National Optical & Scientific Instruments Inc.
6508 Tri-County Parkway
Schertz, Texas 78154
Phone (210) 590-9010 Fax (210) 590-1104

INSTRUCTIONS FOR STEREOSCOPIC ZOOM MICROSCOPE MODELS

420-430PHF-10 (Binocular Head)	420T-430PHF-10 (Trinocular Head)
420-420AHF-10 (Binocular Head)	420T-420AHF-10 (Trinocular Head)
420-1105-10 (Binocular Head)	420T-1105-10 (Trinocular Head)
420-1107-10 (Binocular Head)	420T-1107-10 (Trinocular Head)

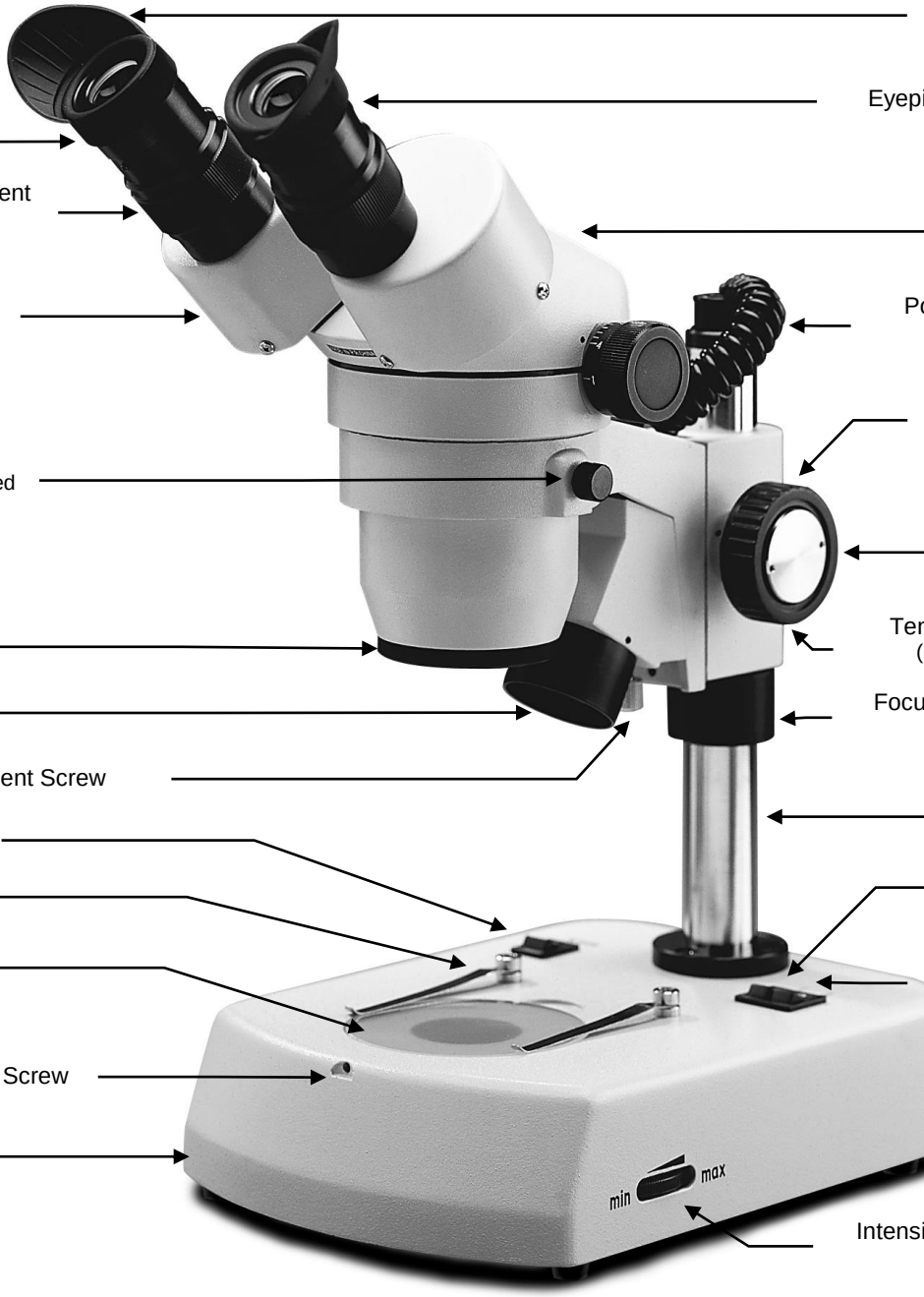
Notice: The first three digits of the model number, for example 420- or 420T-, represent the optical portion of your microscope. Thus, all models starting with 420 have the same binocular head, and all models starting with 420T have the same trinocular head. Procedures for use of the head are the same, regardless of the stand supplied with your specific model.

