WORLD
PRECISION
INSTRUMENTS

INSTRUCTION MANUAL

PSMB5N/PSMT5N

SurgioScope

Serial No._____

www.wpiinc.com

020720

CONTENTS

ABOUT THIS MANUAL

The following symbols are used in this guide:

This symbol indicates a **CAUTION**. Cautions warn against actions that can cause damage to equipment. Please read these carefully.

This symbol indicates a **WARNING**. Warnings alert you to actions that can cause personal injury or pose a physical threat. Please read these carefully.

NOTES and **TIPS** contain helpful information.

Fig. 1—SurgioScope

INTRODUCTION

SurgioScope (**Fig. 1**) is a portable high quality surgical microscope offering outstanding image quality. Incorporating an agile extension arm and excellent working distance objectives, SurgioScope provides convenient movement and maneuverability necessary for accurate positioning. These important features, together with a high quality optical system, provide sharp image contrast and enhanced large field of vision. The SurgioScope comes fully equipped with a foot-controlled motorized focusing system normally only found in surgical microscopes costing substantially more. A unique dual lamp housing enables safe and rapid changing of the lamp during an operation, without the need to power down. The optional video port permits operational procedures to be monitored or recorded simultaneously using a video recorder or camera.

A spring balance system is designed for the arm so that the microscope can move upwards and downwards stopping at any designated position. The adjusting functions of the equipment includes magnification, focusing and inclination.

The lamp housing holds two halogen lamps (12V, 100W); while one is in use, the other is a quick-change spare. Illumination is delivered to the specimen by internal coaxial fiber optic cable. The light intensity can be adjusted continuously according to user's requirement. Two types of voltage supplies are available for this microscope: AC 115V, 50Hz or AC 230V (±10%).

INSTRUMENT DESCRIPTION

Parts List

After unpacking, verify that there is no visible damage to the instrument. Verify that all items are included:
(1) **PSMB5N** or **PSMT5N** SurgioScope (unassembled)
(2) Wrenches (1-6 mm, 1-10 mm)
(2) Halogen bulb, 12V, 100W
(2) Fuses (for 2019 ROHS compliant power supplies)* T2A L250 VAC for 230 V
(2) Fuses (for 2019 ROHOS compliant power supplies)* T4A L250 V for 115 V
(1) Instruction Manual

*One of each fuse is installed and one of each fuse is provided as a spare fuse. These power supplies are identified as the power modules that have the blank plate where the 110/220 switch was located (under the power module next to the power inlet socket. For the fuses for the 110/230 V models, refer to "Specifications" on page 17.

Unpacking

NOTE: It is important to save the original packing carton. Should the microscope need service, it must be packaged in the original packing carton to prevent damage to the instrument during shipping. This is a difficult item to ship.

Upon receipt of this instrument, make a thorough inspection of the contents and check for possible damage. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed damage should be reported at once to the carrier and an inspection requested. Please read the section entitled "Claims and Returns" on page 23 of this manual. Please contact WPI Customer Service if any parts are missing at (941) 371-1003 or customerservice@wpiinc.com.

Returns: Do not return any goods to WPI without obtaining prior approval (RMA # required) and instructions from WPI's Returns Department. Goods returned (unauthorized) by collect freight may be refused. If a return shipment is necessary, use the original container, if possible. If the original container is not available, use a suitable substitute that is rigid and of adequate size. Wrap the instrument in paper or plastic surrounded with at least 100 mm (four inches) of shock absorbing material. For further details, please read the section entitled "Claims and Returns" on page 23 of this manual.

ASSEMBLY INSTRUCTIONS

The SurgioScope should not be placed in a dusty, moist or corrosive environment. Lenses should be carefully maintained. If dust is present on a lens, remove it with clean, dry and oil-free compressed air. Clean grease and water stains with a drop of lens cleaning fluid. The accessories not being utilized should be stored in a sealed box with a desiccant.

Attaching the Post to the Base

CAUTION: The base is heavy. It takes two people to remove the base from its packaging. Be careful not to drop the base, because you could damage the casters.

1. Lay the floor stand on the ground.
2. Remove the inner hexagonal bolt and washer at the end of the post.
3. Insert the post into the hole of the floor stand.
4. Your SurgioScope is designed to seat in the base to limit its movement. Rotate the post until the post pin on the post lines up with the base support and seats into the groove on the end of post.
5. Assemble in order the flat washer, spring washer and inner hexagonal bolt. Then, fasten firmly with the 10 mm hex wrench.

Attaching the Power Supply Housing to the Post

THE ARTICULATING ARM OF THE POWER SUPPLY HOUSING IS SPRING LOADED. USE CARE WHEN UNPACKING THE UNIT. THE ARM MAY SPRING OPEN UPON REMOVAL. DO NOT LIFT BY THE ARM; LIFT THE POWER SUPPLY HOUSING. USE CAUTION TO AVOID PERSONAL INJURY AND EQUIPMENT DAMAGE.

