Form	Deviation Request Form
Title	Technical Procedure for Instrument Calibration and Maintenance
Laboratory Location	Raleigh Lab
Discipline/Section	Firearms
A. Requested deviation applies to:	Technical Procedure for Instrument Calibration and Maintenance Sections 4.0 5.2 5.3.1.3.1, 5.3.1.3.2, and 5.3.3.4 5.13.1, 5.13.1.2, 5.13.1.2.1, 5.13.3, 5.13.5 5.14.4, 5.14.5
B. Requested deviation:	4.0 remove “FA#4327 (Colt, caliber 45 Auto, Model Mark IV Series 80 Combat Commander, Serial Number FC08540E, semiautomatic pistol,)”, add "NIST Standard Reference Material 2460 Standard Bullet" 5.2 remove entirely 5.3.1.2 replace with “Each balance shall be calibration checked monthly. The calibration check shall be conducted using the calibrated 10g (154.32 gr.) reference standard weight.” 5.3.1.3 replace with "Each balance shall be performance checked each day the balance will be used in casework, this performcance check will be documented under the completed tasks in the worksheet for that specific case. If a performance check is conducted and the balance is subsequently powered off, the performance check shall be repeated before the balance is used in casework again. 5.3.1.3.1 replace with “The performance check shall be conducted using a 10g (154.32 gr.) reference weight.” 5.3.3.4 replace with “Using forceps, place the 10 g (154.32 gr.) reference standard weight on the balance. Do not touch the standard weight with bare hands.” 5.3.3.5 replace “1 grain” with “0.05 grain” 5.13.1 Add bullet point “Primary Standard Steel Ruler”, add bullet point “NIST QC cartridge case”, remove bullet point “LAS software performance check reference bullets”, remove “Balance performance check reference bullets”, add 10g performance check reference weight

	5.13.1.2 remove “Reloading Room of the”
	5.13.1.2.1 remove entirely
	5.13.3 add case “and standard bullet” and replace “does” with “do”
	5.13.4 Remove
	5.13.5 replace with "Each 10 gram weight used for performance checking the balances shall be weighed and compared to the calibration check weight annually. The two comparison measurements shall be documented in Resource Manager, and the tolerance shall be +/- .05 grain."
	5.14.4 remove
	5.14.5 remove
C. Necessity for the deviation:	This deviation will remove remaining mentions of test fires being reference items, clarified that balances will be checked after calibration but prior to casework, added where to find documentaition of the performance check for casework, and remove mentions of using Leica Application Suite (LAS) Measurement Module since this method is no longer in use.

D: Technical Review and Authorization	
Technical Authorization	Yes - Authorized
Technical Authorizer	☐ Slish, Jennifer
Duration	1 year / next procedure revision
E: Quality Assurance Authorization	
Acceptable within general QA guidelines and good laboratory practice?	Yes
Significant negative impact to Crime Laboratory Quality System?	No
QA Authorization	Yes - Authorized
QA Authorizer	☐ Suggs, Timothy
Effective Date:	6/14/2024

Version: 9.0
Created at 4/15/2024 1:52 PM by ☐ Quirindongo, Dana
Last modified at 6/12/2024 3:43 PM by ☐ Suggs, Timothy

Close

Technical Procedure for Instrument Calibration and Maintenance

1.0 Purpose – To outline the schedules and procedures involved in the maintenance and verification of critical instrument calibration in the Firearms Section.

2.0 Scope – This procedure applies to all critical instruments used in the Firearms Section.

3.0 Definitions

- **Balance** – An instrument for measuring weight.
- **Calibration** – The process of determining, checking, or rectifying the graduation of any instrument giving quantitative measurements.
- **Calibration Check** – The process of periodically verifying the calibration status of an instrument by comparison with a reference standard.
- **Caliper** – A device consisting of two legs or jaws, one moveable and one stationary, used to measure diameter, thickness or distance between two surfaces.
- **Comparison microscope** – Essentially two microscopes connected to an optical bridge which allows the viewer to observe two objects simultaneously with the same degree of magnification.
- **Critical instruments**– Instruments that have a significant effect on the accuracy or validity of the result of a test.
- **Grain** – A unit of weight. 7000 grains equal one pound. The grain unit is commonly used in American and English ammunition practice to measure the weight of components.
- **Performance Check** – The process of routinely assessing the calibration status of a digital instrument.
- **Micrometer** – An instrument used to measure accurately small distances, usually thickness or diameter.

