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## REVISION HISTORY

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01 QUALITY ASSURANCE

FR-01-01 FRICTION RIDGE OVERVIEW

1 Scope
Please refer to the CLS Customer Handbook, *Case Acceptance and Analysis Policies* chapter, for scope of services.

2 Related Documents
CLS Manual:
- Case Acceptance and Analysis Policies
- Friction Ridge Analysis
- Monitoring the Validity of Results
- Validations and Performance Verifications

3 Forensic Scientist Approval
A. Demonstration of competency in the use of Friction Ridge standard operating procedures is required prior to performing casework.

B. The following areas require Laboratory Director approval to allow casework by a forensic scientist:
   1. Friction Ridge Processing
   2. Friction Ridge Comparison

4 Examiner Assessment
A. Friction Ridge Processing
   1. Forensic scientists performing friction ridge processing will complete at least one proficiency, interlaboratory comparison test, or intralaboratory comparison test for friction ridge processing during each accreditation cycle.
   2. Examination, preservation, and analysis of observed and/or developed prints is not required.

B. Friction Ridge Comparison
   1. Forensic scientists conducting friction ridge comparisons will complete at least one proficiency test for friction ridge comparison annually.
   2. Due to limitations of shared testing material, documentation of analysis and verification may be solely on the Friction Ridge Worksheet (LAB-FR-01). No documentation on exemplars is required.

5 Method Validation
Newly proposed/approved procedures will be validated. A validation plan will include the basic parameters listed in the *Validations and Performance Verifications* chapter of the CLS Manual, as applicable, and appropriate acceptance criteria based on the nature of the method being validated.
FR-01-02  REAGENTS

1  Scope
Establish quality assurance guidelines for reagents, chemical preparations and solvents used in friction ridge development.

2  Related Documents
CLS Manual: Laboratory Equipment

3  Practice
A. A Reagent Preparation Log (LAB-FR-06) will be maintained for each prepared reagent, as applicable. If the reagent is prepared for one time use, the preparation details listed below are instead recorded in the relevant case record.

B. The log will include the following information:
   1. Identity of the reagent
   2. Identity, manufacturer, and lot number of individual components
   3. Preparer initials
   4. Preparation date
   5. Amount prepared
   6. Initials of the analyst who performed the quality check on the reagent
   7. Reagent performance will be verified with the creation of each batch and the results of the quality check documented, unless otherwise specified in the procedure.
      a)  Indicate "+" for a positive result.
      b)  Indicate "-" for a negative result.

C. No reagent or other chemical preparation will be used in casework if the quality check does not meet the expected criteria, is past its applicable expiration date, is not working properly, or is contaminated.

D. If an analyst has reason to suspect that a reagent or other chemical preparation is not working properly or is contaminated, they must:
   1. Check the reagent with proper control samples.
   2. Discard the reagent if it fails the quality check and prepare a new reagent.
      a)  If the reagent continues to fail the quality check, the supervisor and/or Quality Manager is notified and the QI/QAP process is initiated.

E. The container for the reagent will have the following information:
   1. Identity of the reagent
   2. Preparer initials
   3. Preparation date

F. All prepared reagents can be stored at room temperature unless otherwise stated in specific preparation instructions.
4  Records

Reagent Preparation Log (LAB-FR-06)
FR-01-03 EQUIPMENT

1 Scope
Identify significant and non-significant equipment. Significant equipment is required to follow laboratory policy in the Laboratory Equipment chapter of the Crime Laboratory Service Manual.

2 Related Documents
CLS Manual: Laboratory Equipment
CLS Manual: Validations and Performance Verifications

3 General Requirements for Significant Equipment
A. Maintenance, repair, and performance checks will be documented on the Equipment Log (LAB-405) for all significant equipment.
B. Normal maintenance includes keeping the equipment clean and does not need to be recorded.
C. A performance verification will be completed if a major repair is performed. Performance verifications will be documented on the Verification Form (LAB-408b) in accordance with the Validations and Performance Verifications chapter of the CLS Manual.
D. If a performance problem is detected and acceptable performance cannot be obtained after troubleshooting and appropriate corrections, the equipment must be removed from service and clearly labeled as such. The immediate supervisor will be notified and the out of service event will be documented as required in the Laboratory Equipment chapter of the CLS Manual.

1. Repair the equipment and complete a performance verification to ensure it is working properly before the equipment is returned to service. Complete the LAB-408b and submit for review and approval.
2. After the LAB-408b has been approved and is effective, the Section Supervisor and/or Technical Point of Contact will determine if the equipment is ready to return to service and the approval will be documented on the LAB-405.

4 Significant Equipment
4.1 Laser
A. Work instructions: see Coherent TracER chapter
B. Performance Verification: After initial set up and following any major repairs, an appropriate chemically treated test print is used as a performance verification to determine if the laser is operating as expected.
C. Appropriate conditions for the laser are monitored during its use.

4.2 Spex CrimeScope
A. Work instructions: see SPEX CrimeScope chapter
B. Performance Verification: After initial set up and following any major repairs, an appropriate chemically treated test print is used as a performance verification to determine if the light source is operating as expected.
C. Approximate conditions for the light source are monitored during its use.
5 Non-Significant Equipment

5.1 Air Science Fuming Chamber

A. Work instructions: see Air Science Fuming Chamber chapter

B. Maintenance: see Air Science Fuming Chamber chapter

5.2 Balances

A. Calibration

1. Annual calibration is performed by an external vendor.

2. A performance verification with 1g and 10g weights will be performed after initial setup and in the event that the balance goes outside of the control of the laboratory for repair, maintenance, modification, or calibration.

3. Since the tolerance of balances vary, the equipment must meet the specifications outlined on the calibration certificate provided by the manufacturer for satisfactory performance.

B. Routine maintenance includes keeping the balance clean and level, and using the appropriate balance for the weight being measured and precision required.

5.3 Down-flow Workstation

Maintenance: Routine maintenance includes changing filters, as needed.

5.4 Humidity Chamber

A. Approximate conditions for the humidity chamber are pre-set for the particular procedure and will be monitored during its use.

B. Work instructions: see Caron 6105 Fingerprint Development Chamber and/or Air Science Fingerprint Development Chamber chapters

5.5 Fisher Hamilton Forensics Fuming Cabinet

A. Work instructions: see Fisher Hamilton Forensics Cabinet chapter

B. Maintenance: see Fisher Hamilton Forensics Cabinet chapter

6 Software

A. Modifications made to software used in the Friction Ridge section are categorized into one of two groups, minor or major:

1. The version number indicates whether a software update is major or minor (ex: 7.1 to 7.2 is minor and 7.1 to 8.0 is major)

B. Follow CLS procedures regarding evaluation of software modifications.

7 Records

Equipment Log (LAB-405)

Verification Form (LAB-408b)

Equipment Out of Service Incident Form (LAB-410)
FR-01-04 EVIDENCE/CASE DOCUMENTATION

1 Scope
Establish policy concerning the elements of friction ridge evidence and examination records.

2 Friction Ridge Envelope

2.1 Contents

A. Historical Practice
   1. If annotations were present on lifts or on original/designated representations of captured prints, they were considered both evidence and examination records.
   2. If there were no annotations on lifts, they were considered to be evidence only.
   3. Original/designated representation of captured prints retained in printed and/or negative format were considered evidence.

B. Current Practice
   1. Evidence includes:
      a) Lifts created by DPS Crime Laboratory employees;
      b) Submitted printed friction ridge images;
      c) Exemplars received as evidence
   2. Examination Records include:
      a) Composites, enlargements, quality copies, or other printed friction ridge images with annotations;
      b) Quality copies of exemplars (submitted, on file at DPS, or obtained from the FBI)

2.2 Conditions of Storage

A. The friction ridge envelope should be arranged by laboratory abbreviation and numerically by case number in a secure storage area.

B. The laboratory shall determine the secure storage location for friction ridge envelopes.

2.3 Retention

A. The friction ridge envelope will be retained along with preserved friction ridge evidence and exemplars used for comparison.

B. Lift cards, casting materials, and gel lifters submitted to the laboratory will be considered physical evidence. Any suitable prints will be digitally preserved and physical evidence will be returned to the submitting agency.

C. If the submitting agency requests that the submitted exemplars associated with the case be returned, quality copies suitable for comparison must be prepared and retained in the friction ridge envelope or in DIMS.

D. A legible copy of preserved friction ridge evidence that is entered into State’s evidence should be maintained in the friction ridge envelope and the transfer documented in LIMS.
2.4 **Release**

A. Contents of friction ridge envelopes considered evidence only are not released pursuant to routine requests for discovery.

B. Contents of friction ridge envelopes considered both evidence and examination documentation are released pursuant to routine requests for discovery.

3 **Case Documentation**

A. Administrative Documentation

   1. Laboratory Submission Form
   2. Case-related correspondence

B. Technical Records

   1. Laboratory Report
   2. Friction Ridge worksheet(s) and other case notes
   3. Contents of the friction ridge envelope classified as examination records as defined above.
FR-01-05  STANDARD ABBREVIATIONS LIST

1 Scope
This is a listing of abbreviations commonly used in the Friction Ridge discipline. This list has been
generated to assist in the interpretation of case file notes and is not a standardized list of required
abbreviations. The abbreviations are not case sensitive. See also approved abbreviations found

2 Related Documents
AFIS Manual: Standard Abbreviations and Definitions
CLS Manual: Terms and Definitions

3 Abbreviations
3.1 General Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>APS</td>
<td>Adobe Photoshop</td>
</tr>
<tr>
<td>AS</td>
<td>Anatomical Source</td>
</tr>
<tr>
<td>CCH</td>
<td>Computerized Criminal History</td>
</tr>
<tr>
<td>CJIS</td>
<td>Criminal Justice Information System</td>
</tr>
<tr>
<td>CONT</td>
<td>Continue or Continued</td>
</tr>
<tr>
<td>CRS</td>
<td>Crime Records Service</td>
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<tr>
<td>DL</td>
<td>Driver's License</td>
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<tr>
<td>DOB</td>
<td>Date of Birth</td>
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<tr>
<td>DPS</td>
<td>Department of Public Safety</td>
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<td>ELIM</td>
<td>Elimination</td>
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<tr>
<td>FP</td>
<td>Fingerprint(s)</td>
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<td>FPC</td>
<td>Ten-print Fingerprint Card</td>
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<td>HC</td>
<td>Humidity Chamber</td>
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<td>Large</td>
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<td>Laboratory Information Sheet</td>
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<td>Abbreviation</td>
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<td>LM</td>
<td>Left Middle</td>
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<td>Left Palm</td>
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<td>Left Thumb</td>
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<td>MED</td>
<td>Medium</td>
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<td>Not Suitable</td>
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<td>Palm Print(s)</td>
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<td>RI</td>
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<td>RL</td>
<td>Right Little</td>
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<td>Right Palm</td>
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<td>Right Ring</td>
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<tr>
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<td>Serial Number</td>
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<td>Search</td>
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<td>SUB</td>
<td>Substance</td>
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<td>SUS</td>
<td>Suspect</td>
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<tr>
<td>T</td>
<td>Total</td>
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<tr>
<td>UCN</td>
<td>Universal Control Number</td>
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<tr>
<td>VAC</td>
<td>Vacuum</td>
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*Printed copy is uncontrolled. Refer to electronic copy for current version.*
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<td>VC</td>
<td>Verification Criteria</td>
</tr>
<tr>
<td>VE</td>
<td>Visual Examination</td>
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<td>VIC</td>
<td>Victim</td>
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<tr>
<td>VIN</td>
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FR-01-06   GLOSSARY OF TERMS

1   General Definitions

ACE-V – Analysis, Comparison, Evaluation, and Verification. The process of analyzing information, performing a visual comparison, evaluating that comparison to arrive at a conclusion, and having that conclusion verified.

Anatomical Source – Area of friction ridge skin an impression came from, i.e., FP, joint, PP, delta, or sole of the foot.

Angles – Formed by the abutting of one ridge against another; never formed by a single ridge.

Characteristics – Distinctive details of the friction ridges, including Level 1, 2, and 3 details (also known as features).

CJIS – Criminal Justice Information System: A system that provides state, local, and federal law enforcement and criminal justice agencies with access to information such as fingerprint records, criminal histories, and sex offender registrations.

Classification – Used to classify, search, and file fingerprints.

Consultation – A significant interaction between forensic scientists regarding one or more impressions in question; or evidence examination between two or more disciplines.

Converging Ridges – Point at which two or more ridges run into each other to form a point.

Core – The approximate center of a finger impression.

Complete Friction Ridge exemplars – A systematic recording of all friction ridge detail. This includes the extreme sides of the palms, joints, tips, and sides of the fingers (also known as major case prints).

Dactyloscopy – The science of identification by means of fingerprints.

Delta - That point on a ridge at or nearest to the point of divergence of two type lines and located at or directly in front of the point of divergence.

Discrepancy – The presence of friction ridge detail in one impression that does not exist in the corresponding area of another impression (compare with dissimilarity).

Dissimilarity – A difference in appearance between two friction ridge impressions (compare with discrepancy).

Distortion – Variances in the reproduction of friction skin caused by factors such as pressure, movement, force, and contact surface.

Divergence – The spreading apart of two ridges which have been running parallel or nearly parallel.

Edgeoscopy – 1. Study of the morphological characteristics of friction ridges. 2. Contour or shape of the edges of friction ridges.

