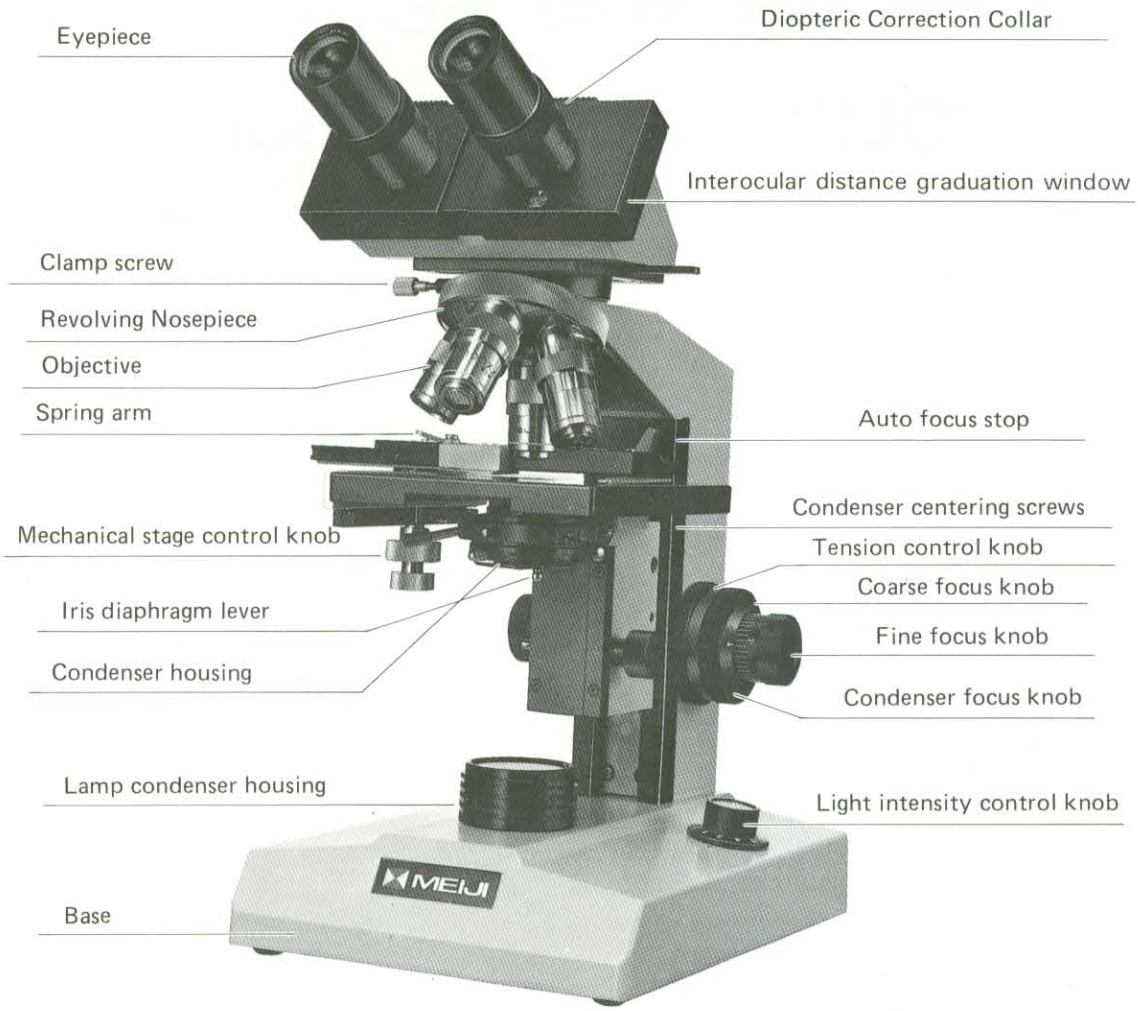
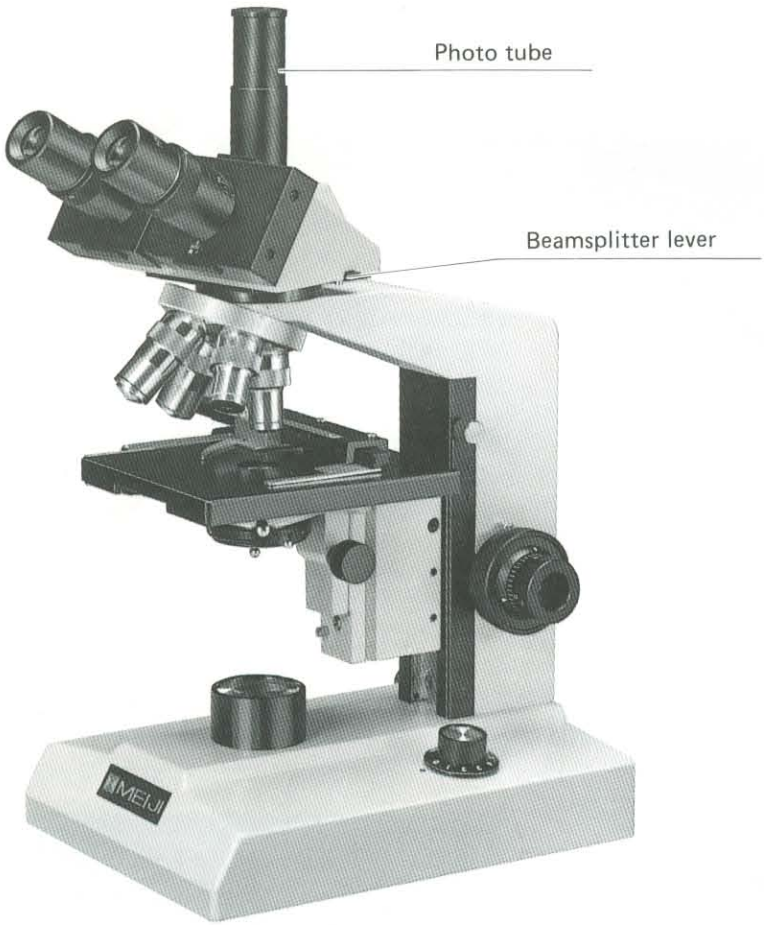
MEIJI