4.0 Equipment, Materials, and Reagents

- Comparison microscopes
- Stereomicroscopes
- Balances
- Static weights
- Digital Measuring Device (DMD-48)
- Measurement tapes
- Calipers
- Micrometers
- Calibrated stage micrometer
- Leica Application Suite (LAS) software
- 10 g reference standard weight
- 1000 g reference standard weight
- Hott-Rods™
- Steel ruler (12″)
- Steel ruler (36″)
- Steel ruler (36” primary standard steel ruler)
- DMD-48 calibration rod (24″)
- Gage block (0.500″)
- Gage block (1.000″)
- Forceps
- Cloth glove

- FA#4327 (Colt, caliber 45 Auto, Model Mark IV Series 80 Combat Commander, Serial Number FC08540E, semiautomatic pistol,)

5.0 Procedure

5.1 Overview

5.1.1 The Section Equipment Monitor or designee shall be responsible for the maintenance of calibration standards and the calibration and calibration checks of critical instrumentation used in the Firearms Section as defined in this procedure.

5.1.2 Each Forensic Scientist shall be responsible for completing performance checks as defined in this procedure.

5.1.3 Reference standards shall be stored in the Firearms Section in a location sufficient to maintain control of the devices and protect them from damage or deleterious effects.

5.1.4 Documentation

5.1.4.1 Each room containing critical equipment shall have a sign listing the critical equipment in that room, its most recent calibration date, and the next calibration due date.

5.1.4.2 All calibration and maintenance records shall be maintained electronically.

5.1.5 Any instrument that does not zero, is broken, or falls outside of the instrument's tolerance range shall be marked "Out of Service" and shall no longer be used in casework until its performance can once again be verified.

5.1.5.1 Any Forensic Scientist who discovers unacceptable or anomalous behavior of critical instruments shall immediately notify the Section Equipment Monitor and Forensic Scientist Manager.

5.2 Leica Application Suite (LAS) Measurement Module

5.2.1 This procedure applies only to those LAS modules used to make measurements for casework.

5.2.2 Maintenance Schedule

5.2.2.1 The LAS measurement module of newly purchased comparison microscopes shall be calibrated prior to use in casework.

5.2.2.2 The LAS measurement module shall be calibrated every calendar year.

5.2.2.3 The LAS measurement module shall be calibration checked monthly using a calibrated stage micrometer.

5.2.2.4 The LAS measurement module of each comparison microscope shall be performance checked each day the module will be used in casework. If a performance check is

conducted and the LAS software is subsequently closed, the performance check shall be repeated before the module is used in casework again.

5.2.2.4.1 The performance check shall be conducted using a reference bullet. Reference bullets shall be created by firing caliber 45 Auto, 230 grain, total metal jacketed bullets from the following firearm:

5.2.2.4.1.1 Colt, caliber 45 Auto, Model Mark IV Series 80 Combat Commander, Serial Number FC08540E, semiautomatic pistol, Firearm Reference Collection #FA4327. This firearm shall be maintained in the Raleigh Laboratory Firearm Reference Collection.

5.2.2.4.2 One land impression, chosen by the Section Technical Leader, shall be marked with an engraved asterisk on each reference bullet. In this manner, the performance checks conducted by the Forensic Scientists will measure the same land impression.

5.2.3 Calibration Procedure

5.2.3.1 The LAS measurement module of each comparison microscope shall be calibrated from either the right or left stage based on the user Forensic Scientist's preference. This shall be the stage from which all future measurements are taken.

