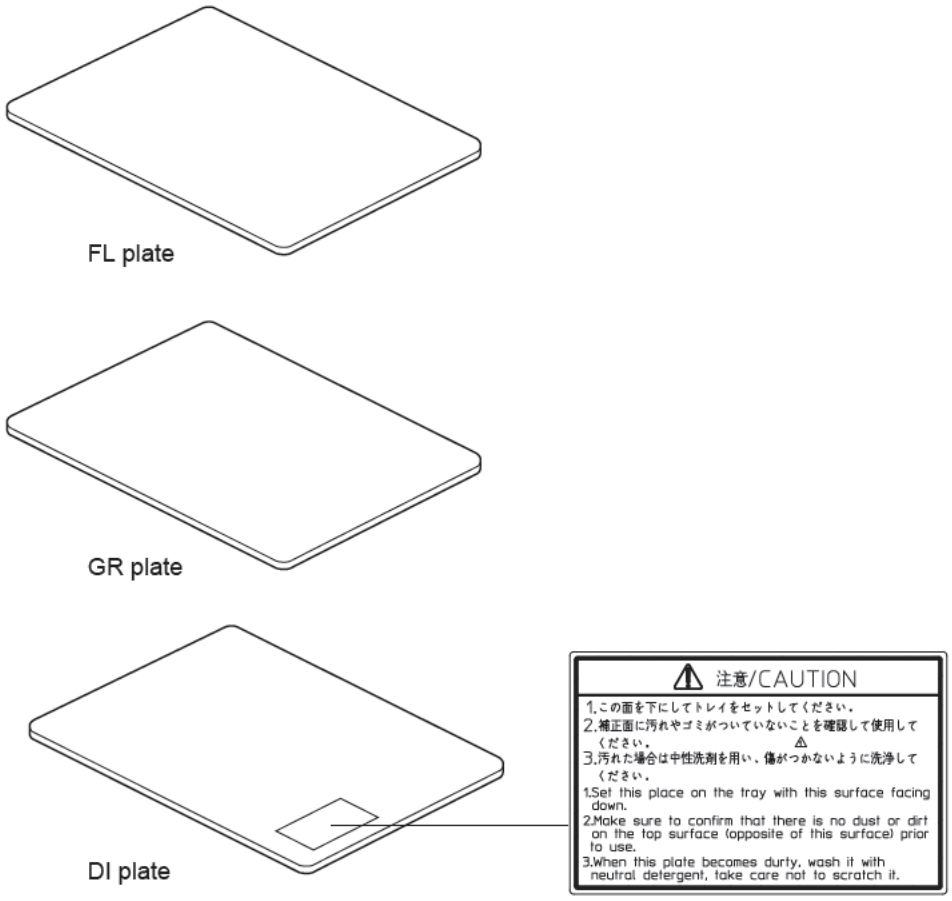


Fig. A.5-5 Calibration plate (3 types)

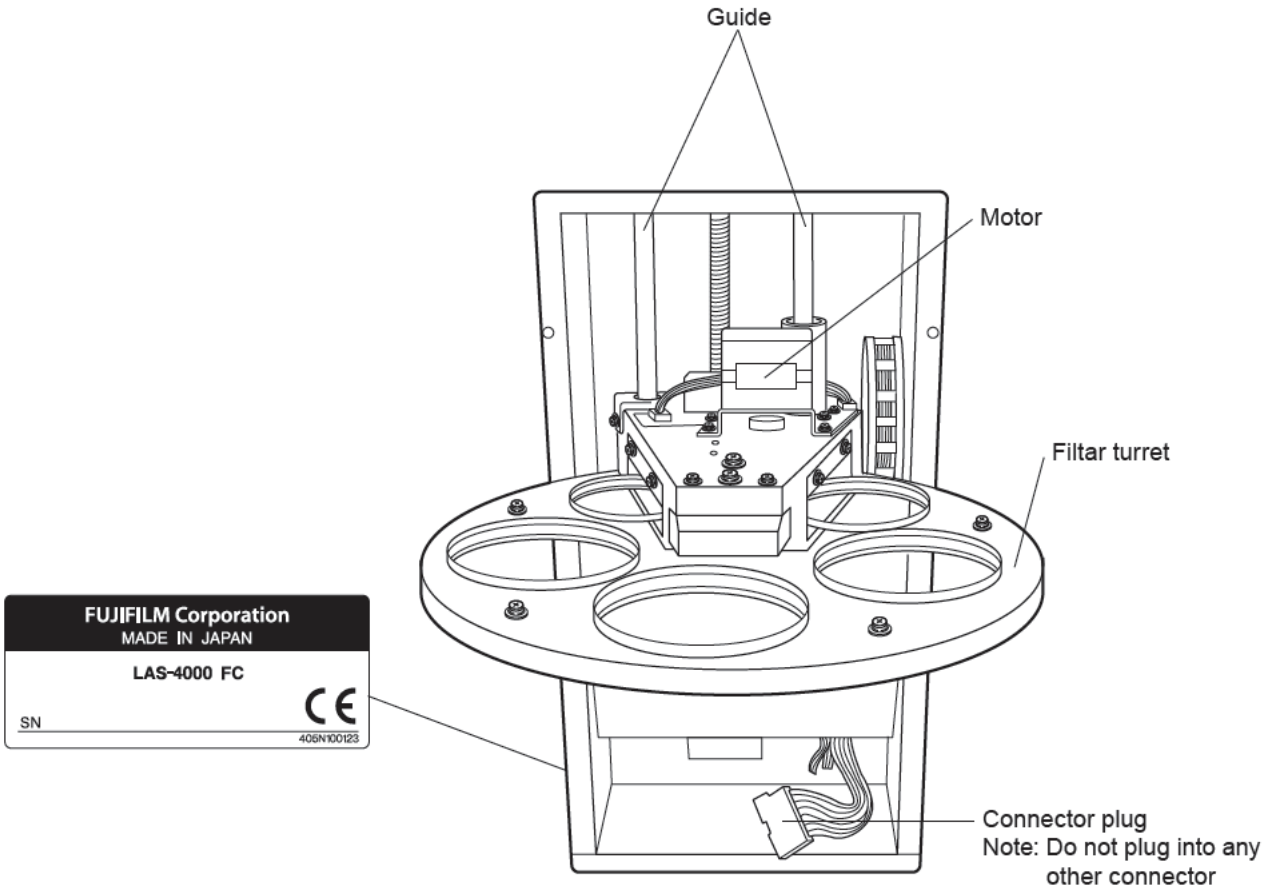


Fig. A.6 Filter changer

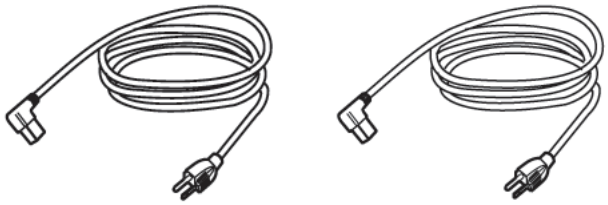


Fig. A.7 Cable



Fig. A.8 Fluorescent filter

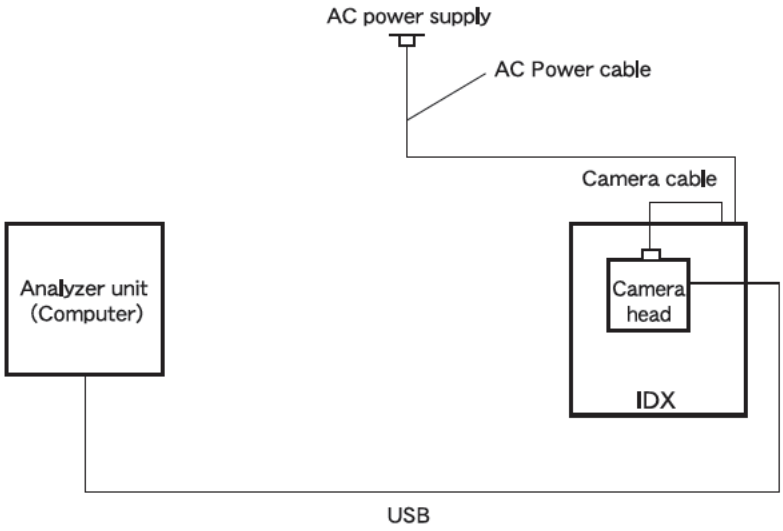


Fig. A.9 Standard system configuration

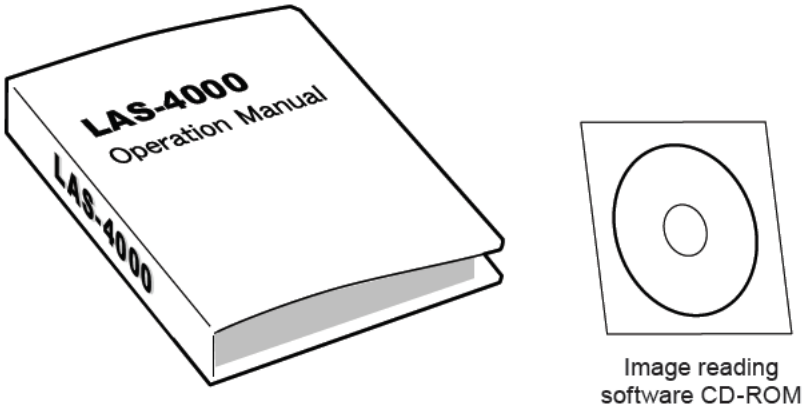


Fig. A.10 Operation manual

Chapter B. Installation

This chapter presents the specifics of equipment installation.

Chapter B. Installation

Contents

1 INTRODUCTION B-1

2 COMPONENTS B-2

3 INSTALLATION PROCEDURES B-4

4 Modification Procedure to Support In-Vivo B-45

1 INTRODUCTION

This chapter presents the procedures for service personnel to install the LAS-4000 system.

2 COMPONENTS

When the LAS-4000 system is purchased new, normally the system is shipped packaged as shown below.

System for domestic use in Japan

No.	Item	Q'ty	Remarks
1	Camera Head	1	with 2 dedicated screws
2	F mount adapter	1	Optional
3	Intelligent Dark Box	1	
4	High-sensitivity lens (VRF43LMD)	1	
5	Wide viewing angle lens (Sigma 24mm F1.8 recommended, Nikkor 24mm F2.8)	1	
6	Transmitted UV light unit	1	
7	Transmitted white light unit	1	
8	EPI tray	1	
9	White-DIA tray	1	
10	UV-DIA tray	1	
11	NP tray	1	
12	AC POWER cable	1	Enclosed in the product package for Japan and for North America
13	USB cable	1	
14	Filter changer	1	with lens hood
15	Calibration plate (3 models)	3	Two for EPI and one for DIA * The FL plate for EPI (blue and ultraviolet) is enclosed for a blue incident light source and an ultraviolet incident light source. * The GL plate for EPI (green, red and near-red) is enclosed for a green incident light source, a red incident light source and a near-read incident light source.
16	Optical filter	7	Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785 * Y515-Di is enclosed for the blue incident light source. * 575DF20 is enclosed for the green incident light source. * L41 is enclosed for the UV incident light source. * R670 is enclosed for the red incident light source. * 605DF40 is enclosed for the UV transmitted light source. * IR785 is enclosed for he near-red incident light source.
17	Operation Manual	1	
18	Reading software "Image Reader" (Mac/Win)	1	CD-R
19	Blue incident-light unit	1	Optional
20	Green incident-light unit	1	Optional
21	Red incident-light unit	1	Optional
22	Near-red incident light unit	1	Optional
23	UV incident light unit	1	Optional
24	Calibration plate	1	Optional For EPI (green and red) * The calibration plate for EPI (green and red) is attached to the green incident-light unit and the red incident-light unit.
25	Optical filter	7	Optional Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785

(For models used in Japan)

System for use in foreign countries

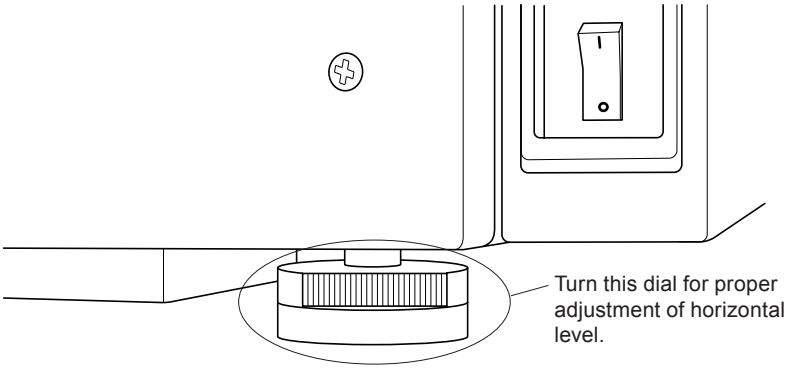
No.	Item	Q'ty	Remarks
1	Camera Head	1	with 2 dedicated screws
2	F mount adapter	1	Optional
3	Intelligent Dark Box	1	
4	High-sensitivity lens (VRF43LMD)	1	
5	Wide viewing angle lens (Sigma 24mm F1.8 recommended, Nikkor 24mm F2.8)	1	
6	Transmitted UV light unit	1	
7	Transmitted white light unit	1	
8	EPI tray	1	
9	White-DIA tray	1	
10	UV-DIA tray	1	
11	NP tray	1	
12	AC POWER cable	1	Enclosed in the product package for North America
13	USB cable	1	
14	Filter changer	1	with lens hood
15	Calibration plate (3 models)	3	Two for EPI and one for DIA * The FL plate for EPI (blue and ultraviolet) is enclosed for a blue incident light source and an ultraviolet incident light source. * The GL plate for EPI (green, red and near-red) is enclosed for a green incident light source, a red incident light source and a near-read incident light source.
16	Optical filter	7	Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785 * Y515-Di is enclosed for the blue incident light source. * 575DF20 is enclosed for the green incident light source. * L41 is enclosed for the UV incident light source. * R670 is enclosed for the red incident light source. * 605DF40 is enclosed for the UV transmitted light source. * IR785 is enclosed for the near-red incident light source.
17	Operation Manual	1	
18	Reading software "Image Reader" (Mac/Win)	1	CD-R
19	Blue incident-light unit	1	Optional
20	Green incident-light unit	1	Optional
21	Red incident-light unit	1	Optional
22	Near-red incident light unit	1	Optional
23	UV incident light unit	1	Optional
24	Calibration plate	1	Optional
			For EPI (green and red) * The calibration plate for EPI (green and red) is attached to the green incident-light unit and the red incident-light unit.
25	Optical filter	7	Optional Y515-Di(SYBR Green) 510DF10(GFP) 575DF20(Cy3) L41 R670(Cy5) 605DF40(EtBr) IR785

3 INSTALLATION PROCEDURES

1. Unpacking

2. Place the IDX on a desk.

3. Adjust the horizontal level of IDX as required depending on the installing position.

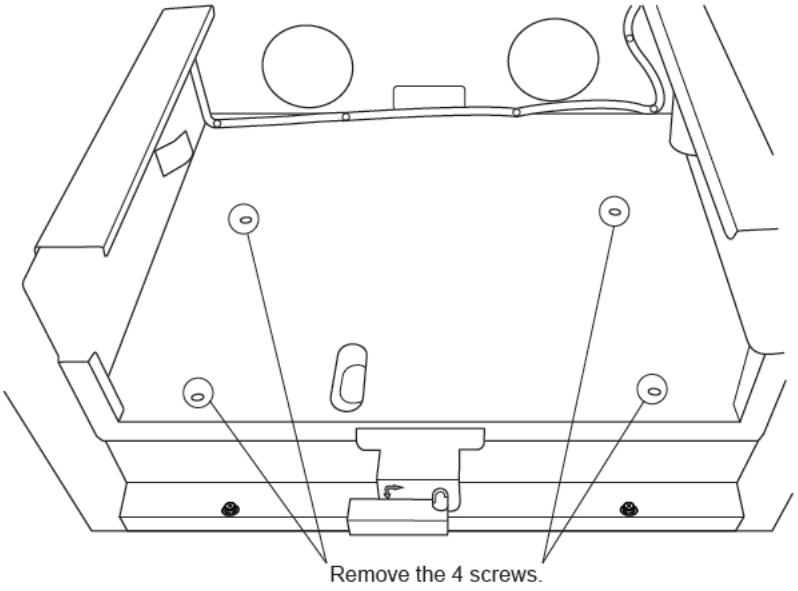


   Turn the level adjustment dials at the four (4) legs of IDX.
   There is no need for level adjustment except if the door opens naturally due to any inclination of the unit when the front door is set open.

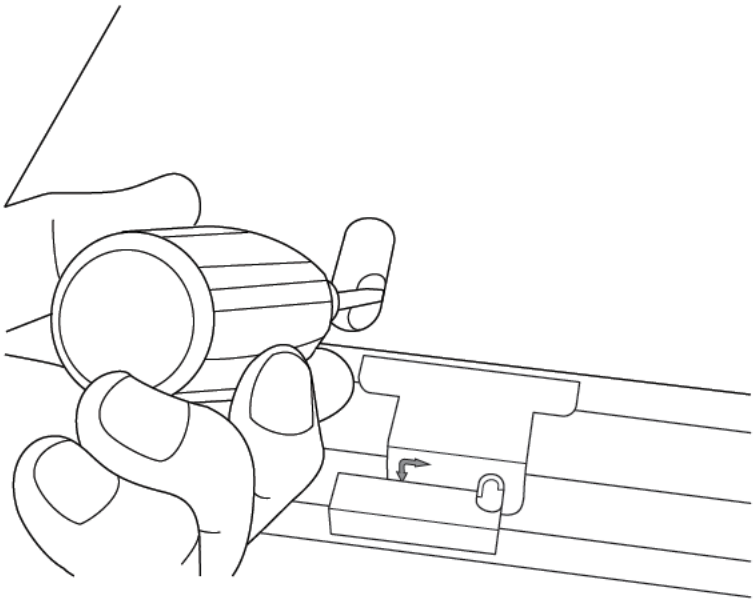
4. If you want to reverse the door opening/closing direction from the original condition when the system is delivered, remove the hinge-fixing screws and dismantle the entire door, also dismantle the lock support by removing the fixing screws, and change the installing position of the door from the original condition. Remember to also change the installing position of interlock hook fixed in top of the door.

5. Open the door and remove the cushioning materials from the inside.
   → Keep the cushioning materials in a suitable place ready for re-use during future transportation.

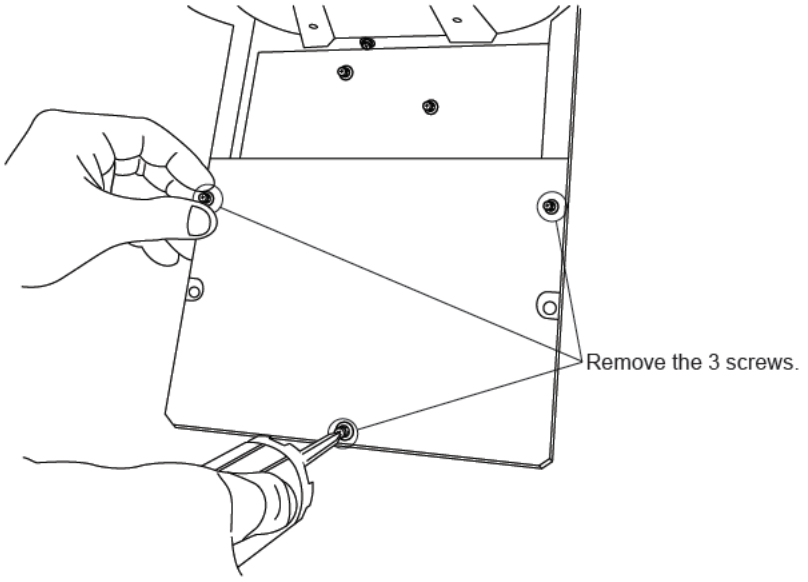
6. Remove the 4 screws securing the lifting table.
   → Keep the screws in a suitable place ready for use to fix the filter changer.



7. Using a flat-ended screwdriver in the screw for manual UP/DOWN operation of the lifting table turn the screw counterclockwise to move the lifting table up 2 cm or more above the initial condition.
   Move the unit up until, as a guideline, the mark <4> in the front far end becomes covered.

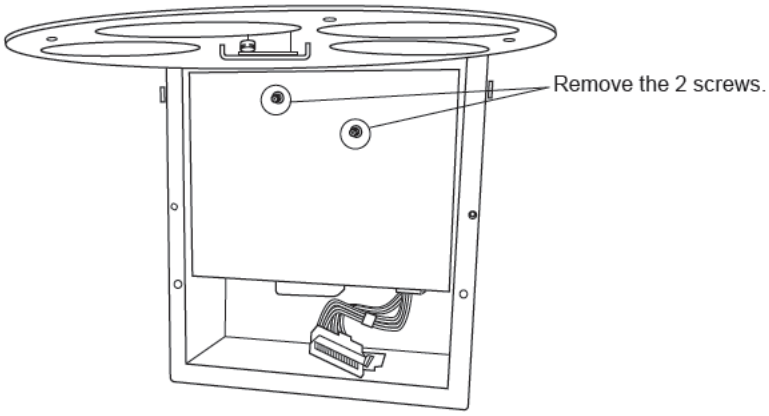


8. Remove the 3 screws securing the protective cover and separate the protective cover from the filter changer.

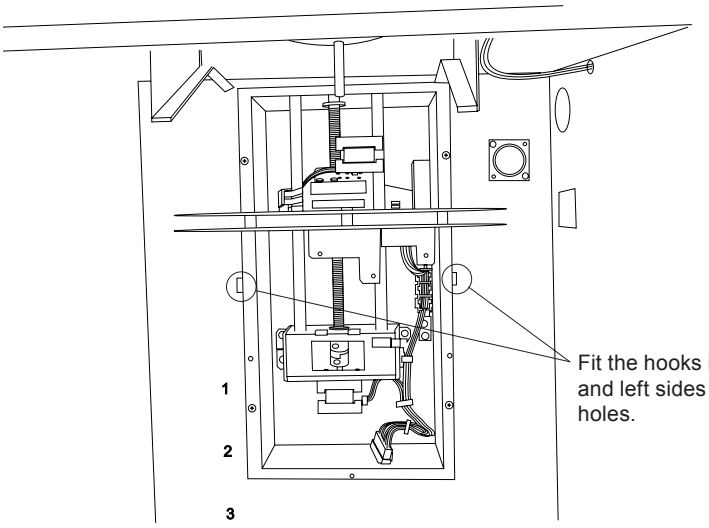


* The lens hood is enclosed with the filter changer. Remember to take out the hood.

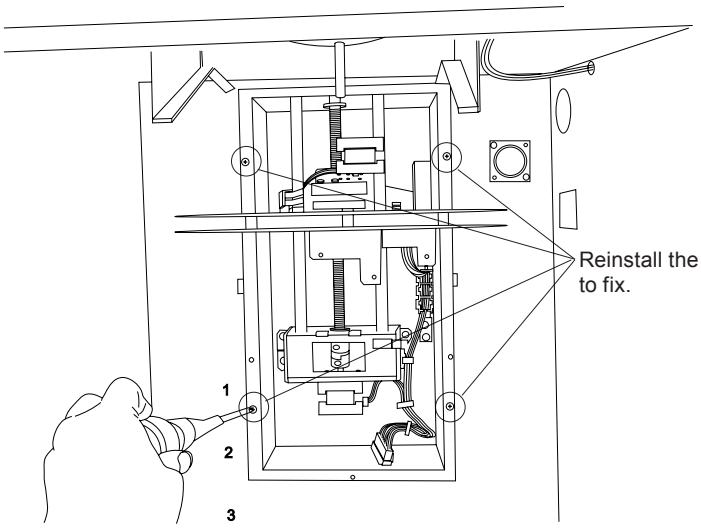
9. Remove the 2 screws securing the inner cover and separate the inner cover from the filter changer.



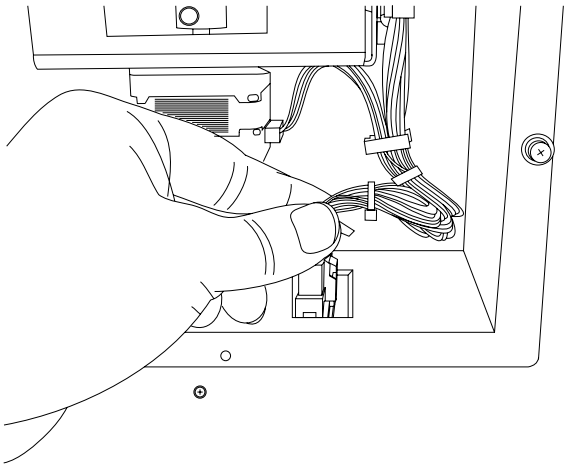
10. Fit the hooks on the right and left of the filter changer into the holes shown in the diagram below.



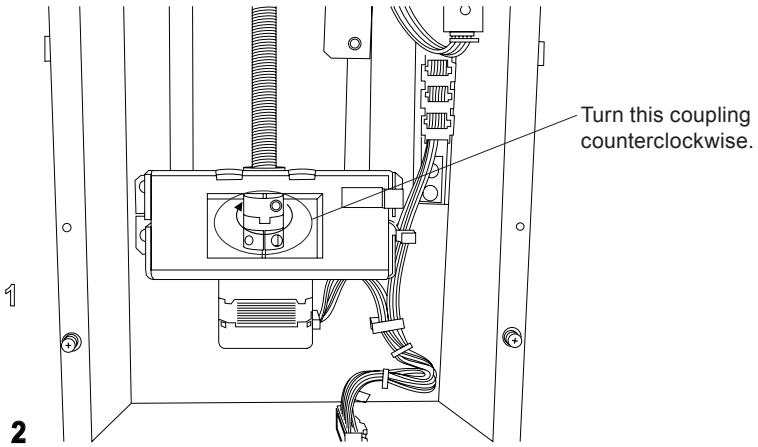
11. Use the 4 screws removed from the lifting table to fix the filter changer.



12. Connect the cable harness from the filter changer to the connector in IDX.

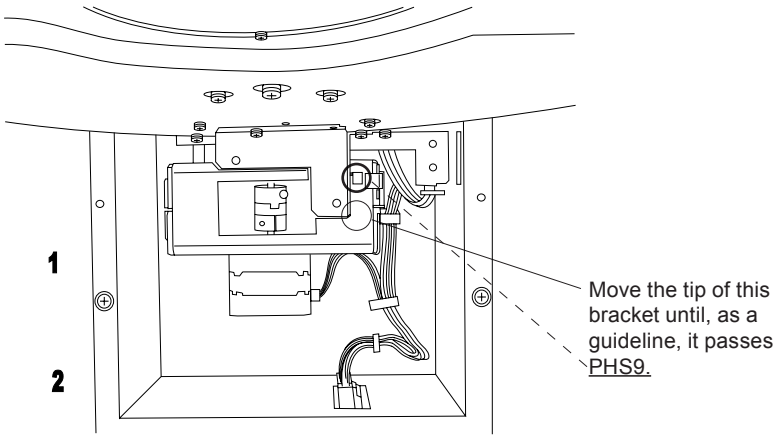


13. Manually turn the coupling in the filter changer counterclockwise and move down the filter turret.

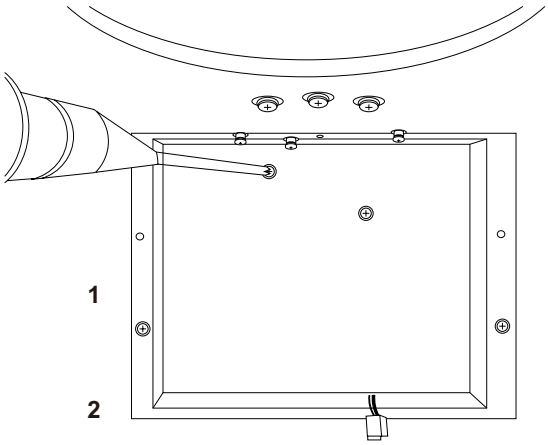


The position to move down to is where the tip of the bracket passes PHS9 as shown in the following illustration.

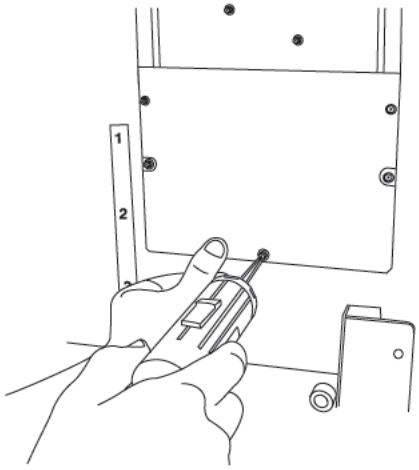
* Do not move down to the lower limit, because the position of the screw holes on the protective cover may not match that on the filter changer.



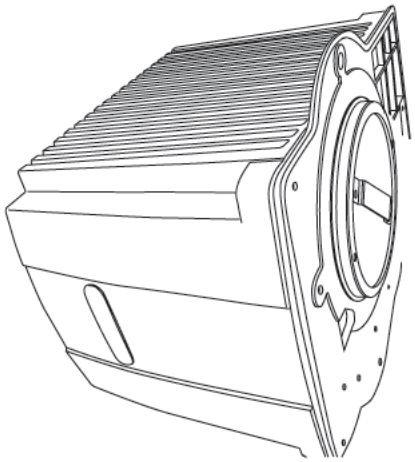
14. Reinstall the inner cover separated in Step 9 and secure with the 2 screws.

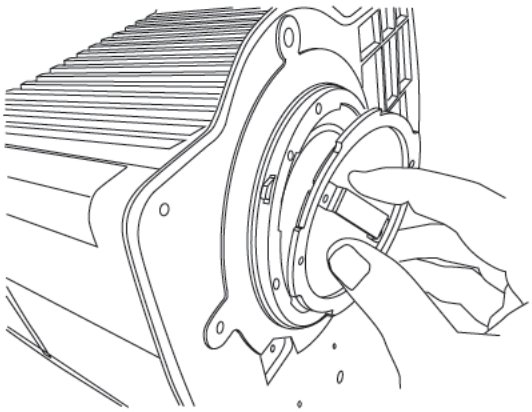


15. Reinstall the protective cover separated in Step 8 and secure with the 3 screws.



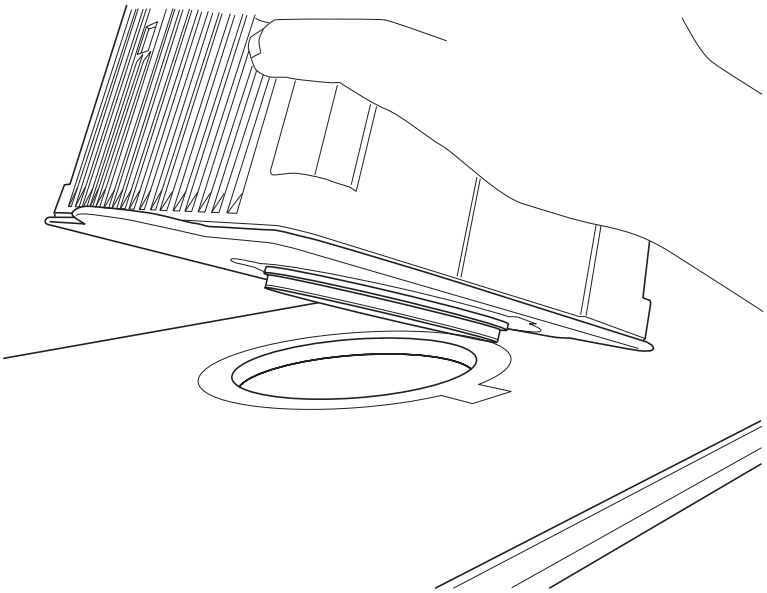
16. Remove the mount cap from the camera head.

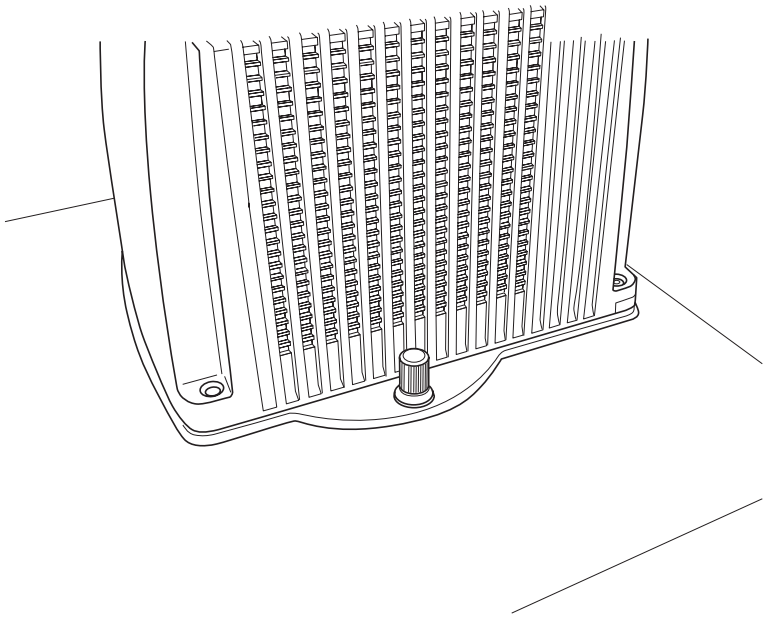




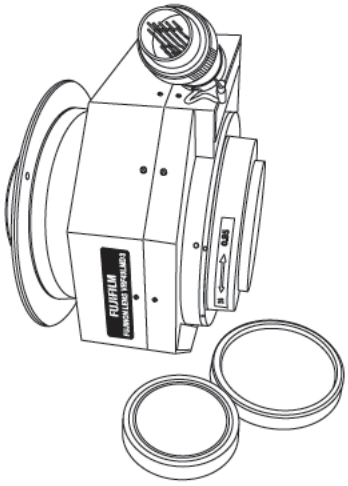
* Do not touch the shutter in this step, it becomes exposed when the adapter is removed.

17. Attach the camera head to the IDX.
    Use the 2 screws supplied with the camera head to fasten the camera head to the IDX.

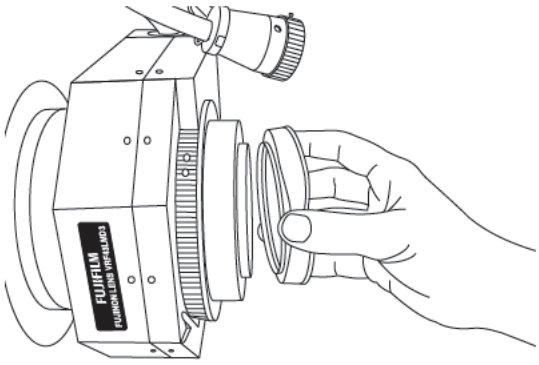




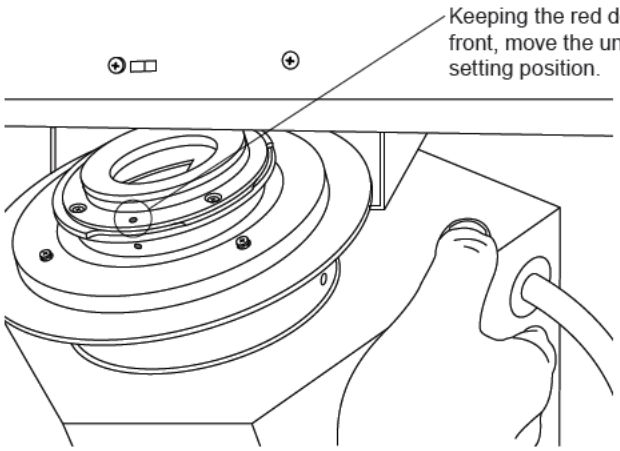
18. Prepare a high-sensitive lens. Remove the 2 caps on the top and bottom of the lens.
    * If the customer uses F1.8 lens, go to Step 23.



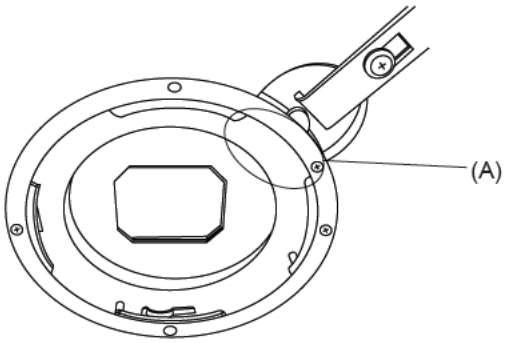
19. Install the lens hood to the high-sensitivity lens unit.

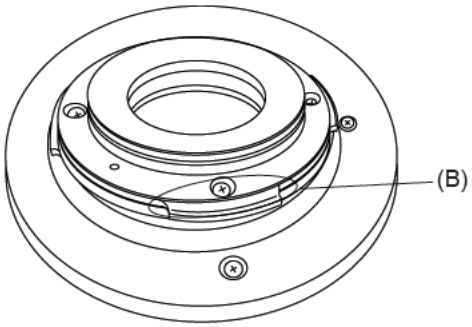


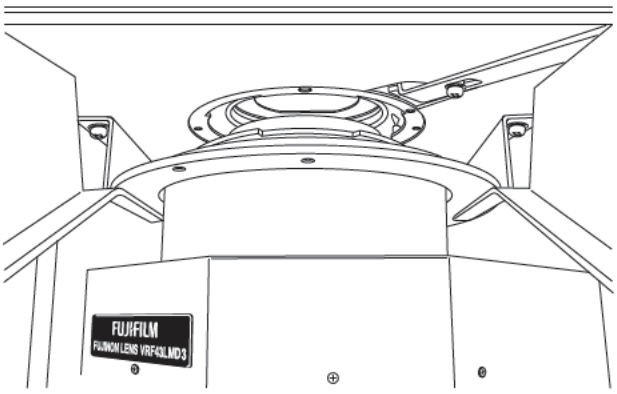
Hold the high-sensitivity lens unit with the red dot on the unit seen at the front. Put thecircular flange of the unit on the installation unit guide in IDX and slowly push theunit along the geometry of the guide far enough until it presses against the stopper in thefar end.



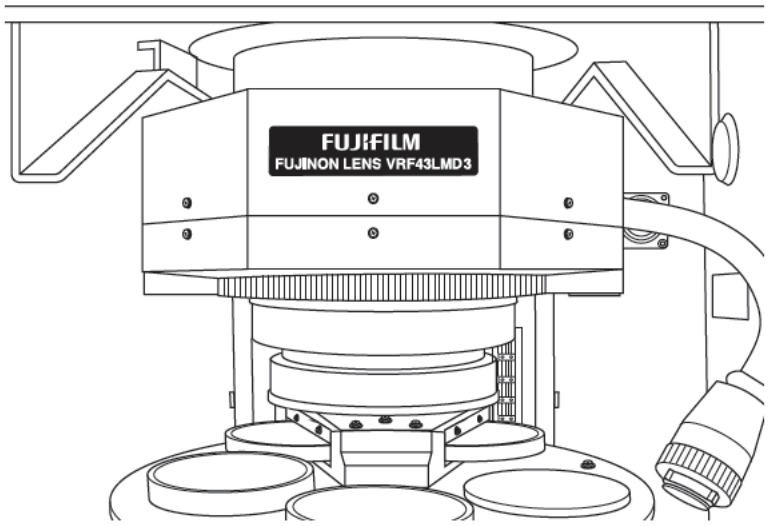
20. Keeping the lens unit horizontal, lift it up and fit the concave part (B) on the unit into the groove (A) on the lens unit-installing section in camera head.



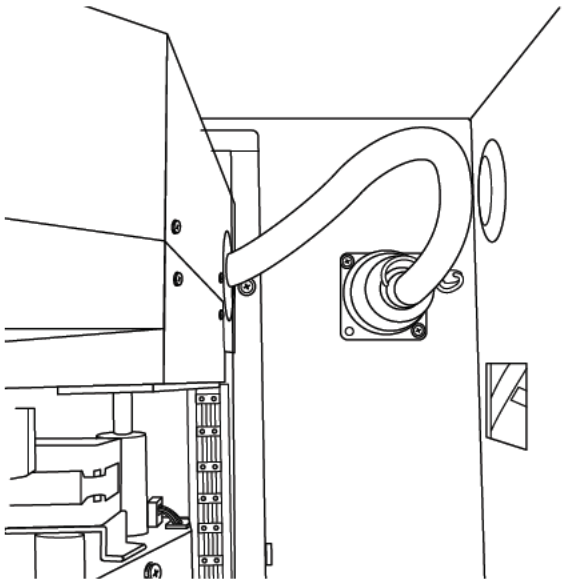




21. Turn the entire body of the lens clockwise (to the right) until you hear it lock in place. The FUJIFILM logo should face the front.

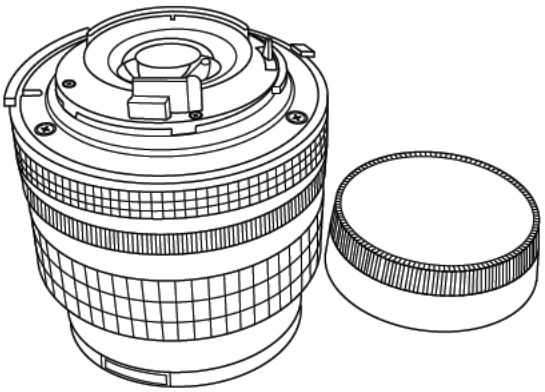


22. Insert the cable from the high-sensitivity lens unit into the connector on the IDX and then turn the cable ring to fix properly.

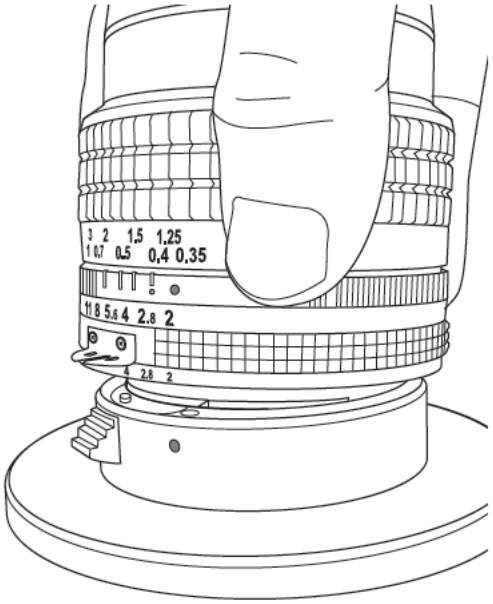


→ Proceed to Step 27 on page B-17.

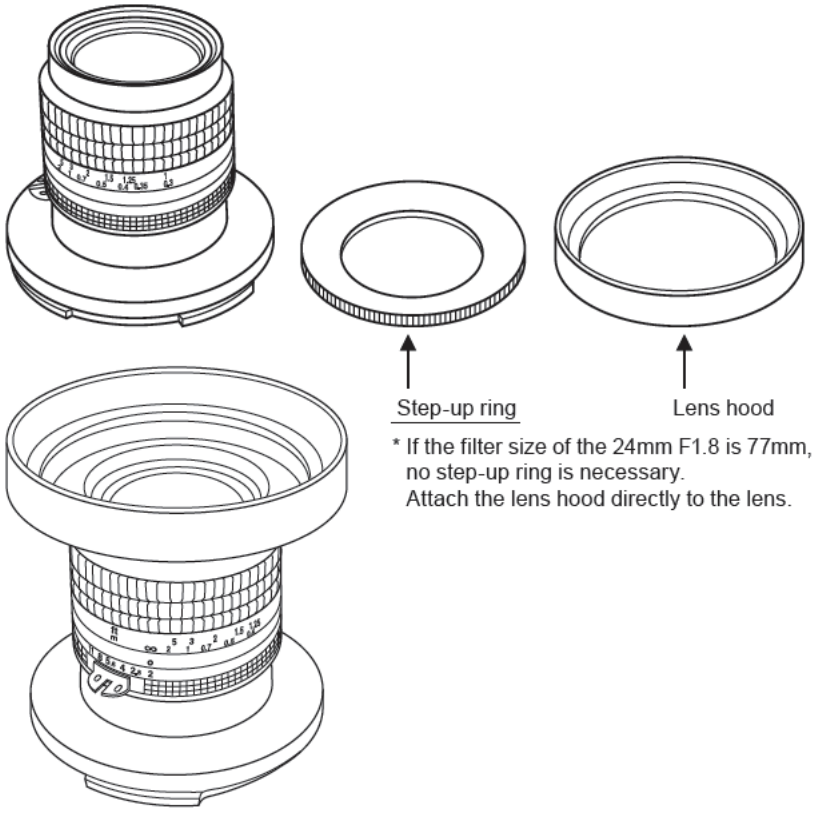
23. Remove the lens cap in the mount side of the 24mm F1.8 lens.



24. Fit the concave part in the lens side, in which the lens is installed opposed to the F-mount adapter, into the notch in the head F-mount side and then turn the lens counterclockwise. Be sure to turn the lens until a click sound is heard.

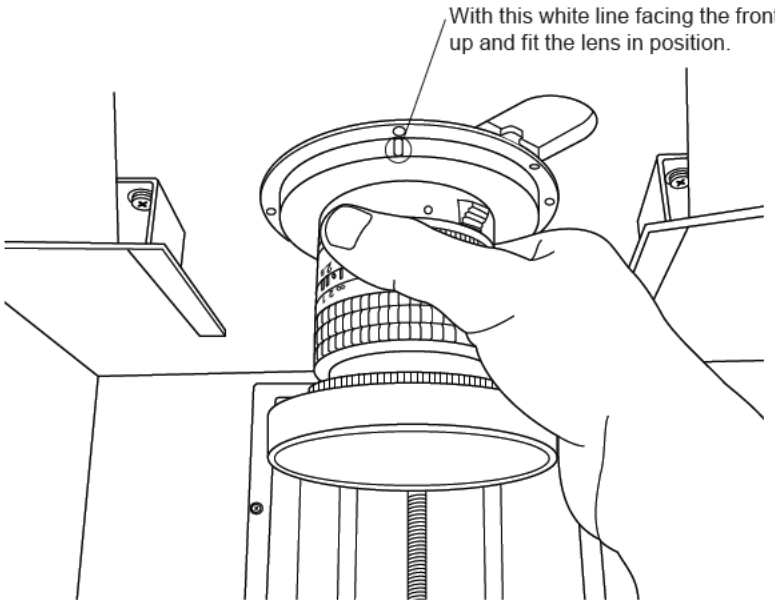


25. Remove the lens cap and then install the step-up ring and lens hood in this order.

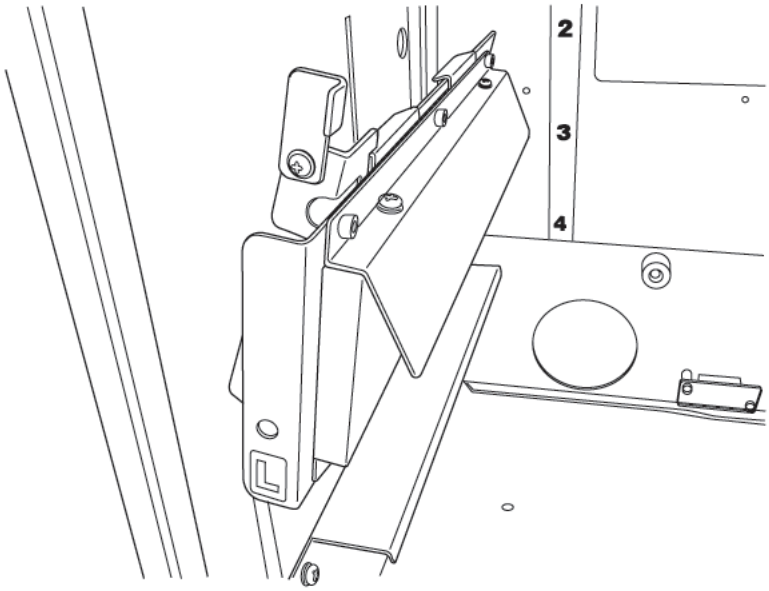


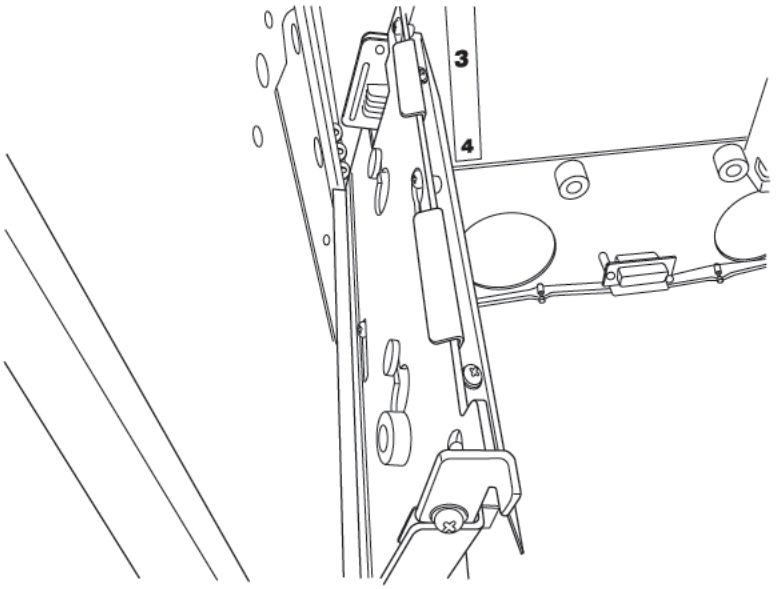
* If the filter size of the 24mm F1.8 is 77mm, no step-up ring is necessary.
Attach the lens hood directly to the lens.

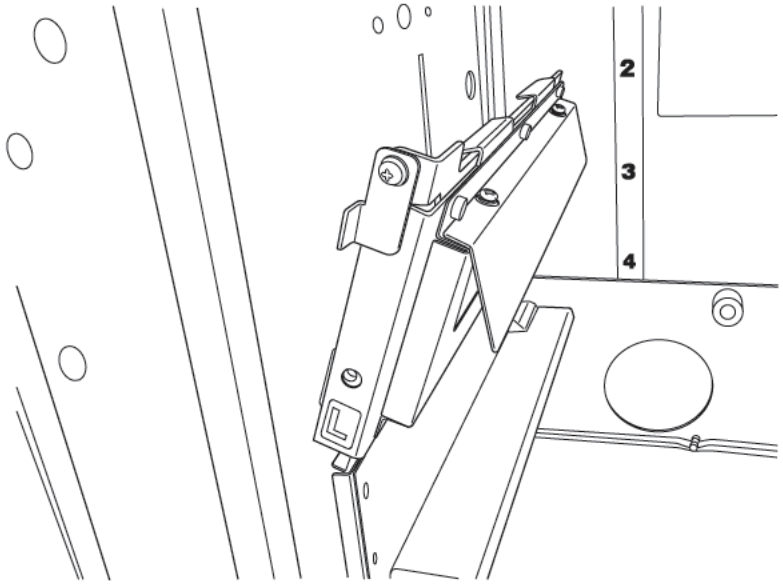
26. Install the wide field view lens fit in the F-mount adapter into the camera head.
With the white line on the F-mount adapter facing the front, lift up and fit the lens in position.



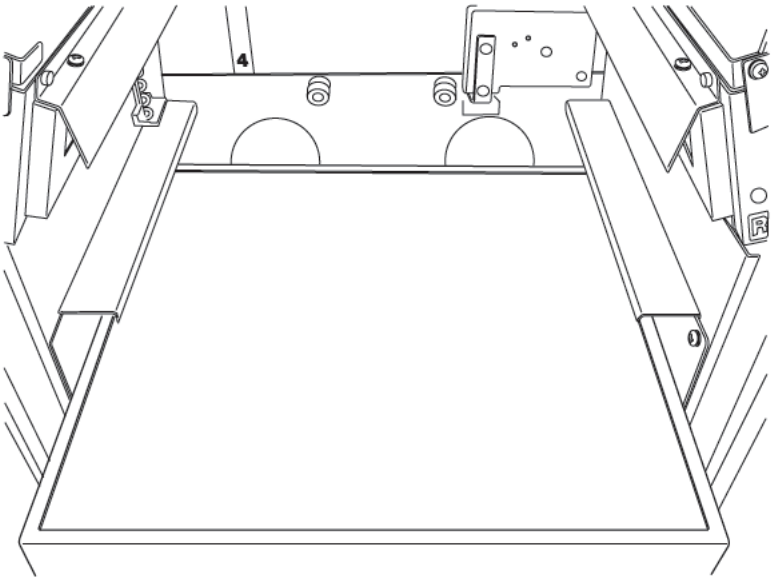
27. Attach an incident light source unit.
If the user purchased more than one type of incident light source units, any type may be attached.
However, light sources of the same type must be mounted on both sides.

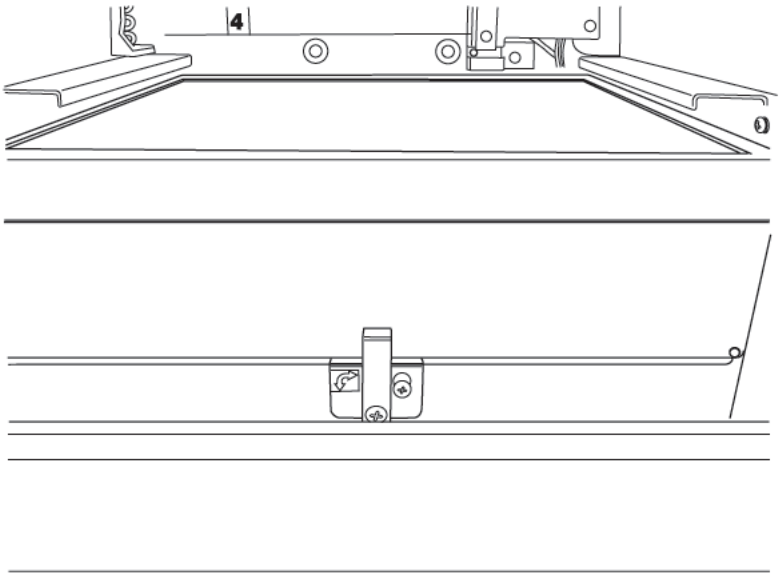



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4


2
3
4

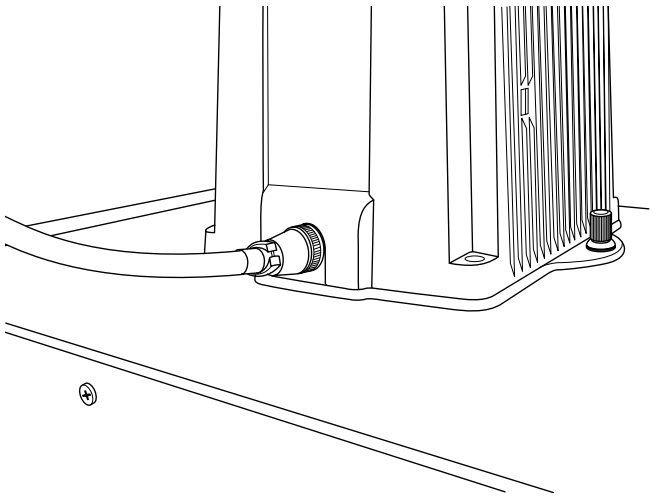
28. Set a transmitted light source unit.
    If the user purchased both a white transmitted light source unit and a UV transmitted light source, either type may be attached.





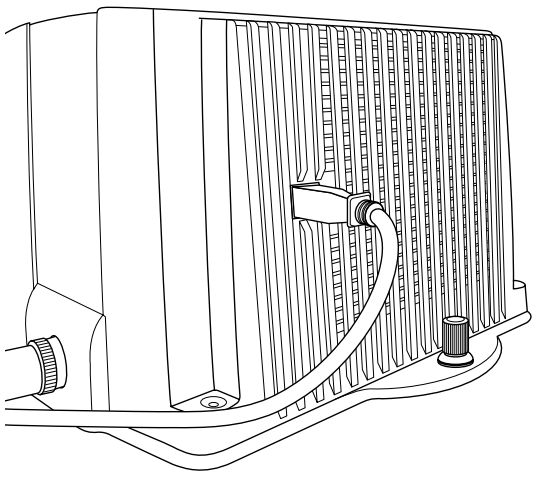
Lock the latch upward to prevent coming off of the unit or the connector.

29. Connect the camera cable from IDX to the rear of the head.



30. Connect the AC power cable to IDX.
    Turn on the power, and check that IDX starts up successfully when operated independently.

31. Connect the USB cable to the side of the head.



    * If the host computer operates with Windows OS, a USB cable must be connected only after the FUJI Control driver is installed.

32. Turn on the host computer.

33. Install the FUJI USB Control driver, FUJI Function driver, and Image Reader software.
    * Refer to page B-21.
    For a Macintosh, only install the Image Reader software.
    Refer to page B-29.

Installing the Software

1-1. Installation (For Windows®)

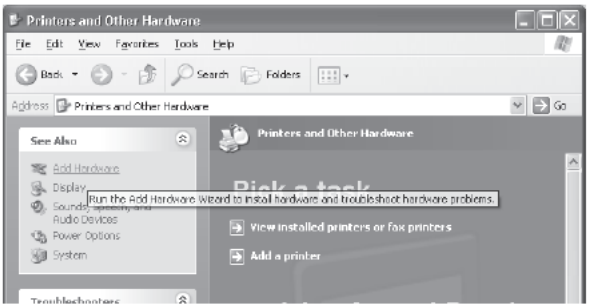
It installs in the following sequence.

① Installation of FUJIUSB Control Driver
② Installation of FUJIUSB Function Driver
③ Installation of ImageReader Software

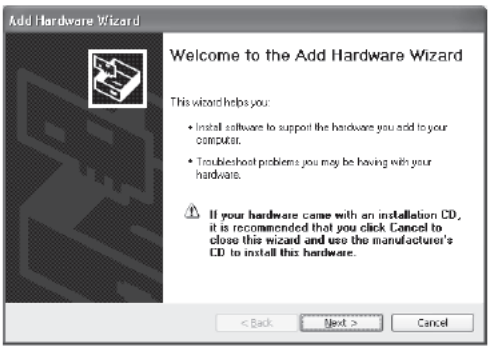
① Installation of FUJIUSB Control Driver

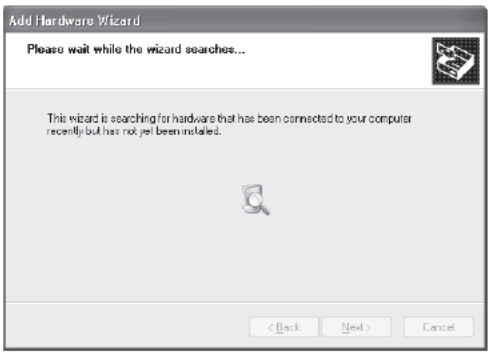
Note Install the FUJI Control driver while the PC and LAS-4000 are not connected properly by a USB cable.