Exclusion – The decision that there are sufficient features in disagreement between two areas of friction ridge impressions to conclude the two impressions did not originate from the same source.

Exemplars (finger, palm, foot) – The prints of an individual, associated with a known or claimed identity, and deliberately recorded electronically, by ink, or by another medium (synonymous with known prints).

Fingerprint – An impression of the friction ridges of all or any part of a finger.
**Focal Point** – A group of specific features used to narrow down the search target area. These may include the core, delta, crease, scar, or a large field of friction ridge detail such as thenar or hypothenar of the palm. Also known as anchor point.

**Friction Ridge** – A raised portion of the epidermis on the palmar or plantar skin consisting of one or more connected ridge units.

**Friction Ridge Characteristic** – Ridge characteristics apply to the distinguishing qualities in identifying fingerprints; also referred to as minutiae, Galton details or points. Most common level two characteristics are:

1. **Bifurcation** – The forking or dividing of one ridge into two ridges.
   a) **Ridge Island or Enclosure** – It is the result of a ridge splitting, forking, and rejoining again. Consists of two bifurcations.

2. **Dot** – A ridge that is as long as it is wide.

3. **Ridge Ending** – Ridge runs along and then comes into an abrupt ending.
   a) **Short Ridge** – A ridge traveling a short distance that consists of two ridge endings.

**Friction Ridge Detail (morphology)** – An area comprised of the combination of ridge flow, ridge characteristics, and ridge structure.

**Identification** – The decision that there are sufficient features in agreement between two areas of friction ridge impressions to conclude the two impressions originated from the same source.

**Incomplete Comparison** – A comparison that does not result in a conclusion.

**Inconclusive-Due to Exemplars** – The decision that a definitive conclusion cannot be reached due to an absence of complete and legible exemplars.

**Inconclusive-Due to [Latent, Patent, Plastic] Print** – The decision that a definitive conclusion cannot be reached when one of the following occurs:

4. Corresponding features are observed but are not sufficient to identify, and dissimilar features may be observed but not sufficient to exclude.

5. The print does not meet the exclusion criteria.

**Latent Print** – A transferred impression of friction ridge detail that is not readily visible to the naked eye.

**Level 1 Detail** – Friction ridge flow, pattern type, and general morphological information.

**Level 2 Detail** – Friction ridge paths and associated events, including minutiae.

**Level 3 Detail** – Friction ridge dimensional attributes such as width, edge shapes, and pores.

**Natural Breaks** – Creases, folds, or scars in the friction ridge skin causing the impression to appear as two or more parts.

**Orientation** – The location and direction of an area of friction ridge detail. May be denoted by an arrow pointing distally.

**Patent Print** – Friction ridge detail visible during initial visual examination prior to the application of development techniques.

**Pattern Area** – The area of a print in which the pattern type is present.
Pattern Types: Arch – Plain - That type of pattern in which the ridges enter upon one side, make a rise or wave in the center, and flow or tend to flow out the opposite side.

Pattern Types: Arch – Tented – That type of pattern which may have an angle, an upthrust, or two of the three basic characteristics of a loop.

Pattern Types: Loop – That type of pattern in which one or more ridges enter upon either side, recurve, touch or pass an imaginary line drawn from the delta to the core and pass out or tend to pass out upon the same side the ridges entered.

6. Ulnar – Ridges flow towards the ulna bone (towards the little finger).

7. Radial – Ridges flow towards the radius bone (towards the thumb).

Pattern Types: Whorl – That type of pattern that has at least two deltas and a recurve in front of each.

8. Plain – One or more ridges which make or tend to make a complete circuit, with two deltas, between which when an imaginary line is drawn, at least one recurving ridge within the inner pattern area is cut or touched.

9. Central Pocket Loop – Consists of at least one recurring ridge or an obstruction at right angles to the line of flow, with two deltas, between which when an imaginary line is drawn, no recurring ridge within the inner pattern area is cut or touched.

10. Double Loop – Two separate loop formations with two separate and distinct sets of shoulders and two deltas.

11. Accidental – A combination of two different types of patterns with the exception of the plain arch, with two or more deltas; or a pattern which possesses some of the requirements for two or more different types; or a pattern which conforms to none of the definitions.

Plastic Print – Three dimensional ridge detail made in a soft, pliable surface such as clay or wax.

Preserved Friction Ridge Evidence –

1. Latent, patent, or plastic prints that have been preserved by photography, scanning, lifting, or casting by a DPS Crime Laboratory employee.

2. Submitted digital images of latent, patent, or plastic prints that are acquired into Foray ADAMS by a DPS Crime Laboratory employee.

Simultaneous Impressions – Two or more impressions left on a surface at the same time that occupy the same relative position to each other.

Sufficient – Adequate for a specific function or task such as performing a comparison, testing a conclusion, or arriving at a conclusion.

Sufficient Recurve – That part of a recurving ridge between the shoulders of a loop. It must be free of any appendages abutting upon the outside of the recurve at a right angle.

Target Group (Area) – A unique and distinctive group of level two friction ridge detail that can be searched for and recognized in an exemplar.

Tolerance – The amount of variation in appearance of friction ridge features to be allowed during a comparison should a corresponding print be made available.
Type Lines – The two innermost ridges which start parallel, diverge, and surround or tend to surround the pattern area.

Unnatural Breaks – Areas in the print that are devoid of friction ridges causing the impression to appear as two or more parts.

Verification Criteria – The quantity of level two friction ridge characteristics in agreement between two prints.

2 Definitions for Digital Imaging of Friction Ridge Impressions

Acquisition – Process of obtaining or downloading digital assets.

ADAMS – Authenticated Digital Asset Management System; consists of computer hardware and software. Hardware includes workstation, server, and backup. Software includes Digital Workplace, Adobe Photoshop, Foray Image Calibrator, Grayscale FFT, and Chromatic FFT. ADAMS may also be generically referred to as DIMS (Digital Information Management System).

Asset – Any electronic file.

Authentication – The process of determining whether a recording or image is original, continuous, and free from unexplained alterations (e.g., additions, deletions, edits, or artifacts) and is consistent with the stated operation of the recording device used to make it.

Calibration – Image processing to create a 1:1 representation.

Camera RAW – The raw data as it comes directly off the CCD (Charged Coupled Device). No in-camera processing is performed. In order for it to be viewed it must be converted into a conventional file format using the processing power of a computer with appropriate software. The original data remains unchanged while a great degree of flexibility exists to process the data including white balance, exposure latitude and color correction. Due to the nature of camera RAW images, any processing performed to the image must be saved into a secondary format.

Composite – Print-out of any scanned or photographed image.

Export – The process of duplicating assets including related metadata pertaining to the asset and copying them to another location (e.g. memory card, CD-R, or DVD-R). The original asset remains on the system.

Image Processing – Any process intended to improve the visual appearance of an image. Processed images are referred to as working images. Image processing is sometimes referred to as enhancement.

JPEG Standard (.jpg) – Joint Photographic Experts Group is a file format used in digital imaging to compress images. Image compression reduces the size of an image file, saves storage space and reduces the time needed to transmit an image from one location to another. The JPEG format is subject to degradation and loss of data each time it is saved.

Lossless Compression – Compression in which no image data is lost and the image can be retrieved in its original form.

Nikon Electronic File Format (.nef) – The proprietary RAW format used in Nikon digital cameras.

Original Image – An accurate and complete replica of the primary image, regardless of media.

Tagged Image File Format (.tif) – A file format used in digital imaging to compress images. Some compression of data occurs, though it is not subject to data degradation.
**Working Image** – Copy of an original image that may be calibrated or processed for the purpose of comparative analysis. Processed images are considered working images.

### 3 Literature References and Supporting Documentation

Fingerprint Training Manual, Published by the Federal Bureau of Investigation, Identification Division, Technical Section, REV. 11-83.


FR-01-07 REPORT WRITING GUIDELINES

1 Scope

The required elements and reporting statements for friction ridge examinations performed are included in this chapter as well as the Laboratory Reports, Letters, and Certifications chapter of the CLS Manual. A wide variety of circumstances may occur, requiring variations in report writing language. However, these guidelines must be followed as closely as possible. Templates of the reporting statements are available in the LIMS by utilizing designated Hotkeys.

Bolded and bracketed portions of the reporting statements indicate situational/case specific wording.

2 Related Chapters/Documents

Report Appendix
AFIS Manual: Standard Abbreviations and Definitions
AFIS Manual: Report Writing Guidelines
CLS Manual: Laboratory Reports, Letters, and Certificates

3 Friction Ridge Examination (Processing and Comparison)

3.1 Required Elements

A. Relate evidence and outermost container in the LIMS to the friction ridge examination request or reference previous report.

B. If friction ridge examination was requested but evidence was not examined, indicate the reason(s) for no analysis. This does not apply to submitted exemplars.

C. Report the result for all evidence examined.

D. Indicate in the report if any trace evidence or other forensic evidence was collected by the reporting forensic scientist and its associated disposition.

E. Indicate in report if friction ridge impressions were observed, developed, and/or further developed and clarify if suitable or not suitable for identification.

F. Clearly report individual(s) compared and indicate exemplar information.

G. If a DPS Crime Laboratory employee is listed on the submission form for elimination purposes, the employee’s date of birth and corresponding SID shall not be listed on the report.

H. If a case involves comparisons to exemplars of a DPS Crime Laboratory employee due to a contamination event, the employee’s personal identifying information shall not be listed on the report.

I. For all comparison conclusions, indicate:

1. Item description [item] (include item number, item description, and print location as necessary)

2. Source [subject name] (If individuals share the same subject name, include the associated SID if from DPS files, associated FBI UCN if from FBI files, associated DHS EID/FIN if from DHS files, DoD TCN if from DoD files, submitted exemplars, or other identifier as necessary)

3. For inconclusive results, [reason] for conclusion
J. For cases in which AFIS is requested by submitting agency but not fulfilled, indicate [reason] for not transferring case to the AFIS Section as specifically requested.

K. For AFIS results, as applicable:
   1. Indicate that searches were conducted.
   2. Indicate which databases were searched (AFIS, FBI, DHS, DoD, or any combination).
   3. Indicate search results.
      a) If a matching print is found and verified, the search will be reported as “Identified”.
      b) If no matching print was located in the database, the search will be reported as “negative results”. (This does not indicate that no matching print exists in the database).
   4. Indicate if unidentified prints are stored in database(s).
   5. Provide statute of limitations reporting statement for all charges other than homicide, sexual assault, attempted homicide, child pornography, kidnapping, prints in an unknown deceased or questioned death, and arson.

L. Indicate disposition of submitted evidence, derived evidence (photographs, images, and lifts), and exemplars used for comparison.

M. The Friction Ridge Report Appendix will be sent with the final report to provide further explanation regarding reported conclusions to the recipient.

3.2 Requested Analysis

A. Comparisons

   “Unless otherwise stated, the suitable [latent, patent, plastic] print(s) [observed/developed/preserved] was compared to the exemplars from [DPS/FBI/DHS/DoD] files for: [SID/FBI UCN/EID and FIN/TCN] bearing the name [name].”

B. No Comparisons

   “The suitable [latent, patent, plastic] print(s) [observed/developed/preserved] was not compared to [subject name] due to [reason].”

C. AFIS Search – Hits (Identification)

   “As a result of the AFIS examinations performed by [name as appears in LIMS], Forensic Scientist at the Texas DPS Austin Crime Laboratory, the suitable [latent, patent, plastic] print(s) was compared, unless otherwise stated, to the exemplars from [DPS/FBI/DHS/DoD] files for: [SID/FBI UCN/EID and FIN/TCN] bearing the name [name].”

   “This is a supplemental report. Reference the [Latent Print, Friction Ridge] Examination Laboratory Report issued [issue date] and the [Latent AFIS, AFIS] Laboratory Report issued [issue date]. The AFIS examinations were performed by [name as appears in LIMS], Forensic Scientist at the Texas DPS Austin Crime Laboratory.”

   “This is a supplemental report. Reference the [Latent Print, Friction Ridge] Examination Laboratory Report issued [issue date]. As a result of the AFIS examinations performed by [name as appears in LIMS], Forensic Scientist at the Texas DPS Austin Crime Laboratory.”
Laboratory, the suitable [latent, patent, plastic] print(s) was compared, unless otherwise stated, to the exemplars from [DPS/FBI/DHS/DoD] files for: [SID/FBI UCN/EID and FIN/TCN] bearing the name [name]

D. AFIS Search – NS/AF or Negative Search Results

“The AFIS examinations were performed by [name as appears in LIMS], Forensic Scientist at the Texas DPS Austin Crime Laboratory.”

E. Supplemental Report – Additional Evidence or Individual Submitted for Comparison

“This is a supplemental report due to [reason]. Reference the [Latent Print, Friction Ridge] Examination Laboratory Report issued [issue date].”

F. Supplemental Report – Additional Evidence, Agency Request for AFIS, Previous Workflow

“This is a supplemental report due to additional evidence submitted for examination and due to agency request for AFIS examination. Reference the [Latent Print, Friction Ridge] Examination Laboratory Report issued [issue date].”

3.3 Conclusions

Note: “latent, patent, plastic” may be used for print clarification in comparison statements, as needed.

A. No Comparisons to Palm Prints – Suitable Finger and Palm Print(s) – Individual(s) Listed – Only FP exemplars available

“[Quantity] print(s) was not compared to [subject name] due to [reason].”

B. No Comparisons – No Individuals to Compare

“[Quantity] print(s) was not compared.”