5.2.3.2 Place the stage micrometer on the appropriate stage. The use of a blank piece of white paper under the stage micrometer will improve visibility.

5.2.3.3 In the LAS Software, go to the Scale Bar field and be certain orientation is set to "Horizontal."

5.2.3.4 Go to the Acquire tab > Camera tab > Image Formats and set resolution to the highest level available for both captured format and live format.

5.2.3.5 Place both nosepieces to the 2X objective.

5.2.3.6 Adjust the focus with the stage micrometer centered on the area between and including 0.800 inch and 1.000 inch.

5.2.3.7 Go to the Acquire screen > Camera tab > Calibration Settings field > Type. Select "Calculated."

5.2.3.8 Select "New" and then name as follows: objective and date (e.g. 2X, 12-15-10). After naming the file, choose "OK."

5.2.3.9 A red line will appear on the screen. Adjust the red line to extend 0.200 inch from 0.800 inch to 1.000 inch within the stage micrometer scale. Be certain that the red line starts and ends consistently in relation to the hash mark on the stage micrometer (e.g., if the red line starts along the right edge of the .8 hash mark, it must end along the right edge of the 1.0 hash mark).

5.2.3.10 Go to the Calibration Settings Tab and type in the value for the actual length of the line shown on the image (0.200) in inches. Choose "Save" in the Calibration Settings area.

5.2.3.11 Go to the Acquire screen > Camera tab > Calibration Settings field > Configuration drop down. Select the old calibration and delete.

5.2.4 Calibration Check Procedure

5.2.4.1 The LAS measurement module of each comparison microscope shall be calibration checked using the stage (left or right) used during the calibration procedure.

5.2.4.2 Place the stage micrometer on the appropriate stage. The use of a blank piece of white paper under the stage micrometer will improve visibility.

5.2.4.3 In the LAS Software, click on the Setup Tab to verify the microscope's serial number.

5.2.4.4 Go to Options > Preferences > Image and ensure the following settings:

5.2.4.4.1 "Always Confirm Image Name" and "Capture to fixed folder location" boxes are checked.

5.2.4.4.2 "In this format" is set to "Tiff."

5.2.4.5 Go to the Scale Bar field and be certain orientation is set to "Horizontal."

5.2.4.6 Go to the Acquire tab > Camera tab > Image Formats and set resolution to the highest level available for both captured format and live format.

5.2.4.7 Place both nosepieces to the 1X objective.

5.2.4.8 Adjust the focus with the stage micrometer centered on the area between and including 0.600 inch and 1.000 inch.

5.2.4.9 Acquire the image and save with the following file name format: Cal Check, date, objective, stage, and initials of the person performing the calibration check.

5.2.4.9.1 The images taken immediately following the recalibration of the microscope shall be named "Recal Check."

5.2.4.10 In the "Image Data" area, add the serial number of the microscope in the "Description" field.

5.2.4.11 Go to the Process Screen, > Annotate Tab > Basic Annotation field, click "Show". In the "Line" area, click "Show" and then choose "Distance Line" from the drop down menu. Measure an area of the stage micrometer that equals 0.200 inch and verify that the distance line reads 0.200 inch.

5.2.4.11.1 This measurement can be accomplished with the scale bar.

5.2.4.12 Under the Information Tab, make sure that "Image Name," "Date," "Time," and "Description" are checked.

5.2.4.13 Click "Merge" and "Replace."

5.2.4.14 Repeat the above procedure (beginning with **5.2.3.8**) for the following objectives..

5.2.4.14.1 For the 1X Objective with the 1.5 magnifier, place the stage micrometer centered on the area between and including 0.800 inch to 1.000 inch and measure 0.195 inch for the calibration check.

5.2.4.14.2 For the 2X Objective, change both objectives to 2X, place the stage micrometer centered on the area between and including 0.800 inch to 1.000 inch and measure 0.185 inch for the calibration.