(1) Open the control panel and click “Printers and Other Hardware”.
(2) Click the “Add Hardware”.

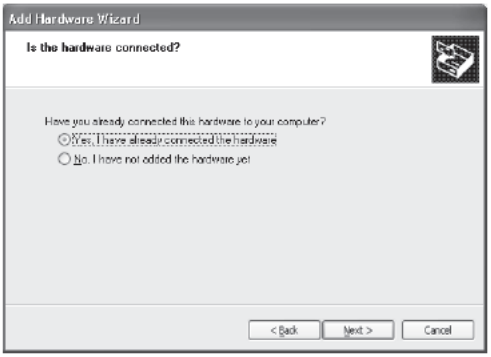


(3) Click the Next button.

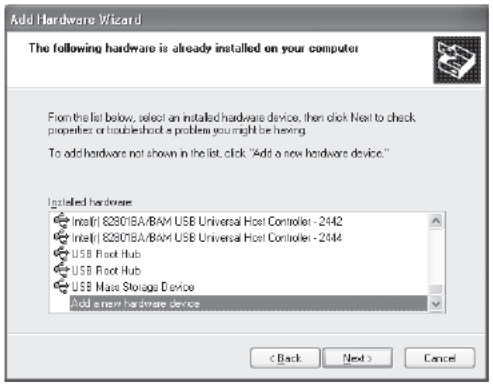




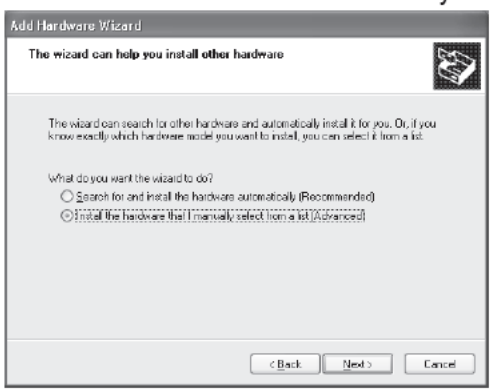
(4) Select “Yes, I have already connected the hardware” and click the Next button.



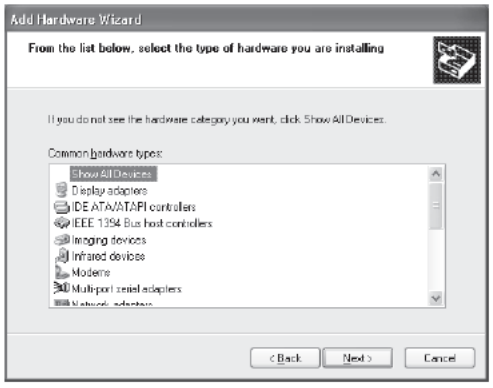
(5) Select “Add a new hardware device” and click the Next button.



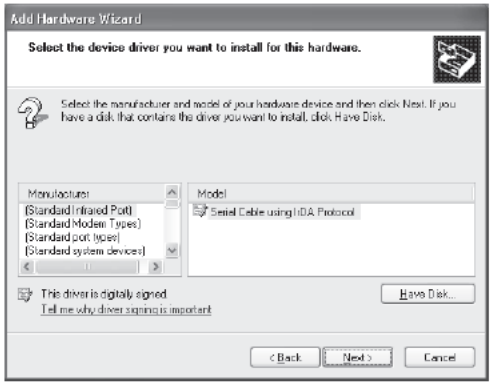
(6) Select “Install the hardware that manually select from a list [Advanced]” and click the Next button.



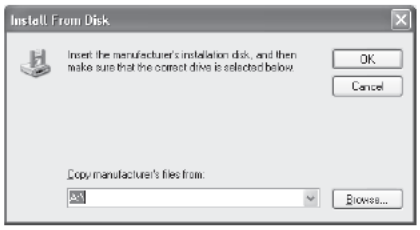
(7) Select “Show All Devices” and click the Next button.



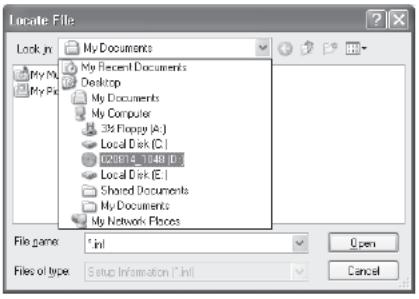
(8) Click “Have Disk...” button.



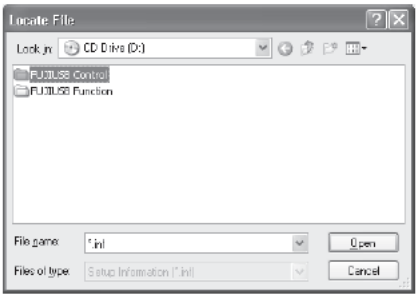
(9) Click “Browse...” button.



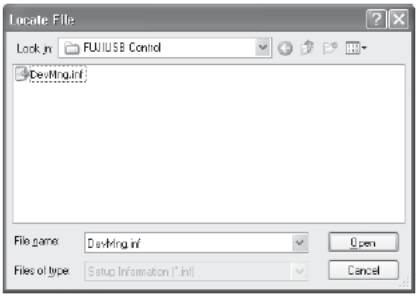
(10) Set the folder in which a file is saved to LAS-4000 CD-ROM.



(11) Open the FUJI USB Control folder.



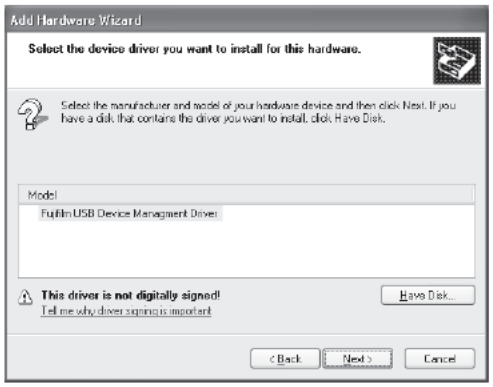
(12) Select a DevMng.inf file and click the Open button.



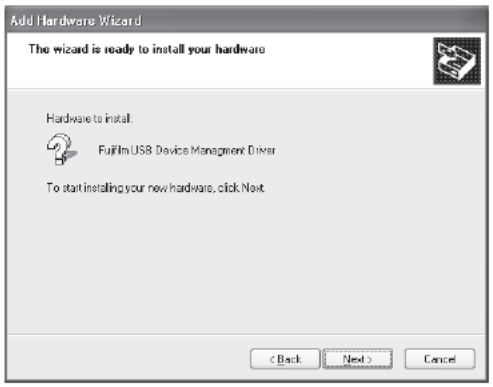
(13) Click the OK button.



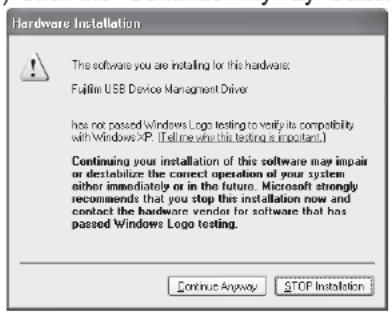
(14) Click the Next button.



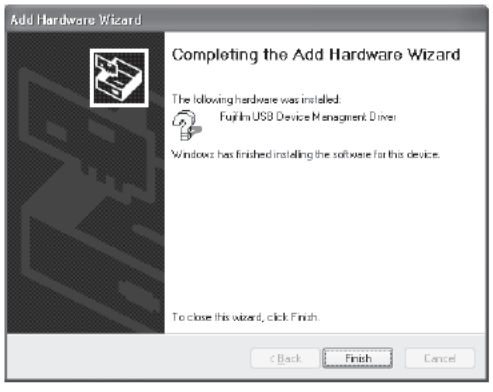
(15) Click the Next button.



(16) Click the “Continue Anyway” button.



(17) Click the Finish button.

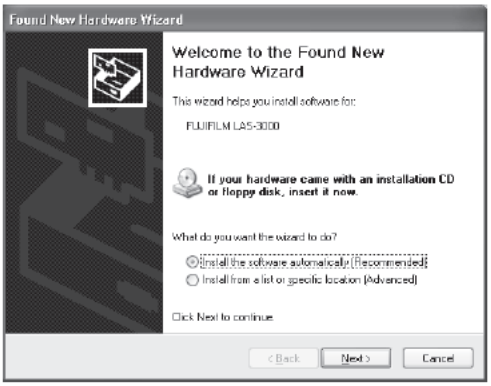


② Installation of FUJI USB Function Driver

(1) Connect the USB cable and turn ON the power switch of the IDX.

Note Perform this operation, or the personal computer may be reset.

(2) Click the Next button.





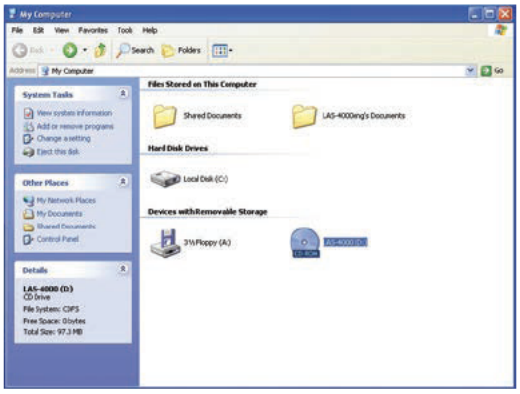
(3) Click the Finish button.



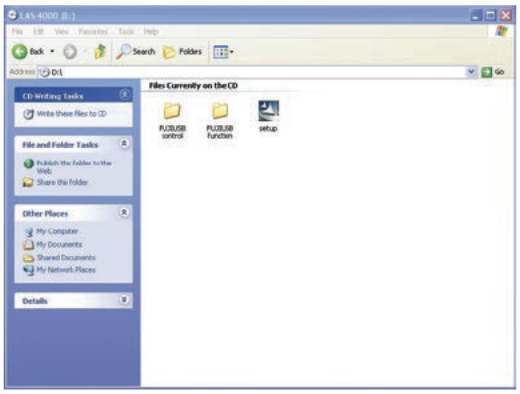
③ Installation of ImageReader Software

Note Perform with the personal computer and LAS-4000 correctly connected using a USB cable.

Perform an installation in the following procedure.
(1) Insert the installation CD-ROM of LAS-4000.
(2) Click the LAS-4000 icon.



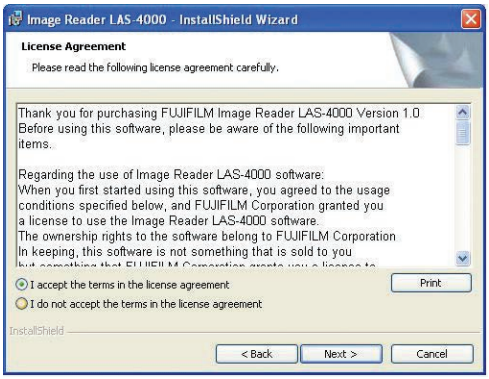
(3) Click the setup icon.



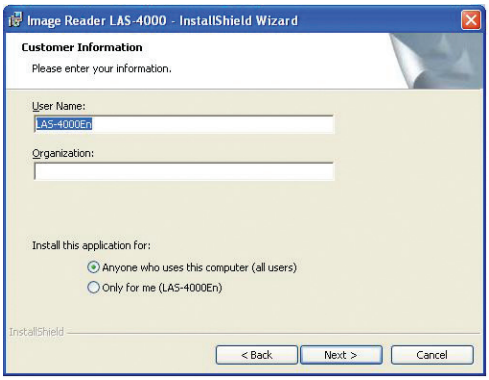
(4) Choose a setup language and click “OK” button.



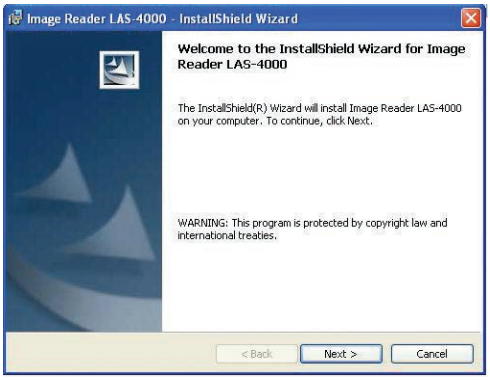
(5) I accept the terms and conditions set forth in this license agreement.



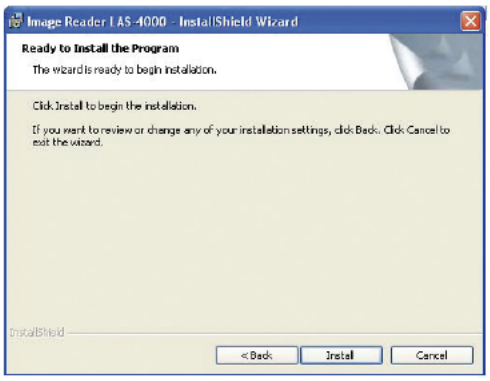
(6) Enter user information.



(7) Click the “Next” button.



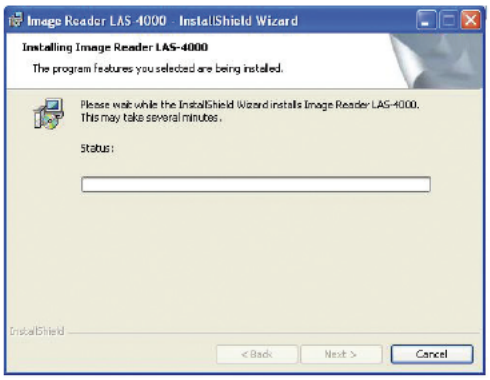
(8) Click the “Install” button.



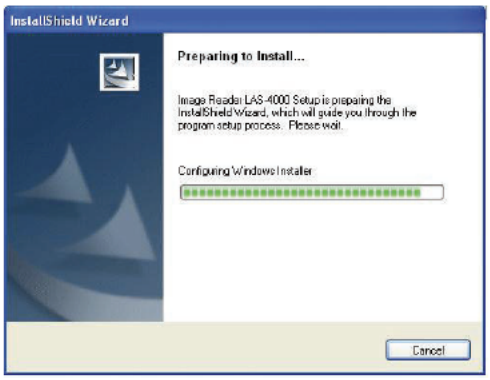
(9)



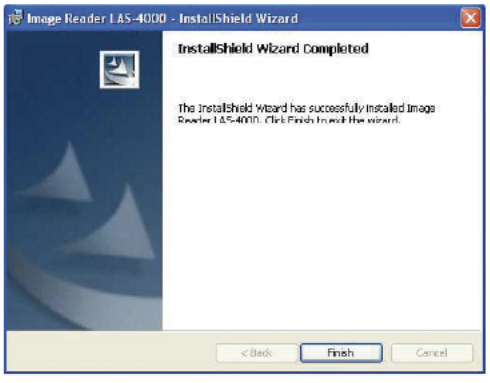
(10)







(11)



The installation is successfully completed.

1-2. Installation (For Windows® VISTA)

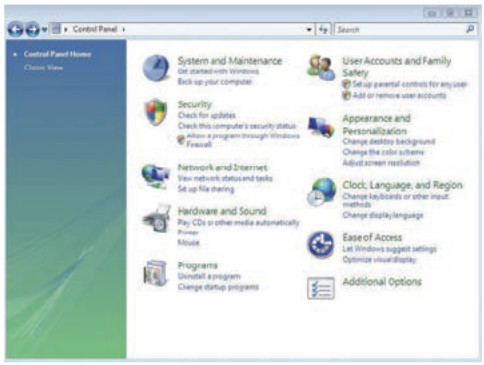
It installs in the following sequence.

① Installation of FUJI USB Control Driver
② Installation of FUJI USB Function Driver

① Installation of FUJI USB Control Driver

Note Install the FUJI Control driver while the PC and LAS-4000 are not connected properly by a USB cable.

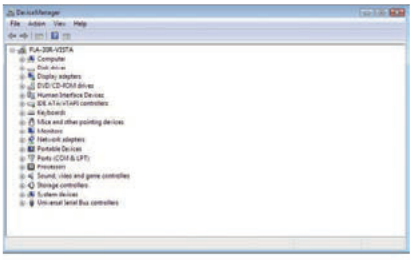
(1) Open the Control Panel and select the “Hardware and Sound”.

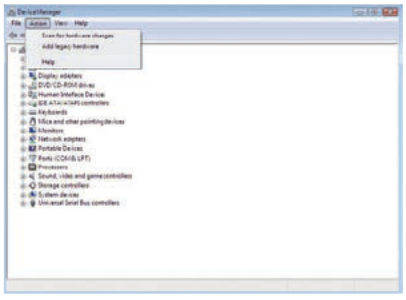


(2) Select the “Device Manager”.



(3) Select “Add legacy hardware” from the “Action” pull-down menu.

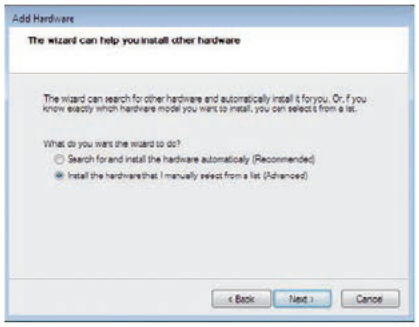




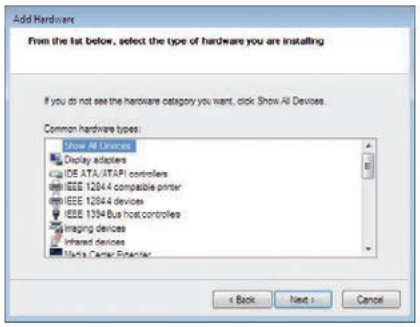
(4) Click “Next” to continue.



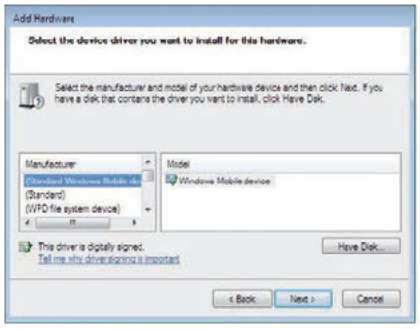
(5) Check “Install the hardware that I manually select from a list (Advanced)” and click “Next”.



(6) Select “Show all Devices” and click “Next”.



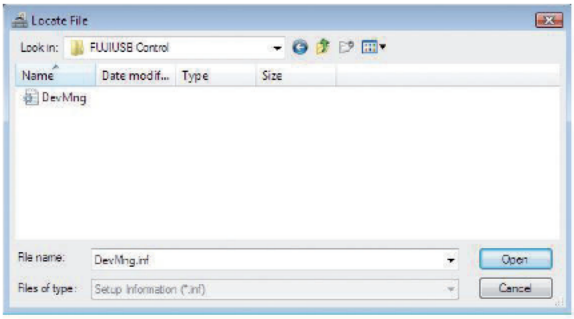
(7) Click “Have Disk”.



(8) Click the “Browse” button.



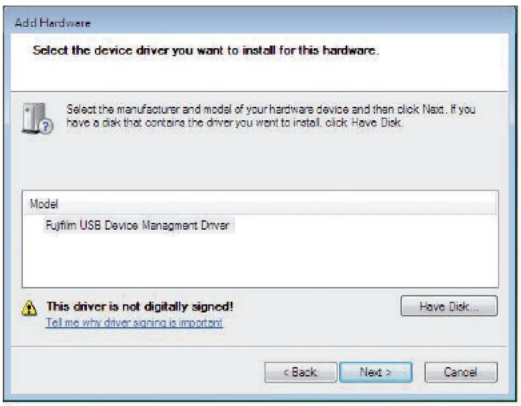
(9) Select “DevMng”.



(10) Click “OK”.

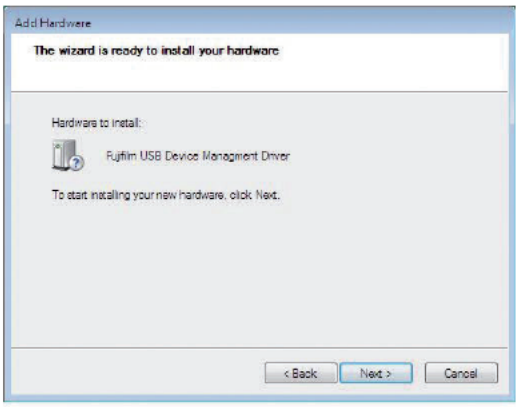


(11) Click “Next” to continue.



*Then, confirm that Fujifilm USB Device Management Driver is shown in the window.

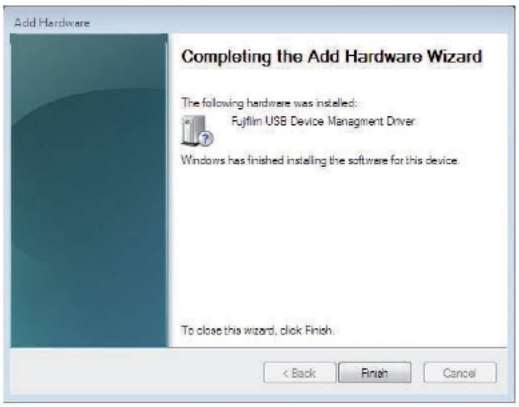
(12) Click “Next”.



(13) Select “Install this driver software anyway”.



(14) Click “Finish”.

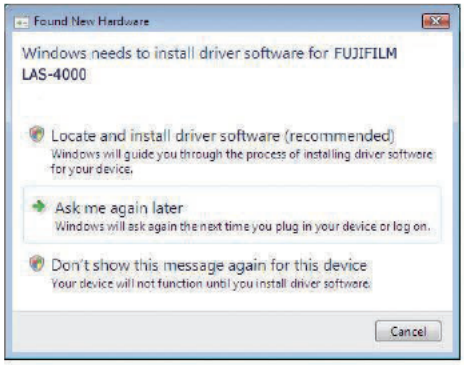


② Installation of FUJI USB Function Driver

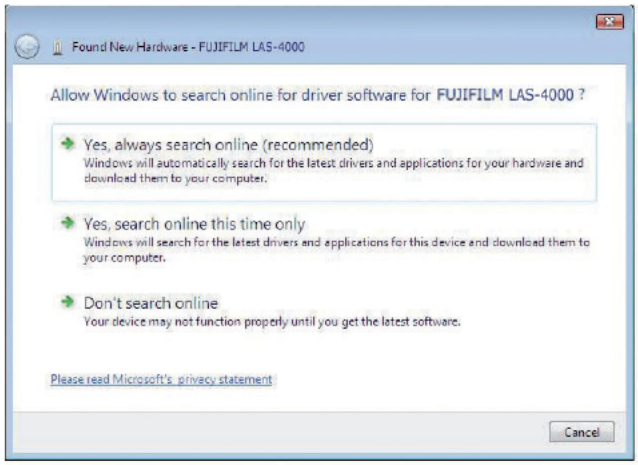
(1) Connect the USB cable and turn ON the power switch of the LAS-4000.

Note Perform this operation, or the personal computer may be reset.
Perform this operation with the PC and LAS-4000 correctly connected with a USB cable.

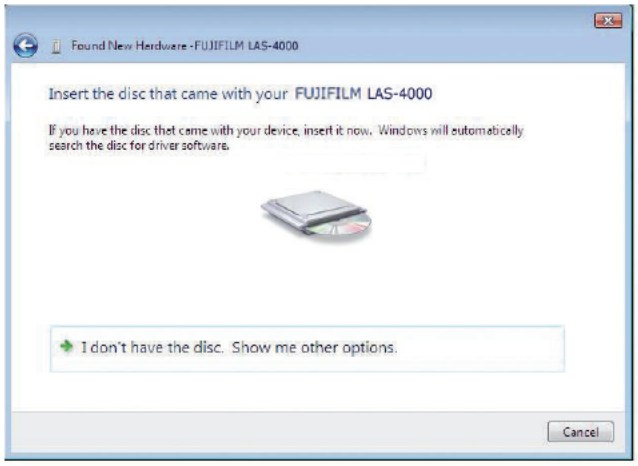
(2) "Locate and install driver software (recommended)".



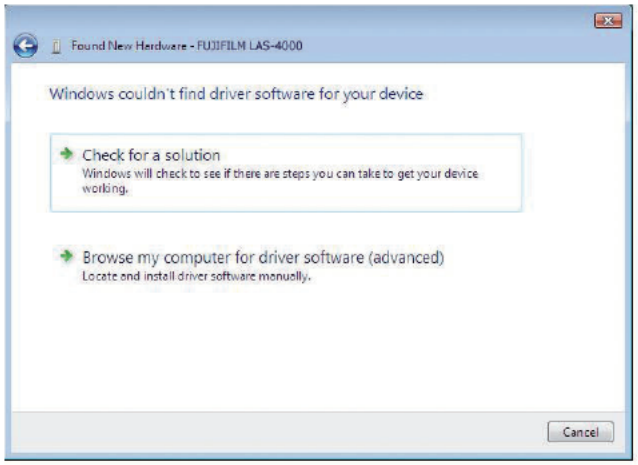
(3) Select "Don't search online".



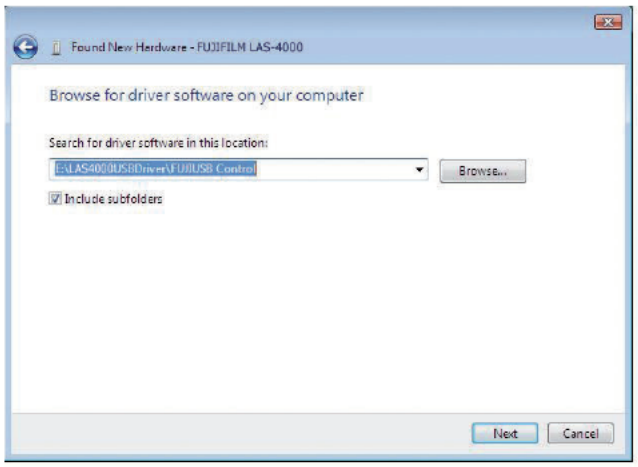
(4) Select “I don’t have the disc. Show me other options”.



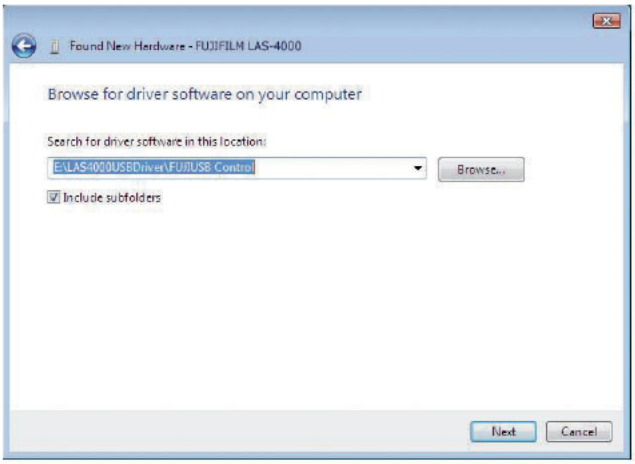
(5) Select “Browse my computer for driver software (advanced)".



(6) Click “Browse…”.



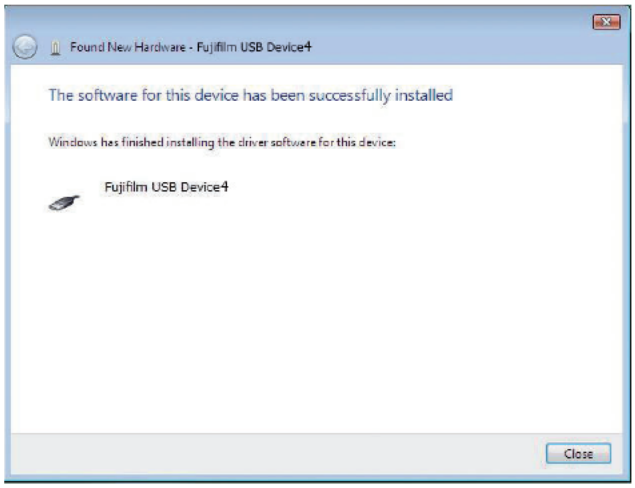
(7) Select the “Function Driver”.



(8) Select “Install this driver software anyway”.



(9) Confirm that Fujifilm USB Device4 is shown.



Tips Correspondence between the No. attached to the Device and the product
LAS-3000 → Fujifilm USB Device
LAS-4000 → Fujifilm USB Device4
FLA-7000 → Fujifilm USB Device2
FLA-9000 → Fujifilm USB Device5

1-3. Installation (For Macintosh)

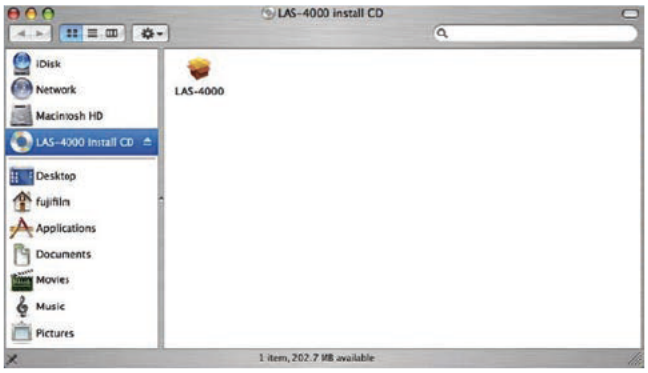
Perform an installation in the following procedure.

< For Mac OSX >

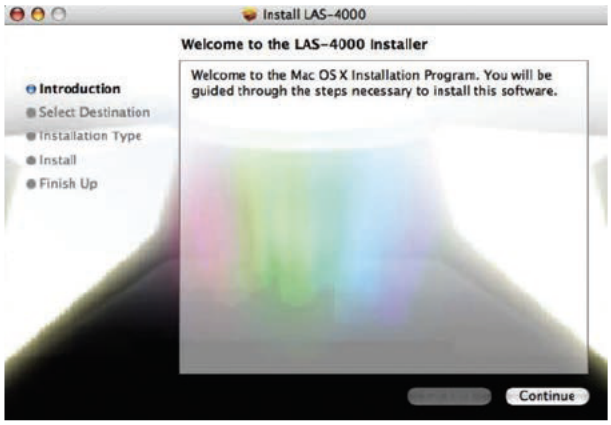
(1) Double-click “LAS-4000 install CD” icon and open it.



(2) Double click the LAS-4000 icon to start the installer.



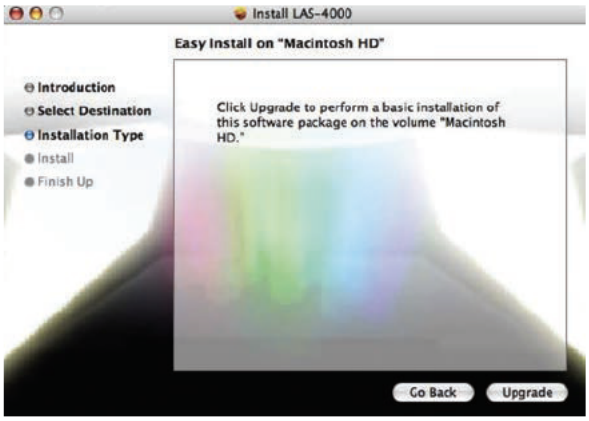
(3) Click “Continue” button in “Introduction” screen.



(4) Select the disk where you install the software in “Select install destination” screen, and click “Continue” button.



(5) Click “Install” button in “Type of installation” screen.



(6) Enter your name and password.





(7) When “Software is installed normally” is displayed in “FInish” screen, click “Close” button.

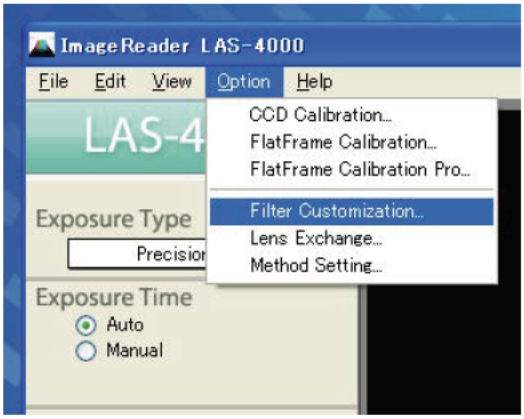


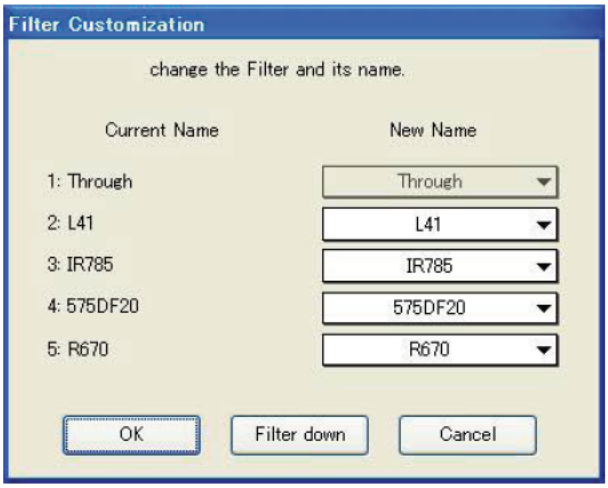
34. Set filters to the filter turret.
In LAS-4000, unlike LAS-3000, filters may be set in any positions other than Position No.1 on the turret.

* Five filters can be set on the turret (four if chemoluminescence is in used). However, the user may have more than five types of filters, depending on the number of light sources purchased by the user.
In such a case, it is recommended to ask the user in advance what is the main purposes of use. You can select suitable filters to be set to the unit, based on this information from the user.
This information may not be obtained from the user at the time of the installation. In such a case, obtain this information from the user when you explain the filter replacement at the user instruction meeting, and then you may customize the set of filters.

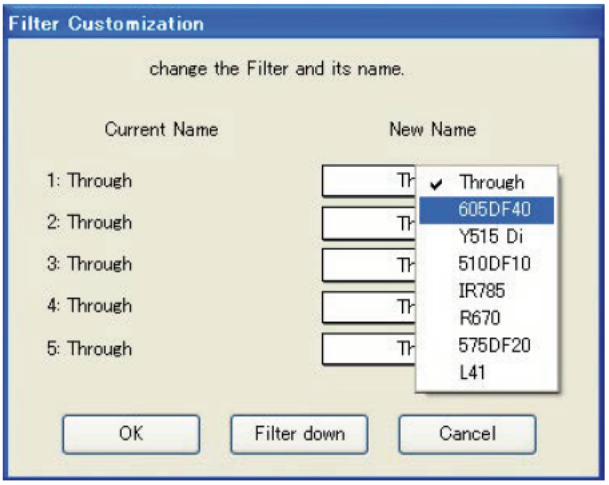
Reference: As of December 20, 2006, following filters are enclosed corresponding to respective light sources:
Blue LED —— Y515Di
Green LED — 575DF20
EPI-UV ——— L41(UV cut filter)
Red LED —— R670
IR-LED ——— IR785
DIA-UV —— 605DF40

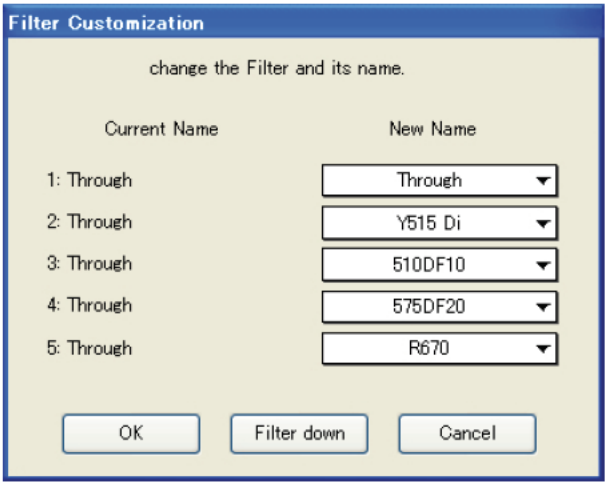
Start Image Reader, pull down the Option menu, and select <Filter Cutomization>.



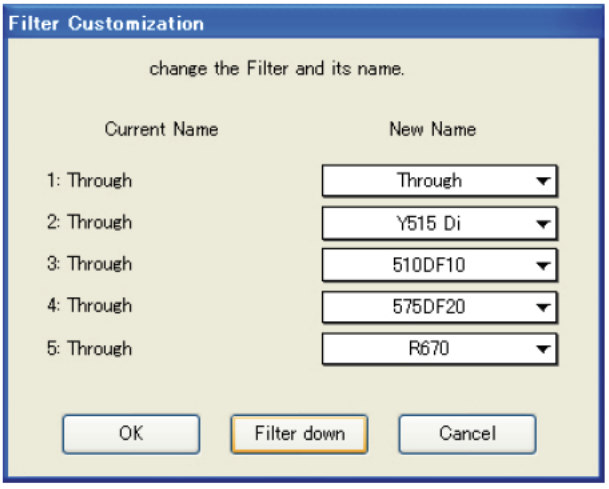


Select from the pull-down menu a filter to be set to each set position number on the turrent.



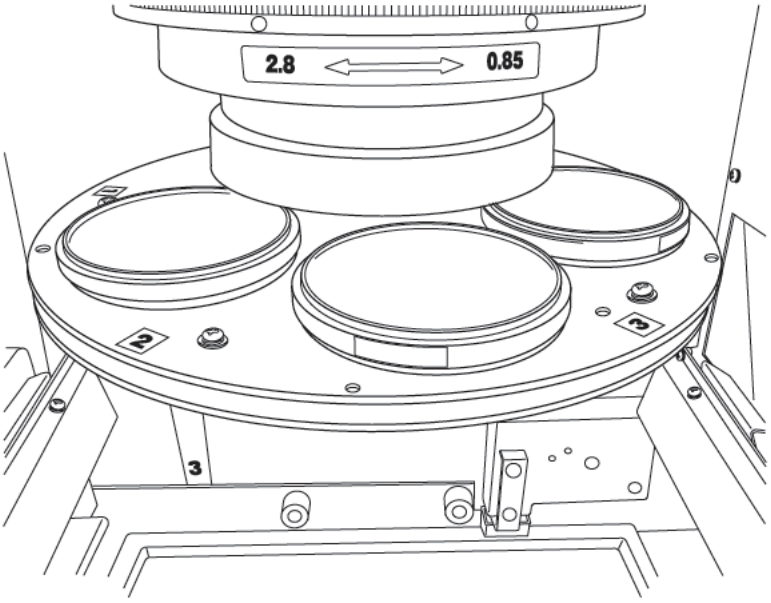


When all selections are complete, click the <Filter down> button.



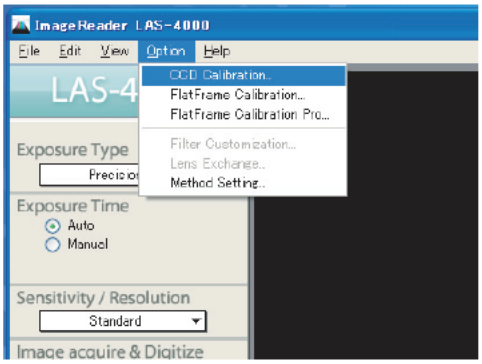


Set filters to the filter turret.

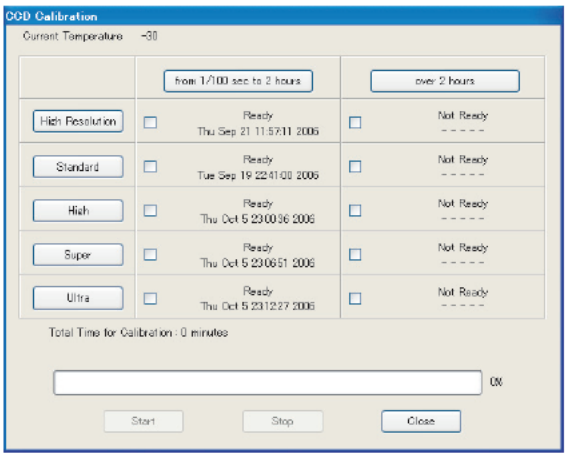


* After setting the filters, check that the filter types and set positions are consistent with those set on Image Reader.

35. Execute CCD calibration.
Start up the Image Reader.
When the cooling temperature reaches the set temperature, the status changes to “Ready,” so pull down the Option menu and select “CCD Calibration.”



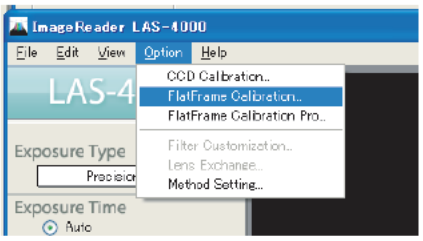
After placing check marks in the required sensitivity and exposure time range check boxes in the displayed dialog box, click on the “Start” button. A calibration file will be created and stored in the specified folder.



36. Execute Flat Frame Calibration Lite.
    * Prior to executing Flat Frame Calibration Lite, adjust the focus at each level.

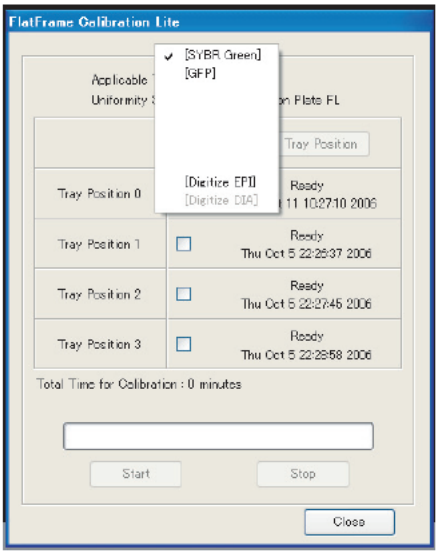
    The system operates normally after the above CCD calibration is completed, so the following explanation is given on the premise the Image Reader has been started up and the status is “Ready.”

    Pull down the Option menu and select “Flat Frame Calibration Lite.”



* For Flat Frame Calibration Pro, the usage conditions are different than the standard setting, so basically the operation is executed by the user. So unless there is a specific request by the user, during installation, only Flat Frame Calibration Lite need be executed.

Pull down the Method Name part on the displayed dialog box and select the method for executing Flat Frame Calibration Lite.
* Only methods that can be used when executing calibration can be selected.



Applicable Tray: EPI Tray — Incident light source tray
Uniformity Standard: Calibration Plate FL —
As of December 20, 2006, there are two types of plates: a light gree plate and a pink plate.
Each is designed for the following light sources:
EPI UV, DIA-UV, and Blue LED — Light green plate
Green LED, Red LED, andIR LED — Pink plate
Calibration Plate DI — Plate with white matte surface

After placing a check for the required tray position, clicking the “Start” button will create a calibration file and store it in the specified folder.

37. Take a photograph of the test chart to confirm that the image is correctly captured.

38. Completed.

39. Setting the type of wide field view lens
    Wide field view lenses supposed to be used with LAS-4000 are Nikon 50mm F1.4 and SIGMA 24mm F1.8. Thus the parameters in LAS-4000 have been optimized for these lenses for appropriate application.
    Be sure to set the names of the wide field view lenses delivered or to be delivered to the user.

    (1) From the same directory level at which LAS-4000 Image Reader resides, select LensType.

    (2) When the dialog below is displayed, select <Sigma24mmF1.8> and then click the Update button.



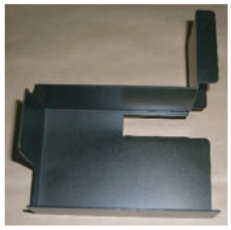
4 Modification Procedure to Support In-Vivo

Before beginning modification work, turn off the power to the unit. Install the unit in a well ventilated area.

Modification Kit Components

(1) Front frame
(2) Temperature regulation unit
(3) EPI tray for anesthetic
(4) Cover for door interlock cables
(5) Addition connection cables used between the power supply and the lifter unit (A,B,C)
(6) Insulok



(A) 
(B) 
(C) 

Tool used

Philips-head screwdriver, nippers

Procedures for remodeling

1. Turn on the power to the pre-modification system, start up the Image Reader, and move the tray position to the No.2 position. Shut down the Image Reader and turn off the system power.

2. Remove the door.

   (1) Remove the 4 screws and then remove the door. The screws will be reused, so do not lose them.
   Also at this time, do not forget to remove the hinge covers. The hinge covers will also be reused, so do not lose them.



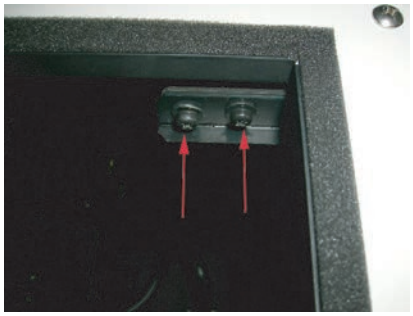

   (2) Remove the screws from the 2 blanks top and bottom, door lock, and screws for hiding the screw holes on the side the door lock is not attached to. Both of these will be reused, so please do not loose them.





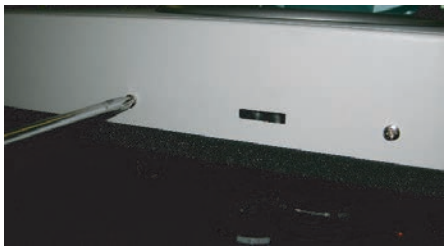
3. Remove the 2 screws and then remove the interlock unit.
   *Everything but the interlock cover will be reused, so do not lose them.

   (1) Remove the screws and then remove the interlock cover.



   (2) The connector area for the interlock unit is located at the top right of the door frame as seen from the front, so remove the connector.

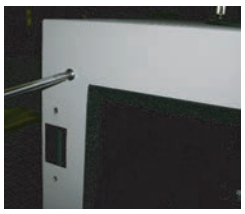
   (3) Remove the 2 screws and then remove the interlock unit.
   *If reinstalling the interlock unit after another work procedure, be sure to install it in the same orientation as at first.



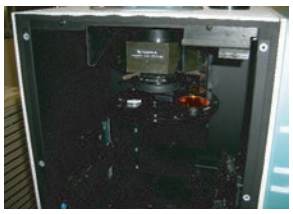


4. Remove the door frame

   Remove the 6 screws (3 each on the left and right) from the door frame and then remove the door frame.
   * The screws will be reused, so do not lose them.







5. Attach the interlock unit connectors. 1. Placing the interlock unit that has been connected to the connector on top of the IDX as shown in the photograph makes it easier to perform the following cover attachment work.




6. Attach the interlock unit cover (new type). As shown by the arrow in the photograph, insert the cable in the inside of the cover and use the screws to install the cover.





7. Install using the reverse order of disassembly and install the new frame, interlock unit, hinge cover, blanks, door lock, and the screws for hiding the screw holes on the side not connect

   *** After the In-Vivo remodeling, the anesthetic gas generator shall always be located to the left of the LAS-4000 from the front view. Taking into consideration the usability after the remodeling, the door may be attached so that it is opened in the direction opposite to the default one (opened to the right from the door side or from the front view).**
   In this case, hinge covers ----> The IDX is on the right side as viewed from the front.
   Blanks ----------> The IDX is on the left side as viewed from the front.

   Before installing the new frame, pass the interlock unit cable to the inside of the new cover as shown in the photograph. The interlock unit can hang down as shown in the pre-assembly photograph.




hinge covers Blanks




Install the door lock with it facing the inside of the indented area.




8. After installing the interlock actuator connected to the door <in the position where it comes to the top when the door is connected>, install the door. **This work is required when before the modification the door opened to the left as seen from the front.**

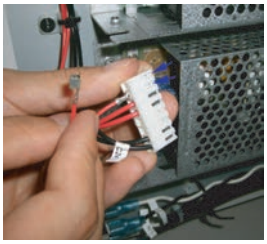
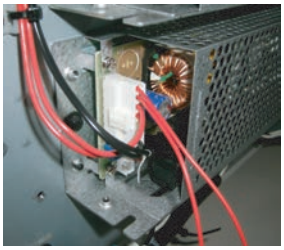




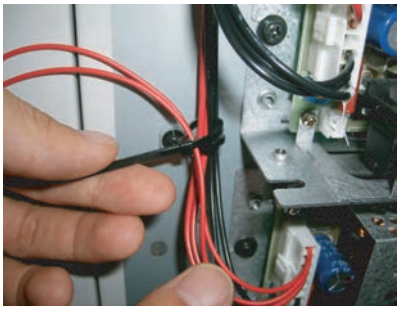
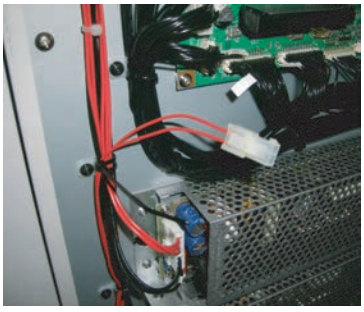
9. Remove the right side cover.



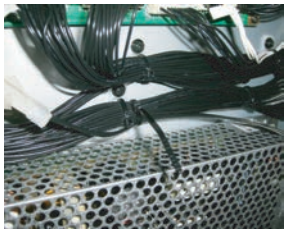

10. Disconnect the 24V power supply connector (power supply connector at the bottom).
    Red and black wires have already been inserted into the connector, but there are 4 insertion openings that are empty.
    Insert the prepared 2 terminals of cable A (red wire) into the 2 locations on the outside (see photo).
    The terminals must be properly oriented when inserted. Check the orientation of the other terminals before making the insertion.
    Insert the connector back in its original position.
    * During the work after this point, be very careful not to touch the primary power cable when handling the harness.

11. Use a band to bundle the cables together.

12. Connect cable B. Use a band to bundle the cables together.
    (2 locations)

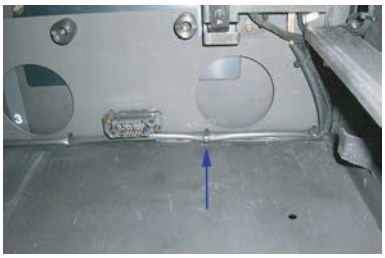




13. Open the inner cover in the right side. Remove the cable cover to which the light-blocking sponge is attached. Insert the cable B connector to the inside.

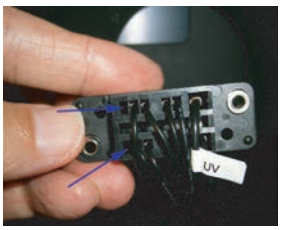


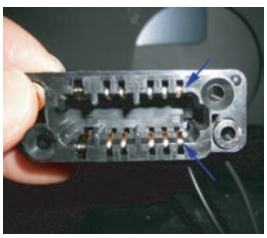



14. While viewing the IDX from the front, access the insulok on the right side of the connector set for the transparent light source unit from the bottom and cut it.

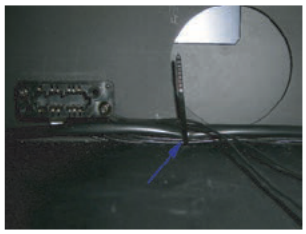


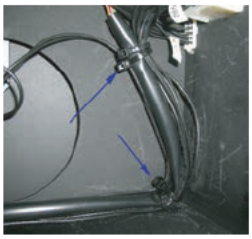

15. Disconnect the transmitted light source connector. (Remove the 2 screws) While viewing the back of the connector, the 2 places for inserting the terminals are open, so insert 2 new cable C terminals into these two locations. After inserting the terminals, look at the connector from the front to check to make sure the terminals are inserted securely.

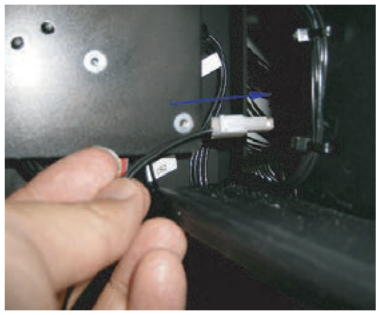
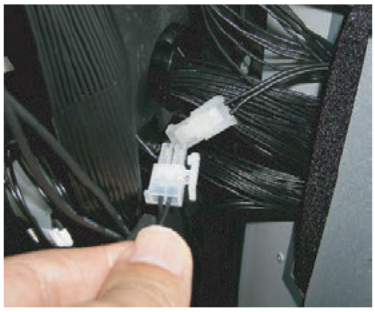


16. Connect the connector to its original position. Place the new cables behind the tube containing the existing cable bundle to hide them and then fasten them with bands. Use the connector right side band fastening mechanism with the band passed through from the bottom (the band bump faces the bottom).

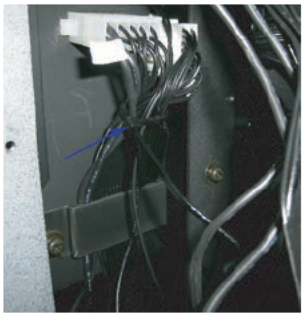
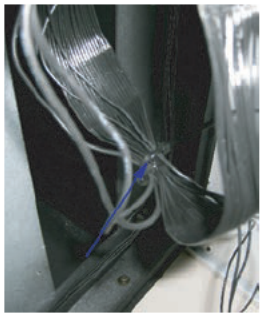




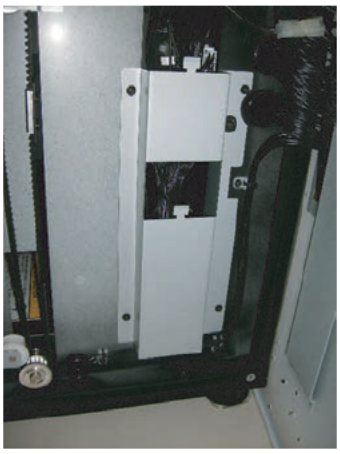
17. Insert the cable C terminal connector into the hold on the right side from which other cables are protruding.
Connect them to cable B.

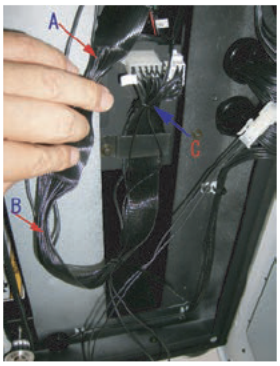
18. Remove the cable cover. (Remove the screws. Cut off the 2 bands.)
Use bands to fasten the new cable to the existing cable bundle.

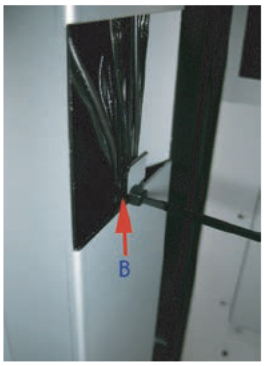




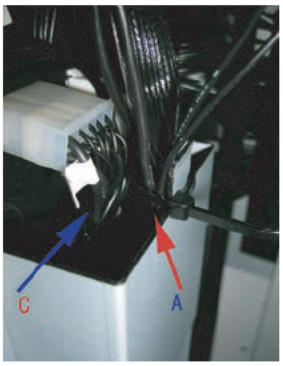
19. Attach the cable cover. Use bands in the 2 locations of the cable cover for fastening the cables.




At this time, the parts to which the cable is attached that are not attached to the insulok before the cover is attached parts A and B as shown in the photograph. Be careful not to mistakenly bundle them with the insuloks that are already bundled up to part C.







20. Return the inner cover to its original position. Attach the cable cover with thelight-blocking sponge. Attach the right side cover.

21. Ready the temperature controller and set it in the transparent light source unit placement position. Lock the lock bar.

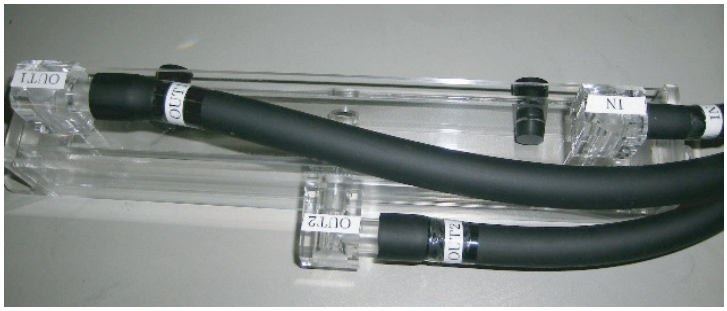




22. Ready a splitter adapter and hoses.



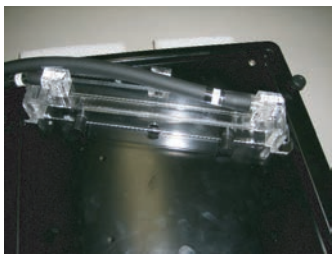
23. Check the labels on the 3 hoses (Wide: 2 hoses, Narrow: 1 hose) and connect them to the splitter adapter.

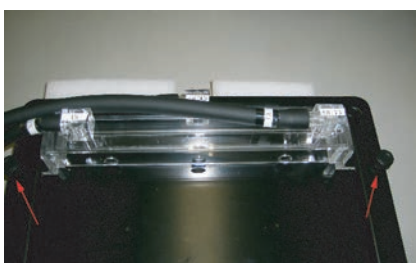


24. Ready the in-Vivo tray. Loosen the screws of the splitter pipe adapter fastening brackets on both sides of the in-Vivo tray.



25. Attach the splitter adapter, tighten the bracket screws on both sides of the tray, and secure the position of the adapter.
    * At this stage the adapter fastening position can be freely set (The final position will eventually be determined by adjusting it to match the size of the sample used by the user).



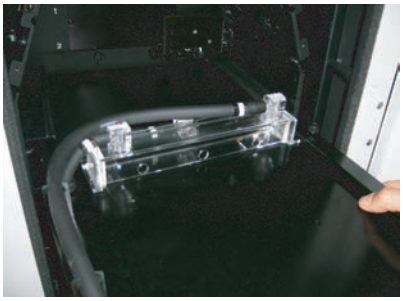
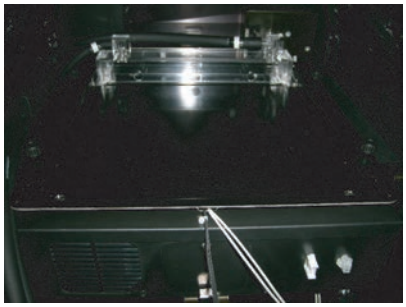


26. Insert the hose into the hose holding frame on the left side of the tray and secure it. When doing this, the hose attachment order is IN, OUT2, and OUT 1 from the button up.

