TOPCON

REPAIR MANUAL

ISSUED..... AUG. 2003
REVISED .....

PHOTOGRAPHING DEVICE

SL-D SERIES

TOPCON CORPORATION

P-SLD_OPTION-0-0308-14

CONTENTS

1. INTRODUCTION

Although this product features the same basic principles as the photographing device used with the SL-7F/7E, 8Z, the following main improvements have been performed: clear view and greater operational ease.

1-1 Features

- **There are five types of camera (TV camera) to take a photograph: Nikon D1, Fuji S1 Pro or S2 Pro, JVC KY-F70, SONY DXC-390 and Topcon DC-1. The user can select a camera.**

The above are main features which are different from the photographing device used with the SL-7F/7E, 8Z.

1-2 Target Users of This Manual

This is optical equipment designed for ophthalmic testing. This manual is intended mainly for those experienced in handling optical instruments, including repairs and adjustments. Those who have no experience in those areas should take the repair course sponsored by Topcon.

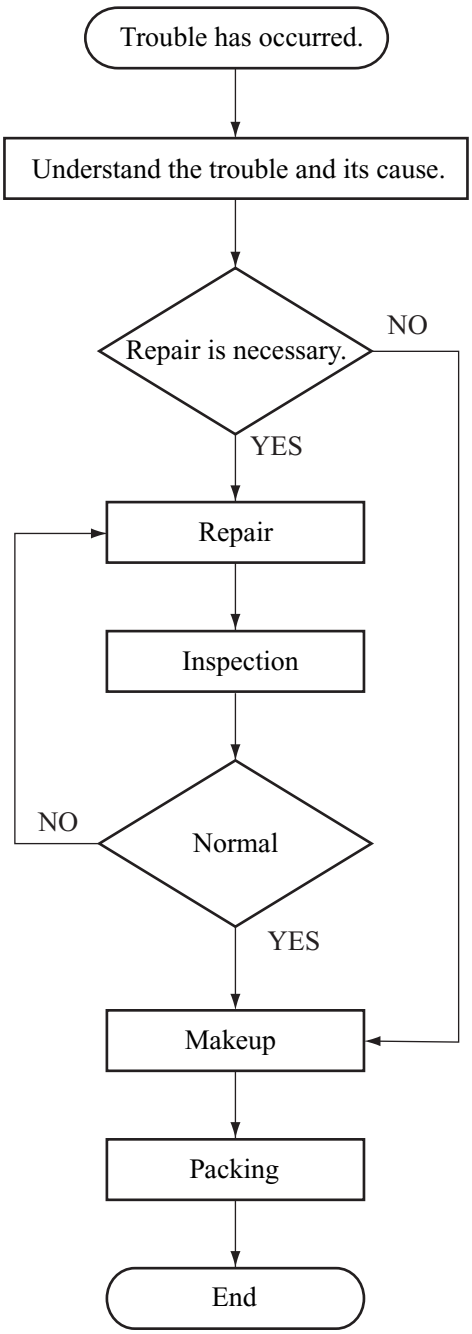
1-3 How to Use This Manual and Precautions

1-3-1 Precautions for repair

(1) Carry out repair, assembly, disassembly and adjustment on optical systems in clean areas where no dust or foreign matter will affect instrument performance.
(2) Refer to the SL-D7/accessories assembly and instruction manuals regarding assembly and inspection.
(3) Always carry out repairs according to the instructions in this manual, by using the specified materials and tools.
(4) Compilation of instructions in this manual is based on the assumption that metal parts must be changed as a single part and optical components by individual units.
(5) Refer to the service parts list for disassembly and assembly of parts not described in this manual.
(6) Never use grease or sealant except when specified by this manual.
(7) Order parts using the name and numbers found in the service parts list.

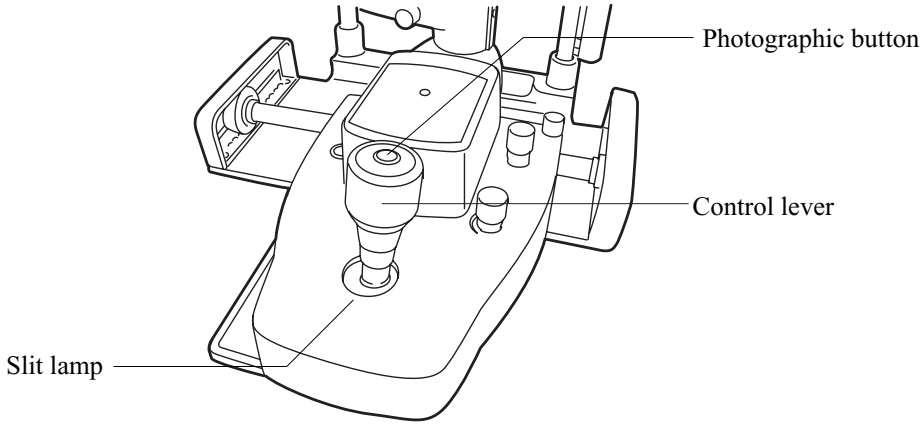
1-3-2 Repair procedure

Follow the procedures described in the flow chart below.

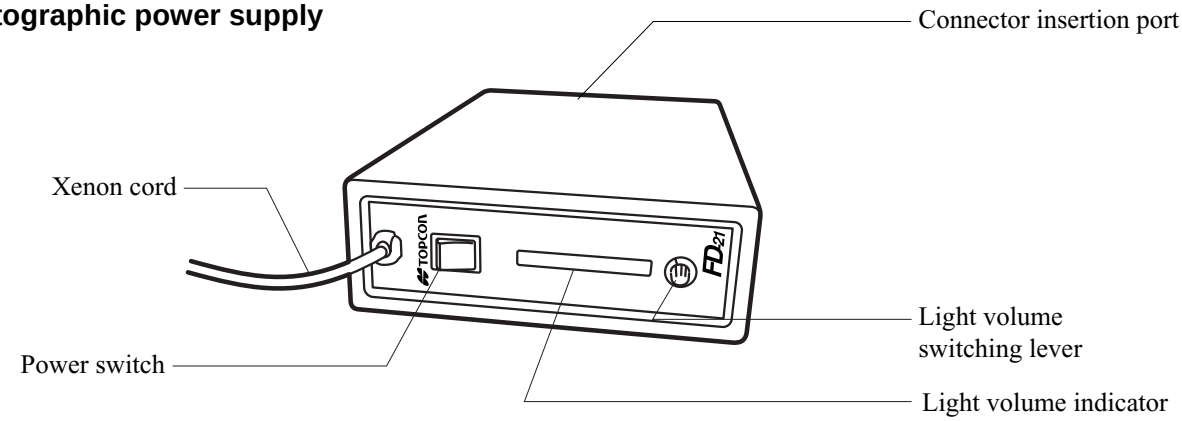


1-4 Part Names and Functions

• **SL-D7**



• **Photographic power supply**



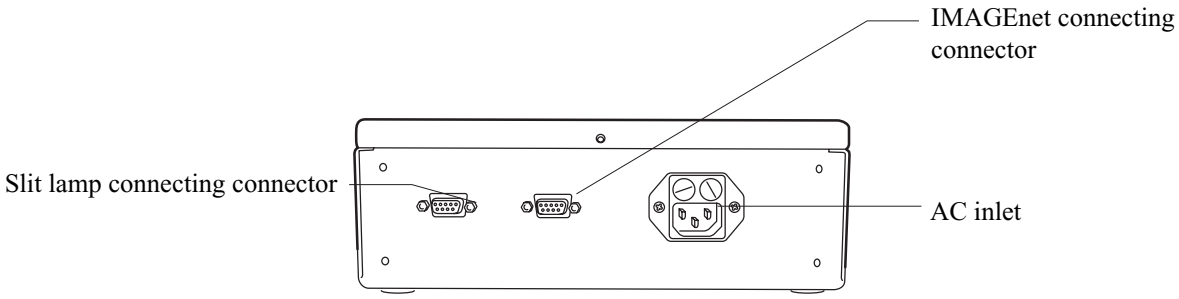
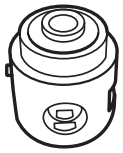
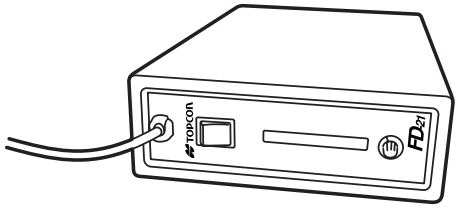
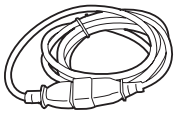
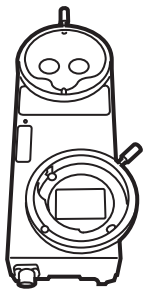
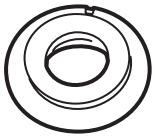
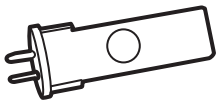


Illustration of connector insertion port

• Components of the photographing device for digital camera

Name	Q'ty	Name	Q'ty
Xenon relay lens 	1	Photographic power supply 	1
Background lighting (BG-3) 	1	Power cord (FD-21) 	1
Photographic arm cover 	1	Cable support 	1
Camera attachment and connecting cable (when SR-52 or SR-53 is used) 	1	Mount adapter for camera 	1
Xenon lamp 	1		

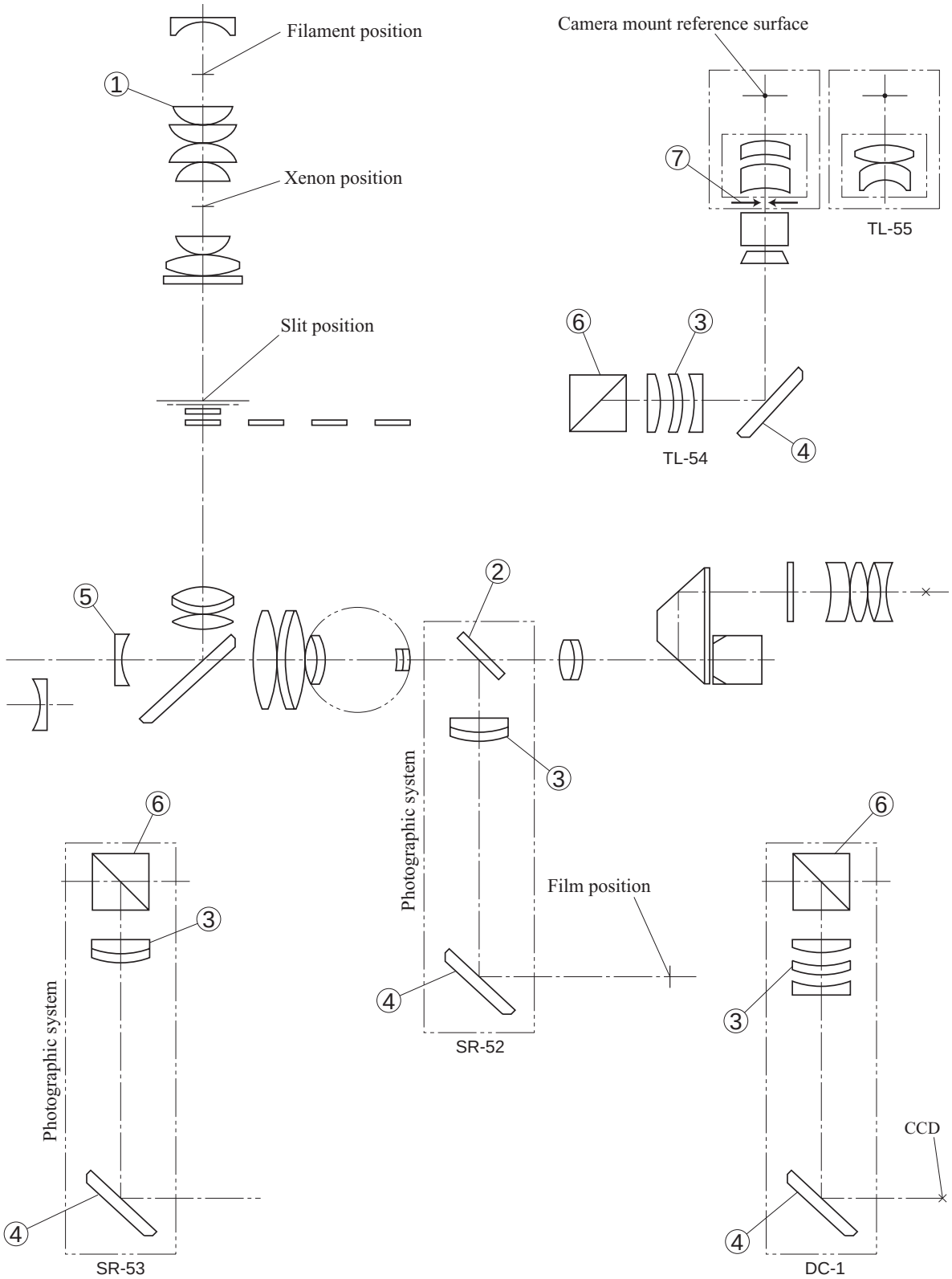
Note:The camera attachment and connecting cable are different according to the camera being used.

