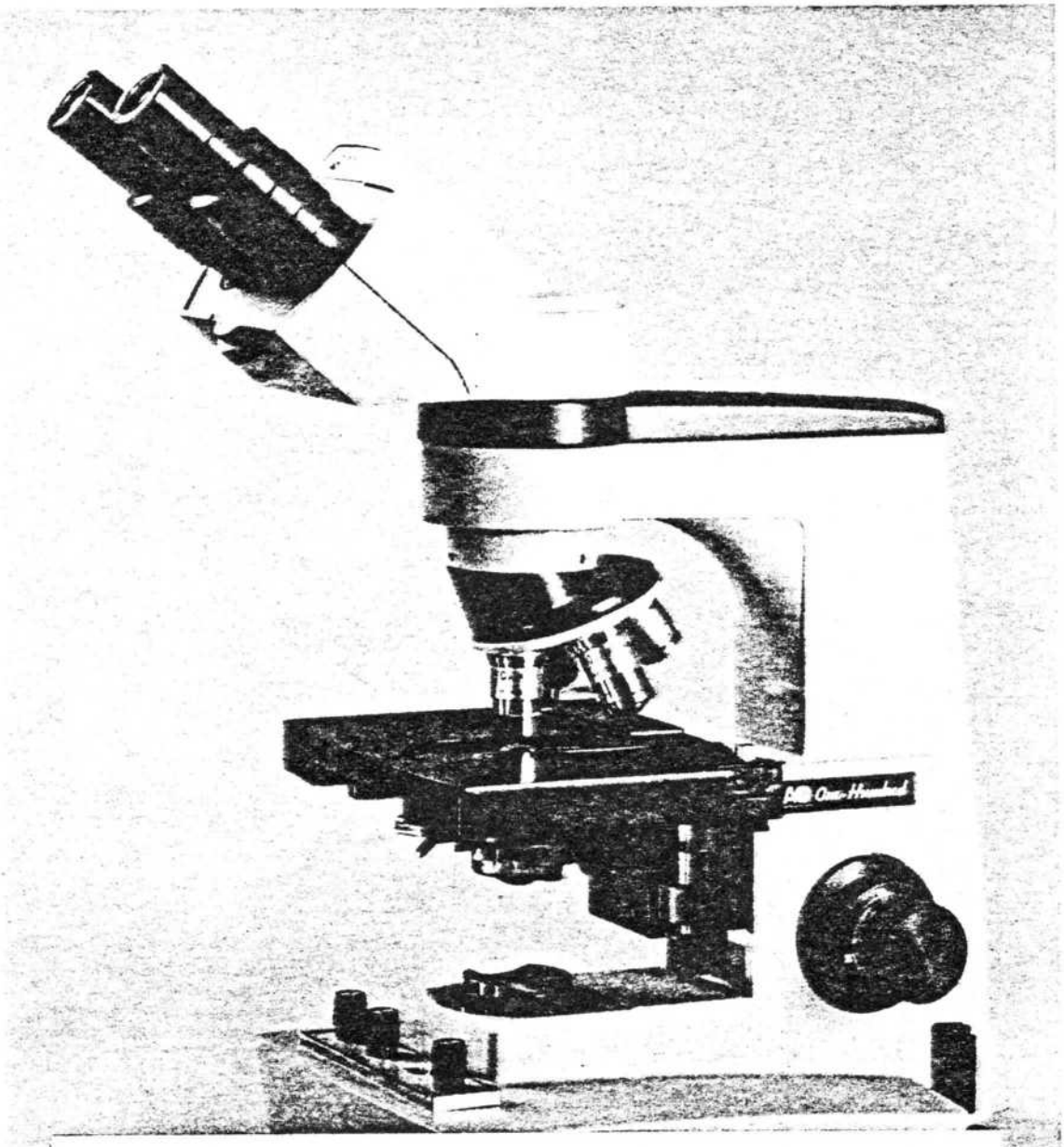
SERVICE MANUAL

Series One-Hundred MICROSTAR®
Advanced Laboratory Microscopes



This Service Manual does not necessarily contain information on all changes that have occurred to the subject instrument since the manual's date of issue. It was prepared for the use of AO Scientific Instrument factory-trained service personnel who are kept up to date through a program of Service Bulletins and Training Seminars.

AO® Scientific Instruments
DIVISION OF WARNER-LAMBERT TECHNOLOGIES, INC.
TECHNICAL SERVICES
P.O. Box 123, Buffalo, N.Y. 14240

TSM-75-2 11/82

$1.00

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The equipment supplied may not agree in all details with our description or illustrations because instruments are subject to modification and improvement.

SERVICE

Repairs should be performed by qualified service personnel. Complete repair facilities are available at many AO Scientific Instruments authorized dealers, and AO Scientific Instruments, Technical Service Centers.

AO® Scientific Instruments

TECHNICAL SERVICES

Technical Services is a well-established, proven instrument repair facility with five strategically located Service Centers. It has been operating for nearly sixteen years - and is the only field Service Organization maintained by an optical instrument manufacturer.

We offer your customer complete service in these areas:

Repair
Reconditioning/Exchange
Preventative Maintenance Program
Loaners

Tech Services is an ideal backup support in selling instruments

This is Why -

Since Technical Services repairs all instruments AO Scientific Instruments manufactures, you can offer complete coverage to your customers. Independent service outfits cannot.

We service and repair only AO Scientific Instruments products; we do not diversify any time or any effort to competitive products.

Each Technical Services Center is fully equipped with specialized tools, fixtures and calibration instrumentation required for proper evaluation and repair of all AO Scientific Instruments products.

Our costs are moderate! AO Scientific Instruments repair rates are usually much less than those charged by independent service people.

All Service Centers carry extensive Parts Inventories so that aspect of downtime is minimized.

Our work is warranted by technicians professionally trained in Buffalo. They can handle any repair problem - no matter how involved.

And, finally -

Technical Services' Price Lists clearly state all conditions under which it operates. Study them carefully so you will be well informed when you encourage your customers to channel their service needs to the people best equipped to help them.

This is important

Your customer's satisfaction in having his instruments maintained at highest performance levels means that he will give first consideration to future AO Scientific Instruments purchases.

SERVICE CENTER LOCATIONS

When shipping to a Service Center, prefix addresses listed below with:

"AO SCIENTIFIC INSTRUMENTS, TECHNICAL SERVICES"

REGION	ADDRESS	TELEPHONE NO.
New York City	85 Campus Plaza Edison, N.J. 08837	Edison (201) 225-4720
Philadelphia	5425 Marlton Pike Route 70 Pennsauken, N.J. 08109	Philadelphia (609) 488-1233
Boston	40 Washington Street Wellesley Hills, MA 02181	Boston (617) 237-7744
Atlanta	2191 Northlake Pkwy. Bldg. 11, Suite 148 Atlanta, GA 30084	Atlanta (404) 938-8059
Buffalo	Eggert and Sugar Roads Buffalo, NY 14215	Buffalo (716) 891-3211
Chicago	5405 Milton Parkway Rosemont, IL 60018	Chicago (312) 992-0790
Detroit	1561 Howard Street Detroit, MI 48216	Detroit (313) 961-2467
Dallas	9630 Chartwell Drive Dallas, TX 75243	Dallas (214) 343-3754
Houston	5900 North Freeway Houston, TX 77076	Houston (713) 692-1926
Los Angeles	11133A Vanowen Street North Hollywood, CA 91605	North Hollywood (213) 980-7080
Seattle	Rt. 1, Box 250-B Vashon Island, WA 98070	Seattle (206) 567-5135

INTRODUCTION

This Service Manual has been prepared as an instruction guide for performing troubleshooting, field repair and routine maintenance of the Model 100 Microscope.

It is intended to assist both operating and service personnel.

Instructions for setup and use, in addition to directions for performing routine maintenance, are given in the Reference Manual 100-101 that is packaged with the instrument or is available from the factory in Buffalo, New York.

TABLE OF CONTENTS

ILLUSTRATIONS

1.0 BASIC MAINTENANCE MATERIALS

The tools, accessories and lubrication material listed will assist the operator in the basic maintenance of this Microscope.

1. Small camel-hair brush - ½ inch
2. Infant ear syringe
3. Screwdrivers - assorted, Jeweler's type and off-set type
4. Lens paper
5. Cotton Tip applicators
6. Allen wrenches - assorted sizes
7. Alcohol - Methyl - technical grade
8. Lubricant grease - Mobil #3 or Shell Plastilube
9. Tube of graphite powder to mix with grease

   NOTE: Sporting Goods stores supply a graphite/grease mixture used to lubricate fishing reels and firearms.

10. Volt-ohm multi-test meter

11. K2216 Modified

2.0

Method for Inserting and Calibrating AO® Eyepiece Reticles in AO Eyepieces Nos. 133, 134, 142, 145, 146, 146B, 147, 147B, 157, 157B, 176, 180, 184

To Insert Reticles: Reticle insertion procedure varies with eyepiece type and construction. Therefore, first identify eyepiece by catalog number engraved on it. Then follow applicable directions below.

1. Wide Field Eyepiece:

   Catalog No. 180 — 10X

   Accepts reticles of AO 475-481 Series, 21.9mm in diameter. Place reticle, with ruled side up, into bottom of eyepiece. Seat reticle against field diaphragm (Figure 1). Push retaining ring against reticle to hold in place.

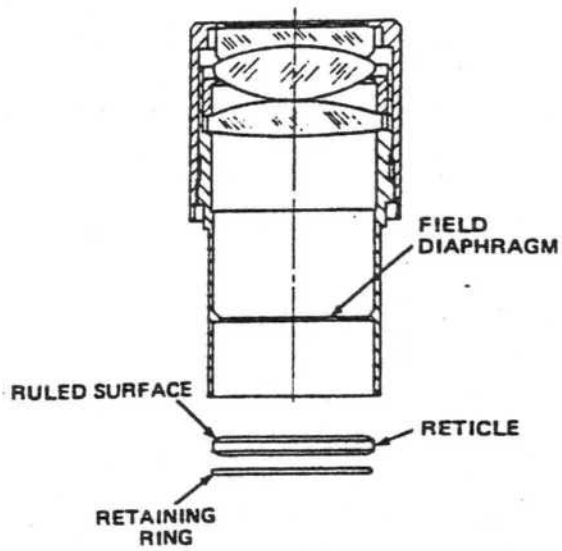


Figure 1. Catalog No. 180 10X Wide Field Eyepiece

2. Wide Field Eyepieces:

   Catalog Nos. 134, 145, 176 — 10X
   147, 147B, 184 — 15X
   157, 157B — 20X

   These eyepieces accept reticles of AO 1400 Series, 20mm in diameter.

   To insert a reticle into the eyepiece, place the reticle into the No. 148 reticle mount with the ruled side facing up. Slide the mounted reticle into the eyepiece tube until it seats against the field diaphragm.

   NOTE: Reticles provided for STEREOSTAR® /Zoom Microscopes are factory-installed in reticle mount.

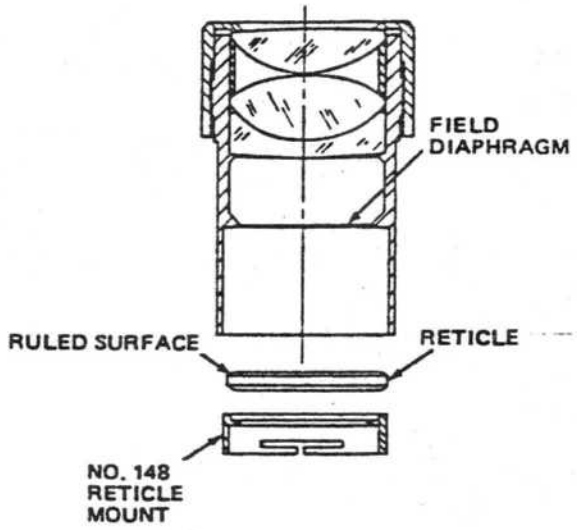


Figure 2. Catalog No. 176 Wide Field Eyepiece

3. Wide Field Eyepieces:

   Catalog Nos. 146, 146B — 10X

   The 146 and 146B eyepieces accept reticles of the 1400 series, 20mm in diameter. To install reticle, remove field lens assembly using wrench as indicated in Figure 3. Do not completely disassemble eyepiece. Insert reticle, with ruled side up, into retaining cell of the field lens assembly. Use care to keep lenses clean.

4. Huygenian Eyepieces:

   Catalog No. 133 — 5X
   Catalog No. 142 — 10X

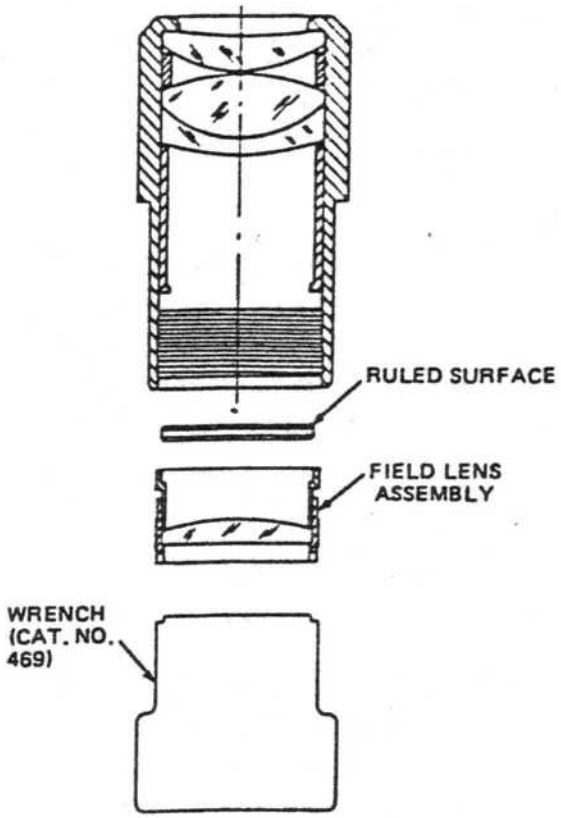


Figure 3. Catalog No. 146 Wide Field Eyepiece

Both Cat. No. 133 and Cat. No. 142 accept reticles of AO 405-427 series, 21mm in diameter. To install a reticle in the Huygenian eyepiece, the reticle must be inserted in the eyepiece from the top with the ruled side facing down, and secured with circular spring retainer.

Calibration of Micrometer Disc

The projected values of reticle graduations vary with the optical combination used and, consequently, should be pre-calibrated before accurate measurements can be made.

To calibrate, focus on a stage micrometer and move it until the zero graduations on it and on the reticle line up exactly. Choose a graduation as far (numerically) up the reticle scale as possible that corresponds exactly with a line on the micrometer scale. The calibration factor is this distance on the micrometer scale divided by the distance on the reticle scale. The calibration factor is actually the true distance subtended by one unit on the reticle scale.

