OLYMPUS STEREO MICROSCOPES

MODELS VMF, VMT & VMZ

REPAIR MANUAL

OLYMPUS

TO OLYMPUS MICROSCOPE SERVICING PERSONNEL

Before repair of microscopes of VM series:
Although this repair manual refers only to the methods of repair and adjustment of VMT-4, VMT-2 and VMZ of the VM series, it also enables you to understand those of VMF.
Listed in this repair manual are a variety of tools and jigs, without which the required optical adjustments are not possible. It is, therefore, requested that the optical system not be disassembled unless the necessary jigs are available.

Requisites for repairs:

1. First of all, ascertain what parts of the microscope the user or owner of which wishes you to repair.
2. Never fail to check the entire function of the microscope before you commence its repair.
   a) Find out what parts are defective and how much they are damaged.
   b) Prior to repair, think of the best possible order of disassembling the defective parts in a most efficient way.
3. After completing the repair, check the functions of not only the re-assembled parts but also the entire microscope to make sure no defect should be left unremedied.
4. Be careful not to deform repair parts during the assembly; make it practice to use tools and jigs specified for purpose.
5. Make repairs promptly and accurately.

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1. REPAIR TOOLS AND GREASES

1-1 Regular Tools

OT 0011	Set of screwdrivers (6 pcs.)
OT 0015	Phillips screwdriver (medium size)
OT 0016	Phillips screwdriver (large size)
OT 0018	Screwdriver (large size)
OT 0021	Adjustable spanner (round tip)
OT 0022	Adjustable spanner (flat tip)
OT 0023	Handle of small size Phillips screwdrivers, using OT 0027
OT 0027	Tip of small size Phillips screwdriver, using OT 0023
OT 0035	Tweezer (special made)
OT 0205	Allen wrench (2 mm) (In case of VMZ 3 pcs. are needed.)
OT 0216	Set of Allen wrenches (8 pcs.)
OT 1021	Hi-Super Bond (adhesive)
OT 1027	Alon-Alpha (adhesive)
OT 1028	Araldite (adhesive)
OT 1131	Shellac (20 g)

1-2 Special Tools and Jigs

	C–2	G10X Eyepiece with cross-hair
	C–15	Focusing magnifier (PM-FT)
	KKAA 0008	Pin face wrench for coarse adjustment nut (AA 000800, AA000900)
	KN 0003	Test plate for Stereo Microscope Alignment (5/100 concentric)
*	KN 0027	Standard eyepiece for optical tube length alignment
	VM–KC003	Jig for interpupillary distance
	VM–KC004	Support stand
	VM–KC005	Jig for observation tube alignment
	VM–KC006	Standard objective lens for optical tube length
	VM–KC007	Positioning jig for objective lens tube
	VM–KC010	Jig for zoom lens alignment

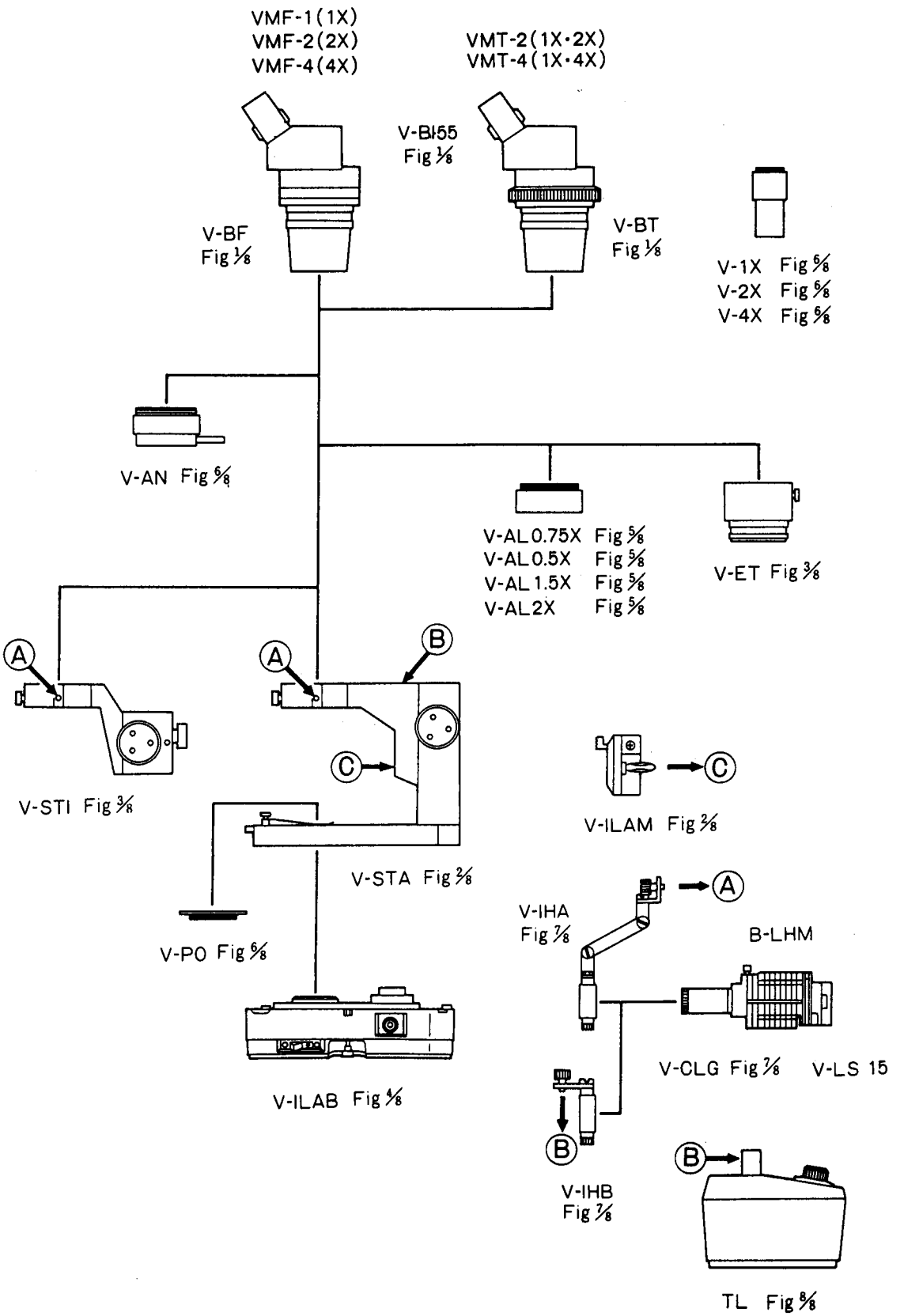
1-3 Greases

OT 2007	1 kg	Same kind of grease
OT 2008	50 g	
OT 2011	1 kg	Same kind of grease
OT 2012	50 g	
OT 2023	1 kg	Same kind of grease
OT 2024	50 g	

* In case of repairing a small number of the microscopes, expensive KN0027 can be substituted by regular GW10X or GWH10X eyepiece which is attached to the microscope. Although accuracy somewhat deteriorates as a result, it is not to such an extent as to adversely affect observation through the microscope.

2. EXPLODED PARTS DIAGRAMS

VM SERIES



3. DISASSEMBLY OF VMT-4 OR VMT-2

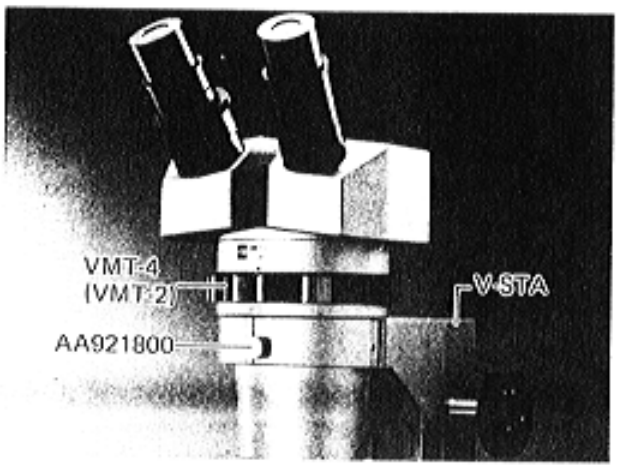


Fig. 1

In this repair manual, the left or right side of the microscope is, as shown in Fig. 1, the side on the left or right as viewed from the position of the operator or the observer, unless otherwise specified.
Also, unless otherwise specified, the screws and nuts are threaded right-handedly. To loosen them for disassembly, therefore, turn them counterclockwise and to tighten for assembly, turn them clockwise.

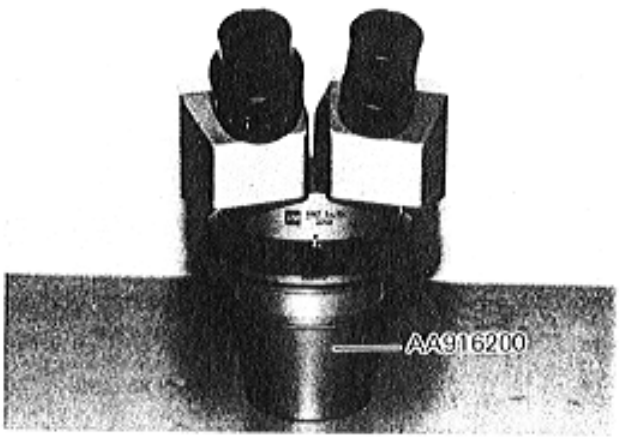


Fig. 2

3-1 Loosen Screw AA921800 and pull up Body VMT-4 for removal from Stand V-STA.
(See Figs. 1 and 2.)

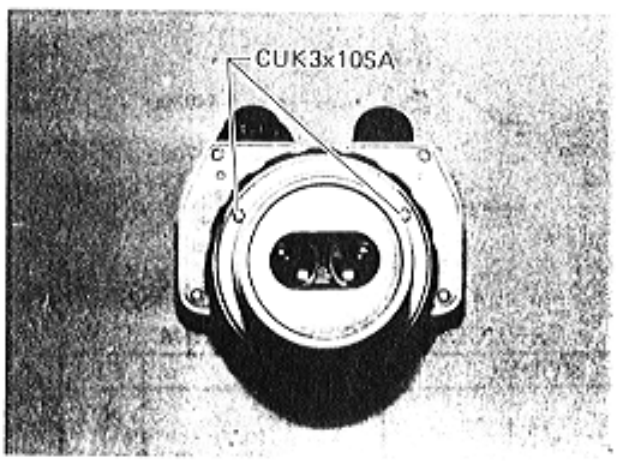


Fig. 3

3-2 Remove Objective Cover AA916200 by unscrewing 3 pieces of CUK3x10SA after turning the Body upside down. (See Fig. 3.)

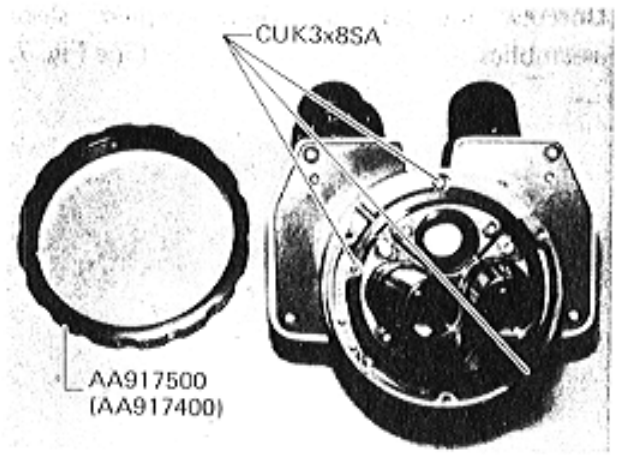


Fig. 4

3-3 Remove Magnification Changer AA917500 (or AA917400 in case of VMT-2). (See Fig. 4.)

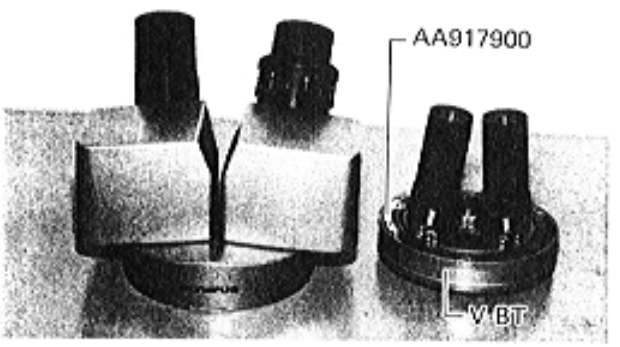


Fig. 5

3-4 Remove Turret V-BT by unscrewing 3 pieces of CUK3x8SA. (See Figs. 4 and 5.)

3-5 Remove Click Spring AA917900 by unscrewing 2 pieces of 3PUK2x4SA. (See Fig. 5.)

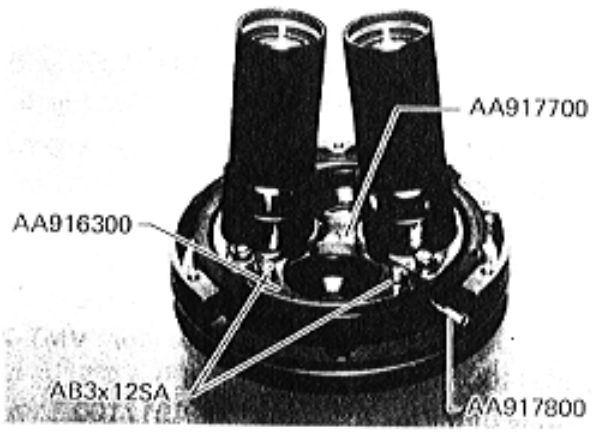


Fig. 6

3-6 Remove Objective Mount Assembly AA916300 by unscrewing 2 pieces of AB3x12SA from each component. (See Fig. 6.)

3-7 Remove Shaft AA917700. (See Fig. 6.)

3-8 Remove Screw AA917800. (See Fig. 6.)

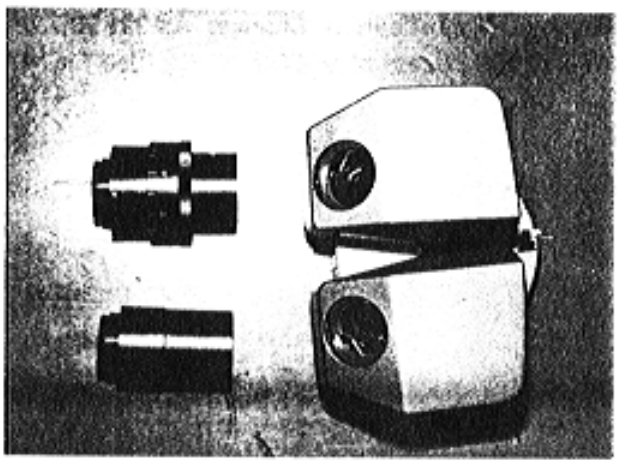


Fig. 7

3-9 Unscrew the left and right eyepiece sleeve assemblies. (See Fig. 7.)

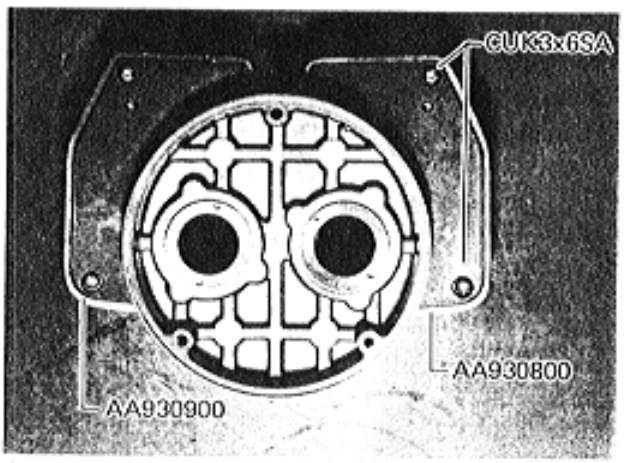


Fig. 8

3-10 Remove Mirror Covers AA930800 and AA-930900 by unscrewing 2 pieces each of CUK3 x6SA. (See Fig. 8.)
Mirror Cover AA930900 is on the left and Mirror Cover AA930800, on the right.

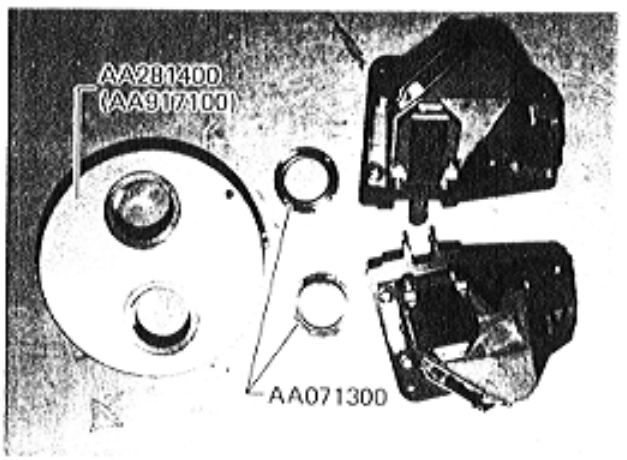


Fig. 9

3-11 Remove Base of Mirror Assembly AA281400 in case of VMT-4, or AA917100 in case of VMT-2, by unscrewing Nuts AA071300 with Adjustable Spanner OT0021. (See Fig. 9.)

The following components are for VMT-4 ZJ850900:

Base of Mirror Assembly	AA281400
Connecting Plate, right	AA930600
Connecting Plate, left	AA930700

The following components are for VMT-2 ZJ851100:

Base of Mirror Assembly	AA917100
Connecting Plate, right	AA930600
Connecting Plate, left	AA930700

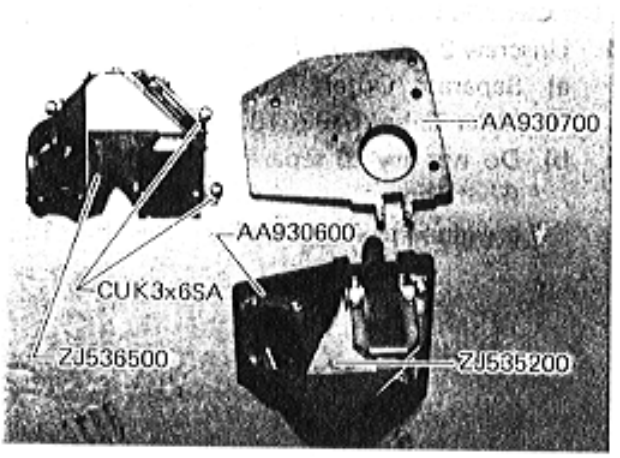


Fig. 10

3-12 Remove Connecting Plates AA930600 and AA930700 by unscrewing 3 pieces of CUK3 x6SA from each plate.

