

INVERTED RESEARCH METALLURGICAL  
MICROSCOPE SYSTEM

**PMG3-F2**

REPAIR MANUAL

OLYMPUS

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## **INTRODUCTION**

This PMG3-F2 repair manual is compiled to cover only the portion modified because of application to the PM-20 system, therefore, repair work common to PMG3-F2 and PMG3 is to be carried out in accordance with the PMG3 repair manual.

Since the PM-CB20 is used as the automatic exposure control unit instead of PM-CBSP, this manual describes the newly required units and adjusting procedures. Specifically, as the prism in the photometry light path prism section was replaced with a new one (PG3-PRPB-2), it describes new disassembly and assembly procedures, and as the printed circuit boards were modified concurrently with the change of the automatic exposure control unit, it describes new photometry and lamp voltage adjusting procedures.

To service the PM-CB20 only, follow the instructions given in the PM-20 repair manual.

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## 1. Name and code in OLYMPUS

Product name	Inverted research metallurgical microscope system
Code in OLYMPUS	PMG3-F2

## 2. Outline

This microscope system is used in the areas of steel and metallic materials industry and in industrial laboratories and inspection departments of automobile industry, electrical machinery industry, etc., to inspect the crystals and inclusions for the acquisition of information on material composition and sizes by photomicrography.

The automatic exposure control unit, PM10CBSP, of this microscope system was replaced with PM-CB20 for the purpose of acquiring the CE mark. Other units incorporated into this microscope system are the same as the ones of the existing PMG3-F, except the units in photomicrography system. No compatibility, however, exists between this microscope system and the existing PMG3 because of differences in the electric system.

### Main changes

- Automatic exposure control unit
- Photometry light path prism section, PRPB-2 (spot measuring range 1%)
- Photometry board, Junction board

With regard to the placement of this microscope system in the market of the same or similar product lines, it belongs to the class of high-grade products; specifically, the expanded peripheral system makes it easier to shoot photographs (to be competitive against other rival companies).

The service life of this microscope system is 8 years.

In regard to the status of conformance to external standards, the CE marking was successfully acquired through the CE (EMC directive) self verification.

## 3. Features

### 1) Optical system

- ① A long-barrel (LB) IC objective used in the optical system makes possible a higher level of optical performance.
- ② The single-lens reflex system, including various imprinting features, allows the images viewed at a binocular section to be photographed easily.

- ③ The front image of a specimen viewed from the side of an objective can be observed and photographed.
- ④ The universal illumination method makes possible the switching between brightfield, darkfield, polarized light, differential interference contrast and fluorescent BG excitation.
- ⑤ The super widefield design allows a much wider visual field to be observed.
- ⑥ A zoom photo eyepiece used in the optical system allows easy magnification setting and framing. Also a click set in the middle of zooming (3.3×, 4×) allows the optical system to be used in ways similar to the conventional turret method.

## 2) Ease of operation

- ① Because the stage surface (327mm from desk surface) is set lower than the eye point, it is easy to replace a specimen. Also the home-position stage makes it easier to handle a focusing knob and a stage X/Y knob, enabling an operator to work for long hours without fatigue.
- ② A movable mirror set on the side face in the lower part of the stage enables an operator to identify the area of a specimen to be observed.
- ③ The lamp housing designed with the pre-center method makes the cumbersome process of lamp centering unnecessary. Also a halogen lamp of 12V 100W installed in this lamp housing can increase the level of brightness.
- ④ The work of observation and photomicrography can be done much more easily.

## 3) Photomicrography

- ① The single-lens reflex method allows easy photomicrography.
  - Focusing can be done at the binocular section.
  - Framing can be done at the binocular section.
- ② A zoom photo eyepiece helps an operator do the work of magnification setting and framing easily.
- ③ Both a 35 mm camera and a large format camera can be mounted on this microscope system and they can be alternated by light path switching. Also the PM-20 system can be applied to both cameras and the type of a large format camera can be changed easily.
- ④ Using either spot or average measurement, photographing by automatic exposure is possible and such high-grade functions as the AE lock, FL mode, etc., are provided.
- ⑤ The bright frame function is provided to allow easy framing operation when background in the visual field is dark such as in darkfield or fluorescence observation.

Also optional function of making a visual field bright is available when imprinting a grain size scale.

- ⑥ Using the optional macroscope attachment, the low-magnification photomicrography up to 1× to 4× becomes possible by using a 35 mm camera.

#### 4) System performance

- ① Light source: In addition of a halogen lamp of 12V 100W, a mercury burner of 200W and a xenon lamp of 150W can also be mounted, except in the OE area. (A separate power supply is required to use the mercury burner and xenon lamp.)
- ② Photomicrography and TV systems: In addition to 35 mm and large format cameras, a TV system and a projection screen can also be mounted by using an optical relay unit.
- ③ Stage: Because a both-end support coupling method is used, a large-size specimen can be placed on the stage. Also a rotary stage is available as an option.
- ④ Revolving nosepiece: The revolving nosepiece of the BH2 system can be selectable.
- ⑤ Observation tube: The observation tube of the BH2 system can be selectable.
- ⑥ Macroscope attachment: The fiber optics illuminator can be set so that the light points at the observation surface.

### 4. Using conditions

#### 1) Operating environment

Temperature: 0 to 40°C

Humidity: 30 to 85%

#### 2) Allowable power voltage fluctuations

Less than  $\pm 10\%$  of selectable input voltages

#### 3) Applicable units

- ① Objective: The metallurgical-type objective which is used for the LB series  
When the objective of MDPL 80×, NeODPL 80× or 150× is used, it may interfere with the stage insert plate when a revolving nosepiece is turning.  
The range that microscopy can be made without this interference is as follows:

	Objective	NeOSPL 50 ×	NeOSPL 100 × D	MDPL 80 × D	NeODPL 80 × (D)	MDPL 150 × (D)
	Working distance	0.5	0.3	0.2	0.18	0.33 [mm]
Range that no interference occurs	Tear-type stage insert plate	Full range	Full range	Within $\phi 6$ from the center of a hole	—	Full range
	Stage insert plate of 25 × 74	25 × 50	25 × 50	19 × 50	12 × 50	25 × 50 [mm]
Stage stroke		50 × 50 [mm]				
Thickness of the insert plate		0.15 [mm]				

## Notes:

In the super-widefield observation, the MDPL- and NeODPL-series objective cannot be used.

If a heavy specimen is mounted or if a specimen holder applies strong pressure to a specimen, interference will occur at distances smaller than shown in the above table.

## ② Eyepiece

SWHK10 × or WHK10 ×

## ③ MTU light path

This light path cannot be used, except for PMG3-MTU. (The photomicrography system cannot be mounted sideways.)

## ④ Macro light path

This light path cannot be used, except for PMG3-MCR.

## ⑤ Revolving nosepiece

BH2-5NRE, BH2-MRE

## ⑥ Observation tube

The observation tube of BH2-series can be used. The photomicrographic performance of the trinocular tube cannot be guaranteed because it is difficult to identify the correct position of a specimen when observed under the trinocular tube.

