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INSTRUCTIONS FOR

MODEL DC4-156-S

COMPOUND BIOLOGICAL MICROSCOPE WITH DIGITAL CAMERA

(For microscope operation only. Camera operation covered in separate instructions)

HOW TO USE YOUR MICROSCOPE SERIAL NUMBERS

1. Microscope serial number: This number (etched on back arm of microscope) is the number under which your warranty is registered.
2. Microscope DM number: This number (found on a white sticker on the bottom of the microscope) is used for logging on the Motic web site, which gives you the ability to download free software upgrades.

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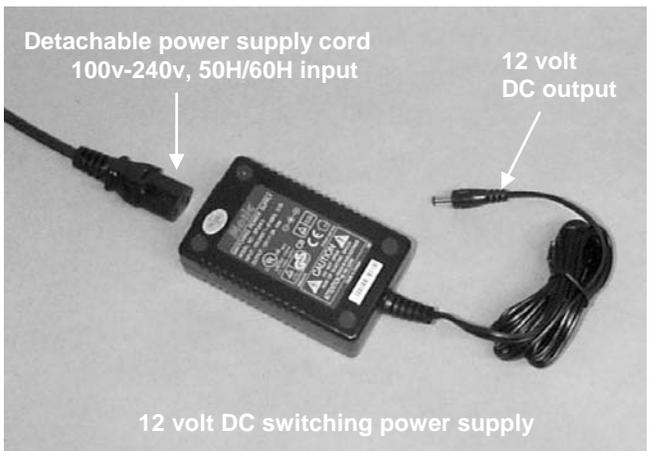
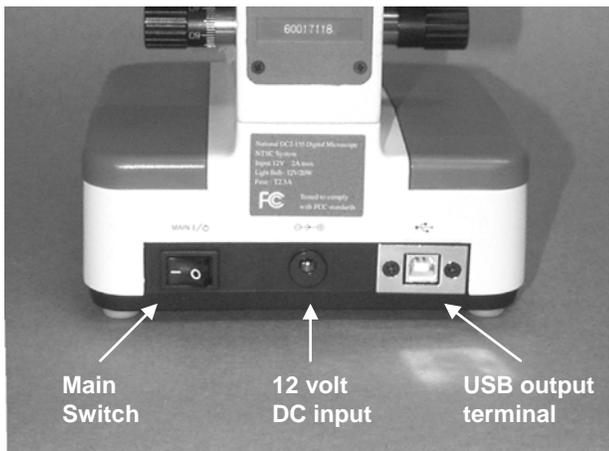
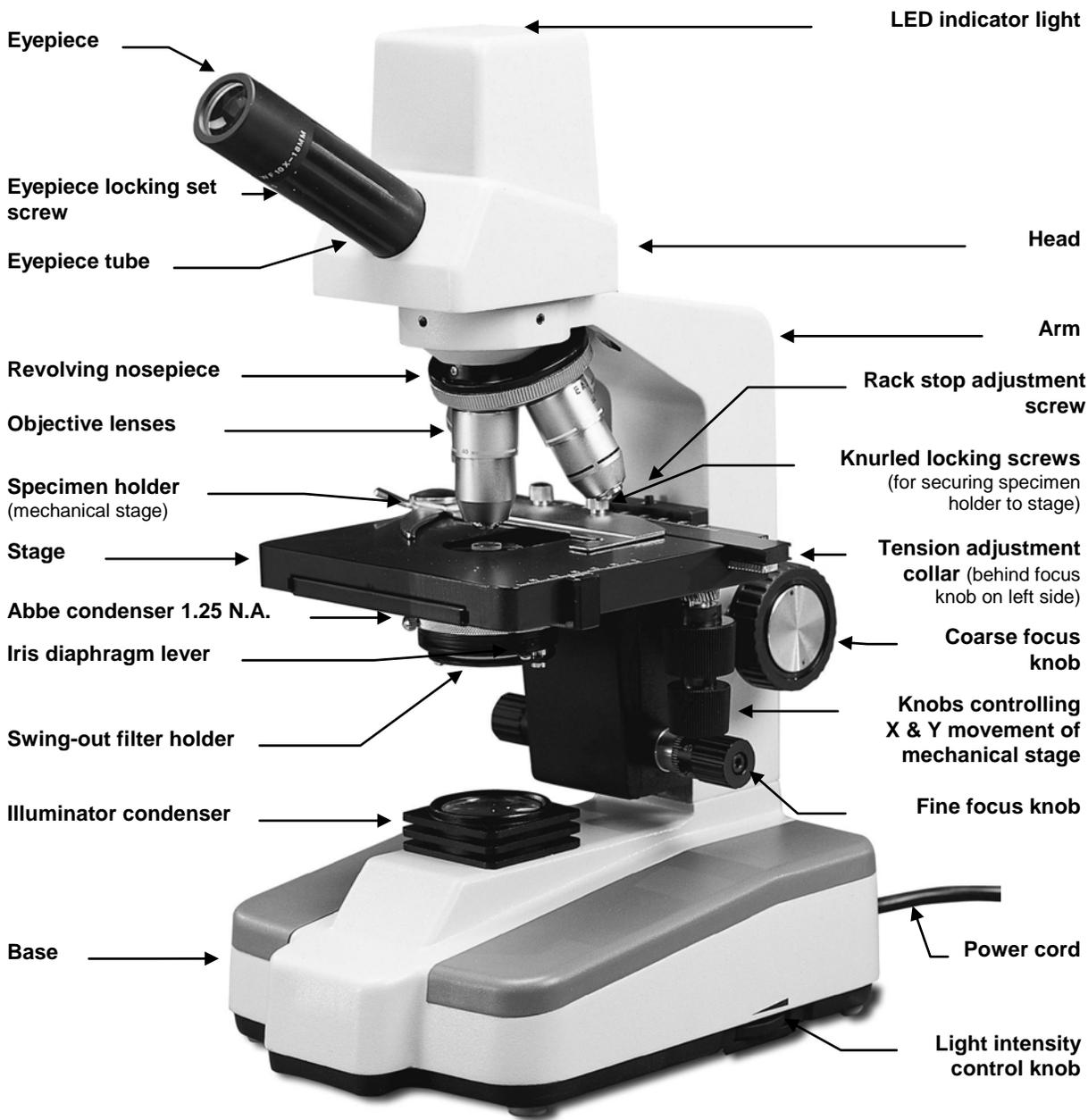
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*One per dome month, winners will be selected by our website.

