



TABLE OF CONTENTS

Table of Contents	1
Revision History.....	2
01 Fundamentals Unit.....	3
FR-TM-01-01 Overview of the Friction Ridge Training Program.....	3
FR-TM-01-02 History of Fingerprints.....	10
FR-TM-01-03 Physiology of Friction Ridge Skin	14
FR-TM-01-04 Report Writing and Case Review.....	17
FR-TM-01-05 Court Testimony for Friction Ridge Discipline.....	22
02 Chemical Testing and Digital Image Processing Unit	28
FR-TM-02-01 Friction Ridge Laboratory, Equipment, and Safety	28
FR-TM-02-02 Documentation of Examinations.....	31
FR-TM-02-03 Development Techniques	33
FR-TM-02-04 Preservation of Friction Ridge Detail – Lifting and Casting	40
FR-TM-02-05 Preservation of Friction Ridge Detail – Digital	42
FR-TM-02-06 Digital Imaging of Friction Ridge Detail.....	49
03 Comparison Unit	54
FR-TM-03-01 Pattern Interpretation	54
FR-TM-03-02 Friction Ridge Exemplars.....	57
FR-TM-03-03 Friction Ridge Classification Systems and AFIS.....	61
FR-TM-03-04 Basic Friction Ridge Comparison	64
FR-TM-03-05 Analysis	67
FR-TM-03-06 Comparison and Evaluation.....	71
FR-TM-03-07 Verification	73
04 Forms	76
Training Forms 76	
Friction Ridge Training Checklist	76



REVISION HISTORY

Effective Date	Brief Description of Change(s)
8/10/2020	Original Issue Previous revision history for individual chapters included in archived documents



01 FUNDAMENTALS UNIT

FR-TM-01-01 OVERVIEW OF THE FRICTION RIDGE TRAINING PROGRAM

1 Introduction

Individuals employed by the Texas Department of Public Safety as forensic scientists in the Friction Ridge discipline must meet specific qualifications before being approved to perform casework. Qualifications consist of educational requirements, general laboratory training requirements, chemical testing training requirements, and comparison training requirements.

2 Requirements

- A. A forensic scientist in the Friction Ridge discipline shall meet the education and course requirements as listed in the job description.
- B. A trainee must successfully complete competency tests before beginning supervised work responsibilities.

3 Purpose

The Friction Ridge Training Program is designed to provide the trainee with sufficient background knowledge, laboratory skills, education, competency, and supervised hands-on experience to adequately perform independent friction ridge work with minimal supervision.

4 Program Format

- A. The training time for a forensic scientist in the Friction Ridge discipline is approximately 18 to 24 months. Trainees having prior experience in latent print comparison and/or chemical testing may be evaluated in order to modify the training time and program according to their skills and knowledge. Any modifications to the training program must be documented in the training notebook and approved by the System Quality Manager and the TPOC from the laboratory hosting the training.
- B. The training program is divided into three units, each consisting of a set of modules. In addition, every trainee must complete General Laboratory Training.
 1. **General Laboratory Training** – Introduces the trainee to general laboratory practices, forensic science, quality assurance, general laboratory safety, legal issues, ethics, and department and laboratory policy.
 2. **Fundamentals Unit** – Introduces the trainee to the history of fingerprints, the biological principles supporting friction ridge comparisons, court testimony, report writing, and case review.
 3. **Chemical Testing and Digital Image Processing Unit** – Introduces the trainee to equipment use, development techniques, preservation of friction ridge detail, and digital image processing.
 4. **Comparison Unit** – Introduces the trainee to pattern interpretation, recording exemplars, classification systems, and the Analysis, Comparison, Evaluation and Verification (ACE-V) methodology.



5 Safety

- A. Chemicals used may be toxic and flammable.
- B. Biological specimens may contain infectious agents. Use appropriate laboratory safety precautions and observe Universal Bloodborne Pathogens precautions, as outlined in the Safety Program Manual.
- C. All firearms shall be treated as being loaded until they are verified to be unloaded.

6 Responsibilities

6.1 Trainer Responsibilities

- A. Meetings between the trainee, the trainer, and/or the supervisor should be held weekly in order to evaluate the trainee's progress, plan future study and practical assignments, and discuss any deficiencies requiring additional training.
- B. The trainer will document the trainee's progress. The specific duration of each module is an approximation only and may be adjusted at the trainer's discretion.

6.2 Trainee Responsibilities

- A. The training program covers information that requires the trainee to keep up with reading assignments on a self-study basis. The beginning of each module provides a suggested timeframe for completion. The trainee is responsible for informing his/her trainer or supervisor when problems arise at any time during the training period.
- B. The trainee must maintain detailed records of training in a training notebook that is updated on an ongoing basis. The notebook must be available for review at any time during the training period by the trainer, quality assurance, or management.
- C. The trainee will read and sign the International Association for Identification (IAI) *Code of Ethics for Latent Print Examiners* and retain in the training notebook.
- D. The Friction Ridge Training Manual will list required and suggested readings. The trainee should thoroughly research the selected topics for complete understanding of the material presented. The trainee is expected to actively look for pertinent reading material in addition to those readings listed. Supplemental articles and handouts not listed in the Training Manual may be provided to the trainee for additional reading.

6.3 Friction Ridge Training Notebook

Note: All case information, including case number, names, and any other identifying information, will not be included in the training notebook, with the exception of cases listed on the Supervised Work Log (LAB-307).

- A. During the training program, the trainee is responsible for keeping training records in a notebook.
- B. Contents of the training notebook include:
 - 1. Friction Ridge Training Checklist (LAB-FR-TM-01)
 - 2. Results, documentation, and/or other products of Observed/Supervised Performance and Independent Exercise activities, as outlined in training modules.
 - 3. Competency test(s) and results
 - 4. Written examination(s)



5. Training Record (LAB-303) of activities not captured on the Training Checklist
 - a) *Supplementary training activities*
 - i. *Research, if performed (summary of participation)*
 - ii. *Special projects (summary of participation)*
 - b) *List of supplemental reading (books, articles, etc.) completed*
 - c) *List of supplemental in-house training videos viewed*
 - d) *List of lectures, schools, conferences attended*
6. List documenting the number of cases and type of cases the trainee observed being worked by other examiners. This can include:
 - a) *Laboratory processes observed (LAB-303)*
 - b) *Consults with other disciplines observed (LAB-303)*
7. List of courtroom testimony attended and observations/evaluations (LAB-306)
8. *Code of Ethics for Latent Print Examiners*, signed by trainee
9. Supplemental to the training notebook: Supervised Work Log (LAB-307)

7 Review and Authorization

7.1 Training Program Assessment

- A. The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of each module.
- B. The trainee will provide an assessment (LAB-304) of each unit completed to the trainer and supervisor.

7.2 Observed Performance

The trainee will observe forensic scientists in the Friction Ridge discipline perform various aspects of their job duties prior to the Practical Exercises and Competency Tests.

7.3 Supervised Performance

The trainer will observe the trainee perform various aspects of their job duties prior to the Independent Exercises.

7.4 Independent Exercises

Independent Exercises will cover aspects of the friction ridge training material provided within the module. Independent Exercises will be assigned as:

A. Brief Summaries

The trainee will complete assigned brief summaries of the Training Outline Lesson Plan that focus on key concepts. The trainer will review the summaries for completeness and accuracy.

B. Practical Exercises

The trainee will complete assigned practical exercises. The trainer will review the exercises for completeness and accuracy.



C. Practical Analysis, Comparison, Evaluation, and Verification (ACE-V) Exercises

The trainee will successfully complete exercises as determined by the trainer and/or supervisor which include Target Group Memorization; Exemplar to Exemplar Comparison; Analysis; Comparison and Evaluation; and Verification. The results will be documented as instructed for each exercise by the trainee and provided to the trainer for evaluation. Practical ACE-V Exercises will be graded **Pass** or **Fail**, and if no errors are present, the trainer will also indicate result as **All Correct** on the exercise. If errors are made, the trainer will document the type of error as listed below:

1. **Clerical errors** do not indicate test failure. The trainer will mark the error on the documentation and the trainee will strikethrough the error, handwrite in the correction, initial, and date.
2. **Missed identification** may or may not indicate test failure. The trainer will return a missed identification to the trainee for a second attempt to independently search for the corresponding print. If the identification is made, the trainer will indicate result as **All Correct-Second Attempt** on the exercise.
 - a) *The trainer and the trainee will discuss the missed identification in an attempt to determine the root cause of the missed identification and identify strategies to prevent similar missed identifications in the future.*
 - b) *If the trainee is unable to make the identification, the trainer will consult with the trainee in an effort to guide the trainee to a thorough analysis of the print that should allow the trainee to make the identification. If the identification is made, the trainer will indicate result as **All Correct-Third Attempt** on the exercise.*
 - c) *If the trainee is still unable to make the identification, the trainer will provide the trainee composites of the print with the corresponding exemplar. The trainee and trainer will work through the comparison and attempt to determine the root cause of the missed identification and identify strategies to prevent similar missed identifications in the future. The trainer will indicate result as **All Correct-Consult** on the exercise.*
3. **Erroneous identification** will indicate test failure. The trainer will indicate result as **Fail** on the exercise. The supervisor, trainer, and trainee will consult to determine the root cause of the error. Additional training in the comparison and identification of friction ridge detail shall occur and additional Practical ACE-V Exercises will be assigned.

7.5 Qualifying Examinations

- A. Qualifying Examinations will cover aspects of the friction ridge training material provided within the corresponding module or unit. Questions on the written examination will deal with knowledge of the theory, understanding of the subject matter, scientific application, critical thinking, and synthesis of the knowledge in its application.
- B. Qualifying Examinations will be graded. Any incorrect answers will be returned to the trainee in order to make appropriate corrections. The trainer will document result as **Pass/Fail** on the exam.
 1. The passing score for all Qualifying Examinations is $\geq 75\%$. The trainer and trainee will discuss any incorrect answers. The trainer will document result as **Pass** on the exam.



2. A score of <75% will require evaluation of deficiency, root cause identified and documented, additional training, and another test will be provided to the trainee. The trainer will document $\geq 75\%$ result as **Pass-Second Attempt**.
3. If the retest grade is <75%, an HR process begins in accordance with Department policy.

7.6 Competency

Competency requirements for Chemical Testing and Digital Image Processing Unit, Comparison Unit, and Friction Ridge Training Program are outlined below.

- A. The trainee will prepare bench notes utilizing either the Laboratory Information Sheet (LAB-403, LAB-404) and the Friction Ridge Worksheet (LAB-FR-01) or only the Friction Ridge Worksheet.
- B. If a competency test is failed, the deficiency is evaluated, root cause identified and documented in the training record, additional training is provided, and a second competency test is given. If the trainee is unable to pass the second competency test, the Quality Manager is notified and an HR process begins in accordance with Department policy.
- C. Chemical Testing and Digital Image Processing Unit
 1. At the completion of the Chemical Testing and Digital Image Processing Unit, the trainee will complete a competency test. The competency test will require the trainee to examine sufficient test items to cover the spectrum of approved processing and preservation techniques.
 2. The trainer will review the competency test for completeness and accuracy and indicate result as **Complete** on the test. If the trainee does not successfully complete the competency test, the trainer will document **Fail** on the test.
- D. Comparison Unit
 1. At the completion of the Comparison Unit, the trainee will complete a competency test. This test will not be administered until the trainee has successfully completed progressively more challenging Practical ACE-V Exercises with conclusions that are scientifically supported by the evidence, as determined by the trainer and/or the supervisor.
 2. The competency test will be graded. The trainer will document result as **Pass/Fail** on the competency test. If there are no errors, the trainer will indicate result as **All Correct**. If errors are made, the trainer will document the type of error as listed below:
 - a) **Clerical errors do not indicate test failure. The trainer will mark the error on the documentation and the trainee will strikethrough the error, handwrite in the correct answer, initial, and date.**
 - b) **Missed identification may or may not indicate test failure. The trainer will return a missed identification to the trainee for a second attempt to independently search for the corresponding print.**
 - i. **If the identification is made, the trainer will indicate result as All Correct-Second Attempt on the competency test. The trainer and the trainee will discuss the missed identification in an attempt to determine the root cause of**



the missed identification and identify strategies to prevent similar missed identifications in the future.

- ii. *If the trainee is unable to make the identification, the trainer will indicate result as **Fail** on the competency test.*
- c) **Erroneous identification** will indicate test failure. The trainer will indicate result as **Fail** on the competency test.