1. Carefully lift the power supply housing from the shipping container. The arm knob (**Fig. 3**) must remain tight to prevent the arm from springing up and injuring the person assembling the microscope.

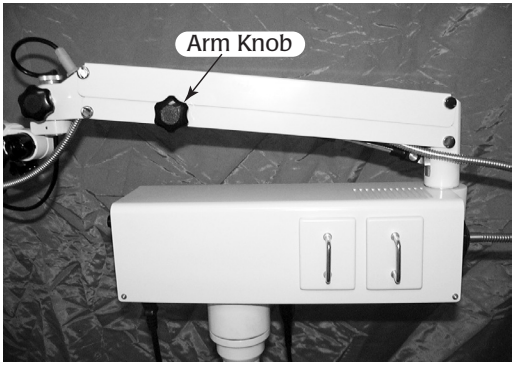


Fig. 2—Knob in the picture must remain tight.

2. Slide the post cap over the post and align the hole in the post cap with the slot in the top of the post as shown in **Fig. 3.**

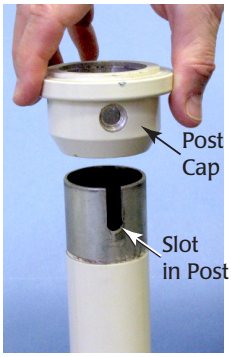


Fig. 3—(Left) Align post cap with post.
Fig. 4—(Right) Insert the shaft.

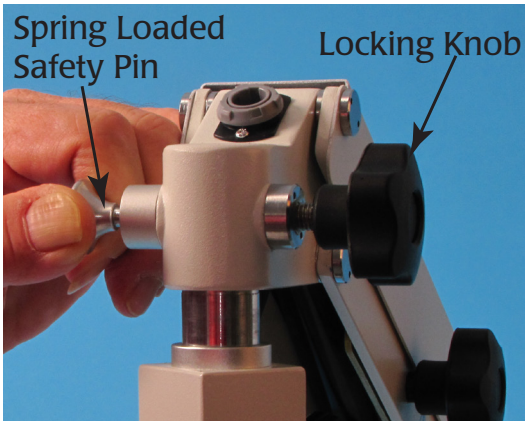
3. Insert the shaft on the bottom of the power supply housing into the post (**Fig. 4**).

4. Insert the 6 mm hexagonal bolt into the hole in the post cap. Using the 6 mm hex wrench (provided), tighten it into the threaded hole in the power supply housing to securely connect it to the post (**Fig. 5**)

Fig. 5—Tighten the hex bolt

Attaching the Microscope Head to the Arm

1. Loosen the locking knob on the end of the articulating arm so that the hole in the arm is clear to accept the microscope head assembly (**Fig. 7**).



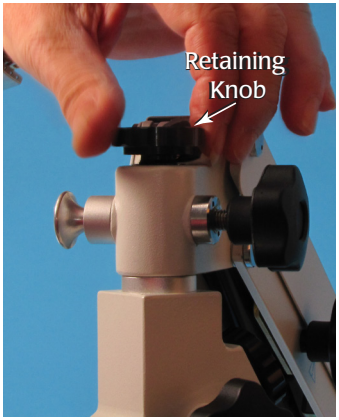


Fig. 6—(Left) Attaching the scope head
Fig. 7—(Right) Fixing Nut

2. Remove the retaining knob (**Fig. 7**) from the head assembly.
3. Hold the spring-loaded safety pin out (**Fig. 6**) and insert the microscope head assembly from the bottom.
4. Release the spring-loaded safety pin, and verify that the spring-loaded safety pin goes back into the groove on the shaft.
5. Repostion the retaining knob on the top of the microscope head assembly. Fasten the retaining knob finger tight (**Fig. 7**).

6. Line up the notch and insert the 5-pin plug of the motor control cable into the 5-pin socket (**Fig. 8**).

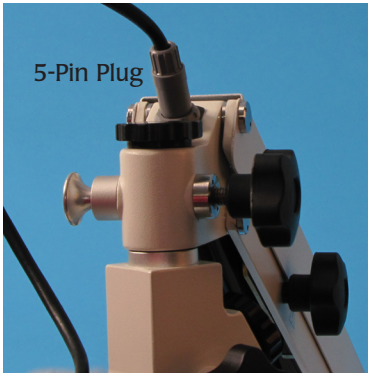


Fig. 8—5-pin plug

Attaching the Handles

1. Position the microscope head for convenient access to the screws that hold the handles (**Fig. 9**).

CAUTION: Gravity (and a little vacuum) holds the eyepieces in place. Do NOT invert the head without first removing the eyepieces.

Fig. 9—(Left) Position the head.
Fig. 10—(Right) Attach the handles.

2. Remove the two screws with the hex head wrench provided.
3. Line up the holes in the handle with the screw holes, and reinsert the screw. Fasten securely with the hex head wrench provided (**Fig. 10**).