INSTRUCTION MANUAL
FOR **RM** SERIES
BIOLOGICAL MICROSCOPE

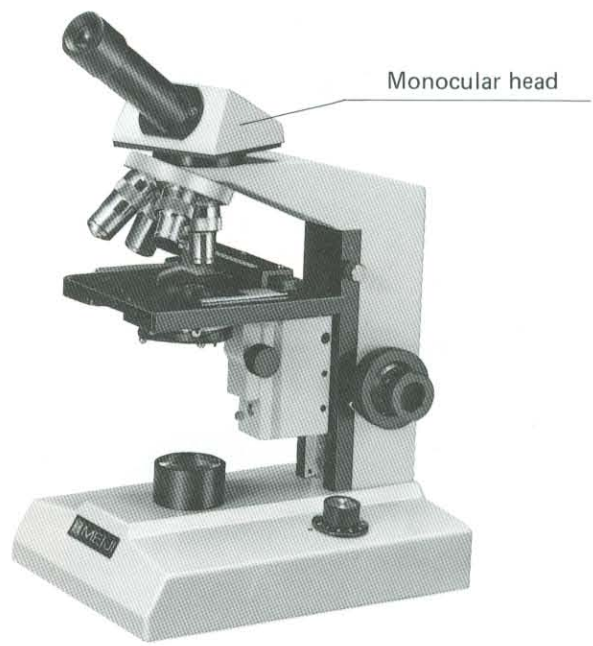
MEIJI-LABAX CO.,LTD.



RM-B (Binocular Model)



RM-T (Trinocular Model)



RM-M (Monocular Model)

I. UNPACKING AND ASSEMBLING

The RM Series Microscope will normally be delivered in a styrofoam packing case, which can be used for future transport or storage if required.

1. Remove all components carefully from packing and check that they conform to those specified for the RM Series Model you have purchased.
   When the microscope is delivered in a wooden cabinet, unlock the lid with the key attached and remove the large screw, which is fastening the microscope to the cabinet from the bottom of the cabinet, with a large screwdriver or the special tool attached.
   And remove the microscope from the cabinet and remove all components from the accessory drawers of the cabinet.