E. Friction Ridge Training Program

1. The trainee will complete a mock friction ridge case at the end of the training program as a comprehensive competency test.

2. Report Writing

The trainee will formulate a report based on their results of analysis and interpretation of evidence processed in a mock case. The report will demonstrate the trainee's ability to properly convey results and conclusions and will be the basis of the trainee's mock trial.

3. Mock Trial

- a) *The trainee will provide testimony in a mock trial based on the mock case worked during the Friction Ridge Training Program Competency Test.*
- b) *The Testimony Technical Review form (LAB-313) is used to document performance regarding the technical aspects of the testimony. All results must be Yes or N/A to be considered passing.*
- c) *The Testimony Survey Form (LAB-314) is used to document performance regarding the examiner's behavior, demeanor, manner, etiquette, delivery, and professionalism. All ratings must be average or above to be considered passing.*

7.7 Work Authorization

A. Upon completion of the training program, the trainee may begin performing supervised work with the approval of the Laboratory Director using the Work Authorization form (LAB-309).

B. Supervised Work

- 1. The trainee will complete assigned supervised work. The mentor will observe the trainee perform casework, perform full evidence reviews of all evidence processed, perform suitability reviews, and perform verifications.
- 2. The mentor may not serve as the technical reviewer and it is recommended that the mentor not serve as the administrative reviewer.
- 3. Due to the varied nature and complexity of the assigned supervised cases, the number of cases completed and the time required to complete supervised work will vary.

- a) *Trainees with no prior latent print comparison experience:*
 - i. *Chemical Testing: The trainee must complete 5 cases that involve chemical testing. Additional supervised cases may be assigned at the discretion of the mentor and supervisor.*
 - ii. *Digital Image Processing and Comparison: The trainee must complete 20 cases that involve digital image processing and comparisons. Additional supervised cases may be assigned at the discretion of the mentor and supervisor.*



- b) *Trainees with documented prior latent print comparison experience:*
 - i. Chemical Testing: *The trainee must complete 5 cases that involve chemical testing. Additional supervised cases may be assigned at the discretion of the mentor and supervisor.*
 - ii. Digital Image Processing and Comparison: *The trainee must complete 5 cases that involve digital image processing and comparisons. Additional supervised cases may be assigned at the discretion of the mentor and supervisor.*
- C. The trainee will be recommended by the trainer to be approved to perform independent work after demonstrating to the mentor the ability to accurately examine and process evidence for friction ridge detail, preserve friction ridge detail, digitally process preserved images, and form accurate comparison conclusions during their supervised work.
- D. The Quality Manager approves the trainee to conduct independent work by signing the Work Authorization form (LAB-309).

7.8 Retraining

Retraining will be conducted as outlined in the Employee Training Program chapter of the CLS Manual and will be documented in the training record.



FR-TM-01-02 HISTORY OF FINGERPRINTS

Duration 2 to 3 weeks

Purpose Provide the trainee with historical aspects of the science of fingerprints and provide an extensive background on fingerprint identification.

Prerequisite FR-TM-01-01, General Laboratory Training Manual: Fundamentals Unit

1 Objectives

1.1 Theoretical

Friction ridge identification is an invaluable tool worldwide. This module will provide a backbone for the history of the use of fingerprints that dates from ancient times to the present. The trainee will gain a global understanding of the progression of fingerprint identification throughout history to realize how the science of fingerprints has evolved, as well as develop an understanding for the impact on the discipline in the state of Texas.

1.2 Practical

Following the completion of training, the trainee will be able to discuss:

- A. Early pioneers in the field and their impact on the discipline.
- B. Scientific researchers of the friction ridge skin and their impact on the discipline.

2 Training Outline

2.1 Lesson Plan

- A. The use of fingerprints in ancient times
 1. Megalithic artworks
 2. Babylon clay tablets
 3. China clay seals
- B. The use of fingerprints 221 B.C. to A.D. 1637
 1. Chinese business contracts
 2. Indian contracts
- C. Early pioneers in the discipline (18th to 20th Centuries)
 1. Thomas Bewick
 2. Sir William Herschel
 3. Henry Faulds
 4. Alphonse Bertillon
 5. Sir Francis Galton
 6. Juan Vucetich
 7. Sir Edward Richard Henry
 8. Edmond Locard
 9. Salil Kumar Chatterjee



- D. Scientific researchers in the discipline (biology, anatomy, embryology, and histology)
1. Nehemiah Grew
 2. Govard Bidloo
 3. Marcello Malpighi
 4. J.C.A. Mayer
 5. Johannes Evangelista Purkinje
 6. Hermann Welcker
 7. Arthur Kollmann
 8. Inez Whipple
 9. Harris Hawthorne Wilder
 10. Harold Cummins
 11. Alfred Hale
 12. Michio Okajima
 13. William Babler
- E. Modern era of the use of fingerprints
1. Henry Classification System starts in England and Wales (1901)
 2. Civil fingerprinting starts in New York State, Henry P. de Forest (1902)
 3. Fingerprinting starts in New York State Prisons, Captain James Parke (1903)
 4. St. Louis Exposition, Sgt. John Kenneth Ferrier (1904)
 5. The Will and William West Case (1904)
 6. Military starts fingerprinting, Army (1905)
 7. International Association for Identification (IAI) forms, originally named the International Association for Criminal Identification (1915)
 8. Large departments send fingerprint cards to the International Association of Chiefs of Police (IACP), St. Louis (1920's)
 9. FBI Criminal Identification Division started by Director J. Edgar Hoover (1924)
 10. The international exchange of fingerprint data (1932)
 11. Prototype fingerprint reader was developed (1972)
- F. Fingerprint history in the state of Texas
1. Texas starts state repository (1912)
 2. Texas DPS formed by the 44th Legislature (August 10, 1935)
 3. Texas DPS moves to its current location (1936)
 4. One millionth record created by DPS (1959)
 5. Houston Police Department implements the first automated system in state of Texas (1976)



6. Two millionth record created by DPS (1978)
7. Benchmark tests for Texas DPS automated system (1989)
8. Texas DPS Automated Fingerprint Identification System (1991; on-line January 1992)
9. Texas DPS adds palm print search capability (on-line March 2009)
10. FBI adds palm print search capabilities (2013)

2.2 Required Readings

- A. Ashbaugh, DR. *Quantitative-Qualitative Friction Ridge Analysis*. Boca Raton, FL: CRC Press; 1999. Chapters 2, 5.
- B. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 1.
- C. Cummins, H and Midlo, C. *Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics*. New York, NY: Dover Publications, Inc.; 1961. Chapter 1.
- D. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapter 1.
- E. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 1.
- F. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*; 2011. Chapter 1.

2.3 Suggested Readings

Michele Triplett's Fingerprint Dictionary. (online resource: <http://fprints.nwlean.net/a.htm>)

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

The trainer and trainee will discuss topics to ensure the trainee has a solid understanding of the significant events in the history of friction ridge identification.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will write a research paper on one historical figure or era in fingerprint history approved by the trainer. The paper must be at least 3 pages long with a bibliography. The paper will be maintained in the trainee's training notebook for review prior to completion of module. The trainee will present their paper at a section meeting.



4 Assessment

4.1 Competency and Qualifying Examination

The trainer will administer a written examination to the trainee.

4.2 Evaluation of Training

The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-01-03 PHYSIOLOGY OF FRICTION RIDGE SKIN

Duration 2 to 3 weeks

Purpose Educate the trainee with the terminology and anatomy of the friction ridge skin to provide a foundation for the understanding of the biological basis for the use of friction ridge detail in identification.

Prerequisite FR-TM-01-02

1 Objectives

1.1 Theoretical

Skin, the heaviest organ on the human body, functions to protect the inner contents of the body, allows for body temperature regulation, and provides a means for a sense of touch. On the palmar and plantar surfaces of the body, the skin is corrugated with ridges and furrows, and is known as friction ridge skin. This unique arrangement of friction ridge skin is formed in utero and remains unchanged except for size until after death, barring illness or injury.

The trainee will gain a broad understanding of the terminology and anatomy for the human hands and feet. The trainee will also develop an understanding of the human sweat glands and the components of natural latent print residue.

1.2 Practical

Following the completion of training, the trainee will be able to discuss:

- A. Friction ridge skin formation during fetal development.
- B. The biological basis of friction ridge skin uniqueness.
- C. The biological basis of friction ridge skin permanence.

2 Training Outline

2.1 Lesson Plan

- A. Structure of the friction ridge skin
 - 1. Friction ridges
 - 2. Friction ridge breadth
 - 3. Pores
 - 4. Specific ridge path
 - 5. Incipient ridges
 - 6. Friction ridge imbrication
 - 7. Layers of skin
 - a) *Epidermis*
 - i. *Stratum basale* (“generating layer”)
 - ii. *Epidermal cells*
 - iii. *Desmosomes*
 - iv. *Primary epidermal ridges*
 - v. *Secondary epidermal ridges*



- b) *Dermis*
 - i. *Dermal papillae*
 - ii. *Sweat glands*
- 8. Flexion creases
- B. The growth of friction ridge skin
 - 1. Limb development
 - 2. Volar pads
 - a) *Development of epidermis*
 - b) *Development of dermis*
 - c) *Primary ridge formation*
 - d) *Minutiae formation*
 - e) *Secondary ridge formation*
 - f) *Pattern formation*
 - g) *Genetic influence*
 - h) *Ridge path*
 - i) *Ridge morphology*
 - j) *Maturation of skin*
 - 3. Scar formation
- C. Abnormal friction ridges
 - 1. Effects of injury or disease
 - 2. Digit malformations
- D. Chemical composition of human sweat and latent print residue
 - 1. Sweat glands
 - a) *Eccrine*
 - b) *Apocrine*
 - c) *Sebaceous*
 - 2. Components
 - a) *Water*
 - b) *Organic compounds*
 - c) *Inorganic compounds*

2.2 Required Readings

- A. Ashbaugh, DR. *Quantitative-Qualitative Friction Ridge Analysis*. Boca Raton, FL: CRC Press; 1999. Chapter 2 (Scientific Researchers), Chapter 3, and pages 87 – 92.
- B. Cummins, H and Midlo, C. *Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics*. New York, NY: Dover Publications, Inc.; 1961. Chapters 2, 9 – 13.



- C. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapter 3.
- D. Lin, CH et al. "Fingerprint Comparison I: Similarity of fingerprints." *Journal of Forensic Sciences*. 1982 Apr, 27(2).
- E. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 2.
- F. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*, 2011. Chapters 2 and 3.
- G. Wertheim, K and Maceo, AV. "Friction Ridge Formation During the Critical Stage," *Journal of Forensic Identification*; 2002, 52 (1).

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

The trainer and trainee will discuss topics to ensure the trainee has a solid understanding of the biological basis for friction ridge identification.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will write a research paper on an aspect of the physiology of friction ridge skin approved by the trainer. The paper must be at least 3 pages long with a bibliography that includes at least one recent article. The paper will be maintained in the trainee's training notebook for review prior to completion of module. The trainee will present their paper at a section meeting.

4 Assessment

4.1 Competency and Qualifying Examination

The trainer will administer a written examination to the trainee.

4.2 Evaluation of Training

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-01-04 REPORT WRITING AND CASE REVIEW

Duration 2 to 3 weeks

Purpose Educate the trainee with report writing terminology to convey to the customer the results of analysis and interpretation, and the knowledge to accurately review the work of peers.

Prerequisite Chemical Testing and Digital Image Processing Unit; Comparison Unit

1 Objectives

1.1 Theoretical

The laboratory report is the culmination of the examination process in which scientific data is compiled into a format easily understood by any non-scientific recipient. The report is the method through which the examiner is able to state what the evidence means and also what it does not mean. The report should be able to “stand alone” since decisions may be made by customers based on the report without contacting the examiner. All results and/or conclusions in the formal report must be supported in the case documentation such that any supervisor or independent examiner would be able to draw the same conclusions after reviewing the detailed case record. A thorough review of each case record is performed to ensure that conclusions and supporting data are reasonable and within the constraints of scientific knowledge. There are two separate components to the case review process.

A. Technical Review

The technical review is an evaluation of the documentation to check for consistency, accuracy, and completeness. The review is an evaluation of reports, notes, composites, exemplars, and other documents to ensure an appropriate and sufficient basis for the scientific conclusions. The technical review must be conducted by a second qualified examiner.

