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

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INSTRUCTIONS FOR  
**450 SERIES**  
STEREOSCOPIC MICROSCOPES

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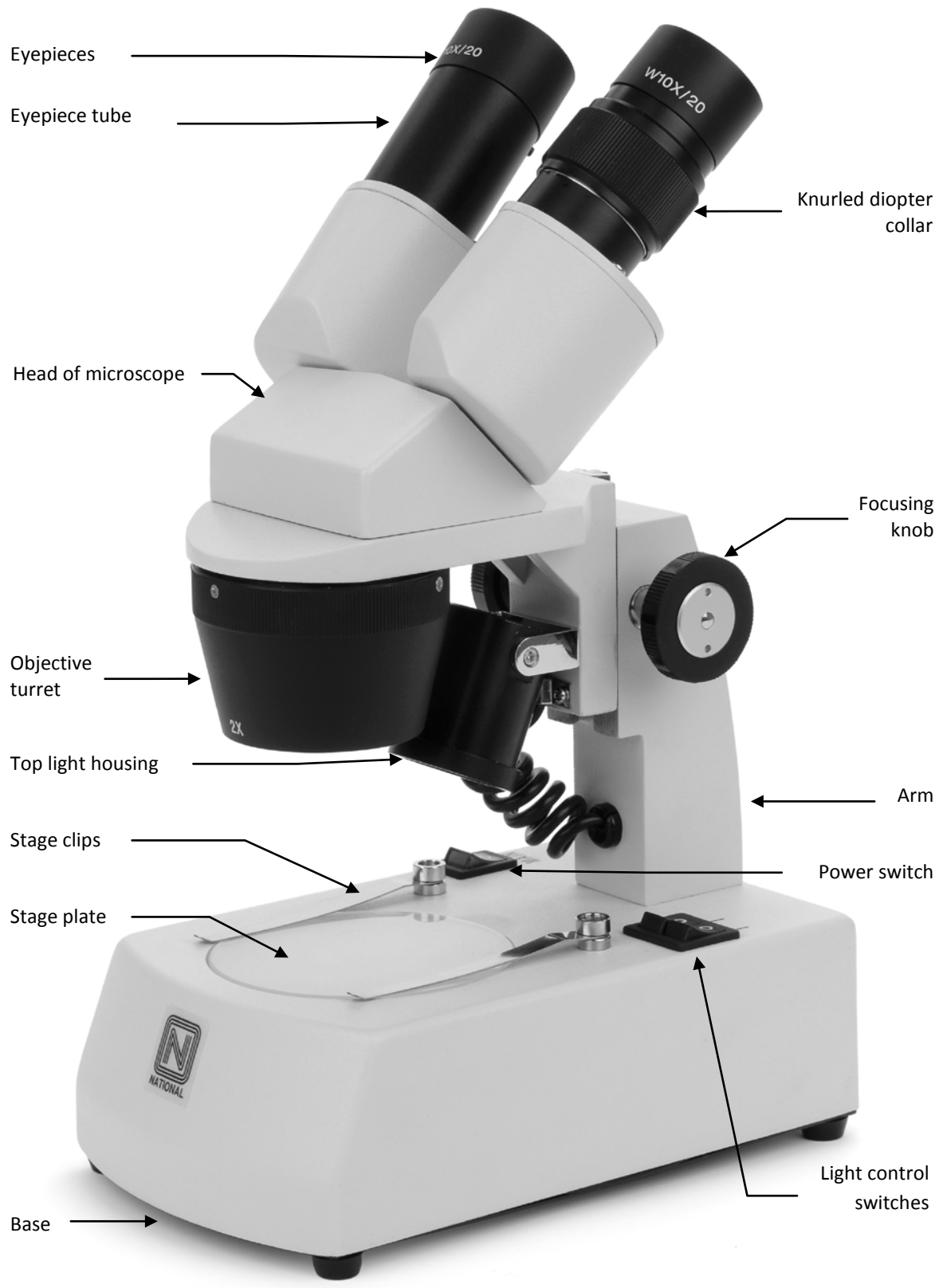
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Stereoscopic microscopes are used for viewing 3-dimensional objects, inspection or assembly of small parts, and for dissection of biological specimen. They provide an upright, unreversed image which permits easy manipulation of the object being viewed 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**