• Cameras to be connected

Cameras which can be connected to SL-D7 are as follows. The camera attachment and connecting cable are different according to the camera.

Recommended camera	Camera attachment
Nikon D1 series	Camera attachment SR-52
Fuji S1 Pro or S2 Pro	Camera attachment SR-53
JVC KY-F70	TV relay lens TL-54
SONY DXC-390	TV relay lens TL-55
Topcon DC-1	Built-in type photographic unit

1-5 Names of Optical Parts and Functions

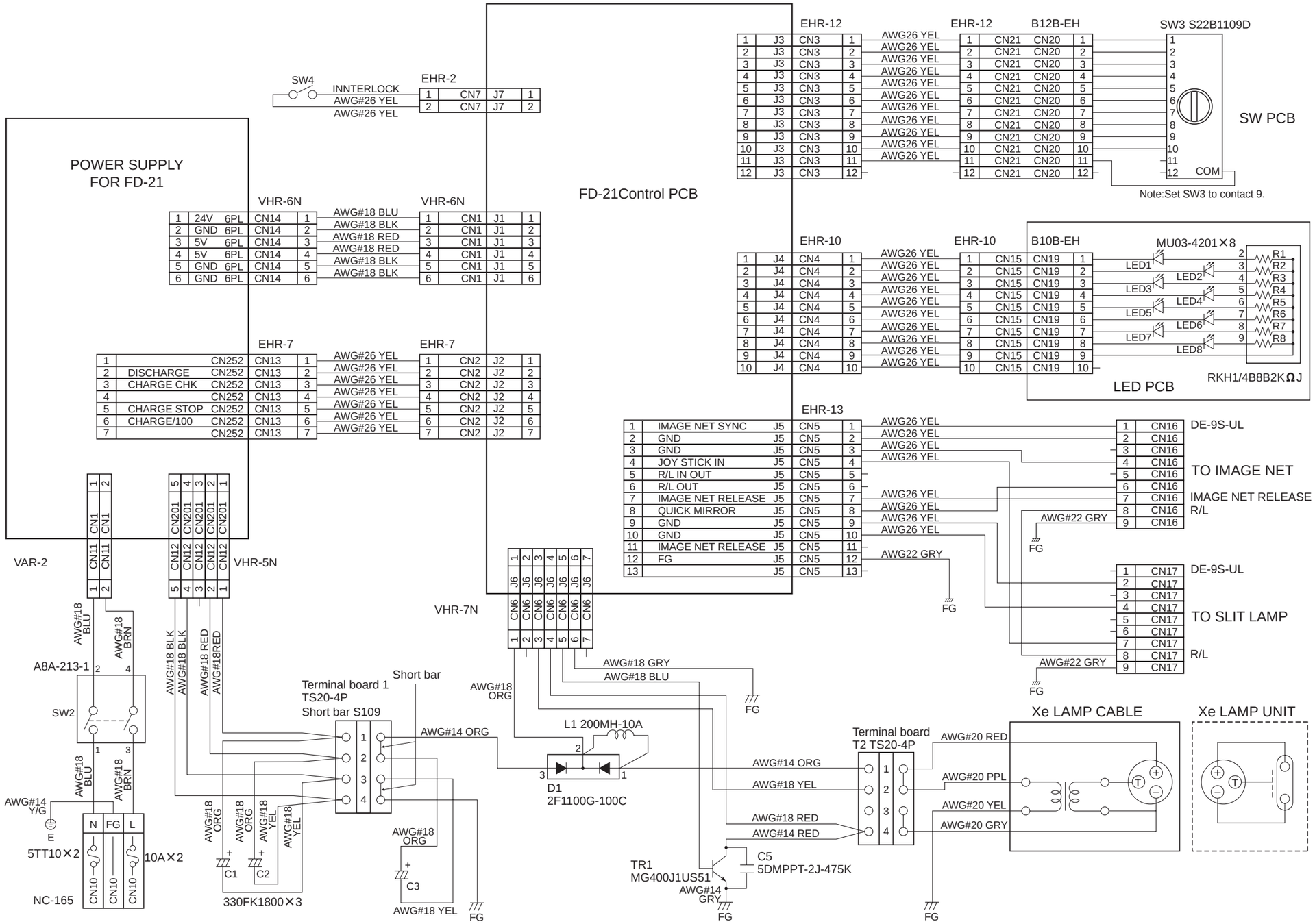


Names of optical units	Operation
①Condenser lens	Condensing/positioning is to be made for main bulb filament.
②Quick return mirror	Reflects the observed image and switches it to the camera side.
③Photographic lens	Lens for projecting the observed image Focusing of the observed image
④Reflection mirror	Used to reflect the observed image.
⑤Diffusion lens	Increases the lighting field when taking a photograph of anterior eye section.
⑥Beam splitter	Divides the image into two parts.
⑦Forming lens	Forms the image.

*Refer to the SL-D7 repair manual regarding other lenses.

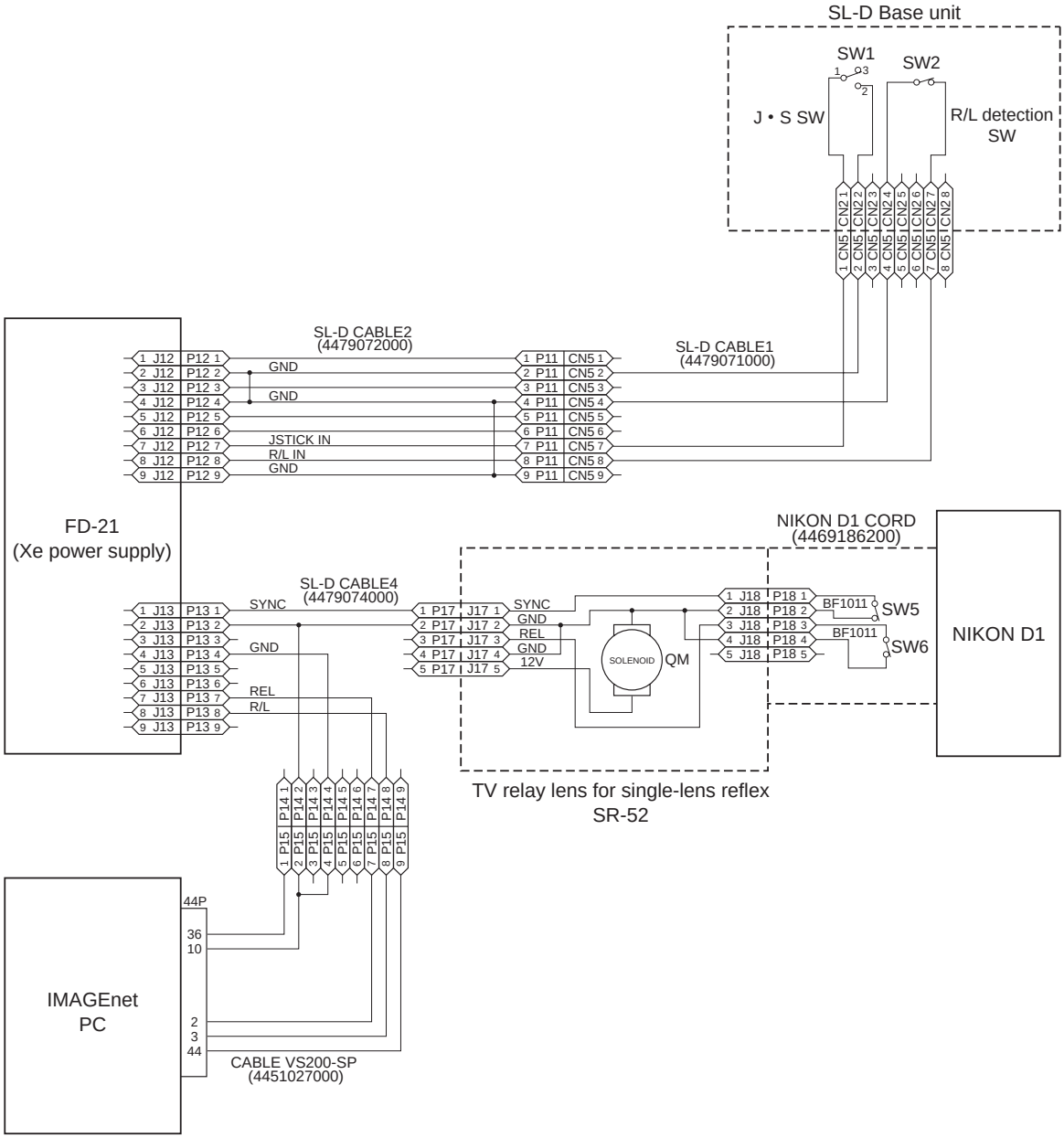
1-6 Electric System Wiring Diagram

1-6-1 Power supply electric system wiring diagram (FD-21)

