Motic®

BA210LED Digital

Digital Microscope Instruction Manual

Note If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WWW.MOTIC.COM

Motic China Group Co.,Ltd

CE

Dear Customer,

Thank you for choosing a Motic Digital Microscope.

We are constantly improving our instruments and adapting them to the requirements of modern research techniques and testing methods. This may involve modification to the mechanical as well as optical components of our digital microscope.

Therefore, all descriptions and illustrations in this instruction manual, including all specifications are subject to change without prior notice.

Best regards,

Your Motic Team

FCC Statement:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

Correct operation ensures the digital microscope's long-term proper usage. Contact your local Motic distributor for maintenance needs or contact Motic directly through our website www.motic.com.

INFINITY CORRECTED OPTICS

In this optical concept the light beams are parallel after leaving the objective in the direction of the eyepieces. A second optical element, the tube lens (normally located in the eyepiece tube) is used to converge the parallel beams, resulting in an intermediate image. The intermediate image is focussed by the eyepieces, to provide the real image for visual observation.
The implementation of a tube lens gives the opportunity to minimize chromatic aberrations and other “optical defects”. Further, in “Infinity Optics” the distance between the objective and tube lens is not as strictly fixed as in the (historically older) “Finite Optics” of 160mm tube length.
This allows additional optical components to be inserted between the objective and tube head. Fluorescence attachments, discussion bridges, eye level risers and other options can be added without affecting the image quality.
In general “Infinity Optics” provides flexibility and the opportunity to add additional optional features.

CONVENTIONAL DIGITAL MICROSCOPE

The conventional digital microscope has a two-stage magnification system. There are two lens systems, the objective and the eyepiece, mounted at opposite end of a body tube. The objective forms an enlarged real image of the object being examined and is called intermediate image. The intermediate is further enlarged by the eyepiece and is seen as a virtual image of the intermediate image. The eye can examine this final image, situated at infinity. The total magnification of the digital microscope is determined by the focal lengths of the objective and eyepiece, and can be calculated as objective magnification X eyepiece magnification. For instance, 40x objective X 10x eyepiece = 400x magnification.

DIGITAL MICROSCOPE TERMINOLOGY

Abbe Condenser

A two-lens sub-stage condenser located below the stage of adigital microscope and functions to collect light and direct it onto the object being examined.Its high numerical aperture makes it particularly suited for use with most medium-and high-magnification objectives.

Aperture, Numerical (N.A.)

The numerical aperture is an important factor determining the efficiency of the condenser and objective. It is represented by the formula: (N.A. = **ηsinα**), where **η** is the refractive index of a medium (air, water, immersion oil etc.) between the objective and the specimen or condenser, and **α** is half of the maximum angle at which light enters or leaves the lens from or to a focused object point on the optical axis.

Cover Glass Thickness

Transmitted light objectives are designed to image specimens that are covered by a thin cover glass (**cover slip**). The thickness of this small glass piece is now standardized at 0.17 mm for most applications.

Diaphragm, Condenser

A diaphragm, which controls the effective size of the condenser aperture. A synonym for the condenser illuminating aperture diaphragm.

Magnification

The number of times by which the size of the image exceeds the original object. Lateral magnification is usually meant. It is the ratio of the distance between two points in the image to the distance between the two corresponding points in the object.

Micrometer: *um*

A metric unit of length measurement
= $1x10^{-6}$ meters or 0.000001 meters

Nanometer (nm)

A unit of length in the metric system equal to 10^{-9} meters.

Phase–contrast (microscopy)

A form of microscopy, which converts differences in object thickness and refractive index into differences in image amplitude and intensity.

Real Viewfield

The diameter in millimetres of the object field.

$$\text{Real Viewfield} = \frac{\text{Eyepiece Field of View}}{\text{Objective Magnification}}$$

For example BA210 :

Eyepiece field of view = 20mm
Objective magnification = 10X
Diameter of the object field = 20/10
= 2.0mm

Diopter adjustment
The adjustment of the eyepiece of an instrument to provide accommodation for the eyesight differences of individual observers.

