# 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 Unit.

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

## 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.
- **Chronograph** – An electronic device used to measure and record the velocities of projectiles.
- **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
- NRA approved static weights
- Digital Measuring Device (DMD-48)
- Measurement tapes
- Calipers
- Micrometers
- Chronograph
- Sound meter
- NIST-traceable calibrated stage micrometer
- Leica Application Suite (LAS) software
- 10 g reference standard weight
- 1000 g reference standard weight
- Hott-Rods™
- NIST-traceable ruler (12″)
- NIST-traceable ruler (36″)
- DMD-48 calibration rod (24″)
- Gage block (0.500″)
- Gage block (1.000″)

- Forceps
- Cloth glove
- FA#3280 (U.S. Springfield Armory, caliber 22 Long Rifle, bolt action rifle, serial number 666A, Model M2)
- Federal Gold Medal Target, caliber 22 Long Rifle, 40 grain solid lead bullet ammunition

## 5.0 Procedure

### 5.1 Overview

**5.1.1** The Equipment Monitor (EM) shall be responsible for the maintenance of calibration standards and the calibration and calibration checks of critical instrumentation used in the Firearms Unit 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** NIST-traceable reference standards shall be stored in the Firearms Unit 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** The office of each Forensic Scientist shall contain a logbook or log sheet to be used for documenting the calibration and calibration check information of the critical instruments located in that office.

**5.1.4.2** The Firearms Unit EM shall maintain the logbooks for critical instruments not assigned to an individual Forensic Scientist.

**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 either repaired or replaced.

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

### 5.2 Comparison Microscopes

#### 5.2.1 Maintenance

**5.2.1.1** The Leica Application Suite (LAS) measurement module of newly purchased comparison microscopes shall be calibrated prior to use.

**5.2.1.2** Each comparison microscope shall be serviced and cleaned annually by an outside vendor.

**5.2.1.2.1** The original record of this maintenance shall be maintained by the Section Document Custodian or his/her designee. A copy of the record may be placed in the pertinent logbook.

**5.2.1.3** The LAS measurement module of each comparison microscope shall be calibrated annually by the Unit EM or his/her designee.

**5.2.1.4** On those microscopes where the LAS measurement module is actively being used to make measurements, the LAS measurement module shall be calibration checked monthly by the Unit EM or his/her designee.

**5.2.1.4.1** The calibration check shall be conducted using a NIST-traceable calibrated stage micrometer.

**5.2.1.5** The LAS measurement module of each comparison microscope shall be performance checked by the Forensic Scientist to whom the comparison microscope is assigned. The performance check shall be conducted 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.

**5.2.1.5.1** 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:

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

**5.2.1.5.2** One land impression, chosen by the Unit EM, shall be marked with an engraved star on each reference bullet. In this manner, the performance checks conducted by the Forensic Scientists will measure the same land impression.

### 5.2.2 Calibration Procedure

**5.2.2.1** 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.

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

**5.2.2.3** In the Leica Application Suite (LAS) Software, go to the Scale Bar field and be certain orientation is set to "Horizontal."

**5.2.2.4** Go to the Acquire tab > Camera tab > Image Formats and set resolution to highest level (2592 x 1944, Interlaced Large HQ) for both captured format and live format.

**5.2.2.5** Place both nosepieces to the 1X objective.

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

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

**5.2.2.8** Select "New" and then name as follows: objective and date (e.g. 1X, 12-15-10). After naming the file, choose "OK."

**5.2.2.9** A red line will appear on the screen. Adjust the red line to extend 0.400 inch from 0.600 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 .6 hash mark, it must end along the right edge of the 1.0 hash mark).

**5.2.2.10** Go to the Calibration Settings Tab and type in the value for the actual length of the line shown on the image (0.400) in inches. Choose "Save" in the Calibration Settings area.

**5.2.2.11** Repeat the above procedure for each additional objective to be calibrated.

**5.2.2.11.1** For the 1X Objective with the 1.5 magnifier, place the stage micrometer centered on the area between and including 0.700 inch to 0.960 inch and measure 0.260 inch for the calibration.

