Motic®

Panthera Series
Scientific Instrument
Operation Manual



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

The clear knowledge of this Instruction Manual is needed to operate Motic Panthera Series Microscopes at maximum performance and to ensure safety at all specified operations. Please familiarize yourself with the use of this microscope and pay special attention to the safety hints given in this manual. This Document is not subject of a update routine, please download a newer version from the Motic website, if needed. Keep this instruction manual in reach and easily accessible for future user reference. All Specifications, Illustrations and items in this Manual are subject to changes.

WWW.MOTIC.COM

MOTIC HONG KONG LIMITED

CE c UL us LISTED E250223

English:

Please familiarize yourself with the instruction manual provided in English. Versions in other languages are available for download at:

http://www.motic.com/Panthera/Panthera_Eng_OP.zip

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1. GENERAL NOTES ON MICROSCOPE SAFETY

1.1 General safety notes and Instruction

Please familiarize yourself with this operation manual before using the microscope.

If additional information or support is needed, please contact Motic after sales Service.

To ensure safe operation and optimal function of the instrument, please adhere to the precautions and warnings outlined in this manual.

Please observe the following indicators:

	**CAUTION, Risk of Danger**
	This symbol indicates a possible hazard to the user of the microscope.
	**CAUTION, Risk of Dangerous heat**
	This symbol indicates a possible hazard to the user of the microscope.
	**CAUTION, Risk of Electrical Danger**
	This symbol refers to disconnecting the power unit from a power source before opening the microscope.
	**INFO**
	This symbol refers to a useful information or hint.
	**Disposal**
	This symbol refers to a safety precaution that should be adhered to under all circumstances.
	Microscope ON
	This symbol refers to the on (active electrical system) status of the microscope.
	**Microscope OFF**
	This symbol refers to the off (inactive electrical system) status of the microscope.
	**Risk of Dangerous Electrical Current**
	This symbol refers to potential hazardous electrical voltage/current and must be observed at all circumstances.

1.2 Microscope safety, FCC and EMC conformity

This microscope has been designed, produced and tested in compliance with required safety standards and regulations. UL, CE, FCC, EMC

“Safety of equipment used for *measurement control and laboratory use”*

CE Panthera Microscope Series Products are in conformity with the requirements of the CE Directive 98/79/EC Annex 1 and carries the CE mark accordingly.
Conform to Class B Noise immunity is in compliance with EN 61326 and EMC and
Radio-noise suppression is in compliance with EN 5501 1


The microscopes listed in this document are disposed of in compliance with WEEE Directive 2002/96/EC.


Lamp bulbs, LED Modules, lamphouses and lampdrawers 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.


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

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

1.3 Transporting, unpacking, storage of the microscope

Please observe and follow the safety notes given in this document for transportation, unpacking and storage of the microscope.



- The microscope is delivered as packed into a commercial standard plastic and cardboard packaging; please re-use the original packaging for any transportation only.
- It is advised to keep and re-use the original packaging for long-term storage or returning to the manufacturer to avoid losing the warranty.
- Upon receipt and unpacking the equipment, please verify that all parts specified on the delivery note are present.
- Adhere to transport and storage temperatures as specified in this manual.
- Set the microscope up on a stable worktable with a solid and smooth surface suitable for proper usage.
- Do not touch optical surfaces.

1.4 Instrument Disposal



Please observe the following safety notes for the disposal of the microscope:
Defective microscopes, accessories and consumables should be disposed of in compliance with the provisions of the local law.

1.5 Usage of the microscope

The microscope, as well its accessories, must not be used for microscopic techniques or purposes other than those described in this operating manual.
Please always observe the following safety notes when using the microscope:



Motic cannot assume any liability for applications other than its intended use, including the included modules and components. This includes service or repair work that is not carried out by authorized Motic service personnel. In the case of non-compliance, all warranty claims and liabilities shall be forfeited.



The microscope should only be operated by trained personnel who are familiar with this operation manual and therefore aware of the possible dangers involved.



This microscope is a high-precision instrument that can be impaired in its performance or even destroyed when handled improperly.





This microscope is equipped with a built-in power supply, allowing electric-net voltages to be used in the range between 100 - 240 V ± 10%, 50/60 Hz. In case of any irregularity on the electrical system observed, please switch off the microscope, keep it safe-guarded and consult the Motic after sales service.



Please only use rated power cords as described in the Appendix of this document.



Always disconnect the power cable before opening the microscope and changing the lamp or LED source.



Wait for the lamp to cool down before replacing it and do not touch the new bulb.



The microscope may only be opened by qualified Motic service staff.



The operation of the microscope in explosion-risk environments is not allowed.



Immersion oil can be harmful. Please only use Motic immersion oil and follow the safety instructions given. Immersion oil is to be used for microscope application only. Please do not swallow, and avoid any contact with the skin. Please use only for the intended purposes.

1.6 Intended use of the Microscope

This microscope is an optical instrument that has been designed for the usage in the observation and documentation of magnified images of specimens.
Do not use this microscope for any purpose other than its intended use.

CE This microscope complies with the requirements of directive 98/79/EG concerning in-vitro diagnostic medical devices. CE marking shows the conformity to the directive.

NOTE: This microscope has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Regulations. These limits are designed to provide protection against harmful interference during operation in a commercial environment. This equipment uses and generates frequencies and energy, if not properly installed in accordance with the instruction manual, may cause interference to radio communications. Operation of this microscope in a residential area is not permitted.

FCC WARNING: Changes or modifications would void the microscope's FCC compliance and is therefore not permitted.

