

A. Purpose:

To describe the techniques that can be utilized to recover an obliterated serial number.

B. Responsibility:

Forensic Science Examiners or other employees assigned to the Unit.

C. Safety:

1. The analyst shall use appropriate PPE (eye protection, gloves, lab coat).
2. Serial number restorations shall be conducted in a fume hood.

D. Procedure:

Operability testing, if requested, shall be conducted prior to any serial number restoration attempts.

1. Chemical and Mechanical Serial Number Restoration

- a. The condition of the obliterated area(s) and any visible characters shall be documented in the notes by photographs and/or sketches prior to restoration attempts.
- b. The notes shall demonstrate the progression of the restoration attempt(s).
- c. During any stage of the restoration, a second analyst must verify the restored characters by initialing the appropriate space on the Serial Number Worksheet (QR FA-8, 8a).
 - i. Visual Examination

Make note of the position of the serial number as located on the weapon. If the primary serial number is not on the receiver or frame, note the location and indicate it is a "secondary" serial number location. Determine the physical property (e.g. magnetic or non-magnetic) of the area of the primary and other serial number if present. If only using the secondary serial, the analyst will indicate in the report that the serial number is a secondary number if it is the only number restored. If the secondary serial number is used to support the partial restoration of the primary serial number it should be noted and indicate the secondary or supported restoration may not reflect the original primary serial number.

Determine, if possible, the location, size, style (font), hidden numbers and the number of characters typically found in the serial number of the item in question. Record the source(s) of this information if used, such as the Firearms Reference Collection, the Firearms Reference Table (Royal Canadian Mounted Police), or the ATF Firearm Serial Number Structure Guide.

2. Preparation

- a. Cleaning
 - i. Items may generally be cleaned with a cotton-tipped swab saturated with the cleaning solution (methanol/acetone).
- b. Polishing
 - i. Can be done with fine grit sand paper, emery cloth, or an electric polishing tool such as a Dremel.
 - ii. Depending on the extent of the obliteration, continue polishing until the surface is mirror-like, removing the scratches. If the obliteration is severe, it may not be possible or desirable to remove all of the scratches.
 - iii. Any characters that become visible shall be documented.
- c. If the serial number is not visible, or only a portion of the serial number is visible after polishing, chemical and/or magnetic processing may be conducted.

3. Magnetic Particle Inspection

Magnetic particle inspection is generally used on magnetic or ferrous metals, but can also be used on other types of metals. It is considered a non-destructive method of serial number restoration.

- a. Spray the Magnaflux oil suspension (red or black) into a small cup or beaker.
- b. Place the poles of the magnet on either side of the obliteration. Placement may be adjusted as needed. Press the power button.
- c. Using a disposable pipette, drip the oil suspension onto the area of obliteration.
- d. Document any characters that become visible.
- e. This method may be used alone or in conjunction with chemical reagents.

4. Chemical Processing

- a. Determine the most appropriate reagent for the type of metal.
- b. Using a cotton swab, apply the reagent to the area of obliteration.
- c. Document any characters that become visible.
- d. Polishing may be used in between applications of the reagent.
- e. When complete, flush the area with water to neutralize the chemicals. Then dry the area and apply oil to inhibit oxidation.
- f. Suggested chemicals for use:
 - i. For use on magnetic material, such as steel (suggested use going from weakest to strongest):
 - 25% Nitric Acid Solution