B. Administrative Review

The administrative review is a review of the report and supporting documentation to check for consistency with laboratory policies and for editorial correctness. The administrative review must be conducted by someone other than the reporting examiner.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Reduce technical data to a concise conclusion.
- B. Produce a report in a format easily understandable to a non-scientist.
- C. Technically and administratively review friction ridge cases from the examinations performed and conclusions reached to the written report.

2 Training Outline

2.1 Lesson Plan

- A. Report writing (hotkey statements)
 1. Report Title
 2. Case Information
 3. Submission Information



4. Requested Analysis/Exam Count
 - a) *Result Data Extension*
 - b) *Date(s) of Analysis*
 5. Test Method(s)
 6. Evidence Description, Results of Analysis and Interpretation
 7. Investigative Leads and Requirements for Further Analysis
 8. Disposition
 9. Report Closing
- B. Technical Review
1. Utilize the Friction Ridge Technical Review Checklist (LAB-FR-05).
 2. The technical review will be performed on the final draft. The supporting case information should be organized in a logical fashion.
 3. The results, interpretations, opinions, and conclusions must be reasonable, within the constraints of validated scientific knowledge, and supported by the examination records.
 4. The reporting statements should be written to ensure that results are communicated properly and clearly to the customer.
- C. Administrative Review
1. The administrative review will be performed on the final draft to ensure that the report conclusion statements are logical and accurate and there are no spelling or grammatical errors.
 2. The chain of custody and disposition of the evidence will be reviewed for all evidence associated to the report.
- D. Crime Laboratory Service Manual topics
1. Review of Laboratory Records
 2. Document Management
 3. Deviation from Documented Procedures
 4. Quality Incident/Action Plan Process
 5. Examination Verification
 6. Case Record
 7. Laboratory Case Reports
 8. Control of Laboratory Records
 9. Conditional Release of Records and Information
 10. Evidence Management



2.2 Required Readings

- A. Texas Department of Public Safety Crime Laboratory Service Manual. (current version).
 1. Structural Requirements (Standard 5 – 17025), section 5.6
 2. Resource Requirements (Standard 6 – 17025), section 6.4 I
 3. Process Requirements (Standard 7 – 17025), sections
 - a) 7.2 A.10
 - b) 7.7 A.7
 - c) *Management of Nonconforming Work*
 4. Forensic Disclosure and Compliance Policy
 5. Receipt and Review of Laboratory Requests for Service
 6. Submission and Receipt of Evidence
 7. Evidence and Database Sample Integrity
 8. Evidence Processing
 9. Return of Evidence
 10. Laboratory Records
 11. Laboratory Reports, Letters, and Certificates, sections
 - a) *General Requirements*
 - b) *Laboratory [Discipline / Relevant Test] Reports*
 12. Review of Laboratory Records
 13. Records Requests and Release of Laboratory Records and Information
 14. Expunction and Destruction of Laboratory Records and Information
 15. Document Management and Deviation
 16. Electronic Storage and Archival of Records
 17. Quality Incident (QI) and Quality Action Plan Process (QAP)
- B. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version).
 1. Evidence/Case Documentation
 2. Approved Standard Abbreviations List
 3. Report Writing Guidelines
 4. Case Review
 5. Friction Ridge Exam Counting
 6. Physical Evidence Examination
 7. Instructions for Friction Ridge Worksheet
 8. Instructions for Friction Ridge Comparison Worksheet
 9. Digital Imaging of Friction Ridge Impressions



10. Friction Ridge Comparison
11. AFIS Database Searches
- C. Texas Department of Public Safety Crime Laboratory. LIMS Manual. (current version).
 1. Laboratory Information Management System
 2. Storage of Evidentiary Images in DIMS
 3. Entry of Case Activities

2.3 Suggested Readings

- A. Maceo, AV. "Documenting and Reporting Inconclusive Results." *Journal of Forensic Identification*. 2011; 61(3).
- B. SWGFAST *Standard for the Technical Review of Friction Ridge Examinations*. (final version)
- C. SWGFAST *Standard for Reporting Friction Ridge Examinations*. (final version)
- D. SWGFAST *Standard for a Quality Assurance Program in Friction Ridge Examinations*. (final version)
- E. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 12.

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

- A. The trainer will provide 10-20 completed cases to the trainee to read to allow familiarity with the method of report writing in the laboratory.
- B. The trainer will demonstrate to the trainee the technical review and administrative review of at least one case.
- C. The trainer and trainee will discuss topics to ensure the trainee has a solid understanding of report writing and all types of case reviews.

3.5 Supervised Performance

- A. The trainer will provide the trainee with case documentation for at least 10 cases. The trainee will review the case documentation and formulate a mock laboratory report for each case.
- B. The trainer will provide the trainee with case documentation and reports for at least 10 cases. The trainee will practice technically and administratively reviewing each case.

Note: Trainee can go through the review process in LIMS under trainer's supervision, but **will not** complete milestones.



3.6 Independent Exercises

The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan (topics A through C only).

4 Assessment

4.1 Competency and Qualifying Examination

- A. The trainer will administer a written examination to the trainee.
- B. The report written for the mock case assigned at the end of the Friction Ridge Training Program serves as the competency for report writing.

4.2 Evaluation of Training

The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-01-05 COURT TESTIMONY FOR FRICTION RIDGE DISCIPLINE

- Duration** 2 to 4 months; court observations and mock testimony will be ongoing
- Purpose** Educate the trainee with legal opinions and special considerations regarding courtroom testimony in the friction ridge discipline.
- Prerequisite** Concurrent with GLT Forensic Legal Unit and all modules of Friction Ridge Training Manual
-

1 Objectives

1.1 Theoretical

Expert testimony is the most dynamic aspect of any examiner's duties. The examiner must prepare for court by first beginning to work a case using good laboratory and scientific practice, maintaining complete and contemporaneous notes, and in forming technically correct conclusions that are supported by the documented observations. The trainee will gain a strong foundation regarding significant legal opinions and ongoing research in the friction ridge discipline. The trainee will have an extensive understanding of proper procedures for presenting friction ridge testimony that is accurate, reflects knowledge of the science, and uses effective and understandable terminology.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Confidently speak to the public on friction ridge discipline topics.
- B. Qualify as an expert in the discipline.
- C. Present friction ridge discipline-related testimony.
- D. Prepare courtroom enlargements for presentation in court.

2 Training Outline

2.1 Lesson Plan

- A. Court precedents and historical court cases relative to the friction ridge discipline
 1. [People \(Illinois\) v. Jennings](#) 252 Ill. 534, 96 N.E. 1077 (1911)
 2. [State \(New Jersey\) v. Charles Connors](#) 87 N.J.L. 419, 94 Atl. 812 (1915)
 3. [McGarry, B.J. v State \(Texas\)](#) 82 Tex 597 (1918)
 4. [State \(Nevada\) v. B.E. Kuhl](#) 42 Nev. 185; 175 P. 190; Nev. LEXIS 29; 3 A.L.R. 1694 3 ALR 1694 (1918)
 5. [State \(Oregon\) v. Smith](#) 128 Or. 515, 273 P. 323 (1929)
 6. [Stacy v. State \(Oklahoma\)](#) 49 Okl. Crim. 154, 292 P. 885 (1930)
 7. [People \(Michigan\) v. Les](#) 267 Mich. 648 255 NW 407 (1934)
 8. [Commonwealth \(Massachusetts\) v. Bartolini](#) 299 Mass. 503, 510, 13 N.E.2d 382, 387, cert. denied (1938)
 9. [Grice, Newton v State \(Texas\)](#) 142 Tex. Crim. 4 151 SW 2nd 211 (1941)
 10. [Schmerber v. State \(California\)](#) 384 U.S. 757, 763-764 (1966)



B. Admissibility of digital evidence

1. [State \(Virginia\) v. Robert Douglas Knight](#) CR-90-1353-02-F (1991). [link is for trial memorandum for People (California) v. Jacicson for summary of Knight case outcome]
2. [State \(Washington\) v. Eric Hayden](#) No. 38162-8-I (1998)
3. [State \(Ohio\) v. Hartman](#) No. 98-1475 (2001)
4. [State \(Florida\) v. Reyes](#) Circuit Court of the 17th Judicial Circuit, Broward County (2002-2003)

C. Legal challenges to fingerprints (sample of Daubert and Frye hearing links)

1. [United States v. Byron Mitchell](#) 199 F. Supp. 2d 262, 2002 U.S. Dist. LEXIS 6270. Pennsylvania-U.S. District (2002)
 - a) [Government Proposed Findings of Facts and Conclusions of Law](#)
 - b) [Government's Post-Daubert Hearing Memorandum](#) CN 96-00407 (1999)
 - c) [United States v. Byron Mitchell](#) 365 F.3d 215 3rd Cir. (2004)
2. [United States v. Llera Plaza I](#) 179 F. Supp. 2d 492 (Pennsylvania) (2002)
 - a) [United States v. Llera Plaza II](#) 188 F. Supp. 2d 549 (Pennsylvania) (2002)
3. [United States v. Havvard](#) 117 F. Supp. 2d 848 (Indiana) (2000)
 - a) [United States v. Havvard](#) 260 F.3d 597 (Indiana) (2001)
4. [Commonwealth \(Massachusetts\) v. Patterson](#) 445 Mass. 626 (2005)
5. [State \(New Hampshire\) v. Richard Langjill](#) No. 2009-373 (2007)
 - a) [State \(New Hampshire\) v. Richard Langjill](#) (2010)
6. [State \(Maryland\) v. Brian Rose](#) (2007)
 - a) [State \(Maryland\) v. Brian Rose](#) (2009)

D. Courtroom procedures for the guilt/innocence phase

1. Direct examination (prosecution)
 - a) *Qualifying questions*
 - b) *Voir dire*
 - c) *Friction ridge testimony*
 - d) *Courtroom enlargements*
2. Cross examination (defense)
 - a) *Defense tactics*
3. Re-direct examination and re-cross examination
4. Courtroom procedures for the punishment phase
 - a) *Penitentiary (Pen) packet*



E. Special topics

1. Support for no minimum criteria for making an identification
 - a) [IAI 1973 Resolution](#)
 - b) *The Ne'urim Declaration: 1995 Symposium Report: Israel National Police: International Symposium on Fingerprint Detection and Identification*
 - c) [IAI Resolution 2009](#): "There currently exists no scientific basis for requiring a minimum amount of corresponding friction ridge detail information between two impressions to arrive at an opinion of single source attribution" *Identification News 2009, 39 (5), 3 – 4*
 - d) [Quantifying the weight of evidence from a forensic fingerprint comparison: a new paradigm](#). C. Neumann. 2012
 - e) [Quantifying the weight of fingerprint evidence through the spatial relationship, directions, and types of minutiae observed on fingerprints](#). C. Neumann. 2015
2. Strengthening Forensic Science in the United States: A Path Forward (NAS Report)
3. Forensic science in criminal courts: ensuring scientific validity of feature-comparison methods (President's Council of Advisors on Science and Technology [PCAST] Report)
4. [Errors](#) in friction ridge comparison identifications
 - a) *Stephen Cowans (2004)*
 - b) *Brandon Mayfield (2004)*
 - c) *Lana Canen (2012)*
 - d) *Beniah Alton Dandridge (2015)*
5. Studies
 - a) *Expertise*
 - b) *Accuracy*
 - c) *Reliability*
 - d) *Error rate*
 - e) *Confirmation bias/cognitive bias/contextual bias*
 - f) *Probability and statistics*

2.2 Required Readings

- A. Cited cases and hyperlinked materials from the Lesson Plan.
- B. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 9.
- C. Olsen, RD. *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas; 1978. Chapter 10, Sections 132, 134.
- D. Moenssens, AA. *Fingerprints and the Law*. Philadelphia, PA: Chilton Book Company; 1969. Appendix 1, pages 204 – 211.



- E. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 10, pages 270 – 280.
- F. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapter 10.
- G. Tangen, JM et al. “Identifying Fingerprint Expertise,” *Psychological Science*, 2011. 22(8), 995 – 997.
- H. Ulery, BT et al. “Accuracy and reliability of forensic latent fingerprint decisions.” *Proceedings of the National Academy of Sciences*, 108(19) 2011: 7733 – 7738. March 2011.
- I. Ulery, BT et al. “Repeatability and Reproducibility of Decisions by Latent Fingerprint Examiners.” *PLoS ONE* 7(3) April 2012.
- J. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*, 2011. Chapters 13 – 15.
- K. United States Department of Justice. Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapter 17.

