Firearms/Toolmarks Discipline
Case Assignment, Records, Results, and Verifications

1 Purpose

This document establishes the procedures for case assignment, records, conclusions rendered, and verifications that are specific to the Firearms/Toolmarks Discipline (FTD) of the FBI Laboratory. This document supplements the FBI Laboratory Quality Assurance Manual (QAM) and the FBI Laboratory Operations Manual (LOM).

2 Scope

The methodology utilized by the FTD is Evaluation, Classification, Comparison, Conclusion and Verification (E3CV). This methodology is utilized by trained, qualified and authorized personnel who handle evidence, perform classifications and comparisons, render conclusions, complete verifications, and issue results through the examination of evidence.

3 Casework Assignment

3.1 Case assignment in the FTD will be handled as outlined in the LOM *Practices for Assigning Cases and Conducting Examinations*.

3.2 Case assignment, as applied to Blind Verification (BV), will be handled as outlined in the FTD QAM *Blind Verification Procedure*.

3.3 The person performing routine casework assignments will review the incoming submission and make the appropriate assignment based on Examiner caseload, qualification(s), and authorization(s).

3.4 For new submissions directly related to a previous submission, the original Examiner should be assigned when practicable. However, if an alternate Examiner assignment is necessary, it will be based upon Examiner caseload, qualification(s), and authorization(s). The person performing casework assignments may reassign a submission if the original Examiner is unavailable.

3.5 Legacy casework information for the Scientific and Biometrics Analysis Unit / Toolmark Group (SBAU/TG) is maintained in the FBI Explosive Reference Tool (EXPeRT) database.

4 Case File Records

4.1 Legacy Records

4.1.1 Examination records consist of all case-related documentation that supports the results and/or conclusions presented in a *Laboratory Report*. In the FTD, examination records include:

- Information captured from test fired bullets/cartridge cases and test toolmarks
- Completed FTD Worksheets (*FTD QAM Case Assignment, Records, Results, and Verifications, Appendix B)*
- Attachments that accompany FTD Worksheets

4.1.2 Administrative records consist of case-related information that do not support the results and/or conclusions presented in a *Laboratory Report*. In the FTD, administrative records include:

- Laboratory Work Sheet
- *Activity and Communication Log* (7-245)
- *Chain-of-Custody Log* (7-243 and/or 7-243a)
- *Case Record Report*
- Secondary Evidence Log
- *FTD Technical and Administrative Review Form* (*TARF*, *FTD QAM Preparing, Reviewing, and Providing Results, Appendix B)*
- Copy of incoming requests

4.1.3 Each Examiner is responsible for ensuring a 1A envelope is generated that will become a serialized portion of the case file in Sentinel. At the time of an administrative review (see *FTD QAM Preparing, Reviewing, and Providing Results*), all records generated under one request for examination must be accounted for in their entirety. Each page of the examination records (e.g., *FTD Worksheets*) will be numbered sequentially, and the number of examination and administrative records, in total, will be recorded on the 1A envelope.

4.1.4 Where appropriate, envelopes may be used to contain voluminous case notes, photographs, or charts. The envelope will bear the laboratory number, initials of the Examiner, and a description of the contents (e.g., the totality of the contents of 34 photographs enclosed).

4.1.5 If personnel are unavailable to sign/record a *Chain-of-Custody Log*, the Unit Chief (UC) will sign on their behalf to maintain the continuity of the chain-of-custody. A record of the circumstances describing this necessity must be included in the *Activity and Communication Log*.

4.1.6 When personnel who have completed examination records (e.g., *FTD Worksheets*) are no longer with the FBI Laboratory, the issuing Examiner will record why the physical initials are not present in the *Activity and Communication Log*.

4.2 Forensic Advantage Records

Forensic Advantage (FA) can generate administrative and examination records. When preparing examination records, the *LOM - Practices for Assigning Cases and Conducting Examinations, LOM - Practices for Processing a Submission and Evidence Breakdown, LOM - Practices for Preparing, Reviewing, and Issuing Laboratory Reports and Retaining Records in Forensic Advantage (FA)* and *LOM - Practices for Processing a Single Unit Submission (SUS)* will be followed.