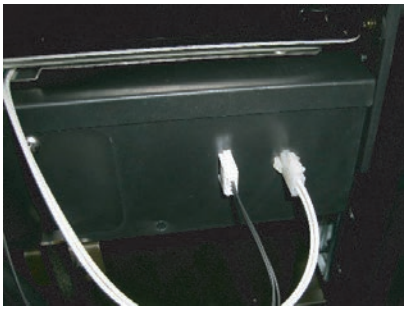




27. Place the tray in the IDX.

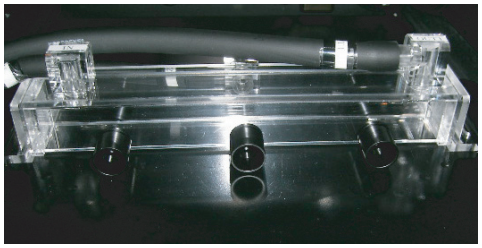
28. Connect the connectors coming out from the tray to the temperature controller terminals.

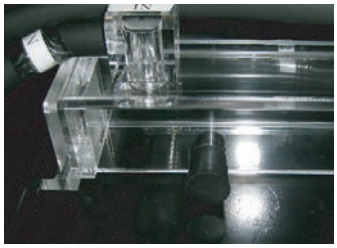


29. Connect the hoses to the hose connections at the bottom left on the front of the IDX. Check the hose labels and connector labels to avoid making the wrong connections.



30. Insert adapters or rubber plugs in the 3 holes in the splitter pipe adapter.
    * Select adapters or rubber plugs depending on the number of samples used by the user.
      Hole in which a sample is place: Adapter, hole in which a sample is not placed: Rubber plug





This completes the expansion work.
Perform the following confirmation work after equipment expansion.

31. Temperature controller operation check
    Remove the screws on the front of the controller, remove the lid, and check if there is a display on the liquid crystal display when the power is turned on.





After completing the check, replace the lid and screws.
Further, touch the in-Vivo tray surface to make sure it is no longer loose.

32. Light blocking effect check
    Start up the LAS system.
    Write characters on the white paper and place it in the in-Vivo tray. The tray can be in any position.
    While in the chemiluminescence mode, put it in the Super mode and manually set the exposure time to 5 min.
    Check the photographed image, and if characters cannot be seen in the image, the light blocking effect is OK.

    End

Chapter F. Troubleshooting

This chapter presents countermeasures to trouble occurring with the LAS-4000 system.

Chapter F. Troubleshooting

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1 LAS-4000 Error Codes List (for User)

CODE	Description	Solution
8000	UV exposure did not work properly, and then UV auto-OFF function became activated for safety.	• Restart the reading software alone, or both LAS-4000 system and reading software. • ON-CALL if the error persists.
9100	Temperature exceeded the predetermined upper limit and then temperature control-OFF function became activated for safety.	• Check if the air intake and exhaust ports in the camera head are blocked. • Turn OFF the power to the LAS-4000 once and let it stand for a while. Then restart both LAS-4000 and reading software. • ON-CALL if the error persists.
A000	No response was received to the transmission from camera head to IDX.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
A100	Transmission was attempted from camera head to IDX when IDX was not able to receive the transmission.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
A200	Transmission from camera head to IDX was identified as incorrect parameter at IDX.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B001	At startup diagnosis, the stage unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B002	At startup diagnosis, the filter unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B004	At startup diagnosis, the focus unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B008	At startup diagnosis, the iris unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B010	At startup diagnosis, the incident-light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B020	At startup diagnosis, the transmitted UV light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B040	At startup diagnosis, the transmitted white light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B0**	If two or more units are defined as faulty at startup diagnosis, the relevant codes among the above B001 through B040 will be ORed.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B101	During normal operation, the stage unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B102	During normal operation, the filter unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B104	During normal operation, the focus unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B108	During normal operation, the iris unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B110	During normal operation, the incident-light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.

CODE	Description	Solution
B120	During normal operation, the transmitted UV light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B140	During normal operation, the transmitted white light unit was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
B1**	If two or more units are defined as faulty during normal operation, the relevant codes among the above B101 through B140 will be ORed.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D000	At startup diagnosis, EEPROM (M/C parameter storage memory) was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D100	At startup diagnosis, SDRAM (image data memory) was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D2**	At startup diagnosis, the mechanical shutter was defined as faulty.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D300	The startup diagnosis of the IDX did not finish within a specified period of time (180 sec).	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D400	The stage/ filter/ iris/ focus operation did not finish within a specified period of time (180 sec).	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D500	The stage operation did not finish within a specified period of time (180 sec).	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D600	Line interruption was executed at an incorrect timing.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D700	A fault was detected in the panel LED board connector.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D800	A fault was detected in the IDX heat-radiation fan.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
D900	A fault was detected in the camera head heat-radiation fan.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.
DC01	During the exposure, a fault was detected in the mechanical shutter.	• Restart both LAS-4000 and reading software. • ON-CALL if the error persists.

2 Error Codes Displayed on the Analyzing Unit and their Solutions

CODE	Description	Possible Cause / Solution
1000	An attempt was made to upgrade the version of the camera head ROM in an invalid mode for upgrading. (Details) This error occurs if the USB command for upgrading is received in any invalid mode for upgrading. After occurrence of this error, restart the LAS-4000, and the permissible upgrading mode should be enabled. Camera head EEPROM 0 address 0x0010 upgrading mode	If retry is unsuccessful and the error persists, CPLS4 board is faulty.
1001	The file for which upgrading of the version of the camera head ROM was not appropriate. (Details) This error can occur if: The Motorola S format file for upgrading of ROM version does not contain FUJIFILM-LIGHT-3(\n) in the first line, and XUP-LOAD-FINISH (\n) in the last line.	If retry with a correct file is unsuccessful, CPLS4 board is faulty. USB I/F and/or its peripherals may be faulty. (including PC and cables).
1002	Upgrading of version of camera head ROM did not finish successfully. (Details) During the interpretation and loading of the Motorola S format file into Flash Memory, unexpected data (involving checksum, S code, etc.) was detected.	If retry with a valid file is unsuccessful, CPLS4 board is faulty. USB I/F and/or its peripherals may be faulty (including PC and cables).
2000	Unexpected USB command code was received.	Restart both LAS-4000 and reading software.
2101	Unexpected USB command descriptor was received.	Restart both LAS-4000 and reading software.
2102	Unexpected request data length of USB command was received.	Restart both LAS-4000 and reading software.
2200	Unexpected request data content of USB command was received.	Restart both LAS-4000 and reading software.
23**	USB command was received at an unexpected timing. (Details) The asterisks ** refer to USB command code.	Restart both LAS-4000 and reading software.
8000	UV exposure did not work properly and then the UV auto-OFF function became activated for safety. (Details) The error occurs when the auto-OFF function is executed after the UV lighting time reaches 10 minutes and 40 seconds in the control of theDRLS4 board. Normally, the UV light unit will be properly turned OFF by the USB I/F command from the reading software. (Increment and Repetition will be terminated in response to this automatic shutdown.)	The USB cable was disconnected and/or the reading software was terminated abnormally during the UV exposure. DRLS4 board is faulty.
9000	At startup diagnosis, IDX door was set to open. (Details) This error occurs when the door is set to open during the startup diagnosis of IDX.	The door was set to open. Faulty DRLS4 board INT-1 (door sensor); DR-4, R-INT poor connection

CODE	Description	Possible Cause / Solution
9100	Due to overheating, the temperature control shutdown function became activated in the safety device. (Details) This error occurs when the thermal switch on the DRLS4 board is activated. An electric error bit will be turned ON, causing the Peltier supply current to be cut off. When the temperature returns to the normal range, the normal condition will be restored.	DRLS4 board, DR16 poor connection Blocked air intake/exhaust ports
A000	No response was received to the transmission from camera head to IDX. (Details) If he serial 232C communication between camera head and IDX is found incorrect, retry may be attempted a maximum of three times. This error occurs if IDX does not yet respond to the third retry.	CPLS4 board CL7 DRLS4 board DR15 Incorrect connection of camera head cable.
A100	Transmission from camera head to IDX was attempted when IDX was not yet ready for reception. (Details) If the serial 232C communication between camera head and IDX is faulty, retry may be attempted a maximum of three times. This error occurs when IDX does not respond to the transmission even at the third retry because it is performing another operation.	Restart both LAS-4000 and reading software.
A200	Transmission from camera head to IDX was defined as invalid parameter at IDX. (Details) If the serial 232C communication between camera head and IDX is faulty, retry may be attempted a maximum of three times. This error occurs if IDX defines the contents transmitted as invalid even at the third retry.	CPLS4 board CL7 DRLS4 board DR15 Incorrect connection of camera head cable
B001	At startup diagnosis, the stage unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty stage unit Faulty detection sensor PHS1 - 7 DRLS4 = DR3 Faulty motor PM 1 DRLS4 = DR12 Faulty DRLS 4 board
B002	At startup diagnosis, the filter unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty filter unit Faulty detection sensor PHS 9 - 12 DRLS4 = DR4 Faulty motor PM 2/3 DRLS4=DR10 Faulty DRLS4 board
B004	At startup diagnosis, the focus unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty focus unit Faulty detection sensor PHS14 DRLS4 = DR6 Faulty motor PM 5 Faulty DRLS4 board
B008	At startup diagnosis, the aperture unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty iris unit Faulty detection sensor PHS13 DRLS4 = DR6 Faulty motor PM 4 DRLS4 = DR11 Faulty DRLS 4 board
B010	At startup diagnosis, incident-light unit was defined as faulty. (Details) This error occurs if the electric signal for that type of incident-light unit is abnormal.	Different incident-light units may have been installed in the right and left sides. Defective or faulty incident-light unit DRLS4, DR8
B020	At startup diagnosis, the transmitted UV light unit was defined as faulty. (Details) This error occurs if the electric signal for that type of transmitted-light unit is abnormal. This error also occurs if the bit for the incorrect transmitted UV temperature is turned ON.	Defective or faulty transmitted UV light unit DRLS4, DR9

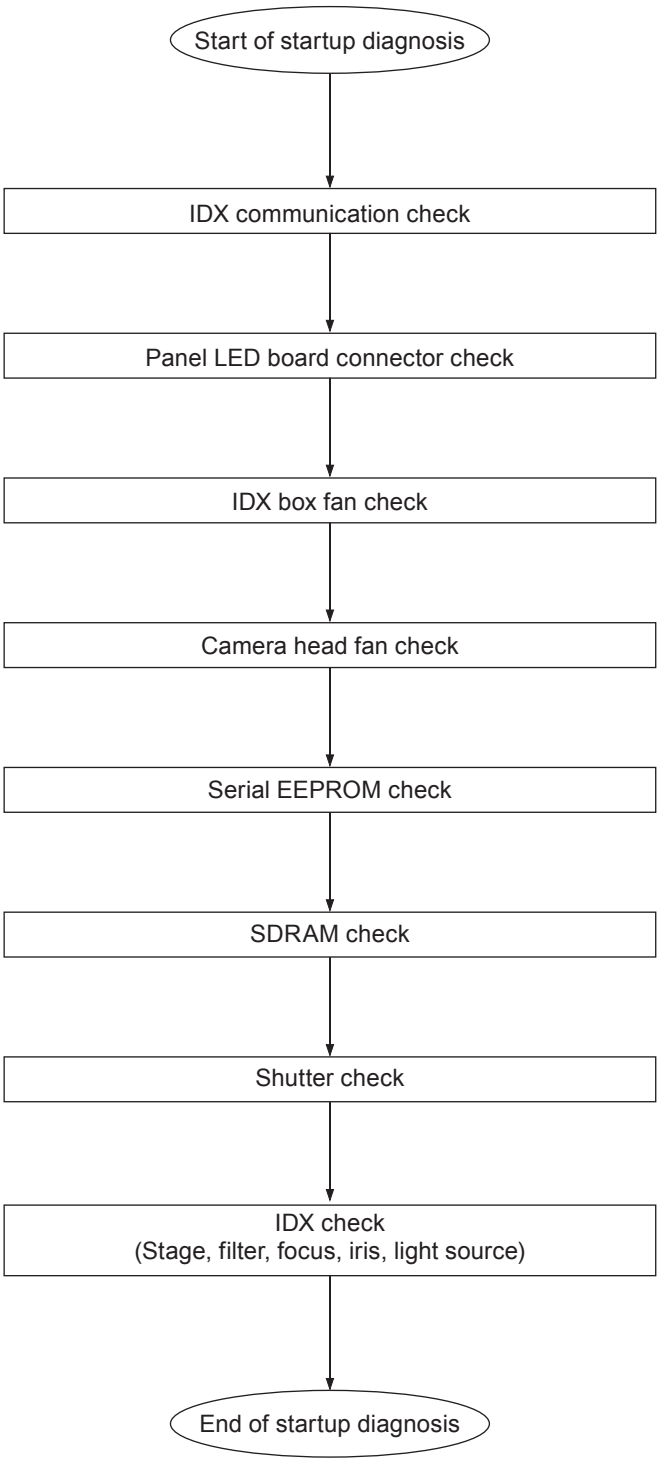
CODE	Description	Possible Cause / Solution
B040	At startup diagnosis, the transmitted white light unit was defined as faulty. (Details) This error occurs if the electric signal for that type of transmitted light unit is abnormal.	Faulty transmitted white light unit DRLS4, DR9
B0**	If two or more units are found faulty at the startup diagnosis, the relevant codes among the above B001 through B040 will be ORed.	
B101	During operation, the stage unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty stage unit
B102	During operation, filter unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty filter unit
B104	During operation, the focus unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty focus unit
B108	During operation, the iris unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty iris unit
B110	During operation, the incident-light unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty incident-light unit
B120	During operation, the transmitted UV light unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty transmitted UV light unit
B140	During operation, the transmitted white light unit was defined as faulty. (Details) For details, see the description about the corresponding code in the ERROR LOG.	Faulty transmitted white light unit
B1**	If two or more units are found faulty at the startup diagnosis, the relevant codes among the above B101 through B140 will be ORed.	
BA01	Thee command to operate the stage was received while the IDX stage unit was faulty or it was not yet installed,.	Restart both LAS-4000 and reading software.
BA02	The command to operate the focus was received while the IDX focus unit was faulty or it was not yet installed.	Restart both LAS-4000 and reading software.
BA04	The command to operate the filter was received while the IDX filter unit was faulty or it was not yet installed.	Restart both LAS-4000 and reading software.
BA08	The command to operate the iris was received while the IDX iris unit was faulty or it was not yet installed.	Restart both LAS-4000 and reading software.
BA10	The command to operate the incident-light unit was received while the IDX incident-light unit was faulty or it was not yet installed.	Restart both LAS-4000 and reading software.
BA20	The command to operate the UV lighting was received while the IDX transmitted UV light unit was faulty or it was not yet installed,	Restart both LAS-4000 and reading software.
BA40	The command to operate the IDX transmitted white lighting was received while the IDX transmitted white light unit was faulty or it was not yet installed,	Restart both LAS-4000 and reading software.

CODE	Description	Possible Cause / Solution
D000	At startup diagnosis, EEPROM (M/C No. parameter storage memory) was defined as faulty. (Details) This error occurs if a mismatch is found from the comparison between checksum values of EEPROM addresses 1 through 24 (in units of 2-byte) and addresses 46 and 47.	Faulty CPLS4 board EEPROM data changed by maintenance tool
D100	At startup diagnosis, SDRAM (image data memory) was defined as faulty. (Details) This error occurs if a mismatch is found by writing and reading 0x5555 at the DRAM first address (0xC0000000) and 0xAAAA at the last address (0xC07FFFFE).	Faulty CPLS4 board
D201	At startup diagnosis, the mechanical shutter was found faulty. (Details) Shutter opening may be retried a maximum of three times. If on electric error bit is found turned ON at the third retry, this error results.	Shutter unit CPLS4, CL10
D202	At startup diagnosis, the mechanical shutter was found faulty. (Details) Shutter opening may be retried a maximum of three. If the open sensor does not respond even at the third retry, this error results.	Shutter unit CPLS4, CL10
D204	At startup diagnosis, the mechanical shutter was found faulty. (Details) Shutter opening may be retried a maximum of three times. If the close sensor does not respond even at the third retry, this error results.	Shutter unit CPLS4, CL10
D210	At startup diagnosis, mechanical shutter was found incorrect. (Details) Closing of shutter may be retried a maximum of three times. If the error bit is found turned ON at the third retry, this error results.	Shutter unit CPLS4, CL10
D220	At startup diagnosis, the mechanical shutter was found incorrect. (Details) Opening of shutter may be retried a maximum of three times. If the open sensor does not respond even at the third retry, this error results.	Shutter unit CPLS4, CL10
D240	At startup diagnosis, mechanical shutter was found incorrect. (Details) Shutter closing may be retried a maximum of three times. If the close sensor does not respond even at the third retry, this error results.	Shutter unit CPLS4, CL10
D2**	If the mechanical shutter error occurs at the startup diagnosis, the above D201 through D240 will be ORed.	
D300	The startup diagnosis of the dark box did not finish within a specified period of time (180 sec).	IDX individual units DRLS4
D400	Filter iris operation did not finish within a specified period of time (180 sec).	IDX individual units DRLS4
D500	Stage operation did not finish within a specified period of time (180 sec).	IDX individual units DRLS4
D600	Timing of line interruption was invalid.	CPLS4

CODE	Description	Possible Cause / Solution
D700	Panel LED board connector was found faulty. (Details) This error occurs if an electric error bit is turned ON.	DRLS4, CN5, DPLS3
D800	The dark box fan was found faulty. (Details) This error occurs if an electric error bit is turned ON.	DRLS4, CN7 Faulty IDX fan
D900	The camera head fan was found faulty. (Details) This error occurs if an electric error bit is turned ON.	AGLS4, CN7 Faulty camera head fan
DA00	IDX failed to complete the operation within 180 seconds from the reception of the command for motor maintenance operation. (Details) This error can occur only when the motor is set to operate based on the maintenance command.	IDX individual units DRLS4
DB00	IDX failed to complete the operation within 180 seconds from the reception of the command for self-diagnosis unit maintenance. (Details) This error can occur when the self-diagnosis is set to complete based on the maintenance command.	IDX individual units DRLS 4
DC01	During exposure, the mechanical shutter was found faulty. (Details) This error occurs if the error bit is turned ON in the shutter operation during exposure.	Shutter unit CPLS4, CL10
E000	OS system call was defined as faulty. (Details) OS system call in the camera head was not successfully processed.	Restart both LAS-4000 and reading software.

3 Startup Sequence

(If any error occurs in the process of startup sequence, the subsequent diagnostic steps will be canceled.)



4 Detailed description of Individual Codes in ERROR LOG

ERROR LOG will be automatically created by the reading software when any error occurs.

LOG DATA Each Item [0] – [19] 20bytes [19] = LF

No.	Symbol	Meaning	Value (X: variable value)
1	“Timing =”	Logging timing	“BOOTEND” →End of startup diagnosis “ERROR” →Error occurs
2	“Camera =”	Camera head control software version	“ XXXX” (Dec 4 digit)
3	“IDX =”	IDX control software version	“ XXXX” (Dec 4 digit)
4	“CamSeriNo.=”	Camera head serial number	“XXXXXXXX” (Dec 8 digit)
5	“IDXSeriNo.=”	IDX serial number	“XXXXXXXX” (Dec 8 digit)
6	“BootCount =”	Total startup counts	“ XXXX” (Dec 4 digit)
7	“ReadCount =”	Total read counts	“ XXXX” (Dec 4 digit)
8	All in-between blanks are space 0x20		
9			
10			
11	“**** Diagnostic ****”		
12	“StageError =”	Error in the stage unit	“ XXXX” (Hex 4 digit)
13	“FilterError=”	Error in the filter unit	“ XXXX” (Hex 4 digit)
14	“FocusError =”	Error in the focus unit	“ XXXX” (Hex 4 digit)
15	“IrisError =”	Error in the iris unit	“ XXXX” (Hex 4 digit)
16	“LaserError =”	Error in the light source unit	“ XXXX” (Hex 4 digit)
17	“ShutError =”	Error in the mechanical shutter unit	“ XXXX” (Hex 4 digit)
18	“EtcError =”	Other errors	“ XXXX” (Hex 4 digit)
19	“****** Status *****”	*: “Status” represents the value at the logging timing	
20	“ErrorCode =”	Additional sense code	“ XXXX” (Hex 4 digit)
21	“CameraState=”	Camera status	“ XXXX” (Hex 4 digit)
22	“IDXState =”	IDX status	“ X” (Character string 1 digit)
23	“CameraSeqNo=”	Camera head sequence number	“ XXXX” (Dec 4 digit)
24	“Target(DA) =”	Target temperature	“ XXXX” (Hex 4 digit)
25	“Target(IF) =”	Target temperature after adjustment	“ XXXX” (Hex 4 digit)
26	“CoolTemp =”	IDX cooling temperature	“ XXXX” (Hex 4 digit)
27	“CoolDA =”	Peltier applied voltage	“ XXXX” (Dec 4 digit)
28	“UsualDA0 =”	Setting value of Serial DAC0	“ XXXX” (Hex 4 digit)
29	“FocusDA1 =”	Setting value of Serial DAC1	“ XXXX” (Hex 4 digit)
30	“OFDDA2 =”	Setting value of Serial DAC2	“ XXXX” (Hex 4 digit)
31	“ImageLine =”	Setting of image data line numbers	“ XXXX” (Dec 4 digit)
32	“ReadLine =”	DRAM write-in data line numbers	“XXXX.XX” (Dec) (4 digit integers, and 2 digit decimals)
33	*** ExpLED Time ***		
34	“I_RED=”	Incident light near infrared LED ntegrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
35	“ RED=”	Incident light red LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
36	“GREEN=”	Incident light green LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)

37	“WHITE=”	Incident light white LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
38	“BLUE=”	Incident light blue LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
39	“ UV=”	UV Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
40	“CLEAR=”	Transmissive light white LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
41	“OPT01=”	Incident light option 01 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
42	“OPT02=”	Incident light option 02 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
43	“OPT03=”	Incident light option 03 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
44	“OPT04=”	Incident light option 04 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
45	“OPT05=”	Incident light option 05 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
46	“OPT06=”	Incident light option 06 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
47	“OPT07=”	Incident light option 07 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
48	“OPT08=”	Incident light option 08 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
49	“OPT09=”	Incident light option 09 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
50	“OPT10=”	Incident light option 10 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
51	“OPT11=”	Incident light option 11 LED Integrated lighting time	“XXXX hXXmXXs” (Dec) (4 digit hours, 2 digit minutes and 2 digit seconds)
52	“**** Now Status ***”	*:“ Now Status” represents the value at the time of log reading	
53	“ErrorCode =”	Additional sense code	“ XXXX” (Hex 4 digit)
54	“CameraState=”	Camera status	“ XXXX” (Hex 4 digit)
55	“IDXState =”	IDX status	“ X” (Character string 1 digit)
56	“CameraSeqNo=”	Camera head sequence number	“ XXXX” (Dec 4 digit)
57	“Target(DA) =”	Target temperature	“ XXXX” (Hex 4 digit)
58	“Target(IF) =”	Target temperature after adjustment	“ XXXX” (Hex 4 digit)
59	“CoolTemp =”	IDX cooling temperature	“ XXXX” (Hex 4 digit)
60	“CoolDA =”	Peltier applied voltage	“ XXXX” (Dec 4 digit)
61	“UsualDA0 =”	Setting value of Serial DAC0	“ XXXX” (Hex 4 digit)
62	“FocusDA1 =”	Setting value of Serial DAC1	“ XXXX” (Hex 4 digit)
63	“OFDDA2 =”	Setting value of Serial DAC2	“ XXXX” (Hex 4 digit)
64	“ImageLine =”	Setting of image data line numbers	“ XXXX” (Dec 4 digit)
65	“ReadLine =”	DRAM write-in data line numbers	“XXXX.XX” (Dec) (4 digit integers, and 2 digit decimals)
66	All in-between blanks are space 0x20		
67			
68			
69			
70			
71			

72			
73			
74			
75	“**********”		
76	AA remaining lines are null.		
77			
78			
79			
80			
81			
99			

Data are in ASCII codes. They may be stored as text files.

Stage Error Detailed Information

CODE	Description
0001	At startup diagnosis, any position sensor did not respond to the operation of the stage motor.
0100	At startup diagnosis, lower position sensor did not respond to the operation of the stage motor.
0200	At startup diagnosis, position 4 sensor did not respond to the operation of the stage motor.
0400	At startup diagnosis, position 3 sensor did not respond to the operation of the stage motor.
0800	At startup diagnosis, position 2 sensor did not respond to the operation of the stage motor.
1000	At startup diagnosis, position 1 sensor did not respond to the operation of the stage motor.
2000	At startup diagnosis, upper position sensor did not respond to the operation of the stage motor.
4000	At startup diagnosis, position sensors did not respond in the order of upper, 1, 2, 3, 4, and lower, to the operation of the stage motor.
	At startup diagnosis, the above errors occur in the form of OR value.
B011	At the ORIGIN RETURN cycle, a time-out occurred in the rough shift-down operation.
B012	At the ORIGIN RETURN cycle, a time-out occurred in the rough shift-up operation.
B013	At the position alignment cycle, a time-out occurred in the rough shift-down operation.
B014	At the position alignment cycle, a time-out occurred in the rough shift-up operation.
B015	At the position alignment cycle, a time-out occurred in the shift-down operation from threshold.
B016	At the position alignment cycle, a time-out occurred in the inching movement.

Filter Error Detailed Information

CODE	Description
0001	At startup diagnosis, filter UP/DOWN OK sensor did not respond to the rotation of the filter rotating motor. At startup diagnosis, filter rotation ORIGIN sensor did not respond to the rotation of the filter rotating motor. At startup diagnosis, filter UP/DOWN OK sensors at 5 points did not respond to the rotation of the filter rotating motor.
0002	At startup diagnosis, UP/DOWN ORIGIN sensor did not respond to the motion of the filter UP/DOWN motor. At startup diagnosis, filter UP END Limit sensor did not respond to the motion of the filter UP/DOWN motor.
0004	At startup diagnosis, filter rotation ORIGIN sensor did not respond to the motion of the
	filter rotating motor. At startup diagnosis, filter UP/DOWN OK sensors at 5 points did not respond to the motion of the filter rotating motor.
0008	At startup diagnosis, filter UP/DOWN OK sensor did not respond to the motion of the filter rotating motor.
0010	At startup diagnosis, UP/DOWN ORIGIN sensor did not respond to the motion of the filter UP/DOWN motor.
0020	At startup diagnosis, UP/DOWN ORIGIN sensor did not respond to the motion of filter UP/DOWN motor. Position 1 sensor did not respond to the operation of the stage motor.
	At startup diagnosis, the above errors are ORed.

CODE	Description
B041	Parameter error during the relocation of filter UP/DOWN motor to the lens specified position
B042	Time-out error during the relocation of filter UP/DOWN motor to the lens specified position
B043	Time-out error during rough relocation of filter UP/DOWN motor to the home position
B044	ORIGIN search time-out error during the fine-pitch relocation of filter UP/DOWN motor to the home position
B045	Final processing time-out error during the fine-pitch relocation of filter UP/DOWN motor to the home position
B046	Accelerated/decelerated driving time-out error during the relocation of the filter UP/DOWN motor to the home position
B047	Time-out error of threshold relocation at constant speed during the relocation of the filter UP/DOWN motor to the home position
B049	Parameter error of the current position for filter rotation
B04A	Parameter error of the specified position for filter rotation
B04B	Time-out error of operation closer to a specified position during the relocation of the filter turret to the specified position
B04C	Time-out error of the threshold relocation to a specified position during the relocation of the filter turret to the specified position
B04E	Retry error during the relocation of the filter turret to a specified position

Focus Error Detailed Information

CODE	Description
0001	At startup diagnosis, focus ORIGIN sensor remained OFF and did not respond to the rotation of the focus motor. At startup diagnosis, focus ORIGIN sensor did not deactivate even when the focus motor was turned in the direction away from the home position.
0002	At startup diagnosis, focus ORIGIN sensor remained OFF and did not respond to the rotation of the focus motor. At startup diagnosis, the above errors were ORed.
B031	Time-out error during the relocation closer to the ORIGIN at ORIGIN search cycle
B032	Time-out error during the relocation away from the ORIGIN at ORIGIN search cycle
B033	Time-out error during the relocation to a specified position away from ORIGIN
B034	Filter UP/DOWN alarm detection error during the relocation to a direction away from ORIGIN
B035	Focus adjustment time-out error
B036	Parameter error during focus adjustment (system error)
B037	Time-out error during the relocation to the ORIGIN at ORIGIN search cycle

IIRIS Error Detailed Information

CODE	Description
0001	At startup diagnosis, iris ORIGIN sensor (F0.8) remained OFF and did not respond to the rotation of iris. At startup diagnosis, iris ORIGIN sensor did not deactivate even when the iris motor was turned in a direction away from ORIGIN.
0002	At startup diagnosis, aperture ORIGIN sensor remained OFF and did not respond to he rotation of iris.
	At startup diagnosis, the above errors were ORed.
B021	Time-out error of relocation to ORIGIN during ORIGIN search
B022	Time-out error of relocation away from ORIGIN during ORIGIN search
B023	Time-out error of relocation from ORIGIN to F2.8
B024	Time-out error of relocation to ORIGIN during ORIGIN search

Light source Error Detailed Information

CODE	Description
B051	UV time-out error

Other Error Detailed Information

CODE	Description
****	Communication error command

5 Possible Faults not Displayed on the Analyzing Unit and Countermeasures

Observation	Cause	Solution
Analyzing unit CCD temperature indication does not change to [Ready] after a sufficient time (about 10 min.) has elapsed since the start of cooling.	1. Surrounding temperature too high 2. CCD set temperature too low 3. Camera head cable installation failure 4. Incorrect camera head fan 5. DC power cable failure 6. Internal harness failure or disconnection 7. Peltier defect/service life over 8. AGLS4 board defect 9. CPLS4 board defect 10. DRLS4 board failure 11. ZWS100AF-12/JA power supply defect Replace the part. 12. The breaker is turned OFF.	Confirmation by user Confirmation by user Confirmation by user Replace parts. Replace parts. SendBack SendBack SendBack SendBack SendBack SendBack
It looks as if there is fog on the image.	1. At time of CCD cooling, there was frost or drops of water on the glass of the light-receiving unit (light-receiving unit abnormality) 2. Camera head abnormality	(1) Confirm usage environment (2) SendBack SendBack
Even when the set exposure time has elapsed, reading operation does not end.	1. CPLS4 board failure 2. Camera head failure	SendBack SendBack
Panel LED does not light correctly. (At time of startup diagnosis, all LEDs light.)	1. AC cable installation failure 2. AC power cable failure 3. Defective POWER switch 4. Power supply unit failure 5. Internal harness failure or disconnection 6. DPLS4 board failure 7. DRLS4 board failure 8. The breaker is turned OFF.	Confirmation by user Replace the part. Replace the part. SendBack SendBack SendBack SendBack
Image is not displayed on monitor in focus mode.	1. Exposure dose is low 2. Incident illumination LED failure 3. CPLS4 board failure 4. Camera head failure	Confirmation by user Replace the part. SendBack SendBack
Optional functions do not work in focus mode. (Image display position shift and magnification/reduction functions)	1. CPLS4 board failure	SendBack
Image Reader does not recognize the controller. Error is displayed.	1. Internal harness failure or disconnection 2. USB cable disconnection 3. USB cable failure 4. CPLS4 board failure	SendBack Confirmation by user Replace the part SendBack
When normal exposure mode is quit, this fact is not displayed on the monitor.	1. Exposure dose is low 2. LED illumination does not light at time of fluorescent measurement 3. CPLS4 board failure 4. Incorrect filter setting 5. Incorrect lens setting	Confirmation by user Confirmation by user SendBack Confirmation by user Confirmation by user

Observation	Cause	Solution
When long-time exposure mode is finished, read data is abnormal. Ex.: Image cannot be read. The angle of read image has shifted. Abnormal line data can be seen, etc.	1. Exposure dose is low. 2. CPLS4 board failure 3. Camera head failure 4. Incorrect filter setting 5. Incorrect lens setting	Confirmation by user SendBack SendBack Confirmation by user Confirmation by user
Binning mode images cannot be read.	1. CPLS4 board failure 2. Camera head failure	SendBack SendBack
IDX door cannot be opened/closed. IDX door cannot be locked.	1. Door installation failure 2. Hinge defect 3. Hook catch defect 4. Stopper defect 5. Foreign matter attached to the lock	Confirmation by user Replace the part. Replace the part. Replace the part. Replace the part.
Abnormal sound is audible when dark box is opened/closed.	1. Door installation failure 2. Hinge creaks 3. Hinge defect	Confirmation by user Apply grease Replace the part.
Light unit does not light.	1. Poor connector connection 2. Defective harness in IDX 3. Faulty incident-light unit 4. Defective DRLS4 board 5. Faulty UV light unit (Faulty UV tube) 6. Faulty white light unit (Faulty DIA board) 7. Trouble in the door interlock	Confirmation of connector connection Replace the part. Replace the part. Replace the part. Replace the part. Replace the part.
Something resembling light leakage is visible on image.	1. Placed adjacent to a strong light source. Exposed to direct sunlight. 2. IDX door does not shut completely. 3. Sponge tape for light shielding peeled off. 4. IDX light leakage	Confirmation by user Confirmation by user Replace the part. Replace the part.
Image Reader does not allow selection of the option “IDX unit.”	1. Relevant unit connector disconnected from the DRLS4 board 2. Defective DRLS4 board	Ask the service personnel for repair. Replace the part.
Image Reader keeps displaying the message “Please close the door.”	1. Incompletely closed door 2. Defective door sensor key and/or sensor	Confirmation by user Replace the part.
The system does not run.	1. AC power cable disconnection 2. Camera cable poor connection 3. The breaker is turned OFF.	Confirmation by user Confirmation by user

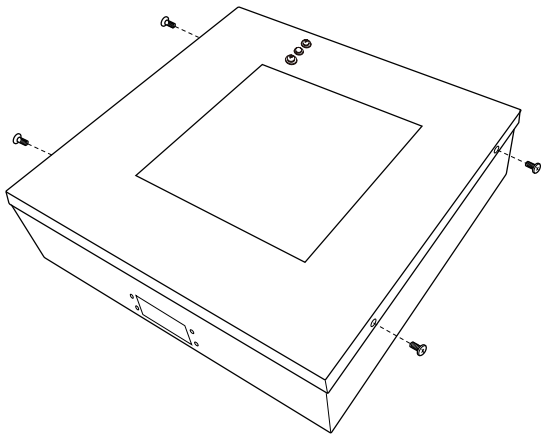
6 Parts Replacement Procedure for Specific Components

6.1 UV transmitted light source (840Y100118) 20cm x 20cm

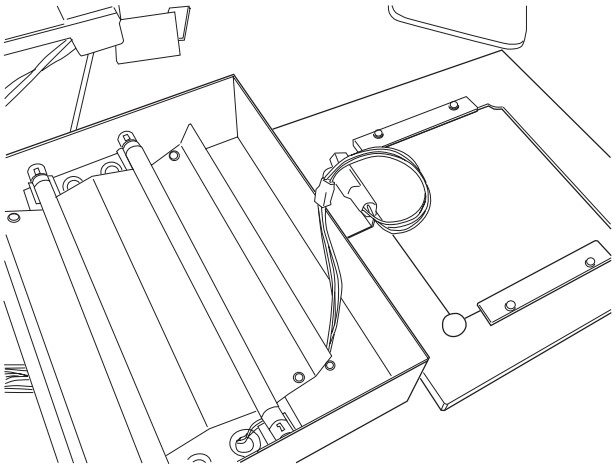
* For UV tubes, it is recommended to replace all (2) UV tubes at once. This is because it could cause uneven intensity of illumination to replace only end-of-life tubes for deteriorated strength through aging.

6.1.1 UV Tube (123S0029)

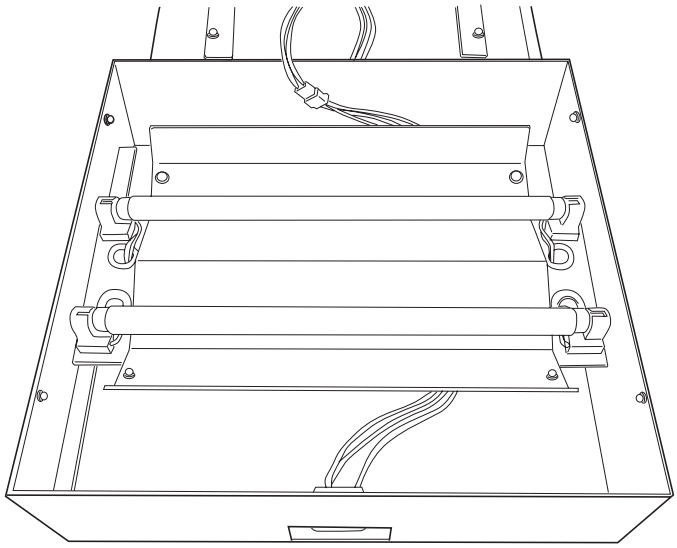
1. Remove the cover from the UV light unit by removing a total of 4 screws, 2 on each side.



2. There is a cable coming from the micro switch in the cover, so be careful when removing the cover.



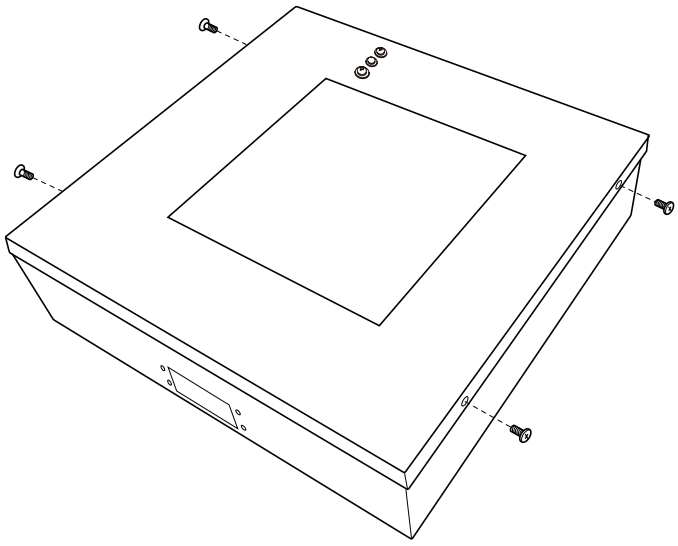
3. Wear cotton gloves when replacing the UV tube.



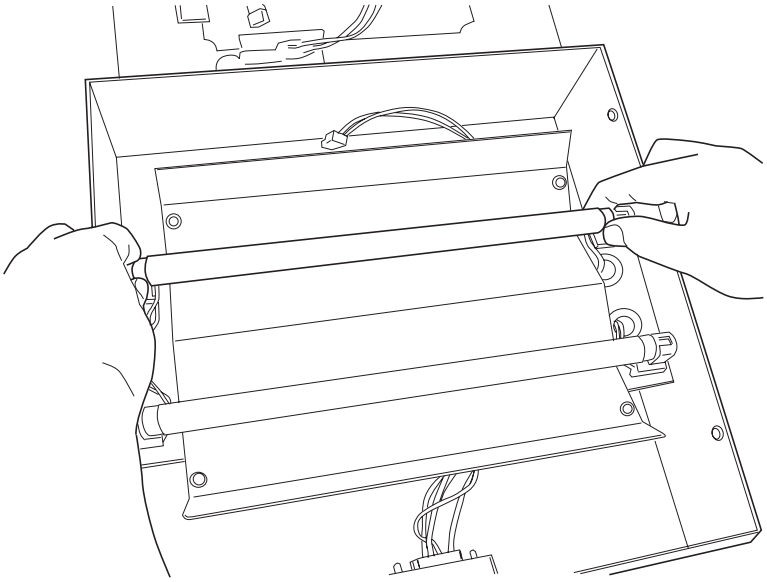
4. After the replacement, remake the flat frame.

6.1.2 Inverter (113S0190)

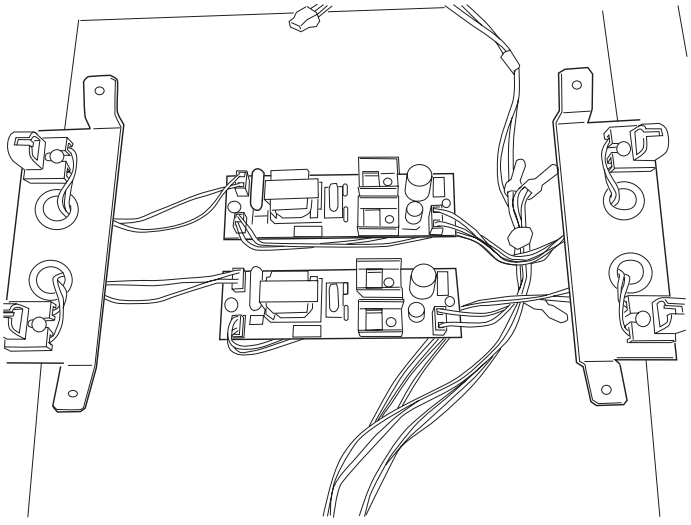
1. Remove the cover from the UV light unit by removing a total of 4 screws, 2 on each side.



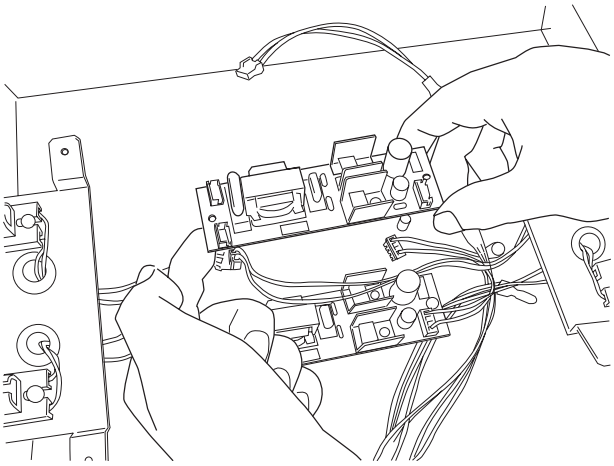
2. Disconnect all the UV tubes.Be sure to wear lint-free cotton gloves.
   Reinstall the UV tube in the same condition as originally installed. Thus make an accurate note of the original plug receptacle to be installed in and its original installation position for each UV tube.



3. Remove the reflector plate by removing the 4 screws.
   Be sure to wear lint-free cotton gloves.



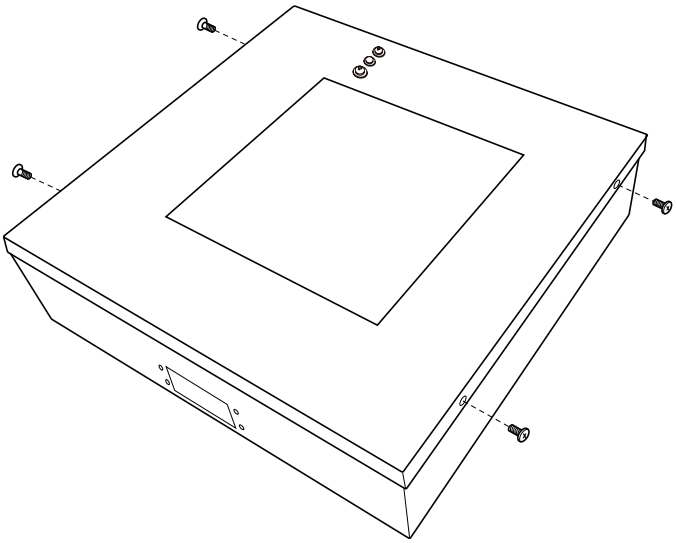
4. Disconnect 3 connectors and 2 fixing screws to replace the inverter.



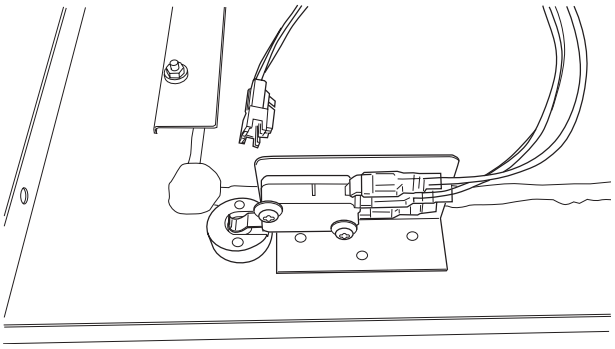
5. After the replacement, remake the flat frame.

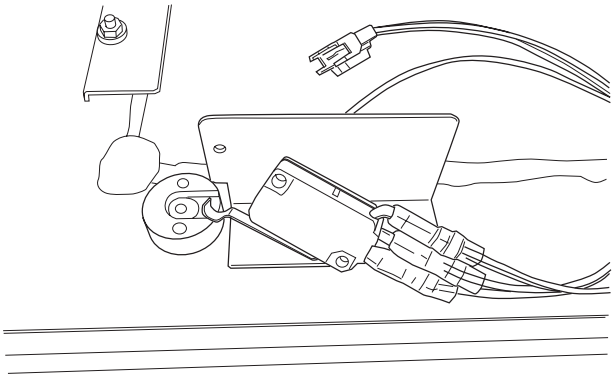
6.1.3 Micro switch (128S1094)

1. Remove the cover from the UV light unit by removing a total of 4 screws, 2 on each side.

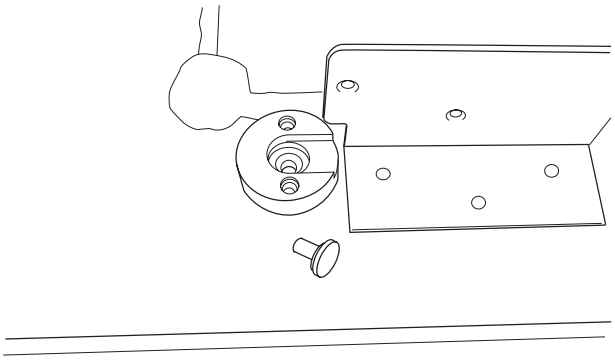


2. Remove the 2 screws and replace the micro switch.



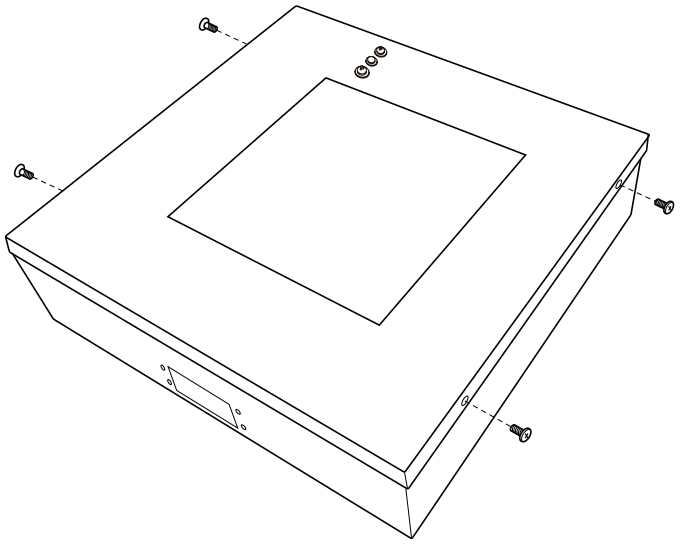


* A pin is inserted in the area that pushes the micro switch as shown in the figure. Be careful not to lose this pin while working.

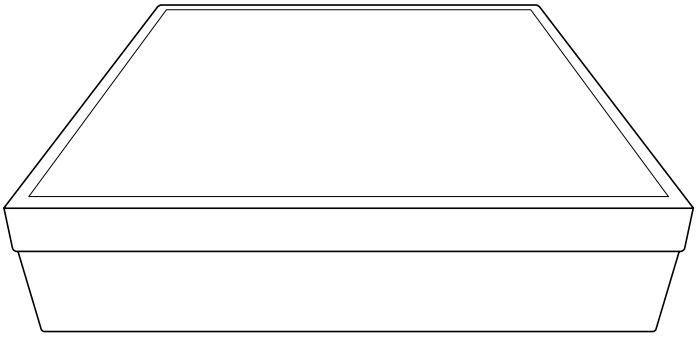


6.1.4 Cover (350Y100978)

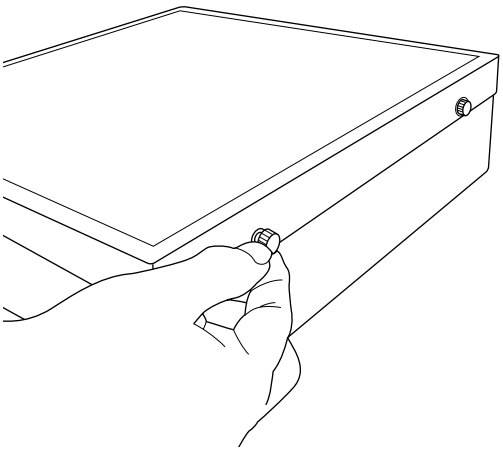
1. Remove 4 screws (2 in the right side, 2 in the left side). Detach the cover from the UV transmitted light source unit, and replace.



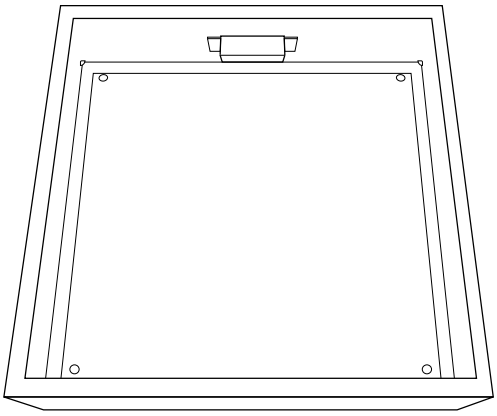
6.2 White Transmitted-Light Unit (840Y100039)



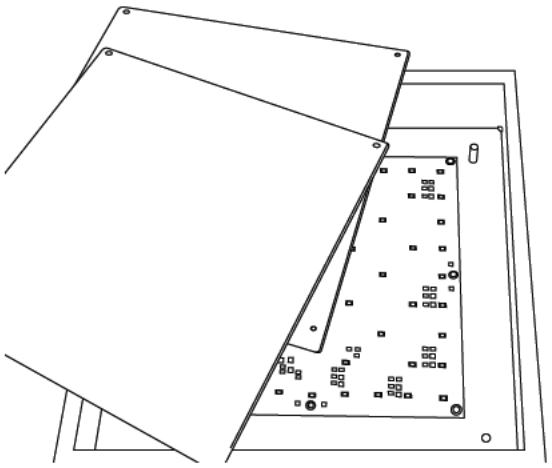
1. Remove a total of 4 screws, 2 on each side.



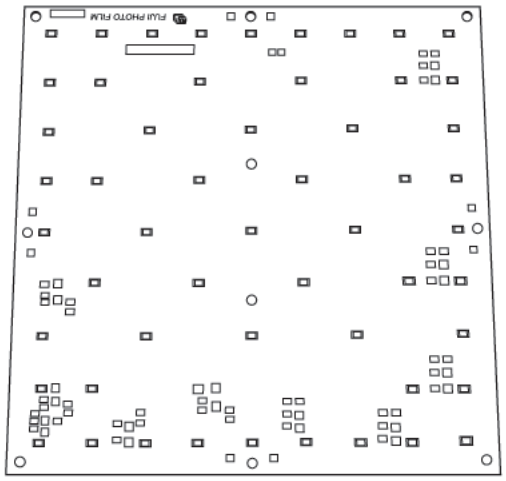
2. Remove the top cover.



3. Remove the intermediate plate by removing the 4 screws.



4. Remove the white LED board by removing the 10 fixing screws and the connector, and then replace the white LED board.



6.3 Blue Incident Light Unit (840Y100037 (right)) (840Y100038 (left))

6.3.1 Blue Incident Light Unit (840Y100037 (right)) (840Y100038 (left))

6.4 Green Incident Light Unit (840Y100043 (right)) (840Y100044 (left))

6.4.1 Green Incident Light Unit (840Y100043 (right)) (840Y100044 (left))

6.5 Red Incident Light Unit (840Y100045 (right)) (840Y100046 (left))

6.5.1 Red Incident Light Unit (840Y100045 (right)) (840Y100046 (left))

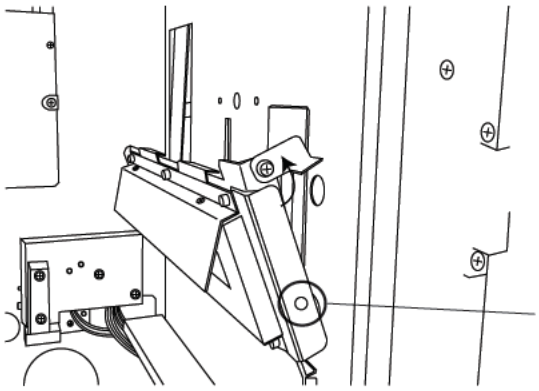
6.6 UV Incident Light Unit (840Y100048 (right)) (840Y100049 (left))

6.6.1 UV Incident Light Unit (840Y100048 (right)) (840Y100049 (left))

6.7 IR Incident Light Unit (840Y100050 (right)) (840Y100051 (left))

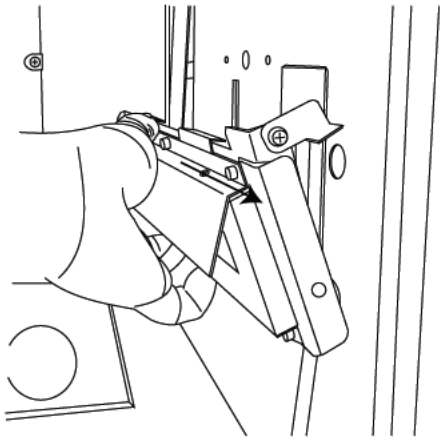
6.7.1 IR Incident Light Unit (840Y100050 (right)) (840Y100051 (left))

1. Release the lock.

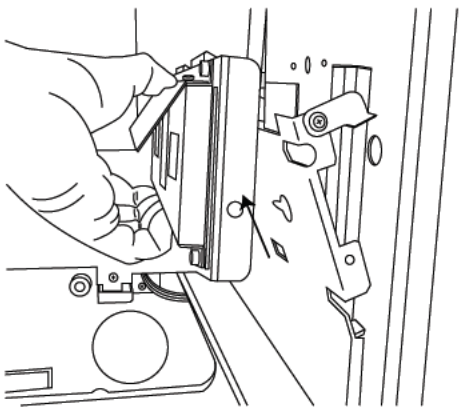


For a blue incident-light unit, remove the delivery retaining screw.

2. Slide the light source unit toward the front.



3. Lift up and remove the light source unit at the position where the guide pin comes off.



4. Replace the light source unit.
   To install, perform the removal procedure in reverse.

6.3.2 Blue LED board
(113Y100066A (right))
(113Y100067A (left))

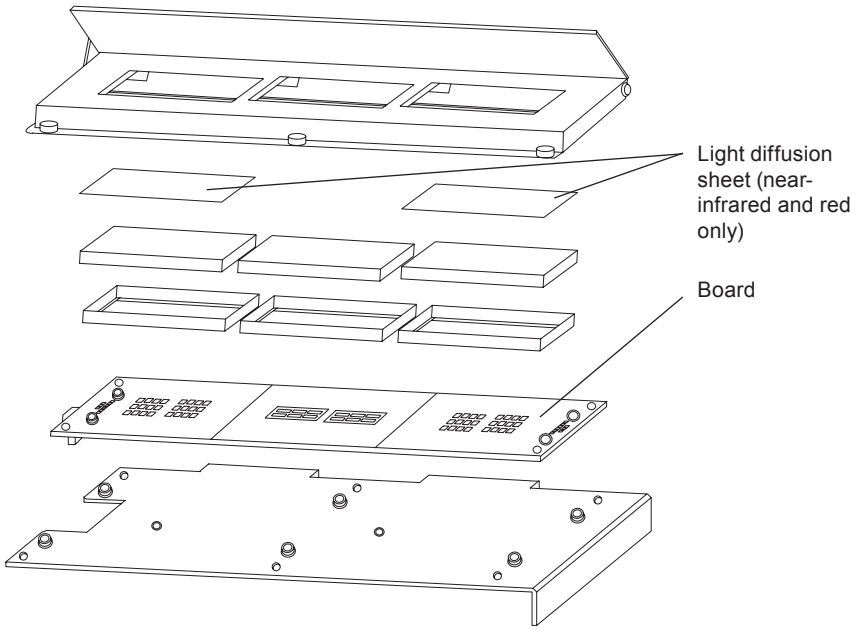
6.4.2 Green LED board
(113Y100068A (right))
(113Y100069A (left))

6.5.2 Red LED board
(113Y100070A (right))
(113Y100071A (left))

6.6.2 UV board
(113Y100064A (right))
(113Y100065A (left))

6.7.2 IR board
(113Y100072B (right))
(113Y100073B (left))

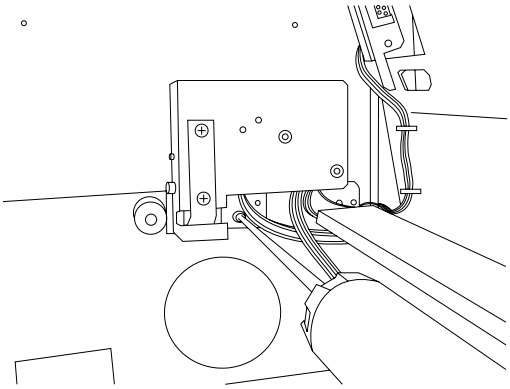
1. Remove the incident light unit following the replacement procedure described in Section 6.3.1, 6.4.1, 6.5.1, 6.6.1 and 6.7.1, then remove the cover and replace the board.