Example: We have chosen Cat. No. 400 Stage Micrometer (2mm scale/200 divisions) and Cat. No. 475 Reticle (10mm scale/100 divisions), corresponding to X and Y respectively. Note that the zero graduations line up exactly. We can see that the highest reticle graduation that lines up

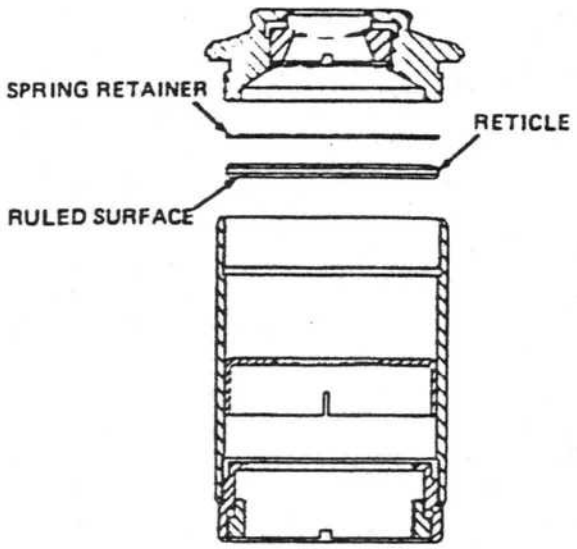
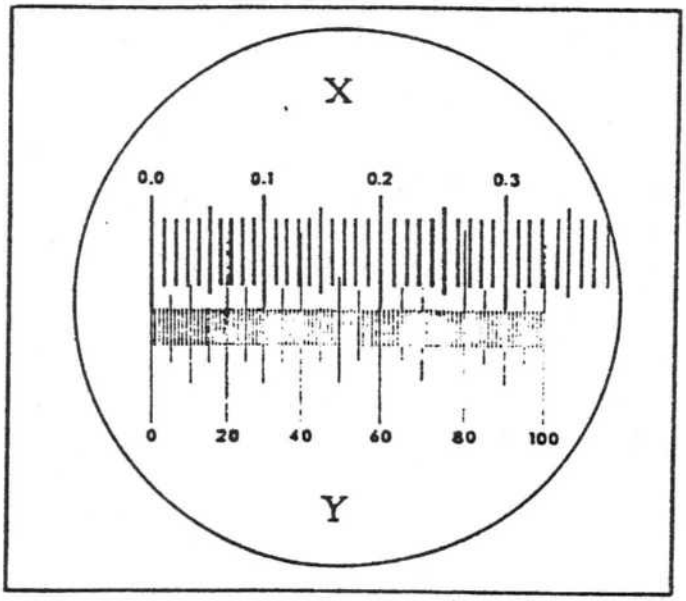


Figure 4. Catalog No. 177 10X Huygenian Eyepiece

exactly with a micrometer graduation is at 90 divisions. This corresponds with 0.3 on the micrometer scale.



Our calibration factor is:

$$C = \frac{x}{y}$$

$$= \frac{0.3\text{mm}}{90}$$

$$= .0033\text{mm per reticle division}$$

The number of divisions covered by the specimen multiplied by the calibration factor C gives the length of the specimen. For example, if a particular specimen covered 67 reticle units, its true length would be 67 x .0033mm = 0.22mm.

3.0 EYEPIECE CLEANING

Remove the eyepiece and hold it under a bright light. Tilt the eyepiece so the light reflects off the lens surface. Examine the lens for dirt and clean as required.

Loosen dirt with a camel-hair brush and blow off loose particles with an infant ear syringe.

If the lens has oil or grease on the surface, clean sparingly with a clean cotton tip applicator dampened with alcohol. Use a gentle circular motion to clean.

DO NOT --

1. Breathe on the lens surface as this will deposit moisture/oil particles.

2. Soak the lens surface with alcohol as it will not clean properly.

3. Scrub the lens excessively as the anti-reflective coating can be scratched and the lens will have to be replaced.

4. Use paper towels or tissues as they are coarse enough to scratch the coated lens surfaces.

5. Touch the lens or cotton applicator with the fingers as body oil will be deposited on the cleaning material and the lens.

6. Use acetone or xylene to clean lenses.

Place the eyepiece in the Microscope Body and observe a plain bright field of view. Rotate the eyepiece and if any spots in the field of view rotate, the inner lens surfaces may require cleaning.

Refer to the eyepiece diagrams, Figure 6. There are two methods used to assemble eyepieces. In both cases, they should be disassembled by placing them upside-down on a table covered with a soft cloth.

When disassembling the eyepiece, it is very important that the lens surface be identified so that it is not reversed at assembly. Some of the curvatures will look identical but optimum performance can only be achieved if it is replaced so the curve of the lens faces the proper direction.

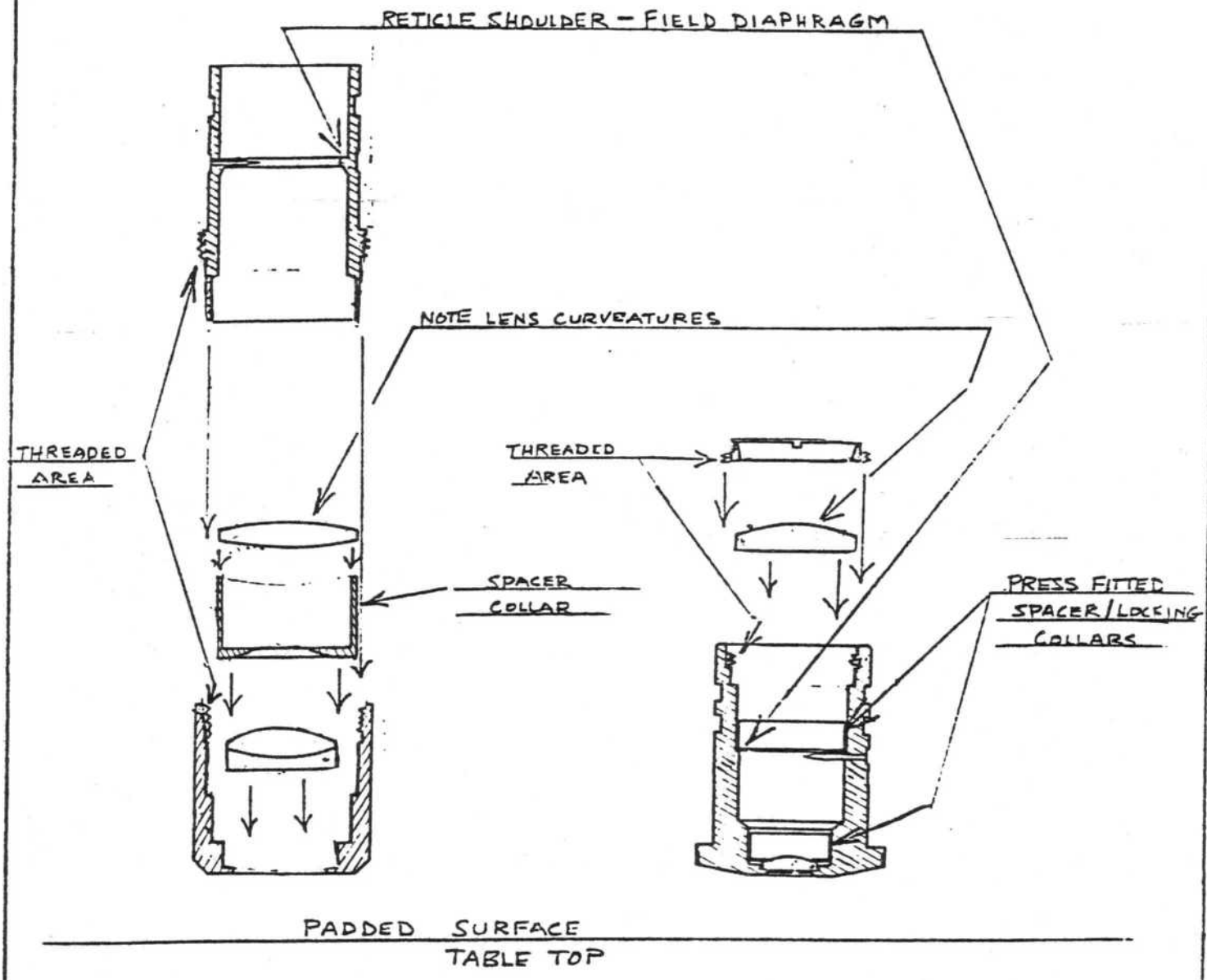
The No. 138 10x Wide Field Eyepiece can be disassembled by unscrewing the top and bottom sections. Separate the eyepiece halves carefully, as the lenses are held in place with spacer collars and can fall out when the housing is removed. Refer to Figure 5.

Hold lenses by the edges and clean using the same procedure described for exterior lens surfaces.

Reassemble the eyepieces using Figure 5 as a guide for lens elements, spacers and lock rings.

Cat. No. 138 10X Wide Field Eyepiece
with Pointer

Cat. No. 139 10X Huygenian Eyepiece
with Pointer



EYEPIECE VIEWS

FIGURE 5

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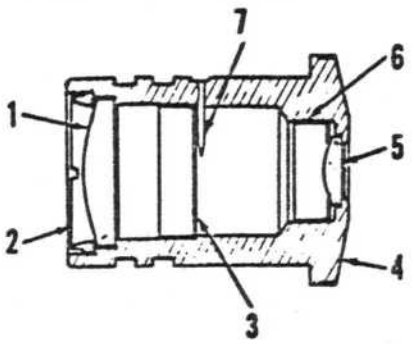
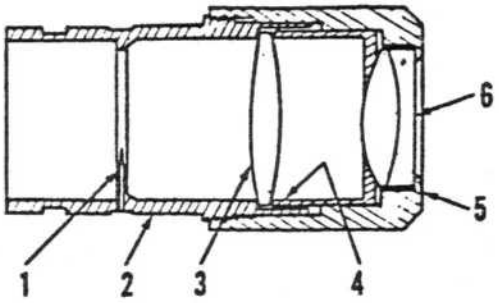


Cat. No. 139 10X Huygenian Eyepiece with Pointer



Cat. No. 138 10X Wide Field Eyepiece with Pointer

Figure 2 Eyepieces

Index No.	Part No.	Description	Qty
	Cat. No. 139	10X Huygenian Eyepiece with Pointer	
1	163-601	Field Lens	1
2	163-3	Retainer	1
3	139-12	Diaphragm	1
4	139-11	Body	1
5	139-605	Front Lens	1
6	139-13	Retainer	1
7	160-50	Pointer	1
	Cat. No. 138	10X Wide Field Eyepiece with Pointer	
1	164-4	Pointer	1
2	138-8	Tube	1
3	63-613	Eyepiece Crown	1
4	138-10	Separator	1
5	138-9	Cap	1
6	63-705	Eyepiece Doublet	1

FIGURE 6

WG-8-81

4.0 OBJECTIVES

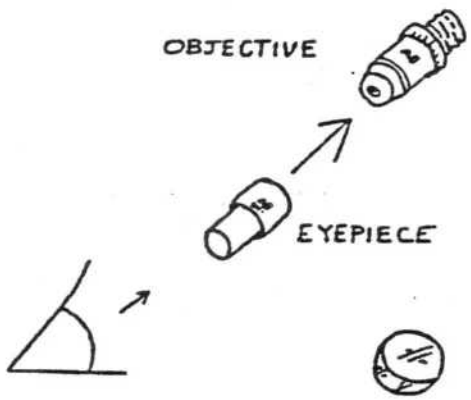
Microscope objectives must not be disassembled. Special fixtures, tool and techniques are required to service this critical part of the instrument.

Reconditioned exchange objectives are available from all Technical Service Centers that are conveniently located throughout the Country.

Exterior objective lens surfaces can be inspected and cleaned,

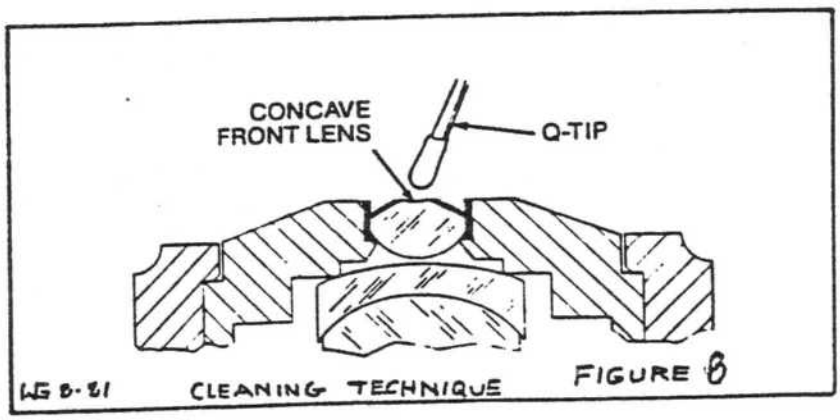
Remove the objective from the nosepiece using care that the front lens element does not hit the stage when detaching from the threaded nosepiece opening. The nosepiece should be raised to the uppermost position and a cloth placed across the stage surface.

Examine the front lens of the objective using a magnifying glass. An eyepiece, held backwards, can be used as a magnifier. Refer to Figure 7. A crescent shadow on one side of the lens can indicate oil leakage inside the lens, and the objective should be returned immediately for exchange.



OBJECTIVE EXAMINATION

WG 8-81 FIGURE 7



WG 8-81 CLEANING TECHNIQUE FIGURE 8

The objective front lens can be cleaned using the same material and techniques as when cleaning the eyepiece lenses. Refer to Figure 8.

5.0 STAGE

Reference: Figure 9

Reconditioned exchange 1194Amechanical stage attachments are available from all Technical Services Centers.

The 1194-4 stage plate must not be removed from the Microscope stand. It is adjusted to proper height and leveled using factory fixtures.

Exposed gear surfaces may be cleaned with alcohol and a cotton tip applicator. A small amount of lubricant can be applied to the gears with a plain applicator stick.

Recommended Lubricant - Plastilube #1, Warren Refining Chemical Company, Cleveland, Ohio

5.1 Removal of Mechanical Stage from Stand

5.1.1 Remove all objectives from nosepiece turret.

5.1.2 Loosen screw (13) with 9/64" Allen wrench.

5.1.3 Slide stage up and lift off stand.

5.2 Disassembly of Mechanical Stage into Assembly Groups

5.2.1 Unscrew 2 knobs (2) on slide holder assembly and lift it off stage plate.

5.2.2 Turn stage over to remove control assembly.

5.2.2.1 Remove screws (19) in short rack (18).

5.2.2.2 Lift out rack.

5.2.2.3 Remove 2 screws (19) from control assembly in part (44).

5.2.2.4 Lift out control assembly.

5.2.3 Turn knob (8) to move sub-stage away from stage top and slide off.

5.3 Servicing Stage Assembly Groups

5.3.1 Slide Holder Assembly (#1 and #3)

Routine maintenance of assembly would consist of cleaning and lubricating. Fingers may have to be straightened so that they are parallel with stage plate surface. Glass slide must stay flat on stage surface when fingers are moved. Proper clearance between slide fingers and stage surface is .05 to .010 or the thickness of a sheet of paper.