4.2.1 Examination records consist of all case-related documentation that supports the results and/or conclusions presented in a *Laboratory Report*. In the FTD, examination records include:

- Information captured from test fired bullets/cartridge cases and test toolmarks
- Completed FTD Worksheets ((*FTD QAM Case Assignment, Records, Results, and Verifications, Appendix B)*
- Attachments that accompany FTD Worksheets

4.2.2 Administrative records consist of case-related information that does not support the results and/or conclusions presented in a *Laboratory Report*. In the FTD, administrative records not already captured in FA will be maintained as described in section 4.1.3.

4.2.2.1 At the completion of an FA case, the Examiner will generate and retain the Case Record Report (CRR) to record the Technical and Administrative Reviewer's approvals and/or comments. This record must be retained electronically by uploading to Sentinel or printed and retained in the physical 1A as an administrative record.

5 Examination Records

5.1 When applicable, examinations performed will be recorded on the appropriate *FTD Worksheet* and will include the relevant description of the class and microscopic characteristics of the evidentiary item being examined.

5.1.1 When conducting examinations, the data fields on the *FTD Worksheets* represent the minimum amount of information required for examination records and cannot be eliminated from the form. For data fields not relevant to an examination, "not applicable" (or its derivative) will be entered into the field.

5.1.2 Examination records that pertain to unknown items of evidence shall be completed in order to document characteristics suitable for comparison prior to the actual comparison to a known item of evidence, to exemplars from a known item of evidence, or to another unknown item of evidence.

5.2 For records not captured on an *FTD Worksheet,* the laboratory number, date of examination(s), and Examiner's handwritten initials will be placed on each page.

5.3 When a source identification or fracture fit (through either microscopic comparison or physical fit evaluation) conclusion is reached, a photograph and/or image will be taken to illustrate and record the area(s) that supports the Examiner's conclusion.

5.3.1 A photograph and/or image produced through light comparison microscopy (LCM) and/or virtual comparison microscopy (VCM) that illustrates an Examiner's comparison conclusion will be included in the *FTD Results Worksheet*.

5.3.2 When a photograph and/or image cannot be captured, the examiner will include a detailed description of the location and marks that support the conclusion. This description will be included in the *FTD Results Worksheet*.

5.3.3 If an item is too large for LCM photography, a photograph using a DSLR or equivalent camera may be used for the documentation.

5.4 A source exclusion will be recorded in the examination records and may be accompanied with a photograph.

5.5 Abbreviations and notations are acceptable if they are readily comprehensible and/or are clearly recorded. A list of common discipline abbreviations appears in the *FTD QAM Case Assignment, Records, Results, and Verifications, Appendix A*.

5.6 Examination records must be sufficient in detail that, without the benefit of the evidence itself, another qualified Examiner can understand what was being examined and how the Examiner arrived at the reported conclusions.

6 Results / Conclusions

6.1 The conclusions that can be reached within the FTD are described in sections 6.3 to 6.4. The FTD Report Language (*FTD QAM Preparing, Reviewing, and Providing Results*) outlines the methods and limitations statements that must be included in a *Laboratory Report*.

6.2 All conclusions will be recorded on the *FTD Results Worksheet*. Documentation of a conclusion will include a listing of the items compared, the corresponding conclusion(s), and date and initial (to include printed name) or signature of the Examiner.

6.3 Conclusions for Pattern Examinations

6.3.1 Source Exclusion (i.e., Excluded, Elimination)

Source exclusion is an Examiner's conclusion that two toolmarks (firearm or non-firearm) did not originate from the same source.

6.3.1.1 The basis for a source exclusion is an Examiner's opinion that two toolmarks can be differentiated by their class characteristics[1].