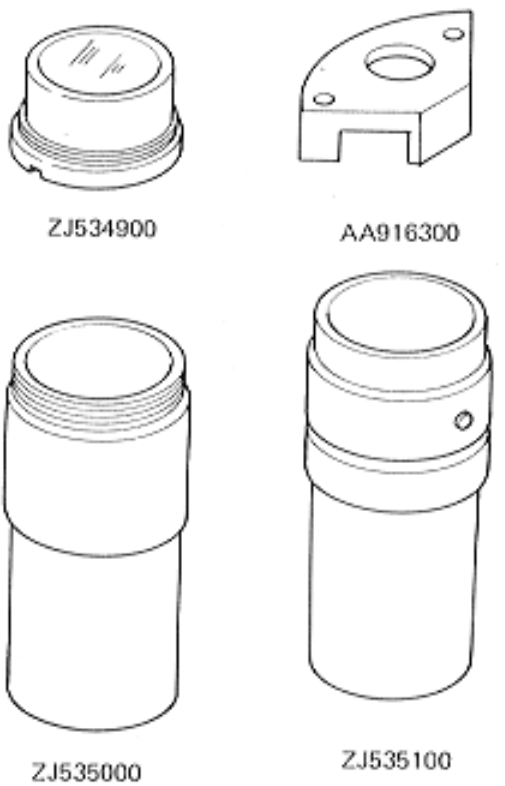


Fig. 11

3-13 Unscrew the objective assembly from Objective Mount Assembly AA916300.

The objective assembly is composed of the following lenses:

V–1X	ZJ534900
V–2X	ZJ535000
V–4X	ZJ535100

(See Fig. 11.)

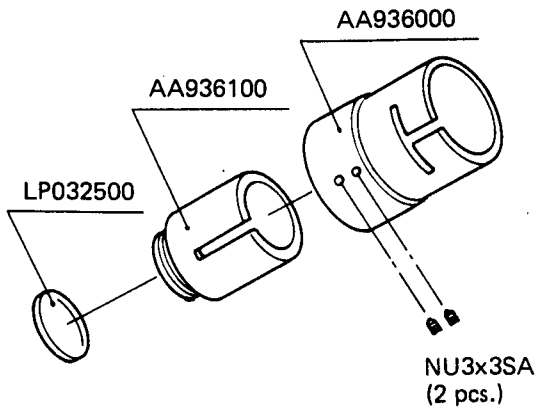


Fig. 12

3-14 Disassemble the right eyepiece sleeve.

3-14-1 Unscrew 2 pieces of NU3x3SA.

a) Separate Outer Tube AA936000 from Inner Tube AA936100.

b) Do not try to separate Glass LP032500 from Inner Tube AA936100 since they are glued to each other. (See Fig. 12.)

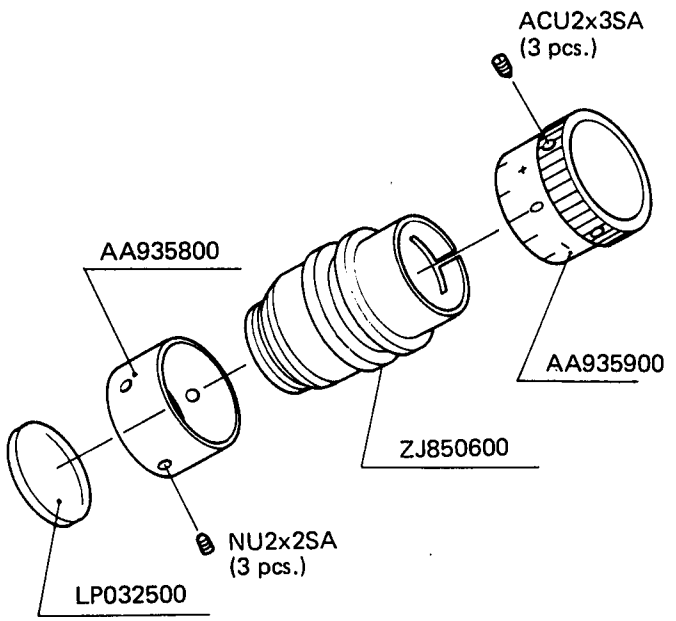


Fig. 13

3-15 Disassemble the left eyepiece helicoid assembly. (See Fig. 13.)

a) Remove Diopter Ring AA935900 by unscrewing 3 pieces of ACU2x3SA.

b) Remove Tube AA935800 by unscrewing 3 pieces of NU2x2SA.

c) Do not try to separate Glass LP032500 from Tube AA935800 since they are glued to each other.

d) Brush contaminated grease off Helicoid ZJ850600, using xylol or gasoline.
After removing the grease, wipe off the xylol or gasoline with dry cloth and apply Grease OT2008.
After wiping Glass LP032500 with lens paper, clean it with the lens paper to which a solution prepared by mixing 7 parts of ether with 3 parts of alcohol, is applied in small quantities.

The booklet on "How to Clean the Microscope Lens" is available for your lens cleaning.

4. ASSEMBLY OF BINOCULAR TUBE V-BI 55

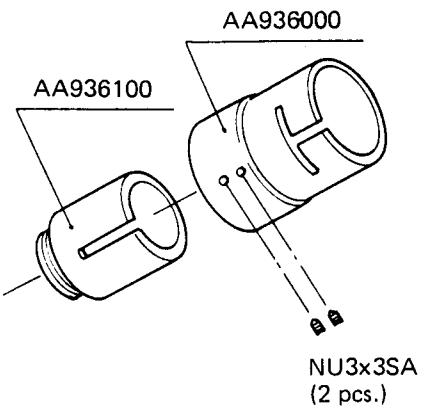


Fig. 14

4-1 Temporary assembly of the right eyepiece sleeve
Fix Outer Tube AA936000 temporarily on Inner Tube AA936100 with 2 pieces of NU3x3 SA, which must fit into the slot in Inner Tube AA936100. (See Fig. 14.)

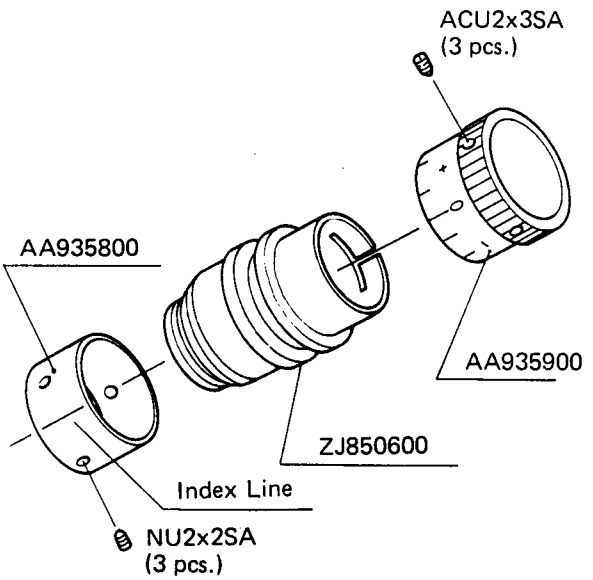


Fig. 15

4-2 Temporary assembly of the left eyepiece helicoid
a) Fix Tube AA935800 temporarily on Helical Tube ZJ850600 with 3 pieces of NU2x2SA in such a manner that the index line on Tube AA935800 will be located on the left.
b) Fix Diopter Ring AA935900 temporarily on Helical Tube ZJ850600 with 3 pieces of ACU2x3SA. (See Fig. 15.)

4-3 Fix Connecting Plate AA930600 temporarily on Right Mirror Assembly ZJ535200 with 3 pieces of CUK3x6SA. (See Fig. 10.)

4-4 Fix Connecting Plate AA930700 temporarily on Left Mirror Assembly ZJ536500 with 3 pieces of CUK3x6SA. (See Fig. 10.)

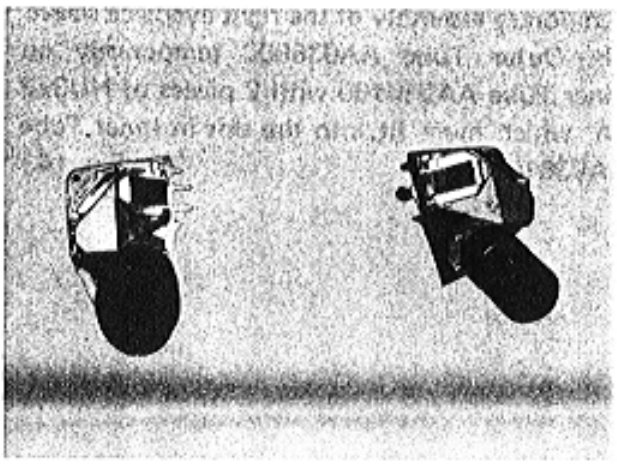


Fig. 16

4-5 Fix the temporarily assembled right eyepiece sleeve temporarily on Right Mirror Assembly ZJ535200. (See Fig. 16.)

4-6 Fix the temporarily assembled left eyepiece sleeve temporarily on Left Mirror Assembly ZJ536500. (See Fig. 16.)

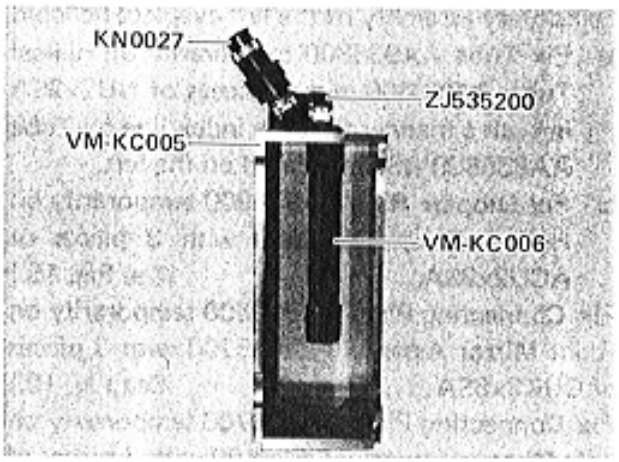


Fig. 17

4-7 Adjustment of the eyepiece sleeve

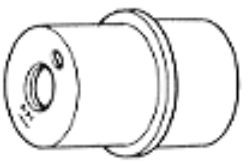
a) Jigs and tools required,

VM-KC005: Jig for observation tube alignment
VM-KC006: Standard objective for optical tube length
C–2: G10X eyepiece with cross hair
C–15: Focusing magnifier (PM-FT)
KN0027: Standard eyepiece for optical alignment

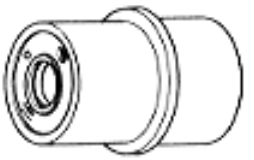
b) Screw Standard Objective VM-KC006 into the bottom side of Right Mirror Assembly (See Fig. 16.) and insert Standard Objective VM-KC006 into an opening at the center of the top panel of Jig VM-KC005 so as to mount the Right Mirror Assembly on Jig VM-KC005. (See Fig. 17.)
Use LSE or an electric bulb to illuminate Standard Objective VM-KC006 from the bottom.

c) Use of Focusing Magnifier (PM-FT) C–15

(1) Olympus eyepieces are corrected for two different diopters, regardless of magnifications. One type is corrected for –1 diopter, the other for –4 diopter. They can be identified by external appearances as illustrated below:



–1 diopter eyepiece
(currently used)

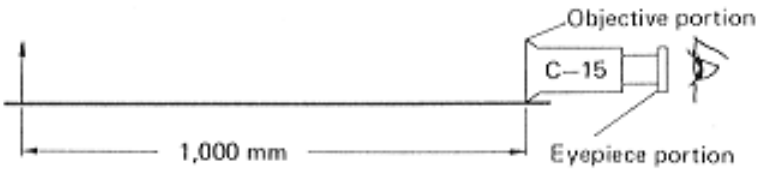


–4 diopter eyepiece
(old type & KN0027)

These illustrations above represent the eyepiece GW10X for stereo microscopes.
The –1 diopter eyepiece has a plain front surface, while the –4 diopter eyepiece has a recess on the front surface.

(2) Focusing with Focusing Magnifier (PM-FT) C–15

1) In case of –1 diopter eyepieces (GW10X or GWH10X):
Looking through the magnifier, move the eyepiece portion in or out until an object 1,000 mm away from the magnifier is brought into focus.



2) In case of –4 diopter eyepieces (KN0027):
Place an object 250 mm away from the C–15 (PM-FT) and focus it in the same manner as with the –1 diopter eyepiece.

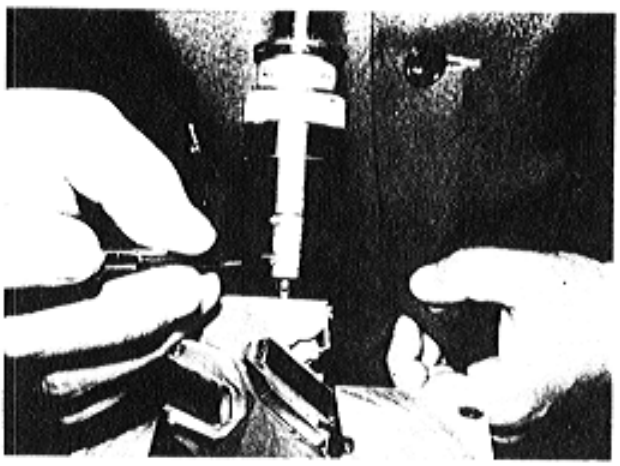


Fig. 18

d) Insert KN0027 into Outer Tube AA936000 of the right eyepiece sleeve.
Place over KN0027 C-15 that has been adjusted to focus at a distance of 250 mm and focus the scale on Standard Objective VM-KC006 through C-15 by moving Outer Tube AA936000 up and down after loosening 2 pieces of NU3x3SA on it. (See Fig. 18.)

e) Dismount the set of the Right Mirror Assembly and Standard Objective VM-KC006 from Jig VM-KC005 and separate them from each other.
Attach Standard Objective VM-KC006 to the Left Mirror Assembly in the same manner as described for the Right Mirror Assembly in b) above and mount them on Jig VM-KC005. Insert KN0027 into Helical Tube ZJ850600 and focus the scale on Standard Objective VM-KC006 as it was in d) above, by turning the helicoid.

f) After the focusing, align "0" marking on Diopter Ring AA935900 with the index line on Tube AA935800 and fix Diopter Ring AA935900 in place with 3 pieces of ACU2 x3SA.

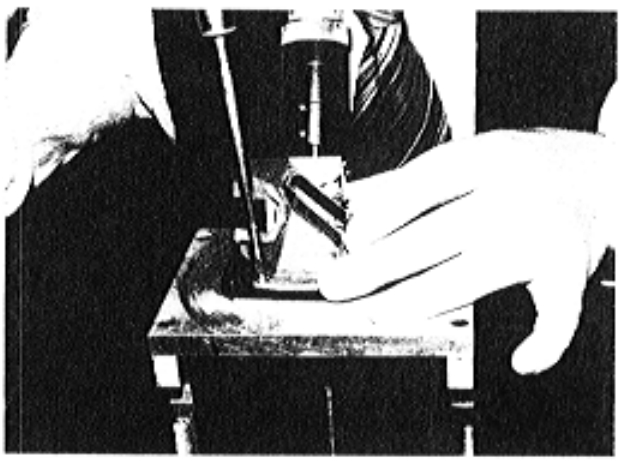


Fig. 19

4-8 Adjustment of optical axis with the aid of G10X eyepiece with cross hair.

a) Screwing Standard Objective VM-KC006 into the bottom side of Right Mirror Assembly, and inserting Standard Objective VM-KC006 into an opening at the center of the top panel of Jig VM-KC005 so as to mount the Right Mirror Assembly on Jig VM-KC005, put C-2 G10X eyepiece with cross hair into the right eyepiece sleeve. Loosen 3 pieces of CUK3x6SA which hold Right Mirror Assembly ZJ535200 in place.
(See Fig. 19.)

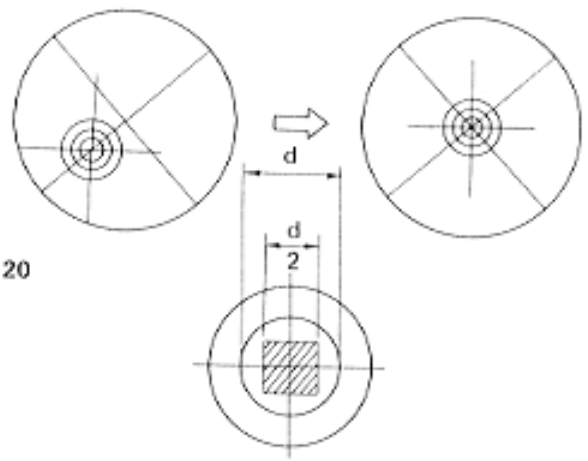


Fig. 20

The dotted lines indicate the spots that are out of focus.

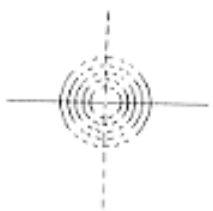


Fig. 22

Adjust the positional relation between the center of the cross hair of C-2 and that of the concentric circles of Standard Objective VM-KC006 by moving Right Mirror Assembly ZJ535200. (See Fig. 20.)

b) Bring the center of the cross hair into the shaded square at the center of the concentric circles that is shown in Fig. 21 and try to put both centers as close to each other as possible. (See Fig. 20.)

c) Screw 3 pieces of CUK3x6SA as tightly as possible.

d) By the use of Standard Objective VM-KC006 and Jig VM-KC005 in the same manner as in 4-7-e), put C-2 G10X eyepiece with cross hair into the Left Eyepiece Sleeve ZJ850600 and make the same adjustment as for the Right Mirror Assembly.

