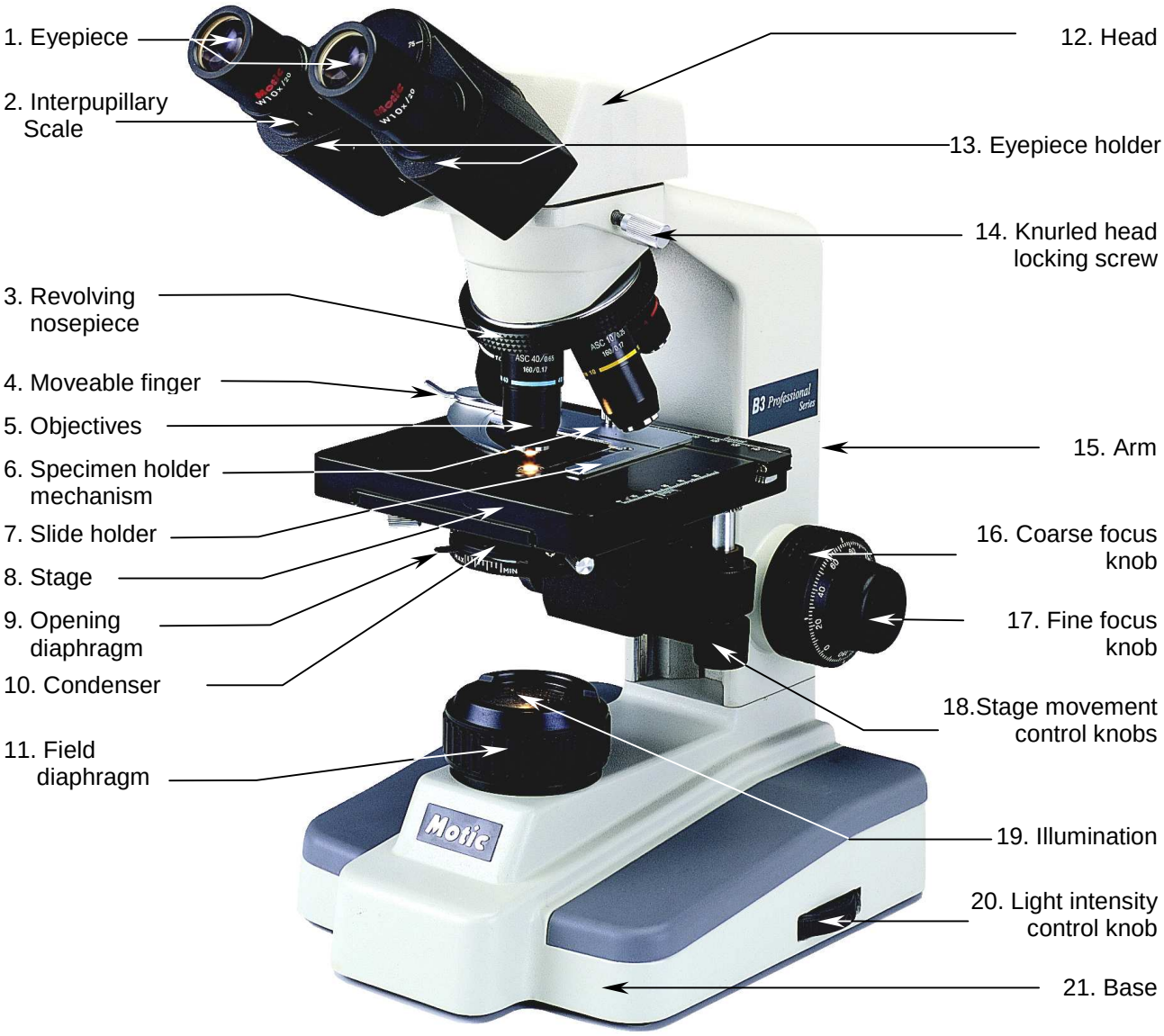
Motic® Microscopes

Instruction Manual

B3 Series


1. Eyepiece
2. Interpupillary Scale
3. Revolving nosepiece
4. Moveable finger
5. Objectives
6. Specimen holder mechanism
7. Slide holder
8. Stage
9. Opening diaphragm
10. Condenser
11. Field diaphragm
12. Head
13. Eyepiece holder
14. Knurled head locking screw
15. Arm
16. Coarse focus knob
17. Fine focus knob
18.Stage movement control knobs
19. Illumination
20. Light intensity control knob
21. Base
B3 Professional Series
Motic

B3-220ASC

Introduction

Thank you for your purchase of a Motic microscope. Motic microscopes are precision instruments, subjected to meticulous examination in order to reach you in perfect condition. Their design combines easy management and optimum functioning with minimum maintenance.
The information contained in this manual is likely to go beyond what the average user needs to know to use the microscope, however, it is provided to answer any queries that may arise.