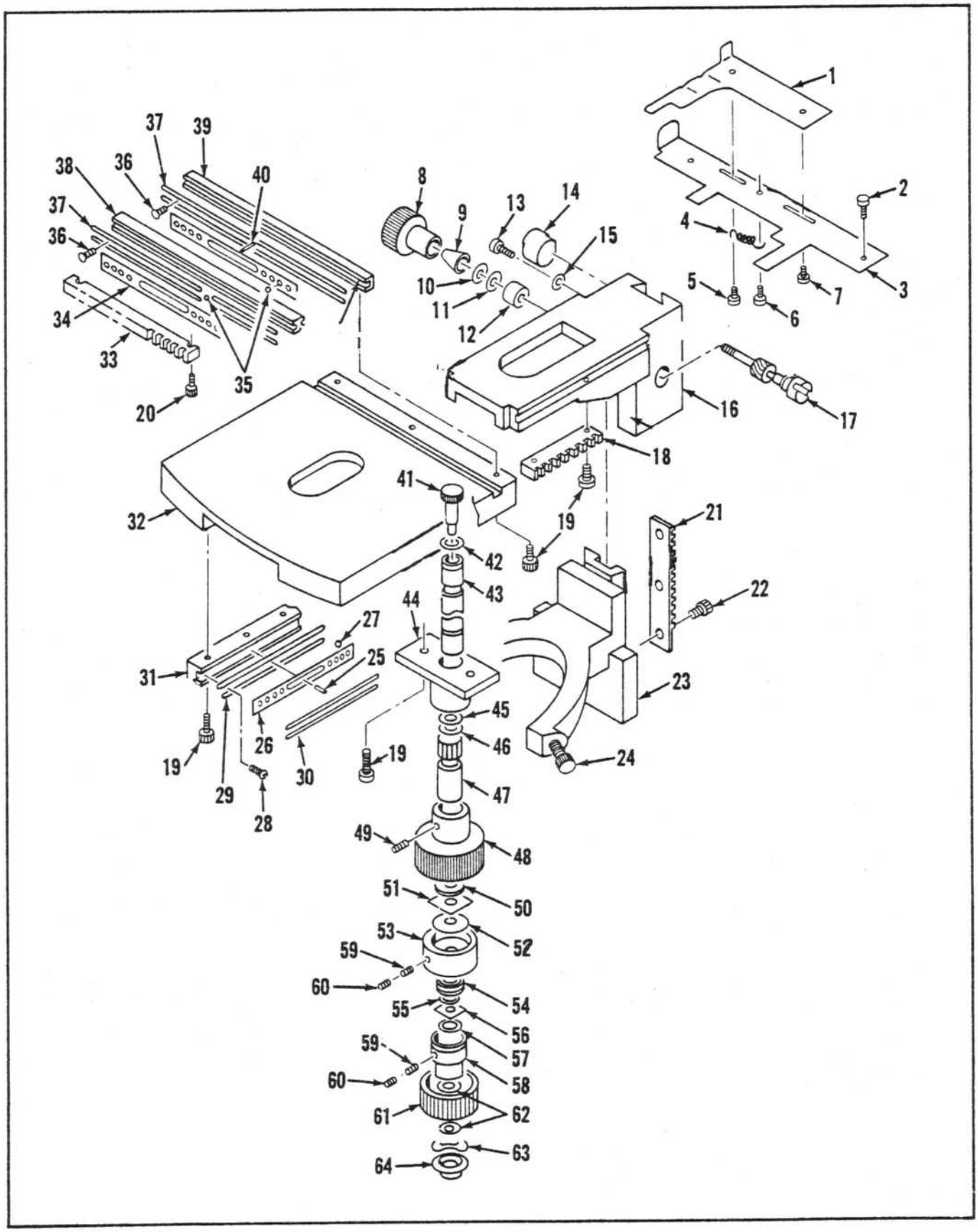


Figure 9 Stage Parts Breakdown

Index No.	Part Number	Description	Index No.	Part Number	Description
1 - 4	1194-857	Slide Holder Assembly	32	1194-4	Stage
			33	1534-46	Rack, long
			34	1194-10	Separator, long
			35	10-6	Ball
5	1062-12	Screw, spring	36	0128-1	Screw
6	0866-1	Screw	37	1194-8	Wire, long
7	1062-13	Screw, slide	38	1194-5	Slide, cross
8	1194-13	Knob	39	1194-88	Guide, long
9	35-48	Bearing, thrust	40	X-50707	Pin
10	1062-60	Spacer	41	1194-33	Inner pinion
11	01186-1	Washer	42	1194-37	Washer
12	35-47B	Bearing, pinion	43	1194-34	Sleeve
13	1194-19	Screw	44	1194-15	Mount
14	1194-41	Lock, slide	45	1194-36	Washer
15	X-16101	Washer	46	1194-38	Washer
16	1194-2	Stage, base	47	1194-35	Outer shaft
17	1194-853	Adjusting Pinion Assembly	48	1194-40	Knob, large
			49	X-36845	Screw
18	1194-17	Rack, short	50	1534-33	Washer
19	1194-32	Screw	51	1534-29	Washer, square
20	0861-1	Screw	52	X-50584	Washer
21	1062-57	Rack	53	1534-26	Adjusting Nut
22	0862-1	Screw	54	1534-31	Washer
23	1194-86	Fork, condenser	55	1534-34	Washer
24	1194-854	Centering Screw Assembly	56	1534-30	Washer, square
			57	1062-76	Washer, spring
25	X-50947	Pin	58	1534-48	Adjusting nut
26	1194-11	Separator, short	59	1534-38	Nylon plug
27	35-14B	Ball	60	X-53538	Set screw
28	X-1390-1	Screw	61	1194-39	Knob, small
29	1194-9	Track, short	62	1534-36	Washer
30	1062-19	Track, short	63	1534-37	Washer, wave
31	1194-6	Guide, short	64	X-53447	Retaining ring

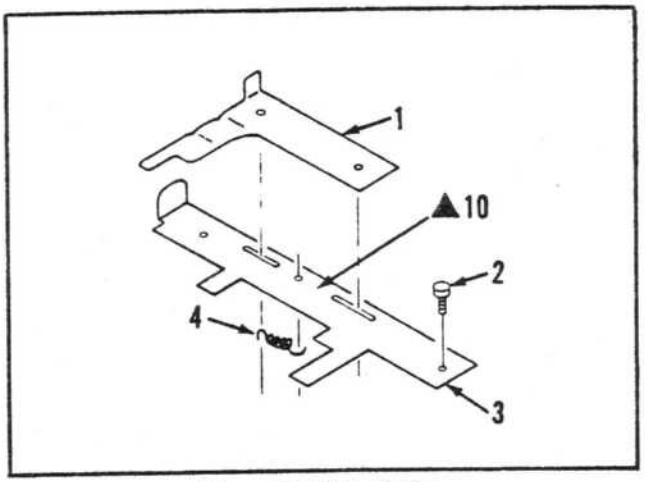


Figure 10 Slide Holder

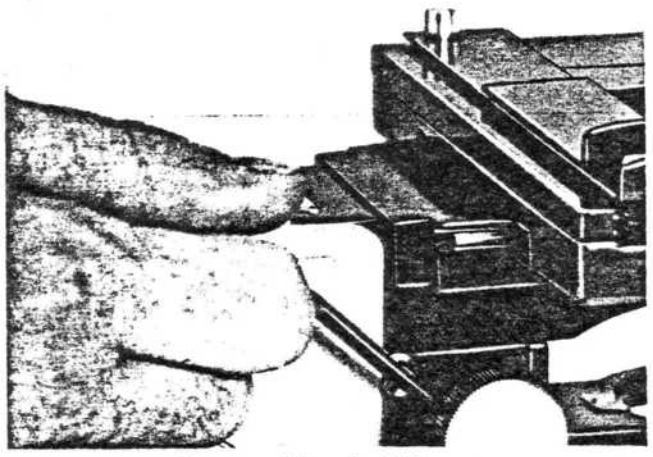


Figure 11 Stage Lock Screw

5.4 Disassembly of Stage Control Group (#41 to #64)

5.4.1 Place 1/16 Allen wrench through opening to knob (61) into adjustment nut (58) hole and loosen set screw (60).

5.4.2 Fit tool K2216 into slot on knob (61). Unscrew nut and remove.

5.4.3 Remove:

5.4.3.1 Spring washer (57)
5.4.3.2 Square washer (56)
5.4.3.3 Washer (55)
5.4.3.4 Washer (54)

5.4.4 Place 1/16 Allen wrench through opening in knob (48), in adjusting nut (53) hole and loosen set screw (60).

5.4.5 Remove adjusting nut (53) using tool K2216.

5.4.6 Remove:

5.4.6.1 Spring Washer (52)
5.4.6.2 Square washer (51)
5.4.6.3 Nylon washer (50)

5.4.7 Remove knob (48) and pinion (47) by pulling downwards off sleeve (43).

CAUTION: Do not attempt to remove or adjust screw (49). Excessive tightening will cause a bind on fitted sleeve (43).

5.4.8 Push inner pinion (41) out of sleeve (43).

5.5 Assembly of Stage Control Group (#41 to #64) (Figure 13)

5.5.1 Slide large control knob (48) and pinion (47) over lubricated sleeve (43).

NOTE: The 1 washers (45 and 46) must be in place between the pinion (47) and the mount (44).

5.5.2 Replace and lubricate each part:

5.5.2.1 Spring washer (52)
5.5.2.2 Square washer (51)
5.5.2.3 Nylon washer (50) in slot on adjusting nut (53).

5.5.3 Turn the adjusting nut (53) onto the sleeve (43) and tighten using tool K2216.

5.5.4 Tighten 1/16 Allen screw (60) against nylon plug (59) until tight.

5.5.5 Push inner pinion (41) and washer (42) through sleeve (43).

5.5.6 Place washers into slot on small control knob (61) in following order:

5.5.6.1 Spring washer (57)
5.5.6.2 Square washer (56)
5.5.6.3 Nylon washer (55)
5.5.6.4 Washer (54)

Washers will be pre-lubricated.

5.5.7 Turn small control knob (61) onto inner pinion (43) and tighten (1).

5.5.8 Tighten set screw (60) through hole in control knob with 1/16 Allen wrench.

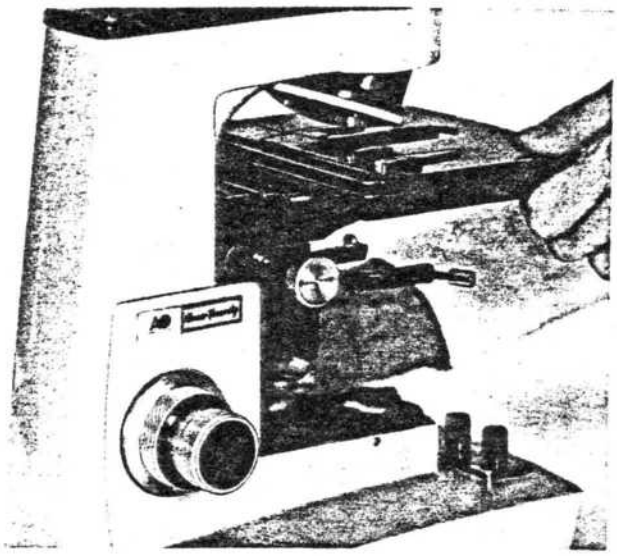


Figure 12 Removing Stage

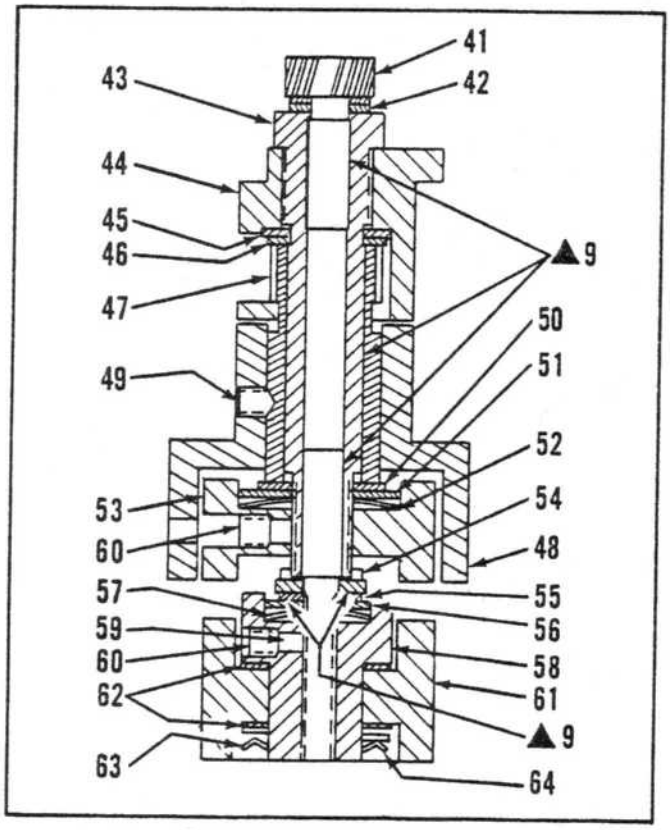


Figure 13 Control Assembly

5.6 Disassembly of Sub-Stage and Condenser Fork

5.6.1 To disassemble the adjustment pinion group (8 to 12) first place large blade screwdriver in screw (17) to prevent it from turning. Grasp knob (8) on opposite end of pinion (17) and unscrew until knob comes off. See Figure 14.

5.6.2 Push out pinion assembly (17).

5.6.3 Remove loose parts from knob end:

5.6.3.1 Tapered thrust bearing (9)
5.6.3.2 Spacer (10)
5.6.3.3 Washer (11)
5.6.3.4 Pinion bearing (12)

5.6.4 Lubricate bearing points.

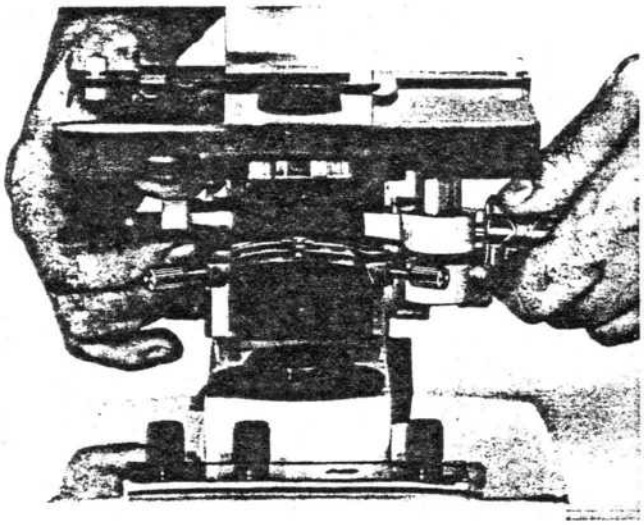


Figure 14 Sub-Stage Tension Screw

5.7 Assembly of Sub-Stage and Condenser Fork

5.7.1 Push adjustment pinion assembly (17) through hole in stage base (16).

5.7.2 Place on threaded end:

5.7.2.1 Pinion shaft (17)
5.7.2.2 Pinion bearing (12)
5.7.2.3 Washer (11)
5.7.2.4 Spacer (10)
5.7.2.5 Tapered thrust bearing (9) - small diameter towards knob.

NOTE: Put small amount of grease on the inside of both tapered thrust bearing halves (9) so they stick to the shaft.

5.7.3 Turn knob (8) onto pinion shaft (17). Force it tight. Back off to necessary tension for smooth motion of sub-stage.

5.7.4 Lubricate slide ways.

5.8 Final Assembly of Mechanical Stage

5.8.1 Control Assembly

5.8.1.1 With stage top face down, place short rack (18) in position and fasten lightly with 2 screws (19); do not tighten screws - leave rack loose.

5.8.1.2 Place control assembly in position under the loose short rack and lightly fasten mount (44) with screws (19).

5.8.1.3 Center short rack (18) screw holes to screws and tighten screws (19).

5.8.1.4 Push control assembly in so that both pinions contact the two racks. Fasten the mount (44) securely with screws (19).

5.8.1.5 If necessary, move either of the racks (18 or 33) so that there is no back lash and no bind; motion must be smooth.

5.8.2 Sub-Stage or Condenser Fork

5.8.2.1 Lubricate slide ways.

CAUTION: Do not move these slideways together dry. They can stick together making it difficult to separate.

5.8.2.2 Slide sub-stage into stage base ways until pinion touches rack. Turn knob (8) to engage the gears and move the condenser fork upwards.

5.8.2.3 Check back lash in rack and pinion and adjust as necessary.

NOTE: If there is back lash between rack and pinion, place shim stock under rack to provide a more positive engagement with the pinion and obtain a smooth motion.

