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# REPAIR MANUAL

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ISSUED..... AUG. 2003

REVISED .....

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SLIT LAMP

SL-D7

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TOPCON CORPORATION

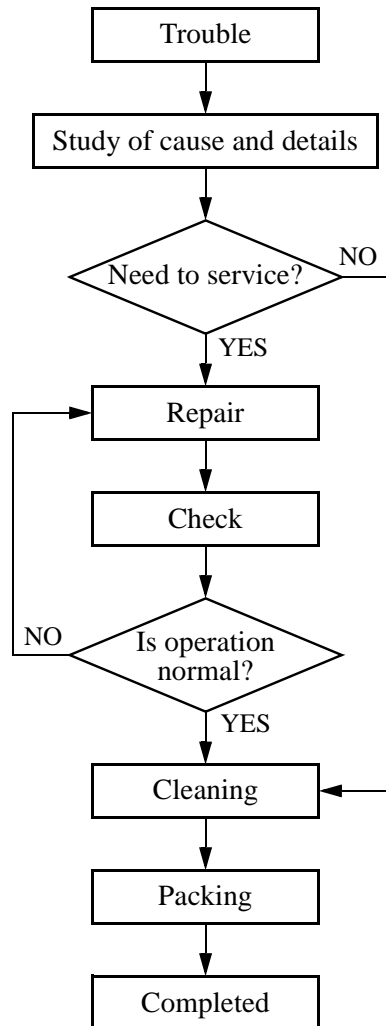
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# 1. INTRODUCTION

## 1-1 How to Use This Repair Manual

(1) Follow the procedure described in the flowchart below.

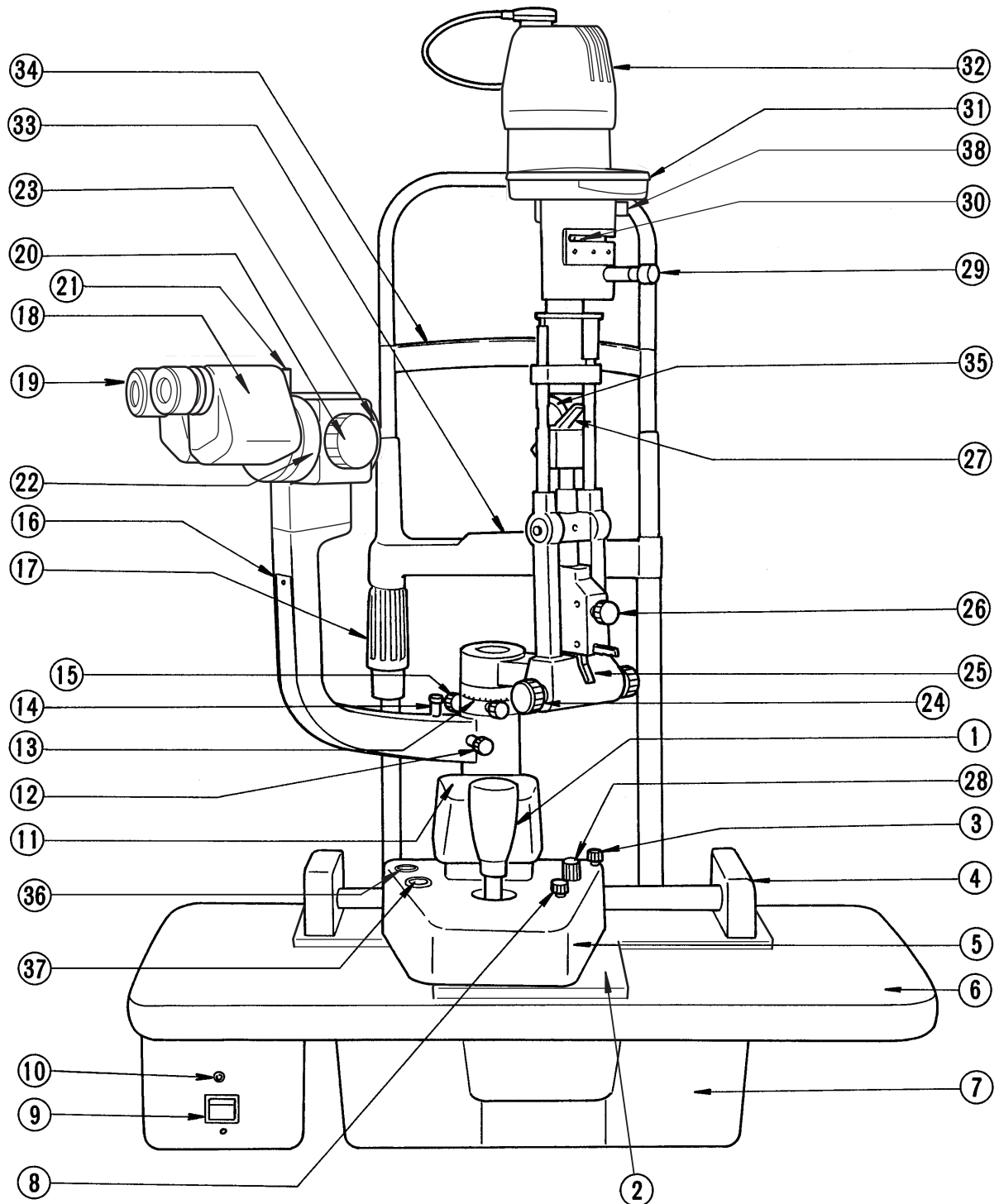


## 1-2 Precautions for Repairs

- (1) Disassemble, assemble, repair or adjust the optical system in the clean area where no dust or foreign matter will affect the instrument.
- (2) For assembly and inspection, refer to the assembly and instruction manual of SL-D7.
- (3) When repairing this instrument, use proper materials and tools correctly according to this manual.
- (4) As a rule, a metallic part should be replaced as a single part and an optical part as a unit in this manual.
- (5) Refer to the service parts list for the disassembly or assembly of the component not mentioned in this manual.
- (6) Don't use other lubricating oils or adhesives except those specified.
- (7) Order repair parts according to the service parts list.

## 1-3 Nomenclature

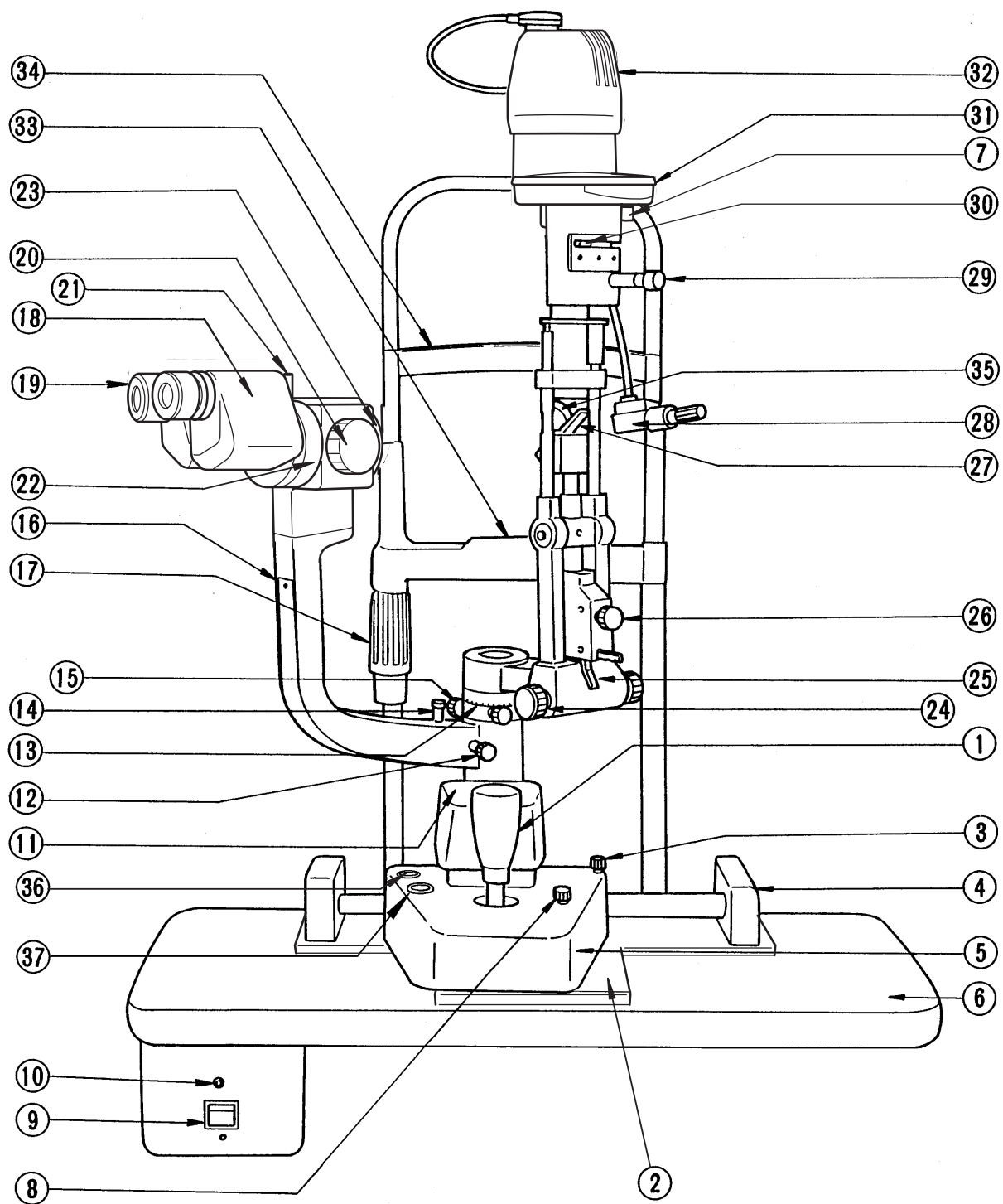
For Japan



- ① Control lever
- ② Chin rest base plate
- ③ Cross slide fixing knob
- ④ Rail cover
- ⑤ Cross slide
- ⑥ Table
- ⑦ Accessory drawer
- ⑧ Brightness control dial
- ⑨ Power switch
- ⑩ Pilot lamp
- ⑪ Up-and-down balance spring
- ⑫ Microscope arm fixing knob
- ⑬ Angle scale
- ⑭ Click stop roller
- ⑮ Illumination arm fixing knob
- ⑯ Arm cover
- ⑰ Chin rest up-and-down handle
- ⑱ Eyepiece
- ⑲ 12.5× eyepiece (with click)
- ⑳ Magnification change handle
- ㉑ Eyepiece tightening knob
- ㉒ Barrier filter unit
- ㉓ Objective lens
- ㉔ Slit width adjusting handle
- ㉕ Inclination stop lever
- ㉖ Centering knob
- ㉗ Mirror
- ㉘ R/L lock switch
- ㉙ Aperture/slit change handle
- ㉚ Filter selection lever
- ㉛ Aperture/slit display window
- ㉜ Lamp house cover
- ㉝ Chin rest
- ㉞ Forehead rest
- ㉟ Diffusion lens
- ㊱ Connector for light adjustment (5P)
- ㊲ Connector for image taking-in operation (8P)
- ㊳ Color temperature conversion filter