5.2.5 Performance Check Procedure

5.2.5.1 Place the reference bullet on the stage used during the calibration procedure.

5.2.5.2 Using the LAS measurement module, measure the width of the designated land impression.

5.2.5.3 The tolerance for this width shall be +/- 0.005 inch.

5.2.5.4 If the measured width falls within this tolerance range, the successful performance check shall be recorded in Forensic Advantage (FA).

5.2.6 Failure of a Check

5.2.6.1 In the event that a performance check fails, a calibration check shall be performed before the LAS measurement module may be used in casework.

5.2.6.2 In the event that a calibration check fails, a calibration shall be performed before the LAS measurement module may be used in casework. If this calibration is unsuccessful, the LAS measurement module shall be removed from casework as outlined in 5.1.5 above.

5.3 Balances

5.3.1 Maintenance Schedule

5.3.1.1 Each balance shall be serviced, cleaned, and calibrated every calendar year by an outside vendor.

5.3.1.2 Each balance shall be calibration checked monthly.

5.3.1.3 Each balance shall be performance checked each day the balance will be used in casework. If a performance check is conducted and the balance is subsequently

powered off, the performance check shall be repeated before the balance is used in casework again.

5.3.1.3.1 The performance check shall be conducted using a reference bullet. Reference bullets shall be unfired caliber 45 Auto, 230 grain, total metal jacketed bullets.

5.3.2 Calibration Check Procedure

5.3.2.1 Small Capacity Balances

5.3.2.1.1 Be certain the balance is level.

5.3.2.1.2 Turn on the balance and zero or tare the balance.

5.3.2.1.3 Be certain the balance is reading in grains.

5.3.2.1.4 Using forceps, place the 10 g (154.32 gr.) reference standard weight on the balance. Do not touch the standard weight with bare hands.

5.3.2.1.5 Record the resulting weight. The tolerance for each balance shall be +/- 0.05 grain.

5.3.2.2 Large Capacity Balance

5.3.2.2.1 Be certain the balance is level.

5.3.2.2.2 Turn on the balance and zero or tare the balance.

5.3.2.2.3 Be certain the balance is reading in grams.

5.3.2.2.4 Using a glove, place the 1000 g reference standard weight on the balance. Do not touch the standard weight with bare hands.

5.3.2.2.5 Record the resulting weight. The tolerance for the balance shall be +/- 0.05 gram.

5.3.3 Performance Check Procedure

5.3.3.1 Be certain the balance is level.

5.3.3.2 Turn on the balance and zero or tare the balance.

5.3.3.3 Be certain the balance is reading in grains.

5.3.3.4 Place the reference bullet on the balance.

5.3.3.5 The tolerance for this weight shall be +/- 1 grain.

5.3.3.6 If the measured weight falls within this tolerance range, the successful performance check shall be recorded in FA.

5.3.4 Failure of a Check

5.3.4.1 In the event that a performance check fails, a calibration check shall be performed before the balance may be used in casework.

5.3.4.2 In the event that a calibration check fails, the balance shall be removed from casework as outlined in 5.1.5 above.

5.4 Calipers

5.4.1 Maintenance Schedule

5.4.1.1 Each caliper shall be calibrated every calendar year by an outside vendor.

5.4.1.2 Each caliper shall be calibration checked monthly.

5.4.2 Calibration Check Procedure

5.4.2.1 Close the jaws of the caliper and verify that the caliper reads zero.

5.4.2.2 Using the gage blocks, open the jaws of the caliper and measure the widths of the 0.500″ and 1.000″ blocks.

5.4.2.2.1 Use the entire surface of the jaws, being careful to hold the caliper level or the reading may fluctuate.

5.4.2.3 Record the lengths. The tolerance for each caliper shall be +/- 0.004 inch.

5.4.3 Failure of a Check

5.4.3.1 In the event that a calibration check fails, the caliper shall be removed from casework as outlined in 5.1.5 above.