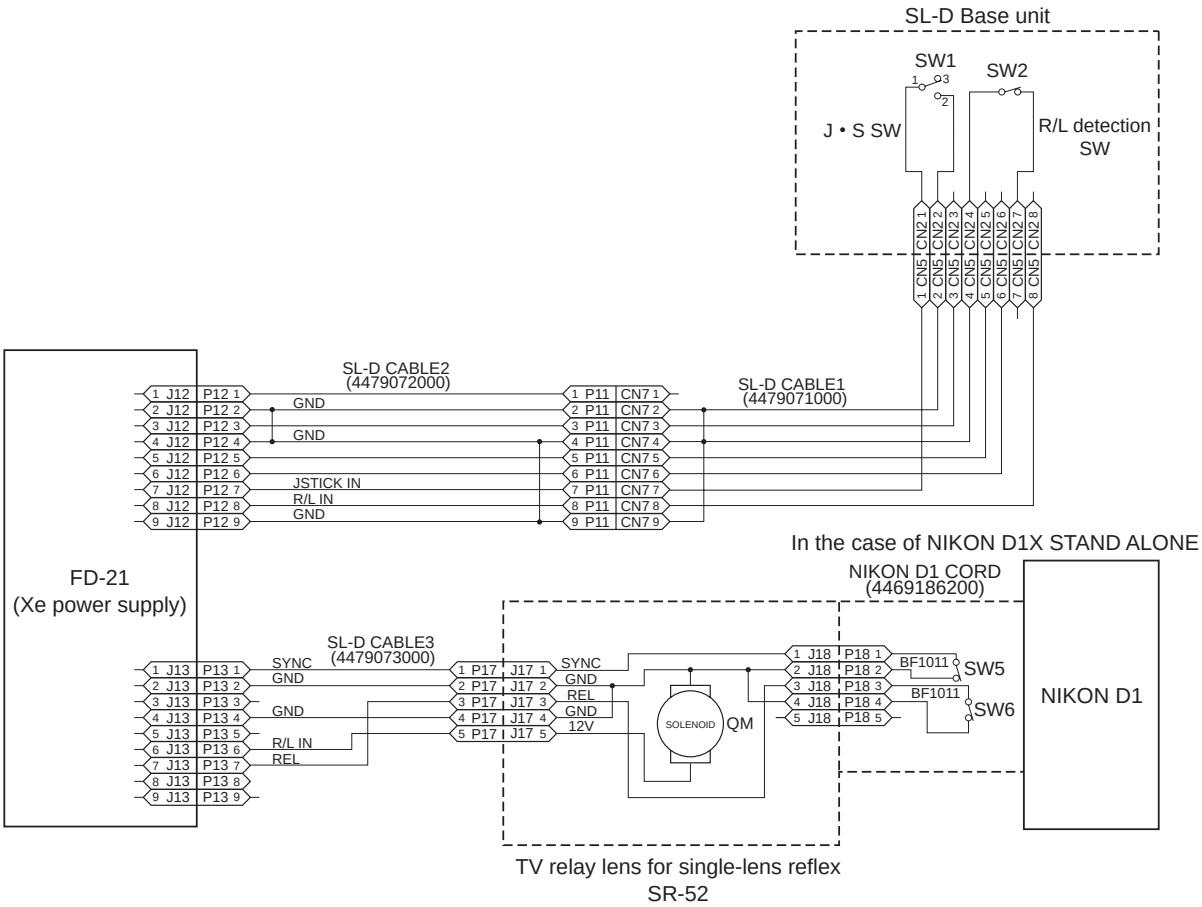


1-6-2 Main unit electric system wiring diagram

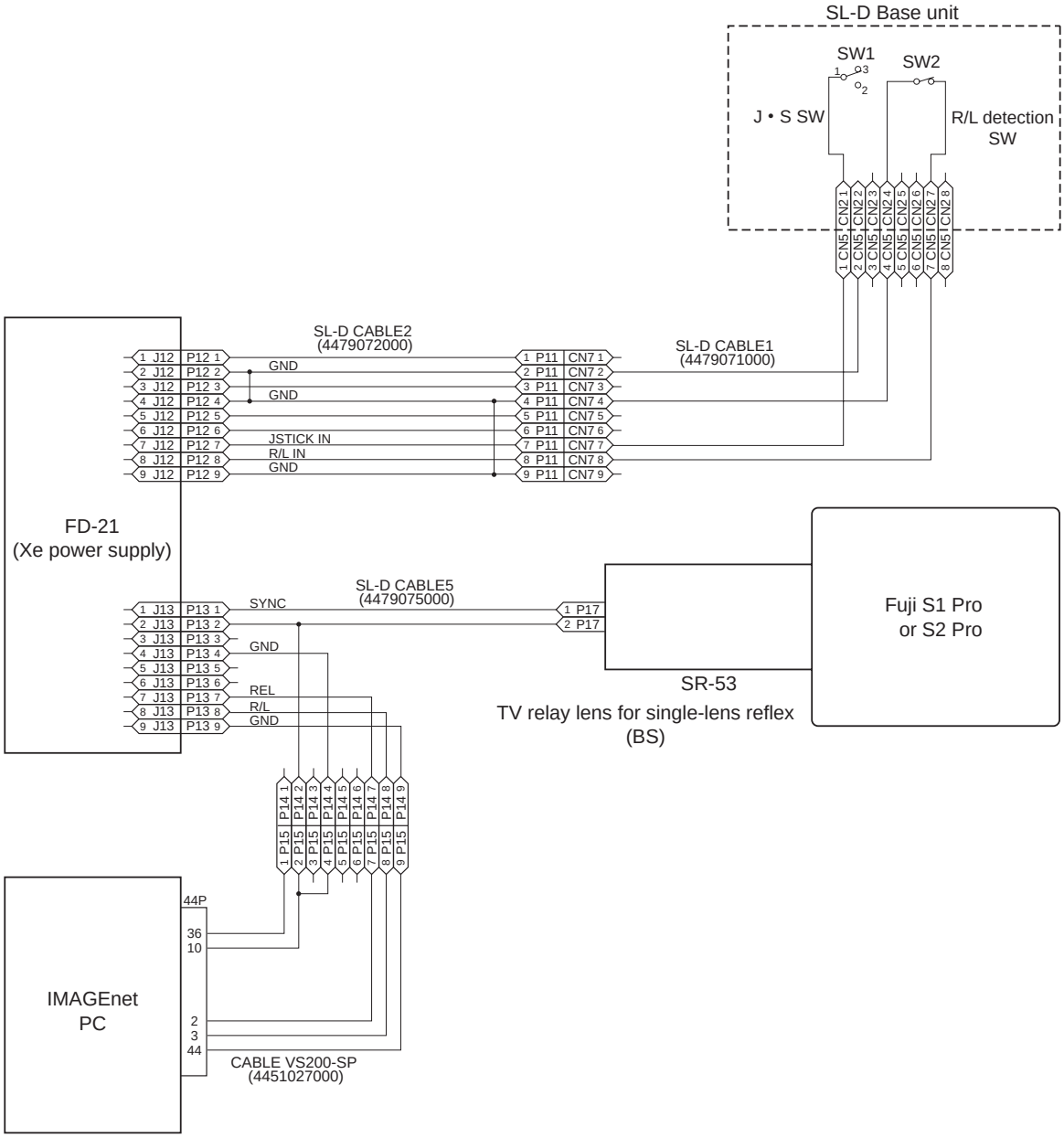
(1) SL-D7+SR-52+Nikon D1+FD-21 (IMAGEnet is connected)



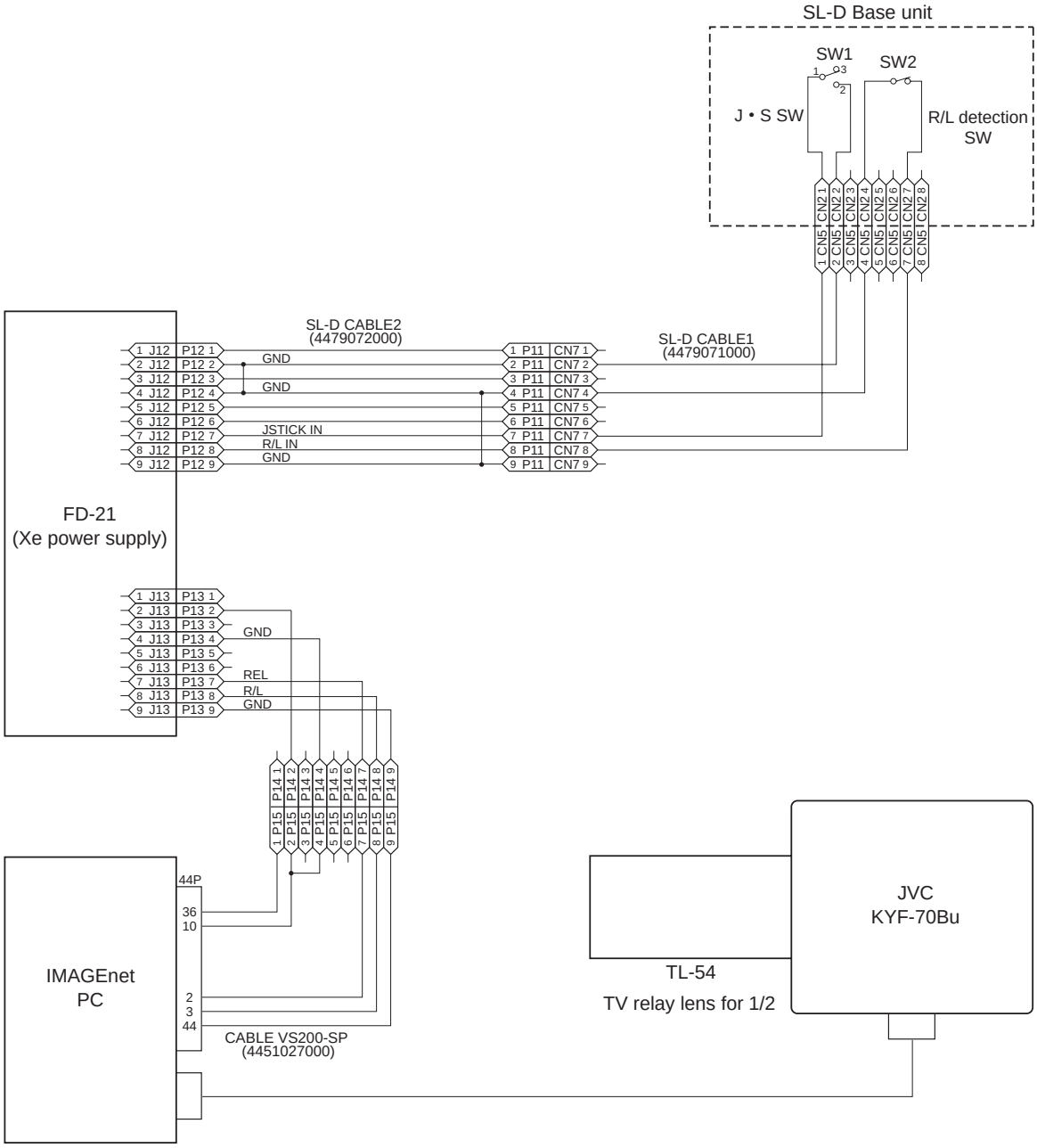
(2) SL-D7+SR-52+Nikon D1+FD-21 (STAND ALONE is connected)



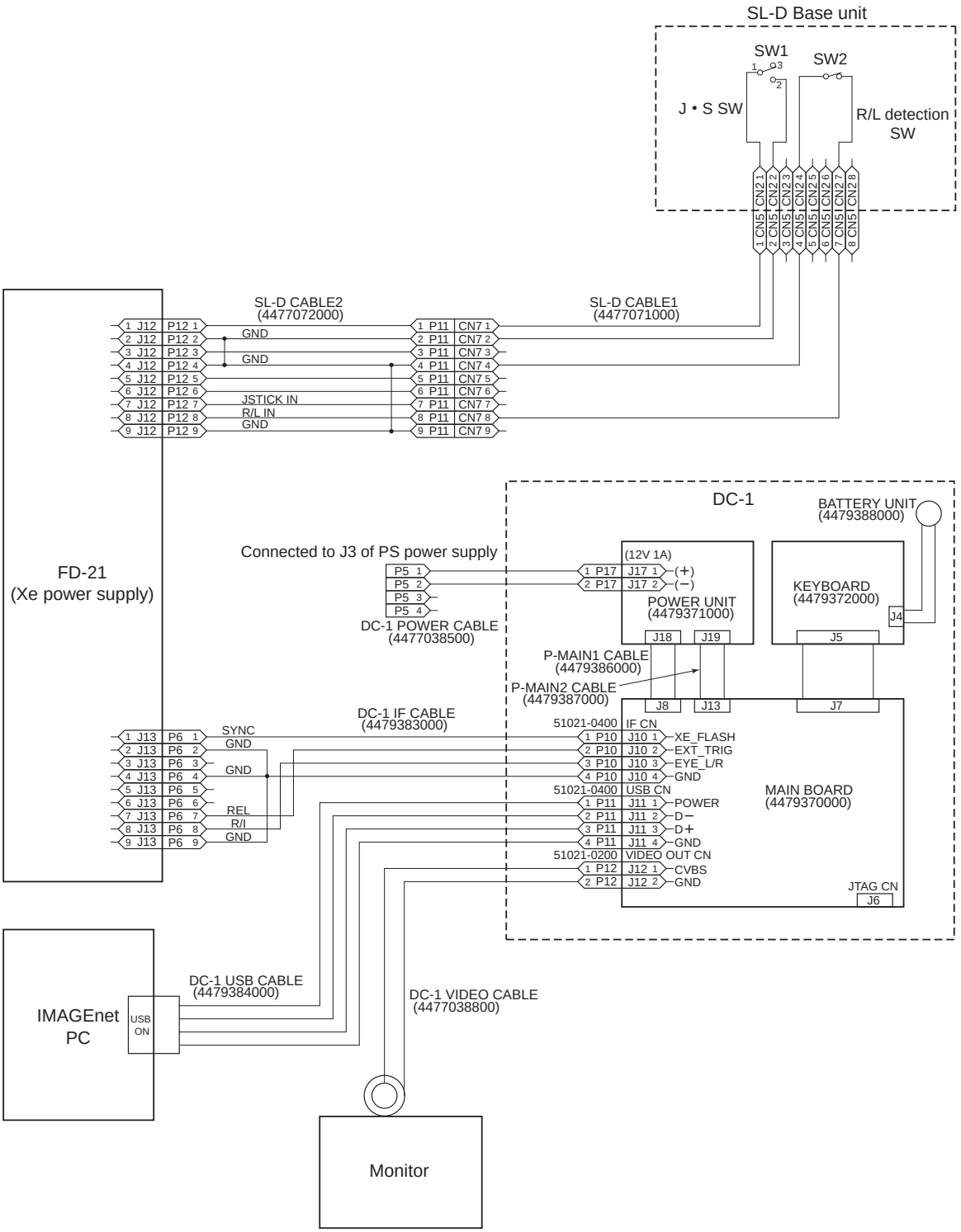
(3) SL-D7+SR-53+Fuji S1Pro or S2 Pro+FD-21 (IMAGEnet is connected)