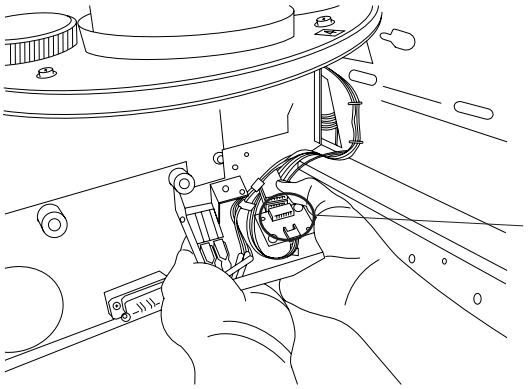
6.8 Incident Light Unit Cable (136Y100222A)

1. Lift the lifting table up to Position 1 using Image Reader. Remove the incident light unit from the right and left sides.

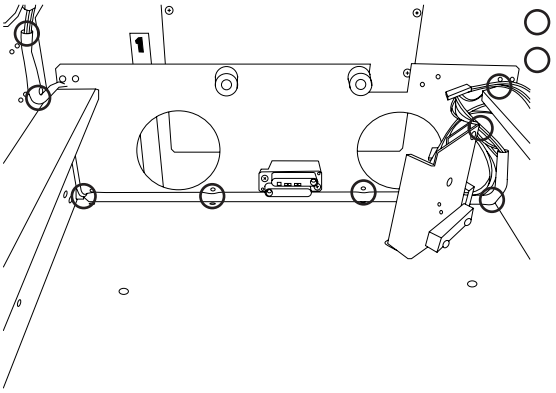
2. Remove the bracket of the micro switch and the relay board by removing 1 screw.



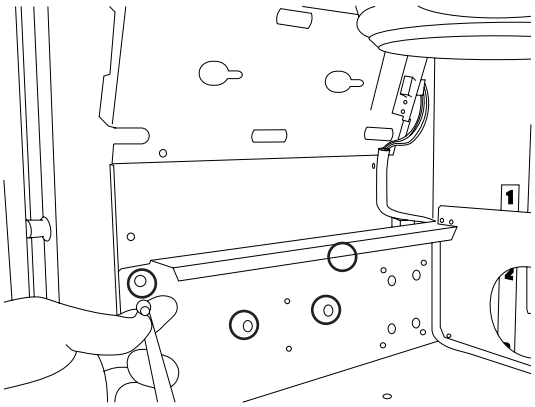
3. Disconnect the larger one of the 2 connectors of the relay board.

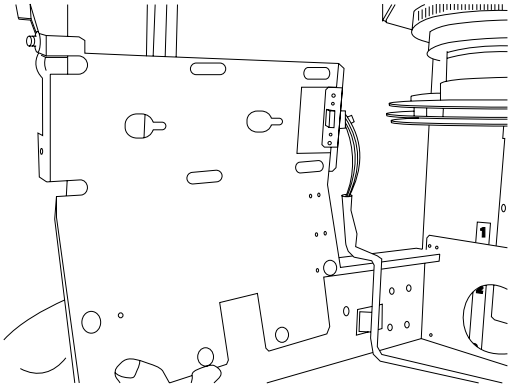


4. Cut all 10 cable ties fixing the cable.

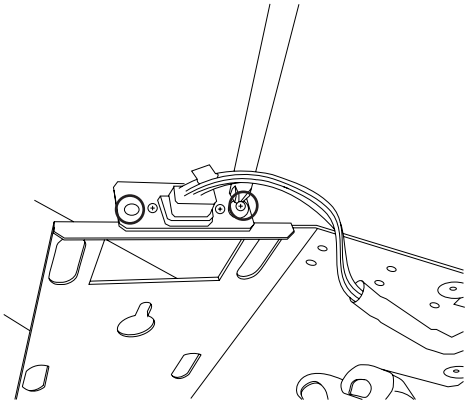


5. Remove the bracket for fixing the incident-light unit in the right and left sides by removing the 4 fixing screws.

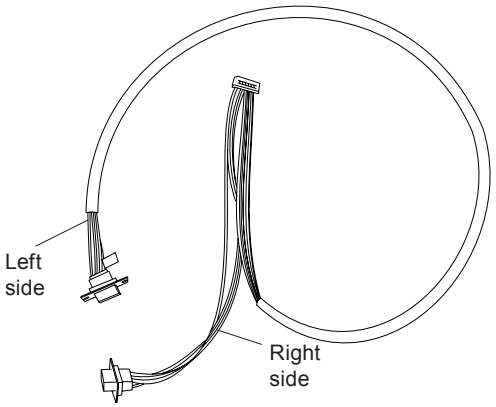




6. Disconnect the connector from the bracket by removing the 2 fixing screws.



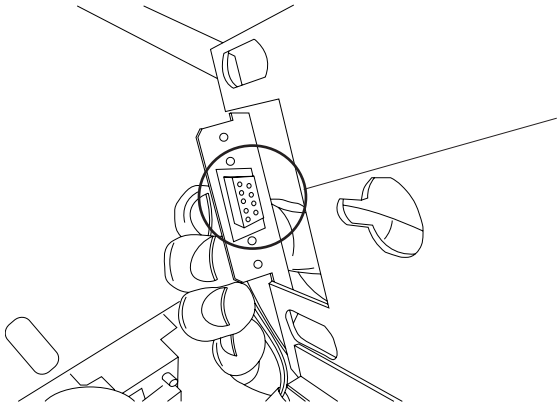
7. To install the light source cable, perform the removal procedure in reverse.



Connect the connector of the shorter length side from the intermediate connector to the right side, and the connector of the longer side to the left side.

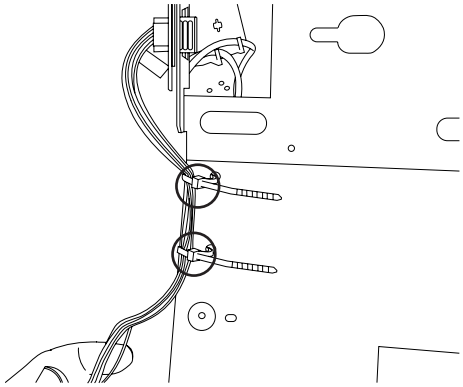
When connecting the connector, pay attention to the following two points.

* Pay attention to the position of the connector when connecting the connector.
  Align the shape of the connector with the cut shape of bracket.
  See the following sketch.



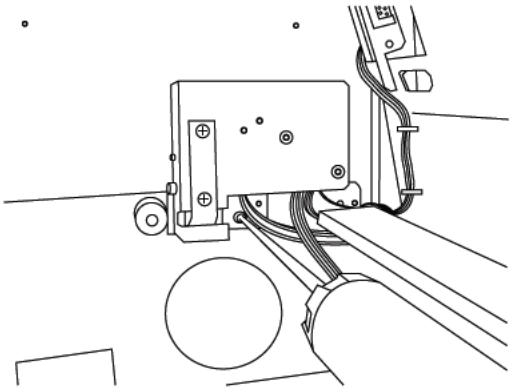
Align the shape of the connector with the cut shape of bracket.

* Before installing the bracket in the right and left sides for fixing the incident-light unit, temporarily fix the cable with cable ties.
  If the bracket is installed beforehand, it is difficult to fix the cable ties.

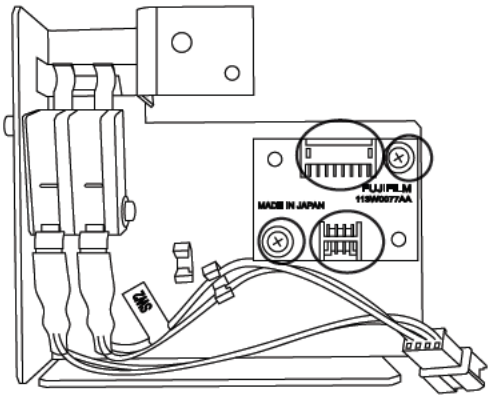


6.9 Relay Board (CNLS4) (113Y100061A)

1. Remove the bracket of the micro switch and the relay board by removing 1 screw.



2. Remove the 2 fixing screws and 2 connectors, and replace the board.



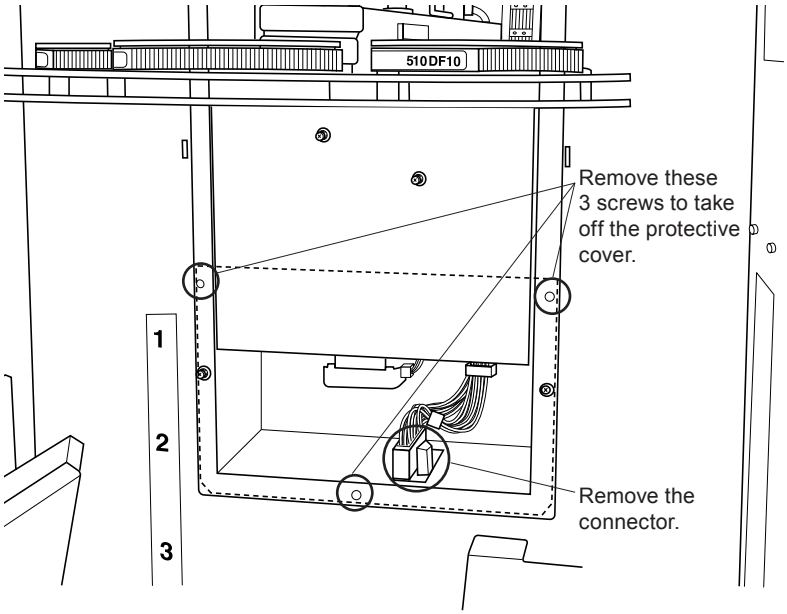
* When installing the board, pay attention to the position of the board. Install the board in the same position as that before removing.

6.10 Filter Changer

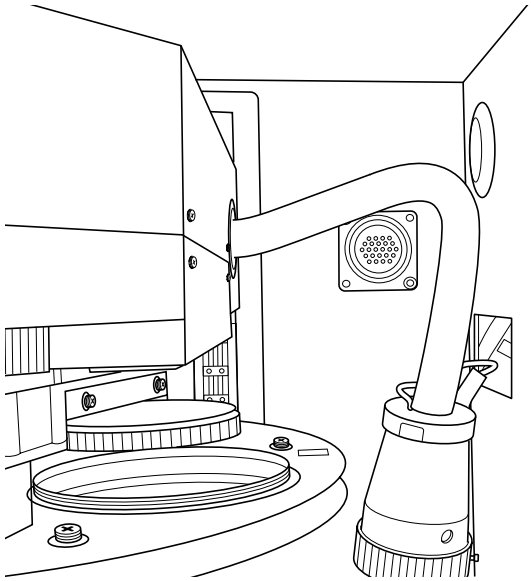
6.10.1 Lower limit sensor PHS9 (146S0029A)

* Before performing the work in this section, remember to move the lifting table and filter changer turret down to the bottom end.

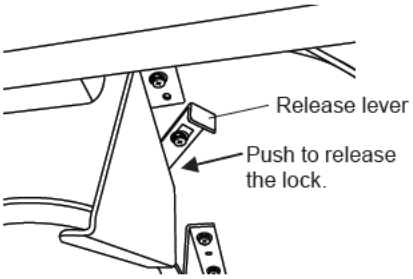
1. Remove the protective cover from the filter changer unit by removing the 3 fixing screws.

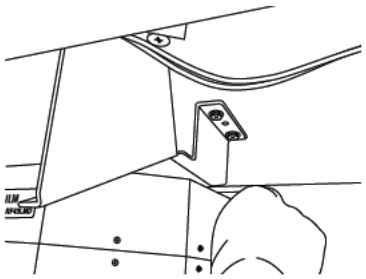


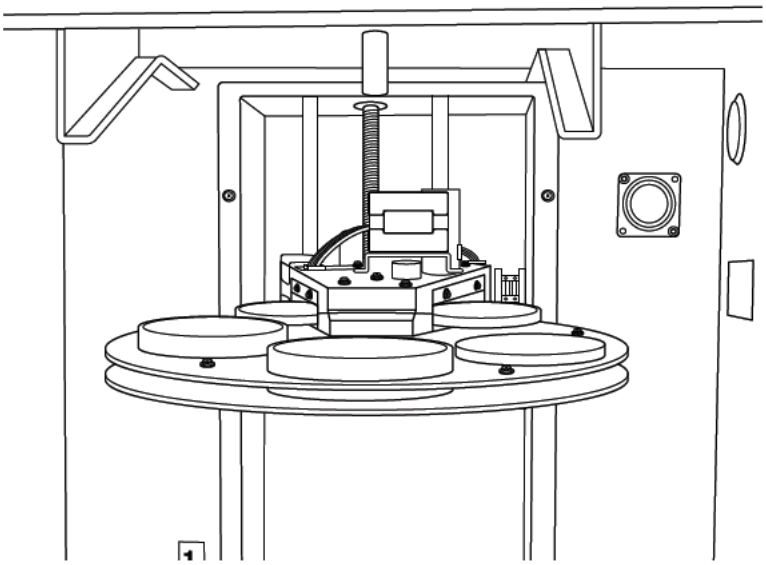
2. Disconnect the lens cable from the high-sensitivity lens unit.



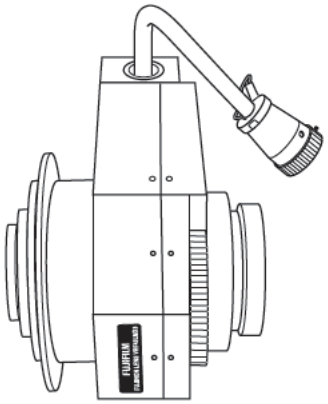
3. Holding down the release lever, turn counterclockwise and remove the lens unit.



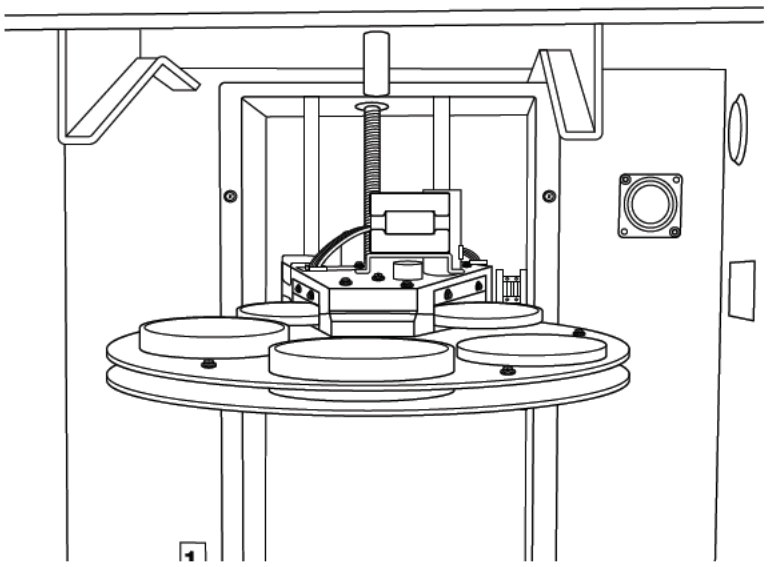




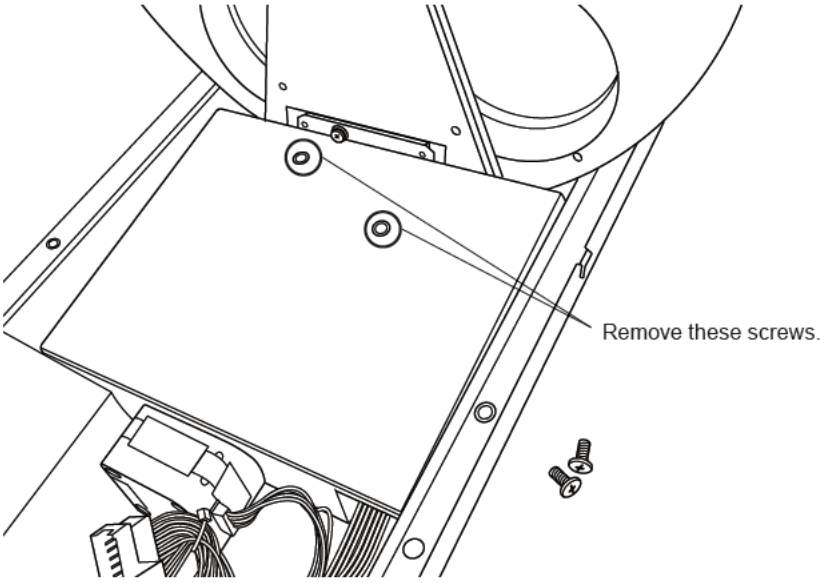
* Do not place the lens unit vertically (in the direction in which the rubber part is exposed to any load), place it sideways.



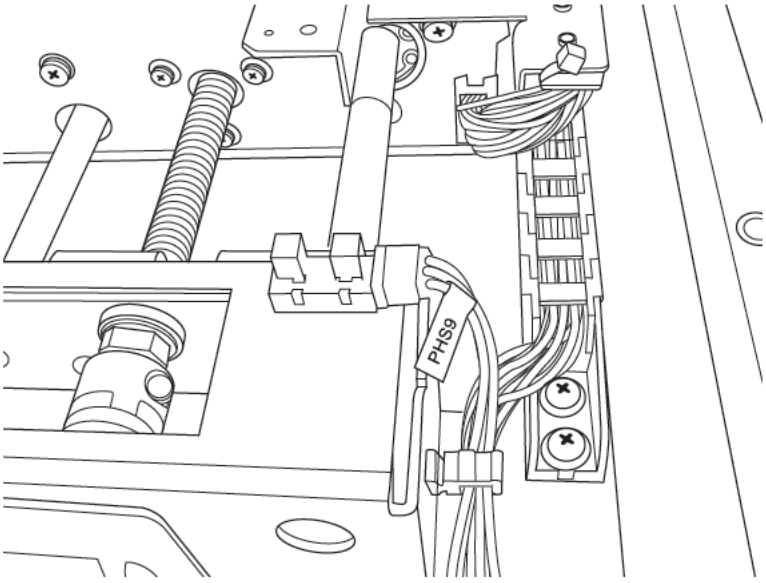
4. Remove the filter changer from IDX by removing the fixing screws.



5. Remove the filter changer unit cover by removing the 2 fixing screws.

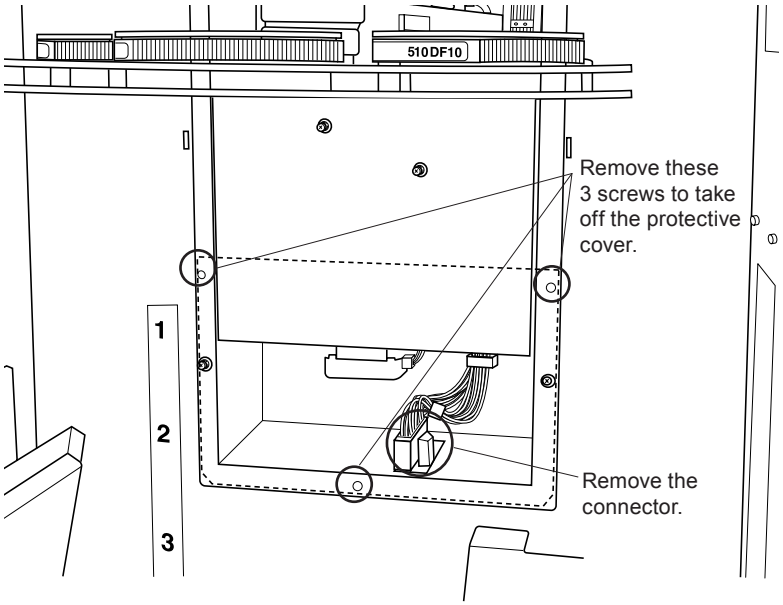


6. Remove PHS9 and replace it.

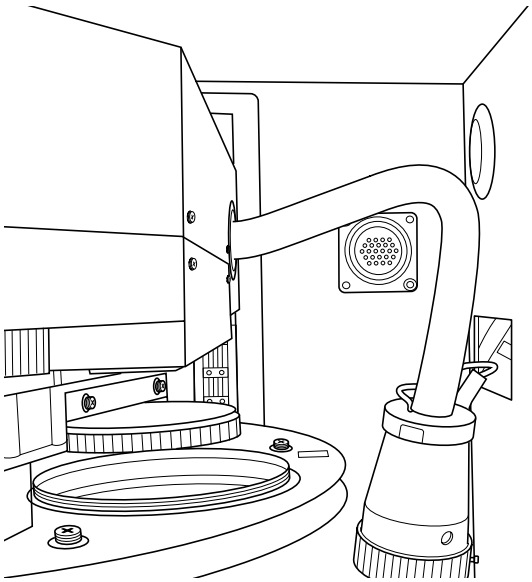


6.10.2 Upper limit sensor PHS10 (146S0029A)

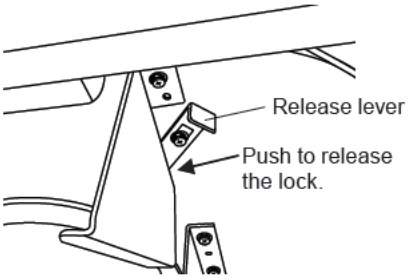
1. Remove the protective cover from the filter changer unit by removing the 3 fixing screws.

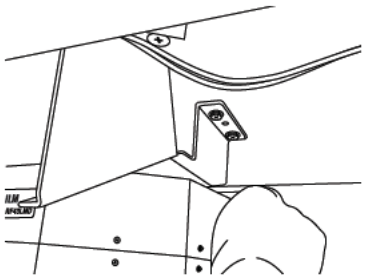


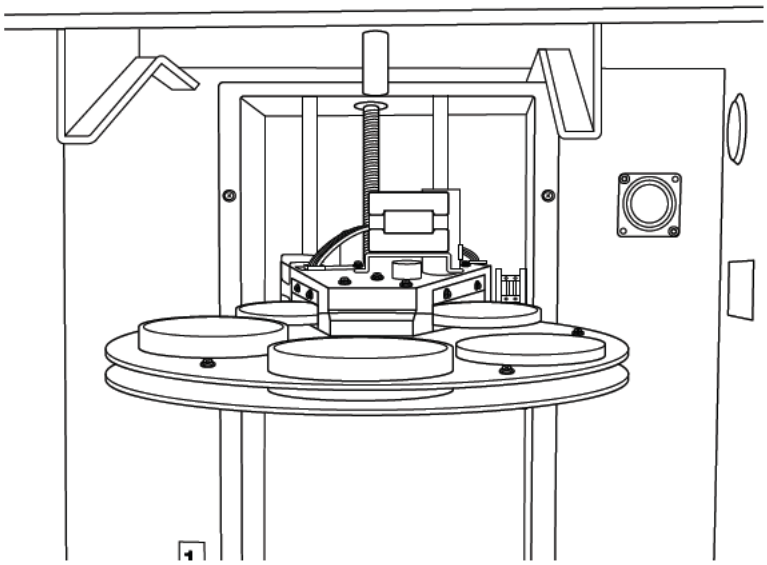
2. Disconnect the lens cable from the high-sensitivity lens unit.



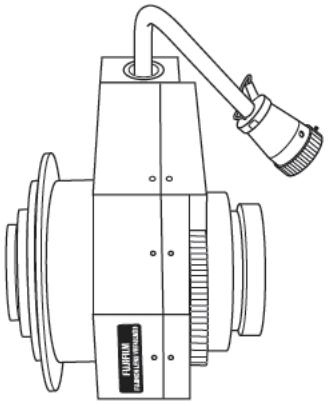
3. Holding down the release lever, turn counterclockwise and remove the lens unit.



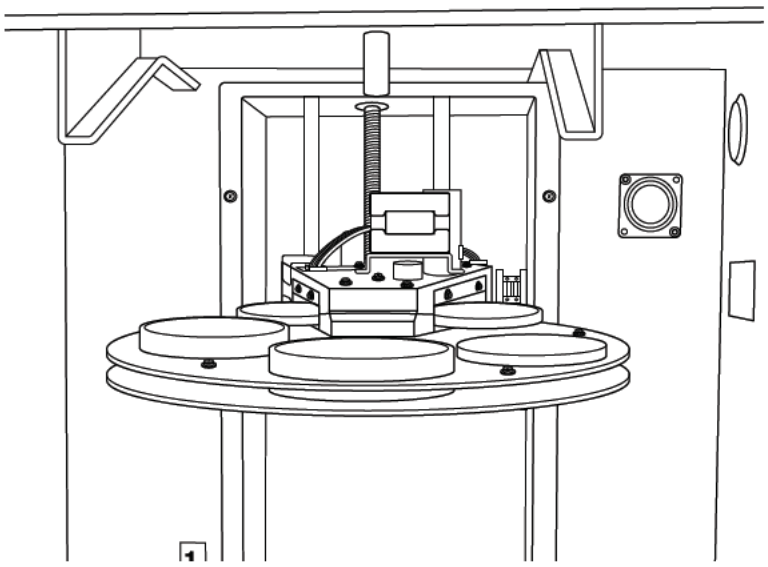




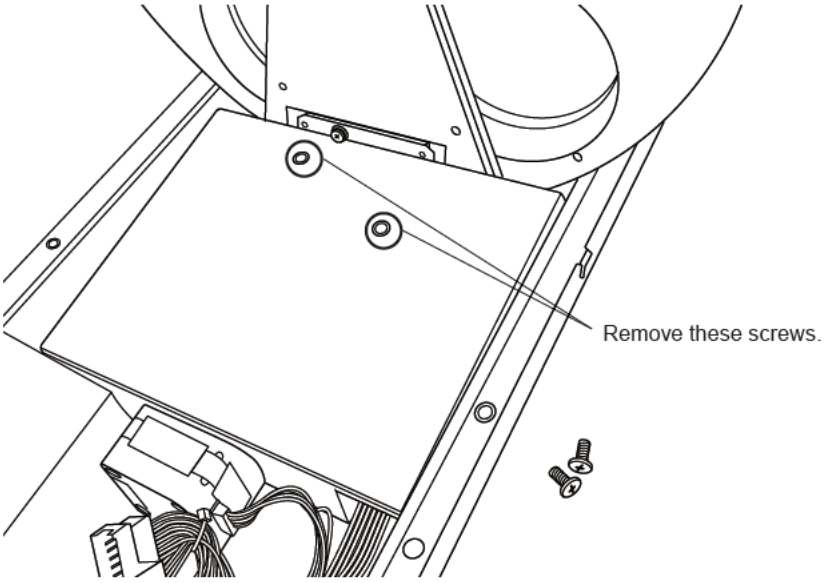
* Do not place the lens unit vertically (in the direction in which the rubber part is exposed to any load), place it sideways.



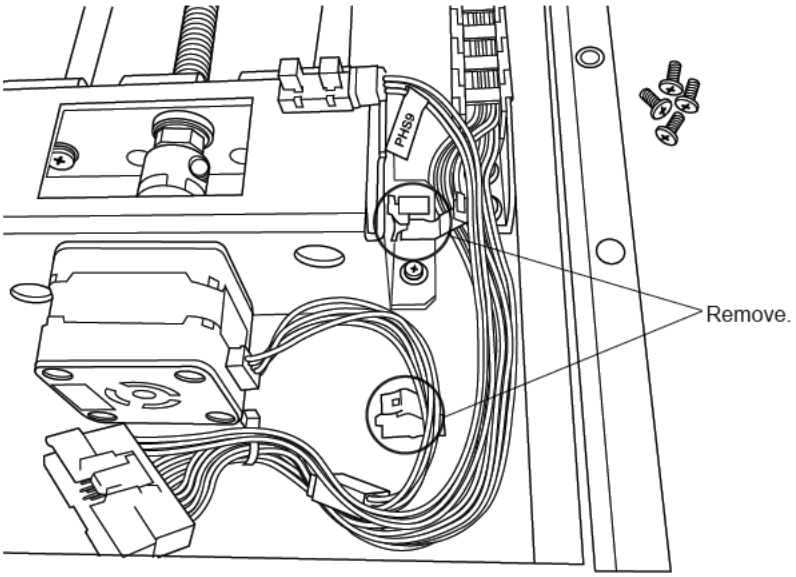
4. Remove the filter changer from IDX by removing the fixing screws.



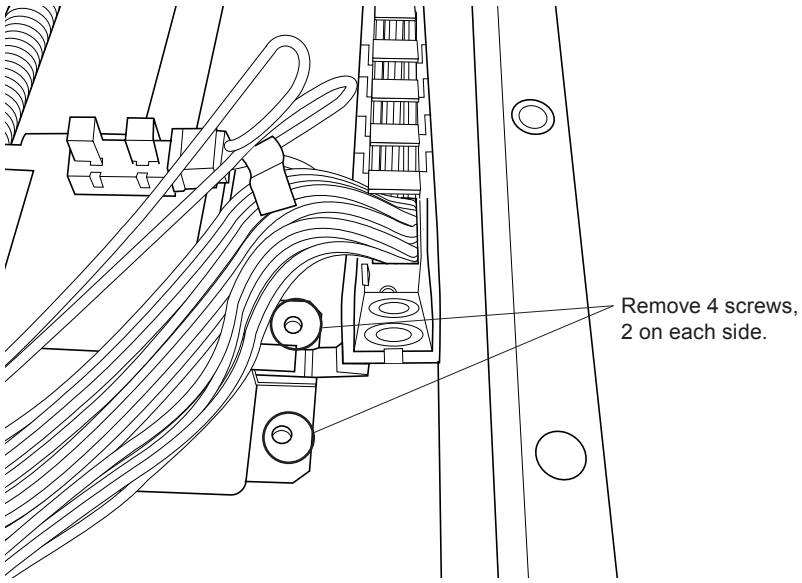
5. Remove the filter changer unit cover by removing the 2 fixing screws.



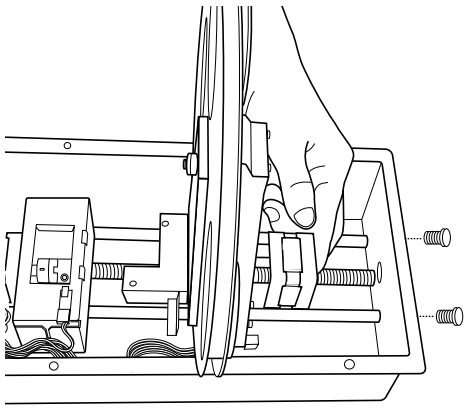
6. Remove the 2 cable ties for the cable bundle.

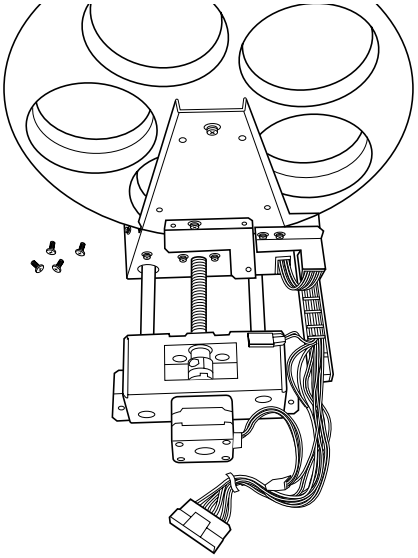


7. Remove a total of 4 screws securing the motor bracket, 2 on each side.

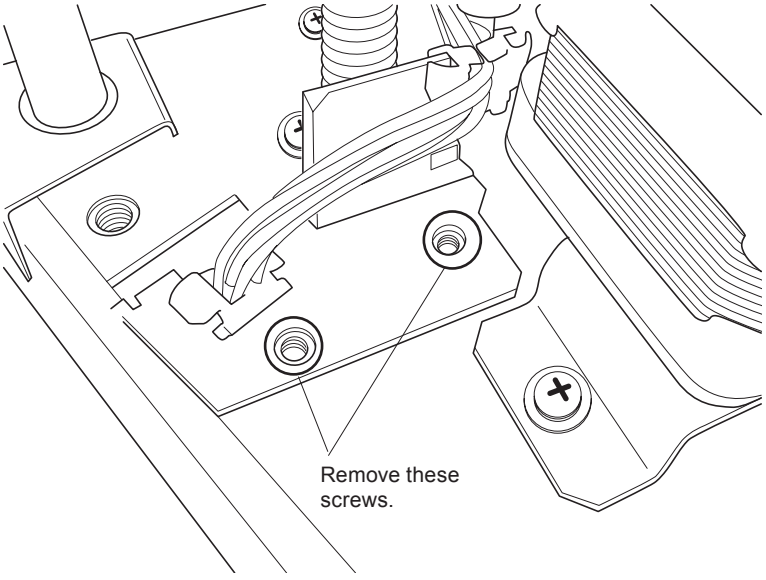


8. Moving the entire inner unit, remove the bracket from the unit guide.

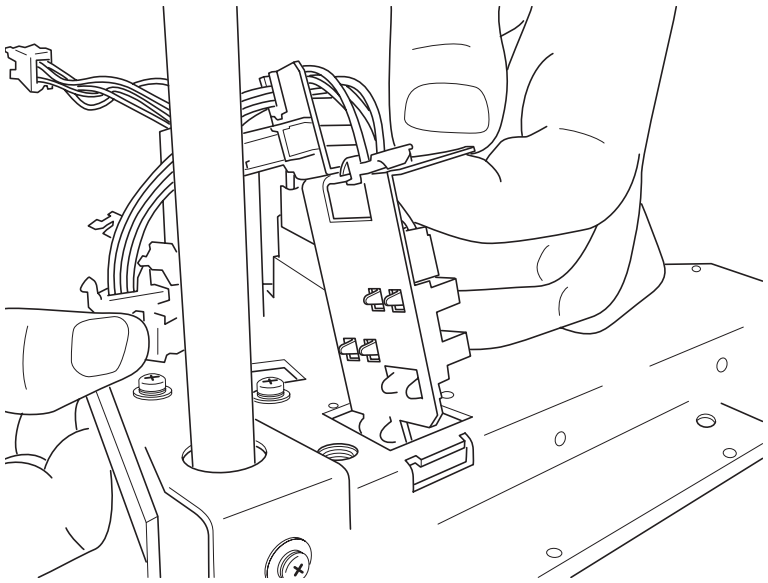




9. Remove the 2 screws securing the sensor bracket.

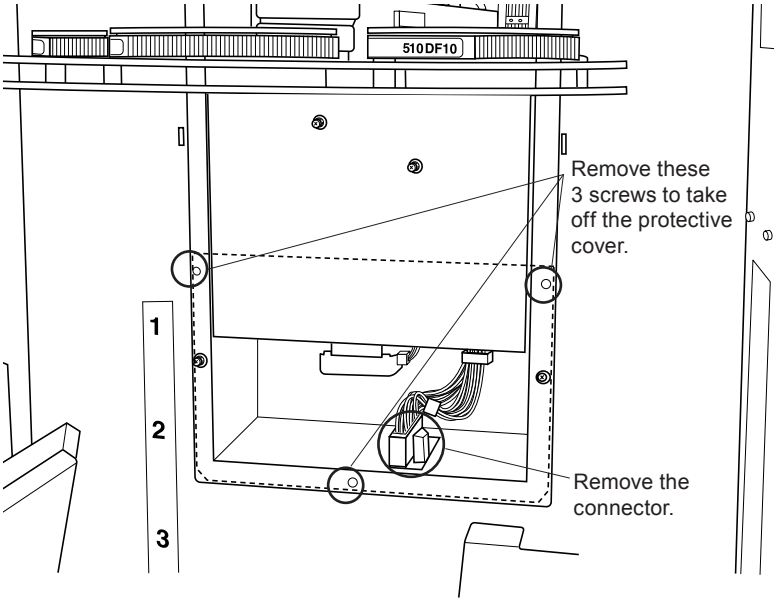


10. Pull out the entire sensor bracket and replace the sensor.

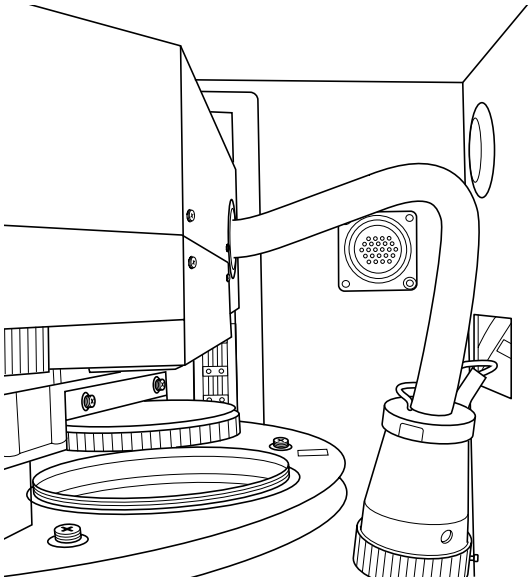


6.10.3 Filter turret rotary motor (118SX161A) and filter turret

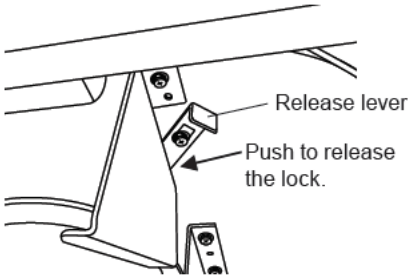
1. Remove the protective cover from the filter changer unit by removing the 3 fixing screws.

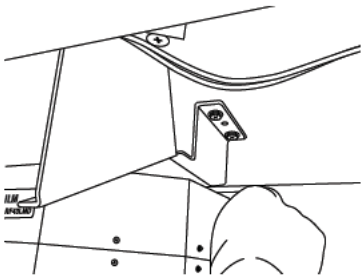


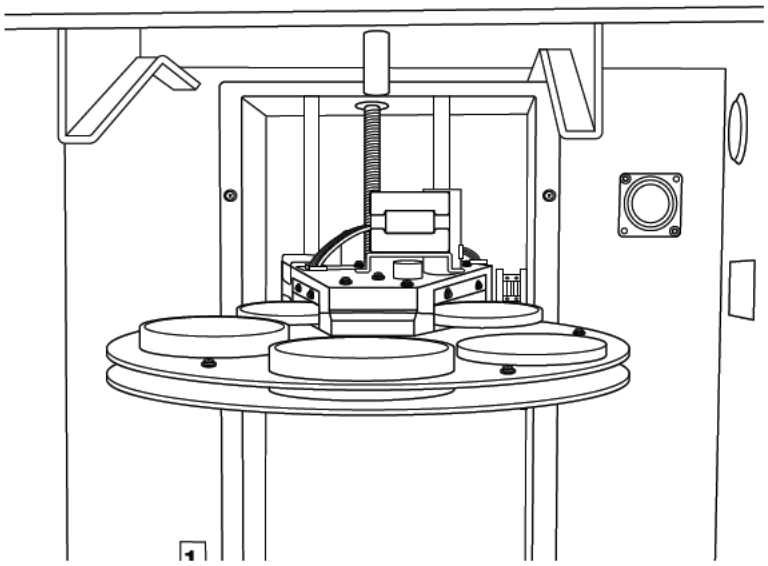
2. Disconnect the lens cable from the high-sensitivity lens unit.



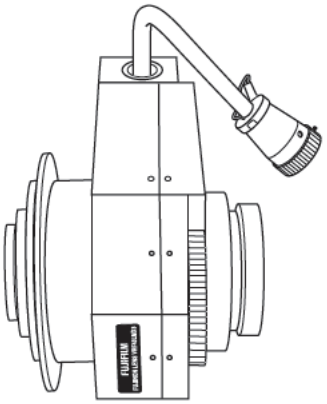
3. Holding down the release lever, turn counterclockwise and remove the lens unit.



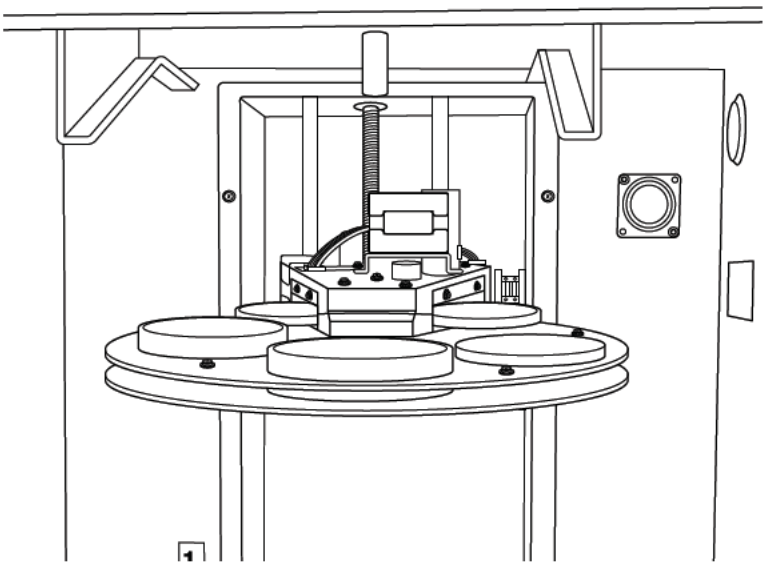




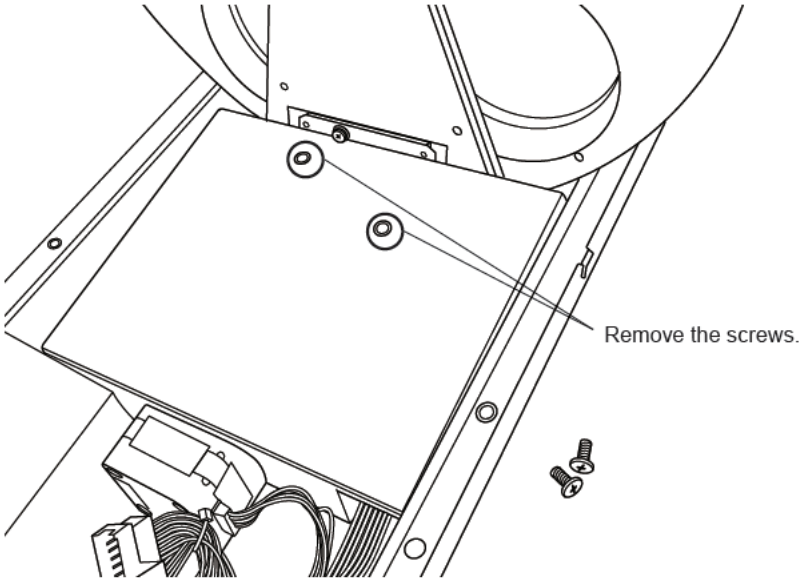
* Do not place the lens unit vertically (in the direction in which the rubber part is exposed to any load), place it sideways.



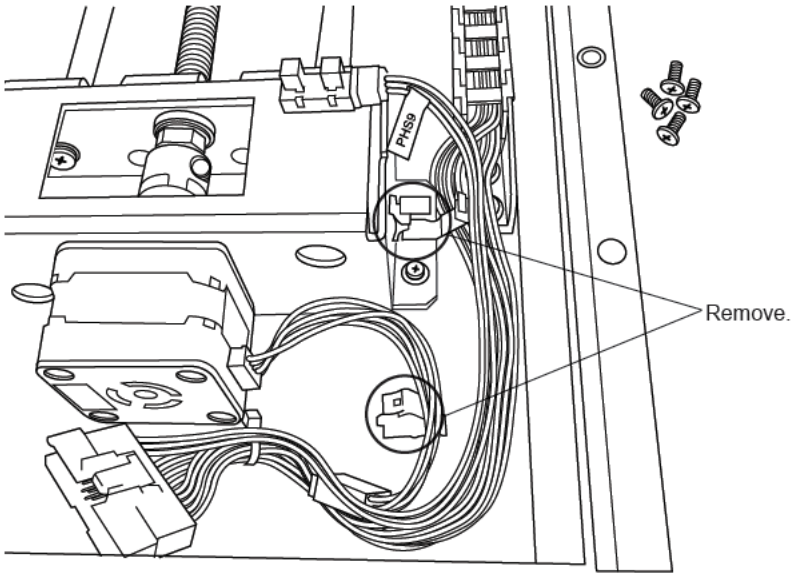
4. Remove the filter changer from IDX by removing the fixing screws.



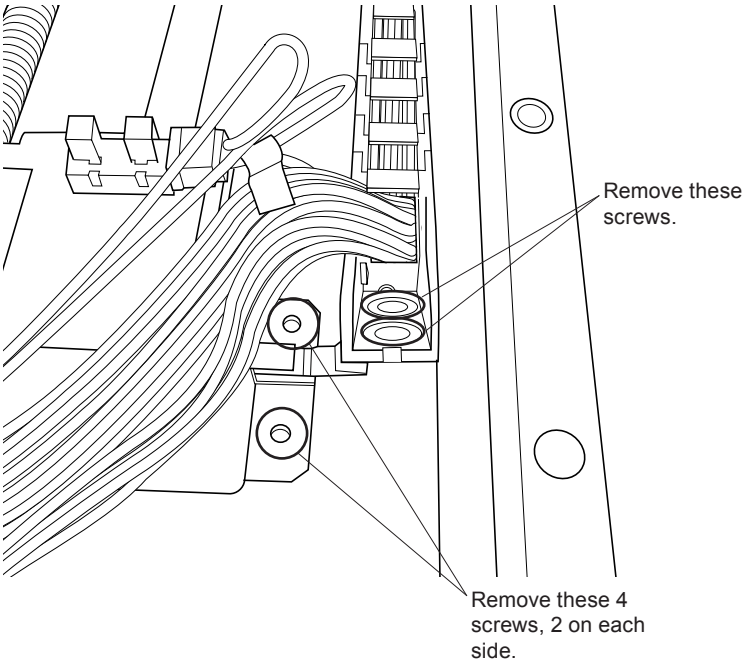
5. Remove the filter changer unit cover by removing the 2 fixing screws.



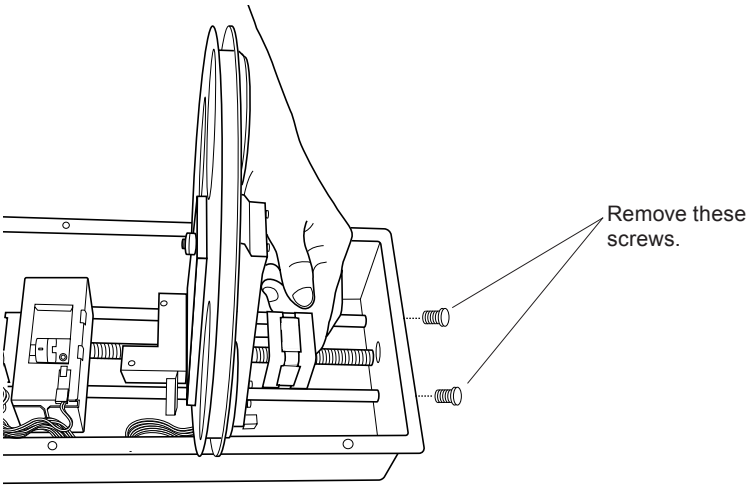
6. Remove the 2 cable ties for the cable bundle.

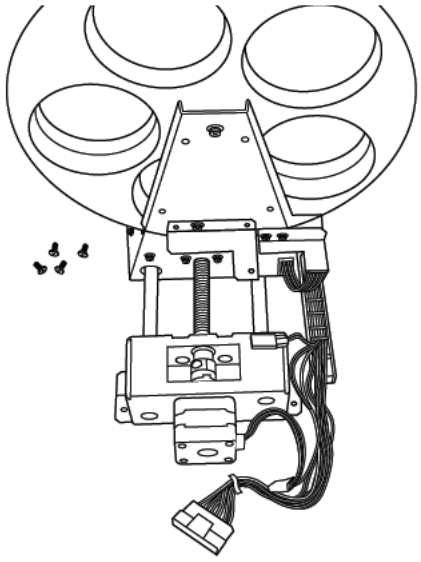


7. Remove a total 4 screws, 2 screws securing the belt bracket and 2 screws securing motor bracket.

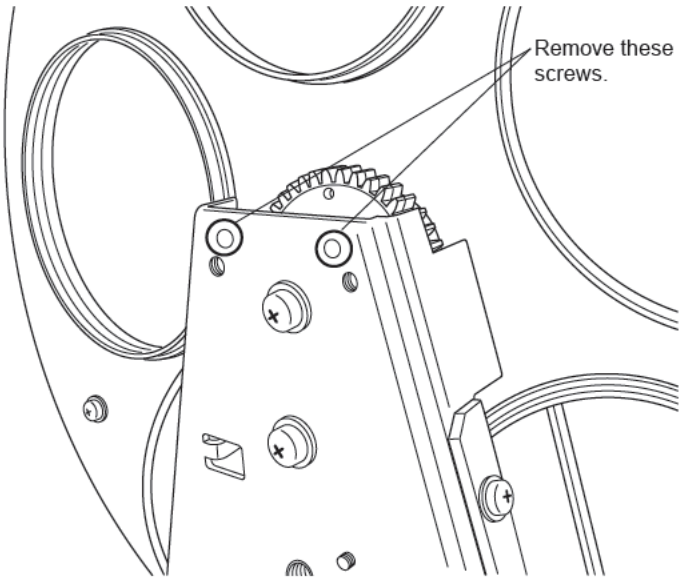


8. After removing 2 screws, move the entire inner unit and remove the bracket from the unit guide.

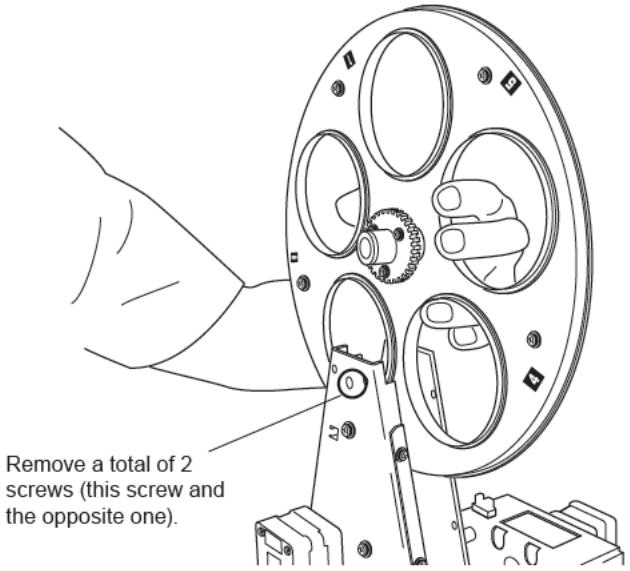




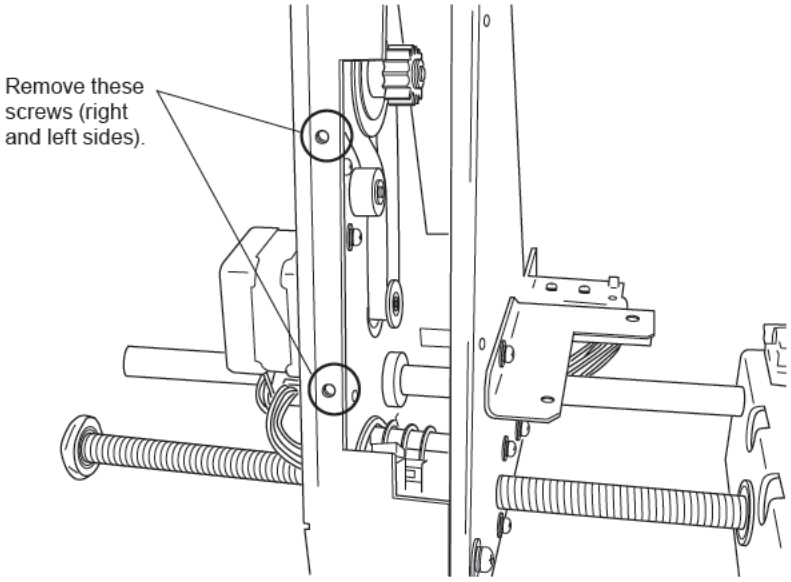
9. Remove the turret central guide by removing the 2 fixing screws.



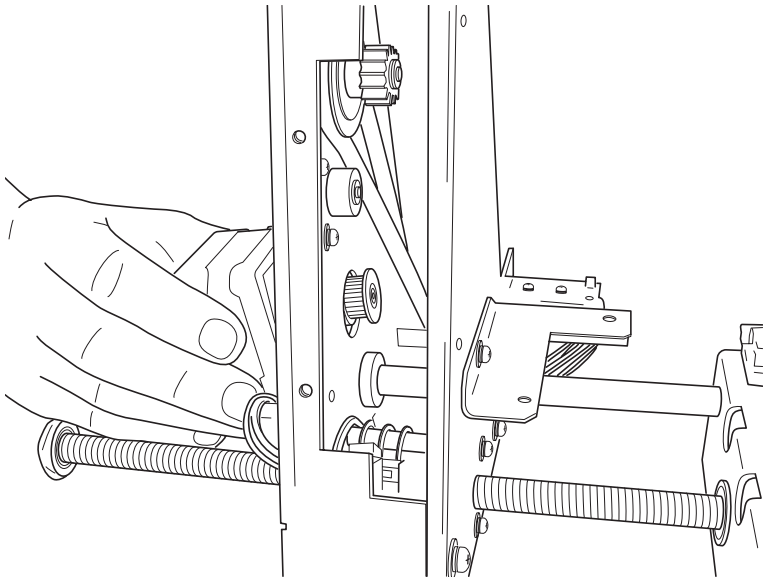
10. After removing 2 screws, slowly pull up and remove the turret.



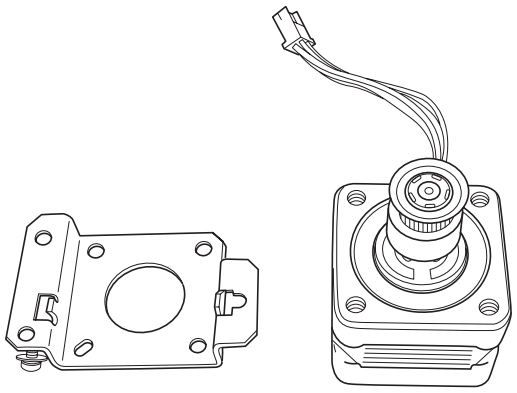
11. Remove the guides from the right and left sides of the turret post by removing a total of 4 screws, 2 on each side.



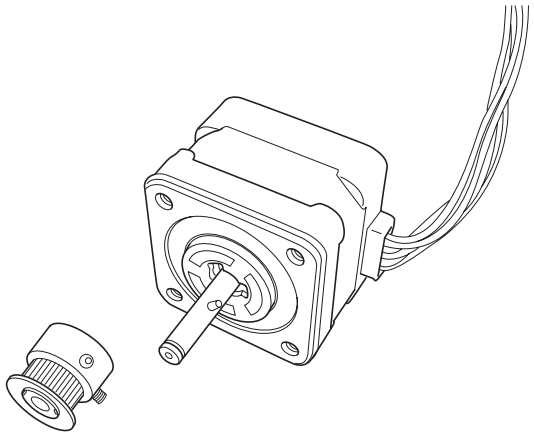
12. Disengage the belt and pull out the motor with the bracket by removing the 3 fixing screws securing the motor bracket.



13. Remove the bracket by removing the 4 fixing screws.

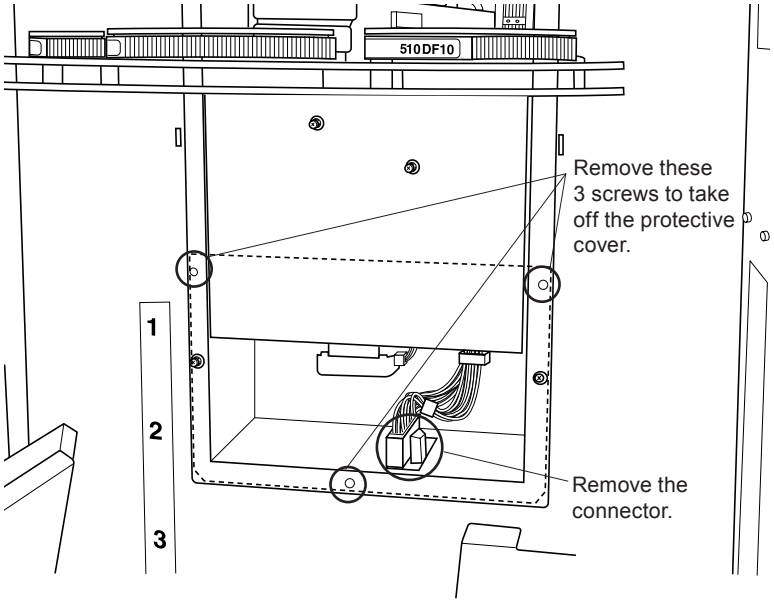


14. Remove the timing belt pulley from the motor shaft by removing the 2 hexagonal screws (M3) of the motor. Replace the motor.

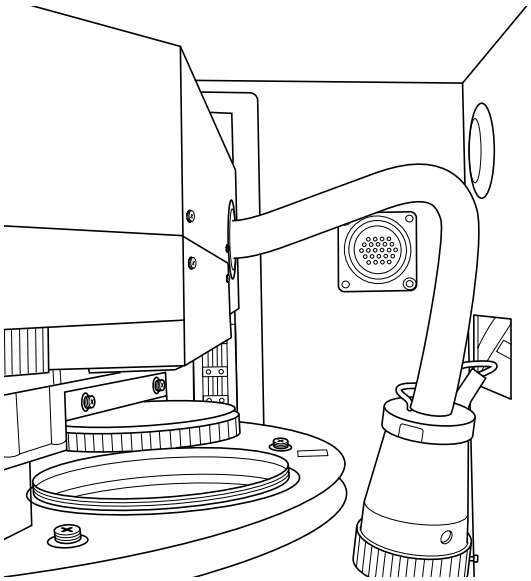


6.10.4 Filter turret lifting motor(118SX161A)

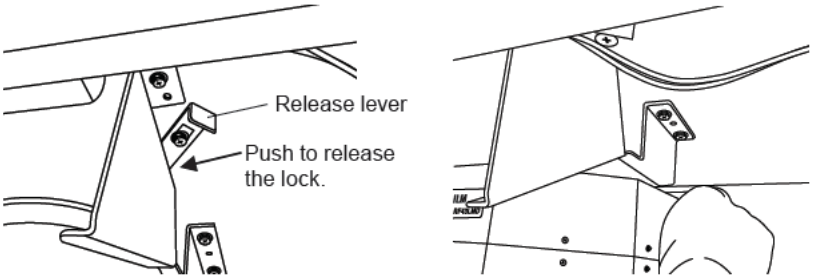
1. Remove the protective cover from the filter changer unit by removing the 3 fixing screws.