2.3 Suggested Readings

- A. Hak, JW. Admissibility of Digital Evidence in Criminal Prosecutions: A Survey of Case Law January 2003.
- B. Symposium Report. “Israel National Police: International Symposium on Fingerprint Detection and Identification.” *Journal of Forensic Identification*, 1995.45 (5), 578 – 584.
- C. Moenssens, AA. *Fingerprints and the Law*. Philadelphia, PA: Chilton Book Company; 1969. Chapters 3 – 11.
- D. National Institute of Standards and Technology. *Latent Print Examination and Human Factors: Improving the Practice Through a System Approach*. Expert Working Group on Human Factors in Latent Print Analysis. U.S. Department of Commerce, National Institute of Standards and Technology. 2012.
- E. National Research Council. *Strengthening Forensic Science in the United States: A Path Forward*. The National Academies Press. Washington D.C. 2009.
- F. Ramotowski, RS. *Lee and Gaensslen’s Advances in Fingerprint Technology*. 3rd Edition. Boca Raton, FL: CRC Press; 2013. Chapter 15.
- G. United States Department of Justice. Office of the Inspector General Oversight and Review Division. *A Review of the FBI’s Handling of the Brandon Mayfield Case*. 2006.
- H. United States Department of Justice. Office of the Inspector General Oversight and Review Division. *A Review of the FBI’s Progress in Responding to the Recommendations in the Office of the Inspector General Report on the Fingerprint Misidentification in the Brandon Mayfield Case*. 2011.
- I. President's Council of Advisors on Science and Technology. *Forensic science in criminal courts: ensuring scientific validity of feature-comparison methods*. September 2016.



3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

- A. The trainee will observe testimony of experienced examiners providing testimony in the friction ridge discipline.
- B. The trainee should also observe testimony, when possible, from examiners in other disciplines to develop a sense for the operation of the courtroom.
- C. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of court testimony.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. **Recommended:** The trainee should present original research papers and/or present and lead discussions on recent event articles to the Friction Ridge Section. The topics will be approved by the trainer.
- C. The trainee will prepare qualifying questions and answers.
- D. The trainee will prepare Daubert questions and answers.
- E. The trainee will prepare an identification courtroom enlargement.
- F. The trainee should prepare a courtroom binder to include, at a minimum, the following: Statement of Qualifications, Disclosure Form, Accreditation Documents, Copies of Certificates, Reference Material.

Note: This binder will not be included in the training notebook

- G. The trainee will provide practice testimony throughout the training program. The trainee's performance during practice testimonies will be documented in the training notebook.
 1. The use of the Testimony Technical Review Form (LAB-313) and Testimony Survey Form (LAB-314) is optional for practice testimony.
 2. The number of practice testimonies required will be determined by performance. Trainer and TPOC approval is needed to move on to the competency.

4 Assessment

4.1 Competency and Qualifying Examination

- A. The trainer will administer a written qualifying examination to the trainee.
- B. The trainee will participate in a final mock trial based on the mock case worked during the Friction Ridge Training Program Competency Test. Members of the mock testimony



panels will provide oral and/or written feedback and recommendations to the trainee and complete a LAB-313 and LAB-314.

4.2 Evaluation of Training

The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.

4.3 Evaluation of Training Program by Trainee

The trainee will provide feedback of training material and trainer for each unit completed utilizing the Training Evaluation Form (LAB-304).



02 CHEMICAL TESTING AND DIGITAL IMAGE PROCESSING UNIT

FR-TM-02-01 FRICTION RIDGE LABORATORY, EQUIPMENT, AND SAFETY

Duration 1 to 2 weeks

Purpose Familiarize the trainee with good laboratory practice and basic operation of equipment in the Friction Ridge Section and its function in the Crime Laboratory.

Prerequisite General Laboratory Training Manual: Fundamentals Unit

1 Objectives

1.1 Theoretical

The Friction Ridge section is responsible for the examination of friction ridge evidence. When necessary, the Friction Ridge section coordinates with other disciplines in the Crime Laboratory in order to collect all types of physical evidence available. The friction ridge discipline utilizes a variety of visual, physical, and chemical techniques in order to facilitate recognition, development, and preservation of friction ridge detail on physical evidence. Safety for all occupants of the Crime Laboratory is a primary concern for the Department.

The trainee will gain a broad understanding of the safe operation and handling of the equipment used in the friction ridge discipline. The trainee will develop good laboratory practice, begin to develop a thorough understanding of the standard operating procedures, and also gain comprehensive insight regarding how the friction ridge discipline functions within the Crime Laboratory System.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Apply good laboratory practice.
- B. Operate equipment used in the Friction Ridge section.
- C. Locate reference material available.

2 Training Outline

2.1 Lesson Plan

- A. Friction Ridge section capabilities and services offered
- B. Friction Ridge section orientation
 1. Duty station (Austin, Garland, Lubbock, Weslaco)
 2. Physical layout of the Friction Ridge section
 - a) *Work area and equipment assignment*
 - b) *Location of reference material*
 3. Location of evidence vaults and procedures for evidence storage
- C. Personal protective equipment
 1. Storage location
 2. Proper care and use
 3. Limitations



- D. Equipment (see section 3.3)
 - 1. Location
 - 2. Operation (including procedures for opening/closing laboratory)
 - 3. Safety
 - 4. Equipment Log
 - 5. Interpretation
 - 6. Limitations
- E. Chemicals, reagents, and powders
 - 1. Safety Data Sheets (SDS)
 - 2. Reagent log
 - 3. Fume hoods
 - 4. Storage location

2.2 Required Readings

- A. Texas Department of Public Safety Crime Laboratory Service Manual. (current version).
 - 1. Friction Ridge Examination
 - 2. Laboratory Equipment, sections
 - a) *Laboratory-Prepared Reagents*
 - b) *Commercially-Prepared Reagents*

2.3 Suggested Readings

- A. Masters, NE. *Safety for the Forensic Identification Specialist*. Lightning Powder Co, Salem, 1995.
- B. Equipment Operation Manuals.

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to, gloves, lab coat, and eye protection.
 - 1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 - 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, Reagent Preparation

None



3.3 Equipment

- Fisher Hamilton
- Air Science
- Humidity Chamber
- Coherent TracER
- SPEX CrimeScope
- Balance
- Foray ADAMS
- Down-flow Workstation

3.4 Observed Performance

- A. The trainer demonstrates to the trainee proper operation of equipment used in the Friction Ridge section and discusses interpretations, limitations, documentation needs, and safety issues.
- B. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of the friction ridge laboratory, equipment, and safety.

3.5 Supervised Performance

The trainer observes the trainee applying good and safe laboratory practice while operating laboratory equipment.

3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will demonstrate understanding of proper use and safety for the equipment in the Friction Ridge Section.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-02-02 DOCUMENTATION OF EXAMINATIONS

Duration 1 to 2 weeks

Purpose Provide guidelines for the accurate documentation of the physical examination of evidence for friction ridge detail.

Prerequisite FR-TM-02-01

1 Objectives

1.1 Theoretical

Proper documentation of examination is essential to the integrity of analyses and conclusions. Case documentation may be referenced while providing court testimony. Documenting interactions with both internal and external customers via case activities in LIMS provides lab personnel universal access to information in the case record.

The trainee will gain a broad understanding of how proper and contemporaneous documentation maintains the integrity of their examinations. The trainee will also understand the minimum requirements for documenting friction ridge examinations and the forms utilized by the friction ridge discipline for documentation.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Document all steps in the examination of evidence for friction ridge detail.
- B. Recognize what interactions should be documented and then properly add them to Case Activities in LIMS.

2 Training Outline

2.1 Lesson Plan

- A. Forms
 1. Laboratory Information Sheet (LAB-403, LAB-404)
 2. Friction Ridge Worksheet (LAB-FR-01)
 3. Friction Ridge Comparison Worksheet (LAB-FR-04)
- B. Approved Abbreviations
 1. General
 2. Processing
- C. LIMS

2.2 Required Readings

- A. Texas Department of Public Safety Crime Laboratory Service Manual. (current version). Laboratory Records
- B. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version).
 1. Approved Standard Abbreviations List;
 2. Physical Evidence Examination



- C. Texas Department of Public Safety Crime Laboratory. LIMS Manual. (current version). Entry of Case Activities (LIMS-02-19)
- D. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*, 2011. Chapter 10.

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

- A. The trainer will demonstrate proper and complete documentation practices to the trainee.
- B. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of the documentation of examinations.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Documentation of Examinations utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and/or Friction Ridge Worksheet (LAB-FR-01).
 - 1. Process evidence in five mock cases.
 - 2. Document physical examinations, chemical testing, and results.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-02-03 DEVELOPMENT TECHNIQUES

Duration 2 to 4 months, preparation of all reagents is on-going

Purpose Educate the trainee to apply laboratory-approved development techniques in the proper sequence using good laboratory practice and maintaining a safe working environment

Prerequisite FR-TM-02-01, FR-TM-02-02

1 Objectives

1.1 Theoretical

Forensic Scientists will encounter three general categories of friction ridge impressions on evidence: latent, patent, and plastic prints. Latent prints are generally comprised of perspiration or sebaceous material. They are typically not visible to the naked eye and require some type of development technique to be visualized. Patent prints are visible and are made in material other than perspiration, such as blood or paint, and may or may not require additional development. Plastic prints are also visible but are three-dimensional prints that do not require further development.

The perspiration which makes up latent print residue is exuded from minute sweat pores that run along the ridges of friction ridge skin. When friction ridge skin comes into contact with an object, this material may be transferred to that surface, leaving a latent print. This latent print residue is comprised of approximately 98.5% water. The remaining material includes various organic and inorganic compounds. Different development techniques will react with specific components of latent print residue. Some development techniques may be utilized in sequence in order to maximize print development. Several techniques require fluorescent examination with a LASER or other light source. The Forensic Scientist must always be cognizant of which development techniques will interfere with examination by other forensic disciplines.

The trainee will gain a broad understanding of the factors involved in how the components of latent or patent print residue guide the selection and sequence of development techniques. The trainee will gain extensive knowledge of laboratory validated and approved development techniques as well as an awareness of techniques that are employed by other laboratories.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Plan the scope of examinations and perform approved and validated development techniques in proper sequence in order to maximize print development on an extensive range of surfaces that are encountered during casework examinations.
- B. Perform laser and other light source examinations.
- C. Separate adhesive materials.
- D. Understand the limitations for development techniques.
- E. Recognize and preserve other types of forensic evidence that may be damaged or destroyed by development techniques.



2 Training Outline

2.1 Lesson Plan

- A. Types of prints
 - 1. Latent
 - 2. Patent
 - 3. Plastic
- B. Factors affecting print recovery
 - 1. Perspiration and sweat (latent print residue)
 - a) *Amount and type of residue on donor skin*
 - 2. Surface
 - a) *Condition and health of donor skin*
 - b) *Substrate (type/shape/condition)*
 - i. *Porous*
 - ii. *Semi-porous*
 - iii. *Non-porous*
 - iv. *Textured*
 - v. *Adhesive*
 - vi. *Bloody*
 - vii. *Contaminant (dirt, debris, oil, grease)*
 - 3. Contact (between donor skin and substrate)
 - a) *Deposition pressure*
 - b) *Movement*
 - c) *Overlays*
 - 4. Environment
 - a) *Air current/temperature/humidity/rain*
 - b) *Handling of item after print is deposited*
- C. Visual examinations prior to development
 - 1. Recognize and preserve visible (patent or plastic) prints prior to further processing
 - 2. Recognize matrix for selection of development techniques
- D. Sequence of visual examinations and development techniques
- E. Development techniques
 - 1. Powder techniques
 - a) *Black Powder (BP)*
 - i. *Conventional*
 - ii. *Magnetic*
 - iii. *Fluorescent*