## ⑦ High-luminance lamp housing

AH2-LSRF, AH2-LSRX

## ⑧ Photomicrography system

PM-CB20



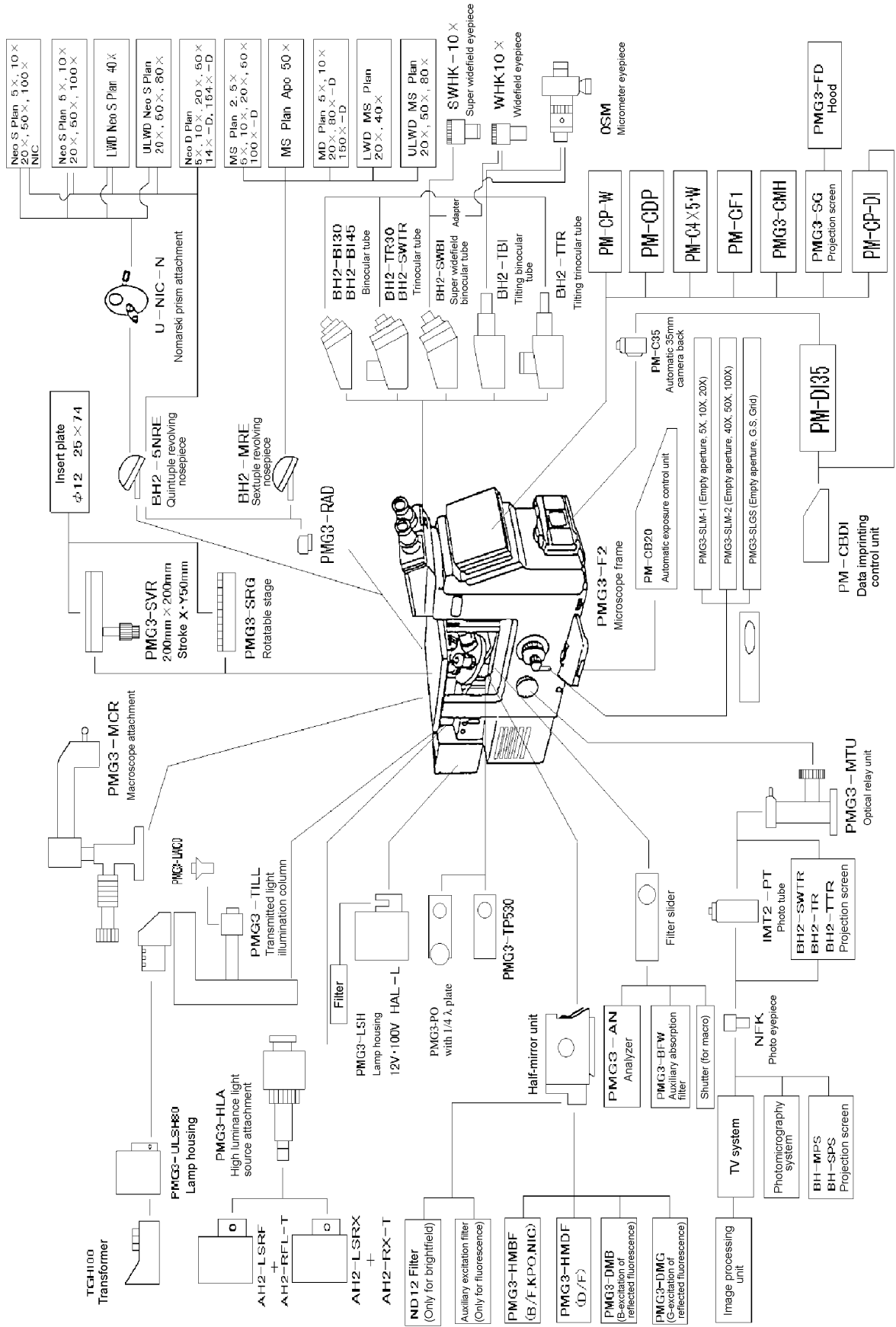
## 4) Inapplicable units

- ① No compatibility with the old PMG2 system and PME2 system.
- ② Units that are not shown in the system diagram cannot be used.

## 5) Others

- ① If the position of camera light path switching (35mm ↔ large format) does not match the position of the camera selector switch on PM-CB20, proper exposure cannot be obtained.
- ② The direction of insertion of the PO slider for Nomarski DIC observation is different from that of PO slider for polarizing observation.
- ③ In the bright grain-scale grid photomicrography, the image of a specimen may look faint or the regularity of the array of vertical and horizontal lines may be lost by photomicrography conditions.
- ④ With the case of half mirror for brightfield (PM3-HMBF), FS and AS images may be blurred if 26ND12 is not installed.
- ⑤ If the provided dummy scale is placed where the scale slider is to be inserted, the parfocality cannot be guaranteed.
- ⑥ The revolving nosepiece does not have an upper-limit stopper. Therefore, be careful not to push a specimen up.
- ⑦ When the Nomarski prism frame is not installed, adapter for revolving nosepiece (PMG3-RAD) must be used. If PMG3-RAD is not used, the focus cannot be obtained.
- ⑧ Using the trinocular tube, it is difficult to identify the correct position of a specimen on the stage surface.
- ⑨ Because a focal point and a frosted filter imaging position are very close to each other (15 μm at 100 ×) at high magnification, frosted filter can be exposed to view when defocusing. This, however, is not abnormal.

5. System diagram



## 6. Specifications

Item	Specifications	Remarks
1	<p>Magnification</p> <p>1) Photo eyepiece 2.5 ×-5 × zoom (35 mm camera) Turret magnification change (double by the zooming ratio) 2.5 ×, 5 × stopper stop 3.3 ×, 4 × clip stop (Magnification guaranteed at 3.3 ×)</p> <p>2) Total magnification Zoom: 1 ×, 2 × Observation: 25 ×-3000 × Photography: 6.25 × -750 × (35mm camera) 18.75 × -2250 × (large format camera)</p> <p>3) Applicable objectives (refer to the system diagram) Neo, DIC compatible Neo compatible B/F, KPO compatible</p>	<p>SWHK 10 × (or WHK 10 ×) MSPlan 2.5 × MDPlan 150 ×</p>
2	<p>Focusing</p> <p>1) Low magnification Manual focusing with a built-in focusing telescope</p> <p>2) High magnification Manual focusing (A focusing telescope can be used.)</p> <p>3) Range of the up and down stroke of the revolving nosepiece Up direction: 1.5mm, down direction: 6.5mm, total: 8mm</p>	
3	<p>Illumination system</p> <p>1) Universal illumination (brightfield, darkfield, polarizing and differential interference contrast, fluorescence) is possible by exchanging the mirror unit.</p> <p>2) Aperture diaphragm: Manual adjustment (<math>\phi</math> 1.2 - 6)</p> <p>3) Field diaphragm: Manual adjustment, centering method (<math>\phi</math> 2.1 - 17)</p> <p>4) Light intensity adjustment: Manual switching (turret) ND6, 12, 25, 50</p> <p>5) Slider Detachable PO slider (fixed <math>1/4 \lambda</math> plate) Detachable inspection plate (<math>\lambda</math> plate)</p>	<p>Koehler illumination</p>

4	Light source	<ol style="list-style-type: none"> <li>1) Lamp housing (with a cordless socket on which 12V100WHAL-L can be mounted)</li> <li>2) High-luminance light source (200 W mercury and 150 W xenon) can be mounted simultaneously (mounting attachments are required)</li> <li>3) Lamp housing (for transmitted light; 12V50WHAL) can be mounted (TGH is required)</li> </ol>	
5	Filter	<ol style="list-style-type: none"> <li>1) Color temperature conversion filter (LBD, LBT)</li> <li>2) Built-in ND filter and contrast filter Turret 1: IF550, O560, LBD, LBT, empty aperture Turret 2: ND50, ND25, ND12, ND6, empty aperture</li> </ol>	
6	Photomicrography	<ol style="list-style-type: none"> <li>1) One 35 mm camera and one large format camera. A total of two cameras can be mounted.</li> <li>2) Light path selection: Manual switching</li> <li>3) Imprinting of a scale or a grain size scale</li> <li>4) Data (8 digits) imprinting is possible</li> <li>5) A screen can be fitted to the portion where a large format camera is mounted.</li> </ol>	<p>Option Option Option</p>
7	Photomicrography system	<ol style="list-style-type: none"> <li>1) With an automatic exposure function (PM-CB20 is used)</li> <li>2) ISO/ASA setting range 35mm: 3-25600 Large format: 25-25600</li> <li>3) Manual switching between 30% average measurement and 1% spot measurement</li> <li>4) Exposure: Warning - ① Proper, under, over Indication - ① Shutter action                   ② Remaining exposure time                   ③ Estimated exposure time</li> <li>5) Compensation for reciprocity failure characteristics of the film used</li> <li>6) Recall for the previous exposure time</li> <li>7) Multiple exposure, exposure time locking</li> <li>8) With an automatic film advance system</li> <li>9) With an anti-backlighting shutter (manual operation)</li> <li>10) To be connected to the side face of the right handrest on the frame</li> </ol>	<p>In increments of 1/3 step</p>