**Note: Refer to the instruction manual for the functions.**

For TMS, TE, TS and General

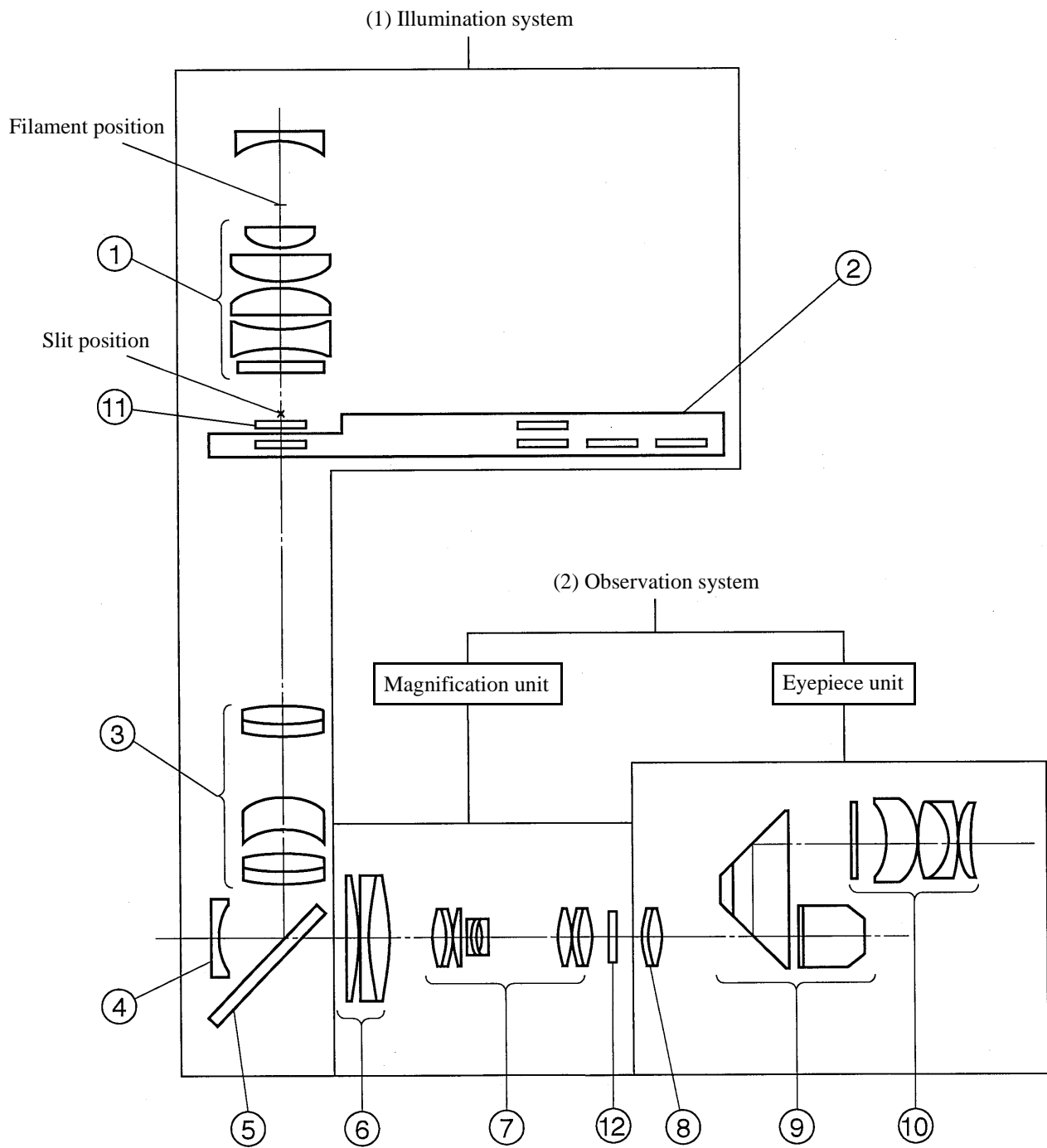


- ① Control lever
- ② Chin rest base plate
- ③ Cross slide fixing knob
- ④ Rail cover
- ⑤ Cross slide
- ⑥ Table
- ⑦ Color temperature conversion filter
- ⑧ Brightness control dial
- ⑨ Power switch
- ⑩ Pilot lamp
- ⑪ Up-and-down balance spring
- ⑫ Microscope arm fixing knob
- ⑬ Angle scale
- ⑭ Click stop roller
- ⑮ Illumination arm fixing knob
- ⑯ Arm cover
- ⑰ Chin rest up-and-down handle
- ⑱ Eyepiece
- ⑲ 12.5× eyepiece (with click)
- ⑳ Magnification change handle
- ㉑ Eyepiece tightening knob
- ㉒ Barrier filter unit (depending on destination, TE)
- ㉓ Objective lens
- ㉔ Slit width adjusting handle
- ㉕ Inclination stop lever
- ㉖ Centering knob
- ㉗ Mirror
- ㉘ Fixation target
- ㉙ Aperture/slit change handle
- ㉚ Filter selection lever
- ㉛ Aperture/slit display window
- ㉜ Lamp house cover
- ㉝ Chin rest
- ㉞ Forehead rest
- ㉟ Diffusion lens
- ㊱ Connector for optical adjustment (5P)
- ㊲ Connector for image taking-in operation (8P)

**Note: Refer to the instruction manual for the functions.**



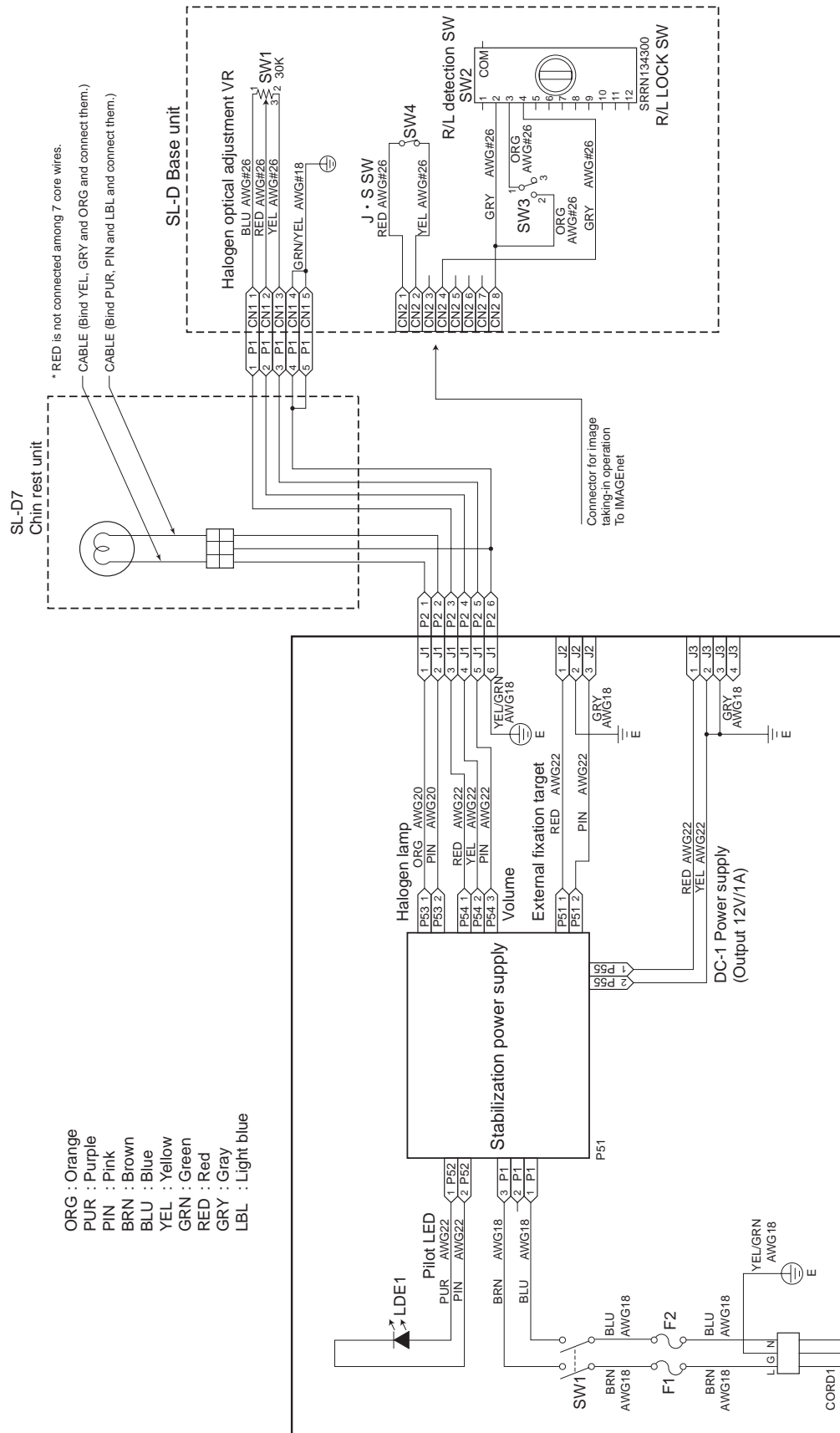
## 1-4 Optical Arrangement



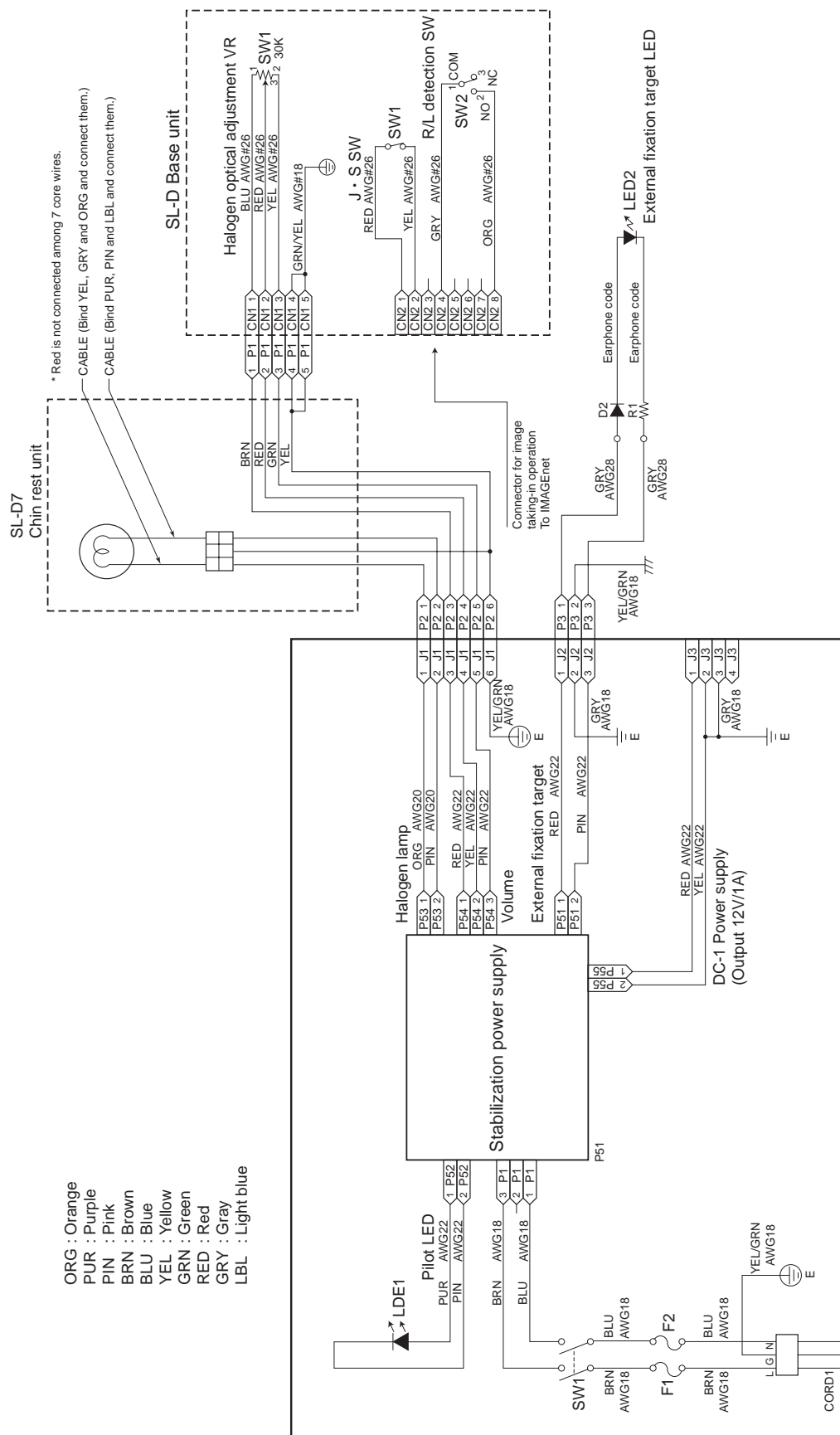
<b>Names of optical units</b>	<b>Functions</b>
① Condenser lens	Adjusts the condensing position for the main bulb filament.
② Filter	Selects the blue, red-free, ND, heat absorbing, UV cut, IR cut or exciter filter according to the clinical purpose.
③ Projection lens	Projects and focuses the slit image.
④ Diffusion lens	Widens the illumination field when photographing the anterior eye section.
⑤ Reflection mirror	Reflects the slit image to project it into the anterior eye section.
⑥ Microscope objective lens	
⑦ Magnification drum lens	
⑧ Eyepiece objective lens	Used to focus the observed image in the eyepiece and to align the optical axis.
⑨ Image erecting prism	Changes the inverted image in the microscope to the erect one and adjusts the rotation centering axis to prevent the image from moving due to the pupillary distance shift.
⑩ Eyepiece	Magnifies the observed image in the microscope and adjusts the diopter to the patient's eye.
⑪ Color temperature conversion filter	
⑫ Barrier filter	By combining with the exciter filter installed to the illumination system, observes and photographs the anterior eye section in fluorescent light.