The digits following the first – (dash) represent the stand portion of your microscope. The different stands available have features and functions unique to each.

The digits following the second – (dash) represent the power factor of the eyepieces supplied with your microscope. For example, -10 would indicate that your microscope is supplied with WF10x eyepieces.

You made your selection of stands when you originally purchased your microscope. The above explanation is provided so that when ordering and installing replacement bulbs you use the correct bulb for your particular model number.

Illustrated: Model 420-430PHF-10



Rubber Eyeshields

Eyepiece Locking Set Screw

Eyepieces

Knurled Diopter Adjustment
(on both eyepieces)

Head

Eyepiece Tube Housing

Power Cord for Top Light
(incidental illumination)

Focusing Assembly
Locking Knob

Head Locking Screw
(head retaining screw located
on opposite side)

Focusing Knob
(both sides)

Tension Adjustment Collar
(behind this focusing knob)

Knurled Cover Ring

Light Shade

Focusing Assembly Locking
Support Collar

Top Light Beam Adjustment Screw

Post

Main Power Switch

Incidental (top)
Light Switch

Stage Clips

Stage Plate
(frosted illustrated)

Transmitted (bottom)
Light Switch

Stage Plate Locking Set Screw

Fuse

Base

Intensity Control for Top Light

Model 420-420AHF-10

Model 420-1105-10

Model 420-1107-10

Stereoscopic microscopes are used for viewing 3-dimensional objects, inspection or assembly of small parts, and for dissection of biological specimen. They provide an upright, unreversed image which permits easy manipulation of the object being viewed while looking through the microscope. They are designed for viewing solid objects at low magnification, but they will also permit viewing of some transparent specimen slides.

For optimum viewing satisfaction, follow these simple procedures. Nomenclature used to describe components and controls can be identified by referring to the diagram at left.

UNPACKING

1. Carefully remove microscope stand and head assembly from cartons. Remove rubber eyeshields, blue filter, frosted stage plate, dustcover, and "L" hex key wrench (used for changing stage plates). The black/white contrast plate (80mm diameter) is already mounted in the microscope base. (Models with –1105 or –1107 do not include blue filter, frosted stage plate, "L" hex key wrench. –1107 does have contrast plate.)

2. Make certain not to touch any of the lens surfaces while handling the microscope. Dust, dirt, fingerprints can damage the delicate lens surfaces or adversely affect image quality.

3. Examine packing material before you discard it. **Retain the styrofoam container in case you need to transport, store, or return the microscope for service.** If it becomes necessary to ship the microscope for any reason, pack it in the styrofoam container, and then pack the styrofoam in another corrugated shipping container for optimum protection. Use of the styrofoam alone will not provide adequate protection in transit, and will void your warranty.

ASSEMBLY

1. Mounting the stereo zoom head to stand (models with top and bottom illumination):

   A. Loosen head locking screw and head retaining screw.

   B. Insert head into the stand (do not force), positioning head to face either forward or backward, whichever suits your preference or needs.

   C. Tighten head retaining screw and head locking screw.

   D. Instructions for –1105 and –1107 stands are covered by separate sheet.

2. **Install rubber eyepiece shields over top of eyepieces with the flared portion of the shields positioned at the outside edge of eyepieces.**

OPERATION

1. ILLUMINATION (only for models with illuminators)

   A. Before operating microscope, adjust intensity control located on side of base to the minimum position. This should be done prior to each time light is turned on or off. Failure to do so will significantly shorten bulb life.