**5.2.2.11.2** 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 0.200 inch for the calibration.

**5.2.2.12** Go to the Acquire screen > Camera tab > Calibration Settings field > Configuration drop down. Select each old calibration in turn and delete.

### 5.2.3 Calibration Check Procedure

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

**5.2.3.2** 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, click on the Setup Tab to verify the microscope's serial number.

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

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

**5.2.3.4.2** "In this format" is set to "Tiff."

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

**5.2.3.6** Go to the Acquire tab > Camera tab > Image Formats and set resolution to highest level (2592 x 1944, Interlaced Large HQ) for both captured format and live format.

**5.2.3.7** Acquire an image of the serial number from stage micrometer box (using the 0.4X objective) and save with the following file name format: Cal Stan, date, objective, stage, and initials of person performing the calibration check (e.g., "Cal Stan, 12-15-10, 0.4X, Right, ABC").

**5.2.3.8** In the "Image Data" area, type the microscope serial number in the "Description" field. In the Process screen, under the "Annotate" tab > "Information" field, select the check boxes for "Image Name", "Description", "Date", and "Time." In the "Actions" field, click "Merge", then "Replace." This will store the photo with the information inserted.

**5.2.3.9** Place both nosepieces to the 1X objective.

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

**5.2.3.11** 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.

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

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

**5.2.3.13** 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.

**5.2.3.13.1** This measurement can be accomplished with the scale bar.

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

**5.2.3.15** Click "Merge" and "Replace."

**5.2.3.16** Repeat the above procedure (beginning with **5.2.3.10**) for each additional objective calibrated.

**5.2.3.16.1** 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.

**5.2.3.16.2** 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.

### 5.2.4 Performance Check Procedure

**5.2.4.1** Place the reference bullet on the stage used during the calibration procedure.

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

**5.2.4.3** The tolerance for this width shall be +/- 0.005 inch. If the measured width falls within this tolerance range, the successful performance check shall be recorded in Forensic Advantage (FA).

**5.2.5** In the event that a performance check fails, a calibration check shall be performed by the Unit EM or his/her designee before the LAS measurement module may be used in casework.

**5.2.6** In the event that a calibration check fails, the following procedure shall be followed:

**5.2.6.1** Supervisor/Forensic Scientist Manager is notified.

**5.2.6.2** Vendor is notified of error/problem.

**5.2.6.3** Supporting documentation is required; provide the following information:

- Serial number of microscope/camera.
- Specific objective(s) that failed.
- Date of failure/date equipment was taken out of service.
- Date that vendor was notified.
- Date that equipment was evaluated/corrected.
- Date that equipment was put back into service.

## 5.3 Stereomicroscopes

### 5.3.1 Maintenance

**5.3.1.1** Each stereomicroscope shall be serviced and cleaned annually by an outside vendor.

**5.3.1.2** Stereomicroscopes do not require calibration, calibration checks, or performance checks.

## 5.4 Balances

### 5.4.1 Maintenance

**5.4.1.1** Each balance shall be serviced, cleaned, and certified annually by an outside vendor.

**5.4.1.1.1** The original record of this maintenance shall be maintained by the Section Document Custodian or his/her designee. A copy of the record may be placed in the pertinent logbook.

**5.4.1.2** Each balance shall be calibration checked monthly by the Unit EM or his/her designee.

**5.4.1.3** Each balance shall be performance checked by the Forensic Scientist to whom the balance is assigned. The performance check shall be conducted 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.

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

### 5.4.2 Calibration Check Procedure

#### 5.4.2.1 Small Capacity Balances

**5.4.2.1.1** Be certain the balance is level.

**5.4.2.1.2** Turn on the balance and zero or tare the balance.

**5.4.2.1.3** Be certain the balance is reading in grains.

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

**5.4.2.1.5** Record the resulting weight in the appropriate logbook. The tolerance for each balance shall be +/- 0.05 grain.

#### 5.4.2.2 Large Capacity Balance

**5.4.2.2.1** Be certain the balance is level.

**5.4.2.2.2** Turn on the balance and zero or tare the balance.

**5.4.2.2.3** Be certain the balance is reading in grams.

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

**5.4.2.2.5** Record the resulting weight in the appropriate logbook. The tolerance for the balance shall be +/- 0.05 gram.