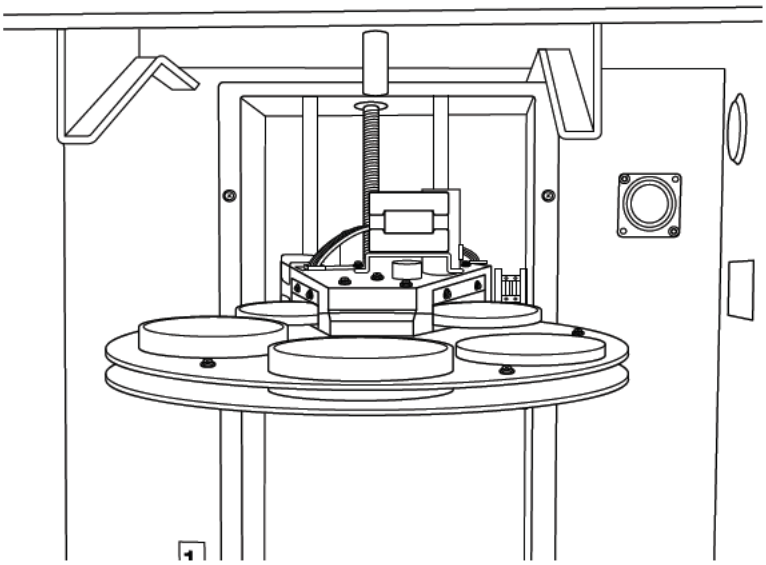


2. Disconnect the lens cable from the high-sensitivity lens unit.

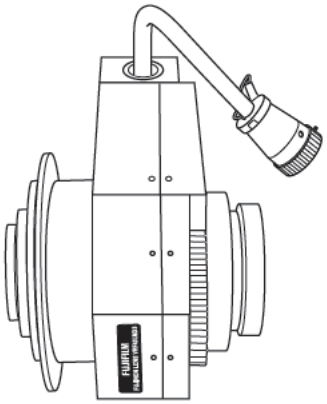


3. Holding down the release lever, turn counterclockwise and remove the lens unit.

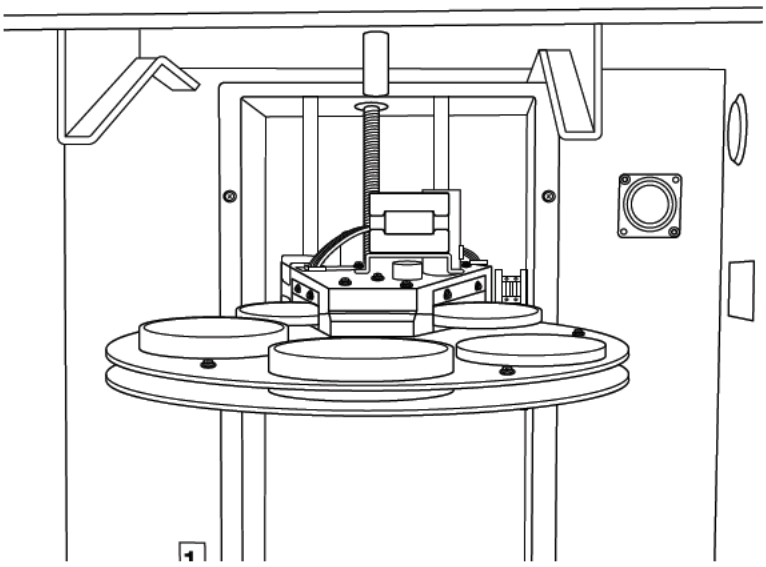




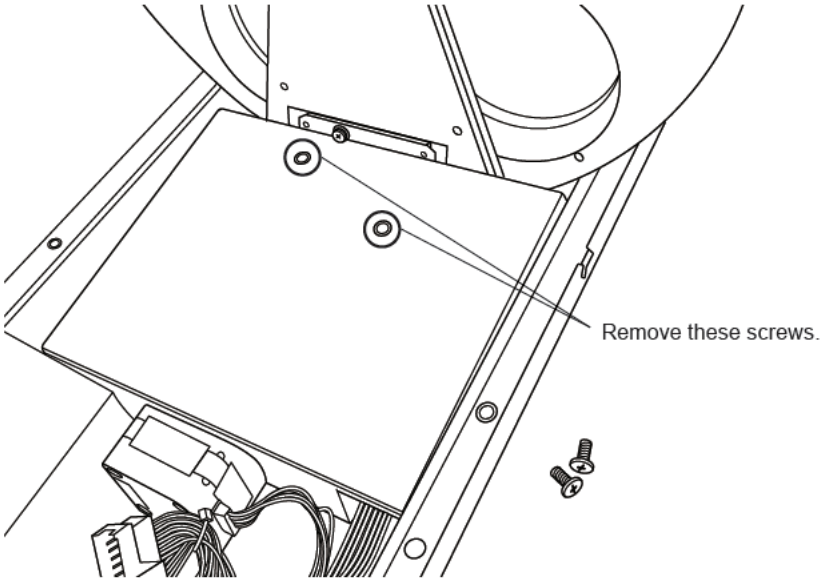
* Do not place the lens unit vertically (in the direction in which the rubber part is exposed to any load), place it sideways.



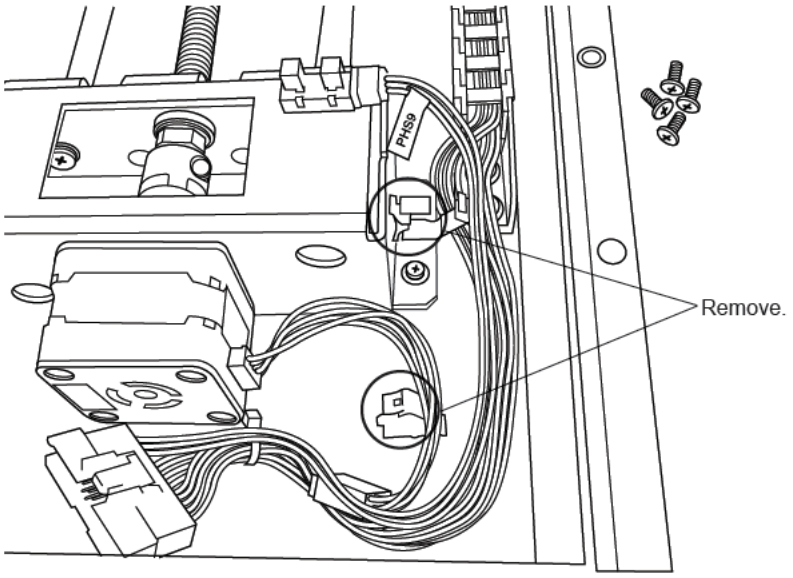
4. Remove the filter changer from IDX by removing the 4 fixing screws.



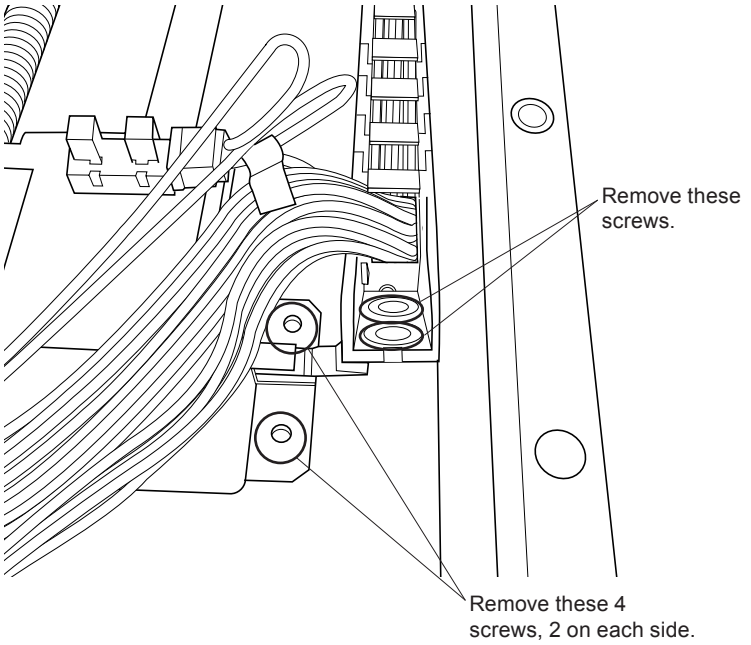
5. Remove the filter changer unit cover by removing the 2 fixing screws.



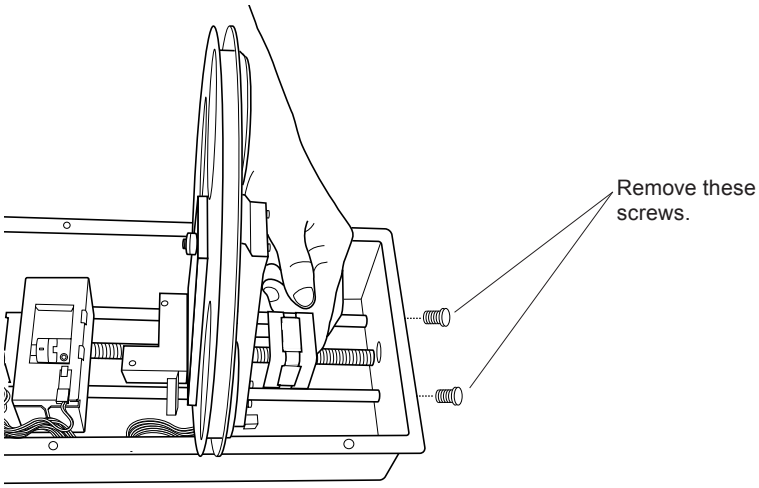
6. Remove the 2 cable ties for the cable bundle.

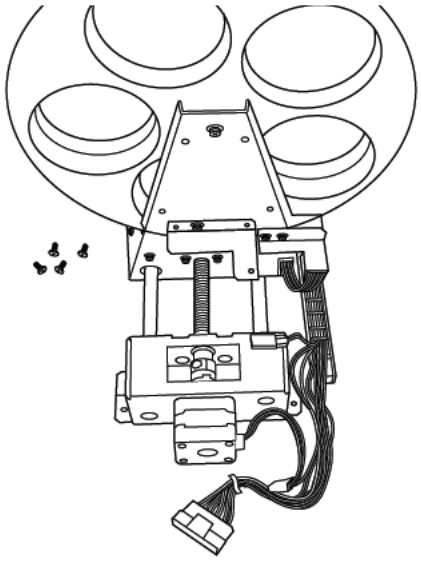


7. Remove a total 4 screws, 2 screws securing the belt bracket and 2 screws securing motor bracket.

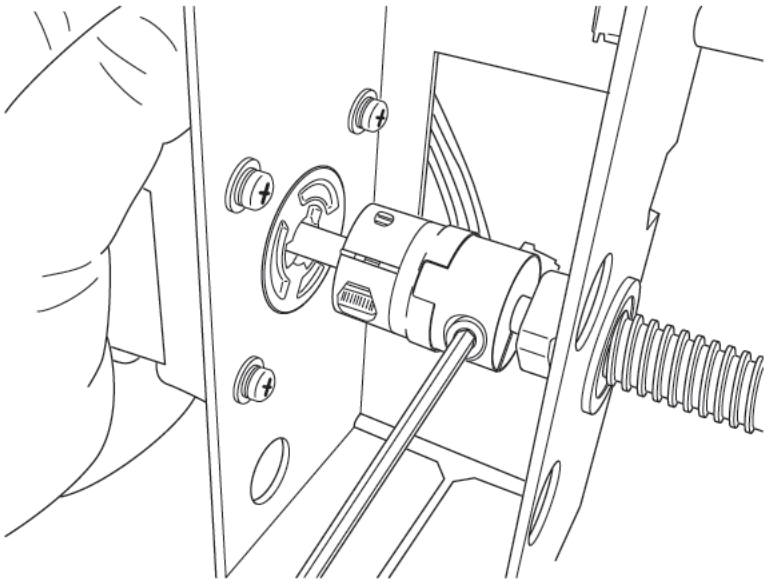


8. After removing 2 screws, move the entire inner unit and remove the bracket from the unit guide.

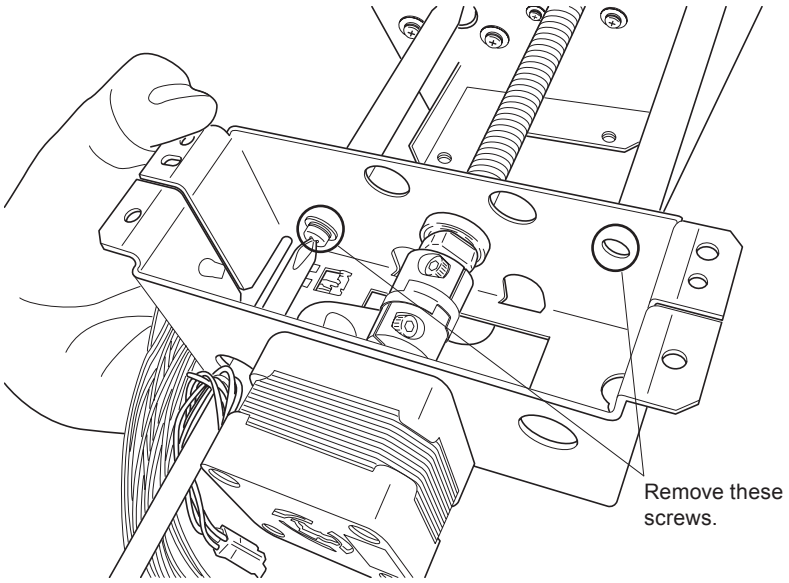




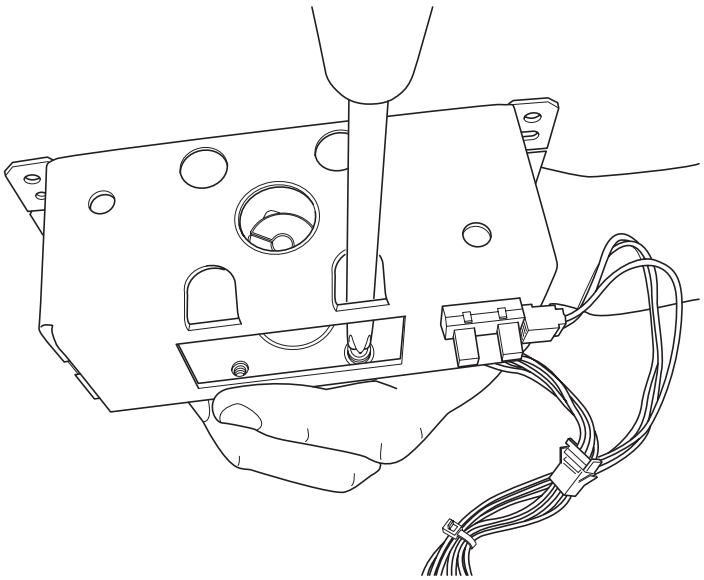
9. Using an Allen wrench, set the shaft free.



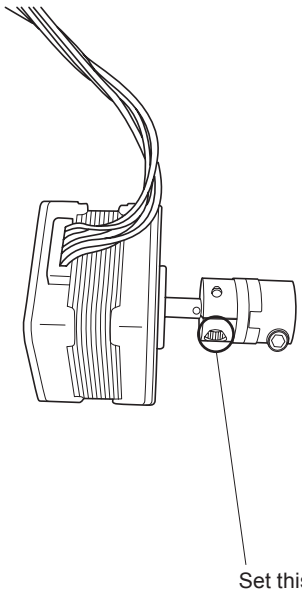
10. Remove the 2 screws and take off the motor with the bracket.



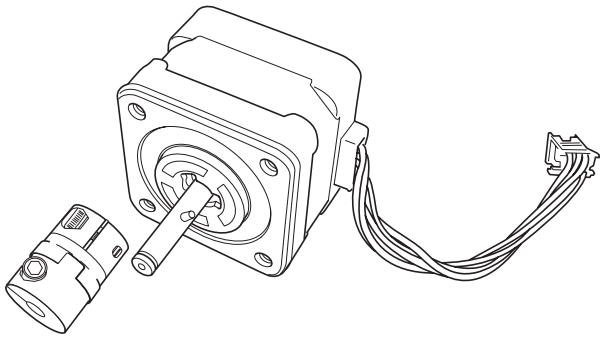
11. Remove the bracket by removing the 4 fixing screws.



12. Using an Allen wrench, set the shaft free and remove the coupling.



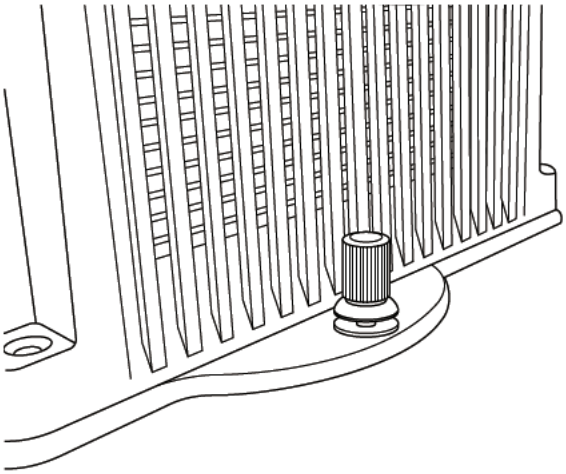
13. Replace the motor.



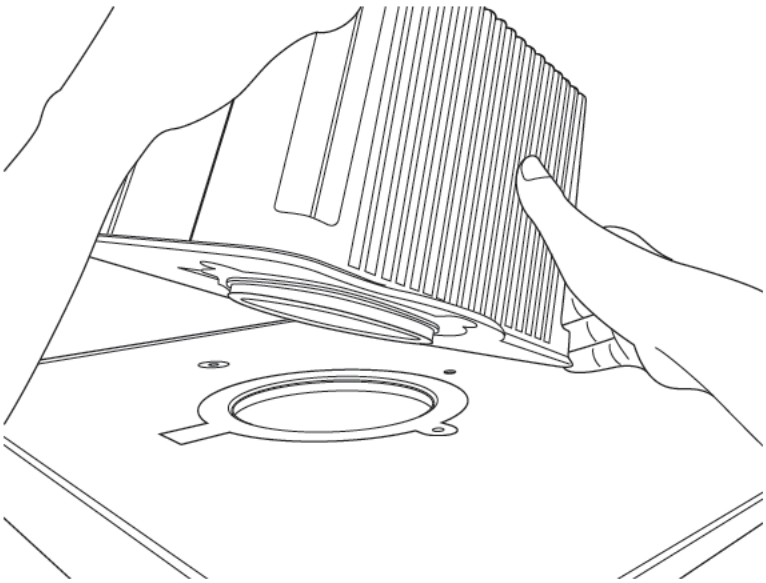
6.11 Camera Head (848Y100012)

6.11.1 Fan (119W0011B)

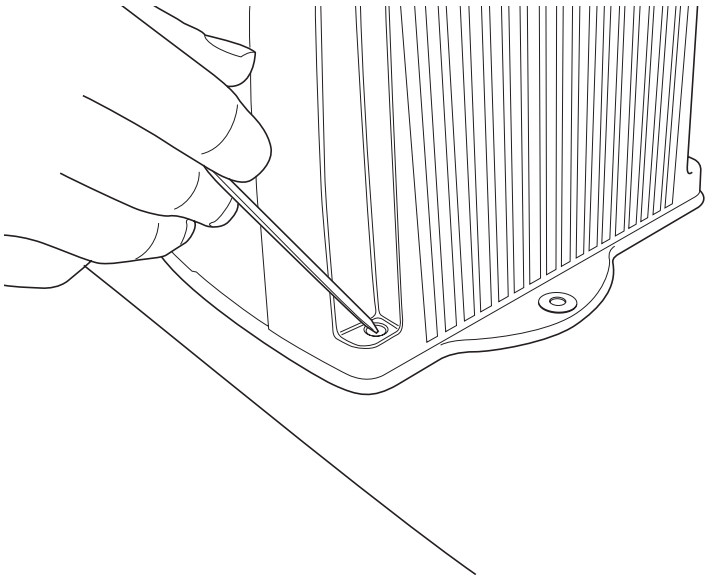
1. Remove the lens unit.
2. Disconnect the USB cable.
3. Disconnect the camera cable.
4. Remove a total of 2 screws, one on each side.

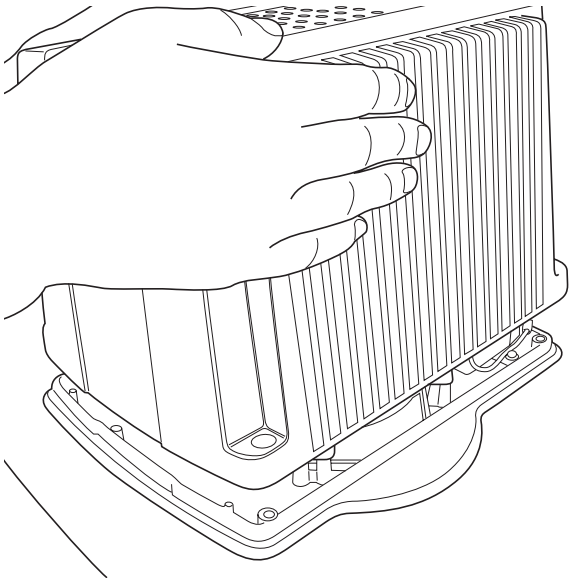


5. Turn the camera head slightly clockwise and check that the lock is disengaged. Then slowly pull up the camera head.

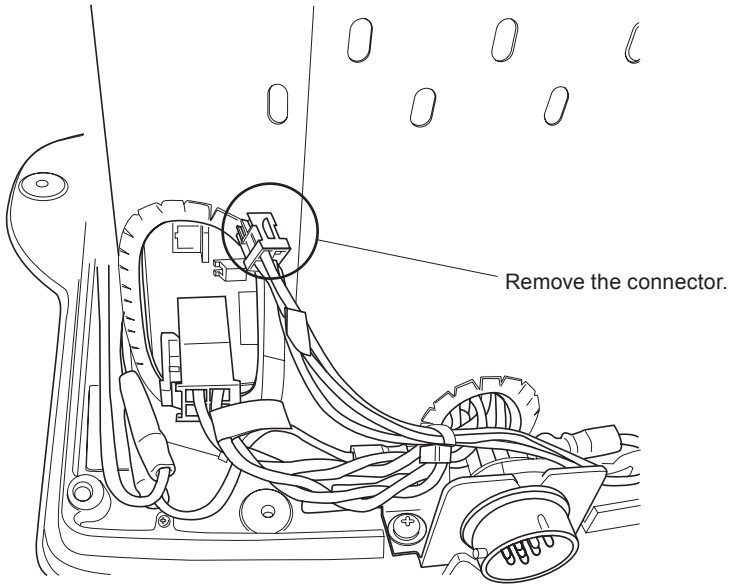


6. Remove the head cover by removing the 4 screws with an Allen wrench.

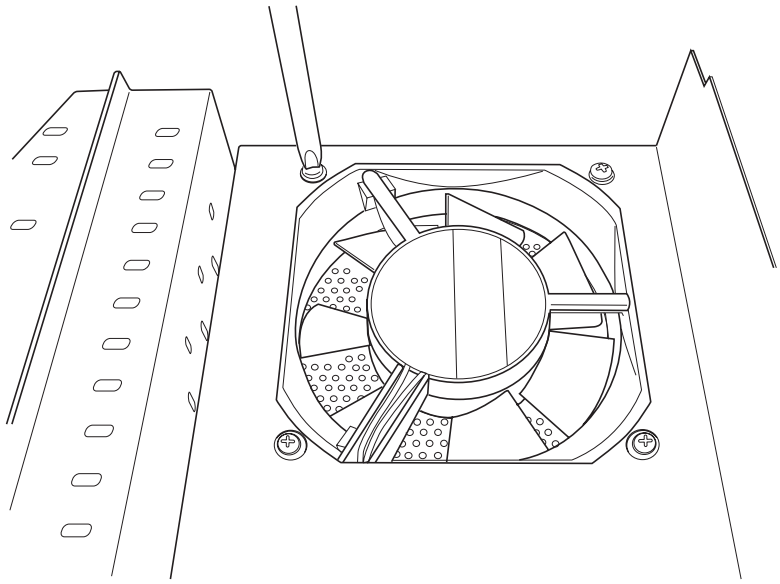




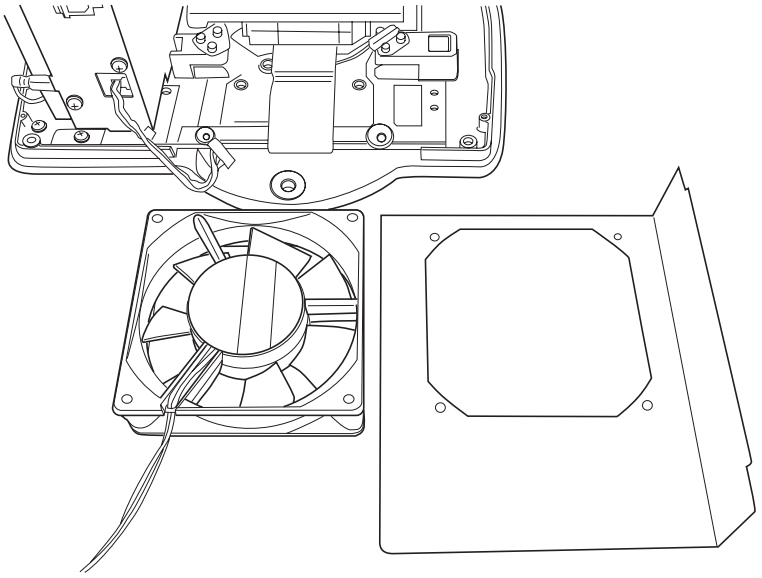
7. Disconnect the fan cable connector.



8. Remove 4 screws that hold the fan and the bracket.

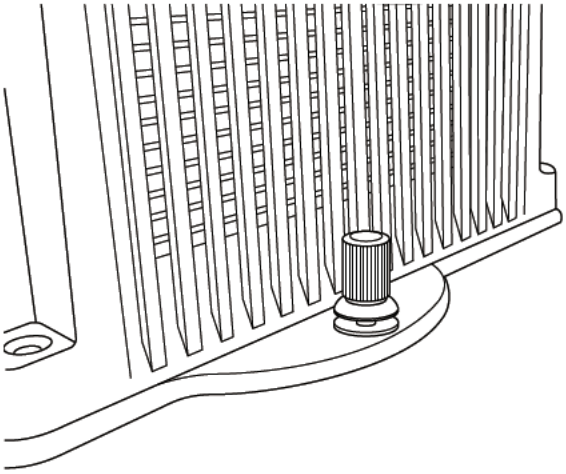


9. Replace the fan.

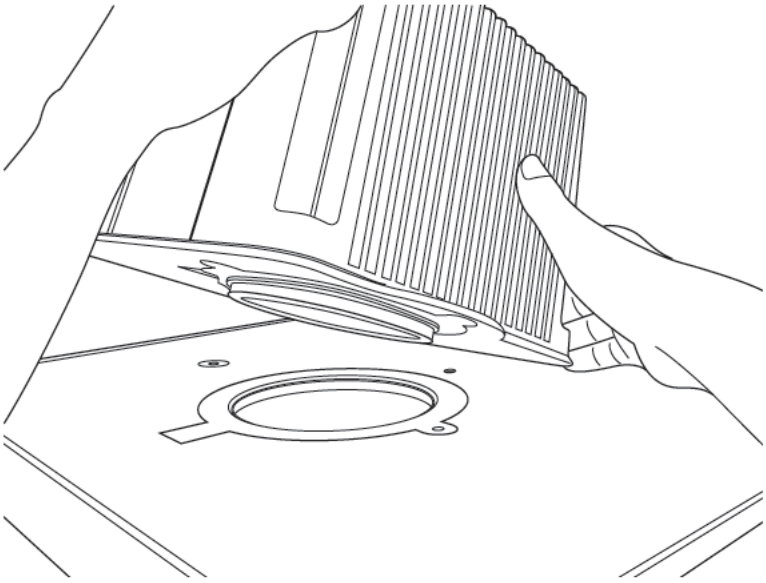


6.11.2 Shutter (398Y100010)

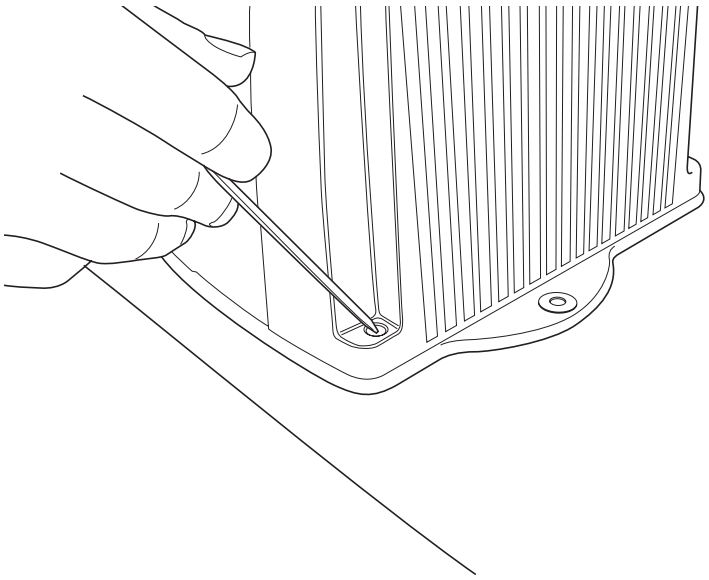
1. Remove the lens unit.
2. Disconnect the USB cable.
3. Disconnect the camera cable.
4. Remove a total of 2 screws, one on each side.

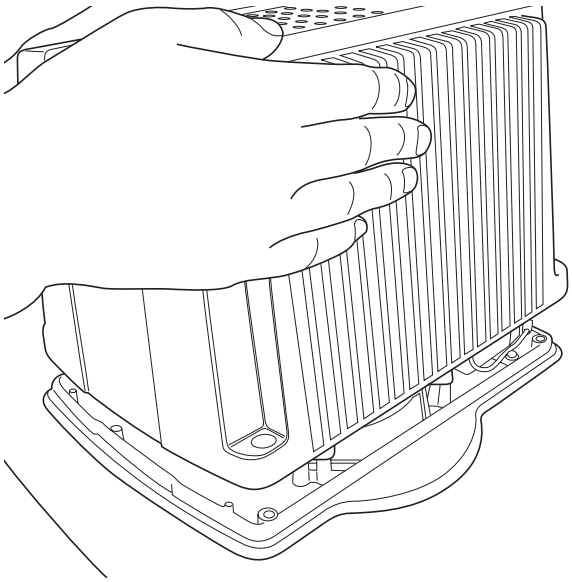


5. Turn the camera head slightly clockwise and check that the lock is disengaged. Then slowly pull up the camera head.

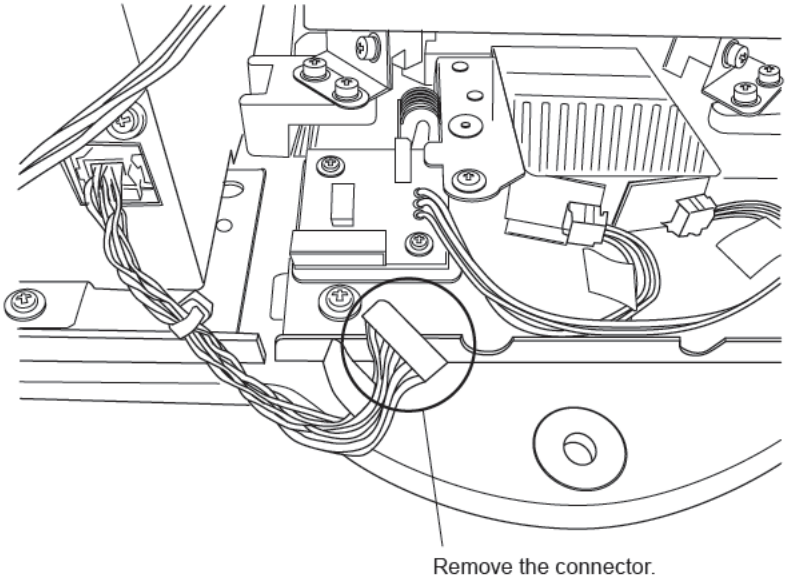


6. Remove the head cover by removing the 4 screws with an Allen wrench.

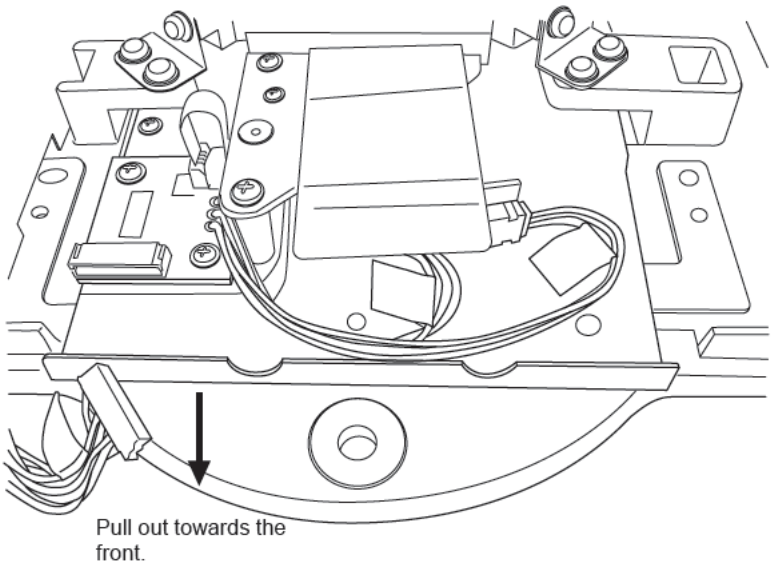




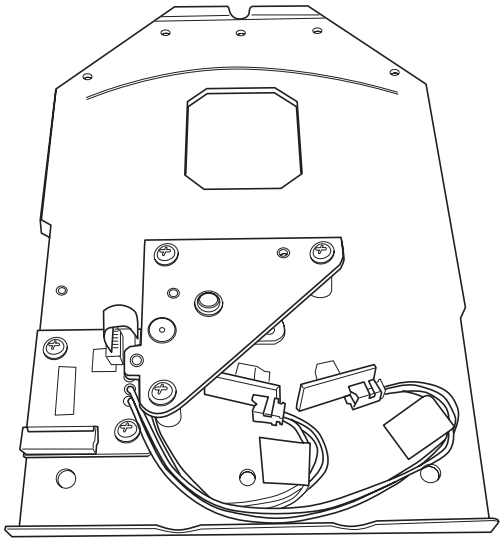
7. Disconnect the SHCN1 connector.



8. Remove the 2 screws securing the shutter, then slowly pull out the shutter towards the front.



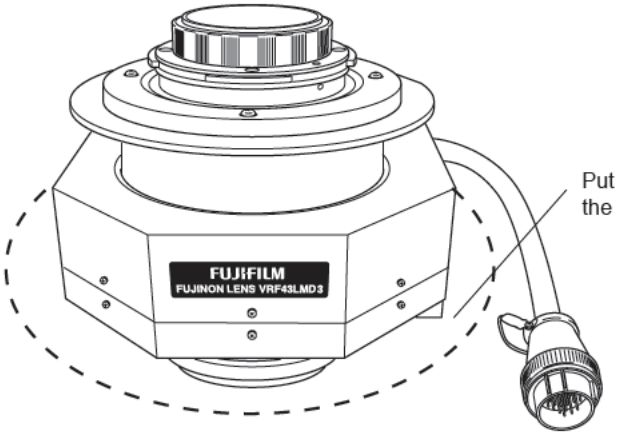
9. Replace the shutter.



10. Lifting the PET film, slowly install the shutter.

6.12 High-Sensitivity Lens Unit

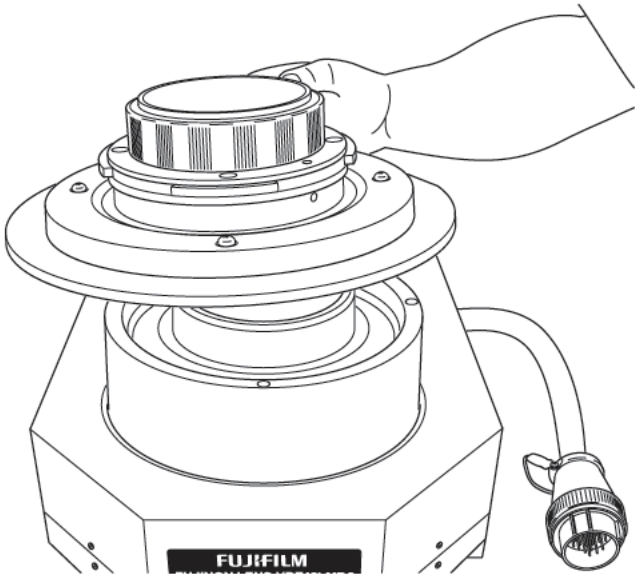
6.12.1 Mount ASSY (23B10630010)



* Nothing is drawn under the lens in the above sketch for the sake of clarity. However, the lens may be damaged if it is put directly on a hard surface like a table. Therefore, provide a styrene-foam cushion, or the like, and put the lens on it.

1. Remove the 4 screws.

2. Replace the mount ASSY.

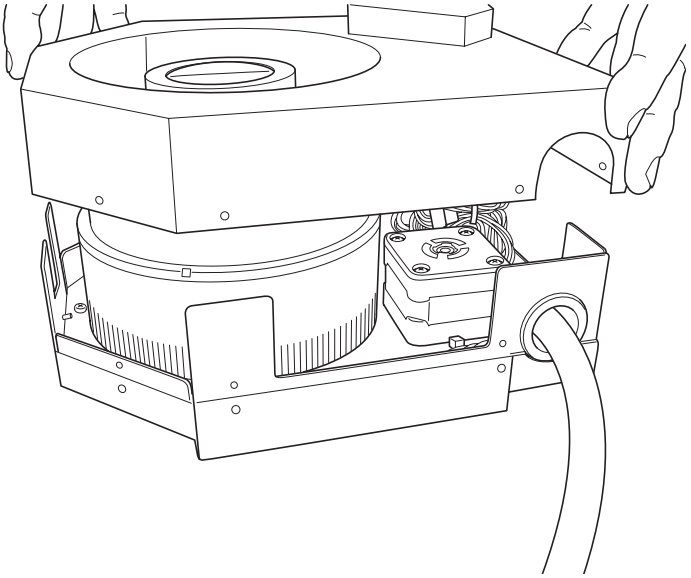


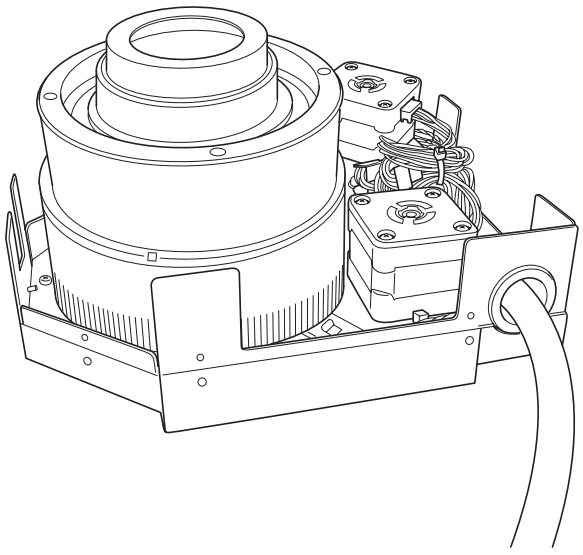
Remember to install the mount ASSY in the correct orientation, matching the red dot on the mount with the right side of the Fuji Photo Film label.

6.12.2 Cover (Top) (11A10334511)

1. Remove the mount ASSY.

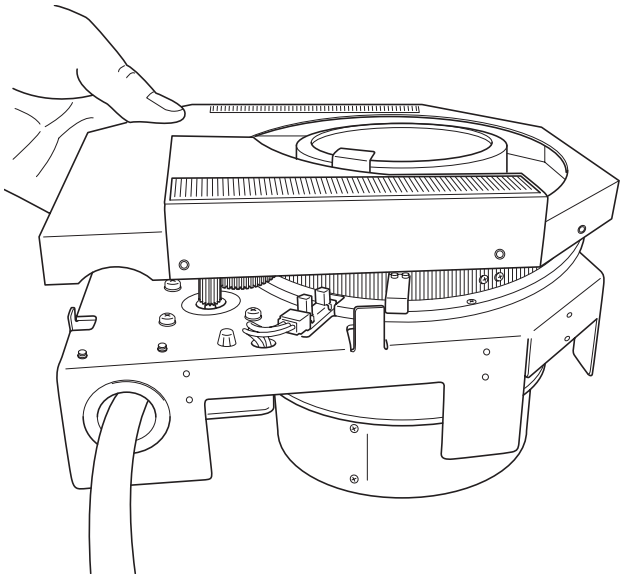
2. Remove the cover by removing the 10 fixing screws. Replace the cover.





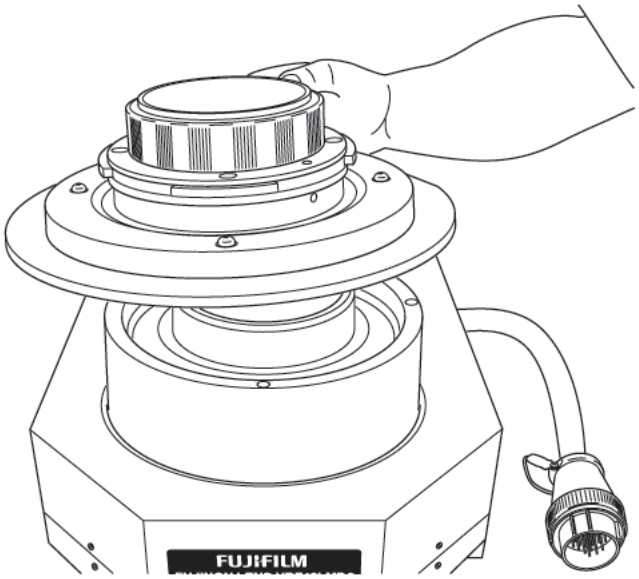
6.12.3 Cover (Bottom) (11A10334471)

1. Remove the cover by removing the 10 fixing screws. Replace the cover.



6.12.4 Iris Motor (101B11441630)

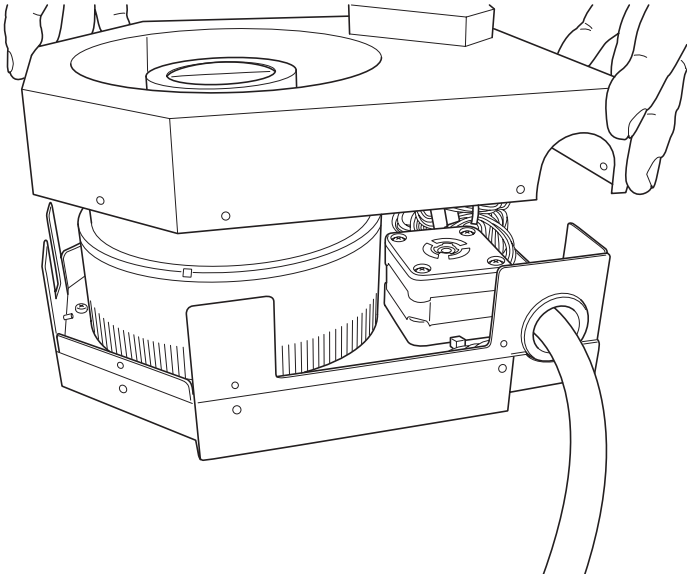
1. Remove the mount.
2. Remove the 4 screws.
3. Replace the mount ASSY.

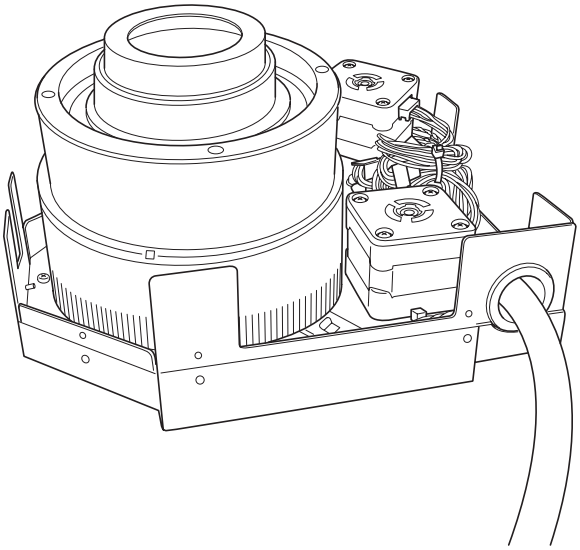


* To reassemble the mount ASSY, align the red dot provided in the mount ASSY with the right side of the “FUJIFILM” label as before the disassembling.

4. Remove the (top) cover.

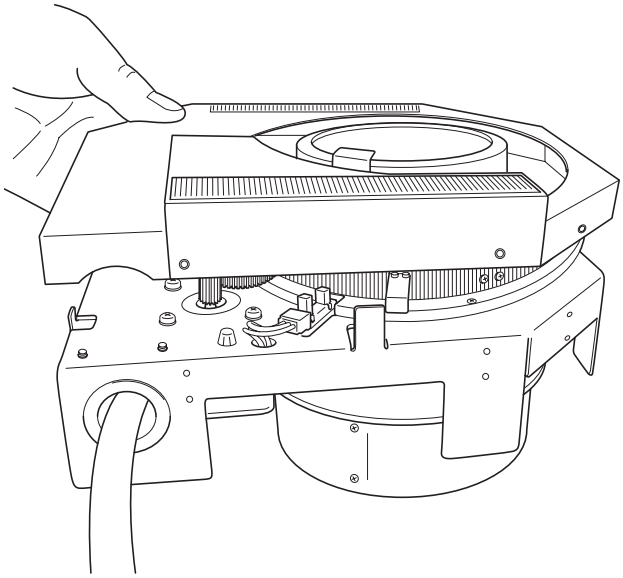
5. Remove 10 screws to detach the cover.



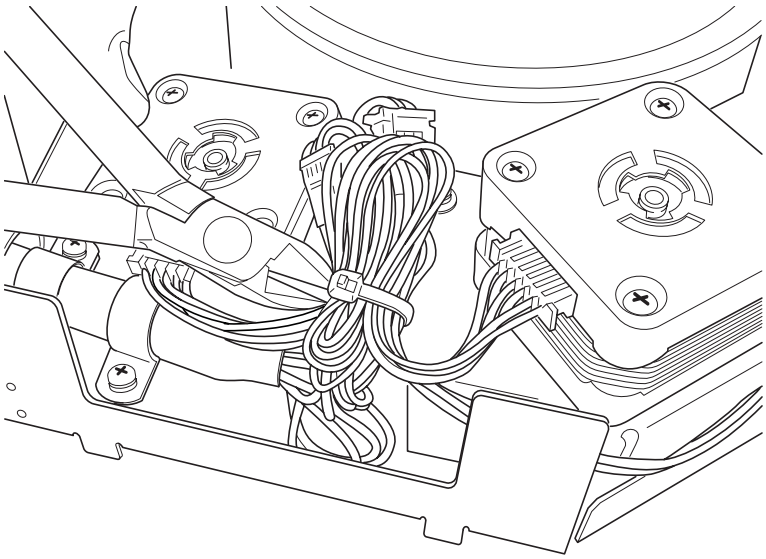


6. Remove the (bottom) cover.

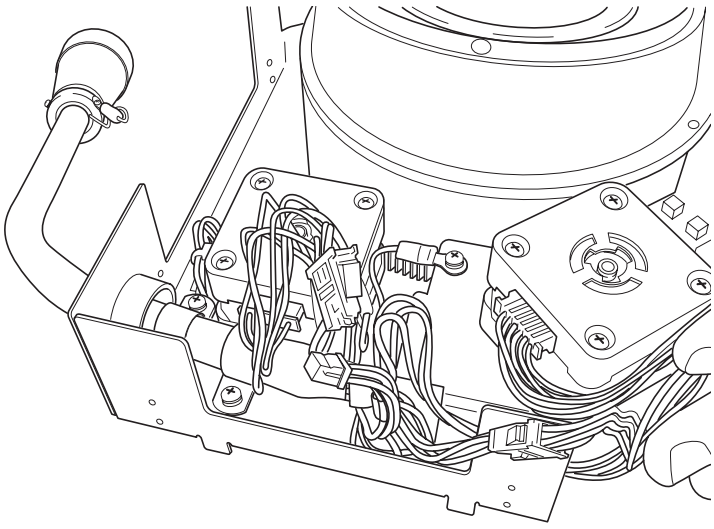
7. Remove the cover by removing the 10 fixing screws.
   Replace the cover.



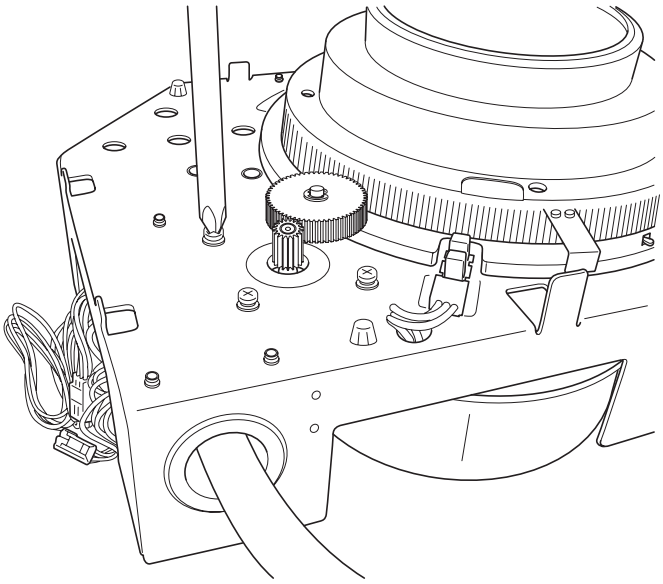
8. Cut off the cable tie.

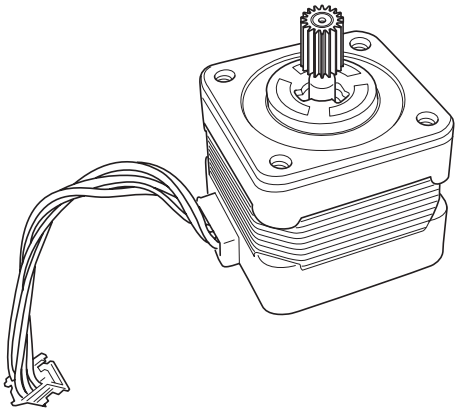


9. Disconnect the iris motor connector.



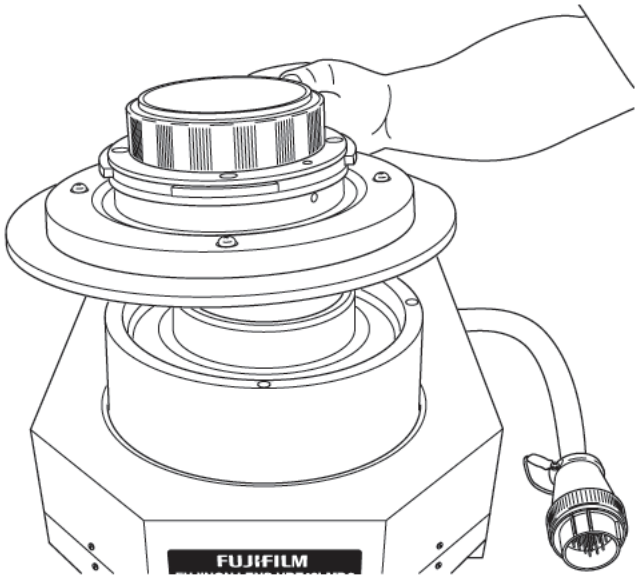
10. Remove the motor by removing the 3 fixing screws.
    Replace the motor.





6.12.5 Focusing Motor (101B10687181)

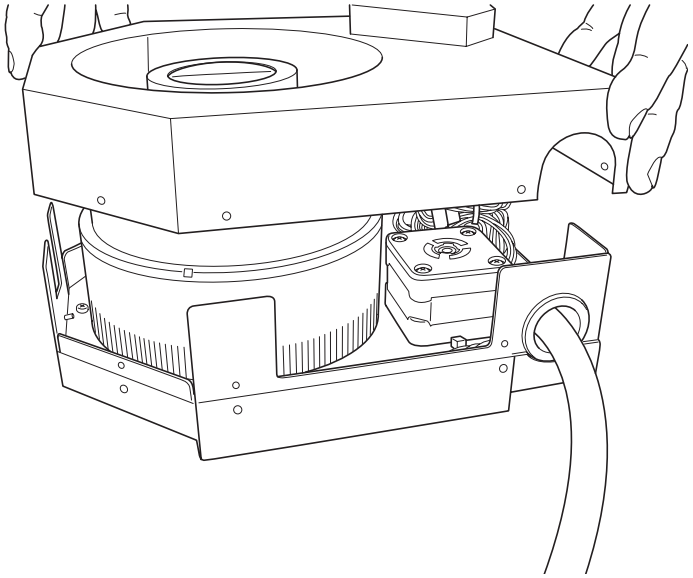
1. Remove the mount.
2. Remove the 4 screws.
3. Replace the mount ASSY.

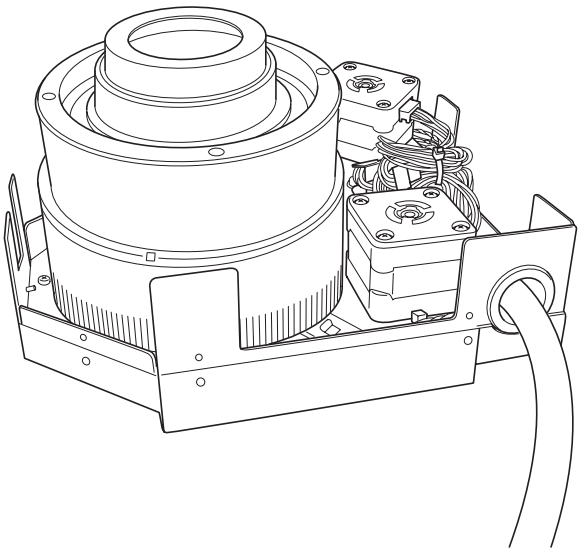


* To reassemble the mount ASSY, align the red dot provided in the mount ASSY with the right side of the “FUJIFILM” label as before the disassembling.

4. Remove the (top) cover.

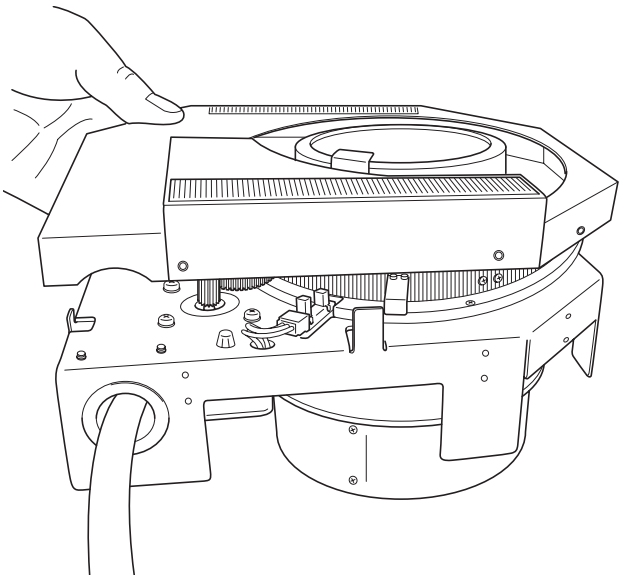
5. Remove 10 screws to detach the cover.



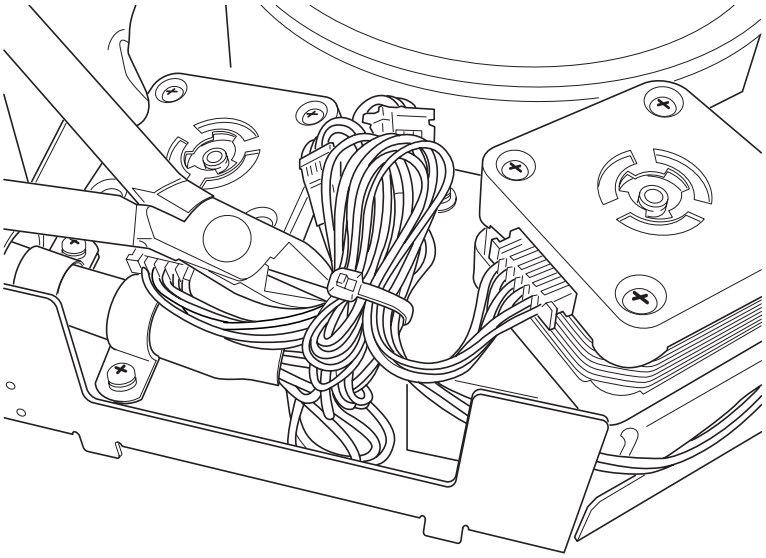


6. Remove the (bottom) cover.

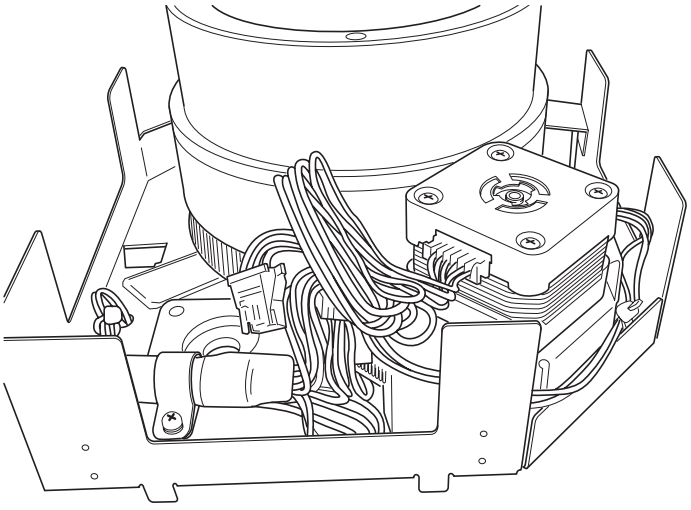
7. Remove the cover by removing the 10 fixing screws.
   Replace the cover.