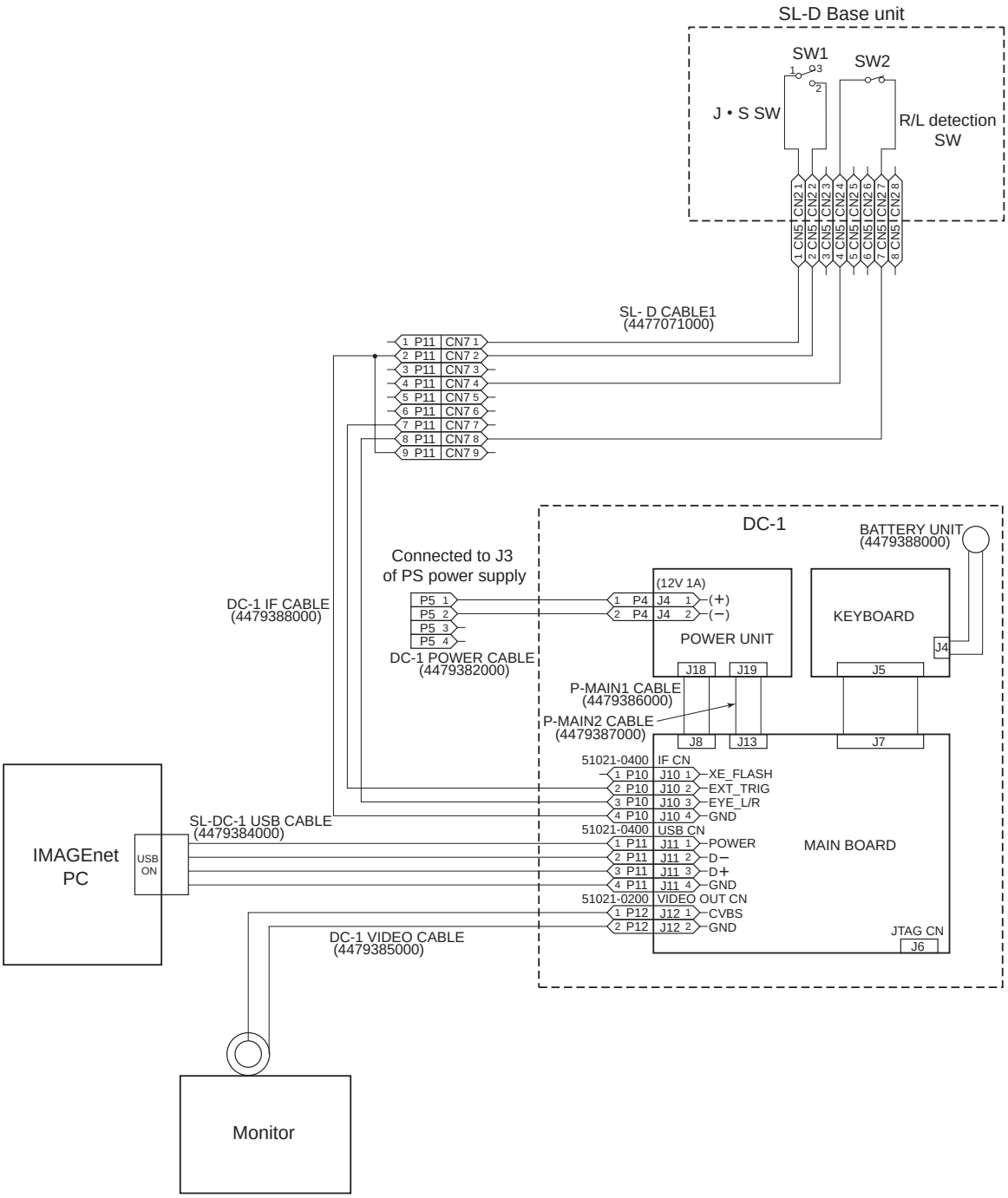
(4) SL-D7+TL-54+JVC KY-F70BU+FD-21 (IMAGEnet is connected)



(5) SL-D7+DC-1+FD-21 (IMAGEnet is connected)



(6) SL-D7+DC-1(IMAGEnet is connected)



2. REPAIR WORKS

2-1 Inspection

Unit	No.	Item	Checking method and judgment	Adjustment and repair methods	Tools and tool No.
SR-52	(1)	Shift of screen center	Project the ϕ0.2 aperture on the test bar and measure with the focus positioning tool. [±1mm in up/down/right/left]	Positioning of optical axis for SR-52	Focus positioning tool 1
	(2)	Blurring of photographic image	Project the ϕ10 aperture on the test bar and use the focus positioning tool to observe the focus of the scale line and test bar surface.	Focusing for SR-52	Focus positioning tool 1
SR-53	(1)	Shift of screen center	Project the ϕ0.2 aperture on the test bar and measure with the focus positioning tool. [±1mm in up/down/right/left]	Positioning of optical axis for SR-53	Focus positioning tool 1
	(2)	Blurring of photographic image	Project the ϕ10 aperture on the test bar and use the focus positioning tool to observe the focus of the scale line and test bar surface.	Focusing for SR-53	Focus positioning tool 1
DC-1	(1)	Shift of camera center	Project the ϕ0.2 aperture on the test bar and check by taking a photograph.	Replacement of the unit	——
	(2)	Blurring of camera	Project the ϕ10 aperture on the test bar and observe the focus by taking a photograph.		——

2-2 Adjustments

* Before carrying out adjustment, if the screw lock has been applied to any screw, dissolve it using Isoamyl acetate.

2-2-1 SR-52

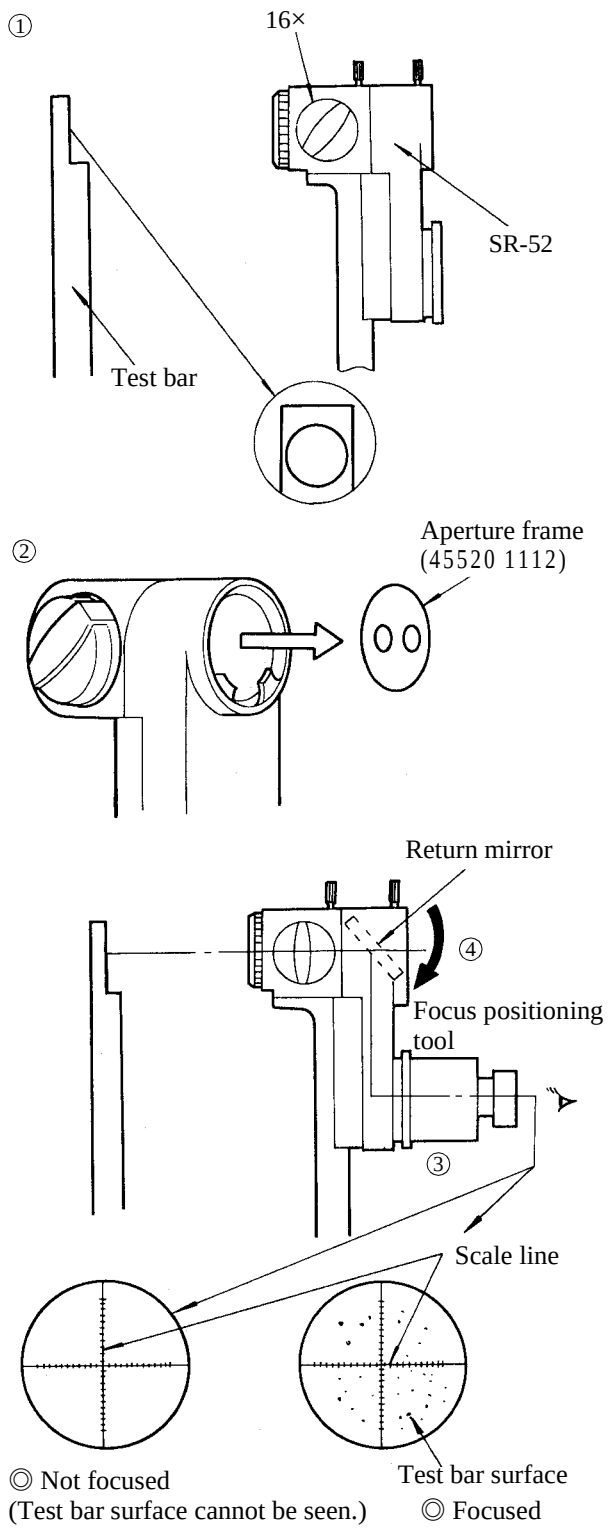
Illustration	Procedure
	(1) Focusing The photographic focal point is poor and photographs are not clear. ① Attach SR-52 to the main unit, turn the magnification drum to 16× and project the ϕ10 aperture on the test bar. ② Remove the aperture frame (45520 1112). ③ Attach the focus positioning tool to the camera mount unit. ④ Lower the return mirror with your finger and make sure that the scale line on the focus positioning tool is fit to the focus on the test bar surface.

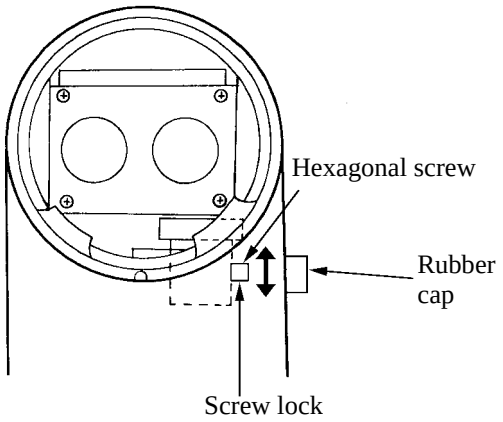
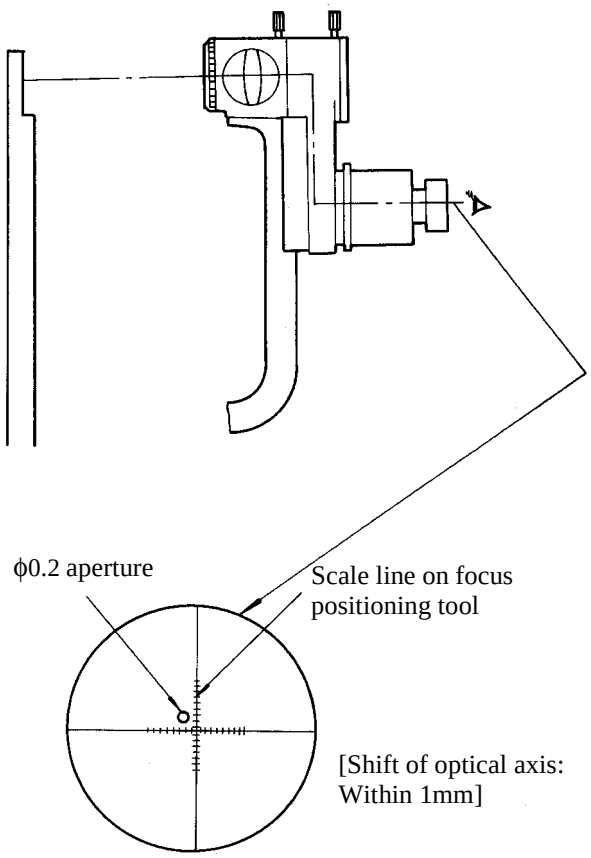
Illustration	Procedure
⑤  ⑥  	⑤ If the focus is off, remove the rubber cap, loosen the hexagonal screw, and move the tool up and down to where the focus is best. After adjusting the position, apply the screw lock and attach the rubber cap. ⑥ Project the ϕ0.2 aperture on the test bar and, as looking into the focus positioning tool, check the amount of shift. ⑦ When the optical axis is shifted, carry out positioning of optical axis. * Refer to "(2) Positioning of optical axis" in P.17 and P.18.