Your new microscope combines high performance features, with an excellent degree of optical resolution and clarity of image. It incorporates a mechanical stage that provides a travel range of 70mm x 50mm in X and Y directions with a graduation of up to 0.1 mm, thus permitting the perfect positioning of the specimen. Also included are objectives located on a ball bearing nosepiece allowing movement in both directions; a precision coarse and fine focusing system; a moveable Abbe condenser with a numerical aperture of 1.25 N.A. and a built-in 12V/ 20W halogen variable light source.

These instructions should be read carefully before operating the microscope. They will permit you to use your new microscope to its fullest capabilities. Terminology used to describe components and controls can be found in the diagram on page 2.

These instructions are based on the assembly and use of the B3-220 (Binocular) with additional notes applying specifically to other models in the series.

Unpacking

All components of the microscope have been carefully packed to make sure they reach you in perfect condition. We recommend that you do not discard any packing containers in case you need to return the microscope or store it for long periods of time; or should it become necessary to transport it to a technical service for any repair, or maintenance procedure.

The box should contain the following components, depending on the model:

- B3-220 (Binocular): Stand, Power cable, monocular head, two eyepieces, two eyepiece protectors, four objectives, condenser, sample holder mechanism, blue, green and yellow and frosted filters, fuse, dust cover, a bottle of immersion oil and a 2mm hexagonal key.

- B3-223 (Trinocular): Stand, Power cable, trinocular head, two eyepieces, two eyepiece protectors, four objectives, condenser, sample holder mechanism, blue, green and yellow and frosted filters, fuse, dust cover, a bottle of immersion oil and a 2mm hexagonal key.

Remove, and handle the microscope and all its components with extreme care.

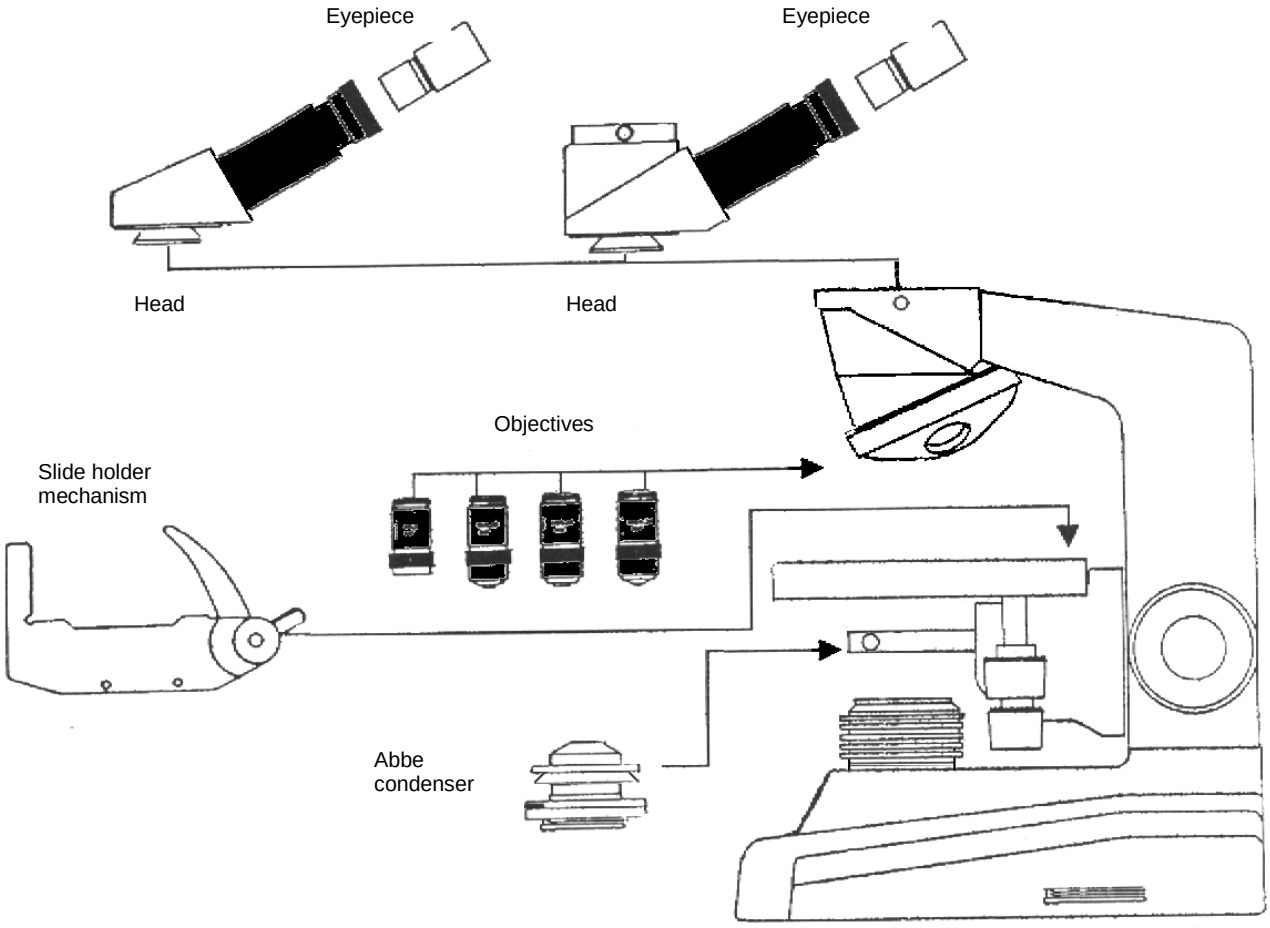
Avoid touching the lenses of the optical elements and keep clear of contact with dust, water or other contaminating agents, as they could stain, or damage the lens surface and affect the quality of the image.

