Firearms Methods Manual

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1 Procedure for the Examination of Firearms

1.1 Safety Considerations

This procedure involves hazardous materials, operations and equipment. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to follow appropriate safety practices and to determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered. Appropriate hearing and eye protection must be worn when applicable.

1.2 Safe Firearm Handling

Proper handling of firearms evidence will prevent most accidents. The only way to prevent accidents is to practice safety at all times - in the evidence receiving area; firearms section; test firing area; and in court. Safe firearm handling within the laboratory environment corresponds with safe firearm handling in general.

- The muzzle of the firearm should always be pointed in a safe direction.
- If the Evidence Receiving Section is advised by a department that the firearm being submitted is loaded, the packaging shall be boldly marked “Loaded Firearm”. However, in all cases, firearms will be handled as if they are loaded during the submission process, while being secured in the evidence vault and during the initial examination process. Each firearm will be examined by authorized staff to ensure it is unloaded and safe to handle before being examined by another section or returned to the submitting agency. The package will be marked with the date and initials of the authorized staff in an easily viewable location.
- Submitting agencies are encouraged to unload firearms prior to submission. However, agencies may wish to have firearms with corrosion, blood or fingerprints unloaded by qualified laboratory personnel.
- Once a firearm has been examined it shall be secured in the evidence vault or returned directly to the submitting agency in an unloaded condition. If the packaging reflects that the firearm was loaded, such markings will be lined through, initialed and marked “Unloaded Firearm”.
- Test firing or any examination of the firearm that utilizes loaded cartridges or cartridge components will only be performed in a designated testing area.
- After test firing a gun, the scientist/Lab Technician 2 must ensure that it is unloaded before leaving the designated shooting area. Depending on the type of action utilized by the firearm, the scientist/Lab Technician 2 shall visually inspect the magazine, cylinder and the chamber(s). The scientist/Lab Technician 2 should also consider, whenever possible, engaging the unloaded firearm’s safety, removing the magazine and leaving the action open.
- Any ammunition that is submitted loaded in a magazine shall be removed for documentation purposes prior to test firing.

1.3 Pre-firing safety examinations

It is the responsibility of the firearm scientist/Lab Technician 2 to ensure that all appropriate safety and function checks are performed on a firearm and/or ammunition prior to test firing.
Following is a list of safety checks which should be considered. The scientist/Lab Technician 2 must be mindful that individual case situations may require a more extensive function test process than that which is listed here.

1.3.1 Firearms Submitted With Extraneous Items Attached

- All extraneous items attached to the firearm must be removed, if the scientist/Lab Technician 2 believes they may render the firearm unsafe or interfere with the action.

1.3.2 Deciding whether or not a firearm can be safely test fired from the normal hand-held position.

- Is the chamber/bore clear?
- Are there any signs of cracks or weaknesses in major parts of the firearm, such as the frame, slide or barrel?
- Does the firearm function, lock-up or dry fire as you would expect it to?
- Is the correct ammunition being utilized?

1.3.3 Is it appropriate to utilize the evidence ammunition?

- Are there signs of reloading? If so, reconsider the need to test fire the submitted ammunition.
- Are there splits in the cartridge case neck and/or other significant damage to the cartridge case?
- Is the ammunition of the correct caliber?
- Are there existing tool marks on pertinent surfaces of the ammunition?

1.3.4 Muzzle Loaders

- Does the chamber/barrel appear sound?
- If a muzzleloader is received in the loaded condition, it must have the bullet and charge removed. It may then be properly loaded prior to test firing.

1.3.5 Evidence Examination

If any of the above considerations indicate a potential safety concern and test firing is necessary, that firearm must be remote fired.

1.4 Test Firing and Evidence Examination

- Examination gloves (i.e. nitrile, latex, etc.) and PPE to protect exposed skin (i.e. lab coat, sleeves, etc.) will be worn during test firing and evidence handling. Reduced PPE may be worn during microscopic *exams or when handling small parts during firearm disassembly* to allow for appropriate dexterity.

- Sticky mats will be placed at firing range exits to reduce gunshot residues being tracked outside the firing range.
- Firing range ventilation systems will be operated during test firing to exhaust/filter airborne gunshot residues away from the designated firing areas.
- ~~Jacketed or lead-free bullets and non-lead primer may be utilized for test firing when appropriate.~~
- Employees should wash their hands with soap and water after removing gloves or before leaving laboratory areas if contamination of the hands may have occurred during lab work.

1.4.1 Cleaning

- Horizontal work surfaces that the scientist routinely encounters fired components with, including within the workspace in the firing ranges and lab benches will be cleaned ~~each day~~ *the week* of use, using wetted wipes or towels.
- Floor surfaces can be cleaned using a wet mop or “Swiffer” style wet mop, as needed.
- Use of dry sweeping or compressed air should be avoided.
- Appropriate PPE (examination gloves, lab coats, etc.) will be utilized during cleaning practices.
- Cleaning and replacement of HVAC systems, HEPA filters, tank water filter, and range surfaces willbe performed by a qualified vendor, as needed.

1.5 Examination Documentation

Examination details will be included in the case record such as the evidence packaging, contents, open/seal date, and the method of testing performed. In addition to the technical record requirements detailed in the Laboratory Quality Assurance manual, the following case documentation practices should be used whenever appropriate.

Photographs will be used to document individualizing characteristics that support the scientist’s conclusion. The conclusion and the magnification will be documented in thecase record. If several items are identified as having been fired by the same gun, only one photograph is required. Annotation of the photographs will include at minimum the case number, item number, and scientist initials. The photographs will be included in the case record. A photograph of evidence may also be taken to document the physical condition of evidence, serial number restoration results, indications of modified firearms, or as anillustration in a scientific article.

Images included in the case record for supplemental description of the evidence do not require annotations (For example: photos of serial number or headstamp).

1.6 Physical Examinations

The examination of any firearm or firearm related component will include the recording of firearm information. This record will include the manufacture data of the firearm and will serve as a source todocument the condition of the firearm as received and any tests performed to or with the firearm. This may include determining the following:

- Caliber/Gauge
- Manufacturer
- Model
- Serial Number
- Type of firearm Action
- Safeties
- Operating Condition
- Rifling Characteristics
- Location of Identifying Markings
- Magazine Capacity
- Chamber Length
- Choke Device (if present)

Wherever utilized, test methods not included in this manual will be fully described or suitably referenced in the case record to allow the test to be repeated under conditions as close as possible to the original.

1.7 Foreign Material

Firearm evidence recovered during an investigation may contain other foreign material transferred from the crime scene or other source. This material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The scientist needs to be cognizant of the potential value of foreign material relative to the known case facts.

1. The observation of foreign material will be recorded in the examination documentation.
2. The value of further examination of the material will be assessed. Consultation with other respective laboratory sections may be required.
3. If further examination of the material is warranted, it shall be removed and preserved either by, or under the direction of, the other laboratory section.

Removal of foreign material may also be necessary to allow the safe or proper examination and testing of an item. If the foreign material is not going to be retained for further examination, proceed with the following applicable steps:

1. For evidence containing blood, tissue or other biohazards, soak the evidence for at least five (5) minutes in at least a 10% bleach solution.
2. Remove loose material by cleaning with water, soap, methanol, solvent, oil, etc.

1.8 Rusted Firearms

Rusted firearms or those found in water may be submitted for examination.

Whenever practical the firearm should be removed from the water, dried, and lubricated with a suitable firearm lubricant prior to submission to the laboratory. If this is not practical, or if the firearm is to be processed for DNA, the firearm may be submitted in the condition as recovered or submerged in water; however, the submission of actively submerged firearms should be allowed only as a last resort and only if submitted in properly secured water-tight packaging, in order to minimize the risk of leaking and contamination of additional evidence. Immediate attention should be given to firearms that have been recovered from water in order to preserve DNA and minimize further damage to the firearm.

1. Determine if the firearm is loaded and if it is, unload the firearm. If it cannot be readily verified to be unloaded it must be examined in an area designated for the firing of firearms. A scientist must take all necessary steps to ensure that the firearm is unloaded.
2. If the preservation of DNA or processing of Latent Prints is a priority, the firearm should be allowed to dry and be examined by authorized staff as soon as possible, before the application of any solvents or lubricants.
3. The scientist must determine to what extent restoring the firearm is necessary (i.e., for test firing, for recovering manufacturer information, serial number, etc.).
4. The firearm should be cleaned and lubricated with suitable cleansers and lubricants if deemed necessary to prevent further damage or deterioration. The use of patches and / or bore snake application can be considered on a case by case basis. Soaking of the firearm in solvents or lubricants can be considered if the firearm is heavily seized, however caution should be used if applying solvents that can result in further binding or operability impairment if allowed to dry in place (WD-40).

1.9 Firearm Malfunction Examination

A Firearms scientist may be called upon to examine a firearm to determine whether the firearm will malfunction (fires without pulling the trigger, fires with safety on, cycles improperly, etc.). Before performing this type of examination, the scientist may wish to acquire a detailed account of the incident from the submitting agency.

Examinations may include external and internal observations or striking / dropping the firearm in attempts to duplicate the actions of the firearm at the time of discharge. To the extent possible, the scientist should attempt to keep the firearm in the same condition as received. Any disassembly beyond routine field stripping (basic disassembly for cleaning/examination purposes) as well as any additional changes, must be specifically documented in the scientist's notes.

No single procedure can sufficiently outline the steps necessary to examine all firearms for any malfunction.However, the following list of examinations should serve as a guideline for the scientist.

1.10 Physical Check (Condition of Firearm as Received)

- Loaded / Unloaded.
- Cocked / Un-cocked.
- Safety position.
- Cartridge position.
- Stuck cartridges / fired cartridge cases.
- Presence and/or location of flares.

1.10.1 Visual Abnormalities

- Barrel (loose, etc.).
- Receiver (condition).
- Slide (condition).
- Signs of impact; parts broken or missing, especially the firing pin, ejector and/or extractor.
- Screws (loose or missing).
- Alterations or adaptations.
- Sights.

1.10.2 Action (External)

- Relationships of the action parts.
- Correct assembly.
- Normal locking of action.
- Cylinder rotation (securely locks).
- Hand relationship to the ratchet (worn).
- Trigger (not returning, sticks, broken spring, etc.).
- Trigger pull (single action, double action) and striking of hammer.