# 1-5 Electric Circuit

For Japan



**For Export**



## 2. REPAIR GUIDE

### 2-1 Accuracy Check

No.	Item	How to check and allowance	How to adjust and repair	Tools and No.
1	Same focal point due to magnification	Focus at the maximum magnification and then decrease the magnification in turn, 25×, 16×, 10× and the minimum. Measure the diopter difference at each magnification.	Focus setting of microscope ..... P. 12	Diopter telescope ①
2	Image shifts when adjusting the pupillary distance.	Place the standard scale on the object. Set the pupillary distance at the minimum and then at the maximum and measure the maximum shift width of the optical axis. [within 0.05mm]	Accuracy setting of pupillary distance prism box ..... P. 15	Eyepiece with scale ② Standard scale ③
3	The slit width narrows of itself.	Check if the frictional force of handle is too weak to obtain the desired position when changing the slit width.	Adjustment of slit width adjusting force ..... P. 19	
4	When releasing the inclination unit, it inclines too quickly.	Check if the slit illumination inclines too quickly when removing the stopper.	Adjustment of inclination unit rotary force ..... P. 16	
5	Difference between the aperture and slit image	Measure the difference of the center in the slit open/close direction. [ Aperture $\phi 0.2$ : Within 0.03 ] [ Aperture $\phi 1, \phi 2$ : Within 0.1 ]	Center setting of aperture and slit image ..... P. 16	
6	The slit image shifts due to the slit rotation.	Set the aperture to $\phi 0.2$ . Rotate the slit vertically and then horizontally and measure the maximum shift distance of the slit image on the focusing rod.	Slit image shift setting when rotating the slit ..... P.17	Eyepiece with scale ② Standard scale ③
7	The slit image is out of focus.	Even after setting the same focal point in the microscope, the slit image is out of focus.	Focus setting of slit image ..... P.17	
8	The slit image shifts when rotating the illumination unit horizontally (in 30° right and left each).	Rotate the illumination arm in 30° right and left each and measure the shifting distance of the slit image. [Within 0.1mm]	Slit image shift setting when rotating the slit illumination unit horizontally ..... P.18	Eyepiece with scale ② Standard scale ③
9	The slit image shifts due to inclination.	Project the slit image on the focusing rod horizontally and incline it. Measure the vertical shifting distance of the slit image. [Within 0.05mm]	Slit image shift setting when inclined ..... P.18	Eyepiece with scale ② Standard scale ③
10	Trouble of click power of small and large arms	Check the click power by placing the small and large arms at stops on the same line.	Adjustment of click power of small and large arms ..... P.19	
11	Inclination of slit image	Project the slit image on the focusing rod and measure its inclination with the eyepiece. [Within 0.24mm at the slit length 14mm]	Adjustment of inclination of slit image ..... P.19	Eyepiece with scale ② Focusing rod ④

\* The width of a line provided on the eyepiece with scale is 0.02mm. When checking the accuracy, use this line as a guideline.

## 2-2 Adjustment

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

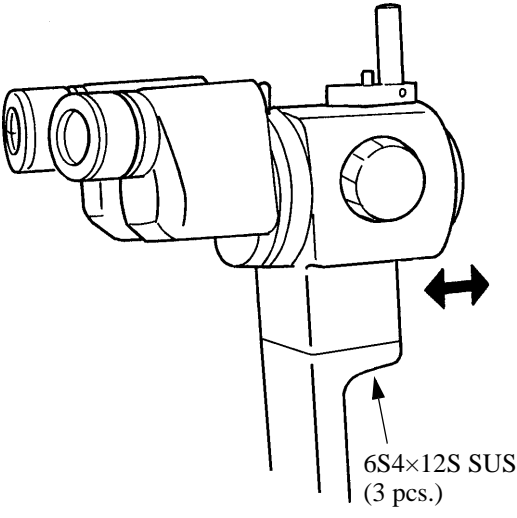
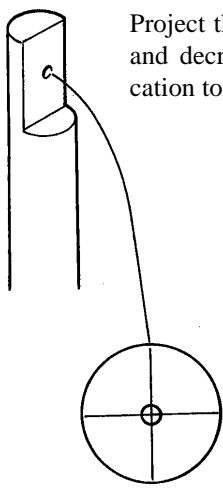
Illustration	Procedure										
 <p>6S4×12S SUS (3 pcs.)</p>  <p>Project the image on the focusing rod and decrease the maximum magnification to the minimum.</p> <table border="1" data-bbox="215 1534 726 1825"> <thead> <tr> <th>Displayed magnification ×</th><th>Diopter difference (dpt)</th></tr> </thead> <tbody> <tr> <td>25</td><td>0.5</td></tr> <tr> <td>16</td><td>0.6</td></tr> <tr> <td>10</td><td>0.15</td></tr> <tr> <td>(Minimum)</td><td>0.35</td></tr> </tbody> </table>	Displayed magnification ×	Diopter difference (dpt)	25	0.5	16	0.6	10	0.15	(Minimum)	0.35	<p><b>1. Focus setting of microscope</b></p> <ol style="list-style-type: none"> <li>① Loosen the screws 6S4×12S SUS (3 pcs.) fixing the microscope on the arm.</li> <li>② Change magnification as looking into the diopter telescope. Move the microscope back and forth, tighten the screws 6S4×12S SUS where it is in focus and apply the screw lock.</li> </ol>
Displayed magnification ×	Diopter difference (dpt)										
25	0.5										
16	0.6										
10	0.15										
(Minimum)	0.35										

Illustration	Procedure
<p>① Diopter telescope</p> <p>Eyepiece unit</p> <p>② Image lens frame (44670 1501)</p> <p>③ Magnification lens frame</p> <p>CQ2x5S Each 3 pcs. left and right</p> <p>Clamp knob</p> <p>Objective lens</p> <p>Magnification unit</p>	<p><b>2. Focusing</b></p> <p>When the microscope unit does not well focus and the slit image is not clear (with magnification drum unit at 16×):</p> <ol style="list-style-type: none"> <li>① Remove the eyepiece unit. Place the diopter telescope and sight a target as far as possible to check for diopter zero setting. The “0” on the diopter adjusting ring should be at the zero marker with 0.5 diopter allowance. If not, correct it.</li> <li>② Put into or put out the image lens frame (44670 1501) so that the finest focus is obtained at the “0” diopter on the scale. After adjustment, apply the screw lock.</li> <li>③ Mount the eyepiece unit on the magnification unit. Turn the magnification unit clamp knob clockwise to couple the eyepiece unit with the magnification unit, and then set the magnification drum at 25.6×. Focus each unit by moving the magnification lens frame (44670 1016) forward and backward.</li> <li>④ Apply the screw lock after focusing.</li> </ol>

Illustration	Procedure																										
<div><p>② Standard scale      ① Eyepiece with scale</p><p>Magnification unit</p><p>Eyepiece unit</p><p>③ Inward</p><p>Right eye</p><p>Eyepiece scale</p><p>Difference in height</p></div> <p>Optical axis parallelism between left and right</p> <table><tr><th rowspan="2">Direction</th><th rowspan="2">Optical axis parallelism</th><th colspan="5">Material dimensional conversion (mm)</th></tr><tr><th>6×</th><th>10×</th><th>16×</th><th>25×</th><th>40×</th></tr><tr><td>High and low</td><td>Within 20'</td><td>Within 0.24</td><td>Within 0.15</td><td>Within 0.09</td><td>Within 0.06</td><td>Within 0.04</td></tr><tr><td>Inward</td><td>50' ±25'</td><td>0.59 ±0.29</td><td>0.36 ±0.18</td><td>0.23 ±0.11</td><td>0.14 ±0.07</td><td>0.09 ±0.04</td></tr></table> <div><p>Eyepiece unit</p><p>④ 6SV3×5S Each 3 pcs. left and right</p><p>Objective lens frame</p><p>Magnification unit</p><p>Image lens</p><p>⑥ CQ2×5S Each 3 pcs. left and right</p></div>	Direction	Optical axis parallelism	Material dimensional conversion (mm)					6×	10×	16×	25×	40×	High and low	Within 20'	Within 0.24	Within 0.15	Within 0.09	Within 0.06	Within 0.04	Inward	50' ±25'	0.59 ±0.29	0.36 ±0.18	0.23 ±0.11	0.14 ±0.07	0.09 ±0.04	<h3>3. Optical axis setting</h3> <p>① Put the eyepiece with scale on the eyepiece unit and turn the diopter adjusting ring to adjust diopter.</p> <p>② Project a slit as narrow as possible (length: 9mm) on the standard scale.</p> <p>③ Judge which is wrong, the magnification unit or eyepiece unit.</p> <p>Set the magnification unit at 16× where no lens is set. Then, check the difference of images between when placing the slit vertically and horizontally to determine that the eyepiece is correctly adjusted.</p> <div><p>Difference</p><ul style="list-style-type: none"><li>• Optical axis: Difference in height: Within ±0.04mm Difference in height between left and right: Within 0.045mm</li><li>• Inward difference Inward slant: Within 0.15mm Inward slant between left and right: Within 0.23mm</li></ul></div> <p>④ When something is wrong with the eyepiece unit:</p> <p>Use the 6SV3×5S, 3 pcs. each on left and right sides, to move the objective lens frame (44670 1501) and adjust the difference within the standard.</p> <p>After adjustment, tighten the screws well and apply the screw lock.</p> <p>⑤ When the eyepiece unit is normal:</p> <p>Set the magnification unit at 40× and 25.6× and give the same checks in ③ above.</p> <p>See the table at left for the difference levels.</p> <p>⑥ When something is wrong with the magnification unit:</p> <p>Move the image lens frames (44670 1013, 44670 1016) with each 3 pcs. of CQ2×5S at 40× and 25.6× to be within the standard.</p> <p>After adjustment, tighten the screws well and apply the screw lock.</p>
Direction			Optical axis parallelism	Material dimensional conversion (mm)																							
	6×	10×		16×	25×	40×																					
High and low	Within 20'	Within 0.24	Within 0.15	Within 0.09	Within 0.06	Within 0.04																					
Inward	50' ±25'	0.59 ±0.29	0.36 ±0.18	0.23 ±0.11	0.14 ±0.07	0.09 ±0.04																					



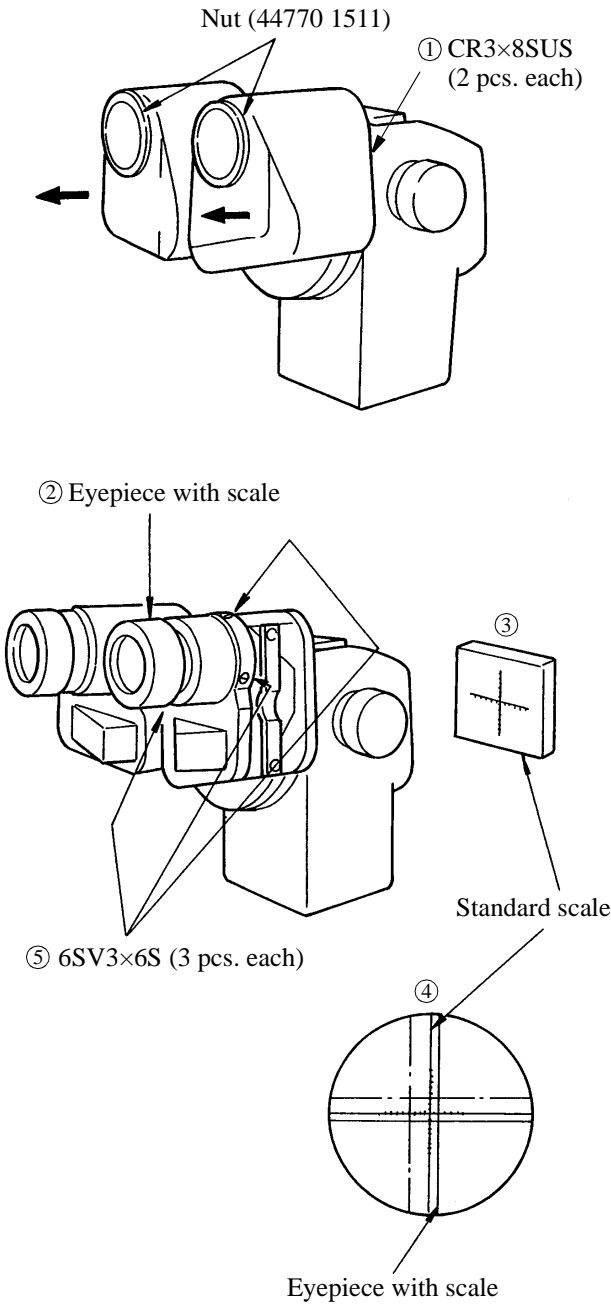
Illustration	Procedure
 <p data-bbox="316 1684 638 1713">[Image shift: Within 0.05mm]</p>	<p data-bbox="810 302 1431 365"><b>4. Accuracy setting of pupillary distance prism box</b></p> <ol data-bbox="815 371 1431 987" style="list-style-type: none"> <li>① Remove the nuts (44770 1511), loosen the screws CR3×8SUS (2 pcs. each) and remove the covers (44770 1503, 44770 1504).</li> <li>② Put the eyepiece with scale into the microscope unit.</li> <li>③ Bring the standard scale to the front focal point of the microscope unit.</li> <li>④ Adjust the eyepiece with scale and then move the pupillary distance prism box from the minimum to the maximum to check the difference from the standard scale.</li> <li>⑤ Move the eyepiece holder (44670 1521) with the screws 6SV3×6S (3 pcs. each) until the image does not move even when moving the pupillary distance prism box from the minimum to the maximum (in both right and left).</li> <li>⑥ Tighten the screws 6SV3×6S (3 pcs. each) fully after setting the accuracy.</li> </ol>