   B. Make certain that the main voltage of your microscope corresponds to the voltage of your power outlet, either 120v or 220v. Insert microscope plug into matching voltage outlet.

   C. The microscope is furnished with two stage plates. The frosted glass plate is used when viewing transparent specimen slides or for viewing some specimen thin enough through which light can pass (insect wings, etc.) The plastic black/white contrast plate can be used when viewing opaque objects or for dissecting. Choose side of plate providing best contrast with specimen.

   D. There are three rocker type light controls located on top surface of microscope base.

      MAIN = Turns power on and off
      "I" = Turns incidental light on (top illumination)
      "T" = Turns transmitted light on (substage illumination)

      NOTE: USE TRANSMITTED ILLUMINATION ONLY WITH FROSTED GLASS STAGE PLATE AND BLUE FILTER IN PLACE. HEAT GENERATED IN BASE FROM BOTTOM LIGHT WILL WARP OR DAMAGE THE PLASTIC BLACK/WHITE PLATE. SUCH DAMAGE WILL NOT BE COVERED BY WARRANTY.

      Remove black/white stage plate by loosening locking set screw located on front of base with supplied "L" wrench. Insert daylight blue filter into machined groove provided in center of base. Install frosted glass stage plate. Tighten locking set screw.

Incidental illumination can be used with either frosted glass plate or black/white plastic stage plate. The top light has an intensity control located on side of base. When using incidental light, always set intensity control at its lowest level before turning lamp on or off. This measure will extend bulb life. The top light can also be centered on specimen by using the top light beam adjustment screw. This allows user to select the best spot illumination required for specimen being viewed.

Transmitted and incidental illumination combined can provide extra illumination for certain objects where additional top illumination will enhance the object being viewed.

2. INTERPUPILLARY ADJUSTMENT

This permits each user to adjust spacing between eyepieces in order to accommodate distance between their eyes. While looking through the microscope eyepieces with both eyes, grasp eyepiece tube housings with both hands and rotate them on their axis, moving eyepieces apart or together until a full field of view is observed and images blend into one. Interpupillary distance is now corrected for your own inter-ocular distance and does not require further adjustment later unless another user changes this adjustment.

3. FOCUSING

A. Adjust zoom control knobs (located on both sides of head) so that the lowest magnification number “1” is positioned at the black index dot on head. Lower magnifications have larger fields of view, making it easier to position and locate area to be viewed.

B. Place a flat object or specimen slide (cover glass up), on stage plate.

C. Position focusing knobs in the center of focusing range.

D. On post mounted models, the height of viewing head can be adjusted up or down on the post in order to focus on difference sized objects. Loosen the locking knob located on the locking support collar, allowing the support collar to slide down to bottom of post. While firmly holding viewing head with one hand, loosen locking knob located on back of focusing assembly so that head can move freely up or down on post.

While looking through microscope, move viewing head up or down on post until object can be seen in approximate focus. Tighten focusing assembly locking knob. Position the support collar under the focusing block and tighten locking knob on support collar. It is not necessary to make this adjustment every time you change objects to be viewed, so long as the different objects are of similar thickness or height.

E. On models having the “fixed arm” type stand, the up/down movement of viewing head is limited to the traverse permitted by the regular focusing knobs. This limits the size object that can be viewed on the stage to about 45mm thickness. Also note that optional #705-420 0.5x objective lens cannot be used on any 420 series model that is supplied with the “fixed arm” type stand –420AHF. The 0.5x objective increases the working distance more than the upward traverse permitted by the fixed arm mount.

F. Both eyepieces have knurled diopter adjustment rings. Rotate both left and right diopters in a clockwise direction to the lowest position.

G. Adjust zoom control to the highest magnification by aligning the number “4” on knob to the black index dot on head.

H. While looking through right eyepiece with one eye, rotate focusing control knob until specimen comes into sharp focus through right eyepiece.

I. Adjust zoom control knob to the lowest magnification.

J. Adjust the right diopter until the image is sharp. Do not change the focusing knob position.

K. Without changing the position of the focusing knob, adjust the left eyepiece diopter until you obtain a sharp image in left eyepiece. the image should now be sharp throughout the zoom power range.

