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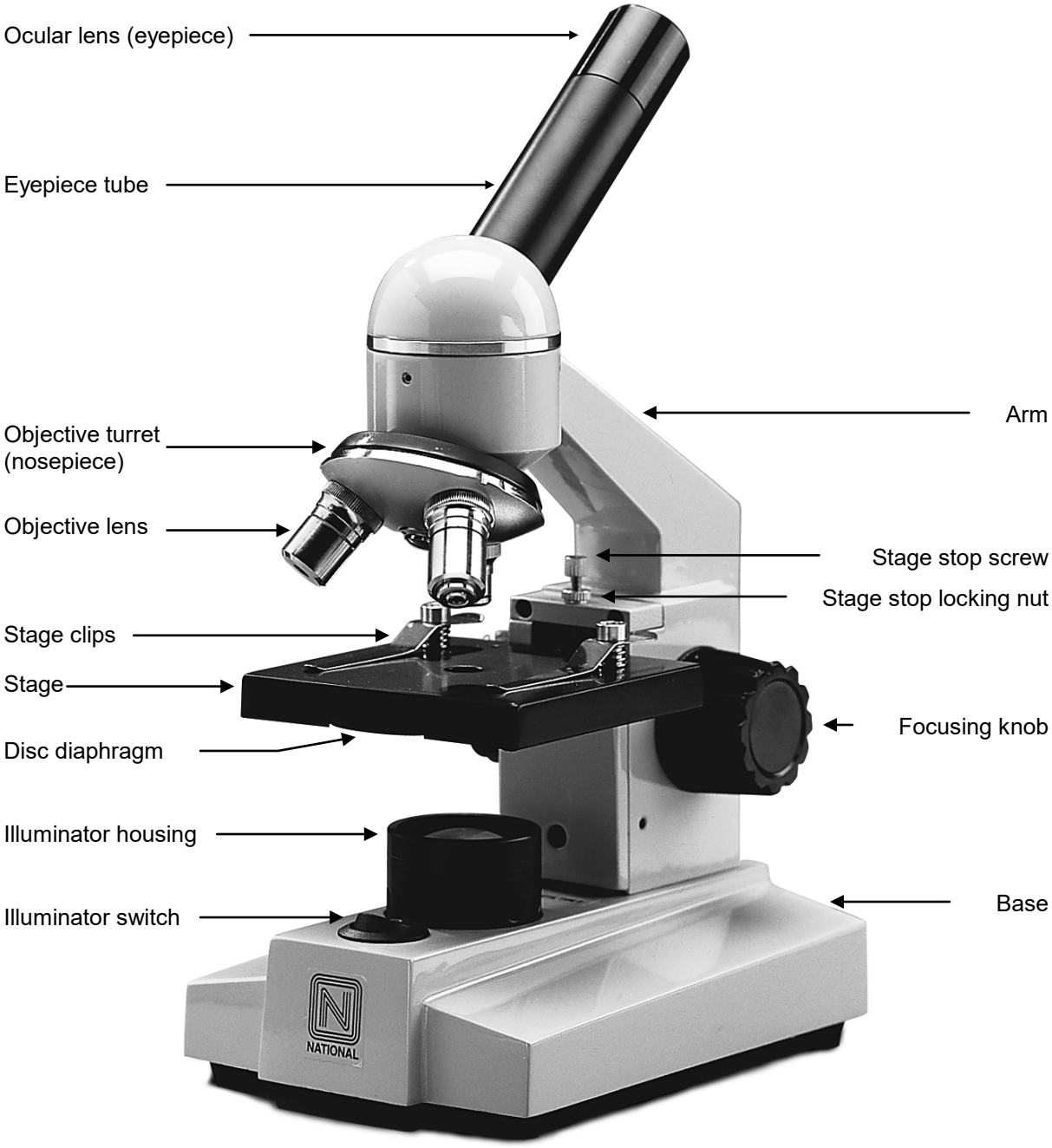
INSTRUCTIONS FOR

MODEL 104

ELEMENTARY COMPOUND MICROSCOPE


Ocular lens (eyepiece)
Eyepiece tube
Arm
Objective turret (nosepiece)
Objective lens
Stage stop screw
Stage stop locking nut
Stage clips
Stage
Focusing knob
Disc diaphragm
Illuminator housing
Base
Illuminator switch
NATIONAL

INTRODUCTION

Thank you for your purchase of a National microscope, It is a well built, precision instrument and carefully checked to assure that it reaches you in good condition. It is designed for ease of operation and years of carefree use. The information in this manual probably far exceeds what you will need to know in order to operate and maintain your microscope. However, it is provided to answer questions which might arise, and to help you avoid any maintenance expense that may be unnecessary.

