

Wake County Bureau of Forensic Services

Firearms Unit Technical Procedures

Effective Date: 9/6/2023

Chapter 9: Serial Number Restoration

Issued By: Director

9: Serial Number Restoration

1. Purpose

1.1. This procedure outlines the procedures in the restoration of obliterated or altered serial numbers or other manufacturer's markings on firearms and other metallic items.

2. Equipment, Materials, Reagents

- 2.1.** Stereomicroscope
- 2.2.** Rotary grinding tool
- 2.3.** Horseshoe magnet or electromagnetic yoke
- 2.4.** Magnaflux baths
- 2.5.** Cupric chloride
- 2.6.** Hydrochloric acid
- 2.7.** Sodium hydroxide
- 2.8.** Ferric chloride
- 2.9.** Nitric acid
- 2.10.** Deionized water
- 2.11.** Cleaning solution
- 2.12.** Oil
- 2.13.** Cotton-tipped swabs
- 2.14.** Disposable pipettes
- 2.15.** Polishing compound
- 2.16.** Sandpaper
- 2.17.** Fume hood
- 2.18.** Millipore System
- 2.19.** Digital Camera
- 2.20.** Personal protective equipment

3. Procedure

3.1. Preparation

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3.1.1. Serial Number restorations are potentially destructive and will be performed after all other examinations have been completed.

3.1.2. Firearms that are contaminated with potentially biohazardous material will be cleaned.

3.2. Prepared Reagents

3.2.1. Serial Number restoration reagents may be prepared in any amount provided that the component ratios listed below are kept constant.

3.2.1.1. 10% Sodium Hydroxide

3.2.1.1.1. Preparation: Dissolve 10 g of sodium hydroxide in 90 mL of deionized water.

3.2.1.1.2. Storage: Room temperature

3.2.1.1.3. Expiration: One year

3.2.1.1.4. Lot number: Eight-digit format:
year/month/day/NaOH10%/initials of preparer

3.2.1.1.5. Quality Control Check: Alkaline reading on pH paper or strips

3.2.1.2. 25% Nitric Acid

3.2.1.2.1. Preparation: Add 25 mL of nitric acid to 75 mL of deionized water.

3.2.1.2.2. Storage: Room temperature

3.2.1.2.3. Expiration: One year

3.2.1.2.4. Lot number: Eight-digit format –
year/month/day/HNO325%/initials of preparer

3.2.1.2.5. Quality Control Check: Acidic reading on pH paper or strips

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3.2.1.3. Acidic Ferric Chloride

3.2.1.3.1. Preparation: Dissolve 25 g of ferric chloride in 100 mL deionized water. Add 25 mL of hydrochloric acid.

3.2.1.3.2. Storage: Room temperature

3.2.1.3.3. Expiration: One year

3.2.1.3.4. Lot number: Eight-digit format – year/month/day/AcidicFeCl₃/initials of preparer

3.2.1.3.5. Quality Control Check: Acidic reading on pH paper or strips

3.2.1.4. Fry's Reagent

3.2.1.4.1. Preparation: Dissolve 90 g of cupric chloride in 100 mL deionized water. Add 120 mL of hydrochloric acid.

3.2.1.4.2. Storage: Room temperature

3.2.1.4.3. Expiration: One year

3.2.1.4.4. Lot number: Eight-digit format – year/month/day/Fry/initials of preparer

3.2.1.4.5. Quality Control Check: Acidic reading on pH paper or strips

3.2.2. Prepared reagents shall be labeled with the following:

3.2.2.1. Identity of the reagent

3.2.2.2. Initials of the preparer

3.2.2.3. Date of preparation

3.2.2.4. Lot number

3.2.2.5. Expiration date

3.2.2.6. QCC due date

3.2.2.7. Any additional information as required by the Wake County Bureau of Forensic Services Health and Safety Manual

3.2.3. Prepared reagents shall be quality control checked (QCC) after preparation and prior to use for casework.

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3.2.4. Preparation of reagents and all corresponding QCC(s) will be documented on the Prepared Reagent Log (Wake County Bureau of Forensic Services-267).

3.3. Examination

3.3.1. All observations and actions will be recorded in the appropriate fields in the case notes.

3.3.2. The Serial Number Restoration Worksheet (Wake County Bureau of Forensic Services-017) may be used to aid in documentation during restoration.

3.3.2.1. If used, it must be included in the case file.

3.3.3. Determine the following properties of the serial number area:

- Position
- Location
- Size
- Style
- Hidden numbers
- Number of characters typically found in the serial number

3.3.4. Take photographs of the item prior to any examinations and document the original condition of the item.

3.3.5. The Firearms Examiner may take any action to reveal a hidden serial number.

3.3.6. A description of the obliteration will be recorded in the case notes.

3.4. Methods

3.4.1. The following methods may be used at the Firearm Examiner's discretion to restore a serial number:

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3.4.1.1. Surface Enhancement

3.4.1.1.1. Remove any scratches that obscure the serial number by polishing the area using an appropriate method.

3.4.1.1.1.1. Do not over polish, this can worsen the obliteration.

3.4.1.2. Magnetic Particle Inspection Method

3.4.1.2.1. Utilize the non-destructive Magnetic Particle Inspection Method prior to chemical processing, when appropriate.