### 5.4.3 Performance Check Procedure

**5.4.3.1** Be certain the balance is level.

**5.4.3.2** Turn on the balance and zero or tare the balance.

**5.4.3.3** Be certain the balance is reading in grains.

**5.4.3.4** Place the reference bullet on the balance.

**5.4.3.5** The tolerance for this weight shall be +/- 1 grain. If the measured weight falls within this tolerance range, the successful performance check shall be recorded in Forensic Advantage (FA).

**5.4.4** In the event that a performance check fails, a calibration check shall be performed by the Unit EM or his/her designee before the balance may be used in casework. If this calibration check should also fail, the balance shall be removed from casework as outlined in 5.1.5 above.

## 5.5 Trigger Pull Static Weights

### 5.5.1 Maintenance

**5.5.1.1** Each set of static weights shall be calibration checked annually by the Raleigh Laboratory Firearms Unit EM or his/her designee.

### 5.5.2 Calibration Check Procedure

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

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

**5.5.2.3** Be certain the balance is reading in pounds.

**5.5.2.4** Place the weight carefully on the balance and record the weight in the appropriate logbook. The tolerance for each static weight shall be +/- 0.05 pound.

**5.5.2.5** Repeat this process for each of the static weights.

## 5.6 Digital Measuring Device (DMD-48)

### 5.6.1 Maintenance

**5.6.1.1** The DMD-48 shall be calibration checked quarterly by the Unit EM or his/her designee.

**5.6.1.2** The DMD-48 shall be performance checked prior to being used in casework by the Forensic Scientist who will use it. The performance check shall be conducted 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.

**5.6.1.2.1** The performance check shall be conducted using the DMD-48 calibration rod.

### 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 in the appropriate logbook. The tolerance for the DMD-48 shall be +/- 0.03 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. If the measured length falls within this tolerance range, the successful performance check shall be recorded in Forensic Advantage (FA).

**5.6.4** In the event that a performance check fails, a calibration check shall be performed by the Unit EM or his/her designee before the DMD-48 may be used in casework. If this calibration check should also fail, the DMD-48 shall be removed from casework as outlined in **5.1.5**.

## 5.7 Measurement Tapes

### 5.7.1 Maintenance

**5.7.1.1** Each measurement tape shall be calibration checked annually by the Unit EM or his/her designee.

### 5.7.2 Calibration Check Procedure

**5.7.2.1** Extend the measurement tape to more than 24 inches.

**5.7.2.2** Compare each measurement tape directly with the 36 inch NIST-traceable ruler at 6 and 24 inches.

**5.7.2.3** Record the lengths in the appropriate logbook. The tolerance for each measurement tape shall be +/- 1/16 inch.

## 5.8 Calipers

### 5.8.1 Maintenance

**5.8.1.1** Each caliper shall be calibrated annually by an outside vendor.

**5.8.1.1.1** The original record of this maintenance shall be maintained by the Section Document Custodian or his/her designee. A copy of the record may be placed in the pertinent instrument logbook.

**5.8.1.2** Each caliper shall be calibration checked monthly by the Unit EM or his/her designee.

### 5.8.2 Calibration Check Procedure

**5.8.2.1** Close the jaws of the caliper and verify that the caliper reads zero.

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

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

**5.8.2.3** Record the lengths in the appropriate logbook. The tolerance for each caliper shall be +/- 0.004 inch.

## 5.9 Micrometers

### 5.9.1 Maintenance

**5.9.1.1** Each micrometer shall be calibrated annually by an outside vendor.

**5.9.1.1.1** The original record of this maintenance shall be maintained by the Section Document Custodian or his/her designee. A copy of the record may be placed in the pertinent instrument logbook.

**5.9.1.2** Each micrometer shall be calibration checked monthly by the Unit EM or his/her designee.

### 5.9.2 Calibration Check Procedure

**5.9.2.1** Close the jaws of the micrometer and verify that the micrometer reads zero.

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

**5.9.2.2.1** Hold the micrometer level or the reading may fluctuate.

**5.9.2.3** Record the lengths in the appropriate logbook. The tolerance for each micrometer shall be +/- 0.004 inch.

## 5.10 Chronograph

### 5.10.1 Maintenance

**5.10.1.1** The chronograph shall be calibration checked prior to being used in casework by the Forensic Scientist who will use it.

