1. Introduction

A serial number is a unique series of letters and/or numbers applied by the manufacturer to identify a firearm. The process of applying a serial number affects the material in the immediate area surrounding and below the number. Serial numbers may be obliterated to reduce the ability to identify and track a firearm, however, they can be restored using various techniques, such as polishing and chemical etching. This procedure details how the Chemical Analysis Section (CAS) will perform serial number restorations on firearms.

Unless otherwise approved, all serial number restoration activities are paperless and only an electronic case file shall exist.

2. Safety

2.1 Firearms

- 2.1.1 All firearms shall be treated as though they are loaded.
- 2.1.2 Always point the firearm in a safe direction.
- 2.1.3 Check the status of safety.
- 2.1.4 Inspect the chamber, ensure the magazine/ammunition source has been removed.
- 2.1.5 Keep action/bolt open and secure with cable tie.
- 2.1.6 Keep finger and equipment off of the trigger.
- 2.1.7 CAS personnel are responsible for ensuring that all appropriate safety checks are performed on a firearm prior to any serial number restoration attempts.
- 2.1.8 Refer to Firearms unit “SOP-02 General Firearms Safety” for further guidance.

2.2 Equipment/Reagents

- 2.2.1 Serial number restoration shall be conducted in a fume hood.
- 2.2.2 Proper caution shall be exercised and the use of PPE (eye protection, face mask, gloves, lab coat) shall be utilized to avoid exposure to reagents.
  - 2.2.2.1 Blue lab coats (or color different than those used in other CAS lab spaces) shall be used in the serial number restoration room. Lab coats will be changed daily and shall not be removed from the room except for disposal.
- 2.2.3 Consult the appropriate Material Safety Data Sheet (MSDS) for each reagent prior to use.

2.2.4 When mixing acid and water, acid shall be added to water. Never add water to acid.

2.2.5 Upon completion of testing for the day, the room shall be wiped down using de-lead wipes and analysts must wash hands using de-lead soap.

2.2.6 Refer to "GL 2 Safety Manual" for further guidance.

3. Equipment

3.1 Fume hood

3.2 Stereomicroscope

3.3 Rotary polishing tool (Dremel) with attachments

3.4 Sandpaper

3.5 Cotton swabs

3.6 Camera and applicable software

3.7 Tablet

4. Reagents

4.1 If the item number listed is not available, an equivalent may be purchased.

4.1.1	Acidic Ferric Chloride	Reagents CF001400
4.1.2	Davis Reagent	Reagents CD000500
4.1.3	Ferric Chloride Solution	Reagents CF000400
4.1.4	Fry's Reagent	Reagents CF180100
4.1.5	Nitric Acid (25% v/v)	Reagents CN200200
4.1.6	Phosphoric Nitric Acid	Reagents CP000700
4.1.7	Sodium Hydroxide	Reagents CS144800
4.1.8	Turner's Reagent	Reagents CT000300
4.1.9	7075 Aluminum	Precision Forensic Testing
4.1.10	4140 HT Steel	Precision Forensic Testing
4.1.11	1018 Steel	Precision Forensic Testing
4.1.12	303 Stainless Steel	Precision Forensic Testing

5. Quality Control

5.1 Every purchased reagent or reference material received shall have a Certificate of Analysis (COA) stored electronically within CAS and QMS. Any updated versions of a COA are saved alongside the previous version.

5.2 Expiration dates shall be determined by the manufacturer. If no expiration date is provided by the manufacturer, the expiration date assigned shall be five years from the date the reagent is received.

5.3 Expiration dates with just a month and a year will be considered expired on the last day of that month.

5.4 Expired materials shall not be used with casework.

5.5 The following information must be present on reagent containers:

- 5.5.1 Name of reagent
- 5.5.2 Any serious health or safety hazards associated with reagent; hazard placards may be posted in a central location within the lab.
- 5.5.3 Lot number
- 5.5.4 Date received and initials of the person who received the reagent
- 5.5.5 Once a reagent has been opened, the date opened and the initials of the person who opened the reagent
- 5.5.6 Storage conditions
- 5.5.7 Expiration date

5.6 The following information must be present on reference materials:

- 5.6.1 Name of reference material
- 5.6.2 Lot number
- 5.6.3 Expiration date

5.7 Before a new lot of a reagent or reference material is used for analyzing casework, it will be validated for use.

- 5.7.1 The reagent information, reference material used, observed result, if the reagent passed or failed and analyst initials will be documented on the form "SNR QR1 Reagent QC Log". This form will be retained electronically.
- 5.7.2 The observed result can be a color change on the swab, discoloration of the metal or effervescence.
- 5.7.3 A photo of the swab and/or metal will document the observed result.