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- Davis Reagent
 - Turner's Reagent
 - Fry's Reagent
 - ii. For use on non-magnetic material (suggested use going from weakest to strongest):
 - Phosphoric/Nitric Acid
 - 10% Sodium Hydroxide Solution
 - 25% Nitric Acid Solution
 - Acidic Ferric Chloride
 - Ferric Chloride
 - iii. For use on non-magnetic aluminum media:
 - 10 % Sodium hydroxide
 - iv. Highlighter for above listed chemicals
 - 25 % Nitric Acid
 - v. Other:
 - Ferric chloride (and/or acidic ferric chloride) used in combination with nitric acid may be beneficial when used on frames/receivers containing zinc.
 - Sodium hydroxide used in combination with nitric acid may be beneficial when used on frames/receivers containing aluminum. Note that this combination will produce heat and a strong reaction.
 - Phosphoric acid used in combination with nitric acid may be beneficial when used on frames/receivers containing zinc and/or aluminum.
5. Electrolytic Method
- Applying voltage to the chemical reagent process speeds up the reaction between the acid and the metal.
- a. Using an alligator clamp, attach the positive terminal of the low voltage power supply to the frame or receiver of the firearm.
 - b. Hold the negative terminal of the low voltage power supply to a cotton swab moistened with the desired reagent.
 - c. Turn on the power supply to low.
 - d. Swab the obliterated area, taking care to not touch the frame/receiver with the negative terminal on the cotton swab.
 - e. Document any characters that become visible.
 - f. Polishing may be used in between applications of the reagent.

- g. When complete, flush the area with water to neutralize the chemicals. Then dry the area and apply oil to inhibit oxidation.

6. Hidden Serial Number

- a. In the event that a serial number is not able to be restored, the analyst should research if the weapon contains a hidden serial number.
- b. There are several resources that can be used: ATF Serial Number Structure Guide, as the Firearms Reference Collection, the Firearms Reference Table (Royal Canadian Mounted Police), and the Smith & Wesson Hidden Serial Number Guide.
- c. On firearms with hidden serial numbers, disassembly of the firearm and/or removal of material may be necessary to reveal this number. Record in the case notes any action taken to reveal a hidden serial number.
- d. In this case, the analysis will be conducted under the request type titled "SN – Hidden/QR code".

7. QR or Dot Matrix Codes

- a. In some cases, the firearm may have a QR code or a dot matrix code as the serial number record. These codes will be recorded digitally and then scanned using a QR reader to determine the alphanumeric information.
- b. In some cases, the manufacturer needs to be contacted with the alphanumeric value to determine if this is a serial number.
- c. In this case, the analysis will be conducted under the request type titled "SN – Hidden/QR code".

E. Reporting Results

Hidden/Secondary

Submission XXX-XXX was submitted for serial number restoration. Submission XXX-XXX was examined and found to have an obliterated serial number. A portion of the frame was removed to reveal a hidden, replicate serial number that reads _____. A hidden serial number placed by the manufacturer on the frame was located and reads _____.

QR/Dot Matrix

Submission XXX-XXX was submitted for serial number restoration. Submission XXX-XXX was examined and found to have an obliterated serial number. A QR (or Dot Matrix) code was located on the weapon and determined to be the following serial number that reads that reads _____.

F. Serial Number Restoration - CAS

Beginning July 2025, Serial Number Restorations will be conducted by the CAS Unit using premade chemicals.

1. Operability Prior to CAS Serial Number Restoration

- a. Operability testing (if needed) will be conducted on the weapons prior to serial number restoration.
- b. At the completion of the operability testing, the weapon will have a zip-tie placed through the barrel and chamber to indicate that the weapon has been rendered safe. The weapon is then zip-tied back into the box.
- c. The blue zip-tie with the lab case number will be placed in the trigger guard and should not be removed.
- d. Once the weapon is sealed back in the box, the evidence will be transferred to the storage location CAS - Serial Number Incoming in B-28.
- e. At the completion of the Serial Number Restoration by the CAS Unit, a copy of the report containing the recovered serial number will be provided to the Deputy Director/Assistant Director.
 - i. If the NIBIN Entry was conducted by DSS staff, the analyst will be provided the report to update the Serial Number information in NIBIN.
 - ii. If the NIBIN Entry was conducted at a DSS kiosk, the Deputy Director/Assistant Director will email the report to the officer that made the acquisition for the Serial Number information to be updated in NIBIN.

2. QR/Dot Matrix/Hidden Serial Number

- a. In the event that the serial number is not able to be restored, the Firearms Unit will be contacted to determine if a QR/Dot Matrix or Hidden Serial Number may be present.
- b. If there is a QR/Dot Matrix or Hidden Serial Number, the weapon will be transferred to the Firearms Unit for processing. The evidence will be stored in FA B-28 Operability/Gun Storage or in the analyst's possession. A "SN – Hidden/QR code" LIMS request will be added for this process.
- c. Refer sections D.6 and D.7 of this SOP for processing guidance and Section E for Reporting.