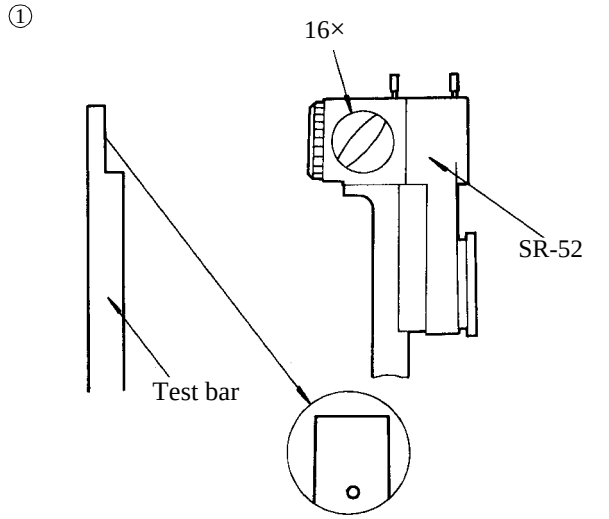
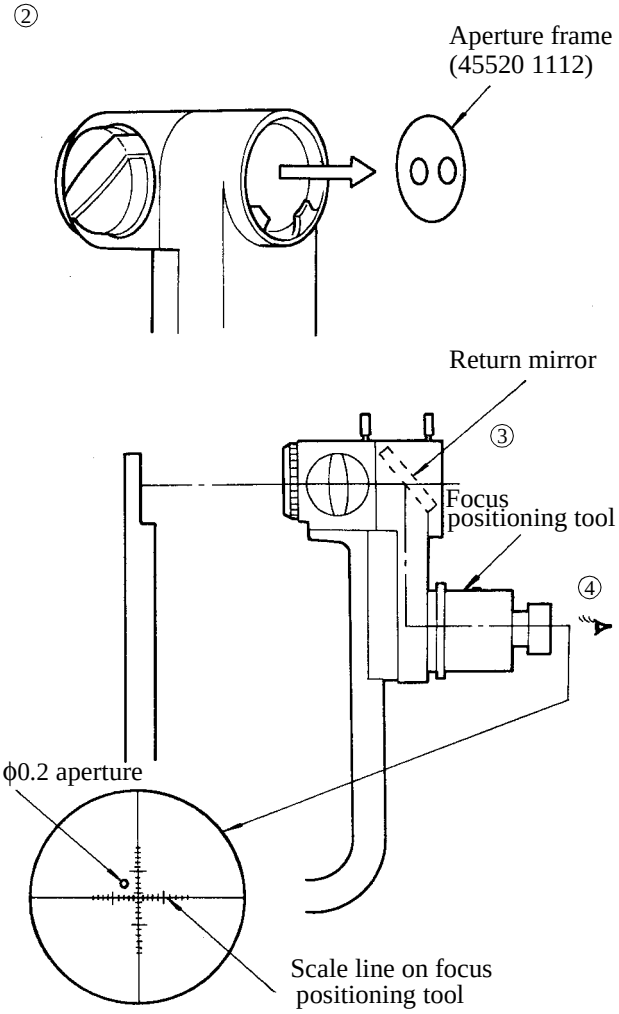
Illustration	Procedure
①  ②  	(2) Positioning of optical axis The photographic image is off in relation to the observed image. ① Attach SR-52 to the main unit, turn the magnification drum to 16× and project the ϕ0.2 aperture on the test bar. ② Remove the aperture frame (45520 1112). ③ Attach the focus positioning tool to the camera mount unit. ④ As looking into the focus positioning tool, check the amount of shift. Screen center shift: ±1mm

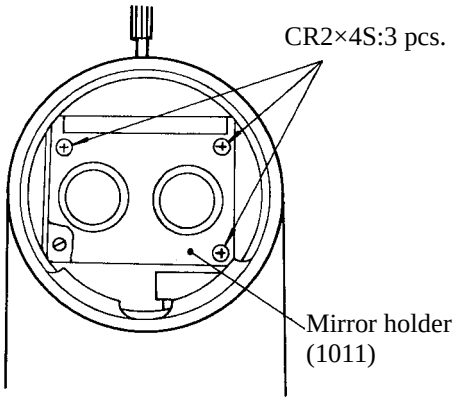
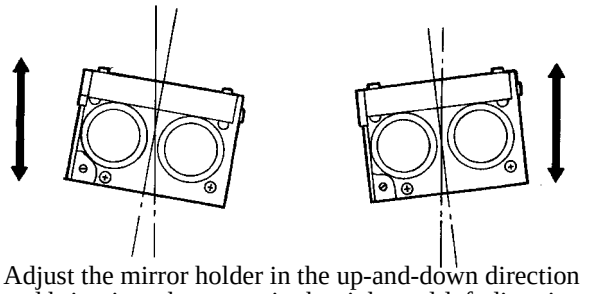
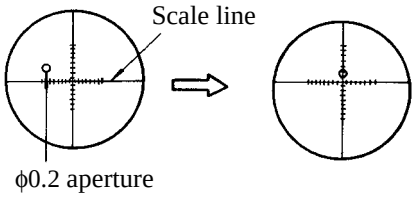
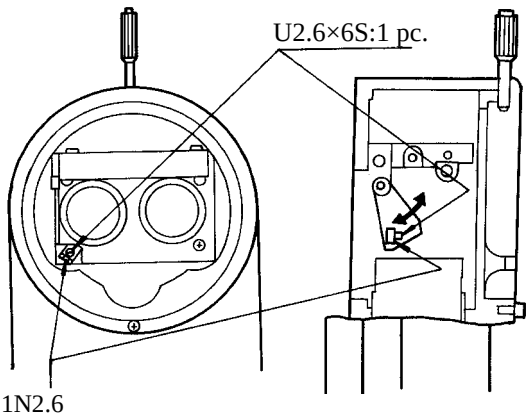
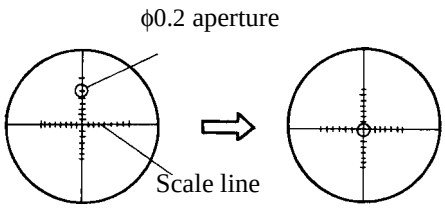
Illustration	Procedure
⑤   Adjust the mirror holder in the up-and-down direction and bring it to the center in the right-and-left direction. ⑦   	⑤ When the optical axis is shifted by 1mm or more in the right-and-left direction: Loosen the 3 screws CR2×4S and move the one side of the mirror holder (1011) up and down for adjustment. ⑥ After adjusting accuracy, tighten the 3 screws CR2×4S securely and apply the screw lock. ⑦ When the optical axis is shifted by 1mm or more in the up-and-down direction: Loosen the 1 piece 1N2.6, adjust 1 piece U2.6×6S and bring the optical axis to the center.

Illustration	Procedure
 Adjust 1 piece U2.6×6S and bring the optical axis to the center.	⑧ After adjusting accuracy, tighten 1N2.6 securely and apply the screw lock.

2-2-2 SR-53

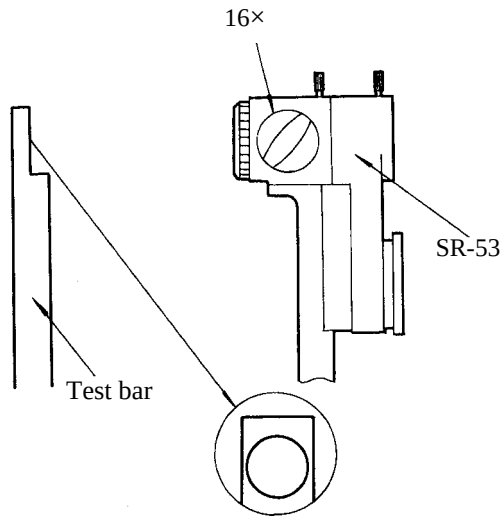
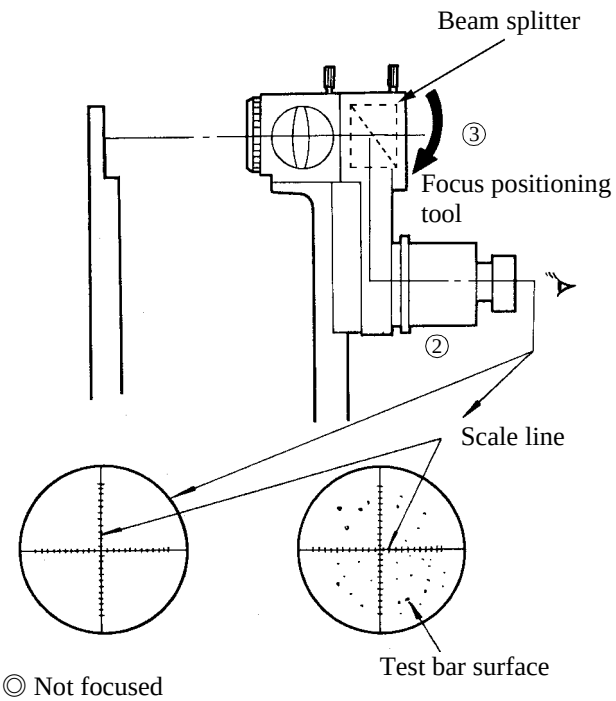
Illustration	Procedure
①   ◎ Not focused (Test bar surface cannot be seen.) ◎ Focused	(1) Focusing The photographic focal point is poor and photographs are not clear. ① Attach SR-53 to the main unit, turn the magnification drum to 16× and project the ϕ10 aperture on the test bar. ② Attach the focus positioning tool to the camera mount unit. ③ Make sure that the scale line on the focus positioning tool is fit to the focus on the test bar surface.

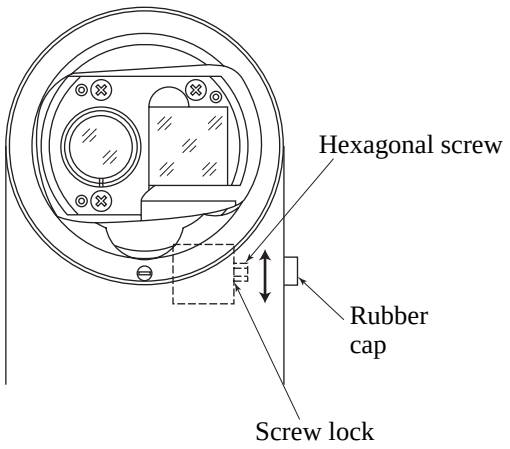
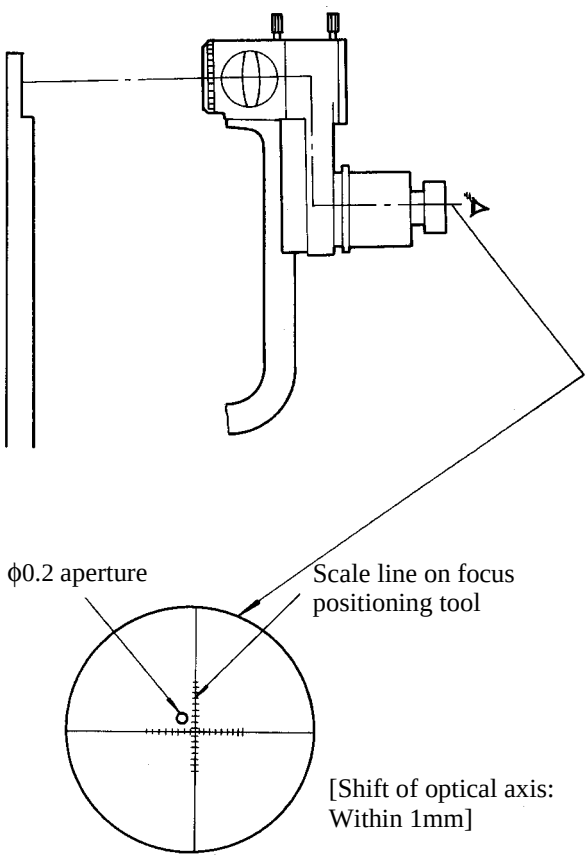
Illustration	Procedure
④  ⑤  	④ If the focus is off, remove the rubber cap, loosen the hexagonal screw, and move the tool up and down to where the focus is best. After adjusting the position, apply the screw lock and attach the rubber cap. ⑤ Project the ϕ0.2 aperture on the test bar and, as looking into the focus positioning tool, check the amount of shift. ⑥ When the optical axis is shifted, carry out positioning of optical axis. * Refer to "(2) Positioning of optical axis" in P.22 and P.23.