Depth of Focus
The axial depth of the space on both sides of the image plane within which the image is sharp. The larger the N.A. of objective, the shallower the depth of focus.

Field of View (F.O.V.)
That part of the image field, which is imaged on the observer's retina, and hence can be viewed at any one time. The field of view number is now one of the standard markings of the eyepiece.

Filter
Filters are optical elements that selectively transmit light. It may absorb part of the spectrum, or reduce overhaul intensity or transmit only specific wavelengths.

Immersion Oil
Any liquid occupying the space between the object and digital microscope objective.
Such a liquid is usually required by objectives of 3-length or less. mm focal

Resolving Power
A measure of an optical system's ability to produce an image which separates two points or parallel lines on the object.

Resolution
The result of displaying fine details in an image

Total Magnification
The total magnification of a digital microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.

Working Distance
This is the distance between the objective front lens and the top of the cover glass when the specimen is in focus. In most instances, the working distance of an objective decreases as magnification increases.

X–axis
The axis that is usually horizontal in a two-dimensional coordinate system. In microscopy X-axis of the specimen stages is considered that which runs left to right.

Y–axis
The axis that is usually vertical in a two-dimensional coordinate system. In microscopy Y-axis of the specimen stages is considered that which runs front to back.

1.SETTING UP THE INSTRUMENT

Avoid placing the instrument in locations exposed to direct sunlight, dust, vibration, high temperature and high humidity and where it is difficult to unplug the power supply cord.

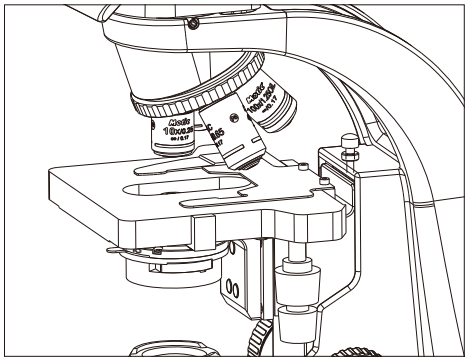
1.1 Operating environment

- Indoor use
- Altitude: Max 2000 meters
- Ambient temperature: 15°C to 35°C
- Maximum relative humidity: 75% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C
- Supply voltage fluctuations: Not to exceed ±10% of the normal voltage.
- Pollution degree: 2 (in according with IEC60664)
- Installation / Overvoltage category: 2 (in according with IEC60664)
- Air pressure of 75kPa to 106 kPa
- Avoid frost, dew, percolating water, and rain

1.2 Verifying input voltage

- The automatic voltage selection works with a broad range of settings. However, always use a ower cord that is rated for the voltage used in your area and that has been approved to meet local afety standards. Using the wrong power cord could cause fire or equipment damage.
- If using an extension cord, use only a power supply cord with a protective earth (PE) wire.
- In order to prevent electric shock, always turn the power switch on the power supply off before connecting the power cord.

1.3 Mechanical stage



- Remove specimen holder for fast hand scanning of slides.
- Left hand and right hand operation stages are available.

1.4 Specimen holder

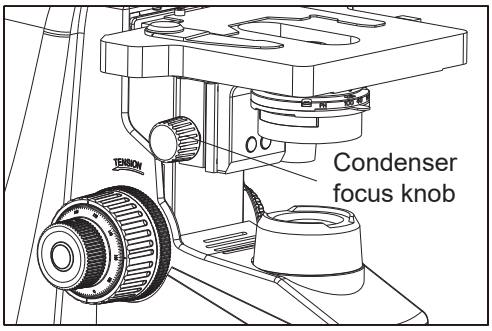
- Attach the specimen holder, using the two mounting holes.

1.5 Objectives

- Lower the stage completely. Screw the objectives into the revolving nosepiece so that clockwise rotation of the nosepiece brings the next higher magnification objective into position.

1.6 Condenser

- Raise the stage by turning the coarse focus knob.
- Raise the condenser carrier by turning the condenser focus knob.
- Insert the condenser into the mount with aperture scale facing forward towards the user.
  Secure with the condenser clamp screw.
- Turn the condenser focus knob to raise the condenser as far as it will go.