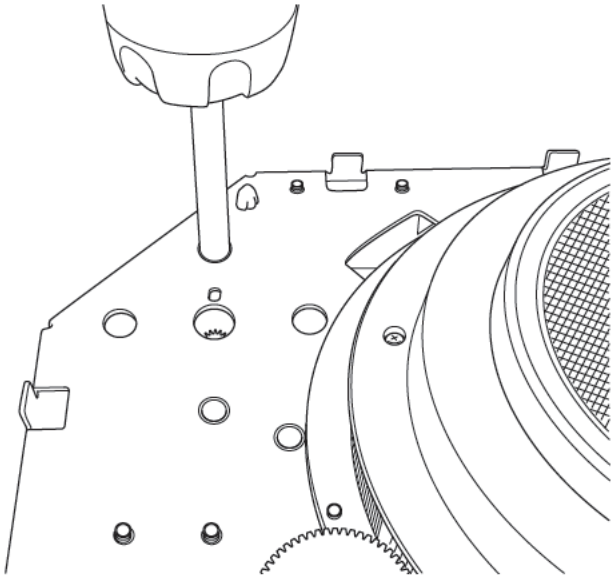
8. Cut off the cable tie.

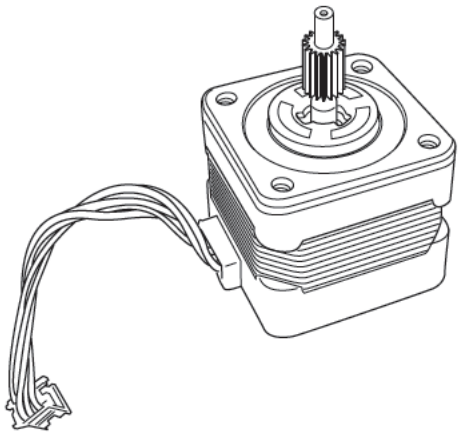


9. Disconnect the focusing motor connector.



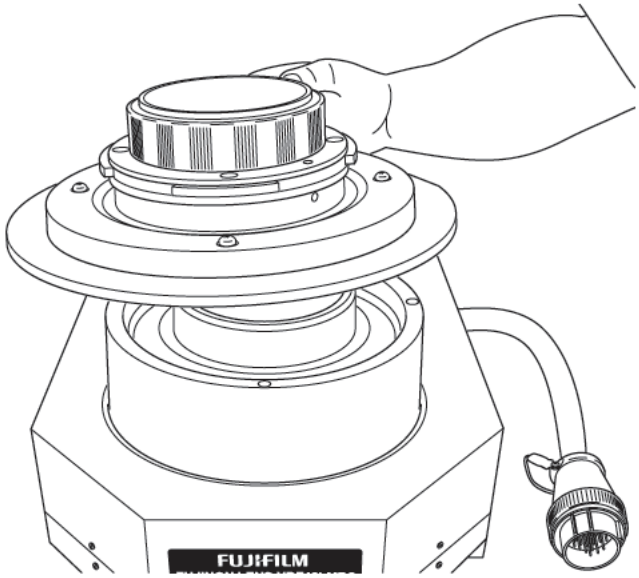
10. Remove the motor by removing the 3 fixing screws.
    Replace the motor.





6.12.6 Photo Interrupter (Focusing) (106K1136271)

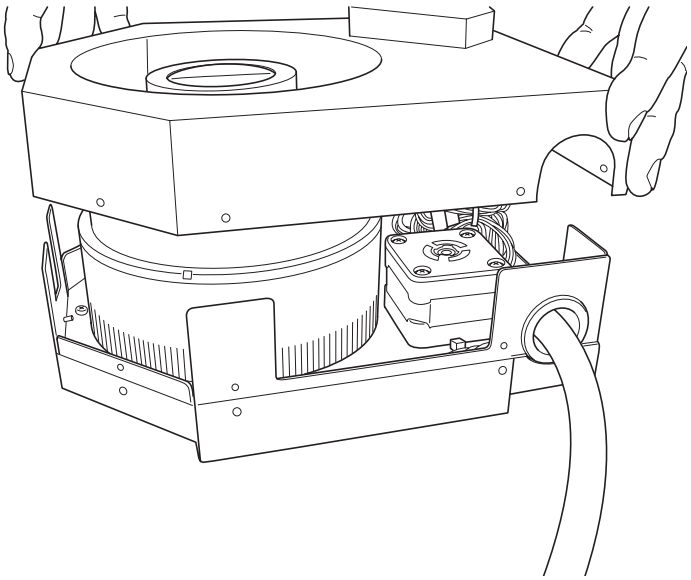
1. Remove the mount.
2. Remove the 4 screws.
3. Replace the mount ASSY.

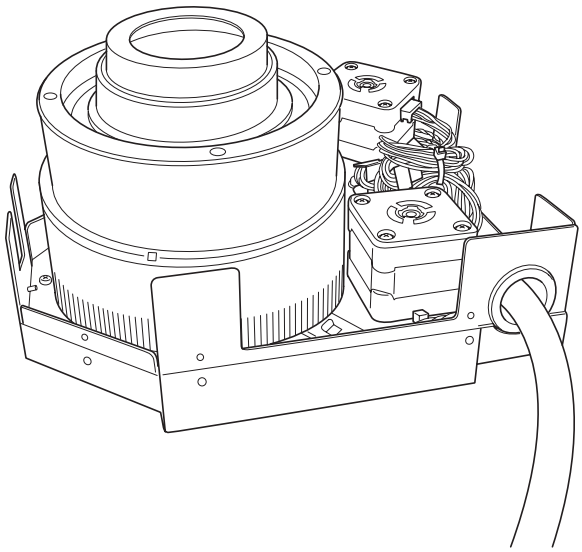


* To reassemble the mount ASSY, align the red dot provided in the mount ASSY with the right side of the “FUJIFILM” label as before the disassembling.

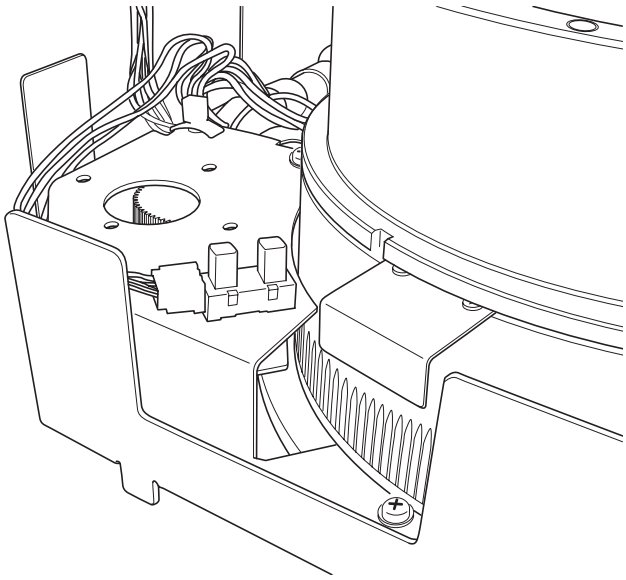
4. Remove the (top) cover.

5. Remove 10 screws to detach the cover.

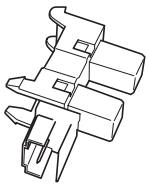




6. Disconnect the photo interrupter (focusing) connector.

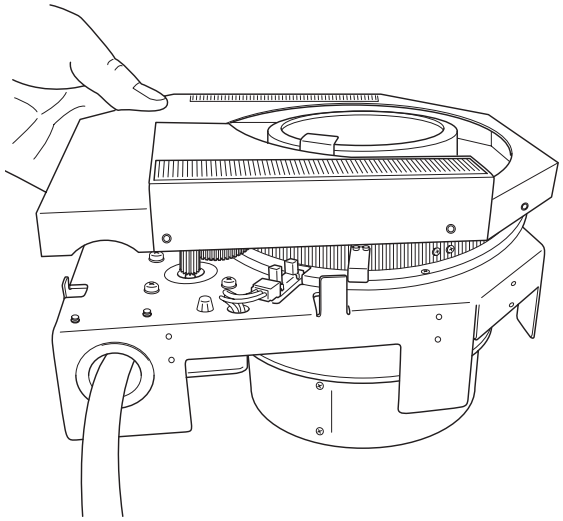


7. Pull up and remove the photo interrupter (focusing).
   Replace the photo interrupter.

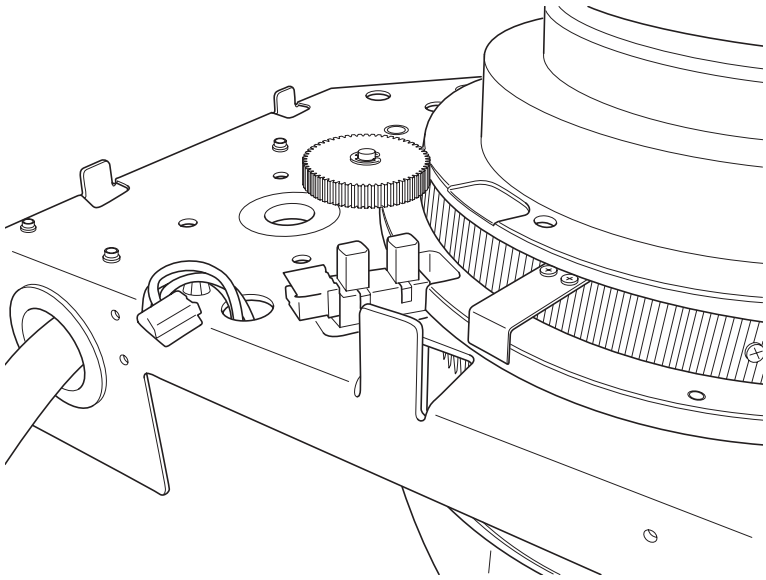


6.12.7 Photo Interrupter (Iris) (106K1136271)

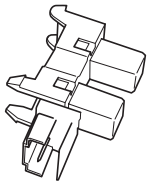
1. Remove the (bottom) cover.
2. Remove the cover by removing the 10 fixing screws. Replace the cover.



3. Disconnect the photo interrupter (iris) connector.



4. Pull up and remove the photo interrupter (iris), and replace it.

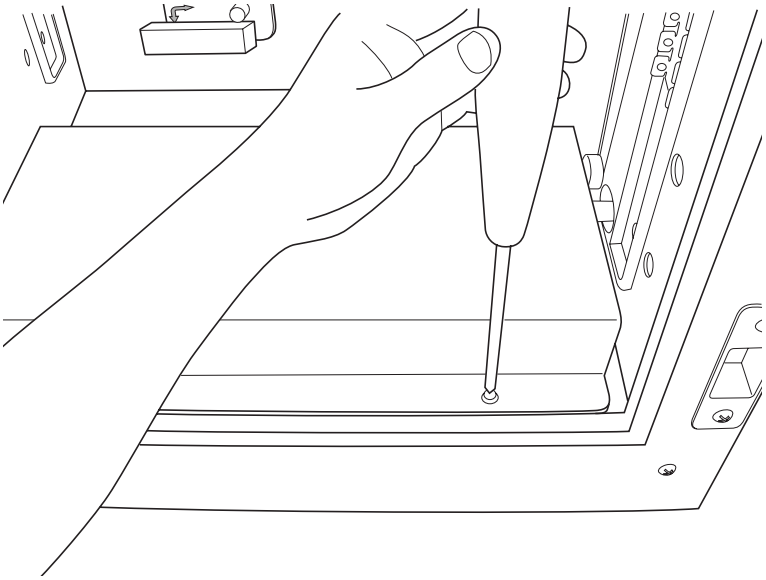


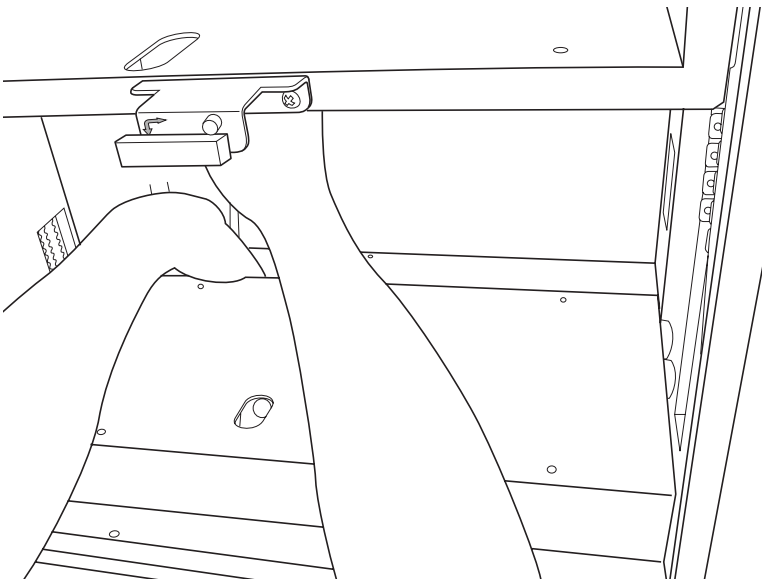
6.13 IDX

6.13.1 Lifting table Driving Motor (118SX167A)

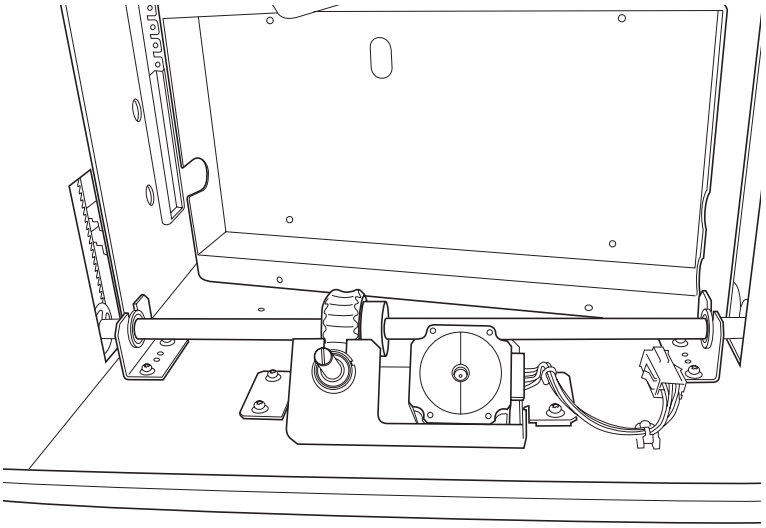
1. When the lifting table is located at the LOW END position, turn the screw for the manual lifting operation of the lifting table counterclockwise with a flat-ended screwdriver to raise the lifting table.
   Raise the lifting table high enough to allow inserting a screwdriver to remove the lifting table cover.

2. Remove 2 screws from the front and 2 screws from the far end.

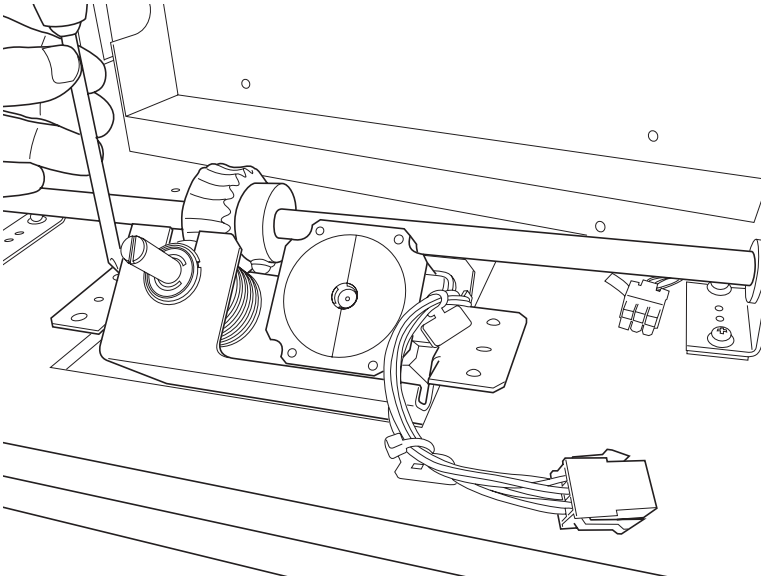




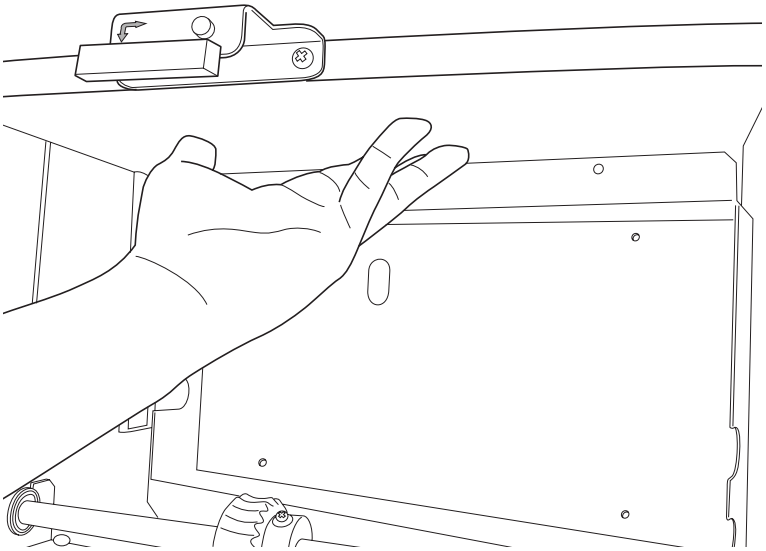
3. Remove the cover. Rest the cover against the far end (to prevent possibly falling lifting table). * The cover cannot be taken off from the IDX.



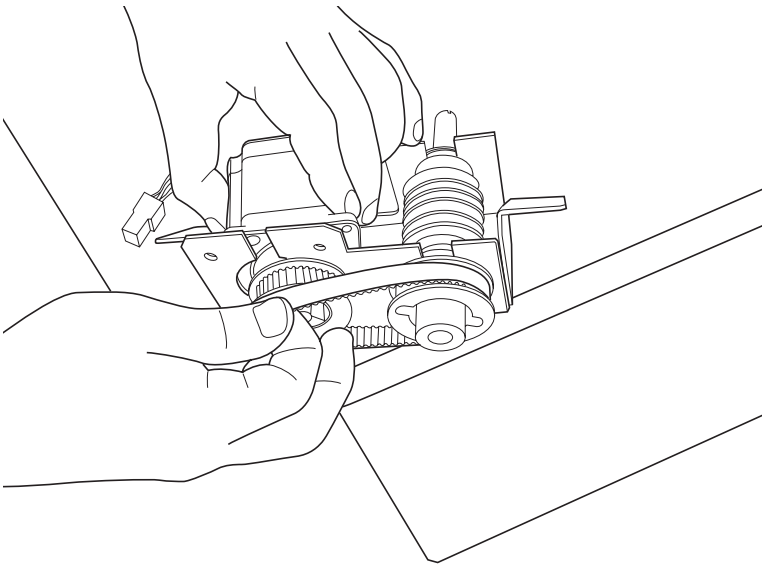
4. Disconnect the cable connector, remove the 4 screws and pull up and remove the bracket.



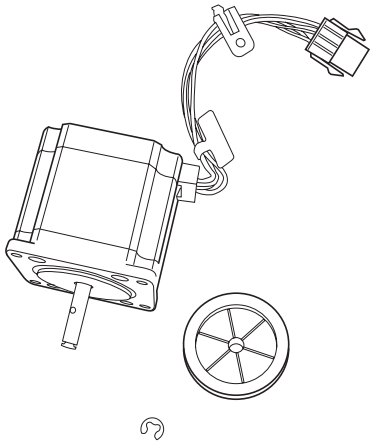
* Pay special attention to this step because the lifting table can shift down due to its own weight.
It is recommended to hold the lifting table with one hand while pulling up the bracket for removal.
The removed cover should be placed leaning against the far end in the above step 3 to prepare for possible sudden downward movement of lifting table.



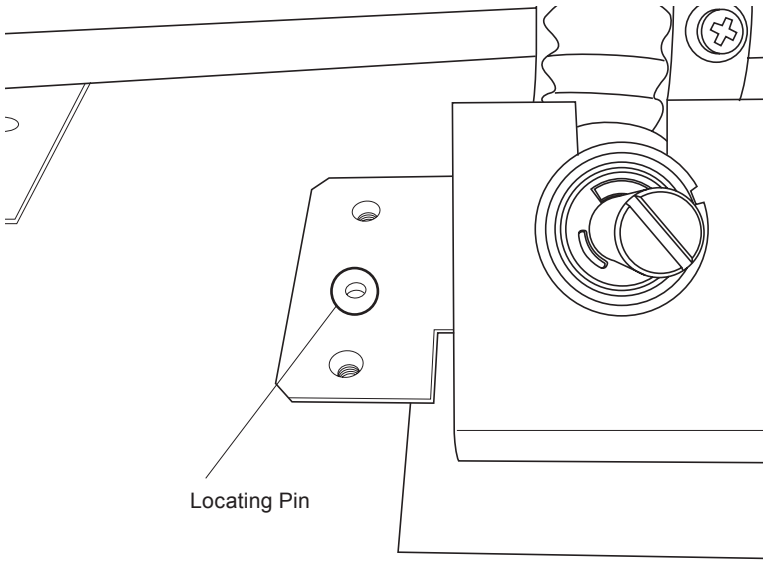
5. Disengage the belt.



6. Remove the E-ring and replace the motor.

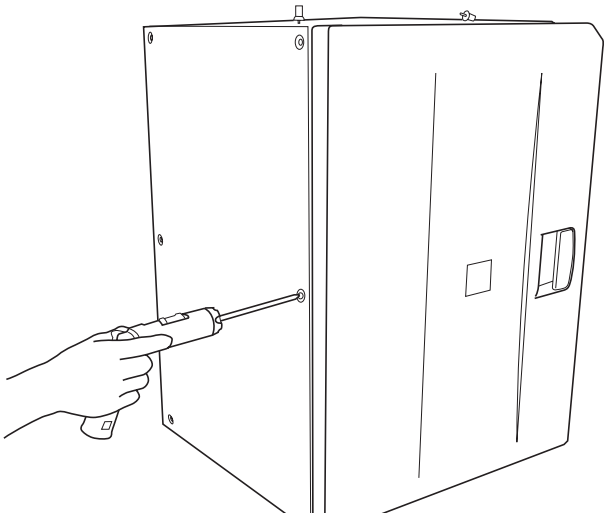


7. After replacing motor, reinstall the bracket, aligning with the locating pin.

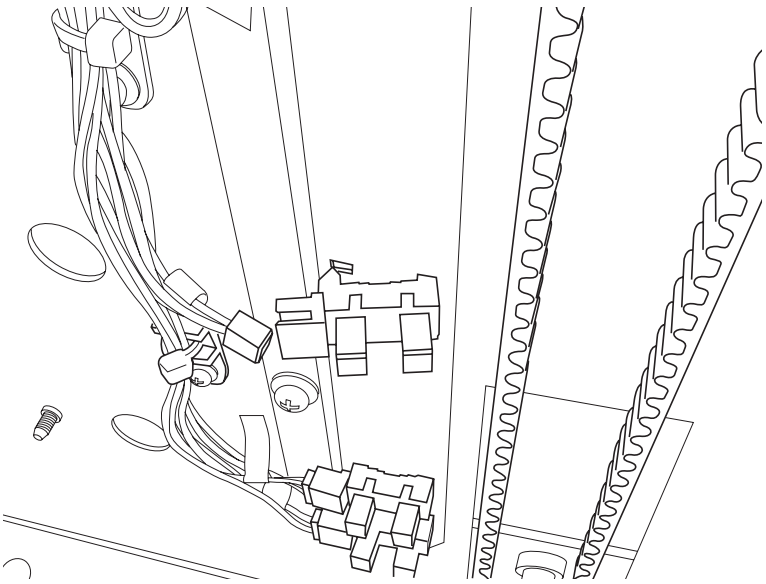


6.13.2 Tray position sensor (146S0029A)

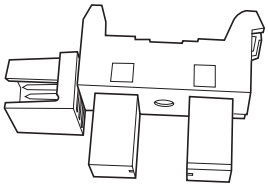
1. Remove the left side cover by removing the 6 screws.



2. Disconnect the connector and pull out the sensor, picking it up by holding both sides.

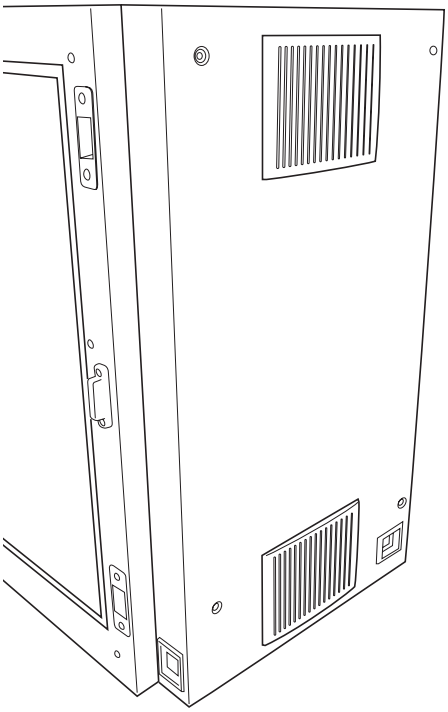


3. Replace the sensor.

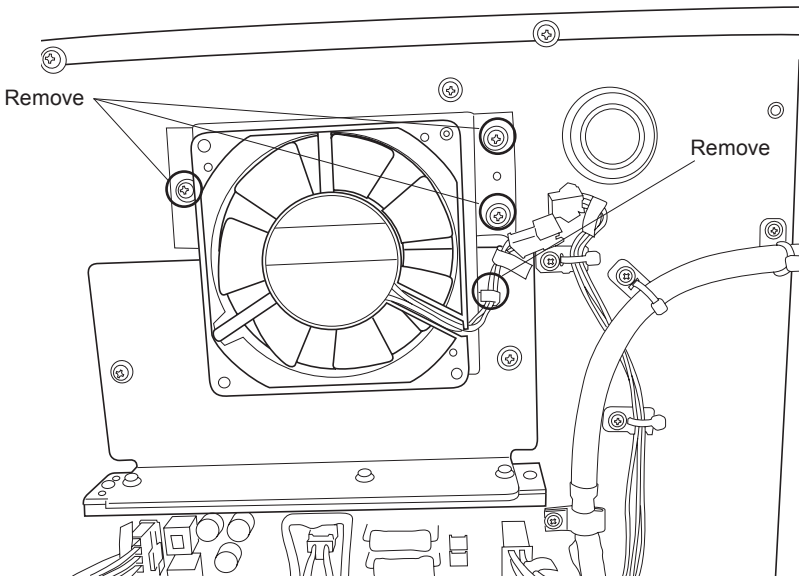


6.13.3 Exhaust heat fan (119S0099)

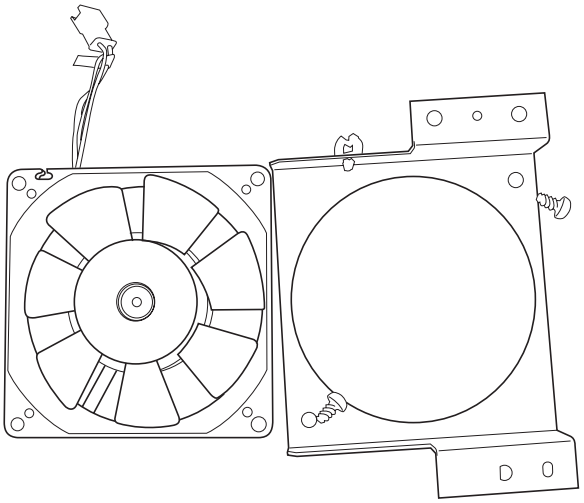
1. Remove the right side cover by removing the 4 screws.



2. Remove the 3 screws (one on the left and 2 on the right) fixing the fan bracket to the IDX.
   Disconnect the connector, remove the fan cable tie, and remove the fan with the bracket.

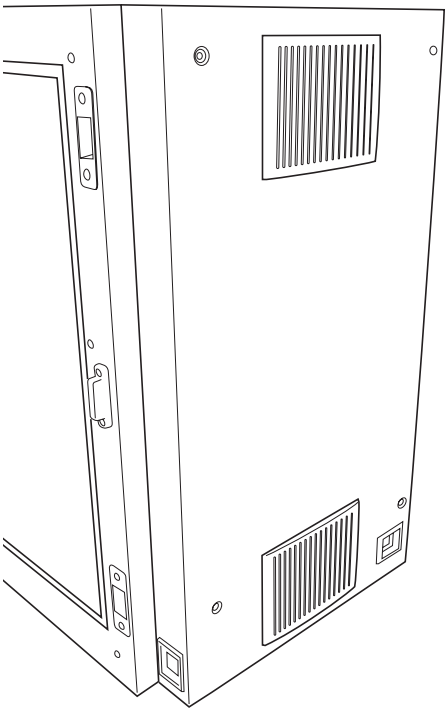


3. Remove the fan from the bracket by removing the 2 screws. Replace the fan.

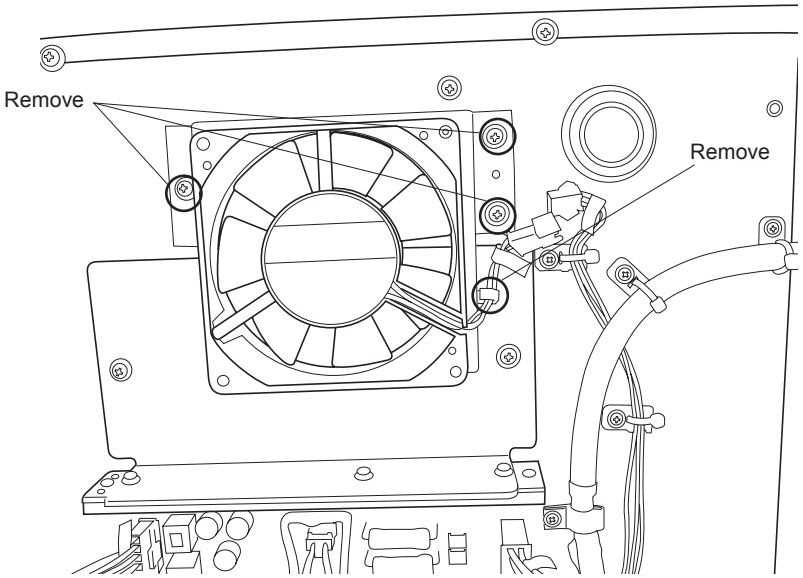


6.13.4 DRLS 4 Board (113Y100056A)

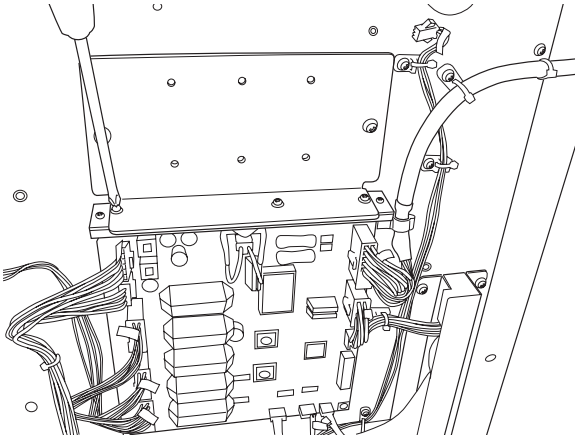
1. Remove the right side cover by removing the 4 screws.



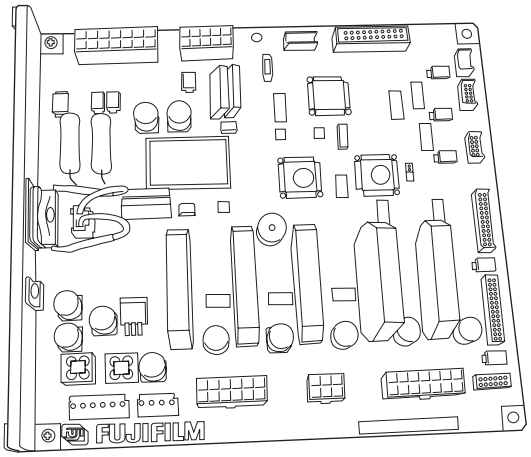
2. Remove the 3 screws (one on the left and 2 on the right) fixing the fan bracket to the IDX.
   Disconnect the connector, remove the fan cable tie, and remove the fan with the bracket



3. Remove the 3 screws to remove the upper part of bracket.

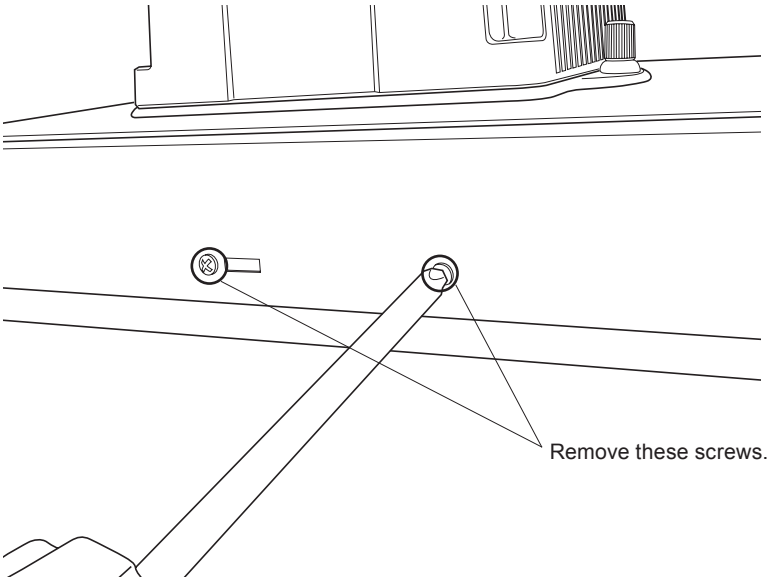


4. Disconnect all the connectors and remove the 4 screws to replace the board.

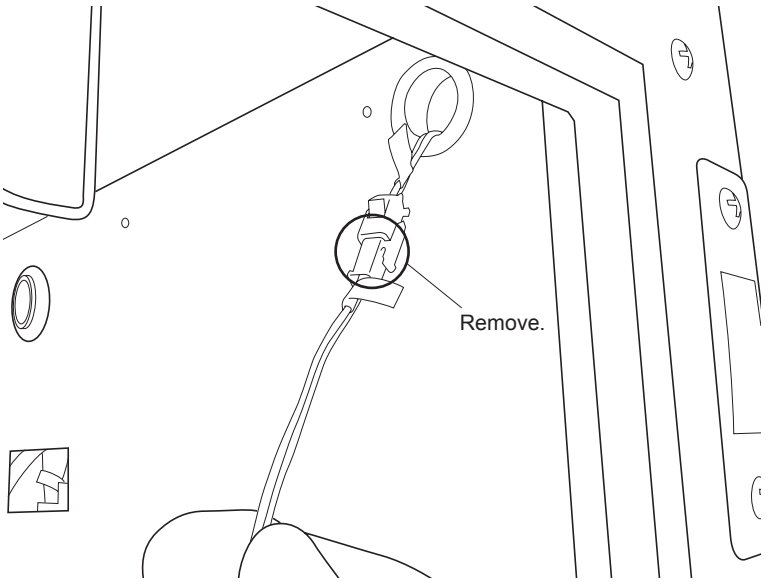


6.13.5 Micro Switch (for the door, top position) (136Y100242A)

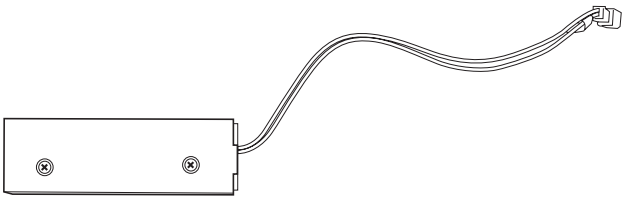
1. Remove the 2 screws.



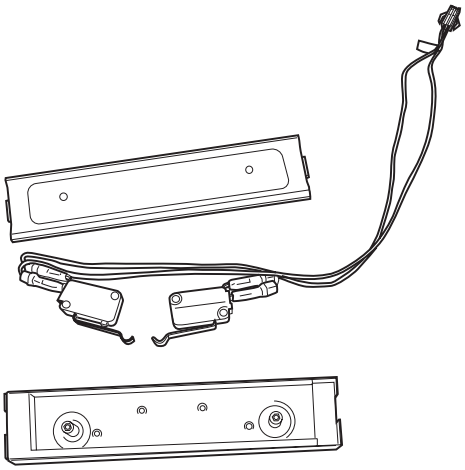
2. Disconnect the connector.



3. Remove the micro switch with the bracket.

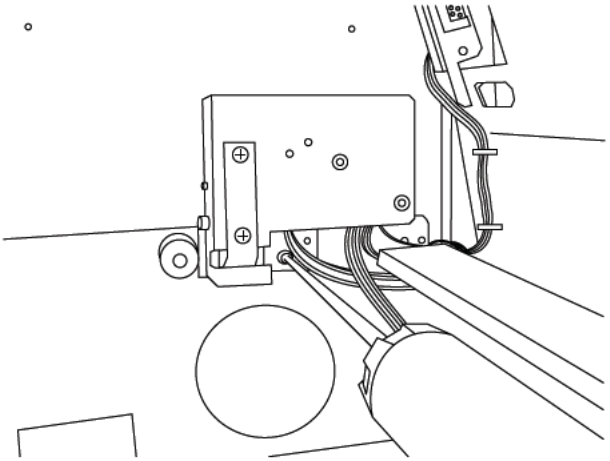


4. Remove the micro switch from the bracket by removing the 6 screws. Replace the micro switch.

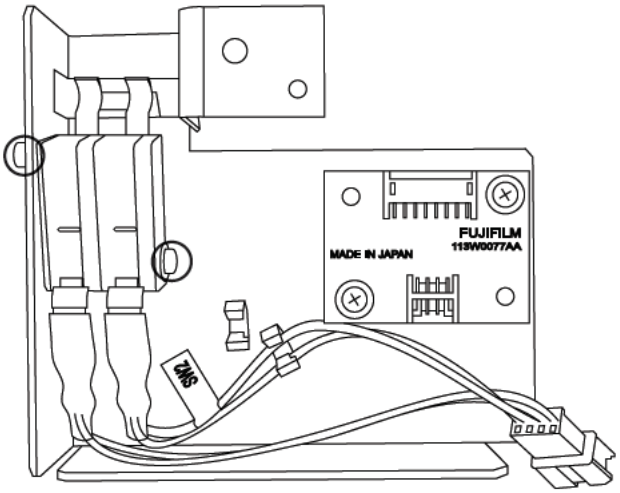


6.13.6 Micro Switch (located at the far end in IDX for detection of tray) (136Y100241A)

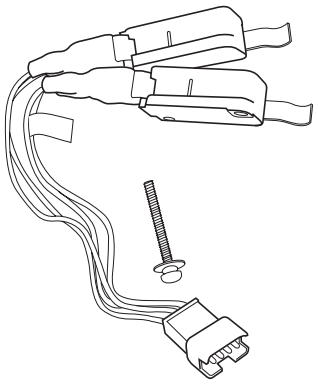
1. Remove the bracket of the micro switch and the relay board by removing one screw.



2. Remove the micro switch by removing 2 fixing screws.



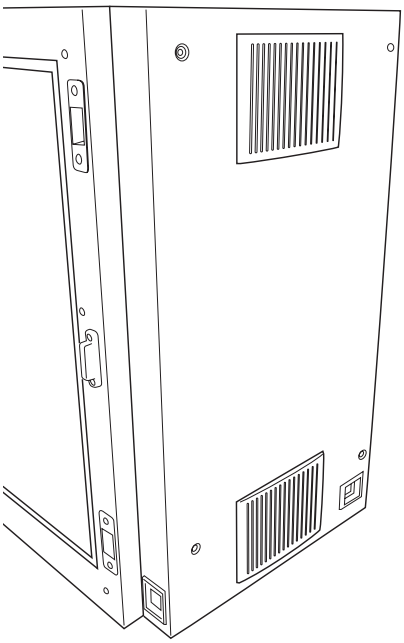
3. Replace the micro switch.



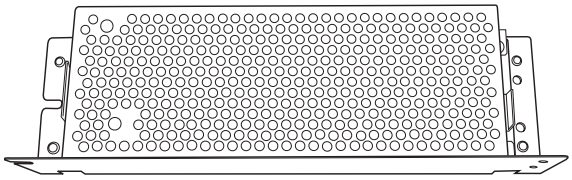
* The micro switch is composed of 2 parts which are designed to function independently from each other to detect the type of tray. This means that the 2 parts must be reinstalled in the correct order after the replacement of the micro switch.
Remember to fit the part (SW1) not labeled “SW2” among the 2 parts of micro switch in such a manner that it comes in close contact with the wall of the bracket.

6.13.7 Power Supply (125S0326 for 12V) (125S0327 for 24V)

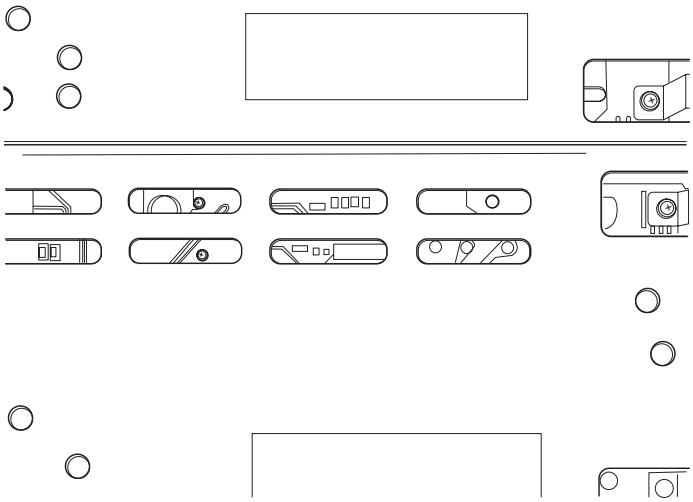
1. Remove the right side cover by removing 4 screws.



2. Disconnect the connector and remove 1 screw from the left side and 2 screws from the right side.

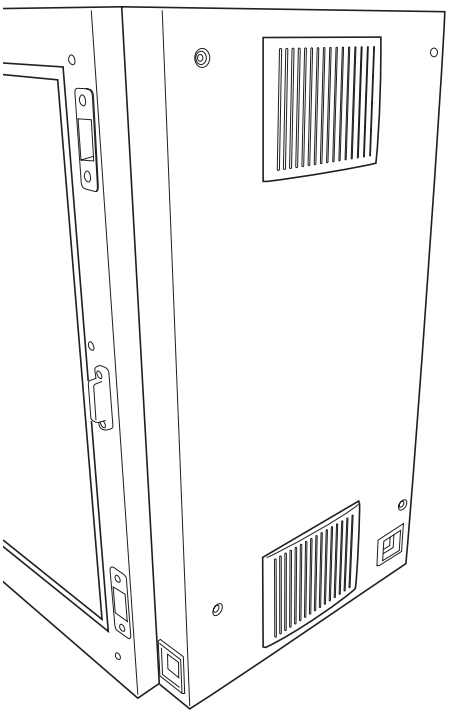


3. Replace the power supply.
   * To remount the power supply, mount the power source for 12V to the upper side, and for 24 to the lower side.
   A sticker indicating the voltage (for 12V or 24V) is stuck on the back side of the power supply unit. Check the sticker to confirm the voltage before mounting.

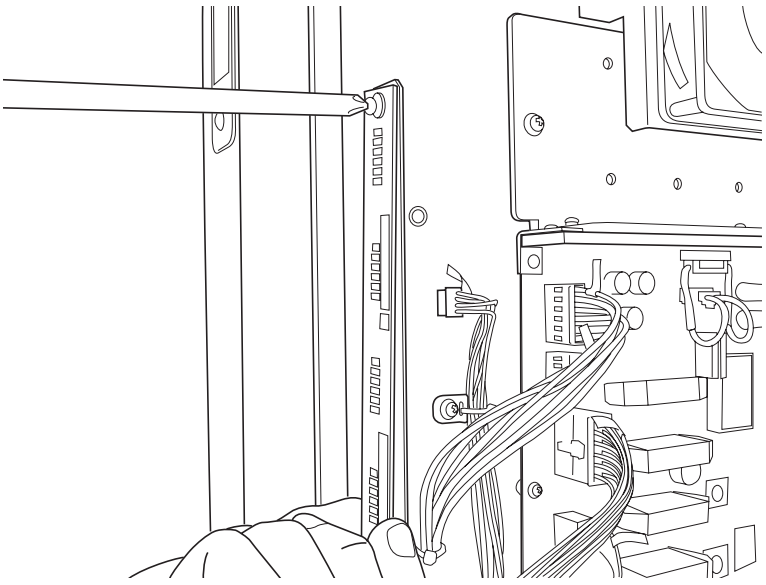


6.13.8 DPLS4 Board (113Y100059A)

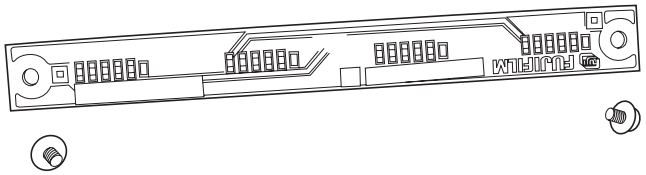
1. Remove the right side cover by removing 4 screws.



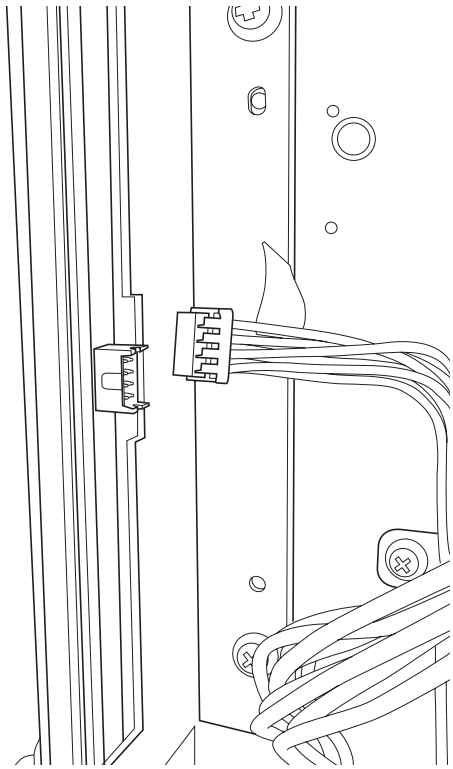
2. Disconnect the connector and remove the 2 screws.



3. Replace the DPLS4 board.

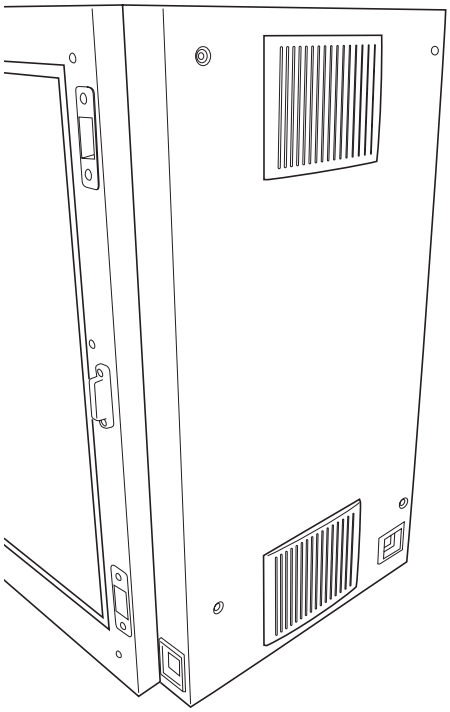


* After replacement, remember to install a new board in the correct orientation, do not set it upside down.
Identify the correct orientation by the relative position of the notch and connector.
Check that “POWER” is lighted green after turn-on.



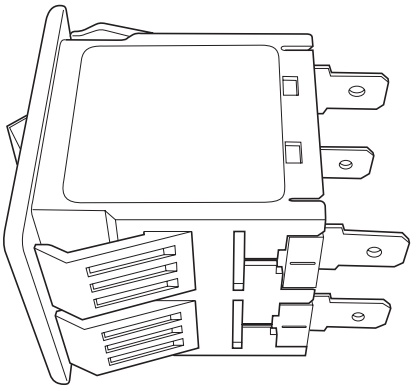
6.13.9 POWER Switch (128N0067)

1. Remove the right side cover by removing 4 screws.



2. Remove the 4 Fasten terminals and remove 2 screws.

3. Remove the switch.



4. Replace the switch.
   * After replacement, remember to reinstall the Fasten terminals in the correct orientation, do not set it upside down.
   No need to worry about the right and left positions, but reinstall the terminals taking care to match the color of the upper and lower terminals.

Chapter G. Technical Explanations

This chapter describes the design concept and technology adopted in the LAS-4000 system.

Chapter G. Technical Explanations

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1 INTRODUCTION

This chapter presents the LAS-4000 system operation principles and technical information, as well as the maintenance procedures for the component units.

2 SYSTEM CONFIGURATON

■ Camera head:	Cooling CCD camera main unit
■ Lens:	Captures optical information that is subjected to detecton and forms images.
■ EPI/DIA/NP Tray:	Retains samples that are subjected to detection.
■ Intelligent Dark Box:	A dark box used to supply power to the camera head and expose the subject.
■ Incident-light unit:	EPI illuminator-type LED light source for fluorescent/digitization use
■ Transmitted white light unit:	DIA illuminator type white LED light source used for digitization
■ Transmitted UV light unit:	DIA illuminator-type UV light source for fluorescent use for UV excitation
■ Fluorescent Filter:	A filter to cut any excitation light and transmit the intended fluorescent light
■ Image reading software (Image Reader):	On the analyzing unit (computer), controls the camera head and inputs exposure data via the camera controller.
■ Analyzing software:	On the analyzing unit (computer), stores and analyzes exposure data read using reading software.
■ Analyzing unit (computer):	Controls the camera head and IDX, and captures exposure data via the camera controller.

3 TECHNICAL EXPLANATIONS (HARDWARE)

3.1 Camera Head

3.1.1 CCD

A CCD area sensor (hereafter called CCD) is used in the LAS-4000 camera head as the image pickup element.
The CCD incorporated in the LAS-4000 features a zigzag array (effective pixels: 3.15 million) that provides higher resolution and sensitivity than the CCD in the LAS-1000plus.
The High Resolution mode allows high-resolution images equivalent to 6.30 million pixels (2048x3072) with the aid of supplement processing.
In addition to the square-pixel type CCD, there are various other CCD types in accordance with their operation systems. Following are the most representative CCD systems and their features.
The CCD in the LAS-4000 is of the progressive scanning type.

(A) Full frame
The structure is simple, and it is possible to secure a large photo diode area and electric charge accumulation, making it possible to secure wide dynamic range.
When light enters from the front side, the sensitivity reduces as it passes through the electrode.
For light incident from the rear, the sensitivity problem will not result, but it will be hard to actually produce the CCD.
Basically, a mechanical shutter is required for the full frame CCD, and smears will appear if the image is exposed to light during reading; thus, this type of CCD is not suited for movie camera use.

(B) Frame transfer
This type of CCD receives light in the same part as the full-frame CCD, but it does not require a mechanical shutter because a light-shielded section that is equivalent to the same number of pixels as the light-receiving unit has been provided on the CCD chip.
For the same number of pixels, chip area twice larger will be required, resulting in greater expense.

(C) Interline
The interline type CCD was developed for movie camera use, which basically does not require a mechanical shutter.
The spectral sensitivity is good because it is not necessary to form an electrode on the photo diode.
Because an electrode that is not sensitive to light has been provided on the CCD, light cannot be received effectively, as the photo diode area is limited.

(D) Progressive scan
This type of CCD can read all pixels, and with this CCD, it is possible to obtain images with no blurring without using a mechanical shutter. The CCD drive mechanism is complicated compared with the above 3 systems.

3.1.1.1 LAS-4000 CCD

The LAS-4000 system uses a high-resolution, high-sensitivity black-and-white CCD with a wide dynamic range, 3,200,000-pixels, and interline progressive scanning. This CCD has been specially designed for the LAS-4000 camera.

Model: MS3833
Maker: Fujifilm

Following are the special features.

(A) High resolution
With a total of 3,335,040 pixels, and with 3,145,728 effective pixels in a zigzag array (1,024 horizontal x 1,536 vertical x 2), the CCD provides a high-resolution image of 6,291,456 (2,048 horizontal x 3,072 vertical) pixels with the aid of supplement processing. In the reading in High Resolution mode, it is possible to record an area the size of A4 paper at approx. 100 µm pitch.
(Pixel pitch on the chip is approx.11 µm.)

(B) High sensitivity
The limited photo diode area, a defect of the interline type CCD, has been solved by adopting an on-chip type micro lens and a zigzag array of photo diodes, and dark current occurring during long-time exposure has been kept to a minimum by adopting a low-dark-current type built-in photo diode.

(C) Wide dynamic range
In current high-resolution CCDs, greater importance has been placed on making pixels ever smaller, neglecting the dynamic range. However, in the LAS-4000 system, the specially designed CCD has made it possible to achieve a high-resolution image boasting wide dynamic range and high sensitivity.
The maximum electric charge accumulation that is available for the dynamic range index is equivalent to 80,000 electrons.

(D) Other
The LAS-4000 system incorporates a focus mode for focusing.
The CCD can be driven at a fast transfer rate to transfer captured images to the analyzing unit via the USB interface, thereby allowing easy focusing.
In addition, this type of CCD seldom causes smears, even in cases of over-exposure, owing to its overflow drain structure. The same structure also makes it possible to realize the electronic shutter in focus mode.

3.1.1.2 Cooling of CCD

The CCD's characteristics vary depending on the applied temperature. Among these characteristics, the dark current (dark noise) generated in the photo diode can be effectively minimized through cooling. In a high-sensitivity camera such as that used in the LAS-4000 system, it is essential to keep dark noise to a minimum.

The CCD used in the LAS-4000 system generates small dark-current noise even in the normal temperature range. However, cooling the CCD temperature to as low as -30°C will further reduce the dark current to about 0.03e (electron)/sec per pixel. With a camera with such a small dark-current noise, it is possible to obtain an excellent image with minimum noise even for an extended exposure as long as two (2) hours.

The lower the cooling temperature, the greater the decrease in dark current noise. Assuming the practical exposure time to be 10 minutes, a cooling temperature as low as -25°C will be sufficient for attaining good performance in the LAS-4000 system.

3.1.1.3 Slow Scan

In high-definition mode, the LAS-4000 camera obtains wide dynamic range images using the slow scan method.
With an ordinary movie camera, it is not possible to fully utilize the high-sensitivity, wide dynamic range CCD performance. An ordinary movie camera acquires images in accordance with TV format (for NTSC/EIA, 60 fields/sec. and 30 frames/sec., interlaced), which requires a very wide band. Due to this factor, dynamic range must be sacrificed, which will make it impossible to realize performance specific to the CCD sensor.
The CCD sensor boasts wide dynamic range ((3 orders) and excellent linearity. To make the best use of these characteristics, a special reading system has been adopted. This reading system, called the slow scan system, operates much slower than any conventional movie camera. When long-time exposure is required to detect faint light, the slow scan system is particularly useful.
In the LAS-4000 system, images are read at the timing of 1 Mega samples/sec. for each pixel to shorten the reading time (a weakness of the slow scan system) as much as possible, considering the balance with reading noise.

3.1.1.4 Focus Mode

In addition to the normal exposure mode, the LAS-4000 camera has a focus mode for easy focusing, in which the CCD is driven at high speed.
Because of the progressive-scanning CCD, the exposure can be adjusted using the electronic shutter, with the mechanical shutter left open. In focus mode, it is also possible to determine accurate focusing even for subjects with different brightness levels.
In practice, however, exposure to any subject that is too bright can cause smearing. Because focusing is the primary objective in the focus mode, exposure data will be handled as 8-bit data and the frame rate will be about 10 frames/sec for pan-focus and about 5 frames/sec for pan-focus all. The frame rate however depends on the timing of the electronic shutter.

3.1.1.5 Binning

Binning is the reading processing in which accumulated electric charges of the adjacent pixels are synthesized in the transfer path. Though binning processing decreases spatial frequency, the S/N ratio increases and especially widens the low-illuminance detection dynamic range.
In the LAS-4000 system, four (4) reading modes are available: 2-pixel coupling (Standard), 8-pixel coupling (High), 32-pixel coupling (Super) and 128-pixel coupling (Ultra). Thus, theoretically, this makes it possible to obtain an S/N ratio that is $\sqrt{}2$, $\sqrt{}8$, $\sqrt{}32$ and $\sqrt{}128$ times as large, respectively, as those attained in the High Resolution mode.
In addition, because a CCD of overflow drain structure has been adopted, possible electric charge overflow due to synthesis processing will not adversely affect images.

3.1.1.6 Reading Noise

When reading image data from the CCD, noise generation cannot be avoided, deteriorating image data.
Reading noise consists of the following.

(A) Dark noise in the electric charge transfer path
(B) Noise generated when converting electric charges into voltage
(C) Noise generated in the transfer path amplifier
(D) Noise generated during analog signal processing
(E) Noise generated when converting analog signals into digital ones

In the LAS-4000 system, various methods have been adopted to keep the reading noise level less than 30e-(electron) / pixel.

(A) Dark noise in the electric charge transfer path
During long-time exposure, dark noise is generated in the electric charge transfer path and will be read together with images. Through cooling, it is possible to decrease the dark noise generated in the electric charge transfer path. However, in the LAS-4000 system, a low noise level has been achieved by sweeping out, even during exposure, the dark noise accumulated in the transfer path and then transferring the electric charges.

(B) Noise generated when converting electric charges into voltage
While images are being read, the MOS transistor inside the CCD is switched over. During switching, noise is generated. Most of such noise is represented by reset noise. The reset noise can be eliminated effectively through correlational double sampling (CDS; described in 3.1.1.7). In the LAS-4000 system, digital CDS is performed in normal exposure mode to minimize the noise.

(C) Noise generated in the transfer path amplifier
The CCD used in the LAS-4000 system has been designed using the same technology as that used for Fujifilm's specially developed honeycomb CCD as a photographic film scanner. For this reason, noise in the CCD amplifier has been kept to the minimum level.

(D) Noise generated during analog signal processing
In an ordinary movie camera, band processing is performed in accordance with video signals, resulting in the adoption of a complicated clamp circuit. Noise generated by this complicated circuit tends to increase reading noise, in turn. In the LAS-4000 system, high-precision parts have been used to realize optimum band properties, resulting in high-precision, low-noise performance with just a simple circuit configuration. In addition, by separating the focus mode from the circuit, problems due to the combined use of the 2 modes have been avoided.