1.10.3 Safeties

- ¼, ½, full cock, seating check (any false seating positions, pull off/push off, etc.).
- Function of grip, magazine and/or disconnector.
- *Manual Safety* ~~Thumb/finger~~ - note positions when firearm will fire.
- Rebound hammer or inertia firing pin - Will firing pin ride on primers? Is firing pin *seized* ~~frozen~~ or bent? (Drop hammer several times to check above safeties.)
- Does the slide or bolt have to be completely closed to fire?
- Can the safeties be bypassed? Will dropping hammer bypass safeties? (This may require primed cartridge tests.)
- Will a light blow on the rear of the hammer, when it is in battery, discharge the primer?
- Is the firing pin impression off center (both single action and double action operation)?

USE CAUTION WHEN FIRING LIVE CARTRIDGES OR PRIMED CARTRIDGE CASES

1.10.4 Action Check

- Check feeding (magazine, carrier or lifter, feed ramp, magazine lips, etc.).
- Dummy cartridges/snap caps may be used when testing the action to prevent damage.
- Will a cartridge fire on closing of the bolt or slide (slam fire)?
- Extractor and/or ejector markings on evidence cartridges/fired cartridge cases consistent and/or normal?
- Unusual marks exhibited on the cartridges/fired cartridge cases.

1.10.5 Check for any inherent "quirks" known about the particular firearm based on literature or case data.

1.10.6 Test Fire Firearm (note operation, misfires, etc.)

- Note any operational problems.
- Ammunition involved (proper cartridge, type, reloads, etc.).
- Check consistency of the *characteristics* ~~impression~~ on test and evidence.

1.10.7 Misfire Testing

- If the firearm misfires during testing, consider further testing with multiple cartridges (e.g., a full magazine or cylinder) to establish the frequency of the problem.
- Attempt to determine if the misfire is caused by an issue with the firearm or is a by-product of the ammunition (e.g., old, inert, reloaded, primer seated too low, etc.).
- Submitted cartridges with a firing pin impression will be considered having a firing pin strike, as the manner in which the impression was imparted is not known.

1.10.8 Special Situational Tests

Discretion should be considered in situational testing if the force needed could disturb the internal action and/or cause changes which might prevent determining the exact cause of the malfunction.

1.10.9 Action (Internal)

- Hammer notch(s) (worn, burrs, dirt, etc.)
- Sear (worn, broken, burrs, etc.)
- Safeties (relationships and general parts relationship)
- Springs (weak, broken, altered, etc.)
- Signs of any tampering or faulty assembly

1.10.10 Bore/Chamber Casting for Class and Individual Characteristics

Occasionally, firearms are received for which the caliber may not be known or may be different than is designated on the firearm and in the literature. In order to facilitate firing of test shots that are of the correct caliber for a particular firearm, it may be necessary to make a bore and/or chamber cast. Then, by measuring the cast, the correct cartridge can be determined. Casting can be done to better visualize the class and individual characteristics present on a firearm for examination and / or comparison purposes.

Casts can be made using various casting materials such as low melting point metals and silicone rubber compounds. The procedure below is for Mikrosil® and Accutrans®.

1.10.11 Technique

1. Ensure that the firearm is unloaded.
2. Check the bore/chamber/breech to make sure it is clear.
3. Clean the bore / chamber / breech if needed due to excessive dirty / debris / fouling.
4. Lubricate bore / chamber / breech as needed.
5. Mix Mikrosil® or Accutrans® per manufacturer's instructions.
6. Carefully remove cast once the material has had time to set.

1.10.12 Interpretation of Results

The correct caliber of the firearm can be determined by measuring the mouth, base, overall length, rim (if pertinent) and shoulder length of the cast.

1.10.13 References

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2. "Technical Protocols for the Handling of Firearms and Ammunition," FBI: 1992, June.
3. Gamboe, Tom, MAFS Firearms Workshop: "Trigger Pull Methods," AFTE Journal: Vol. 18, No. 3, pp 77.
4. Rios, Ferdinand, Thornton, John, "Static vs. Dynamic Determination of Trigger Pull"; AFTE Journal: Vol. 16, No. 3, pp 84.
5. "The Proper Method for Measuring Weapons," AFTE Journal: Vol.14, No. 3, pp 10.
6. Denio, Dominic; "Making a Rusted Gun Functional," AFTE Journal: Vol. 13, No. 3, pp 29.
7. Hueske, Edward E., "Silencers - A Review And A Look At The State Of The Art," AFTE Journal: Vol. 23, No. 2, pp 668.
8. Crum, Richard A; Owen; Edward M.; "Silencer Testing", AFTE Journal: Vol. 21, No. 2, pp 433.
9. Thompson, Roger C., "Firearms Malfunction Worksheets"; AFTE Journal: Vol. 15, No. 1, pp 100.
10. American National Standards Institute, Inc., American National Standard Voluntary Industry Performance Standards Criteria for Evaluation of New Firearms Designs Under Conditions of Abusive Mishandling for the Commercial Manufacturers (ANSI/SAAMI Z299.5-1996), February, 1996.
11. Striupaitis, Peter P., "Bore Casting Techniques for Caliber Designation of Rifles"; AFTE Journal: Vol. 15, No. 2, pp 88.
12. Poole, Robert A., "Mikrosil Casting Material Information"; AFTE Journal, Vol. 15, No. 2, pp 80.
13. The Ohio Criminal Law Handbook, Sixteenth Edition, Title XXIX, Criminal Code.

2 Procedure for Test Firing

2.1 Introduction

A minimum of two (2) test shots should be fired and recovered to provide reference standards for the submitted firearm. Recovery methods include the water tank, *Cotton / Ballistic Fiber Recovery Box* ~~cottonwaste recovery box~~, and bullet trap/range. The type of firearm and ammunition testedwill usually dictate the type of recovery method used. The water recovery tank and *Cotton / Ballistic Fiber Recovery Box* ~~cotton waste recovery box~~ are both suitable methods for recovering bullets. The bullettrap or range is usually used to test fire firearms when the recovery of the fired projectiles is not necessary.

2.1.1 Safety Considerations

This procedure involves hazardous materials, operations and equipment. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to follow appropriate safety practices and determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered.

2.1.2 Procedure

1. The scientist/Lab Technician 2 may wish to consider indexing and sequencing each shot, if applicable.
2. Proper hearing and eye protection must be worn.
3. Ensure that the exhaust fans or system is turned on.
4. Activate Range in Use light, if applicable.
5. Ensure that lids or doors of the recovery device are closed and secured properly.
6. Water tank - ensure that the water level is appropriate.
7. *Cotton / Ballistic Fiber Recovery Box* ~~Cotton waste recovery box~~ – the scientist may place partitions of paper at various points in box to ensure tracking of test shot. The scientist should consider wetting the first section of *Cotton/Ballistic fiber* in the box.
8. Fire the firearm. If the firearm is capable of firing both single and double action modes, a minimum of one (1) shot per mode should be considered. A minimum of two (2) test shots should be fired and recovered.
9. Water tank - recover the bullets using a net, pole, or some other appropriate
10. *Cotton / Ballistic Fiber Recovery Box* ~~Cotton waste recovery box~~ - bullets are recovered by searching through *Cotton/Ballistic Fiber*.
11. Ejected cartridge cases ~~must~~ *should* be retrieved.
12. The bullet and cartridge case of each test shot must be marked with a unique identifier whenever possible.

2.1.3 Remote Firing

During the course of examining a firearm, it may be determined that it would be unsafe for the scientist to fire the firearm by holding it as designed. If it is necessary to obtain test standards from this firearm, the firearm should be fired remotely. ~~The Zero-One® (or a similar device) can be utilized for firing long arms and some handguns, while the Ransom Rest® (or a similar device) can be utilized for firing handguns. The Secure Firing Device Verifire® can be utilized for virtually every type of firearm.~~

The scientist should follow all safety recommendations set forth by the manufacturer of the shooting device used.

Due to the potential hazard of the firearm malfunctioning or undergoing a catastrophic failure, the scientist must be stationed behind a protective shield or at a safe distance from the firearm when discharging the firearm.

2.1.3.1 **Technique**

1. Set up the chosen remote firing device, as per guidelines set forth by the manufacturer, in front of the appropriate recovery system.
2. Place firearm in device. It is recommended that the scientist first dry-fire the firearm in the remote firing device before using live ammunition.
3. It is recommended that no more than one (1) cartridge is loaded into the firearm at a time during the test firing of the firearm. Otherwise, no more than two (2) cartridges should be loaded at a time.
4. Activate the remote device while standing behind the firearm.
5. Obtain fired test standards.

2.1.4 Downloading

Due to the limitations of a Firearms section's bullet recovery devices, it may be necessary to reduce or change the powder load of the cartridge in order to obtain a velocity suitable for safely collecting test standards for comparison purposes. Even with a reduced load, it may be necessary to fire the firearm remotely.

2.1.4.1 **Technique**

1. Pull the bullet out of the cartridge using an inertia bullet puller or a reloading press.
2. Remove existing powder, as needed. Loosely pack a small piece of tissue into the case to fill the gap between the bullet and powder. Note that this method is not appropriate in all instances, as excessive space inside the cartridge may cause excessive pressure to build up inside the cartridge case. The scientist may consider consulting a reloading manual for suggested powder/bullet combinations.
3. Seat the bullet back into the cartridge case.

When utilizing downloaded cartridges the scientist needs to be aware of the potential for bore obstructions resulting from the firing of downloaded cartridges (i.e. “squibs”). Extra caution should be used when using downloaded cartridges.

2.1.5 Primed Cartridge Case/Shotshell/Percussion Cap/ Primer

During the course of examining a firearm, it may be determined that it would be unsafe for the scientist to fire the firearm as designed. If it is not necessary to obtain test standards for comparison purposes or NIBIN entry, the firing condition of the firearm can be tested using a primed cartridge case primed shotshell, percussion cap, or primer.

2.1.5.1 **Technique**

Obtain a primed cartridge case in the desired caliber or pull the bullet of an unfired cartridge using an inertia bullet puller or reloading press, retaining only the primed cartridge case. For shotguns, obtain a primed shotshell in the desired gauge or cut open an unfired shotshell removing all components, retaining only the primed shotshell.

Load the primed cartridge case, primed shotshell, percussion cap or primer into the chamber of the firearm and test fire in front of the bullet trap or down range. Repeat if the firearm has more than one action.

2.2 Interpretation of Results

When all testing of the firearm is complete, the Forensic Scientist / Laboratory Technician ~~II~~ 2 will render a conclusion as to whether the firearm was operable or inoperable, as received. If any malfunctions that inhibit the normal operation of the firearm are observed during test firing, a description of the malfunctions and any subsequent actions taken will be provided in the case notes and the report remarks section, including the final technical disposition of the firearm (operable, rendered operable / capable of firing, inoperable etc.)