A. Place the microscope in an upright position on a flat, stable and clean surface.

B. Unscrew the black plastic protectors from the revolving nosepiece (3).

C. Remove the rest of the components from the box.

Assembly



All the steps described for the assembly of the microscope must be undertaken with extreme care, and without forcing the placement of the distinct parts and elements of the microscope.

A. Condenser (10):

a. Turn the coarse focus knob (16) until the stage (8) is in its highest position.

b. Turn the focussing knob on the condenser (Fig.1), until the condenser holder reaches its lowest position.

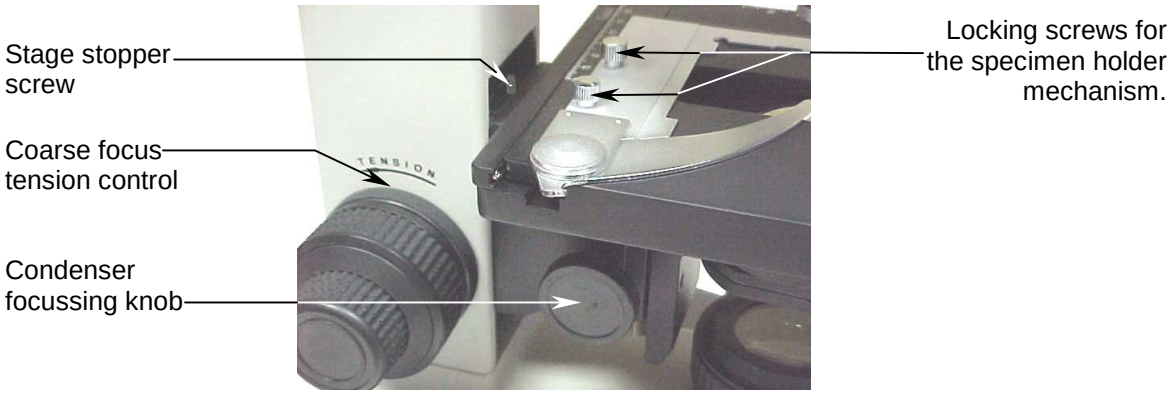


Fig. 1

c. Unscrew the locking screws, that also center the condenser (Fig. 2).