2. Fuming techniques
 - a) *Iodine Fuming (IF)*
 - b) *Superglue (Cyanoacrylate Ester) Fuming (SG)*
 - c) *Other techniques*
3. Cyanoacrylate dye stains
 - a) *Rhodamine 6G (R6G)*
 - b) *Ardrox (component of RAM)*
 - c) *MBD (component of RAM)*
 - d) *RAM*
 - e) *Other techniques*
4. Amino acid reagents
 - a) *1,2-Indanedione (IND)*
 - b) *1,8-Diazafluoren-9-one (DFO)*
 - c) *Ninhydrin (NIN)*
 - d) *Other techniques*
5. Metal deposition reagents
 - a) *Silver Nitrate (historical significance)*
 - b) *Physical Developer (also known as a lipid reagent)*
 - c) *Other techniques*
6. Lipid reagents
 - a) *Oil Red O (ORO)*
 - b) *Other techniques*
7. Blood reagents
 - a) *1,2-Indanedione (IND)*
 - b) *1,8-Diazafluoren-9-one (DFO)*
 - c) *Ninhydrin (NIN)*
 - d) *Amido Black (AB)*
 - e) *Acid Yellow 7 (AY)*
 - f) *Leucocrystal Violet (LCV)*
 - g) *Other techniques*
8. Adhesive reagents
 - a) *Gentian Violet (GV)*
 - b) *Fluorescent Gentian Violet (FGV)*
 - c) *Sticky-Side Powder (SSP)*
 - d) *Rhodamine 6G (R6G)*



- e) *FreeZ-It or canned air for separation*
 - f) *Other techniques*
 - 9. Fluorescence examinations
 - a) *Light Sources (LS) (laser or other light source)*
 - i. *Prior to application of physical and/or chemical development techniques*
 - ii. *Post fluorescent dye stain and fluorescent reagent application*
- F. Limitations
- 1. Challenging surfaces
 - a) *Semi-porous*
 - b) *Thermal paper*
 - c) *Metallic*
 - i. *Gun Blueing*
 - ii. *Acidified Hydrogen Peroxide and Vinegar*
 - d) *Gloves*
 - e) *Adhesives*
 - f) *Contaminant (dirt, debris, oil, grease)*
 - 2. Adhesive removal techniques
 - a) *Manually*
 - b) *Freezing (circuit refrigerant or canned air)*
 - c) *Heat application*
 - d) *Chemicals (adhesive remover)*
 - 3. Sequence of development techniques
 - a) *Solvents used in reagent preparation*
 - b) *Non-porous: VE → SG → FD → LS*
 - c) *Porous: VE → IF → IND → DFO → NIN*
 - d) *Multi-surface and semi-porous: plan scope of development techniques in order to maximize development potential focusing on probative evidence*
 - 4. Sequence of forensic evidence collection
 - a) *Trace Evidence screening*
 - i. *Collection and/or FR/TE consults available*
 - ii. *Order of disciplines: TE → FR*
 - b) *Biological evidence screening (DNA)*
 - i. *Contamination concerns (preventative measures)*
 - ii. *FR/DNA consults*
 - iii. *DNA → FR (with exceptions)*



- c) *Firearms & Toolmarks evidence*
 - i. *FR/FTM consults for safety and securing firearm evidence*
 - ii. *Order of disciplines: FR → FTM*
- d) *Forensic Document Examination and Digital/Multimedia*
 - i. *FDE/DM consults*
 - ii. *Order of disciplines: FDE/DM → FR*
- e) *Seized Drugs evidence*
 - i. *Contamination concerns (preventative measures)*
 - ii. *FR/SD consults*
 - iii. *Order of disciplines: FR → SD*

2.2 Required Readings

- A. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 4.
- B. Olsen, RD. *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas; 1978. Chapter 3 – 8.
- C. Ramotowski, RS. *Lee and Gaensslen's Advances in Fingerprint Technology*. 3rd Edition. Boca Raton, FL: CRC Press; 2013. Chapters 1 – 14.
- D. Safety Data Sheets (SDS) for each chemical/reagent.
- E. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version).
 - 1. Physical Evidence Examination;
 - 2. Powder Processing;
 - 3. Magnetic Powder Processing;
 - 4. Iodine Processing;
 - 5. Ninhydrin Processing;
 - 6. DFO (1,8-Diazafluoren-9-One) Processing;
 - 7. Cyanoacrylate Ester (Super Glue) Processing;
 - 8. Rhodamine 6G Fluorescent Dye Processing;
 - 9. RAM Fluorescent Dye Processing;
 - 10. Gentian Violet Processing;
 - 11. Fluorescent Gentian Violet Processing;
 - 12. Sticky Side Powder Processing;
 - 13. Amido Black Processing;
 - 14. IND (1,2-Indanedione) Processing;
 - 15. Oil Red O (ORO) Processing
 - 16. Acid Yellow 7 (AY) Processing



- F. United States Department of Justice: Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapters 13 – 15.
- G. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*, 2011. Chapter 7.

2.3 Suggested Readings

- A. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 4.
- B. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapters 4 – 7.
- C. Menzel, RE. *An Introduction to Laser, Forensic Lights and Fluorescent Detection Techniques*. Salem, OR: Lightning Powder Company, Inc.; 1991. Chapters 1, 3 – 5.

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
 - 1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 - 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, Reagent Preparation

Follow standards and controls as indicated in the Friction Ridge Manual to ensure that reagents prepared and applied will provide desired results.

3.3 Equipment

- Fisher Hamilton
- Air Science
- Humidity Chamber
- Coherent TraceER
- SPEX CrimeScope
- Balance
- Down-flow Workstation

3.4 Observed Performance

- A. The trainee will observe and assist in the preparation of all mixed reagents.
- B. The trainee will observe trainer or designee perform development techniques.
- C. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of the development techniques.



3.5 Supervised Performance

- A. The trainee will prepare all mixed reagents.
- B. The trainee will perform development techniques. The quality of developed latent and patent prints obtained by trainee will be reviewed by the trainer until the trainer believes the trainee is confident to obtain desired results independently.

3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Development Techniques.
 - 1. Select substrates suitable for processing with sets of given development techniques or a series of development techniques.
 - 2. Document the activities.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-02-04 PRESERVATION OF FRICTION RIDGE DETAIL – LIFTING AND CASTING

Duration 3 to 5 days

Purpose Educate the trainee with proper methods utilized to preserve friction ridge detail via various lifting and casting techniques.

Prerequisite FR-TM-02-01, FR-TM-02-02; concurrent with FR-TM-02-03

1 Objectives

1.1 Theoretical

Prints developed with powdering techniques that are evaluated as suitable for preservation must be collected and preserved for analysis and possible comparison.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Preserve friction ridge evidence through various lifting and casting techniques.
- B. Properly document friction ridge evidence.

2 Training Outline

2.1 Lesson Plan

- A. Lifting techniques
 1. Tape (transparent or frosted) and backing cards
 2. Hinge lifters
 3. Rubber/gel lifters
- B. Casting techniques
 1. Mikrosil
 2. AccuTrans

C. Documentation

2.2 Required Readings

- A. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 4, pages 109 – 112.
- B. Olsen, RD. *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas; 1978. Chapter 9.
- C. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version).
 1. Powder Processing;
 2. Magnetic Powder Processing;
 3. Lifting Techniques
- D. United States Department of Justice: Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapter 14.



- E. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 8, section 6.

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Lift tape
- Tape dispenser
- Backing cards
- Casting equipment

3.4 Observed Performance

- A. The trainer will demonstrate proper lifting and casting techniques and proper documentation requirements.
- B. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of lifting and casting techniques.

3.5 Supervised Performance

The trainee will demonstrate lifting and casting techniques. The quality of lifted prints and casts made will be verified by the trainer until the trainer and the trainee believe the trainee is confident in obtaining the desired results independently.

3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Lifting and Casting.
1. Process provided or trainee selected substrates using approved methods and lifting techniques.
 2. Document activities utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and Friction Ridge Worksheet (LAB-FR-01) or solely the Friction Ridge Worksheet.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-02-05 PRESERVATION OF FRICTION RIDGE DETAIL – DIGITAL

Duration 2 to 4 weeks

Purpose Educate the trainee with proper methods and practices for digitally preserving friction ridge detail.

Prerequisite FR-TM-02-01, FR-TM-02-02, FR-TM-02-03, FR-TM-02-04; Concurrent with FR-TM-02-06

1 Objectives

1.1 Theoretical

Documentation of friction ridge evidence through digital preservation is an approved and appropriate method to obtain comparison quality images. The Crime Laboratory originally photographed friction ridge evidence using conventional film-based photography, including 35 mm and black and white 4x5 format film cameras. In 2008, the Crime Laboratory completed a validation for the use of digital technology in casework.

The trainee will gain applicable knowledge of the use and settings of equipment for digital preservation which meet or exceed laboratory requirements. The trainee will also develop an understanding of established industry standards and guidelines.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Preserve friction ridge evidence utilizing proper equipment and settings to achieve the highest resolution digital image with either digital photography or scanning.
- B. Apply specialized lighting techniques and filters appropriately to facilitate high contrast friction ridge detail through photography.
- C. Archive digital images.

2 Training Outline

2.1 Lesson Plan

- A. Digital photography of friction ridge impressions
 1. Camera equipment
 - a) *Digital-Single Lens Reflex (D-SLR) camera body*
 - b) *Lens*
 - c) *Camera support (tripod or copy stand)*
 - d) *Accessories*
 - e) *Camera lighting*
 2. Recommended Camera Settings
 - a) *File format: RAW*
 - b) *Mode: Color*
 - c) *Focus: Manual*



- d) *Image size: Use the largest image size available (This setting will maximize the limited area that can be captured to maintain minimum resolution).*
 - e) *ISO setting: Use lowest ISO setting available on camera.*
 - f) *Aperture: F-Stop: Adjustable depending on desired depth of field. For prints on a curved surface, consider an increased depth of field, for prints on flat surfaces, consider a decreased depth of field. (f-22 will give a greater depth of field than f-8, i.e. f-22 allows more area to appear in focus than f-8).*
 - g) *Shutter speed: Adjustable depending on desired shot (Using aperture priority, the camera will select the correct shutter speed).*
 - h) *Other*
3. Resolution
- a) *Requirements*
 - b) *Factors that affect resolution*
 - i. *Image sensor size and number of pixels on image sensor*
 - ii. *The size of the area acquired*
4. Traditional photography versus digital photography
- a) *Emulsion/CCD or CMOS Sensor*
 - b) *Film grain/pixel*
5. Elements of image exposure – Exposure Triangle
- a) *ISO exposure index (sensitivity)*
 - b) *Aperture (lens opening)*
 - i. *Depth of field*
 - c) *Shutter Speed (exposure time)*
6. Lighting techniques
- a) *Direct*
 - b) *Transmitted (also referred to as Back)*
 - c) *Oblique*
 - d) *Bounce*
 - e) *Direct Reflection*
 - f) *Coaxial (also referred to as Front Directional and Axial)*
 - g) *Diffused*
 - h) *Laser (or other light source(s) available)*
 - i) *Ambient*
 - j) *Other*
7. Use of filters
8. Guideline for marking evidence for preservation purposes
9. Documentation and scale



10. Bracketing
11. Using multiple exposures to reduce backgrounds
12. Common photographs
 - a) *Comparison quality photographs*
 - i. *Visible prints – unprocessed latent, patent, or plastic prints*
 - ii. *Powder developed prints*
 - iii. *Chemically developed prints with LASER*
 - iv. *Chemically developed prints without LASER*
 - v. *Friction ridge skin*
 - b) *Documentation photographs*
13. Software
 - a) *Adobe Bridge (current version)*
 - i. *Setup/settings*
 - ii. *Bracketed Shots - often taken in order to obtain best exposure (While it is permissible to retain bracketed shots, only the best exposures and best represented images should be considered for retention as evidence).*
 - iii. *Batch re-name and re-naming files to approved file nomenclature:*
 - iv. *Renaming captured images using software on the computer is acceptable, but not required. When performed, captured images will be re-named by Friction Ridge Section standards which will include the laboratory case number, photographer's initials, and sequential number for the image. An example of the image file name is:*

AUS-1301-12345.XX.01.nef

AUS-1301-12345.	XX.	01.	nef
<ul style="list-style-type: none"> •Laboratory case # •Followed by dot 	<ul style="list-style-type: none"> •Operator initials •2 or 3 letters •Followed by dot 	<ul style="list-style-type: none"> •Sequence •2 or 3 digits •Followed by dot 	<ul style="list-style-type: none"> •File format •Camera Raw (.nef) or TIFF (.tif)

- b) *Foray ADAMS*
 - i. *Complete acquisition information for acquiring assets into Foray ADAMS. You will need information from the submission form to complete these entries.*
 - ii. **Asset Folder Type:** *Select the respective discipline from the drop-down menu*
 - iii. **Asset Folder Number:** *Enter the laboratory case number*
 - iv. **Contributing Agency ID:** *Default entry*
 - v. **Acquired By:** *Default entry*
 - vi. **Captured By:** *Default entry; entry should be updated to reflect captured by other laboratory personnel if applicable*
 - vii. **Crime:** *Select from drop down menu according to the defined offense codes*
 - viii. **Date of Crime:** *Select the offense date*



