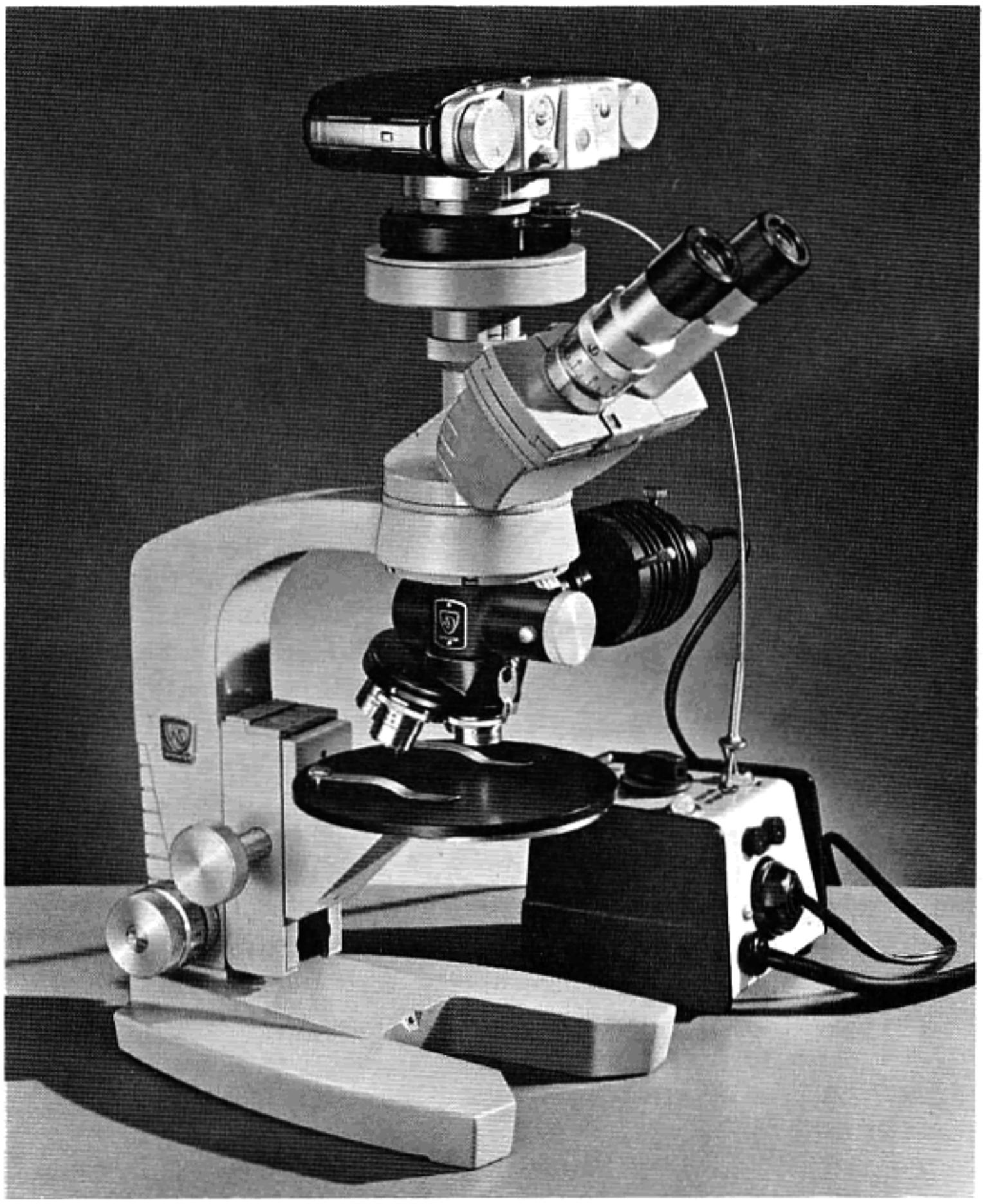
METALSTAR model 2200 Metallurgical Microscope