Operable. The firearm is capable of firing / discharging a primed cartridge case as submitted. A firearm being received in a disassembled condition may, at the discretion of the Forensic Scientist / Laboratory Technician ~~II~~ 2, be considered fully operable if all components that allow successful test firing are present and reassembly is relatively straightforward (i.e. basic field strip, bolt removed, separated upper and lower receiver etc.)

Inoperable. The firearm is not capable of firing / discharging a primed cartridge case as submitted.

An inoperable firearm that is rendered operable / capable of firing through a series of actions (i.e. replacement of missing, worn, or broken parts, removal of debris, or complex / technical reassembly beyond what is generally consistent with a field strip etc.) may, at the discretion of the Forensic Scientist, be reported as **"Inoperable / Rendered Operable".** The manner by which the firearm was rendered operable / capable of firing will be indicated in the report remarks section.

Some defects or malfunctions may not precisely fall into one of the above categories. It is therefore recognized that the overall operability conclusion is subject to individual case context, as well as examiner discretion.

2.3 References

1. “New Ballistics Tank from Detroit-Armor Corporation Allows Fast Recovery Without Projectile Distortion,” AFTE Journal: Vol. 16, No. 3, pp 106.
2. “Bullet and Cartridge Case Recovery,” AFTE Journal: Vol. 16, No. 2, pp 75.
3. AFTE Journal: 1973, February, pp 9.
4. AFTE Newsletter: 16, pp17.
5. “Bullet and Cartridge Case Recovery,” AFTE Journal: Vol. 16, No. 2, pp 75.
6. McBrayer, William S., “What? Another Water Tank and Bullet Stop!”, AFTE Journal: Vol. 10, No. 2, pp 90.
7. “Bullet and Cartridge Case Recovery,” AFTE Journal: Vol. 16, No. 2, pp.75.
8. Biasotti, A. A., “Vise/Rest for Remote Firing”, AFTE Journal: Vol. 11, No. 4, pp 16.
9. Lyman Reloading Handbook for Rifle, Pistol and Muzzle Loading, Lyman Gun Sight Products: Middlefield, Conn., 1971.
10. “Reduced Powder Loads,” AFTE Newsletter: No. 3, pp 14.

3 Procedure for Fired Evidence Examination

3.1 Safety Considerations

This procedure may involve hazardous materials including evidence that may be contaminated with a biohazard. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to follow appropriate safety practices and to determine the applicability of regulatory limitations prior to use. Proper caution to include strict adherence to Universal Precautions and the Blood Borne Pathogen Plan must be exercised and the use of personal protective equipment must be considered to avoid exposure to any potential hazards.

CHEMICAL	HAZARD			
	Health	**Flammability**	**Reactivity**	**Contact**
10% Bleach	2	0	1	
Methanol	1	3	0	
Acetone	1	3	0	

WARNING! Methanol is flammable and can pose a **SEVERE FLAMMABILITY HAZARD.**

WARNING! Acetone is flammable and can pose a **SEVERE FLAMMABILITY HAZARD**.

The scientist should consider using eye protection, gloves and a fume hood as appropriate.

3.2 Preparations

All reagents should be ACS grade or equivalent.

Note: Always add acid to water. Never add water to acid.

10% Bleach Solution:
Prepare at least 10% solution by mixing 10 milliliters of bleach and 90 milliliters of water.

4 Physical Examination and Classification of Projectiles, Cartridges/Cartridge Cases and Shotshells

The initial examination of any fired evidence will include the completion of a bullet worksheet and/or cartridge case worksheet. The appropriate worksheets will include the physical description of the fired/unfired evidence and will serve as a source to document the condition ofthe evidence as received and any tests or comparisons performed.

The bullet worksheet may include the following:

- Presence of trace material (retain, if necessary)
- Caliber / gauge
- Bullet / slug weight - bullet weight in grains or ounces
- Number of lands and grooves on fired bullet
- Direction of twist
- Bullet composition and style
- Land and groove impression measurements. (If predicting type of firearm)
- Manufacturer of bullet / projectile
- Presence or number of cannelures
- Condition of the fired evidence as received
- Suitability of the fired evidence for comparison purposes
- Rifling Style

The cartridge case worksheet may include the following:

- Caliber / gauge
- Headstamp
- Firing pin impression
- Breech face marks
- Cartridge case and primer finish
- Extractor / ejector locations
- Any apparent toolmarks present
- Information on shotshell
- ~~Ignition system~~
- Entry into NIBIN and results, if applicable

4.1 Foreign Material

Fired evidence recovered during an investigation may contain foreign material transferred from the crime scene or other source.

Foreign material observed on fired evidence will be handled in accordance with the methods described for foreign material found on firearms in Section 1.4.1 of this manual.

4.2 Caliber Determination

Caliber, or the base diameter, is one of the class characteristics of a fired bullet. The determination of caliber will aid the scientist during the identification or elimination of a suspect firearm and may assist in generating a list of potential source firearms.

The following may be utilized to determine the caliber of a fired bullet. The condition of the bullet will determine which steps can be used.

1. Measure the base diameter of the evidence bullet using a measuring device and compare this measurement with known measurements published in reference literature.
2. Determine the number and widths of the land and groove impressions and compare to published data tables.
3. Physical characteristics of the evidence bullet, such as weight, bullet shape, composition, nose configuration, and number and placement of cannelures, may aid in caliber determination.

4.3 Interpretation of Results

If the base is mutilated, the scientist may only be able to determine that the evidence is consistent with a range of calibers (i.e. nominal caliber or caliber class) or that the caliber cannot be determined.

4.4 References

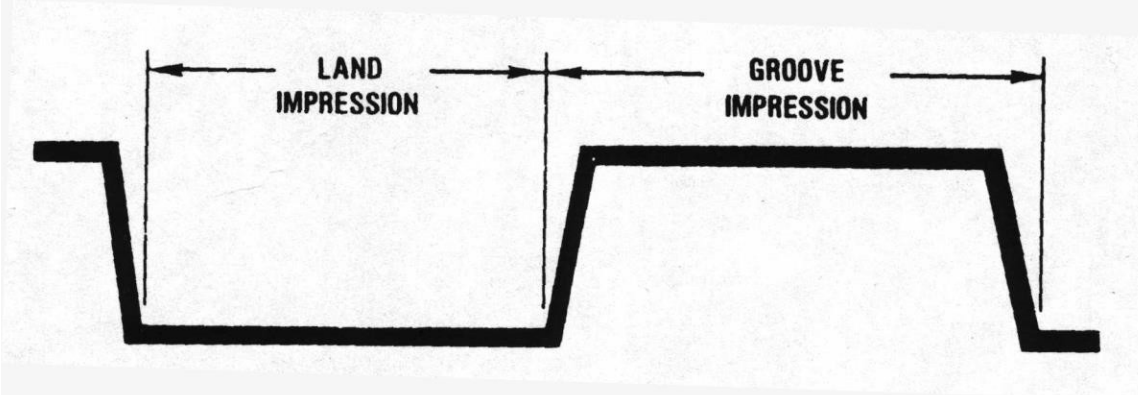
1. Standard Method for the Examination and Documentation of Ammunition and Ammunition Components. ANSI/ASB Standard 096, First Edition. 2022

2. Standard Test Method for the Forensic Examination and Testing of Firearms. ANSI/ASB Standard 093, First Edition. 2020

5 Land and Groove Width Impression Measurement

One of the class characteristics used in the discipline of firearms identification is the width of the land impressions and groove impressions. *An assessment of these impressions may aid the scientist during the elimination of a suspect firearm*. ~~These measurements aid the scientist during the identification or elimination of a suspect firearm~~. If no firearm is submitted, these measurements will be used in determining the General Rifling Characteristics of the firearm involved. This procedure utilizes a stereoscope, comparison microscope, calipers and a micrometer.

In measuring a fired bullet to determine the width of the land impression or the groove impression, it is paramount that the points used for beginning and ending a measurement comply with the discipline-wide practice. This practice utilizes the anchor points shown below.



5.1 Micrometer Method

1. The fired bullet in question is mounted on one stage of the comparison microscope. The micrometer is mounted on the other stage.
2. Both stages must be at the same magnification level (1X, 1.5X or 2X objective) and be in focus.
3. Align the image of the measurement gap (opening) of the micrometer with the image of the appropriate land impression being measured and record the measurement to the nearest thousandth of an inch.
4. Repeat the above procedure utilizing the groove impression.

5.2 Caliper Method

1. *The fired bullet is positioned under the stereo microscope.*
2. *Magnification and focal length are adjusted to best visualize both caliper and the fired bullet*
3. *The caliper measurement gap (opening) is used to measure the appropriate land impression and record the measurement to the nearest thousandth of an inch. Repeat the above procedure utilizing the groove impression.*

5.3 LAS X Software Method

1. *The fired bullet in question is mounted on one stage of the comparison microscope.*
2. *Select an appropriate magnification and ensure it is the same on both stages.*
3. *Click the Live button on the bottom left edge of the screen to start the live acquisition of the bullet.*
4. *Ensure that both shoulders (anchor points) of the rifling impression to be measured can be visualized at the same time and are in focus on the screen.*
5. *Open the "Annotation Tools" by clicking the toolbox.*
6. *Select the "Distance Line Tool". Right click on the "Distance Line Tool" to ensure it is measuring "Line Length".*
7. *Measure the distance between both anchor points of a land impression by clicking on one anchor point and then the second anchor point and record the measurement to the nearest thousandth of an inch.*
8. *Repeat the above utilizing the groove impression.*

The operating instructions for the microscope being used to measure should be followed (Help – Contents – Instructions (at the top) – User Interface – Measurements – Carrying out Measurements in the Image – Configuring Measurements).

5.3.1 Interpretation of Results

It may be necessary to measure several land and groove impressions in order to record a reliable measurement. The minimum tolerance for these measurements will be 0.003".

5.4 General Rifling Characteristics Utilization

The FBI General Rifling Characteristics (GRC) File, or similar reference file, can be utilized when attempting to determine a list of possible firearms that could have fired an evidence bullet. The identity and version of the reference used will be recorded in the case record. **Note that GRC files are an investigative aid and should not be construed as all-inclusive lists of firearms available with those particular rifling characteristics**.

5.5 Shotshell Wadding Examination

By examining wadding, the scientist may be able to determine the gauge and manufacturer, and if the wad contains markings suitable for comparison.

- Trace material present must be recorded. Trace material should be retained, when necessary.
- If contaminated with blood, the wad should be disinfected.
- Determine gauge by directly comparing the base of the evidence to the bases of known laboratory standards until the corresponding size is found. Gauge can also be determined by measuring the base diameter of the wad and comparing these measurements to known measurements. Note the approximate size of pellet impressions in plastic wad cups.
- Manufacture data can be determined by locating information stamped into the wad or by comparing the wad to known laboratory standards or reference materials.
- Microscopic examination may reveal striations suitable for identification of the wad back to the shotgun that fired it.
- If unfired evidence shotshells are submitted, it may be necessary to disassemble one for comparative purposes.
- Record all information on an appropriate worksheet.