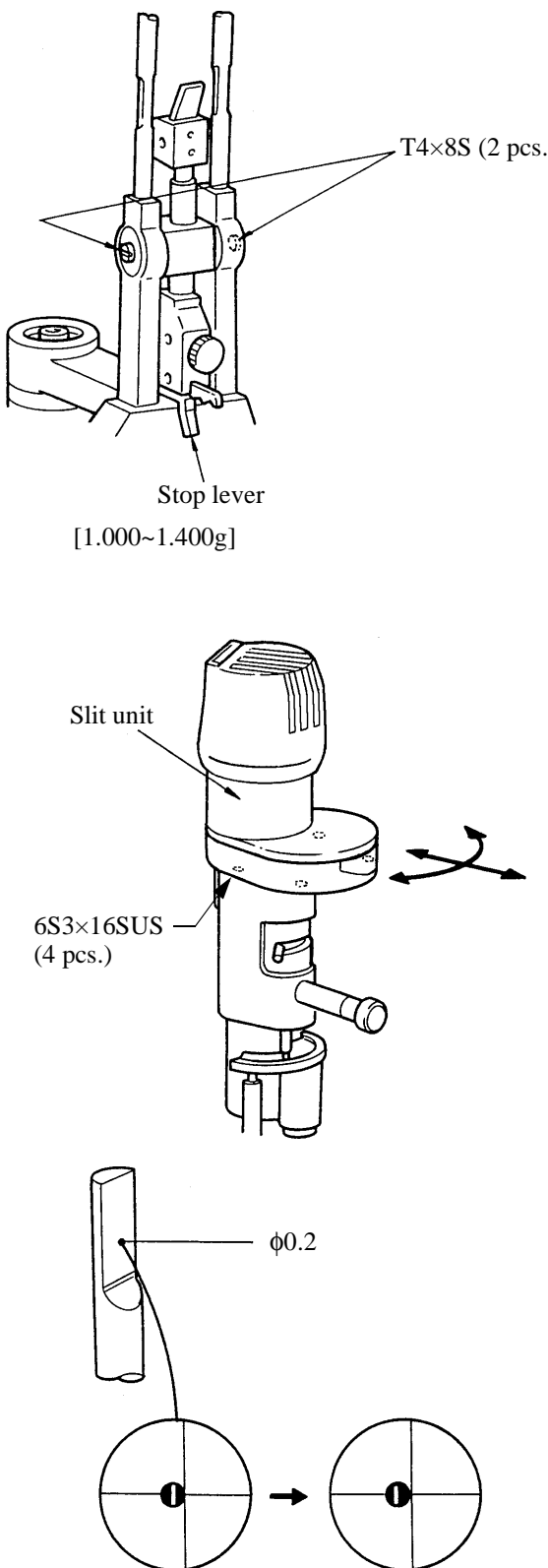
Illustration	Procedure
 <p>T4×8S (2 pcs.)</p> <p>Stop lever [1.000~1.400g]</p> <p>Slit unit</p> <p>6S3×16SUS (4 pcs.)</p> <p>φ0.2</p> <p>[ Aperture φ0.2: Within 0.03 Aperture φ1, φ2: Within 0.1 ]</p>	<p><b>5. Adjustment of inclination unit rotary force</b> Release the inclination stop lever and incline the illumination unit. If the illumination unit falls by itself while the stop lever is not applied to the stopper, make adjustment with the screws T4×8S (2 pcs.) on both sides of the rotary unit for the proper weight and tighten them.</p> <p><b>6. Center setting of aperture and slit image</b> When the slit does not close evenly from the periphery toward the center at aperture φ0.2:</p> <ol style="list-style-type: none"> <li>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the dipoter adjusting ring.</li> <li>② Project the slit size of φ0.2 on the focusing rod.</li> <li>③ Check the amount of off-center by moving the slit change handle.</li> <li>④ Loosen the screws 6S3×16SUS (4 pcs.) and make adjustment by moving the slit unit right and left or up and down.</li> <li>⑤ Tighten the screws fully after adjustment.</li> </ol> <p>* The above adjustment should be accompanied with Procedure 7 in the next page.</p>

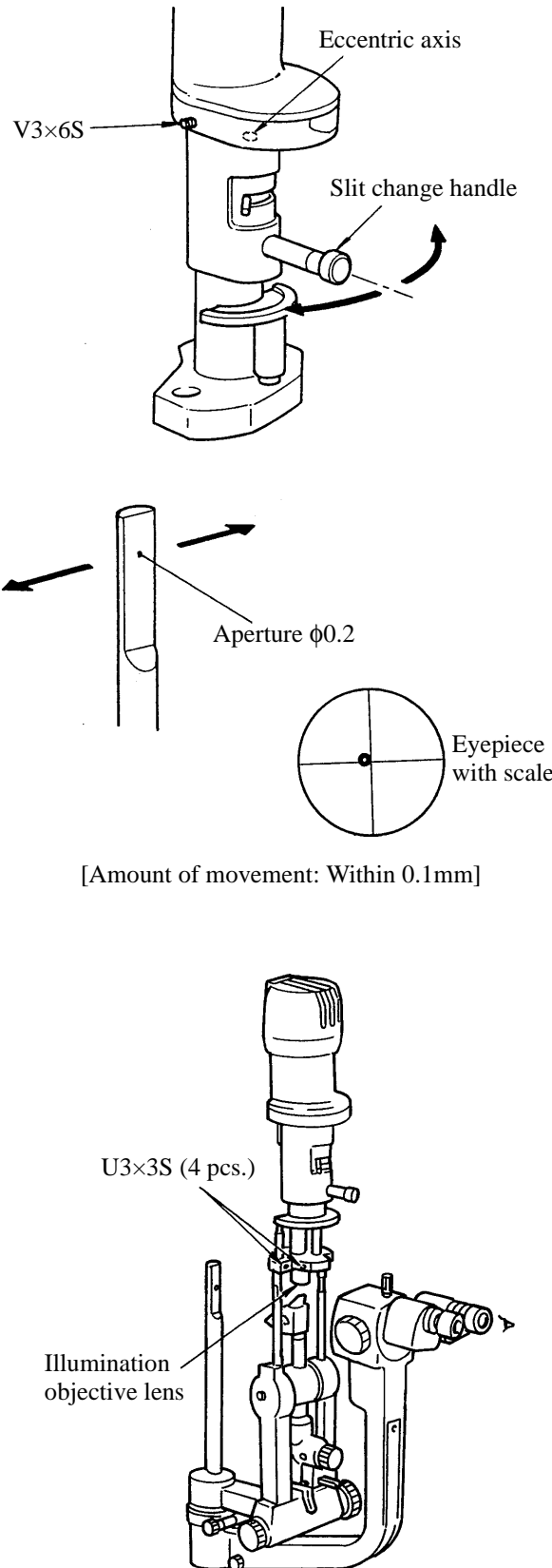
Illustration	Procedure
 <p>[Amount of movement: Within 0.1mm]</p>	<p><b>7. Slit image shift setting when rotating the slit</b>  When the rotational center of <math>\phi 0.2</math> moves if the aperture of <math>\phi 0.2</math> is projected on the slit rod screen and the slit change handle is moved:</p> <ol style="list-style-type: none"> <li>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.</li> <li>② Project the aperture of <math>\phi 0.2</math> on the focusing rod.</li> <li>③ Check the amount of movement by turning the slit change handle in <math>180^\circ</math>.</li> <li>④ Adjust the eccentric axis (44630 2529) to effect "0" in up and down and "0.1" in right and left by loosening the screw V3×6S on the head of the aperture/filter unit.</li> </ol> <p>* The above adjustment should be accompanied with Procedure 6 in the previous page.</p> <p><b>8. Focus setting of slit image</b></p> <ol style="list-style-type: none"> <li>① Adjust the diopter of the microscope unit with the diopter adjusting ring.</li> <li>② Project the aperture of <math>\phi 14</math> on the focusing rod.</li> <li>③ Loosen the screws U3×3S (4 pcs.) and set the focus by moving the illumination objective lens frame in and out.</li> <li>④ After focusing, tighten the screws U3×3S (4 pcs.) fully and then apply the screw lock.</li> </ol>