5.5 Micrometers

5.5.1 Maintenance Schedule

5.5.1.1 Each micrometer shall be calibrated every calendar year by an outside vendor.

5.5.1.2 Each micrometer shall be calibration checked monthly.

5.5.2 Calibration Check Procedure

5.5.2.1 Close the jaws of the micrometer and verify that the micrometer reads zero.

5.5.2.2 Using the gage blocks, open the jaws of the micrometer and measure the widths of the 0.500″ and 1.000″ blocks.

5.5.2.2.1 Hold the micrometer level or the reading may fluctuate.

5.5.2.3 Record the lengths. The tolerance for each micrometer shall be +/- 0.004 inch.

5.5.3 Failure of a Check

5.5.3.1 In the event that a calibration check fails, the micrometer shall be removed from casework as outlined in 5.1.5 above.

5.6 Digital Measuring Device (DMD-48)

5.6.1 Maintenance Schedule

5.6.1.1 The DMD-48 shall be calibration checked quarterly.

5.6.1.2 The DMD-48 shall be performance checked each day it will be used in casework and for each separate case in which the DMD-48 will be used. If a performance check is conducted and the DMD-48 is subsequently powered off, the performance check shall be repeated before the DMD-48 is used in casework again.

5.6.2 Calibration Check Procedure

5.6.2.1 Power on the DMD-48.

5.6.2.2 Using the attached handle, slide the rear movable plate until it is flush with the front plate.

5.6.2.3 Zero the DMD-48 by pressing the "X_0" button.

5.6.2.4 Remove the end caps from the 24" calibration rod and place it in the center of the unit, with one end against the front plate.

5.6.2.5 Slide the rear movable plate until it contacts the end of the calibration rod.

5.6.2.6 Record the length. The tolerance for the DMD-48 shall be +/- 0.03 inch.

5.6.2.7 Compare the 24" calibration rod directly with the 36" steel rule.

5.6.2.8 Record the length. The tolerance for the 24" calibration rod shall be +/- 1/16 inch.

5.6.3 Performance Check Procedure

5.6.3.1 Power on the DMD-48.

5.6.3.2 Using the attached handle, slide the rear movable plate until it is flush with the front plate.

5.6.3.3 Zero the DMD-48 by pressing the "X_0" button.

5.6.3.4 Remove the end caps from the 24" calibration rod and place it in the center of the unit, with one end against the front plate.

5.6.3.5 Slide the rear movable plate until it contacts the end of the calibration rod.

5.6.3.6 The tolerance for this length shall be +/- 0.03 inch.

5.6.3.7 If the measured length falls within this tolerance range, the successful performance check shall be recorded in FA.

5.6.4 Failure of a Check

5.6.4.1 In the event that a performance check fails, a calibration check shall be performed before the DMD-48 may be used in casework.

5.6.4.2 In the event that a calibration check fails, the DMD-48 shall be removed from casework as outlined in 5.1.5 above.

5.7 Trigger Pull Static Weights

5.7.1 Maintenance Schedule

5.7.1.1 Each set of static weights shall be calibration checked each calendar year.

5.7.2 Calibration Check Procedure

5.7.2.1 All individual weights shall be weighed on the large capacity balance.

5.7.2.2 Be certain the balance is level. Turn on the balance and zero or tare it.

5.7.2.3 Be certain the balance is reading in pounds.

5.7.2.4 Place the weight carefully on the balance and record the weight. The tolerance for each static weight shall be +/- 0.05 pound.

5.7.2.5 Repeat this process for each of the static weights.

5.7.3 Failure of a Check

5.7.3.1 In the event that a calibration check fails, the weights shall be removed from casework as outlined in 5.1.5 above.