Positioning the Head

The head can be positioned as desired. Loosen the positioning knobs so that the articulation points rotate freely. When the head is in position, tighten the positioning knobs.

The photos below show the axes on which the head can be rotated.

NOTE: The head cannot be positioned at exactly 90°. Rather, it is canted to one side a little.

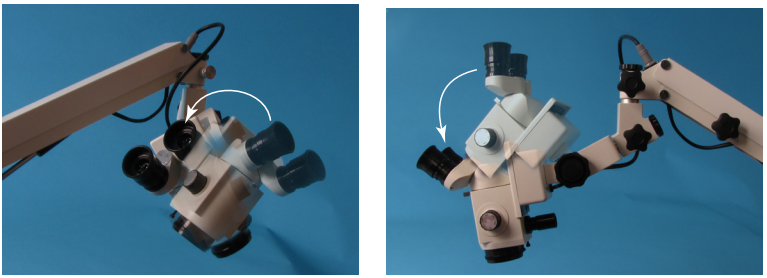


Fig. 11—The head can be rotated on multiple axes.

Attaching the Fiber Optic Cable

NOTE: If desired, the fiber optic cable may be routed through the mounting hooks on the under side of the articulating arm (**Fig. 12**).

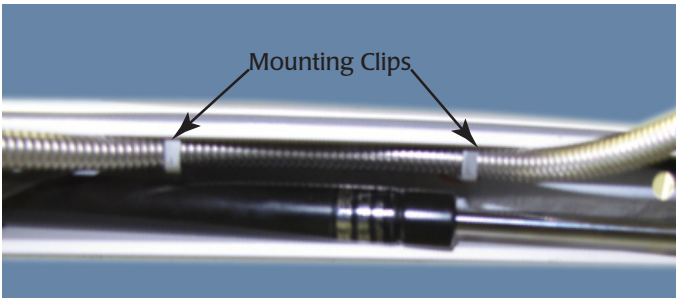
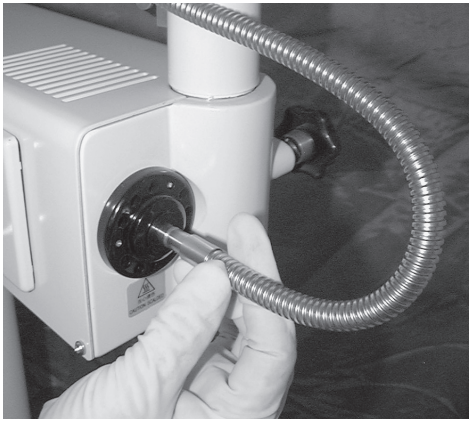


Fig. 12—Underside of the articulating arm with the fiber optic cable run through the mounting clips.

1. Insert one end of the fiber optic cable (**Fig. 13**) into the light port connector on the power supply housing.



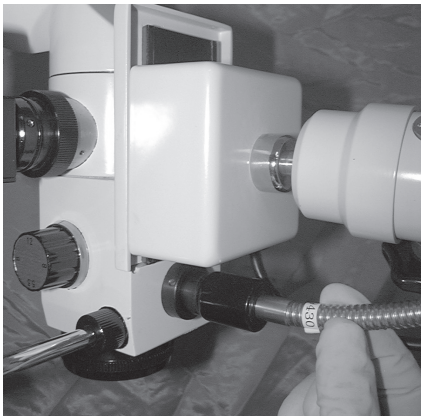


Fig. 13—(Left) Fiber optic cable in the power supply housing
Fig. 14—(Right) Fiber optic cable in the microscope

2. Insert the other end of the fiber optic cable into the corresponding light input port on the microscope head assembly (**Fig. 14**).

Attaching the Foot Switch

Connect the 6-pin plug from the foot switch to the 6-pin socket located under the power supply housing (**Fig. 15**).