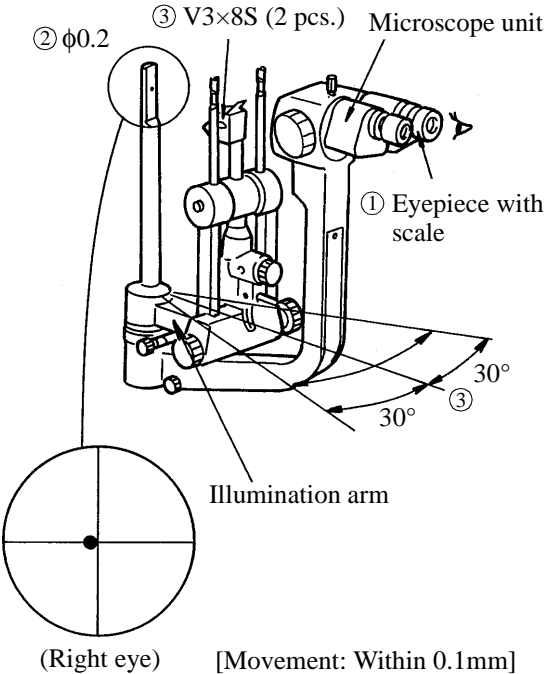
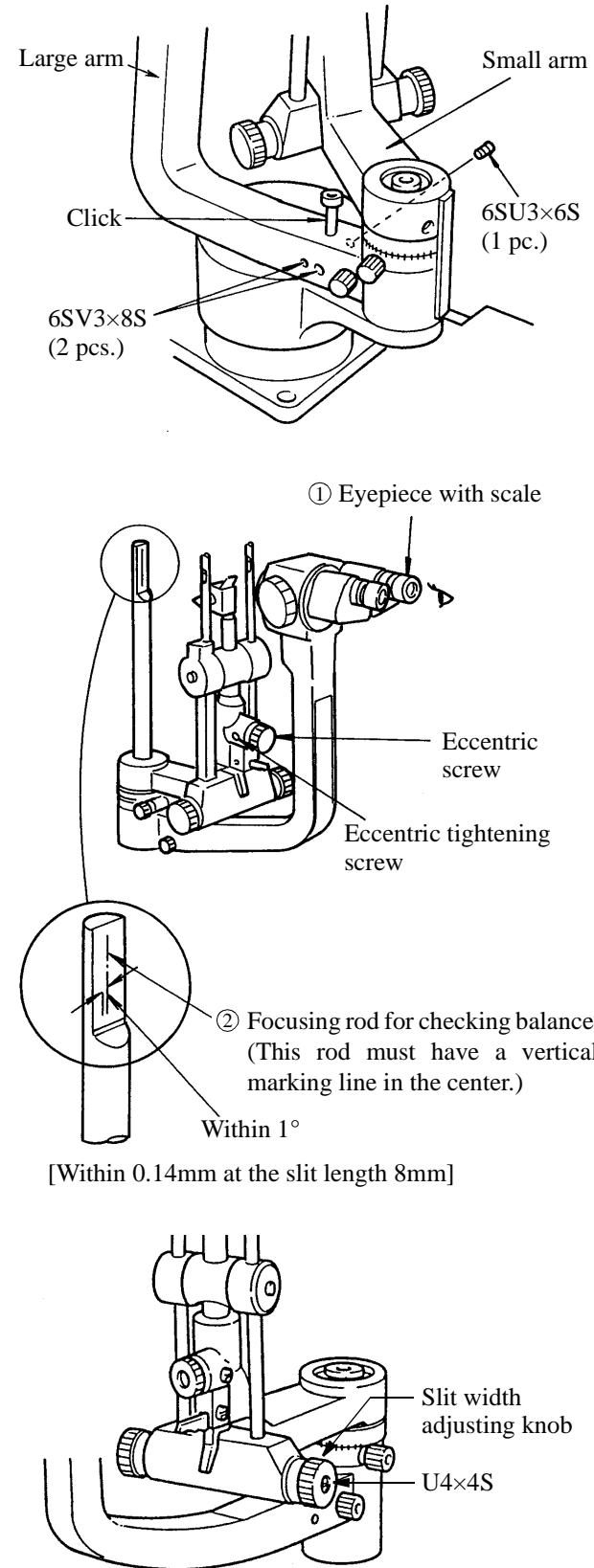
Illustration	Procedure
 <p>② <math>\phi 0.2</math></p> <p>③ V3×8S (2 pcs.)</p> <p>Microscope unit</p> <p>① Eyepiece with scale</p> <p>30°</p> <p>30°</p> <p>Illumination arm</p> <p>(Right eye) [Movement: Within 0.1mm]</p>	<p><b>9. Slit image shift setting when rotating the slit illumination unit horizontally (in 30° right and left each)</b></p> <ol style="list-style-type: none"> <li>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.</li> <li>② Project the aperture of <math>\phi 0.2</math> on the focusing rod.</li> <li>③ Watch the deviation as moving the illumination arm in 30° right and left and, after loosening the screws V3×8S (2 pcs.) of the mirror bracket, adjust to keep the right and left movement within 0.1.</li> <li>④ After adjustment, tighten the screws fully and apply the screw lock.</li> </ol> <p><b>10. Slit image shift setting when inclined</b></p> <ol style="list-style-type: none"> <li>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.</li> <li>② Project the aperture of <math>\phi 0.2</math> on the focusing rod.</li> <li>③ Watch the amount of movement as moving the inclination unit as shown by the arrow.</li> <li>④ Make adjustment with the screws V3×8S (2 pcs.) and U3×3S (2 pcs.) of the mirror bracket.</li> </ol>

Illustration	Procedure
 <p>Large arm</p> <p>Small arm</p> <p>Click</p> <p>6SV3×8S (2 pcs.)</p> <p>6SU3×6S (1 pc.)</p> <p>① Eyepiece with scale</p> <p>Eccentric screw</p> <p>Eccentric tightening screw</p> <p>② Focusing rod for checking balance (This rod must have a vertical marking line in the center.)</p> <p>Within 1°</p> <p>[Within 0.14mm at the slit length 8mm]</p> <p>Slit width adjusting knob</p> <p>U4×4S</p> <p>[When slit widens: 200~700g] [When slit narrows: 100~300g]</p>	<p><b>11. Adjustment of click power of small and large arms</b></p> <p>Adjust the click power for the proper weight with the screws 6SV3×8S (2 pcs.) and 6SU3×6S (1 pc.) and then tighten them fully.</p> <p>* When the illumination arm is rotated, the click stop should be firmly sensed and it should be possible to prevent the microscope arm from rotating.</p> <p><b>12. Adjustment of inclination of slit image</b></p> <p>① Put the eyepiece with scale into the microscope unit and adjust the diopter with the diopter adjusting ring.</p> <p>② Project the slit image after inserting the focusing rod for checking balance. (Project the slit image as narrow as possible to obtain the maximum length.)</p> <p>③ Loosen the eccentric tightening screw (6SU5×6SUS). Adjust the inclination to be within 1° with the eccentric screw (44670 3513). After adjustment, apply the screw lock.</p> <p><b>13. Adjustment of slit width adjusting force</b></p> <p>When the slit width adjusting knob operation becomes too light and slit narrows the width by itself, adjust it by tightening the screw (U4×4S) in the center of slit width adjusting knob on the right.</p>

## 2-3 Repairing Order

### Precautions for repairs

1. The following sections describe the disassembly and assembly of units.  
For correctly repairing these components, a wide experience in assembly and adjustment of medical equipment is required. Only suitably qualified persons should carry out the following work.
2. The special tools for repair are as follows:
  - White whetstone for slit
  - Slit holder toolIf these tools are required, order them from TOPCON.
3. Before loosening screws, if the screw lock has been applied to them, dissolve it using Isoamyl acetate.  
When retightening them after repair, apply the fresh screw lock.

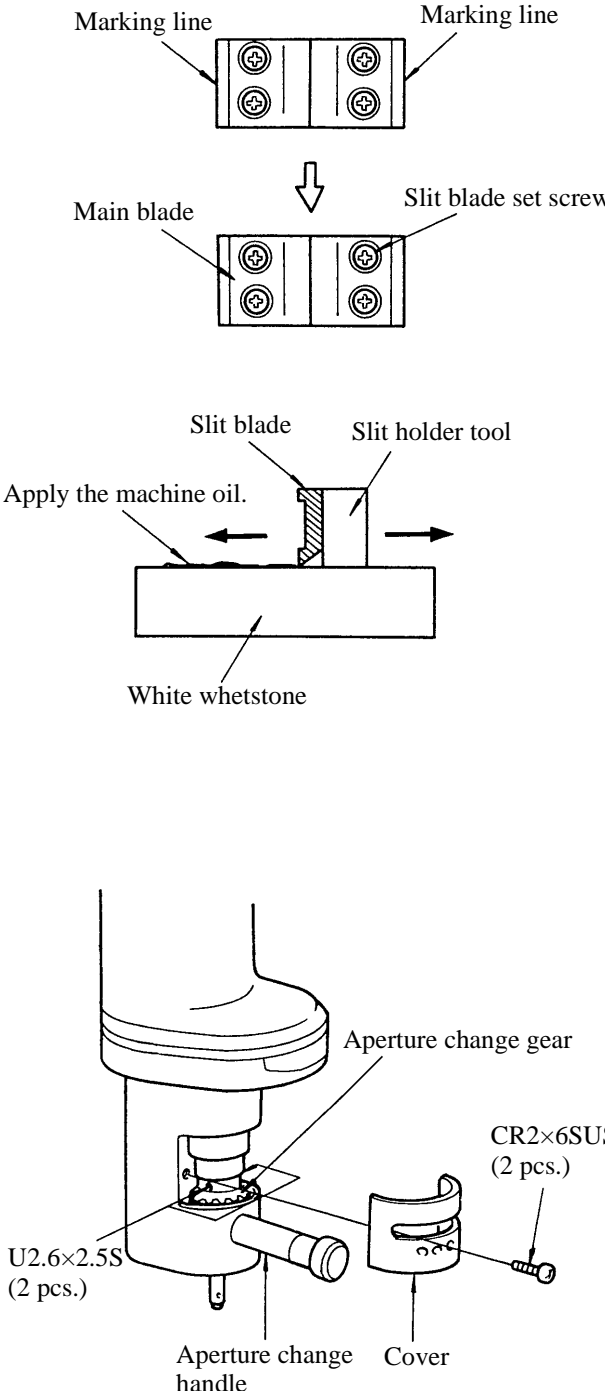
## 2-3-1 Disassembly and assembly of illumination unit

Illustration	Procedure
<p>① Plug</p> <p>Lamp house unit</p> <p>②</p> <p>⑤ Slit unit</p> <p>Aperture/filter unit</p> <p>③ ④ 6S3×6SUS (4 pcs.)</p> <p>Aperture change gear (40310 2518)</p> <p>③ U2.6×2.5S (2 pcs.)</p> <p>Aperture change handle</p> <p>① CR2×6SUS (2 pcs.)</p> <p>Cover (44770 2601) (For TAC: 44675 2524)</p>	<p><b>1. Removing the slit unit</b></p> <ol style="list-style-type: none"> <li>① Disconnect the plug of the lamp house.</li> <li>② Remove the lamp house by turning in the arrow direction.</li> <li>③ Apply the amyl solvent to the top of the screw.</li> <li>④ Remove the screws 6S3×16SUS (4 pcs.).</li> <li>⑤ Remove the slit unit by pulling up.</li> </ol> <p><b>2. Removing the aperture/filter change lever unit</b></p> <ol style="list-style-type: none"> <li>① Remove the screws CR2×6SUS (2 pcs.).</li> <li>② Remove the filter handle cover (44770 2601). * For TAC (44675 2524)</li> <li>③ Loosen the screws U2.6×2.5S (2 pcs.).</li> </ol>

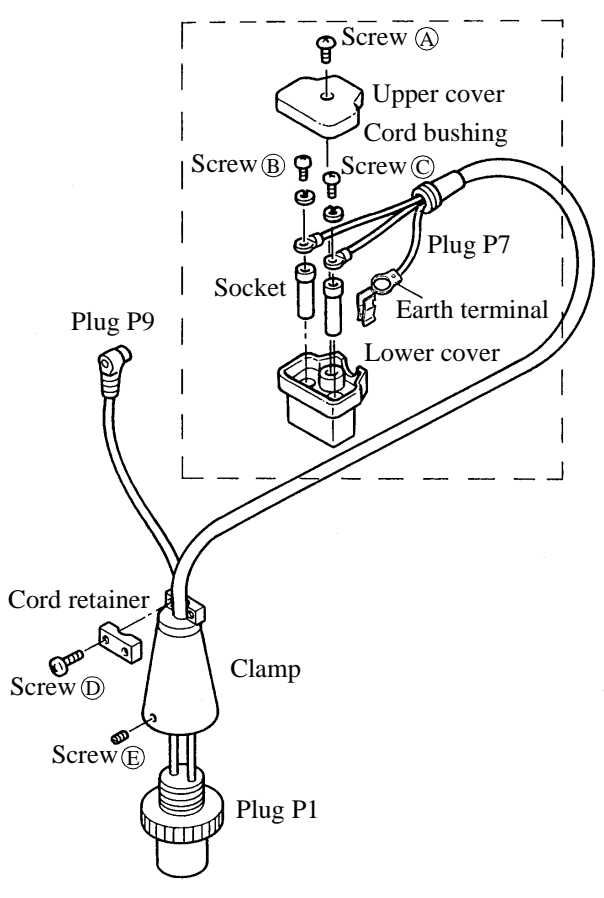
# Important points for assembly

Illustration	Points
<p>Slit blade (40310 2539)</p> <p>Main blade</p> <p>① Opening direction</p> <p>Slit width control link</p> <p>Pin hole</p> <p>③ Rod pin</p> <p>②</p> <p>Slit width control link plate</p> <p>CQ3x8S</p> <p>Main blade</p> <p>Wedge-shaped slit</p>	<p><b>1. When the slit does not close:</b></p> <p>The slit must always close on the screen of the focusing rod. If not, check the slit unit for dust or foreign matters. If there is no dust or a foreign matter, carry out as follows.</p> <ol style="list-style-type: none"> <li>① Make sure that the slit blade spring works correctly. (Move it in the opening direction by hand right and left.)</li> <li>② Make sure that the slit width control link spring works correctly. (Move the slit width control link up and down with your finger.)</li> <li>③ Make sure that the slit width control link is tightly connected with the plate. If not, move the link up and down by turning the rod pin for adjustment.</li> <li>④ In case of the wedge-shaped slit blade, (after applying the amyl solvent to the top of the screws for dissolving the screw lock,) adjust it by loosening the screws CQ3x8S (2 pcs.) a little against the main blade to close completely.</li> </ol>