5.8 Measurement Tapes

5.8.1 Maintenance Schedule

5.8.1.1 Each measurement tape shall be calibration checked each calendar year.

5.8.2 Calibration Check Procedure

5.8.2.1 Extend the measurement tape to more than 24 inches.

5.8.2.2 Compare each measurement tape directly with the 36" steel ruler at 6 and 24 inches.

5.8.2.3 Record the lengths. The tolerance for each measurement tape shall be +/- 1/16 inch.

5.8.3 Failure of a Check

5.8.3.1 In the event that a calibration check fails, the measurement tape shall be removed from casework as outlined in 5.1.5 above

5.9 Hott-Rods

5.9.1 Maintenance Schedule

5.9.1.1 Each Hott-Rod shall be calibrated every 5 years by an outside vendor.

5.9.1.2 Each Hott-Rod shall be calibration checked each calendar year.

5.9.2 Calibration Check Procedure

5.9.2.1 Compare each Hott-Rod directly with the 36" steel ruler at 20 inches.

5.9.2.2 Record the length. The tolerance for each Hott-Rod shall be +/- 1/16 inch.

5.9.3 Failure of a Check

5.9.3.1 In the event that a calibration check fails, the Hott-Rod shall be removed from casework as outlined in 5.1.5 above

5.10 Steel Rulers

5.10.1 Maintenance Schedule

5.10.1.1 Each steel ruler shall be calibrated every 5 years by an outside vendor.

5.10.1.2 Each steel ruler shall be calibration checked each calendar year.

5.10.2 Calibration Check Procedure

5.10.2.1 Compare the 36" steel ruler directly with the 36" primary standard steel ruler.

5.10.2.2 Record the lengths. The tolerance for the 36" steel ruler shall be +/- 1/16 inch.

5.10.2.3 Compare the 12" steel ruler directly with the 36" primary standard steel ruler.

5.10.2.4 Record the length. The tolerance for the 12" steel ruler shall be +/- 1/16 inch.

5.10.3 Failure of a Check

5.10.3.1 In the event that a calibration check fails, the ruler shall be removed from casework as outlined in 5.1.5 above

5.11 Comparison Microscopes

5.11.1 Maintenance Schedule

5.11.1.1 Each comparison shall be serviced and cleaned as needed by an outside vendor.

5.11.1.2 Comparison microscopes do not require calibration, calibration checks, or performance checks.

5.12 Stereomicroscopes

5.12.1 Maintenance Schedule

5.12.1.1 Each stereomicroscope shall be serviced and cleaned each calendar year by an outside vendor.

5.12.1.2 Stereomicroscopes do not require calibration, calibration checks, or performance checks.

5.13 Reference Standards

5.13.1 The Firearms Section maintains the following reference standards:

- 0.500” and 1.000” gage blocks
- DMD 24” calibration rod
- 10g and 1000g weight standards
- Stage micrometer
- 2461 standard cartridge case
- 2460 standard bullet
- LAS software performance check reference bullets
- Balance performance check reference bullets

5.13.1.1 These reference standards are utilized for calibration and quality control checks and have certificates of traceability or equivalent documentation.

5.13.1.2 These reference standards are stored in the Reloading Room of the Firearms Section.

5.13.1.2.1 The performance check reference bullets are stored in individual offices alongside the corresponding instruments.

5.13.1.3 All employees of the Firearms Section have access to the Firearms Section reference standards.

5.13.2 The gage blocks, 10g and 1000g reference weights, the stage micrometer, and DMD-48 calibration rod shall be calibrated every five (5) years by an outside vendor.

5.13.2.1 The DMD-48 calibration rod shall be calibration checked against the 36" primary standard steel ruler each calendar year.

5.13.3 The NIST QC cartridge case shall be maintained with the reference standards, but does not require calibration.

5.13.4 The designated land impression of each reference bullet used for performance checking the LAS Measurement Module shall be measured immediately following the annual recalibration of the LAS Measurement Software. The width shall be documented and the tolerance shall be +/- .005 inch.

5.13.5 Each reference bullet used for performance checking the balances shall be weighed immediately following the annual certification of the balances. The weight shall be documented and the tolerance shall be +/- 1 grain.