C. No Comparisons – As a Result of an Identification

“[Subject name] was not compared to [quantity] print(s).”

D. Preserved but Determined Not Suitable

“[Quantity] print(s) [observed/developed/preserved] was determined not suitable for identification.”

E. No Suitable Prints

“No suitable prints were [observed/developed/preserved].”

F. No Prints

“No prints were [observed/developed/preserved].”

G. Submitted Exemplars Not Compared

“No used for comparison.”

H. Incomplete Comparison

“A comparison to [subject name] was performed on [quantity] print(s) but a conclusion was not rendered. The print was ultimately identified to [subject name].”

I. Exclusion

“[Subject name] was excluded as the source of [quantity] print(s).”
J. Identification

“[Subject name] was identified as the source of [quantity] print(s).”

K. Re-examination of Previously Reported Print

“[Subject name] was previously [excluded/inconclusive] as the source of [quantity] print(s). Re-examination of this print(s) was performed due to the result of an AFIS search; this print was identified to [subject name].”

L. Inconclusive due to Exemplars (Incomplete)

“The comparison of [quantity] print(s) to [subject name] was inconclusive due to insufficient exemplars.”

M. Inconclusive due to [Latent, Patent, Plastic] Print (Level 2 detail marked in common)

“The comparison of [quantity] print(s) to [subject name] was inconclusive due to insufficient detail in the print(s), and this individual cannot be identified or excluded as the source of the print(s).”

N. Inconclusive due to [Latent, Patent, Plastic] Print (Does not meet the exclusion criteria)

“The comparison of [quantity] print(s) to [subject name] was inconclusive due to insufficient detail in the print(s), and this individual cannot be excluded as the source of the print(s).”

O. Inconclusive due to Lack of Examiner Consensus

“The comparison of [quantity] print(s) to [subject name] was inconclusive due to the lack of examiner consensus, and this individual cannot be identified or excluded as the source of the print(s).”

P. AFIS

Note: “latent, patent, plastic” may be used for print clarification in AFIS statements, as needed.

1. Does Not Meet Criteria for AFIS Search

“[Quantity] print(s) does not meet the criteria for an AFIS search.”

2. Not Eligible for AFIS Search

“[Quantity] print(s) is not eligible for an AFIS Search.”

3. AFIS/FBI Search, No Hit, Stored in ULDB

“An AFIS/FBI search was performed on [quantity] print(s) with negative results. The print(s) was stored in the Unsolved Latent Database.”

4. AFIS/FBI Search, No Hit, Stored in both ULDB and FBI ULF

“An AFIS/FBI search was performed on [quantity] print(s) with negative results. The print(s) was stored in the Unsolved Latent Database and the FBI Unsolved Latent File.”

5. AFIS/FBI/DHS Search, No Hit, Stored in All Databases

“An AFIS/FBI/DHS search was performed on [quantity] print(s) with negative results. The print(s) was stored in the Unsolved Latent Database, the FBI Unsolved Latent File, and the DHS IDENT Unsolved Latent File.”
6. AFIS/FBI/DHS/DoD Search, No Hit, Stored in All Databases

“An AFIS/FBI/DHS/DoD search was performed on [quantity] print(s) with negative results. The print(s) was stored in the Unsolved Latent Database, the FBI Unsolved Latent File, the DHS IDENT Unsolved Latent File, and the DoD Unsolved Latent File.”

Q. Examination Requested, Evidence Not Examined

1. Syringes

“Friction ridge examination was not performed on this item. Syringes will not normally be examined for prints by the DPS Crime Laboratories. Please submit a written request from the prosecuting attorney for the examination of syringes. Note that any uncapped syringes must be rendered safe.

Please review the guidelines in the Laboratory Customer Handbook at: https://www.dps.texas.gov/CrimeLaboratory/Pubs.htm”

2. Projectiles

“Friction ridge examination was not performed on this item. Fired projectiles will not be examined for prints by the DPS Crime Laboratories.

Please review the guidelines in the Laboratory Customer Handbook at: https://www.dps.texas.gov/CrimeLaboratory/Pubs.htm”

3. Misdemeanor seized drugs offenses

“Friction ridge examination was not performed on this case. Evidence related to misdemeanor drug offenses is not typically examined for prints by the DPS Crime Laboratories. Please submit a written request from the prosecuting attorney for the examination of this misdemeanor drug offense indicating that an examination is needed for adjudication purposes.

Please review the guidelines in the Laboratory Customer Handbook at: https://www.dps.texas.gov/CrimeLaboratory/Pubs.htm”

4. Evidence previously analyzed for seized drugs

“Friction ridge examination was not performed on this case. Evidence that has previously been analyzed by a DPS Seized Drugs Section is not typically examined for prints by the DPS Crime Laboratories. Please submit a written request from the prosecuting attorney indicating that an examination is needed for adjudication purposes.

Please review the guidelines in the Laboratory Customer Handbook at: https://www.dps.texas.gov/CrimeLaboratory/Pubs.htm”

5. Bundles

“Friction ridge examination was not performed on this item per the DPS Friction Ridge bundle/packaging processing policy.

Please review the guidelines in the Laboratory Customer Handbook at: https://www.dps.texas.gov/CrimeLaboratory/Pubs.htm”

6. Lack of Customer Response

“No friction ridge examination was performed on [agency item #] due to a lack of case information. Multiple contact attempts were made to obtain required case information. Per the DPS Laboratory Customer Handbook at
3.4 Investigative Leads and Requirements for Further Analysis

A. Subjects without Exemplars
   “Submit a fully rolled set of [exemplars] for [name] for comparison.”

B. No Suspect
   “If a suspect is developed in this case, submit a fully rolled set of [exemplars] for comparison.”

C. Inconclusive Due to Exemplars
   “If further comparisons are required, submit a fully rolled set of [exemplars] for [name] for comparison.”

3.5 Dispositions

A. Evidence
   “The [evidence] will be [returned, transferred, or forwarded] to [agency/laboratory section].”
   “The exemplars used for comparison will be retained in our files.”
   “The preserved friction ridge evidence will be retained in our files.”
   “The [evidence] will be retained in our files.”
   “The [evidence] is being retained [reason].”

B. AFIS
   1. Notify customer if AFIS search request not fulfilled.
      a) Austin Crime Laboratory
         “This case will not be forwarded to the AFIS Section due to [reason].”
      b) All Regional Crime Laboratories
         “This case will not be forwarded to the Texas DPS Austin Crime Laboratory AFIS Section due to [reason].”
   2. Statute of Limitations
      “Once the statute of limitations has expired, the print(s) will be deleted from any unsolved database in which it is registered. If your agency needs the print(s) to remain in the database(s) indefinitely, please contact the reporting examiner.”

4 Limitations

A. Non-routine casework may not be represented clearly by these reporting statements. It may be necessary to modify reporting statements to accurately reflect the results.

B. Reporting statements may be combined as necessary.
C. Subject names listed in the report may be different than those provided on the submission form. Subject names will reflect the actual names that are present on the exemplars used for comparison. In some instances, the name listed in the report will reflect a signature that is present on the exemplars.

D. Multiple evidentiary items assigned to a single agency item number that have no prints or no suitable prints observed or developed may be grouped for examination documentation and reporting purposes with a singular result and/or conclusion.

E. For cases where the original report was generated in a legacy LIMS, it is not required to itemize the evidence listed on the legacy report(s); any friction ridge evidence received in the current LIMS must be itemized.

5 Literature References and Supporting Documentation


FR-01-08 REPORT APPENDIX

1 Scope

The following information is meant to provide context to the opinions reached and reported by the Texas DPS Friction Ridge Forensic Scientist. This appendix will be included with each Friction Ridge report.

2 Appendix Outline

Friction Ridge Report Appendix

Texas Department of Public Safety – Friction Ridge Examination

A conclusion is an interpretation of observations made by the Friction Ridge Forensic Scientist that is expressed as an expert opinion.

**IDENTIFICATION** – The conclusion that two friction ridge impressions originated from the same source due to sufficient features in agreement, and the forensic scientist would not expect to see the same arrangement of details repeated in an impression that came from a different source.

**EXCLUSION** – The conclusion that there are sufficient features in disagreement between two areas of friction ridge impressions to conclude the two impressions did not originate from the same source.

**INCONCLUSIVE DUE TO INSUFFICIENT EXEMPLARS** – When a print cannot be identified or excluded due to an absence of complete and legible exemplars. In this situation, the exemplars available for comparison may exhibit poor quality prints or lack specific comparable areas required for a complete examination.

**INCONCLUSIVE DUE TO INSUFFICIENT DETAIL IN THE [LATENT, PATENT, PLASTIC] PRINT:**

1) When corresponding features are observed but are not sufficient to identify and dissimilar features are observed but are not sufficient to exclude. In this situation, submission of additional exemplars will not assist in determining Identification or Exclusion.

OR

2) When the print does not meet the established Exclusion Criteria and no corresponding features are observed. In this situation, all relevant exemplars are present in order to perform a thorough comparison and all comparison efforts have been exhausted. This Inconclusive conclusion means that a reliable and repeatable Exclusion conclusion is unable to be established with the quantity and clarity of friction ridge detail present.

**INCONCLUSIVE DUE TO LACK OF EXAMINER CONSENSUS** – When the reporting examiner and all verifying examiners cannot reach a unanimous consensus for the final interpretation/opinion.

**AFIS Eligibility:**

Cases with unidentified suitable prints will be submitted for an AFIS examination, except in instances where the prints are considered not eligible for an AFIS search. If one or more of the following applies to an unidentified print, the print may not be searched by the AFIS Forensic Scientist:

1. Inconclusive conclusions with level 2 features marked in common with an exemplar print
2. Palm prints that aren’t searched when all fingerprints have been identified and there are no palm print exemplars on file for the individual
3. Once the maximum number of prints are searched and there are remaining unidentified prints in the case

Criteria for an AFIS Search:

**FINGERPRINTS** – Contain at least eight minutiae for a fingerprint or finger joint print with no voids or distortions of ridge detail between them.

*Note: A fingerprint may not meet the criteria for an AFIS search, even if it has eight or more minutiae, if the minutiae are located on the sides or on the tip of the finger. A core, delta(s), and a visible pattern type may also be necessary.*

**PALM PRINTS** – Contain at least twelve minutiae within a square inch on a palm with no voids or distortions of ridge detail between them.

*Note: A palm print may not be searched, even if it has twelve or more minutiae, if the general area from which it was produced (interdigital, thenar, or hypothenar) is unknown, or if the orientation is unknown.*

Prints containing fewer than two deltas with an unknown anatomical source and/or unknown orientation may not be searched in AFIS regardless of the number of minutiae contained therein.

A conclusion is an interpretation of observations made by the AFIS Forensic Scientist that is expressed as an expert opinion.

**NEGATIVE RESULTS** – A decision reached when comparisons of a search print to file prints on a candidate list generated by AFIS do not result in an identification. It indicates that the comparisons performed for a candidate list all resulted in some combination of exclusion and/or inconclusive decisions.

**NOTE:**

Due to the flexibility of friction ridge skin, the motion and/or pressure of touching friction ridge skin to a surface, and the condition of the surface being touched, variations in appearances and/or distortion of the friction ridge skin may be present in the recovered print. The quality of a recovered print is dependent on the conditions in which it was deposited.

Please contact the reporting forensic scientist for more information.
FR-01-09 CASE REVIEW

1 Scope
In addition to the technical and administrative review processes noted in Review of Laboratory Records in the CLS Manual, the following processes shall be performed as specified. Additional reviews may be performed at the discretion of the reporting forensic scientist, reviewer, and/or supervisor.

2 Related Chapters/Documents
Friction Ridge Comparison
CLS Manual: Review of Laboratory Records

3 Practices

3.1 Verification
A. The verification process for comparison conclusions is outlined in the Friction Ridge Comparison chapter.
B. Verification is a separate process from technical review.

3.2 Technical Review
A. The Friction Ridge Technical Review Checklist (LAB-FR-05) will be completed by the technical reviewer and included in the case record.
B. Technical review is documented in LIMS.

3.3 Evidence Review
When performed, it is a review of physical evidence by a second forensic scientist to ensure an accurate description of the evidence, the application of proper processing techniques (if applicable), and the documentation and/or preservation of ridge detail.
A. A random evidence review of at least five cases per month per forensic scientist as available will be performed by another forensic scientist or the supervisor on cases where no suitable prints or no prints were present. However, a forensic scientist may request to have another forensic scientist review the evidence at the reporting forensic scientist’s discretion.
B. In cases involving a death where no suitable prints were observed, developed, or preserved, a review of the evidence must be performed by a second forensic scientist to ensure that a complete analysis was done.
C. If there is a disagreement between forensic scientists concerning the quality of a print, the reporting forensic scientist should show the reviewer the reasoning and how his/her opinion was reached. If there is still a disagreement between forensic scientists, the print will be determined Not Suitable for Identification.
D. Disagreements between forensic scientists on the quality of a print must be documented.
E. There is no maximum number of reviews that can take place.
F. Evidence review is documented in LIMS and on the Friction Ridge Worksheet (LAB-FR-01).
3.4 Suitability Review

A. A second forensic scientist reviews the suitability of the reporting forensic scientist's preserved friction ridge evidence. If there is a disagreement between forensic scientists concerning the quality of a print, the reporting forensic scientist should show the reviewer the reasoning and how his/her opinion was reached. If there is still a disagreement between forensic scientists, the print will be determined Not Suitable for Identification.