Fig. 2

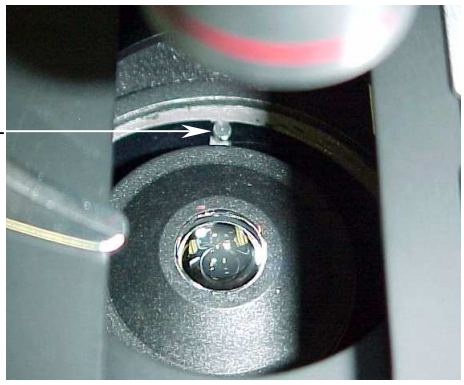


Fig. 3

d. Insert the condenser in the support, so that the slot on the collar lines up with the positioning pivot. (Fig. 3)

e. Tighten the locking screws and centralise, until well supported and turn the focusing knob of the condenser until it is in its highest position.

B. Specimen holder mechanism (6): Turn the coarse focus knob (16) until the stage (8) reaches its lowest position. Unscrew the two locking screws (Fig. 1) of the specimen holder mechanism. Place the mechanism on the stage with the moveable finger pointing upwards (4) so the holes on the mechanism line up with the locking screws. Tighten locking screws firmly.

C. Objectives (5): Ensure that the revolving nosepiece (3) is well positioned: i.e. that it does not revolve freely, but rotates until a “click” is heard, showing that it is secure in place. Place objectives, starting with the lowest magnification 4X in any of the holes in the revolving nosepiece. Next, place that of the second lowest magnification 10X in the hole alongside, and so forth: the 40X objective, and finally the 100X objective can be placed.

D. Head (12): Loosen the knurled locking screw on the head (14) and remove the protective cover on the collar where the head is placed. Insert the head, until it is well supported on the stand (15). Although the head can be placed in any position, we recommend for your comfort that the eyepiece tubes (13) face forward on the microscope. Firmly re-tighten the knurled locking screw.

E. Eyepieces (1): Remove the protective covers on the eyepiece tubes (13). Gently place the eyepieces in the tubes without touching the lens surface.

F. Filter: Place the blue filter on the illuminator (19). Make sure that the filter is well positioned.

G. Power cable: Insert the power cable in the connector situated in the lower back part of the microscope. (Fig. 4)

Warning: Before connecting the microscope to a power source, make sure that the voltage coincides with that of the microscope.

Operation

A. Starting Up

1. Before using the microscope, adjust the light intensity control (20) to minimum position. This should be repeated every time the microscope is switched on or off to prolong the use of the bulb.

2. Switch to position ON. (Fig. 4)

3. Turn illumination control until the image is illuminated.

4. Light intensity must be adjusted according to the objective used (5), or the type of preparation to be observed.

B. Interpupilliary adjustment of head.

1. Look through the eyepieces (1) move the eyepiece holder tubes (13) by rotating them on their axis.

2. When the field of vision is complete through both eyepieces, ie. that the two images unify into one, interpupilliary distance is correct.

3. Each person may have to adjust interpupilliary distance to receive the same image.

C. Focussing the microscope.

1. Rotate the nosepiece (3) and place the 10X objective (5) in the optical path, making sure that it correctly clicks into place.

2. Rotate the coarse focus knob (16) until the stage (8) rests in its lowest position.

3. Place a microscopic sample on the stage, make sure the cover slip faces upwards.

4. Swing the moveable finger (4) on the mechanism (6), support the slide against the side holder (7) and gently release the moveable finger, until the slide is well supported.

5. Ensure that the sample on the slide is in the optical path, to do so, move the stage using the knobs controlling the X/Y movement of the stage. (18).

6. Looking through the eyepiece (1), turn the coarse focus knob until the preparation appears in focus.

7. Readjust the focus with the fine focus knob (19) until the image appears sharply defined.

D. Adjusting diopter for differences in eyesight.

1. With your right eye, look into the right eyepiece tube (1) and adjust the sharpness of the image using the fine focus knob (19).

2. With your left eye, looking through the left eyepiece, adjust the focus by rotating the diopter corrector (2) on the left hand eyepiece tube until the image is sharp. Do not use the fine focus knob.

E. Köehler illumination.

The ideal level of illumination when all illumination elements are brought into proportion, basically, by the condenser and the field diaphragm.

1. Focus on a sample with the 10X objective (5)..

2. Close the field diaphragm (11) turning the ring situated on the illuminator (19), until it appears in the field of vision.