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

Remove microscope stand and head assembly from carton. Remove rubber eyeshields, dustcover and warranty card. Remove "pin spanner wrench" (used to adjust focusing tension), "L hex wrench" (used to remove locking set screw on stage plates), plastic black and plastic white contrast plates (80mm diameter). Your microscope is also supplied with a frosted glass stage plate (80mm diameter), which is already mounted in the microscope base. LED models only will have a auto recharger included.

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 & OPERATION**

1. Install rubber eyepiece shields over top of eyepieces, with the flared portion of the shields positioned at the outside edge of eyepieces. These help block out undesired light reflections, and to position your eyes at the proper point above the eyepieces.
2. This model is furnished with three 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 black or white contrast plate can be used when viewing opaque objects or for dissecting. Choose plate providing best contrast with specimen.

FROSTED GLASS PLATE MUST BE USED IF USING BOTTOM ILLUMINATION. HEAT GENERATED IN BASE FROM BOTTOM LIGHT WILL WARP OR DAMAGE THE PLASTIC BLACK OR WHITE PLATE. SUCH DAMAGE WILL NOT BE COVERED BY WARRANTY. It is acceptable to leave the glass plate in place for most viewing purposes.

To switch plates or to reverse sides of contrast plate, use the "L hex wrench" to loosen set screw at side of base, only enough to permit removal of plate. Replace plate and tighten set screw.

3. **Make certain that the main voltage of your microscope corresponds to the voltage of your power outlet, 120v AC. Insert microscope plug into matching voltage outlet.**
4. LED models only:
  - A. LED models are powered by 3 rechargeable AA nickel metal hydride batteries (supplied). These batteries may be recharged, as required, using the recharger (supplied). Each set of batteries may be recharged approximately 500 times before replacing, and each charge will provide up to 50 hours of microscope operation. The LED component (bulb) will last for up to 50,000 hours before replacement is required.

## **WARNING**

**DO NOT USE regular AA alkaline batteries. Use of other than rechargeable AA nickel metal hydride batteries could result in batteries exploding during recharge. ONLY USE THE SUPPLIED SWITCHING BATTERY RECHARGER WITH AUTOMATIC "TRICKLE CHARGE".**

B. It is recommended that you charge the batteries before initial use and after prolonged storage as the batteries may have discharged. Plug output cord from battery charger into DC recharging socket located on back of microscope base. Your automatic switching recharger operates on 100 to 240 volts AC 50/60 Hz. Plug recharger into your AC wall outlet. Battery recharger is also equipped with an automatic “trickle charge” feature, the red LED indicator lamp located on recharger will be illuminated when batteries are receiving maximum charge. After batteries are charged, the red LED indicator lamp will turn to green and charger automatically switches to “trickle charge”. The charger can be left plugged in, but for safety reasons it is a good idea to disconnect the charger from the AC wall outlet and the output cord from recharging socket after 12 hours. Batteries and charger may feel warm when charging, and unplugging the recharger is a safety precaution. Note that your microscope can be used during recharging.

5. 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)

REMEMBER to never operate bottom (transmitted) light with plastic stage plate in use.

- 6. Adjust the interpupillary distance between eyepieces to match that of your own eyes. Looking through microscope with both eyes, grasp both sides of microscope head and gently push eyepiece tubes together or pull apart until the two images blend into one image.
- 7. Turn objective turret until smaller number (lowest magnification) is towards front of microscope (away from arm), making certain that turret “clicks” into indexed position.