6.3.1.2 A source exclusion is reached when there is a discernible or measurable difference in class characteristics. Class differences may result from intentional design decisions made by the manufacturer or from minor variations in tool dimensions or finishing methods that are within acceptable manufacturing tolerances for a particular tool.

6.3.2 Source Identification (i.e., Identified, Identification)

Source identification is an Examiner's conclusion that two toolmarks (firearm or non-firearm) originated from the same source. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and that the quality and quantity of corresponding individual characteristics is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another source, and has found insufficient disagreement of individual characteristics to conclude they originated from different sources.

6.3.2.1 The basis for a source identification conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics provide extremely strong support for the proposition that the two toolmarks came from the same source and extremely weak support for the proposition that the two toolmarks came from different sources.

6.3.2.2 A conclusion of source identification is reached when the comparison of the microscopic marks demonstrates sufficient agreement. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by the correspondence of a pattern or combination of patterns of surface contours. Agreement is significant when the agreement in the microscopic marks exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool.

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[1] The Department of Justice Uniform Language for Testimony and Reports for Forensic Firearms/Toolmarks Discipline – Pattern Match Examination allows for a source exclusion to be based upon differences in individual characteristics. A source exclusion based upon differences in individual characteristics is not approved by the FBI Laboratory Firearms/Toolmarks Discipline. This determination is based on the observations that indicate individual characteristics may not be permanent.

6.3.2.3 A source identification is the statement of an Examiner's opinion (an inductive inference[2]) that the probability that the two toolmarks were made by different sources is so small that it is negligible. A source identification is not based upon a statistically-derived or verified measurement or an actual comparison to all firearms, tools, or toolmarks in the world.

6.3.3 Inconclusive (i.e., No Conclusion)

Inconclusive is an Examiner's conclusion that all observed class characteristics are in agreement but there is insufficient quality and/or quality of corresponding individual characteristics such that the Examiner is unable to identify or exclude the two toolmarks (firearm or non-firearm) as having originated from the same source.

6.3.3.1 The basis for an inconclusive conclusion is an Examiner's opinion that there is an insufficient quality and/or quality of individual characteristics to identify or exclude. Reasons for an inconclusive conclusion include the presence of microscopic similarity that is insufficient to form the conclusion of source identification; a lack of any observed microscopic similarity; or microscopic dissimilarity that is insufficient to form the conclusion of source exclusion.[1]

6.3.3.2 An inconclusive conclusion indicates that the microscopic marks in question may or may not have originated from the same or known source.

6.4 Conclusions for Fracture Examinations

6.4.1 Exclusion

Exclusion is an Examiner's conclusion that two or more fractured items do not physically fit together. When an exclusion decision is reached between fractured items from the same object, it is based on a one-to-one comparison of those fractured items.

6.4.1.1 The basis for an exclusion conclusion is an Examiner's opinion that the observed class characteristics and/or corresponding individual characteristics of the two or more fractured items provide extremely strong support for the proposition that the fractured items do not physically fit together and extremely weak or no support for the proposition that the fractured items physically fit together.

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[2] Inductive reasoning (inferential reasoning):

A mode or process of thinking that is part of the scientific method and complements deductive reasoning and logic. Inductive reasoning starts with a large body of evidence or data obtained by experiment or observation and extrapolates it to new situations. By the process of induction or inference, predictions about new situations are inferred or induced from the existing body of knowledge. In other words, an inference is a generalization, but one that is made in a logical and scientifically defensible manner. OXFORD DICTIONARY OF FORENSIC SCIENCE 130 (Oxford Univ. Press 2012).

6.4.2 Fracture Fit

Fracture fit is an Examiner's conclusion that two or more fractured items were once part of the same object. This conclusion is an Examiner's opinion that all observed class characteristics are in agreement and the quality and quantity of corresponding individual characteristics of the fractures is such that the Examiner would not expect to find that same combination of individual characteristics repeated in another object and has found insufficient disagreement in individual characteristics to conclude they originated from different objects. This conclusion can only be reached when two or more fractured items physically fit together or when a comparison of the corresponding fractured surfaces reveals a fit.