5.8.3 Slide Holder

5.8.3.1 Place slide holder on cross slide (38) and securely fasten in place with the two index finger knobs (2).

5.8.3.2 Clearance under slide fingers must be between 0.075mm - .25mm.

5.9 Mechanical Stage Check List

5.9.1 The slide fingers must hold a 25mm x 75mm x 1.00mm thick glass slide firmly.

5.9.2 The N-S and E-W motions must operate smoothly without binding or backlash.

5.9.3 The sub-stage slide must move smoothly with no backlash or looseness in the control knob.

5.9.4 When mechanical stage is mounted on a finished Microscope, check the stage height for the auto focus position.

The following steps should be taken to return the stage to correct height for normal slides (approximately 1.0mm):

5.9.5 Place slide on stage.

5.9.6 Rotate nosepiece to 10X objective.

5.9.7 Lower nosepiece with coarse adjustment to lower limit.

5.9.8 Turn fine adjustment so that it is approximately in the middle of its excursion (five turns from either stop).

5.9.9 Support stage with hand and loosen socket head locking screw on left side of stage, using 9/64" wrench provided.

5.9.10 Raise stage until stage and stand dovetails are at the same level. Specimen should be in approximate focus. If not, adjust stage height accordingly while looking through Microscopes.

5.9.11 Tighten socket screw.

5.9.12 Bring specimen into sharp focus with fine adjustment.

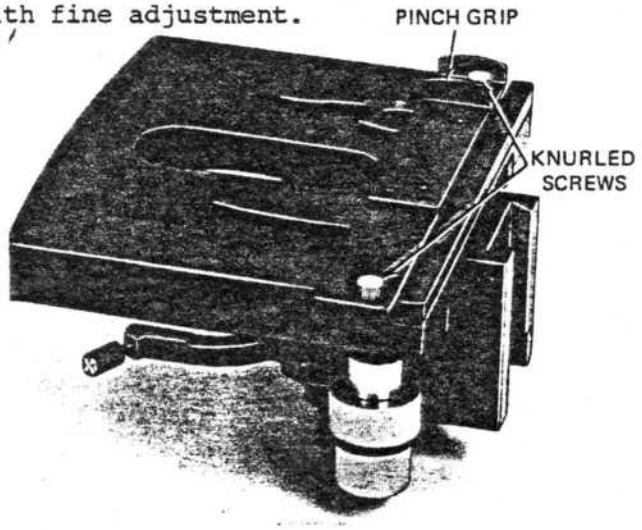


Figure 15 Slide Holder on Stage

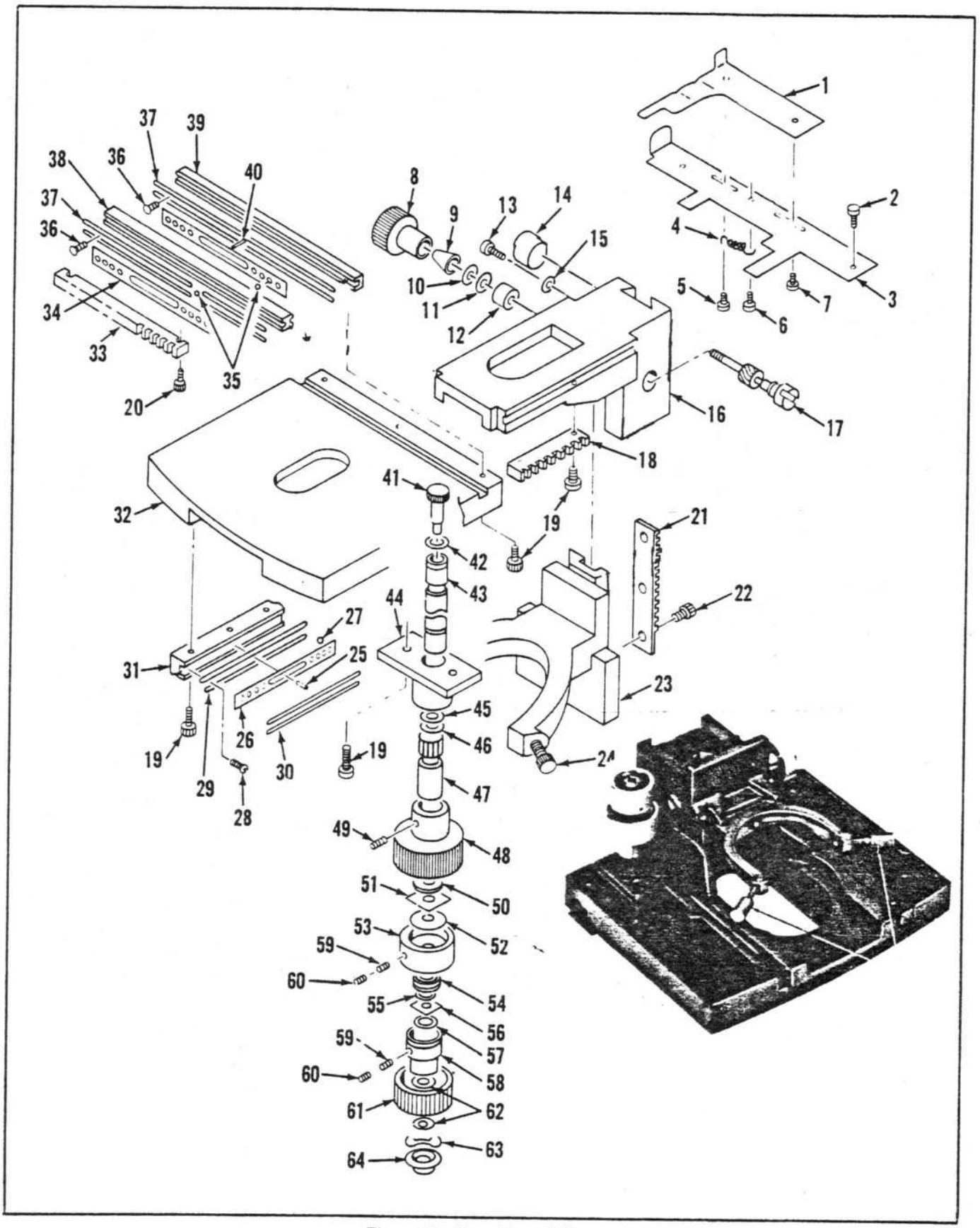


Figure 16 Stage Turned Over

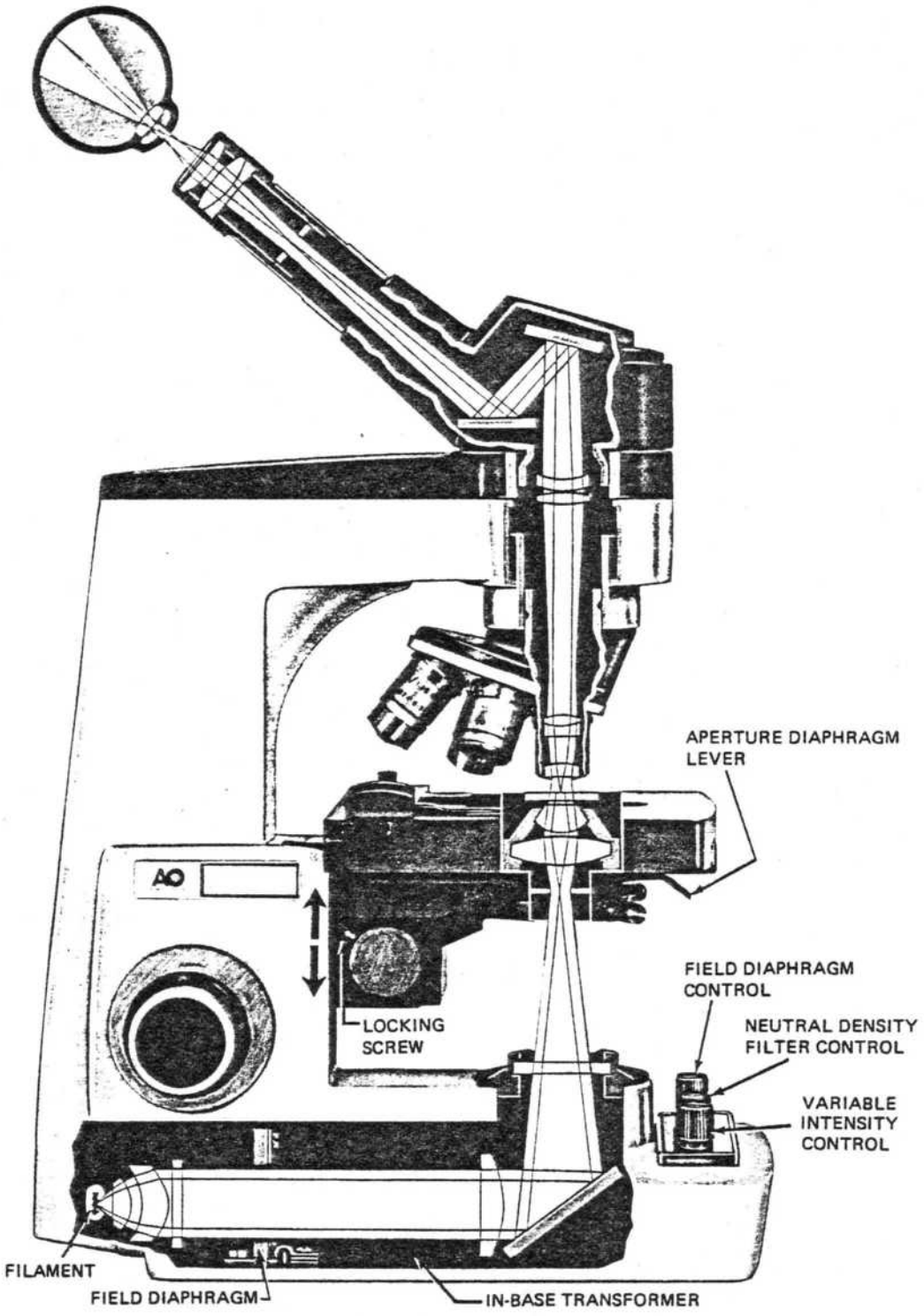


Figure 17 Stage Height Adjustment

6.0 AUTOFOCUS STOP SETTING

6.1 When adjusting the auto focus stop, raise the nosepiece carefully. If the stop has not been set properly, the nosepiece may drop suddenly. The objective will hit the slide which will probably result in damage to both.

6.2 Place a slide on the Microscope Stage. Rotate the LH fine adjustment control CW to its lowest stop. Lower the nosepiece with the LH/CA knob to a point where the 45X objective is almost touching the slide.

6.3 Raise the nosepiece by rotating the LH FA knob 3¼ turn CCW.

6.4 Loosen the set screw on the LH/CA knob.

6.5 Focus onto the slide by rotating the RH CA knob in either direction while holding the LH CA knob stationary with the other hand.

When the slide is in focus, tighten the LH/CA knob set screw in place which should position the auto focus adjustment where the slide will automatically come into focus when the CA is turned all the way down and the FA is rotated upwards 3¼ turns. The tolerance is ±3/8 of a turn on the FA knob.

7.0 BASE ILLUMINATOR (Figure 18)

7.1 The Illuminator

The inbase illuminator used in the 100 Microstar Microscope is a self-contained unit. It is composed of a controlled, low voltage power supply, a halogen lamp and an optical system to align the light.

7.1.1 To Remove the Illumator from the Microscope

7.1.1.1 Remove lamp socket (34).

7.1.1.2 Remove 3 control knobs by loosening the set screws in each knob, 2 each.

7.1.1.3 Tip Microscope over on its side.

7.1.1.4 Remove 4 cap screws with Allen wrench, 1 on each corner of base, next to cork pads.

7.1.1.5 Lift stand off base.

7.1.2 Replacing Illuminator in Microscope

7.1.2.1 The 3 control knobs and lamp sockets must be removed.

7.1.2.2 Place Microscope stand over illuminator allowing the control shaft to extend through the proper holes.

NOTE

If the control mount (18) has been moved, it may be necessary to loosen the 3 screws (11) to adjust the control mount (18) so that the control shafts are centered and move freely.

7.1.2.3 Tip Microscope over on its side.

7.1.2.4 Place the 4 capscrews in the holes near each cork pad and tighten.

7.1.2.5 Secure the 3 screws (11) when the control shafts move freely.

7.1.2.6 Set Microscope upright.

7.1.2.7 Replace the control knobs and tighten locking set screws.

7.1.2.8 Push the lamp socket (34) into position through opening in side of scope stand.

7.1.2.9 Plug illuminator power cord into 110V AC receptacle.

7.1.2.10 Turn on lamp with control (16) and check the variation of light intensity.

7.2 Troubleshooting Illuminator Optical System

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. Light not centered	a. Lamp socket may not be pushed in fully.	a. Check lamp socket to be sure it is firmly seated.
	b. Lamp adapter may have moved putting lamp (33) off center.	b. See Lamp Alignment Section VII, G.
2. Light weak or hazy	Dirt film on collimator lens or first surface mirror.	Clean surfaces.
3. Dark spots in light field	a. Dirt on mirror or lens.	a. Clean surface.
	b. Scratches on first surface mirror.	b. Replace mirror. See Section C, 2 &3 .
4. Line across light field	Cracked lens, mirror or filter.	Replace where necessary.
5. Unable to regulate field diaphragm	a. Bent control (12).	a. Replace control.
	b. Control cable (8) loose at clamp (10a) Fig. P.	b. Tighten clamp and adjust to standard. See Section C,5 .
	c. Iris leaves stuck together.	c. Clean leaves.
	d. Iris leaves bent or damaged.	d. Replace damaged leaves.