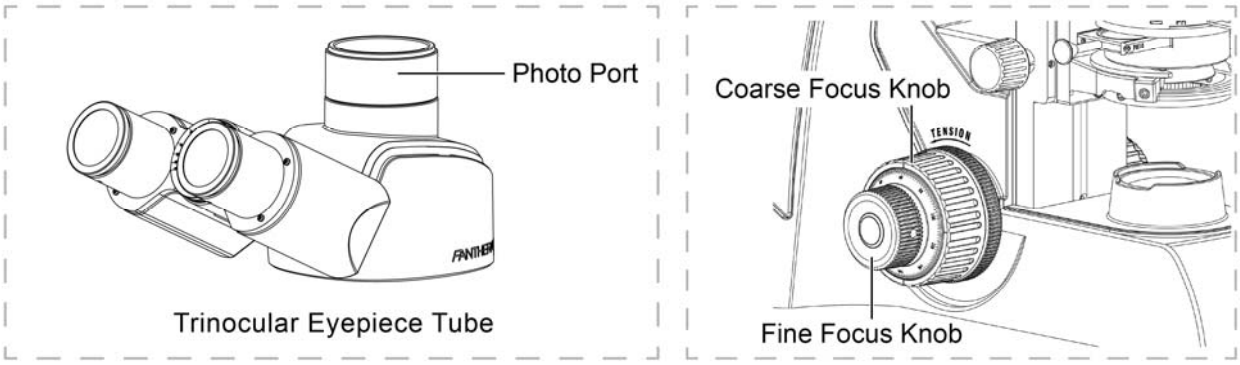
1.7 Microscope warranty

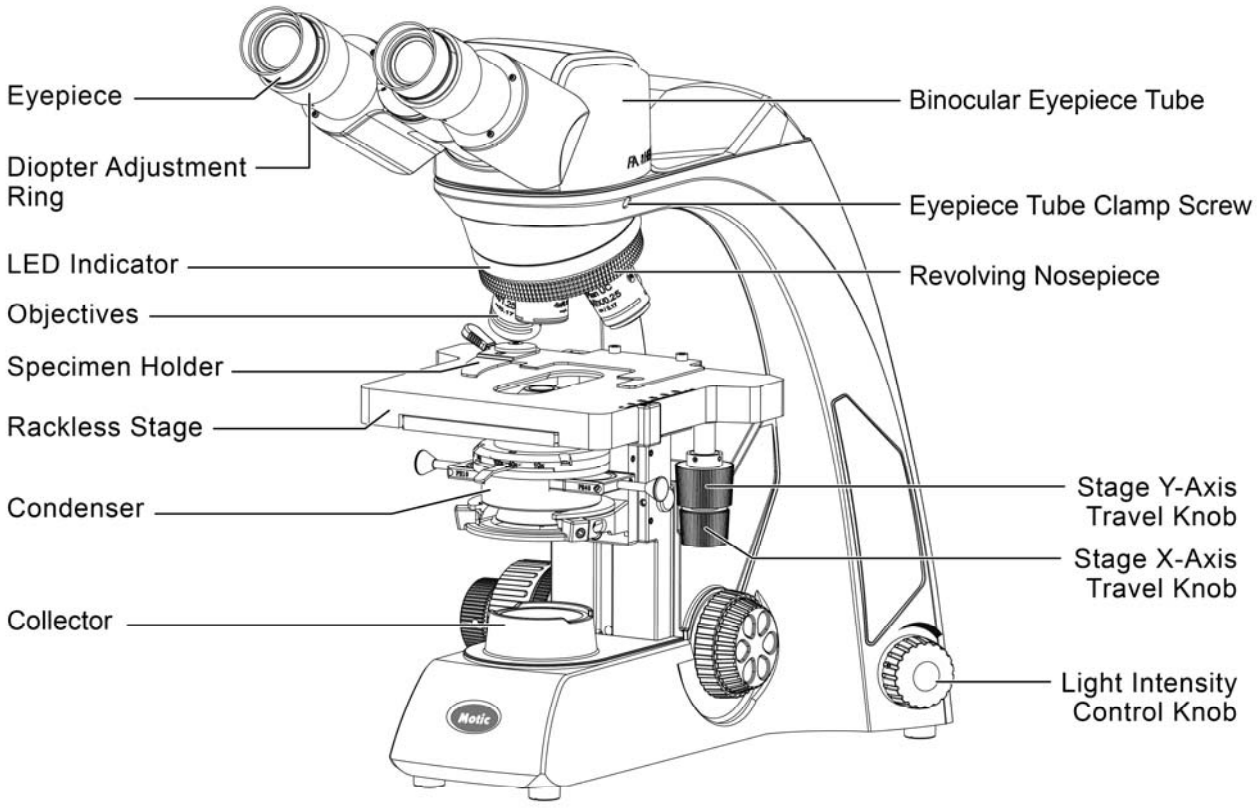
The microscope should only be used for the microscopy applications mentioned and instructed in this operation manual. Please note the following information on the microscope's warranty:

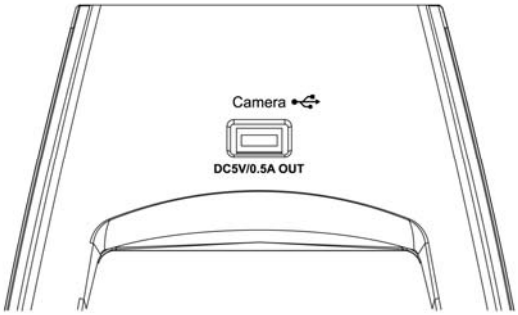
- Motic must be notified of possible defects for steps to be taken to minimize damage.
- If notified of such a defect, Motic will evaluate the defect and if within warranty, rectify it at user's discretion, either by repairing the microscope or by delivering a replacement.
- Natural wear or defects caused by improper use are not covered by the microscope warranty.
- Motic shall not be held liable for damage caused by faulty operation, negligence or tampering with the microscope.
- Altering or tampering of the microscope shall lead to a forfeit of all warranty claims.

2. NOMENCLATURE

2.1 Panthera E2 (Binocular Version)

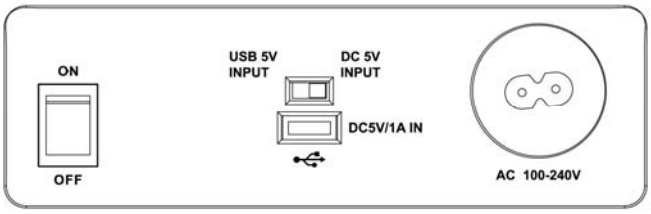






Input Switch

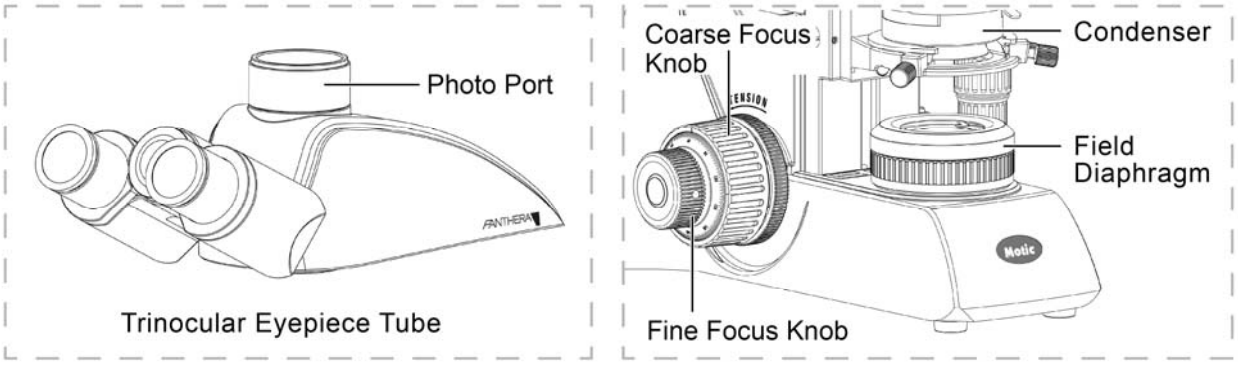
The switch on the back of the Panthera E2 is utilized to easily switch power supply methods for the microscope. Flicking the switch to the left (labeled as **“USB 5v input”**) powers the microscope with a built-in battery pack and flicking it to the right (labeled as **“DC 5v input”**) powers the microscope with the main power supply.