5.5.1 Interpretation of Results

If the wad is mutilated or soaked with blood or other body fluids, the scientist may not be able to specifically determine gauge size. The scientist should also recognize that some manufacturers may duplicate the design of another manufacturer.

5.6 Shot Pellet Examination

By examining recovered shot pellets, the scientist may be able to determine the actual shot size. The determined size can then be compared to the shot size loaded in submitted unfired shotshells or to the size that the submitted fired shotshell was marked to have contained.

The scientist may use any of the below techniques to determine shot size.

- Visual / microscopic comparison *to known shot pellets*.
- *Measure diameter of evidence pellets using a caliper or micrometer and compare those results to reference data tables.*
- *Weigh the pellets individually or as a group (taking the average of similar sized pellets) and compare those results to available reference data tables while taking into account the apparent composition of the evidence pellets.*
- ~~Record the total number of pellets received.~~
- ~~Determine the composition of the pellets.~~
- ~~Make note if pellets all appear to be similar in size. If several different sizes are present, determine each specific size.~~
- ~~Pellet size - compare laboratory standards of known shot sizes side by side with the evidence pellets, or measure diameter using a caliper or micrometer. Compare to the submitted fired pellets, if applicable.~~
- ~~Pellet weight - pellets may be weighed individually or by averaging the weight of several similar-sized pellets. Record results in grains.~~
- ~~Consult pellet size and weight data from a suitable reference source.~~
- ~~Record findings on an appropriate worksheet.~~

6 Microscopic Comparison

One of the primary examinations conducted in the Firearms section is the determination of whether fired ammunition components, such as bullets or cartridge cases, were fired by the same firearm or one particular firearm.

The comparison microscope allows the scientist to place the evidence on one stage of the microscope and the known standard or another evidence specimen on the other stage. A correspondence of matching individual characteristics confirms that both items were produced by the same source.

1. Select the corresponding objective settings and ensure that the objectives are locked in place.
2. The illumination used must be properly adjusted. Oblique lighting is usually preferred.

3. Prior to any microscopic comparison, the comparison microscope must be performance checked by placing two items sharing a common origin on each stage (e.g., such as test fired bullets or cartridge cases) to ensure there is consistent magnification on both stages.If a firearm is submitted for comparison, inter-compare test fired components first to establish reproducibility of class and individual characteristics. Record of this comparison must be included on the appropriate worksheet.
4. Evaluate the markings on the evidence and determine if they are suitable for comparisons. If unsuitable for comparisons, no further analysis is necessary.
5. Compare unknown item of evidence to either another unknown item of evidence or known standards by placing one item on each stage.
6. The entire evidence surface should be considered.
7. If an identification is not initially made, the scientist should consider the following factors:
   - Angle of lights.
   - Type of lights.
   - The need for additional known standards.
   - The position of the evidence, the tests or both the evidence and the tests.
   - The possibility of cleaning the firearm.
   - The possibility that the firearm has been altered in the time between discharge and submission to the laboratory.
8. In the case of test-to-evidence bullet / cartridge case comparisons, evaluate the evidence markings for reproducible individual detail. If the evidence marking details are sufficient and the initial comparison results are inconclusive, then a minimum of two additional test fires will be generated.
9. Photograph identifications in accordance with section 1.5 of the FA Methods Manual.
10. The scientist must take steps to ensure that the items are returned to the correct package.

It is suggested that any identification be indexed to record the corresponding orientation.

6.1 Interpretation of Results

The range of conclusions utilized for microscopic comparisons will be based on those recommended by the Association of Firearm and Tool Mark Examiners (AFTE).

For the purposes of the following descriptions, the words “tool” and “toolmark” should be considered synonymous with any firearm part capable of producing a mark for comparison (e.g., breech face, firing pin, rifled barrel, etc.) or any markings imparted on fired ammunition components (e.g., breech face mark, firing pin impression, rifling on fired bullet, etc.).

Due to the nature of the evidence examined in the Firearms section, class characteristics can be used as a means to reach an exclusion, but cannot be solely used as a means to reach an identification. Additionally, individual characteristics can be used as a means to reach either an identification or an exclusion.

6.1.1 Source Identification

- Agreement of a combination of individual characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool

6.1.2 Support for Same Source

- Some agreement of individual characteristics and all discernible class characteristics but insufficient for an identification

6.1.3 Inconclusive

- Due to the absence of or lack of reproducibility of individual characteristics and agreement in all discernible class characteristics, no other conclusion can be reached.
- Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility
- Reason(s) for inconclusive determinations must be recorded in the case record and clearly communicated in the laboratory report
- Inconclusive findings which may be the result of the firearm's failure to reproduce individual characteristics from shot to shot due to excessive barrel leading, rusting, misalignment, erratic skidding from worn rifling or oversize bore, etc.

6.1.4 Support for Different Source

- Some disagreement of individual characteristics and agreement of all discernible class characteristics but insufficient for an exclusion.

The discipline recognizes that an elimination of a firearm by other than class characteristics is possible. If a scientist arrives at an opinion where the firearm is eliminated, for any reason, the scientist must substantiate the reasons supporting the opinion and incorporate theminto the work notes. In those cases, the following factors should be considered:

- Condition of the working surface of the tool and/or substrate
- Material composition of the working surface of the tool and/or substrate
- Time of the event to time of analysis factors

- History of the tool
- Number of items
- Consistency and reproducibility of the individual characteristics

6.1.5 Source Exclusion

- a significant disagreement of discernible class characteristics and/or individual characteristics

6.1.6 Unsuitable

- unsuitable for comparison (e.g., fired bullet fragments, jacket fragments, lead bullet cores or fragments, overlapping toolmarks, etc.)
- reason(s) for unsuitable determinations must be recorded in the case record and clearly communicated in the laboratory report

6.2 References

1. Mathews, J. Howard. Firearms Identification; 1970; Vo1. No. 1.
2. Barnes, Frank C.,Cartridges of the World, 7th ed., 1993.
3. Association of Firearm and Tool Mark Examiners Glossary; 3rd ed., 1994.
4. Lutz, Monty C.; Ward, John G. "Determination of Bullet Caliber From an X-ray ; AFTE Journal: Vol. 21, No. 2, pp 168
5. U.S. Department of Justice, Federal Bureau of Investigation, NCIC, Criminalistics Laboratory Information System (CLIS) Operating Manual, 1998.
6. Walsh, J. F. "Accuracy, Speed and Conversion in Rifling Measurements" AFTE Journal: Vol. 9, No. 1, pp 50.
7. AFTE Newsletter: 1969, December, No. 4, pp 28.
8. Howe, Walter, J. “Laboratory Work Sheets.”; AFTE Newsletter: 1969, August, No.2, pp 13.
9. "American Institute of Applied Science Firearms Identification Lesson 5"; AFTE Journal: Vol. 14, No. 3, pp 69.
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11. Kind, S.S.; Lange, B.G.; “Some Observations on the Ammoniacal Extraction Method in Blood Stain Grouping and it’s Comparison with Other Extractive and Non-extractive Techniques,” Journal of the Forensic Science Society: Vol. 16, No. 1, pp 47.
12. Smith, O’Brien C., M.D.; Berryman, Hugh E., Ph. D.; Symer, Steven A., M.A. “Detrimental Effects of Cleaning or Sterilizing on Bullet Striations.”; AFTE Journal: Vol. 22, No. 2, pp 129.
13. ANON. “Firearms Identification Lesson 8."; AFTE Journal: Vol. 14, No. 4, pp 58.
14. ANON. “Mikrosil Casting Material Information.” AFTE Journal: Vol. 15, No. 2, pp 80.
15. Barber, D.C.; Cassidy, F.H. “A New Dimension with Mikrosil Casting Material”; AFTE Journal: Vol. 19, No. 3, pp 328.

16. Kennington, Robert H; McGuire, Dennis L. "Comparative Micrography Techniques"; AFTE Journal: Vol. 9, No. 1, pp 7.

7 Procedure for Serial Number Restoration

7.1 Introduction

Many valuable items manufactured today have serial numbers for identification. These numbers are usually die-stamped. This process produces a compression of the metal/plastic in the area immediately surrounding and a short distance below the penetration of the die. Serial numbers are removed and/or obliterated in a variety of ways. The serial number may be restored if the obliteration is not taken past the previously mentioned compression zone. It is desirable to remove the grinding and filing scratches introduced during obliteration. The polishing procedure can be effective independently but is more often used in conjunction with various chemical or heat restoration procedures.

Serial Number Restoration is potentially destructive testing and examiner discretion should be utilized with regard to chemical restoration attempts on areas of the firearm likely to impact operability (barrel, slide, excessive frame plastic removal etc.).

7.2 Safety Considerations

This procedure involves hazardous materials, operations and equipment. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to follow appropriate safety practices and determine the applicability of regulatory limitations prior to use. Proper caution must be exercised and the use of personal protective equipment must be considered to avoid exposure to hazardous conditions. Consult the appropriate MSDS for each chemical prior to use.

CHEMICAL	**HAZARD**			
	Health	**Flammability**	**Reactivity**	**Contact**
Crystalline Cupric Chloride	3	0	0	CORROSIVE
Concentrated Hydrochloric Acid	3	0	0	
Nitric Acid	3	0	0	oxy
Sodium Hydroxide*	3	0	1	
Ferric Chloride	2	0	0	

* Note that NFPA does not rate this product. The values listed are estimates specified by Fisher Chemical Co.

WARNING! Crystalline Cupric Chloride is toxic and can pose a **SEVERE HEALTH HAZARD.**

WARNING! Hydrochloric Acid is toxic and can pose a **SEVERE HEALTH HAZARD.**

WARNING! Nitric Acid is toxic and can pose a **SEVERE HEALTH HAZARD.**

WARNING! Nitric Acid is a strong oxidizer and can pose a **SEVERE CONTACT HAZARD.**

WARNING! Sodium Hydroxide is toxic and can pose a **SEVERE HEALTH HAZARD**

The scientist should consider using eye protection, gloves and a fume hood as appropriate.

7.3 Preparations

All reagents should be ACS grade or equivalent

Note: Always add acid to water – never add water to acid

Fry's Reagent: Combine nine (9) grams of Crystalline Cupric Chloride with twelve (12) milliliters of Concentrated Hydrochloric Acid and ten (10) milliliters of distilled water. Utilizing these proportions, mix the quantity desired.