3. Next, focus the field diaphragm, moving the condenser (10) using its focusing control (Fig. 1). Do not use the coarse (16) or the fine focus control knobs (17).

   NB: The focus of the field diaphragm is not completely sharp, although it can be adjusted to the maximum possible.

4. Center the condenser using the locking and centering screws (Fig. 2). As a consequence, the field diaphragm will be centred.

5. Once field diaphragm is focused and centred, open the diaphragm just enough so that the field of vision disappears. It must not be fully opened if optimum illumination is to be obtained.

   NB: For each objective used, the field diaphragm must be opened to a different degree. If anything irregular appears in the field of vision, an element of the illuminator or filter for example, appears in focus. Move the condenser just enough to remove it from view.

F. Adjusting the opening diaphragm.

The opening diaphragm (9) must not be used to regulate light intensity. Its function is to obtain the best resolution possible of the object, and proportion best image contrast. The less the iris is opened, the better the image contrast, although reducing the opening too much will worsen image contrast. The best means of finding the best image contrast is to experiment with the size of the opening. Suggested apertures (openings) are as follows:

OBJECTIVE	IRIS APERTURE
4X	Totally closed to 1/8 open.
10X	From 1/8 to 1/4
40X	From 1/4 to 1/2
100X	From 1/2 to 3/4

G. Changing magnification.

1. Position the 10X objective (4) in the optical path.

2. This microscope arrives parfocalised, although it is possible that small differences exist between objectives. If so, readjust slightly using the fine focus knob (19).

3. When the 40X and 100X objectives are changed, it must be done with extreme care, in particular making sure that the objectives do not make contact with the slide as this could damage the objective front lens.

4. To obtain maximum resolution with the 100X objective, it is necessary to apply immersion oil between the slide and the front lens of the objective.

   a. Use a very small amount of immersion oil, a tiny drop should be enough.

b. If air bubbles appear, they can be removed by moving the revolving nosepiece (3) slightly back and forth.

c. After using the microscope, all parts that have come into contact with immersion oil must be cleaned. Using a soft cotton cloth lightly dampened with Xylene. If the 100X objective is not cleaned, oil could dry on the lens surface resulting in the view being blocked, and possible damage occurring. This must be repeated each time the microscope is used.

NB: Immersion oil must ONLY be used with the 100X objective, which is the only objective prepared for it. If any other objective comes into contact with immersion oil, it must be cleaned immediately.

How to adapt a photographic, or a video camera. (Only for B3-223 model)

Model B3-223 comes equipped with a vertical port on the top of the head that permits the attachment of a photographic, or reflex type camera through use of the corresponding adapters.

The two position sliding rod allows the microscope image to appear easily through this third path.

- When the rod is pushed completely into the head, 100% of the image is directed to the binocular eyepiece for observation.
- In the extended position, 30% is directed to the binocular eyepiece, and 70% to the vertical port.

A. To adapt a photographic camera, an adapter tube is required (Fig. 5). This tube includes a 2,5X lens for photography which measures the parfocality correctly between the images of the binocular and vertical ports. The adapter tube also requires a T mount adapted to fit the T threads of all photographic camera brands on the market.

Fig. 5

1. To install the camera on the microscope, first extract the removable lens on the camera, and place the appropriate T thread. Then attach the adapter tube to the thread.
2. Loosen the knurled screw located on the side of the vertical port until the protective cap can be removed. (Fig.6).
3. Insert the adapter tube with the camera already connected to the vertical port. If it does not fit easily, unscrew the knurled screw until the adapter tube fits in and is firmly in place.
4. Tighten the knurled screw to secure the camera well.
5. Place the sliding rod to mid or extended position so that the image can be projected to the photographic camera.
6. Operate the camera according to manufacturers instructions.