REFERENCE MANUAL



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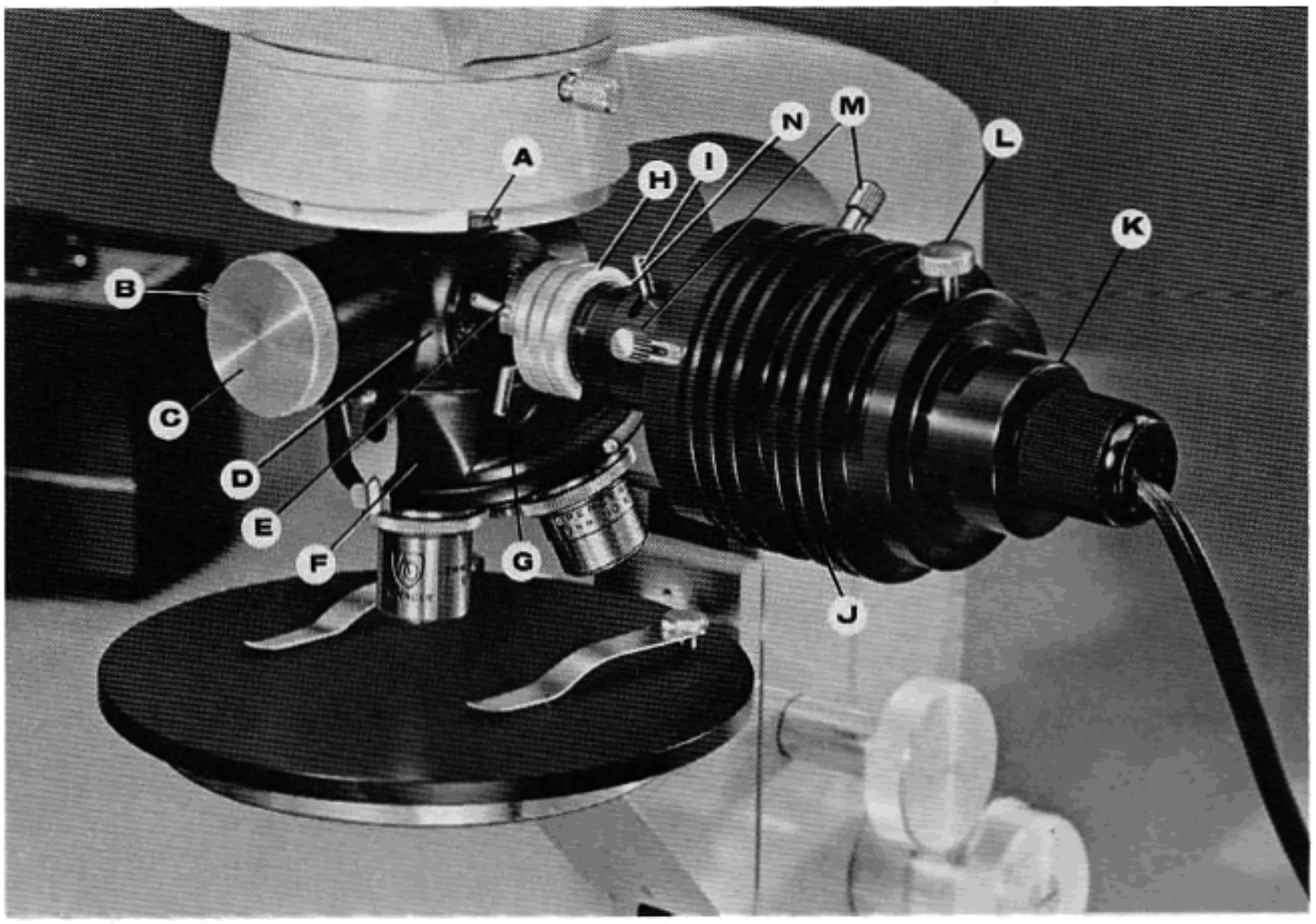

FIG. 1

DIRECTIONS FOR OPERATION AND CARE OF AO SPENCER VERTICAL ILLUMINATOR MODEL 2500

A Locking Ring
B Clamping Screw
C Reflector Slide Knob
D Vertical Illuminator Body
E Filter
F Revolving Nosepiece
G Aperture Diaphragm Lever
H Filter Retaining Sleeve
I Field Diaphragm Lever
J Illuminating Unit
K Lamp Socket Assembly
L Socket Retaining Screw
M Lamp Centering Screws
N Allen Screw

I. When you receive your Model 2200 METALSTAR, the Vertical Illuminator Body (D) and nosepiece (F) (either revolving or quick-change adapter) will be attached to the microscope arm. The Illuminating Unit (J) will be unattached and the Vertical Illuminator Tube will be sealed with a protective glass window. Remove window by unscrewing in a counterclockwise direction. Screw in Illuminating Unit (J). Orient unit so that socket retaining screw (L) points vertically (Fig. 1). Then tighten knurled ring located just in front of finned housing (not shown in illustration) to lock in place.

