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INSTRUCTIONS FOR

MODEL DC-128

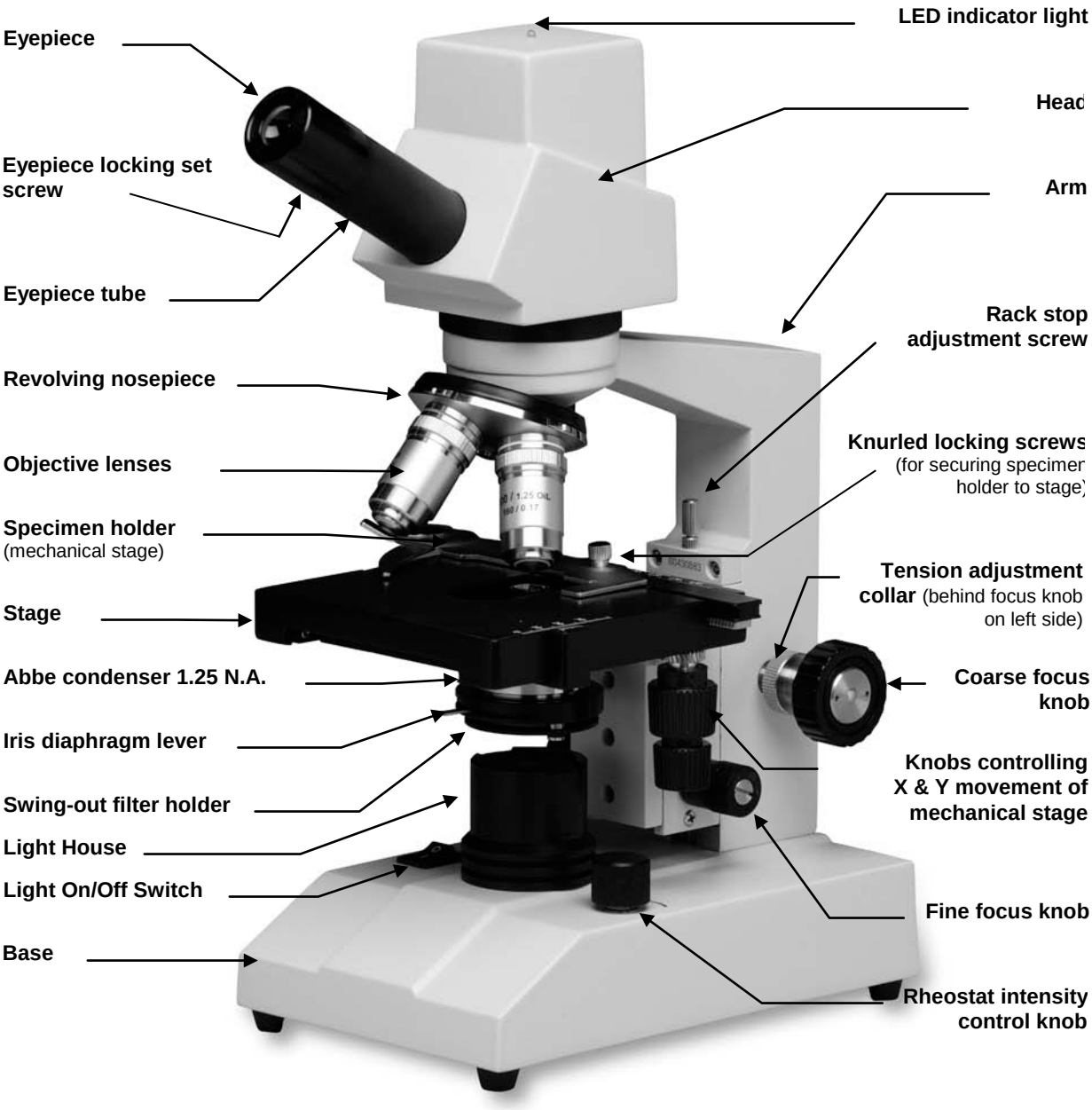
COMPOUND BIOLOGICAL MICROSCOPE
WITH DIGITAL CAMERA

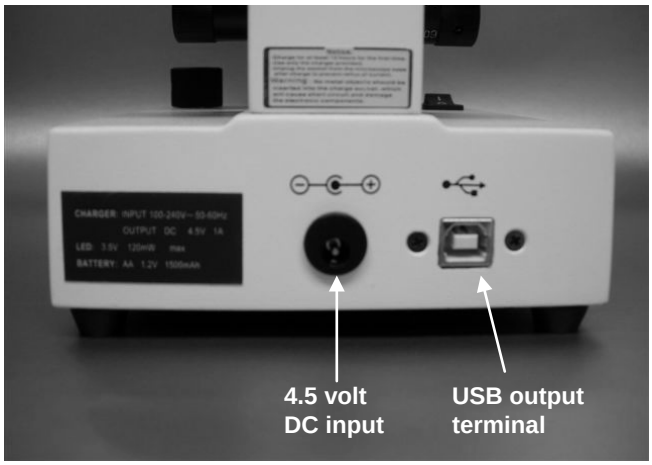
(For microscope operation only. Camera operation covered on Motic Images CD.)