Carefully read instructions before operating microscope. Nomenclature used to describe components and controls are identified on opposite page of the manual.

UNPACKING THE MICROSCOPE

Do not discard Styrofoam container or packing materials. Save in case instrument needs to be transported or shipped for repairs. Remove microscope and dustcover from container. Remove all tape and packing material used to protect microscope during shipment. Make certain lens surfaces do not come in contact with dirt, fingerprints or oil. Damage of lens surfaces occurs when they come in contact with such contaminants, and image quality is reduced.

DESCRIPTION OF COMPONENTS

A. OCULAR LENS (eyepiece): Lens closest to the eye, magnifies the primary image formed by the objective lens. The inclined eyepiece is equipped with a “pointer” that rotates as the eyepiece is rotated.

B. OBJECTIVE LENS: Lens closest to the specimen, forms the first magnified image of the specimen.

C. OBJECTIVE TURRET (nosepiece): Revolving turret designed to hold objective lenses, permits changes of magnification by rotating different powered objective lenses into optical path.

D. STAGE CLIPS: Two locked-on clips hold specimen slide in place on stage.

E. STAGE: Platform of the microscope where the specimen slide is placed.

F. DISC DIAPHRAGM: Rotating disc located below stage, with 5 or 6 holes of various apertures, designed to help achieve optimum resolution of the objective lens. Smaller apertures used for lower magnifications and larger apertures used for higher magnifications.

G. SAFETY STAGE STOP: When properly adjusted, controls maximum upward travel of stage while focusing, prevents higher power objectives from breaking specimen slides, prevents damage to objective lenses. This safety stage stop has been pre-adjusted at the factory.

H. FOCUSING KNOBS: Focusing knobs located on each side of arm, when turned, raise or lower body tube to bring specimen into focus.

I. ILLUMINATION: Built-in substage illumination provides 120v 15 watt light that is constant and reliable.

OPERATION OF MICROSCOPE

A. Always carry microscope by grasping arm with one hand and placing other hand under base.

Place microscope directly in front of you in a manner which permits you to comfortably look into the eyepiece. Note that the head of the microscope rotates 360°, permitting you to operate the microscope from the front or the back, whichever is most convenient. Most users will position the microscope with the arm facing you so that focusing knobs are most convenient to reach.

B. First, assure that light is available for illumination the specimen.
   1. Plug cord into a standard 120 volt AC three-wire grounded outlet.

   2. Flip switch located on base to ON position.

   3. In case of equipment malfunction, see Troubleshooting procedures located at the back of this manual.

C. Rotate focus knobs to move stage down (away) from objectives as far as possible.

D. Place specimen slide, cover slip facing up, on stage with specimen centered over hole in middle of stage.

E. Rotate disc diaphragm to position the largest aperture under the hole in center of stage.

F. Turn the objective turret until the 4x (smallest) objective lens clicks into position in the optical path.

   Note that each time you change from one objective lens to another you should turn the turret until you hear the click, which indicates that the lens is properly indexed in the optical path.

G. While looking through the eyepiece, rotate focusing knobs until specimen comes into focus. If image does not appear in field of view, move specimen slide slightly on stage until image appears in field of view.

H. Turn the disc diaphragm, observing that different apertures affect the sharpness of the image. Turn diaphragm until sharpest possible image is obtained. When turning the disc diaphragm, you should hear a click as each aperture comes into proper position under the hole in center of stage. If aperture is not properly positioned, you will observe shadows in the field of view when looking through the microscope.

I. Changing magnification

   1. Note that each of the three objectives have a different color ring. This permits the teacher to instruct the class to switch magnifications by referring to the color of the ring.