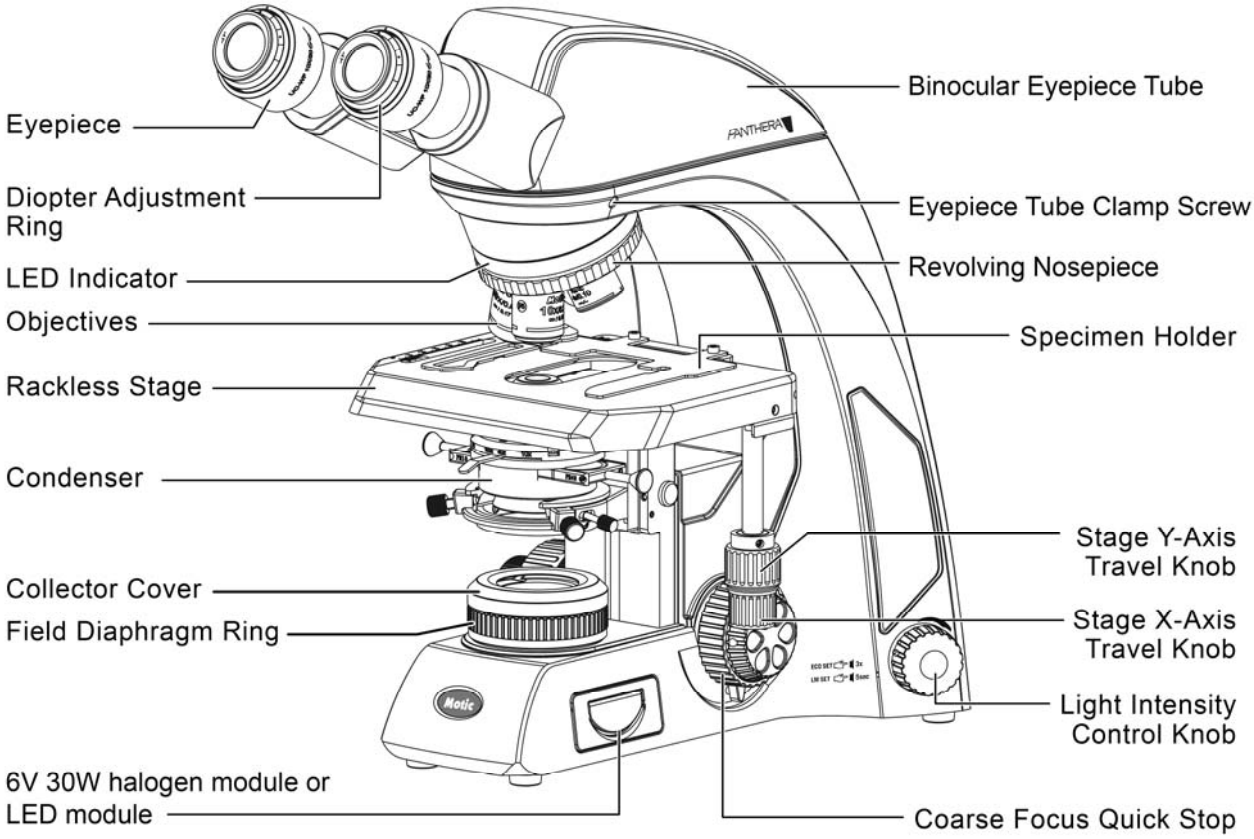


USB Output

The USB output port on the back of the Panthera C2 and E2 can be used to recharge the microscope’s built-in battery while the microscope is still connected to power with the main power supply. Additionally, it can also be used as a power source for any external camera which uses a DC 5V/0.5A input.

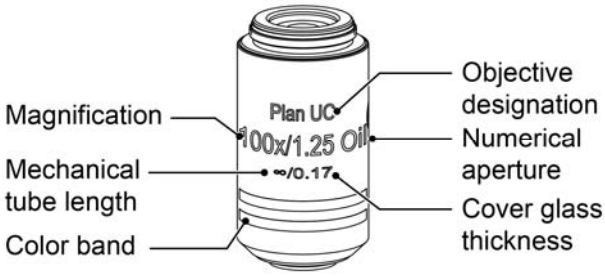
2.2 Panthera C2 (Binocular Version)





Objective Lenses:

Magnification	N.A.	W.D (mm)
Plan UC 2X	0.05	7.2
Plan UC 4X	0.1	30.5
Plan UC 10X	0.25	17.4
Plan UC 20X	0.45	0.8
Plan UC 40X	0.65	0.6
Plan UC 60X	0.8	0.35
Plan UC 100X/1.25 Oil	1.25	0.16
Plan UC 100X/0.8	0.8	2



Working distance (WD): The distance from the cover glass top surface to the nearest point of the objective.

Numerical aperture (NA): The NA is a performance indicator. The higher the NA, the higher the resolving power.
It describes the ability of the lens to collect light under steep entry angles.

Resolution: The ability to differentiate two points, or minimum distance under which two points can be differentiated.

Focal depth: The area along the optical axis where a focused image appears to be sharp. If the aperture iris diaphragm is stopped down, the focal depth becomes bigger. The greater the NA of an objective, the shorter the focal depth.

Field number: A value that indicates the diameter of the image of the field diaphragm that is formed by the lens in front of it (mm).

Field of view: The actual size of the field of view (mm) in the eyepiece.

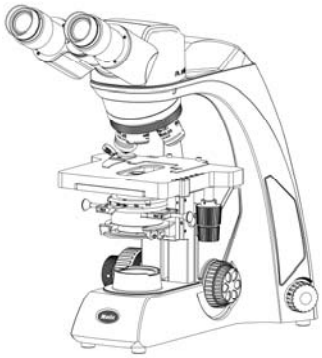
Total magnification: Objective magnification multiplied by the eyepiece magnification.

3. SETTING UP THE MICROSCOPE

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

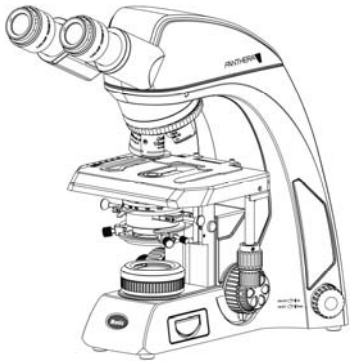
3.1 Operating environment

- 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.



Panthera E2

- PowerOnDevice (USB Camera Power, USB Powerpack)
- Cabinet size bino, trino head
- Camera power device
- Rackless stage



Panthera C2

- Light Tracer, digital light control
- Trino, Plan UC optic
- Rackless stage

Please familiarize yourself with the instructions given in this operation manual.
In case of unresolved questions, please contact Motic after sales service or consult Motic Webservices for further instructions.

4. ASSEMBLING THE MICROSCOPE

4.1 Verifying input voltage

- The automatic voltage selection works with a broad range of settings, please check the power rating of your country before the use of the microscope.
- Always use a power cord that is rated for the voltage used in your area and that has been approved to meet local safety 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.

4.2 Illumination

4.2.1 Halogen bulb

- The quartz halogen bulb provides a nearly complete vis light specimen with high luminance and natural temperature.
- The halogen bulb maintains the same level of brightness and color temperature throughout its full lifespan.

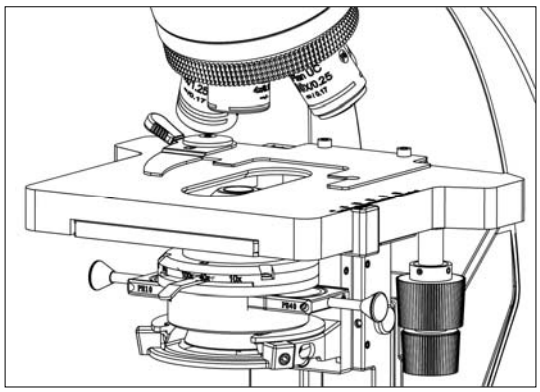
4.2.2 LED

- LED is more economical and environmentally friendly and combines the advantages of low heat and a long lifespan. There are two different color temperatures available: high contrast blue and warm color temperature.

4.3 Stage

4.3.1 Panthera E2

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

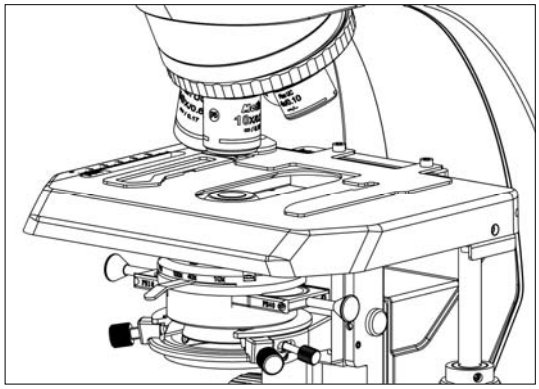


(Fig. 1)

4.3.2 Panthera C2

Panthera C2 Stage is fitted with a rackless stage providing more clearance for the user and avoids the possibility to scratch the user's hand.

- Remove specimen holder for fast hand scanning of slides.
- Left-handed and right-handed operation stages are available as options.
  Left hand operation stages are available as options. It should be used with the short stage knob to avoid interference with the fine focus knob.