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About the Digital Microscope

Your new digital microscope incorporates a built in camera that utilizes ultra high-speed data transmission made possible through a simple plug and play USB 2.0 cable. In order to achieve optimum results, it is important that you carefully read both this and the software instructions located on Motic disc before operating your microscope or camera.

UNPACKING

1. Your microscope is packed with the following components, all of which have been checked at the factory. Carefully remove all components and check against this list. Retain styrofoam container in case microscope must be transported or returned to factory for any reason.
 - A. Microscope, with WF10x eyepiece, four objective lenses, 1.25 N.A. Abbe condenser, specimen holder already installed.
 - B. Instruction manual
 - C. CD Motic Images software (instructions for software on disc)
 - D. Calibration slide
 - E. 12VDC switching power supply, operates on 100v-240v, 50H/60H
 - F. Power cord
 - G. USB 2.0 cable (for connecting to computer)
 - H. Rubber eyecup
 - I. Blue filter and frosted neutral filter.
 - J. 2mm "L" type key wrench (for rack stop adjustment)
 - K. 0.9mm "L" type key wrench (for tension adjustment collar)
 - L. Dustcover
 - M. Warranty card
2. Retain Styrofoam container in case microscope must be transported or returned to factory for any reason. If it becomes necessary to ship the microscope for any reason, repack 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.

DESCRIPTION OF COMPONENTS

1. LED INDICATOR LIGHT: Indicates if camera is on, power supplied by USB.
2. EYEPIECE (ocular lens): Lens closest to the eye, magnifies the primary image formed by the objective lens.
3. OBJECTIVE TURRET (nosepiece): Revolving turret which holds objective lenses, permits changes of magnification by rotating different powered objective lenses into optical path. Reverse position permits easier access to stage when positioning specimen slides.
4. OBJECTIVE LENS: Lens closest to the object being viewed, forms first magnified image of the specimen.
5. MECHANICAL SPECIMEN HOLDER: Permits precise, mechanical manipulation of the specimen slide.
6. STAGE: Platform of the microscope where the specimen slide is placed.
7. CONDENSER: A 1.25 N. A. Abbe condenser lens positioned under center of stage, condenses light rays from substage illumination and fills the back lens element of objective lens to improve image resolution.
8. IRIS DIAPHRAGM: Attached to bottom of Abbe condenser, controls aperture of light by moving control lever left or right.
9. SWING OUT FILTER HOLDER: Used for holding 32mm filters.