6.4.2.1 The basis for a fracture fit conclusion is an Examiner's opinion that the observed class characteristics and corresponding individual characteristics of the two or more fractured items provide extremely strong support for the proposition that they were once part of the same object and extremely weak support for the proposition that the fractured items originated from different objects.

6.4.2.2 A fracture fit conclusion is the statement of an Examiner's opinion (an inductive inference[2]) that the probability that two or more fractured items were not part of the same object is so small that it is negligible. A fracture fit conclusion is not based upon a statistically-derived or verified measurement or an actual comparison to all fractured items in the world.

6.4.3 Inconclusive

Inconclusive is an Examiner's conclusion that no determination can be reached as to whether two or more fractured items could have originated from the same object.

6.4.3.1 The basis for an inconclusive conclusion is an Examiner's opinion that there is an insufficient quantity and/or quality of observed characteristics to determine whether two or more fractured items could have originated from the same object. Reasons for an inconclusive conclusion include the presence of physical or microscopic similarity that is insufficient to form the conclusion of fracture fit; a lack of any observed similarity; or physical or microscopic dissimilarity that is insufficient to form the conclusion of exclusion.[3]

7 Verifications

7.1 An examiner conducting verification will be qualified and authorized in the same component/parameter within the discipline. For field examinations in which a verification may be necessary, a verifier must be available to complete the verification.

7.1.1 Verifications involve the physical and/or virtual examinations of the items listed in the corresponding result statement.

7.1.1.1 Verifications utilizing LCM will involve the physical examinations under a comparison microscope.

7.1.1.2 Verifications utilizing VCM will involve the virtual observations using an approved 3D topographical instrument(s).

7.1.2 Results of the verification will be recorded on the *FTD Results Worksheet*.

7.1.2.1 The verifier is responsible for ensuring that the item designations listed on the *FTD Results Worksheet* are correct.

7.1.2.2 If the verifier agrees with the conclusions of the original Examiner, they will record the item identifiers and the conclusions on the *FTD Results Worksheet*. The verifier will also date and initial (to include printed name) or sign the *FTD Results Worksheet*.

7.1.3 In the event the verifier disagrees with an identification, fracture fit or elimination opinion, the Examiner is prohibited from requesting a verification from a third Examiner. The Examiner and verifier will follow the *LOM - Practices for Resolution of Scientific or Technical Disagreement.*

7.1.3.1 If the original Examiner chooses to agree with the verifier, and changes their conclusion, the reason for the change, the identity of the Examiner making the change, and the date of the change shall be recorded on the *FTD Results Worksheet.* See *LOM - Practices for Resolution of Scientific or Technical Disagreement.*

7.2 Identification

Verifications will be performed on all source identification and fracture fit conclusions.

7.3 Exclusion (Elimination)

7.3.1 Verifications will not be performed for elimination conclusions when there is a difference in general features.

7.3.2 Verifications will be performed when a minor difference in a measured class characteristic is the basis for the exclusion.

7.3.3 Verifications are not required when an exclusion is based on a noticeable measured difference in class characteristics or the physical comparison of a discernible difference in class characteristics.

7.4 Serial Number Restoration Verifications

Complete (non-transitory in nature) serial number restorations requires a verification.

Verification will involve physical observations and if necessary, stereoscopic examinations. The results of the verification will be recorded on the *FTD Serial Number Restoration Worksheet* (*FTD QAM Case Assignment, Records, Results, and Verifications, Appendix B).*

7.5 Gunshot Residue and Shot Pattern Distance Determination Verifications

Distance approximations (brackets) determined for muzzle-to-garment or shot pattern distances requires a verification. Verification will involve physical observations of test exemplars and evidence. The results of the verification will be recorded on the *FTD Gunshot Residue Distance Determination Worksheet* (*FTD QAM Case Assignment, Records, Results, and Verifications, Appendix B).*

7.6 Verification for Expedited Results

If expedited examination results are provided to a contributor prior to any technical or administrative reviews, the instructions outlined in the LOM - *Practices for Preparing, Reviewing, and Issuing Laboratory Reports and Retaining Records in Forensic Advantage (FA)* or the LOM - *Practices for Preparing, Reviewing, and Issuing Laboratory Reports and Retaining Records for Legacy Cases*, as appropriate, will be followed.