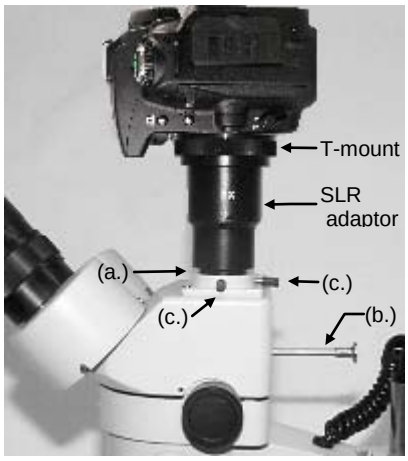
Specification Chart

Eyepieces	Zoom Objective Position	Standard Objective 1X (supplied)		Auxiliary Objective 0.5X (Optional)		Auxiliary Objective 0.75X (Optional)		Auxiliary Objective 1.5X (Optional)	
		Working Distance – 79mm		Working Distance - 137mm		Working Distance - 90mm		Working Distance - 34mm	
		Total Magnification	Field Size	Total Magnification	Field Size	Total Magnification	Field Size	Total Magnification	Field Size
WF5X Field No.22 (Optional) (No Reticle Holder) Interpupillary Distance 59~83	1X	5X	22mm	2.5X	44mm	3.75X	29.3mm	7.5X	14.7mm
	2X	10X	11mm	5X	22mm	7.5X	14.6mm	15X	7.3mm
	3X	15X	7.3mm	7.5X	14.7mm	11.25X	9.8mm	22.5X	4.9mm
	4x	20X	5.5mm	10X	11mm	15X	7.3mm	30X	3.7mm
WF10X Field No. 20 (Supplied) Accepts Reticle 23mm O.D. Interpupillary Distance 54~78	1X	10X	20mm	5X	40mm	7.5X	26.7mm	15X	13.3mm
	2X	20X	10mm	10X	20mm	15X	13.3mm	30X	6.7mm
	3X	30X	6.7mm	15X	13.3mm	22.5X	8.9mm	45X	4.4mm
	4x	40X	5mm	20X	10mm	30X	6.7mm	60X	3.3mm
WF15X Field No. 13 (optional) (No Reticle Holder) Interpupillary Distance 50.5~74.5	1X	15X	13mm	7.5X	26mm	11.25X	17.3mm	22.5X	8.7mm
	2X	30X	6.5mm	15X	13mm	22.5X	8.7mm	45X	4.3mm
	3X	45X	4.3mm	22.5X	8.7mm	33.75X	5.8mm	67.5X	2.9mm
	4x	60X	3.25mm	30X	6.5mm	45X	4.3mm	90X	2.2mm
WF20X Field No. 10 (optional) (No Reticle Holder) Interpupillary Distance 52~76	1X	20X	10mm	10X	20mm	15X	13.3mm	30X	6.7mm
	2X	40X	5mm	20X	10mm	30X	6.7mm	60X	3.3mm
	3X	60X	3.3mm	30X	6.7mm	45X	4.4mm	90X	2.2mm
	4x	80X	2.5mm	40X	5mm	60X	3.3mm	120X	1.7mm

Stand	Specimen Height		Specimen Height		Specimen Height		Specimen Height	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
-430PHF	0.0mm	93mm	0.0mm	19mm	0.0mm	66mm	0.0mm	120mm
-420AHF	0.0mm	45mm	Inoperative	Inoperative	0.0mm	18mm	27mm	72mm
-1105	0.0mm	437mm	0.0mm	363mm	0.0mm	410mm	00mm	464mm
-1107	0.0mm	97mm	0.0mm	23mm	0.0mm	70mm	0.0mm	124mm

4. ADAPTING SLR OR C-MOUNT CAMERA (to trinocular model only)

A. Trinocular model #420T is equipped with a port (a.) on top of binocular head. By using optional accessory adaptors, either SLR or C-mount cameras can be mounted onto the microscope.



These models are also equipped with a sliding rod (b.) located on the back side of the head. When this rod is pushed completely into the head, the microscope image is directed 100% into both eyepieces of the microscope. When this rod is pulled as far as possible away from the head, the microscope image is directed into the trinocular port. You will still be able to observe image through left eyepiece, but no image will be visible through right eyepiece.