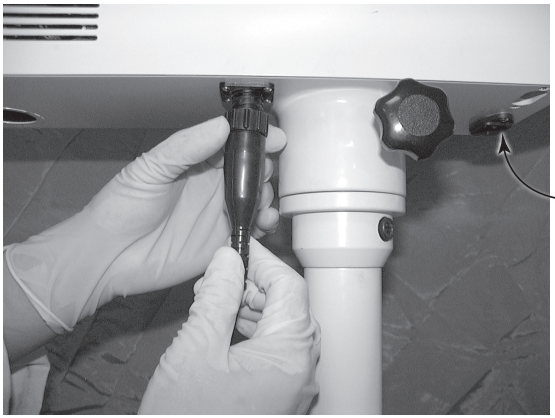


Fig. 15—Attach the foot switch

Assembly of the Beam Splitter, CS-Mount and Camera

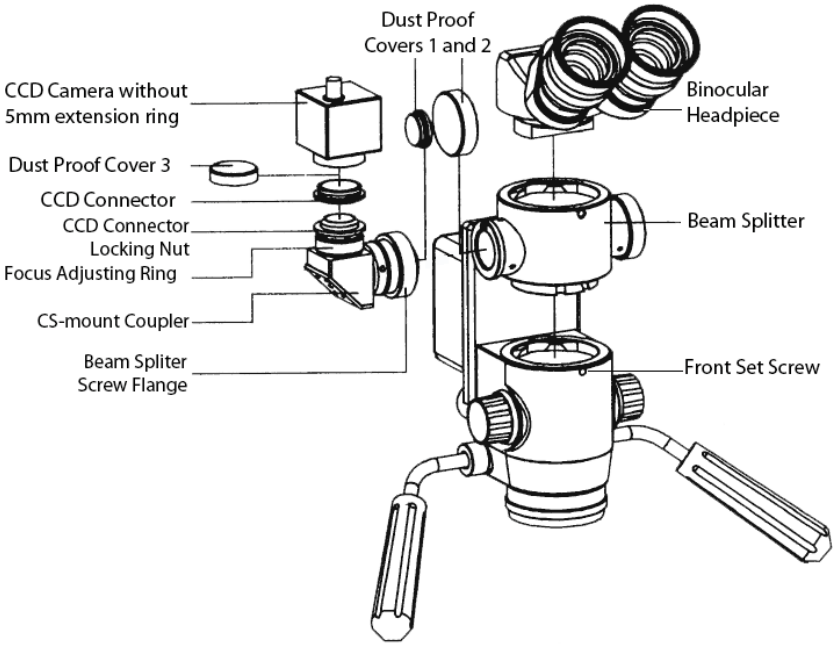


Fig. 16—Camera mounting - exploded view

1. Loosen the front setscrew below the binocular headpiece and carefully remove the binocular headpiece (**Fig. 16**).
2. Place the beam splitter in the aperture and tighten the setscrew.

Fig. 17—(Right) Installing the beam splitter.

3. Place the binocular headpiece into the beam splitter and tighten the setscrew on the beam splitter.
4. Remove dust-proof cover 2 from left or right side of the beam splitter and store it in a clean, dust-free location.

   NOTE: The CS-mount is optically tuned to one side or the other of the beam splitter. Usually, it is the right side.
5. Remove dust proof cover 1 from the CS-mount coupler.

6. Place the CS-mount coupler into the beam splitter and turn the beam splitter screw flange to tighten it in place (**Fig. 16**).

   NOTE: The orientation, (rotation) of the CS-mount coupler is keyed so that it can be mounted in one of three positions. To minimize cable interference, mount the coupler as shown in **Fig. 15**. It should be mounted in the same direction as the top of the microscope.

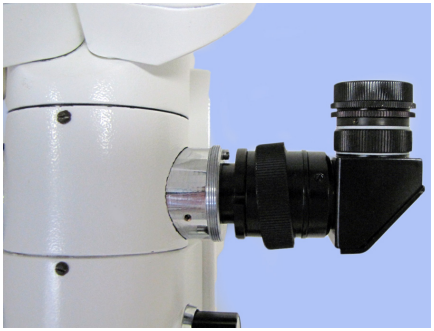


Fig. 18—CS-mount attached to the beam splitter

7. Remove dust-proof cover 3 from the CS-mount coupler.
8. Remove the camera lens cover from the camera (**Fig. 19**).

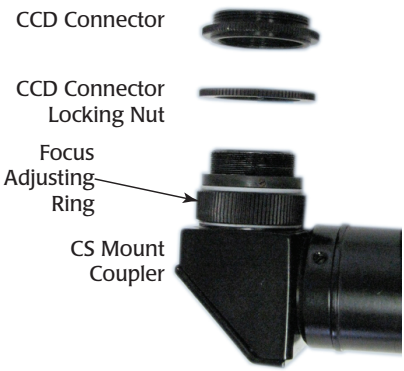


Fig. 19—(Left) Camera with cap and extension ring removed
Fig. 20—(Right) CS-mount coupler

9. Remove the 5 mm extension ring from the CCD camera.
10. Remove the CCD connector from the CS-mount coupler (**Fig. 20**).
11. Thread the male threads of the CCD connector onto the camera all the way until the CCD connector is butted against the camera.

CAUTION: DO NOT OVERTIGHTEN these connections or they may become difficult to remove.

12. Lower the CCD connector locking nut into its lowest position on the CS-mount.
13. Thread the CCD connector locking nut onto the CS-mount coupler, and adjust the CCD locking nut to its lowest position.
14. Thread the camera with the CCD connector assembly onto the CS-mount coupler (**Fig. 21**).

Fig. 21—Camera mounted on the CS-mount coupler

15. To properly orient the camera, it must be connected to a live monitor for visualization. When the camera is oriented properly, thread the CCD connector locking nut upward to bind against the CCD connector. This locks the camera into position.
16. If you remove the camera, be sure to remove the CCD connector from the camera (**Fig. 22**) and re-install it on the CS-mount. Reinstall the appropriate dust-proof covers.