4-9 Check on resolving power with the aid of GWH10X or GW10X eyepiece

If the following phenomena develop, replace ZJ535200 and the pair of Mirror Assemblies ZJ536500 and make the adjustment all over again. (See Fig. 22.)

a) When concentric circles are focused along a line, e.g., x-axis, they are out of focus along another line, e.g., y-axis.

b) When the center of concentric circles is focused, one sector of the concentric circles goes out of focus.

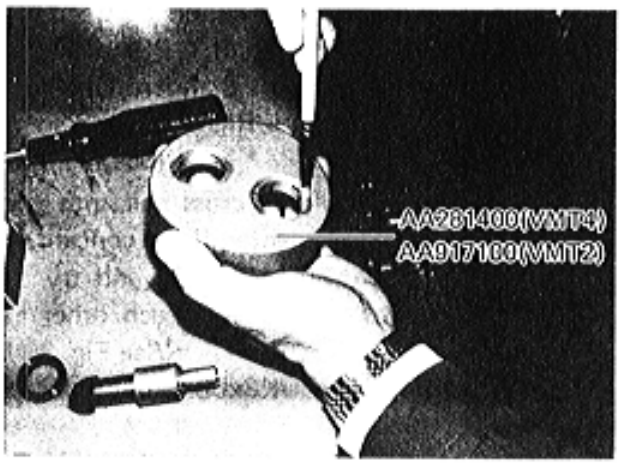


Fig. 23

4-10 Dismount the Mirror Assembly ZJ536500 from Jig VM-KC005 and separate Standard Objective VM-KC006.

4-11 Apply Grease OT 2008 to Base of Mirror Assembly AA281400 or AA917100. (See Fig. 23.)

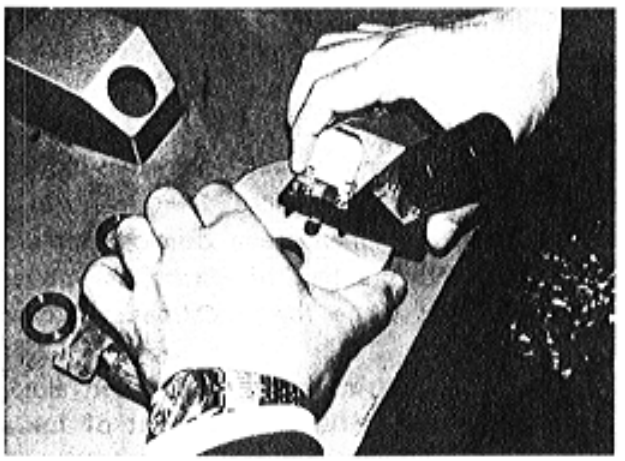


Fig. 24

4-12 Mount Mirror Assembly ZJ850900 or ZJ-851100 on Base of Mirror Assembly AA-281400 or AA917100 and check if the inter-pupillary distance adjustment device fits properly. (See Fig. 24.)

4-13 Remove the left and right eyepiece sleeves.

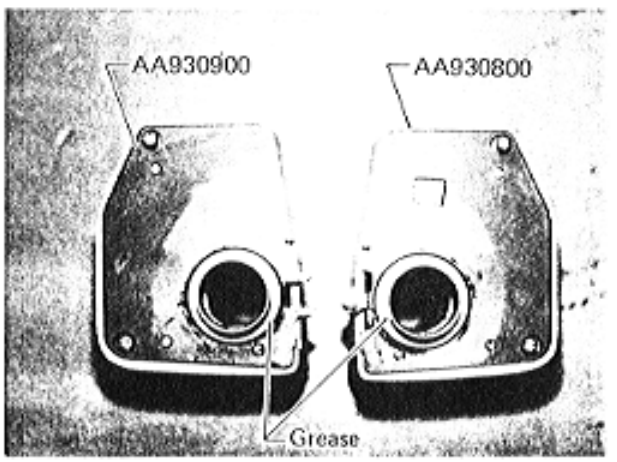


Fig. 25

4-14 Fix Mirror Covers AA930800 and AA930900 over the pair of Mirror Assemblies with 4 pieces of CUK3x6SA, 2 each on Cover. (See Fig. 25.)

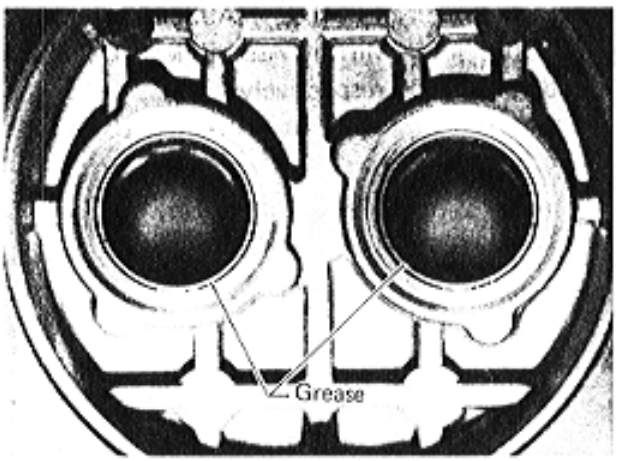


Fig. 26

4-15 Fix Mirror Assembly ZJ850900 or ZJ851100 to Base of Mirror Assembly AA281400 or AA917100. (See Figs. 25 and 26.)

a) Fix Mirror Assembly ZJ850900 or ZJ-851100 in Base of Mirror Assembly AA-281400 or AA917100. (Apply Grease OT 2008 to the interfaces.) (See Fig. 26.)

b) Apply Grease OT 2008 to the spots indicated by arrows. (See Fig. 25.)

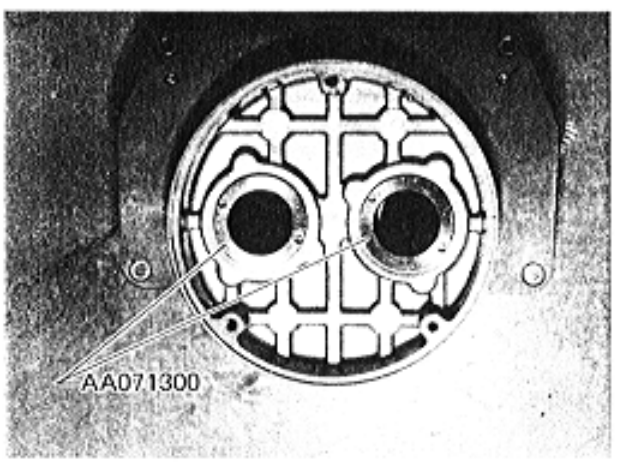
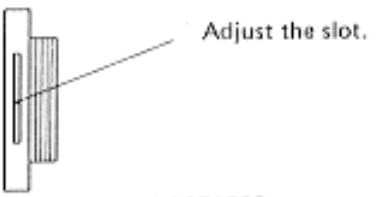


Fig. 27

c) Tighten Nuts AA071300 with Adjustable Spanner OT 0021. (See Fig. 27.)

d) In case they are loose in the direction of thrust or the interpupillary distance adjustment device moves with too little friction resistance, widen the slot in Nut AA-071300 with the tip of a screwdriver, to make adjustment.



AA071300

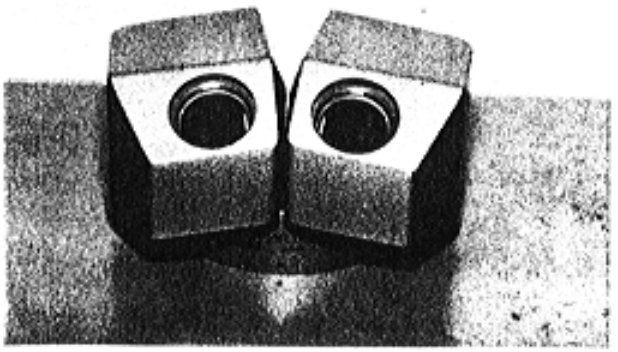


Fig. 28

4-16 Screw Eyepiece Tubes AA936000 and ZJ-850600 into Mirror Assemblies AA535200 and AA536500 respectively.

(See Figs. 28 and 29.)

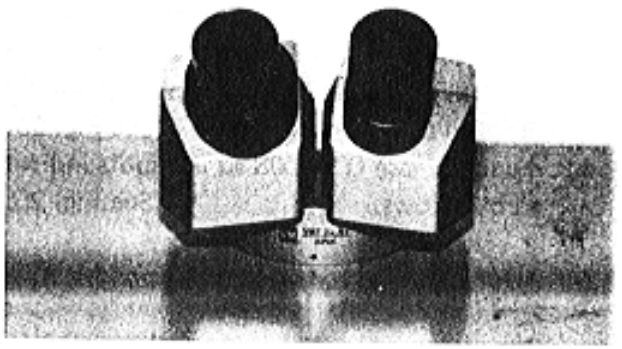


Fig. 29

CAUTION:

When assembling the mirror unit, care should be exercised to keep it free from dust or any other contaminants since the removal is difficult after the assemblage.

5. ASSEMBLY OF BODY V-BT

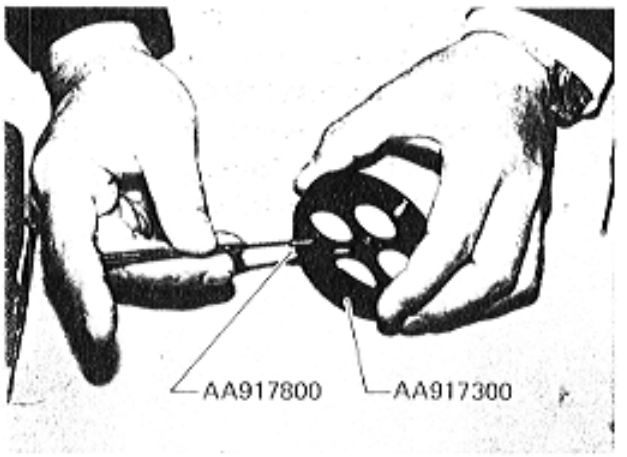


Fig. 30

5-1 Fix Screw AA917800 into Objective Turret AA917300, using Hi-Super Bond OT 1021. (See Fig. 30.)

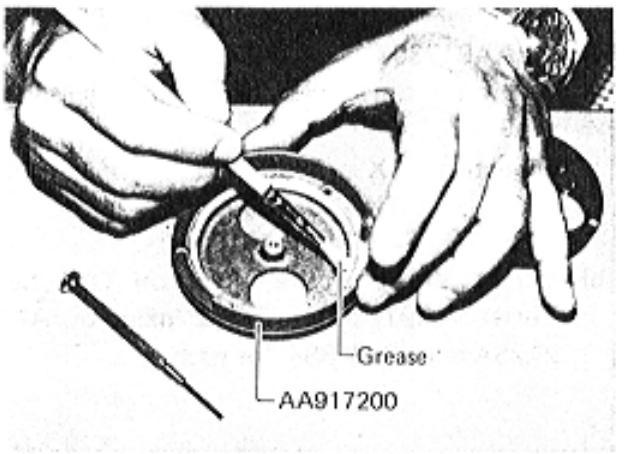


Fig. 31

5-2 Fix Objective Turret AA917300 to Stopper Base AA917200 with Shaft AA917700. (See Figs. 31 and 32.)

- Apply Grease OT 2008 to that surface of Stopper Base AA917200 which will be in contact with Objective Turret AA917300. (See Fig. 31.)

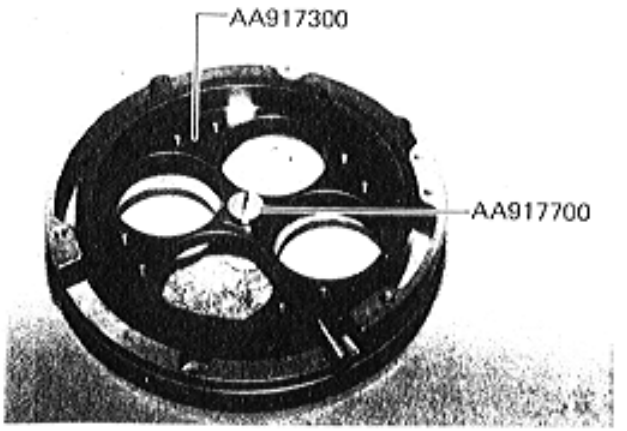


Fig. 32

- Apply Grease OT 2008 to the opening into which Shaft AA917700 will be screwed. (See Fig. 32.)

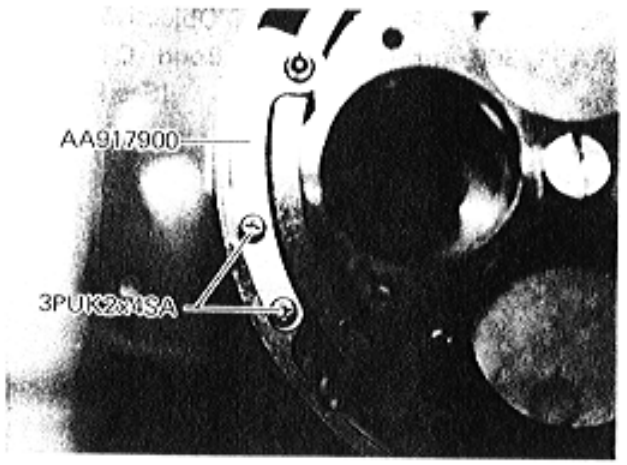


Fig. 33

5-3 Attach Click Spring AA917900 to Stopper Base AA917200 with 2 pieces of 3PUK2x4SA.

- Put Click Spring AA917900 in place so as to settle Ball B 1/8 securely in the V-shaped groove in Objective Turret AA917300 and tighten 2 pieces of 3PUK2x4SA.

(See Fig. 33.)

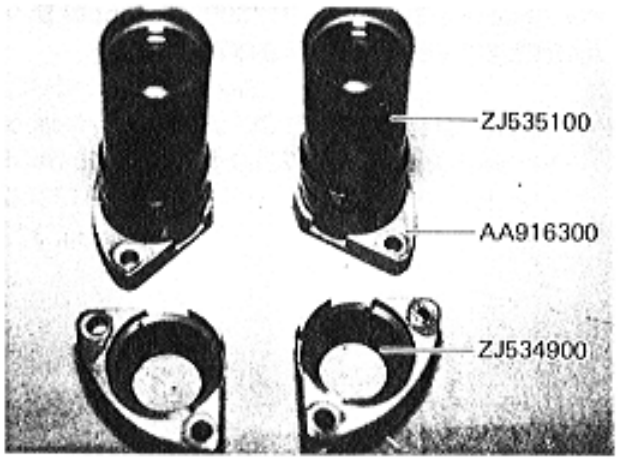


Fig. 34

5-4 Fix the objective units temporarily on Objective Turret AA917300. (See Figs. 34 and 35.)

a) Screw the objectives onto Objective Mount AA916300.

Objectives 1X ZJ534900
2X ZJ535000
4X ZJ535100

b) Mount the objective units on Objective Turret AA917300, using 2 pairs of AB3 x12SA and KNW 3SA for each unit.

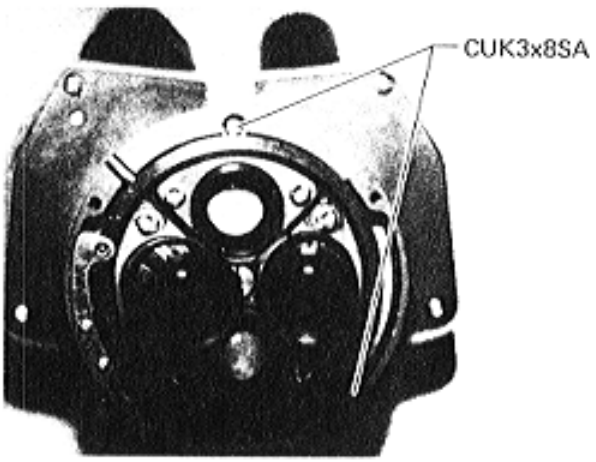


Fig. 35

5-5 Fix BT unit on Bi unit with 3 pieces of CUK3 x8SA. (See Fig. 35.)

6. OVERALL ADJUSTMENT

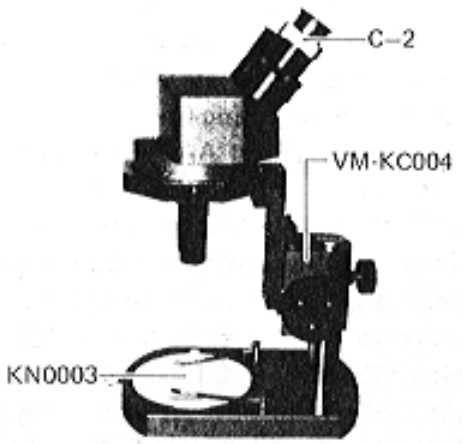


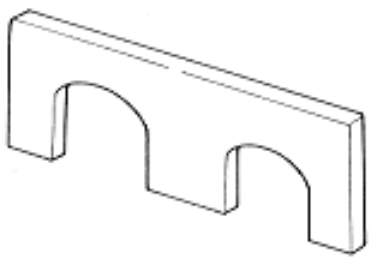
Fig. 36

6-1 Arrange Support Stand VM-KC004 as seen in Fig. 36.

VM-KC003: Jig for interpupillary distance
VM-KC004: Support stand
KN0003: Test plate for stereo microscope alignment (5/100 mm concentric)
C–2: G10X eyepiece with cross hair for stereo microscopes
C–15: Focusing magnifier (PM-FT)
KN0027: Standard eyepiece for optical tube length alignment (See the asterisked note on page 1.)

(See Fig. 36.)

* For parfocality adjustment, be sure to apply VM-KC003 to the left and the right eyepiece tubes.



VM-KC003

Fig. 37

6-2 Adjust the left and the right 1X objectives for parfocality.

a) Apply shellac to the threaded section of the right 1X Objective ZJ534900 and fix it on Objective Mount AA916300.
b) Insert KN0027 into the right Eyepiece Sleeve AA936000 and place C–15 on the eyepiece. Focus the concentric circles on Test Plate KN0003 with coarse adjustment knobs.
c) Take KN0027 out of the right Eyepiece Sleeve AA936000 and insert it into the left eyepiece sleeve. Align "0" on the Diopter Ring with the index line.
d) Put C–15 on KN0027 and while looking through C–15, focus the concentric circles on Test Plate KN0003 by turning the left Objective ZJ534900. (The objective moves up and down by turning.)
e) After making sure that they are focused, unscrew the left Objective ZJ534900 from the objective mount. Apply shellac to the threaded section of the left Objective ZJ534900 and put it back on the objective mount. Repeat step d) above.