Illustration	Points
 <p>Marking line</p> <p>Marking line</p> <p>Main blade</p> <p>Slit blade set screw</p> <p>Slit blade</p> <p>Slit holder tool</p> <p>Apply the machine oil.</p> <p>White whetstone</p> <p>Aperture change gear</p> <p>U2.6×2.5S (2 pcs.)</p> <p>Aperture change handle</p> <p>Cover</p> <p>CR2×6SUS (2 pcs.)</p>	<p>⑤ In case of the broken slit blade:</p> <p>(a) Make a marking line before disassembly to set the slit blade into the original position.</p> <p>(b) Remove the slit blade set screws.</p> <p>(c) First, whet the main blade. (Refer to the illustration on the previous page.)</p> <p>* Place the slit blade on the slit holder tool perpendicularly and evenly and whet it uniformly and horizontally. After whetting, remove burrs. When removing burrs, be careful not to damage the slit edge and scoop only the burred part lightly by hand. After whetting, wipe off the machine oil with ether and apply it thinly to the whetstone again.</p> <p><b>2. Stiffness and unevenness of the aperture/slit change handle</b></p> <p>If the aperture change handle has stiffness, unevenness or play, remove the screws CR2×6SUS (2 pcs.), remove the cover (44770 2601), loosen the set screws U2.6×2.5S (2 pcs.) of the aperture change gear (40310 2518) and adjust the tooth clearance to move smoothly.</p>

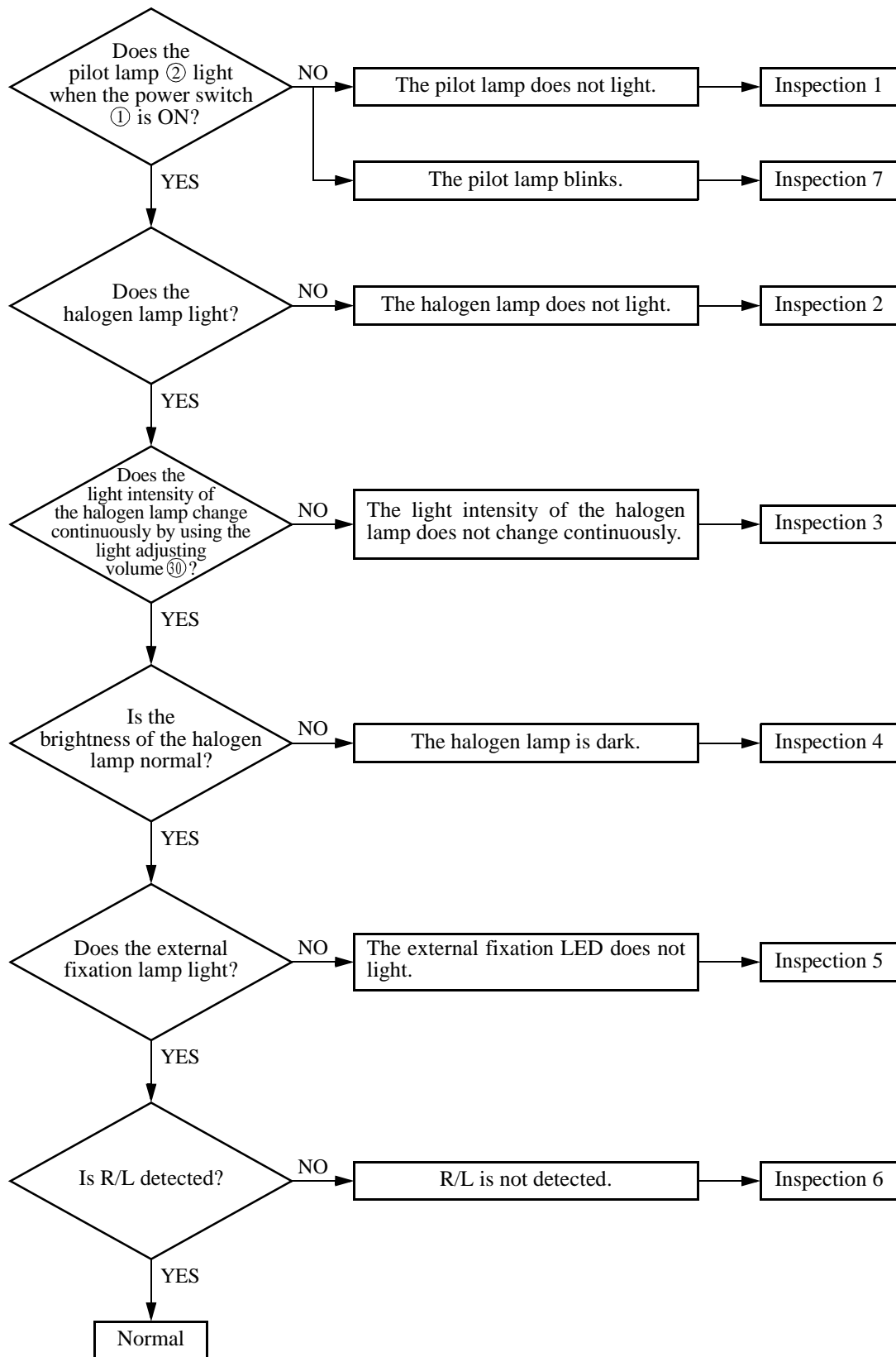
## 2-3-2 Disassembly and assembly of power supply unit

Illustration	Procedure
 <p>The diagram illustrates the disassembly of the power supply unit. It shows the removal of plug P7 and plug P1. Key components labeled include: Screw A, Upper cover, Cord bushing, Screw B, Screw C, Plug P7, Socket, Earth terminal, Lower cover, Plug P9, Cord retainer, Clamp, Screw D, Screw E, and Plug P1. A dashed box highlights the upper assembly components.</p>	<p><b>1. Removing the plug P7</b></p> <ol style="list-style-type: none"> <li>① Remove the screw ①A.</li> <li>② Remove the upper and lower covers.</li> <li>③ Remove the screws ①B and ①C and then remove the socket.</li> </ol> <p><b>2. Removing the plug P1</b></p> <ol style="list-style-type: none"> <li>① Remove the two screws ①D.</li> <li>② Remove the screw ①E.</li> <li>③ Remove the clamp from the plug by turning.</li> <li>④ Remove the cords.</li> </ol> <p>* For TE, the earth terminal is prepared.</p>

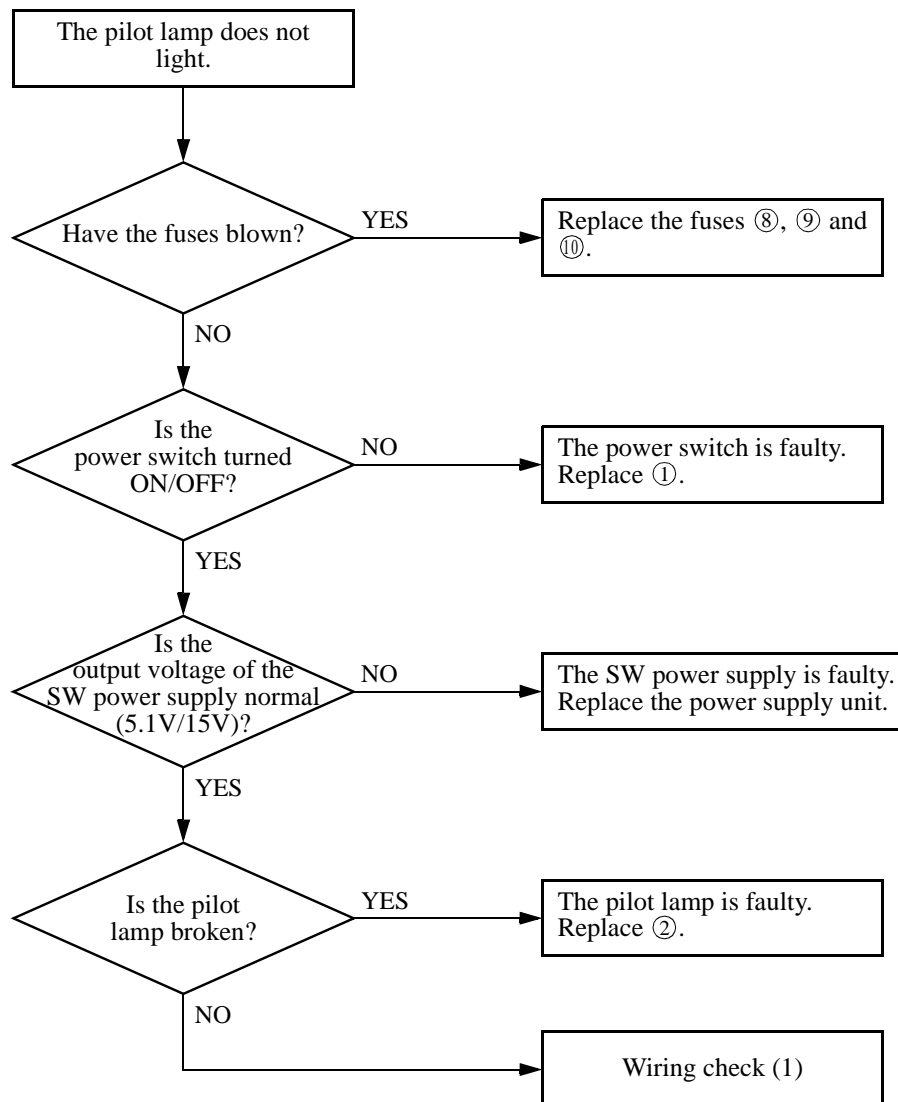
### 2-3-3 Trouble shooting (Main body)

No.	Trouble	Cause	Remedy	Tool	Reference page
1	The slit does not close.	Dust is stuck to the slit.	Wipe off dust with ether many times.	• Eyepiece with scale	P.22, 23
		The slit is wedge-shaped.	Adjust the slit blade.	• Eyepiece with scale	P.22, 23
2	There is a difference between the aperture of $\phi 0.2$ and the slit center.	The accuracy is not good in the incorporation of the slit unit and illumination unit.	Loosen the slit box tightening screws (4 pcs.) to position them accurately.	• Standard scale • Eyepiece with scale	P.16
3	Difference between the slit center and microscope center.	The reflection mirror in the illumination unit is not positioned correctly.	Position the reflection mirror in the illumination unit accurately.	• Standard scale • Eyepiece with scale	P.17, 18

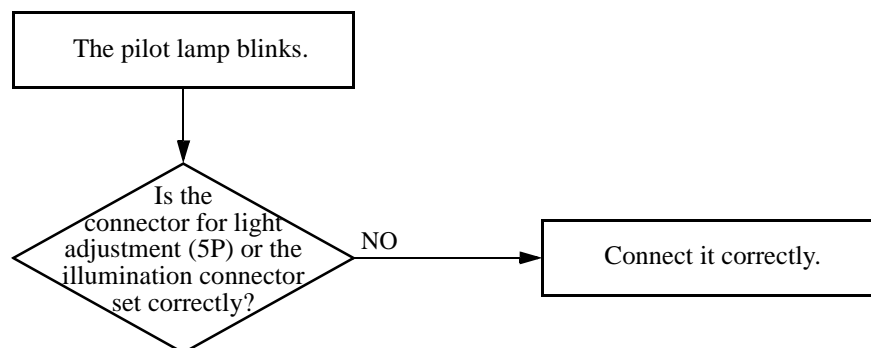
## 2-3-4 Trouble shooting (Power supply unit)