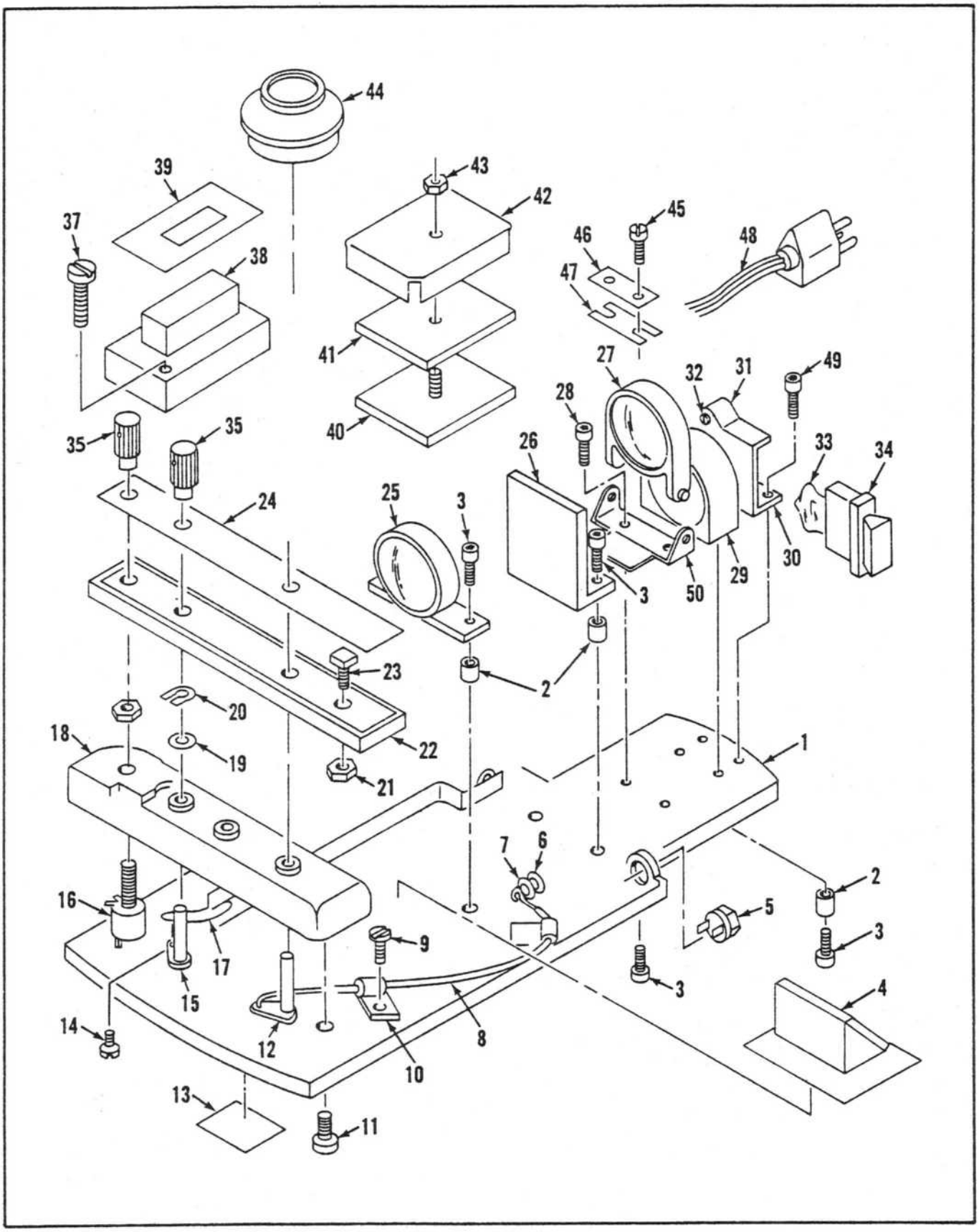


Figure 18. In-Base Transformer and Illuminator

Index No.	Part Number	Description	Qty Per Assy
1	1130-1	Base, illuminator	1
2	1130-49	Bushing	6
3	X-19400	Screw	10
4	1130-605	Mirror	1
5	1066-19	Jack	1
6	01030-1	Washer	1
7	X-50590	Ring	1
8	1130-34	Connector	1
9	X-53467	Screw	2
10	X-34325	Cable Clamp	2
11	X-19406	Socket Head Cap Screw	3
12	1130-862	Control Shaft Assembly	1
13	1130-82	Data Plate	1
14	1130-40	Screw, dog	1
15	1130-859	Control Shaft Assembly	1
16	1130-77	Control	1
17	1130-11	Link, filter	1
18	1130-74	Mount Control	1
19	X-53065	Washer, spring	2
20	X-50972	Retaining Ring	2
21	X-8081-2	Nut	2
22	1130-18	Cover, control	1
23	1130-28	Screw, square head	2
24	1130-35	Plate, control	1
25	1130-867	Collimator Lens Mounted	1
26	1130-855	Iris Mount Assembly	1
27	1130-866	Filter Mount Assembly	1
28	X-34510	Screw	2
29	1130-865	Collector Lens Assembly	1
30	1130-857	Lamp Adapter Assembly	1
31	1130-21	Lampholder Bracket	1
32	X-34587	Screw	2
33	1120	Halogen Lamp	1
34	1130-858	Lamp Socket Assembly	1
35	1130-42	Knob	2
37	X-53425	Screw	2
38	1130-81	Transformer	1
39	1130-55	Gasket	2
40	1130-83	P. C. Board Assembly	1
41	1130-13	Insulator	1
42	1130-75	P. C. Board Cover	1
43	X-8005	Nut	1
44	1130-850	Window and Mount Assembly	1
45	X-53110	Screw	5
46	1130-44	Clamp	1
47	1130-53	Insulator	1
48	X-53034	Power Supply Cord	1
49	X-53111	Screw	2
50	1130-54	Bracket, filter	1

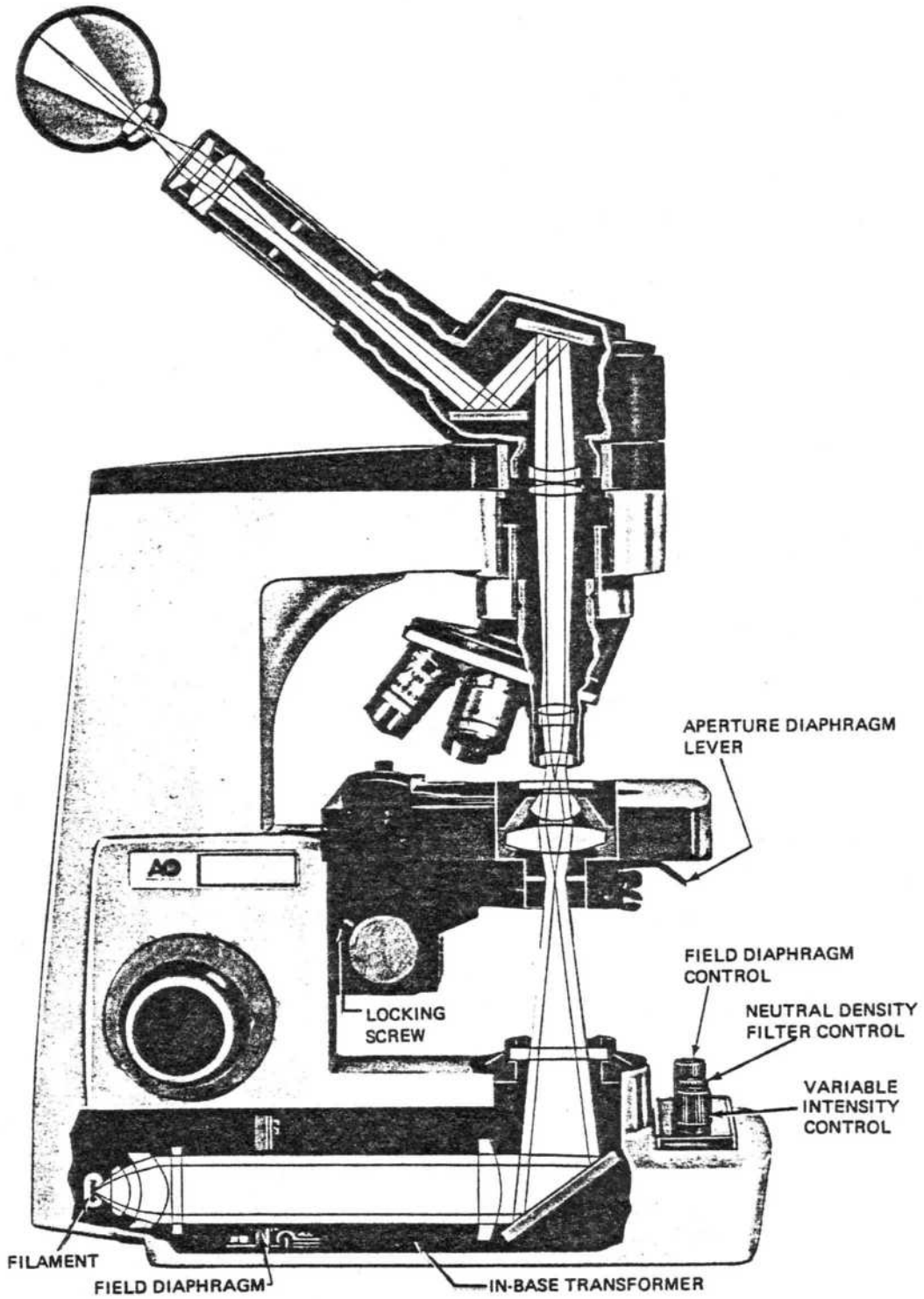


Figure 19 Cut-Away Stand Light Path

7.3 Servicing the Illuminator Optical System

7.3.1 Lens and Iris Diaphragm

7.3.1.1 The parts:

Collector Lens (29)
Iris Diaphragm (26)
Collimator Lens (25)

are placed on base (1) in pre-aligned, machined holes.

7.3.1.2 The parts are held secure with capscrews (3).

7.3.1.3 The capscrews (3) are centered with sleeves (2). These sleeves must not be removed.

NOTE

Each of these parts may be exchanged individually and will be in center when resecured.

7.3.2 Removing Mirror (4) When Damaged

7.3.2.1 Mirror must be broken off with care.

NOTE

The cements holding the mirror are not soluble.

7.3.2.2 The mirror mounting pads must be carefully scraped to remove possible cement build up. Do not scrape metal from pad surface which can cause a mirror tilt.

7.3.3 Installation of Mirror

7.3.3.1 The first surface mirror (4) is placed onto 4 clean, raised machined pads of the base, mirror mount.

7.3.3.2 Slide mirror down so it is centered on raised pads.

7.3.3.3 While holding the mirror in position, temporarily tack in place with Loctite 404.

7.3.3.4 Apply RTV Silicone cement on edge of mirror and base.

NOTE

Do not place cement between mirror and pads. Maintain direct glass to metal contact when placing RTV Silicone cement on edge of mirror.

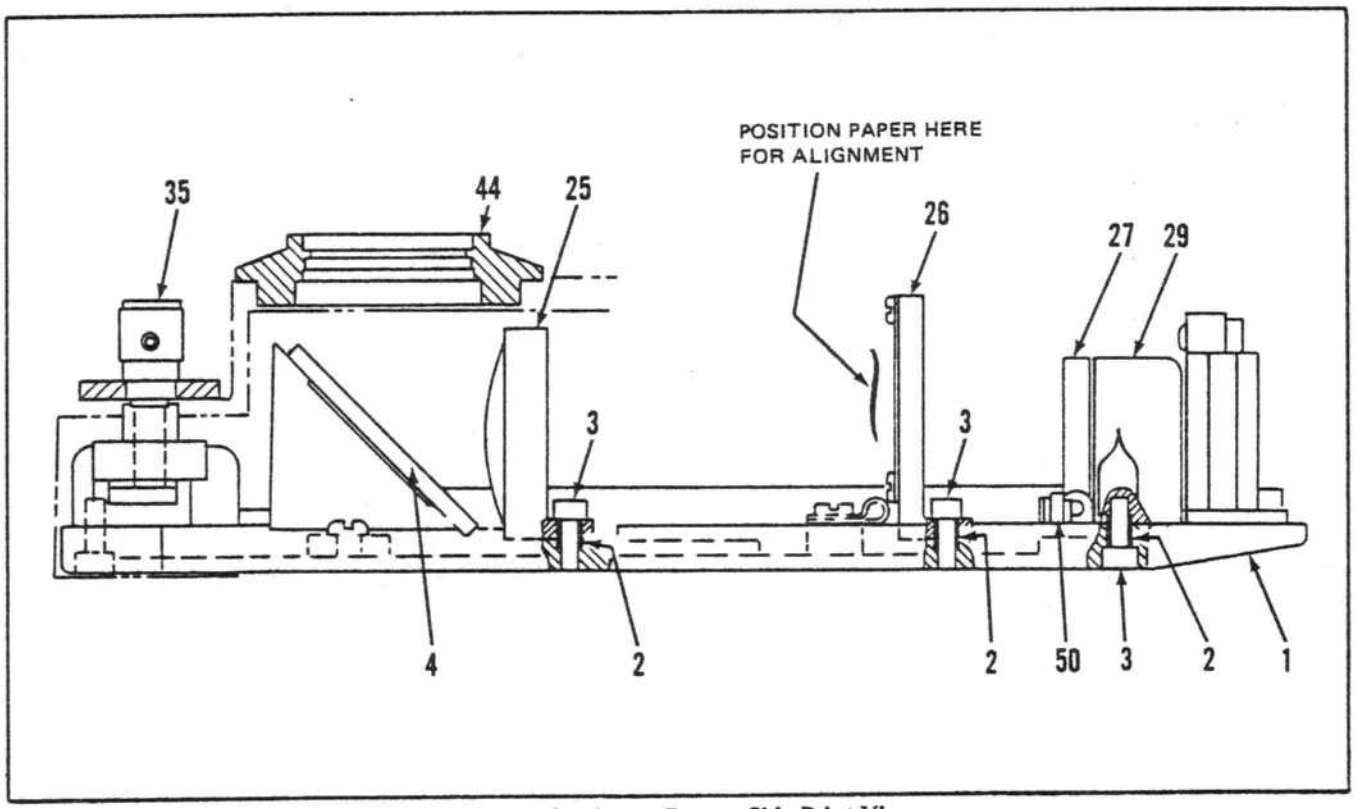


Figure 20 Iluminator Base – Side Print View

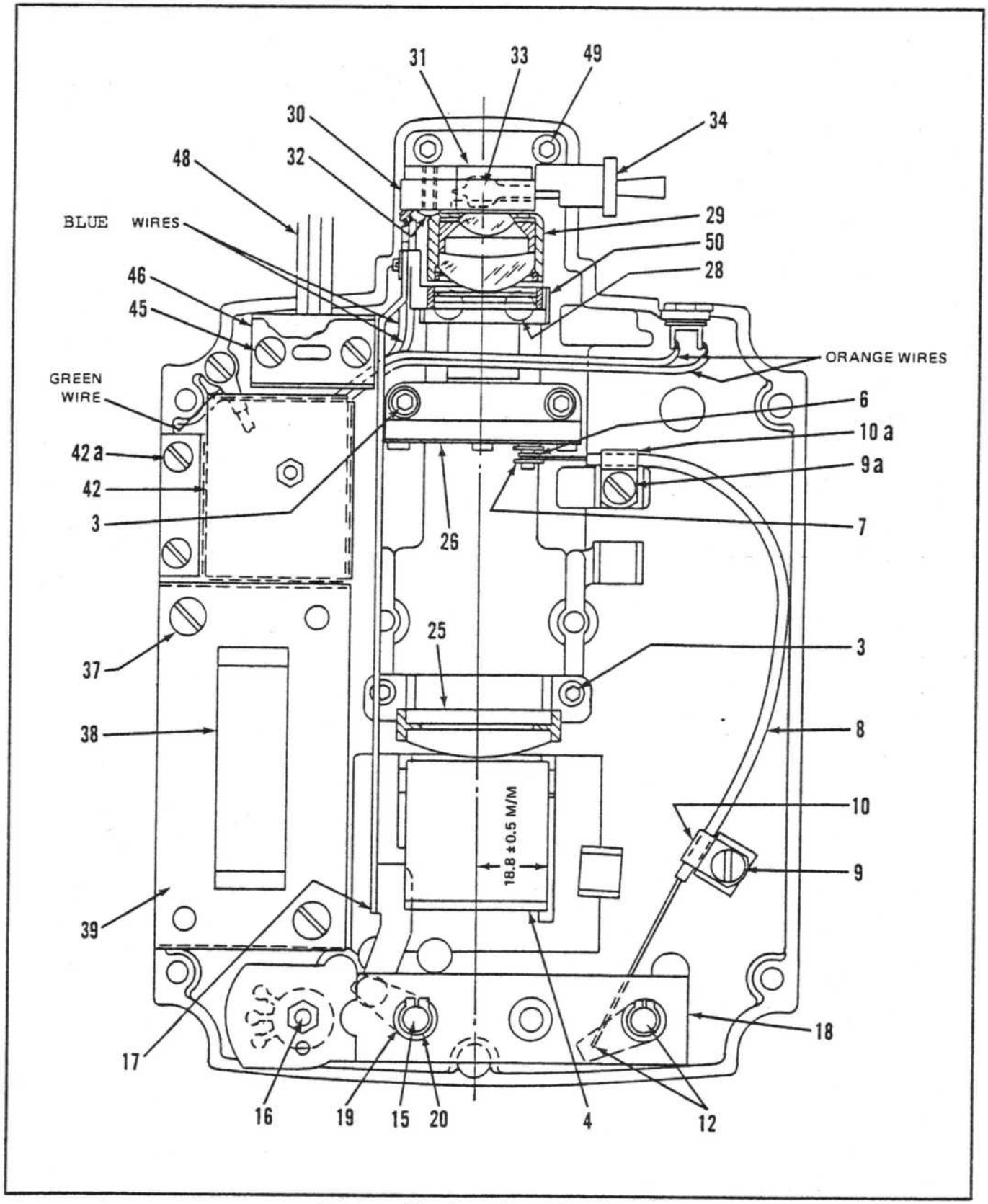


Figure 21 Illuminator Base – Top Print View

7.3.4 Filter

7.3.4.1 The neutral density filter (27) is held in position by the mount (50) with screws (28).

7.3.4.2 The filter and mount (50) are secured with the mount spaced an equal distance from the collector lens mount (29).