5.8 Materials are acceptable for use if the observed result is the expected result detailed in Table 1.

5.9 Materials will be marked with a green sticker (or similar marking) to indicate that a reagent/reference material has been validated for use.

Table 1: Reagent QC Results

Reagent	Reference Material	Expected Result
Acidic Ferric Chloride	7075 Aluminum	Immediate effervescence on metal surface
Davis Reagent	303 Stainless Steel or 1018 Steel	Immediate brown discoloration of swab
Ferric Chloride Solution	7075 Aluminum	Immediate slight effervescence on metal surface
Fry's Reagent	303 Stainless Steel	Immediate black discoloration of swab

Nitric Acid (25% v/v)	4140 HT Steel	Brown discoloration of swab and metal
Phosphoric Nitric Acid	4140 HT Steel	Effervescence and discoloration on metal surface
Sodium Hydroxide	7075 Aluminum	Effervescence and discoloration on metal surface
Turner's Reagent	1018 Steel	Immediate gray discoloration of swab

6. Procedure

6.1 Initial Examination

6.1.1 If operability or other firearms related testing was requested, ensure it was completed by the Firearms Unit within the DSS prior to beginning any serial number restoration attempts.

6.1.2 Retrieve evidence to be analyzed from "SNR Incoming" and scan to analyst custody.

6.1.3 Photograph the evidence as received (packaging, entire firearm).

6.1.4 If the evidence was tested for operability, analysts can work off the subitems created by the Firearms Unit. If evidence was submitted for serial number restoration only, the analyst shall create subitems.

6.1.4.1 Each area on the firearm where an obliteration is present will be further itemized (e.g. "Obliterated serial number on the frame from Item XXX-XXX).

6.1.5 Mark all evidence items with item number and initials.

6.1.6 Determine and document the following, as appropriate:

6.1.6.1 Make

6.1.6.2 Model

6.1.6.3 Type of metal

6.1.6.4 Possible ATF serial number structure

6.1.6.5 Location of obliteration

6.1.6.5.1 The primary serial number is located on the receiver or the frame. Serial numbers on the slide or barrel are secondary serial numbers.

6.1.6.6 Initial condition

6.1.6.6.1 This includes any coatings or trace materials present, as well as if any

characters are visible prior to any restoration attempts.

6.1.6.6.2 Attempts will be made to restore all visible obliterated serial numbers.

6.1.6.6.3 Full visible characters must be verified by an authorized analyst.

6.1.6.7 Suspected method of obliteration

6.1.6.7.1 Ground: a smooth, concave or coarsely sanded area

6.1.6.7.2 Scratched: result of a pointed hand tool

6.1.6.7.3 Drilled: bored down area from a drill

6.1.6.7.4 Engraved: scratches from an electric scribe

6.1.6.7.5 Punched: a series of punch marks or holes

6.1.6.7.6 Peened: result of force from a blunt object

6.1.6.8 If hidden serial numbers are present

6.1.6.8.1 Hidden serial numbers may only be present on Smith & Wesson and Hi-Point firearms

6.1.7 Prior to proceeding with polishing, the area where the obliterated serial number is may be cleaned with water or a solvent (Methanol or Acetone) utilizing a cotton swab.

6.2 Polishing

6.2.1 Polishing the area may be used to remove obliteration scratches that obscure the serial number. Polishing may be effective at restoring the serial number prior to the use of chemical etching if the obliteration is not severe.

6.2.2 Polish the area using a rotary grinding tool with a polishing or sanding wheel attached or a fine-grit sandpaper.

6.2.3 Continue polishing until the surface is mirror-like and all scratches are removed.

6.2.3.1 If the obliteration is severe, it may not be possible to remove all scratches.

6.2.4 Photograph and record result after polishing.

6.2.4.1 Full visible characters must be verified by an authorized analyst.

6.2.4.2 Unknown characters can be noted with a "?".

6.2.4.2.1 This "?" differs from a "?" that appears on the final report; during restoration, the "?" is used for a character not yet restored.

6.2.5 If the serial number cannot be restored with polishing alone, proceed with chemical etching.

6.2.6 Polishing can occur throughout the restoration process as determined by the analyst.

6.3 Chemical Etching

6.3.1 Prior to the application of a reagent to the serial number area, the reagent must be tested on reference material.

6.3.1.1 Use Table 1 to determine which reference material to use for a specific reagent.

6.3.1.2 The reagent and reference material used, as well as the observed result will be documented. A photo of the swab and/or metal will document the observed result.