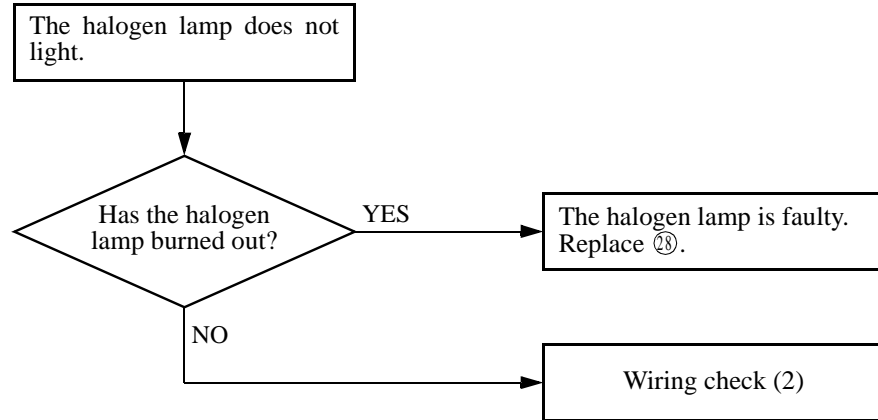
Inspection 1	Inspection Procedure	Inspection Details
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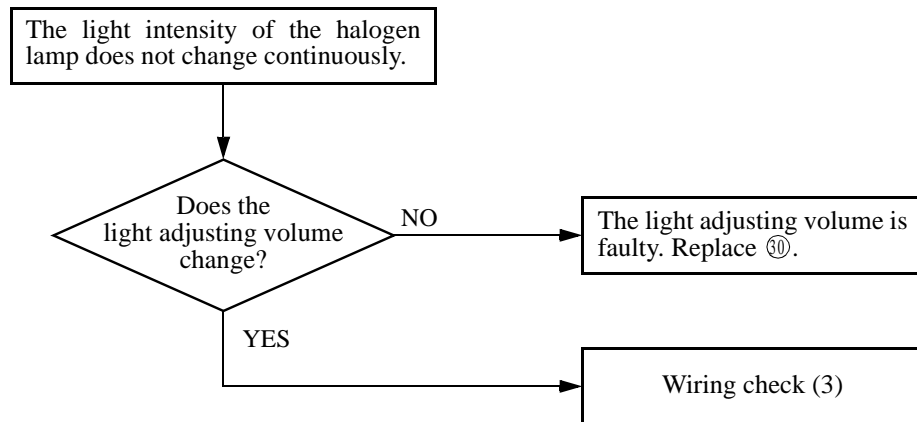
Inspection 7	Inspection Procedure	Inspection Details
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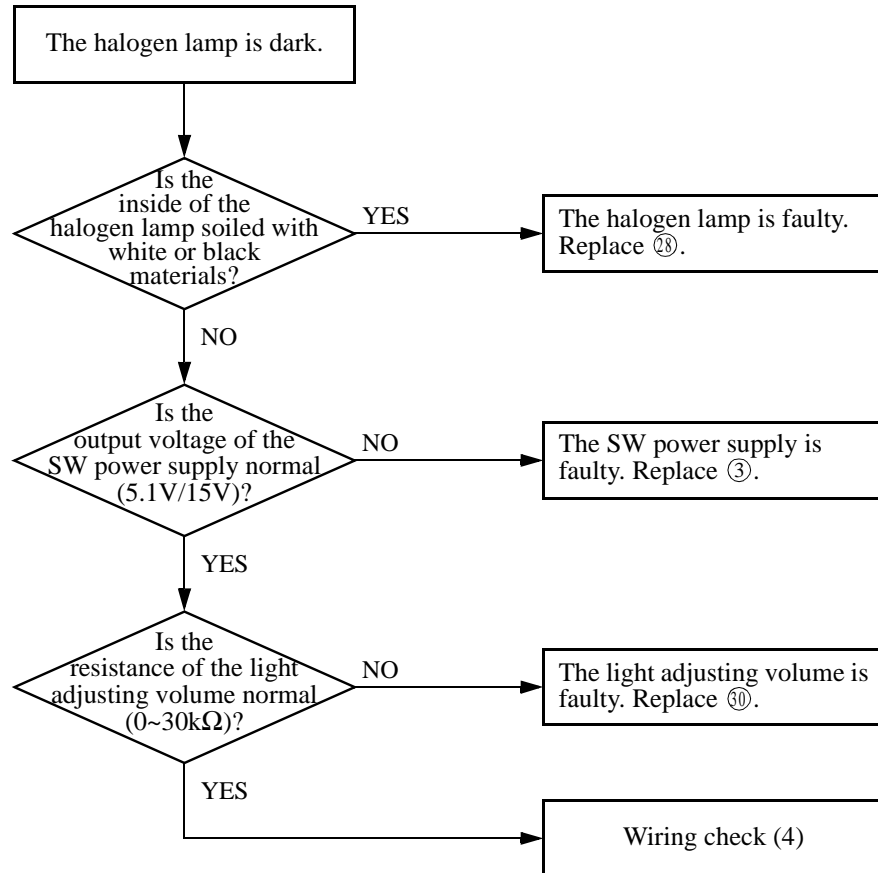
Inspection 2	Inspection Procedure	Inspection Details
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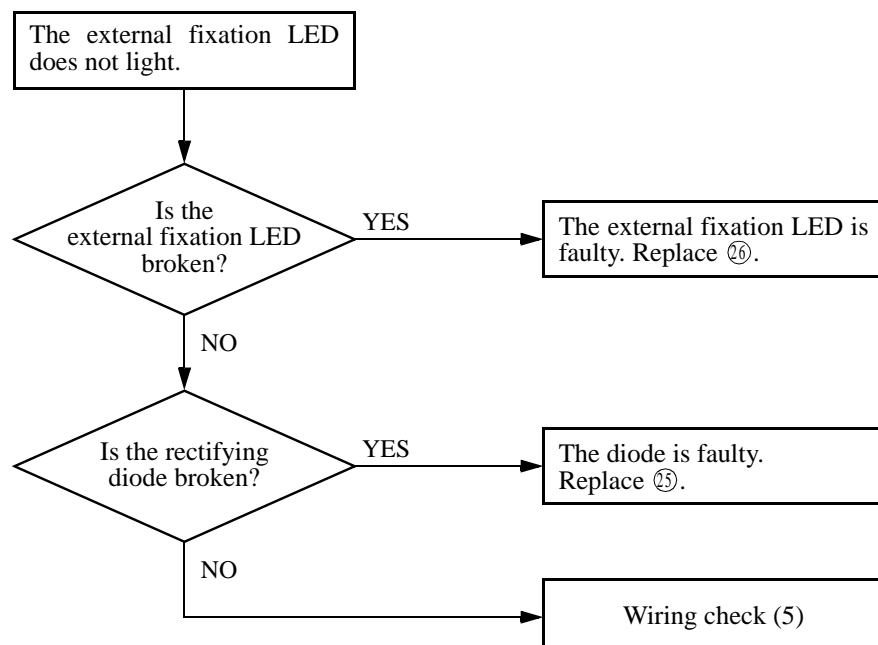
Inspection 3	Inspection Procedure	Inspection Details
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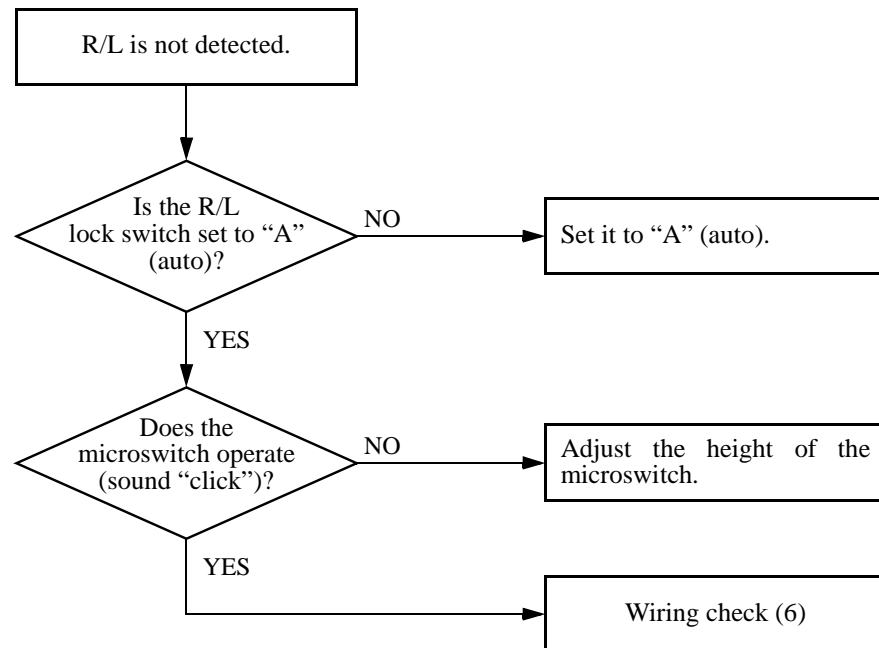
Inspection 4	Inspection Procedure	Inspection Details
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Inspection 5	Inspection Procedure	Inspection Details
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Inspection 6	Inspection Procedure	Inspection Details
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## 2-3-5 Wiring check

This section describes the special checks that are required when the problem is diagnosed as “Wiring check” in the flowcharts of “2-3-4 Trouble shooting”. The number in parentheses for the wiring check in “2-3-4 Trouble shooting” corresponds to “No.” in the following table.

Use the tester to check between “From” and “To” in “Area for checking”.

If the wire passes through a part on the way, such a part is shown in “Via”.

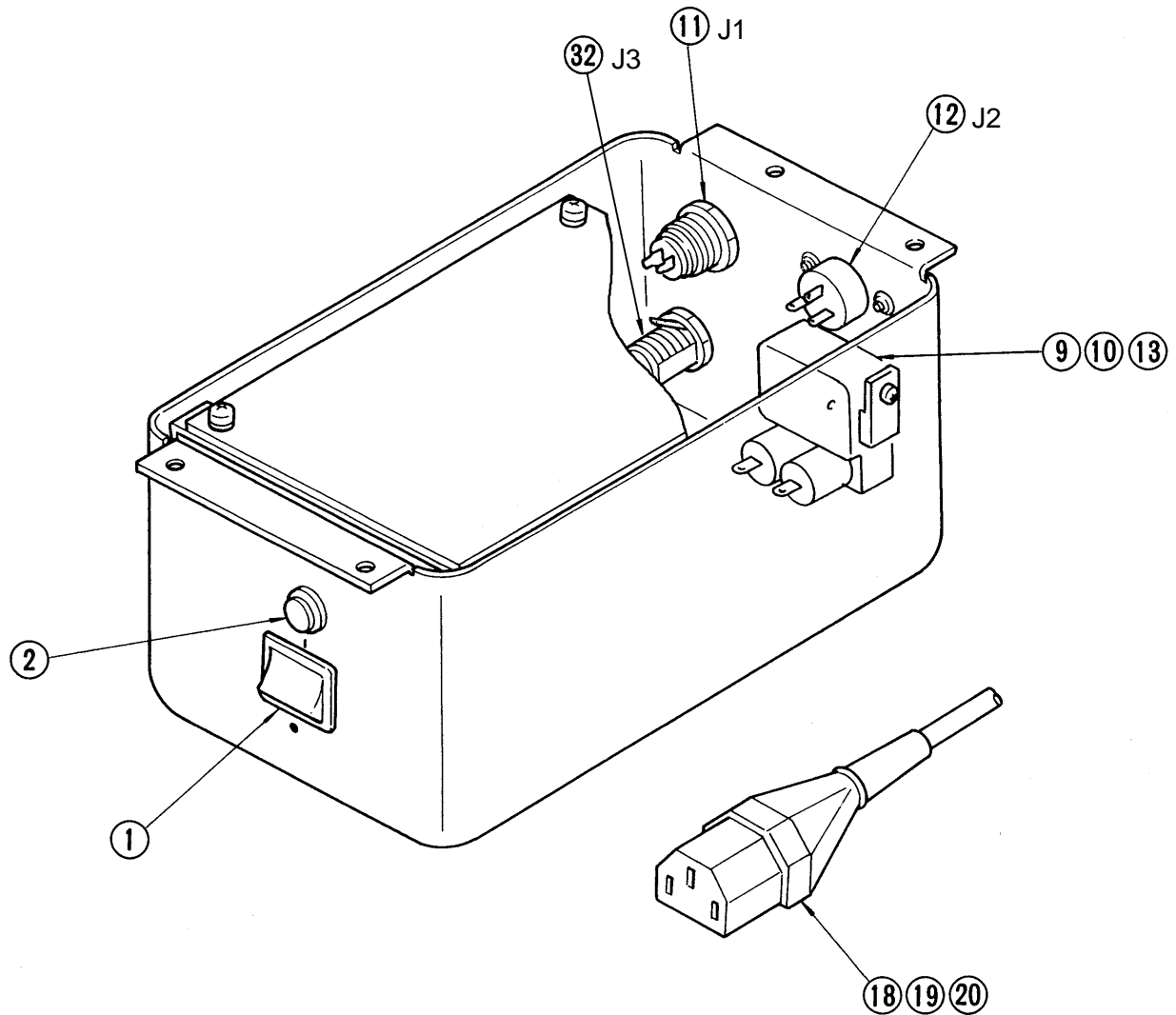
Check it at the same time. Refer to “Electric parts arrangement”.