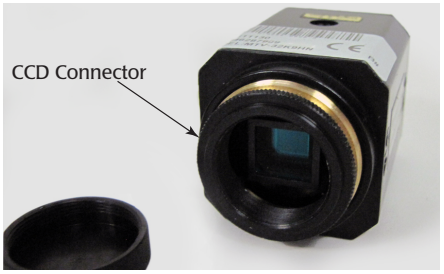


Fig. 22—Camera removed from the SurgioScope with CCD connector attached

NOTE: Adjustments may need to be made to the dynamic balance of the pantographic arm depending on the mass of the camera, beam splitter and CS-mount. See “Balance setting” on page 16.

NOTE: The coaxial video cable and power cable for the camera may be routed through the pantographic arm next to the fiber optic cable to keep them out of the working area. See “Attaching the Fiber Optic Cable” on page 7. An extension cord and a covering sheath may be necessary to protect the power cable from damage.

Camera Operation and Setup

1. Set up a test subject and focus on it through the eyepieces.
2. Set the diopters on the eyepieces to zero (0) (**Fig. 24**).

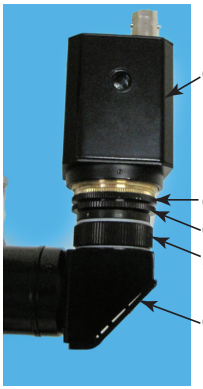


Fig. 23—(Left)Diopters on the eyepiece
Fig. 24—(Right) Camera mounted

3. Turn on the camera and adjust the display monitor so that the camera image can be observed while making adjustments to the microscope.
4. While observing the image, adjust the focus adjusting ring on the CCD adaptor until a sharp image is seen on the monitor (**Fig. 24**).
5. If the camera cannot be focused, verify that the 5 mm extension ring is not attached to the camera. This microscope is configured to use a CS-mount that does not use the 5 mm extension included with the camera. If the 5 mm extension ring is still attached, remove it from the setup and readjust the focus for proper viewing of the test subject.
6. If the center of the image is off, verify that the correct side of the beam splitter is being used.

   NOTE: The flat side of the CS-mount coupler has a number of adjusting screws to center the image reflected off the internal mirror. These adjustments have been set at the factory and should not be modified by the user. If necessary, the beam splitter and the CS-mount may need to be returned to the factory for adjustment.

Assembled SurgioScope

When the SurgioScope is fully assembled, it should look like the microscope shown in **Fig. 26**.

Fig. 25—Assemble SurgioScope

OPERATING INSTRUCTIONS

To power on the SurgioScope use the On/Off switch located on the back of the power supply housing. The SurgioScope is supplied with the F200 objective installed. This objective can be easily unscrewed and replaced with one of the optional objectives.

NOTE: If you are wearing glasses, fold the rubber eyepiece covers down.

Focusing the SurgioScope

1. Adjust the diopters on the eyepieces to the zero (0) (**Fig. 28**).

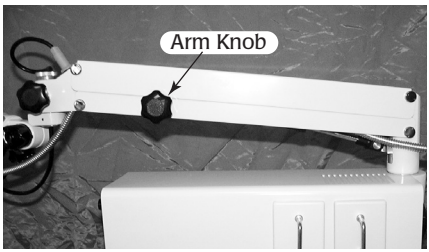


Fig. 26—(Left) Diopters on the eyepiece set to zero
Fig. 27—(Right) Arm knob on the articulating arm

Fig. 28—The orange locking buttons on the side of the eyepieces prevent diopter adjustments from shifting. To change your diopter setting, depress the orange button before rotating the eyepiece.

2. Use the foot pedal to adjust the focus motor drive to the center of its travel.
3. Loosen the arm knob (**Fig. 27**) at the middle of the articulating arm and move the microscope up and down to set the coarse focus. Normally, for F200 objective, the objective should be above 200 mm from the working surface. See Fig. 32 on page 19.
4. Tighten the arm knob.
5. Adjust the fine focus using the foot pedals, while observing with one eye, until the image in the eyepiece is clearest.
6. Using both eyes, adjust the diopters (so each eyepiece gives a clear image.
7. Observe the image with both eyes at once. Adjust the interpupillary distance so that the images merge and a stereoscopic effect is achieved.

MAINTENANCE
Replacing the Bulbs

The power supply housing is equipped with a spare bulb module. If the bulb burns out during operation:

1. Turn off the power switch and pull out the bulb module (**Fig. 29**). Replace it with the spare bulb module, turn the power on and continue the operation.

Fig. 29—Spare bulb module

2. After the operation, replace the burned-out bulb ir microscope for its next use. (Replace the lamp with
   1. Open the bulb module.
   2. Pull out the ceramic socket and let it cool.
   3. Remove the bulb from the two clamping springs
   4. Install the replacement bulb, and reinsert the bu

Replacing the Fuse

1. Disconnect the power.
2. Using a flat blade screwdriver, remove the fuse holder located on the back of the power supply housing (**Fig. 30**).