B. Disagreements between forensic scientists on the quality of a print must be documented.

C. Review is documented in LIMS and on the composite(s) when performed. Documentation of the review will be added to the Friction Ridge Worksheet (LAB-FR-01) when finalized.

D. Inter-laboratory Suitability Reviews - DPS laboratories may request review from another DPS Laboratory.
   1. The requesting DPS Laboratory will forward the relevant composite(s) or electronic equivalent. An electronic equivalent for these purposes is a digital scan of the composite(s) that allows the reviewer to observe the analysis documentation of anatomical source and orientation arrow, as well as descriptions on the composite, but does not require a resolution sufficient to examine the image(s) of the print.
      a) Electronic copies of composites are considered convenience copies and are to be used for reference during review. These are not considered part of the case record.
      b) If documentation is necessary, the reviewer will create an additional composite to be retained in the case record.
      c) Reviews performed electronically will be documented in LIMS when performed. Documentation of the review will be added to the composite and Friction Ridge Worksheet (LAB-FR-01) before technical review.
   2. Reviewing laboratory will not make a new laboratory case number.

4 Records

Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)
AFIS Layout Sheet (LAB-AF-01)
Friction Ridge Technical Review Checklist (LAB-FR-05)
FR-01-10  FRICTION RIDGE EXAM COUNTING

1  General Instructions

The information requested by LIMS is used for uniform statistical reporting to document the number of total examinations made in a case. Enter all examination information in LIMS prior to technical review.

2  Examination Information

Total Articles Processed/Examined – Indicate with a number value the total number of articles/items/exhibits processed and/or submitted lift cards examined.

Suitable Prints Examined – Indicate with a number value the total number of suitable prints examined.

Individuals Compared – Indicate with a number value the total number of suspects, victims, and elimination individuals compared.

Individuals Identified – Indicate with a number value the total number of suspects, victims, and elimination identifications made.

Photographs Taken – Indicate with a number value the total number of photographs taken by the individual forensic scientist as listed on the Friction Ridge Worksheet (LAB-FR-01). Do not count the photographs that were taken at a crime scene or by another forensic scientist or section pertaining to the requested service.

Lifts Collected – Indicate with a number value the total number of lift cards collected by the individual forensic scientist as listed on the Friction Ridge Worksheet (LAB-FR-01).

Scans Taken – Indicate with a number value the total number of scans taken by the individual forensic scientist as listed on the Friction Ridge Worksheet (LAB-FR-01).

Images Processed – Indicate with a number value the total number of processed images including multiple processed images of a single original image.

Inclusions – Indicate with a number value the total number of prints that were identified to suspects, victims, and/or elimination individuals.

Exclusions – Indicate with a number value the total number of prints that were excluded to suspects, victims, and/or elimination individuals.

Inconclusives – Indicate with a number value the total number of prints that were inconclusive to suspects, victims, and/or elimination individuals.
02 PHYSICAL EXAMINATION AND CHEMICAL TESTING

FR-02-01 PHYSICAL EVIDENCE EXAMINATION

1 Scope
To establish uniform documentation and collection methods that will be utilized by the Friction Ridge section. The forensic scientist initially examining the evidence is primarily responsible for the preservation and possible collection of evidentiary materials that may be on evidence.

The forensic scientist will be given flexibility to determine an appropriate course of action in regard to the collection, preservation, and processing of evidence with the ultimate goal of quality and efficiency. The procedures presented are intended to assist the forensic scientist in the examination of physical evidence. They are to be used in conjunction with all applicable laboratory policies, good laboratory practice, and proper scientific methodology.

2 Related Chapters/Documents
Lifting Techniques
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
CLS Manual: Receipt and Review of Laboratory Requests for Service

3 Safety
A. Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection, as applicable.
B. All evidence that contains broken glass should be handled carefully and, if necessary, with the type of hand protection to prevent accidental cutting. Large pieces of broken glass and sharp/pointed evidence (knives) should be packaged in such a manner that the pieces cannot protrude from the package.
C. Large and heavy evidence should never be picked up by one person and moved by hand unless the proper safety belts are worn. The use of hand trucks and dollies is recommended to move any evidence over 50 pounds.
D. For large amounts of possible biological materials, use disposable coats, gloves, and approved eye protection, and a mask. For small amounts, the use of a regular lab coat can be substituted.
E. All firearms should be treated as if loaded. They must be rendered safe prior to any handling, marking and/or packaging by the forensic scientist. Rendering a firearm safe does not necessarily mean that it must be unloaded. It means that it must be placed in such a condition that it cannot be fired if it is dropped or the trigger accidentally pulled.

4 Equipment and Materials
Varies with the type of technique used to develop prints
- Envelopes, tape, working paper
- Evidence marking pens or scribing tool
- Boxes, paper envelopes, plastic bags, or appropriate evidence containers
- Friction Ridge Envelope
5 Standards, Controls, and Calibration
None

6 Precautions
A. Do not attempt to power on a mobile device or any other digital device, regardless of requested analysis. Contact a member of the Digital/Multimedia section at the Austin Regional Laboratory for assistance.

B. Due to the composition of prints, they can sometimes be destroyed by contact with other evidence.
   1. Evidence being submitted for friction ridge examination must be handled as little as possible to minimize loss of potential friction ridge evidence.
   2. Evidence should be processed as soon as possible so potential friction ridge evidence is not left to the environment's effects.

7 Procedure
A. Obtain the evidence.

B. Upon receipt of the evidence, verify that the Laboratory Submission Form (LAB-201) is complete and accurate. If changes are made by the forensic scientist, ensure there is documentation supporting the reason for any changes and the amendment is recorded in the case record in accordance with the CLS Manual.

C. Identify the forensic request(s) made and review whether the evidence has been processed in the proper sequence of disciplines, especially with regard to potentially destructive examination techniques.

D. Prepare a clean work surface.

E. Ensure that the outermost evidence container is marked with, at a minimum, the case number and forensic scientist's initials.

F. Open the container making sure not to break previous seals if at all possible.

G. All wet or damp evidence should be dried immediately in a vent hood away from direct sunlight, dust, or heavy air current.

H. Perform a visual examination of the evidence with gloved hands (if applicable) prior to processing.
   1. Document any potential evidence that is not related to Friction Ridge and take appropriate action (i.e. communicate with the submitting agency or consult with appropriate disciplines).
   2. A photocopy or photograph of a porous item must be made prior to processing if:
      a) There is a forensic need to preserve information present on the item, and
      b) The processing technique will cause ink to run, dissolve, or otherwise obliterate the information present on the item.
   3. Document the presence or absence of any latent, patent, or plastic prints on the evidence prior to processing. If preservation is required, proceed to the Digital Imaging of Friction Ridge Impressions chapter.
I. Plan an approach to process the evidence for prints. Keep in mind the sequential process for each technique.
   1. Perform the processing technique or series of processing techniques in sequence.
   2. If the evidence is not processed in accordance with the routine sequence, document the variance.

J. Multiple evidentiary items assigned to a single agency item number may be grouped for examination documentation and reporting purposes.

K. After each processing technique or series of processing techniques, examine the evidence and document the presence or absence of prints. If preservation is required, proceed to the *Digital Imaging of Friction Ridge Impressions* or *Lifting Techniques* chapter.

L. Document the sequence of examinations and activities performed to include the processing technique or series of processing techniques and the respective results on a Laboratory Information Sheet (LAB-403, LAB-404), Friction Ridge Worksheet (LAB-FR-01), or in LIMS.

   **Note:** When Laboratory Information Sheets and/or LIMS are used to document observations and processing techniques performed, required information must be incorporated into the Friction Ridge Worksheet (LAB-FR-01) prior to case review. This incorporation can be a single-line summary.

M. If prints are submitted for comparison:
   1. Label with case number, forensic scientist's initials, and the LIMS number.
   2. Proceed to the *Digital Imaging of Friction Ridge Impressions* chapter for acquisition and processing of prints that are potentially suitable for identification.
   3. Proceed to the Friction Ridge Comparison chapter for examination of prints.

N. If prints are submitted in a digital format for comparison:
   1. Label the media with case number, forensic scientist's initials, and the LIMS number.
   2. Prepare a Contact Sheet of the submitted evidence image(s).
   3. Proceed to the *Digital Imaging of Friction Ridge Impressions* chapter for acquisition and processing of friction ridge images potentially suitable for identification.
   4. Proceed to the Friction Ridge Comparison chapters for examination of submitted friction ridge images.

O. After an automated search with positive results:
   1. Ensure all relevant potential candidate information and/or exemplars needed for comparison are obtained.
   2. Proceed to the Friction Ridge Comparison chapter.

P. Following completion of processing and review of any digital imaging and evidence (if applicable), mark the evidence with the lab case number, forensic scientist's initials, and the LIMS item number. If the evidence is too small to label or if markings may interfere with other forensic disciplines examining the evidence, mark the proximal container with the lab case number, forensic scientist's initials, and the LIMS item number.
Q. All evidence to be returned or transferred should be placed back inside its original container. If the evidence cannot be re-packaged in the original container, it should be packaged appropriately with a note indicating that the original container is inside the new container. The evidence is placed in a secure storage location.

R. Retained evidence and/or examination documentation is placed into a Friction Ridge Envelope. Upon completion of the case, it is properly sealed and barcoded to secure storage.

8 Interpretation

A. All prints potentially suitable for identification will be preserved unless the customer has requested a sample selection.

B. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

9 Limitations

A. There is no scientifically valid method to determine how long a print may have been on a surface.

B. Evidence that has been wet or damp will not preclude the possibility of developing prints. However, experience has shown that it will likely decrease the ability to recover friction ridge evidence.

10 Records

Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)
Laboratory Submission Form (LAB-201)
Laboratory Information Sheet (LAB-403, LAB-404)

11 Literature References and Supporting Documentation

FR-02-02 POWDER PROCESSING

1 Scope
Powder processing is the most basic method of developing prints on non-porous surfaces. Powder is applied to a surface by lightly dusting over the surface with a soft bristle type brush or duster. Once prints are developed they should be preserved by photography and/or lifted with lifting tape and placed on a lift card.

Black is the most commonly used color of powder (even on dark colored surfaces). However, there are fluorescent powders that may be used which require the use of an alternate light source and appropriate filters.

2 Related Chapters
Lifting Techniques
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScope
Instructions for Coherent TracER

3 Safety
A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.

B. Powder can easily be inhaled.

4 Equipment and Materials
- Jar of fingerprint powder
- Fingerprint brushes – fiberglass, short bristle brush, or feather duster
- Container to hold powder – shallow dish, lid, or lab weighing dish
- Lifting tape – clear, frosted, or polyethylene. Comes in 1 1/2", 2", or 4" widths. Use with tape dispenser or without.
- Lift cards – smooth index stock or commercial lift cards, copy paper for large lifts
- Flashlight or good overhead lighting
- Camera
- Downflow Workstation

5 Standards, Controls, and Calibration
None

6 Procedure
Suggested Steps for Powder Processing
1. Take the jar of powder and tap the jar into the palm of the hand several times to break up clogs of powder and loosen the powder that has settled.

2. Pour a small amount of powder (two to three tablespoons) into a container.
3. Choose a type of brush to apply powder.
   a) Fiberglass or nylon – to be used on small or large objects.
   b) Feather duster – for larger objects.
   c) Short bristle – for small objects and also used for cleaning off excessive powder on prints by lightly brushing in the direction of ridge flow.

4. Hold brush between palms of your hands, rub hands back and forth several times to loosen and fluff out bristles or feathers.
   a) Dip the brush into the container of powder lightly to pick the powder up.
   b) Tap the brush several times with your index finger over container to release excess powder.

5. Apply the powder to the surface by lightly dusting over the surface (only the tips of bristles or feathers should touch the surface).
   a) Twirling motion – fiberglass brush
   b) Back and forth motion – fiberglass, feather duster, or short bristle brush
   c) Figure eight type motion – feather duster
   d) Once a print is visible, view the print and then apply a few more strokes of powder. If the print starts to lighten up or starts looking spotty – stop processing. The print is at its maximum contrast. Additional processing will destroy or deteriorate the print.

6. Remove excess powder from the processed evidence.
   a) Tap evidence lightly on counter.
   b) Use short bristle brush (brushing with the flow of ridges).

7. Preserve the print by either photography or a lifting technique appropriate to the evidence.

8. Multiple lifts of the same print can be made, as necessary.

7 Interpretation
   A. Proceed to the Lifting Techniques and/or Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
   B. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

8 Limitations
   A. Powder processing should not be used on porous items such as checks, cardboard, paper sacks, etc. A chemical process would be best suited for these types of evidence; however, if the paper or cardboard has a shiny or glossy surface (such as magazine covers or matchbook covers) powder processing may be used.
   B. Gloves will make it difficult to rub out air bubbles once lifting tape is placed over the developed print.

9 Records
   Friction Ridge Worksheet (LAB-FR-01)
10 Literature References and Supporting Documentation


FR-02-03  MAGNETIC POWDER PROCESSING

1 Scope

Magnetic powder is composed of finely ground metal shavings mixed with colored powder. The powder is applied using a metal rod or wand that has a magnet inside which attracts and holds the magnetic powder.

Black is the most commonly used color of magnetic powder (even on dark colored surfaces). However, there are fluorescent magnetic powders which may be used. These types of powders require the use of an alternate light source and appropriate filters.