2. Examine all packing materials to ensure that no small items are accidentally discarded.

3. Place the microscope stand on a firm, level table.

4. Loosen the clamp screw by turning it counterclockwise, and insert the cone fitting at the base of the viewing head into the recess in the top of the microscope arm-stand. Push the cone fitting toward and against the spring-stopper until the viewing head gently slips into position. Tighten the clamp screw until the head is firmly gripped **(Fig. 1)**

5. Should it be required to rotate the viewing head to an alternate position: loosen the clamp screw; gently rotate the head to the desired position; and again firmly tighten the clamp screw.

6. Next, install the objective starting with the objective of lowest power. While facing the front of the microscope insert the objective into the nearest threaded hole in the nosepiece **(Fig. 2)** of the microscope. The objective should easily screw into the nosepiece with a clockwise turning motion. DO NOT FORCE. If the objective does not turn easily, reseat the objective and try again. Tighten the objective firmly, but do not apply exces-

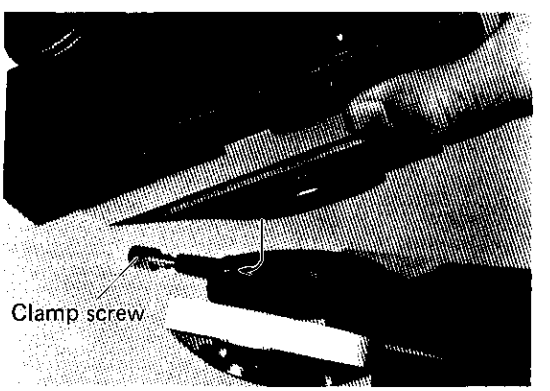


Fig. 1

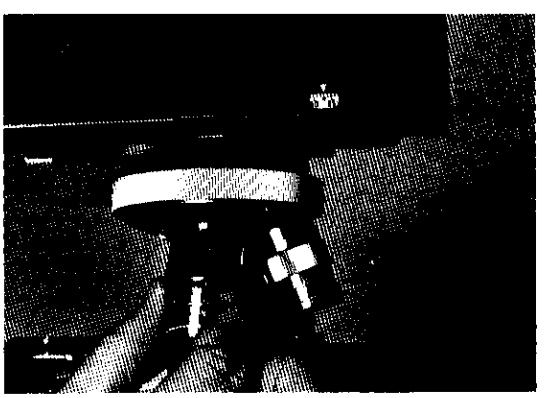


Fig. 2

sive torque. After the first objective is installed turn the nosepiece clockwise and install the next higher objective in the same fashion. Ensure that both male and female threads of objectives are clean otherwise parcentricity and parfocality may be affected.

7. Insert the eyepiece(s) into the eyetube(s) of the viewing head.

8. Insert the Abbe condenser by loosening the condenser lock screw and firmly tighten after inserting the condenser.

9. The tension control knob **(Fig. 3)** is provided to allow the individual user to adjust the focus tension to his/her own preference. Tension may be increased by turning the knob with a counterclockwise motion. A lighter tension may be set by turning clockwise.

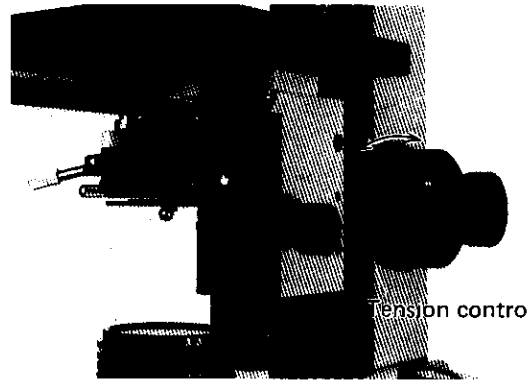


Fig. 3

Ⅱ. PRELIMINARY ADJUSTMENTS

1. Before making electrical connection, be sure that the operating voltage of the microscope is correct for your main supply. Connect the plug of the illuminator to the main supply and switch ON by turning the light intensity control knob clockwise to its minimum position at point 1.

2. Secure the microslide specimen to be observed to the stage by first retracting the spring arm of the mechanical stage and positioning the microslide within the cradle of the mechanical stage. Gently return the spring arm allowing it to bear pressure on the microslide. **(Fig. 4)**

3. Completely open the condenser iris diaphragm with the lever located directly below the condenser.
   The correct setting of this control is described later, but initially it is useful to have as much light as possible, therefore, open the aperture fully. **(Fig. 5)**

4. Rotate the nosepiece to position the lowest power objective for viewing and focus the specimen. You may close the iris diaphragm at this time to improve contrast.