Fig. 30—(Right) Back of the power supply housing

3. Replace the fuse with an appropriate new fuse rated for your local AC mains voltage.
4. Reinstall the fuse holder.

CAUTION: Only use fuses of the same type of specification and rated value (See "Specifications" on page 17). For safety, disconnect power before removing the lower cover and replacing the fuse.

Balance setting

The balance setting of this instrument has been checked and adjusted before leaving the factory. No further adjustment should be necessary during surgical procedures. However, if adjustment is required, contact WPI technical support at 941.371.1003 or technicalsupport@wpiinc.com for specific instructions. You will need a flat blade screw driver to adjust the balance tension. The adjustment screw is found on the lower part of the articulating arm.

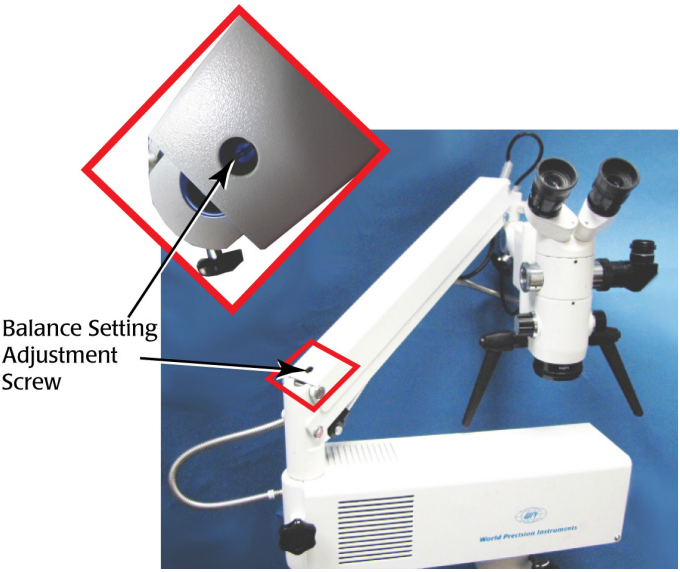


Fig. 31—Location of the balance setting adjustment screw

ACCESSORIES

Part Number	Description
500162	Replacement lamp, 12W, 100W
501636	1/2" CS-mount adaptor (requires Beam splitter 501637)
501637	Beam Splitter
503008	103cm Post
503009	89cm Post

SPECIFICATIONS

This instrument conforms to the following specifications:

Microscope

Total Magnification (F200)..... 1.2–20x
Adjustable Diopter ..... ±6 Diopter
Adjustable Interpupillary Distance..... 50 mm – 70 mm
Eyepiece..... 12.5x
Fine Focus Adjustment Range..... 30 mm
Optional Camera ..... COLCAM, USBCAM50 (½" CCD), USBCAM33 (⅓" CCD)
Power..... 110V, 50-60Hz, or 220V, 50-6Hz
Fuse (for 2019 ROHS compliant power supplies)*.....T2A L250 VAC for 230 V
.....T4A L250 V for 115 V
.....T1.25 A 250 V (230 VAC) and T2.5 A 250 V (115 VAC) for the 110/220 model
Shipping Weight.....94 lb. (43 kg)

*These power supplies are identified as the power modules that have the blank plate where the 110/220 switch is located (under the power module next to the power inlet socket.

Lens Characteristics

F100 #504284 wd=90 mm	**Total Magnification**	**6.4x**	**10x**	**16x**	**26x**	**40x**
	Field of View	25 mm	15.5 mm	10 mm	6 mm	4 mm
	Camera Field of View (1/2" CCD)	25 mm	15.5 mm	10 mm	6 mm	4.5 mm
	Camera Field of View (1/3" CCD)	17.5 mm	11.5 mm	7 mm	4.55 mm	2.75 mm
F200 *(included)* wd=190 mm	**Total Magnification**	**3.2x**	**5x**	**8x**	**13x**	**20x**
	Field of View	50 mm	31 mm	20 mm	12 mm	8 mm
	Camera Field of View (1/2"a CCD)	50 mm	31 mm	20 mm	12 mm	8 mm
	Camera Field of View (1/3" CCD)	35 mm	23 mm	14mm	9mm	5.5 mm
	Objective Focal Length	200 mm				
F250 #504285 wd=240 mm	**Total Magnification**	**2.56x**	**4x**	**6.4x**	**10.4x**	**16x**
	Field of View	65 mm	40 mm	25 mm	16 mm	10 mm
	Camera Field of View (1/2" CCD)	63 mm	40 mm	25 mm	16 mm	10 mm
	Camera Field of View (1/3" CCD)	45 mm	28 mm	18 mm	11 mm	7 mm
F300 #504286 wd=290 mm	**Total Magnification**	**2.13x**	**3.34x**	**5.34x**	**8.67x**	**13.34x**
	Field of View	75 mm	46.5 mm	30 mm	18 mm	12 mm
	Camera Field of View (1/2" CCD)	75 mm	46.5 mm	30 mm	18 mm	12 mm
	Camera Field of View (1/3" CCD)	52.5 mm	34.5 mm	21 mm	13.5 mm	8.25 mm
F350 #504287 wd=340 mm	**Total Magnification**	**1.83x**	**2.86x**	**4.57x**	**7.42x**	**11.42x**
	Field of View	91 mm	57 mm	36 mm	22 mm	14 mm
	Camera Field of View (1/2" CCD)	88 mm	55 mm	35 mm	21 mm	13 mm
	Camera Field of View (1/3" CCD)	60 mm	38 mm	24mm	15 mm	9.5 mm