2 Related Chapters

Powder Processing
Lifting Techniques
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScope
Instructions for Coherent TracER

3 Safety

A. Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.

B. Powder can be easily inhaled.

4 Equipment and Materials

- Magnetic Powder Kit (contains jars of magnetic powder and magnetic wand)
- Lifting tape (same tape as for regular Powder Processing)
- Lift cards (same cards as for regular Powder Processing)
- Flashlight or good overhead lighting
- Camera
- Downflow Workstation

5 Standards, Controls, and Calibration

None

6 Procedure

Suggested Steps for Magnetic Powder Processing

1. Take the jar of powder and tap the jar into the palm of the hand several times to break up clogs of powder and loosen powder that has settled.

2. Place large bulb end of wand into the jar to pick up metal shavings. Any overspill can be picked up with the wand and released back into the container.

3. Go over the surface using a back and forth motion with only the metal shavings coming in contact with the surface. CAUTION: If the metal bulb end comes in contact with the surface, it may scratch or destroy a print.
4. Remove excess powder from the evidence processed.
   a) Tap evidence lightly on the counter,
   b) Use a short bristle brush (brushing with the flow of ridges), or
   c) Apply light air current

5. Pull the rod out of the wand to release metal shavings.

6. Preserve the print by either photography or a lifting technique appropriate to the evidence.

7. Multiple lifts of the same print can be made, as necessary.

7 Interpretation
   A. Proceed to the Lifting Techniques and/or Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
   B. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

8 Limitations
Magnetic Powder Processing is not suited for processing metal objects or porous items such as checks, raw cardboard, or paper sacks. However, it may be used on shiny or glossy surfaces such as magazine covers, match book covers, etc.

9 Records
Friction Ridge Worksheet (LAB-FR-01)

10 Literature References and Supporting Documentation
FR-02-04  IODINE PROCESSING

1 Scope

Iodine fuming is the oldest chemical technique for developing prints on porous and non-porous surfaces. Iodine Fuming reacts with the sebaceous oil in latent print residue. The iodine is applied to a surface by allowing the fumes from the iodine crystals to come in contact with the surface to be processed. Once prints are developed, they should be photographed immediately as they will dissipate over a short period of time.

It can be used in conjunction with other processes if used in the following order:

1. Iodine Fuming
2. IND
3. DFO
4. Ninhydrin

2 Related Chapters

Ninhydrin Processing
DFO (1 8-Diazafluoren-9-one) Processing
Digital Imaging of Friction Ridge Impressions
IND (1,2-Indanedione) Processing
Friction Ridge Comparison

3 Safety

A. Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.

B. Iodine crystals and fumes are extremely caustic to metals and are also upper respiratory irritants. The fumes can easily be inhaled. Processing should be done in a vent hood, and if done outdoors, a fume mask should be worn.

C. Burns can occur from touching hot metal parts, hot water, or steam. Use caution when you turn a steam iron upside down as there may be hot water in the reservoir.

4 Equipment and Materials

- Commercially available Iodine Fuming Kit
- Iodine Crystals
- Large zip top plastic bag
- Camera

5 Standards, Controls, and Calibration

A. Process a test print as a control every day the processing method is used

1. Place a test print onto a clean white card.
2. Apply Iodine Fuming to the card.
3. The fumes will produce positive results if prints are developed.
4. Results will be documented on the Friction Ridge Worksheet (LAB-FR-01).
6 Procedure

6.1 Commercially Available Iodine Fuming Kit

1. Place thumbs over the ampoule in the plastic tube. Position index fingers under the tube at each end of the ampoule. Bend the tube breaking the ampoule to release the iodine crystals.
2. Grasp the wand covering the iodine crystals with your hand.
3. Take a breath and hold it, then place the plastic tube in your mouth and blow onto the surface to be processed.
4. While blowing into the wand, move the other end of the tube in a circular pattern around the area to be fumed. Increase the size of the circular pattern with each revolution. For best results, hold the fuming end of the tube ½” to ¾” from the surface being fumed and rotate the tube end with a slow steady motion. **Do not inhale the iodine fumes.**
5. Examine the evidence for prints. Mark any prints to be preserved by photography.

6.2 Application with Iodine Fuming Bag

1. Place 1g Iodine crystals in the bottom of plastic ziptop bag.
2. Place evidence to be processed in the ziptop bag, and zip the bag shut.
3. Generate heat in bag by shaking bag or placing bag under floodlights.
4. Do not let crystals come in direct contact with the evidence to be processed.
5. Examine the evidence for prints. Mark any prints to be preserved by photography.

6.3 Fixing the Print (optional)

1. Pass a hot steam iron or run tap water over the evidence.
2. Preserve the print by photography.

7 Interpretation

A. Positive results are obtained when the print appears with a coloration ranging from pale yellow to dark brown. Fixing the print will alter the color to light or dark purple.
B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

8 Limitations

A. Iodine fuming is effective on those prints of recent origin and less effective as time increases. This may be a function of the absorption of the porous surface.
B. Prints developed with iodine fuming fade quickly and must be preserved immediately.

9 Records

Friction Ridge Worksheet (LAB-FR-01)
10 Literature References and Supporting Documentation


United States Department of Justice. Federal Bureau of Investigation. The Science of

FR-02-05  NINHYDRIN PROCESSING

1 Scope
Ninhydrin is used for developing prints on porous surfaces such as paper, cardboard, and smooth raw wood. Ninhydrin reacts with the amino acids that are present in latent print residue. It is sensitive to old prints, as well as fresh prints, and can be used to develop prints in blood on porous surfaces. The first known use of Ninhydrin for developing prints was in the early 1950s. Ninhydrin can be mixed using two carriers: acetone or petroleum ether.

It can be used in conjunction with other processes if used in the following order:

1. Iodine Fuming
2. IND
3. DFO
4. Ninhydrin

2 Specifications
Ninhydrin (NIN)/Petroleum Ether Base
Ninhydrin (NIN)/Acetone Base

3 Related Chapters/Documents
Iodine Processing
DFO (1,8-Diazafluoren-9-one) Processing
Digital Imaging of Friction Ridge Impression
IND (1,2-Indanedione) Processing
Friction Ridge Comparison
Instructions for Air Science Fingerprint Development Chamber
Instructions for Caron 6105 Fingerprint Development Chamber
Instructions for SPEX CrimeScope
CLS Manual: Laboratory Equipment

4 Safety
A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.
B. Ninhydrin should be used in a laboratory fume hood, a well-ventilated area, or outside.
C. Ninhydrin is mixed with a carrier such as methanol, acetone, or petroleum ether (which is highly flammable).
D. Excess is disposed of as any flammable liquid.

5 Equipment and Materials
- Humidity chamber
- Camera
- Ninhydrin/Acetone Base
- Ninhydrin/Petroleum Ether Base
- Ninhydrin crystals
- Acetone
- Methanol
- Isopropyl alcohol
- Petroleum Ether
- Stirring device
- Graduated cylinder
- Scale
- Beaker
- Funnel

6 Standards, Controls, and Calibration
None

7 Precautions
A. Evidence that may have potential DNA evidentiary value may be processed for prints with Ninhydrin first. If the offense is sexual in nature or if there are obvious blood stains, consult with a DNA analyst prior to processing with Ninhydrin.

B. Carriers that Ninhydrin is mixed with can interfere with other types of analyses such as document examinations involving inks and questioned writing. Acetone will cause certain inks to run or dissolve. Forensic document examinations should be performed prior to Ninhydrin processing.

8 Procedure
8.1 Reagent Preparation
A. Ninhydrin/Petroleum Ether Base Solution (0.5%)
1. Ensure glassware is clean.
2. The petroleum ether carrier will not dissolve the Ninhydrin crystals. They must be dissolved in methanol.
3. A stirring device should be used for mixing.
4. Dissolve 5g Ninhydrin crystals in 30mL methanol.
5. Add 40mL isopropyl alcohol and 930mL petroleum ether.
6. Store reagent in a dark storage bottle. Shelf life is six months.

B. Ninhydrin/Acetone Base Solution (0.6%)
1. The concentration of the Ninhydrin base solution may be altered at the discretion of the forensic scientist to improve the sensitivity on a case by case basis.
2. Dissolve 6g Ninhydrin crystals in 1000mL Acetone.
3. Store reagent in a dark storage bottle. Shelf life is six months.
8.2 Quality Testing

1. Place a test print on paper and allow the perspiration to dry.
2. Apply Ninhydrin solution to the paper.
3. To accelerate the development, place the paper into a humidity controlled chamber.
4. A positive result is indicated by the development of the print.
5. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and indicate the results in the log.

8.3 Application

1. Select the appropriate Ninhydrin base solution depending on the other substances on the surface. Acetone will cause certain inks to dissolve.
2. Apply the Ninhydrin solution to evidence by spraying, dipping, or brushing.
3. After the Ninhydrin has dried, place the processed evidence in a humidity chamber to accelerate the development process.
   a) 5 minutes at 80°C and 70% relative humidity.
4. Examine the evidence for prints. Mark any prints to be preserved by photography or scanning.
5. Developed prints on some dark-colored surfaces may be viewed with a light source for increased contrast.

9 Interpretation

A. Ninhydrin will cause a print to be developed in a pinkish-purple color. These prints must be preserved by photography or scanning.

B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.

C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

10 Limitations

Ninhydrin is best suited for a porous item. If the surface is shiny or glossy, another process may produce better results.

11 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation


FR-02-06  DFO PROCESSING

1  Scope
DFO is a fluorescent reagent used for developing prints on porous surfaces. DFO is a Ninhydrin analogue and reacts with the amino acids that are present in print residue. It is sensitive to old prints as well as fresh prints and can be used to develop prints in blood on porous surfaces.

It can be used in conjunction with other processes if used in the following order:

1.  Iodine Fuming
2.  IND
3.  DFO
4.  Ninhydrin

2  Specifications
DFO (1, 8-Diazafluoren-9-One) Stock solution
DFO (1, 8-Diazafluoren-9-One) Working Solution

3  Related Chapters/Documents
Iodine Processing
Ninhydrin Processing
Digital Imaging of Friction Ridge Impressions
IND Processing
Friction Ridge Comparison
Instructions for Air Science Fingerprint Development Chamber
Instructions for Spex CrimeScope
Instructions for Caron 6105 Fingerprint Development Chamber
Instructions for Coherent TracER
CLS Manual: Laboratory Equipment

4  Safety
A.  Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.
B.  The reagent is flammable. It is a sensitizer and causes staining of the skin.
C.  Mixing must be performed in a vent hood.
D.  DFO is mixed with carriers that are highly flammable and irritant. Must be disposed of like any other flammable chemical.
5 Equipment and Materials
- Graduated cylinder
- Humidity chamber
- Propanol
- Acetone
- Xylene
- DFO Stock and Working Solution
- DFO
- Methanol
- Ethyl Acetate
- Glacial acetic acid
- Petroleum Ether
- Laser or light source
- Camera
- Stirring device
- Scale
- Beaker

6 Precautions
A. Evidence that may have potential DNA evidentiary value should not be processed for
prints with DFO prior to DNA collection.
B. Carriers that DFO is mixed with can interfere with other types of analyses such as
document examinations involving inks and questioned writing. Forensic document
examinations should be performed prior to DFO processing.

7 Standards, Controls, and Calibration
None

8 Procedure
8.1 Reagent Preparation
A. DFO Stock Solution
1. Ensure glassware is clean.
2. Dissolve 1g DFO powder in 180mL methanol.
3. Stir until dissolved.
4. Add 20mL Glacial Acetic acid.
5. Store in dark bottles. Shelf life is six months.
B. DFO Working Solution
1. Combine 10mL Isopropyl alcohol, 50mL Acetone, 50mL Xylene, 60mL DFO Stock
   Solution, and 830mL Petroleum Ether.
2. If the solution is not clear, add additional 10mL Isopropyl alcohol.
3. Store in dark bottles. Shelf life six months.
8.2 Quality Testing

1. Place a test print on paper and allow the perspiration to dry.
2. Apply DFO working solution to the paper.
3. To accelerate the development, place the paper into a humidity controlled chamber (no humidity).
4. Developed prints are observed through an orange/amber viewing filter using a laser or light source. A positive result is indicated by the development of the print.
5. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and indicate the results in the log.

8.3 Application

1. Apply the DFO working solution to evidence for approximately ten seconds.
2. Allow evidence to dry for approximately three minutes.
3. Repeat steps 1 and 2.
4. Heat is then applied to the dried evidence by placing it in an oven that contains no humidity or use an iron with no steam.
   a) Heat for ten minutes at 100°C (212°F).
5. View under a laser or light source.
6. Examine the evidence for prints. Mark any prints to be preserved by photography.

9 Interpretation

A. The prints will appear as a pinkish-orange color. However, when viewed under various lasers or light sources, the prints will fluoresce brightly and are much more visible, especially on a dark colored surface that may hide prints developed with Ninhydrin alone.

B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.

C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

10 Limitations

Potential background staining of evidentiary items.

11 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation

FR-02-07 CYANOACRYLATE ESTER (SUPER GLUE) PROCESSING

1 Scope

The super glue process was first used for developing prints by the Japanese police in the late 1970s. A glue containing cyanoacrylate is placed in an aluminum dish on a heating device in an airtight chamber with the evidence. As the glue is heated, the resulting fumes circulate throughout the chamber adhering to latent print residue on the evidence. The developed prints can either be photographed with special lighting techniques or further processed with powder or fluorescent dye. The process will develop fresh prints as well as old prints.