25% Nitric Acid Solution: Prepare a 25% Nitric Acid solution (25 milliliters of Concentrated Nitric Acid and 75 milliliters of distilled water), mix the quantity desired.

45% Sodium Hydroxide Solution: Prepare a 45% Sodium hydroxide solution (45 grams of Sodium Hydroxide and 100 milliliters of distilled water), mix the quantity desired.

10% Sodium Hydroxide Solution: Prepare a 10% Sodium hydroxide solution (10 grams of Sodium Hydroxide and 100 milliliters of distilled water), mix the quantity desired.

Ferric Chloride: Add 25 grams of Ferric Chloride to 100 milliliters of distilled water, mix the quantity desired.

Acidic Ferric Chloride: Add 25 grams of Ferric Chloride to 25 milliliters of Concentrated Hydrochloric Acid and 100 milliliters of distilled water, mix the quantity desired.

7.4 Polishing

7.4.1 Technique

1. Note and record any visible characters prior to polishing.
2. Plastic – if possible, examine the reverse side of the item to see if any characters are visible.
3. Polish the obliterated area by hand, or using a Dremel® tool with a sanding disc.
4. Depending on the extent of the obliteration, continue polishing until the surface is mirror-like removing all scratches. If the obliteration is severe it may not be possible or desirable to remove all of the scratches.
5. Note and record any characters which become visible.
6. If all of the characters do not become visible, proceed to the appropriate chemical restoration procedure.

7.5 Chemical Restoration

Reagent/Procedure	Suitable for
Fry's Reagent	Steel
Nitric Acid	Aluminum or Brass
Sodium Hydroxide	Aluminum
Ferric Chloride	Steel / Pot Metal

7.5.1 Reagent reliability testing

Prior to use, the serial number restoration reagent(s) will be applied to a control area of the medium to be tested. Indication that the reagent is working as expected may include:

- Change in the appearance of the metal surface being worked
- Change in the appearance of the reagent-soaked swab (e.g., darkening)
- Reaction of the reagent on the metal surface (e.g., bubbling)

Record of reagent reliability testing will be recorded in the examination documentation.

7.5.2 Technique

1. Moisten cotton tip applicators (swabs) with the suitable chemical solution and apply to the obliterated area.
2. After a few seconds, wipe off the solution and inspect for visible numbers. Repeat as necessary. This process may take several hours. The scientist may wish to build a clay "dam" around the obliterated area, and fill it with a larger volume of solution.
3. Fry's Reagent - The scientist may wish to alternate between swabs saturated with the Fry's Reagent and the 25% Nitric Acid solution.
4. If any characters become visible note these characters.

7.6 References

1. Treptow, Richard, S. "Handbook of Methods for the Restoration of Obliterated Serial Numbers."; NASA: 1978.
2. Polk, Donald, E.; Giessen, Bill, C. "Metallurgical Aspects of Serial Number Recovery", AFTE Journal: Vol. 21, No. 2, pp 174.
3. Roberts, Van. "Restoration of Serial Numbers in Plastic."; AFTE Journal: Vol. 13, No. 4, pp 40.

8 Acquisition Protocols for NIBIN

NIBIN is the National Integrated Ballistic Information Network, a computer-assisted ballistics imaging database used to compare images of the unique markings registered on cartridge cases after being fired. The primary goal of the program is to link cases that are unsolved or previously unassociated.

8.1 Types of Specimens

The following types of specimens may be entered into NIBIN:

- Cartridge Cases or Shotshells fired from semi-automatic/full-automatic firearms and 12 Gauge shotguns.
  - Note: Only authorized staff are permitted to create test fires from a submitted firearm for NIBIN entry purposes. Refer to section 1.10 of this manual for guidance. When BCI staff generate test fires from a firearm, this requires a Laboratory Report that details the operability of the firearm. NIBIN entry information will be disseminated via a laboratory report.
- At the discretion of the scientist/technician or by request, cartridge cases from other types of firearms may also be entered into NIBIN.
- A preliminary examination of test fires will be performed prior to NIBIN entry. Any discrepancies identified between class characteristics, or indications of double impressions will be documented in the case record as not suitable for NIBIN entry.
- A triage of the evidence will be performed prior to NIBIN entry. Triage is the process of assessing cartridge cases to determine the best representative sample from a group of cartridge cases having similar firearm produced markings for NIBIN entry. This is not, nor should it be interpreted as a comparative examination to determine how many firearms may have been responsible for firing the cartridge cases.
- If test fires or cartridge cases are obtained and submitted by the law enforcement agency after crime scene evidence has been submitted and entered for the same case, the test fires/cartridge cases should be triaged with the original evidence. If the original evidence is not available, the test fires/cartridge cases may be entered in addition to the previously entered evidence.

8.2 Case Maintenance Fields

Lab Technician 2s will label cartridge cases with a “N”. This ensures that NIBIN labeling does not interfere with Firearms labeling when the Firearms examiner later marks cartridge case (cc) evidence. Test fires will be labeled with a “T” and the Lab Technician 2 and/or firearm forensic scientist will also include their initials when labeling.

The following formats shall be used when entering information into the NIBIN Case Maintenance Fields:

<u>Case Number</u>
LAB(Year)-five or six digit case numberExample –RICH03-34567

<u>Exhibit Number</u>
Test Fire: Item number T (for test fire) exhibit number
BCI 1T1

Cartridge Case: Item number N (for NIBIN) exhibit number

Example: BCI 1N1

Firearm

FA-Item # Example – FA-02

Ori. Agency Contact

Law Enforcement Agency point of contact email

Comments

Include special instructions or comments for unusual case circumstances
Examples-"National search needed" "historical case or agency backlog case", "envelope only" (when only test fires are received and missing firearm information), or "QC"

Multiple Acquisitions

- For rare firearms that may require acquiring multiple images/entries due to the shape of the firing pin impression use the following nomenclature in BrassTrax:
  - BCI 1N1c – use this for a circular impression
  - BCI 1N1e – use this for an elliptical impression
  - BCI 1N1r – use this for a rectangular impression
- For these acquisitions also include a comment explaining why two images were acquired (i.e. Due to differing class characteristics).

Corrections to BrassTrax entry

If an administrative error (typo) in one of the BrassTrax fields is identified after receiving the lead/no lead notification from the NNCTC, make the correction in BrassTrax; strikeout, initial and make the correction on the PDF notification; and include it in the notes. Request an amended notification from the NNCTC and attach the corrected/amended PDF notification to the laboratory report. Also include the amended notification in the notes. The notes packet will contain both the strike-out notification and the corrected (amended NNCTC) notification.

If an administrative error (typo) in one of the BrassTrax fields is identified after the report has been issued, make the correction in BrassTrax and request an amended notification from the NNCTC. Create an amended OUTN assignment (go to reports tab and highlight your previous report, then hit the reset button), strike out, correct and initial the error on the original notification; add the corrected notification to the notes packet; and attach the amended notification to the report. Send for peer and admin review, and issue the amended report.

8.3 Correlation Analysis

The correlation can be performed by the ATF NIBIN National Correlation and Training Center (NNCTC), or qualified BCI staff. NNCTC correlation results providing lead and no lead information is obtained by the BCI Laboratory Technician 2 via a secure cloud-based portal called Huddle. Notifications are available 24/7 within Huddle.

8.3.1 ATF NNCTC Workflow

Leads and no leads identified by NNCTC:

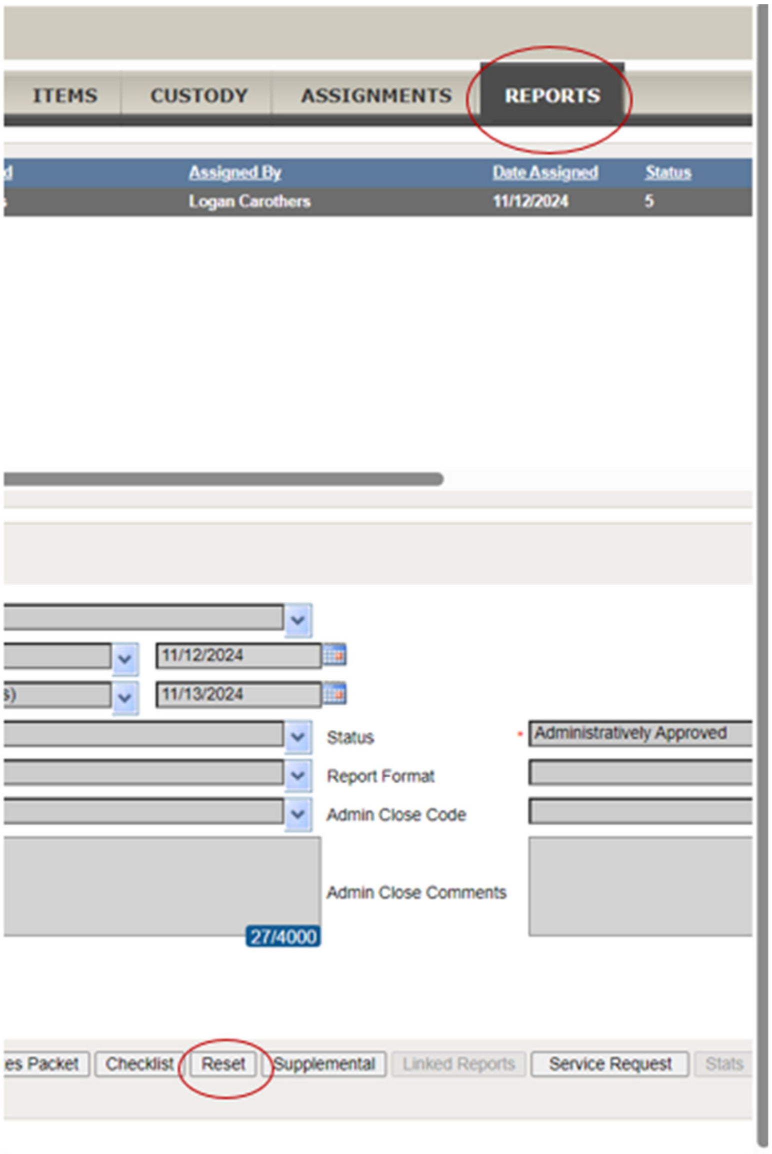
- NNCTC issues notification to BCI Laboratory

- BCI Laboratory Forensic Scienstist/ BCI Lab Technician 2 downloads the lead/no lead notification from Huddle
- BCI Laboratory Forensic Scientist /BCI Lab Technician 2 notifies all affected agencies of potential lead information via email, and the OUTN report will be issued to the submitting agency.
- BCI Laboratory Forensic Scientist/Lab Technician 2 updates NIBN assignment to OUTN (outsourced NIBIN) assignment.
- BCI Laboratory Forensic Scientist/Lab Technician 2 retains documentation of the correspondence and the NNCTC documentation
  in the LIMS case record:
  - The NNCTC notification is attached to the LIMS OUTN assignment report template by the BCI Laboratory Forensic Scientist/Lab Technician 2.
  - Supervisor (or admin designee) approves the report.
  - Case investigator receives auto-generated email upon admin approval of OUTN report notifying them that the report is available in OHLEG.