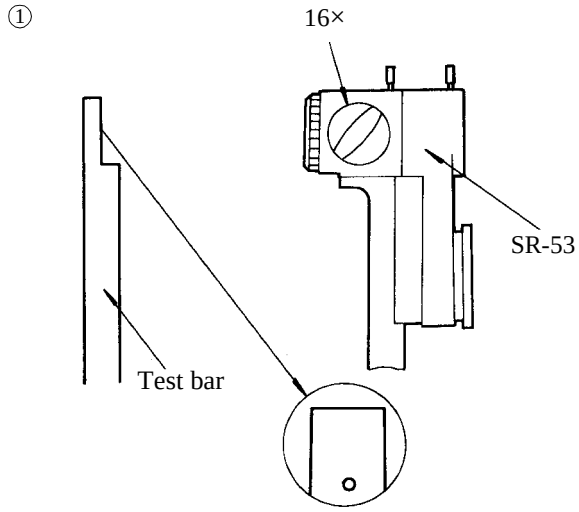
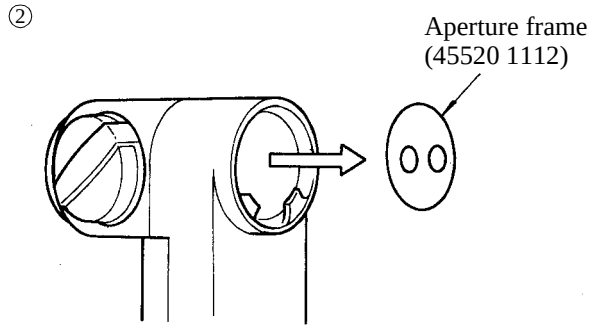
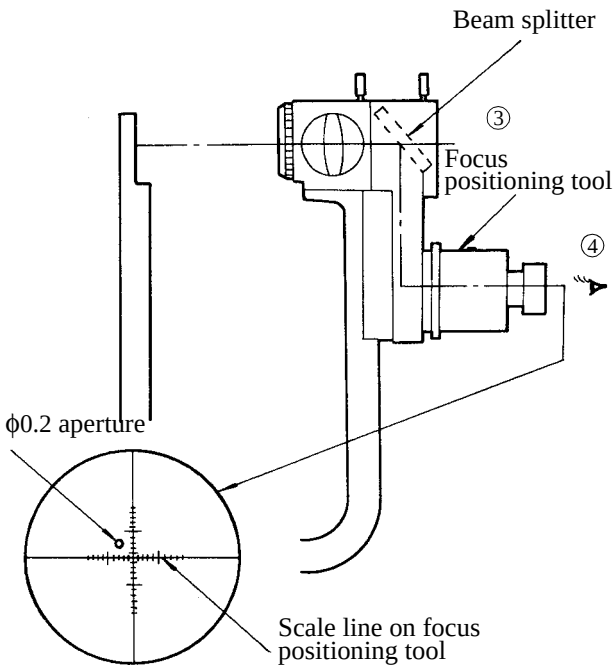
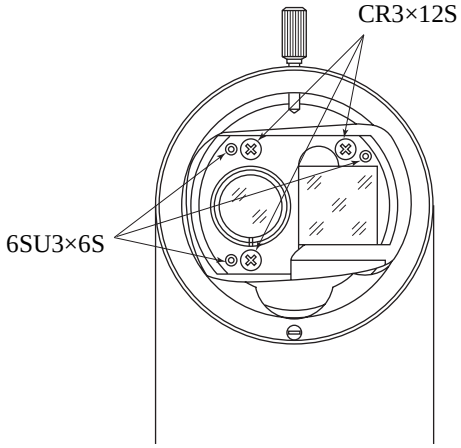
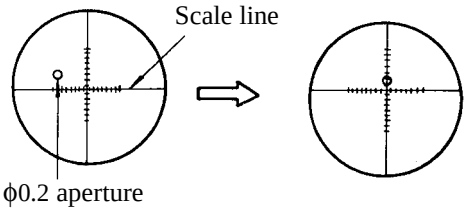
Illustration	Disassembly procedure
①  ②   	(2) Positioning of optical axis The photographic image is off in relation to the observed image. ① Attach SR-53 to the main unit, turn the magnification drum to 16× and project the ϕ0.2 aperture on the test bar. ② Remove the aperture frame (45520 1112). ③ Attach the focus positioning tool to the camera mount unit. ④ As looking into the focus positioning tool, check the amount of shift. Screen center shift: ±1mm

Illustration	Procedure
⑤   	⑤ When the optical axis is shifted by 1mm or more in the right-and-left direction: Make adjustment with the 3 push screws (6SU3×6S) and the 3 pull screws (CR3×12S). ⑥ After adjusting accuracy, apply the screw lock to the 6 screws.

2-3 Order of Repairs

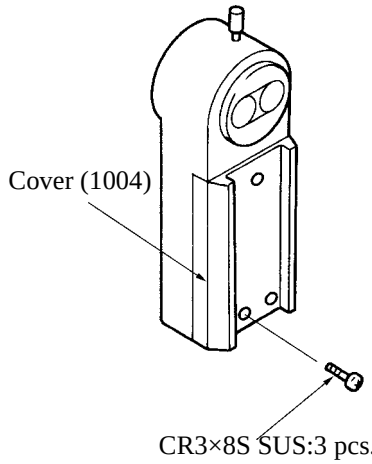
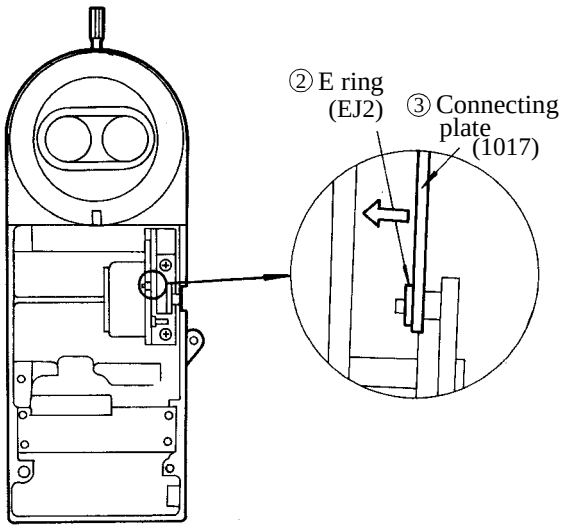
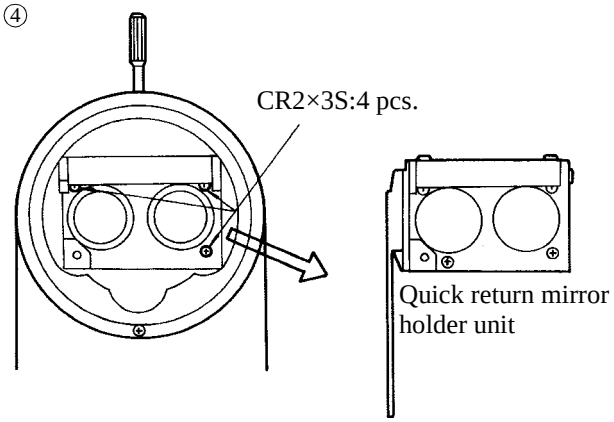
Precautions for repairs:

1. The following sections describe disassembling and assembling units. Correctly repairing these components requires considerable experience in assembly and adjustment of medical equipment. Only qualified persons should carry out the following repairs.

2. Special tools are necessary for repair.
   • Focus positioning tool
   When this tool is necessary for repair owing to unavoidable circumstances, please order it from Topcon.

3. Before loosening screws, use Isoamyl acetate to dissolve the screw lock that has been applied to the screws. Apply fresh screw lock after repair.

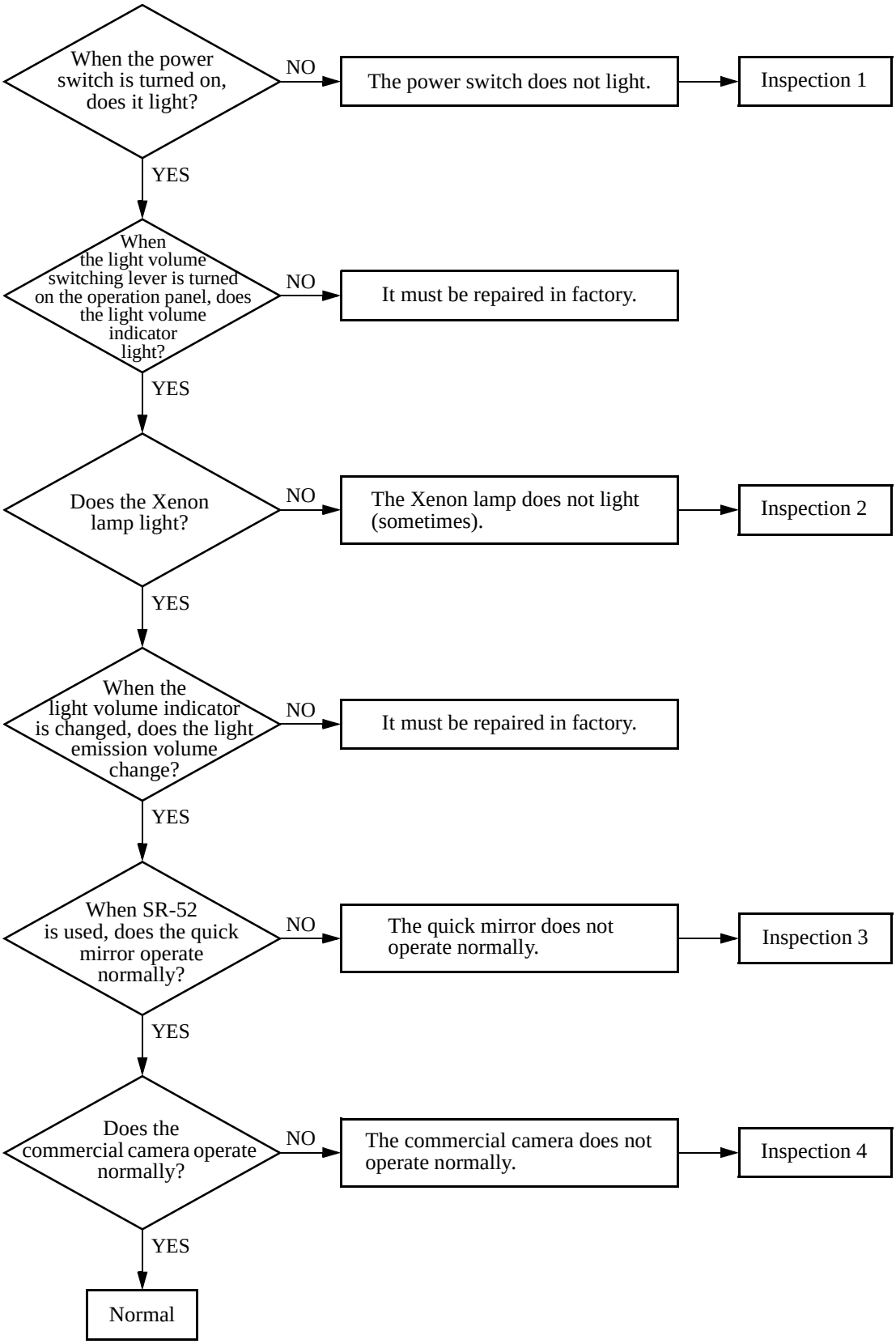
2-3-1 SR-52 Disassembly and assembly procedure

Illustration	Disassembly procedure
①   ④  	(1) Removal of cover ① Remove the 3 screws CR3×8S SUS and then remove the cover (1004). (2) Removal of the quick return mirror holder unit ① Remove the cover (1004). ② Remove the E ring. ③ Remove the connecting plate (1017) from the shaft. ④ Remove the 4 screws CR2×3S. ⑤ Remove the quick return mirror holder unit.