5.13.6 Failure of a Check

5.13.6.1 In the event that any of the calibration checks or performance checks of reference standards fails, the reference standard shall be removed from casework as outlined in 5.1.5 above.

5.14 Reference Collections / Reference Specimens

5.14.1 The Firearms Section maintains the following in-house reference collections:

- Firearm
- Ammunition

5.14.2 The reference collections maintained in the Firearms Section shall not be considered evidence.

5.14.3 Prior to use in casework, the Firearms Section Technical Leader shall approve the materials and any data generated from the collections for use.

5.14.4 Test fires are considered reference items in the Laboratory.

5.14.5 Test fires used for comparison purposes shall be returned to the submitting agency.

6.0 Limitations – N/A

7.0 Safety – N/A

8.0 References

Association of Firearm and Tool Mark Examiners. *Procedures Manual*. 2001.

9.0 Records

- Forensic Advantage Resource Manager Files
- Equipment service reports
- Equipment / Standard calibration reports

10.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
10/20/2021	9	**Header** and throughout– corrected to reflect organizational change. **3.0 –** removed definition for chronograph. **4.0 –** removed "NRA-approved" from 4th bullet point, removed chronograph and soundmeter, changed "Calibrated" to "Steel" for ruler bullet points, removed last two bullet points and added a new last one. Reordered instrument sections. Renamed all "Maintenance" sections to "Maintenance Schedule". Created new "Failure of a Check" sections to each appropriate instrument and moved failure information here. **5.1.1** and **5.1.5.1** – changed "Chemistry Technician" to "Equipment Monitor or designee". Renamed **5.2** and added new **5.2.1**. New **5.2.2.1** – changed "Leica Application Suite (LAS)" to "LAS". New **5.2.2.2** – removed "of each comparison microscope" and changed "annually" to "every calendar year". New **5.2.2.3** – removed "On those microscopes where the LAS measurement module is actively being used to make measurements for casework,". New **5.2.2.4.1.1** – reordered firearm description. New **5.2.2.4.2** – changed "star" to "asterisk". New **5.2.3.3** – changed "Leica Application Suite (LAS)" to "LAS". New **5.2.3.4** and **5.2.4.6** – changed "highest level (2592 x 1944, Interlaced Large HQ)" to "the highest level available". New **5.2.3.5** and **5.2.3.8** – changed "1X" to "2X". New **5.2.3.6** and **5.2.3.9** – changed "0.600" to "0.800". Removed old **5.2.2.11** and subsections. New **5.2.3.11** – changed "each old calibration in turn" to "the old calibration". New **5.2.4.14** – changed "for each additional objective calibrated" to "for the following objectives". Separated 2nd sentence of new **5.2.5.3** into new **5.2.5.4**. New **5.3.1.1** – changed "certified" to "calibrated" and changed "annually" to "every calendar year". Separated 2nd sentence of new **5.3.3.5** into new **5.3.3.6**. New **5.3.3.6** – changed "Forensic Advantage (FA)" to "FA". New **5.3.4.2** - reworded to mirror other similar sections and changed "5.1.3" to "5.1.5". New **5.4.1.1** – changed "annually" to "every calendar year". New **5.5.1.1** – changed "annually" to "every calendar year". New **5.6.1.2** – removed "using the DMD-48 calibration rod". Separated 2nd sentence of new **5.6.3.6** into new **5.6.3.7**.

		New **5.7.1.1** – changed "annually" to "each calendar year". **5.7.2.4** – removed "in the appropriate logbook" New **5.8.1.1** – changed "annually" to "each calendar year". Created new sections for Hott-Rods, steel rulers, and comparison microscopes. Added new **5.13.1** and subsections. New **5.13.2** – removed calibrated rulers and Hott-Rods. New **5.13.2.1** – removed "and Hott-Rods" and changed "annually" to "each calendar year". Updated **5.13.4** from reading comparison microscope to LAS Measurement Module and LAS Measurement software Added new **5.13.6** and **5.13.6.1**. Added new **5.14**