10. SAFETY RACK STOP: When properly adjusted, controls maximum upward travel of stage. Prevents higher power objectives from breaking specimen slides, prevents damage to objective lenses. This stop has been pre-adjusted at the factory.
11. FOCUSING KNOBS: Coarse focusing knobs (larger knobs) located on each side of arm, raise or lower stage to bring specimen image into focus. Fine focus knobs (smaller knobs located just below coarse focusing knobs) permit more precise image adjustment.
12. ILLUMINATION: Built-in substage electric illuminator provides constant, reliable pre-focused illumination.
13. RHEOSTAT INTENSITY CONTROL: Controls illumination intensity. Always turn control to lowest intensity before turning microscope power on or off. This extends bulb life.
14. 12VDC POWER CORD/CONVERTER: Accepts 100v-240v 50H/60H input and supplies 12VDC power to the microscope. Note that this converter accommodates either 120v or 240v and 50H or 60H power supply, eliminating the need for any additional transformer.
15. ON/OFF SWITCH: This turns microscope lamp on
16. USB 2.0 CABLE: Connects microscope & camera to computer.

OPERATION

Your microscope is fully functional as a standard microscope. The following instructions apply only to operation of the microscope. Refer to the software instructions for installation of the software and operation of the camera. Some steps for microscope operations are altered slightly in the software documentation, in order to utilize some of the unique features provided by the digital camera and software.

1. Illumination.
 - A. **Adjust intensity control on side of base to the minimum position.** This should be done prior to each time light is turned on or off, in order to extend bulb life.
 - B. Plug one end of power cord into 12VDC switching power converter and other end into power outlet. Plug 12VDC converter into power jack on base of microscope. Flip power switch on microscope base "on". Note that camera LED indicator will not light until USB 2.0 cable is connected to computer, and camera turned on by software commands.
2. Focusing the microscope.
 - A. Position the 4x objective lens into the optical path, making sure that lens is properly indexed in its click-stop position.
 - B. Swing moveable finger on slide holder outward. Place specimen slide (cover slip up) on top of stage surface against fixed side of slide holder. Slowly release moveable finger until it makes contact with specimen slide.
 - C. Rotate coarse focusing controls until specimen comes into focus.
 - D. Adjust fine focus controls until specimen is in sharp focus.
 - E. Adjusting the aperture (opening) of iris diaphragm.

Iris diaphragm should not be used to control the brightness of illumination. Iris diaphragms are designed to help achieve high resolution of specimen and provide contrast in the image. Smaller apertures will deliver higher contrast to image. However, closing aperture too much will reduce resolution. Experimentation is the best method of determining the correct opening of diaphragm. Some suggested openings for iris diaphragm are:

OBJECTIVE

4x
10x
40x
100x

DIAPHRAGM OPENING

From fully closed to 1/8 open
1/8 to 1/4 open
1/4 to 1/2 open
1/2 to 3/4 open

- F. Usage of filters (one 32mm O.D. transparent blue filter and one frosted neutral filter has been provided with your microscope)
- Placing a filter into the optical path will absorb some of the light from the illuminator base, limiting the light output. Filters should only be used when they help enhance the image or to help reduce brightness of field.
 - To insert filter, grasp filter holder knob and swing out filter holder, insert filter into slot provided and swing filter into optical path.
 - When handling the filter do not touch lens surfaces as fingerprints and smudges will result in poor images.
- G. Changing magnification.
- Rotate revolving nosepiece to position 10x objective into optical path.
 - This microscope has been parfocalized, which allows changes from one objective to another while requiring only a slight adjustment of the fine focus controls.
 - When changing to the 40x and 100x objective lens, care must be exercised when positioning these lenses into the optical path, in order to prevent damaging the front lens element and specimen slide.
 - In order to obtain maximum resolution of the 100x oil immersion lens, it is necessary to apply immersion oil between the coverglass of slide and front lens of the objective.
 - Use of a very small amount of immersion oil is required.
 - All air bubbles must be removed from between lens and slide by gently rotating nosepiece back and forth.
 - When finished viewing, all parts that come in contact with oil must be cleaned. Failure to do so could permanently damage the 100x oil objective lens. Use of Windex to clean immersion off lens surfaces is recommended.