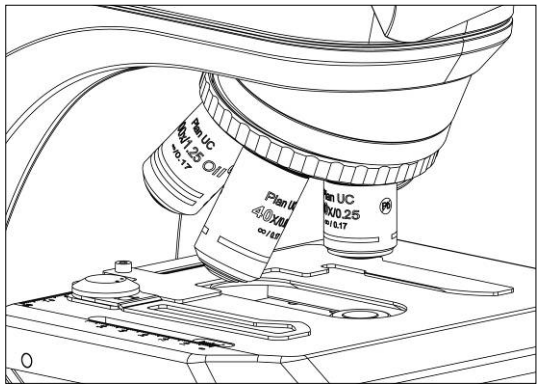
(Fig. 2)

4.4 Specimen holder

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

4.5 Objectives

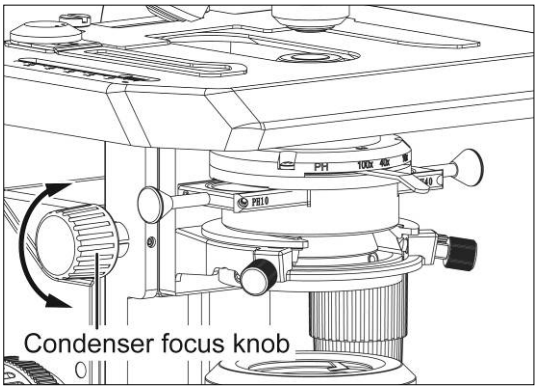
- Lower the stage completely. Screw the objectives into the revolving nosepiece so that clockwise rotation of the nosepiece brings the next higher magnification objective into position**.**



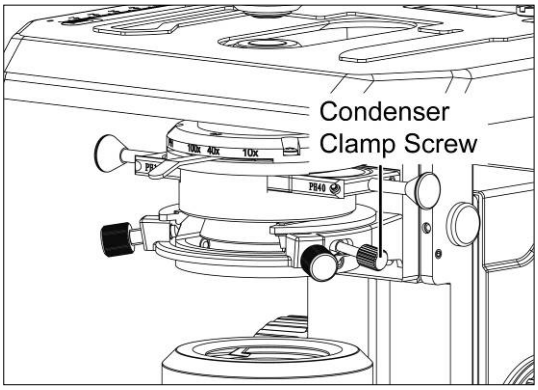
(Fig. 3)

4.6 Condenser

- Raise the stage by turning the coarse focus knob.
- Completely lower the condenser carrier by turning the condenser focus knob. (Fig. 4-1)
- Insert the condenser into the dovetail mount with aperture scale facing forward towards the user. Secure it with the condenser clamp screw. (Fig. 4-2)
- Turn the condenser focus knob to raise the condenser as far as it will go. (Fig. 4-1)



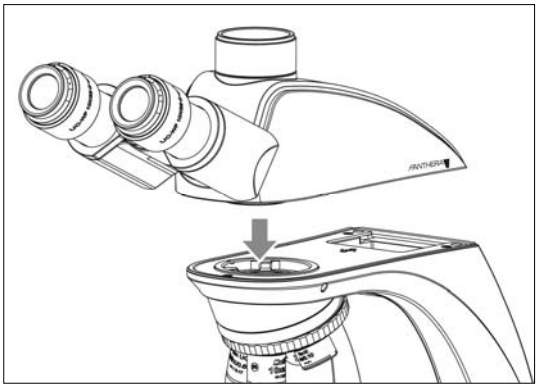
(Fig. 4-1)



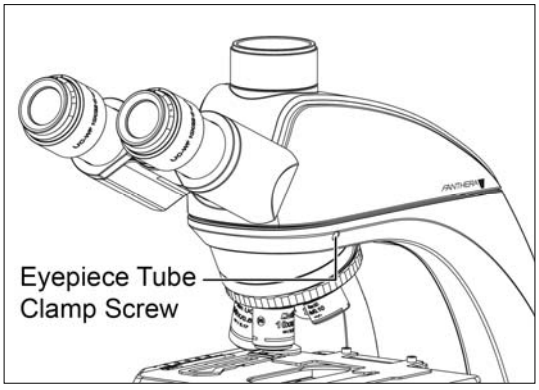
(Fig. 4-2)

4.7 Eyepiece tube

- Loosen the eyepiece clamp screw (Fig. 5-2). Insert the round dovetail mount on the eyepiece tube into the round dovetail mount on the microscope arm (Fig. 5-1). Tighten the eyepiece tube clamp screw to secure the eyepiece tube in place. (Fig. 5-2)



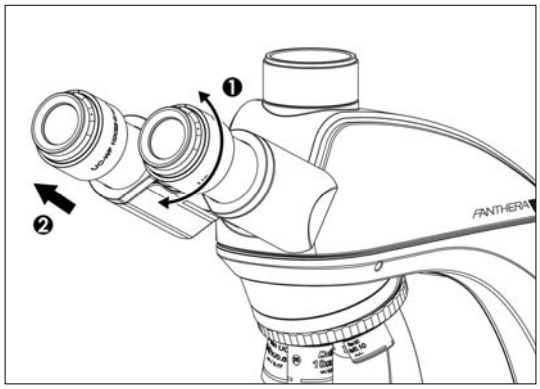
(Fig. 5-1)



(Fig. 5-2)

4.8 Eyepieces

- Use the same magnification eyepieces for both the eyes.
- To secure the eyepiece in the eyepiece sleeve, tighten the clamp screws.
- Twist the eyepiece (anti-clockwise or clockwise) with 20~30 degree (Fig. 6.1) and pull the eyepieces gently out when removing the eyepiece. (Fig. 6.2)

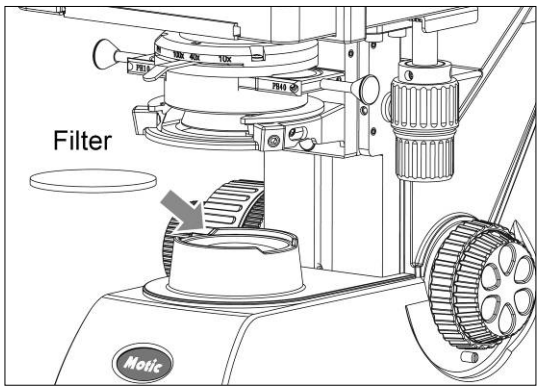


(Fig. 6)

4.9 Filters

4.9.1 Panthera E2:

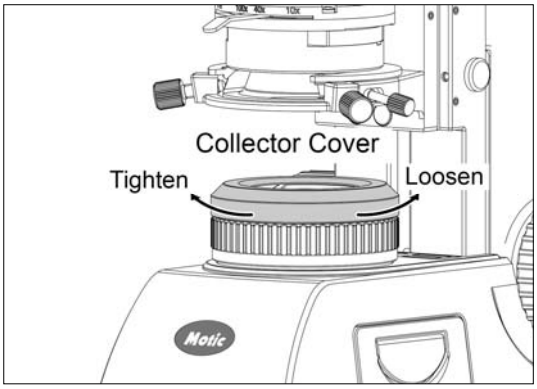
- Place the filter in the filter holder located around the field lens (Fig. 7)



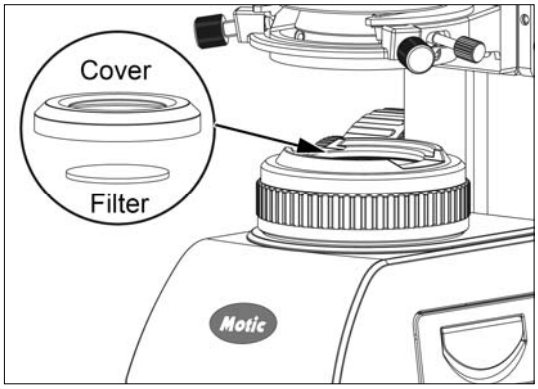
(Fig. 7)

4.9.2 Panthera C2:

- Remove the collector cover (Fig. 8-1) and place the filter in the filter holder located around the field lens (Fig. 8-2), screw back the collector cover (Fig. 8-1), taking care that dust, dirt and fingerprints do not get on the filter and the field lens.