FIG. 2

II. TO ATTACH OBJECTIVES TO QUICK-CHANGE NOSEPIECE
Objectives are attached to the Vertical Illuminator by means of intermediate objective adapters with handle. The objective is screwed into the adapter which in turn locks into the nosepiece (lower part of the Vertical Illuminator)

as shown in Fig. 2. The objective adapter seats into the recess in the Vertical Illuminator with the two cutaway portions of the adapter ring fitting over the ends of the U-shaped spring. The adapter, after being correctly seated, is secured in place by a slight rotation in a counterclockwise direction to a stop.

III. CHOICE OF BEAM SPLITTER AND HALF APERTURE FIRST SURFACE MIRROR

The AO Spencer Vertical Illuminator is furnished with both beam splitter and half aperture first surface mirror. When the knob (C) is pushed all the way in, the beam splitter is in place; when the knob is pulled all the way out against the set screw (B), the half aperture first surface mirror is in position. The beam splitter should be used at all magnifications, unless reduction of resolution can be tolerated in order to obtain increased illumination and "relief effect".

It is important that the beam splitter be kept clean. Lack of complete cleanliness will result in scattered light and greatly reduced contrast. The beam splitter is cleaned by removing the set screw (B) and withdrawing the shaft containing the beam splitter and mirror by pulling the knob (C). Cleaning of all optical surfaces should be accomplished by gently wiping with soft clean linen cloth or lens tissue, moistened with alcohol or xylol.

IV. MOUNTING OF SPECIMEN

It is essential that the specimen be mounted so that the polished surface is accurately perpendicular to the optical axis. This can best be accomplished by mounting the metal specimen on a standard 1 x 3 inch microscope slide with a piece of plasticine, or modeling clay, between the specimen and glass slide. The surface of the specimen can be made parallel to the slide with a leveling press or other leveling device. Departure from correct orientation of the specimen will result in one side of the image appearing in focus and the opposite side out of focus. In order to examine very thin specimens under 95X oil immersion, the specimen must be mounted so that the top surface is at least 7mm above stage level.

V. ADJUSTMENT OF ILLUMINATION

1. Connect the illuminating unit to the transformer.

2. Insert a low power objective such as the 16mm and bring the objective into approximate focus, rotating the knob (C) slightly while looking at the specimen until the spot of light is roughly centered. Now open both field and aperture diaphragms (I) and (G), and focus the objective accurately.

3. Close field diaphragm (I) until its image appears in the field of view. The edges of the diaphragm should be in focus simultaneously with the specimen. If not, the field diaphragm may be brought into focus by loosening the small Allen screw (N) and sliding the unit containing the field diaphragm in or out, then tightening the screw at the position of best focus.

The field diaphragm may appear to be off center after the rough centering of the reflector accomplished in step 3. Final adjustment of the reflector is now made by rotating knob (C) until the field diaphragm appears centered in the field.

4. Open field diaphragm until edges just disappear from the field of view, but not farther than necessary to accomplish this. This adjustment reduces stray light to a minimum.

5. If the field of view is not uniformly illuminated, center the bulb by adjusting centering screws (M) until uniform illumination is obtained. This adjustment need not be made again until the bulb is replaced.

6. The aperture diaphragm (G) controls the effective aperture of the objective. Maximum resolution is obtained at full aperture, with the diaphragm open sufficiently wide to fill the back of the objective. This can be checked by removing the eyepiece and looking down the eyepiece tube where an image of the aperture diaphragm can be observed at the rear lens of the objective.

   It may be desirable to close the diaphragm down somewhat from this position to obtain increased contrast or greater depth of focus. The aperture diaphragm should never be used to reduce the amount of illumination. If the illumination is too bright at full aperture for comfortable observation, it should be reduced by cutting down the voltage with the variable transformer, or by inserting a filter into the light path.

7. Filters are inserted by sliding the retaining sleeve (H) back, inserting the filter (E), and sliding the retaining sleeve forward to lock the filter in place.

8. For photomicrographic work where a separate light source of high intensity is desired, the illuminating unit is removed by unscrewing the entire unit. A protective glass window is supplied which screws into the Vertical Illuminator Tube in place of the illuminating unit.

VI. TO RELUBRICATE MICRO-GLIDE STAGE

The two-piece assembly of the Micro-Glide Stage needs no maintenance other than occasional relubrication of the bearing surfaces. It is suggested that the following steps be observed to remove top glide-plate and relubricate.