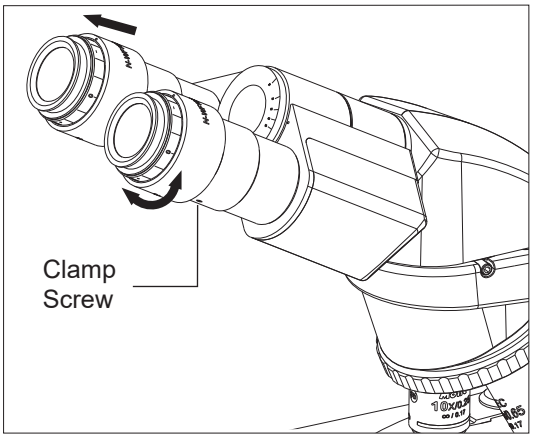


1.7 Eyepiece tube

- Loosen the eyepiece clamp screw. Insert the round dovetail mount on the eyepiece tube into the round dovetail mount on the digital microscope arm. Tighten the eyepie ce tube clamp screw to secure the eyepiece tube in place.

1.8 Eyepieces

- Use the same magnification eyepieces for both the eyes.
- To lock the eyepiece, insert each eyepiece completely into the eyepiece sleeve and tighten the clamp screws.
- Twist the eyepiece (anti-clockwise or clockwise) with 20~30 degree and pull the eyepieces gently out when removing the eyepiece.

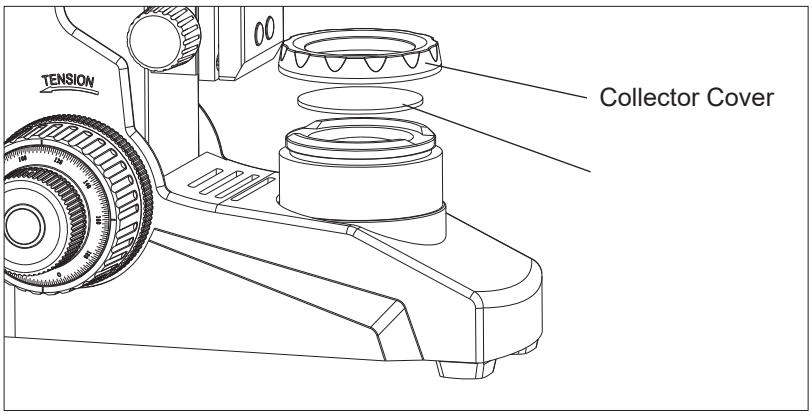


1.9 Filters

- Remove the collector cover and place the filter in the filter holder located around the field lens, screw the collector cover, taking care that dust, dirt and fingerprints do not get on the filter and the field lens.
- Filter selection:

Filter	Function
ND2 (T=50%)	For brightness adjustment in photomicrography
ND4 (T=25%)	
ND16 (T=6.25%)	
Blue filter (colour balance filter)	For routine microscopy and photomicrography
Green interference (546nm)	For phase contrast and contrast adjustment with black and white film
HE (didymium filter)	For colour photomicrography of HE stained specimen with tungsten type film

- A diffuser is built into the base of the digital microscope.



2.0 Power cord

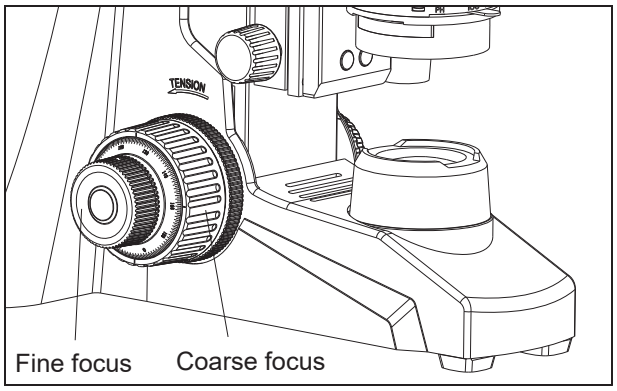
- Connect the socket of the of the power cord to the AC inlet on the rear of the base of the digital microscope. Plug in the other end of the cord to an AC outlet with ground conductor.

