



# **TENNESSEE BUREAU OF INVESTIGATION**

## *Forensic Services Division*

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### Firearms/Toolmarks Standard Operating Procedures Manual

#### Firearm Examination and Classification Procedure

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## **5.0 FIREARM EXAMINATION PROCEDURE**

**5.1 Scope:** This procedure is used for the initial examination of a firearm.

**5.2 Precautions/Limitations:** The firearm examiner shall visually inspect the firearm to ensure that it is not loaded. If loaded, care must be taken to unload the firearm by first removing the source of ammunition and then ensuring the chamber is empty by physical and visual means.

### **5.3 Related Information:**

- 5.3.1** Section 4 Safe Firearm Handling Procedure
- 5.3.2** Appendix 1 Worksheets
- 5.3.3** Appendix 3 Firearm Safety
- 5.3.4** Appendix 4 Range of Conclusions
- 5.3.5** Section 6 Test Firing Methods
- 5.3.6** Section 7 Barrel and Overall Length Measuring Procedure
- 5.3.7** Section 8 Ejection Pattern Testing Procedure
- 5.3.8** Section 9 Rusted Firearm Procedure
- 5.3.9** Section 20 Toolmark Tests and Casting Procedure
- 5.3.10** Section 21 Serial Number Restoration Procedure

### **5.4 Instruments:**

- 5.4.1** Overall Length and Barrel Length Measuring Device (Monturo Device)
- 5.4.2** Hott Rod Measuring Device
- 5.4.3** Trigger Pull Weights
- 5.4.4** Digital Caliper
- 5.4.5** Dial Caliper

### **5.5 Reagents/Materials:**

- 5.5.1** Accu-Trans or other casting material

### **5.6 Hazards/Safety:**

**5.6.1** It is the responsibility of the firearm examiner to employ appropriate safety and health practices. Safe firearm handling procedures shall be strictly followed at all times.

**5.6.2** Appropriate hearing and eye protection shall be worn when applicable.

### **5.7 Reference Materials/Controls/Calibration Checks:**

- 5.7.1** TBI FTIU Firearm Reference Collection
- 5.7.2** TBI FTIU Ammunition Reference Collection

### **5.8 Procedures/Instructions:**



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**5.8.1** Document the original packaging and seals of the evidence containers.

**5.8.2** Mark the outside of the original packaging with the case number, exhibit number and examiner's initials.

**5.8.3** Determine if the request for examination form indicates that serological or latent fingerprint examination is needed. If determined that serological or fingerprint examination is necessary, transfer the evidence to that unit prior to examining.

**5.8.4** Remove the firearm from the packaging and ensure the firearm is unloaded. If a magazine is received in a loaded condition, it must first be unloaded prior to conducting any examinations when using it with a firearm. Consideration should be given to documenting the order of the cartridges in the magazine as they are unloaded.

Follow safe firearm handling procedures at all times.

- **Treat all firearms as if they are loaded.**
- **Always point the muzzle of the firearm in a safe direction.**
- **Never load live cartridges or primed cartridge cases into a firearm in an office or examination room. All firearms testing with live cartridges or primed cartridge cases will be conducted in the Firearms Range and/or Bullet Recovery Tank areas. These tests include: function testing, safety functions, cycling live cartridges for chambering/extraction marks, ammunition capacity on firearms/magazines using live ammunition, bullet/cartridge case recovery, shooting test patterns for distance determination, ejection patterns, and any other tests conducted with live cartridges or primed cartridge cases. Magazine capacity testing with dummy cartridges can be performed in the examination area.**

**5.8.5** Fill out a firearm worksheet. If the firearm is for NIBIN entry only, an abbreviated worksheet may be used. Examples of these worksheets are included in Appendix 1 of this manual. These worksheets will include the following:

- Laboratory Number and Exhibit Number assigned to the firearm.
- Initials of the examiner/technician.
- Start date or date of examination.
- Manufacturer and Model
  - Normally found engraved/embossed on the firearm frame or barrel.
  - If make/manufacturer/model is not on the firearm, then compare firearm to reference materials or firearms in the reference collection.