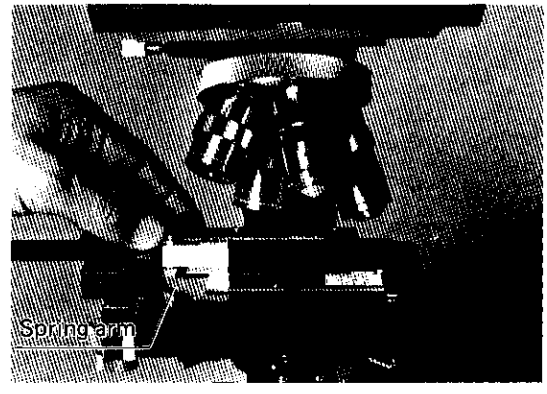


Fig. 4

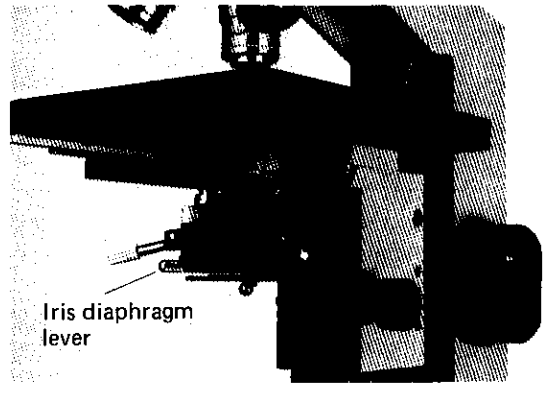


Fig. 5

Ⅲ. ADJUSTMENT OF THE OPTICAL SYSTEM

Binocular Head Adjustments

1. Adjust the interocular distance of the binocular head to match the interpupillary distance of your eyes by pulling or pushing the eyetubes in a horizontal direction. The interocular distance is adjustable within a range of 54mm to 72mm **(Fig. 6)**.

2. For compensation of the tube length established in setting the interocular distance above, the height of the eyetubes must be set at the corresponding length. This is done by first sharply focusing the slide specimen using the 40X objective. Now switch to the 10X objective and without re-focusing the specimen, adjust each eyepiece individually by turning the respective diopteric correction collars until the specimen being viewed is again sharply defined. **(Fig. 7)**
   The binocular head will now be optically correct for viewing by you, but will need to be adjusted again to match the optical capacities of other viewers.

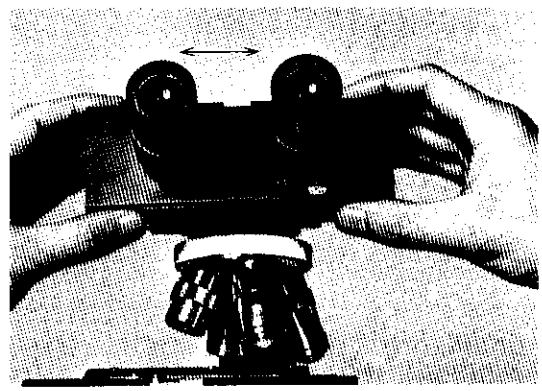


Fig. 6

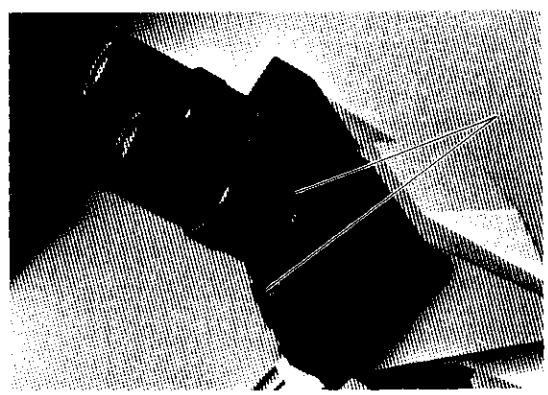


Fig. 7

Iris Diaphragm

1. The iris diaphragm is not intended to control the brightness of the illumination but to induce contrast into the specimen by diffracting light passing through the specimen.
   It should be noted that a reduction in the diameter of the iris aperture smaller than the optimum setting for each objective does increase contrast and depth of focus, yet at the same time introduces undesirable diffraction and loss of resolution. Therefore, a compromise must be found to achieve maximum contrast with minimal loss to the resolving power inherent in the **RM** optical system.
   The "theoretically proper" iris aperture is different for each objective since the angle of light required by each objective is determined by its Numerical Aperture (N.A.). Therefore, the required iris aperture for the 10X (N.A. 0.25) objective will not be the same as for the 40X (N.A. 0.65).