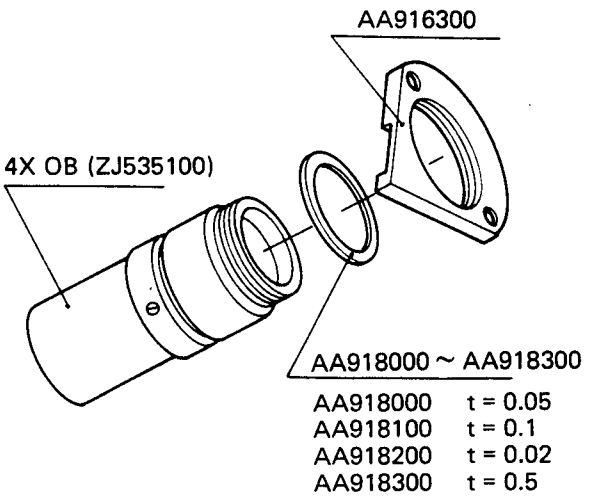


Fig. 38

6-3 Parfocalize 4X (2X) objective with 1X objective.

a) Turn Objective Turret AA917300 to the 1X side and focus Test Plate KN0003 through the right objective, using C—15.

b) Turn Objective Turret AA917300 to the 4X side and insert one of the 4 washers AA-918000 to AA918300 between the right objective and the objective mount to make so much adjustment as to enable the right objective to focus Test Plate KN0003 with the aid of C—15. (See Fig. 38.)

c) Adjust the left objective to make it parfocal with the right objective. [Follow step b) above.]

d) Unscrew the objectives from the objective mount and after applying a small amount of shellac to each of their threaded sections, restore them to the objective mount.

e) Make sure of the parfocality.

6-4 Make sure with the aid of C—15 of parfocality between the 1X objective and the 4X (2X) one and also between the left and the right objectives.

* Standard value

Left and right	—1 diopter (1 graduation)
Magnification change	—1 diopter (1 graduation)

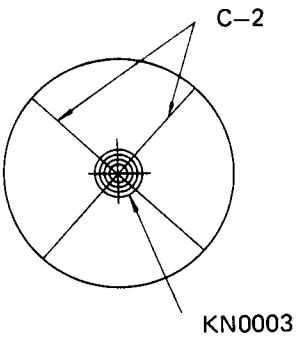


Fig. 39

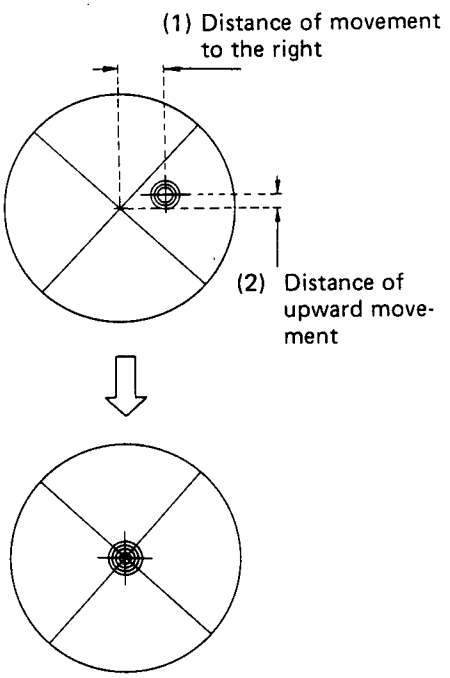


Fig. 40

6-5 Adjustment for centration of the left and the right 4X (2X) objectives

a) Loosen 2 Screws AB3x12SA on the right Objective Mount AA916300 and move the objective mount. Fix with the screws the objective mount as near at the center of the range of the movement as possible.

b) Keep 2 Screws AB3x12SA half tightened in the left Objective Mount AA916300.

c) Insert C–2 into the right Eyepiece Sleeve AA936000 and focus Test Plate KN0003. Shift the Test Plate so as to make the center of its concentric circles coincide with that of the cross hair of C–2. (See Fig. 39.)

d) Shift C–2 to the left Eyepiece Sleeve and see how far the center of the cross hair is from that of the concentric circles of the Test Plate. (See Fig. 40.)

e) Make the center of the concentric circles of the Test Plate coincide with that of the cross hair of C–2 by moving the integrated left objective mount. (See Fig. 40.)

f) After completion of the centration, tighten Screws AB3x12SA.

g) Make sure of centration of the cross hair and the concentric circles by looking through C–2 inserted firstly into the right Eyepiece Sleeve and secondly into the left Eyepiece Sleeve. When they are found eccentric with each other, repeat steps c) through e) until they are concentric.

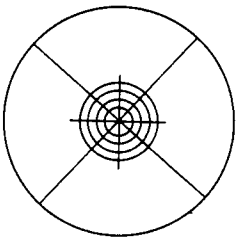


Fig. 41

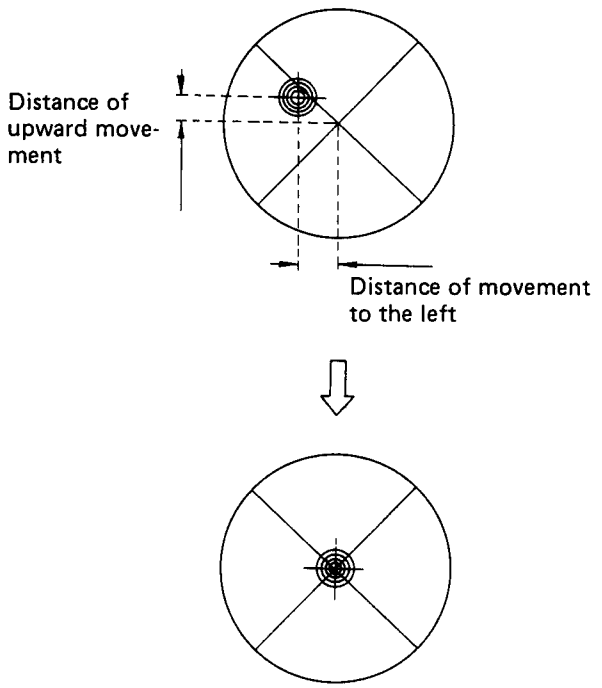


Fig. 42

6-6 Correction of parfocality at the change of magnification from 1X to 4X (2X) and vice versa, and centration of the left and the right 1X objectives.

a) Set the magnification at 4X and insert C–2 into the right Eyepiece Sleeve. Move the Test Plate so as to make the center of its concentric circles coincide with that of the cross hair of C–2. (See Fig. 41.)

b) Change the magnification to 1X and see how far the centers are apart from each other. (See Fig. 42.)

c) Slightly loosen Screws AB3x12SA in the 1X Objective Mount and bring the center of the concentric circles of the Test Plate to that of the cross hair of C–2 by moving the objective mount. (See Fig. 42.)

d) Tighten Screws AB3x12SA securely.

e) Check to see if they are concentric and, if not, repeat steps a), b) and c).

f) Insert C–2 into the left Eyepiece Sleeve and make the left and the right 1X objectives concentric with each other by following steps d) through g) in 6-5. above.

Standards L.I.F.O.

1. For centration of tolerance between the left and the right objectives of each magnification L.I.F.O. (Length of Image Formation Plane of Objective): 0.2
2. For parcentration tolerance of one objective with the other
   L.I.F.O.: 0.2

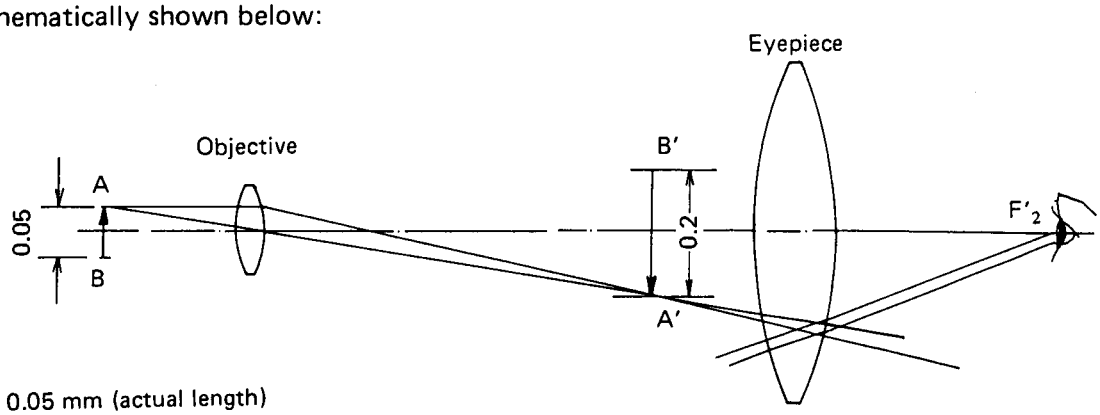
   Since the size of the image of an object (specimen) varies with the objective magnification, the term "Length of Image Formation Plane of Objective" (L.I.F.O.) is used to indicate these standard tolerances in this repair manual.
   Fig. 43 gives these standards for each magnification. The following formula explains the relationship of the actual length with L.I.F.O.

$$\text{Actual length} = \frac{\text{L.I.F.O.}}{\text{Objective power}}$$

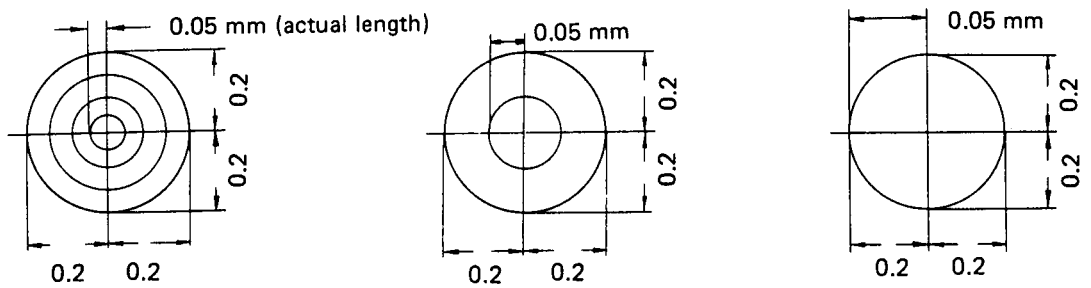
In case of the 4X objective, for example, the calculation is as follows:

$$\text{Actual length} = \frac{0.2}{4} = 0.05 \text{ mm}$$

Therefore, the actual length of the 4X objective is within the radius of the smallest of the concentric circles of the Test Plate.
The value (standard value) of one graduation for each magnification is schematically shown below:



AB = 0.05 mm (actual length)
A'B' = 0.2 (L.I.F.O.)



(One graduation for 1X = 0.05 mm) (One graduation for 2X = 0.1 mm) (One graduation for 4X = 0.2 mm)

Fig. 43

6-7 Perform the final checks on the following:

a) Parfocality of the left and the right 1X objectives and decentrations of the left and the right 1X objectives.

b) Parfocality of the left and the right 4X (2X) objectives and decentrations of the left and the right 4X (2X) objectives.

c) Parfocality maintained between the 1X and the 4X objectives after magnification change from 1X to 4X and vice versa and decentrations of the same objectives after magnification change.

d) Existence of dust or any other contaminants on the lens surfaces (Dust and contaminants can readily be detected by looking through the lenses from the eyepiece side, with a light source placed on the objective side.

e) Resolving power (Use GW10X or GWH10X eyepiece for this check.)

g) Contrast and distortion

* Any abnormality detected in the final check must be remedied by replacing the related parts or by making necessary adjustments.

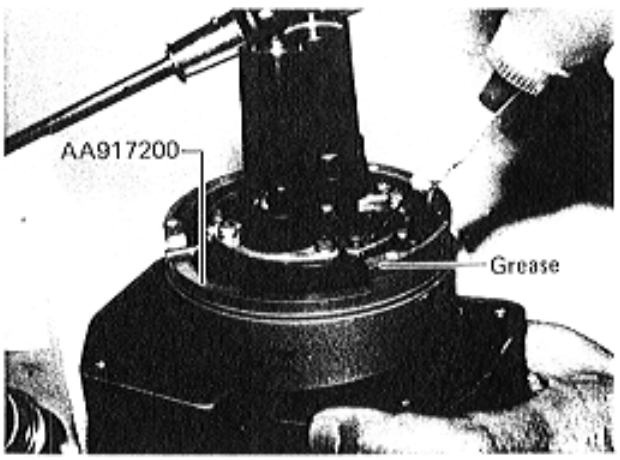


Fig. 44

6-8 Dismount the microscope from Support Stand VM-KC004.

6-9 Apply shellac to Screws AB3x12SA to prevent Objective Mount AA916300 from loosening. (See Fig. 44.)

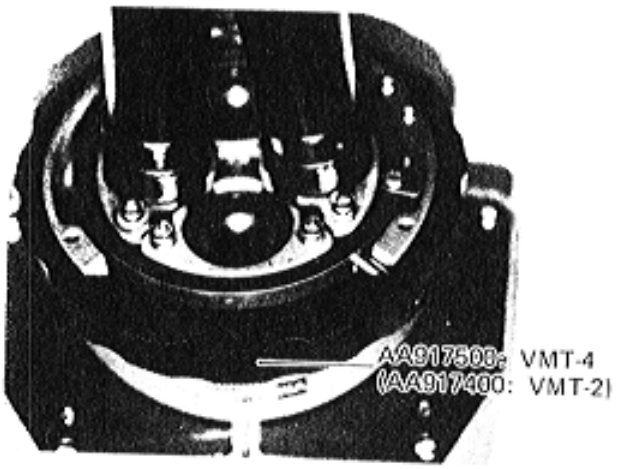


Fig. 45

6-10 Place Magnification Changer AA917500 or AA917400 in position.

a) Apply Grease OT 2008 to where Stopper Base AA917200 comes in contact with Magnification Changer AA917500.

b) Place Magnification Changer AA917500 in position and make sure that it rotates smoothly. (See Fig. 45.)

Fig. 46

6-11 Fix Objective Cover AA916200 in place with 3 pieces of CUK3x10SA.

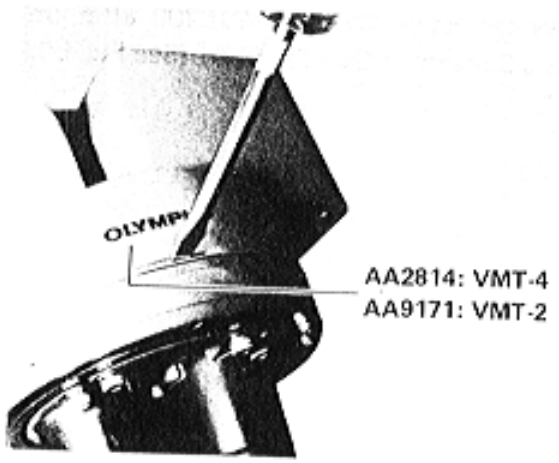


Fig. 47

6-12 Check if Magnification Changer AA917500 operates properly.

a) If it does not turn smoothly, replace either Objective Cover AA916200 or Magnification Changer AA917500.

b) If it rattles longitudinally or does not turn lightly, adjust the width of the slot in Base of Mirror Assembly AA281400 (or AA-917100). (See Fig. 47.)

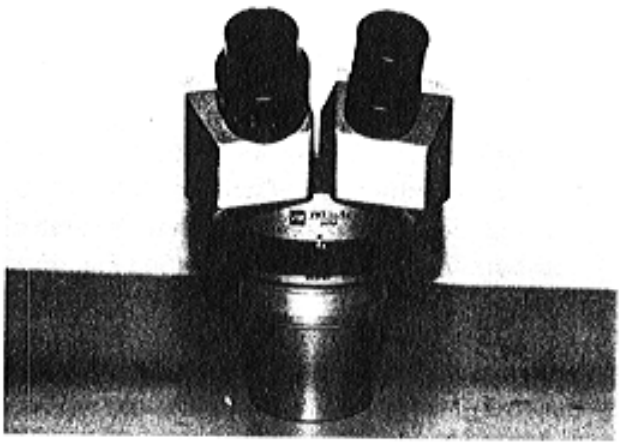


Fig. 48

7. DISASSEMBLY OF VMZ

Fig. 49 shows VMZ.

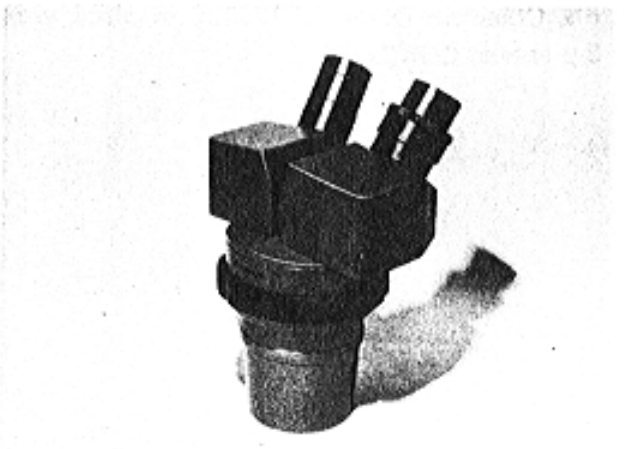


Fig. 49

7-1 Remove Objective Cover AA916200 after unscrewing 3 pieces of CUK3x10SA. (See Fig. 50.)