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- If unable to ascertain manufacture or model, a notation of unknown or N/A should be entered.
- Importer should be documented if specified on the firearm.
  
- **Caliber/Gauge**
  - Normally found engraved/embossed on the firearm frame, slide, or barrel.
  - If caliber/gauge designation is not on the firearm, then one or more of the following methods should be employed to determine caliber:
    - Compare firearm to reference firearms;
    - Measure barrel diameter with a shotgun choke gauge or other suitable means;
    - Use of dummy rounds; or
    - Literature search.
  
- **Type and Action**
  - Pistol, revolver, derringer, rifle, shotgun, etc.
  - Single action, double action, double action only, semiautomatic. Action type is not required on NIBIN-only firearms.
  - Examiner may add a secondary type (e.g., top-break, single-shot, double barrel, etc.).
  
- **Serial Number**
  - Record the serial number and its location. Location of serial number is not required for NIBIN-only firearms.
  - If no serial number is found/observed, a comparison of known firearms for serial number location(s) should be made. If the firearm was manufactured prior to 1968, and not stamped with a serial number, a notation of none or N/A shall be entered. This can be determined by comparison with reference firearms, or a literature search.
  - If serial number has been obliterated, see the Serial Number Restoration Procedure (Section 21).
  
- **General Rifling Characteristics (Encouraged for NIBIN-only firearms)**
  - Determine the general rifling characteristics (class characteristics) of the firearm.
    - Count the number of lands and grooves.
    - Determine the direction of twist (Right-hand, Left-hand).
  - Measurements may be made and recorded of the land and groove widths of the test bullets if these measurements are used in eliminating a firearm based on class characteristics.
  - Accu-Trans or other casting material may be used to make a cast of the barrel, and land and groove widths may be measured from this cast.
  
- **Safeties (Not required for NIBIN-only firearms)**



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- The examiner should list the type and position of all safeties incorporated into the firearm, both manual and passive. (e.g., lever safety, ¼ cock, ½ cock, grip safety, magazine safety, firing pin safety, rebound hammer, disconnect, etc.)
- Determine if safeties operate properly. This may be accomplished by engaging and disengaging all safeties, dry firing, or other means. If not operating properly, indicate observed problems.
- Operating Condition
  - For NIBIN-only firearms, test firing may be utilized to determine the operability of the firearm. This does not have to be documented.
  - On revolvers, determine if the cylinder rotates and locks-in during the single-action mode of firing. If the revolver will fire in the double-action mode, determine if the cylinder locks-in before the hammer is released from sear engagement.
  - When the hammer is cocked on firearms that fire in the single-action mode, determine if the hammer can be pushed off the sear.
  - Determine if there are any missing or broken parts.
  - If any safety or other component/system of the firearm is found to be defective, this defect should be described, investigated, and accounted for, to the extent possible. Any misfires or operational problems encountered during test firing shall be noted on the firearm worksheet or in the examiner's notes.
  - Before test firing, the examiner should test all semi-automatic firearms to ensure that they have not been altered either intentionally or through wear or damage to fire as automatic firearms.
  - Before test firing, the examiner should ensure the firing pin does not protrude from the breech on semi-automatic firearms. If firing pin protrusion is present, the pistol may slam-fire.
  - Additional procedures for function testing are found in Test Firing Methods (Section 6) of this manual.
- Bore Condition
  - Is the barrel relatively clean and/or oiled or fouled?
  - The examiner may run a clean patch or cotton tipped swabs through the barrel to assist in the examination.
  - The examiner may note any gunpowder residue, leading, copper fouling, oxidation/rust, dirt/debris, lint, etc.
  - **Specifically note any obstructions in the barrel or if the barrel appears bulged or cracked. Bulges may appear as rings when examining the bore.**
  - For NIBIN-only firearms, the bore shall be checked for obstructions or damage prior to firing. Documentation is not required.
- Trigger Pull (Not required for NIBIN-only firearms)

Trigger pull is defined as the amount of force which must be applied to the trigger of a firearm to cause sear release.