8	Observation tube	1) The BH2 observation tube series can be mounted (super widefield can be used: BH2-SWBI).	Visibility of a specimen on the stage cannot be guaranteed on the trinocular tube.
9	Half-mirror	1) 4 detachable mirrors can be used (of the dovetail sliding type) ① Half-mirror for brightfield (PMG3-HMBF) ② Half-mirror for darkfield (PMG3-HMDF) ③ Dichroic mirror for B-excitation (PMG3-DMB) ④ Dichroic mirror for G-excitation (PMG3-DMG) Up to two different mirrors can be mounted.	
10	Revolving nosepiece	1) The BH2 series revolving nosepieces can be mounted (dovetail type). Standard revolving nosepieces: ① Quintuple revolving nosepiece (BH2-5NRE) and quadruple revolving nosepiece (BH2-NRE) for brightfield and darkfield ② Quintuple revolving nosepiece exclusively for brightfield (BH2-MRE)	
11	Mounting unit on the analyzer insertion port	1) Three types of detachable sliders can be inserted (square hole sliding type). ① Analyzer (PMG3-AN) ② Auxiliary absorption filter (PMG3-BFW) ③ Shutter (PMG3-SHW)	Option Option
12	Mounting the polarizer	1) Detachable (square hole sliding type) 2) Insertion/removal type (click stop)	
13	Mounting the $\lambda$ plate	1) MTP530 (sensitive tint plate) can be inserted, mounted or removed (square hole sliding type). ① PMG3-MTP530	
14	Switching between MTU·MACRO /BI and BI	1) 2-step selection (knob insertion/removal) ① BI=100% ②-1 BI: MTU=20:80 (division of an objective image) -2 BI: MTU=80:20 (division of a macroscopic image)	

15	Mounting the scale slider	<p>1) Three detachable sliders can be mounted (square hole sliding type):</p> <p>① 5×, 10×, 20×, empty aperture (PMG3-SLM1)</p> <p>② 40×, 50×, 100×, empty aperture (PMG3-SLM2)</p> <p>③ Grain scale, grid, empty aperture (PMG3-SLGS)</p> <p>2) Built-in LED (red) for bright scaling</p>	Option
16	Switching between BI and PHOTO/BI	<p>1) 2-step selection (knob insertion/removal)</p> <p>① BI=100%</p> <p>② BI: PHOTO=20:80</p>	
17	Switching between 35mm and large format cameras	<p>1) 2-step selection (knob insertion/removal)</p> <p>① 35mm 100%</p> <p>② Large format 100%</p>	
18	Switching between average and spot measurement	<p>1) 2-step selection (sliding type)</p> <p>① Average 30%</p> <p>② Spot 1%</p>	
19	Inserting and removing the frame	<p>1) The bright frame can be inserted into and removed from a light path (knob insertion/removal type).</p> <p>2) The LED (red) for bright frame is built in.</p> <p>3) The LED is turned off in interlocking with a shutter.</p>	
20	Anti-backlighting shutter	<p>1) This shutter can be inserted into and removed from a light path (knob insertion/removal type).</p>	
21	Mounting the stage	<p>1) Circular dovetail mounting, 4-point support type</p>	Same as IMT-2
22	Mounting PMG3-MTU	<p>1) Screw mounting (same as PMG3-MCR)</p>	
23	Mounting the microscope attachment	<p>1) Screw mounting</p>	Same as MTU
24	Mounting the lamp housing for transmitted light	<p>1) Fitting type (fixed with screw)</p>	
25	Eyepoint height	<p>1) 434mm from the desk top</p>	
26	Dimensions (mm)	<p>1) 360 (W) × 706 (D) × 430 (H) (Stage height: 327mm from the desk surface)</p>	
27	Weight	<p>Max. 35Kg (with one large format camera)</p>	
28	Mounting the mirror for checking the area to observe	<p>1) Screwing type (screw diameter: M5)</p> <p>2) A universal joint allows the mirror to be oriented to any desired direction.</p>	

29	Electric system	<ul style="list-style-type: none"><li>1) Input power source 100V system: 100V, 120V 200V system: 220V, 230V, 240V</li><li>2) Power switching Slide switch</li><li>3) Safety device Breaker type</li><li>4) Rated power consumption 100V: 1.7A 120V: 1.5A 220V: 0.8A 240V: 0.75A</li><li>5) Rated frequency 50 - 60Hz</li></ul>	
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## 1. List of jigs and tools

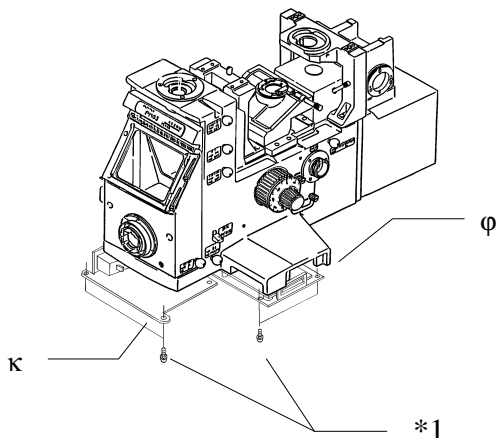
No.	Description	Page
PG3 KC004	LU5003 positioning jig	D-2
PG3 KC005	LU5002 positioning jig	D-2
PG3 KC006	AB4830 positioning jig	D-3
PG3 KC022	Prism mount ass'y positioning pin	D-5
PG3 KC024	Master scale 2	D-13
A2 KC0012	Standard illuminometer	D-9
OT031700	Thickness gauge	D-5, 7
ZJ539500	Pointer	D-13

## 2. List of lubricants and chemicals

No.	Description	Page
OT2024	Grease (light)	D-3, 4
OT1315	Epoxy adhesive (5 min.)	D-1, 2, 4
OT1983	Solvent-based adhesive (red)	D-3, 4, 7
OT1131	Shellac	D-2, 4



1. PRPB-2 disassembly procedure

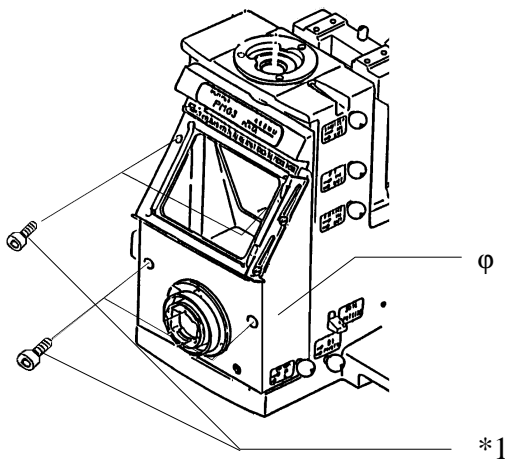


1-1

Remove the screws \*1, BOTTOM COVER-B ASS'Y ① and BOTTOM COVER ②.

Screw: CUK3 × 6SA \*1 12 pcs.

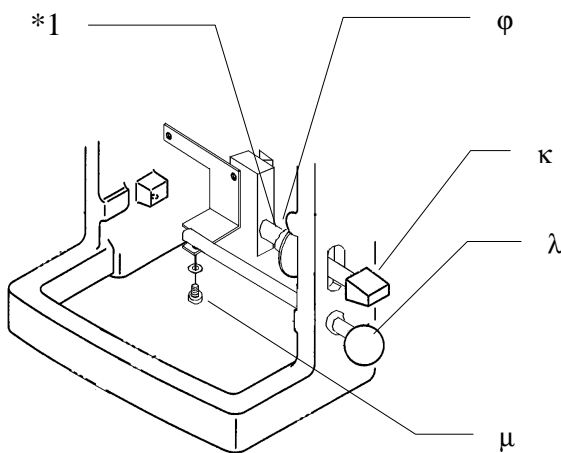
J Each unit is fixed from bottom with screws. For facilitating the disassembly work, it is recommended that the PMG3 frame be laid down.



1-2

Remove the screws \*1 and CAMERA MOUNT UNIT (CW) ①.

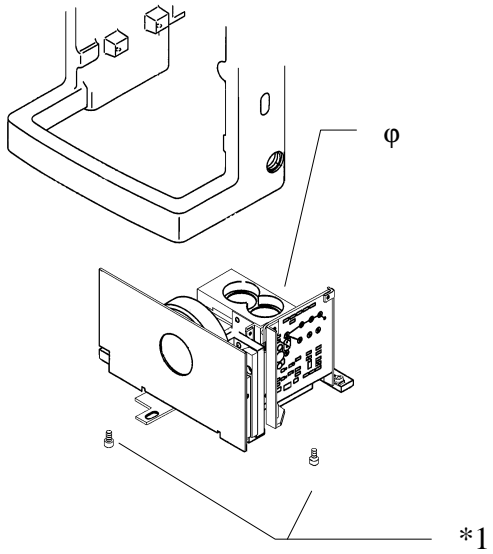
Screw: AB3 × 30SA \*1 4 pcs.