- ix. **Captured On:** Select the date of photograph/scan
- x. **Category:** Select from the drop-down menu
- xi. **Location:** No entry is required
- xii. **Description:** No entry is required
- xiii. Preparing a contact sheet (Reference Appendix: Creating a Contact Sheet)

14. Limitations

- a) User knowledge of equipment specifications
- b) Ambient lighting versus controlled lighting
- c) Specialized filters
- d) Other

B. Digital Scanning

1. Scanning equipment

- a) Professional digital scanner
- b) Software
- c) Accessories

2. Recommended Scanner Settings

- a) Flat-work (Evidence, Lift Cards, Exemplars)
 - i. Mode: Professional
 - ii. Document type: Reflective
 - iii. Image type: 24 Bit Color
 - iv. Scan quality: Best possible
 - v. Resolution: 1200 ppi, 2400 ppi, or 4800 ppi
- b) Conversion of photographic negatives (Option 1)
 - i. Mode: Professional
 - ii. Document Type: Film with film holder
 - iii. Film Type: B&W Negative film or Positive
 - iv. Image Type: 24 Bit Color
 - v. Scan Quality: Best possible
 - vi. Resolution: 1200 ppi, 2400 ppi, or 4800 ppi
- c) Conversion of photographic negatives (Option 2)
 - i. Mode: Professional
 - ii. Document Type: Film (film with holder)
 - iii. Film Type: Color Negative film
 - iv. Image Type: 8-Bit Grayscale
 - v. Scan Quality (as applicable): Best possible
 - vi. Resolution: 1200 ppi, 2400 ppi, or 4800 ppi



3. Resolution
 - a) *Requirements*
 4. Guideline for marking evidence for preservation purposes
 5. Documentation and scale
 6. Common scans (*Reference Scanning Images and Acquisition into Foray ADAMS* chapter)
 - a) *Exemplars*
 - b) *Lift cards*
 - c) *Negatives*
 - d) *Chemically developed prints*
 7. Limitations
- C. Archiving original digital photographs and digital scans
1. Legal ramifications
 - a) *Do not alter original file*
 2. Nomenclature for file re-naming
 3. Electronic media
 - a) *Hard drive and backup*

2.2 Required Readings

- A. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 5, pages 150 – 157.
- B. Robinson, EM. *Crime Scene Photography*. 2nd Edition. 2010. Chapters 2 – 4, 7, Appendix, Glossary.
- C. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version). *Digital Imaging of Friction Ridge Impressions*
- D. United States Department of Justice. Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapter 16.
- E. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 8.

2.3 Suggested Readings

- A. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 5.
- B. Forensic Imaging and Multi-media Glossary Covering Computer Evidence Recovery (CER), Forensic Audio (FA), and Forensic Video (FV): A Joint Project of The International Association for Identification and the Law Enforcement/Emergency Services Video Association International, Inc. Version 7.0, Last updated July 15, 2006.
http://www.theiai.org/guidelines/iai-leva/forensic_imaging_multi-media_glossary_v7.doc
- C. All [SWGFAST](#) Guidelines/Standards. (final versions)
- D. [SWGIT](#) Guidelines, Section 8. (final version)



- E. Texas Department of Public Safety Crime Laboratory. Forensic Digital Image Validation: Latent Prints. 2008. [Valid-Method-AUS-LP-DigitalImageCapture-Summary](#)
- F. United States Department of Justice. FBI Handouts, 2008: Traditional Photographic TERMS, Electromagnetic Radiation, Light, Color Film Characteristic, Color CCD Characteristic, Identification Photography: Photography of Latent Impressions.
- G. United States Department of Justice. *FBI Digital Imaging Terms and Software Terminology*.

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
 - 1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 - 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, and Reagent Preparation

- A. Friction ridge impressions used for comparative analysis must be captured in the highest resolution lossless format available (i.e. RAW or TIFF) at a minimum of 1000 pixels per inch (ppi) or higher resolution when the image is sized 1:1, or by using existing film photographic techniques. Grayscale digital imaging should be at a minimum of 8 bits. Color digital imaging should be at a minimum of 24 bits. This applies to images captured by examiners.
- B. The original images and working images stored on a secure server are considered evidence.

3.3 Equipment

- Foray ADAMS
- Camera
- Scanning equipment

3.4 Observed Performance

- A. The trainer will demonstrate proper documentation.
- B. The trainee will observe the trainer photographing visible prints, patent prints, plastic impressions, and developed prints.
- C. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of the methods for digital preservation of friction ridge evidence.

3.5 Supervised Performance

The trainee will demonstrate digital preservation techniques. Digital images captured by the trainee will be reviewed by the trainer until the trainer and the trainee believe the trainee is confident in obtaining the desired results independently.



3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will begin Practical Exercise: Scanning.
 - 1. Scan developed friction ridge detail on items provided by the trainer.
 - 2. Document activities utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and Friction Ridge Worksheet (LAB-FR-01) or solely the Friction Ridge Worksheet.
- C. The trainee will begin Practical Exercise: Photography and Lighting.
 - 1. Photograph friction ridge detail on items provided by the trainer.
 - 2. Document activities utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and Friction Ridge Worksheet (LAB-FR-01) or solely the Friction Ridge Worksheet.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-02-06 DIGITAL IMAGING OF FRICTION RIDGE DETAIL

Duration 2 to 4 weeks

Purpose Educate the trainee with methods used for digital imaging of friction ridge impressions.

Prerequisite FR-TM-02-01, FR-TM-02-02, FR-TM-02-03, FR-TM-02-04; Concurrent with FR-TM-02-05

1 Objectives

1.1 Theoretical

Many of the traditional darkroom techniques that were historically accepted for use in forensic science have a direct counterpart by applying digital image processing with a computer and appropriate software. Adobe Photoshop is used for the viewing and processing of digital images of friction ridge impressions acquired through digital photography and scanning. The goal of digital image processing is to improve the contrast of the friction ridge detail against the background so that comparison to exemplars can be performed more effectively. The software records the sequence of digital processing made by the examiner and is essential to the integrity of the image.

The trainee will gain extensive knowledge of equipment and software used for digital image processing and archiving. The trainee will also have an extensive understanding of the available image processing tools for calibration, color evaluation, and tonal range and contrast adjustments to apply in sequence to friction ridge images.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Perform digital image processing on friction ridge evidence using Digital Image Management System and image processing software.
- B. Print composites and contact sheets of digital images.
- C. Archive digital images.

2 Training Outline

2.1 Lesson Plan

- A. Digital Image Management System (DIMS) Software
 1. FORAY Authenticated Digital Asset Management System (ADAMS) (Reference *Photographed Images and Acquisition into Foray ADAMS* chapter)
- B. Image processing software
 1. Adobe Photoshop (current version)
 - a) *Photoshop tools and tool bars*
 - i. *Approved tools vs. prohibited tools*
 - ii. *Special tools requiring guidelines for use (levels, area selection, dodge, and burn)*



- b) *Image size*
 - i. *Calibration: Resample must be **Off** – to ensure that changes made to the dimensions of the image (width and height) are also made to the resolution*
 - ii. *Re-Sizing: Resample must be **On** – to ensure that changes made to the resolution are not made to the dimensions of the image*
 - c) *Shortcuts*
 - d) *Setup/settings*
 - e) *History tracking functionality*
 - f) *Camera Raw viewer*
 - i. *White Balance adjustments*
 - ii. *Exposure adjustments*
 - iii. *Shadow and Highlight adjustments (fill light)*
- C. Recommended general workflow for Adobe Photoshop digital image processing (Reference *Digital Image Processing in Foray ADAMS* chapter)
- 1. Calibrate, if necessary
 - a) *Crop Method*
 - b) *Ruler (Measure) Tool Method*
 - c) *Foray Image Calibrator*
 - 2. Rotate, if necessary (90° increments)
 - 3. Evaluate Color
 - a) *Color Mode (select single color channel)*
 - i. *RGB*
 - ii. *CMYK*
 - iii. *LAB Color*
 - b) *Adjusting individual color values*
 - i. *Black & White*
 - ii. *Hue/Saturation*
 - iii. *Calculations*
 - iv. *Color Balance*
 - c) *Chromatic FFT (Pattern Removal Filter)*
 - 4. Convert to Grayscale Mode
 - 5. Pattern Removal Filter
 - 6. Using multiple exposures to reduce backgrounds
 - 7. Invert (negative) and rotate/flip canvas/horizontal (mirror)
 - 8. Adjust tonal range and contrast
 - a) *Brightness/Contrast*



- b) *Levels*
 - i. *Legal ramifications*
 - ii. *Suggested guidelines*
- c) *Shadows and Highlights*
- d) *Curves*
- e) *Dodge/Burn*
 - i. *Legal ramifications*
 - ii. *Suggested guidelines*
- f) *Exposure*
- g) *Apply Image*
- 9. Fine tune
 - a) *Noise*
 - i. *Dust & Scratches*
 - ii. *Reduce Noise*
 - b) *Sharpen*
 - i. *Unsharp Mask*
 - ii. *Smart Sharpen*
 - iii. *Sharpen Edges*
- D. Archiving
 - 1. Legal ramifications
 - a) *Do not alter original file*
 - i. *Save original file*
 - b) *Save (processed image)*
 - 2. Nomenclature for file re-naming
 - 3. Electronic media
 - a) *Hard drive and backup*
- E. Printing
 - 1. Composite: printout containing a life size representation and/or enlargements of friction ridge evidence printed on one sheet (if possible) used for documentation and comparison purposes. (Reference *Printing Composites chapter*)
 - a) *Printer, paper, and ink selection (if applicable)*
 - i. *Specifications*
 - b) *Rotate (90 degree increments)*
 - c) *Life size representations and enlargements*
 - d) *Documentation*
 - 2. Contact Sheet: thumbnail representations of all images in a given subset (Reference *Creating a Contact Sheet chapter*)



2.2 Suggested Readings

- A. Foray Technologies. *Digital Processing of Evidentiary Photography... doing more with your digital images*. Revised January 2008, pages 37 – 63.
- B. Forensic Imaging and Multi-media Glossary Covering Computer Evidence Recovery (CER), Forensic Audio (FA), and Forensic Video (FV): A Joint Project of The International Association for Identification and the Law Enforcement/Emergency Services Video Association International, Inc. Version 7.0, Last Updated July 15, 2006.
http://www.theiai.org/guidelines/iai-leva/forensic_imaging_multi-media_glossary_v7.doc
- C. Ramotowski, RS. Lee and *Gaensslen's Advances in Fingerprint Technology*. 3rd Edition. Boca Raton, FL: CRC Press; 2013. Chapter 16.
- D. Robinson, EM. *Crime Scene Photography*. 2nd Edition. 2010. Chapters 10 – 12.
- E. [SWGIT](#) Guidelines, Section 11. (final version)
- F. Texas Department of Public Safety Crime Laboratory. Friction Ridge Section. Foray Validation / Performance Check. 2009. [Valid-Instrument-AUS-LP-Foray-ADAMS-2009-0908](#)

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
 1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Foray ADAMS
- Camera
- Scanning equipment

3.4 Observed Performance

- A. The trainer will demonstrate digital image processing.
- B. The trainee will observe the trainer preparing composites and contact sheets.
- C. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of digital imaging.

3.5 Supervised Performance

The trainee will demonstrate digital imaging techniques. Digital images processed by the trainee will be reviewed by the trainer until the trainer and the trainee believe the trainee is confident in obtaining the desired results independently.



3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Scanning from FR-TM-02-05.
 - 1. Perform digital image processing on scans taken during the previous module.
 - 2. Document activities utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and Friction Ridge Worksheet (LAB-FR-01) or solely the Friction Ridge Worksheet.
- C. The trainee will complete Practical Exercise: Photography and Lighting from FR-TM-02-05.
 - 1. Perform digital image processing on photographs taken during the previous module.
 - 2. Document activities utilizing the Laboratory Information Sheet (LAB-403, LAB-404) and Friction Ridge Worksheet (LAB-FR-01) or solely the Friction Ridge Worksheet.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-02) upon completion of the module.