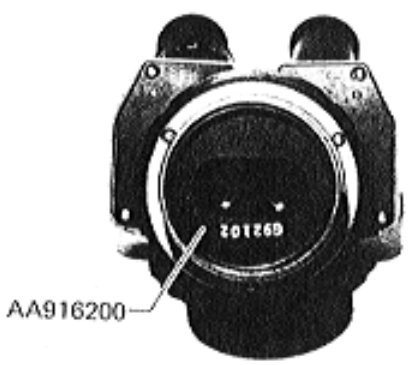


Fig. 50

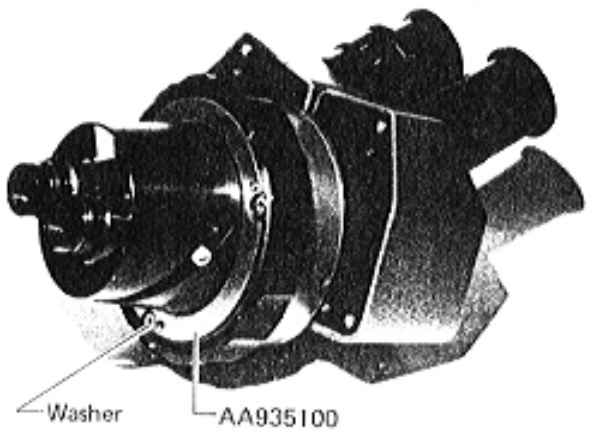


Fig. 51

7-2 Remove Fixing Ring AA935100 after unscrewing 3 pieces of 3PUK2x6SA. Also, remove an adjusting washer, if any, at the same time. (See Fig. 51.)

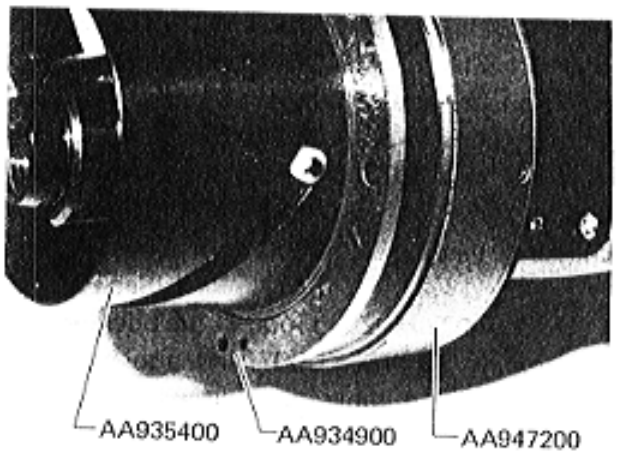


Fig. 52

7-3 Remove Pin AA935300 and detach Circular Cover AA947200 after unscrewing 2 pieces of 3PUK2x3SA.
Remove the left and the right Pins AA934900 or AA935000 and then Zoom Guide AA935400. (See Fig. 52.)

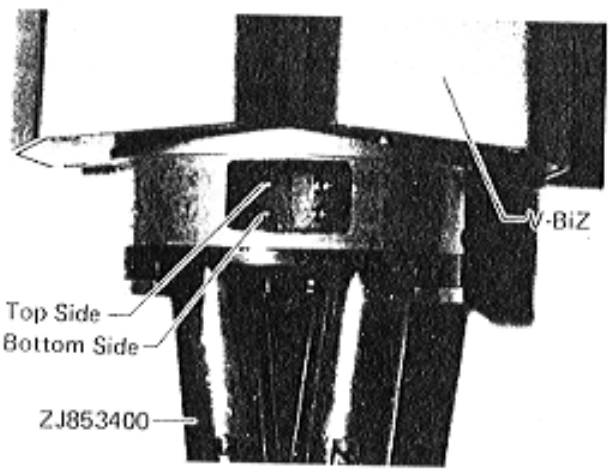


Fig. 53

7-4 Detach the left and the fight V-BiZ after unscrewing 2 pieces of ACU4x8SA and 1 piece of ACU4x6SA both of which are located on the left and the right in the top side.
Detach the left and the right Zoom Tubes ZJ853400 after unscrewing 3 pieces of ACU4 x8SA on the left and the right in the bottom side. (See Fig. 53.)

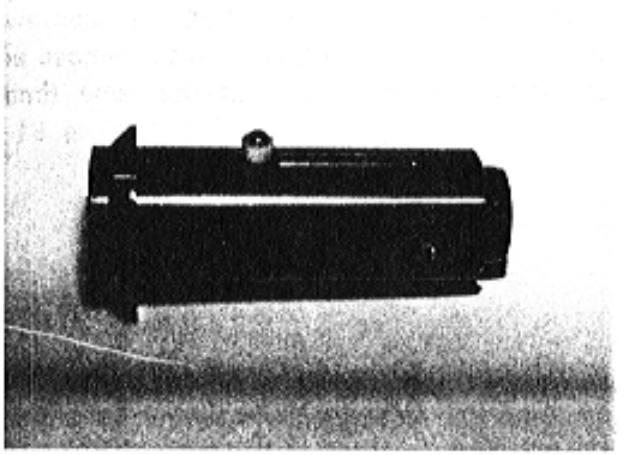


Fig. 54

7-5 Read page 48, Section 15 prior to dissasembly of Zoom Tubes 853400. (See Fig. 54.)

8. ASSEMBLY AND ADJUSTMENT OF VMZ

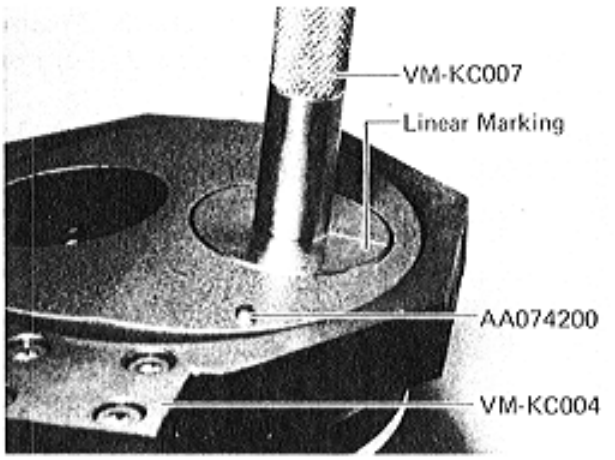


Fig. 55

8-1 Mount Base of Mirror Assembly ZJ853300 on Support Stand VM-KC004 and clamp it with knob on the side of Support Stand VM-KC004. Insert Zoom Tube AJ853400 (which has been adjusted independently) into the right opening (on the side of Screw AA074200) in Base of Mirror Assembly ZJ853300 from above. (See Fig. 55.)

Push Zoom Tube ZJ853400 in the opening with Positioning Jig VM-KC007 and also insert the latter into the same opening with its linear marking being on the right. (See Fig. 55.)

Tighten 3 pieces of ACU4x8SA securely, each of which is located at a different spot on the lower side of the periphery of Base of Mirror Assembly ZJ853300. (See Figs. 53 and 55.)

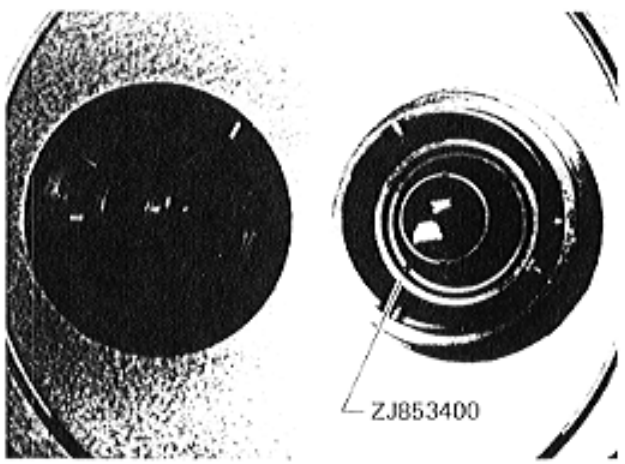


Fig. 56

8-2 Insert Zoom Tube ZJ853400 (which has been adjusted independently) into the left opening of Base of Mirror Assembly ZJ853300 from above and fix Zoom Tube ZJ853400 temporarily at any desired position with 3 pieces of ACU4x8SA on the lower side of the periphery. (In this case, VM-KC007 is not used.) (See Fig. 56.)

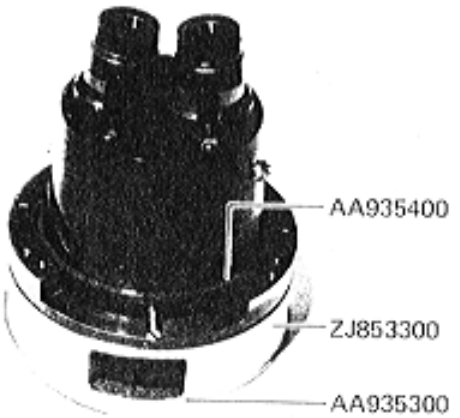


Fig. 57

8-3 Apply Grease OT 2012 to where Pin AA934900 or AA935000 comes in contact with Base of Mirror Assembly ZJ853300 and incorporate Zoom Guide AA935400 into Base of Mirror Assembly ZJ853300. Screw Pin AA935300 into the Zoom Guide. (See Fig. 57.)

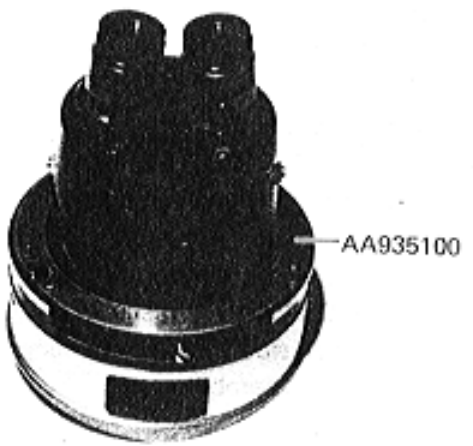


Fig. 58

8-4 Attach Fixing Ring AA935100 to Zoom Guide AA935400 and apply Grease OT 2012 to where they come in contact with each other. Screw them together with 3 pieces of 3PUK2x6SA. (See Fig. 58.)

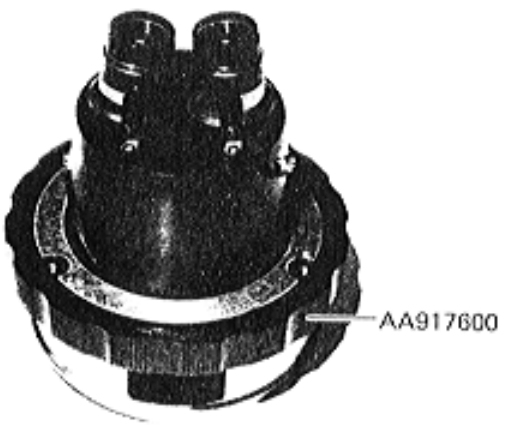


Fig. 59

8-5 Fix Magnification Changer AA917600 in place after applying a thin coat of Grease OT 2008 to its inside surface. (See Fig. 59.)

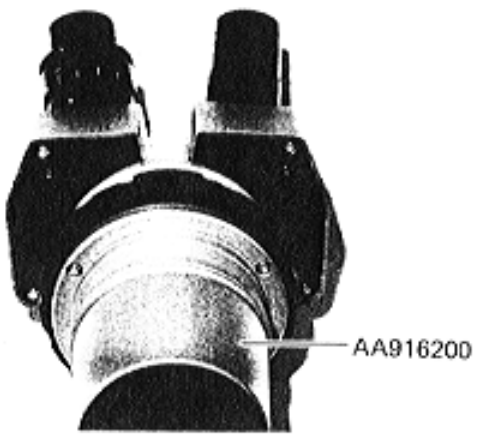


Fig. 60

8-6 Fix Objective Cover AA916200 in place with 3 pieces of CUK3x10SA.
Fix each of the left and the right eyepiece tubes temporarily in place with 2 pieces of ACU4 x8SA and 1 piece of ACU4x6SA, both of which are located on the upper side. (See Fig. 60.)

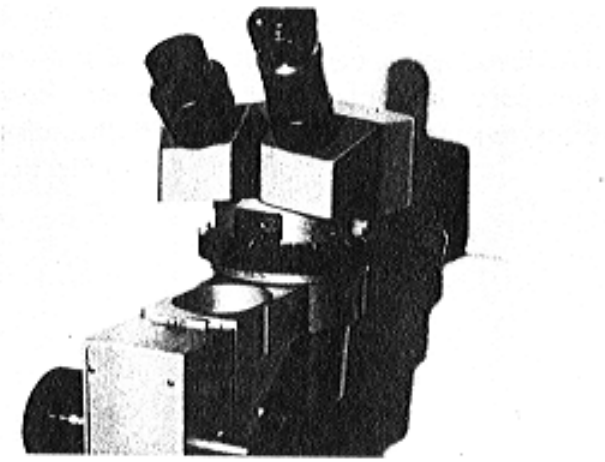
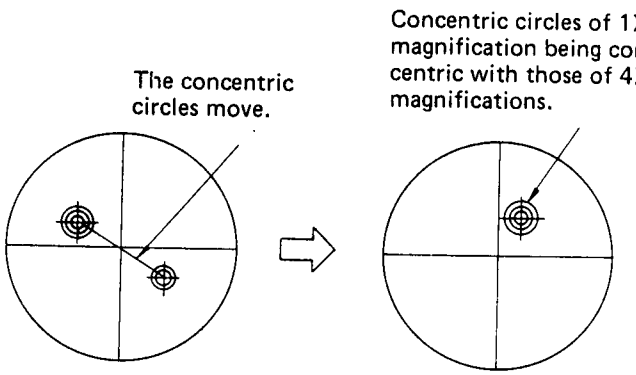


Fig. 61

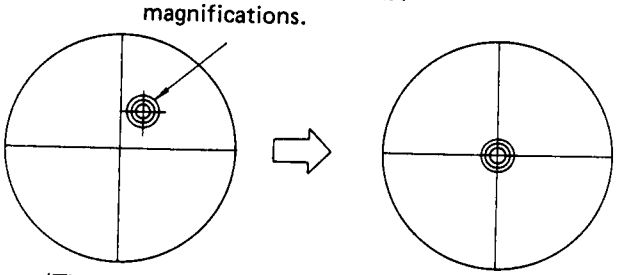
8-7 Adjustment of optical axis
Jigs and tools required
Test Plate KN0003
G10X eyepiece with cross hair C–2
Allen wrench OT 0205, 3 pieces

a) Mount the left and the right mirror units on Base of Mirror Assembly ZJ853300 and fix them together temporarily with 2 pieces of ACU4x8SA and 1 piece of ACU4x6SA on the upper side of the periphery of the Base of Mirror Assembly. (See Fig. 61.)



(By moving Test Plate KN0003, the center of the concentric circles positioned with the zoom magnification set at 1X is made to coincide with that positioned with the zoom magnification set at 4X.)

Fig. 62



(The center of the concentric circles of 1X and 4X magnifications is made to coincide with that of the cross hair by moving the mirror assembly.)

Fig. 63

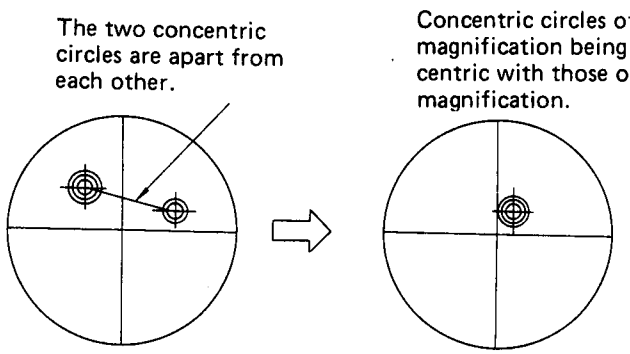
b) Insert C–2 into the right mirror unit and set the zoom magnification at 1X. Move Test Plate KN0003 to make the center of its concentric circles coincide with that of the cross hair of C–2. Change the zoom magnification to 4X and the center of the concentric circles will move. Then, move the Test Plate again to the 1X position. Put the zoom magnification back to 1X and the center of the concentric circles will move again. **With the position of the center of the concentric circles kept in mind, change the zoom magnification again to 4X and the center will shift once again. Then, move the Test Plate to shift the center of the concentric circles to the spot that is memorized as where the center was when the zoom magnification was set at 1X.** Repeat the above steps of moving the Test Plate and changing the zoom magnifications and the center positioned with the zoom magnification set at 1X will finally coincide with that positioned with the zoom magnification being at 4X. In this case, the center of the concentric circles does not have to always coincide with that of the cross hair. (See Fig. 62.)

- Standard
  L.I.F.O. = 0

CAUTION:
Under no circumstances must the Test Plate be manipulated once the two centers of the concentric circles have coincided with each other.

c) Make the center of the cross hair of C–2 coincide with that of the concentric circles of 1X and 4X magnifications.
Apply Allen wrenches OT 0205 to the 3 screws, two ACU4x8SA and one ACU4 x6SA, both of which are referred to in a) above and make the center of the concentric circles of 1X and 4X magnifications coincide with that of the cross hair by moving the screws back and forth. (See Fig. 63.)

- Standard
  L.I.F.O. = 0.2 max.

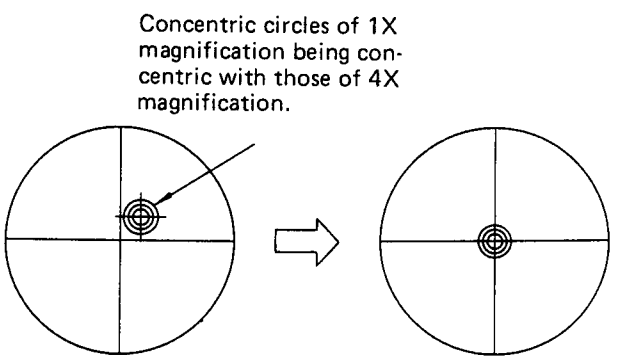


(The centers of the concentric circles of 1X and 4X magnifications are made to coincide with each other by moving the Zoom Tube.)

Fig. 64

d) With the left mirror unit fixed temporarily in place, make the center of the concentric circles of 1X magnification coincide with that of 4X magnification.
Apply Allen wrenches OT 0205 to 3 pieces of ACU4x8SA located on the lower side of the left section of the periphery of Base of Mirror Assembly ZJ853300 and make the centers of the concentric circles of 1X and 4X magnifications coincide with each other by moving not the Test Plate but Zoom Tube ZJ853400 through backward and forward movement of the 3 screws.
(See Fig. 64.)

○ Stnadard
L.I.F.O. = 0



(The center of the concentric circles of 1X and 4X magnifications is made to coincide with that of the cross hair by moving the mirror assembly.)