G. In-House Reagent Preparation (if necessary)

- 1) Reagents that are prepared in the laboratory shall be logged in the reagent log book. Refer to GL-2 Safety Manual for proper labeling. All chemicals are made in-house and will have a one-year expiration date unless the certificate of analysis for one of the chemicals indicates a retest date prior to one year. All reagents are tested as described above at the time of preparation and recorded on the reagent preparation log sheet. The results must be acceptable before indicating that the reagent is suitable to use in casework. The QC Check is conducted again on the days of use in casework.

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Note: In the preparation of reagents, always pour the acidic portion into the water to avoid a violent exothermic reaction.

- a. Fry's Reagent
 - i. 90g cupric chloride (CuCl_2)
 - ii. 100mL distilled water (dH_2O)
 - iii. 120mL hydrochloric acid (HCl)
- b. Turner's Reagent
 - i. 2.5g cupric chloride (CuCl_2)
 - ii. 25mL ethanol ($\text{C}_2\text{H}_6\text{O}$)
 - iii. 30mL distilled water (dH_2O)
 - iv. 40mL HCl (Hydrochloric acid)
- c. Davis Reagent
 - i. 5g cupric chloride (CuCl_2)
 - ii. 50mL distilled water (dH_2O)
 - iii. 50mL HCL (Hydrochloric acid)
- d. 25% Nitric Acid
 - i. 75mL distilled water (dH_2O)
 - ii. 25mL nitric acid (HNO_3)
- e. Acidic Ferric Chloride
 - i. 25g ferric chloride (FeCl_3)
 - ii. 100mL distilled water (dH_2O)
 - iii. 25mL Hydrochloric acid (HCl)
- f. Ferric Chloride
 - i. 25g ferric chloride (FeCl_3)

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- ii. 100mL distilled water (dH₂O)

 - g. 10% Sodium Hydroxide
 - i. 10g sodium hydroxide (NaOH)
 - ii. 90mL distilled water (dH₂O)

 - h. Phosphoric/Nitric Acid (for non-ferrous material)
 - i. 98mL 85% phosphoric acid (H₃PO₄)
 - ii. 2mL concentrated nitric acid (HNO₃)
 - or-
 - iii. 50mL concentrated phosphoric acid (H₃PO₄)
 - iv. 3mL concentrated nitric acid (HNO₃)
- 2) QC Check
- i. The firearm has a chemical log book that is used when serial number chemicals are made. The log will include the chemical name, the date prepared, the lot number, the initials of the analyst who prepared it and if the quality check was conducted on the chemical. Once the chemical has been found to be acceptable, a colored dot will be initiated and dated with the date of the test. This dot will be taped to the chemical bottle and will signify the chemical is okay to use. Before any chemical is used, every analyst should check for this sticker.
 - ii. Prior to using any chemical reagent, a quality control check shall be conducted and documented on the Serial Number Restoration Worksheet.
 - iii. Two (2) pistol slides are located in the fume hood. One is a ferrous material, the other is non-ferrous. These will be used to perform the QC check.
 - iv. Using a cotton swab moistened with the desired reagent, dab a small amount onto the appropriate slide.
 - v. The appearance of bubbles is a positive control which indicates that the reagents are working properly.
 - vi. If the reagent does not bubble as expected, the reagent has failed the QC check. This should be documented in the Firearms Chemical Reagent Log.
 - vii. The failing reagent should be disposed of properly and remade.

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3) Equipment:

- a. PPE
- b. Fume hood
- c. Polishing tools
- d. Chemical reagents
- e. Cotton swabs
- f. MagnaFlux magnet and supplies
- g. Low voltage direct current power supply

4) References:

- a. GL 2 Safety Manual
- b. FA SOP-02 General Firearms Safety
- c. ATF Serial Number Structure Guide
- d. Treptow, Richard S., *Handbook of Methods for Restoration of Obliterated Serial Numbers*, NASA, January 1977.