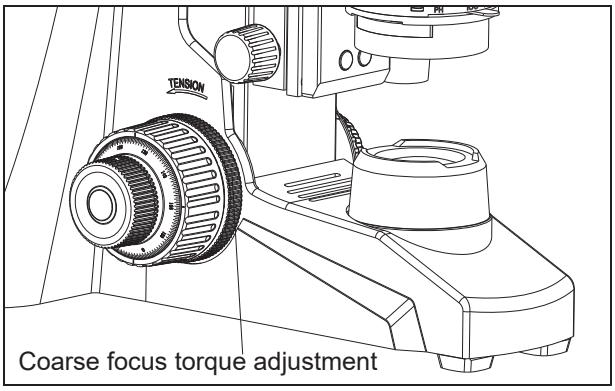
2.USAGE OF DIGITAL MICROSCOPE COMPOENTS

2.1 Coarse and fine focusing

- Focusing is carried out with the coarse and fine focus knobs at the left and right of the digital microscope stand.
- The direction of vertical movement of the stage corresponds to the turning direction of the focus knobs.
- One rotation of the fine focus knob moves the stage 0.2mm. The graduation on the fine focus knob is 2 microns.

•Never attempt either of the following actions, since doing so will damage the focusing mechanism:
•Rotate the left and right knob while holding the other.
•Turning the coarse and fine focus knobs further than their limit.





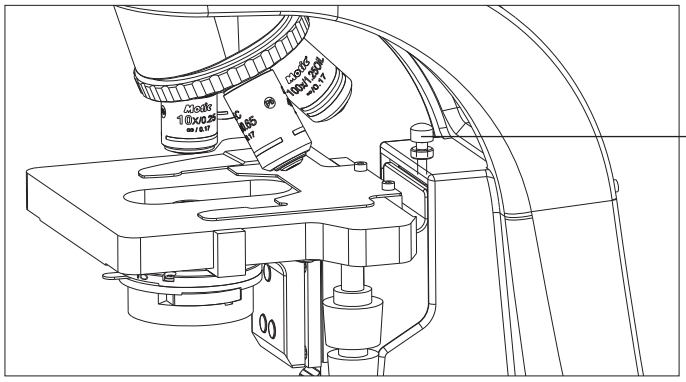
2.2 Coarse focus torque adjustment

- To increase the torque, turn the torque adjustment ring located behind the left-hand coarse focus knob in the direction indicated by the arrow. To reduce the torque, turn the ring in the direction opposite to that indicated by the arrow.

2.3 Stage upper limit stop adjustment

(Upper Stage Limit is preset at the factory; please only adjust if necessary)

- The Stage Upper Limit stop marks the stage position at which the specimen is in focus i.e. by restricting the movement of the coarse focus knob.
- With the specimen in focus, turn the stage upper limit stop knurled ring clockwise until it reaches the stop.
- When the stage upper limit stop is in position, the stage cannot be raised from that position. However, the fine focus knob can move the stage regardless of the limit but will only lower the stage.
- Lower the stage by using the coarse focus knob anticlockwise.



2.4 Beam splitter lever

- The beam splitter lever of the trinocular eyepiece tube can be used to select the amount of light distributed between the trinocular eyepiece tube and the vertical phototube.
- When the beam splitter lever is pushed in until it reaches the limit, 100% of the light enters the observation tube. When the beam splitter lever is pulled out to the limit, the ratio of light entering the observation tube and phototube will be 20:80.

2.5 Interpupillary distance adjustment

- Before adjusting the interpupillary distance, bring a specimen into focus using the 10x objective.
- Adjust the interpupillary distance so that both the right and left field of view become one.
- This adjustment will enable the user to observe the specimen with both eyes

2.6 Diopter adjustment

- Diopter adjustment compensates for the differences in vision between the left and right eyes. In addition to making observation through both eyes easier, this adjustment also reduces the extent to which focusing is lost when the objective magnification is changed. In particular, this occurs when a low magnification objective is used.
- The left eyepiece has a separate focusing provision to compensate for slight differences in the focusing of each eye.
- Using the right eye only and viewing through the right-hand eyepiece, adjust the focus with the digital microscope fine or coarse adjustment until the image of the specimen is at its sharpest.
- Using the left eye only and viewing through the left-hand eyepiece with its independent diopter-focusing ring, focus until the specimen image is at its sharpest.
- The digital microscope should now be ready binocular viewing.