Fig. 65

e) Insert G10X eyepiece with cross hair C–2 into the left mirror unit and make the center of the cross hair and that of the concentric circles of Test Plate KN0003 coincide with each other. Apply Allen wrenches OT 0205 to 2 pieces of ACU4x8SA and 1 piece of ACU4x6SA on the upper side of the periphery of Base of Mirror Assembly ZJ853300 and adjust the left mirror unit by moving the screws back and forth.

CAUTION:
Do not mistake the upper screws for the lower ones. (See Fig. 53.)

○ Stnadard
L.I.F.O. = 0.05 max.
(See Fig. 65.)

8-8 Check on parfocality and others

a) Parfocality

Insert KN0027 into the right eyepiece tube and mount Focusing Magnifier C–15 on KN0027. With the zoom magnification set at 4X, focus the Test Plate by manipulating the focusing knob.

Shift KN0027 and C–15 into the left eyepiece tube and focus the Test Plate by turning Diopter Ring AA935900.

- Standard

  The turn must not be beyond ±1.5 graduation from "O" position on the Diopter Ring.

b) Centration of the left and the right optical axes

With the zoom magnification being at 4X, insert C–2 into the right eyepiece sleeve. Move the Test Plate so as to make the center of its concentric circles coincide with that of the cross hair of C–2.

c) Insert C–2 into the left eyepiece sleeve and check to see how far the center of the concentric circles is apart from that of the cross hair.

- Standard

  L.I.F.O. = 0.2 max.

d) Resolving power

Make sure that no astigmatism is observed either at the center or any one side of the field of vision. (See Section 4-9 above.)

8-9 Assembly of Circular Cover AA947200

After detaching Objective Cover AA916200, Magnification Changer AA917600 and Pin AA935300 again, fix Circular Cover AA947200 in place with 3 pieces of 3PSK2x3SA and restore the detached parts to where they were. (See Fig. 66.)

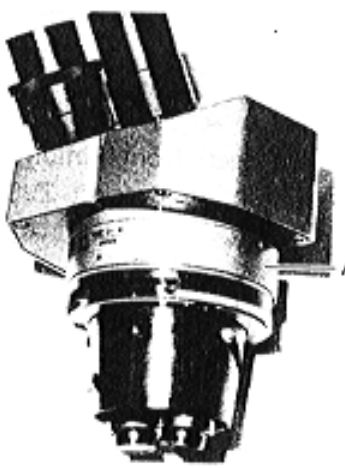


Fig. 66

9. DISASSEMBLY OF STAND V-STA

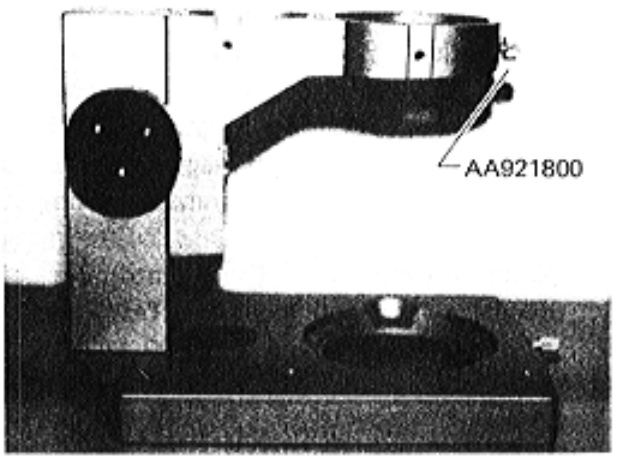


Fig. 67

9-1 Remove Screw AA921800. (See Fig. 67.)

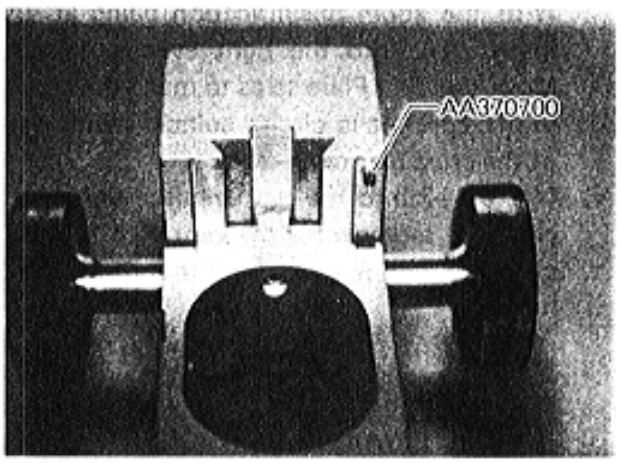


Fig. 68

9-2 Detach Stopper AA370700. (See Fig. 68.)

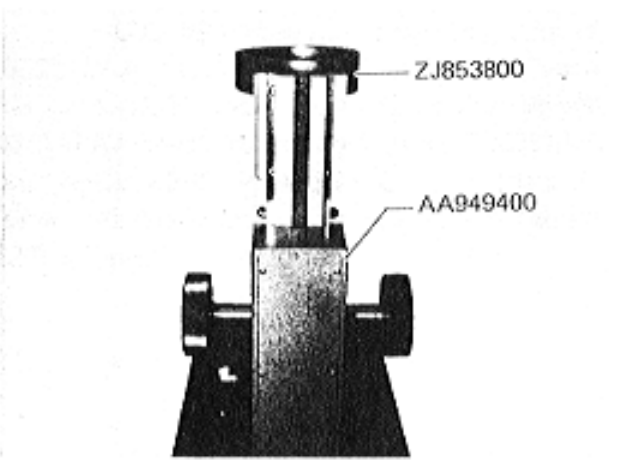


Fig. 69

9-3 Remove Mounting Bracket ZJ853800 from Pillar AA949400.
Move up Mounting Bracket ZJ853800 by turning Focusing Knob AA973500 until Rack AA-949600 is disengaged from Pinion AA949800 and pull up Mounting Bracket ZJ853800 out of place. (See Fig. 69.)

9-4 Detach Rack AA949600 after unscrewing 2 pieces of AB3x10SA. (See Fig. 70.)

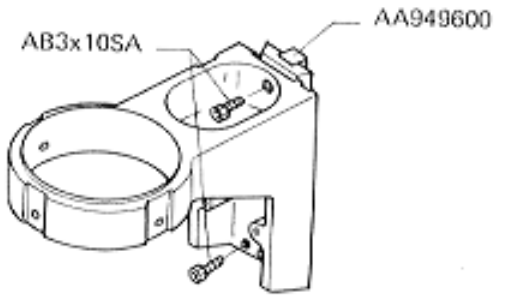
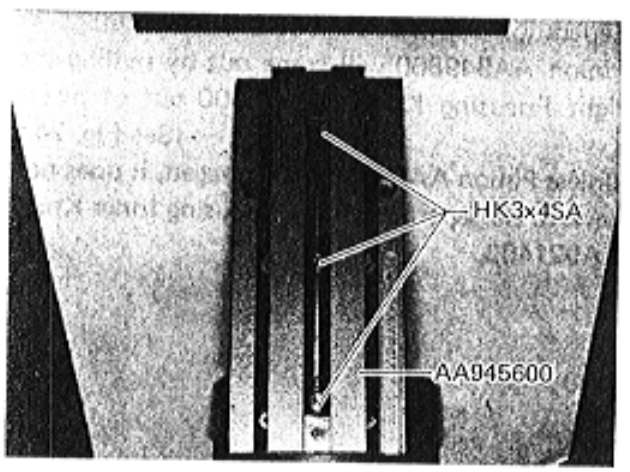
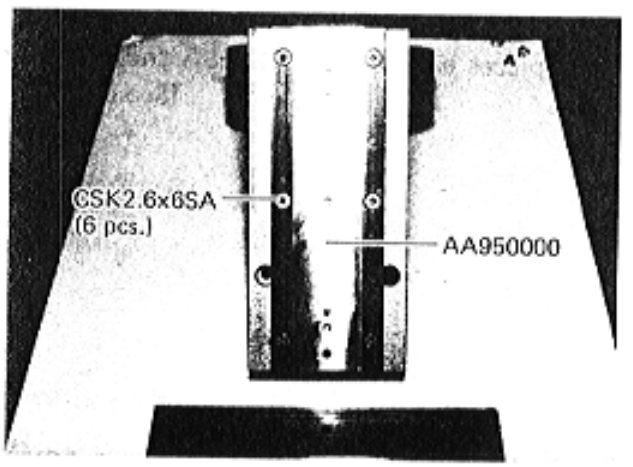


Fig. 70



9-5 Detach Dovetail AA945600 after unscrewing 3 pieces of HK3x4SA. (See Fig. 71.)

Fig. 71



9-6 Detach Plate AA950000 after unscrewing 6 pieces of CSK2.6x6SA. (See Fig. 72.)

Fig. 72

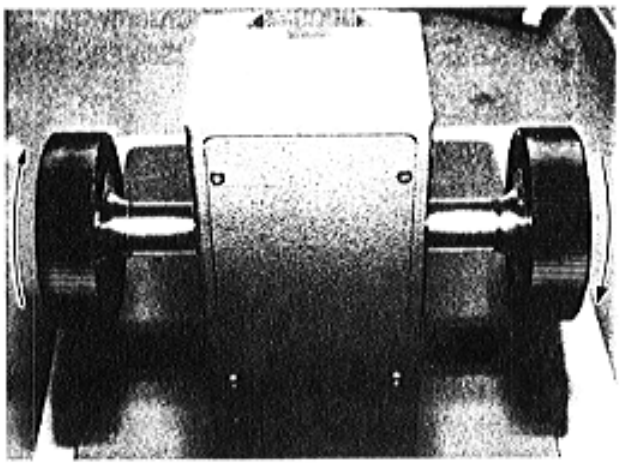


Fig. 73

9-7 Disassembly of Focusing Knobs AA073500
Hold the left and the right Focusing Knobs AA073500 by hand and turn them counter-clockwise at the same time. (See Fig. 73.)
By doing so, the left Focusing Knob AA073500 will come apart. (See Fig. 74.)

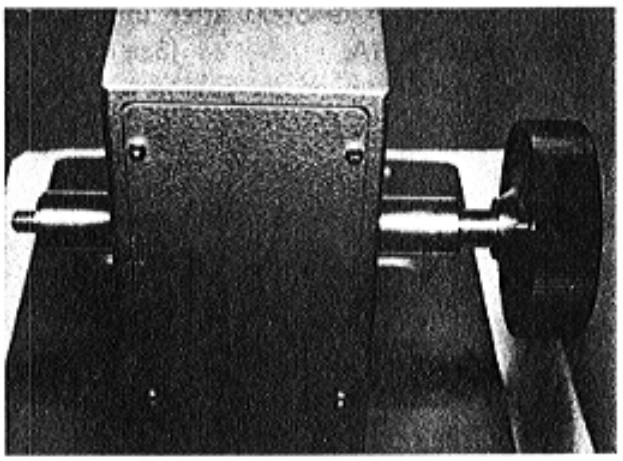


Fig. 74

9-8 Separation of Pinion AA949800
Pinion AA949800 will come out by pulling the right Focusing Knob AA073500 out of place. (See Fig. 74.)
Unless Pinion AA949800 is damaged, it does not have to be separated from Focusing Inner Knob AA921400.

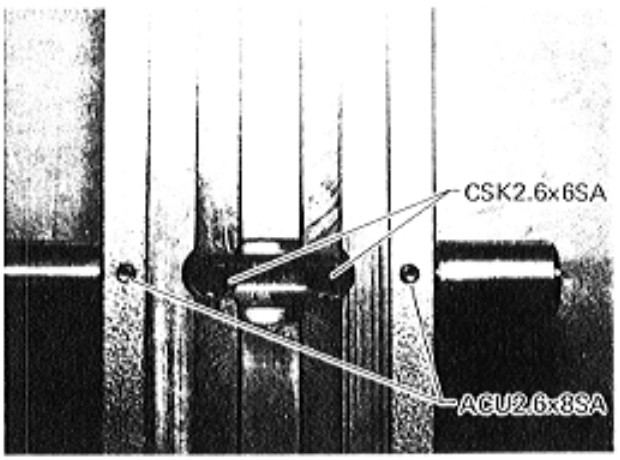


Fig. 75

9-9 Detach Pinion Sleeve AA949700 after unscrewing 2 pieces each of CSK2.6x6SA and ACU2.6 x8SA. (See Fig. 75.)

9-10 Modification of Pinion AA949800

Pinion AA949800 is modified as depicted below, thereby making it necessary to make minor changes in Focusing Inner Knobs AA921400 and AA921300. The new model can be distinguished from the old one by measuring the diameters of the thicker ends of the tapered sections with slide calipers. As given in Figs. 76 and 77, the old model has the tapered section with the thicker end measuring 5.7 mm in diameter and the new one, 7.8 mm.

DESCRIPTION

(OLD)

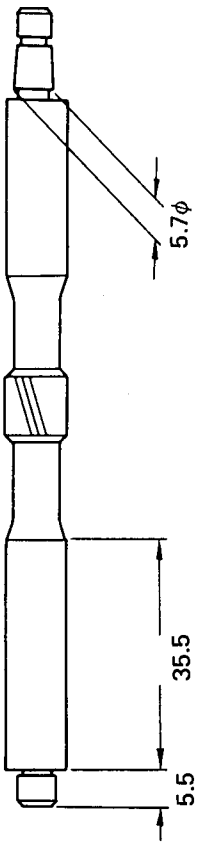


Fig. 76

(NEW)

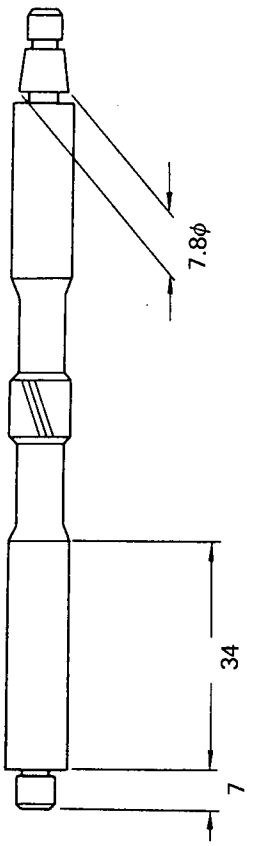


Fig. 77

NOTE:

Reason of modification: Sometimes, the tension adjustment of the coarse focusing control does not work well.

1. In case the pinion AA949800 be found faulty, the coarse adjustment knob AA921400 should be also replaced as new type coarse adjustment knob has the thread in the hole of knob.
2. If you have TAPER REAMER KC-2001, grind the inner hole of coarse adjustment knob AA-921300 so as to accept the new pinion AA949800 which is widened to 7.8 mm in diameter, because the old pinion is no longer available. If you do not have TAPER REAMER KC-2001, replace the coarse adjustment knob AA921300.

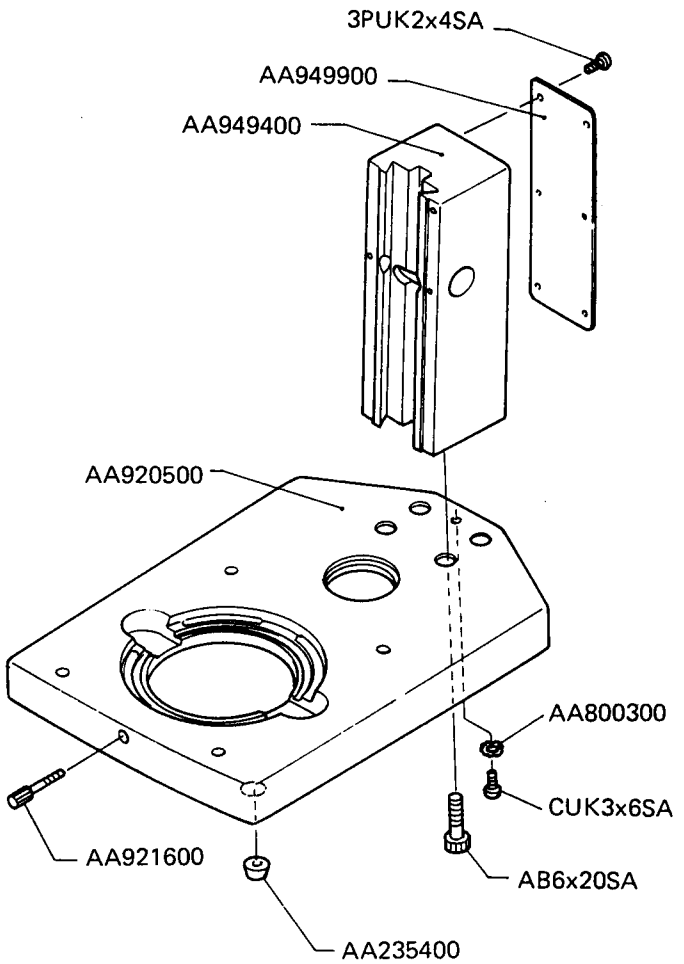


Fig. 78

9-11 Withdraw Fixing Screw AA921600. (See Fig. 78.)

9-12 Detach Pillar AA949400 after unscrewing 4 pieces of AB6x20SA. (See Fig. 78.)

9-13 Detach Cover AA949900 after unscrewing 6 pieces of 3PUK2x4SA. (See Fig. 78.)

9-14 Withdraw Screw CUK3x6SA to take off Grounding Terminal AA800300. (See Fig. 78.)

9-15 Detach Rubber Legs AA235400 from Base AA920500. (The Rubber Legs are glued to the Base.) (See Fig. 78.)

10. ASSEMBLY OF STAND V-STA

10-1 Glue Rubber Legs AA235400 to Base AA920500. (See Fig. 78.)

a) Use Araldite OT 1028 as an adhesive.

b) Upon solidification of the adhesive that glues the Rubber Legs to the Base, place Base AA920500 on the level surface of a board and check to see if the Base shakes on it.

c) If it does, shorten with a file or the like whichever rubber leg is longer than the others, to prop up the Base horizontally.

10-2 Screw Pinion Sleeve AA949700 to Pillar AA949400 with 2 pieces each of CSK2.6x6SA and ACU2.6 x8SA.

Screw Cover AA949900 to Pillar AA949400 with 6 pieces of 3PUK2x4SA.