B. To mount SLR camera, the accessory #930-420 SLR adaptor (included) is required, along with a T-mount available from any camera store. This accessory has a 2.0x photo lens incorporated within the adaptor.

Remove front lens of SLR camera. Attach appropriate T-mount in place of front camera lens. Screw threaded end of T-mount onto threaded end of SLR adaptor.

Locate two knurled screws (c.) located on side of trinocular port on microscope. Turn both screws counter-clockwise to permit removal of black plastic disk covering trinocular port.

Insert SLR adaptor tube, with camera already mounted to adaptor, into trinocular port. If adaptor does not insert easily, further loosen knurled screws at side of port until adaptor tube drops into port and is firmly seated. Retighten knurled screws to secure adaptor and camera in place. Pull sliding rod (b.) until fully extended, to direct microscope image to trinocular port.

Proceed with operation of camera according to manufacturers directions.

C. To mount C-mount ready camera, the accessory #930-421 video adaptor (included) is required. This adaptor has a 0.4x lens which assures image parfocality when viewed through a video monitor.

Observe that C-mount adaptor has two black knurled rings. If your camera has a 1/2 inch chip, leave both knurled rings in place, thereby creating a “CS” type mount. If your camera has a 1/3 inch chip, remove only the top black knurled ring from C-mount by turning counter-clockwise. The remaining black knurled ring is a “C” type adaptor. You may also purchase the optional 0.5x lens, accessory #930-422, designed specifically for 1/2 inch chips. It is designed with an adjustable focusing lens for parfocality.

Thread the front of the camera onto threads of C-mount adapter.

Locate two knurled screws (c.) located on side of trinocular port on microscope. Turn both screws counter-clockwise to permit removal of black plastic disk covering trinocular port.

Insert C-mount adapter into trinocular port. If adaptor does not insert easily, further loosen knurled screws (c.) at side of port until adaptor tube drops into port and is firmly seated. Retighten knurled screws to secure adaptor and camera in place. Pull sliding rod (b.) until fully extended, to direct microscope image to trinocular port.

MAINTENANCE

WARNING: For your own safety, turn switch off and remove plug from power source before maintaining your microscope. If the power cord is worn, cut or damaged in any way, have it replaced immediately to avoid shock or fire hazard.

1. OPTICAL MAINTENANCE

   A. Do not attempt to disassemble any lens components. Consult a microscope service technician when any repairs not covered by instructions are needed.

   B. Prior to cleaning any lens surface, brush dust or lint off lens surface using a camel hair brush. You can also use an ear syringe or canned compressed air, such as that sold by most computer stores.

   C. To clean eyepiece lenses, do not remove from eyepiece tube. Clean only the outer lens surface. Breath on lens to dampen surface, then wipe with lens paper or tissue or use a cotton swab moistened with distilled water. Wipe lenses with a circular motion, applying as little pressure as possible. Avoid wiping dry lens surface as lenses are scratched easily. If excessive dirt or grease gets on lens surfaces, a small amount of Windex can be used on a cotton swab or lens tissue. To clean objective lenses, do not remove objectives from microscope. Clean front lens element only, following same procedure.

2. MECHANICAL MAINTENANCE

   The only mechanical adjustment the microscope might require is the tension of the focusing mechanism. This has been adjusted at the factory, but over the course of time it may loosen and cause the head of the microscope to slip downward on the focusing block.

   The tension adjustment collar is located between arm and focus knob on left side of microscope. With a jewelers type screwdriver, loosen slotted set screw located on knurled surface of the tension adjustment collar. Turn collar clockwise to tighten tension, counter-clockwise to loosen tension. After adjusting, tighten the set screw to lock collar in place.

   NOTE: It is recommended that you leave the tension as loose as possible for ease of focusing, yet not so loose that it permits the head of microscope to drift downward from its own weight and cause the microscope to “drift” out of focus.

3. ELECTRICAL MAINTENANCE (only for models with illumination)

   The extent of electrical maintenance, by other than a qualified technician, should be bulb replacement. BE CERTAIN TO TURN SWITCHES OFF AND REMOVE PLUG FROM POWER SOURCE OUTLET BEFORE CHANGING BULBS.