2.7 Condenser (Sourced Focused (Critical) Illumination)

- Critical illumination relies on using the sub-stage condenser to produce a focused image of the homogeneous light source in the plane of the specimen in order to achieve an even illumination condition over the entire field of view.
- To have the light source focused in the plane of the specimen, an imaging disc with concentric circles (and with its matte surface facing toward the digital microscope base) is placed on the field lens and is focused on to the specimen plane. This is achieved by moving the condenser up or down with condenser focus knob.
- The correct vertical setting of the condenser remains unaltered when changing magnifications. Because the light source is imaged onto the specimen, both the specimen and the light source are said to be in the field plane. The condenser iris diaphragm controls the N.A. of the system, and is therefore said to be located in an aperture plane of the digital microscope.

2.8 Use of aperture diaphragm

- The condenser aperture diaphragm is provided for adjusting the numerical aperture (N.A.) of the illuminating system of the digital microscope, it decides the resolution of the image, contrast, depth of focus and brightness.
- Stopping down will lower the resolution and brightness but increase the contrast and depth of focus.
- An image with appropriate contrast in most cases can be obtained with an aperture diaphragm closed down to 2/3 of the maximum value.
- To adjust the aperture diaphragm:
  - adjust the condenser aperture diaphragm ring referring to the condenser aperture scale, or
  - by observing the diaphragm image visible on the exit pupil inside the eyepiece tube, or
  - by using a centering telescope after removing one of the eyepieces and focusing on the aperture diaphragm.
- When swinging-out the top lens of the condenser for low magnification objectives, open the condenser aperture diaphragm completely.

3.PHOTOMICROGRAPHIC PROCEDURE

- To ensure vibration free operation, set the digital microscope on a sturdy vibration free table or a bench with a vibration proof device.
- Pull the optical path selection lever of the trinocular eyepiece tube all of the way out to the limit, the ratio of light entering the observation tube and phototube will be 20:80.
- For the same total magnification, select a combination of the highest possible objective magnification and lowest possible projection lens magnification to achieve the utmost image definition and contrast.
- To ensure optimal illumination, check the position and centring of the lamp and position of the condenser.
- Select a blue filter for routine application. An additional colour-compensating filter can also be used depending on the colour rendition.
- Adjusting the field diaphragm is important for the purpose of limiting extraneous light that may cause flare and lower the contrast. Stop down the diaphragm to achieve an illuminated area slightly larger than that of the field of view.
- A change of depth of focus, contrast and resolution of image is attainable with an aperture setting that is 2/3 of the objective N.A.
- For specific photomicrographic procedures, refer to the manual of the specific camera being used.

4.USING OIL IMMERSION OBJECTIVES

- Oil immersion objectives are labelled with the additional engraving “Oil” and are to be immersed in oil between the specimen and the front of the objective.
- The immersion oil supplied by Motic is synthetic, non-fluorescing and non-resining oil, with a refractive index of 1.515
- Normally, cover glass must be used with oil immersion objectives with a few exceptions. Deviations from thickness are not important as a layer of immersion oil acts as compensation above the cover glass.
- The small bottle of oil supplied with every immersion objective facilitates application of the oil to the cover slip.
- Remove any air bubbles in the nozzle of the oil container before use.
- Immersion oil must be used sparingly. After the examination, the oil should be wiped off the objective with a lens cleaning tissue and the residual film removed with soft cloth moistened with

petroleum benzene or absolute alcohol.