2 Related Chapters

Powder Processing
Magnetic Powder Processing
Rhodamine 6G Fluorescent Dye Processing
RAM Fluorescent Dye Processing
Lifting Techniques
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Fisher Hamilton Forensics Cabinet
Instructions for Air Science Fuming Chamber
Instructions for Spex CrimeScope

3 Safety

A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.

B. Precautions must be taken so that the glue does not get onto the skin. If the glue does get onto the skin and is attached to something, do not try to pull apart. Use warm, soapy water or acetone and then rub apart to release.

C. Use in a vent hood or use an exhaust system to remove fumes from the chamber prior to opening the fuming chamber and removing the evidence.

D. Hydrogen cyanide gas is produced when cyanoacrylate ester (super glue) is heated above 400°F. The flash point for HOT STUFF - Original (Red Label) is 176°F to 200°F.

4 Equipment and Materials

- Airtight fuming chamber
- Glue containing cyanoacrylate (such as super glue)
- Aluminum dish to hold glue
- Heating device
- Camera
5 Standards, Controls, and Calibration

A. Process a test print as a control to determine processing time for evidence.
   1. Place a test print on the inside of fuming chamber.
   2. When the print is fully developed, the processing time should be complete.
   3. Results will be documented on the Friction Ridge Worksheet (LAB-FR-01).

6 Procedure

6.1 Fuming Tank and Fuming Cabinet

1. Place the aluminum dish on a heating device and pour approximately one teaspoon of glue into the dish.
2. Place the evidence into the fuming chamber either by suspending or standing so all areas are exposed. (Do not suspend directly over glue dish.)
3. Seal up the fuming chamber.
4. Turn on the heating device. Monitor progress of fuming by viewing test print placed on inside of chamber.
5. After print(s) are developed (usually 8 to 30 minutes), turn the heating device off and exhaust the fumes from chamber before opening.
6. Remove evidence and view with angle overhead lighting for developed prints.
7. If prints have been developed, they may be preserved by photography prior to further processing.
8. Depending on the type of evidence additional processing techniques for development of the prints may be used. Refer to the following chapters:
   a) Powder Processing or Magnetic Powder Processing
   b) Rhodamine 6G Fluorescent Dye Staining or RAM Fluorescent Dye Processing

6.2 Fuming Cabinet

See the Instructions for Fisher Hamilton Forensics Fuming Cabinet chapter.

6.3 Fuming Chamber

See the Instructions for Air Science Fuming Chamber chapter.

7 Interpretation

A. If prints are present, they will turn white or light gray in color.

B. Perform Powder Processing, Magnetic Powder Processing, Rhodamine 6G Fluorescent Dye Processing or RAM Fluorescent Dye Processing as necessary to further process prints.

C. Developed prints may be preserved prior to further processing. Proceed to the Digital Imaging of Friction Ridge Impressions chapter.

D. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.
8 Limitations

A. Fuming times may vary accordingly with the condition and surface of substrate, size of chamber, relative humidity, and heating device used.

B. Cyanoacrylate Ester (Super Glue) processing is not used on porous items, such as paper, cardboard or raw wood. However, if surface of these items is a shiny or glossy surface it may be used.

C. Cyanoacrylate Ester (Super Glue) Processing may interfere with DNA analysis and blood enhancement techniques.

9 Records

Friction Ridge Worksheet (LAB-FR-01)

10 Literature References and Supporting Documentation

Lee HC and Gaensslen RE. Advances in Fingerprint Technology. 2nd Edition.

FR-02-08 RHODAMINE 6G FLUORESCENT DYE PROCESSING

1 Scope

Rhodamine 6G is to be used only on non-porous evidence and after Cyanoacrylate Ester (Super Glue) processing. Rhodamine 6G is a fluorescent dye used to make cyanoacrylate-developed prints more visible on various colored surfaces. Lasers or light sources are used in conjunction with this process. Rhodamine 6G processed prints will have to be photographed under a light source.

Different carriers for the working solution can be utilized to decrease processing times, preserve inked markings on evidence, or for use on special surfaces.

Rhodamine 6G Working Solution #1 (Petroleum Ether carrier) is used in place of Rhodamine 6G Working Solution #2 (Methanol carrier) when there is a question about or a problem with a waxy or varnished surface.

2 Specifications

Rhodamine 6G Stock Solution
Rhodamine 6G Working Solution #1
Rhodamine 6G Working Solution #2

3 Related Chapters/Documents

Cyanoacrylate Ester (Super Glue) Processing
RAM Fluorescent Dye Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Coherent TracER
Instructions for Spex CrimeScope
CLS Manual: Laboratory Equipment

4 Safety

A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.
B. Rhodamine 6G working solution and stock solutions are extremely flammable and caution should be used.
C. This reagent should be mixed and applied to evidence under a fume hood so that it is not inhaled.

5 Equipment and Materials

- Rhodamine 6G Stock Solution
- Rhodamine 6G
- Methanol
- Acetone
- Acetonitrile
- Isopropanol
• Petroleum Ether
• Scales
• Stirring device
• Glass beakers
• Graduated cylinders
• Dark storage bottles
• Plastic squirt bottle
• Laser or light source
• Camera

6 Standards, Controls, and Calibration

A. Surface Control: may be necessary when the evidence has a waxy or varnished surface.
   1. When applying the solution to a surface of concern, place a small amount of solution on a place away from developed prints.
   2. If the surface begins to cloud over, use Rhodamine 6G Working Solution #1 (Petroleum Ether carrier).

7 Procedure

7.1 Reagent Preparation

A. Rhodamine 6G Stock Solution
   1. Combine 1g Rhodamine 6G and 1000mL Methanol.
   2. Stir on a stirring device until the Rhodamine 6G is dissolved.
   3. Store in a brown bottle.
   4. Shelf life of stock solution: 15 years

B. Rhodamine 6G Working Solution #1
   1. Rhodamine 6G Stock Solution – 12mL
   2. Acetone – 60mL
   3. Acetonitrile – 40mL
   4. Methanol – 60mL
   5. Isopropanol – 128mL
   6. Petroleum Ether – 3700mL
   7. Combine the ingredients in the order listed in a brown bottle.
   8. Shelf life of the working solution: six months

C. Rhodamine 6G Working Solution #2
   1. Rhodamine 6G Stock Solution – 8.5mL
   2. Methanol – 4000mL
   3. Place into a brown bottle.
   4. Shelf life of the working solution: six months
D. Either working solution can be strengthened or weakened by changing the amount of stock solution added to the formulation. Any alteration to these formulations must be fully documented and only used for that particular case.

7.2 Quality Testing

1. Using a squirt bottle, apply Rhodamine 6G working solution #1 or #2 to a cyanoacrylate-treated test print.
2. Allow the sample to dry.
3. Place the treated sample under a light source. A positive result is indicated by the print fluorescing.
4. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and document the results on the log.

7.3 Application

1. After Cyanoacrylate Ester (Super Glue) processing, apply the appropriate Rhodamine 6G working solution to the evidence by either dipping or using a spray device or squirt bottle.
2. Place the evidence under a fume hood to dry.
3. Examine the evidence under the laser or light source with the appropriate filter for the wavelength. The power setting (beam intensity) may be adjusted as needed.
4. If the dye appears to be in excess, it may be rinsed with an application of distilled water or methanol over the evidence to reduce its thickness. A second application of dye stain may be necessary after the rinse.
5. Examine the evidence for prints. Mark any prints to be preserved by photography.

8 Interpretation

A. The prints should fluoresce.
B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

9 Limitations

A. When prepared as indicated, Rhodamine 6G may overwhelm a weak print.
B. Working solution #2 (Methanol-based carrier) may cause certain inked markings to run and may take considerable time to dry depending on the substrate. It also may cause waxy or varnished surfaces to become cloudy.

10 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

11 Literature References and Supporting Documentation

FR-02-09   RAM FLUORESCENT DYE PROCESSING

1  Scope
RAM is to be used only on non-porous evidence and after Cyanoacrylate Ester (Super Glue) processing. RAM is a fluorescent dye used to make cyanoacrylate-developed prints more visible on various colored surfaces. Lasers or light sources are used in conjunction with this process. RAM processed prints have to be photographed under a light source.

2  Specifications
Rhodamine 6G Stock Solution
MBD Stock Solution
RAM Working Solution (Spex CrimeScope)
RAM Working Solution (Laser)

3  Related Chapters/Documents
Cyanoacrylate Ester (Super Glue) Processing
Rhodamine 6G Fluorescent Dye Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScope
Instructions for Coherent TracER
CLS Manual: Laboratory Equipment

4  Safety
A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.
B. The RAM reagent is flammable and inhalation may cause upper respiratory tract irritation. Prolonged exposure may result in systemic toxic effects. It should be mixed and applied to evidence under a fume hood.

5  Equipment and Materials
- Rhodamine 6G Stock Solution
- MBD Stock Solution
- Rhodamine 6G
- MBD
- Ardrox P-133D
- Methanol
- Isopropyl alcohol
- Acetonitrile
- Petroleum ether
- Acetone
- Glass beakers
• Graduated cylinders
• Dark storage bottles
• Stirring device
• Light source
• Camera

6 Standards, Controls, and Calibration
None

7 Procedure
7.1 Reagent Preparation
A. Rhodamine 6G Stock Solution
   1. Combine 1g Rhodamine 6G and 1000mL Methanol.
   2. Stir on a stirring device until dissolved.
   3. Store stock solution in a brown bottle.
   4. Shelf life: 15 years
B. MBD Stock Solution
   1. Combine 1g MBD and 1000mL Acetone.
   2. Stir on a stirring device until dissolved.
   3. Store stock solution in a brown bottle.
   4. Shelf life: 15 years
C. RAM Working Solutions
   1. Combine the chemicals and reagents in the order listed for the respective application. If the ingredients are not mixed in the order listed, separation of the chemicals may occur.
      a) For use with a Spex CrimeScope:
         i. 12mL Rhodamine 6G Stock Solution
         ii. 8mL Ardrox P-133D
         iii. 28mL MBD Stock Solution
         iv. 80mL Methanol
         v. 40mL Isopropyl Alcohol
         vi. 32mL Acetonitrile
         vii. 3800mL Petroleum Ether
      b) For use with a laser:
         i. 6mL Rhodamine 6G Stock Solution
         ii. 4mL Ardrox P-133D
         iii. 14mL MBD Stock Solution
iv. 40mL Methanol  
v. 20mL Isopropyl Alcohol  
vi. 16mL Acetonitrile  
vii. 3800mL Petroleum Ether

2. Store working solution in a brown bottle.  
3. Shelf life for working solutions: 30 days.

7.2 Quality Testing

1. Using a squirt bottle, apply RAM to a cyanoacrylate treated test print.  
2. Allow the sample to dry.  
3. Place the treated sample under a light source. A positive result is indicated by the print fluorescing.  
4. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and document the results in the log.

7.3 Application

1. Select the appropriate RAM working solution dependent upon the light source used. After Cyanoacrylate Ester (Super Glue) processing, apply RAM working solution to the evidence either by dipping, using a spray device, or squirt bottle.  
2. Place the evidence in a fume hood to dry.  
3. Examine the evidence under the selected light source and view using an orange filter.  
   a) Place the evidence under the laser at a mid-range setting (approximately 5 to 6 watts of power). The range may be adjusted as needed.  
   b) Place the evidence under the Spex CrimeScope using a range of 505 to 555nm.  
   c) If the dye appears to be in excess, it may be rinsed with an application of distilled water or methanol over the evidence to reduce its thickness.  
4. Examine the evidence for prints. Mark any prints to be preserved by photography.

8 Interpretation

A. The prints should fluoresce.  
B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.  
C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

9 Limitations

A. RAM may be mixed too strong and can overwhelm a weak print.  
B. If the ingredients are not mixed in the order listed, separation of the chemicals may occur.

10 Records

Friction Ridge Worksheet (LAB-FR-01)  
Reagent Preparation Log (LAB-FR-06)
11 Literature References and Supporting Documentation

FR-02-10  GENTIAN VIOLET PROCESSING

1 Scope
Gentian Violet (Crystal Violet) is a dye that produces a purple colored image when reacting to fatty constituents of sebaceous sweat and/or the disturbance on the adhesive side of various types of tape.

2 Related Chapters/Documents
Cyanoacrylate Ester (Super Glue) Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScope
CLS Manual: Laboratory Equipment

3 Specifications
Gentian Violet (GV)

4 Safety
A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.

B. No known safety hazards other than it stains skin and clothing.

5 Equipment and Materials
- Scales
- Beakers
- Stirring device
- Storage bottle
- Gentian Violet dye powder
- Distilled water
- Camera

6 Standards, Controls, and Calibration
None

7 Precautions
The non-adhesive side of the tape should be processed first using Cyanoacrylate Ester (Super Glue) Processing.

8 Procedure
8.1 Reagent Preparation
1. Prepare fresh a 0.1% Gentian Violet dye stain solution (e.g. 1g Gentian Violet powder: 1000mL distilled water).
2. Mix until dissolved.
3. Test the solution and record results.
8.2 Quality Testing

1. Apply a test print to the adhesive side of tape.
2. Apply reagent to the tape and rinse.
3. A positive result is indicated by the print being stained and visible.
4. Results will be documented on the Reagent Preparation Log (LAB-FR-06) or, if prepared for single use, on the Friction Ridge Worksheet (LAB-FR-01).