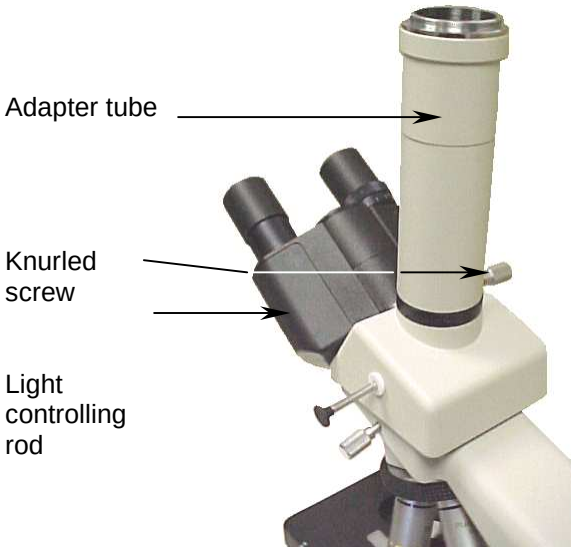


Fig. 6

B. To adapt a video camera, an adapter tube is required. (Fig. 5). This adapter includes a 0,5X lens for videos that measures the correct parfocality between the images of the binocular and vertical ports shown as an image on the TV monitor. The adapter tube also includes a “C” knurled ring and a “CS” type ring to accommodate different types of video cameras.

1. To install the camera to the microscope, screw the adapter tube to the video camera.

2. Loosen the knurled screw (Fig. 6) located on the side of the vertical port of the head, until the protective cap can be removed.

3. Insert the adapter tube with the camera already connected to the vertical port. If it does not connect easily, unscrew the knurled screw until the adapter tube fits in, and is secure in place.

4. Tighten the screw, to secure the camera.

5. Place the sliding rod, to mid or extended position to allow the image to be projected to the camera.

6. Operate the camera according to the manufacturers instructions.

7. If the image on the TV monitor does not appear in focus when the objective is changed, this is possibly due to the “CS” mount. Place it, or remove it, according to the procedure to obtain parfocality.

Maintenance

WARNING: FOR YOUR SECURITY, SWITCH OFF AND REMOVE PLUG FROM POWER SOURCE OUTLET BEFORE MAINTAINING YOUR MICROSCOPE IN ORDER TO AVOID SHOCK OR FIRE HAZARD.

CONSULT YOUR DISTRIBUTOR IF YOUR MICROSCOPE REQUIRES ANY MAINTENANCE OR REPAIR PROCEDURE NOT COVERED IN THIS INSTRUCTION MANUAL.

A. Optical Maintenance

1. Do not attempt to remove any optical component.

2. Before cleaning any lens, remove surface traces of dust using a fine brush, especially for lenses, or with low pressure. Both can be obtained in any photography shop.

3. Cleaning the eyepiece.

    a. Do not remove the eyepiece (1) from the eyepiece tube (13).

    b. Only clean the lens surface, misting the lens with breath.

    c. Afterwards, dry the lens with special lens paper in circular movements, from center out to the exterior of the lens. Do not wipe the lenses when dry, as they can be easily scratched.

4. Cleaning the objectives.

    a. Do not remove the objectives (5) from the microscope.

    b. Only clean the surface area. Use a soft cotton cloth dampened with Xylene. Dry the lens using the same cloth.

5. Cleaning the condenser.

    a. Only clean the top lens surface of the condenser (10) using any of the methods mentioned above for cleaning the eyepieces or objectives.

6. Cleaning the illuminator lens.

    a. Only clean the top lens of the illuminator (19) using any of the methods mentioned above for cleaning the eyepieces or objectives.

B. Electrical maintenance

WARNING: FOR YOUR SECURITY, SWITCH OFF AND REMOVE PLUG FROM POWER SOURCE OUTLET BEFORE MAINTAINING YOUR MICROSCOPE IN ORDER TO AVOID SHOCK OR FIRE HAZARD.

1. Changing the bulb.

    a. Lay the microscope on its side taking extreme care, especially with the eyepieces (1) and the specimen slide holder mechanism (6).

    b. Unscrew the screw marked by the arrow. (Fig. 7).

    c. Open the cap where the bulb is located.

    d. With a cloth, carefully grasp the bulb and pull it out to disconnect it from the socket.

    e. Do not touch the replacement bulb with fingers, use a clean cloth to insert the pins of the bulb into the socket.