2. The proper iris aperture is easily determined. Remove one eyepiece and view the field produced by the objective at the bottom of the empty eyepiece tube. Now, slowly close the iris setting until approximately 70–80% of the objective field is illuminated. The iris aperture is now closely matched to the N.A. of the objective, or at least with the objective(s) with which you will be making most of your observations.
   If additional contrast is required to permit accurate viewing of the specimen, the diaphragm should be slowly closed until the details of the specimen are sharply defined.

Ⅳ. USE OF THE 100X OIL IMMERSION OBJECTIVE

1. In order to eliminate diffraction and make use of the excellent resolving capability of the 100X objective, it is necessary to exclude air from the space between the cover glass over the specimen and the front lens of the 100X objective. This is accomplished by placing a drop of immersion oil onto the cover glass. The controls are then manipulated to immerse the front lens of the objective into the oil. This forms an air tight connection through which the specimen may be viewed without interference from the atmosphere. Care must be taken not to let the lens of the objective and the cover glass come into direct contact since the viewing surface of the lens itself could be scratched or otherwise married. **(Fig. 8)**

2. To insure a long life for your oil immersion objective, clean immediately after each use. Use only high grade lens cleaning tissue and liquid lens cleaner. Avoid hard rubbing, as this will cause wear to the optical coating of the lens and ultimate deterioration of its resolving capability.

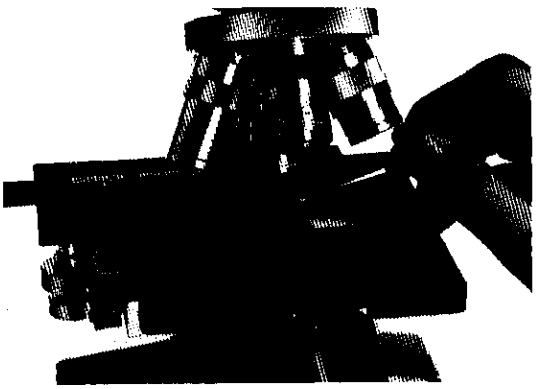


Fig. 8

V. ILLUMINATION SYSTEM

1. The illumination system of the **RM** Series uses a 6V, 20W Halogen lamp. The brilliance of the lamp is controlled by the light intensity control knob mounted on the base, with graduations from 0 to 10.
   The point 0 is the OFF position; and the points 1 through 10 are for increasing degrees of light intensity. It is suggested that the control be set to 6 or 7 for observation of normally stained microslide specimens; and adjusted to 8 through 10 for photomicrography.

2. The replacement of the Lamp is easily accomplished by removing the bottom cover of the lamp housing in the base of the microscope **(Fig. 9)** . Follow this procedure:
   a. Turn switch to the OFF position, and pull the line cord from the wall receptacle.
   b. Remove the eyepieces from the microscope as these could fall out and be damaged when the microscope is tipped.

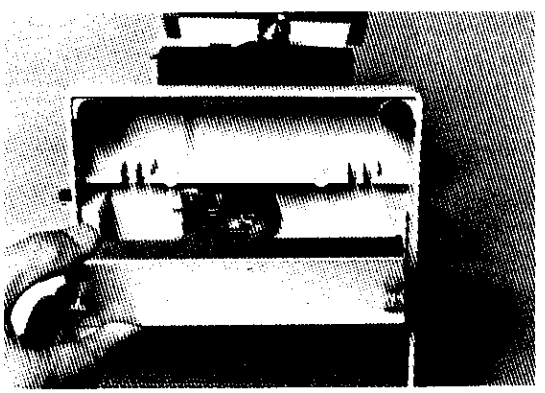


Fig. 9

   c. Gently tip the microscope backward so that it is supported by the arm on the surface of the table.
   d. Loosen the thumb screws holding the lamp housing cover in position and remove the cover.

e. After making certain the old bulb is cool to the touch remove it by pulling it straight out of its socket. DO NOT TWIST as the lamp pins may break off and become lodged in the socket.

f. Handle the new bulb only with tissue paper or the plastic in which it is wrapped. DO NOT HANDLE WITH BARE FINGERS—BULB MAY EXPLODE WHEN HEATED IF NOT HANDLED CORRECTLY.