1-3

Loosen the screw \*1 and set the SHAFT HOLDER ① free. Remove the KNOB ② by turning it counterclockwise. Remove the SET SCREW ④ and SHAFT ③ in that order.

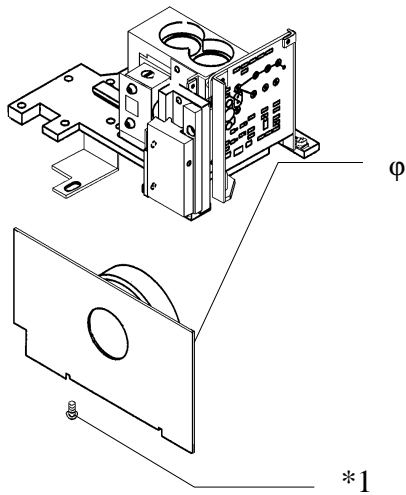
Screw: ACU2.6 × 4SA \*1 1 pc.



1-4

Loosen the screws \*1 and remove the PRPB UNIT ①.

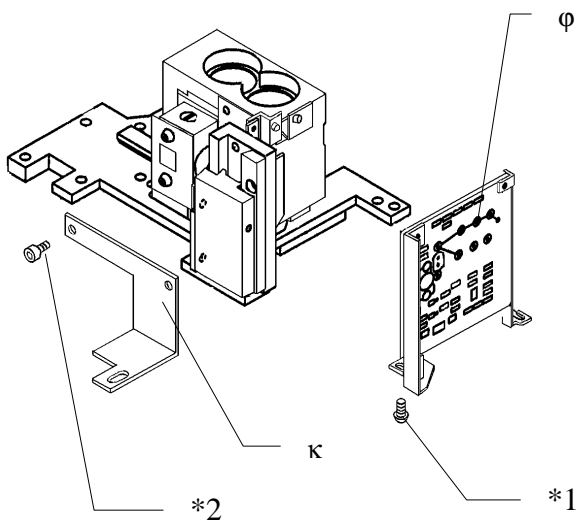
Screw: AB3 × 8SA \*1 4 pcs.



1-5

Remove the screws \*1 and SHUTTER ASS'Y ①.

Screw: CUK3 × 8SA \*1 2 pcs.



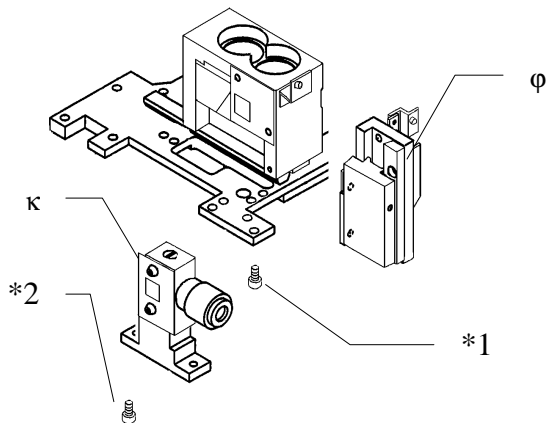
1-6

Remove the screws \*1 and PHOTOMETRY BOARD ①.

Remove the screws \*2 and CONNECTING PLATE ②.

Screw: CUK3 × 4SA \*1 2 pcs.

CUK3 × 8SA \*2 2 pcs.

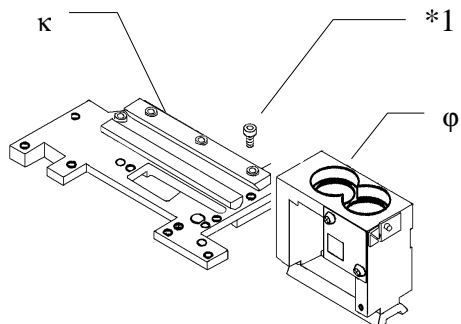


1-7

Remove the screws \*1 and DOVETAIL ASS'Y ①.

Remove the screws \*2 and PRISM MOUNT ASS'Y ②.

Screw: AB3 × 8SA \*1 2 pcs.  
 AB3 × 6SA \*2 2 pcs.

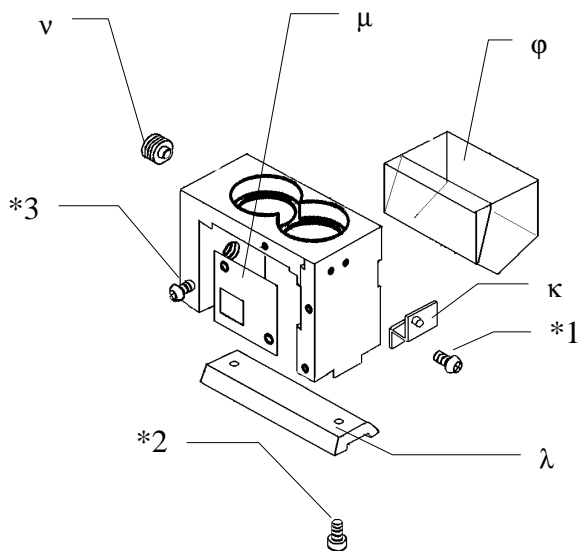


1-8

Remove the stopper screws \*1 and PRISM MOUNT ASS'Y ①.

J The DOVETAIL ② is bonded after a specified working force was adjusted. Because the working is not reproducible if the DOVETAIL ② is removed, be sure not to remove it as long as it is not damaged.

Screw: AB3 × 8SA \*1 2 pcs.



1-9

Remove the screws \*1 and SENSOR PLATE ②.

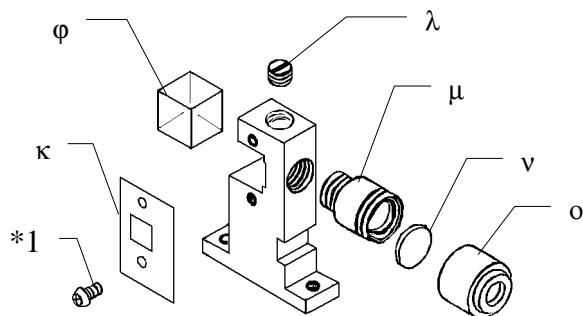
Remove the screws \*2 and DOVETAIL ③.

Remove the screws \*3 and DIAPHRAGM ④.

Remove the SET SCREW ⑤, take adhesive off and remove the PRISM ①.

Screw: 3PUK2 × 4SA \*1 2 pcs.  
 AB3 × 8SA \*2 2 pcs.  
 3PUK2 × 4SA \*3 2 pcs.

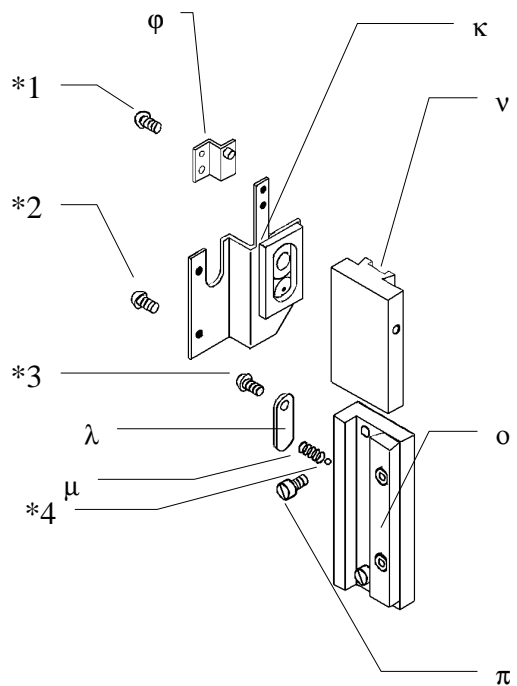
1-10



Remove the screws \*1 and DIAPHRAGM ②.  
 Remove the LENS FRAME ④, LENS ⑤ and TUBE ⑥ in that order.  
 Remove the SET SCREW ③, take adhesive off and remove the PRISM ①.

Screw: CUK3 × 4SA \*1 2 pcs.