No.	Remarks	Area for checking		
		From	Via	To
(1)	Disconnection	Inlet (L)	Fuse holder (F1) ~ Power switch (SW1)	SW power supply (P1-3)
		Inlet (N)	Fuse holder (F2) ~ Power switch (SW1)	SW power supply (P1-1)
		Connector (P52-1)	——	Pilot lamp (P.L)
		Connector (P52-2)	——	Pilot lamp (P.L)
(2)	Disconnection/ Short circuit	Connector (P2-1)	——	Halogen lamp (H.L)
		Connector (P2-2)	——	Halogen lamp (H.L)
		Connector (J1-3)	Connector (P2-3~P1-1)	Volume (CN1-1)
		Connector (J1-4)	Connector (P2-4~P1-2)	Volume (CN1-2)
		Connector (J1-5)	Connector (P2-5~P1-3)	Volume (CN1-3)
(3)	Disconnection/ Short circuit	Connector (J1-3)	Connector (P2-3~P1-1)	Volume (CN1-1)
		Connector (J1-4)	Connector (P2-4~P1-2)	Volume (CN1-2)
		Connector (J1-5)	Connector (P2-5~P1-3)	Volume (CN1-3)
(4)	Disconnection/ Short circuit	Same as Wiring check (2).		
(5)	Disconnection	Connector (P2-1)	Diode (D2)	External fixation LED (LED2-A)
		Connector (P2-3)	Resistor (R1)	External fixation LED (LED2-K)
(6)	Disconnection	Connector (CN2-4)	——	Switch (SW2-4)
		Connector (CN2-8)	——	Switch (SW2-3)

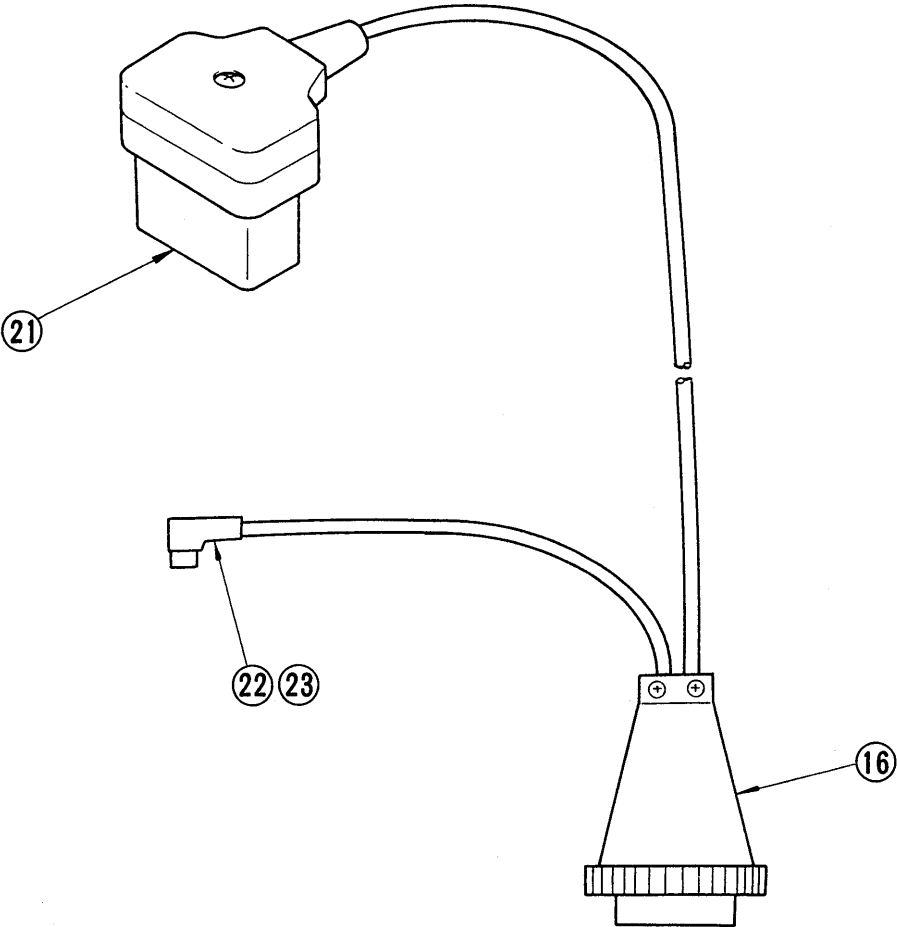
## 2-3-6 Electric parts arrangement

(1) PS-70/PS-70A/PS-70E Power supply

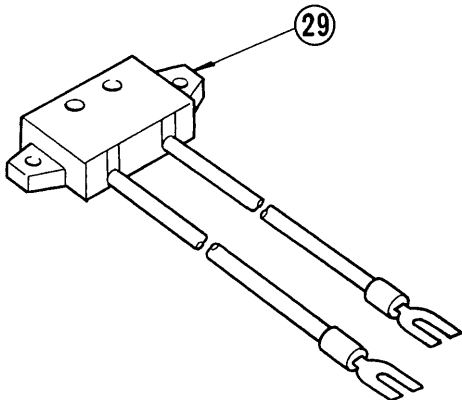
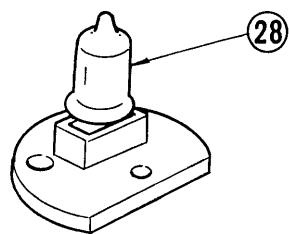
\* PS-70E (for TE) is equipped with the insulation plate and fireproof plate.



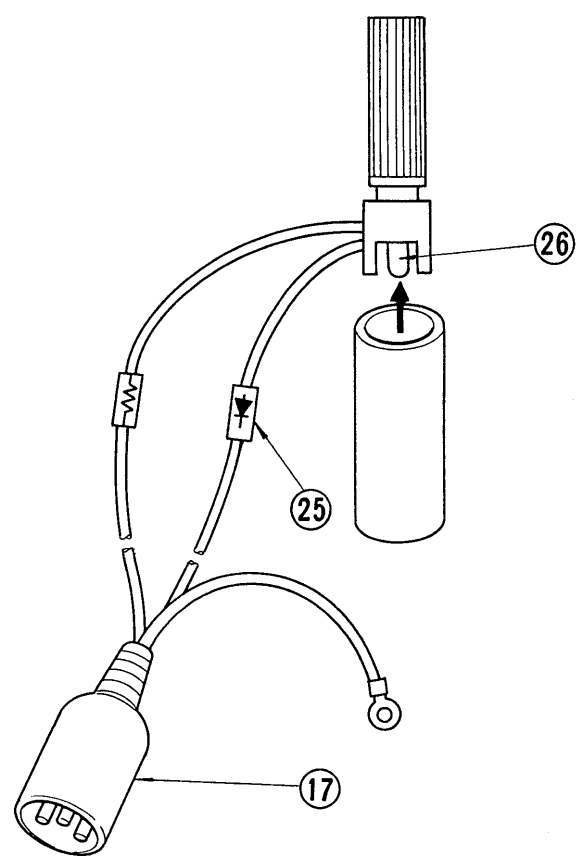
(2) Halogen lamp cord



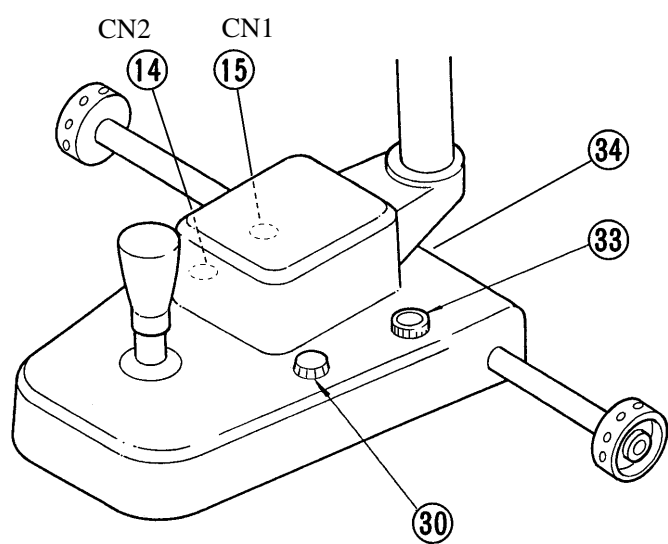
(3) Halogen lamp and socket



(4) External fixation target



(5) Cross slide unit

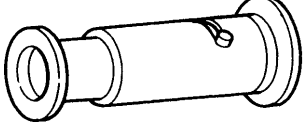
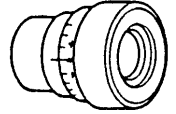
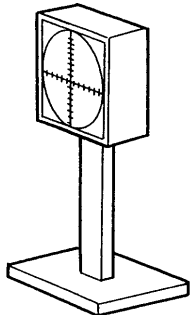



## 2-3-7 List of electric part numbers

No.	Part name	Symbol	Order No.	Rating	Remarks
①	Power switch	SW1	44770 60520	SF-W201A-30BB (Echo Denshi)	
②	Pilot lamp	LED1	40416 51260	DB-1 (Green) (Sato Parts)	
⑨	Fuse	F1, F2	44635 60030	5TT1 (Bell Fuse)	Japan/TMS
⑩	Fuse	F1, F2	44770 63510	5TT750 (Bell Fuse)	TE/TS/General
⑪	Connector	J1	44680 60020	RM12BRD-6S (Hirose)	
⑫	Inlet	J2	40420 55330	MAB3 (Harshmann)	
⑬	Inlet		44630 67730	AP-340 (YAMATE DENKEN)	
⑭	Receptacle	CN2	T22000316A	HR12-10R-8SD (Black) (Hirose)	
⑮	Receptacle	CN1	44642 31520	HR12-10R-5SD (Black) (Hirose)	
⑯	Plug	P2	44680 41520	RM12BPG-6P (Hirose)	
⑰	Plug	P3	40420 55320	MAS30 (Harshmann)	
⑱	Power cord set		42364 51100	(Hanai Densen)	Japan
⑲	Power cord set		44681 65010	(Hanai Densen)	TMS
⑳	Power cord set		40130 50041	(Hanai Densen)	TE/TS/General
㉑	Socket pin		44680 41580		
㉓	Plug	P1	44642 41510	HR10LA5PS600 (Black) (Hirose)	TMS
㉕	Diode	D2	06510 20760	1S2076A (Hitachi)	
㉖	External fixation LED	LED2	44670 42060	HBR5566X (Stanley)	
㉘	Halogen lamp	H.L	44680 25700	(LIFEEREX)	12V 30W
㉙	Halogen lamp socket	(H.L)	44680 25900	990/245 (BENDA & BIRUTS)	
㉚	Light adjusting volume	VR1	44642 31540	RV16YNB303 (TOCOS)	30kΩ
㉛	Connector	J3	40414 49100	HR10A-7R-4S (Hirose)	
㉜	Switch	SW3	44770 38010	SRRN134300 (Alps Denki)	
㉝	Microswitch	SW1	T20000203A	AVL325561 (Matsushita Denki)	

## 2-4 List of Repair Tools

### 2-4-1 List of special repair tools

Tool No.	Name	Illustration	Function/accuracy	Application	Remarks
①	Diopter telescope		Observation magnification (3.4×)	<ul style="list-style-type: none"> <li>Setting the same focus by magnification</li> </ul>	
②	Eyepiece with scale		Eyepiece magnification (12.5×) Thickness of scale line (0.02mm)	<ul style="list-style-type: none"> <li>Setting the parallelism of the slit image</li> <li>Slit width change by slit image rotation</li> <li>Image shift by pupillary distance adjustment</li> </ul>	
③	Standard scale		Thickness of scale line (0.02mm) Interval of one graduation (0.1mm)	<ul style="list-style-type: none"> <li>Image shift by pupillary distance adjustment</li> <li>Difference between aperture and slit</li> <li>Slit image shift by slit rotation</li> <li>Slit image shift by inclination</li> <li>Slit image shift when rotating the slit illumination unit horizontally (in 30° right and left each)</li> </ul>	
④	Focusing rod (with vertical marking line)			<ul style="list-style-type: none"> <li>Inclination of slit image</li> </ul>	

### 2-4-2 List of general repair tools

- Tester (that can measure voltage, current and resistance)
- Set of six slotted screwdrivers
- Set of four Phillips screwdrivers
- Wooden handle Phillips screwdriver for 3mm
- Hexagonal wrench set
- Radio pliers
- Nippers
- Tweezers
- Soldering iron
- Solder

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**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

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**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., Krungthongburi Rd., Klongtongsai, 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

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**TOPCON CORPORATION**

75-1 Hasunuma-cho, Itabashi-ku, Tokyo, 174-8580 Japan.

Phone: 3-3558-2520 Fax: 3-3960-4214 www.topcon.co.jp