**5.10.1.1.1** The calibration check shall be conducted using U.S. Springfield Armory, caliber 22 Long Rifle, bolt action rifle, serial number 666A, Model M2, Firearm Reference Collection #FA3280 and Federal Gold Medal Target, caliber 22 Long Rifle, 40 grain solid lead bullet ammunition, Lot #3AV141.

### 5.10.2 Calibration Check Procedure

**5.10.2.1** The calibration check shall be performed using the following rifle and ammunition:

**5.10.2.1.1** U.S. Springfield Armory, caliber 22 Long Rifle, bolt action rifle, serial number 666A, Model M2, Firearm Reference Collection #FA3280. This firearm shall be maintained in the Raleigh Laboratory Firearm Reference Collection.

**5.10.2.1.2** Federal Gold Medal Target, caliber 22 Long Rifle, 40 grain solid lead, Lot #3AV141. This ammunition shall be maintained with the other reference standards in a designated area of the Raleigh Laboratory Firearms Unit. Once this lot of ammunition is depleted, the chronograph shall be returned to the manufacturer for calibration and a new lot of ammunition shall be used upon return.

**5.10.2.2** The Oehler chronograph shall be set up according to the manufacturer's instructions.

**5.10.2.3** The spacing of the start/stop sensors (skyscreens) shall be placed at a four (4) foot interval. The lens surface of each skyscreen may need to be cleaned. Cleaning shall be performed with a swab and distilled water.

**5.10.2.4** The muzzle of the test firearm shall be placed ten (10) feet from the start sensor. The triangular light diffusers shall form a triangle-within-a-triangle sight picture looking down the barrel at the target from a normal shooting position.

**5.10.2.5** Connect the cables from the skyscreens to the input jacks of the Oehler model 35P as described in the operating manual. Make sure the chronograph has an alkaline 9-volt battery installed and the plugs are pushed all the way into the jacks.

**5.10.2.6** Place the chronograph at a convenient location well behind the muzzle to protect it from muzzle blast.

**5.10.2.7** A string of five (5) verification shots shall be made using the designated rifle and ammunition. The string of shots shall be considered sufficient if no error readings are obtained (indicated by "*" on the printout). If error readings are obtained, a second string of five (5) shots shall be made. No more than five (5) attempts shall be made to obtain an error-free string of verification shots. If five (5) attempts are made and no error-free string is obtained, the chronograph shall be pulled from service and returned to the manufacturer for calibration inspection.

**5.10.2.8** Once an error-free string of verification shots is obtained, the Forensic Scientist shall view the summary of the test shots.

**5.10.2.8.1** If the given standard deviation (indicated by an "S" on the printout) is 25 or greater, the chronograph shall be considered to be "out of calibration" and shall be pulled from service and returned to the manufacturer for calibration inspection.

**5.10.2.8.2** If the given standard deviation is less than 25, the Forensic Scientist may proceed with test firing of the questioned/evidence firearm.

**5.10.2.9** A printout shall be made of each string of verification shots. The printouts shall then be imported into the case file and into the designated Firearms Unit shared folder.

## 5.11 Sound Meter

### 5.11.1 Maintenance

**5.11.1.1** The sound meter shall be calibrated prior to being used in casework by the Forensic Scientist who will use it.

**5.11.1.1.1** The calibration shall be conducted using U.S. Springfield Armory, caliber 22 Long Rifle, bolt action rifle, serial number 666A, Model M2, Firearm Reference Collection #FA3280 and Federal Gold Medal Target, caliber 22 Long Rifle, 40 grain solid lead bullet ammunition, Lot #3AV141.

### 5.11.2 Calibration Procedure

**5.11.2.1** Calibrate the sound meter using the acoustical calibrator.

**5.11.2.2** Insert two (2) 9-volt batteries into the acoustical calibrator and one (1) 9-volt battery into the sound meter.