1-11

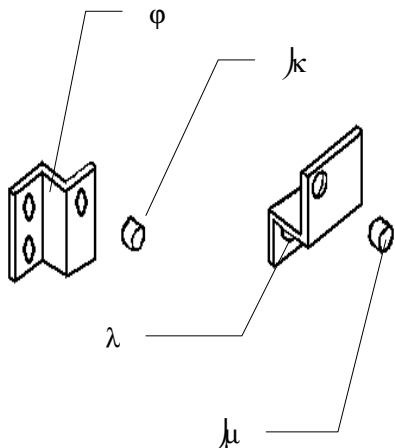


Remove the screws \*1 and SENSOR PLATE ①.  
 Remove the screws \*2 and PLATE ASS'Y ②.  
 First Remove the screw \*3 and then LEAF SPRING ③, SPRING ④ and ball \*4.  
 Remove the STOPPER SCREW ⑦ and pull out DOVETAIL ⑤.

⌋ The DOVETAIL ⑥ is bonded after a specified working force was adjusted. Because the working is not reproducible if the DOVETAIL ⑥ is removed, be sure not to remove it as long as it is not damaged.

Screw: 3PUK2 × 4SA \*1 2 pcs.  
 3PUK2 × 4SA \*2 2 pcs.  
 CUK3 × 4SA \*3 1 pc.  
 B3UO \*4 1 pc.

1. PRPB-2 assembly procedure

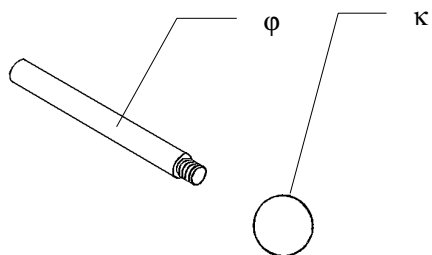


1-1

Bond the MAGNETS, κ and μ to the SENSOR PLATE φ and SENSOR PLATE λ.

- ⌋ Set the white marking on magnet facing front.

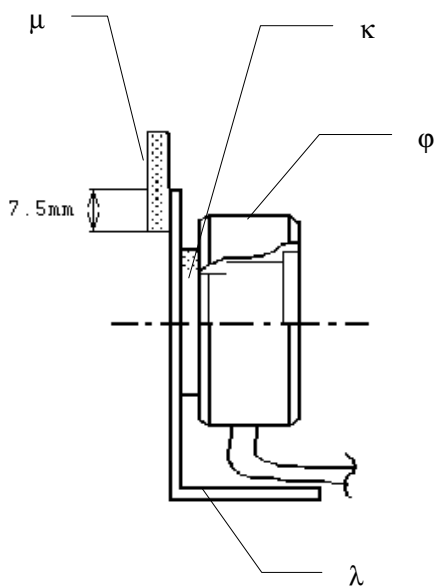
Adhesive: OT1315



1-2

Apply adhesive to the thread of SHAFT ① and turn the KNOB ② clockwise to screw the thread of shaft into it.

Adhesive: OT1315

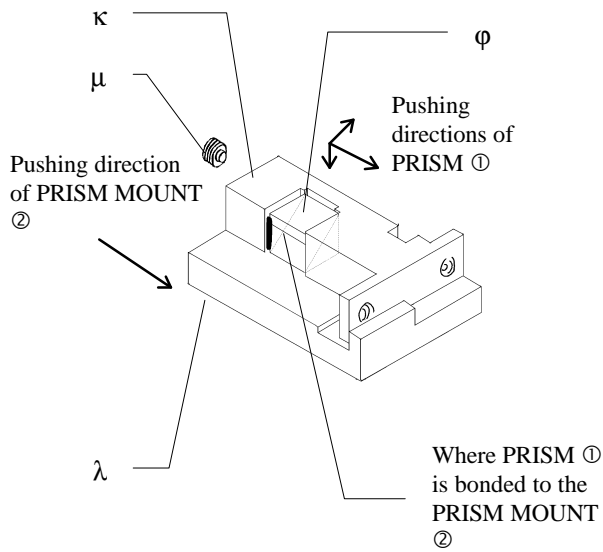


1-3

Bond the SHUTTER ① to the SHUTTER PLATE ③ with the SPONGE ②.

Affix the LIGHT SHIELD ④ as illustrated in the figure at left.

- ⌋ Hold the SHUTTER ① with its cord hanging down and affix the side with a shutter blade to SPONGE ②. Affix the LIGHT SHIELD ④ to the SHUTTER PLATE ③ with double coated tape. At this time, its position is adjusted equal to the center of shutter plate in horizontal direction and attached to the portion of 7.5 mm as shown on the left.



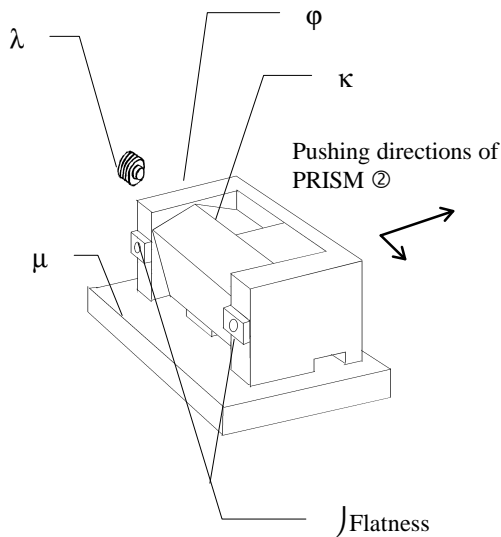
1-4

Position the PRISM MOUNT ② onto the JIG ③. Place the PRISM ① and push it in three directions (as illustrated in the figure at left). Secure it with the SET SCREW ④ and bond it.

⌋ In order to prevent the vignetting of light, apply adhesive in a way that it does not exude to the cemented surface of PRISM ①.

JIG ③: PG3KC004

Adhesive: OT1315



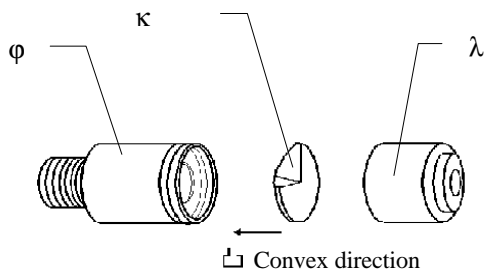
1-5

Position the PRISM MOUNT ① and PRISM ② onto the JIG ④. Push the prism in two directions (as illustrated in the figure at left), secure it with the SET SCREW ③ and bond it.

JIG ④: PG3KC005

Adhesive: OT1315

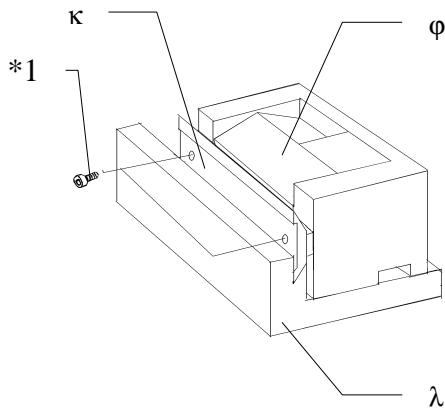
⌋ Before bonding the PRISM ①, check the flatness of the dovetail mounting surface. If the flatness is unsatisfactory, finish the surface to a proper level of flatness by placing a sheet of sand paper (#400) on a surface table and rubbing the dovetail mounting surface against it.



1-6

Position the LENS ② into the LENS FRAME ③ and secure the LENS ② by screwing the lens frame on the TUBE ①.

Adhesive: OT1131



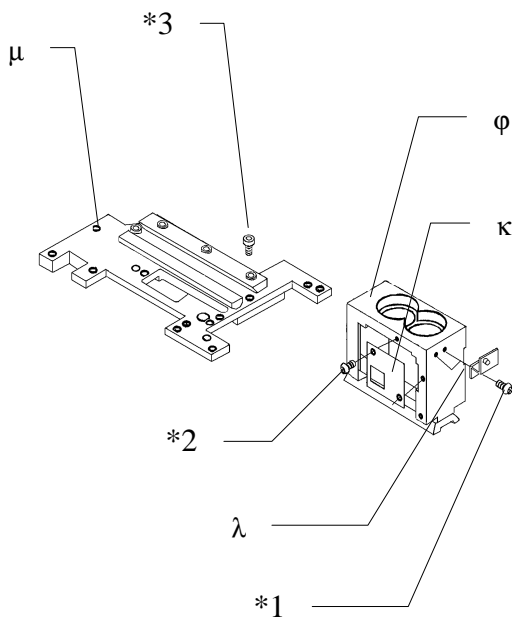
1-7

Position the PRISM MOUNT ASS'Y ① and DOVETAIL ② onto the JIG ③. Set the DOVETAIL ② parallel to the JIG ③ and secure it with the screws \*1.