Replacement Bulb:

Cat. No. MA311 6V, 20W Halogen Lamp for RM-BH, RM-BHP' RM-TH, RM-THP and RM-MH.

Cat. No. MA312 Tungsten Lamp, 115V, 20W for RM-BD and RM-MD.

Cat. No. MA313 Tungsten Lamp, 220/240V, 20W for RM—BD and RM-MD.

VI. ACCESSORIES

Darkfield Filter

The darkfield filter is a inexpensive yet efficient means of achieving darkfield illumination on the 4X, 10X, 20X or 40X objectives. To use simply raise the substage Abbe condenser by turning the condenser focus knob until the desired darkfield effect is obtained.

Phase Contrast

If you have an RM Series model, you must first complete the adjustment procedures listed above using the brightfield position on the turret condenser mount.

After this is accomplished, proceed as follows for phase contrast observation:

1. Adjust the optical system of the microscope to the desired objective in the brightfield mode using the procedures described previously.

2. Rotate the condenser turret to match the objective being used. Example: For phase contrast using the 40X objective, set the turret to the stop marked "40X".

3. Remove one eyepiece and insert the phase centering telescope **(Fig. 10)**.

4. While viewing through the centering telescope, focus it by rotating the top element until the two phase rings (one dark, the other white) are clearly visible.

5. With your fingers, gently adjust the phase annulus on the bottom side of the condenser turret, bringing the two phase rings into concentric alignment.

6. Replace the centering telescope with the eyepiece and you are ready for phase observation.

7. A green filter is supplied with the phase condenser. We suggest it be used when operating in phase. A rotating filter mount is provided on the bottom of the turret.

Note: The phase alignment procedure must be performed for each phase objective, and should be checked with the centering telescope each time the objective or turret setting is changed.

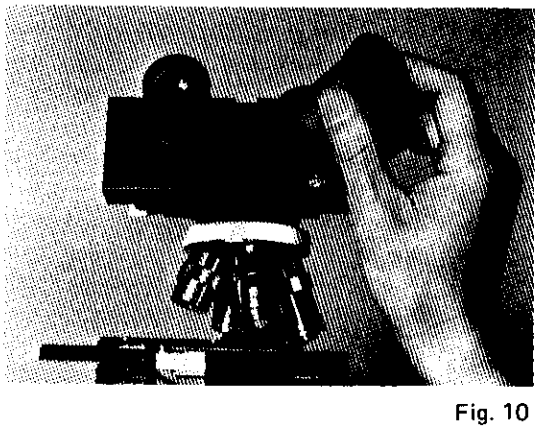


Fig. 10

Ⅶ. PHOTOMICROGRAPHY

The trinocular body is equipped with a photo tube with an outside diameter of 25mm to receive the MA150/50 Camera Adapter. The trinocular body is equipped with a sliding beamsplitter lever which, when in position, directs 80% of the available light to the camera system and 20% to the visual eyepieces. When not in position 100% of the light is passed to the visual eyepieces. **(Fig 11)**
(For mounting the camera system, please refer to the instructions provided with photographic equipment).