7.6.1 When an expedited result is requested of the FTD and a verification is necessary for the result, the expedited result will not be released until a verification has been performed and recorded as outlined in Sections 7.1 through 7.5.

8 References

Association of Firearm and Tool Mark Examiners (AFTE) Journals, July 1992, Vol. 24, No. 3 and Fall 2011, Vol. 43, No. 4.

FBI Laboratory Quality Assurance Manual

FBI Laboratory Operations Manual

Glossary of the Association of Firearm and Tool Mark Examiners, AFTE Training and Standardization Committee, 6th Edition, Version 6.030317.1.

"SWGGUN Admissibility Resource Kit (ARK)." Resources, The Association of Firearm and Tool Mark Examiners. Web, accessed 6 March 2021.

United States. Department of Justice. Office of Legal Policy. Forensic Science. (2020, August) *Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Fracture Match Examination*. Retrieved from the Department of Justice Web site: https://www.justice.gov/olp/page/file/1284761/download

United States. Department of Justice. Office of Legal Policy. Forensic Science. (2020, August) *Department of Justice Uniform Language for Testimony and Reports for the Forensic Firearms/Toolmarks Discipline – Pattern Match Examination*. Retrieved from the Department of Justice Web site: https://www.justice.gov/olp/page/file/1284766/download

Rev. #	Issue Date	History
0	03/02/20	Original issue for Firearms/Toolmarks Discipline, which includes the Firearms/Toolmarks Unit and Scientific and Biometrics Analysis Unit/Toolmark Group. Portions of an existing document (*FTD Case Assignment, Records, Report Writing and Review, Rev 14, 02/13/2019*) were excerpted or modified to create this document. The Scope of the document was expanded to add the E3CV methodology. Edits were made to titles of referenced documents where those titles have changed. Edits were made to reflect the May 26, 2019 reorganization. Minor changes for grammar and clarity were made throughout the document and sections were re-numbered. The FTD BV form was removed as an administrative document and the CRR was added. Additions were made to comply with requirements of ANAB and FBI Laboratory QAM and LOM in sections 5.1.2 and 7.1.3.1. Sections 4.2.1.2.1, and 5.3.3 were added. Sections 5.3 and 7.2 updated to comply with ULTR language. Section 6.3.1.2 was updated to align with reporting language. Section 7.1.3.1 was added for ANAB compliance. Removed Pressure Plate worksheet and updated remaining FTD Worksheets. SWGGUN ARK reference updated. Footnote 2 reference updated and errors in definition corrected.
1	04/15/21	Renumbered Section 4.2; Photography requirement (Section 5.3) edited for clarity; Abbreviations usage (Section 5.4) edited to exempt common abbreviations; Edits made to abbreviation list to add and remove; Sections 6.3, 6.4, 7.1.3, 7.2 edited to align with DOJ ULTRs; Terminology updated in Section 7. Added abbreviations to Appendix A. Updated FTD Worksheets (Appendix B)

