

## Section 7 Serial Number Restoration

### History Page

Revision #	Effective date	History
0	1/12/07	This is an original procedure this procedure has been completely reformatted and updated from the previous procedure that was adopted from the Washington State Patrol.

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## Section 7 Serial Number Restoration

### 7.0 Scope and background

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 produced 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.

#### 7.1. Equipment (refer to section 9 for details on calibration and maintenance of equipment).

- Balance
- Laboratory glassware
- Polishing tools (i.e. dremel tool)
- Magnets

#### 7.2 Reagents

The following recipes are the most common reagents used for serial number restoration. Other acceptable reagents used for serial number restoration can be found in literature provided by the BATF, FBI, AFTE, and the "Handbook of Methods for the Restoration of Obliterated Serial Numbers" by Richard S. Treptow. (See References in this section) Varying the reagent concentrations is acceptable.

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.

**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.

**Cupric Ammonium Chloride Solution:** Add one (1) gram of Cupric Ammonium Chloride and ten (10) milliliters of Concentrated Hydrochloric Acid to ten (10) milliliters of distilled water. Utilizing these proportions, mix the quantity desired.

**Ammonium Persulfate Solution:** Prepare a 10% Ammonium Persulfate solution (10 grams of Ammonium Persulfate and 100 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.

**Turner's Reagent:** Add 2.5 grams of Cupric Chloride to 40 milliliters of Concentrated Hydrochloric Acid, 25 milliliters of 100% Ethanol and 30 milliliters of distilled water, mix the quantity desired.

**Davis Reagent:** Add 5 grams of Cupric Chloride to 50 milliliters of Concentrated Hydrochloric Acid and 50 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.

**Phosphoric/Nitric Acid:** Add 98 milliliters of 85% Phosphoric Acid (85 milliliters of Phosphoric Acid and 15 milliliters of distilled water) to 2 milliliters of Concentrated Nitric Acid, mix the quantity desired. Or, add 50 milliliters of Concentrated Phosphoric Acid to 3 milliliters of Concentrated Nitric Acid, mix the quantity desired.

Or

Add 50 milliliters of Concentrated Phosphoric Acid to 3 milliliters of Concentrated Nitric Acid, mix the quantity desired.

Use Magnaflux 9CM Prepared Bath or Magnaflux 7HF Prepared Bath, available, premixed from: Magnaflux Corporation, 3624 West Lake Avenue, Glenview, IL, 60026. Phone (847) 657-5300

## 7.3 Procedures

### 7.3.1 Polishing Technique

- 7.3.1.1 Note and record any visible characters prior to polishing.
- 7.3.1.2 Plastic – if possible, examine the reverse side of the item to see if any characters are visible.
- 7.3.1.3 Polish the obliterated area by hand, or using a grinding tool.

- 7.3.1.4 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.
- 7.3.1.5 Note and record any characters which become visible.
- 7.3.1.6 If all of the characters do not become visible, proceed to the appropriate chemical/heat restoration procedure.

**7.3.2 Chemical Restoration**

Reagent/Procedure	Suitable for
Fry's, Turner's, Davis Reagent	Steel
Nitric Acid	Aluminum or Brass
Phosphoric/Nitric Acid	Steel / Pot Metal / Aluminum
Cupric Ammonium Chloride	Stainless Steel or Cast Iron
Ammonium Persulfate	Steel
Cupric Chloride	Steel
Sodium Hydroxide	Aluminum
Ferric Chloride	Steel / Pot Metal

Technique

- 7.3.2.1. Moisten cotton tip applicators (swabs) with the suitable chemical solution and apply to the obliterated area.
- 7.3.2.2. After a few seconds, wipe off the solution and inspect for visible numbers. Repeat as necessary. This process may take several hours. The examiner may wish to build a clay "dam" around the obliterated area, and fill it with a larger volume of solution.
- 7.3.2.3. Fry's Reagent - The examiner may wish to alternate between swabs saturated with the Fry's Reagent and the 25% Nitric Acid solution.
- 7.3.2.4. To speed up the process, the examiner may wish to use an electrochemical process. The positive (+) terminal of a standard lantern battery or other source is connected to the obliterated item, and the negative terminal (-) is connected to the cotton swab.
- 7.3.2.5. If any characters become visible note these characters.

**7.3.3 Magnetic Restoration**

The Magnetic Particle Inspection procedure is a non-corrosive, non-destructive technique that utilizes a magnetic field. This method is only applicable with stamped serial numbers in ferrous substrates. Since this technique is non-destructive, it can be attempted at any stage of the restoration: before, during, or after any other methods.

Technique

- 7.3.3.1. Attach a horseshoe-type magnet to the obliterated test area so that the poles of the magnet are on opposite sides of the area to be restored. This will generate a magnetic field around the test area.
- 7.3.3.2. Shake the Magnaflux can vigorously and spray into a beaker or other receptacle.
- 7.3.3.3. With an eyedropper, apply Magnaflux to obliterated area.
- 7.3.3.4. The ferrous shavings in the Magnaflux solution should align themselves with the stress from the die stamping.
- 7.3.3.5. If any characters become visible, note these characters.

#### **7.3.4 Heat Restoration**

The Heat procedure is suitable for restoration of serial numbers in plastic.

##### **Technique**

- 7.3.4.1. Apply heat to the area of obliteration utilizing a high intensity lamp.
- 7.3.4.2. Continue the application of heat until the plastic in the obliterated area starts to liquefy.
- 7.3.4.3. If any characters become visible note these characters.

#### **7.4 Controls**

It will be determined that the reagents are functioning if there is a positive reaction with the metal in a serial number restoration.

#### **7.5 Interpretation of results**

If any characters become visible note these characters including partials.

Photographs are recommended for documentation.

If unable to photograph, second examiner observation and sign off recommended.

If known from a reference, report unrestored characters as letter or number.

#### **7.6 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 establish appropriate safety and health 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.

#### **7.6 References**

Treptow, Richard, S., Handbook of Methods for the Restoration of Obliterated Serial Numbers, NASA, 1978.

Idaho State Police Firearm/Toolmark Procedure Manual Section 7

Polk, Donald, E. and Giessen, Bill, C. “Metallurgical Aspects of Serial Number Recovery”, AFTE Journal ,Vol. 21, No. 2, p.174.

Bureau of Alcohol, Tobacco and Firearms Laboratory, Serial Number Restoration Handbook, 1999.

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