(Fig. 8-1)



(Fig. 8-2)

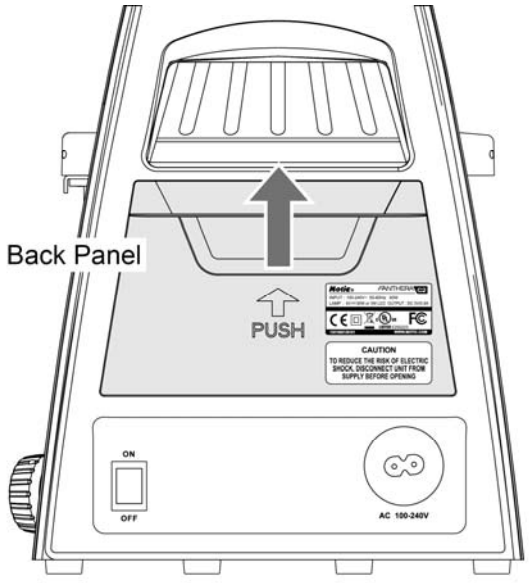
- **Filter selection:**

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

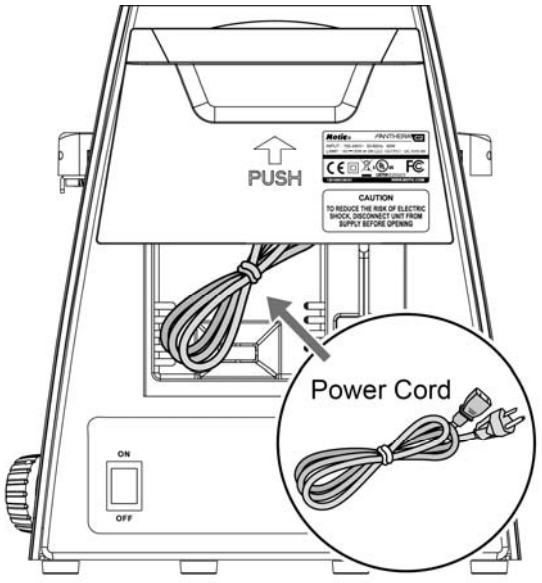
- A diffuser is built into the base of the microscope.

4.10 Power cord

- Take out the power cord (Fig. 9-2) from the cable storage of backside panel (Fig. 9-1).
- Connect the socket of the of the power cord to the AC inlet on the rear of the base of the microscope. Plug in the other end of the cord to an AC outlet with ground conductor.



(Fig. 9-1)



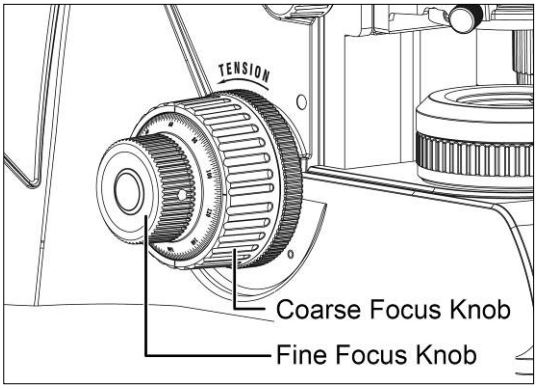
(Fig. 9-2)

5. USAGE OF MICROSCOPE COMPONENTS

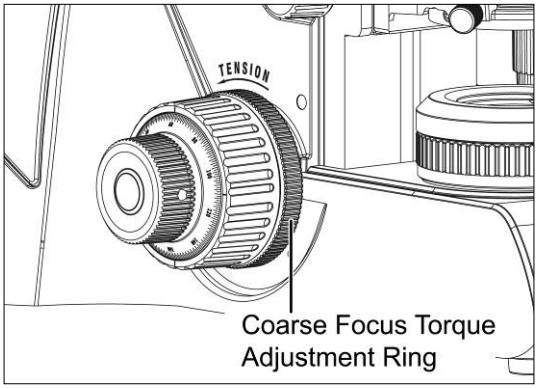
5.1 Coarse and fine focusing (Fig. 10-1)

- Focusing is carried out with the coarse and fine focus knobs at the left and right of the 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:**
- Rotating the left and right knob while holding the other.
- Turning the coarse and fine focus knobs further than their limit.



(Fig. 10-1)



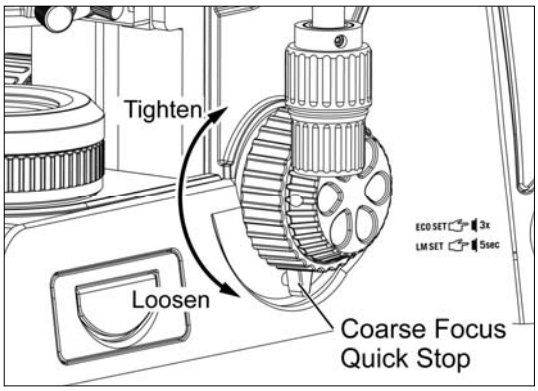
(Fig. 10-2)

5.2 Coarse focus torque adjustment (Fig. 10-2)

- 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.

5.3 Coarse focus quick stop (Fig. 11)

- The coarse focus quick stop makes the stage can fixed at any position at which the specimen is in focus (i.e: by using the handle to lock the coarse focus knob.)
- With the specimen in focus, turn the handle to fix the knob.
- When the coarse focus quick stop is in position, the stage cannot be raised from that position. The fine focus knob will only move to lower the stage.
- Lower the stage by using the coarse focus knob.

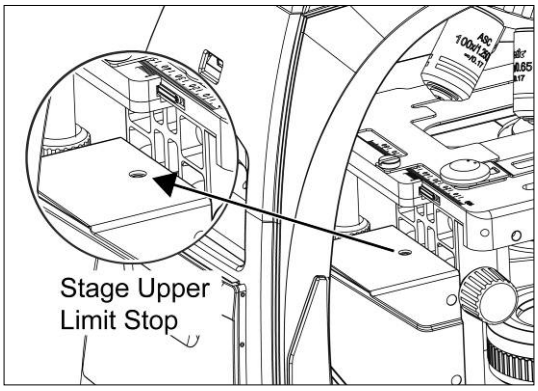


(Fig. 11)

5.4 Stage upper limit stop adjustment (Fig. 12)

(Upper Stage Limit is pre-set at the factory; please adjust only 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.
- Lower the stage by using the coarse focus knob counterclockwise.



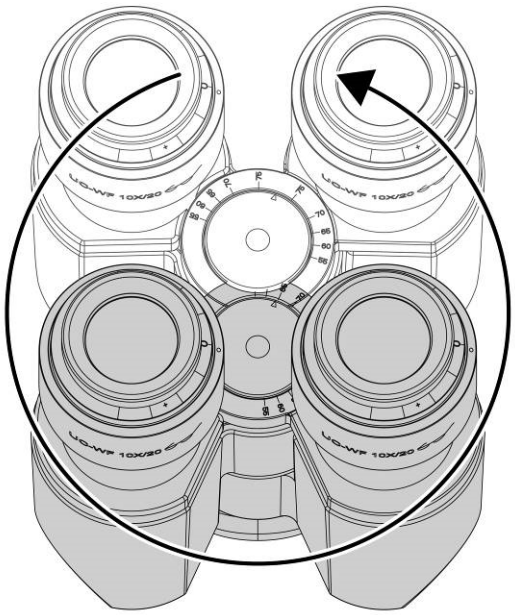
(Fig. 12)

5.5 Interpupillary distance adjustment

Due to every eye being uniquely different, adjustment is necessary to evoke the best performance from the microscope. Interpupillary distance adjustment enables the user to observe the specimen with both eyes without fatigue.