Approval

Redacted - Signatures on File

Firearms/Toolmarks
Acting Unit Chief — Date: 04/15/2021

Scientific & Biometrics
Analysis Unit Chief — Date: 04/15/2021

Firearms/Toolmarks
Technical Leader — Date: 04/15/2021

QA Approval

Quality Manager — Date: 04/15/2021

Appendix A: *FTD Abbreviations*

Additive Manufacturing	AM
Agent Involved Shooting	AIS
appears to be	ATB, atb
aluminum	Al
autoloading	auto
Bureau of Alcohol, Tobacco, and Firearms	ATF, BATF
Barrel length	BL
brass	Br
breechface	bf
bullet	bul
caliber	cal
capacity	cap
cartridge case	CC, C.case, cart. case
Cascade Cartridge Inc.	CCI
Combined Explosives Exploitation Cell	CEXC
consistent with	con/w
could not determine	CND
copper	cu
double action	DA
diameter	dia
directionally focused fragmentation charge	DFFC
explosively formed projectile	EFP
Explosive Reference Tool	EXPeRT
elimination	elim
ejector	ejt, ejr
electronic tracing system	eTrace
evaluation of microscopic marks	EOMM
explosive ordnance disposal	EOD
extractor or extremely	ext
extractor mark	EM
Federal cartridge co.	Fed, FC, FCC
feet	ft
full metal case	FMC
full metal jacket(ed)	FMJ
firing pin	fp
firing pin impression	fpi
fragment	frag
firearms/toolmarks discipline	FTD
firearms/toolmarks unit	FTU
Fracture marks of value	FMOV
function when test fired	FNWTF
gauge	ga

groove impression(s)	GI, gimp(s)
groove engraved area	GEA
grains	gr
general rifling characteristics	GRCs
gunshot residue	GSR
hollow point	hp
Hydrochloric Acid	HCl
identification	ID
impression	imp
improvised explosive device	IED
inches	in
Inconclusive	INC
initialed	init
initials	inits
inside diameter	IND
insufficient	insuff
jacketed hollow point	JHP
jacketed soft point	JSP
Lead	Pb
left twist	L
land impression(s)	LI, limp(s)
land engraved area	LEA
light comparison microscopy	LCM
limited	lim, ltd
limited microscopic marks of value	LMOV
long rifle	LR
Luger	Lug
magazine marks	MM
magazine, magnum	mag
modified griess	MGriess, Mod Griess
manila envelope	me
marks	mks
marked	mkd
microscopic marks of value	MOV
millimeters	mm
model	mod
nickel	Ni
National Crime Information Center	NCIC
National Integrated Ballistic Information Network	NIBIN
National Institute of Standards and Technology	NIST
no microscopic marks of value	NMOV
observable physical characteristics	OPCs
outside diameter	OD
overall length	OAL

Package	pkg
plastic bag	plb
pressure plate	pp
right twist	R
Remington	Rem
Reference Ammunition File	RAF
Reference Firearms Collection	RFC
render safe procedure	RSP
resealable plastic bag	rplb
round nose	RN
sandal foam	sf
Scientific & Biometrics Analysis Unit	SBAU
sealed plastic bag	splb
single action	SA
Sporting Arms and Ammunition Manufacturers Institute	SAAMI
Secondary	2°
semi-jacketed hollow point	SJHP
submachine gun	SMG
Sodium Rhodizonate	SoRho
serial number	SN, S#
special	spl
Special Operations Forces Exploitation	SOFEX
Springfield	sprg
stainless steel	ssteel
semi-wadcutter	SWC
semi-wadcutter HP	SWCHP
Terrorist Explosive Device Analytical Center	TEDAC
test fired okay	TFOK
three-dimensional	3D
toolmarks	TM
Total Metal Jackets	TMJ
toolmarks of value	TMOV
Toolmark Group	TG
trigger pull weight	tp
unable to determine	utd
virtual comparison microscopy	VCM
with	w/
wadcutter	WC
Winchester	Win
weight	wt
Weapons Technical Intelligence	WTI
WTI Exploitation Analysis Tool	WEAT

Appendix B: *Worksheets – Bullet*

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Appendix B: *Worksheets – Cartridge Case*

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Appendix B: *Worksheets – Firearm Function*

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Appendix B: *Worksheets – Firearm*

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Appendix B: *Worksheets – General Examination*

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Appendix B: *Worksheets – Gunshot Residue*

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Appendix B: *Worksheets – Results*

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Appendix B: *Worksheets – Serial Number Restoration*

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Appendix B: *Worksheets – Tool*

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Appendix B: *Worksheets – Toolmark*

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