Microscope Specification Chart

Objective	N.A.	Color Code Ring	Field of View	Working Distance	Magnification with WF10X eyepiece
Din 4X	0.10	Red	4.5mm	26.4mm	40X
Din 10X	0.25	Yellow	1.8mm	5.5mm	100X
Din 40X	0.65	Blue	0.45mm	0.48mm	400X
Din 100X	1.25	White	0.18mm	0.06mm	1000X

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. Do not remove eyepieces or objective lenses to clean. 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.

NOTE: Fingerprints or other matter on the front lens element of the objective lens is the single most common reason that you will have difficulty in focusing the microscope. Before having costly servicing done, or before returning to National for "warranty repair", make certain to examine the front lens element with a magnifying glass or eye loupe for the presence of such contaminants. If a microscope is returned to National for warranty repair, and it is determined that such contaminants are the problem, this is not covered under warranty and National will submit a cost estimate for cleaning.

2. MECHANICAL MAINTENANCE

- A. The rack stop screw has been pre-adjusted at the factory and should not require re-adjustment. However, if you do attempt re-adjustment, note the following procedure. Using a 2mm "L" type hex key wrench, loosen rack stop socket set screw. With fine focus adjustment at mid-range, focus on standard slide until sharp image is obtained. Rotate rack stop set screw in clockwise direction until tight.
- B. Coarse focus tension adjustment prevents the stage from drifting down from its own weight and causing the image to move out of focus. This has been adjusted at the factory, but over the course of time it may loosen and cause the stage of the microscope to slip downward on the focusing block.

The tension adjustment collar is located between arm and coarse focus knob on right side of microscope. Using a 0.9mm "L" type hex key wrench, loosen the socket set screw located in the hole on tension adjustment collar. Turn collar clockwise to tighten tension, counter-clockwise to loosen tension. Use of a wide rubberband will provide a better grip on the tension adjustment collar. After adjusting, tighten the socket 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 stage of microscope to drift downward from its own weight and cause the microscope to "drift" out of focus.

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

3. ELECTRICAL MAINTENANCE

- A. 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.**
- B. To replace bulb, gently lay microscope on side. Using a Phillips (cross-head) type screwdriver, remove 5 each 3mm Phillips screws from bottom of base. Remove base plate to expose bulb. Using a tissue or cloth to gently grasp the halogen bulb, pull straight out of lamp socket. Your microscope requires a 12 volt, 20 watt halogen bi-pin bulb, available from the dealer from which your purchased your microscope. This is a common microscope bulb, Osram #64425 or equal. Make certain that new bulb is clean. Grasping bulb gently with tissue or cloth, insert pins straight into lamp socket. Replace base, and secure with 5 each 3mm Phillips screws.

TROUBLESHOOTING

PROBLEM	REASON FOR PROBLEM	SOLUTION
Light fails to operate.	Outlet inoperative. AC power cord not connected. 12 volt DC output plug not plugged into DC power jack. Lamp burned out.	Have qualified service technician repair outlet. Plug into outlet. Plug 12 volt DC output plug into DC power jack. Replace lamp.
Image does not remain in focus	Stage of microscope drops from its own weight.	Adjust tension control.
Image will not focus	Rack stop not set at proper position. Slide upside down. Slide cover slip too thick.	Adjust rack stop. Place slide on stage with cover slip up. Use 0.17mm thick cover slip (No.1 cover slip)
Poor resolution (image not sharp)	Objective lenses dirty. Eyepiece lens dirty. Too much light.	Clean objective lenses. Clean eyepiece lenses. Adjust disc diaphragm.
Spots in field of view.	Eyepiece or condenser lens dirty. Specimen slide dirty.	Clean lens. *** Clean slide.
***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:

- #610-155 WF10x eyepiece w/pointer
- #800-160 Replacement bulb, 12v 20 watt halogen bi-pin, (Osram #64425 or equal)

LIMITED LIFETIME WARRANTY

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