#### Single Action Trigger Pull

- Ensure that the firearm is unloaded.



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- Use the dead weight method with the barrel of the firearm perpendicular to the ground/floor.
- Rest the trigger hook of the standard trigger weight hanger on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm.
- The firearm will be cocked in the single action mode, with the safeties disengaged.
- Record in pounds the least amount of weight the trigger can carry that releases the hammer/striker from sear engagement. Record this amount to the nearest 1/8<sup>th</sup> pound.
- The use of dummy rounds should be considered when performing trigger pull analysis on rimfire revolvers to prevent damage to the firing pin.

#### **Double Action Trigger Pull**

- Ensure that the firearm is unloaded
- Use the dead weight method with the barrel of the firearm perpendicular to the ground/floor.
- Rest the trigger hook of the standard trigger weight hanger on the trigger where the average finger would normally rest, making sure it is not touching any other part of the firearm.
- The firearm should be in the double action mode with the hammer at rest and the safeties disengaged.
- Record in pounds the least amount of weight the trigger can carry that releases the hammer/striker from sear engagement. Record this amount to the nearest 1/8<sup>th</sup> pound.
- The use of dummy rounds should be considered when performing trigger pull analysis on rimfire revolvers to prevent damage to the firing pin.

- **Firing Pin**

- Examine firing pin and note its shape (e.g., hemispherical, rectangular, elliptical, etc.). Documentation of the firing pin shape is not required for NIBIN-only firearms but must be entered into the NIBIN system for acquisition of the images.
- Firing pin type (e.g., striker, inertia, fixed, etc.). Firing pin type is not required for NIBIN-only firearms.

- **Finish (Not required for NIBIN-only firearms)**

- Describe the finish or multiple finishes (e.g., stainless slide, gray aluminum frame, or blue barrel and tempered steel receiver).
- Describe any rust/oxidation on finish. Additional information may be found in Rusted Firearm Procedure (Section 9) of this manual.
- Describe any wear/damage/trauma to finish.

- **Capacity (Not required for NIBIN-only firearms)**

- On revolvers, enter the number of chambers in the cylinder.
- For other firearms, determine the maximum number of cartridges that can be loaded in the firearm, which may include chamber(s), internal magazine, or submitted detachable magazine(s).



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- Always use dummy rounds when determining capacity, except in those instances where no dummy rounds are available. Live ammunition may be used in a safe area (shoot tank/range). If live ammo is used, these cartridges must not be returned to the reference ammunition collection.
- Magazine(s)
  - Describe type and capacity of magazine(s) submitted with the evidence firearm.
  - If the magazine submitted with the firearm does not fit the firearm, this shall be noted. If the examiner can determine the type/manufacturer of the firearm that the magazine does fit, it should be noted.
  - NIBIN-only firearms only require documentation that a magazine(s) was submitted. This information may be recorded in the case notes.

- Barrel length (Not required for NIBIN-only firearms)

Barrel length is defined as the distance between the end of the barrel and the face of the closed breechblock or bolt for firearms other than revolvers. On revolvers, it is the overall length of the barrel including the threaded portion within the frame. Barrel length normally should include compensators, flash hidere, etc., if affixed.

See Barrel and Overall Length Measuring Procedure (Section 7) for additional information.

- Overall length (Not required for NIBIN-only firearms)

Overall length of a firearm is defined as the dimension measured parallel to the axis of the bore from muzzle to a line at right angles to the axis and at the rearmost point of the butt plate or grip.

See Barrel and Overall Length Measuring Procedure (Section 7) for additional information.