8.3 Application

1. Dip the tape into staining solution for one to two minutes.
2. Rinse tape off under slow running tap water or dip into a beaker of water.
3. Allow the evidence to dry. Discard all solutions after use.
4. Examine the evidence for prints. Mark any prints to be preserved by photography.

9 Interpretation

A. The prints should be stained and visible.
B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

10 Limitations

A. Do not use on water-soluble tapes or stickers.
B. Paper backing tapes (e.g. masking tape) tend to stain if left in dye too long.
C. Some colors of backing of tape can obscure the print (such as black electrical tape).
D. Adhesives are commonly stuck to self or other surfaces and may need to be separated prior to processing. Separation can be achieved manually or by freezing, applying heat, or applying chemical separators (e.g. Un-du, Freeze-It, or canned air).

11 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation

FR-02-11   FLUORESCENT GENTIAN VIOLET PROCESSING

1  Scope
Fluorescent Gentian Violet is comprised of Gentian Violet (Crystal Violet) and Rhodamine 6G Fluorescent Dye. It produces a purple colored image when reacting to fatty constituents of sebaceous sweat and/or the disturbance on the adhesive side of various types of tape.

2  Related Chapters/Documents
Cyanoacrylate Ester (Super Glue) Processing
Rhodamine 6G Fluorescent Dye Processing
Gentian Violet Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Coherent TracER
Instructions for Spex CrimeScope
CLS Manual: Laboratory Equipment

3  Specifications
Fluorescent Gentian Violet (FGV)
Rhodamine 6G Fluorescent Dye

4  Safety
A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.
B. Gentian Violet and Rhodamine 6G may cause eye and skin irritation. If ingested or inhaled, irritation or an allergic reaction may take place.
C. Gentian Violet and Rhodamine 6G should be mixed and applied to evidence under a fume hood so it is not inhaled.

5  Equipment and Materials
- Scales
- Glass beakers
- Graduated cylinders
- Stirring device
- Glass bowl
- Light source
- Camera
- Crystal Violet
- Ethyl Alcohol
- Distilled water
- Rhodamine 6G
6 Standards, Controls, and Calibration

None

7 Precautions

The non-adhesive side of the tape should be processed first using *Cyanoacrylate Ester (Super Glue) processing*.

8 Procedure

8.1 Reagent Preparation

A. Crystal Violet Stock Solution
   1. Prepare fresh. Add 1.5g Crystal Violet to 100mL Ethyl alcohol.
   2. Mix until dissolved.

B. FGV Working solution:
   1. Prepare fresh. Combine 10mL Crystal Violet Stock Solution, 500mL distilled water, and 0.5g Rhodamine 6G.
   2. Mix until dissolved.
   3. Test the solution and record results.

8.2 Quality Testing

1. Apply a test print to the adhesive side of tape.
2. Apply reagent to the tape and rinse.
3. Examine under light source using an orange filter. A positive result is indicated by the print being stained and visible.
4. Date, initial, and indicate the results on the Reagent Preparation Log (LAB-FR-06), or, if prepared for single use, on the Friction Ridge Worksheet (LAB-FR-01).

8.3 Application

1. Pour enough working solution in a bowl to cover the evidence.
2. Apply working solution directly onto the adhesive side of tape (time of exposure may vary), by brushing, or dipping.
3. Rinse excess from tape using a gentle flow of tap water. Discard all solutions after use.
4. Allow evidence to dry.
5. Examine the evidence under light source using an orange filter.
6. Mark any prints to be preserved by photography.

9 Interpretation

A. The prints should fluoresce.
B. Proceed to the *Digital Imaging of Friction Ridge Impressions* chapter to preserve prints.
C. Preserved prints are analyzed for suitability as defined in the *Friction Ridge Comparison* chapter.
10 Limitations
   A. Fluorescent Gentian Violet is used only on adhesive side of tape.
   B. A light source must be used to examine the evidence.
   C. Adhesives are commonly stuck to self or other surfaces and may need to be separated prior to processing. Separation can be achieved manually or by freezing, applying heat, or applying chemical separators (e.g. Un-du, Freeze-It, or canned air).

11 Records
Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation
FR-02-12 STICKY SIDE POWDER PROCESSING

1 Scope

This technique is used to develop prints on the adhesive sides of tapes, decals, and other evidence. The non-adhesive side of the tape should be processed first using Cyanoacrylate Ester (Super Glue) Processing.

2 Related Chapters/Documents

Cyanoacrylate Ester (Super Glue) Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScope
CLS Manual: Laboratory Equipment

3 Safety

Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.

4 Equipment and Materials

- Sticky side powder or equivalent
- Photo Flo 200 or equivalent
- Camel hair brush
- Dropper bottle
- Spoon
- Mixing jar
- Adhesive surface processing powder commercially prepared
- Camera

5 Standards, Controls, and Calibration

A. Process a test print as a control every day method is used
   1. Apply a test print to the adhesive side of tape.
   2. Apply the sticky side powder. Rinse off the excess.
   3. A positive result is indicated by the print being visible.
   4. Results will be documented on the Friction Ridge Worksheet (LAB-FR-01).
6 Procedure

6.1 Preparation

Note: Commercially prepared processing powder requires no preparation.

1. Place approximately one teaspoon of sticky side powder into mixing jar. An appropriate shade of powder will be used to create contrast with background.
2. Fill a container half full of water and half full of Photo Flo 200. Shake well.
3. Using the dropper, add this solution to the powder in the mixing jar one to two drops at a time until a paste with the consistency of thin paint has formed.

6.2 Application

1. Using the camel hair brush, begin brushing the mixture on the adhesive side of the tape.
2. Leave on for 10 to 15 seconds and then rinse off under slow running tap water or agitate it gently in a beaker of water.
3. Allow evidence to dry.
4. Examine the evidence for prints. Reapply as described above for improved contrast if necessary.
5. Mark any prints to be preserved by photography.

7 Interpretation

A. The prints should be stained and visible.
B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.
C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

8 Limitations

A. This processing technique works best on adhesive surfaces. It may have limited success on the non-adhesive side of tapes.
B. Sticky side powder processing may interfere with DNA analysis.
C. Adhesives are commonly stuck to self or other surfaces and may need to be separated prior to processing. Separation can be achieved manually or by freezing, applying heat, or applying chemical separators (e.g. Un-du, Freeze-It, or canned air).

9 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

10 Literature References and Supporting Documentation

FR-02-13 AMIDO BLACK PROCESSING

1 Scope

Amido Black, also known as Naphthol Blue-Black, is one of the techniques available to develop or enhance prints that have been left in blood. It stains the proteins in the blood turning the print a dark blue or black color.

Amido Black can be mixed using two carriers: methanol/acetic acid and water/citric acid. The Amido Black water-based formula is used in place of the methanol-based formula when there is a question about or a problem with a painted surface. When determining which formula should be used, test a small area of the item (away from the impression) with the Amido Black methanol-based solution to check for background staining and/or distortion. If no issues are noted, proceed with the methanol-based solution. If the background staining cannot be rinsed away by the Rinse solution, or if the paint on the item distorts, test another small area with the Amido Black water-based solution. If no issues are noted, proceed with the water-based solution. If background staining still cannot be rinsed away, use a different enhancement technique.

2 Specifications

Amido Black/Water Base
Citric Acid Solution
Amido Black/Methanol Base and Rinse

3 Related Chapters/Documents

Cyanoacrylate Ester (Super Glue) Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Spex CrimeScoper
CLS Manual: Laboratory Equipment

4 Safety

A. Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.

B. Only mix chemicals in a vent hood.

C. Chemicals are flammable and skin irritant.

D. Caution should always be exercised around a bloody crime scene or handling evidence which may contain blood.

E. Excess chemicals are disposed of as a flammable liquid.

F. Since Amido Black is mixed with methanol, which is highly flammable, extreme caution should be taken when at a crime scene as to make sure all pilot lights on gas heaters and stoves are not lit. Use in a well-ventilated area.
5 Equipment and Materials

- Scales
- Beakers
- Graduated cylinder
- Stirring device
- Plastic squirt bottles
- Dark brown storage bottles
- Kodak Photo Flo 600 (Photo Flo 200 or equivalent may be substituted)
- Naphthol blue-black powder
- Citric acid
- Glacial acetic acid
- Methanol
- Citric Acid Rinse Solution
- Amido Black/Water/Citric Acid Base Solution
- Amido Black/Methanol Base Solution
- Amido Black/Methanol Rinse Solution
- Camera

6 Precautions

Amido Black may impact the ability of evidentiary blood samples to undergo serology testing. Have evidentiary blood samples collected by appropriate personnel prior to processing.

7 Standards, Controls, and Calibration

A. Surface Control: when applying the solution to a surface of concern, test a similar substrate prior to application on evidentiary items.
   1. Apply solution to substrate.
   2. Rub the surface with a gloved fingertip.
   3. If the paint rubs off, use the Amido Black/Water/Citric Acid Base Solution.

8 Procedures

8.1 Reagent Preparation

A. Amido Black/Methanol Base Solution
   1. Combine 2g Naphthol blue-black, 100mL Glacial acetic acid, and 900mL Methanol.
   2. Stir until completely dissolved.
   3. Store reagent in clear or dark bottles.
   4. Shelf life is 15 years.

B. Amido Black/Methanol Rinse Solution
   1. Combine 100mL Glacial acetic acid and 900mL Methanol.
   2. Store reagent in clear or dark bottles.
   3. Shelf life is 15 years.
C. Citric Acid Stock Solution/Rinse Solution
   1. Add 19g Citric Acid to 1000mL distilled water.
   2. Stir until completely dissolved.
   3. Store reagent in clear or dark bottles.
   4. Shelf life is 15 years.

D. Amido Black/Water/Citric Acid Base Solution
   1. Add 2g Naphthol blue-black to 1000mL Citric Acid stock solution.
   2. Stir until completely dissolved.
   3. Add 2mL Photo Flo and stir lightly.
   4. Store reagent in clear or dark bottles.
   5. Shelf life is 15 years.

8.2 Quality Testing
   1. Apply solution(s) to a sample of dried blood prints.
   2. Rinse with the appropriate rinsing solution and let dry.
   3. A positive result is indicated by the print turning dark blue or almost black in color.
   4. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and indicate the results on the log.

8.3 Application
   1. Select the appropriate Amido Black base solution dependent upon the surface. Use the Amido Black/Water/Citric Acid Base Solution when surface conditions are of concern.
   2. Apply the selected base solution by dipping, spraying, or using a squirt bottle to thoroughly dried prints in blood. Apply until the entire print has turned from a reddish-brown color to a blue-black color. Background staining may occur on porous surfaces.
   3. If necessary, the base solution can be re-applied before the final rinse to achieve sufficient clarity.
   4. Rinse off excess base solution with the appropriate rinse solution (use additional rinses as necessary).
      a) For Amido Black/Methanol Base use Amido Black/Methanol Rinse Solution.
      b) For Amido Black/Water/Citric Acid Base use Citric Acid Rinse Solution.
   5. Allow evidence to dry.
   6. Examine the evidence for prints. Mark any prints to be preserved by photography. 
      Note: Developed prints on some dark-colored surfaces may be viewed with a light source for increased contrast.
9 **Interpretation**
   
   A. In the presence of blood, a color change from a reddish-brown color to a blue-black color will occur.
   
   B. Proceed to the *Digital Imaging of Friction Ridge Impressions* chapter to preserve prints.
   
   C. Preserved prints are analyzed for suitability as defined in the *Friction Ridge Comparison* chapter.

10 **Limitations**
   
   A. The Amido Black water-based formula is used in place of the methanol-based formula when there is a question or a problem with a surface condition.
   
   B. The Amido Black water-based formula is not as fast in staining the bloody prints as the methanol-based and does not stain the prints as dark as the methanol-based formula.
   
   C. Cyanoacrylate Ester (Super Glue) processing may interfere with this process.
   
   D. Amido Black will not develop prints in perspiration, fats and oils, or salts.
   
   E. Background staining can occur on porous surfaces.

11 **Records**
   
   Friction Ridge Worksheet (LAB-FR-01)
   
   Reagent Preparation Log (LAB-FR-06)

12 **Literature References and Supporting Documentation**
   
   Lee HC, and Gaensslen RE. Advances In Fingerprint Technology, 2nd Edition
   
FR-02-14 IND (1,2-INDANEDIONE) PROCESSING

1 Scope

IND is a fluorescent reagent used for developing prints on porous surfaces such as paper and cardboard. IND is a Ninhydrin analogue and reacts with amino acids that are present in latent print residue. It is sensitive to old prints as well as fresh prints and can be used to develop prints in blood on porous surfaces.

In 1998, Hauze, et al, reported in the Journal of Forensic Sciences on the application of IND on paper to visualize prints. There are several different formulas and development parameters regarding formula concentration, solvent choice, and accelerated development methods that have been experimented with since that time. The IND formula used by Almog, et al, has been noted to obtain fingerprint fluorescence at varied concentrations ranging from 0.0004% to 0.25% with only slight background fluorescence noticeable at the highest concentration.