7.3.5 Iris Diaphragm Control

7.3.5.1 The aperture size of the iris diaphragm (26) is regulated by control shaft (12) with cable (8).

7.3.5.2 To obtain minimum opening, adjust control cable (8) at clamp (10a).

7.3.5.2.1 Loosen screw (9a).

7.3.5.2.2 Push or pull control cable (8) in clamp (10a) so that when control shaft (12) is against its stop, there is a minimum opening.

7.4 The Power Supply

The Power Supply is composed of three major parts: a transformer for step-down power, PC board and potentiometer to control and vary the power, and two sockets as outlets where lamps may be attached to give the proper light intensity to illuminate a specimen on the Microscope stage.

7.5 Troubleshooting the Power Supply

PROBLEM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. No light	Lamp burned out.	Replace lamp (33).
2. No power	Is unit plugged in 110V AC receptacle plug?	a. Plug into a 110V AC outlet. b. Move to another 110V AC outlet.
3. Failure to turn on	Switch is broken.	Replace PC board and control. See Section F, 3 & 4.
4. Unable to change lamp intensity	Lamp control potentiometer broken.	Replace PC board and control. See Section F, 3 & 4.
5. Intermittent light when instrument is relocated	Break in 110V power cord.	Replace power cord (48).
6. Low voltage shock	Bare wire touching base somewhere.	Check wiring, ground and insulation on parts.
7. Burnt order - no power	Transformer (38)	Replace. See Section F, 1 & 2.
8. Burnt odor - no power	PC board (40)	Replace. See Section F, 2 & 3.
9. Unable to push in lamp socket assembly (34)	Damaged lamp adapter (30)	Replace. Must be aligned to optical center. See Section G.
10. Intermittent light	Poor solder contacts - cold solder contacts.	Resolder contacts where necessary.

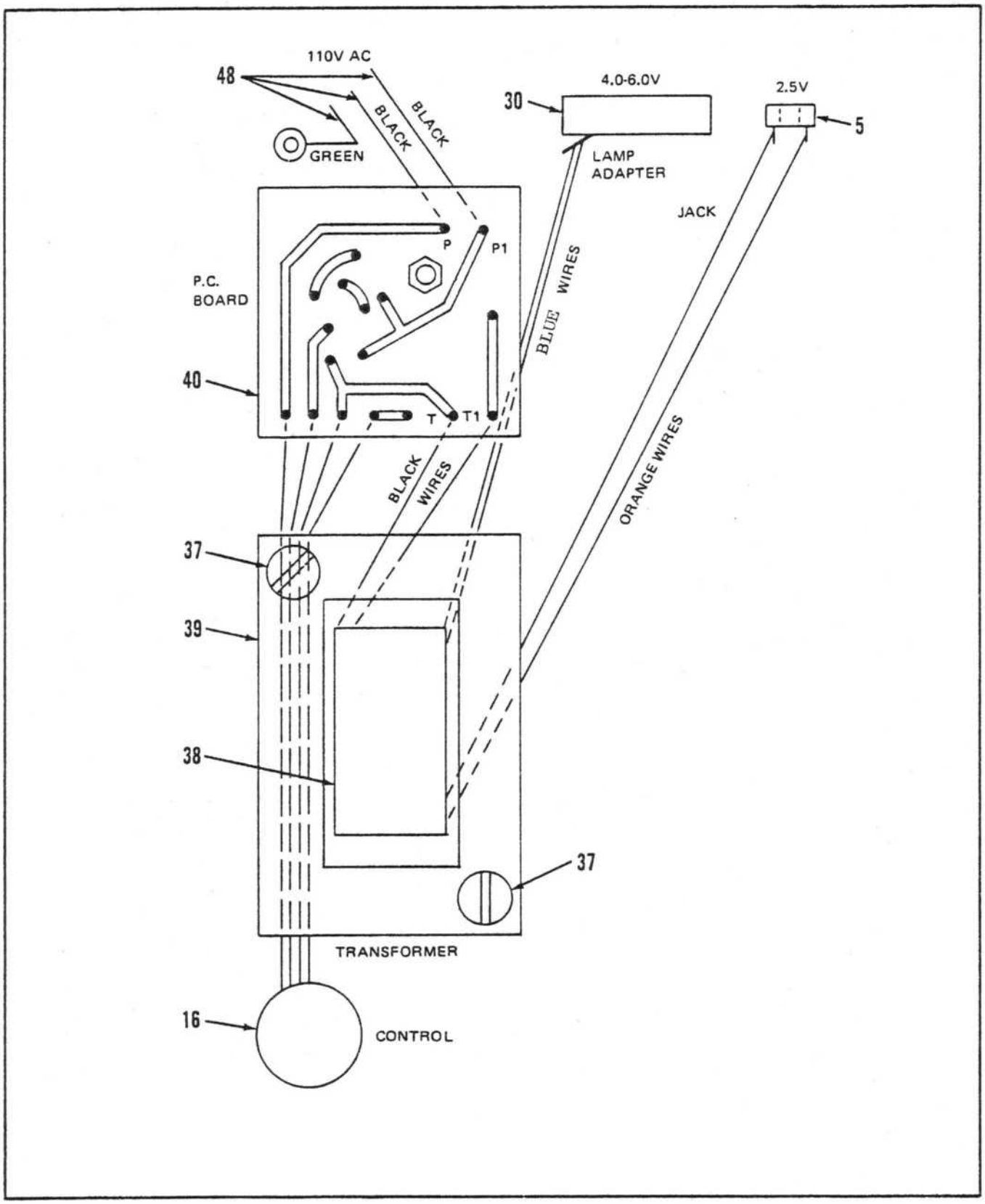


Figure 22 Illuminator – Wiring Diagram

7.6 Servicing Power Supply Parts

7.6.1 Removal of Transformer

7.6.1.1 On PC board (40) remove: (Refer to Figure 17)

7.6.1.1.1 Nut (43)
7.6.1.1.2 Cover Screws (42A)
7.6.1.1.3 Cover (42)
7.6.1.1.4 Insulation Board (41)

7.6.1.2 Unsolder pairs of wire connections: (Refer to Figure 18)

7.6.1.2.1 Black - from T and T1 on PC board (40
7.6.1.2.2 Blue - to lamp adapter (30)
7.6.1.2.3 Orange - to dual viewer power jack (5)

NOTE: Do not move screws (32) on ceramic lamp adapter (30) or screw (49) on lamp holder bracket (31). These parts are aligned to a center position.

7.6.1.3 Remove 2 screws (37) from transformer (38).

7.6.1.4 Lift out transformer (38).

7.6.2 Installing Transformer (38)

7.6.2.1 Clean solder out of openings where black, blue and orange wires were removed.

7.6.2.2 Check the 3 sets of lead wires on transformer (38) for cracked insulation or exposed wire.

7.6.2.3 Place rubber insulation (39) on top and bottom flats of transformer (38).

7.6.2.4 Place transformer (38) in position with wire leads toward base (1). Blue and orange wires will go under PC board (40).

7.6.2.5 Secure transformer (38) to base (1) with screws (37).

7.6.2.6 Place pairs of wire leads onto correct parts:

7.6.2.6.1 Black-PC board (40) to T and T1
7.6.2.6.2 Blue-Ceramic lamp adapter (30)
7.6.2.6.3 Orange-Dual viewing power jack (5)

7.6.2.7 Solder each connection for good contact using 40-60 electronic type solder.

7.6.2.8 On PC board install:

7.6.2.8.1 Insulator board (41)
7.6.2.8.2 Cover (42)
7.6.2.8.3 Nut (43) to fasten all parts together

7.6.2.9 Secure PC board cover (42) to base (1) with 3 screws (42A).

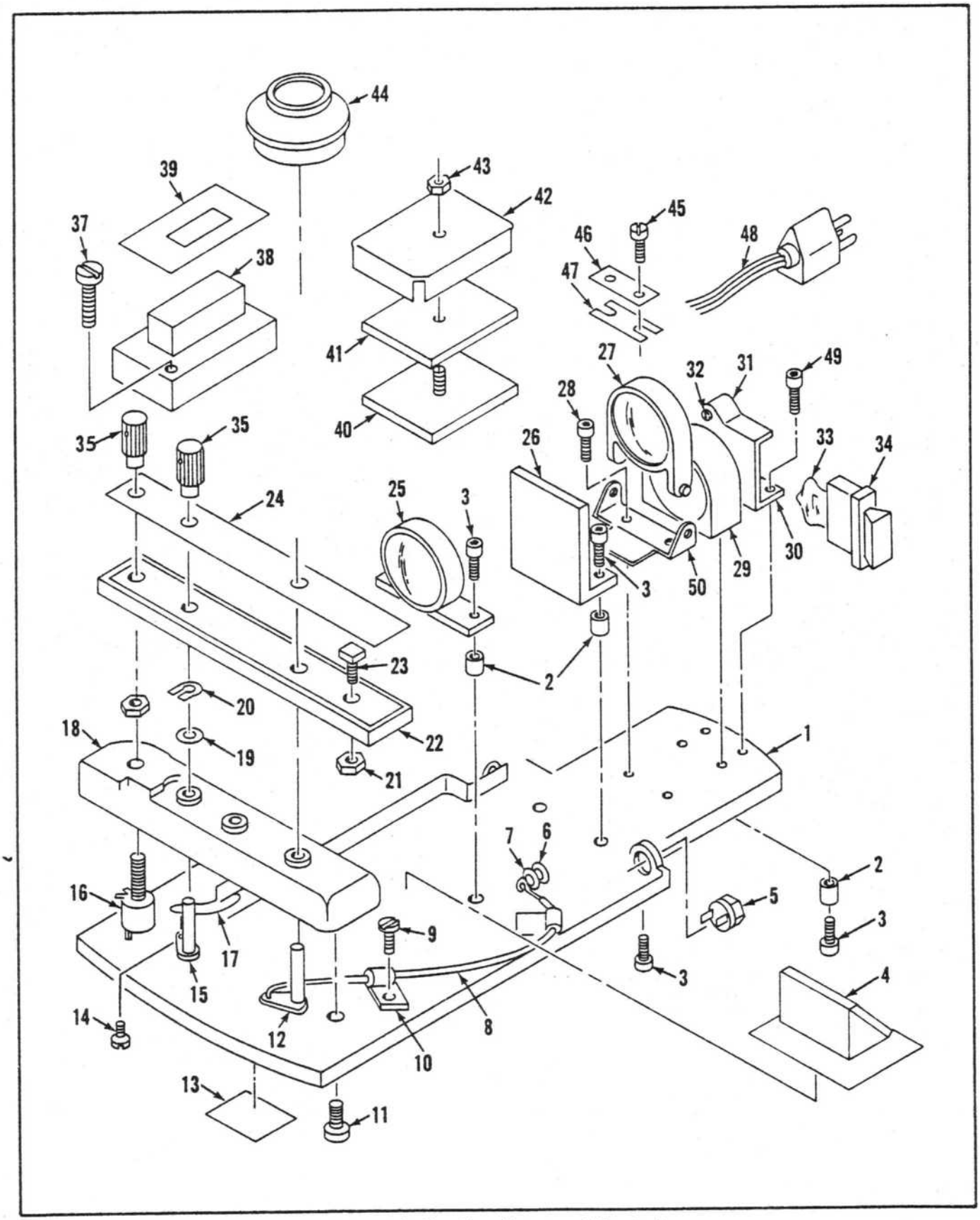


Figure 23 In-Base Transformer and Illuminator

7.6.2.10 Check power operation with:

7.6.2.10.1 Lamp (33) in lamp socket (34).
7.6.2.10.2 Test lamp in dual viewing power jack (5).
7.6.2.10.3 Plug power supply cord (48) into 110V AC receptacle.
7.6.2.10.4 Rotate control (16) to turn on lamp and vary the intensity.
7.6.2.10.5 A voltage check may be read at each lamp socket with a VOM.
7.6.2.10.6 At the blue wire contacts 4.0 - 6.0V AC
At the orange wire contacts 2.5V AC

7.6.3 Removal of PC Board

7.6.3.1 On PC board (40) remove:

7.6.3.1.1 Nut (43)
7.6.3.1.2 Cover screws (42A)
7.6.3.1.3 Cover (42)
7.6.3.1.4 Insulator Board (41)

7.6.3.2 Unsolder the pair of black wires on PC board (40) at points T & T1, and P & P1.

7.6.3.3 Remove 2 screws (37) from transformer (38).

7.6.3.4 Remove nut holding control (16) to control mount (18).

7.6.3.5 Remove 3 cap screws (11) from underside of base (1) that holds control mount (18). (Refer to Figure 14.)

7.6.3.6 Lift control mount (18) up; slide control (16) out.

7.6.3.7 Lift transformer (38) and remove complete PC board assembly (40) board assembly (40) with control (16).

7.6.4 Installation of PC Board (Refer to Figure 23)

7.6.4.1 Place control (16) in control mount (18).

7.6.4.2 Secure control (16) with nut to hold it in control mount (18).

7.6.4.3 Lift transformer (38), slide multi-colored wire underneath and place PC board (40) in position on top with printed circuit side up.

7.6.4.4 Secure transformer (38) with screws (37).

7.6.4.5 Fasten control mount (18) to base (1) with 3 cap screws (11) from under side of base.

NOTE: Control mount (18) may have to be moved, when illuminator base is installed on Microscope stand. The 3 controls must operate freely.