- 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.

Panthera microscopes series are equipped with a swivelling binocular head to provide the flexibility to adjust the view height for each individual viewer's convenience (Fig. 13).



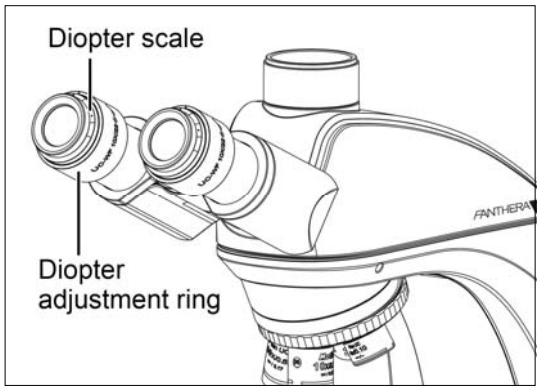
360°swiveling movement, interpupillary distance 50 to 75mm

(Fig. 13)

5.6 Diopter adjustment

Every human eye is different, so adjusting the instrument is necessary in order to ensure the best performance.

- Set the diopter on both eyepieces to the **"0"** position.
- Change to 10x magnification and bring the image of the specimen into focus using one eye only.
- Change to the other eye and follow below steps:
  - Correct the focus for the second eye by using only the diopter adjustment ring (Fig. 14). Do not use the coarse / fine focusing knob.
  - Change to a higher magnification to verify the result and if necessary, repeat the procedure to match the sharpness for higher magnification.
  - Keep this final diopter position for all magnification / lenses. The diopter position for each user can be recorded from the scale (Fig. 14), so it can easily be reset.

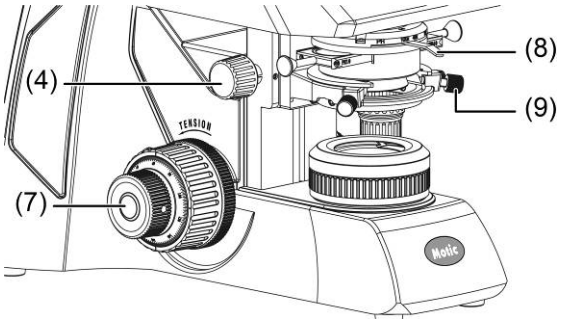


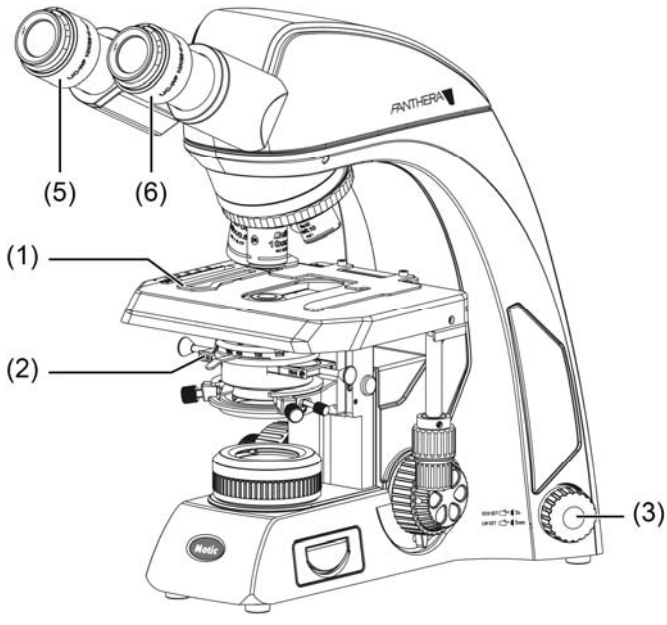
(Fig. 14)

5.7 Adjustment of Brightfield (Only for Panthera C2)

5.7.1 Full Kohler Illumination

- Place contrast-rich specimen slide into the slide holder (1) and swing in a 10x Objective Lens.
- Move any darkfield or phase contrast slider (2) out of the beam path, if equipped with it.
- Adjust the illumination intensity to sufficient brightness (3).
- Turn the knurled condenser height adjustment knob (4) to bring the Abbe condenser up to its top mechanical stop position.
- Look through one eyepiece (5) and turn the focusing drive (7) to focus the 10x lens on the specimen.
- Look through the second eyepiece (6) and if necessary, adjust the diopter until the second eyepiece has sharp image.
- Fully open the aperture diaphragm using the knurled ring aperture ring the condenser (8). Then close the field diaphragm until it becomes visible; it may appear not sharp by now.
- Adjust the condenser using the centring screws (9) by bringing the light pot of the field diaphragm into the centre of the field of view.
- Open the field diaphragm iris diameter so that it disappears out of the field of view.
- Remove one of the eyepieces and set the aperture diaphragm (10) iris diameter to 2/3rd of its field of view.
- Insert the eyepiece back in the tube.







5.8 Use of aperture diaphragm

- The condenser aperture diaphragm adjusts the NA of the illumination system, which controls the resolution, contrast, depth of focus, and brightness of the image.
- Stopping it down will lower the resolution and brightness but increase the contrast and depth of focus.
- An image with appropriate contrast can be obtained with an aperture setting that is 2/3 of the objective N.A.

To check the adjustment of the aperture diaphragm:

- Check the condenser aperture scale.
- Remove one eyepiece and check the image directly in the eyepiece tube.
- Use a centring telescope after removing one of the eyepieces and focusing on the aperture diaphragm.

5.9 Use of field diaphragm (Only for Panthera C2)

- The field diaphragm determines the illuminated area on the specimen. For normal observation, the diaphragm is set slightly larger than the field of view. If the illuminated area is set much larger than the field of view, extraneous light will enter the field of view. This will create a flare in the image and lower the contrast.
- The thickness spec of the glass slide must be 1.7mm or less, otherwise the field diaphragm may not be focused on the specimen plane.

On condensers with swing-in front lens, the diaphragm does not have any effect when the condenser top lens is swung out of the optical path in the swing-out type condenser.
Fully open the field diaphragm, as the N.A. of the illuminating system will be reduced if the diaphragm is excessively stopped down.

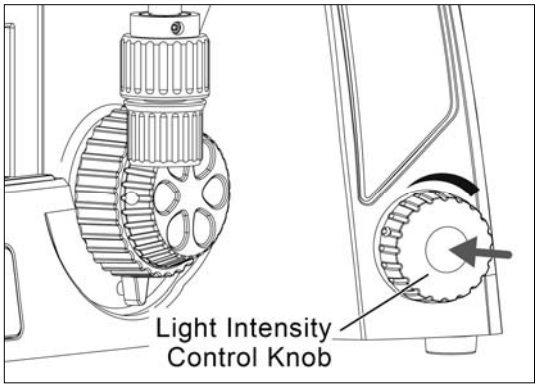
5.10 Brightness and contrast adjustment

- Neutral density filters are used for brightness adjustment in routine microscopy and photomicrography.
- For phase contrast and contrast adjustment with black and white film, a green interference filter (546nm) is recommended.
- An HE (didymium) filter for colour photomicrography, Haematoxylin, Eosin (HE) or Fuchsin stained specimen with tungsten type film is available.

5.11 Illumination brightness adjustment

5.11.1 Panthera E2:

To adjust the brightness, turn the light intensity control knob and observe the change in brightness until the desired level has been reached.