4.1 Competency and Qualifying Examination

- A. The trainer will administer a comprehensive written examination to the trainee at the completion of the Chemical Testing and Digital Image Processing Unit.
- B. The trainer will administer a competency test to the trainee at the completion of the Chemical Testing and Digital Image Processing Unit.

4.2 Evaluation of Training Program by Trainee

The trainee will provide feedback of training material and the trainer for each unit completed utilizing the Training Evaluation Form (LAB-304).



03 COMPARISON UNIT

FR-TM-03-01 PATTERN INTERPRETATION

Duration 1 - 2 weeks

Purpose Familiarize the trainee with the terminology and interpretation of friction ridge skin patterns.

Prerequisite None

1 Objectives

1.1 Theoretical

There are three levels of friction ridge detail. This module focuses on the first level of detail. The pattern or overall flow of the friction ridges present in a friction ridge impression is referred to as the first level of friction ridge detail. First level detail is not sufficient for identification, but may assist in determining the anatomical source and orientation of a friction ridge impression. The first level detail of the distal joint of the finger, commonly referred to as a fingerprint, may be used for classification purposes. The trainee will gain a broad understanding of the use of friction ridge flow and the terminology used for pattern interpretation.

1.2 Practical

Following the completion of training, the trainee will be able to recognize:

- A. Loop patterns.
- B. Arch patterns.
- C. Whorl patterns.
- D. Non-typical ridge flow and its effect on pattern typing.
- E. Friction ridge skin injury.
- F. Diseases on friction ridge skin.

2 Training Outline

2.1 Lesson Plan

- A. Friction ridge flow
 - 1. Focal points and ridge flow features
 - a) *Delta*
 - b) *Core*
 - c) *Creases*
 - d) *Scars*
 - e) *Type lines*
 - f) *Sufficient recurve*



2. Loop
 - a) *Patterns*
 - i. *Ulnar loop*
 - ii. *Radial loop*
 - iii. *Left loop*
 - iv. *Right loop*
 - b) *Ridge counting*
 3. Arch patterns
 - a) *Plain arch*
 - b) *Tented arch*
 - c) *Others (arbitrary and cuspal)*
 4. Whorl
 - a) *Patterns*
 - i. *Plain whorl*
 - ii. *Central pocket loop whorl*
 - iii. *Double loop whorl*
 - iv. *Accidental whorl*
 - b) *Whorl tracing*
- B. Friction ridge skin injury and disease
1. Scars
 2. Burns
 3. Disease

2.2 Required Readings

- A. United States Department of Justice. Federal Bureau of Investigation: Identification Division Technical Section. *Fingerprint Training Manual*. 1983. pp. 1 – 63.
- B. United States Department of Justice. Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapters 2 – 3.

2.3 Suggested Readings

- A. Cummins, H and Midlo, C. *Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics*. New York, NY: Dover Publications, Inc.; 1961. Chapters 4 – 7.
- B. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 3
- C. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 5



3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Magnifier
- Ridge counters

3.4 Observed Performance

The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of pattern interpretation.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Draw Pattern Types, by drawing various pattern types provided by the trainer.
- C. For the exercises below, the trainee will determine the pattern type of provided fingerprints.
 1. The trainee will complete Practical Exercise: Pattern Interpretation of Loops.
 2. The trainee will complete Practical Exercise: Pattern Interpretation of Arches.
 3. The trainee will complete Practical Exercise: Pattern Interpretation of Whorls.
 4. The trainee will complete Practical Exercise: Pattern Interpretation of Scars.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-03-02 FRICTION RIDGE EXEMPLARS

Duration 1 week

Purpose Educate the trainee with types of friction ridge exemplars utilized for comparison purposes and the proper methods to record exemplars.

Prerequisite FR-TM-03-01

1 Objectives

1.1 Theoretical

Exemplars may be compared to suitable prints or other exemplars. Exemplars recorded of an individual's friction ridge skin may include finger, palm, toe, and sole prints. Good quality, completely rolled exemplars are important to obtain because latent prints are generally fragmentary. The trainee will gain a broad understanding of the methods and purpose for recording friction ridge skin.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Properly record and document friction ridge exemplars
- B. Discuss the proper method for recording friction ridge skin

2 Training Outline

2.1 Lesson Plan

- A. Purpose for recording friction ridge skin
 - 1. Personal identification
 - 2. Licensing
 - 3. Employment
 - 4. Criminal history
 - 5. Other
- B. Friction ridge exemplars
 - 1. Fingerprints
 - 2. Palm prints
 - 3. Toe prints
 - 4. Sole prints
- C. Electronic recording (live scan)
 - 1. Equipment
 - 2. Limitations
- D. Manual recording (ink)
 - 1. Equipment
 - 2. Equipment maintenance



3. Fingerprint card information
4. Limitations
- E. Recording friction ridge skin
 1. Health and safety concerns
 2. Taking fully rolled impressions (recording sequence, rolled nail-to-nail)
 3. Taking simultaneous impressions (recording sequence)
 4. Taking palm prints including finger joints
 5. Taking major case prints (complete friction ridge exemplars)
 6. Taking toe and sole prints
- F. Recording post-mortem friction ridge skin
 1. Health and safety concerns
 2. Fingerprinting the recently deceased
 3. Fingerprinting decomposed friction ridge skin
 4. Fingerprinting macerated friction ridge skin
 5. Fingerprinting desiccated friction ridge skin
 6. Traditional rehydration method
 7. Fingerprinting rehydrated friction ridge skin
 8. Fingerprinting charred friction ridge skin
 9. Laws governing removal of hands/fingers
- G. Access to exemplars
 1. Access to DPS records (limitations apply to searching applicants)
 - a) *Access to records is for official state business and is heavily monitored. Searches can only be made in regards to performing and completing assigned job duties*
 - b) *Texas DPS Crime Records Service: Computerized Criminal History (CCH) Search*
 - c) *Texas DPS CCH Archive Website*
 - d) *Texas DPS Driver's License / Identification*
 - i. *DLS Login*
 - ii. *Image Retrieval System*
 2. The FBI's Criminal Justice Information System (CJIS) FBI CJIS Website
 - a) *Access via AFIS Section*

2.2 Required Readings

- A. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 2.
- B. Cummins, H and Midlo, C. *Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics*. New York, NY: Dover Publications, Inc.; 1961. Chapter 3.



- C. Olsen, RD. *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas; 1978. Chapter 2.
- D. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version)
 1. Friction Ridge Exemplar Submitted Evidence
 2. Friction Ridge Exemplar from Crime Records
 3. Collection of Friction Ridge Exemplar from Living Subjects
 4. Collection of Friction Ridge Exemplar from Deceased Subjects
- E. United States Department of Justice: Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapters 9 – 11, 19.
- F. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 4.

2.3 Suggested Readings

- A. Website: FBI CJIS
- B. Website: [TX DPS Crime Records Service](#)

3 Practice

3.1 Safety

- A. Apply standard laboratory precautions.
- B. Wear appropriate personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
 1. The extent of protection is proportional to the amount of risk involved, and some activities will require more extensive protection.
 2. Consult associated chapters in Friction Ridge Manual for specific safety precautions.

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Fingerprint recording kit
- Post-mortem recording kit

3.4 Observed Performance

- A. The trainer will demonstrate the proper method of recording finger, palm, toe and sole print exemplars.
- B. The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of the methods for recording and retrieving friction ridge exemplars.

3.5 Supervised Performance

The trainee will demonstrate recording of exemplars. The quality of recorded exemplars obtained by the trainee will be reviewed by the trainer until the trainer believes the trainee is confident to obtain desired results independently.



3.6 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Recording Exemplars by recording five sets of fingerprints, five sets of palm prints, two sets of major case prints, and two sets of plantar prints.

4 Assessment

The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-03-03 FRICTION RIDGE CLASSIFICATION SYSTEMS AND AFIS

Duration 3 to 4 days

Purpose Familiarize the trainee with the historical aspect and purpose for maintaining friction ridge classification systems.

Prerequisite FR-TM-03-01, FR-TM-03-02

1 Objectives

1.1 Theoretical

Classification systems were designed to classify prints or sets of prints so they could be easily filed, searched, and retrieved. Although friction ridge skin is unique to an individual, the recurring patterns allow for systematic classification. The trainee will gain a broad understanding of the Modified Henry Classification System, the NCIC Classification System, and AFIS classification. The trainee will also gain a basic understanding of the AFIS Section.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Interpret pattern symbols from the Modified Henry Classification System, the NCIC Classification System, and AFIS classification.
- B. Interpret AFIS documentation.

2 Training Outline

2.1 Lesson Plan

- A. Classification systems
 1. The Modified Henry Classification System
 - a) *Primary Classification*
 - b) *Secondary Classification*
 - c) *Sub-Secondary Classification*
 - d) *Major Division*
 - e) *Final*
 - f) *Key*
 2. NCIC Fingerprint Classification System
 - a) *Pattern symbols*
 3. Automated Fingerprint Identification System (AFIS) Classification
 - a) *Pattern symbols*
- B. AFIS
 1. Criteria for searching
 2. Databases
 - a) *State (civil and criminal)*
 - i. *Finger and palm searches*



- b) *FBI (civil and criminal)*
 - i. *Finger and palm searches*
 - c) *DHS (Immigration and Customs Enforcement, Customs Border Patrol, Citizenship and Immigration Services, Department of State, and more)*
 - i. *Finger search only (no palms)*
 - ii. *Offenses searched: persons crimes, drugs, fraud, and theft of a firearm*
 - iii. *May also search by request*
 - d) *DoD (foreign nationals and suspected criminal/terrorist activity)*
 - i. *Finger search only (no palms)*
 - ii. *Searched by request only*
- 3. FR/AFIS workflow
 - 4. Documentation
 - 5. Limitations
 - a) *Quality of exemplars in database*
 - b) *Do not search tips or sides of fingers that are not normally recorded on exemplars*
 - c) *“No Hit” result does not equal an exclusion*

2.2 Required Readings

- A. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version). *AFIS Database Searches*
- B. United States Department of Justice: Federal Bureau of Investigation: Identification Division Technical Section. *Fingerprint Training Manual*. 1983. Pages 64 – 103.
- C. United States Department of Justice: Federal Bureau of Investigation. *The Science of Fingerprints: Classifications and Uses*. 1984. Chapters 4 – 8.
- D. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapters 5 – 6.

2.3 Suggested Readings

- A. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press. 1993. Chapter 3.
- B. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapter 8.
- C. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapters 6 – 8.
- D. Texas Department of Public Safety Crime Laboratory. AFIS Manual. (current version).
 - 1. AFIS Examination
 - 2. AFIS-Friction Ridge Case Workflow



3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

None

3.4 Observed Performance

The trainer and trainee will discuss topics to ensure the trainee has a solid understanding of friction ridge classification and the FR/AFIS workflow.

3.5 Independent Exercises

The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-03-04 BASIC FRICTION RIDGE COMPARISON

Duration 2 to 3 months

Purpose Familiarize the trainee with the basic friction ridge comparison process.

Prerequisite FR-TM-03-01, FR-TM-03-02, FR-TM-03-03

1 Objectives

1.1 Theoretical

There are three levels of friction ridge detail. This module focuses on the second level of detail and provides an introduction to the ACE-V Methodology. The friction ridge path present in a friction ridge impression is referred to as the second level of friction ridge detail. This level of detail contains significant data on the individuality of a print and can be used along with level one detail to effect an identification. The trainee will gain a broad understanding of the comparison process.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Compare exemplars and render a conclusion based on the comparison.
- B. Analyze distortion in exemplars and natural breaks such as creases and scars.

2 Training Outline

2.1 Lesson Plan

- A. Analysis of friction ridge detail
 1. Scars, creases, incipient ridges, and breaks may be observed at all three levels of friction ridge detail.
 2. Observe friction ridge flow (first level detail)
 - a) *Pattern type*
 - b) *Focal points*
 3. Observe friction ridge path (second level detail) (location, type, direction, and relationship)
 - a) *Bifurcation*
 - b) *Dot*
 - c) *Ridge ending*
 4. Observe friction ridge shape (third level detail)
 - a) *Scars*
 - b) *Creases*
 - c) *Edges*
 - d) *Width*
 - e) *Pores*
 - f) *Incipient ridges*
 - g) *Breaks*



- B. Comparison (side by side)
 - 1. Locate focal point
 - 2. Locate and memorize target group
 - 3. Search for target group with tolerance for variation in appearance
 - 4. Search multiple target groups
 - 5. Continue comparison beyond target group(s)
- C. Evaluation
 - 1. Assess the value of observed data
 - 2. Reach conclusion

2.2 Required Readings

- A. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 6.
- B. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 10. Pages 252 – 270.
- C. Olsen, RD. *Scott's Fingerprint Mechanics*. Springfield, IL: Charles C Thomas; Springfield, 1978. Chapter 1
- D. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 14.