7.6.4.6 Solder in place with standard electronic 40-60 solder: (Refer to Figure 18)

7.6.4.6.1 Black wires from transformer to T & T1.
7.6.4.6.2 Black wires from 110V power cord (48) to P & P1.

7.6.4.7 Replace: (Refer to Figure 23)

7.6.4.7.1 Insulation board (41)
7.6.4.7.2 Cover (42)
7.6.4.7.3 Nut (43) to fasten all parts together.

7.6.4.8 Secure cover (42) to base (1) with screws (42A).

7.6.4.9 Test power operation with:

7.6.4.9.1 Lamp socket assembly (34) and lamp (33), pushed into ceramic lamp adapter (33).

7.6.4.9.2 Test lamp(33)in dual viewing power jack (5).

7.6.4.9.3 Plug power supply cord (48) into 110V AC receptacle.

7.6.4.9.4 Rotate control (16) to turn on the lamps and vary the brightness of the lamps.

7.6.4.9.5 A voltage check may be read at each lamp socket with a VOM.
At the blue wire contacts 4.0 - 6.0V AC
At the orange wire contacts 2.5V AC

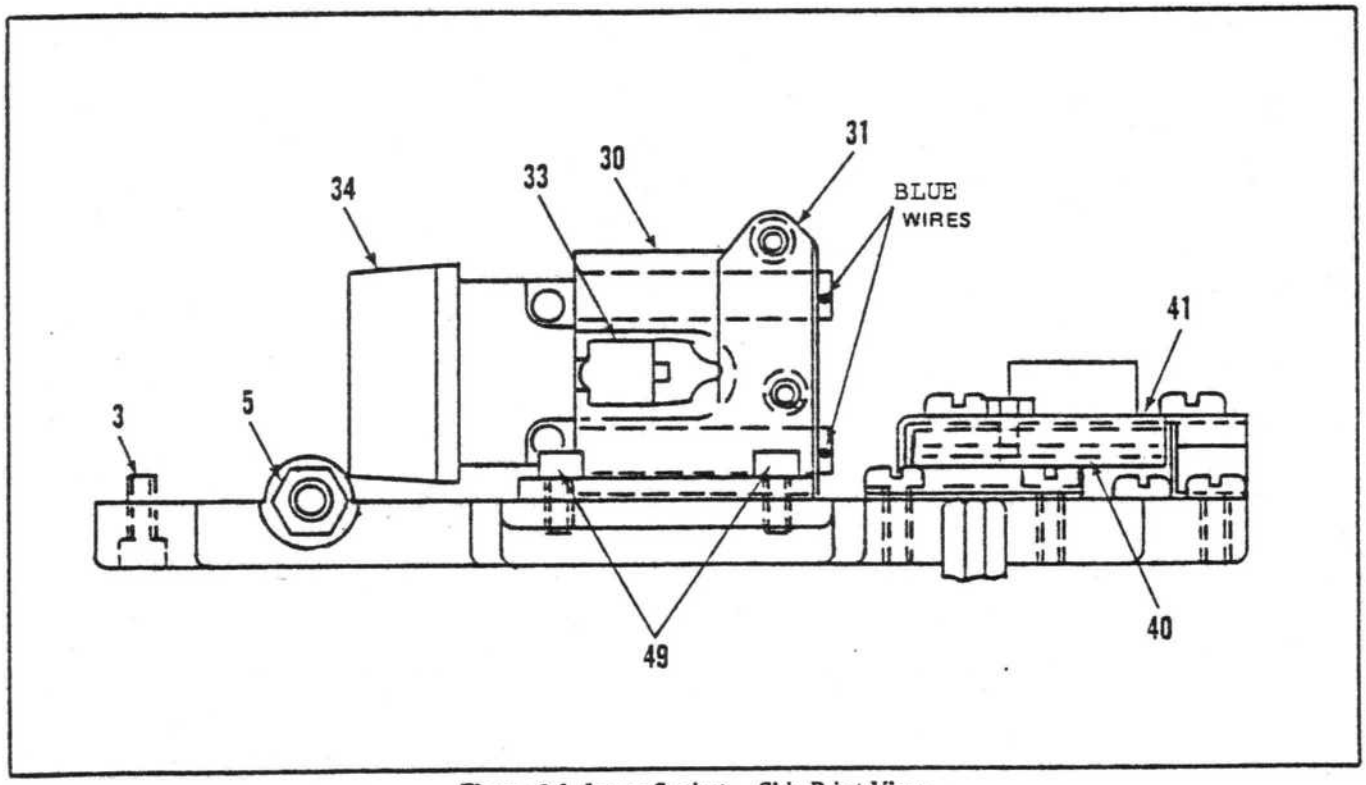


Figure 24 Lamp Socket – Side Print View

EXHIBIT C

PRODUCTS	MINIMUM UNIT PURCHASES
1130 Microtome	100
1140 Microtome	30
Auto Cryocut	15
Polycut	4

7.7 Lamp Alignment to Center

The lamp filament (33) in lamp socket (34) must be aligned to the center line of the illuminator optics of the base.

To adjust lamp (33) to center:

7.7.1 Place a piece of opaque paper in front of the iris diaphragm opening (26).

7.7.2 Open the iris diaphragm (26) completely.

7.7.3 Switch on lamp.

7.7.4 Move the lamp socket (34) in and out to observe the position of the bright spot. It must be spaced equal distant or center of the diaphragm opening.

7.7.5 Centering the lamp filament (bright spot):

7.7.5.1 Loosen 2 screws (32) on ceramic lamp adapter (30).

7.7.5.2 Move ceramic lamp adapter (30) with the lamp socket. Movement will be up or down and in or out as necessary to get the bright spot in center of field.

7.7.5.3 Tighten screws (32).

NOTE

You must keep the lamp adapter (3) level or parallel to the base so that when the lamp socket (34) is put in through the opening in the stand, it will locate firmly and center properly.

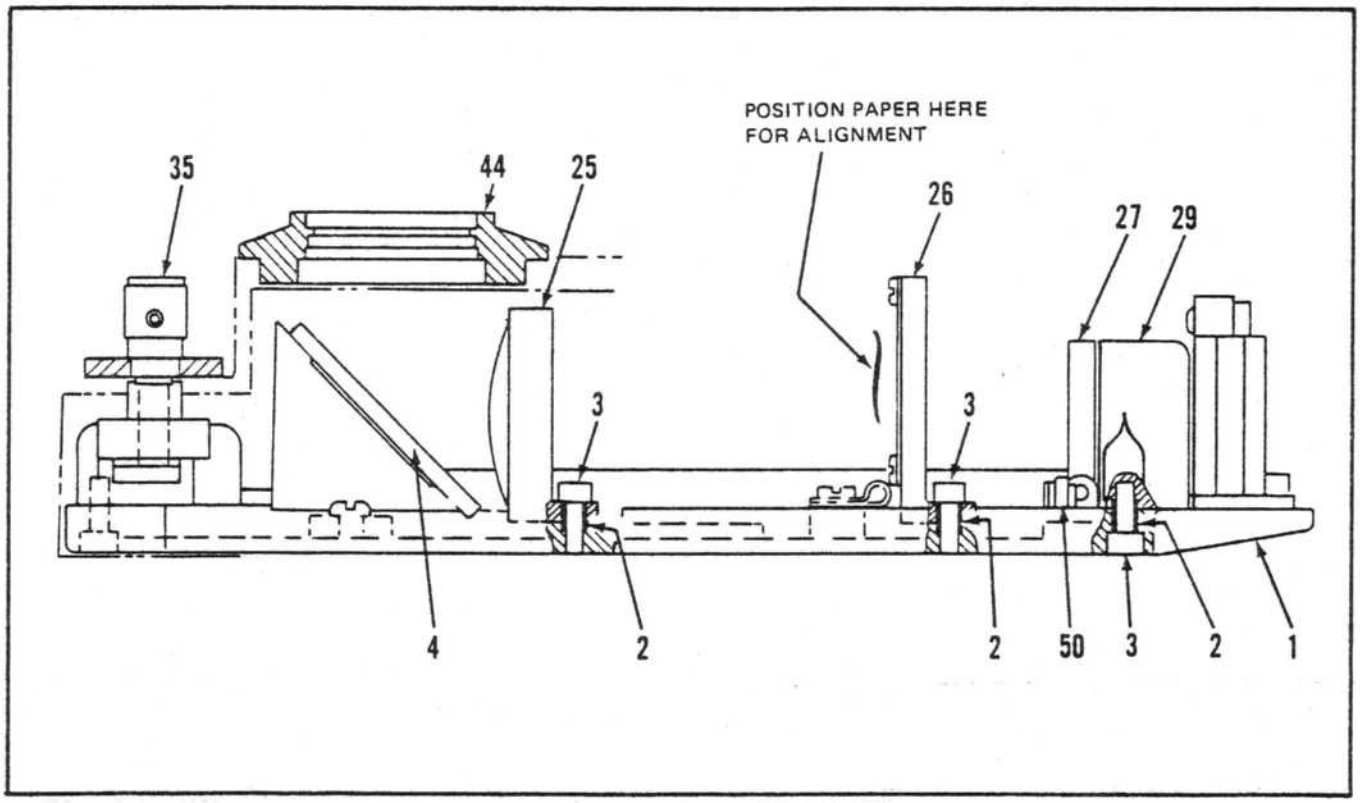


Figure 25 Illuminator Base – Side Print View

8.0 STAND

8.1 Coarse & Fine Adjustment Assembly

8.1.1 Removal of the Coarse & Fine Adjustment Assembly. (See Figure 26)

8.1.1.1 Drill a hole in each F.A. knob cap (4) slightly off center. Insert a hook type tool and pull the caps off.

8.1.1.2 Remove both small truarc retainers (5) from each end of the fine adjustment shaft.

8.1.1.3 Remove both fine adjustment knobs (23 & 6).

8.1.1.4 Remove the flat washer (7) and spring washer (8) from each side of the fine adjustment shaft.

- - - - RIGHT SIDE - - - -

8.1.1.5 Remove the large truarc retainer (9) from the coarse adjustment shaft.

8.1.1.6 Remove any spacer washers (10) from the coarse adjustment shaft.

8.1.1.7 Loosen the two set screws (13) in the coarse adjustment knob (21). Remove the C.A. knob (21).

8.1.1.8 Remove the spring washer (20) and flat washer (14).

- - - - LEFT SIDE - - - -

8.1.1.9 Remove the large truarc retainer (9) from the coarse adjustment shaft.

8.1.1.10 Remove any spacer washers (10) from the coarse adjustment shaft.

8.1.1.11 Loosen the two set screws (13) and remove the C.A. knob (12) with stop pin (39).

8.1.1.12 Remove the large flat washer (14) from the C.A. shaft.

8.1.1.13 Remove the two fiber bearings (30) from both sides of the stand.

8.1.1.14 Remove the two screws (3) and the left side bearing adapter (15).

NOTE: This #15 bearing adapter has a stop pin pressed into it.

8.1.1.15 Remove the Coarse & Fine Adjustment Assembly (29). Note the clearance cut out in the opening of the stand on the left side.

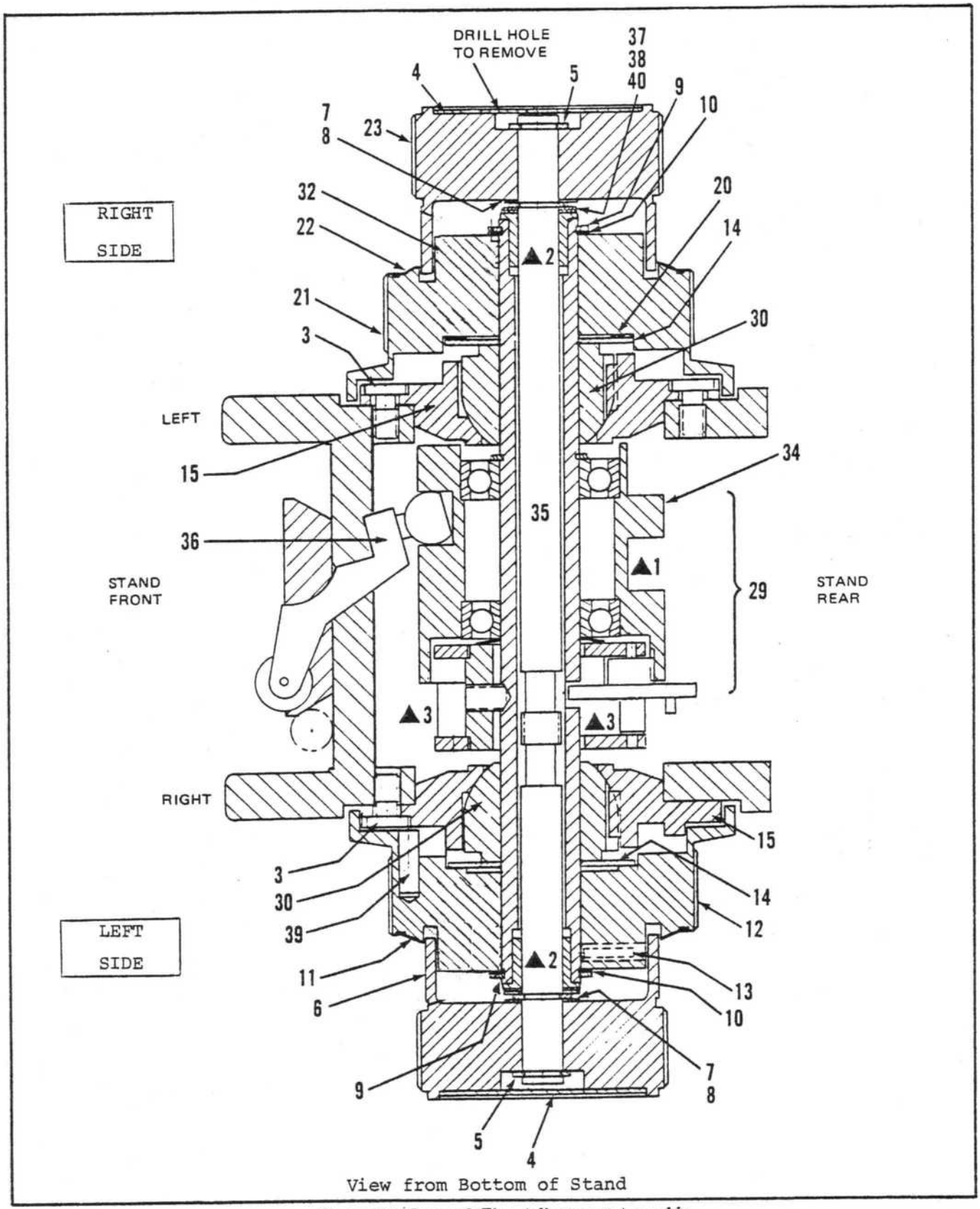


Figure 27 Coarse & Fine Adjustment Assembly

8.1.2 Replacing the Coarse & Fine Adjustment Assembly

8.1.2.1 Lubricate bearing surface of the cam (34).

8.1.2.2 Lubricate the Fine Adjustment Shaft (35) in the area of the bushings if necessary.

8.1.2.3 Lubricate the gear box bearings.

8.1.2.4 File off set screw burrs on the Coarse Adjustment Shaft (41) and insert the assembly (29) through the stand from the left side and through the bearing adapter (15) on the right side. The gear box will be on the left side of the stand.

NOTE: The bearing adapter (15) on the right side has a raised segment positioned at 12 o'clock.

8.1.2.5 Do not force the Coarse & Fine Adjustment (29) against the lever (36). Raise and lower the nosepiece by hand to engage the lever in the cam.

8.1.2.6 Replace the bearing adapter (15) on the left side with the stop pin at the 10 o'clock position. Fasten in place with two screws (3).

8.1.2.7 Replace the bearings (30) on each side of the stand. The small slot in the bearing engages a mating rib in the bearing adapters (15). Raise and lower the nosepiece by hand until the assembly is free in both bearings.

- - - - LEFT SIDE - - - -

8.1.2.8 Replace the flat washer (14) and C.A. knob (12).

NOTE: Do not tighten the knob set screws (13).

8.1.2.9 Replace any spacer washers (10) if required - (see Step 8.1.2.21).

- - - - RIGHT SIDE - - - -

8.1.2.10 Replace the large flat washer (14), the spring washer (20) and the C.A. knob (21).

NOTE: Do not tighten the set screws (13) in the C.A. knob.

8.1.2.11 Replace any spacer washers (10) if required - (see Step 8.1.2.21) and the large truarc retainer (9) on the Coarse Adjustment barrel.

8.1.2.12 Using thumb and fingers of one hand, squeeze both C.A. knobs together to compress the spring washer (20) which provides tension for the Coarse Adjustment.

Tighten the two set screws (13) in the C.A. knob (21).

8.1.2.13 Rotate the Fine Adjustment Shaft (35) and the C.A. knob (21) clockwise (towards the front of the stand), to lower the nosepiece until the lever assembly (36) disengages from the cam (34).