8.3.1.1 **Discrepancies with NNCTC correlation results**

Procedure for when the OUTN report has been issued to LE agency, and there is a discrepancy with the NNCTC correlation results:

- Lead received from NNCTC, and report issued to submitting LE agency
- Additional information obtained from agency (i.e firearm is in their possession, but cc from scene recently entered and "hitting") and/or NIBIN Tech of a discrepancy (NIBIN tech reviewed the MatchPoint images and disagree with correlation results).
- Notify NNCTC (via phone call or email) of the possible discrepancy.
- Document the conversation in the conversation log in LIMS.
- If NNCTC issues an amended report, notify the affected LEAs via email and attach the amended report to the email. Give an explanation in the email as to why they are receiving the amended report.
- Create an amended report. Go to reports tab, and highlight your previous report, then hit the reset button.



- The report wording will be as follows:

  A triage of the submitted firearms evidence was performed. This process includes assessing cartridge case(s) and test fires to determine the best representative sample from those having similar firearm produced markings for NIBIN entry. This is not, nor should it be, interpreted as a comparative examination to the fired cartridge case(s) or as to determine how many firearms may have been responsible for firing the cartridge case(s).

  A cartridge case(s), Exhibit Number: BCI XNX was entered and searched in the NIBIN database.

  A correlation review was performed by the ATF NIBIN National Correlation and Training Center (NNCTC). **No NIBIN lead was generated**. The results are referenced in the attached report. If investigative information becomes available, your agency will be notified. **This report replaces the original report issued by Forensic Science Lab Tech, XXX, dated (insert date) in its entirety.**

All evidence will be returned to the submitting agency.

- Attach amended NNCTC notification to the OUTN report
- Send to peer for admin checklist review and then to supervisor for admin review approval

Procedure for when OUTN report has NOT been issued to LE agency, and there is a discrepancy with NNCTC correlation results:

- Lead received from NNCTC, and no report issued to submitting LE agency
- Additional information obtained from agency (i.e firearm is in their possession, but cc from scene recently entered and "hitting") and/or NIBIN Tech of a discrepancy (NIBIN tech reviewed the MatchPoint images and disagree with correlation results).
- Notify NNCTC (via phone call or email) of the possible discrepancy.
- Document the conversation in the conversation log in LIMS.
- If NNCTC issues an amended report, notify the affected LEAs via email and attach the amended report to the email. (The original report will not be issued).
- Create an OUTN assignment. The report wording will be as follows:

A triage of the submitted firearms evidence was performed. This process includes assessing cartridge case(s) and test fires to determine the best representative sample from those having similar firearm produced markings for NIBIN entry. This is not, nor should it be, interpreted as a comparative examination to the fired cartridge case(s) or as to determine how many firearms may have been responsible for firing the cartridge case(s).

A cartridge case(s), Exhibit Number: BCI XNX was entered and searched in the NIBIN database.

A correlation review was performed by the ATF NIBIN National Correlation and Training Center (NNCTC). No NIBIN lead was generated. The results are referenced in the attached report. If investigative information becomes available, your agency will be notified.

All evidence will be returned to the submitting agency.

- Attach amended NNCTC notification to the OUTN report
- Send to peer for admin checklist review and then to supervisor for admin review approval

8.3.2 BCI Workflow

At a minimum, the top 30 correlations in the Unified Score results will be evaluated for each specimen entry. Additional results can be compared at the scientist/technician's discretion. Any correlation results viewed will be included in the scientist/ laboratory technician's notes.

If an investigative lead is identified:

- Any potential lead is verified by a second qualified NIBIN user.
- BCI Laboratory Forensic Scientist/BCI Lab Technician 2 notifies all affected agencies (when available) of potential lead information via email, and the NIBN report will be issued to the submitting agency.
- The BCI Laboratory Forensic Scientist/BCI Lab Technician 2 retains documentation of the correlation results and lead in the BCI case record.
- Supervisor (or admin designee) approves the report.
- Case investigator receives auto generated email upon approval of report notifying them their report is available in OHLEG.

If no investigative lead is identified:

- BCI Laboratory Forensic Scientist/BCI Lab Technician 2 marks the notification with “No Lead” at the top of the first page and retains documentation of the “no lead” and the correlation results in the BCI case record.
- The no lead notification is attached to the LIMS NIBN assignment report by the BCI Laboratory Forensic Scientist/BCI Lab Technician 2.
- Supervisor (or admin designee) admin approves the NIBN assignment.
- Case investigator receives auto generated email upon approval of report notifying them their report is available in OHLEG.

If BCI is notified of a lead by another NIBIN site (other than the NNCTC):

- If BCI is notified by another NIBIN site of a lead to a BCI case, the BCI Laboratory Forensic Scientist/BCI Lab Technician 2 will disseminate the lead report, via email, to the point of contact for the law enforcement agency for our NIBIN case.
- If there are leads for multiple BCI NIBIN cases, include all the law enforcement agency points of contact for those cases on the email.
- The email should also be sent to the local CGIC (if applicable), and the CIU and Special Agent/ATF TFO points on contact.
- Document the email in the conversation log for each affected case.

8.4 Confirmation

Should a submitting agency request confirmation, any potential identification established by the NIBIN correlation server must be confirmed by a Firearms Forensic Scientist by manually comparing the actual specimens on the comparison microscope.

9 Standards and Controls

9.1 Verification

Verification shall be defined as an independent evaluation of a conclusion by an individual having expertise in the discipline being reviewed.

All microscopic comparison conclusions will be verified by a second scientist.

Potential NIBIN leads generated by a BCI correlation review must be verified by a second qualified NIBIN user.

Serial number restorations will be verified by a second scientist.

Documentation of verifications will be made in accordance with the policies stated in the Laboratory Quality Assurance Manual.

9.1.1 Disputed Verifications

Disputed verifications will be referred to the Laboratory Supervisor and may be subject to the discrepancy resolution policies as defined by the laboratory quality system.

9.2 Test-to-Test Comparisons

Prior to performing any test-to-evidence comparisons on the comparison microscope, it is necessary to perform a test-to-test check. This check is meant to ensure that both stages are functioning properly. This check will be conducted prior to comparing cartridge cases, bullets, tool marks or any other comparative analysis using the comparison microscope. Documentation of the results in the case record is required.

9.3 Prepared Reagents

9.3.1 Container Labeling

Each prepared reagent container will be labeled in accordance with Ohio BCI Laboratory protocol.

9.3.2 Documentation

A record of each reagent prepared will be documented in the section’s “Reagent Preparation Log Book” as per those instructions.

10 Equipment Calibration and Maintenance

10.1 Introduction

To ensure accurate data, all equipment that has a direct effect upon the comparison andmeasurement processes is kept in proper working order. Measurement devices and reference standards receive periodic calibration. Other equipment is examined and maintained periodically to verify safe/effective operation. Calibration / maintenance intervals may be adjusted based upon past performance, where the item has demonstrated that it will remain within specifications throughout the calibration interval.

Any equipment that appears to be damaged, out of calibration or functioning improperly is removed from service until the nature of the problem can be determined and corrected.

An equipment list with calibration / maintenance schedule is maintained at each laboratory location.

10.2 Microscopes

Comparison microscopes will be cleaned and serviced in accordance with the laboratory quality system by an outside vendor. The scientist will verify the calibration of the microscope prior to a test-to-evidence comparison by comparing two known specimens(test-to-test) to ensure there is agreement between them.

Stereo-microscopes will be cleaned and serviced by an outside vendor, in accordance with the policy in the current Lab Quality Assurance Manual.

All maintenance and calibration actions must be documented in the appropriate log or examination documentation.

10.2.1 Microscope Procedure

In general, the optical pathway of any microscope should be free of dust, dirt, debris, etc. The dust cover should be placed over the microscope at the end of each day.

The following procedures should be utilized for cleaning the external surfaces of objectives, eyepieces and condensers:

Dust:
Gently blow it away, using a can of Inert Dusting Gas, or using an absolutely clean soft sable brush.

Fingerprints, Grease, Oil and Dirt:
After blowing away dust, use lens paper, dampened with water or lens cleaner.
White polystyrene foam (small-grain type) can be used for removing residues of immersion oil, skin

grease, and solvents. Break off a small piece and press a projecting part of it against the dry lens, rotating it as co-axially as possible with the objective. Any adhering foam granules can then be removed by blowing them away or using an absolutely clean sable brush.

Always use lens paper, other laboratory wipes are too harsh for use on microscope lens'.

Never use alcohol on lenses.

10.2.2 Comparison Microscope Calibration Check Method(s)

The comparison microscope will be checked prior to use to ensure that it is functioning properly. This check will be performed by placing two items sharing a common origin on each stage (test to test) and observing the agreement between these items. This check is documented in the case examination documentation.

10.3 Scales/Balances

The balance should be cleaned of any debris and level.

Balances will be calibrated annually by an accredited outside vendor. A calibration check will be performed quarterly.

If the balance is moved or overloaded, a calibration check will be performed at that time. The calibration check will be performed using weights that approximate the normal weighing range. Electronic balances with internal calibration will be calibrated according to manufacturer's instructions.

All maintenance and calibration actions must be documented in the appropriate log. The documentation should include the following information, if available: make, model, and serial number of the balance, nature of the defect, how and when the defect was discovered, action taken in response to the defect, comments on the type of maintenance performed, date, and scientist's initials.

10.3.1 Calibration Check Procedure

1. Make sure that the balance is level and there is no debris on it.

2. Use calibrated NIST weights. Be sure to record the serial number for the NIST weights.

3. Tare the balance.

4. Place first weight on the balance and record both the nominal and actual value.

5. Take the weight off of the balance and tare again.

6. Place second weight on the balance and record both the nominal and actual value.

7. Take the weight off of the balance and tare again.

8. Place third weight on the balance and record both the nominal and actual value.

9. Take the weight off of the balance.

10. If the difference between the nominal and actual values is greater than ± 5 grams, do not use the balance until it is repaired and passes the calibration check.

10.4 Micrometers/Calipers

Micrometers/Calipers will receive maintenance by an outside vendor as needed. A calibration check will be performed annually using NIST-certified gauge blocks.All maintenance and calibration actions must be documented in the appropriate log.