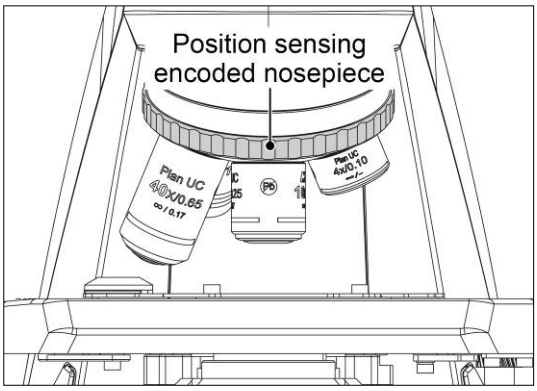


(Fig. 15)

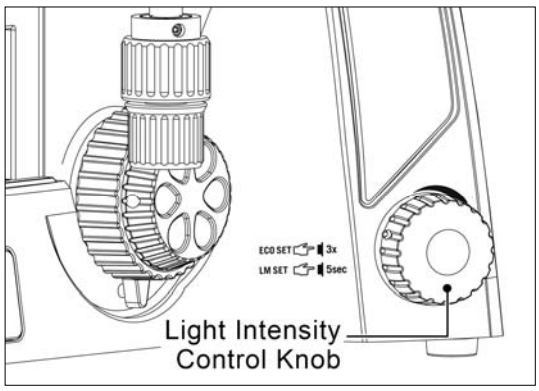
There is no light manager or standby mode available in this model.

5.11.2 Panthera C2 with light manager

- To adjust the brightness, turn the light intensity control knob (Fig. 16-2) and observe change in brightness until the desired level has been reached.
- If the illumination has not been changed for 3 seconds, the actual value will be stored for this objective magnification.
- The light value stored is independently for each objective lens and will be automatically restored once the user returns to the objective lens.



(Fig. 16-1)



(Fig. 16-2)

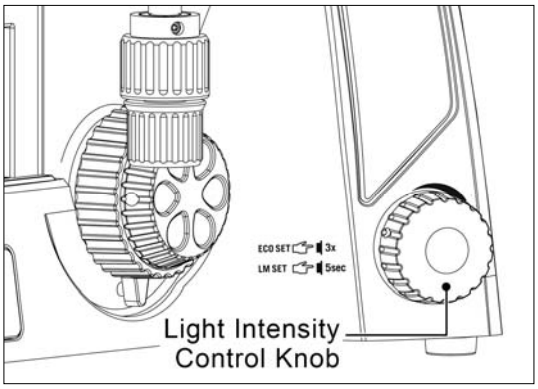
5.12 Restore factory default for intensity (Panthera C2)

- Turn the microscope off by switching the main switch on the backside of the microscope to off.
  Keep the intensity knob pressed and switch microscope on.
  Keep holding the intensity control knob for 10 seconds.
  The system has been reset to factory values.

Default intensity value for each objective is defaulted at 10% of total brightness.

5.13 Turn off light manager

- The light manager enables the microscope to remember the best illumination setting from previous usage. When the microscope is set at the best illumination with objective A, light intensity will be remembered. You can switch to objective B and adjust the illumination.
  When you switch back to objective A, the light intensity will return to its last setting. The light intensity of all five objectives can be remembered.
- The light manager feature can be disabled by pushing the intensity knob (Fig. 17) for 5 seconds. The LED indicator will reduce its intensity from the maximum to the minimum, indicating that the light manager is disabled. To re-activate the light manager, use the same process.
- If you do not touch the microscope for 30 minutes, it will go into ECO mode. The lowest layer of the LED indicator will “breathe” (blink slowly). Any movement of the nosepiece or the intensity knob will re-activate the microscope.
- The ECO mode can be disabled by triple clicking the intensity knob (i.e: in the case of extended video shooting). The LED indicator will illuminate once when ECO mode is disabled. Triple clicking the intensity knob again will reactivate ECO mode. (Fig. 17)



(Fig. 17)

5.14 **Standby mode** (Panthera C2)

Standby mode self activates after 15 minutes of idle time in order to conserve energy and protect the specimen from overexposure.

- To activate standby mode, double click the intensity knob or leave the microscope alone for 15 minutes.
- Touch the intensity knob or nosepiece to turn standby mode off. Intensity will be adjusted to the last memorized status.

If the LED indicator shows a breathing pattern, then standby mode is activated.

5.15 Turning off standby mode

- Before turning on the microscope, press the intensity knob and at the same time, turn on the power. Continue pressing the intensity knob for about 10 seconds.
- When the LED of the indicator ring flickers, release the intensity knob to enter the standby time setting. The two LEDs in the middle of the indicator ring will turn on.
  a. The LED on the left indicates the time it takes to enter the current setting. The LED light will flash once per second and once it finishes flashing, the current setting is in effect.
  b. The LED on the right indicates the current standby time setting and each LED light represents 15 minutes. Each time the intensity knob is pressed, one more LED will light up and will add an extra 15 minutes. The maximum standby time that can be set is 4 hours.

Please note: Restoring the microscope to factory settings will restore each objective to the minimum level of brightness.

5.16 **EMC Filter** (Panthera C2)

- Gently lift up the latches on the EMC filter to open the contraption.
- Measure about 12 cm (~5 in) of the power cord from the very tip of the input end. The end of this small strip of power cord serves as the loop that will loop around the bottom end of the filter.
- Gently loop the power cord around the outside of the EMC filter and let the longer end run straight down through the middle of the open EMC filter.
- Make sure both lines of the power cord are fitted snugly inside the EMC filter and close the contraction, taking care to make sure that the latches are tightly shut.

6. PHOTOMICROGRAPHIC PROCEDURE

- To ensure vibration-free operation, set the 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 the way out to its limit; the ratio of light entering the observation tube and standard 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 color-compensating filter can also be used depending on the color 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.

7. USING OIL IMMERSION OBJECTIVES

- Oil immersion objectives are labelled as “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.
- 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.
- At operating with immersion oil, the space between objective and cover glass must be free of any air bubbles.

8. CARE AND MAINTENANCE

8.1 Do not disassemble

- Disassembly may significantly affect the performance of the microscope, 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.

8.2 Cleaning the microscope

8.2.1 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 Isopropyl alcohol should be used to remove grease or fingerprints.
- Use isopropyl alcohol to remove immersion oil from objective lenses.



Warning: alcohol is a highly flammable liquid; be careful when handling around open flame and always observe the local security advisory on how to handle such substances.

8.2.2 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.

8.3 Disinfecting the Microscope

- Follow the standard procedures for your laboratory.

8.4 When not in use

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

Note:

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

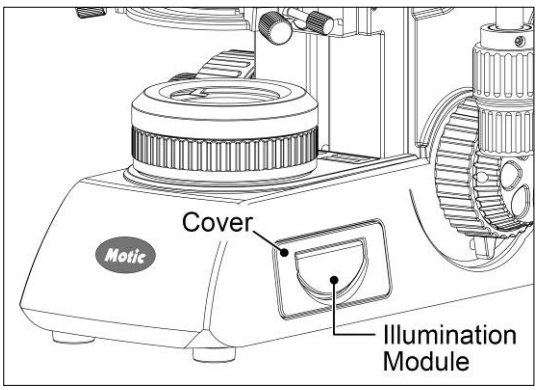
8.5 Bulb replacement



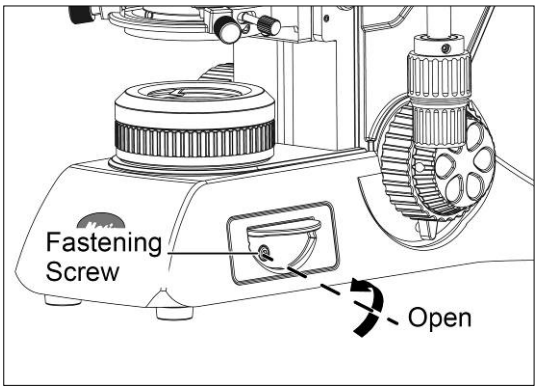
- The lamp and the lamphouse may become very hot during and after a period of operation.
  Risk of burn – do not touch the lamp during or immediately after period of operation.
  Make sure the lamp has cooled sufficiently before attempting to replace the lamp.
- In order to prevent electric shock, always turn the power switch off and unplug the power cord before installing or replacing the bulb.