**5.11.2.3** Insert the microphone of the Digital Sound Level Meter into the Acoustical Calibrator Probe. Be sure the microphone fits snugly and is inserted completely.

**5.11.2.4** Set the sound meter on a stable flat surface using the tripod stand built into the back of the meter. Turn on the Sound Level Meter and select the 50 - 100 dB range. Turn the sound level "speed" selector switch to "slow." Turn the calibration switch to the "C" position.

**5.11.2.5** Move the switch on the Acoustical Calibrator to the "Battery Test" position. Ensure the LED illuminates, indicating a good battery.

**5.11.2.6** Move the switch to the "ON" position on both the acoustical calibrator and the sound meter.

**5.11.2.7** Using the small screwdriver provided with the sound meter, turn the calibration adjustment screw on the sound meter until the display reads 94 dB in the C scale. (Reading may vary slightly from A to C weighting scales, but should be within the accuracy specifications.)

**5.11.2.8** Remove the microphone of the Digital Sound Level Meter from the Acoustical Calibrator Probe. The meter is now calibrated and ready to use.

**5.11.2.9** The Forensic Scientist shall document in the case notes that the meter was calibrated immediately prior to use.

## 5.12 Reference Standards

### 5.12.1 Maintenance

**5.12.1.1** The gage blocks, 10 g and 1000 g reference weights, the stage micrometer, DMD-48 calibration rod, NIST-traceable rulers, and Hott-Rod™ rods shall be calibrated every five (5) years by an outside vendor. The resultant calibration documentation shall be maintained by the Section Document Custodian.

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

**5.12.1.3** The designated land impression of each reference bullet used for performance checking the comparison microscopes shall be measured by the Unit EM or his/her designee immediately following the annual recalibration of the comparison microscopes. The width shall be documented in the appropriate logbook and the tolerance shall be +/- .005 inch.

**5.12.1.4** Each reference bullet used for performance checking the balances shall be weighed by the Unit EM or his/her designee immediately following the annual certification

of the balances. The weight shall be documented in the appropriate logbook and the tolerance shall be +/- 1 grain.

**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**

- Calibration Logbooks

**10.0 Attachments** – N/A

| **Revision History** | | |
|---|---|---|
| Effective Date | Version Number | Reason |
| 09/17/2012 | 1 | Original Document |
| 10/17/2012 | 2 | Added a sentence to the end of 5.2.1.5, 5.4.1.3, and 5.6.1.2 to clarify that performance checks shall be conducted after a power shut down; added comma in 5.2.3.7; changed grains to grain in 5.4.2.1.5. |
| 02/15/2013 | 3 | Removed Raleigh from the header; 3.0 – corrected definition of caliper; 4.0 – specified which instruments are located in the Raleigh Laboratory, removed lead caliper and lead micrometer checks, and added gage blocks; 5.1.4.1 – added log sheet; 5.2.1.2.1 – clarified maintenance of calibration records; 5.2.1.5.1.1 – added Raleigh Laboratory; 5.4.1.1.1 – clarified maintenance of calibration records; 5.4.2.2 – added language in parentheses; 5.5.1.1 – added Raleigh Laboratory; added 5.8.1.1.1; 5.8.2.2 – replaced caliper reference standard with gage blocks; added 5.9.1.1.1; 5.9.2.2 – replaced micrometer reference standard with gage blocks; 5.10 – added language in parentheses; 5.11 – added language in parentheses; 5.12.1.1 – replaced caliper and micrometer reference standards with gage blocks |
| 05/10/2013 | 4 | 5.6.2.6 and 5.6.3.6 – changed tolerance from 0.01 to 0.03 inch |
| 11/15/2013 | 5 | Added issuing authority to header |
| 09/05/2014 | 6 | **Header and various subsections** – corrected to reflect organizational change |
| 12/11/2015 | 7 | 4.0 – removed located in Raleigh Lab<br>5.2.1.4 – added on those actively being used to make measurements<br>5.10 & 5.11 – removed located in Raleigh Lab<br>5.10.2.1 – 5.10.2.9 – transferred from firearms procedure<br>5.11.2.1 – 5.11.2.9 – transferred from firearms procedure |
| | | |