(E) Noise generated when converting analog signals into digital ones
To make the best use of the CCD's wide dynamic range, a 16-bit, 2.5M sampling/sec.
A/D converter has been adopted in the LAS-4000 system. In addition, for digital CDS, an A/D converter boasting excellent dynamic properties has been adopted.

3.1.1.7 Correlational Double Sampling (CDS)

Of the noise described in 3.1.1.5 above, (B) and (C) correlate with the analog signal conversion for each pixel.
For CCD output signals, the 3 electric potentials (for reset, pre-charge level and signal level) are repeated alternately. The real image signals correspond to the difference between the pre-charge level and the signal level.
Signals obtained through digital conversion only of the signal level are simply those modulated by the output signal level that moves horizontally for each pixel. To obtain only real image signals, CDS performs sampling at the pre-charge level and signal level and eliminates correlating sections (unnecessary signals that move horizontally) through calculation.
In slow scan operation, CDS is more effective for eliminating changes in the DC level due to reset noise and/or temperature variations than for eliminating amplifier noise.
In the LAS-4000 system, the pre-charge level and signal level are subjected to A/D conversion in high-definition mode to enable the digital CDS that makes calculations using digital data.

3.1.2 Control Board

The following are the functions of the control board (CPLS4 board) used in the LAS-4000 system:

- Controls the system in response to any command from the analyzing unit.
- Provides communication and data transfer to/from the analyzing unit via USB2.0 interface.
- Generates timing for CCD drive.
- Generates timing for A/D conversion on the analog board and captures necessary data.
- Sets D/A conversion on the analog board.
- Controls the mechanical shutter.
- Communicates with the driving board (DRLS4 board) and provides proper tempera ture control for the Peltier element based on the temperature monitor values obtained from the analog board.

3.1.3 Analog Board

The following are the functions of the analog board used in the LAS-4000 system:

- Submits image signals output from the CCD board to A/D conversion and outputs the data to the control board. Image signals output from the CCD board are divided for the normal exposure circuit or for the focus circuit, and those signals are then converted into digital data through different A/D converters.
  In the normal exposure mode, a 16-bit, 2.5M sampling/sec. A/D converter is used to handle wide-dynamic-range signals.
  In focus mode, a 10-bit, 20M sampling/sec. A/D converter is used to cope with image signals requiring a fast sampling rate.
- As on the analog board there are circuits for the above two modes, variable resistors for adjustment of gains in accordance with the CCD are provided. The variable resistors have been adjusted at the time of assembly, in accordance with the characteristics of each CCD. In addition, the circuits for the two modes are equipped with their own D/A circuits for adjustment of offset levels, thereby allowing adjustment values to be determined from the control board.
- Incorporates the Peltier element protective circuit to cut off the currents in the Peltier element if the cooling fan for the camera head becomes faulty.
- Converts the outputs from individual temperature sensors located at various points in the camera head into digital format to allow monitoring in the control unit.
- Contains the sequence circuit for the hardware to apply voltages to the CCD in order to protect the CCD against possible rupture.

3.1.4 CCD Board

The following are the functions of the CCD board installed in the camera head of the LAS-4000 system:

- Made up of a flexible board, in which is incorporated the CCD (MS3833).
- Contains the temperature sensors to identify the CCD cooling temperature and ambient temperature.
- Draws the currents from the Peltier element into the chamber to power the Peltier element.

3.1.5 Cooling

3.1.5.1 Cooling System

In the LAS-4000 system, the thermo-module is used to electronically cool the CCD in accordance with the Peltier effect.

3.1.5.2 Peltier Effect

The Peltier effect is a phenomenon that occurs in the following process.
N-type and P-type semi-conductors are incorporated with each other using a metal piece. Conducting DC power from the N-type semi-conductor to the P-type semi-conductor will cause a heat flow in the opposite direction of the current flow for the N-type and in the same direction as the current flow for the P-type.

3.1.5.3 Thermo-module

The thermo-module is a heat pump that utilizes the Peltier effect. This heat pump is made of the N-type and P-type semi-conductors that have been put between alumina ceramic plates, provided with no movable parts, and no liquid or gas is used in the pump.

3.1.5.4 Heat Radiation

The quantity of heat generated on the high-temperature side of the thermo-module is transported to the heat sink via a heat pipe. The electric fan provided on top of the heat sink forcibly radiates accumulated heat to the outside.

3.1.6 Airtightness (Sealing)

3.1.6.1 Object of Airtight Design

To avoid dew condensation around the CCD, an airtight design has been adopted in the LAS-4000 system in which the CCD is cooled by the thermo-module. CCD, thermo-module, cold plate and CCD board are covered by the airtight design.

3.1.6.2 Sealed Sections

The following two sections in the light receiving unit of the LAS-4000 are of airtight design:

(1) Optical glass parts through which will pass the light rays to be detected by the CCD.
(2) Connection of the chamber and the heat-radiation plate, containing the wire harness.

3.1.6.3 Sealing Method

(1) An O-ring is pressed against the glass surface.
(2) The wire harness and O-ring are press-contained between the chamber and the heat-radiation plate.

3.1.7 Mechanical Shutter

3.1.7.1 Configuration

(1) Drive Method
Oscillating slider crank drive with 2 pulse motors for the leading shutter and the following shutter.
(2) Control Method
Automatically controls the shutter sequence operation in accordance with shutter speed data and shutter start signals.
(3) Shutter Open/Close Detection Sensor
Using the photointerrupter, detects the opening/closing positions for shutter plate (for each shutter operation).

3.1.7.2 General Specifications

(1)Guarantee Conditions
(a) Operational temperature and humidity
Temperature: +15°C to +30°C
Humidity: 30% to 70% (no dew condensation)
(b) Storage environment
Temperature: -10°C to +60°C
(c) Guaranteed performance: minimum of 50,000 operations
Guaranteed operation: minimum of 100,000 operations
(2) External View
(a) External dimensions: 162 (W) x 110 (D) x 19 (H) (excluding projections)
(b) Weight: Approx. 253 g (excluding harness)

3.1.7.3 Mechanical Specifications

Shutter opening/closing speed 0.1 sec
(Any speed less than 8 sec refers to the use of electronic shutter.)

3.1.7.4 Electric Specifications

Pulse motor electrical specifications
Voltage: 5 V ±10%, Wire-wound resistance: 15Ω/phase

3.1.8 Camera Head External Specifications

- Camera Cable Connector 12-pole connector
- USB Interface USB2.0

3.1.9 Operating Precautions for Camera Head

(1) Do not cover the air intake and exhaust ports in the camera head.
Because the camera head is a cooling-type CCD camera, heat emitted while the CCD is being cooled must be released to the outside. Therefore, if the air intake/exhaust openings are obstructed, the cooling capacity will be decreased, resulting in failure.

(2) Do not touch the shutter
A mechanical shutter is provided at the bottom of the lens retaining unit. Because this shutter consists of an extremely thin, sensitive metal plate, even a slight deformation can cause malfunction and/or failure.

(3) Do not use non-specified fixing screws.
Mounting the camera head using any screws other than those specified can result in deviation in accuracy and/or strength.

(4) Installing the camera cable
Install the camera cable so that it is securely locked.
Remember to turn OFF the power before installing the camera head cable.

3.1.10 Camera Head Maintenance

The camera head does not need periodic maintenance. If the shutter unit or the cooling fan operates incorrectly, it may be easily removed from the camera head for replacement. For a problem involving any other component in the camera head, the component involved must be sent back to us for analysis. Be sure to turn OFF the power before attempting to perform maintenance on the system.

3.2 Lens unit

3.2.1 High-Sensitivity Lens (FUJINON VRF43LMD)

Specifications

Focal length:	43 mm at an object distance of 400 mm (Position)
Aperture ratio:	1:0.85
Stop range:	0.85, 2.8 (2 steps)
Object distance:	300 mm to 700 mm
Mount:	Dedicated mount
Flange back:	25 mm

Focusing and iris are electronically controlled by the reading software. Time for switching positions between 1 ⟺ 4: 5 sec.

Orientation: Vertically downward

Compatible filter size:77 mm diameter (P=0.75).
Threaded into the front end of the lens.

3.2.2 Wide-angle Lens

Specifications

Focal length:	24 mm
Aperture ratio:	1:1.8
Mount:	Nikon F mount. Attached to the LAS-4000 camera head through the dedicated mount adapter.

Focusing and iris manually controlled

Compatible lens barrel length:
50 mm to 72 mm (ex. Ai Nikkor 24 mm F2)
78 mm to 100 mm (ex. Sigma 24 mm F1.8)
The length shall be 270 mm or less when the filter changer is not used.
No limitation applies when the camera head does not connect to the IDX.

3.2.3 Cautions

(1) Do not subject to severe impact.

(2) Do not touch lens surface.

(3) When the high-sensitivity lens is disconnected temporarily, be sure to place it sideways on a desk. Never attempt to put the front surface of lens down onto the desk. For the wide-angle lens, remove it with the mount adapter installed, and put the mount adepter down on the desk.

(4) When the high-sensitivity lens is to be stored for a long period of time, check that the front end of the lens is properly collapsed into the barrel (as when focused at Position 4). Then attach the lens caps to both ends, and store the lens unit in the original packaging box with an appropriate desiccating agent.

(5) Be sure to connect the cable of the lens unit when using the high-sensitivity lens with IDX.

3.2.4 Maintenance

Use an air blower available on the market to blow off all dirt, dust, etc. If you mistakenly touch the lens glass with your bare hands, use a lens cleaner solution available on the market and, with lens cleaning paper that is also available on the market, gently and quickly wipe off the surfaces touched. If the touched surfaces are not cleaned, the sebum left on them will degenerate and not only it will become difficult to remove, but will be a source of mold as well.

3.3 Tray

3.3.1 EPI Tray

The EPI tray is the sample stand on which test samples, such as membranes and/or gels, are placed outside the dark box for setting in the specified position in the IDX. This can be used for the former IDX as well.
Because the aluminum plate coated with fluorine resin all over the surface is used, it can be washed whole easily with neutral detergent if the staining agent is attached.
For the fluorescent image, since the tray does not generate excessive fluorescence, an image having higher contrast than before is obtained.
This tray is used for chemiluminescence and incident digitizing other than fluorescence.
Maximum sample size possible to be set on the tray is 279 x 279mm (R6 or more on the corner).

3.3.2 White-DIA Tray

The DIA tray is the sample stand on which test samples, such as X-ray film and/or CBB stained gels, are placed for setting in the specified position in the IDX. It may be set to the former LAS-1000 series.
This is a dedicated tray for transmitted digitizing and adopts the light diffusion plate made of flush opal glass. The plate consisting of the above-described glass plate attached to an aluminum frame processed with alumite, can be washed whole.
Maximum sample size possible to be set on the tray is 265 mm x 265 mm.

3.3.3 UV-DIA Tray

The DIA-UV tray is the dedicated tray when the transmitted UV light unit is used, and is made of a high UV-proof acrylic material. It is recommended to use gel sheet in consideration of ghost and contamination.
Maximum sample size possible to be set on the tray is 265 mm x 265 mm.

3.3.4 NP Tray

The NP tray incorporates a Fresnel lens and serves as a sample stand specially designed for exposure of a chemiluminescent sample on a micro plate. It become operative only at Position 3 of IDX mounted with a high sensitivity lens. The Fresnel lens is installed adjacent to the micro plate. Exposure by the high-sensitivity lens through the Fresnel lens helps eliminate any parallax of individual wells in the micro plate.
By removing the attachment exposure is available for up to 2 micro plates at the same time.
Damper-equipped hinges allow the tray to be stored with the lens lid left open.
On the edge of tray, on the hinge side, there is a notch which allows IDX to identify the NP tray.

3.3.5 Cautions

3.3.5.1 EPI Tray

Because the fluorine resin coating is easily scratched compared to glass, use a plastic container for handling the samples. Also, do not clean it with tools such as a hard metal brush. If the surface is scratched, the staining solution may remain in the scratches resulting in deterioration of image quality. Some staining solution cannot be removed with just water, therefore, clean the surface thoroughly with a neutral detergent using a soft sponge.

3.3.5.2 White-DIA Tray

Avoid applying a strong impact to this tray because it is made of glass. Also, do not apply pressure on the back for a long time, as it may cause separation of adhesion. Scratches on the glass surface may deteriorate image quality, thus pay special attention when cutting gels.

3.3.5.3 UV-DIA Tray

The DIA-UV tray is easily scratched, thus pay special attention when cutting gels. It is recommended to use gel sheet in consideration of ghost and contamination.

3.3.5.4 NP Tray

Since the lens lid in the NP tray is not designed to be drip-proof, any spills of liquids can contaminate the Fresnel lens.
The Fresnel lens can be damaged if pressure is applied because it is sandwiched between 2 sheets of 1-mm-thick white sheet glass. Especially when transporting, make sure to package with cushioning materials, fixing the lens lid and both sides of the glass with tape so as to make it in the original condition when unpacked before first use.
The Fresnel lens is a large convex lens, and therefore it can cause a burn or a fire due to its light-concentrating effect if it is placed adjacent to a strong light source or it is left exposed to direct sunlight. After use, immediately wipe off any water on the lens and store it in a drawer or other appropriate place, away from direct sunlight.
This tray cannot be used with the LAS-1000 series.

3.3.6 Maintenance

3.3.6.1 EPI Tray
White-DIA Tray

For cleaning, use water and neutral detergent (non-fluorescent detergent for biochemical use is recommended), and a soft sponge so as not to damage the tray.

UV-DIA Tray

These trays are made of PMMA and damaged very easily. Do not wipe them with dry cloth. For cleaning, use water and neutral detergent (non-fluorescent detergent for biochemical use is recommended), and a soft sponge so as not to damage the tray. DO NOT use alcohol or other organic solvents for cleaning.

3.3.6.2 NP Tray

This tray is not drip-proof, and thus it cannot be washed as an assembled unit. Wipe off the lens with a soft cloth. Remove any contamination on the lens or mount with a soft cloth dampened with a small amount of alcohol.

3.4 Calibration Plate

3.4.1 Calibration Plate FL

This plate is used when a blue incident light source and a UV transmitted/incident light source are used.
The fluorescent image of this plate is recorded and stored in advance. This image is applied as a flat frame at the exposure of a fluorescent sample. It is molded in resin containing fluorescent pigments.

3.4.2 Calibration Plate DI

The digitized image of this plate is recorded and stored in advance. This image is applied as a flat frame at EPI digitizing. The grain side of the plate is the face, therefore, place the side where the CAUTION label is attached onto the tray.

The calibration plate is not used in DIA digitizing, the flat frame exposing White-DIA tray itself is used.

3.4.3 Calibration Plate GR

This plate is used when a green incident light source, a red incident light source and a near-infrared incident light source are used.
The fluorescent image of this plate is recorded and stored in advance. This image is applied as a flat frame in the stage of exposure of a fluorescent sample excited by green, red or near-infrared light.

3.4.4 Cautions

- Handle the plate with care using gloves because scratches or dirt affect the image. Pay attention to the light unit and dust or dirt on the tray.
- Sweep dust lightly or blow dust using an air blower, never scrub or wash it.
- In the case of heavy scratches or dirt, replace the plate with a new one and rerecord the corrected image.

3.4.5 Maintenance

- After removing dust or dirt, store the plate in the bag used for shipping.

3.5 Intelligent Dark Box (IDX)

3.5.1 Functions

IDX is a dark box containing the exposure condition control unit and power supply unit for exposure of samples.
Combined with the LAS-4000 camera head, the IDX has functions corresponding to the various image analyzing methods in the biochemical and molecular biology fields.

3.5.1.1 Common Functions

(1) The selection of the illuminator and filter appropriate for the Laboratory work method, and the setting of exposure size are processed by the reading software.

(2) The design of the vertical movement system (allowing 4-step adjustment) is unique, featuring an integrated illuminator unit and sample stand which consistently provide optimum illumination even if object distances vary according to exposure size.

(3) An electric-powered preset autofocusing system is adopted, eliminating the need for focusing each time the unit is activated since proper focusing settings for different exposure positions are retained in the memory, similarly as in the LAS-1000plus system. Iris is also electrically controlled.

(4) Various lighting conditions are available for different Laboratory work methods. Two transmitted-light units are available, white light and UV.

(5) An interlock is furnished for opening/closing the dark box door to ensure safety. If an attempt is made to open the dark box door while either the sample stand or the filter changer is in operation, the operation in progress will be shut down. If the dark box door is open during the exposure, a warning buzzer will sound, and the reading software displays a dialog after exposure, showing the door was open during the exposure.

(6) Both incident-light unit and transmitted-light unit can be replaced with the main power ON and the reading software started.

3.5.1.2 Chemiluminescence Function

IDX is so designed to completely shield every sample against the light beam, thus eliminating possible fogging even in long-time exposures.
By using the high-sensitivity lens at full iris, even slightly chemiluminescent samples may be captured on the images.

3.5.1.3 Fluorescence Function

(1) Incident fluorescence with LED
This light source is combined with a white incident light source into one unit. A blue, green, red, near-infrared and ultraviolet light sources are available as optional light sources.

(2) Fluorescent Excitation with UV Fluorescent Tube
UV unit can be set to the IDX by substitute white transmitted light unit. It emits a dominant wavelength of 312 nm when used with the UV-transmitting filter.
Exposure under UV lighting will start 10 seconds after the start of lighting to maintain a stabilized light source output. In addition, the permissible continuous lighting time is limited to 10 minutes.

Cautions for servicing: To check for proper lighting of a UV light source with interlock released, wear a face shield or other appropriate protective gear. Place a fluorescent plate for corrective shading on the UV emitting section, and observe the lighting status of the fluorescent tube through the fluorescent plate.

3.5.1.4 Transmitted Digitizing Function

IDX allows the installation of white lighting for transmitted digitizing. By combining the White-DIA tray, it is possible to digitize X-ray films and/or CBB-stained gels.

(1) Transmitted Lighting with White LED
57 high-intensity white LEDs are used for the transmitted light source. All LEDs are connected in series by sixes (3 for 1 circuit) and driven by the constant current to minimize the light intensity variation due to the temperature variation and the aging, etc. The white LED is the type of blue LED with the light converted by fluorescence.

(2) Automatic Lighting-on
The lighting will be automatically turned ON in response to the exposure command from the reading software

3.5.1.5 Incident Digitizing Function

In IDX, a white light that is used for incident digitizing may be used together with an excitation light source of each color, as optional light. The white lighting also serves as auxiliary light during the focusing operation.
Using the EPI tray, it is possible to digitize NBT-stained membranes, photos, documents, and/or printed matter.

(1) Cocktail White Light Source by 3 Color LEDs
The white LED used for the transmitted-light source cannot be used, because it emits unwanted light under the influence of the excitation light in the fluorescent exposure using the blue LED, as it uses fluorescence. For this reason, in the LED for the incident white lighting, LEDs of three colors, R, G and B, are centrally arranged to produce the white light.
4 blue, 6 red, and 2 green LEDs are connected in series and driven by constant current to minimize the luminous intensity variation due to the temperature variation and aging.

(2) Automatic Lighting-on
The incident white lighting is automatically turned on at the focusing and also at the time of incident digitizing according to the command from the reading software. The incident white light will turn off when the IDX door is opened during focusing.

3.5.2 Position Setting

	Object distance (Distance between CCD and tray)	Exposure size (by the high-sensitivity lens after correction of distortion)
Position1	340mm	112mm x 75mm
Position2	400mm	150mm x 100mm
Position3	460mm	186mm x 124mm
Position4	520mm	221mm x 148mm

The above-listed positions are determined based on the height of the arrangement of 4 of the 6 inner photo interrupters on the left side of IDX. The remaining 2 photo interrupters are installed for preventing possible overrun. The vertical movement is performed at approx. 25 mm/s.

3.5.3 Driving Board

The following are functions of the driving board (DRLS4 board) installed in IDX:

- Supplies power to the camera head.
- Controls the Peltier current, thereby controlling the temperature of the CCD in the camera head.
- Drives the pulse motor in IDX. Contains 5 circuits.
- Supplies power to the light source unit in IDX and controls ON/OFF of the light unit.
- Detects signals from the sensors in IDX.
- Controls the panel LEDs.

3.5.4 Power Supply

The power supply unit consists of the two types of switching power supplies. The power supply is compatible with the specifications for AC input voltages in Japan, North America and Europe. It provides DC12 V or DC24 V in the above specifications. It uses DC12 V for Peltier elements, and DC24 V for the power supply for the pulse motor and the light source units.

3.5.5 Cautions

(1) Light Source
Do not stare at the light source for lighting in the IDX for a long time.(when the interlock is released)

(2) Inside of IDX
Do not leave samples such as gels inside the IDX for a long time. It may not only cause moisture condensation resulting in rust but also given an adverse effect to the image. The inside of the IDX should always be kept dry.

(3) Cleaning the Inside
Wear protective gloves. When a liquid has dripped inside from the sample, immediately wipe off with waste cloth. If the inside is very dirty, clean with waste cloth soaked with neutral detergent and squeezed tightly. After cleaning, dry the inside by opening the door. When the bottom under the transmitted-light unit is dirty, remove the transmitted-light unit and clean similarly. It is recommended to wear protective goggles if there is substantial quantity of liquid or if it is necessary to look into the inside of the unit.

(4) Reflection of Lighting
Since the incident white lighting is designed to be used for digitizing the membrane filter, the light itself is reflected on the image if a sample with a glossy surface is exposed. Thus the samples in a hybrid bag or sandwitched between the glass plates are not suitable for exposure. Such samples may cause an excessive exposure at focus and smears.

(5) Install Horizontally
The IDX has legs attached to the main base, which serves as an adjuster as well, and can be installed horizontally by adjusting the leg.
Some samples may slide out if the base is inclined and the image may be affected. Keep the dark box as horizontally as possible.

3.5.6 Maintenance

Slightly lubricate the hinge if a squeak noise is heard at the door.
When the exterior is dirty, wipe off using neutral detergent. Do not use an organic solvent as it damages the surface coating.

3.6 Incident-Light Unit

3.6.1 LED Light Source

The incident-light unit is installed symmetrical to IDX to provide illumination diagonally from the top.

3.6.1.1 Blue light source

The blue light source consists of 96 LEDs (NSSB100B manufactured by Nichia Corporation). The main wave length is 470 nm, and the long wavelength components of the LED light are eliminated by installing a B-390 optical filter on the radiation surface. This makes the main wavelength closer to 460 nm, which improves the S/N ratio on fluorescent sample images.

3.6.1.2 Green light source

The green light source consists of 96 LEDs (NSSG100B manufactured by Nichia Corporation). The long wavelength components of the LED light are eliminated by installing a short-path filter on the radiation surface.

3.6.1.3 Red light source

The red light source consists of 180 LEDs (NSSR100B manufactured by Nichia Corporation). The long wavelength components of the LED light are eliminated by installing a short-path filter on the radiation surface.

3.6.1.4 Near-infrared light source

It consists of 180 LEDs (Alpha One Electronics SMC720).
Long wavelength components of the LED light are eliminated by installing a short path filter on the radiation surface.

3.6.1.5 Ultraviolet light source

It consists of 96 LEDs (Nichia Corporation NSSU100).
Visible lights are eliminated by placing an excitation filter U-340.

3.6.2 External Specifications

Power supply	DC 24V
Power demand	Approx. 10W
Main wavelength	Blue:460nm Green:520nm Red:630nm Ultraviolet: 365nm Near-infrared: 710nm

3.6.3 Cautions

Do not stare at the emission and radiation surface for a long time.
When installing or reinstalling the unit, do not touch the emission surface.
Change the same color unit of both right and left side of the light source at the same time. If an incident-light source with different luminescent color is installed, the reading software will not operate correctly.

3.6.4 Maintenance

(1) Do not clean the incident-light unit excessively; just remove dust using an air blower.

(2) When fingerprints or sweat remain on the incident-light unit, use a soft cotton cloth slightly dampened with neutral detergent to gently and uniformly clean the entire incident-light unit surface. Do not scrub the incident-light unit or you will scratch it.

3.7 White Transmitted-Light Unit

3.7.1 LED Light Source

The white transmitted-light unit uses boards provided with 57 white LEDs for transmitted-light illumination. The white LEDs used are NSSW100C, manufactured by Nichia Corporation. The light diffusion plate provided on the radiation surface disperses the light uniformity.

3.7.2 External Specifications

Power supply	DC24V
Power demand	Approx. 5W
Dimensions	322 mm x 313 mm x 87 mm

3.7.3 Cautions

Do not apply pressure to the emission surface because it is made of glass.

3.7.4 Maintenance

The cover may be cleaned as a single component by dismantling the unit (see Chapter F Section 6.2 for the procedure) and removing the 4 fixing screws on the side. Thoroughly dry the cover before reinstallation.

3.8 UV Transmitted-Light Unit

3.8.1 UV Light Source

The UV transmitted-light unit contains 2 UV fluorescent tubes. The main wavelength is 312 nm, and the long wavelength components of the fluorescent tubes are eliminated by using the filter (HOYA U340).

3.8.2 Substitute visible light source

Placing the calibration plate FL on the UV transmitted light source to generate a visible light fluorescence can be used to create a transmitted visible light source. The object protruding from the top of the UV transmitted light source is the change-over switch that is used when using this vis ble light source. When the calibration plate FL is placed on top of the ultraviolet light illumination surface so as to rest on the protruding object on top of the UV transmitted light source, the weight of the cal bration plate FL will push down the switch to make the light source discrimination path the same as when a white transmitted light source is connected.

3.8.3 External Specifications

Power supply	DC24 V
Power demand	21 W
Main wavelength	312 nm
Dimensions	322 mm x 313 mm x 87 mm (Irradiated area 200 mm x 200 mm)

3.8.4 Cautions

Looking directly into the ultraviolet light or exposing the skin to the ultraviolet light for a long period of time can cause the loss of sight or serious burns, skin cancer, or other ailments, so always wear protective equipment when illuminating the light source by itself.
The protective equipment includes, for example, safety goggles or full-face type protection for the eyes, rubber gloves for the hands, and clothing with long sleeves.
The light source is interlocked so that it does not turn on when the door is open.

3.8.5 Maintenance

The cover may be removed with the filter installed by dismantling the unit (see Chapter F Section 6.1 for the procedure) and removing 4 fixing screws on the side.

(1) In this condition, the fluorescent tubes can be replaced.

(2) Do not clean the filter excessively; just remove dust using an air blower.

(3) When fingerprints or sweat remain on the filter, use a soft cotton cloth slightly dampened with small amount of ethanol to gently and uniformly clean the entire filter surface. Do not scrub the filter or you will scratch it.

3.9 EtBr Filter

3.9.1 Optical Specifications

FWHM = 40 nm band pass filter at a central wavelength of 605 nm and a transmittance of 80% or more.

3.9.2 External Specifications

Filter outside diameter	ϕ74 mm
Thickness	4 mm
Holder screw pitch	M77 P0.75

3.9.3 Cautions

(1) Do not subject to severe impact.

(2) Do not touch filter surface.

(3) Do not disassemble because the front and back sides are different.

3.9.4 Maintenance

(1) Do not clean the filter excessively; just remove dust using an air blower.

(2) When fingerprints or sweat remain on the filter, use a soft cotton cloth slightly dampened with small amount of ethanol to gently and uniformly clean the entire filter surface.

3.10 SYBR Green Filter

3.10.1 Optical Specifications

This is an optical high-path filter with a transmittance of 50% at a wavelength of 515 nm, covered with a coating to reflect the blue LED light and unwanted infrared light. Transmittance of 80% or more is available at wavelengths of 550 nm or higher.

3.10.2 External Specifications

Filter outside diameter	ϕ74 mm
Thickness	4 mm
Holder screw pitch	M77 P0.75

3.10.3 Cautions

(1) Do not subject to severe impact.

(2) Do not touch filter surface.

(3) Do not disassemble because the front and back sides are different.

3.10.4 Maintenance

(1) Do not clean the filter excessively; just remove dust using an air blower.

(2) When fingerprints or sweat remain on the filter, use a soft cotton cloth slightly dampened with small amount of ethanol to gently and uniformly clean the entire filter surface.

3.11 GFP Filter

3.11.1 Optical Specifications

This is a combined band-pass filter with a main wavelength of 508 nm and a optical high-path filter with a transmittance of 50% at a wavelength of 515 nm, providing a main wavelength of 510 nm.

3.11.2 External Specifications

Filter outside diameter	ϕ74 mm
Thickness	4.5 mm
Holder screw pitch	M77 P0.75

3.11.3 Cautions

(1) Do not subject to severe impact.

(2) Do not touch filter surface.

(3) Do not disassemble because the front and back sides are different.

3.11.4 Maintenance

(1) Do not clean the filter excessively; just remove dust using an air blower.

(2) When fingerprints or sweat remain on the filter, use a soft cotton cloth slightly dampened with small amount of ethanol to gently and uniformly clean the entire filter surface.

3.12 Filter (Option)

Cy3 Filter
Optical specifications
Band-pass filter with a main wavelength of 575 nm; 4.5 mm in thickness

Cy5 Filter
Optical specifications
This is an optical high-path filter with a transmittance of 50% at a wavelength of 675 nm, covered with a coating to reflect the red LED light. 4.5 mm in thickness

Holder screw pitch: M77 P0.75
Female thread depth: 2.5 mm or more
Compatible filter: ϕ74 mm in diameter, 3 - 4 mm in thickness

3.13 Filter Changer

- The filter changer contains a filter turret to hold up to 5 large-size filters of 77 mm in diameter, and it is electrically powered to accommodate different lens lengths. The lens turret is designed to come in contact with the front end of the lens, accommodating the length of the lens barrel. This allows a follow-up distance of approx. 20 mm with the aid of spring force even for the varying lengths of lens barrel during focusing.
- Filters can be changed with the reading software within 10 seconds.
- Synchronized with the interlock function in IDX, the filter changer will stop the operation in progress if the dark box door is set open.
- For changing the lenses or filters, the turret in the filter changer will be set to shift down to the lower limit position in accordance with the command from the reading software.

Cautions
(1) To install or reinstall the filter changer, hold the frame and motor assembly with hands. Do not attempt to hold only the filter turret.
(2) Do not touch the feed screws and lifting guides because they are lubricated with grease.
(3) Do not attempt to install the filters on top of another. For a filter of up to 4 mm in thickness, insert it in an optionally available filter holder and then put the holder in the filter turret.
(4) Be sure to connect the lens cable of the high-sensitivity lens to IDX when using together with high-sensitivity lens (VRF43LMD). If this lens cable is not connected, the system mistakenly recognizes that a wide field lens is mounted. Accordingly, it will move the filter turret higher than as needed, and may damage the lens and the filter changer itself.

3.14 F-Mount Adapter

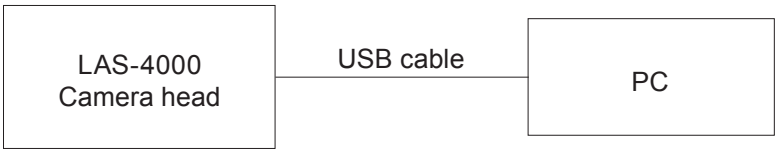
Remove the plastic cap, and it should be possible to install any Nikon F-mount lens.

Limitations: The mechanical back (length of protrusion at the rear of lens) extending from the lens flange should not exceed 33 mm.

4 Technical Explanations (Software)

4.1 Equipment Configuration And Control System

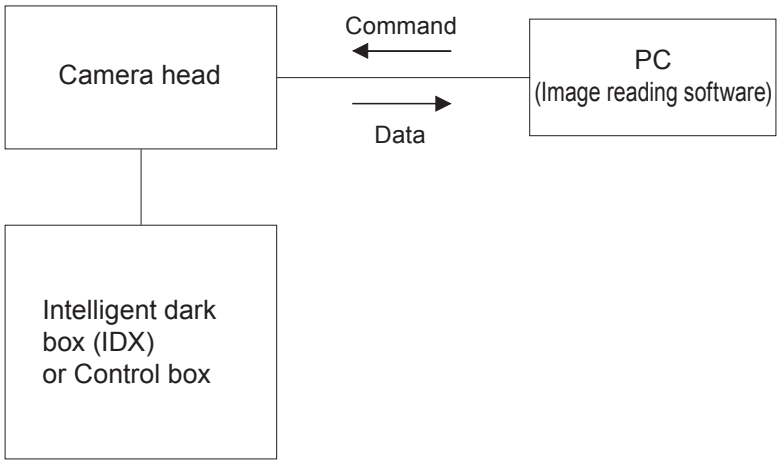
Equipment configuration



LAS-4000 acquires image data (focus image and exposure image) and executes all commands through USB cables.
Caution: Use the USB cable enclosed in the product package. Do not use any other USB cable.

Control configuration

LAS-4000 is passive equipment operated by the command from a PC, except startup diagnosis, immediately after turning on.



Camera head connects to PC to receive commands.
Camera head controls IDX through internal communication (RS232C serial communication).

4.2 Outline of reading software

4.2.1 Methods

On the Method/Tray Position screen, select reading conditions from Chemiluminescence/Fluorescence/Digitize.
A combination of light source, filter and iris is registered as a Method and a unique name representing the combination (such as the name of the reagent used for that combination) is assigned to each Method. In the Fluorescence section, a proper Method is selected to set the image reading conditions.
The user may register or remove a Method on the Menu/Option/Method Setting screen.
In the former system, only three testing methods could be selected (SYBR Green/GFP/EtBr). In LAS-4000, additional testing conditions using new reagents and techniques can be registered as Methods by changing data files.

Method	Name	Light	Filter	Iris
Method registered by user	User can register free names. Up to 20 alphanumeric characters. No [ ] allowed.	Select from lights included in the lightInfo file. Excluding White (DIA) and White (EPI).	Select from filters included in the filterInfo file.	F0.85 F2.8
FUJI-recommend-ed Method	Included in the MethodInfo file.	Included in the MethodInfo file.	Included in the MethodInfo file.	Included in the MethodInfo file.

The MethodInfo, lightInfo and filterInfo files are included in the following Data folder:
Windows C:¥Program Files¥FUJIFILM¥Image Reader LAS-4000¥Data
Mac /Applications/FUJIFILM/LAS-4000/Data

The usermethodInfo file included in the following Data folder:
Windows C:¥Documents and Settings¥AllUsers¥ApplicationData ¥FUJIFILM¥IR_LAS-4000
Mac /Library/Application Support/FUJIFILM/IR_LAS-4000

4.2.2 High-sensitivity Lens and Wide field view Lens

Focus and iris of high-sensitivity lens FUJINON VRF43LMD are electrically controlled from a PC. On the focus screen, there is a button to move the lens up and down for adjusting focus. When the user presses the button, the motor built in the lens unit will move the lens up or down.

In a case of the wide field lens, the focus and the iris should be adjusted manually by the user. Only a button for changing brightness is displayed on the Focus screen. The flat frame correction is performed as in the case of the high-sensitivity lens, but it should be noted that the iris status is not reflected in the correction.

4.2.3 Filter Customization

Filter setting can be customized on the Menu/Option/FilterCustomization screen. Filters can be selected from filters included in filterInfo file. Flat frame correction is selected by identifying the filter name. In the former system, there was limitation on the filter unit set positions because the flat frame correction is identified by the filter unit set position number. In LAS-4000, there is no limitation on the set positions. However, in the Filter Customization screen, “Through” must be set in any of the positions.

4.2.4 In a case of a unit without a filter changer

In a unit not equipped with a filter changer, the flat frame correction is performed on the assumption that filters designated on the Method/Tray position screen are set. The Filter Customization function is disabled.

4.2.5 Selecting Auto/Manual flat frame correction

The user may select Auto/Manual flat frame correction from the Menu/Edit/Preference (LAS4000IR/Preference (for Mac)) screen. If Auto is selected, the newest flat frame correction file that satisfies the conditions is automatically selected. If Manual is selected, the Method/Tray position screen is displayed and then, the FlatFrameCorrection screen is displayed. On this screen, applicable flat frame correction files and a file for no correction are listed. Select a desired file manually from the list.

There is the following limitation depending on the Method selected.

Fluorescence – Fuji-recommended Method, DigitizeEPI, DigitizeDIA	Auto/Manual selectable
Chemiluminescence	Fixed to Auto
Fluorescence – User-registered Method	Fixed to Manual

＊. ＊. ＊ Method menu

It describes the methodInfo file finalized.

＊. ＊. ＊Filter type

It describes the filterInfo file finalized.

＊. ＊. ＊Light type

It describes the lightInfo file finalized.

For the three items above, see the current status table below.

Method	Light	Filter	Iris	Flat creation reference time
SYBR Green	Blue	Y515 Di	F0.85	1/15s
GFP	Blue	510DF10	F0.85	6s
Cy3	Green	575DF20	F0.85	2s
Cy5	Red	R670	F0.85	1/2s
Dy781	IR	IR785	F0.85	120s
DAPI	UV (EPI)	L41	F2.8	1/2s
EtBr	UV (DIA)	605DF40	F2.8	3s
Digitize EPI	White EPI)	Thorough	F2.8	1/30s
Digitize DIA	White (DIA)	Thorough	F2.8	1

＊. ＊. ＊Save function

Compared with the former system, the following extended functions for saving are added.
Save Selected Image

Increment, Repetition, or Program mode: Two or more images assigned with serial numbers are saved at one time.
Save All Image
Increment, Repetition, or Program mode: All images displayed are saved at one time.
MakeIncrementImage
Program mode: An added image file is created from a series of selected images.

＊. ＊. ＊Launch function

Compared with the former system, the link to the FUJIFILM's image analyzing software is added.
When MultiGauge etc. is registered on the Menu/Preference/LaunchApplication screen, and AutoLaunch for Save is checkmarked, MultiGauge will start automatically when images are saved.

＊. ＊. ＊Directories where ImageReader related files are saved.

File	New (Vista)	Old (XP)
Executable file, Library LAS-4000IR.exe LensType.exe FmCibi.dll, LAS4000Lib.dll, QtCore4.dll, QtGui4.dll msvcp71.dll, msvcr71.dll	C:¥Program Files¥FUJIFILM¥Image Reader LAS-4000	No change
Distortion correc ion file, Chemiluminescence Flat correction file	C:¥Program Files¥FUJIFILM¥Image Reader LAS-4000¥DontTouch	No change
MethodInfo, LightInfo, FilterInfo file	C:¥Program Files¥FUJIFILM¥Image Reader LAS-4000¥Data	No change
Fluorescence Flat correction file	C:FUJIFILM_LifeScience¥LAS-4000¥FlatFrame *1	C:¥Program Files¥FUJIFILM¥Image Reader LAS-4000¥FlatFrame
Dark correction file	C:FUJIFILM_LifeScience¥LAS-4000¥CCDCalib *1	C:¥Documents and Settings¥All Users¥ApplicationData ¥FUJIFILM¥IR_LAS-4000¥CCDCalib
LT3FilterList, Lt4000common.ini, UserMethodInfo, ProgramTemplate folder	C:FUJIFILM_LifeScience¥LAS-4000 *1	C:¥Documents and Settings¥All Users¥ApplicationData ¥FUJIFILM¥IR_LAS-4000
Las4000.ini	C:Users¥ (User name) FUJIFILM_ LifeScience ¥LAS-4000	C:¥Documents and Settings¥ (User name)¥Applica ion Data¥FUJIFILM¥IR_LAS-4000 *2

*1 The folder is to be made invisible by default. (LAS-4000 folder and the lower are invisible.)
*2 Folder position is not to be changed in XP.

4.3 Image Correction

4.3.1 Outline of Image Correction

The recorded raw image data is appropriately corrected.
The image correction processing is shown below.
All correction and processing mentioned below except Flat Frame correction is effectually executed by the reading software and users are not conscious of the execution.

Type of correction	Function
Dark Frame correction	The dark current noise of the CCD is corrected. The correction data of the peculiar element determined by exposure time is required. When installing the equipment at the user's site, create correction file groups by the CCD Calibration function. The created data is stored in the “CCDCalib” folder. See clause 4.2. (Note 1), (Note 3)
Spot correction	This is correction to remove a singular Hot pixel or Cold pixel point of the CCD.
Distortion correction	Correcting optical distortion, the position and the size of a pixel are corrected. The data of distortion correction is saved in the “DontTouch” folder.
Flat Frame correction	This is to correct the lowering of edge light intensity caused by the lens and to remove uneven intensity caused from the lightsource location. As it is influenced by the type of lens, lens iris, the type of light source, the type of filter and the tray position, it is necessary to apply a suitable combination. There is correction data that users can create and correction data that users cannot create. (Note 1) (Note 2)
Pixel arrangement supplement processing	Manufactured by Fujifilm Microdevices Co., Ltd. The processing is to convert staggered arrangement peculiar to MS3833 to square arrangement. It is executed only when the sensitivity of image capture is High Resolution.
Linear supplement processing	This processing is to increase the number of pixels decreased by binning image capture to the number of pixels equivalent to the Standard (1536 x 1024). HighBinning (768 x 512) => High (1536 x 1024) SuperBinning (384 x 256) => Super (1536 x 1024) UltraBinning (192 x 128) => Ultra (1536 x 1024)

(Note 1) The correction files saved as FUJI Img/Inf format, which is easily processed by Fuji's image analysis software, are saved in the FlatFrame folder. The other files are saved as special format, through which users cannot analyze images.

(Note 2) The correction data for distortion of camera lens and the correction data group applied to Chemiluminescence are distributed by software installers and cannot be created by users.
Files are saved in the "DontTouch" folder.
The correction data for the flat frame of fluorescence and digitization can be created by users with equipment using a calibration plate.
The correction files created are saved in the FlatFrame folder.

(Note 3) For Mac, CCD Calib folder is stored in the same folder as the execution file of the reading software. For Windows, it is treated as an attribute of a hidden file, which cannot usually be seen. It can be seen when the display setting of the folder option on the control panel is changed.
On Windows, it is stored in "C:¥Documents & Settings ¥ All Users ¥ Application Data ¥ FUJIFILM ¥ IR_LAS-4000".
On Macintosh, the folder is stored in Library/Application Support/ FUJIFILM/IR_LAS-4000.

4.3.2 CCD Calibration

The term CCD Calibration is applied to Dark Frame correction in LAS-4000.
This is a function to subtract dark frame images captured with the shutter closed from raw image data. The image capture conditions (binning, exposure time and cooling temperature) determine what can be applied.

Exposure time	Applied dark frame
[8 sec. or less] 8sec, 7sec, 6sec, 5sec, 4sec, 3sec, 2sec,1sec,1/2sec,1/4sec,1/8sec, 1/15sec,1/30sec,1/60sec,1/100sec	The dark frame captured (single exposure) for the time that is in perfect agreement with exposure time is applied. The cooling temperature, binning and exposure time between real exposure and dark frame exposure should be the same.
[Between 9 sec. or more and 2 hours or less]	The dark frame created by the average of 16 times image capture for 9 sec. is applied. The cooling temperature and binning between real exposure and dark frame exposure should be the same.
[Between more than 2 hours and 30 hours or less]	The dark frame for 2 hours (single exposure) is applied. The cooling temperature and binning between real exposure and dark frame exposure should be the same.

4.4 Features of LAS-4000

4.4.1 Auto Exposure

It finds luminescence strength of a sample by pre-exposure, determines exposure time in response to it, and finally makes real exposure. In the case of Chemiluminescence, for example, as the exposure time is determined by a sample that takes several minutes to obtain proper picture density, excessive luminescence strength may result in the failure of the time investigation of Auto.
Moreover, only four types of algorithm are available for deciding exposure time: chemiluminescence, incident white, other incident, transmitted white and transmitted UV. If it fails, exposure time must be examined in Increment Program or other programs by the user. Before executing Auto exposure, CCD Calibration within 2 hours for all sensitivities must be created.

4.4.2 Digitize DIA

Digitize DIA captures images from film using the white transmitted-light unit. Image data is created by inverting the strength of the acquired image so that the image signal of the high density part of the original film increases.

4.4.3 Image Acquire & Digitize

This is the function of image capture by Digitize EPI in 1/100 sec. after exposure by chemiluminescence. This exposure menu requires the CCD Calibration data for both Digitize EPI and chemiluminescence. When image data captured as Digitize EPI is saved in the FUJI Imag/Inf format, an Img/Inf file is linked and simultaneously created as a set file. The file name is prefixed with “V__”.

4.4.4 Flat Frame Calibration (Lite)

Select Menu/Option/FlatFrameCalibration, and set a tray mounted with a calibration plate for each Method, and take flat frame photographs.

Set the calibration plate on the specified tray, and specify the tray position to create flat frame. It is possible to create flat frames of all the positions continuously from the first position to the fourth position. Image capture method, using Method, is as follows.

Method	Light source	Filter (Setting position)	Iris	Exposure time
EtBr	UV transmission	605DF40 (the second)	F2.8	1/2sec
SYBRGreen	Blue incident	Y515-Di (the third)	F0.85	1/15sec
GFP	Blue incident	510DF10 (the fourth)	F0.85	3sec
DigitizeEPI	White incident	Through (the first)	F2.8	1/30 sec
DigitizeDIA	White transmitted	Through (the first)	F2.8	1 sec

Tray and calibration plate for correction image capture

Method	Tray	Calibration Plate
EtBr	DIA-UV Tray	Calibration Plate FL
SYBRGreen	EPI Tray	Calibration Plate FL
GFP	EPI Tray	Calibration Plate FL
DigitizeEPI	EPI Tray	Calibration Plate DI
DigitizeDIA	DIA Tray	Not used

A file name is determined from a combination of the Method and tray position numbers, and is automatically assigned to the flat frame file to be created. It is saved in the FlatFrame folder.

4.4.5 Flat Frame Calibration (Pro)

When the user select Menu/Option/FlatFrameCalibration Pro, it provides function to create a flat frame file that is suitable to the equipment customized by the user. When a user customizes the equipment, the function to create a suitable flat frame file is provided. Optional letters can be used for the file name. It is also possible to use the user's own optional calibration plate to create correction data.
It is preferable that the file created after exposure is confirmed using image observation software that can handle FUJI Img/Inf format.

4.5 Image Capture Accompanied by CCD Calibration

Under the normal operation, CCD Calibration for exposure needs to be completed in advance. However, if there are no CCD Calibration data, the reading method to execute and correct CCD Calibration of the same exposure time is provided immediately after exposure.

4.6 Repetition Image Capture and Increment Image Capture

4.6.1 Outline

The basic design follows the LAS-1000 series.
Repetition is to capture images repeatedly in the same exposure time every time. Exposure time must be more than 10 seconds. The interval of repetition image capture cannot be clearly defined because it is determined by sensitivity (resolution images) and communication speed of PC. After one image capture finishes, the image data is sent to the PC from the camera, corrected, and displayed. As soon as the processing is finished, the next image capture starts.

Increment is to operate to add the new image data to the old image data. The repetition and interval of exposure, and exposure time for Increment shall be the same as for the Repetition.

4.6.2 Image Processing

Only Dark Frame correction and Spot correction are executed during image capturing. After clicking STOP button, Distortion correction and Flat Frame correction are executed. Therefore, the image during image capture may be different from that after processing.

4.7 Output File Format

After image capture, image files can be saved in 3 formats.
The uses by format are shown.

Format	Explanations
Fuji Image File (* .img)	The most suitable format for image analysis software of Fuji Photo Film Co., Ltd.; the information of exposure condition is completely transmitted and quantitative analysis can be done.
Original Image TIFF File-Linear 16bit Gray (* .tif)	Format to process image analysis software of other companies. Quantification measurement is possible because the density is saved in 16 bit depth.
Window Image TIFF File-8bit Color (* .tif)	The format to use for pasting images for presentation documents. Contrast situation adjusted by users in Range scope and Gradation in Image Reader is fixed and filed. There is no quantification because the data is a Visual picture converted to display color.

4.8 inf File Format

The description of Inf file at the output of FUJI Img/Inf format of LAS-4000 is shown.
All lines are written in text format and the line feed code is LF.

Line No.	Description	Example of description
1	Header	CCD_IMAGE_FILE
2	File name at recording	Sample
3	Reserved	
4	Pixel Size 1 Unit: microns	60.0125
5	Pixel Size 2 Unit: microns	60.0125
6	Pixel Depth	16
7	Pixel Number	1536
8	Raster Number	1024
9	Reserved	

Line No.	Description	Example of description
10	Reserved	
11	Date&Time1	Sat Jul 27 16:25:03 2002
12	Date&Time2	82547503
13	Reserved	
14	Equipment name	LAS-4000
15	Comment	Character string of text up to 30 characters
16	The type of data	IMAGE or FLAT-FRAME
17	The presence of Flat Frame correction	YES or NO (Fix YES for the user's operation)
18	Offset value	256 or 1024 (Without Flat Frame correction)
19	The presence of Flat Frame correction	File name text With correction Applied file name (with extensions) is described. NO Without correction
20	The presence of Spot correction	YES or NO (Fix YES for the user's operation.)
21	The presence of Invert Pixel	YES or NO
22	Binning type	ALL (The equivalent of High Resolution) H2 (The equivalent of Standard) H4V2 (The equivalent of High Binning) H8V4 (The equivalent of Super Binning) H16V8 (The equivalent of Ultra Binning) H4V2 EX (The equivalent of High) H8V4 EX (The equivalent of Super) H16V8 EX (The equivalent of Ultra)
23	ExposureTime Character string containing units	33sec
24	Repeat Times	1 (At Precision) The others are the number of times.
25	Gain	1 Fixed
26	Iris	0.85 or 2.8 (High-sensitivity lens) --- (The other lens)

Line No.	Description	Example of description
27	Lens type	VRF43LMD (High-sensitivity lens) SIGMA24mmF1.8, Nikkor24mmF2.8 ---
28	Tray position and type	4 STD (Describe STD when EPI or DIA is used.) 3 NP (Example when NP tray is used) Tray position and combine STD and NP 0 --- (In the case of Basic)
29	The presence of cooling	YES (Fixed)
30	The state of temperature at exposure	READY or WAIT
31	Temperature at exposure (Given to one decimal place)	-30.1
32	The presence of Auto range scope	YES or NO
33	Negative or positive	NEGA or POSI
34	Below the range (Determined in GUI)	238
35	Above the range (Determined in GUI)	32000 and so on
36	The presence or the absence of correction of optical distortion	YES or NO
37	The type of lighting	NONE BLUE-EPI WHITE-EPI WHITE-DIA UV-DIA --- (In the case of Basic)
38	Filter number and name	1 Through Example 2 605DF40 Example Either of Filter name (which can be changed using reading software); or 1 (in the case of no filter changer)
39	Serial number of camera head	1234567
40	Name and version of reading software	LAS-4000IR Ver 1.0W LAS-4000IR Ver 2.01M LAS-4000IR is fixed, following characters of Version and version number Windows is W. Mac is M.

Line No.	Description	Example of description
41	Curve	LINEAR 0 255
42	Reserve (Gain)	
43	Reserve (Preamp)	
44	Sens./Reso.	HighRsolution/Standard/High/Super/ Ultra/HighBinning/SuperBinning/ UltraBinning
45	Exposure Type	Precision/Program/Invivo/Increment/ Repetition

4.9 Limitations when UV Light Source is Used

In the normal image capture using UV, the lighting time for a UV light source is limited to 10 minutes.

4.10 Identification of the lens

4.10.1 Mechanism of the identification

- Connecting the cable of the lens unit makes IDX recognize that the high-sensitivity lens is installed.
- When the cable is not connected, IDX recognizes that a wide-angle lens is installed.
- The information memorized in EEPROM of the camera head determines which type of wide-angle lens is installed. The lens can be changed on site according to the on-site conditions to Nikkor 24 mm F2.8 if required by the user.

4.10.2 Precautions

When there is a filter changer, IDX presses the filter turret to the top end of the lens at startup diagnosis.
If the equipment is turned ON when the information of wide-angle lens type held by the camera is different from the wide-angle lens installed, the travel to press the filter changer differs, resulting in breaking the filter at startup diagnosis. Therefore, the information of wide-angle lens must be confirmed while the high-sensitivity lens is installed.
As unique correction of optical distortion according to the type of lens is applied, the use of the wrong wide field view lens type leads to improper correction of distortion.

4.11 Filter replacement

The filter replacement can be carried out while in service.

For models without the filter changer, the name of the first setting position can be changed on the screen using the Filter Customization function.

4.12 Light source replacement

The incident-light unit and transmitted-light unit can be replaced while in service. However, as IDX does not have a function to inform the replacement to a PC in real time, the confirmation of the condition should be carried out from the reading software for every replacement.
If different light sources are set in the right and the left side, a warning will be displayed at the startup.

P 章　アフターパーツリスト

Chaper P Spare Parts List

P 章　アフターパーツリスト
Chapter P Spare Parts List

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0 アフターパーツリストの見方

0 Reading the After-sale Parts List

特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
(1)	(2)	(3)	(4)	(5)	(6)

(1) 特記 Mark
改定情報、その他の情報。
Revision or other information.
(-R: 修理することが可能な部品)
(-R: Parts that can be repaired.)

(2) 図番 No.
レイアウトイラスト中の No.
Number on the illustration.

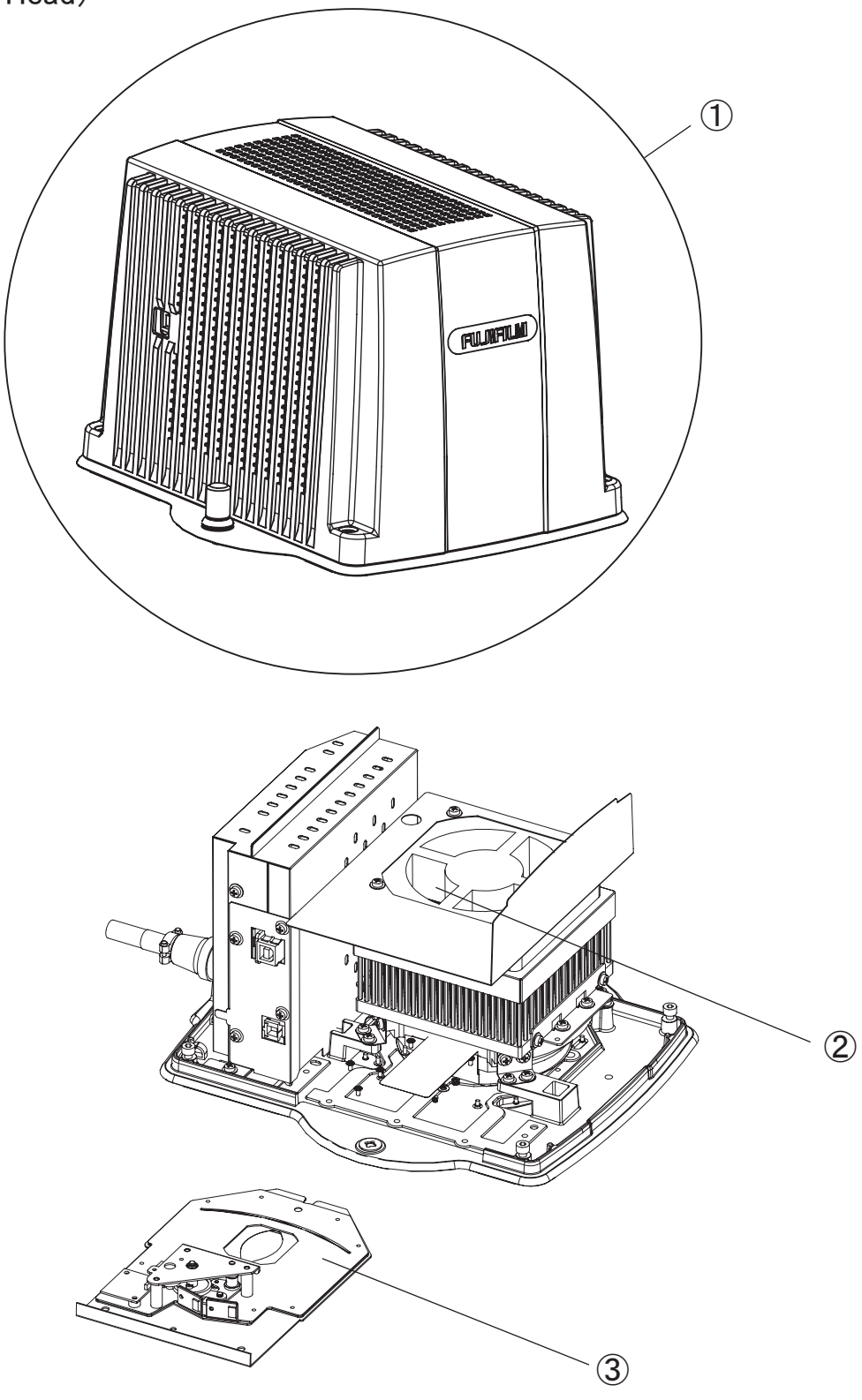
(3) 部品番号 Part Code No.
部品固有のコード番号。

(4) 部品名称 Part Name
部品の一般的な名称を表す。
Described to identify the part.

(5) 個数 Q'ty
そのユニットで使用されている数量を示す。
Quantity of parts used in each unit.