   A. To replace top bulb (National bulb #800-422) .... remove light shade by rotating in a counter-clockwise direction. Remove light housing by rotating in a counter-clockwise direction. Remove light bulb by firmly grasping and pulling straight out from bi-pin socket. Note that this socket holds bulb securely, so you might have to pull rather firmly. Using a cloth, hold new bulb and gently push new bulb into bi-pin socket. Replace light housing and light shade.

   B. To replace bottom bulb in stand –430PHF & -420AHF (National bulb #800-138) .... remove cover plate located on bottom of base by removing four rubber feet that secure cover to base. Holding fluorescent lamp with a cloth, gently pull lamp straight out from socket. Push new lamp into place in same manner and replace cover plate.

   C. Replacement of fuse.
   The fuse is located at right rear side of microscope base. To remove fuse from holder, insert a 6mm screwdriver blade into slot located in rear of fuse holder cap. Slightly depress and rotate screwdriver ¼ turn in direction of arrow, release pressure on screwdriver to release the fuse. Pull cap and fuse out of fuse holder. Insert proper fuse into fuse cap. Insert fuse cap into fuse holder. Using screwdriver, rotate fuse cap assembly in opposite direction of arrow until guide slot engages, depress fuse cap and rotate ¼ turn to lock into fuse holder.

TROUBLESHOOTING

PROBLEM	REASON FOR PROBLEM	SOLUTION
Light fails to operate.	Outlet inoperative.	Have qualified service technician repair outlet.
	AC power cord not connected.	Plug into outlet.
	Lamp burned out.	Replace lamp.
	Fuse blown.	Replace fuse.
Image does not remain in focus	Head of microscope drops from its own weight.	Adjust tension control.
Poor resolution (image not sharp)	Objective lenses dirty.	Clean objective lenses.
	Eyepiece lens dirty.	Clean eyepiece lenses.
Spots in field of view.	Eyepiece lens dirty.	Clean eyepiece lenses. ***
***Spots in field of view can also result from dirt on inside of eyepiece. It is recommended that you have service technician clean inside of lens.		

OPTIONAL ACCESSORIES AND PARTS:

#600-400	Eyepiece shields, rubber, pair
#605-400	WF5X Eyepieces
#615-400	WF15X Eyepieces
#620-400	WF20X Eyepieces
#705-420	Auxiliary 0.5x objective lens (Do not use with stands –420AHF)
#775-420	Auxiliary 0.75x objective lens (Allows only limited maximum specimen height with stands –420AHF)
#715-420	Auxiliary 1.5x objective lens (Minimum specimen height – 27mm on stands –420AHF)
#800-422	Replacement bulb, top light, 12v 15 watt halogen bi-pin
#800-138	Replacement bulb, bottom light, 115v 5 watt fluorescent
#800-907	Replacement bulb for 907 fluorescent ring light
#801-050	Replacement fuse for 220v version, 0.5 amp
#801-100	Replacement fuse for 117v version, 1.0 amp
#908-LED	LED ring light illuminator, requires #931-420 ring light adaptor
#930-420	SLR adaptor with 2.0x photo lens
#930-421	Video “C” mount with .04x lens
#930-422	Video “C” mount adapter with 0.5x lens (for ½” chip sensor)
#931-409	Blue filter, frosted 35.6mm O.D.
#931-420	Ring light adapter, O.D. 54.5mm (permits mounting auxiliary ring light on objective pod)
#965-400-05	Eyepiece reticle, 5mm/100 divisions, O.D. 23mm (for use only with WF10x eyepieces)
#965-400-10	Eyepiece reticle, 10mm/100 divisions, O.D. 23mm (for use only with WF10x eyepieces)
#975-001	Carrying case, anodized aluminum, fabric lining, accessory pockets, Velcro straps, keyed lock. Note: Fits all 420 series except 420-1105 & 420-1107. No case available for these models.

LIMITED LIFETIME WARRANTY

Please see our website, www.nationaloptical.com, for complete warranty details and exclusions.

MicroscopeWorld

www.microscopeworld.com
info@microscopeworld.com
800-942-0528

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