- Locate the field of interest with a lower magnification objective. Swing the objective out of the light path, and add one drop of immersion oil over the site of the specimen.
  Swing in the oil immersion objective. There should be a small column of oil from the cover slip to the objective lens. Use the fine focus to make the image sharp.
- Freedom from air bubbles must be ensured. To check for air bubbles, remove an eyepiece, fully open the field and aperture diaphragms, and look at the exit pupil of the objective within the eyepiece tube. Air bubbles are recognized by presence of a surrounding black ring. Bubbles may often be dislodged by moving the slide to and fro or by slightly rocking the revolving nosepiece back and forth. If not successful in clearing the bubbles then the oil must be wiped off and replaced with a fresh drop.

5.ASSEMBLI NG THE Digital MICROSCOPE

5.1 Preparation

Before installing the software, please ensure the following:

- Plug in the digital Microscope's power cord and switch the unit on.
- Check that you have a Motic software U-disk with your digital microscope.
- Your computer should meet the Minimum System Configuration as listed below.

Minimum System Configuration:

- CPU: Intel based 1.4GHz or better for PC or G4 for Mac
- HDD: 1GB available disk space
- RAM: 512MB or more
- Display Card: 32MB display memory
- Operating System: Windows XP or higher / Mac OSX

5.2 Image Adjustment

- Ensure that you pull the Beam Splitter all the way out until you hear it click into place. This will allow the camera chip inside the head to be exposed to the light from the digital microscope.
- Then you can start the live image transmission by clicking on the Camera icon (shortcut Ctrl M).
  If you do not see an image, please click on “Auto Exposure”. For further details, please consult the software Quick Start Guide contained as a PDF file in the U-disk.
- Bring the image into focus by adjusting the focusing control.
- With a 4X objective selected on the digital microscope, ensure that the image on the screen is in focus and in the center of the screen.
- Using a 40X objective next, adjust the fine focusing to ensure that the observation is on the correct focal plane.
- Please note that when changing from 4X to 40X, the image should be Parfocal as well as Parcentered on screen.

5.3 Calibration

- Put the calibration slide (with four black dots) shipped with the digital microscope on the stage and using a 10X objective focus on one of the dots so that the entire dot can be seen on the computer screen,
  please note the diameter of the dot you are looking at.
- Click on the Calibration Wizard in the Motic Application Program and follow the on-screen instructions to calibrate the digital microscope.

NOTE: Calibration needs to be done at least once and on at least one objective (we recommend the 10X). When the computer screen or the screen resolution is changed, the calibration needs to be done again. Please read the software Quick Start Guide for further information.

6.TROUBLESHOOTING TABLE

As you use your digital microscope, you may occasionally experience a problem.

The troubleshooting table below contains the majority of frequently encountered problems and the possible causes.

6.1 Optical

Problem	Possible Cause
Vignetting or uneven brightness in the field of view or field of view only partially visible	Lamp not installed properly
	Condenser not mounted correctly
	Condenser is set too low
	Aperture diaphragm closed too far
	Revolving nosepiece not clicked into position
	Trinocular eyepiece tube optical path selector lever in intermediate position
	Filter not in placed in properly
Dust or dirt in the field of view	Aperture diaphragm closed too far
	Condenser is set too low
	Dust or dirt on specimen surface
	Dust or dirt on field lens, filter, condenser or eyepiece
Poor image (low contrast or resolution)	Condenser is set too low
	Aperture diaphragm closed too far
	No cover glass
	Too thick or thin cover glass
	Immersion oil not used with oil immersion lens
	Air bubbles in immersion oil
	Specified immersion oil not used
	Immersion oil on dry objective
	Greasy residue on eye lens
	Incorrect illumination

Uneven focus	Specimen holder not fixed securely on stage
	Specimen not secured in position
	Specimen tilted on stage surface
Focusing is not possible with high magnification objectives	Slide is upside down
	Cover glass is too thick
High magnification objectives strike the specimen when changing over from low to high magnification	Slide is upside down
	Cover glass is too thick
	Eyepiece tube diopter not adjusted
Insufficient parfocality of objectives	Eyepiece tube diopter not adjusted
No cohesion of binocular image	Magnification or field of view of left and right eyepieces differ
	Interpupillary distance not adjusted
	Eyepiece tube diopter not adjusted
Eye strain or fatigue	Interpupillary distance not adjusted
	Diopter adjustment not made
	Field of view of left and right eyepiece differ
	Inadequate illumination