Screw: AB3 × 8SA \*1 2 pcs.

Adhesive: OT1126

JIG ③: PG3KC006



1-8

Mount the DIAPHRAGM ② on the PRISM MOUNT ASS'Y ① with the screws \*2.

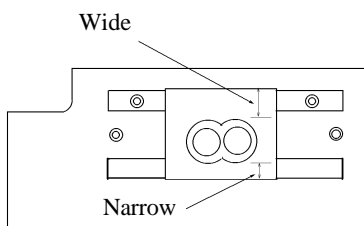
J Mate the face of DIAPHRAGM ② with two faces of PRISM MOUNT ASS'Y ①.

Apply grease to the female dovetail of BASE ASS'Y ④ and the male dovetail of PRISM MOUNT ASS'Y ①. Insert the male dovetail into the female dovetail, ensuring that they are in proper alignment with each other. (See the figure at lower left.)

After confirming that the dovetail works properly, apply adhesive to the threads of stopper screws \*3 and screw them on the BASE ASS'Y ④.

J The dovetail's working force is  $100 \pm 50g$ ; it should be able to work smoothly without play.

Magnified view of the direction in which the PRISM MOUNT ASS'Y ① must be inserted into the BASE ASS'Y ④



Fix the SENSOR PLATE ③ in position with the screws \*1.

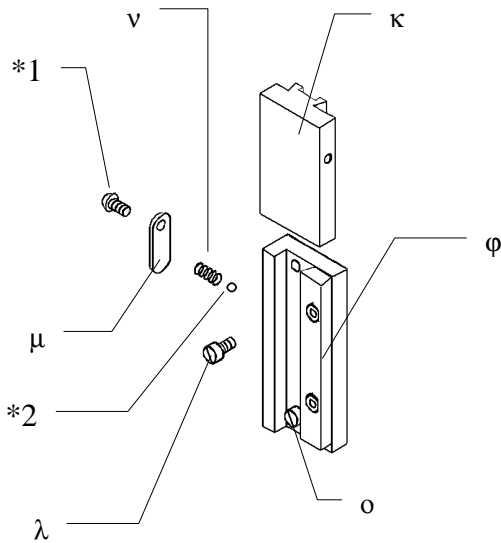
Screw: 3PUK2 × 4SA \*1 2 pcs.

3PUK2 × 4SA \*2 2 pcs.

AB 3 × 8SA \*3 2 pcs.

Grease: OT2024

Adhesive: OT1983



1-9

Apply grease to the DOVETAIL ASS'Y ① and DOVETAIL ②. Insert one into the other.

After confirming that the dovetail works properly, insert the ball \*2 and SPRING ⑤ into the screw hole and secure the LEAF SPRING ④ with the screw \*1.

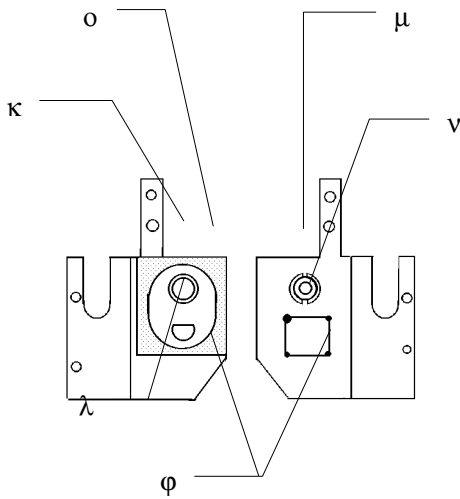
J The working force of the dovetail is  $250 \pm 50g$ . Adjust the click removing force to  $700 \pm 100g$ , ensuring that the dovetail can work smoothly without play.

If the DOVETAIL ⑥ was removed, it must be retained in position with adhesive after necessary adjustments are made.

Screw: CUK3 × 4SA \*1 1 pc.  
B3UO \*2 1 pc.

Grease: OT2024

Adhesive: OT1983, OT1315, OT1131



1-10

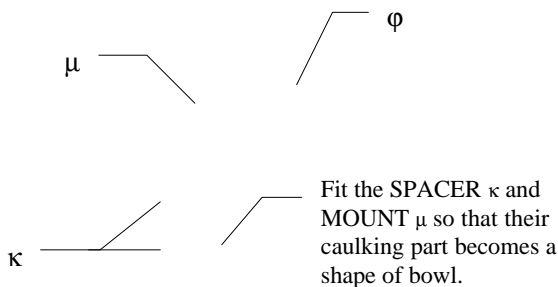
Fit the SPACER ② and MOUNT ④ to the PLATE ① by caulking them from the mount side. (See the figure at lower left showing how they are to be fitted to PLATE ①.)

Apply adhesive to four corners of the ND1.5N ⑤.

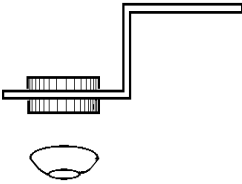
Cut off about one third of the AV SHEET ③ and bond this cut sheet.

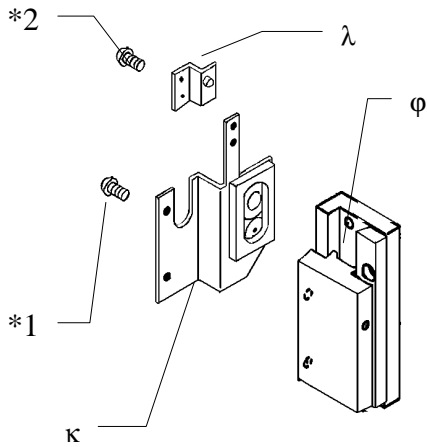
Affix the COVER ⑥ while aligning its two corners with the PLATE ①.

Adhesive: OT1315









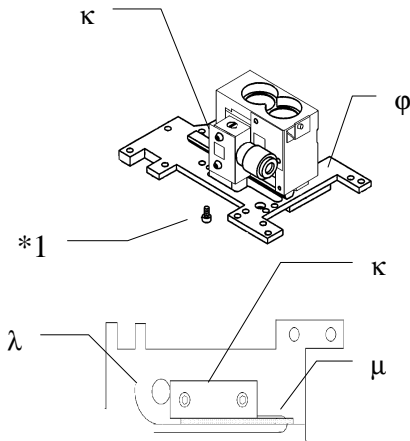
1-11

Secure the PLATE ASS'Y ② to the DOVETAIL ASS'Y ① with the screws \*1.

J Fit the PLATE ASS'Y ② flush with the front of DOVETAIL ASS'Y ①.

Secure the SENSOR PLATE ③ to the PLATE ASS'Y ②.

Screw: 3PUK2 × 4SA \*1 2 pcs.  
3PUK2 × 4SA \*2 2 pcs.



1-12

Secure the PRISM MOUNT ASS'Y ② to the BASE ASS'Y ① with the screws \*1.

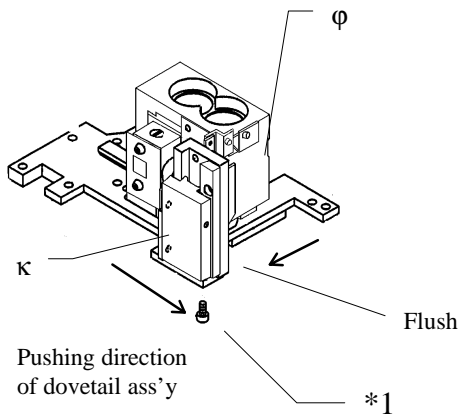
J Position the PRISM MOUNT ASS'Y ② to the BASE ASS'Y ① by using the POSITIONING PIN ③ and THICKNESS GAUGE ④.

Screw: AB3 × 6SA \*1 2 pcs.