HOW TO USE YOUR MICROSCOPE SERIAL NUMBERS

1. Microscope serial number: This number (etched on inside of small ledge immediately behind stage plate) is the number under which your warranty is registered.

2. Microscope & Motic CD DM number: This number (found on a white sticker on the bottom of the microscope and on CD sleeve) is used for logging on the Motic web site, which gives you the ability to download free software upgrades.


LED indicator light
Eyepiece
Head
Eyepiece locking set screw
Arm
Eyepiece tube
Rack stop adjustment screw
Revolving nosepiece
Knurled locking screws (for securing specimen holder to stage)
Objective lenses
Specimen holder (mechanical stage)
Tension adjustment collar (behind focus knob on left side)
Stage
Coarse focus knob
Abbe condenser 1.25 N.A.
Iris diaphragm lever
Knobs controlling X & Y movement of mechanical stage
Swing-out filter holder
Light House
Light On/Off Switch
Fine focus knob
Base
Rheostat intensity control knob


4.5 volt DC input
USB output terminal


4.5 volt DC recharger

About the Digital Microscope

Your new digital microscope incorporates a built-in camera that uses data transmission made possible through a simple plug and play USB cable. In order to achieve optimum results, it is important that you carefully read this manual before operating your microscope. Instructions for software are located on Motic Images CD.

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.

   A. Microscope, with WF10x eyepiece, four objective lenses, and 1.25 N.A. Abbe condenser.

   B. Specimen holder

   C. CD Motic Images software for PC and Mac

   D. Calibration slide

   E. USB cable (for connecting to computer)

   F. Automatic switching recharger operates on 100 to 240 volts AC 50/60 Hz.

   G. 0.9mm "L" type hex key wrench (for replacing LED lamp).

   H. Dustcover

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. LED light becomes illuminated after software commands turn camera ON.

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.

4. OBJECTIVE LENS: Lens closest to the object being viewed, forms first magnified image of the specimen.

5. SPECIMEN HOLDER: Holds 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. FILTER HOLDER: Swing out filter holder with special neutral filter built in.

10. ON/OFF SWITCH: Main power switch for microscope LED Illuminator.

11. LIGHT HOUSE: Built-in substage LED illuminator provides constant, reliable pre-focused illumination equal to a 20-watt tungsten bulb. Powered by 3 rechargeable AA nickel metal hydride batteries, no power outlet or electric cord are needed.

12. RHEOSTAT INTENSITY CONTROL: Controls the intensity of the LED illuminator.
13. 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.

14. MECHANICAL STAGE: Permits precise mechanical manipulation of the specimen slide.

15. TENSION ADJUSTMENT COLLAR: Used to adjust tension of focusing mechanism.

16. 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.

17. RECHARGER: Automatic switching charger used to recharge batteries. The auto recharger will accept 120v to 240v current, either 50H or 60H, without the need for any additional transformer.

18. USB CABLE: Connects microscope & camera to computer.

ASSEMBLY

1. SPECIMEN HOLDER:

   A. Rotate coarse focusing knob to move stage platform to its lowest position.

   B. Remove two knurled screws from mechanical stage platform.

   C. Place specimen holder on stage and using the two knurled locking screws, attach specimen holder to mechanical stage.

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 located on the Motic Images CD for operation of 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. Place microscope directly in front of you in a manner which permits you to comfortably look into the eyepiece and easily reach the focusing controls

2. Assure that light is available for illuminating the specimen.

   A. Your microscope has special LED illumination that is 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 charger into your AC wall outlet. Battery recharger is 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". Note that your microscope can be used during recharging. 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.

   C. Turn "on/off" switch located on microscope base to "on" position and proceed as follows.

3. 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 specimen 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, use the illuminator light intensity control to adjust light level. 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	**DIAPHRAGM OPENING**
4x	From fully closed to 1/8 open
10x	1/8 to 1/4 open
40x	1/4 to 1/2 open
100x	1/2 to 3/4 open

   F. Usage of special built-in neutral filter.

      a) Placing a filter into the optical path will absorb some of the light from the illuminator base, limiting the light output.

      b) When using 4x and 10x objectives the special neutral filter must be in optical path.

      c) When using the higher power 40x and 100x objectives remove filter from optical path.

      d) To remove filter, grasp filter holder knob and swing out filter holder.