3.4.1.2.2. Apply Magnaflux to the serial number area.

3.4.1.2.3. Apply a magnetic field to the serial number area to visualize the serial number.

3.4.1.3. Chemical Processing Method

3.4.1.3.1. Select a chemical reagent appropriate for the material to be examined.

3.4.1.3.2. Test the strength of the chemical solution in an area adjacent to the polished serial number area.

3.4.1.3.2.1. The area may slowly darken due to oxidation and should not bubble or fizz excessively.

3.4.1.3.3. Chemicals will be applied and are listed from weakest to strongest.

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3.4.1.3.3.1. The following reagents are for use on ferrous material:

- Fry's Reagent

3.4.1.3.3.2. The following reagents are for use on non-ferrous material:

- 25% Nitric Acid
- Acidic ferric chloride

3.4.1.3.3.3. The following reagent is for use on non-magnetic or aluminum material:

- 10% Sodium hydroxide

3.4.1.3.4. More than one reagent may be used to improve clarity.

3.4.1.3.5. 25% Nitric acid may be used as an enhancer for any of the above chemical reagents.

3.4.1.3.6. Any chemical reagent may be diluted with water from the Millipore System at the Firearm Examiner's discretion.

3.4.1.3.6.1. Always add acid to water, never add water to acid.

3.4.1.3.7. Apply the solution slowly with a pipette, cotton-tipped swab, or other appropriate applicator.

3.4.1.3.8. Gently rub a cotton-tipped swab across the area in one direction.

3.4.1.3.9. The process may be repeated by wiping off the reagent with water and reapplying a chemical reagent.

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3.4.1.3.10. The oxidation process may be slowed and/or stopped to allow for examination by adding purified water to the area.

3.4.2. The method(s) used, reagent lot numbers, any characters that become discernible, and the position of these characters will be recorded in the case notes. Photographs will be used to document characters that become discernible and the position of these characters at the Firearms Examiner's discretion.

3.5. Reporting

3.5.1. The following information shall be included in a Wake County Bureau of Forensic Services Laboratory Report, when applicable:

3.5.1.1. Report the following in the "*Items Submitted*" section, when applicable:

3.5.1.1.1. < quantity, manufacturer, model, caliber, serial number, item type>.

3.5.1.2. The "*Type of Service*" will be reported as follows:

3.5.1.2.1. *Serial Number Restoration - The application of scientific techniques used for the retrieval, recovery, and/or revisualization of the serial number.*

3.5.1.3. "*Results and Conclusions*" will be reported as follows, when applicable:

3.5.1.3.1. *Methods are as listed in the results.*

3.5.1.3.2. In cross-reference cases add <(Bureau case number)> by item number to further identify related evidence.

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3.5.1.3.3. Full Restoration: the total recognition of all obliterated characters.

3.5.1.3.3.1. *Examination and <magnetic and/or chemical> processing of Bureau Item < item number> restored the original obliterated serial number which was determined to be < restored serial number>.*

3.5.1.3.3.2. *The requesting agency will be responsible for entering the serial number into the National Crime Information Center (NCIC) Stolen Gun Files.*

3.5.1.3.4. Partial Restoration: the recognition of obliterated characters less than the total being sought.

3.5.1.3.4.1. *Examination and <magnetic and/or chemical> processing of Bureau Item < item number> partially restored the serial number. The serial number was determined to be < restored characters and an asterisk (*) to represent unknown characters followed by a list of the potential characters in parenthesis>.*

3.5.1.3.4.2. *The requesting agency will be responsible for entering the serial number into the National Crime Information Center (NCIC) Stolen Gun Files.*

3.5.1.3.5. No Serial Number Restored: the lack of recognition of any obliterated characters or the failure to conclusively identify a sufficient number of characters for a NCIC based on references listed in 5.1 and 5.2.

3.5.1.3.5.1. *Examination and <magnetic and/or chemical> processing of Bureau Item <enter item number> failed to restore a serial number that could be used to complete a NCIC search.*

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3.5.1.3.5.2. *Examination of Bureau Item <item number> revealed that no serial number was present to restore <explain further if necessary>.*

3.5.1.4. *“Disposition”*

3.5.1.4.1. *The item(s) in this report will be returned to the submitting agency unless otherwise stated below.*

3.5.1.4.2. *Firearms Examiner <Insert examiner name verified the restoration results.*

4. Limitations

4.1. The type of material containing the serial number and the original method used to place the serial number on the evidence item (i.e., laser engraving) may prevent this procedure from restoring the serial number.

5. References

5.1. Serial Number Restoration Guide, US ATF

5.2. “Firearms Reference Table”, Royal Mounted Canadian Police

5.3. Association of Firearm and Tool Mark Examiners. Glossary. <https://afte.org/resources/afte-glossary>

6. Records

6.1. Serial Number Restoration Worksheet (Wake County Bureau of Forensic Services-017)

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Document Revision History		
Revision Date	Prepared By	Revision
9/6/2023	C. Foran	Revised 3.2. to “[Acidic] or [Alkaline] reading on pH paper or strips”
11/1/2024	A. Abernethy	Document revised to reflect the agency name change from Raleigh/Wake City-County Bureau of Identification to Wake County Bureau of Forensic Services, effective December 1, 2024. Changed header and revision history format, corrected effective date in header. No change to procedure content.