6.2 Electrical

Lamp does not light	Power supply not plugged in
	Lamp not installed
	Lamp burnt out
Inadequate brightness	Specified lamp not being used
Lamp blows out immediately	Specified lamp not being used
Lamp flickers	Connectors are not securely connected
	Lamp near end of service life
	Lamp not securely plugged into socket

7.CARE AND MAINTENANCE

7.1 Do not disassemble

- Disassembly may significantly effect the performance of the instrument, and may result in electric shock or injury and will void the terms of the warranty.
- Never attempt to dismantle any parts other than described in this manual. If you notice any malfunction, contact your nearest Motic representative.

7.2 Cleaning the digital microscope

7.2.1 Lenses and filters

- To clean lens surfaces or filters, first remove dust using an air blower. If dust still persists, use a soft/clean brush or gauze.
- A soft gauze or lens tissue lightly moistened with the mixture of alcohol and ether (ratio : alcohol : 3 and ether: 7) should be used to remove grease or fingerprints.
- Use only a mixture of alcohol and ether (ratio : alcohol : 3 and ether: 7) to remove immersion oil from objective lenses.
- Because the mixture of alcohol and ether (ratio : alcohol : 3 and ether: 7) is highly flammable, be careful handling around open flame.
- Do not use same area of gauze or lens tissue to wipe more than once.

7.2.2 Cleaning of painted or plastic components

- Do not use organic solvents (thinners, alcohol, ether, etc.). Doing so could result in discolouration or in the peeling of paint.
- For stubborn dirt, moisten a piece of gauze with diluted detergent and wipe clean.
- For plastic components, only moisten a piece of gauze with water and wipe clean.

7.3 Disinfecting the digital microscope

- Follow the standard procedures for your laboratory.

7.4 When not in use

- When not in use, cover the instrument with vinyl dust cover and store in a place low in humidity where mould is not likely to form.
- Store the objectives, eyepieces and filters in a container or desiccator with drying agent.
- Proper handling of the digital microscope will ensure years of trouble free service.
- If repair becomes necessary, please contact your Motic agency or our Technical Service direct.

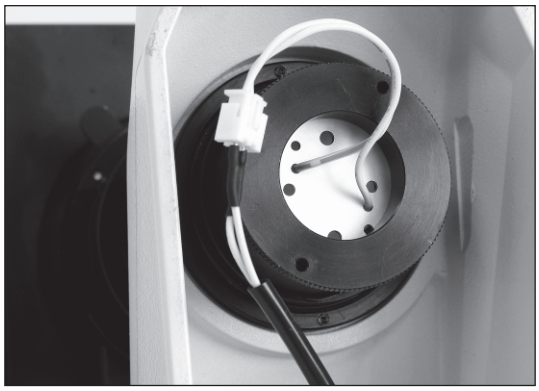
Note:

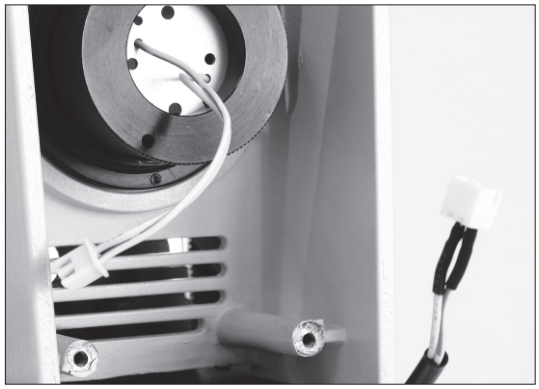
- If equipment is used in a manner not specified by the manufacturer, the warranty may be void.
- To avoid getting wet, do not use the digital microscope near water.