Range of Motion

Maximum Stretch Radius of Arm ..... 870 mm
Vertical Movement Range ..... 700–1100 mm

Illumination

Spot = 42 mm
Dual lamp housing with quick-change spare and internal coaxial fiber optic cable
Halogen-Tungsten Lamp ..... 12V, 100W w/cold reflection

Working Height (Arm Movement Range Above Floor)

The post length, height of your subject above the floor and chosen objective must be considered when determining the laboratory setup of your SurgioScope. Three distances must be defined (**Fig. 32**):

- Specimen Height - The distance from the floor to the top of the test subject on the tabletop.
- Working Distance - The distance from the SurgioScope lens to the point where the test subject comes into focus. This distance is a fixed distance that is different for each objective. At the proper working distance, the test subject is in focus. See “Lens Characteristics” on page 17. For example, an F200 objective has a working distance of 195 mm (7.7”).
- Working Height - The total distance from the floor to the bottom of the SurgioScope lens. When the test subject is in focus, this distance equals the sum of the specimen height and working distance.

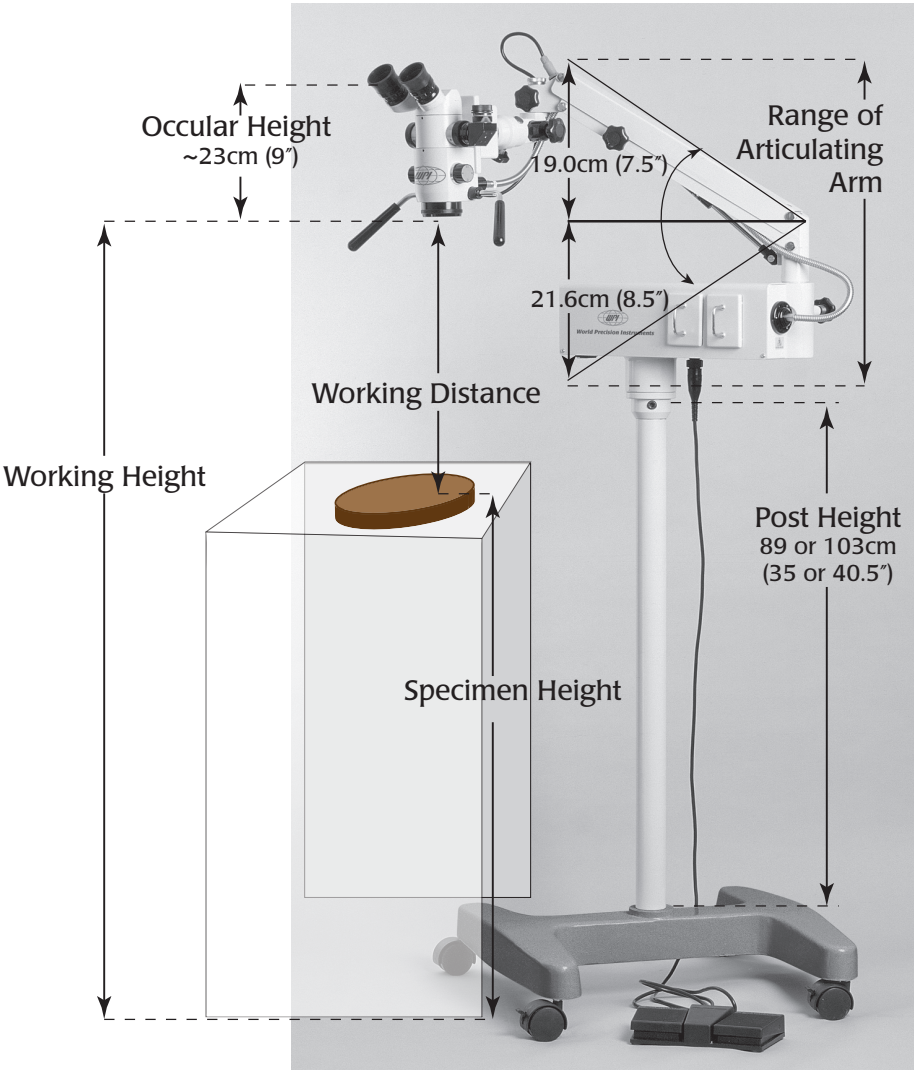


Fig. 32—Important measurements for setting up the SurgioScope

The articulating arm of the SurgioScope allows for a range of working heights in the following ranges:

- 89 cm Post — Focus on specimen 34.5–51″ (88–130 cm)*
- 103 cm Post — Focus on specimen 40.5–57″ (103–146 cm)*

Subtract the working distance from the height above the specimen; 103 cm post recommended for F350 objective.