10.4.1 Micrometers/Calipers Calibration Check Procedure

1. Two separate measurements must be taken, utilizing standard measuring blocks that are NIST traceable.

2. Compare known measurements of blocks with the measurements displayed on the instrument's gauge.

3. To be considered calibrated, the measurements must not exceed a tolerance of +/- 0.002 inches.

10.5 LAS X Software

Calibration checks will be performed annually, after a software update, and/or after a comparison microscope has been moved. The calibration check is only required if LAS X Software is used for measurements in casework.

10.5.1 Comparison Microscope using Software calibration check procedure

1. *Two separate measurements must be taken, utilizing standard measuring blocks that are NIST traceable or using a NIST traceable stage micrometer.*
2. *Compare known measurements of blocks with the measurement displayed by the software.*
To be considered calibrated, the measurements must not exceed a tolerance of ± 0.002 inches.

10.6 Weights

All weights will receive maintenance by an outside vendor as needed. A calibration check of any weights used for balance calibration will be performed annually on all NIST traceable weights used by the section (e.g., 0.5g,10g, 20g, 20g, 50g, 100g). It is not necessary to perform calibration checks on weights that are not used by the section. All maintenance and calibration actions must be documented in the appropriate log. The documentation should include the following information, if available: make, weight, and serial number of the weight(s), nature of the defect, how and when the defect was discovered, action taken in response to the defect, comments on the type of maintenance performed, date, and scientist's initials.

There will be an annual internal calibration check on all NIST traceable weights. Each weight will be checked for calibration using balances that have been inspected and calibrated by an external vendor. Those calibration checks will occur as soon as practical following the external balance calibrations.

10.6.1 Weight Calibration Check Procedure

1. Make sure that the balance is level and clean.

2. Tare the balance.

3. Place each weight on the balance and record both the nominal and actual value for each weight.

4. If the difference between the nominal and actual values is greater than + 0.02 grams*, do not use the weight until it is repaired and passes the calibration check.

*Regarding 1kg, 2kg, or 4kg weights, if the difference between the nominal and actual values is greater than + 5.0 grams, do not use the weight until it is repaired and passes the calibration check.

10.7 Gauge Blocks

All gauge blocks will receive maintenance by an outside vendor as needed. All pertinent information will be recorded in a maintenance log. The documentation should include the following information: length and serial number of the block(s), nature of the defect, how and when the defect was discovered, action taken in response to the defect, comments on the type of maintenance performed, date, and scientist's initials.

The blocks will be cleaned of any debris and handled in the appropriate manner.

A calibrationcheck of these devices will be performed once every three years. All maintenance and calibration actions must be documented in the appropriate log.

10.8 NIBIN Ballistic Database

The NIBIN database is maintained by Leads Online (formally Forensic Technology, Inc. (FTI)) and the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF). If the system appears to be operating improperly, the scientist should notify ~~FTI~~ Leads Online as the primary contact: (866) 348-4247. System maintenance should not be carried out by BCI personnel. Routine maintenance is completed by the vendor every 24 months.

10.8.1 IBIS Correlator Performance Check Procedure

Internal calibration of the cartridge case correlator will be performed semi-annually. Calibration standards will be entered into and correlated against the database. Correlation results must show the reference standards (previously entered) as one of the top ten candidates.

1. Select a reference cartridge case from the database.

2. Re-enter the reference specimen as "Performance Check", using the following protocol:

- CASE ID: (LAB) PC-(YEAR)-(MONTH) **Example: RICHPC-2002-JUL**
- EXHIBIT #: (MONTH & YEAR)-(EMPLOYEE # "C"), "C" for cartridge case **Example: JUL02-245C**
- EVENT TYPE: Q C
- OCCURRENCE DATE: Day of Entry
- LAW AGENCY NAME: OH-BUR CRIM IDENT (LONDON, RICHFIELD, BOWLING GREEN)
- CASE SUPERVISOR: Examiner entering the Performance Check specimens (if available)

3. View the Correlation results in MATCHPOINT for the Performance Check entry.

Interpretation Criteria:
To be considered acceptable, the instrument must rank the selected reference specimens as one of the top ten candidates. If the rank is outside of the top ten candidates, consult ~~FTI~~ Leads Online for further investigation prior to use in casework activities.

Documentation:
Print Correlation Results and retain. Delete Case ID for the Performance Check.

The BrassTrax microscope will be manually calibrated after approximately 50 exhibits are entered, as per vendor instructions. All maintenance and calibration actions must be documented in the appropriate log.

11 Report Wording

11.1 Terminology

- Bullets will be referred to as bullets, rather than slug, projectile, etc. The term slug is properly used when referring to a single projectile shotshell load.
- Cartridge Cases will be called such, rather than shells, casings, shell casings, etc. The AFTE Glossary lists as acceptable the shortened term, case, but not casing.
- Fired specimens will be called fired bullet, fired cartridge case, etc., rather than spent bullet, spent slug, spent casing, spent shell, etc.
- Unfired specimens will be called cartridges ~~(or rounds~~), and if necessary, further described as unfired cartridges ~~(or live rounds),~~ misfired cartridge ~~(round)~~, etc., rather than live shell, unspent shell, unspent cartridge, etc.
- Avoid the use of ambiguous terms such as “fired round” or “spent round”, which do not clearly specify whether the item is a bullet or cartridge case.
- Shotgun ammunition will be referred to as shotshells or shotgun shells, rather than simply shells. A fired specimen is a fired shotshell (shotgun shell); an unfired specimen is an unfired shotshell (shotgun shell).
- Components of a shotshell wad column, whether plastic, felt, fiber or cardboard, can be properly referred to as wads or wadding, unless a more precise description is necessary (e.g., cardboard over-powder wad, plastic shot wad, over-shot wad, etc.).
- The term semi-automatic is preferable to auto-loading for the sake of clarity.
- Designations of true caliber as well as nominal caliber may be specified using a decimal point (e.g., .38 Special caliber, .22 Long Rifle caliber, .38 caliber, etc.).
- With respect to terminology not covered by this list, the AFTE Glossary will be the primary source of reference, but not necessarily the last word.

11.2 Report Content

In addition to the requirements described in the Laboratory Quality Assurance manual, the following details should be included in every report:

1. The item number of the item(s) in question;
2. A brief description of the item(s);
   - Items listed separately on the report need only a brief description of the item to be given with the item number in the body of the report (e.g. "…the S&W revolver, item #1.")
   - If the items are not listed separately on the report ~~form,~~ a more complete description of the item should be given in the body of the report (e.g."…the .38 Special caliber S&W Model 10 revolver, item # 1, serial number 12345."
3. A brief description of the examination and method of testing conducted; Examples of testing methods include, but are not limited to:
   - Microscopic examination
   - Microscopic comparisons
   - Chemical restoration

4. The results of the examination, NIBIN database entries, as well as other observations and findings;

   - BCI Laboratory NIBIN entry notifications and results are distributed upon approval of a "NIBN" and "OUTN" LIMS assignment The following automated email is distributed to the investigating officer:
     " Subject: BCI Lab NIBIN Entry Notification - Lab Case: XXXXXXXXX/Department Case: XXXXX (Please do not reply to this email)

     Your laboratory report from The Bureau of Criminal Investigation Firearms/NIBIN Unit has been approved and is available on www.ohleg.org" Subject: BCI Lab NIBIN Entry Notification - Lab Case: XXXXXXXXX/Department Case: XXXXX (Please do not reply to this email)
     Your laboratory report from The Bureau of Criminal Investigation Firearms/NIBIN Unit has been approved and is available on www.ohleg.org under Evidence Pre-Log and Inquiry. Please remember to also download the accompanying Affidavit (Chemistry cases only) or Statement of Qualifications (SOQ).

     If you do not have access to Evidence Prelog and Inquiry, please have your Chief or Sheriff submit a request on Departmental Letterhead to ohlegsupport@ohioattorneygeneral.gov with the names of the users to be granted access.

     This email is being generated by an automated system. If you have questions concerning this or another case, please contact BCI at the number listed on your submission receipt.

     Agency Case Number: CC23-0336
     Case Number: 23-10830
     Report Number: 1

   - ATF NNCTC NIBIN potential leads and no leads are distributed upon approval of an “OUTN” LIMS assignment.

5. The conclusion, interpretation or meaning, to include:
    - When associations are made, the significance of the association is clearly communicated and properly qualified. See Appendix for Comparison Conclusion Scale, which is distributed along with Firearms Laboratory Reports.
    - When eliminations are established, that result is clearly communicated.
    - When no definitive conclusions can be reached, the reason(s) are clearly communicated.
6. Include a statement in the remarks when submitted cartridges were used for test firing.
7. Include a list of any items not examined at this time.
8. Include a disposition of evidence statement

11.3 Suggested Reporting Examples

The following are examples of wording that may be used in Firearms reports. This wording is not required and does not represent all report wording options.

11.3.1 Example- Firearm Comparison

<u>Findings</u>

Item Description	Comparison	Conclusion
Item 3: Taurus pistol	N/A	Operable
		TAR0123 (serial number confirmed/restored)
	Item 2: One (1) fired jacketed bullet	Source Exclusion
Item 4: CANiK pistol	N/A	Operable
	Item 2: One (1) fired jacketed bullet	Source Exclusion
Item 5: SAR ARMS pistol	N/A	Operable
	Item 2: One (1) fired jacketed bullet	Inconclusive*

* Similar class characteristics but insufficient corresponding individual characteristics to identify or exclude

<u>Remarks</u>

The remaining submitted items from Items 3 and 4 were not examined at this time.

All evidence will be returned to the submitting agency.

<u>Analytical Detail</u>

Analytical findings offered above were determined using visual, physical, and microscopic examinations/ comparisons.

Serial number restoration findings offered above were determined using sanding and/or chemical etching techniques.

11.3.2 Example- Firearm Comparison

Findings

Item Description	Comparison	Conclusion
Item 3: Sig Sauer pistol	N/A	Operable
	Items 1 and 2: Two (2) fired 380 Auto cartridge cases	Source Identification
	Item 4: One (1) fired jacketed bullet	Support for Same Source₮

₮Similar class characteristics and some corresponding individual characteristics, but insufficient for a Source Identification.

Remarks

The three (3) submitted cartridges from item 3 were used for test firing.

All evidence will be returned to the submitting agency.

Analytical Detail

Analytical findings offered above were determined using visual, physical, and microscopic examinations/ comparisons.