Magnification is determined by multiplying the number on the eyepieces times the number on the objective turret. For example, if your microscope is equipped with 10x eyepieces and the turret is positioned so that a 3 is indexed at the front of the microscope, the magnification resulting will be 30 times.

To change magnification, turn objective turret 180° until it “clicks” into position with another number on turret facing to the front of the microscope. Your microscope is parfocalled, and only slight adjustment of the focusing knobs may be required after changing from one magnification to the other.

### Specification Chart

Objective	Eyepiece				Working Distance	Maximum Specimen Height
	WF10X (supplied)		WF15X (optional)			
	Total Magnification	Field Size	Total Magnification	Field Size		
1X	10X	20mm	15X	13mm	75mm	35mm
3X	30X	6.6mm	45X	4.3mm	75mm	35mm
2X	20X	10mm	30X	6.5mm	75mm	35mm
4X	40X	5mm	60X	3.2mm	75mm	35mm

- 8. Place object to be viewed on center of stage surface.
- 9. Turn the focusing knobs until object being viewed is in focus.
- 10. Looking through right side of microscope with right eye, adjust image sharpness by turning the focusing knobs.
- 11. Looking through left side of microscope with left eye, turn diopter adjustment collar located on left eyepiece until left image is sharp. Note the scale on the diopter collar and its position in relationship to the index mark on the eyepiece tube.

You have now adjusted the microscope for your personal vision. When viewing other objects of various sizes, you should not have to make further adjustment of the diopter, and will need only to adjust the focus knobs. If other users change the diopter setting for their vision, you need only to return the diopter scale to your setting in order for it to once again be adjusted for your vision.

12. For optimum sharpness of image in the entire field of view, it is important to position your eyes at the correct point above the eyepieces. Looking through both eyepieces, slowly move your eyes towards eyepieces to a level where clarity of the entire field of view is achieved. After a brief period of viewing, you will easily find the best point for your vision.

## **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 you might ever 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.

To adjust, observe that stem of focus knob on one side of microscope has a tension adjustment collar with four small holes. Only one of these holes contains a small set screw. Using a small jewelers screwdriver, loosen this set screw. Your microscope was supplied with a small pin spanner wrench having one prong. Insert pin of the wrench into one of the holes, turn collar clockwise to tighten tension, counter-clockwise to loosen tension. In the event you have misplaced the wrench, a large rubberband placed around the collar will permit you to grip the collar and turn it by hand in order to accomplish the same adjustment. After adjusting, tighten the small 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 (120v AC Models only)

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.**

Both top and bottom lights use the same 12 volt 10 watt tubular type bulb (National #800-400).

- A. To replace top light bulb .... loosen light housing locking knob to permit removal of light housing. This knob might be very tight, requiring careful use of pliers for removal. Making certain bulb is cool, grasp and pull bulb from two tension clips which hold bulb in place. Holding new bulb with tissue (to avoid getting body oil on surface of bulb), push bulb into tension clips until it slips into position. Replace light housing and secure in place with locking knob.

- B. To replace bottom light bulb .... loosen set screw at side of base in order to remove stage plate. This will expose bottom bulb, which is removed and replaced exactly the same as top light bulb.
- C. Replacement of fuse  
The fuse is located at the left 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.

#### ELECTRICAL MAINTENANCE (LED Models only)

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 light bulb (National #800-452)....Remove two chrome crosshead screws securing upper lighthouse to light bracket and the two chrome crosshead screws securing coiled cord clamp to arm of microscope. Then remove front lens from lighthouse by rotating in a counter clockwise direction. Holding top lighthouse in one hand, remove silver spacer then feed coiled cord through bottom of lighthouse, pushing LED lamp assembly out of lighthouse. Unplug connector on bottom of LED lamp mount and replace with new LED lamp mount assembly. Reassemble lamp assembly in reverse order.
- B. To replace bottom light (National #800-453)....Loosen set screw located at side of base in order to remove stage plate. This will expose bottom LED bulb. Grasp bulb and pull out of socket. Replace with new LED lamp. Note: if light fails to illuminate remove lamp and rotate 180° and install lamp. Reinstall appropriate stage plate.

