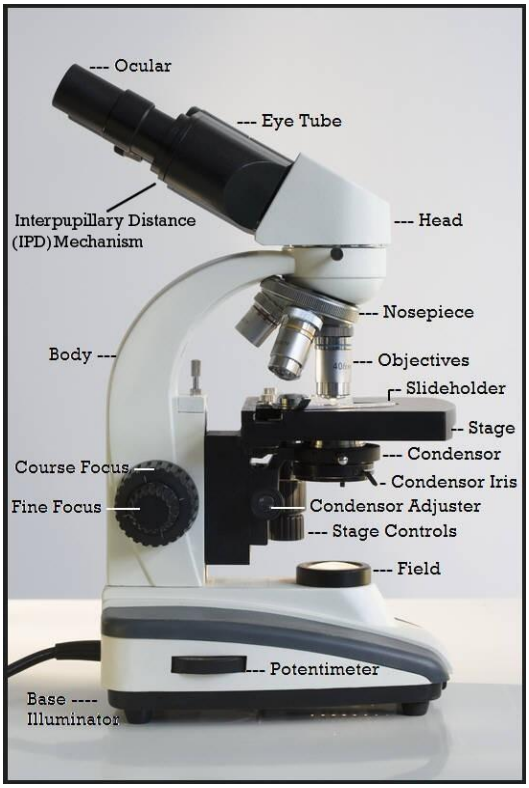
Supplemental Resources

The following images and diagrams are used to support individual videos within the online video training program from Microscopy USA L.L.C. Please use this supplemental information to help with viewing the videos. The full printed training manual is only provided to those individuals seeking full certification for the servicing of clinical microscopes. For details about enrolling in the certification process please go to MicroscopyUSA.com.

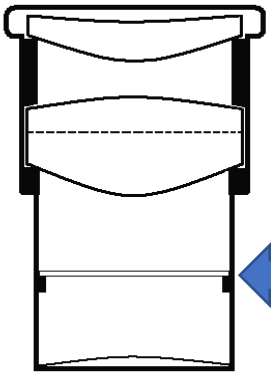
Clinical Microscope Preventative Maintenance Procedure

(Meets or exceeds all College of American Pathology (CAP)™ preventative maintenance service requirements.)

- ☐ **Evaluation**
  Complete a performance check of all optical and mechanical functions; notify the laboratory staff of major concerns prior to servicing.
- ☐ **Tear Down and Cleaning**
  Carefully remove the oculars, head assembly, objectives (maintain sequence), slide holder, mechanical stage (if practical), condenser, blue / interference / neutral density or polarizing filters, field opening bracket with iris (if removable), and other accessories. Clean all optical surfaces using proper technique. Clean all non-optical solid surfaces including the body of the microscope using proper technique.
- ☐ **Lubrication**
  If needed, apply appropriate lubrication to all moving parts … mechanical stage bearing track and rack and pinion gears, slide holder, focus mechanism, rotating nosepiece, condenser rack and pinion gears.
- ☐ **Re-assemble**
- ☐ **Kohler Alignment**
  Complete Kohler Alignment using settings for the condenser alignment screws and the condenser and field iris diaphragms.
- ☐ **Centration Error Check**
  Check and record the specific values for Centration Error … both horizontal and vertical.
- ☐ **Ocular Micrometer Calibration**
  Perform Ocular Micrometer Calibration … only if requested by the laboratory staff.
- ☐ **Full Function Check**
  - Parfocality, Parcentration and Resolution of all Objectives
  - Confirm that all ocular surfaces are clean by rotating oculars under high magnification.
  - Check the function of the Inter-Pupillary Distance (IPD) mechanism.
  - Check the function of focusing oculars and / or focusing eye-tubes.
  - Confirm stage collimation by focus stability during slide movement.
  - Check mechanical stage motion and control knob tension adjustments.
  - Check bulb socket alignment and condition.
  - Confirm proper fusing.
  - Check all accessories for proper function and alignment: phase contrast alignment, polarization and red compensator function, UV bulb alignment, micrometer calibration and documentation, dual-view system alignments, pointer bulbs, camera / CCD function.
  - Electrical Safety Check
- ☐ **Notification of Concerns to Staff**
- ☐ **Written Documentation to Lab Manager** … conforming to CAP inspection requirements
- ☐ **End-of-Day Verification** – a walk around of all lab departments to confirm that all microscopes are working well and that any adjustments are acceptable.