Jigs ③: PG3KCO22

④: OT031700

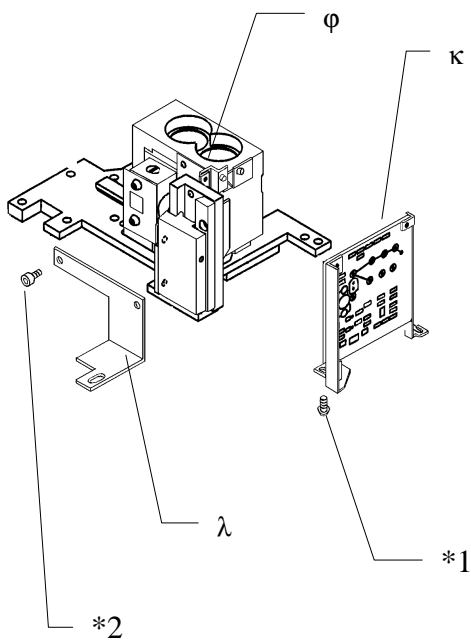
(Thickness gauge: 3 mm)



1-13

Secure the DOVETAIL ASS'Y ② to the BASE ASS'Y ① with the screws \*1. At this time, fit the dovetail ass'y flush with the front and right side of base ass'y on the mounting part while pushing it in the arrow directions. (See the figure at left.)

Screw: AB3 × 8SA \*1 2 pcs.



1-14

Secure the PHOTOMETRY BOARD ② to the BASE ASS'Y ① with the screws \*1.

J Using the screw play to mount the photometry board, adjust the interval between the hall element and magnet of each sensor plate to 1 mm.

Retain the CONNECTING PLATE ③ in position with the screws \*2.

Screw: CUKSK3 × 6SA	*1	3 pcs.
AB3 × 6SA	*2	2 pcs.

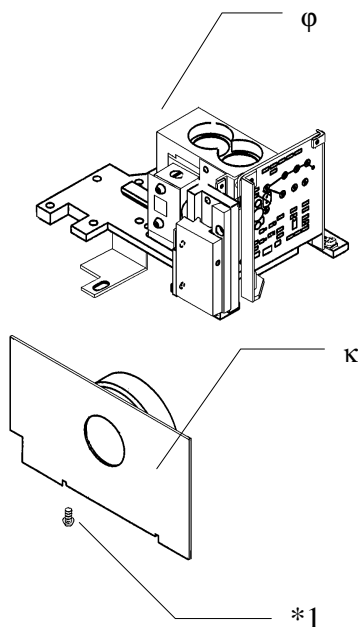
1-15

As a dust-proof measure, affix double-sided tape to blank screw holes at this time. Both sides of this tape must be well tacky.

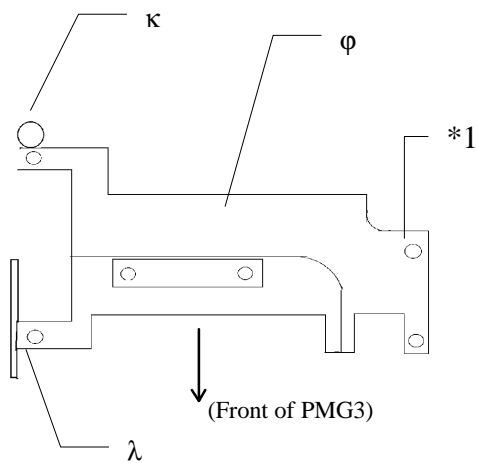
1-16

Secure the SHUTTER ASS'Y ② to the BASE ASS'Y ① with the screws \*1.

Screw: CUK3 × 8SA \*1 2 pcs.



(Bottom view)



1-17

Secure the PRPB UNIT ① to PMG3 frame with the screws \*1.

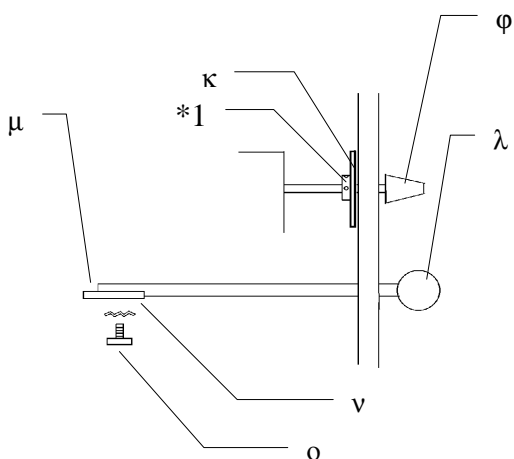
- J Set the POSITIONING PIN ② and the THICKNESS GAUGE ③ in the positions shown at left and adjust the position of PRPB unit.

Screw: AB3 × 8SA \*1 4 pcs.

Jigs ②: PG3KC022

③: OT031700

(Thickness gauge: 1 mm)



1-18

Pinch the frame with the KNOB ① and SHAFT HOLDER ② and screw the shaft into the PRPB UNIT.

- J The SHAFT HOLDER ② is used to prevent the shaft from loosening. Therefore, it must be set at a distance of about 0.1mm from inside surface of the frame and be secured with the screws \*1, ensuring that it does not interfere with the frame.

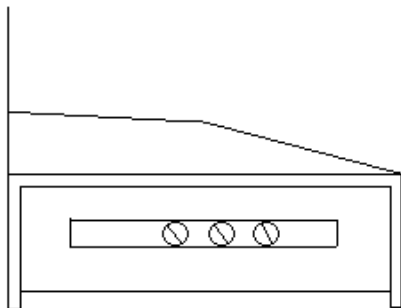
Secure the SHAFT ③ to the PRPB CONNECTING PLATE ④ with the WASHER ⑤ and SCREW ⑥.

Screw: ACU2.6 × 4SA \*1 2 pcs.

Adhesive: OT1983

## 2. Adjustment procedure

### 2-1 Adjusting the lamp voltage



Use the three variable resistors on the right of the armrest to adjust the lamp voltage.

First turn on the lamp and then measure a voltage outputted to the socket.



- R302: For setting the highest voltage
- R304: For setting the lowest voltage
- R309: For adjusting voltage indication

#### 2-1-1 Voltage selector switch/input power voltage setting

- 100V: 100V input on 100V side
- 200V: 200V input on 200V side

#### 2-1-2 Setting the highest voltage

Adjust the R302 trimmer.

Specified highest voltage value: 11.5±0.1v

#### 2-1-3 Setting the lowest voltage

Adjust the R304 trimmer.

Specified lowest voltage value: 2.50±0.05V

#### 2-1-4 Adjusting voltage indication

Adjust the R309 trimmer.

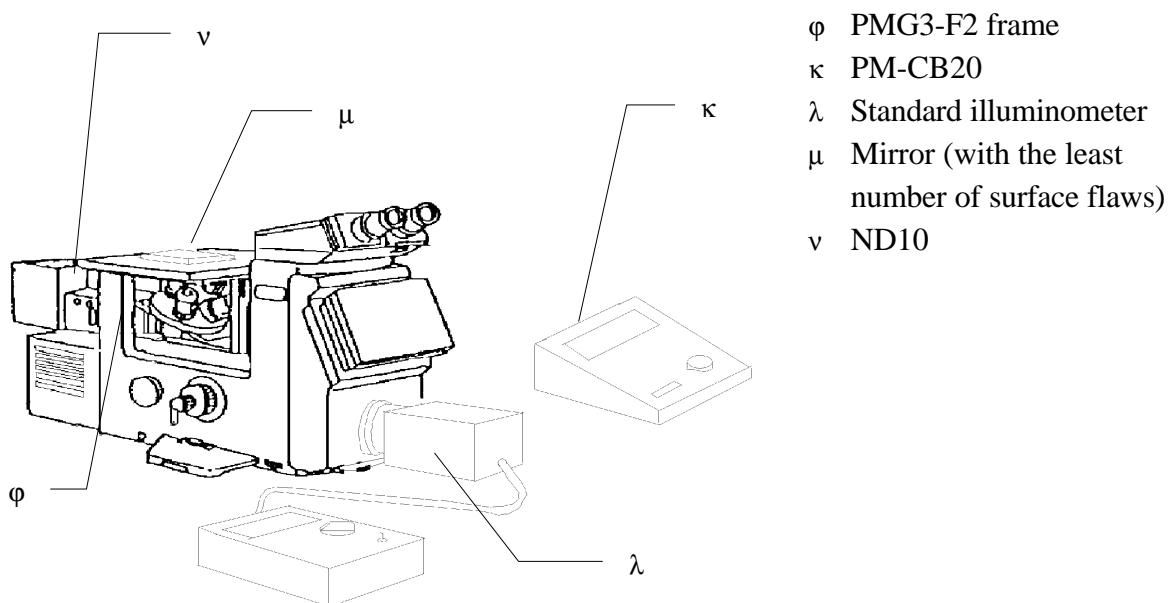
Voltage indication to be adjusted: 8.00±0.05V

)The voltage level indicated by the LED must read "8."