7.5 LED replacement

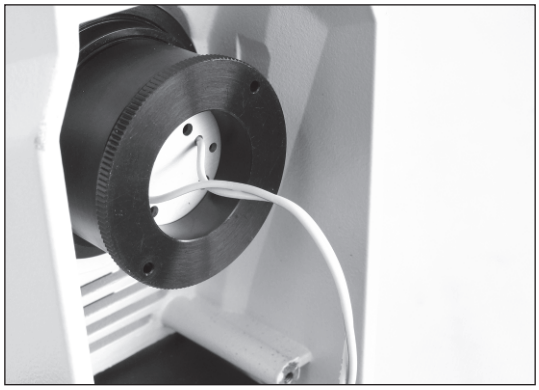
a. Unscrew four hexagonal screws retaining the base plate.

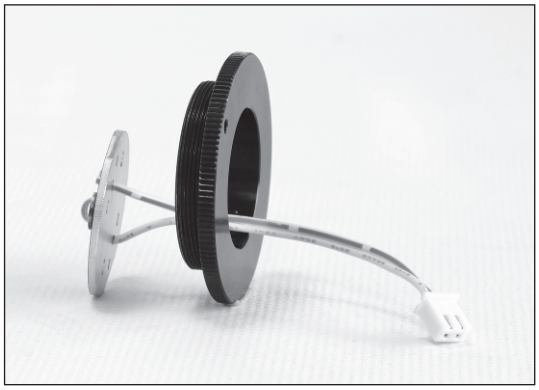
b. Disconnect the LED connection cables from the power supply printed circuit board.





c. Loosen LED board locating ring, take away LED board locating ring.





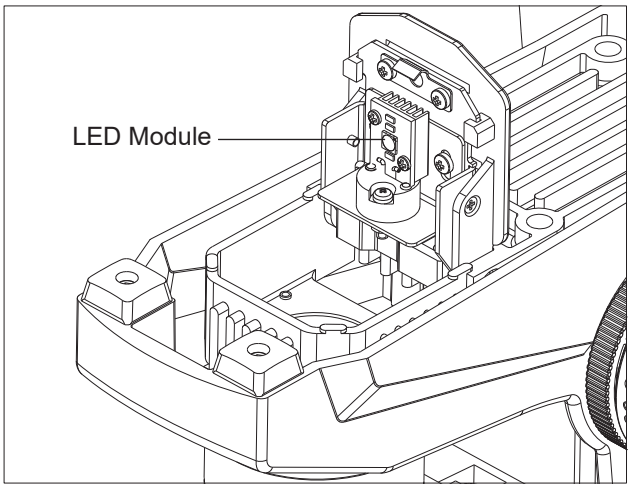
d. Install the new LED.

- Take out a qualified LED groups with power and PIN, nest the pressure ring and reverse action steps as above.
- At the time of installation, the LED group centre should be adjusted to the center of collector as possible, which is called the axis centre.
  When installing the bulb, do not touch the glass surface of the bulb with bare fingers.
  Doing so will cause fingerprints, grease, etc., to burn onto the bulb surface, reducing the Illumination provided by the bulb. If the surface is contaminated, wipe it clean using lens tissue.

7.6 Bulb replacement

The lamp and the lamphouse become very hot during and after a period of operation.
Risk of burn – Do not touch the lamp during or immediately after period of operation.
Make sure the lamp has cooled sufficiently before attempting to replace the lamp.

- Close lamp house cover plate and secure until it snaps into position.



7.6.1 LED Module

- In order to prevent electric shock always turn the power switch off and unplug the power cord before installing or replacing the bulb.
- Place digital microscope on its back and pull back the lamp house cover plate.
- Firmly insert the LED module into the socket pinholes until it reaches the limit .
- Close lamp house cover plate and secure until it snaps into position.

8.WARNING LABELS

The following warning labels (or symbols) are found on the digital microscope, study the meaning of the warning labels (or symbols) and always use the equipment in the safest possible manner.

Warning Label / Symbol	Explanation
	Indicates that the main switch is ON.
	Indicates that the main switch is OFF.
	Indicates alternating current.
	CAUTION! Risk of danger. Please consult documentation in all cases where this symbol is used.

Don’t pick the digital microscope up from the bottom during equipment operation.

Proper handling of the digital microscope will ensure years of trouble free service.
If repair become necessary, please contact your Motic agency or our Technical Service directly.

Motic®

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