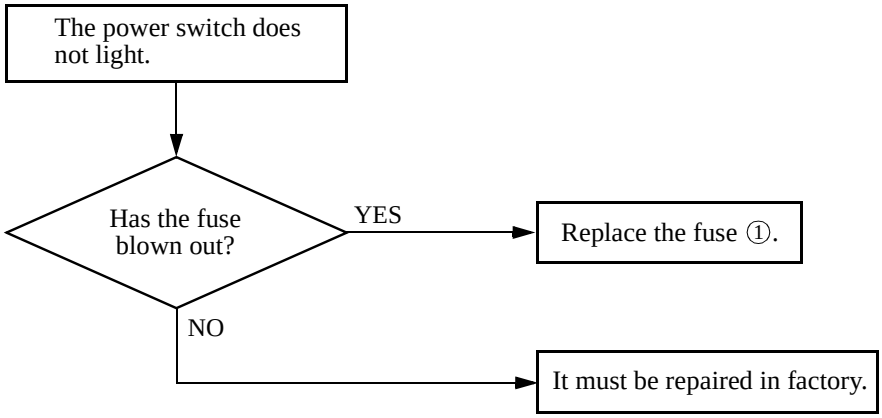
2-3-2 Trouble shooting (Photographic unit)

No.	Symptom	Cause	Treatment	Tools	Reference page
1	Shifting of screen center	• The quick return mirror is incorrectly positioned. • The prism is incorrectly positioned. • The relay is incorrectly positioned.	Take a proper measure for each unit.	• Focus positioning tool	SR-52 (P.17) SR-53 (P.22) Refer to the instruction manual for TL-54/55. Replace the unit for DC-1.
2	Photographic focus is not clear.	Eyepiece visual acuity is not correct.	Attach the test bar and adjust the eyepiece visual acuity.		P. 22, 23
		Focus is not correct on the microscope of the main unit.	Carry out focusing according to the SL-D7 repair manual.	• Diopter telescope	Refer to the SL-D7 repair manual.
		Focus is not correct.	Adjust the photographic lens frame.	• Focus positioning tool	SR-52 (P.15) SR-53 (P.20) Refer to the instruction manual for TL-54/55. Replace the unit for DC-1.

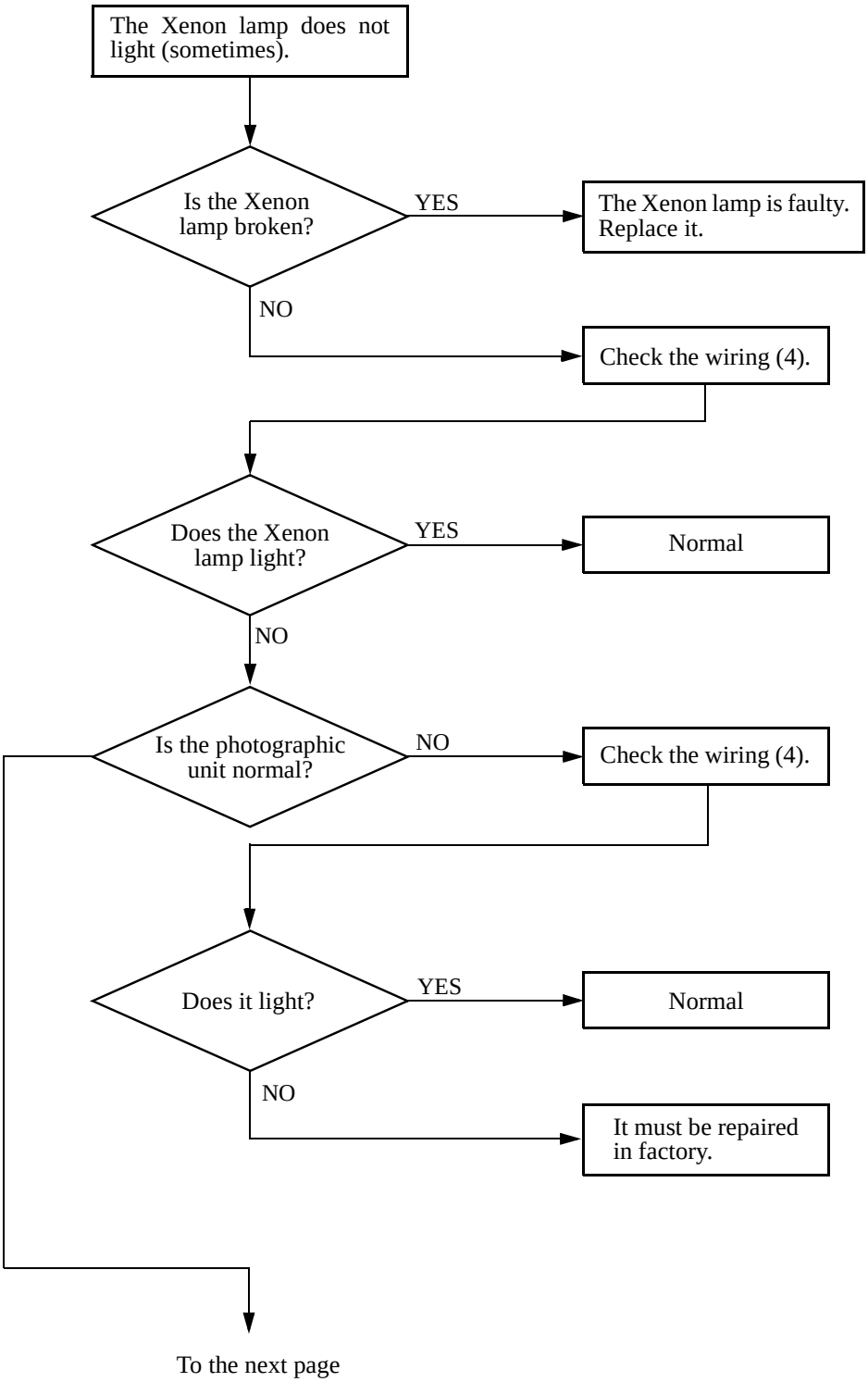
2-3-3 Trouble shooting (Photographic power supply)



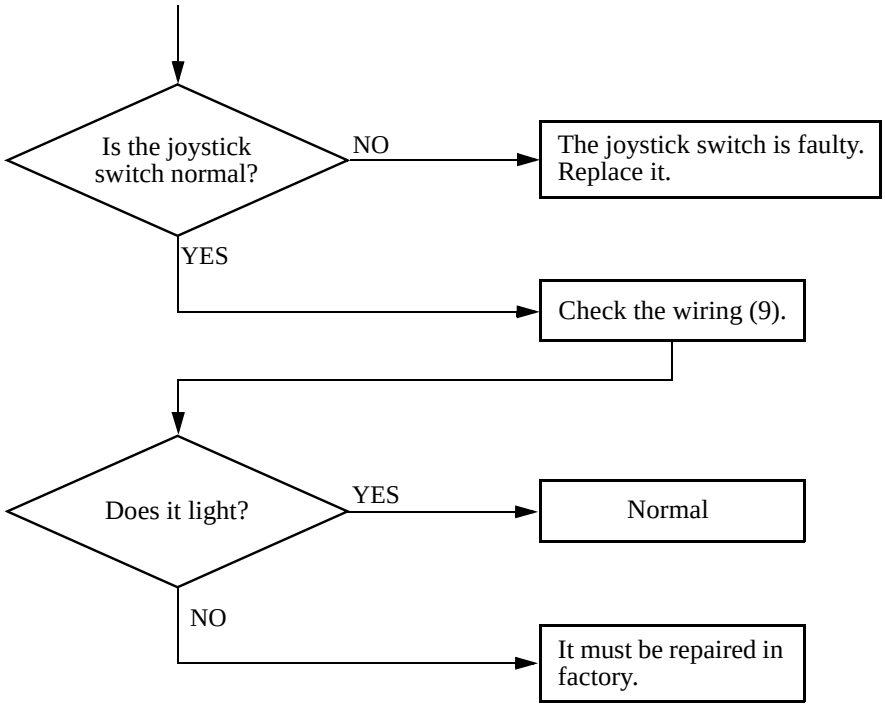
Inspection 1	Checking order	Contents of check



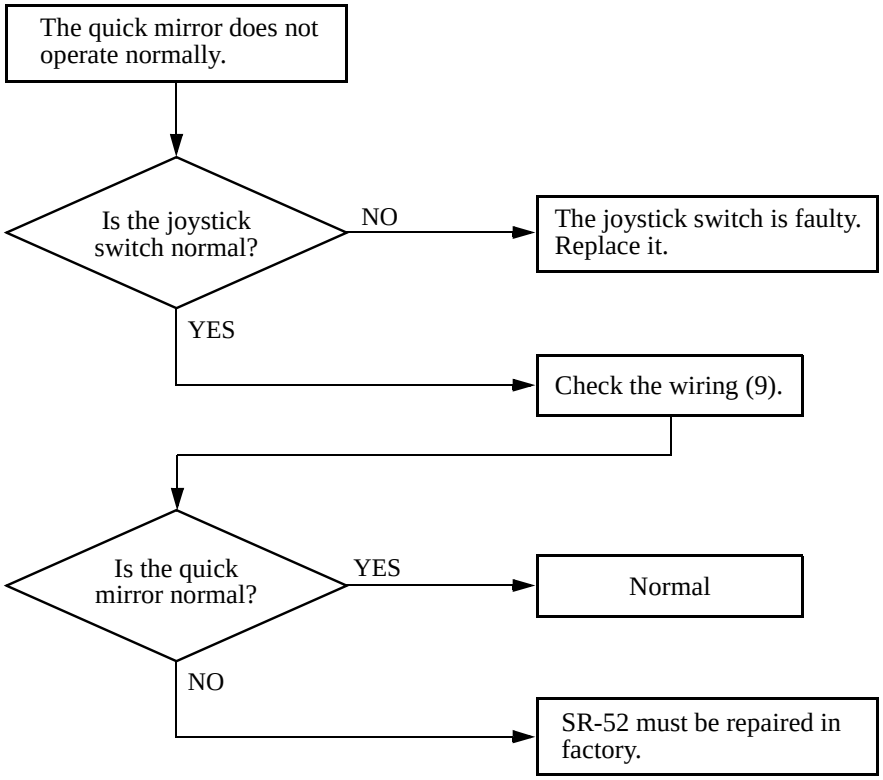
Inspection 2	Checking order	Contents of check