- Direction of Cylinder Rotation (Not required for NIBIN-only firearms)
  - For revolvers, describe the direction the cylinder rotates during normal operation (Clockwise or Counter-clockwise).
  - Revolvers are not routinely entered into the NIBIN system.
- Flare Marks (Not required for NIBIN-only firearms)
  - For revolvers only, check forward end of chambers for discharge rings (flare marks). If all chambers exhibit discharge rings, note any discharge rings that are more prominent than others.
  - Revolvers are not routinely entered into the NIBIN system.
- Ammunition Used for Test Firing
  - Record manufacturer, caliber, cartridge type, and bullet weight (e.g., Winchester 38 Special 130 gr FMC).

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- Product number and lot number, or unique identifier assigned to that lot of ammunition, should be recorded.
- Submitted evidence cartridges may be used for test firing.
  - Record manufacturer, caliber, cartridge type, and bullet weight, if known.
  - Evidence ammunition used for test firing should be engraved with exhibit number and examiner's initials. Alternatively, this may be noted on the test box.
  - If submitted evidence ammunition is used for test firing, it must be clearly reflected in the case notes and itemization. It may also be reflected in the report at the examiner's discretion.

- Ejection pattern (Not required for NIBIN-only firearms)

The ejection pattern of a firearm is the analysis of where a firearm ejects fired cartridge cases. This may be done in a general fashion (e.g. to the right of the shooter) or detailed fashion (e.g. 4-5' at 5 o'clock) at the examiners discretion.

If a detailed or situation-dependent ejection pattern is requested by the submitting agency, the examiner should reference Ejection Pattern Testing Procedure (Section 8).

- Location of Identifying Marks

- Firearms received as evidence shall be marked with the laboratory case number, exhibit number, and examiner's initials. It is the examiner's option as to where the marking will be located. The markings shall be permanently etched, and location recorded on the worksheet or in the case notes.
- Exception: Any police officer's service firearm shall not be marked permanently.
- Exception: NIBIN-only firearms are not required to be permanently marked and may be identified by serial number only. This should be indicated on the worksheet or in the case notes.
- Any other exception at the examiner's discretion. (e.g., a firearm recovered at a pawn shop and thought to be the suspected firearm, but eliminated by analysis, stolen firearms, wildlife cases, etc.)

- Any other data deemed relevant by the firearm examiner. These notations may be made on the worksheet or in the case notes. These notes may include:

- Trace evidence found on firearm.
- Areas with possible blood staining.
- Visual abnormalities (loose barrel, missing sights, attached scopes, etc.).
- Photographs.
- Photocopies.
- Other identifying data (importer, description of grips, etc.).
- Further function testing done in addition to standard procedures.
- The position of the extractor and ejector. Record clock hand settings in the relationship of the shooter (i.e. muzzle forward). Refer to the GRC Orientation Index.



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- Description of method used to obliterate serial number, if applicable. See Toolmark Tests and Casting Procedure (Section 20) and Serial Number Restoration Procedure (Section 21) for additional information.
- If weapon was cleaned or oiled, methods used.
- Any other information deemed important about this firearm by the examiner or technician.

**5.9 Records:** The firearm examiner shall document their findings in the form of handwritten notes, computer generated notes, photography, and/or by utilizing a firearms worksheet.

**5.10 Interpretations of Results:** None.

**5.11 Report Writing:** Most firearm report writing can be found in Appendix 4 – Range of Conclusions. However, firearms occasionally are submitted inoperable or in poor condition and these Range of Conclusions may need to be modified.

**5.12 References:**

Association of Firearms and Toolmark Examiners Glossary, 5<sup>th</sup> Edition, 2007.

Association of Firearms and Toolmark Examiners Training Manual, March 3, 2001.

Association of Firearms and Toolmark Examiners Procedures Manual, July 9, 2001.

“Guidelines for the Documentation of Firearms Examination”, Scientific Working Group for Firearms and Toolmark Examiners, April 13, 2010.

“Technical Protocols for the Handling of Firearms and Ammunition”, FBI, June 1992.

“General Rifling Characteristics”, FBI.

“Federal Firearms Regulations Reference Guide”, ATF, 2005.