10-3 Screw Plate AA950000 to Mounting Bracket AA920700 with 6 pieces of CSK2.6x6SA. (See Fig. 72.)

10-4 Screw Dovetail AA949500 to Mounting Bracket AA920700 with 3 pieces of HK3x4SA. (See Fig. 71.)

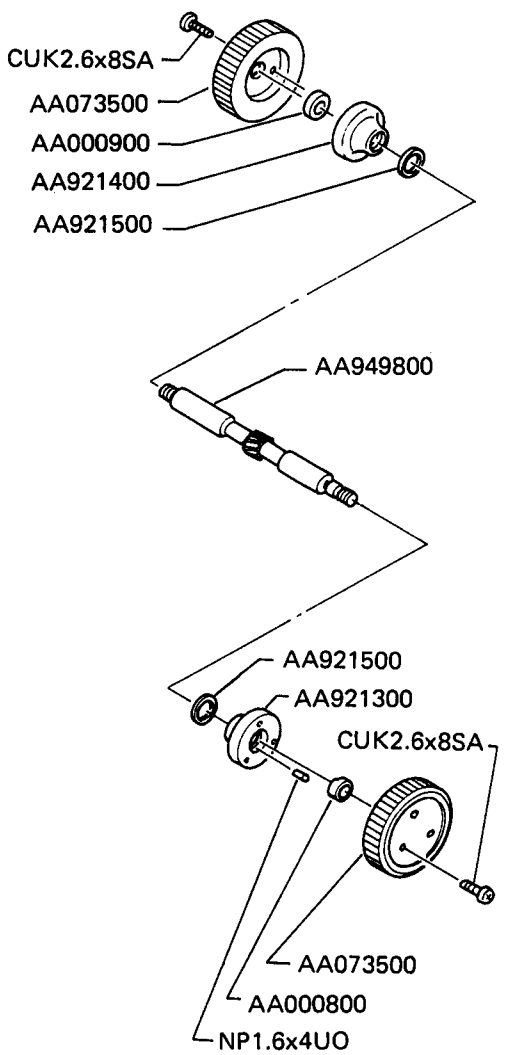


Fig. 79

10-5 Disassembly of Pinion AA949800

a) Unless Pinion AA949800 is so damaged as to require replacement, the left Focusing Knob AA073500 and Focusing Inner Knob AA921400 do not have to be disassembled. The grease can be renewed without detaching the Pinion from the Focusing Knob.

b) In case an old model of Pinion AA949800 has to be removed for replacement, detach it from Focusing Knob AA073500 after unscrewing 3 pieces of CUK2.6x8SA. As explained in Note 2. of 9-10 above, the Pinion as well as the matching Focusing Inner Knob has to be replaced by the new model.

c) For replacement of a new model of Pinion AA949800, separate Focusing Knob AA-073500 after unscrewing 3 pieces of CUK2.6x8SA and while holding Focusing Inner Knob AA921400 firmly with the left hand, unscrew Nut AA000900 with Tool KKAA0008.

Then, with the Pinion firmly held by hand, separate the Focusing Inner Knob by turning. (See Fig. 79.)

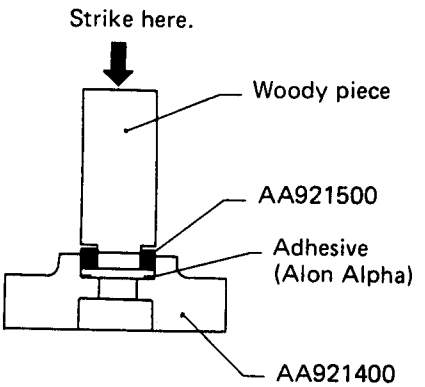


Fig. 80

10-6 Incorporation of Plastic Washer AA921500 into the left Focusing Inner Knob AA921400. Apply a small amount of Alon Alpha OT 1027 into the recess on the Focusing Inner Knob into which the Plastic Washer will be inserted and drive the Plastic Washer into the recess by striking a woody piece placed over the Plastic Washer. (See Fig. 80.)

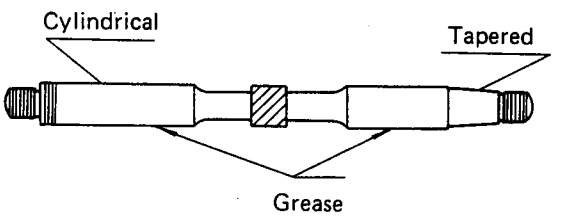


Fig. 81

10-7 After screwing Focusing Inner Knob AA-921400 to the cylindrical end of Pinion AA949800, screw Nut AA000900 tightly with Tool KKAA0008. (See Fig. 81.)

10-8 Glue Plastic Washer AA921500 into the recess on the right Focusing Inner Knob AA921300. (See Fig. 80.)

10-9 Screw the left Focusing Knob AA073500 to the left Focusing Inner Knob AA921400 with 3 pieces of CUK2.6x8SA. (See Fig. 79.)

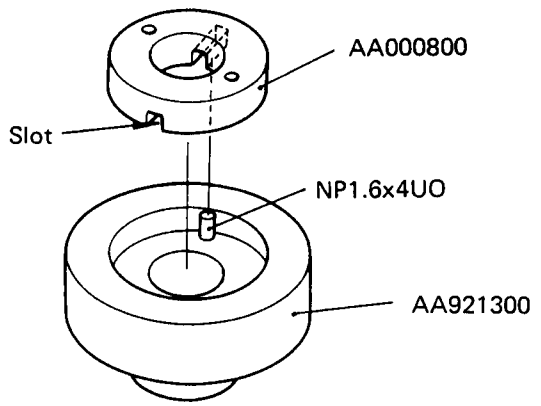


Fig. 82

10-10 Insert Nut AA000800 into the right Focusing Knob AA921300 and screw Focusing Knob AA073500 to the right Focusing Inner Knob with 3 pieces of CUK2.6x8SA.

a) Push the Nut into the Focusing Inner Knob with the former's slot aligned with the latter's dowel pin.

b) Screw Focusing Knob AA073500 to the Focusing Inner Knob.

(See Figs. 79 and 82.)

As shown in the following illustration, the cylindrical side of the Pinion is on the right as viewed from behind.

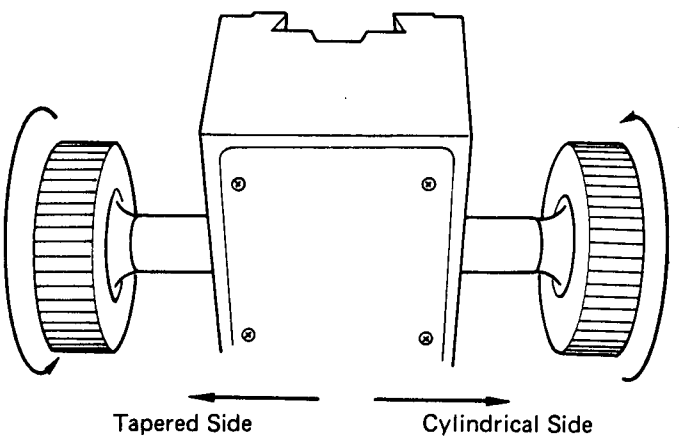


Fig. 83

10-11 Insert into Pinion Sleeve AA949700 Pinion AA949800 the cylindrical end of which is fixed to the left Focusing Knob.

(See Figs. 74 and 83.)

* Apply Grease OT 2008 to that part of the Pinion which comes in contact with the inside surface of the Pinion Sleeve.

(See Fig. 81.)

* Do not apply any grease to the teeth of Rack AA949600 and Pinion AA949800.

10-12 Screw the right Focusing Knob AA073500 to Pinion AA949800. (See Fig. 83.)
Turn the left and the right Focusing Knobs clockwise simultaneously.

11. TENSION ADJUSTMENT FOR FOCUSING KNOB

As you rotate right and left Focusing Knobs in the opposite directions simultaneously, the tension of the focusing adjustment is adjustable for either heavy or light movement.

11-1 If the focusing adjustment tension becomes excessively heavy or light during the adjustment; for instance, the Mounting Bracket ZJ853800 drops as you slightly loosen Focusing Knobs, or the adjustment is too tight to move, then, file right side Washer AA921500 with Special Tool KC-2004 gradually.

11-2 If the tension of the focusing adjustment can not be tightened no matter how Focusing Knobs are rotated in the tightening directions, then enlarge the inner hole of Focusing Inner Knob AA921300 gradually.
After each enlargement, test the tension of Focusing Knobs.

NOTE:
Be careful not to enlarge excessively; otherwise Focusing Inner Knob AA921300 will become unusable.

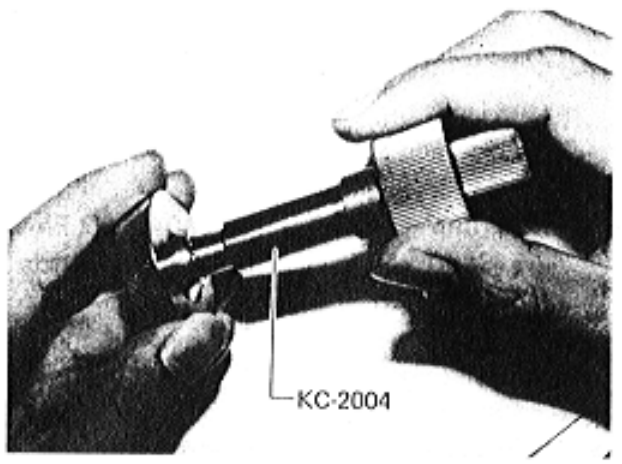


Fig. 84

a) In case of 11-1
File Washer AA921500 with Cutter KC-2004. Take care to file evenly little by little. After each file, test it to avoid excessive filing at a time. (See Fig. 84.)

NOTE:
If Tool KC-2004 is not available, separate Washer AA921500 from Focusing Inner Knob AA-921300 and grind it with a file evenly.

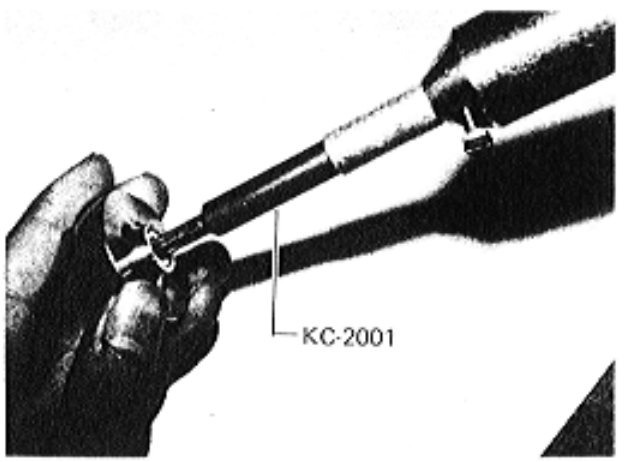


Fig. 85

b) In case of 11-2
Grind the inner hole of Focusing Inner Knob AA-921300 by means of Taper Reamer KC-2001. (See Fig. 85.)

NOTE:
Take care to grind little by little evenly.

11-3 In case of unadjustable heaviness of the focusing tension due to worn-out Washer AA921500.

a) Disengage Pillar AA949400 and Mounting Bracket ZJ853800.
b) Remove right side Focusing Knob AA073500.
c) Remove worn-out washer AA921500.
d) Put replacement washer in position. Apply a small amount of fast drying adhesive into recess of knob, insert new washer with wooden peg.
e) Screw right side Focusing knob onto pinion shaft and check tension of rotation.

12. ADJUSTMENT OF PINION AA949800 & RACK AA 949600

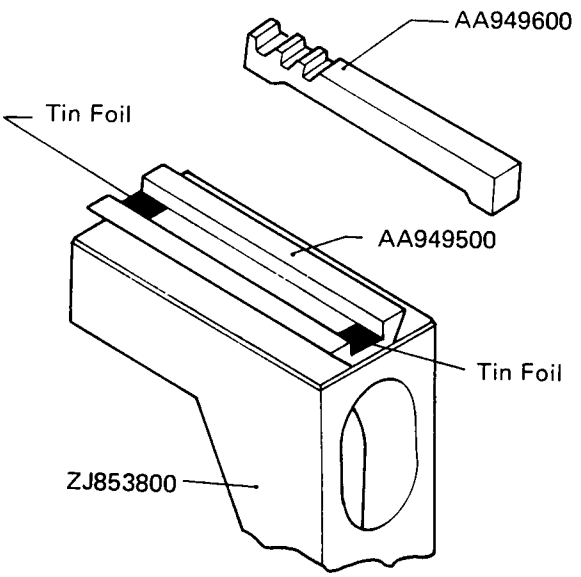


Fig. 86

Insert Dovetail AA949500 of Mounting Bracket into the pillar AA949400.

12-1 How to check play:
Holding pillar AA949400 firmly in your hand, rotate one of the Focusing Knob AA073500 then reverse the direction of the Focusing Knob to feel play between Rack and Pinion.

12-2 If rack and pinion have play:
According to degree of play, insert tin foil in a range of thickness from 0.01 mm to 0.05 mm between rack and dovetail AA949500 until there is no more play. (See Fig. 86.)

12-3 If rack and pinion mesh too tightly:
Slightly file back surface of rack with emery cloth.

* Emery cloth should be placed on a flat surface upon which you press rack with even force. (See Fig. 87.)

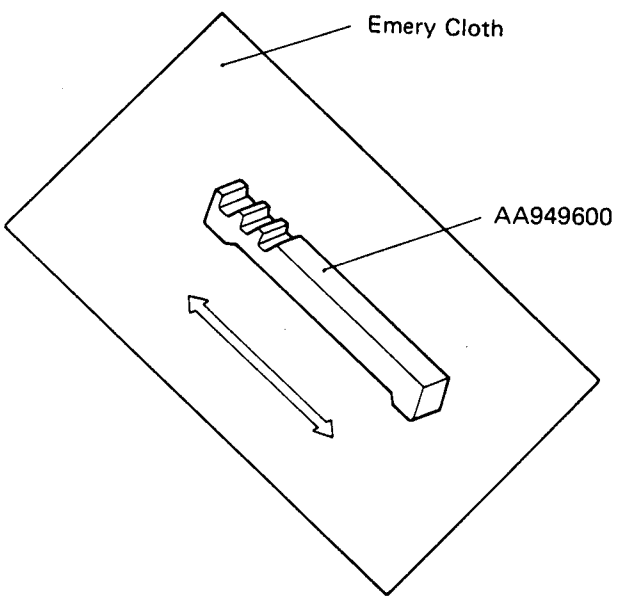


Fig. 87

13. STICKING OF SLIDING SURFACE OF FOCUSING MECHANISM

Causes: Dust or dirt caught between sliding surface impairs movement of focusing mechanism.

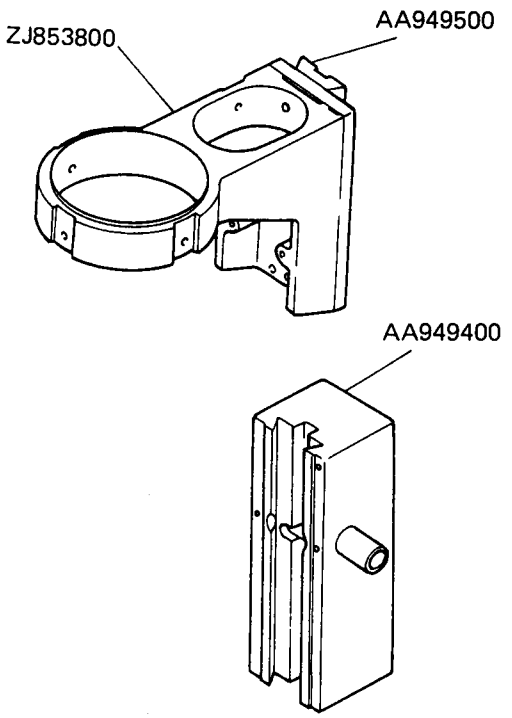


Fig. 88

13-1 Disconnect Pinion AA949800 with Focusing Knob AA073500 (left side).

13-2 Clean sliding surfaces of Pillar and Mounting Bracket. (See Fig. 88.)

13-3 Scrape defective surfaces with scraper to eliminate burrs or unevenness of surfaces.

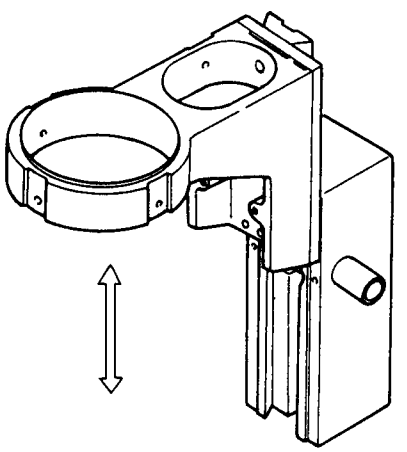


Fig. 89

13-4 To test surface flatness slowly insert Mounting Bracket into Pillar. If you feel unevenness, apply a small amount of abrasive for lapping. (See Fig. 89.)

13-5 Wipe lapped surface clean, apply grease OT 2008. Repeat sliding of Mounting Bracket in Pillar several times until grease is spread all over the surfaces.

13-6 After re-assembly of rack and pinion, check for smooth movement.

14. PLAY IN SLIDING SURFACE OF FOCUSING MECHANISM

Causes: Warn-out surfaces after prolonged use.

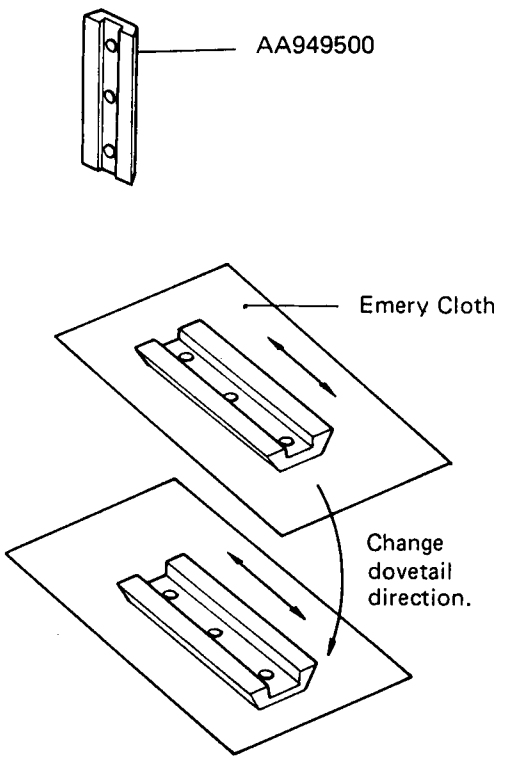


Fig. 90

14-1 Disengage Pillar AA449400 and Mounting Bracket ZJ853800.