2.3 Suggested Readings

- A. Lee, HC and Gaensslen, RE. *Advances in Fingerprint Technology*. Boca Raton, FL: CRC Press; 2001. Chapter 2.
- B. Maceo, AV. "Qualitative Assessment of Skin Deformation: A Pilot Study," *JFI*, 59 (4) Jul./Aug., 2009.

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Magnifier
- Ridge counters
- Foray ADAMS

3.4 Observed Performance

The trainer and trainee will discuss topics to ensure the trainee has a solid understanding of basic friction ridge comparisons techniques.



3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. The trainee will complete Practical Exercise: Mark Ridge Characteristics. The trainee will complete a sufficient number of exercises marking ridge characteristics until the trainee has demonstrated the skill necessary to perform the task.
- C. The trainee will complete Practical Exercise: Count Ridge Characteristics. The trainee will complete a sufficient number of exercises counting ridge characteristics until the trainee has demonstrated the skill necessary to perform the task.
- D. The trainee will complete Target Group Memorization Exercises. The trainee will complete a sufficient number of Target Group Memorization Exercises until the trainee has demonstrated the skill necessary to perform the task.
- E. Exemplar to Exemplar Comparison Exercises will be assigned to the trainee that gradually increase in difficulty. The rate at which the exercises increase in difficulty will be determined by the trainer.
 1. The conclusions made by the trainee will be verified by the trainer.
 2. The trainee will complete a sufficient number of Exemplar to Exemplar Comparison Exercises until the trainee has demonstrated the skill necessary to begin latent print to exemplar comparisons as determined by the trainer and/or supervisor.

4 Assessment

The trainee and trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of module.



FR-TM-03-05 ANALYSIS

Duration 1 to 3 months

Purpose Provide the trainee with extensive training in the ACE-V methodology and the skills to accurately analyze friction ridge detail.

Prerequisite FR-TM-03-01, FR-TM-03-02, FR-TM-03-03, FR-TM-03-04

1 Objectives

1.1 Theoretical

There are three levels of friction ridge detail. The friction ridge shape is referred to as the third level of detail and may be used, along with first and second level detail, to enable an identification. This module focuses on tying together all three levels of detail. The ACE-V methodology is the commonly utilized process for performing friction ridge comparisons. ACE-V is a type of hypothesis testing that provides a framework for forming scientifically accurate conclusions when performing friction ridge comparisons. The most crucial step in this process is Analysis. An accurate and thorough analysis of a print prior to comparing it to exemplars may result in a more efficient comparison through knowledge of the anatomical source and recognizing areas of the print that may not contain reliable level two detail due to distortion issues. Proper analysis will also help guard against confirmation bias.

The trainee will develop a thorough understanding of the ACE-V methodology. The trainee will also gain extensive knowledge of the Analysis phase by utilizing a holistic approach to determine the suitability of a print for identification.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Determine if a print is suitable for identification.
- B. Properly determine the possible anatomical source(s) and orientation(s) of prints.
- C. Recognize distortion issues in a print.
- D. Determine if the distortion effects can be worked through or if that area of the print should not be utilized in the comparison.
- E. Document the analysis of a print.

2 Training Outline

2.1 Lesson Plan

- A. Scientific method
- B. Comparison methodology (ACE-V)
 1. Analysis
 2. Comparison
 3. Evaluation
 4. Verification



C. Levels of friction ridge detail

1. Scars, creases, incipient ridges, and breaks may be observed at all three levels of friction ridge detail.
2. First level: overall friction ridge flow
 - a) *Pattern type*
 - b) *Focal points*
3. Second level: friction ridge path
 - a) *Bifurcation*
 - b) *Dot*
 - c) *Ridge ending*
4. Third level: friction ridge shape
 - a) *Scars*
 - b) *Creases*
 - c) *Edges*
 - d) *Width*
 - e) *Pores*
 - f) *Incipient ridges*
 - g) *Breaks*

D. Distortion in prints

1. Pressure
2. Movement
3. Overlay
4. Matrix
5. Substrate
6. Development method artifacts
7. Natural breaks
8. Unnatural breaks
9. Simultaneous impressions

E. Suitability Criteria

Seven clear level 2 detail plus at least two of the following:

1. Observable orientation
2. Observable anatomical source
3. At least one focal point
4. At least one region of distinct and reliable friction ridge detail to serve as a target group



- F. Due to the extreme variability of friction ridge detail, the reporting forensic scientist may determine a print to be suitable that does not meet the suitability criteria with the agreement of a second forensic scientist. The reporting forensic scientist will document the reasoning and how his/her opinion was reached on the composite, and a suitability review must be performed. All other documentation requirements for a print determined Suitable for Identification will be followed.

2.2 Required Readings

- A. Ashbaugh, DR. *Quantitative-Qualitative Friction Ridge Analysis*. Boca Raton, FL: CRC Press; 1999. Chapters 4 – 9, Glossary.
- B. Cowger, JF. *Friction Ridge Skin: Comparison and Identification of Fingerprints*. Boca Raton, FL: CRC Press; 1993. Chapter 7 – 8.
- C. Moenssens, AA. *Fingerprint Techniques*. Philadelphia, PA: Chilton Book Company; 1971. Chapter 10.
- D. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version). *Friction Ridge Comparison*
- E. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*. 2011. Chapter 9.

2.3 Suggested Readings

- A. Maceo, AV. "Qualitative Assessment of Skin Deformation: A Pilot Study." *Journal of Forensic Identification*. 2009; 59(4).
- B. Maceo, AV. "Qualitative Assessment of Skin Deformation: A Pilot Study, Correction." *Journal of Forensic Identification*. 2009; 59(5).
- C. SWGFAST Standards for Examining Friction Ridge Impressions and Resulting Conclusions. (final version)
- D. SWGFAST Standard for the Documentation of Analysis, Comparison, Evaluation and Verification (ACE-V) (Latent). (final version)
- E. Triplett, M and Cooney, L. "The Etiology of ACE-V and its Proper Use: An Exploration of the Relationship Between ACE-V and the Scientific Method of Hypothesis Testing." *Journal of Forensic Identification*. 2006; 56(3).

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Magnifier
- Ridge counters
- Foray ADAMS



3.4 Observed Performance

The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of ACE-V and the Analysis of prints.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. Analysis Exercises will be assigned to the trainee that gradually increase in difficulty. The rate at which the exercises increase in difficulty will be determined by the trainer. The trainee will complete a sufficient number of increasingly difficult Analysis Exercises until the trainee has demonstrated the ability to obtain desired results independently as determined by the trainer and/or supervisor.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-03-06 COMPARISON AND EVALUATION

Duration 3 to 7 months

Purpose Provide the trainee with extensive training in the ACE-V methodology and the skills to accurately compare prints to exemplars and to form conclusions based on those comparisons.

Prerequisite FR-TM-03-01 through FR-TM-03-05

1 Objectives

1.1 Theoretical

The ACE-V methodology is the commonly utilized process for performing friction ridge comparisons. ACE-V is a type of hypothesis testing that provides a framework for forming scientifically accurate conclusions when performing friction ridge comparisons. The trainee will gain extensive knowledge of the comparison and evaluation phases.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Independently perform the comparison of prints to exemplars and evaluate the results.
- B. Document the comparison and conclusion reached.

2 Training Outline

2.1 Lesson Plan

- A. Comparison
 1. Target group(s)
 2. Tolerance for variation in appearance
- B. Evaluation
 1. Identification
 2. Exclusion
 - a) *Exclusion Criteria (must be present in the print to reach an Exclusion conclusion):*
 - i. *Observable orientation*
 - ii. *Observable anatomical source*
 - iii. *At least one focal point*
 - iv. *At least two regions of distinct and reliable friction ridge detail to serve as a target group*
 3. Inconclusive
 - a) *Inconclusive Due to Exemplars (Incomplete)*
 - b) *Inconclusive Due to Latent, Patent, Plastic Print (Unable to Identify or Exclude)*
 - c) *Inconclusive Due to Latent, Patent, Plastic Print (Unable to Exclude)*
 - d) *Inconclusive Due to Lack of Examiner Consensus*



2.2 Suggested Readings

Maceo, AV. "Documenting and Reporting Inconclusive Results." *Journal of Forensic Identification*. 2011; 61(3).

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Magnifier
- Ridge counters
- Foray ADAMS

3.4 Observed Performance

The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of ACE-V and the Comparison and Evaluation of prints.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. Comparison and Evaluation Exercises will be assigned to the trainee that gradually increase in difficulty. The rate at which the exercises increase in difficulty will be determined by the trainer. The trainee will complete a sufficient number of increasingly difficult Comparison and Evaluation Exercises until the trainee has demonstrated the ability to obtain desired results independently as determined by the trainer and/or the supervisor.

4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.



FR-TM-03-07 VERIFICATION

Duration 2 to 4 weeks

Purpose Provide the trainee with the skills to accurately verify friction ridge comparison conclusions.

Prerequisite FR-TM-03-01 through FR-TM-03-06

1 Objectives

1.1 Theoretical

The verification process serves as a peer review of conclusions formed during ACE. The conclusions must be rigorously scrutinized to ensure that all aspects of the analysis and comparison were given proper consideration during the evaluation phase.

1.2 Practical

Following the completion of training, the trainee will be able to:

- A. Thoroughly and accurately verify conclusions reached by other examiners.
- B. Engage in and document the conflict resolution process.

2 Training Outline

2.1 Lesson Plan

- A. Suitability review
 1. Elements
 2. Documentation
- B. Verification
 1. Identifications
 2. Exclusions
 3. Inconclusive
 - a) *Inconclusive Due to Exemplars (Incomplete)*
 - b) *Inconclusive Due to Latent, Patent, Plastic Print (Unable to Identify or Exclude)*
 - c) *Inconclusive Due to Latent, Patent, Plastic Print (Unable to Exclude)*
 - d) *Inconclusive Due to Lack of Examiner Consensus*
 4. Documentation
- C. Conflict resolution/Consultation
 1. Difference of opinion in analysis
 2. Difference of opinion in evaluation



2.2 Required Readings

- A. SWGFAST *Standard for a Quality Assurance Program in Friction Ridge Examinations*. (final version)
- B. Texas Department of Public Safety Crime Laboratory Service Manual. (current version). *Review of Laboratory Records* chapter, sections
 1. Examination Verifications
 2. Review Resolution Process
- C. Texas Department of Public Safety Crime Laboratory. Friction Ridge Manual. (current version).
 1. Case Review
 2. Instructions for Friction Ridge Worksheet
 3. Instructions for Friction Ridge Comparison Worksheet
 4. Friction Ridge Comparison
- D. United States Department of Justice. National Institute of Justice. *The Fingerprint Sourcebook*, 2011. Chapter 12.

3 Practice

3.1 Safety

None

3.2 Standards, Controls, Reagent Preparation

None

3.3 Equipment

- Magnifier
- Ridge counters
- Foray ADAMS

3.4 Observed Performance

The trainer and the trainee will discuss topics to ensure the trainee has a solid understanding of ACE-V and the Verification of prints.

3.5 Independent Exercises

- A. The trainee will prepare brief summaries highlighting the significance of each topic of the Training Outline Lesson Plan.
- B. Verification Exercises will be assigned to the trainee that gradually increase in difficulty. The rate at which the exercises increase in difficulty will be determined by the trainer. The trainee will complete a sufficient number of Verification Exercises until the trainee has demonstrated the ability to obtain desired results independently as determined by the trainer and/or supervisor.



4 Assessment

The trainee and the trainer will complete the Friction Ridge Training Checklist (LAB-FR-TM-01) upon completion of the module.

4.1 Competency and Qualifying Examination

- A. The trainer will administer a comprehensive written qualifying examination to the trainee at the completion of the Comparison Unit.
- B. The trainer will administer a competency test to the trainee at the completion of the Comparison Unit.

4.2 Evaluation of Training Program by Trainee

The trainee will provide feedback of training material and the trainer for each unit completed utilizing the Training Evaluation Form (LAB-304).



04 FORMS

TRAINING FORMS

	Document Name	FRN
1	Friction Ridge Training Checklist	LAB-FR-TM-01