6.3.1.3 A reagent is acceptable for use if the observed result matches the expected result detailed in Table 1.

6.3.2 Apply the reagent to the area of obliteration utilizing a cotton swab that has been saturated with the reagent.

6.3.2.1 It is generally best to work the reagents in one direction (either right to left or left to right depending on the preference of the analyst).

6.3.3 Document the reagent applied and how long the reagent was applied to the area.

6.3.3.1 The time starts from the initial application until the photo is taken.

6.3.4 Photograph and record result for each application.

6.3.4.1 Full visible characters must be verified by an authorized analyst.

6.3.4.2 Unknown characters can be noted with a "?".

6.3.4.2.1 This "?" differs from a "?" that appears on the final report; during restoration,

the "?" is used for a character not yet restored.

6.3.5 Alternating between or changing reagents may assist in the recovery process.

6.4 Neutralizing

6.4.1 If an analyst wishes to stop the etching between the use of different reagents, the area can be neutralized with water.

6.4.2 Document, photograph and record result each time the area is neutralized.

6.4.3 At the conclusion of the restoration, neutralize the area with water and then apply grease to prevent further etching when the firearm is returned.

6.5 Evidence Storage during Analysis

6.5.1 Evidence may be stored in "SNR Storage" within the serial number restoration room during the day of analysis, however, evidence cannot be stored here overnight.

6.5.2 Evidence must be returned to "SNR Incoming" at the end of the day if the analyst is still actively working on the restoration.

6.5.3 Evidence must be returned to "SNR Outgoing" at the end of the day if the analyst has completed the restoration.

6.6 Documentation of Results

6.6.1 At the conclusion of the serial number restoration attempt, document if the serial number was restored and the characters restored. Possible results include full, partial, or unsuccessful restoration.

6.6.1.1 Full restoration is the total recognition of all obliterated characters.

6.6.1.2 Partial restoration is the recognition of some obliterated characters but less than the total being sought.

6.6.1.3 Unsuccessful restoration is the lack of recognition of any obliterated characters.

6.6.2 If a secondary serial number is restored, it shall be documented on the final report along with the restoration results.

6.6.3 Unrestorable characters shall be represented by a "?".

6.6.4 Characters which could be multiple possibilities shall be represented by a "*" with the possibilities listed. (e.g. The "*" represents a character that could be a 3 or an 8.)

6.6.5 If a restoration attempt was unsuccessful and if the firearm may contain a hidden serial number, the analyst will contact the submitting agency. The submitting agency can request the Firearms Unit to disassemble the firearm to reveal this number.

6.7 Reporting

6.7.1 Full restoration

6.7.1.1 Item XXX-XXX was polished, and the serial number was determined to be XXXXX.

6.7.1.2 Item XXX-XXX was polished and chemically restored to reveal the serial number XXXXX.

6.7.2 Partial restoration

6.7.2.1 Item XXX-XXX was polished and chemically restored to reveal a partial serial number X?X*X. The question mark represents an unrestorable character. The first asterisk represents a character that could be an X or an X.

6.7.3 Unsuccessful restoration

6.7.3.1 Attempts to restore Item XXX-XXX by polishing and the application of chemical reagents on were unsuccessful.

6.7.4 Secondary serial number

6.7.4.1 The serial number restored on Item XXX-XXX is a replicate serial number. Replicate serial numbers are placed by the manufacturer on the slide and the barrel. These numbers represent either a partial or the complete serial number for the firearm as it existed when it left the manufacturer.

6.7.5 Additional items (e.g. magazine, ammunition)

6.7.5.1 Item XXX-XXX was not analyzed.

NOTE: Reporting may vary dependingon case type and can be updated at the discretion of the FSE3 or higher.

7. Case Completion

7.1 Once a case has been closed (technically and administratively reviewed), evidence shall be transferred from “SNR Outgoing” to “ER/ID Storage-Outgoing”.

7.2 One copy of the report will be emailed to the submitting officer and one copy will be saved in a network folder for the applicable firearms analyst to reference.

7.2.1 The email to the submitting officer will have the "Request a Delivery Receipt" option turned on.

8. Limitations

8.1. This procedure is limited to serial numbers that have been roll stamped, impressed, pin stamped, or laser etched.

8.2. QR codes and barcodes will not be decoded.

9. References

3.1 FA SOP-02 General Firearms Safety

3.2 GL 2 Safety Manual

3.3 ATF Serial Number Structure Guide

3.4 Treptow, Richard S., Handbook of Methods for Restoration of Obliterated Serial Numbers, NASA, January 1977