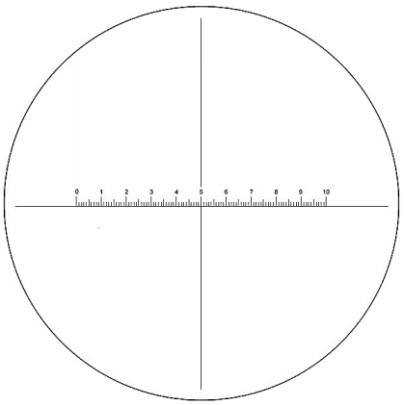


Parts / Proper Function of Clinical Microscopes (1)

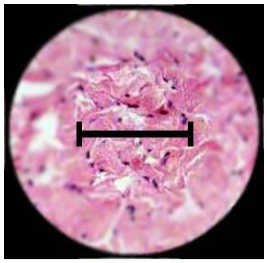


Oculars (3)
Ocular Design / Cleaning

Reticle



Eyestrain / Headache – Cause and Effect(6)
Correcting Mis-aligned Head Optics(7)



50% In Focus

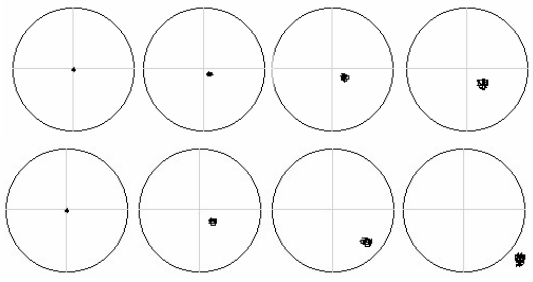
Objectives – Levels of Quality(8)
"Achromat"

Magnification by Color of Ring

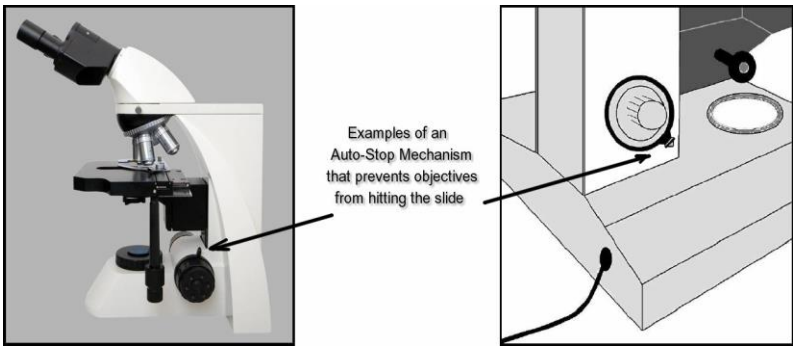
1x Black
2x Brown
2.5x Brown
4x Red
5x Red
10x Yellow
16x Green
20x Green
25x Turquoise
32x Turquoise
40x Light Blue
50x Light Blue
60x Cobalt Blue
63x Cobalt Blue
100x White

Cleaning Objectives(9)
Oil Immersion Objectives(11)

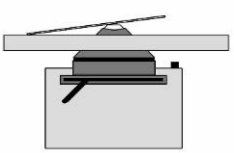
Parfocality Objectives(13)

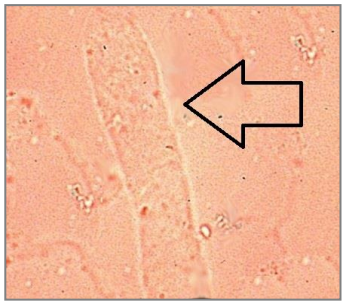


Parcentration Problems(14)

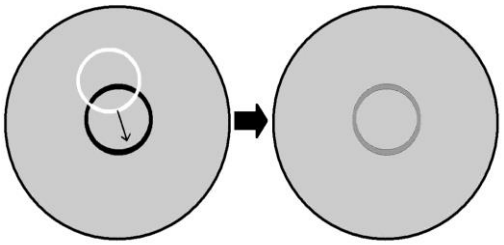


Auto-Stop Settings(31)

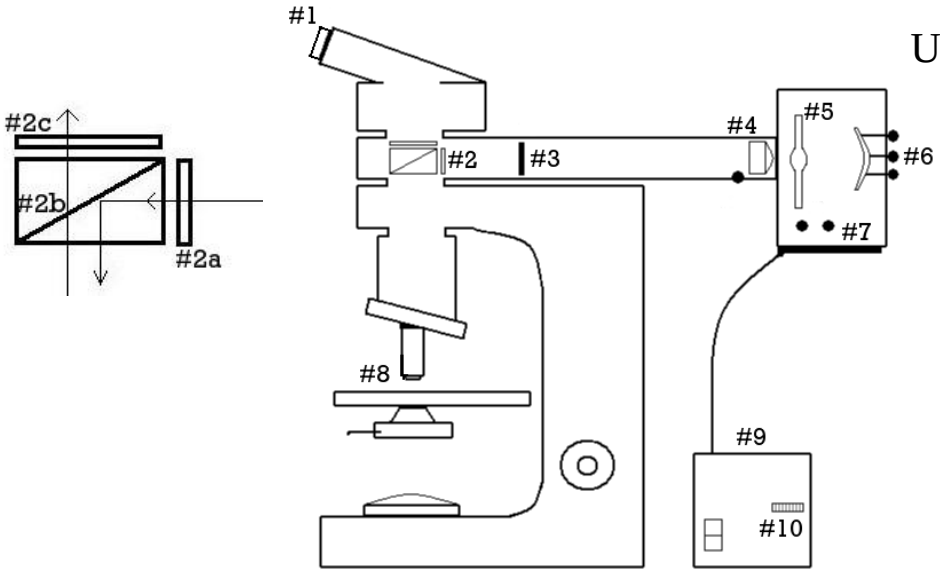




Kohler Alignment(18)