#### C. Recharging batteries:

Plug output cord from battery charger into DC recharging socket located on back of microscope base. Your automatic switching recharger operates on 100 to 240 volts AC 50/60 Hz, plug recharger into your AC wall outlet. The red LED indicator lamp located on recharger will be illuminated when batteries are receiving maximum charge. After batteries are charged, the red LED indicator lamp will turn to green and charger automatically switches to "trickle charge". The charger can be left plugged in, but for safety reasons it is a good idea to disconnect the charger from the AC wall outlet and the output cord from recharging socket after 12 hours. Batteries and charger may feel warm when charging, and unplugging the recharger is a safety precaution.

You may operate the microscope light even while it is being recharged. Simply flip light switch to "on" position and continue using microscope while the recharger is fully engaged.

#### D. Replacing batteries:

Your microscope includes 3 rechargeable AA nickel metal hydride batteries. These may be recharged up to 500 times, but if you observe that a recharge is providing significantly less than 40 hours of operation. It is probably time to replace to batteries.

**IMPORTANT WARNING: DO NOT USE REGULAR ALKALINE BATTERIES IN THIS MICROSCOPE. ANY ATTEMPT TO RECHARGE ALKALINE TYPE BATTERIES COULD RESULT IN BATTERIES EXPLODING.**

Gently lay microscope on its side. Remove the four rubber feet securing base plate to bottom of microscope and remove base plate. Battery case is mounted on base plate. Using small Phillips screwdriver, carefully remove Phillips screw that holds battery case together. Slide lid of case straight out to remove and expose batteries. Remove all 3 batteries and replace with new rechargeable AA nickel metal hydride batteries, making certain to insert with correct polarity according to markings on battery holder. Replace lid and base plate.

Follow instructions on new battery packaging to determine if they are already charged, or if they should be charged before initial use. If recharging is required, follow directions in "3.C" above.

## **TROUBLESHOOTING**

<b>PROBLEM</b>	<b>REASON FOR PROBLEM</b>	<b>SOLUTION</b>
Light fails to operate (AC models)	Outlet inoperative. AC power cord not connected. Lamp burned out. Fuse blown.	Have qualified service technician repair outlet. Plug into outlet. Replace lamp. Replace fuse.
Light fails to operate (LED models)	Batteries fully discharged. Light switch in "off" position. LED "bulb" burned out.	Recharge batteries. Turn light switch "on". Replace LED "bulb".
Image does not remain in focus	Head of microscope drops from its own weight.	Adjust tension control.
Unable to focus image	Objective turret not positioned correctly.	Turn turret until "clicks" into index position.
Poor resolution (image not sharp)	Objective lenses dirty. Eyepiece lens dirty.	Clean objective lenses. 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:**

#615-400	WF15X Eyepieces (pair), increases magnification 50%
#800-400	Replacement top & bottom bulb, 12v, 10 watt (for non-LED models only)
#800-452	Replacement top LED bulb assembly (for LED models only)
#800-453	Replacement bottom LED bulb (for LED models only)
#801-100	Replacement fuse for 117v version, 1.0 amp
#802-003	Auto cut-off recharger for rechargeable LED microscopes only
#940-410	Frosted glass stage plate, 80mm
#941-460B	Black plastic contrast plate, 80mm
#941-460W	White plastic contrast plate, 80mm
#965-400-05	Eyepiece reticle, 5mm/100 divisions, O.D. 23 mm (fits WF10x eyepiece only)
#965-400-10	Eyepiece reticle, 10mm/100 divisions, O.D. 23 mm (fits WF10x eyepiece only)

## **WARRANTY**

Please see our website, [www.nationaloptical.com](http://www.nationaloptical.com), for complete warranty details and exclusions.