   G. Changing magnification.

      a) Rotate revolving nosepiece to position 10x objective into optical path.

      b) This microscope has been parfocalled, which allows changes from one objective to another while requiring only a slight adjustment of the fine focus controls.

      c) 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.

      d) In order to obtain maximum resolution of the 100x oil immersion lens, it is necessary to apply immersion oil between the cover glass of slide and front lens of the objective.

         (1) Use of a very small amount of immersion oil is required.
         (2) All air bubbles must be removed from between lens and slide by gently rotating nosepiece back and forth.
         (3) When finished viewing, all parts that come in contact with oil must be cleaned. Failure to do so could permanently damage the 100x oil immersion objective lens. Use Windex to clean immersion oil off lens surfaces is recommended.

Objective 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 power switch off, remove plug from AC power source and remove charging cord from microscope input before maintaining your microscope. If the power cord, recharger 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 hairbrush. 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. Breathe 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.

      Loosen round knurled locking nut by turning counter clockwise, and then loosen the knurled head rack stop screw. With fine focus adjustment at mid-range, focus on standard slide until sharp image is obtained. Rotate rack stop setscrew in clockwise direction until tight, tighten locking nut.

   B. Coarse focus tension adjustment prevents the stage from drifting down from its own weight and causing the image to move out of focus. The tension adjustment has been adjusted to appropriate tension at the factory. However, after some period of use, tension can loosen, and the stage will "sink" from its own weight or from any slight pressure applied to the stage. This will cause the microscope image to move out of focus, and you will need to readjust the tension control.

      a. When looking at the back of microscope (facing USB port and DC recharging port) the tension adjustment wheel is the chrome-knurled wheel immediately inside the large, coarse focusing knob on the left side of microscope.

      b. Turn adjustment wheel clockwise to tighten tension and counter-clockwise to loosen tension.

      c. 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 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 LED replacement, battery recharging and battery replacement. Before maintenance, be sure that recharger is not connected to microscope.

   B. 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 charger 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.

C. 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.

Note that your microscope can be used during recharging. Simply turn "on/off" switch on back of microscope base to "on" position and proceed as follows. In case of equipment malfunction, see "Troubleshooting" procedure.
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 four rubber feet that secure cover plate to base and remove plate. Battery case is mounted on inside of base. Using small Phillips screwdriver, carefully remove Phillips screw that holds battery case together. Slide lid of case straight back 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 of battery case, replace Phillips screw, replace base plate and four rubber feet.

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.b" above.

D. Replacing LED element:

An LED "bulb" will last up to 50,000 hours, so you don't have to do this exercise very often.

To open the illuminator field lens housing, use hex wrench supplied with your microscope to loosen hex screw on side of lens housing. Remove lens housing to expose LED "bulb." Remove bulb by grasping the plastic base of bulb and gently pulling straight up. Insert new LED "bulb", replace lens housing and tighten hex screw to secure lens housing in place.

TROUBLESHOOTING

PROBLEM	REASON FOR PROBLEM	SOLUTION
Light fails to operate.	Batteries fully discharged.	Recharge batteries.
	Batteries fully discharged and will not recharge.	Replace batteries or replace charger.
	Rheostat control not turned far enough.	Turn rheostat to increase light intensity.
	Light switch in off position.	Turn light switch on.
	LED "bulb" burned out.	Replace LED "bulb".
Image does not focus	Slide upside down.	Place slide on stage with cover slip up.
	Slide cover slip too thick.	Use 0.17mm thick cover slip (No.1 cover slip)
Poor resolution (Image not sharp)	Objective lenses dirty.	Clean objective lenses.
	Eyepiece lens dirty.	Clean eyepiece lenses.
	Too much light, light intensity not adjusted properly.	Adjust light intensity.
	Too much light, iris diaphragm Not adjusted properly.	Adjust iris diaphragm.
	Too much light when using 4x and 10x objective lenses, swing out filter not in optical path.	Place swing in filter into optical path.
Spots in field of view.	Eyepiece or condenser lens dirty.	Clean lens. ***
	Specimen slide dirty.	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:

#610-045	WF10x eyepiece w/pointer
#800-001	Replacement LED light
#802-003	Auto cut-off recharger for rechargeable LED microscope.
#951	Dustcover, 16” tall x 13”, heavy-duty vinyl with stitched seams
#975-001	Carrying case anodized aluminum, fabric lining, accessory pockets, and Velcro straps, keyed lock.

LIMITED LIFETIME WARRANTY

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

MicroscopeWorld

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