8.5.1 Replacing the 6V 30W halogen module or the two different LED modules (Panthera C2)

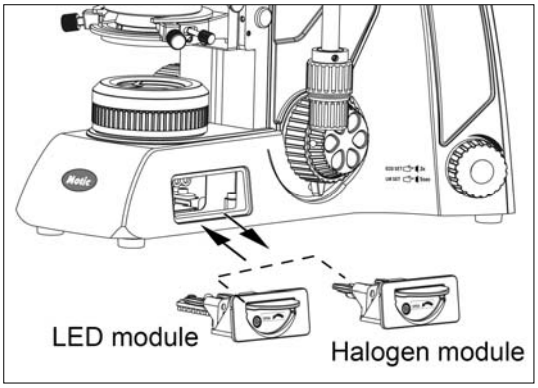
- Lift up the cover of illumination module. (Fig. 18-1)
- Loosen the fastening screw of the illumination module. In doing so, slightly press the screw against the spring and turn it by 90° (counter clockwise). (Fig. 18-2)
- Pull the illumination module out of the stand. (Fig. 18-3)
- If the stand is equipped with a 6V 30W halogen lamp, remove the halogen lamp from the lamp carrier and insert the new halogen lamp. Do not touch the new lamp with bare hands as this will reduce lamp life.
- If the stand is equipped with an LED lamp, replace the complete illumination module including the LED.
- Push the illumination module back into the stand and lock it by means of the screw. In doing so, slightly press the screw against the spring and turn it by 90° (clockwise). (Fig. 18-4)



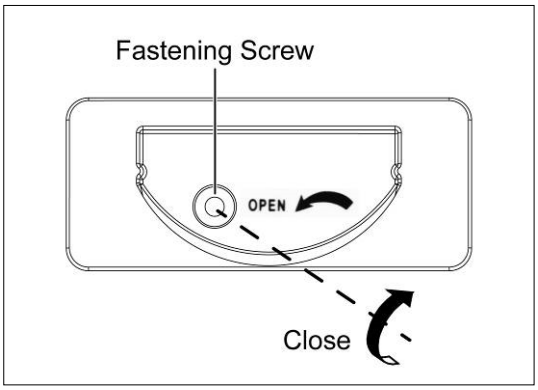
(Fig. 18-1)



(Fig. 18-2)



(Fig. 18-3)



(Fig. 18-4)

8.5.2 Electrical Specifications:

A. Panthera E2:

Camera USB Output: 5V / 1A

Input: AC100~240V, 50~60Hz 0.55A

Bulb: 1W LED, color temperature: 5700K

B. Panthera C2:

Camera USB Output: 5V / 0.8A

Input: AC100~240V, 50~60Hz 1.2A

Bulb: 3W LED or 6V 30W Halogen

LED module, high color temperature: 5500K~ 6000K

LED module, low color temperature: 3000K ~ 3500K

9. TROUBLESHOOTING TABLE

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

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

9.1 Optical

Problem	Possible Cause
Vignetting or uneven brightness in the field of view or field of view only partially visible	Lamp not installed properly
	Lamp not centered
	Diffuser is in intermediate position
	Condenser not mounted correctly
	Condenser is not centered
	Condenser is set too low
	Condenser top lens not fully swung in/out
	Field diaphragm closed too far
	Aperture diaphragm closed too far
	Improper condenser objective combination
	Revolving nosepiece not clicked into position
	Trinocular eyepiece tube optical path selector lever in intermediate position
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 lens
	Incorrect illumination

Unequal focus	Stage installed on inclined plane
	Specimen holder not fixed securely on stage
	Specimen not secured in position
Image tinged yellow	Lamp voltage is set too low
	Blue filter is not being used
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 diopter not adjusted
Insufficient parfocality of objectives	Eyepiece diopter not adjusted
No cohesion of binocular image	Magnification or field of view of left and right eyepieces differ
	Interpupillary distance not adjusted
	Eyepiece 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

9.2 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

10. SELECTION OF THE POWER SUPPLY CORD

Motic's microscopes are certified and tested for safety and environmental conformity. Only power supply cords which conform with the below listed certification marks and countries are applicable.
CAUTION : Do not use non-approved power cord for Motic products, Motic can no longer warrant the electrical safety of the equipment.

Table 1 Certified Cord

	Specifications
Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60 C minimum
Length	3.05 m maximum
Fitting Configuration	Grounding type attachment pull cap opposite terminates in molded-on EC configuration appliance coupling.

The power supply cord should be certified by one of the agencies listed in Table 1, or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1.

Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JQA,JET,TÜV,	
Austria	OVE			UL-APEX/MITI	
Belgium	CEBEC		Netherlands	KEMA	
Canada	CSA		Norway	NEMKO	
Denmark	DEMKO		Spain	AEE	
Finland	FEI		Sweden	SEMKO	
France	LTTE		Switzerland	SEV	
Germany	VDE		United Kingdom	ASTA BSI	
Ireland	NSAI		U.SA	UL	

11. TABLE 2 HAR FLEXIBLE CORD

Approval organizations and cordage harmonization marking methods

Approval organization	**Printed or embossed harmonization marking (may be located on jacket or insulation of internal wiring)**		**Alternative marking utilizing black-red-yellow thread (Length of color section in mm)**		
			Black	**Red**	**Yellow**
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V.	<VDE>	<HAR>	30	10	10
Union Technique de Electricity	USE	<HAR>	30	10	30
Instituto Italiano del Marchio di Qualita (IMQ)	IEMMEQU	<HAR>	10	30	50
British approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KEUR	<HAR>	10	30	30
SEMKO AB Svenska Elektriska Matenelkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichisher Verband fur Elektrotechnik (ÖVE)	<ÖVE>	<HAR>	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacio Electroteca Y Electronica Espanola EE)	<UNED>	<HAR>	30	10	70
Hellenic Organization for Standardization	ELOT	<HAR>	30	30	70
Institute Portages da Qualidade (IPQ)	np	<HAR>	10	10	90
Schweizerischer Elektro TechnischerVerein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

12. MICROSCOPE TERMINOLOGY

Abbe Condenser

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

Aperture, Numerical (N.A.)

The numerical aperture is an important factor determining the efficacy 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 controls the size of the condenser aperture. A synonym for the condenser is the illuminating aperture diaphragm.

Magnification

The number of times by which the size of the image exceeds the original object. Another name often used is “lateral magnification”. 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 unit of length in the metric system equal to $1x10^{-6}$ 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 (mm) of the object field.

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

Example:

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 a microscope that accommodates for the differences in eyesight for each individual observer.

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.)
The extent of the observable world that is seen at any given moment. 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, reduce overhaul intensity, or transmit only specific wavelengths.

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

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
How well fine details are outlined in an image.

Total Magnification
The total magnification of a 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, the X-axis of the specimen stage runs left to right.

Y–axis
The axis that is usually vertical in a two-dimensional coordinate system. In microscopy, the Y-axis runs front to back.

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Design Change: The manufacturer reserves the right to make changes in instrument design in accordance with scientific and mechanical progress, without notice and without obligation.

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