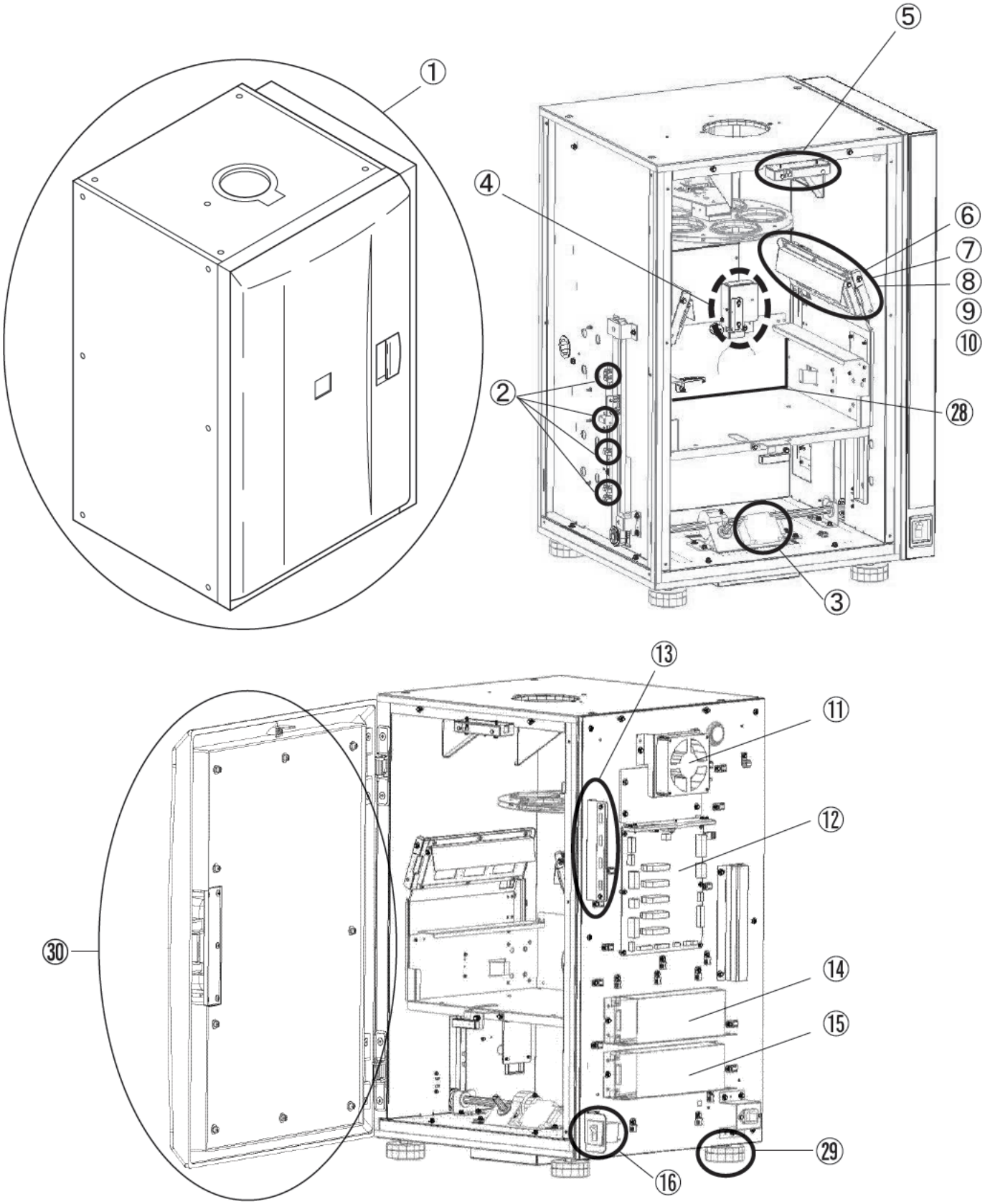
(6) 備考 Remarks
補足情報等を表す。
Complementary information

1 カメラヘッド （Camera Head）

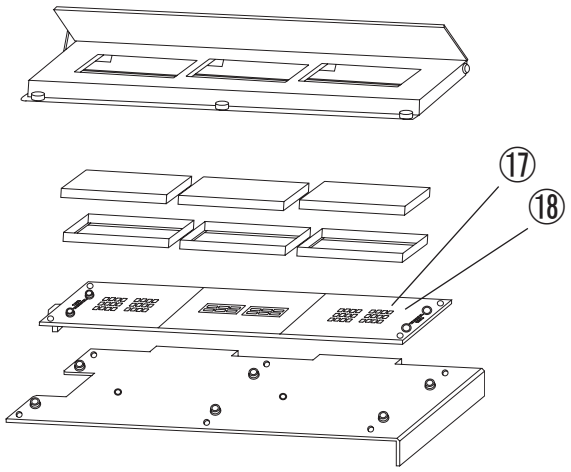


特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
-R	1	848Y100012	撮影部 Camera head	1	CH
	2	119W0011	電動ファン Electric Fan	1	
	3	398Y100010	シャッタ Shutter	1	

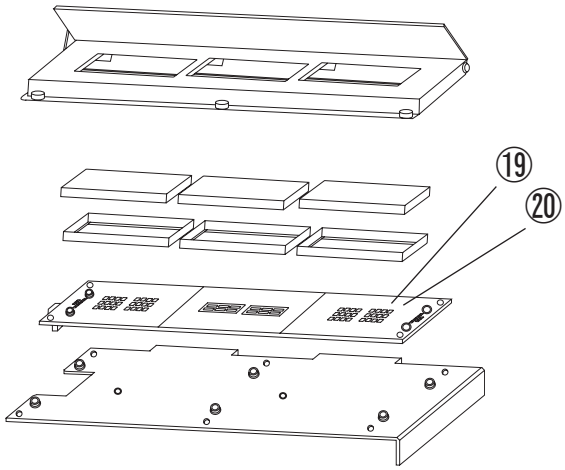
2 IDX (Intelligent Dark Box)



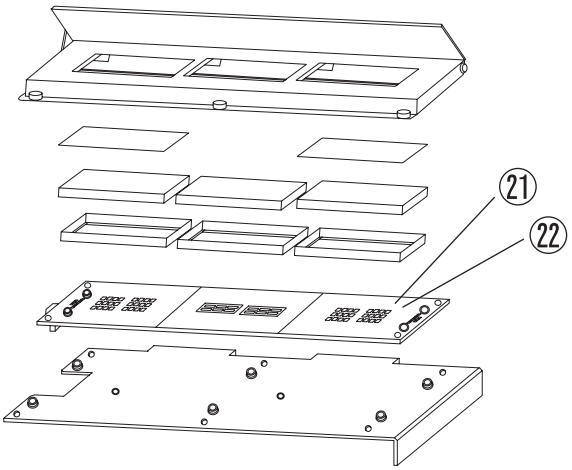
青色落射光源　(Blue Incident LED)



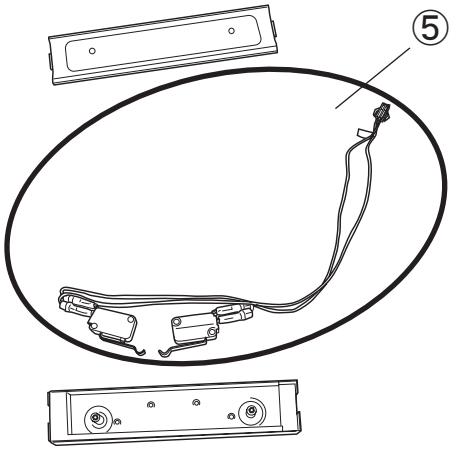
緑色落射光源　(Green Incident LED)



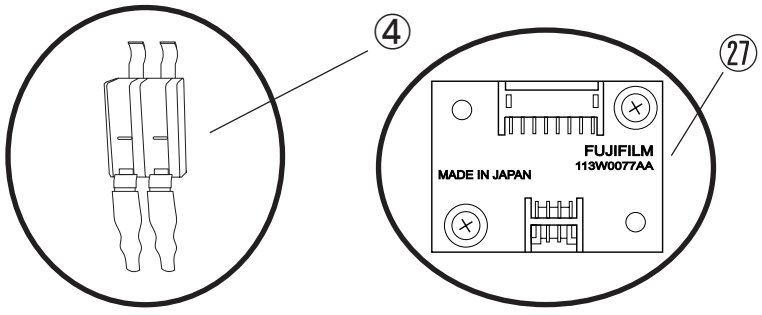
赤色落射光源　(Red Incident LED)



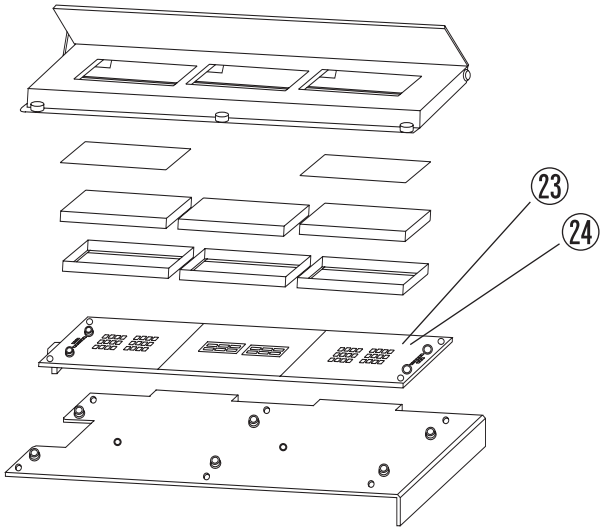
マイクロスイッチ
(ドアセンサ兼インターロック)
Micro Switch (for Interlock)



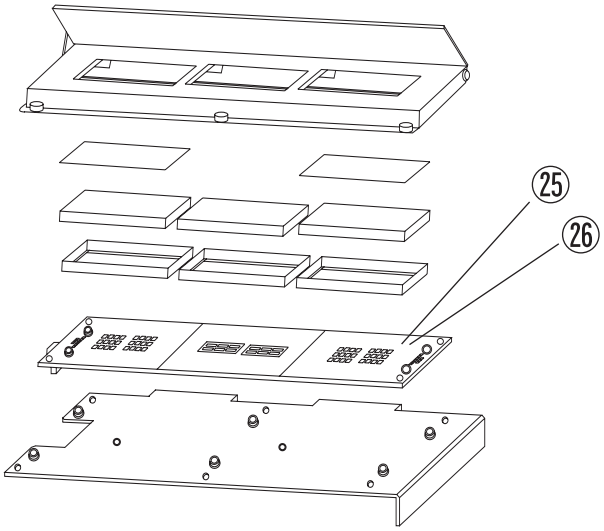
マイクロスイッチ(トレイ検出)と中継基板
Micro Switch (for Tray) and Relay Board (CNLS4)



近赤外落射光源 （NIR Incident LED）



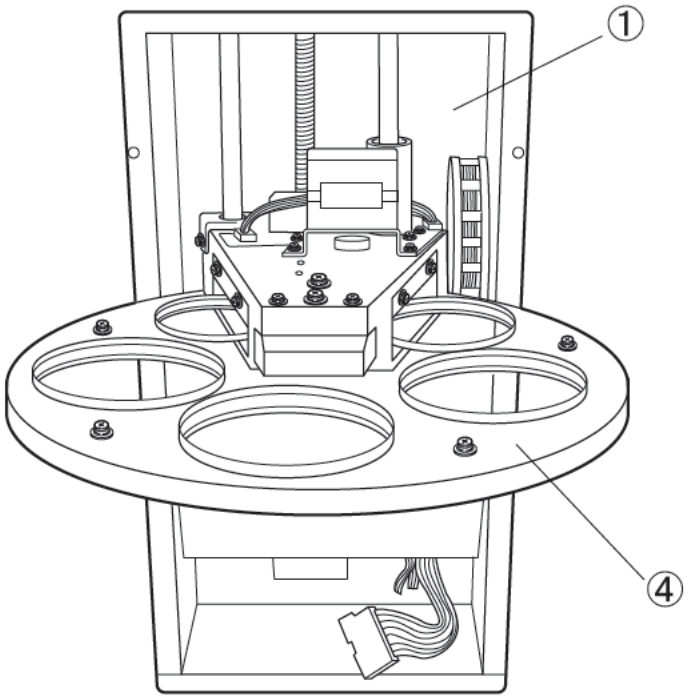
紫外落射光源 （UV Incident LED）

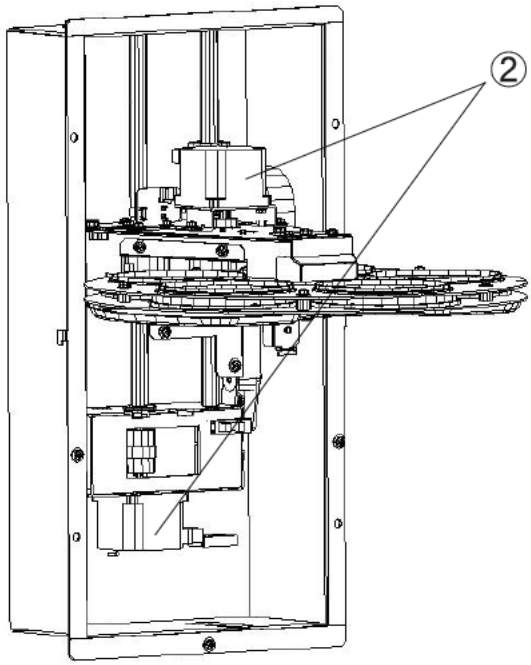


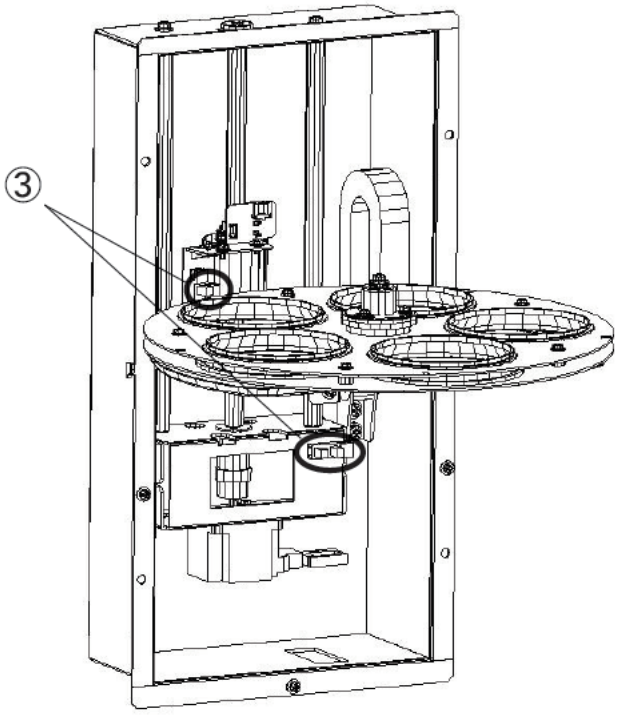
特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
	1	358Y100021	IDX Intelligent Dark Box	1	
	2	146S0029	フォトセンサ Photo Sensor	6	
	3	118SX167	モータ Motor	1	
	4	136Y100241	マイクロスイッチ (トレイ検出) Micro Switch (for Tray)	1	
	5	136Y100242	マイクロスイッチ (インターロック) Micro Switch (for Interlock)	1	
	6	840Y100037 840Y100038	青色落射光源(右), Blue Incident LED(R) 青色落射光源(左), Blue Incident LED(L)	1	
	7	840Y100043 840Y100044	緑色落射光源(右), Green Incident LED(R) 緑色落射光源(左), Green Incident LED(L)	1	
	8	840Y100045 840Y100046	赤色落射光源(右), Red Incident LED(R) 赤色落射光源(左), Red Incident LED(L)	1	
	9	840Y100050 840Y100051	近赤外落射光源(右), NIR Incident LED(R) 近赤外落射光源(左), NIR Incident LED(L)	1	
	10	840Y100048 840Y100049	紫外落射光源(右), UV Incident LED(R) 紫外落射光源(左), UV Incident LED(L)	1	
	11	119W0016	電動ファン Electnic Fan	1	
	12	113Y100056	基板 (DRLS4) Board (DRLS4)	1	
	13	113Y100059	基板 (DPLS4) Board (DPLS4)	1	
	14	125S0326	電源 (12V) Power Supply (12V)	1	
	15	125S0327	電源 (24V) Power Supply (24V)	1	
	16	128N0067	スイッチ Switch	1	
	17	113Y100066	青色LED基板 (右) Blue LED Board (Right)	1	
	18	113Y100067	青色LED基板 (左) Blue LED Board (Left)	1	
	19	113Y100068	緑色LED基板 (右) Green LED Board (Right)	1	
	20	113Y100069	緑色LED基板 (左) Green LED Board (Left)	1	
	21	113Y100070	赤色LED基板 (右) Red LED Board (Right)	1	
	22	113Y100071	赤色LED基板 (左) Red LED Board (Left)	1	

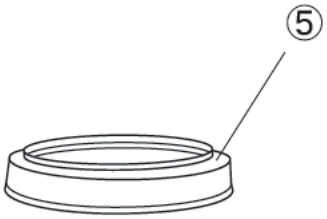
特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
	23	113Y100072	近赤外LED基板 (右) NIR LED Board (Right)	1	
	24	113Y100073	近赤外LED基板(左) NIR LED Board(Left)	1	
	25	113Y100064	紫外LED基板(右) UV LED Board(Right)	1	
	26	113Y100065	紫外LED基板(左) UV LED Board(Left)	1	
	27	113Y100061	中継基板 (CNLS4) Relay Board (CNLS4)	1	
	28	136Y100222	落射光源ケーブル Incident Light Cable	1	
	29	367S2033	レベルアジャスター Level adjuster	4	
	30	350Y100281	ドア Door	1	

3 フィルタチェンジャ （Filter Changer）



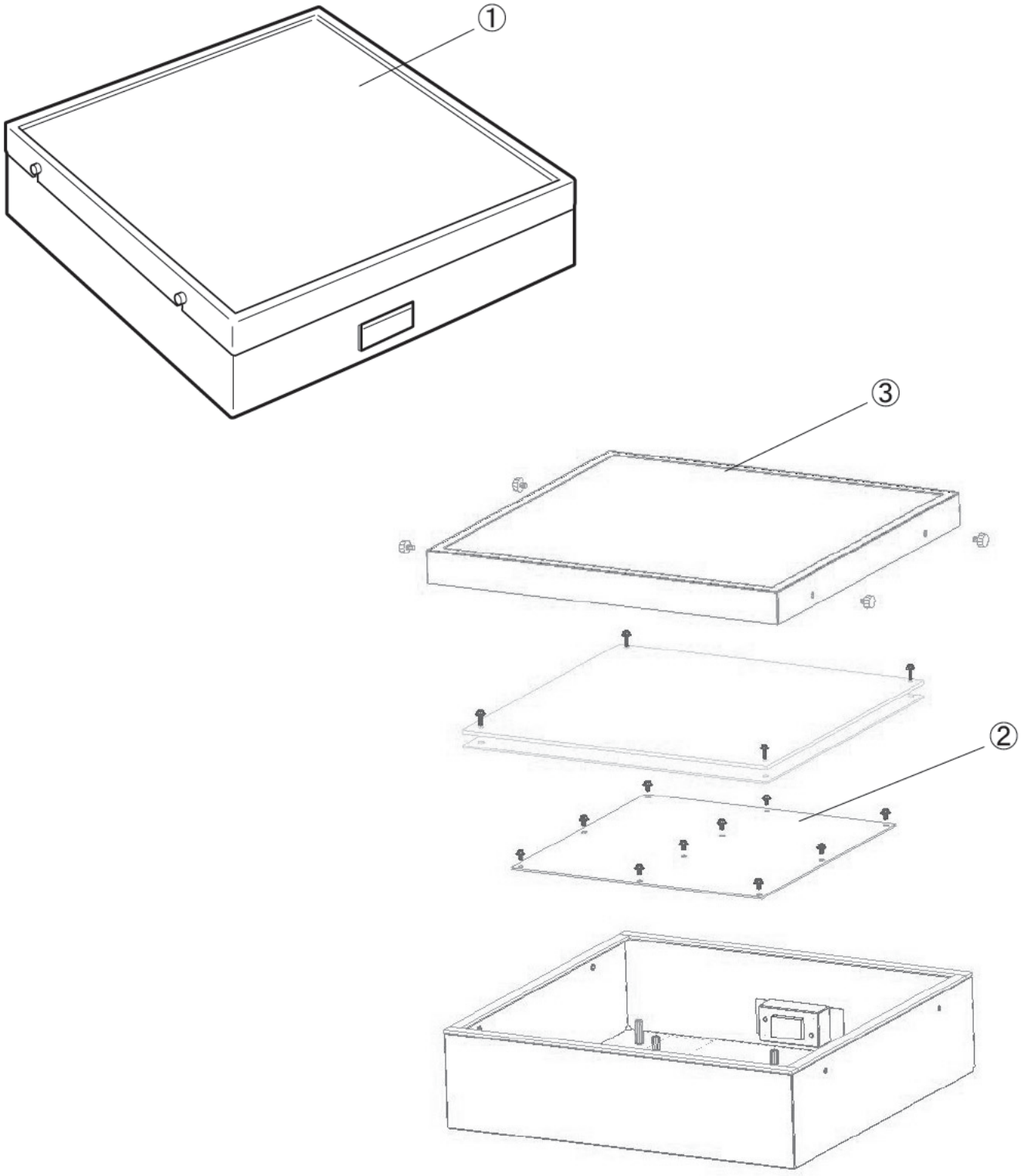






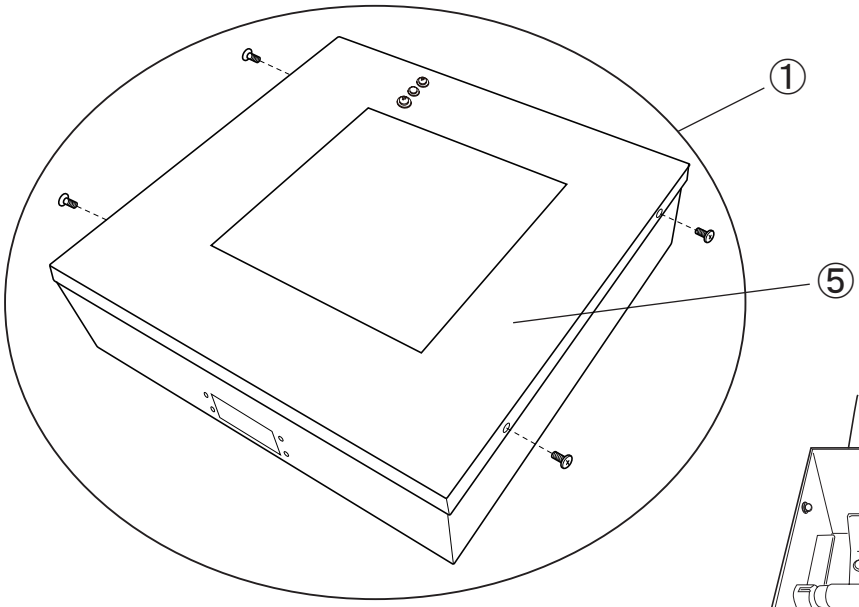
特記 Mark	図番 No.	部 品 番 号 Part Code No.	部 品 名 称 Part Name	個数 Q'ty	備 考 Remarks
	1		フィルタチェンジャ(レンズフード付) Filter Changer (with Lens hood)	1	製品扱いでオーダーすること Order it as product
	2	118SX161	モータ Motor	2	
	3	146S0029	フォトセンサ Photo Sensor	4	
	4	408W0007	フィルターレット Filter Turret	1	
	5	345U0056	レンズフード Lens Hood	1	

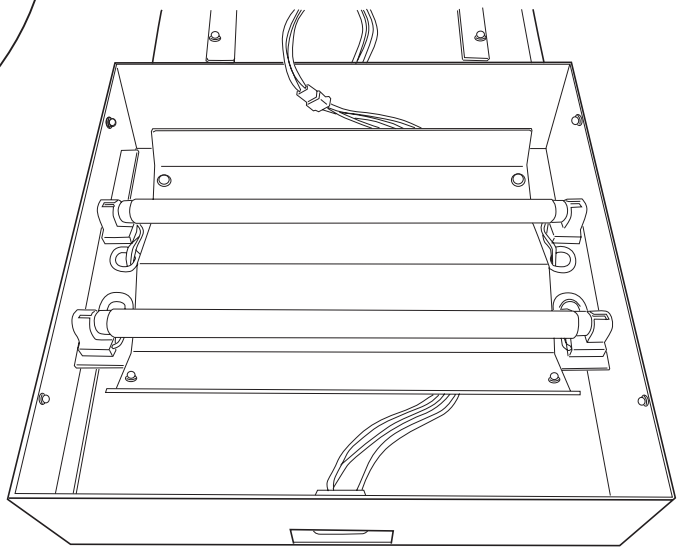
4 白色透過光源 （White DIA Illuminator）

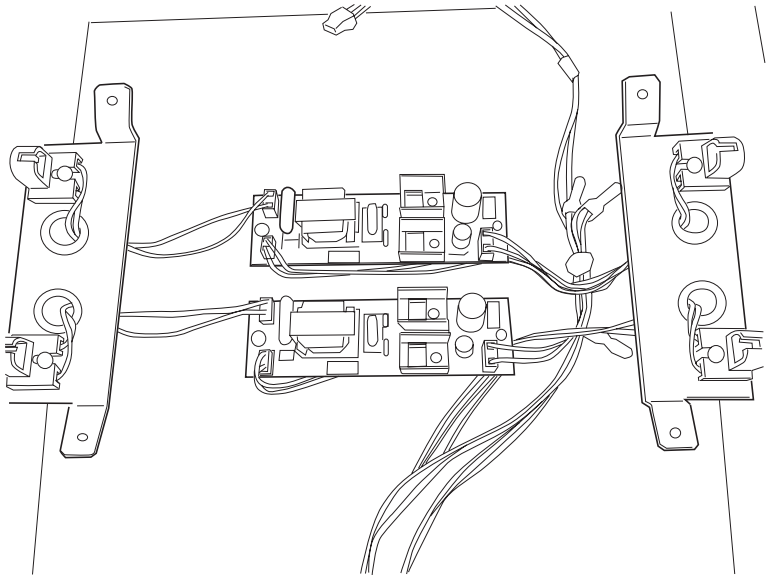


特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
	1	840Y100039	白色透過光源 White DIA Illuminator	1	
	2	113Y100060	基板 Board	1	
	3	350W0115	カバー Cover	1	

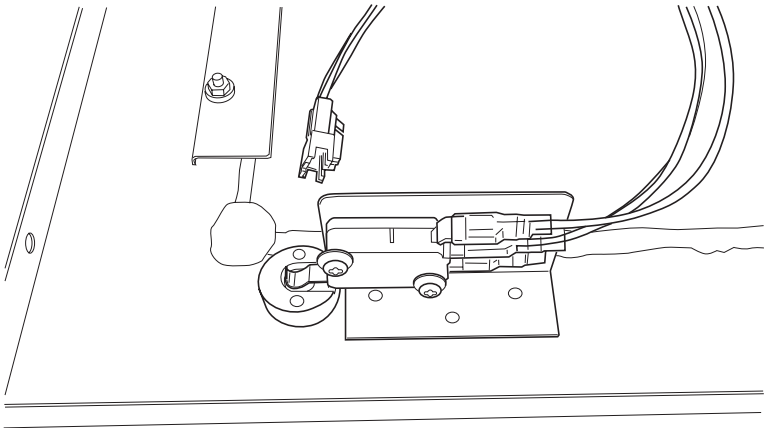
5 UV透過光源 (UV DIA Illuminator (20cm x 20cm))



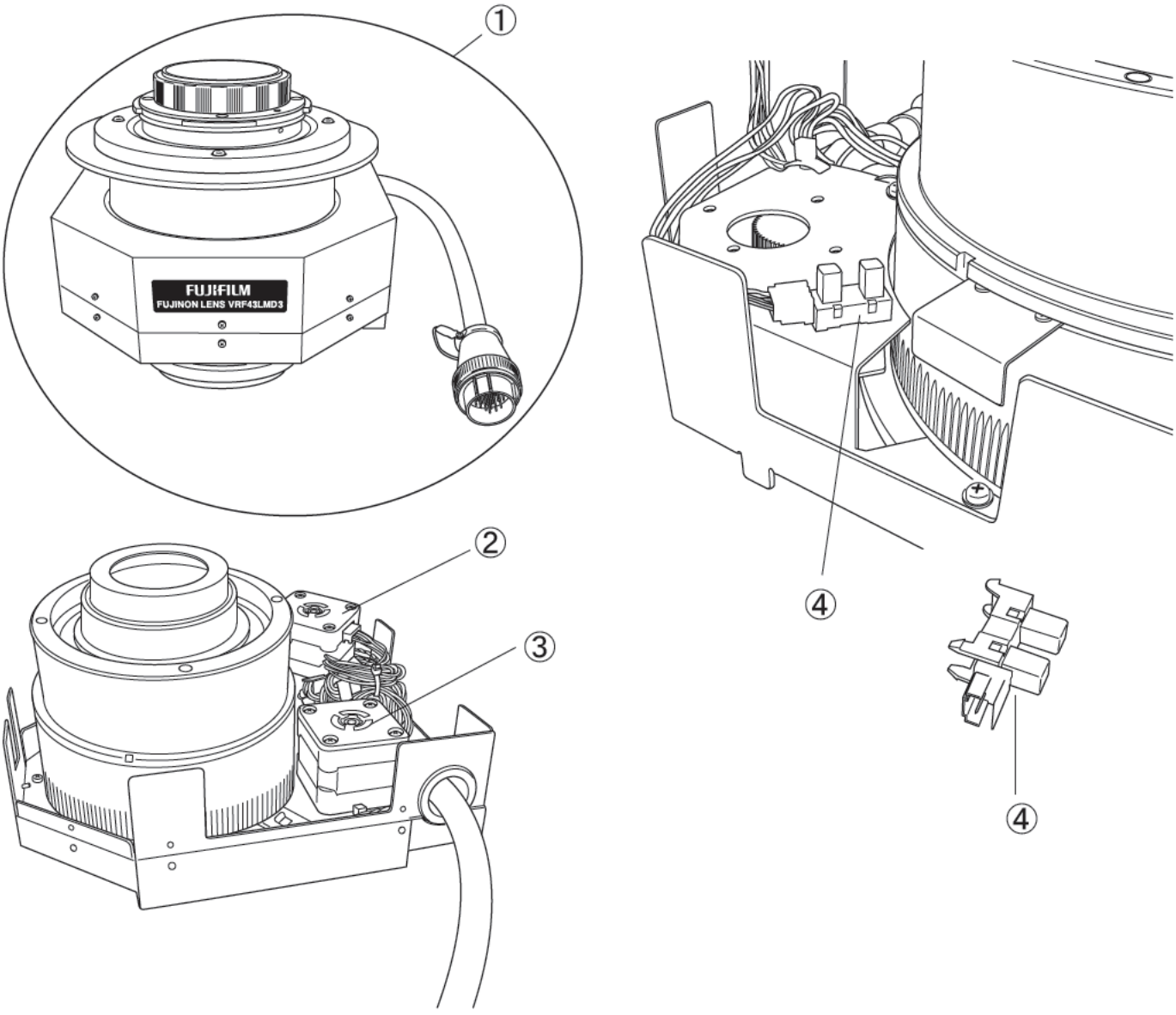




特記 Mark	図番 No.	部品番号 Part Code No.	部品名称 Part Name	個数 Q'ty	備考 Remarks
	1	840Y100118	UV透過光源 UV DIA Illuminator	1	
	2	123S0029	UV管 UV tube	2	
	3	128S1094	マイクロスイッチ Micro Switch	1	
	4	113S0190	インバータ Invertor	2	
	5	350Y100978	カバー Cover	1	UV透過フィルタ付き With a UV-transmitting filter

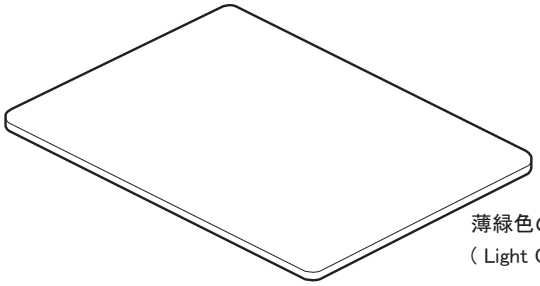


6 高感度レンズ （High Sensivity Lens）



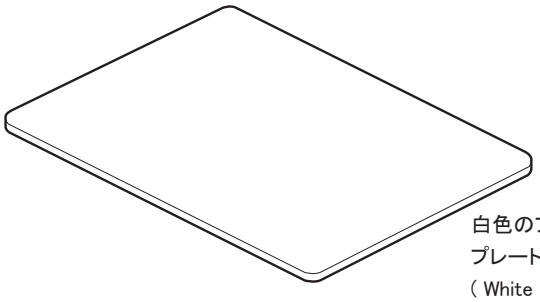
特記 Mark	図番 No.	部 品 番 号 Part Code No.	部 品 名 称 Part Name	個数 Q'ty	備 考 Remarks
	1		高感度レンズ High Sensivity Lens	1	製品扱いでオーダーすること Order it as product
	2	101B10687181	フォーカスモータ Focus Motor	1	
	3	101B11441630	アイリスモータ Iris Motor	1	
	4	106K1136271	フォトセンサ Photo Sensor	2	

7 キャリブレーションプレート（Calibration Plate）



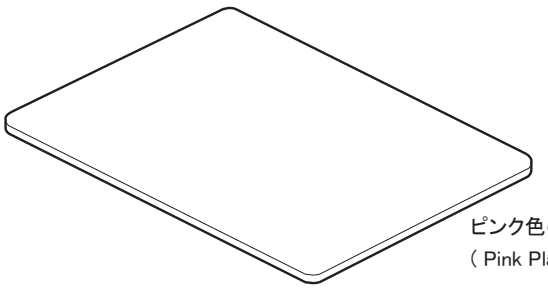
薄緑色のプレート
（ Light Green Plate ）

①キャリブレーションプレート FL
（ Calibration Plate FL ）



白色のプレートにグレーのマット
プレートが貼ってあるもの
（ White Plate with Gray Mat Plate ）

②キャリブレーションプレート DI
（ Calibration Plate DI ）

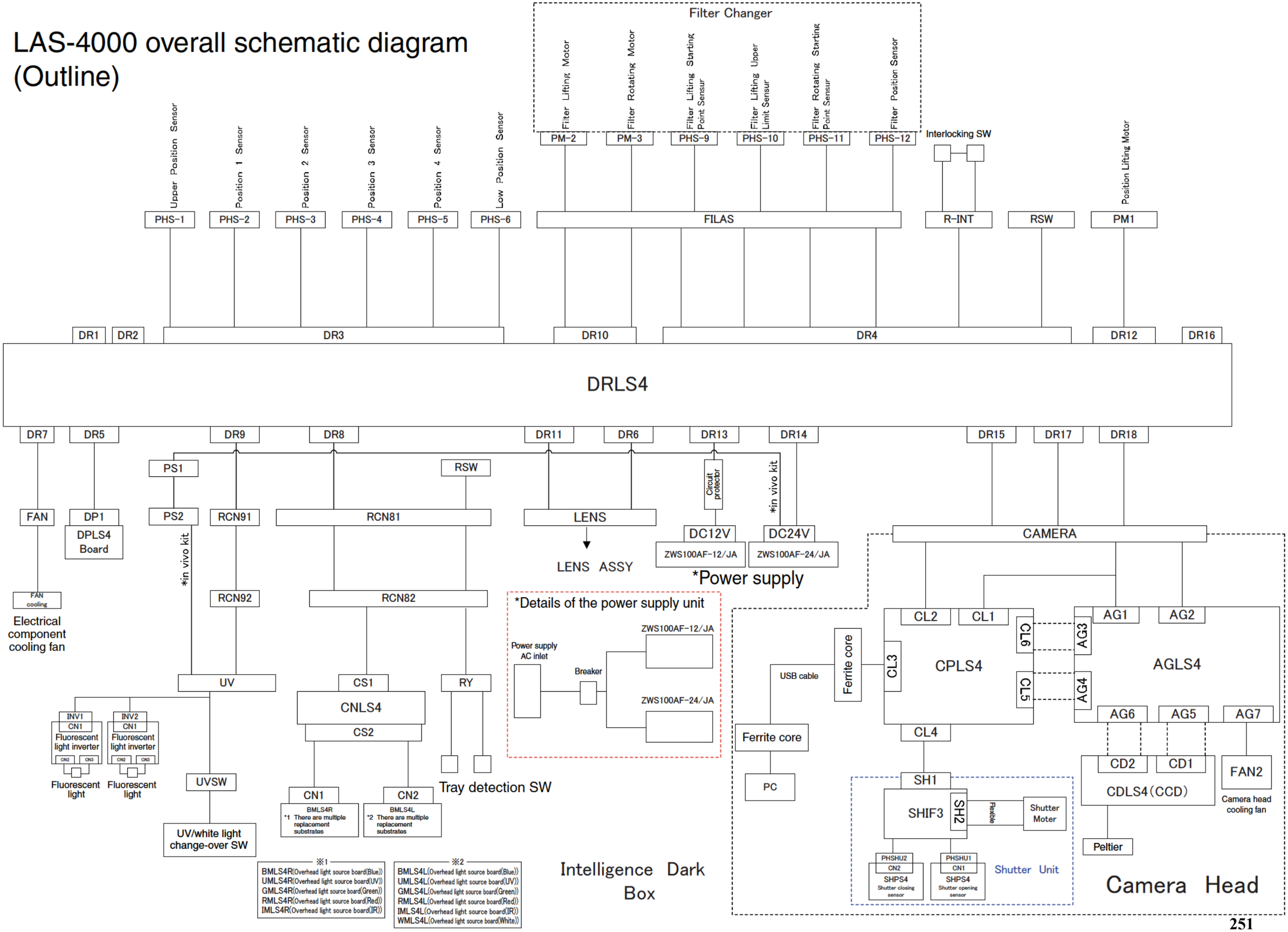


ピンク色のプレート
（ Pink Plate ）

③キャリブレーションプレート GR
（ Calibration Plate GR ）

特記 Mark	図番 No.	部 品 番 号 Part Code No.	部 品 名 称 Part Name	個数 Q'ty	備 考 Remarks
	1	619U0002	キャリブレーションプレート FL Calibration Plate FL	1	
	2	407W0001	キャリブレーションプレート DI Calibration Plate DI	1	
	3	619U0003	キャリブレーションプレート GR Calibration Plate GR	1	

LAS-4000 overall schematic diagram (Outline)



Intelligent Dark Box Ⅳ
DRLS4 1/2
113Y100056B

Connectors on the substrate indicated with the color ■ are gold plated.

DR1 DR2 DR16 DR7 DR5 DR9 DR8 DR11 DR6 DR13 DR14 DR15 DR17 DR18

to PS1-J PAGE 1/6

to RSW PAGE 2/6

LENS

LENS ASSY

※4 UL1007 18AWG
※5 UL1007 16AWG
Closed terminal CE5
(LORD) (LINE) ※3

to Camera Head Page 3/6

CAMERA

DP1 DPLS4 Board 113Y100059A

FAN FAN

FAN(cooling) 119S0099 3610RL-05W-B49-C02 MINEBEA
Electrical component cooling fan

IVK expansion cable

FLEX-S9 24-7/0.2 7030 2651
Reed screen-type Okiflex (9)
(for 3A)
Oki Electric Cable Co., Ltd.

RCN91 RCN81 RCN92 RCN82

PS1-P PS2-J PS2-P

UV

CS1 CS2 CNLS4 113Y100061

RY

CN1 CN2

BMLS4R 113Y100066B
※1 There are multiple replacement substrates

BMLS4L 113Y100067B
※2 There are multiple replacement substrates

Micro SW AM5664 C231

Tray detection SW

※1
BMLS4R(Overhead light source board(Blue))…113Y100066B
UMLS4R(Overhead light source board(UV))…113Y100064B
GMLS4R(Overhead light source board(Green))…113Y100068B
RMLS4R(Overhead light source board(Red))…113Y100070B
IMLS4R(Overhead light source board(IR))…113Y100072B

※2
BMLS4L(Overhead light source board(Blue))…113Y100067B
UMLS4L(Overhead light source board(UV))…113Y100065B
GMLS4L(Overhead light source board(Green))…113Y100069B
RMLS4L(Overhead light source board(Red))…113Y100071B
IMLS4L(Overhead light source board(IR))…113Y100073B
WMLS4L(Overhead light source board(White))…113Y100075B

※3
Circuit protector
(128S1036)

to PAGE 5/6
Transmitted UV source
or
Heater temperature control box

to PAGE 6/6
(Former) Transmitted UV source
or
(Former) Transmitted white light source

to PS1-P PAGE 1/6

PS1-J

IVK expansion cable

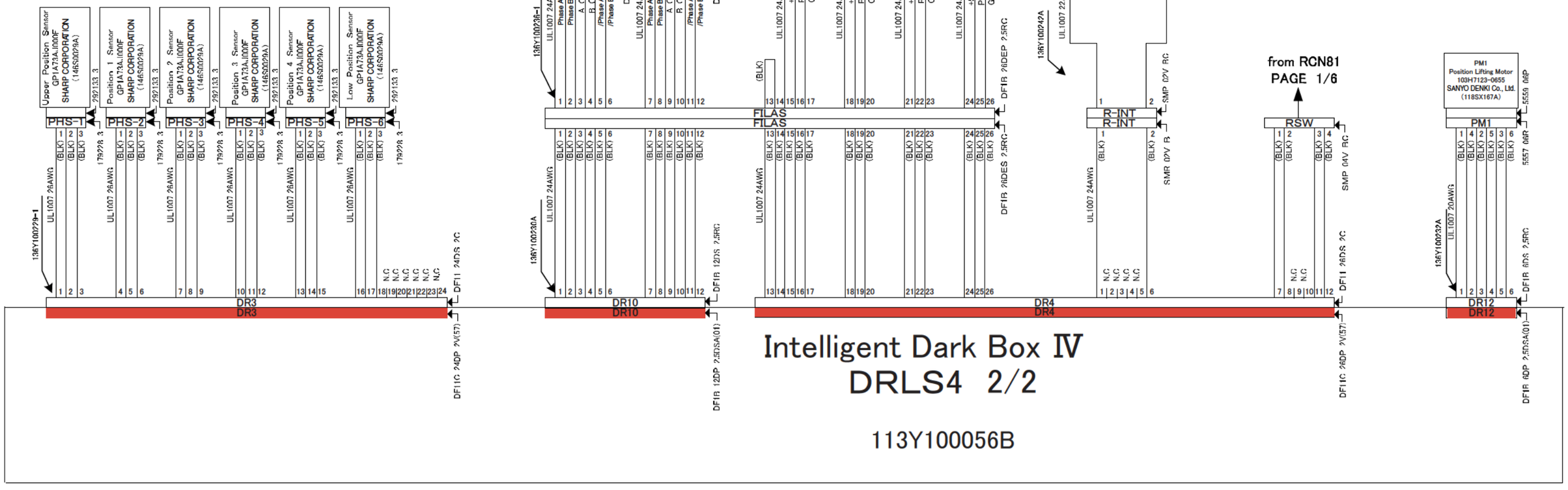
DC12V ZWS100AF-12/JA

DC24V ZWS100AF-24/JA

Power supply
for electrical components, see page 4/6

LAS-4000 overall schematic diagram (1/6)
2008.07.28

Connectors on the substrate indicated with the color ■ are gold plated.



Intelligent Dark Box Ⅳ
DRLS4 2/2

113Y100056B

LAS-4000 overall schematic diagram (2/6)
2008.07.28

Connectors on the substrate indicated with the color ■ are gold plated.

FG1(136Y100218A) × 2 cables
170038-2 (Faston terminal)
235830-23 (Sleeve)
UL1007 18AWG (BLK)
V1.25-3.7

FG2(136Y100219A) × 1 cables
170038-2 (Faston terminal)
235830-23 (Sleeve)
UL1007 18AWG (BLK)
V1.25-3.7

Camera Head (848Y100012_5)

Peltier
9520/118/080B/C02
Fellowtech
(116U0002A1)

Camera head cooling fan

FAN2
Camera Cooling
SANYO DENKI Co., Ltd.
109P0912H4D01
119W0011B_1

DC12V (RED)
Signal (YEL)
GND (BLK)
N.C.

CDLS4
113Y100057B

CD1
CD2
AG7
AG5
AG6
A1A2A3…A25A26B1B2…B25B26
1~12

AGLS4
113Y100055A

AG4
AG3
AG2
AG1
CL5
CL6
CL1
CL2

Shutter unit
(398Y100010)

※6 Solder to SHIF3 board

SHPS4
(113Y100062)
Shutter closing sensor
CN1
PHSHU1

SHPS4
(113Y100062)
Shutter opening sensor
CN1
PHSHU2

Shutter Motor
MSBN020S01
NIDEC SANKYO CORPORATION
(118SX173)

Flexible

SHIF3
(113W0070A3)
SH2
SH1

CPLS4
113Y100054B

CL4
CL3

Phase A
Phase B
A COM
B COM
+5V
PHSHU1
GND
+5V
PHSHU2
GND

PC
M2-USB-N01

Ferrite core
ZCAT1730-0730A
TDK
(138S0486)

136Y100433_1
(USB cable)

UBB-4R-D14T-1(LF)(SN)
M2-USB-N01

136N100010
UAB-300
Nippon DICS Company, Ltd.

CAMERA

+12V(Peltier)
+12V(Peltier)
GND(Peltier)
GND(Peltier)
+20V
+12V
+8V
GND
GND
TXDCHD
RXDCHD
GND

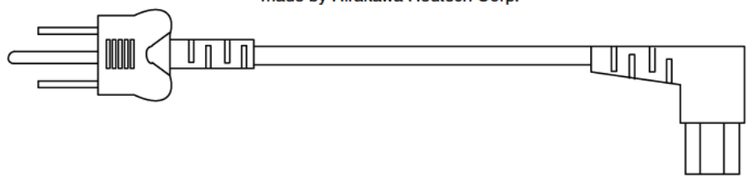
UL1007 24AWG

from DRLS4 board
page 1/6

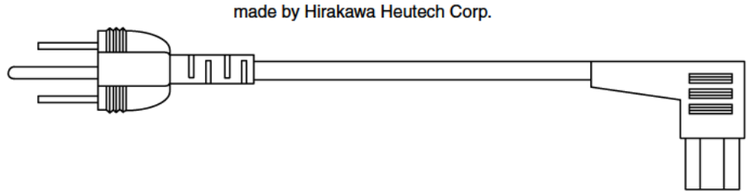
LAS-4000 overall schematic diagram (3/6)
2008.07.28

AC cable

136S0199_1 (3P PLUG) (JPN)
made by Hirakawa Heutech Corp.



136S0144 (3P PLUG) (UL)
made by Hirakawa Heutech Corp.



Power source

Electrical components AC inlet

AP-300-3-B-1-NI
Yamate Electric Co., Ltd.
(AC inlet)

· Breaker (NFB)
SER-F-11-61-10A-GWT
Sanken-Airpax Co., Ltd.
(128N0067)
· Breaker connection terminal
250 faston 170187-2
· Breaker connection sleeve
1-170823-8

136Y100243C

L terminal — UL1015 20AWG (BLK) — L-IN(Faston) — LINE — NFB — LOAD — L-LO(Faston) — UL1015 20AWG(BLK)

N terminal — UL1015 20AWG (WHT) — N-IN(Faston) — N-LO(Faston) — UL1015 20AWG(WHT)

GND terminal — UL1007 18AWG (YEL/GRN)

Ring terminal
FV1.25-4(transparent)

CE-1 closed terminal

CE-1 closed terminal

136Y100234B

VHR-5N

UL1015 20AWG (BLK)	1	
N.C	2	
UL1015 20AWG (WHT)	3	AC12
N.C	4	
UL1007 18AWG (YEL/GRN)	5	

Ring terminal
FV1.25-4(transparent)

ZWS100AF-12/JA
DENSEI-LAMBDA K.K.
(125S0326)

to DRLS4
(DR13)
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VHR-5N

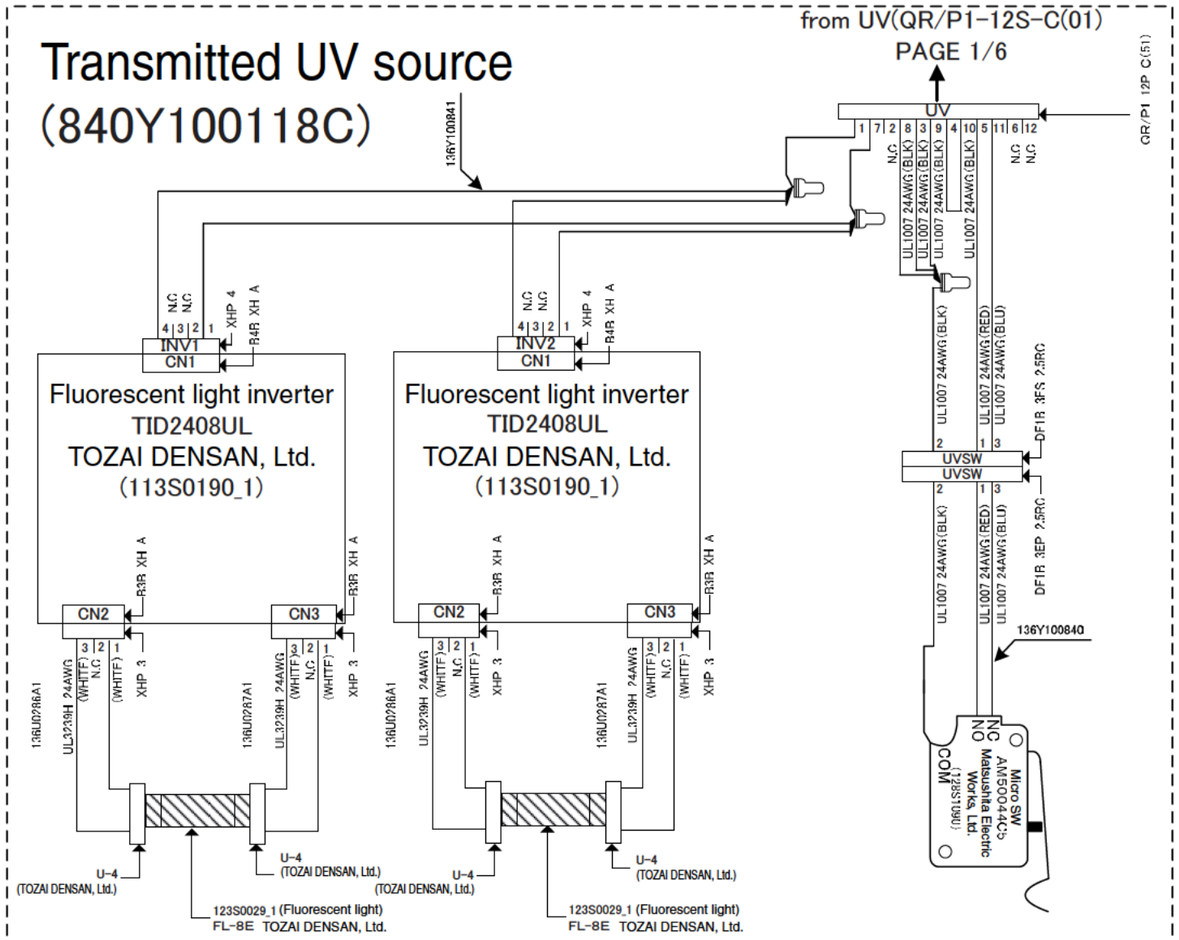
UL1015 20AWG (BLK)	1	
N.C	2	
UL1015 20AWG (WHT)	3	AC24
N.C	4	
UL1007 18AWG (YEL/GRN)	5	

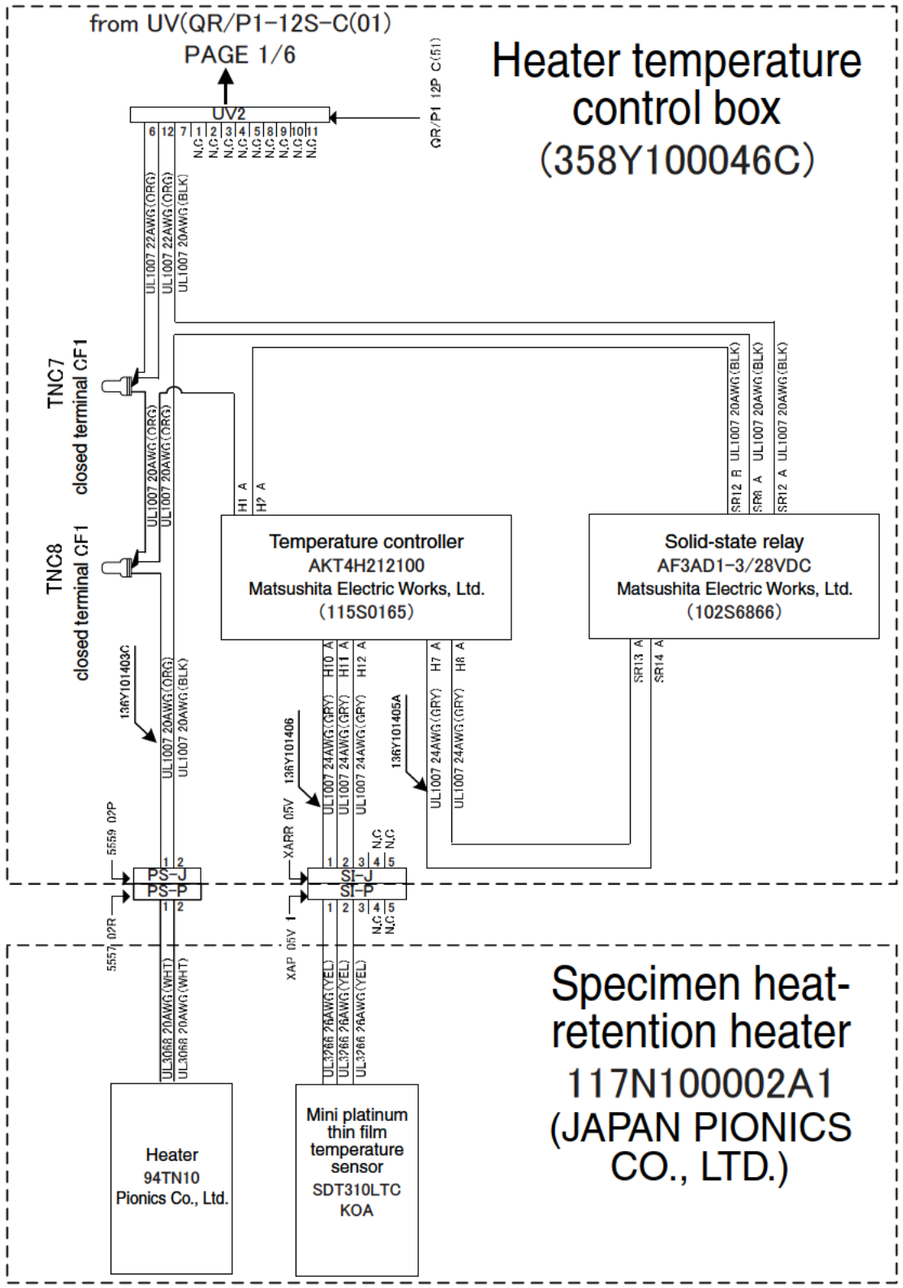
Ring terminal
171506-1

ZWS100AF-24/JA
DENSEI-LAMBDA K.K.
(125S0327)

to DRLS4
(DR14)
PAGE 1/6

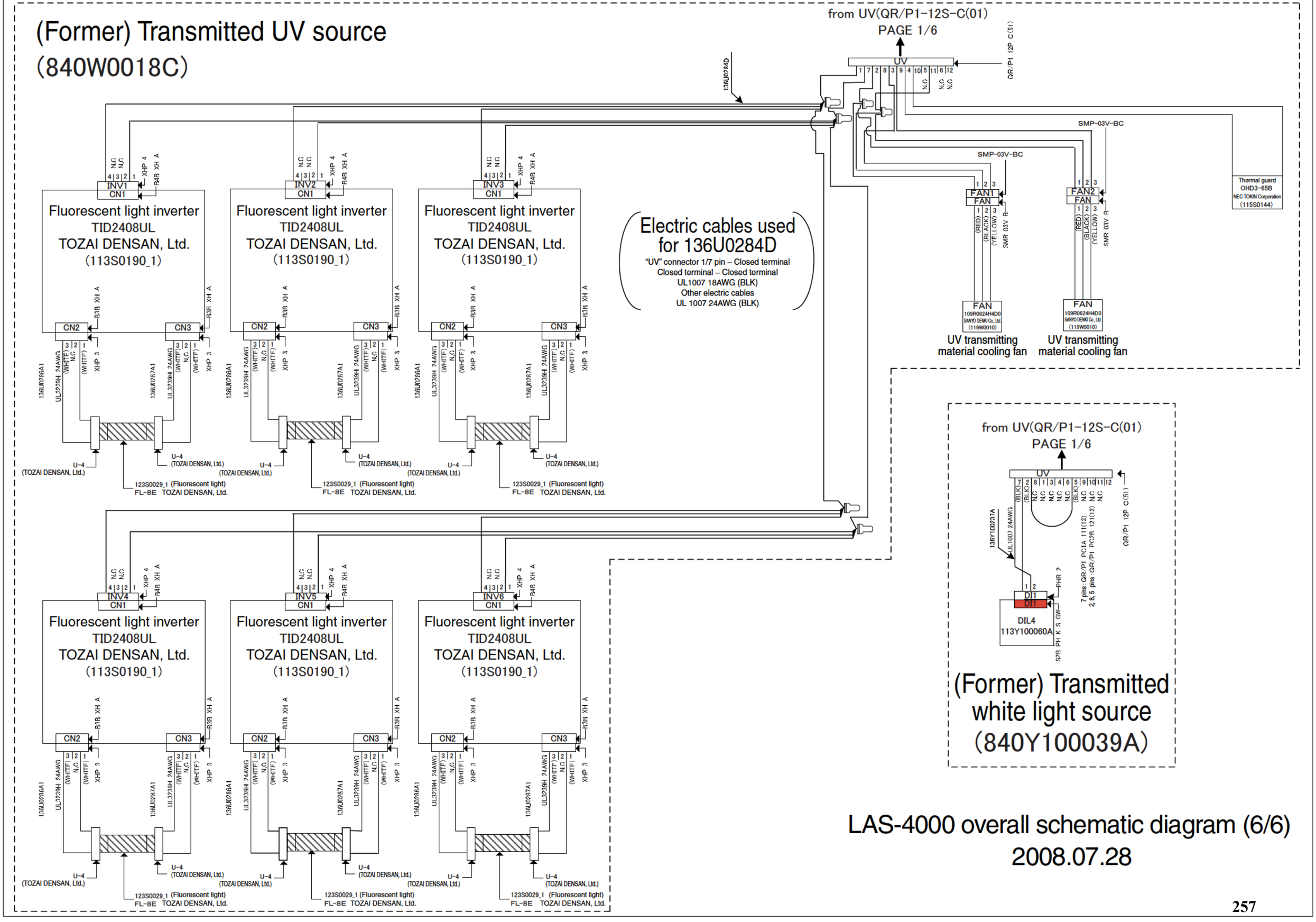
LAS-4000 overall schematic diagram (4/6)
2008.07.28





LAS-4000 overall schematic diagram (5/6)
2008.07.28

(Former) Transmitted UV source
(840W0018C)



LAS-4000 overall schematic diagram (6/6)
2008.07.28