## 2-2 Photometry adjustment

This manual describes the photometry adjustment between PMG3 and PM-CB20. In making repairs on the PM-CB20, therefore, the work of repair must be done in accordance with the PM-20 repair manual.

### 2-2-1 Setting



- φ PMG3-F2 frame
- κ PM-CB20
- λ Standard illuminometer
- μ Mirror (with the least number of surface flaws)
- ν ND10

### 2-2-2 Preparation

Prior to the start of the work of photometry adjustment, turn on the power of standard illuminometer and leave it for 5 minutes or longer to allow it to become stable.

#### 2-2-2-1

Each setting on the PMG3 frame is shown as follows:

- ① ZOOM: 35mm, 2.5×
- ② AS/FS: MAX (light intensity to be adjusted by AS)
- ③ SPOT/AVERAGE (30%): To the SPOT side
- ④ Filter turret  
Color correction: LBD  
ND: Depending on each section to be adjusted
- ⑤ Light path selection: BI/PHOTO side
- ⑥ Camera light path: 35mm

**2-2-2-2 Calibrating the tilt/leap-up**

- ① Set the lamp voltage to about 10V.
- ② By turning on the power while pressing and holding down "RECIP" and "ISO" on PM-CB20, the calibration mode will start.

Time required for the tilt/leap-up calibration: 120 sec.

The following information is displayed on PM-CB20.

```

    BXP. CALIBRATION MODE
    -- AUTO-CALIBRATING--
    AUTO-SP
    
```

This indicates that the tilt/leap-up calibration is automatically executed with the start of the calibration mode.

As the process of calibration ends, the following information is displayed on PM-CB20.

```

    EXP. CALIBRATION MODE
    --END AUTO-CALIBRATION
    "EXPOSE" TO NEXT
    
```

**2-2-2-3 Setting the measurement correction value**

- ① Set the BI/PHOTO selector knob and SHUTTER knob to IN.
- ② Set the filter turret to ND6.
- ③ Press "EXPOSE" and set standard illuminance.

Standard illuminance: 0.80 (Lx)

Press "EXPOSE" and the following information is displayed and, at the same time, the shutter becomes open.

```

    AREA-0
    "STORE" TO CALB DATA
    "EXPOSE" TONEXT
    XXXXX
    
```

(XXXXXX) is an estimated exposure time value.

④ In the case of ISO 6

Estimated exposure time value: 0.3 sec.

④-1

Press "ISO" and set the ISO value to "6" by turning the JOG dial. Pressing "ISO" once again will enter the value "6."

AREA-0	6
DATA	XXXH
"EXPOSE"	TO NEXT
XXXXX	

④-2

Press "STORE" and change the correction value by turning the JOG dial. Press "STORE" once again and verify that the estimated exposure time value has been entered. If the value shown is different from the one you have entered, repeat this process.

J As a correction value, use the value when 0.29 sec. has changed to 0.3 sec.

④-3

After adjusting the estimated exposure time value, press "EXPOSE" to enter the value.

(The setting steps in AREA1 to AREA5 are the same as the above, therefore, they are here omitted in the followings.)

⑤ Setting AREA1-AREA5

⑤-1

Standard illuminance: 0.25 (Lx)

⑤-2 AREA1

In the case of ISO 100

Estimated exposure time value: 1.01 sec.

⑤-3

Standard illuminance: 0.02 (Lx) J1

⑤-4 AREA2

In the case of ISO 25

Estimated exposure time value: 62.3 sec.

AREA-1	100
DATA	XXXH
"EXPOSE"	TO NEXT
XXXXX	

J1: Since the measuring performance for the 0.02 (Lx) region cannot be guaranteed in the standard illuminometer (A2KC0012), the reading give by this illuminometer is used only as a reference. Therefore, after AREA-1 adjustment, ND10 must be inserted and the estimated exposure time value must be adjusted so that it becomes 15.6 sec., in the case where ISO 100 is



used.

⑤-5 AREA3

In the case of ISO 4000

Estimated exposure time value: 0.39 sec.

⑤-6 AREA4

In the case of ISO 800

Estimated exposure time value: 1.95 sec.

⑤-7 AREA5

In the case of ISO 6400

Estimated exposure time value: 0.24 sec.

⑥ Calibrating the average measurement

```
LIGHT PATH MODE
SELECT AUTO-AV PATH
```

⑥-1

Set the measurement selector knob to the 30% side in the same conditions as described under ⑤-7 and the mode will change automatically.

```
CALIBRATION AUT      6400
"EXPOSE" TO NEXT
"STORE" TO CALB DATA
XXXXX      Auto-Av
```

Estimated exposure time value: 0.24 sec.

Correction value: More than A0H

J If the estimated exposure time value for SPOT (1%) is different from that for AVE (30%), adjust the position of the SPOT diaphragm (explained on the next page) and redo the above process from the tilt/leap-up calibration.

```
CALIBRATION AUT      6400
DATA   XXXH
"STORE" TO SET DATA
XXXXX
```

⑦ Entering the calibrated correction value

```
ONLY FACTORY MODE
NOT NEED TO ADJUST
"EXPOSE" TO NEXT
"STORE" TO CALB DATA
```

Correction value (fixed value): 19H

```
ONLY FACTORY MODE
DATA   19H
"STORE" TO SET DATA
XXXXX
```

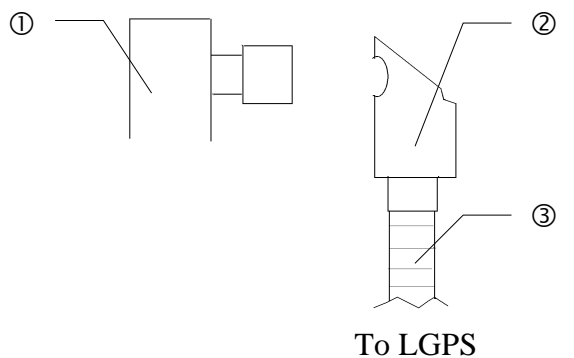
⑧ Writing data to memory

The calibration mode ends normally and the mode changes to the normal operation mode.

END CALIBRATION  
WRITING DATAS TO RAM

END WRITING DATAS  
BACK TO NORMAL MODE

**2-3 Adjusting the positions of SPOT and AVERAGE diaphragms**



Remove the photometry board from the PRPB unit.

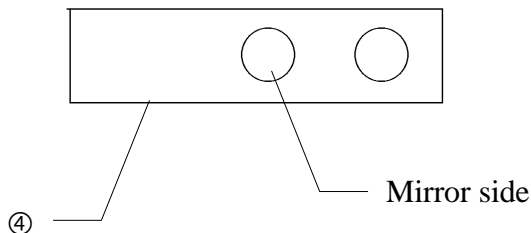
Attach the POINTER ② (ZJ539500) to the end of LGPS FIBER ③ and shed light on the tube of PRISM MOUNT ASS'Y ①.

Setting on the PMG3 frame

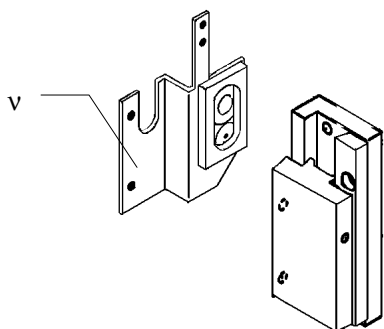
FT - OUT

Light path - PHOTO/BI side

Set MASTER SCALE 2 ④ (jig). (Use the mirror side.)



Jig ④: PG3KC024



By adjusting the position of PLATE ⑤, align the optical axis with the center of eyepiece reticle .