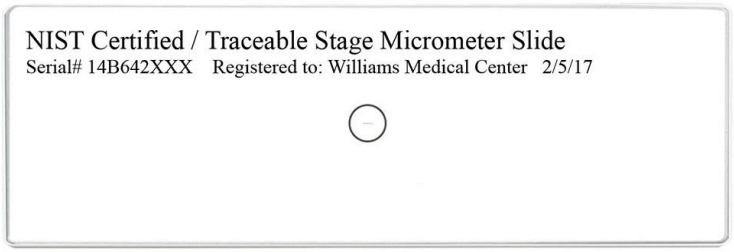


Phase Contrast(29)
Phase Contrast (30)



UV Microscopy(34)(35)(36)

Ocular Micrometer Calibration(32)



1 Division = 0.01 mm

SAMPLE PROCEDURAL CALCULATION ONLY

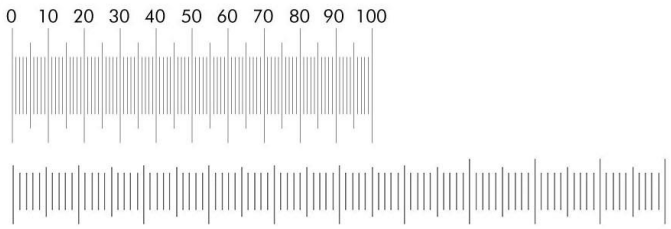
Your results will differ!

This type of calulation must be completed for **each objective** on the microscope!
These results cannot be taken and used on any other microscope! (CAP COM.30690 06/04/2020)
If any optical components on the microscope are changed ... these calculations become invalid and must be repeated.

Line up the zeros on both scales by moving the stage micrometer.
Find a position where the lines on both scales match up.
In the scales shown below: 80 of the Ocular Units = 0.44 mm
Reduce the equation to find what (1) Ocular Unit equals in mm by dividing both sides by 80.
(1) Ocular Unit = 0.0055 mm You list this data with the objective used ... such as the 20x objective.

Ocular Micrometer is a fixed scale always visible in viewing field >>>>>>>>>>>

N.I.S.T. Calibrated Stage Micrometer ... movable slide with calibrations >>>>>>>>



1 Division = 0.01 mm NIST Stage Micrometer Slide

Once calculations have been completed separately on all of objectives ... the data must be properly dislayed on the microscope to avoid a Phase 2 CAP* Deficency.
*College of American Pathology)

SAMPLE Calculation Only - Your values will be different!

$$\frac{\text{80 Ocular Reticle Scale Units}}{80} = \frac{\text{0.44 millimeters Stage Micrometer}}{80}$$

Therefore:

1 Ocular Reticle Scale Unit = 0.0055 millimeters

Sample Documentation for Ocular Micrometer Calibration (Your values will differ!)

The following is an example of proper documentation.
The signed original needs to be securely fixed to the top of the calibrated microscope with clear packaging tape.
A scanned copy needs to be included in the hard-copy service report given to the lab manager.

Ocular Micrometer Calibration - Ocular Micrometer supplied by Dr. Jansen
Stage Micrometer - N.I.S.T. Certification / Serial# 234JBR - Documentation on file.
Microscope: Nikon Eclipse 400 - Pathology - Serial# 463991 Biomed# 27711

10x Objective (Serial# 245118): 1 Ocular Scale Unit = 0.0023 mm
20x Objective (Serial# 651333): 1 Ocular Scale Unit = 0.0055 mm
40x Objective (Serial# 773194): 1 Ocular Scale Unit = 0.0114 mm
100x Objective (Serial# 700943): 1 Ocular Scale Unit = 0.0270 mm
These values may NOT be used on any other microscope.
No optical components may be changed on this microscope.

Calibrated by: *SIGNATURE* Date:

Note: if your NIST stage micrometer is calibrated in millimeters ... report your calibration results in millimeters. Do not convert millimeters to microns ... even if requested by the pathologist. To do would add significant figures to your calculation results ... which is scientifically incorrect.

CAP* stated in their COM.30690 dated June 2020 that this calibration procedure does not have to be repeated assuming that all microscope optical components involved have not been changed. *College of American Pathology

Microscopy USA recommends that this calibration procedure should be confirmed annually.

N.I.S.T / National Institute of Standards and Technology