1. Lower stage to limit of its excursion.
2. Pry up glide-plate to break contact.
3. Clean both bearing surfaces with lint-free cloth and use solvent if necessary.
4. Relubricate both surfaces sparingly with lubricant supplied (Plastilube #1).
5. Replace top glide-plate.
6. Distribute lubricant more uniformly by gliding the stage in various horizontal directions.

HELFPUL NOTES ON PHOTOMICROGRAPHY WITH THE AO SPENCER METALSTAR, SERIES 2200

The following information is based on factory testing during which optimum conditions were maintained.

Specimens used: A random selection of newly etched and polished specimens were used as subjects. These included Enargite, Titanium, Stellite, Stibnite, Nickel Bronze, and forged Brass. Exposure times for all the above did not vary significantly from one specimen to another.

Cameras and film used:

1. AO Spencer No. 635, 35mm Camera; Panatomic X film, speed-ASA25.

2. AO Spencer No. 682G Camera (with Polaroid camera back); Polaroid film type #41.

Microscope Body used:

AO Spencer No. 96 Trinocular Body

Illumination Control:

Primary voltage: 115 volt AC
Secondary voltage: 7.5 volt AC
Lamp, G.E. #1493: New Condition
Filter, AO #2511: Green Glass
Field Diaphragm: Open

EXPOSURE TIMES

OBJECTIVE	682G CAMERA	635 CAMERA
3.5X 30.2mm	1 sec.	1/10 sec.
10X 16mm	1 sec.	1/10 sec.
20X 8mm	1 sec.	1/10 sec.
40X 4mm	2 sec.	1/5 sec.
95X 1.8mm	4 sec.	1 sec.

MISCELLANEOUS NOTES

1. When using film other than the types specified, compare the film speeds and ratio the exposure times accordingly.

2. If fixed monocular body tube No. 74F is used, exposures are only 1/3 to 1/5 the above. If adjustable monocular body tube No. 74A is used, body must be set at "160" in order to maintain tube length of 191.1mm and exposures reduced as indicated above.

SEE BACK PAGE FOR MAGNIFICATION TABLE

3. If the primary voltage is less than 115 volt AC, or if the secondary voltage is less than 7.5 volt, the exposure times will be increased accordingly as shown below:

Primary Voltage	Secondary Voltage	Percent Exposure Time Increase
110V	7.5V	15%
110V	6.5V	35%
110V	6.0V	50%
105V	7.5V	25%
100V	7.5V	35%

Magnifications at the film plane of the No. 635 Camera are listed below together with data for computing magnifications of enlargements.

Objective	Magnification At Film Plane	Enlargement Factor	Magnification of Enlargement
3.5X	12-1/2X	2X/4X	25X/50X
10X	30X	3X/5X	90X/150X
20X	70X	3X/5X	210X/350X
40X	125X	2X/4X	250X/500X
95X	250X	2X/4X	500X/1000X

For the No. 682G Camera, the magnifications at the film plane are the same as the magnifications of the visual image as seen through the eyepiece and are expressed in terms of the resultant magnifications for eyepiece-objective combinations as shown below:

TABLE OF RESULTANT MAGNIFICATIONS AND FIELD DIAMETERS FOR OBJECTIVE-EYEPIECE COMBINATIONS

EYEPIECES (RM= Resultant Magnification) (FD= Field Diameter in mm's)	SHORT MOUNT OBJECTIVES									
	C105 3.5X		C1279 10X		C1283 20X		C1289 40X		C1294 95X	
	RM	FD	RM	FD	RM	FD	RM	FD	RM	FD
133 Single, 1133 Paired 5X Huygenian	25X	4.3	50X	1.76	125X	.82	250X	.44	500X	.19
140 Single, 1140 Paired 8X Huygenian	35X	3.4	100X	1.41	200X	.65	400X	.3	800X	.15
146 Single, 1146 Paired 10X Wide Field	50X	4.5	125X	1.9	250X	.84	500X	.44	1000X	.18
142 Single, 1142 Paired 10X Huygenian	50X	3.3	125X	1.38	250X	.64	500X	.33	1000X	.15
144 Single, 1144 Paired 12X Huygenian	60X	2.3	150X	1.0	300X	.45	600X	.25	1250X	.10
147 Single, 1147 Paired 15X Wide Field	75X	3.8	175X	1.4	350X	.71	700X	.37	1500X	.16
C172 Single, C1172 Paired 20X Compensating	100X	2.0	200X	.70	500X	.32	1000X	.17	2000X	.08

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