The working height must fall within the range the articulating arm allows, or the test subject will not be in focus. For example, if you use an F200 objective, the working distance is 19.5 cm. If the specimen height (to the top of the specimen) is 81 cm, then you have a required working height of 100. cm (81+19. 5cm =100.5 cm). If an 89 cm post is used, you have a working height range of 88-130 cm. Since the working height (100.5 cm) falls within the range of the articulating arm, we have plenty of vertical space for adjusting the focus.

The table below shows the range that the specimen height must fall into based on the working distance of each objective when an 89 or 103 cm post is used. To determine the range, the working distance (of each objective) is subtracted from to total height range allowed by the articulating arm.

Objectives	Actual Working Distance	Specimen height Range (based on the range of the articulating arm)	
		89 cm Post	**103 cm Post**
F100 (Optional)	9.4 cm (3.7")	79.6-120.6 cm (31.3-47.5")	93.6-136.6 cm (36.9-53.8")
F200 (Included)	19.5 cm (7.7")	69.5-110.5 cm (27.4-43.5")	83.5-126.5 cm (32.9-49.8")
F250 (Optional)	24.6 cm (9.7")	64.4-105.4 cm (25.4-41.5")	78.4-121.4 cm (30.9-47.8")
F300 (Optional)	29.4 cm (11.6")	59.6-100.6 cm (23.5-39.6")	73.6-116.6 cm (29.0-45.9")
F350 (Optional)	34.4 cm (13.5")	54.6-95.6 cm (21.5-37.6")	68.6-111.6 cm (27.0-43.9")

For most applications, the WPI technical support team recommends using the 89 cm post with the F100 and F200 objectives and the 103 cm post with both the F300 and F350 objectives.

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WARRANTY

WPI (World Precision Instruments) warrants to the original purchaser that this equipment, including its components and parts, shall be free from defects in material and workmanship for a period of 30 days* from the date of receipt. WPI's obligation under this warranty shall be limited to repair or replacement, at WPI's option, of the equipment or defective components or parts upon receipt thereof f.o.b. WPI, Sarasota, Florida U.S.A. Return of a repaired instrument shall be f.o.b. Sarasota.

The above warranty is contingent upon normal usage and does not cover products which have been modified without WPI's approval or which have been subjected to unusual physical or electrical stress or on which the original identification marks have been removed or altered. The above warranty will not apply if adjustment, repair or parts replacement is required because of accident, neglect, misuse, failure of electric power, air conditioning, humidity control, or causes other than normal and ordinary usage.

To the extent that any of its equipment is furnished by a manufacturer other than WPI, the foregoing warranty shall be applicable only to the extent of the warranty furnished by such other manufacturer. This warranty will not apply to appearance terms, such as knobs, handles, dials or the like.

WPI makes no warranty of any kind, express or implied or statutory, including without limitation any warranties of merchantability and/or fitness for a particular purpose. WPI shall not be liable for any damages, whether direct, indirect, special or consequential arising from a failure of this product to operate in the manner desired by the user. WPI shall not be liable for any damage to data or property that may be caused directly or indirectly by use of this product.

Claims and Returns

Inspect all shipments upon receipt. Missing cartons or obvious damage to cartons should be noted on the delivery receipt before signing. Concealed loss or damage should be reported at once to the carrier and an inspection requested. All claims for shortage or damage must be made within ten (10) days after receipt of shipment. Claims for lost shipments must be made within thirty (30) days of receipt of invoice or other notification of shipment. Please save damaged or pilfered cartons until claim is settled. In some instances, photographic documentation may be required. Some items are time-sensitive; WPI assumes no extended warranty or any liability for use beyond the date specified on the container

Do not return any goods to us without obtaining prior approval and instructions from our Returns Department. Goods returned (unauthorized) by collect freight may be refused. Goods accepted for restocking will be exchanged or credited to your WPI account. Goods returned which were ordered by customers in error are subject to a 25% restocking charge. Equipment which was built as a special order cannot be returned.

Repairs

Contact our Customer Service Department for assistance in the repair of apparatus. Do not return goods until instructions have been received. Returned items must be securely packed to prevent further damage in transit. The Customer is responsible for paying shipping expenses, including adequate insurance on all items returned for repairs. Identification of the item(s) by model number, name, as well as complete description of the difficulties experienced should be written on the repair purchase order and on a tag attached to the item.

** Electrodes, batteries and other consumable parts are warranted for 30 days only from the date on which the customer receives these items.*

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