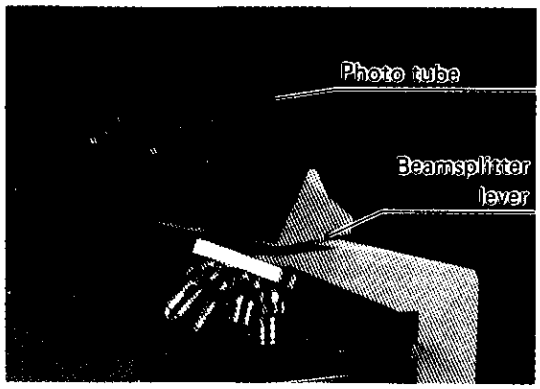


Fig. 11

Ⅷ. TERMS DESCRIBING THE OPTICAL FEATURES OF MICROSCOPES

- **Total magnification**
  Total magnification of a microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.
- **Numerical aperture (N.A.)**
  One of the importnat factors determining the efficiency of condenser and objective. It is represented by the formula:
  $$N.A. = n \sin \alpha,$$
  Where n is the refractive index of a medium (air, immersion oil, etc.) between the objective lens and the specimen or condenser, and α is a half of the maximum angle at which the light rays enter or leave the lens from or to a focused object point on the optical axis. The larger the numerical aperture, the brighter and better resolved the image.
- **Resolving power**
  Capability of discriminating two object points separated by a minute distance on the image the optical system produces, thus being taken as a definition standard of image resolution. The more minute such a distance, the higher the resolving power of the optical system.
  In relation to the numerical aperture, the resolving power is represented by the value:
  $$\lambda/2 \text{ N.A.}$$
  where λ is the wavelength of light being used.
- **Mechanical tube length**
  Length from the attaching surface of the objective on the nosepiece to the top end of the sleeve into which the eyepiece is inserted.
- **Working distance (W.D.)**
  Clearance between the front of the objective and the upper surface of the coverglass, when the image of a specimen is brought into sharp focus.
- **Real viewfield**
  Diameter of the circular area of the specimen actually covered under the microscope.
  Real viewfield = Filed number/objective magnification
- **Field number**
  Generally, it means the diameter of the field diaphragm of the eyepiece.
- **Depth of focus**
  Depth (thickness) of specimen image appearing sharp, extending above and below the focused image plane.

IX. CLEANING

- **Cleaning Painted Surfaces**
  The main microscope components are finished in an extremely durable paint, however, any injurious chemicals which may accidentally come into contact with it should be removed as quickly as possible.
  Paint surfaces should be cleaned with lint-free cloth lightly moistened with industrial alcohol and afterwards polished with a dry cloth.

- **Cleaning Optical Components**
  All optical surfaces must be kept scrupulously clean for optimum performance.
  Remove loose dust carefully with a clean camel hair brush.

  A combined brush/air blower as supplied by photographic dealers will be found extremely useful. Dry aerosol sprays designed specifically for dust removal are also available.

  Oiled or smeared surfaces (objective, condenser and eyelens) should be cleaned by wiping gently with a lens cloth or tissue lightly moistened with industrial alcohol.

  A spiral motion starting from the lens centre should be adopted; never re-use a lens tissue—discard it immediately.

  Dry objectives require only periodic inspection and dust removal unless contaminated with grease or oil. Grease or other dirt on the front of an objective front lens is the most common reason for a poor optical performance of an objective be suspect, it is recommended that the front lens be cleaned and the optical performance re-checked before proceeding further.

  Cleaning can be carried out quite effectively with the help of a fairly high power hand magnifier (say 10X), lens cleaning tissues and industrial alcohol as a solvent.

  (i) Remove the objective from the microscope and place it on a flat surface with the front lens uppermost.

  (ii) Fold a piece of lens tissue four or five times to give a narrow triangular shape with a fine-pointed end (rather like a paper dart).

  (iii) Moisten the pointed end of the lens tissue with a very little alcohol, keeping fingers well away from the solvent to avoid contamination by grease. Do not use an excessive amount of solvent so that the tissue is saturated.

  (iv) Place the tissue against the objective front lens and rotate the objective. In this way the lens can be cleaned up to the edge of the cell and further pressure will cause the tissue to spread sufficiently to clean the whole surface.

  (v) Remove any obstinate marks by repeating the process, breathing on the lens during cleaning. A new, clean piece of tissue should be used each time.

  If the front lens should be heavily contaminated it will probably be necessary to employ acetone as the solvent. In this case, special care should be taken to use no excess solvent as the cement used for the lenses of the objective is readily soluble in acetone. The tissue must only be just moistened with acetone.

- **Notes**
  The above process is applicable to most microscope objectives but is particularly relevant to high power dry objectives.

  The smear, or other dirt, on the front lens can sometimes be seen in viewing the reflection of a broad light source from the concave front surface at an angle of about 45°.

  A 10X or 20X stereoscopic microscope is ideal for cleaning. If, though, neither this nor a hand magnifier is available, a 10X wide field compensating or Complan eyepiece can be used back to front.

  High power objectives are precision components and must be handled carefully; thorough cleaning is a skilled operation which should be performed at regular intervals by a Service Engineer.

X. CLEANING

- **Lubrication**
  Appropriate long-life lubricants are applied to all mechanical movements before leaving the factory; further attention should be required only after prolonged use.