14-2 Detach rack AA949600.

14-3 Detach dovetail AA949500 from Mounting Bracket.

14-4 File the back of dovetail with emery cloth that is flattened on an even surface. To file evenly, slide dovetail in one direction several times on emery cloth, and then reverse sliding direction with even force with which you depress dovetail on emery cloth, in order to avoid tapering of surfaces. (See Fig. 90.)

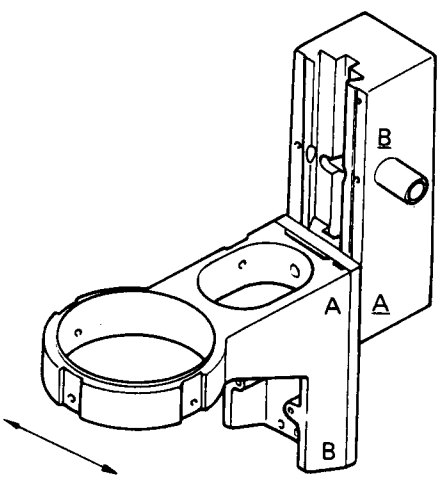


Fig. 91

14-5 Keep lapping of dovetail to such a degree that dovetail and Pillar should be a little tight when assembled.

NOTE:
If dovetail is filed excessively, slightly loosen screws HK3x4SA, 3 pieces that fasten dovetail to Mounting Bracket, and lap dovetail while fastening screws gradually.

14-6 When entire surfaces are lapped correctly which means that its movement is neither too tight nor too loose, stop lapping, clean off abrasive and check play, if any. Holding block firmly in your hand, swing it to the right and left alternately as shown by arrows in sketch, left, with dovetail in position "AA" and then position "BB". If you feel a very faint play between dovetail and Pillar as you swing it, it is all right.

14-7 Grease sliding surface and slide it repeatedly until grease is spread. When you do not feel play as you swing dovetail in position "AA" and "BB", dovetail is lapped correctly. If not, disassemble unit again for re-lapping. (See Fig. 91.)

14-8 Assemble rack.

14-9 Assemble Pillar AA949400 to Base AA920500.

14-10 Attach Stopper AA370700. (See Fig. 68.)

14-11 Fix Screw AA921800, Fixing Screw AA921600, Grounding Terminal AA800300 and Screw CUK3 x6SA all in place.

14-12 Final checks

Visual check on contamination, scratches, etc.

Check on the effect of the taper, the operating conditions of the Rack, Pinion and Dovetail, and on how much tightly the screws are fixed.

15. OPTICAL ALIGNMENT FOR ZOOM LENSES OF VMZ (V-BZ-2)

Although the main body of BHC is used as Jig VM-KC010 (Fig. 96) which is required for adjustment of the zoom lenses hereinafter described, the purchase by the distributor of such a high-priced instrument does not pay unless he has a large number of the repair works requiring its use.

In case of replacement, therefore, of one of the lenses installed in Zoom Tube ZJ853400, it is recommended that, instead of purchasing the expensive instrument for lens adjustment, the distributor purchase from Olympus ZJ856300 composed of a pair of Zoom Tubes ZJ853400 (Fig. 93) that has already been adjusted upon assemblage.

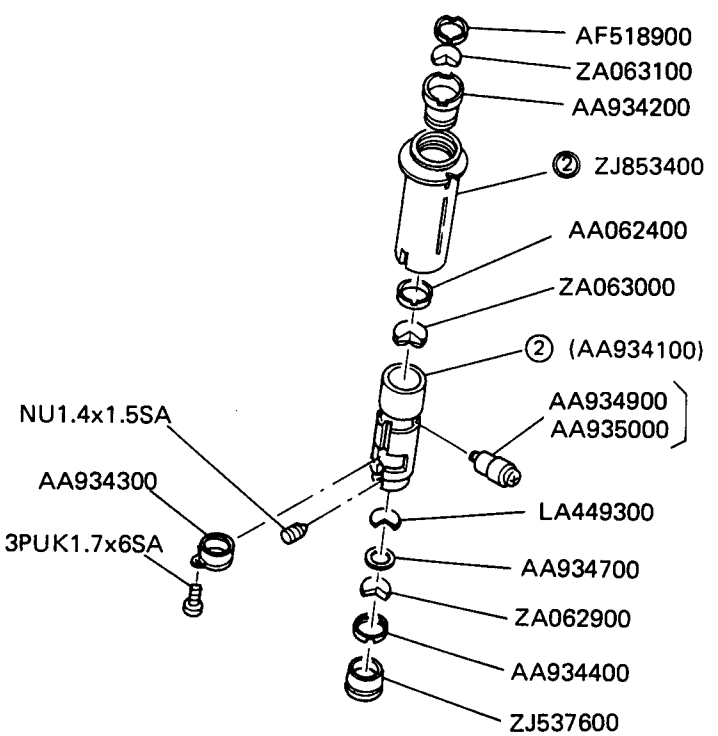


Fig. 92

15-1 Disassembly of Zoom Lenses

a) Detach Roller AA934900.

b) Detach Lens Frame AA934300 after unscrewing 2 pieces of 3PUK1.7x6SA.

c) Withdraw Inner Tube AA934100 from Zoom Tube ZJ853400.

d) Unscrew Lens Frame AA934200 from the Zoom Tube with Adjustable Spanner OT 0022.

Since shellac is applied to the threaded section of the Lens Frame, it is recommended that a small amount of alcohol be given to the threaded section prior to the unscrewing.

e) Unscrew Set Screw NU1.4x1.5SA from the forward end of Inner Tube AA934100.

f) Unscrew Lens Frame ZJ537600.

g) Take out Lens ZA063000 from Inner Tube AA934100 after loosening Retainer Ring AA062400 with the Adjustable Spanner.

With completion of the disassembly, it becomes possible to clean the lenses.

CAUTION:

In disassembling and assembling the Zoom Lenses, care should be exercised so as not to confuse them with the left and the right lenses.

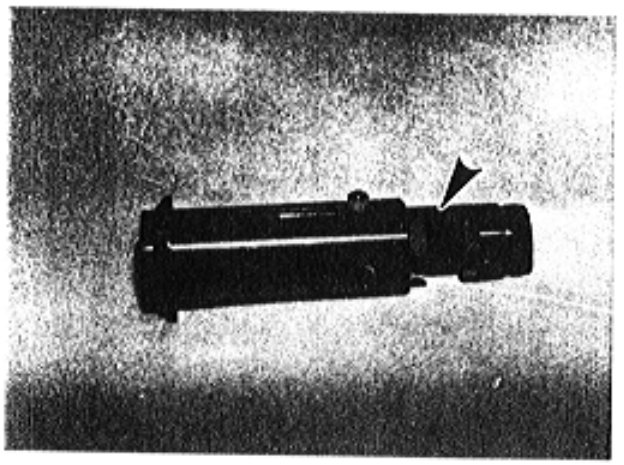


Fig. 93

15-2 Assembly of Zoom Lenses

Upon cleaning the Zoom Lenses, put them back into Zoom Tube ZJ853400 and Inner Tube AA934100.

Apply Grease OT 2024 to the interface between Zoom Tube ZJ853400 and Inner Tube AA934100 in the direction of the arrow in Fig. 93. Make sure that the Inner Tube fits closely into the Zoom Tube.

Perform the assembly in the reverse order of the disassembly.

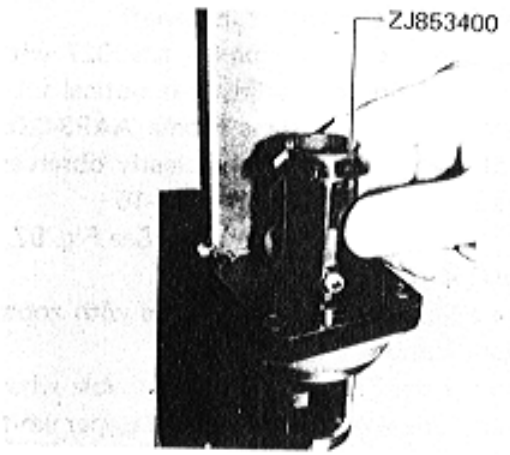


Fig. 94

15-3 Optical alignment

a) Mount Zoom Tube ZJ853400 on Jig VM-KC010 and fix the former to the latter by means of the fixing ring.

(See Figs. 94 and 95.)

b) Assemble the following jig and tools as shown in Fig. 96.

* C–2
* C–15
* KN0027
* VM-KC010

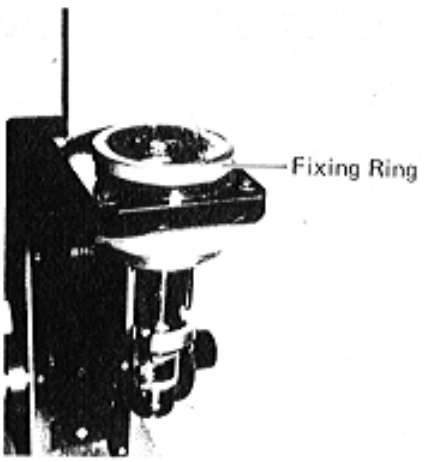


Fig. 95

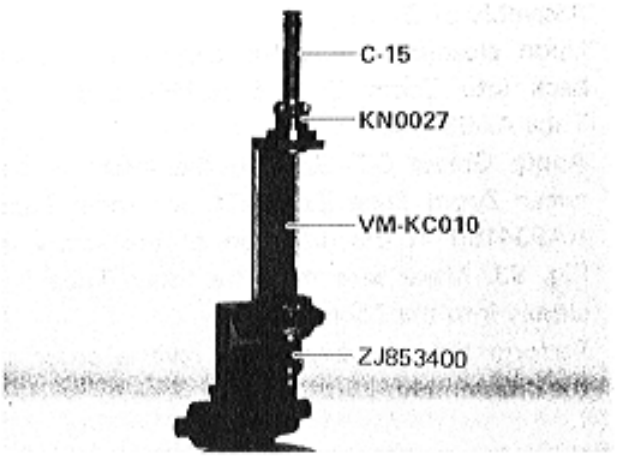


Fig. 96

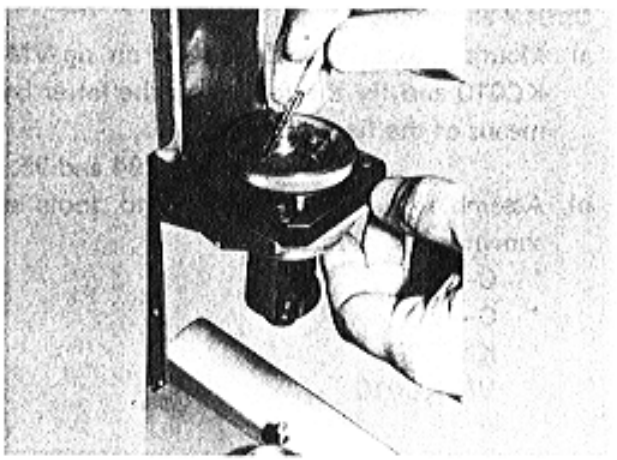


Fig. 97

c) Adjustment of optical tube length
Align the "O" marking on KN0027 with the index line and adjust the optical tube length by turning Lens Frame AA934200 until the specimen can be clearly observed through Focusing Magnifier C–15.
(See Fig. 97.)

CAUTION:
The adjustment must be made with zoom magnification 1X.
Zoom magnification 1X: Obtainable when Inner Tube AA934100 is at the upper limit.
Zoom magnification 4X: Obtainable when Inner Tube AA934100 is at the lower limit.
Upon completion of the adjustment, fix Lens Frame AA934200 firmly to Zoom Tube ZJ853400 by means of shellac.

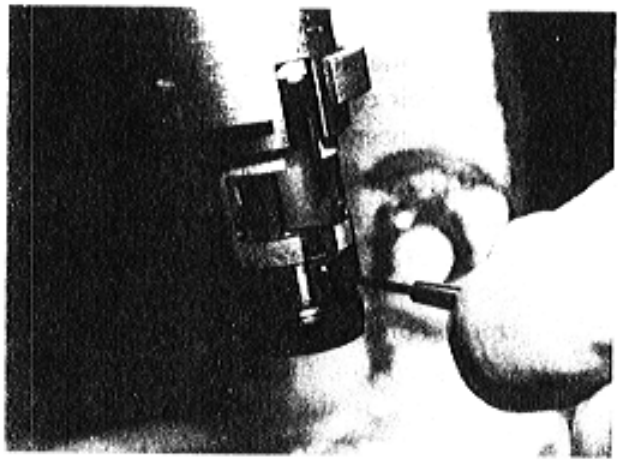


Fig. 98

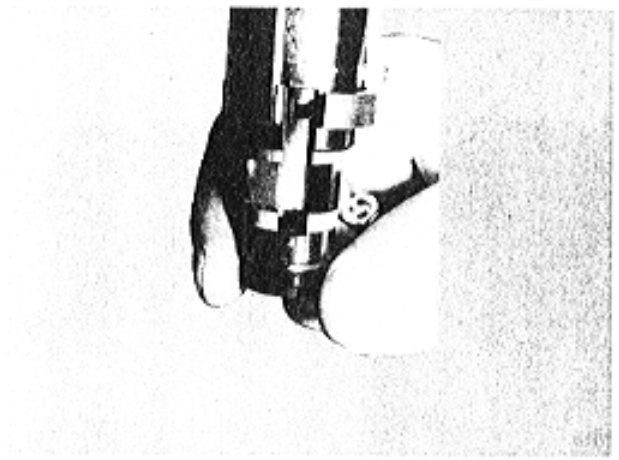


Fig. 99

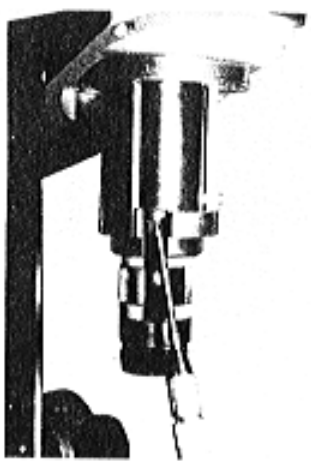


Fig. 100

d) Adjustment of parfocality

With the same jig and tools in use that are used for adjustment of the optical tube length, make focus adjustment so as to enable the specimen to be focused when the zoom magnification is set at 1X as well as 4X.

(Procedure for adjustment)

Loosen Set Screw NU1.4x1.5SA fixed at the forward end of Inner Tube AA934100 and make adjustment by turning Lens Frame ZJ537600. (Parfocalize 1X after 4X.) Upon completion of the adjustment, tighten Set Screw NU1.4x1.5SA and fix Lens Frame ZJ537600 in place.

(See Figs. 98 and 99.)

In the course of the above adjustments, check on the "resolving power" and "astigmatism" at the center of the field of view.

e) Adjustment of positions of concentric circles at the time of change in magnification.

Slightly loosen 2 pieces of 3PUK1.7x6SA that fix Lens Frame AA934300.

(See Fig. 100.)

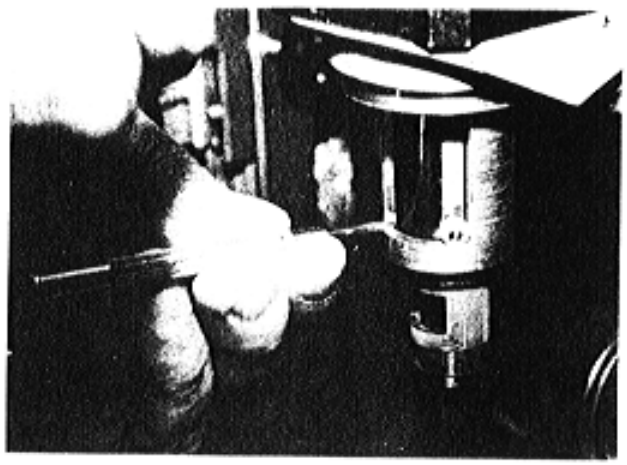


Fig. 101

Shift 1X concentric circles by slightly tapping on the side of Lens Frame AA934300 until their center coincides with the center of 4X concentric circles. (See Fig. 101.)

CAUTION:

Make adjustment so as to bring the center of the 1X and 4X concentric circles into the shaded circle that is drawn in Fig. 102. Upon completion of adjustment of the optical system, clean the lenses again and put them into the main body.

(Field of View through C-2)

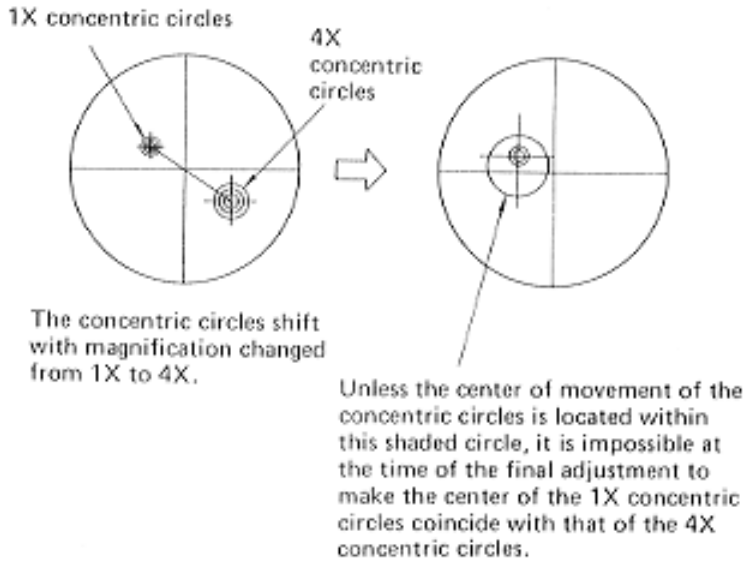


Fig. 102