      4x objective – “Red” color ring
      10x objective – “Yellow” color ring
      40x objective – “Blue” color ring

   2. Total magnification obtained with each objective lens is determined by multiplying the magnification of the eyepiece times the magnification of the objective. Keep in mind that as magnification is increased, field of view (area of the specimen seen when looking through the microscope) decreases. You will find that you use the lower magnifications at most times. Always use the lowest magnification (4x objective) when first focusing on a new specimen slide, as this low magnification provides the biggest field of view, thereby making it easier to find and position the specimen within the field of view.

      10x eyepiece x 4x objective = 40 times mag. (biggest field of view)
      10x eyepiece x 10x objective = 100 times mag. (smaller field of view)
      10x eyepiece x 40x objective = 400 times mag. (smallest field of view)

   3. To change magnification:

      a. Rotate revolving nosepiece to position 10x objective into optical path. Some slight adjustment of focusing knob may be required.

      b. Rotate revolving nosepiece to position 40x objective into optical path. Some slight adjustment of focusing knob may be required.

         Note: Take care when rotating 40x objective into place. This is the longest lens and has a spring retractable mechanism which retracts slightly into its housing if the front of the lens comes in contact with the specimen slide while focusing the microscope. This prevents damage to the lens or slide.

4. To change magnification:

    a. Rotate revolving nosepiece to position 10x objective into optical path. Some slight adjustment of focusing knob may be required.

    b. Rotate revolving nosepiece to position 40x objective into optical path. Some slight adjustment of focusing knob may be required.

    Note: Take care when rotating 40x objective into place. This is the longest lens and has a spring retractable mechanism which retracts slightly into its housing if the front of the lens comes in contact with the specimen slide while focusing the microscope. This prevents damage to the lens or slide.

MAINTENANCE

WARNING: For your own safety, when servicing models with electric illuminators, turn switch to OFF position and remove plug from power source before maintaining microscope. If the power cord is worn, cut or damaged in anyway, have it replaced at once to avoid shock or fire hazard.

A. OPTICAL MAINTENANCE

1. Do not attempt to disassemble any lens components. Consult an expert technical service company when repairs not covered by these instructions are needed.

2. Prior to cleaning any lens surface, brush dirt and lint off lens surface with camel hair brush or compressed air. Use of air in a can, available at most computer stores, is good source of clean air.

3. Do not remove eyepiece lens or objective lenses from microscope. Clean only the outer lens surface by breathing on lens to dampen surface, then wipe with lens paper or cotton swab. Avoid wiping lens surface while dry, as lenses are scratched very easily.

B. MECHANICAL MAINTENANCE

1. Stage stop adjustment: Stage stop has been pre-adjusted at the factory, and should not require readjustment.

2. Metal parts: Use a clean, damp cloth to remove dust or dirt from metal part followed by a dry cloth.

C. ELECTRICAL MAINTENANCE

1. **WARNING: For your safety, turn switch off and remove plug from power source before replacing bulb. Make sure that illuminator housing and lamp are cool before servicing.**

2. Carefully lay microscope on side to reveal base plate on bottom. Observe Phillips head screws in each of the four rubber feet. Using Phillips screwdriver, remove the four rubber feet and lay perforated base plate down to expose bulb.

3. Note that the lamp does not screw out. Remove by depressing lamp slightly and rotating in a counter-clockwise direction until it pops up slightly.

4. Insert new bulb, gently depress into socket and rotate clockwise. Carefully wipe new bulb to insure that it is clean and free of all fingerprints. Any dirt or oil on lamp surface will affect light efficiency and bulb life.

5. Replace metal base plate and rubber feet.

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.
	Disc diaphragm has not “clicked” into proper position and is blocking light source beneath stage	Turn disc diaphragm until it “clicks” into position.
Image does not remain in focus	Cover slip on specimen slide too thick.	Use 0.17mm thick cover slip. (No. 1 cover slip)
	Slide upside down.	Place slide on stage with cover slip facing up.
Poor resolution (image not sharp)	Objective lenses dirty.	Clean objective lenses.
	Eyepiece lens dirty.	Clean eyepiece lenses.
	Too much light.	Adjust disc diaphragm
Spots in field of view.	Eyepiece lens dirty.	Clean eyepiece lenses.
	Specimen slide dirty.	Clean slide.

OPTIONAL ACCESSORIES AND PARTS:

#800-101 Replacement bulb, 115v 15 watt, D.C. medium bayonet base

WARRANTY – 5 YEAR LIMITED WARRANTY

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

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