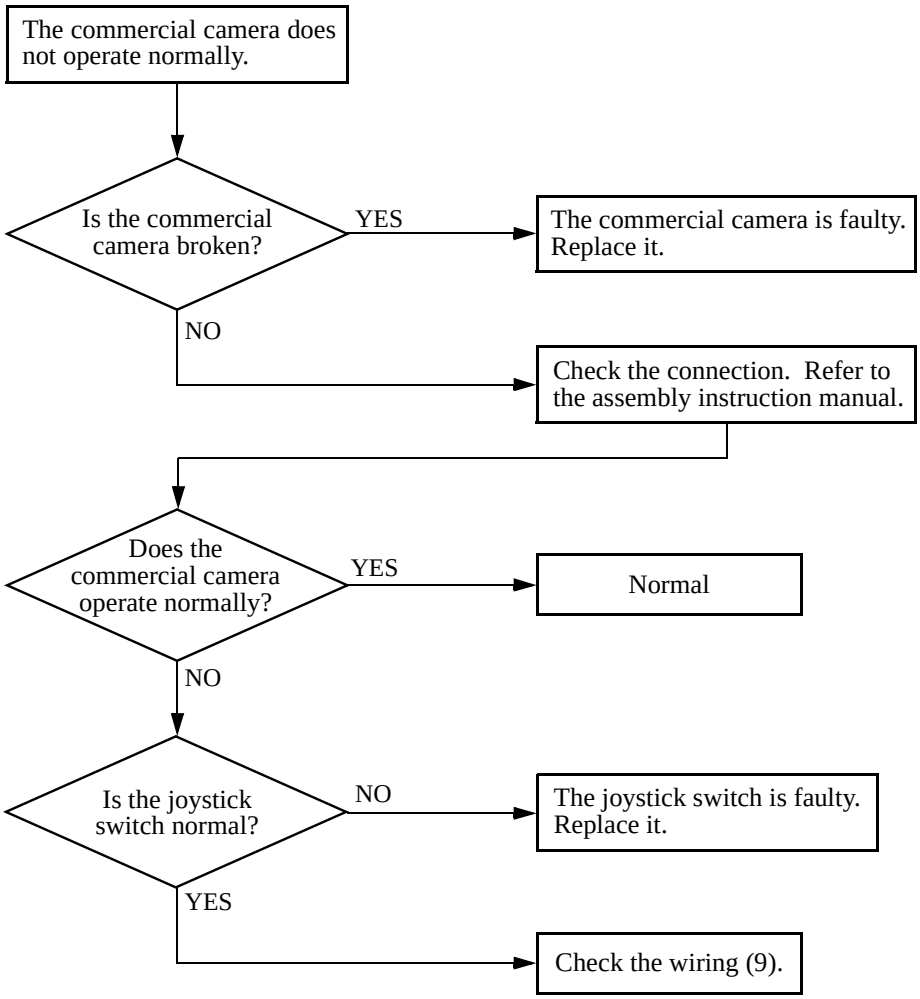
Inspection 2	Checking order	Contents of check



Inspection 3	Checking order	Contents of check



Inspection 4	Checking order	Contents of check



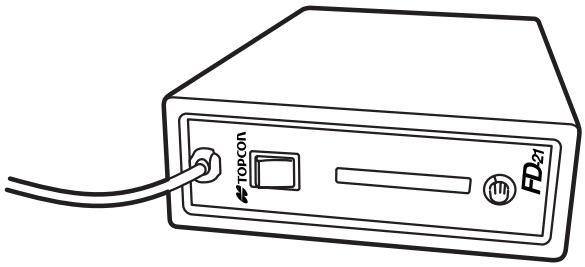
2-3-4 Wiring check

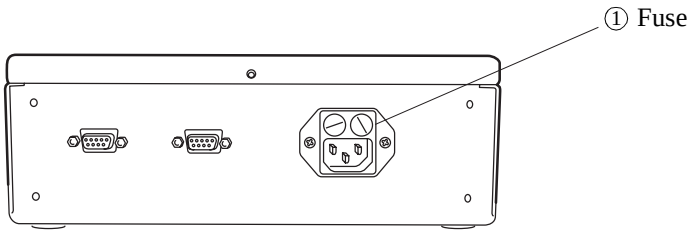
This section describes the special checks that are required when the problem is diagnosed as "Check the wiring" in the flowchart of "2-3-3 Trouble shooting (photographic power supply)". The number in parentheses for the "Check the wiring" in "2-3-3 Trouble shooting (photographic power supply)" corresponds to "No." in the following table.
Use the tester to check between "From" and "To" in "Checking interval".
If the wire passes through a part on the way, such a part is shown in "Via".
Check it at the same time. Refer to "Electric System wiring Diagram".

No.	Applicable matter	Checking interval			
		From	Via	To	Remarks
(4)	Disconnection	Connector P13 ①	~	Connector P17 ①	
		Connector P13 ②	~	Connector P17 ②	
		Connector P13 ④	~	Connector P17 ④	SR-52 Stand Alone type
		Connector P13 ⑤	~	Connector P17 ⑤	
		Connector P13 ⑦	~	Connector P17 ③	
		Connector P13 ④	~	Connector P14 ④	SR-52 IMAGEnet type
		Connector P13 ⑦	~	Connector P14 ⑦	
		Connector P13 ⑧	~	Connector P14 ⑧	
		Connector P13 ②	~	Connector P14 ②	
(9)	Disconnection Short circuit	Connector CN2 ①	~	Common side of joystick SW	
		Connector CN2 ②	~	Normal open side of joystick SW	

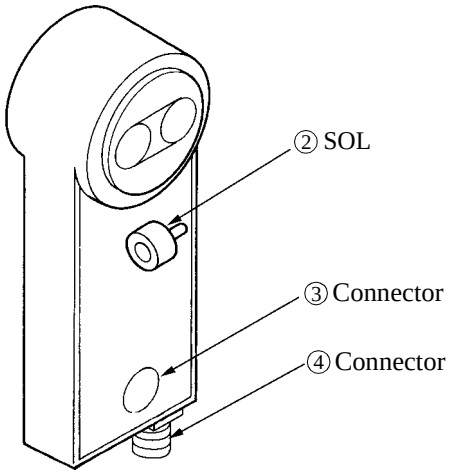
2-3-5 Electric parts arrangement

(1) FD-21

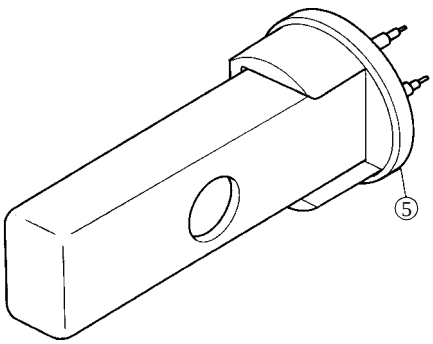




(2) SR-52



(3) Xenon lamp

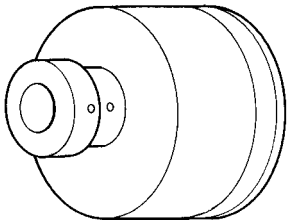
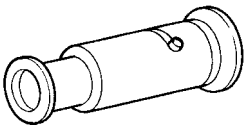


2-3-6 Electric parts number table

No.	Part name	Symbol	Order No.	Rating	Remarks
①	Fuse	F1, F2	44790 5501	5TT10 Bell Fuse	
②	Quick mirror solenoid	SOL1	44790 1023		
③	Connector	J17	44642 31520	HR-12-10R-5SD Hirose	
④	Connector	J18	44691 15050	R03-RB5F Tajimi	
⑤	Xenon lamp	Xe, LAMP	40365 40000		

2-4 Repair Tool List

2-4-1 Special repair tool list

Tool No.	Name	Illustration	Performance/ Accuracy	Application	Remarks
1	Focus positioning tool		Distance between calibrations (0.1mm) for SR-52/53	• Focusing • Positioning of optical axis	
2	Diopter telescope		Observation magnification (3.4×)	• Focusing	

2-4-2 General repair tool list

- Tester (type that can measure voltage, electric current and resistance)
- Set of 6 slotted screwdrivers
- Set of 4 Phillips screwdrivers
- 3mm Phillips screwdriver with wooden handle
- Hexagonal wrench set
- Radio pliers
- Nippers
- Tweezers
- Soldering iron
- Solder

TOPCON MEDICAL SYSTEMS, INC
37 West Century Road,Paramus,New Jersey 07652,U.S.A. Phone:201-261-9450 Fax:201-387-2710 www.topcon.com

TOPCON CANADA INC.
110 Provencher Avenue, Boisbriand, QC J7G 1N1 CANADA Phone:450-430-7771 Fax:450-430-6457 www.topcon.ca

TOPCON OMNI SYSTEMS,INC.
Valley Forge Business Center, 2430 Blvd. of the Generals, Norristown,PA 19403,U.S.A. Phone:610-630-9200 Fax:610-630-6428 www.topconomni.com

TOPCON EUROPE B.V.
（**European Representative**）
Essebaan 11, 2908 LJ Capelle a/d IJssel,THE NETHERLANDS Phone:010-4585077 Fax:010-4585045 www.topconeurope.com
ITALY OFFICE: Via Monfalcone 39, 20092 Cinisello B. mo (MI) ITALY Phone:02-61-25-583 Fax:02-61-25-927

TOPCON DEUTSCHLAND G.m.b.H.
Weidkamp D-180 45356 Essen, GERMANY Phone:0201-8619-200 Fax:0201-8619-275 www.topcon.de Med@topcon.de

TOPCON ESPAÑA S.A.
HEAD OFFICE: Frederic Mompou 5, ED. Euro 3, 08960,Sant Just Desvern Barcelona,SPAIN Phone:93-4734057 Fax:93-4733932 www.topconesp.com
MADRID OFFICE: Avenida Burgos, 16E,1 ° 28036,Madrid,SPAIN Phone:91-302-4129 Fax:91-383-3890

TOPCON S.A.R.L.
89, rue de Paris 92585 Clichy, Cedex,FRANCE Phone:01-4106-9494 Fax:01-4739-0251

TOPCON SCANDINAVIA A.B.
Neongatan 2 S-43151 Molndal, SWEDEN Phone:031-7109200 Fax:031-7109249 info@topcon.se

TOPCON (GREAT BRITAIN) LTD.
Topcon House,Kennet Side,Bone Lane,Newbury,Berkshire RG14 5PX United Kingdom Phone:01635-551120 Fax:01635-551170

TOPCON SOUTH ASIA PTE.LTD.
Blk 192 Pandan Loop, #07-01 Pantech Industrial Complex, SINGAPORE 128381 Phone:62780222 Fax:62733540 www.topcon.com.sg

TOPCON INSTRUMENTS (MALAYSIA) SDN.BHD.
Excella Business Park Block C,Ground & 1st Floor,Jalan Ampang Putra,Taman Ampang Hillir, 55100 Kuala Lumpur,MALAYSIA Phone:03-42701068 Fax:03-42704508

TOPCON INSTRUMENTS (THAILAND) CO.,LTD.
77/162 Sinn Sathorn Tower, 37th Fl.,Krungdhonburi Rd.,Klongtonsai, Klongsarn, Bangkok 10600,THAILAND Phone:440-1152～7 Fax:440-1158

TOPCON AUSTRALIA PTY.LTD.
408 Victoria Road,Gladesville,NSW 2111,AUSTRALIA Phone:02-9817-4666 Fax:02-9817-4654 www.topcon.com.au

TOPCON KOREA CORPORATION
2F Yooseoung Bldg., 1595-3, Seocho-Dong, Seocho-Gu, Seoul, 137-876 KOREA Phone:02-2055-0321 Fax:02-2055-0319 www.topcon.co.kr

TOPCON OPTICAL (H.K.) LTD.
2/F.,Meeco Industrial Bldg.,No.53-55 Au Pui Wan Street,Fo Tan Road,Shatin,N.T.,Hong Kong Phone:2690-1328 Fax:2690-2221 E-mail:sales@topcon.com.hk

TOPCON CORPORATION BEIJING OFFICE
Room No.962 Poly Plaza Building,14 Dongzhimen Nandajie Dongcheng District,Beijing,100027,CHINA Phone:10-6501-4191~2 Fax:10-6501-4190

TOPCON CORPORATION BEIRUT OFFICE
P.O.Box 70-1002 Antelias,BEIRUT-LEBANON Phone:961-4-523525/523526 Fax:961-4-521119

TOPCON CORPORATION DUBAI OFFICE
C/O Atlas Medical FZCO., P.O.Box 54304 C-25, Dubai Airport Free Zone, UAE Phone:971-4-2995900 Fax:971-4-2995901

TOPCON CORPORATION

75-1 Hasunuma-cho,Itabashi-ku,Tokyo,174-8580 Japan.
Phone:3-3558-2520 Fax:3-3960-4214 www.topcon.co.jp

Printed in Japan 0308-400TH ①
P-SLD_OPTION-0-0308-14