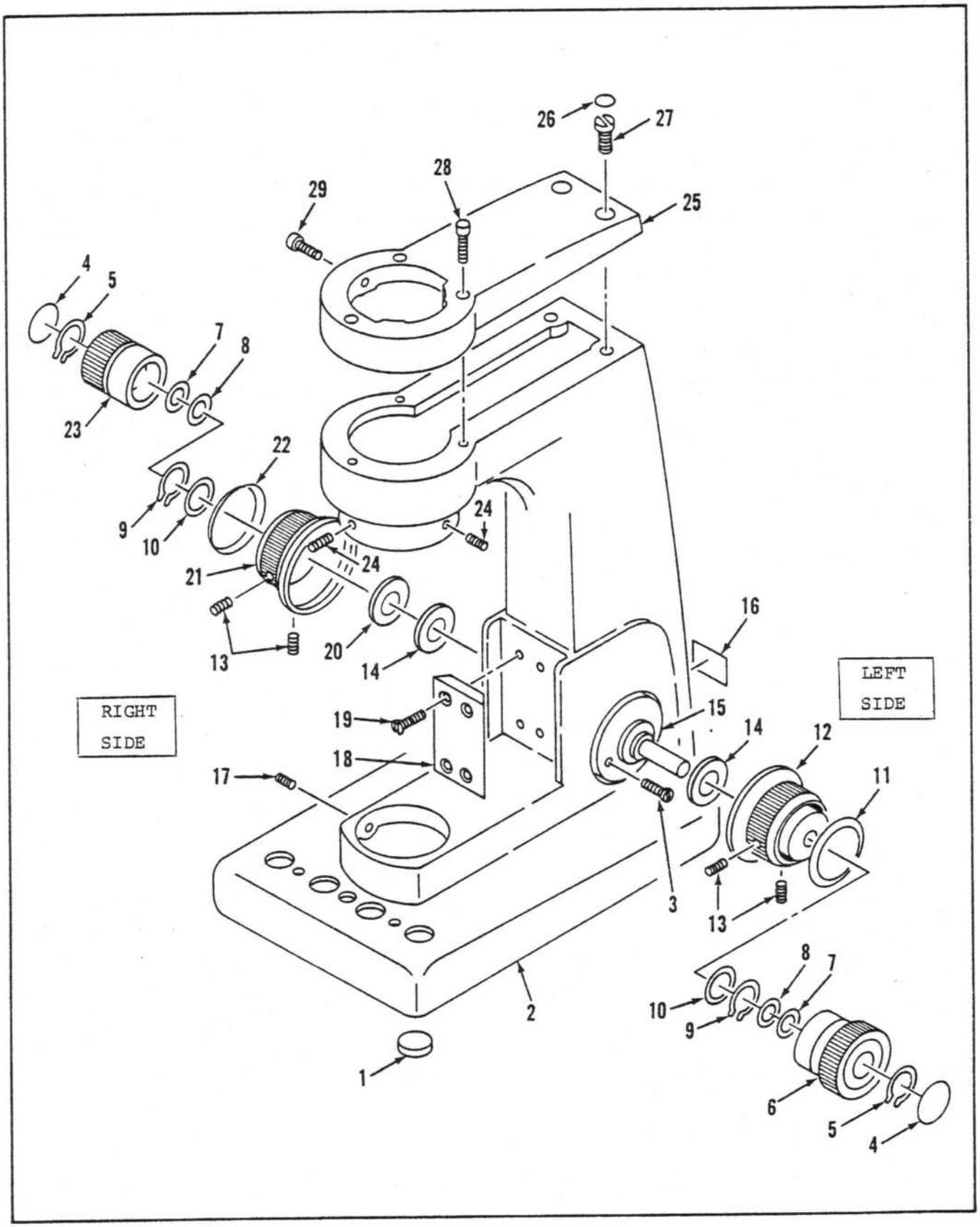


Figure 26 The 110 Stand

Stand No. 110

Index No.	Part Number	Description	Qty Per Assy
1	2-52	Pad	4
2	**140-1**	Frame	1
3	60-57	Screw	4
4	110-49	Disc, decorative	2
5	X-50972	Retaining ring	2
6	**140-3**	Knob, engraved F.A.	1
7	11330-180	Washer	2
8	X-50462	Washer, spring	2
9	X-50473	Retaining ring	2
10	110-18	Spacer	AR
11	110-31	Ring, knob insert	1
12	**140-5**	Knob, C.A.	1
13	110-83	Screw	4
14	110-16	Washer	2
15	110-81	Adapter, bearing	2
16	110-45	Serial plate	1
17	10-93	Screw	1
18	110-35	Stage dovetail	1
19	X-19448	Screw	4
20	110-62	Washer, spring	1
21	**140-6**	Knob, C.A.	1
22	110-32	Ring, knob insert	1
23	**140-4**	Knob, F.A. plain	1
24	10-98	Screw	3
25	**140-2**	Cover	1
26	110-34	Disc	2
27	X-19400	Screw	2
28	X-19418-58	Screw	3
29	10-853	Lock Screw Assembly	1

8.1.2.14 Rotate the C.A. knob (21) counterclockwise (towards the rear of the stand), to raise the nosepiece and re-engage the lever (36) with the cam (34).

8.1.2.15 While holding the left hand C.A. knob (21) tightly with one hand, rotate the C.A. knob (12) counterclockwise (towards the front of the stand) to the stop.

8.1.2.16 Squeeze both C.A. knobs together and tighten the two set screws (13) in the C.A. knob (12).

8.1.2.17 Grasp both Coarse Adjustment knobs (21 & 12) and carefully rotate (towards the rear of the stand) to raise the nosepiece to the upper stop position.

CAUTION: Do not force the C.A. knob (12) beyond the upper stop position or it will slip and the lower stop (Steps 8.1.2.13, 8.1.2.14 & 8.1.2.15) must be reset.

8.1.2.18 Rotate the Fine Adjustment Shaft (35) towards the rear of the stand, to raise the nosepiece the full extent upwards.

8.1.2.19 The nosepiece,in the upper stop positions, should have some movement - 1/16 inch.

Reset lower stop (Steps 8.1.2.13, 8.1.2.14 & 8.1.2.15) if no movement is evident.

8.1.2.20 Inspect C.A. tension (5). Loosen the two set screws (13) in the C.A. knob (21). Push in on the knob to compress the spring washer (20) and retighten the knob set screws (13).

8.1.2.21 Place spacer washers (10) between the large truarc retainers (10) on the Coarse Adjustment barrel (41) and the C.A. knobs as required to fill the space between the truarc and the knob.

CAUTION: Too many spacer washers can cause the Coarse Adjustment to become excessively tight.

SERVICE NOTE: Continued replacement of truarc retainers can cause them to become spread open too far to be effective and they should be replaced.

8.1.2.22 Replace the spring washer (8) and flat washer (7) on the Fine Adjustment Shaft on both sides of the instrument stand.

NOTE: The number of spring washers (8) determine the Fine Adjustment knob tension and the feel of the F.A. stop.

8.1.2.23 Replace both Fine Adjustment knobs (23 & 6).

8.1.2.24 Replace the truarc retainer (13) on each side of the Fine Adjustment shaft (35). Depress the F.A. knobs to insert the retainer into the groove on the shaft.

8.1.2.25 The Fine Adjustment Drive Assembly tension is regulated by the washers on the shaft - - Teflon washers (37); flat steel washer (38) and the one spring washer (40).

8.1.2.26 Clean the face of both F.A. knobs (23 & 6).

8.1.2.27 Fasten new decorative discs (4) to each F.A. knob. Handle the assembly carefully so the ball bearings do not drop out.

8.2 Adjustment Lever Assembly

8.2.1 Remove the coarse and fine adjustment assembly. Refer to Section 8.1.

8.2.2 Remove the base illuminator. Refer to Section 7.1.

8.2.3 Remove the two bolts (42) holding the lever assembly in the stand.

8.2.4 Carefully disengage the roller (65) from the lifting arm (79) and remove the lever assembly.

8.2.5 Replace in the reverse manner.

9.0 **BODY** (Figure 28)

Microscope bodies should not be disassembled. Special fixtures, tools and techniques are required to service this critical part of the instrument.

Reconditioned exchange bodies are available from all AO Technical Service Centers.

Exterior lens surfaces can be inspected and cleaned using the same material and techniques described in Section I.

Remove the eyepieces, then the body from the stand following the assembly instructions given in the reference manual that is packaged with the Microscope. Exercise care in handling the body after detaching from the stand. Sudden shocks, such as dropping the unit, can damage mirrors or prisms and disturb critical optical alignments.

A performance evaluation can be determined by substituting another Microscope body and comparing the image quality while observing a detailed specimen slide.

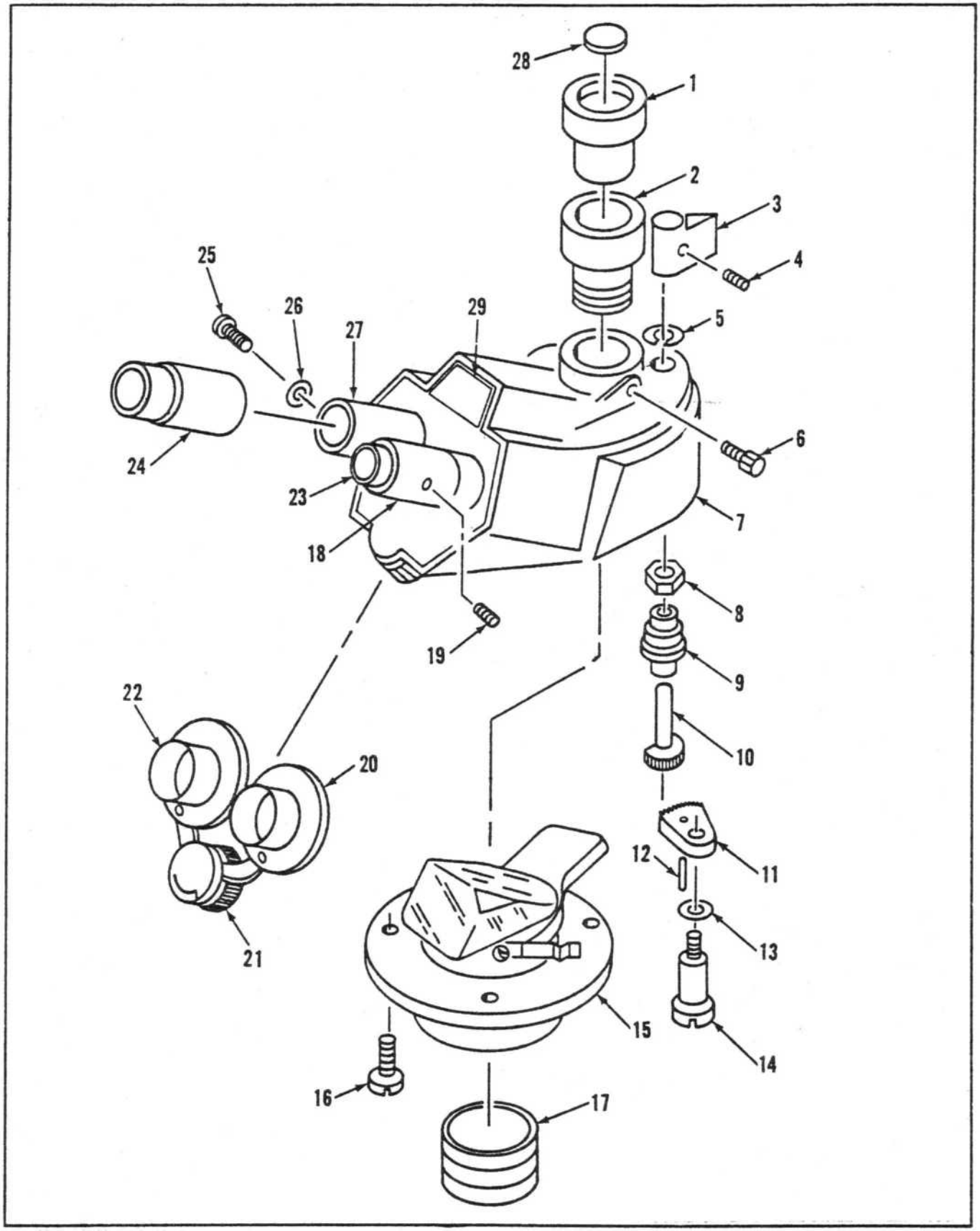


Figure 28 The Trinocular Body

Trinocular Body No. 1103

Index No.	Part Number	Description	Qty Per Assy
1	1103-11	Cap	1
2	1103-15	Adapter Camera	1
3	1135-852	Knob	1
4	X-20590	Set Screw	2
5	X-50820	Retaining Ring	1
6	1043-853	Screw	1
7	1103-13	Body, Trinocular	1
8	1043-64	Locknut	1
9	1043-63	Bushing	1
10	1103-7	Pinion	1
11	1103-6	Gear Sector	1
12	X-50763	Pin	1
13	X-53065	Washer, spring	1
14	1103-8	Shoulder Screw	1
15	1103-852	Adapter and Prism Assembly (Includes items 11-15)	1
16	1102-37	Screw	3
17	1102-851	Cell Assembly	1
18	1102-865	Eyetube, Fixed Assembly	1
19	X-25706	Set Screw	2
20	1102-21	Adapter, R.H.	1
21	1102-22	Knob, P.D.	1
22	1102-20	Adapter, L.H.	1
23	1102-7	Sleeve, fixed	1
24	1102-864	Focusing Eyetube Assembly	1
25	0281-22	Screw	1
26	1042-43	Key, focusing	1
27	1102-9	Eyetube, focusing	1
28	560-15	Disc	1
29	1102-31	Nameplate	1
	1043-64	Body, Binocular	1

PREVENTATIVE MAINTENANCE CHECK LIST

A. Coarse Adjustment

1. Definite stop each end _____
2. About 3/4 turn - total travel _____
3. Feel - tight, loose, gritty _____
4. Other _____

B. Fine Adjustment

1. Definite stop each end _____
2. 6 1/3 total turns _____
3. Clutch slippage _____
4. Feel - tight, loose, gritty _____
5. Lost motion _____
6. Other _____

C. Mechanical Stage

1. Feel - tight, loose, lost motion _____
2. Full travel side to side and forward to back _____
3. Ability of stage fingers to hold slide _____
4. Height of stage fingers above stage surface _____
5. Other _____

D. Stage Plate

1. Mounting - loose _____
2. Tilted - visual _____
3. Other _____

E. Autofocus Setting

Focus using stage micrometer, 1054 eyepiece and 45X objective with CA and FA down. _____

F. Nosepiece

Index - Detent the 10X objective from left side, then from right side. _____

G. Parcentration Of Objectives

When checking parcentering, after reading has been taken, recenter slide to original center.

1. 10X to 45X _____

2. 10X to 4X _____

3. 43X to 100X _____

H. Parfocality Of Objectives

Condenser diaphragm fully open. Focus on stage micrometer scale with lowest power objective. Rotate nosepiece to next highest power objective.

Specifications: Separation of scale lines should still be apparent. Refocus and rotate to the next highest power objective.

1. 4X to 10X _____

2. 10X to 45X _____

3. 45X to 100X _____

I. Substage Condenser

Using a 10X eyepiece, or pinhole eyepiece, and 4X objective, close the condenser diaphragm completely. Lower the condenser until the diaphragm outline is visible in the field of view. Continue to lower the condenser until one side of the diaphragm touches the edge of the field of view. A perfectly centered diaphragm will be concentric with the field of view. _____

K. Binocular Body

1. Parcentration of eyetubes _____

2. PD adjustment function _____

3. Other _____

L. Miscellaneous

1. Optics - dirty or damaged _____

2. Illuminator _____

3. Eyepiece _____

4. Other _____