11.3.3 Example- Gun Prediction

Findings

Item Description	Comparison	Conclusion
Items 4 and 5: Two (2) fired 9mm Luger cartridge cases	Intercompared	Source Identification
		Consistent with being fired by Glock Gen 5 pistols. Other possibilities exist.
Item 1: One (1) fired jacketed bullet	N/A	Consistent with being a .38 caliber/9mm bullet fired by Glock Gen 5 pistols. Other possibilities may exist.
Item 2: One (1) lead bullet core fragment	N/A	Unsuitable^
Item 3: One (1) fired jacketed bullet fragment	Not compared at this time- additional comparisons can be performed should a compatible firearm be submitted for testing	N/A

^Insufficient class and/or individual characteristics present.

Remarks

All evidence will be returned to the submitting agency.

Analytical Detail

Analytical findings offered above were determined using visual and microscopic examinations/ comparisons.

11.3.4 Example- NIBIN report wording matrix

No NIBIN Entry
Test fired specimens from ____ are not entered into the NIBIN database.

NIBIN Entry
A cartridge case(s), Exhibit Number: BCI XXX was entered and searched in the NIBIN database.

NIBIN Triage
A triage of the submitted firearms evidence was performed. This process includes assessing cartridge case(s) and test fires to determine the best representative sample from those having similar firearm produced markings for NIBIN entry. This is not, nor should it be, interpreted as a comparative examination to the fired cartridge case(s) or as to determine how many firearms may have been responsible for firing the cartridge case(s).

NNCTC correlation - lead
A correlation review was performed by the ATF NIBIN National Correlation and Training Center (NNCTC). A NIBIN lead was generated. The results are referenced in the attached report.

NNCTC correlation – when multiple entries
A correlation review was performed by the ATF NIBIN National Correlation and Training Center (NNCTC). A NIBIN lead was generated for BCI XXX. No NIBIN lead was generated for BCI XXX. The results are referenced in the attached report.

NNCTC correlation – no lead
A correlation review was performed by the ATF NIBIN National Correlation and Training Center (NNCTC). No NIBIN lead was generated. The results are referenced in the attached report. If investigative information becomes available, your agency will be notified.

BCI correlation – lead
A correlation review was performed. A NIBIN lead was generated. The results are referenced in the attached report.

BCI correlation – no lead
A correlation review was performed. No NIBIN lead was generated. The results are referenced in the attached report. If investigative information becomes available, your agency will be notified.

Evidence Return
All evidence will be returned to the submitting agency.

Evidence Return when additional items not tested
All evidence will be returned to the submitting agency upon completion of the full analysis.

Investigative Information
If investigative information becomes available, your agency will be notified.

11.3.5 Example- No NIBIN Entry of Test Fires

Preliminary examination was performed on the test fires from (description of gun) (Item XX). However, the test fires were not entered into NIBIN at this time.

11.3.6 Example-Serial number restoration

Findings

Examination of the submitted (description of gun), item #XX, revealed that the serial number had been obliterated from the backstrap. Chemical restoration of the obliterated serial number revealed the following six-character sequence:

D	**_**	**_**	**_**	**6**	**9**
1	~~2~~	~~3~~	4	~~5~~	~~6~~

Character 1: is a “D”
Character 2: is a “1” or “4”
Character 3: could not be determined
Character 4: appears to be a “3”, but may be an “8
Character 5: is a “6”
Character 6: is a “9”

11.3.7 References

1. Association of Firearm and Tool Mark Scientists Glossary, 3rd edition.

12 Reference Collection

12.1 Introduction

Reference collections may be maintained by the Firearms Units for various scientific reasons, to include:

- To identify the make, model and rifling characteristics of evidence firearms.
- To provide exemplar firearms and ammunition for various scientific testing purposes which might otherwise compromise submitted evidence.
- To provide an exemplar resource for training new forensic scientists/ laboratory technicians or in developing new technology for the scientific examination of firearms.
- To provide a source of firearms parts for the temporary repair of evidence firearms for test-firing purposes.
- To provide a resource for the identification of firearms parts recovered at a crime scene.
- To provide a resource for the location and style of firearm serial numbers.

All specimens included in any Firearms Unit reference collections shall be fully documented, uniquely identified and properly controlled.

12.2 Firearms Reference Collection

Ohio BCI firearms reference collections will be maintained under strict regulations and controls. Firearms which are deemed unsuitable for scientific purposes will not be accepted into the reference collection. Firearms are accepted for reference by court order or written authorization of the donor. Where possible, court orders or other authorizations should specify that firearms are turned over for “testing, reference and/or destruction at the discretion of the Ohio Bureau of Criminal Investigation, Firearms section.”

- A record will be made immediately upon receipt of a firearm in the LIMS Lab Asset Manager (LAM) program.-This inventory will include at a minimum: manufacturer, caliber, model, serial number, location and AG tag number. In addition, copies of any paperwork received with the firearms (e.g. court orders, letters of authorization)should also be maintained.
- Firearms reference collections will be maintained in such a manner as to prevent the firearms deterioration and to facilitate their inventory, safety and control.
- Firearms placed in the reference collection will be tagged with a unique designation (AGO asset number).
- The transfer of reference firearms will be recorded. This includes transferring a firearm outside of the laboratory for training, research, or to use it in reference to a BCI Lab case (test fires or for parts). It is not necessary to document on transfer form if you are simply visually looking at a gun and are not removing it from the reference collection.

13 Appendix I: Approved Abbreviations

Abbreviations found in the Firearm section abbreviation list, in the AFTE glossary, and those common to firearm and ammunition industries may be used in examination records.

PACKAGING	EXAMINATION	EXAMINATION
Brn =Brown	≈~ = Approximately	MC = Microscopic Comparison
Bx = Box	Ammo = Ammunition	Neg., (-) = Negative
Cello = Cellophane	BESC = Barrel engraved striation characteristics	N = NIBIN
Cl = Clear	BF, BFM = Breech face (marks)	NT= Not Tested
Cont = Containing	BT= Boat tail	O/U = Over/Under
Contr = Container	CC = Cartridge Case	
Env = Envelope	Char = Characteristics	
HS = Heat Sealed	CTG = Cartridge	R = Right
Kn = Knotted	Cyl = Cylinder	REC = Receiver
Man = Manila	DA = Double Action	RN = Round Nose
Mkd = Marked	DAO/SAO- double action only/single action only	REV = Revolver
Pap = Paper	EB= Evidence bullet	SA = Single Action
PB = Paper Bag	EC= Evidence cartridge/case/shotshell	SJHP = Semi-jacketed HollowPoint
Pkg = Package	EJ, EJR = Ejector	SJSP= Semi-jacketed soft point
Pkt = Packet	EV, E- = Evidence	SMIC = some matching individual characteristics
Pl = Plastic	EXC= Exclusion	SN= Serial Number
Rec'd = Received	EXT, EX = Extractor	SWC = Semi Wad-cutter
Sld = Sealed	FMJ = Full Metal Jacket	T, TF =Test fire(s)(ed)
Sub = Submitted	FP, FPI = Firing Pin (Impressions)	TC= Truncated cone
Un-sld = Unsealed	FPAS= Firing pin aperture shear	TMJ = Total Metal Jacket
Wht = White	GI = Groove Impressions	TRG = Trigger
	GW = Groove Width	WC = Wad-cutter
	GRC= General rifling characteristics	
	GSR = Gunshot Residue	**ELEMENTS/COMPOUNDS**
	HP = Hollow Point	Al = Aluminum
	HEMI= Hemispherical	BR = Brass
	ID = Identification	Cu = Copper
	INC = Inconclusive	Ni = Nickel
	IND = Individual	Pb = Lead
	JHP = Jacketed Hollow Point	ST = Steel
	JSP = Jacketed Soft Point	
	L = Left	
	LE/LEO=Law Enforcement/ (Officer)	
	L/G= Lands and Grooves	
	LI = Land Impressions	
	LHP = Lead Hollow Point	
	LR= Long Rifle	
	LRN = Lead Round Nose	
	LW = Land Width	

14 Appendix II: Ohio Revised Code Definitions (ORC 2923.11)

- “Firearm” means any deadly weapon capable of expelling or propelling one or more projectiles by the action of an explosive or combustible propellant. “Firearm” includes an unloaded firearm, and any firearm that is inoperable but that can be easily rendered operable.

- When determining whether a firearm is capable of expelling or propelling one or more projectiles by the action of an explosive or combustible propellant, the trier of fact may rely upon circumstantial evidence, including, but not limited to, the representations and actions of the individual exercising control over the firearm.

- “Handgun” means any of the following:

  (1) Any firearm that has a short stock and is designed to be held and fired by the use of a single hand;
  (2) Any combination of parts from which a firearm of a type described in ORC 2923.11 division C (1) can be assembled.

- “Semi-automatic firearm” means any firearm designed or specially adapted to fire a single cartridge and automatically chamber a succeeding cartridge ready to fire, with a single function of the trigger.

- “Automatic firearm” means any firearm designed or specially adapted to fire a succession of cartridges with a single function of the trigger.

15 Appendix III: Comparison Conclusion Scale

The following lists the conclusions a Forensic Scientist may reach when performing comparisons. In reaching a conclusion, a Forensic Scientist considers the similarities and dissimilarities and assesses the relative support of the observations under the following two propositions: the evidence originated from the same source or from a different source.

A Forensic Scientist may utilize their knowledge, training, and experience to evaluate how much support the observed similarities or dissimilarities provide for one conclusion over another. A conclusion shall not be communicated with absolute certainty. It is an interpretation of observations made by the Forensic Scientists and shall be expressed as an expert opinion.

1	Source Identification	The observations provide extremely strong support for the proposition that the evidence originated from the same source and the likelihood for the proposition that the evidence arose from a different source is so remote as to be considered a practical impossibility.
2	Support for Same Source	The observations provide more support for the proposition that the evidence originated from the same source rather than different sources; however, there is insufficient support for a Source Identification. The degree of support may range from limited to strong or similar descriptors of the degree of support. Any use of this conclusion shall include a statement of the factor(s) limiting a stronger conclusion.
3	Inconclusive	The observations do not provide a sufficient degree of support for one proposition over the other. Any use of this conclusion shall include a statement of the factor(s) limiting a stronger conclusion.
4	Support for Different Source	The observations provide more support for the proposition that the evidence originated from different sources rather than the same source; however, there is insufficient support for a Source Exclusion. The degree of support may range from limited to strong or similar descriptors of the degree of support. Any use of this conclusion shall include a statement of the factor(s) limiting a stronger conclusion.
5	Source Exclusion	The observations provide extremely strong support for the proposition that the evidence originated from a different source and the likelihood for the proposition that the evidence arose from the same source is so remote as to be considered a practical impossibility; or the evidence exhibits fundamentally different characteristics