



TENNESSEE BUREAU OF INVESTIGATION

Forensic Services Division

Microanalysis Quality Assurance Manual Equipment

Maintenance of Equipment

Polarized Light Microscope, Comparison Polarized Light Microscopes, and Phase Contrast Microscope

The microscopes should be covered when not in use and cleaned as necessary.

Kohler illumination shall be established prior to every use of these microscopes and noted in case notes. If Kohler cannot be established or maintained, take the microscope out of service and consult the Unit Supervisor as to next steps.

Kohler Illumination Procedure

1. Focus the microscope on a sample using transmitted light.
2. Close down the field aperture (field diaphragm). Observe the octagon shaped aperture in the field of view (or if it is really badly out of focus, the entire image will get darker). Close the aperture until it occupies about 2/3 or less of the field of view
3. Focus the condenser with the knobs that raise/lower the entire condenser. The octagon shaped aperture should be made as sharp as possible
4. Center the condenser using the two centering pins.
5. Open the field aperture until it is just out of view.
6. Adjust the condenser aperture so the contrast of the image is appropriate for the analysis.

If a microscope does not reveal an image, verify that the light bulbs are functional. If a bulb is blown, replace it and check for an image. If there is still no image, verify Kohler illumination. If both of these do not produce an image, take the microscope out of service and consult Unit Supervisor as to next steps.

All problems and repairs shall be reported in the equipment maintenance records.

Stereomicroscopes

The stereomicroscopes should be covered when not in use and cleaned as necessary.

If a stereomicroscope does not reveal an image, verify that the light bulbs are functional. If a bulb is blown, replace it and check for an image.



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For stereomicroscopes installed on a boom stand, adjust the position of the stereomicroscope on the stand if an image cannot be brought into good focus.

If an image cannot be established or maintained, take the stereomicroscope out of service and consult Unit Supervisor as to next steps.

Maintain a report of any problems and repairs in the equipment maintenance records.

Polarized Light Microscope with Mettler Hot Stage

A sample of material with a known melting point shall be analyzed for melting point prior to use for determination of fiber melting point in casework. If sample is within its melting point range, the examiner may proceed with evidence analysis. If it is not, the hot stage will be removed from service and the Unit Supervisor will be consulted as to next steps.

Maintain a report of any problems and repairs in the equipment maintenance records.

Ovens

For ovens used in *Fire Debris Analysis*, temperatures shall be checked and recorded in case notes before samples are placed inside and when the samples are removed. Temperature and date shall be recorded on the worksheet. A temperature of 60-80°C shall be maintained for this analysis.

For ovens used to dry acid digestion samples in *Glass Analysis*, the oven should be set to a temperature that will evaporate the acids without softening the plastic tubes (usually approximately 70-90°C).

For ovens used in the examination and analysis of other evidence, the oven should be set to a temperature appropriate to the needs of the evidence.

If any oven is incapable of maintaining a set temperature, take the oven out of service and consult Unit Supervisor as to next steps.

Maintain a report of any problems and repairs in the equipment maintenance records.



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Thermometers

New NIST Certified Oven Thermometers should be purchased annually for all ovens. The NIST Certification documentation shall be maintained in the Microanalysis equipment records. If only one NIST Certified Oven Thermometer is purchased, that thermometer will be used to check the calibration of the other oven thermometers. Place the new thermometer in the oven with the old thermometer and allow the oven to equilibrate for at least 15 minutes. If the thermometers are within $\pm 2^{\circ}\text{C}$ of each other, the old thermometer may continue to be used. This check will be performed annually for as long as the out-of-date thermometer is used and will be recorded in the equipment maintenance records.

Pipettes

Pipettes shall be calibrated annually by an external certified company. The resulting report shall be maintained by the Laboratory Quality Assurance Manager or in the Microanalysis equipment records. If a pipette cannot be calibrated, it will be replaced.

Calipers

The calipers shall be performance checked quarterly as needed with certified gauge blocks. Because the calipers are not routinely used, the examiner should check the equipment maintenance records before each use to determine if the calipers have been checked within the last 3 months. The blocks used will be the 0.050 inch, 0.200 inch, and 0.500 inch. This measurement can vary $\pm .01$ inch. If the measurement exceeds $\pm .01$ inch, remove the calipers from service and consult the Unit Supervisor as to next steps.

Maintain records of the quarterly checks and a report of any problems and repairs in the equipment maintenance records.

Sartorius SC-2 Microbalance

The microbalance has an internal calibration feature that calibrates the span of the balance. The balance should be internally calibrated once each day of use. When the calibration procedure begins, the built-in calibration weights are internally applied by servomotor and removed at the end of the calibration. In addition, 10 and 20 mg weights shall be weighed once each day of use. The balance shall maintain an accuracy of $\pm .005$ mg. This check shall be performed and recorded in case notes prior to using the microbalance for casework. If the



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microbalance does not maintain this accuracy, remove the balance from service and consult the Unit Supervisor as to next steps.

The microbalance should be cleaned at the end of each use. The chamber should be cleaned of any residue from the weighing. Any additional cleaning may be performed as needed.

The microbalance should be re-linearized whenever the balance is moved. An internal calibration is performed at the end of the linearization procedure.

The microbalance shall be checked and calibrated annually by an external certified company. Documentation of these checks and calibrations shall be maintained by the Laboratory Quality Assurance Manager or in the Microanalysis equipment records. If the microbalance does not pass this calibration, remove the balance from service and consult the Unit Supervisor as to next steps.

Mettler Balance

The balance shall be checked quarterly as needed with 1 g and 20 g weights. Because this balance is not routinely used, the examiner should check the equipment maintenance records before each use to determine if the balance has been checked within the last 3 months. If it has not, then the person shall perform the weight check before proceeding. Certified weights will be used for this check. The balance shall maintain an accuracy of +/- .05 grams. The result of the balance check will be maintained in the equipment maintenance records . If the balance is not able to maintain accuracy, remove the balance from service and consult the Unit Supervisor as to next steps.

Maintain a report of any problems and repairs in the equipment maintenance records. This balance shall be checked and calibrated annually by an external certified company and the report shall be maintained by the Laboratory Quality Assurance Manager or in the Microanalysis equipment records.