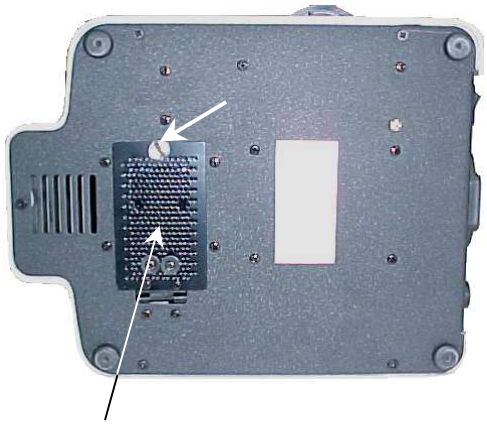


Fig. 7

    f. If bulb is touched accidently, it must be cleaned as this could affect the transmission of light and duration of the bulb.

    Replace the cap, and screw down firmly.

2. Changing the fuse.

    a. With a flat screwdriver, press lightly on the slot on the fuse cap (Fig. 4) and turn 1/4 in the direction of the arrow indicated.

    b. Release pressure and the fuse cap should be able to be removed easily. Remove it completely.

    c. Remove the fuse by pulling it out, and insert the new one. Ensure that a 0.5 amp fuse is being used.

    d. Replace the fuse cap.

    e. Repeat step (a.) this time 1/4 in the opposite direction of the arrow indicated. The cap should be well closed.

C. Mechanical maintenance.

1. Adjusting the tension of the coarse focus control.

The tension adjustment control (Fig. 8) is located between the coarse focus knob (16) and the arm (15). The coarse focus nov comes pre-adjusted by the manufacturer. The ideal tension point is that which permits coarse focus knob to move as loosely as possible, without the stage (8) moving down on its own.

a. To tighten the focussing controls of the coarse focus knob, the ring must be turned in an anti-clockwise direction, as indicated by the arrow. To loosen it, the ring must be turned clockwise.

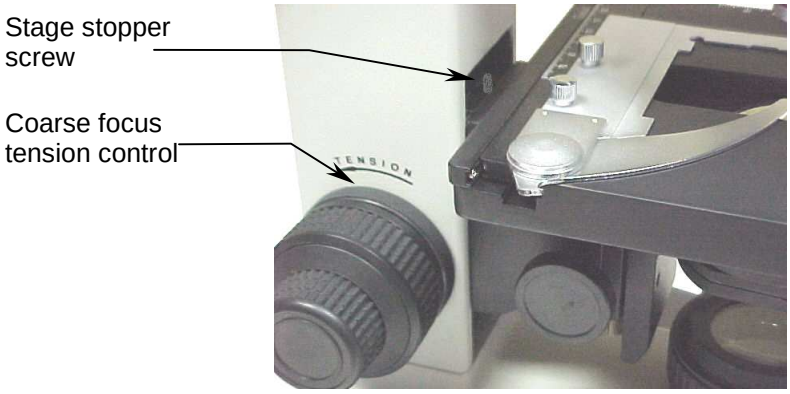


Fig. 8

2. Adjusting the stage stopper.

The 40X and 100X (optional) objectives incorporate security measure in that the lens tip retracts to avoid damage to the front of the lens should it come into contact with the slide. An additional measure of security consists of an adjustable stopper on the ascending movement of the stage. The stopper comes pre-adjusted by the manufacturer for standard slides with cover slips 0.17mm thick. For observing other types of samples, however, it may become necessary to readjust the stage stopper.

a. Loosen the stage stopper screw (Fig. 8) with a 2mm hexagonal key.

b. Focus on the sample using only the fine focus knob (5) with firstly the 4X objective, and 10X objective.

c. Tighten the stage stopper screw until firm enough for the stage is supported, and cannot ascend further.

Troubleshooter

ELECTRICAL

PROBLEM	CAUSE	SOLUTIÓN
Bulb does not work.	Plug outlet does not work Cable not connected Bulb burned out. Fuse blown. Wrong bulb.	Repair by a qualified specialised technician. Connect cable. Replace bulb. Replace fuse. Replace by the correct bulb.
Bulb burns out in short time.	Voltage too high.	Reduce light intensity to a minimum before turning the microscope on or off.
Bulb burns out immediately.	Wrong bulb.	Replace with the correct bulb.
Bulb flickers.	The bulb is not correctly inserted into the socket. Bulb about to burn out. Fuse holder not locked into proper position. Loose connection at plug outlet.	Insert correctly. Replace bulb. Close correctly. Repair by a qualified specialised technician.
Fuse blows in short time.	Wrong fuse.	Replace with the appropriate fuse.
Fuse blows immediately.	Short circuit	Repair by a qualified technician.

IMAGE QUALITY

PROBLEM	CAUSE	SOLUTIÓN
No image.	Nosepiece not positioned properly. Image too bright.	Turn until clicks into place. Reduce the intensity of the light.
Poor resolution.	Dirty objective. Dirty eyepiece. Slide upside down. Wrong cover slip used with slide. Light too bright. Dirty condenser.	Clean objective. Clean eyepiece. Replace the slide with the cover slip facing upwards. Use 0.17mm thick cover slips. Reduce light intensity or adjust the diaphragm aperture. Clean condenser.
Spots in field of view	Dirty eyepiece. Dirty slide. Dirty condenser.	Clean eyepiece. Clean preparation. Clean condenser.
Uneven illumination of field.	Nosepiece not positioned properly. Diaphragm aperture not sufficiently open.	Turn until it clicks into place. Adjust appropriately.

MECHANICAL

PROBLEM	CAUSE	SOLUTIÓN
It does not stay in focus.	The stage is sliding down on its own.	Adjust the tension of the coarse focus knob.
It does not focus.	The stopper on the ascending movement of the stage needs adjusting.	Readjust the stopper.

Moving the microscope

- Avoid moving the microscope if possible.
- Carry the microscope in both hands, with one hand holding the arm (15), and the other supporting the base (21).
- Keep the microscope in an upright position.

Repairs

If the microscope needs repairing, or revision by authorised personnel, we would recommend that it be stored in its polystyrene box and returned to the distributor. Attach a note with a description of the problem, or details of the required revision.

Warrantee

All MOTIC microscopes are warranted against any manufacturing defect for a 5 year period. Damage occurring by any unauthorised repair work, or occurring through misuse or modification of the microscope will not be included under the conditions of the warrantee. Bulbs and fuses are not under warrantee.

The warrantee service is provided by MOTIC, or its authorised distributors. Defective products will be repaired free of charge when returned to MOTIC, or one of its distributors. Transport costs will be covered by the purchaser.

OWING TO POSSIBLE MODIFICATIONS AND IMPROVEMENTS IN THEIR MANUFACTURE, CHANGES MAY OCCUR TO MICROSCOPES WITHOUT PRIOR NOTICE.

Using Phase-contrast microsocopy

It is applied mainly to the contrast of unstained specimens. Common illumination effects are directed at the objective. In the case of phase contrasting, the procedure is slightly different because the objective itself plays a part in the illumination. Special phase contrast objectives are required which are engraved additionally with the letters iePhlr. If you look through the wrong end of a phase contrast objective, you will see a ring which only permits a certain amount of light to pass through. A ring of light from the zone diaphragm in the contrasting device passes through the condenser and then through the practically translucent objective ring.

Required equipment

Either (A): Phase contrast objective Plan 10x PH (12.220.265) with
10x phase contrast attachment (12.220.266)
Phase contrast objective Plan 40x PH (12.220.260) with
40x phase contrast attachment (12.220.261)

Or (B): Complete phase contrast set including turret type condenser for 10x, 20x, 40x and 100x PH and brightfield applications (12.220.296)

Adjustments using equipment (A)

a. Adjust object in brightfield
b. Turn in Plan 10x PH objective 12.220.265
c. Plug phase stop 12.220.266 into condenser
d. Adjust lamp brightness to the object
e. Open luminous field and aperture diaphragms in the condenser
f. Perfect phase contrast is produced only if the dark ring in the objective and the bright phases stop exactly coincide. Control both rings for looking through the empty binocular tube (eyepieces removed) or through the centering telescope (12.220.280) inserted in the tube.
g. The phase stops in the turret condenser are centered using the screws.

Special note: Especially clean glass-to-air surfaces on the specimen are required in phase contrast even more than in brightfield (no fingerprints).

Using Darkfield microscopy

It is applied
a. To study minute objects or object features such as treponemas, spirochetes, flagellates, bacteria etc., or emulsions, if phase contrast does not supply sufficient contrast.
b. If the specific colours or natural (unstained) objects are well visible (living organisms in water like algae, unicellular organisms, lower animals).

Required equipment
a. Always a condenser with central stop and a numerical aperture which is higher than that of the objective used.
b. Darkfield attachment (12.220.275) is suitable for use phase contrast for 10x, 20x and 40x objectives.