There is minimal or no discoloration or background staining evident on the IND processed samples that consistently appears when processing with DFO. IND may be used in place of DFO. It can be used in conjunction with other processes if used in the following order:

1. Iodine Fuming
2. IND
3. DFO
4. Ninhydrin

2 Specifications

IND (1,2-Indanedione)

3 Related Chapters/Documents

Iodine Processing
Ninhydrin Processing
DFO (1,8-Diazafluoren-9-one) Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Instructions for Air Science Fingerprint Development Chamber
Instructions for Spex CrimeScope
Instructions for Caron Humidity Chamber
Instructions for Coherent TracER
CLS Manual: Laboratory Equipment

4 Safety

A. Wear proper protective equipment. This may include, but is not limited to, gloves, lab coat, and eye protection.

B. Chemicals used in preparation and process are flammable and irritant.

C. Avoid contact with skin and eyes.
5 Equipment and Materials

- Glassware: beakers, graduated cylinder
- Stirring device
- Balance
- Fume hood
- Humidity Chamber
- Laser or light source
- Camera
- 1,2-Indanedione
- Glacial Acetic Acid, ACS (99-100%)
- Ethyl Acetate, ACS
- Petroleum Ether, ACS

6 Standards, Controls, and Calibration

A. After being stored for 30 days, the reagent must be quality tested each day when used in casework and the result documented in the case record.

B. If the IND solution separates, it must be quality tested prior to use on evidence and the result will be documented in case record.

7 Precautions

A. Evidence that may have potential DNA evidentiary value should not be processed for prints with IND prior to DNA collection.

B. Carriers that IND is mixed with can interfere with other types of analyses such as document examinations involving inks and questioned writing. Forensic document examinations should be performed prior to IND processing.

8 Procedure

8.1 Reagent Preparation: 0.1% IND Solution (weight/volume)

- 1 g 1,2-Indanedione
- 10 mL Glacial Acetic Acid, ACS (99.5+%)  
- 90 mL Ethyl Acetate, ACS  
- 900 mL Petroleum Ether, ACS

1. Dissolve 1g 1,2-Indanedione crystals in 10mL Glacial Acetic Acid and 90mL Ethyl Acetate. A stirring device should be used for mixing.

2. Add 900mL Petroleum Ether.

3. Store reagent in a dark storage bottle.

4. Shelf life is three months.
8.2 Quality Testing

1. Place a test print on paper and allow the perspiration to dry.
2. Apply 0.1% IND solution to the paper.
3. To accelerate the development, place the paper in a humidity chamber.
4. Developed prints are observed through an appropriate viewing filter using a laser or light source. A positive result is indicated by the print being developed.
5. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and indicate the results.

8.3 Application

1. Apply the 0.1% IND solution to evidence by spraying, dipping, or brushing.
2. Allow evidence to dry for approximately three minutes.
3. After the 0.1% IND solution has dried, place the processed evidence in a humidity chamber to accelerate the development process.
   a) 10 minutes at 100°C and 60% relative humidity
   b) Alternatively: The best results obtained for the thermal paper samples were achieved by not accelerating the development and allowing them to develop naturally in the laboratory environment from 4 to 12 hours.
4. Developed prints are observed through an appropriate viewing filter using a laser or light source.
5. Examine the evidence for prints. Mark any prints to be preserved by photography.
6. The results may also be seen on some samples with white light and develop as a light pale pink color.

9 Interpretation

A. Increasing or decreasing the intensity of the fluorescence may be carried out by adjusting the amount of 1,2-Indanedione in the formula.

B. The prints may appear a pale pink color; however, when viewed under various light sources the prints will fluoresce brightly and are much more visible, especially on a dark colored surface that might hide prints that have been developed with Ninhydrin alone.

C. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.

D. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

10 Limitations

A. Thermal paper will discolor from various shades of grey to black that may render any printing on the paper unreadable.

B. Thermal paper should be allowed to develop overnight and not be heated in the Fingerprint Development Chamber.

C. Evidence determined to be semi-glossy should be allowed additional development time prior to being examined or placed in the humidity chamber. The additional time may allow the IND to react with amino acids absorbed under the semi-glossy layer.
11 Records

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation


Sirchie Finger Print Laboratories, Inc. 1,2-Indanedione, Catalog No. LV508. 2003.

FR-02-15  OIL RED O PROCESSING

1 Scope

Oil Red O is a lipid stain used for developing prints on porous surfaces. Beaudoin (2004) reported in the Journal of Forensic Identification on the application of Oil Red O on paper that had been wet. Rawii and Beaudoin (2006) further examined the use of Oil Red O versus Physical Developer. Oil Red O stains the lipids in fingerprint residue a red color that is visualized. According to Beaudoin (2010), Oil Red O has been used to develop a 21 year old suitable print in casework.

According to Guigui and Beaudoin (2007), Oil Red O can be used in sequence with other development techniques; however, a specific carrier (HFE 7100 NOVEC) must be used if IND, DFO, or Ninhydrin is used before Oil Red O. Petroleum Ether and other carriers may dissolve the lipids that the Oil Red O stains.

A buffer such as water or sodium phosphate dibasic heptahydrate is used to rinse the evidence after Oil Red O processing.

Oil Red O is effective in developing prints on thermal receipts and currency.

2 Specifications

Oil Red O (ORO)

3 Related Chapters/Documents

Digital Imaging of Friction Ridge Impressions
Instructions for Spex CrimeScope
CLS Manual: Laboratory Equipment

4 Safety

A. Chemicals used in preparation are basic and irritant.
B. Avoid contact with skin and eyes.
C. Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.

5 Equipment and Materials

- Glassware: beakers, graduated cylinder
- Balance
- Fume Hood
- Benchtop Rocker
- Stirring device
- Filter Paper
- Two (2) Glass Trays
- Oil Red O
- Methanol
- Sodium Hydroxide
- Water (tap or deionized)
- Camera
6 Standards, Controls, and Calibration

None

7 Precautions

A. Evidence that may have potential DNA evidentiary value should not be processed for prints with ORO prior to DNA collection.

B. Carriers that ORO is mixed with can interfere with other types of analyses such as document examinations involving inks and questioned writing. Forensic document examinations should be performed prior to ORO processing.

8 Procedure

8.1 Reagent Preparation

A. Stain Solution

1. 1.54 g Oil Red O
2. 770 mL Methanol
3. 9.2 g Sodium Hydroxide

1. Dissolve 1.5 g Oil Red O in 770mL Methanol. A stirring device can be used.
2. Dissolve 9.2g Sodium Hydroxide in 230mL water by stirring. Add to the above solution.
3. Filter the solution into a dark storage bottle. Discard any Oil Red O that does not dissolve.
4. Prepare fresh.

B. Water Buffer: tap or deionized water

8.2 Quality Testing

1. Place a test print on a porous surface.
2. Apply Oil Red O to the porous surface.
3. Developed prints will be visualized in normal lighting. A positive result is indicated by the print being developed (usually within five minutes of processing).
4. Date, initial, and indicate the results on the Reagent Preparation Log (LAB-FR-06), or, if prepared for single use, on the Friction Ridge Worksheet (LAB-FR-01).

8.3 Application

1. Immerse the item(s) in a glass tray containing enough Oil Red O to cover the item(s).
2. Place the glass tray on the benchtop rocker and use appropriate setting to rock the solution back and forth. Leave the item submerged in the solution for 30-90 minutes or until all prints are developed.
3. Remove the item(s) and place in the glass tray or appropriate glassware containing the water buffer.
   a) The water buffer should be changed out frequently between items of evidence, using fresh water with each item as necessary.
4. Remove the item(s) and let dry.
5. Examine the item(s) for prints. Mark any prints to be preserved by photography.

9 **Interpretation**

A. Developed prints appear red in color.

B. Proceed to the *Digital Imaging of Friction Ridge Impressions* chapter to preserve prints.

C. Preserved prints are analyzed for suitability as defined in the *Friction Ridge Comparison* chapter.

10 **Limitations**

A. Oil Red O can cause the ink from thermal paper to fade/disappear. Any necessary ink or questioned document examination must be performed prior to Oil Red O processing.

B. The Friction Ridge section uses petroleum ether as the main carrier with porous processing chemicals. Petroleum ether can dissolve the lipids that Oil Red O stains. Therefore, Oil Red O cannot be used in sequence with other porous processing chemicals unless an alternate carrier is validated. Oil Red O can be used on currency, thermal paper, or paper that is suspected of having been wet.

C. Although other buffer solutions are available, the Friction Ridge section uses the water buffer to rinse evidence after Oil Red O processing.

D. Most prints should develop within 30 minutes; however, prints will not continue to develop after 90 minutes.

E. Heavy background staining of evidence may occur and have a negative effect on the contrast and clarity of any prints developed. This staining will appear a deep red color. Remove evidence immediately to avoid over-processing.

F. Prints developed with Oil Red O can fade overnight and must be preserved the same day the evidence is processed.

11 **Records**

Friction Ridge Worksheet (LAB-FR-01)
Reagent Preparation Log (LAB-FR-06)

12 **Literature References and Supporting Documentation**


FR-02-16  ACID YELLOW PROCESSING

1  Scope
AY is a technique used to develop or enhance prints that have been left in blood on dark, non-porous evidence. It stains the proteins in the blood and fluoresces under a light source. Prints developed using AY must be photographed under a light source with a blue-green light (400-490 nm).

AY can be used in conjunction with other processes if used in the following order:

1.  Cyanoacrylate Ester (Super Glue)
2.   AY
3.   Rhodamine 6G Fluorescent Dye

2  Specifications
AY Fixing Solution
AY Working Solution
AY Rinse

3  Related Chapters/Documents
Cyanoacrylate Ester (Super Glue) Processing
Rhodamine 6G Fluorescent Dye Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
Spex CrimeScope
CLS Manual: Laboratory Equipment

4  Safety
A.  Wear personal protective equipment. This includes, but is not limited to, gloves, lab coat, and eye protection.
B.  Chemicals used in preparation and process are flammable and irritant.
C.  Avoid contact with skin and eyes.
D.  Mix only in a vent hood.
E.  Caution should be exercised when handling evidence which contains blood.

5  Equipment and Materials
- Distilled water
- 5-Sulfosalicylic Acid Dihydrate (ACS or Reagent grade) (SSA)
- Acid Yellow 7 (AY)
- Glacial Acetic Acid
- Ethanol
- Fume hood
- Balance
6 Standards, Controls, and Calibration

Surface Control: when applying the solutions to a surface of concern, test a similar substrate prior to application on evidentiary items.

7 Precautions

AY may impact the ability of evidentiary blood samples to undergo serology testing. Have evidentiary blood samples collected by appropriate personnel prior to applying development techniques.

8 Procedure

8.1 Reagent Preparation

A. Fixing Solution
   - 20 g 5-sulfosalicylic acid dihydrate
   - 1000 mL distilled water
   1. Dissolve 20 g of 5-sulfosalicylic acid in 1000 mL distilled water. A stirring device should be used for mixing.
   2. Store reagent in a dark bottle.
   3. Shelf life: 6 months.

B. Working Solution
   - 1 g Acid Yellow
   - 700 mL distilled water
   - 250 mL ethanol
   - 50 mL glacial acetic acid
   1. Dissolve 1 g of Acid Yellow in 700 mL distilled water.
   2. Add 250 mL ethanol.
   3. Add 50 mL glacial acetic acid.
   4. Store reagent in a dark bottle.
   5. Shelf life: 6 months.
C. Rinse Solution
   - 700 mL distilled water
   - 250 mL ethanol
   - 50 mL glacial acetic acid

1. Add 250 mL of ethanol to 700 mL distilled water.
2. Add 50 mL of glacial acetic acid.
3. Store reagent in a dark bottle.
4. Shelf life: 6 months.

8.2 Quality Testing
1. Apply to a sample of dried blood prints and let dry.
2. A positive result is indicated by the print fluorescing under the blue-green light of a light source (400-490 nm).
3. Date and initial the container and Reagent Preparation Log (LAB-FR-06), and indicate the results on the log.

8.3 Application
1. Immerse the evidence in a glass tray containing enough fixing solution to cover the evidence.
2. Place the glass tray on the benchtop rocker and use an appropriate setting to rock the fixing solution back and forth for 3-5 minutes, increasing the processing time for a greater amount of blood.
3. Alternatively, if the evidence does not fit in a glass tray, the fixing solution can be applied by moistening a piece of filter paper thoroughly with a spray bottle containing the fixing solution, and pressing the paper onto the entire area of interest and allowing to process for 3-5 minutes.
4. Remove the evidence and place in a second glass tray containing enough working solution to cover the evidence.
5. Place the glass tray on the benchtop rocker and use an appropriate setting to rock the working solution back and forth for 5-10 minutes, increasing the processing time for a greater amount of blood.
6. Alternatively, the working solution can be applied using a spray bottle. Allow the stain to react for 5-10 minutes.
7. Remove the evidence and place in a third glass tray containing enough of the rinse solution to cover the evidence.
8. Place the glass tray on the benchtop rocker and use an appropriate setting to rock the rinsing solution back and forth for 1 minute.
9. Alternatively, the rinse solution can be applied using a spray bottle. Excess rinse solution can be removed with towels or special vacuums that can handle liquids.
10. Remove the evidence and let dry.
11. Developed prints are observed through an appropriate viewing filter using a light source at 400-490 nm (450nm is ideal).
12. Examine the evidence for prints. Mark any prints to be preserved by photography.
9 Interpretation

A. In the presence of blood, a color change will occur from a reddish-brown color to a fluorescent yellow.

B. Proceed to the Digital Imaging of Friction Ridge Impressions chapter to preserve prints.

C. Preserved prints are analyzed for suitability as defined in the Friction Ridge Comparison chapter.

10 Limitations

A. AY is not permitted for use on firearms, ammunition components, or metal items submitted for trace evidence analysis. Amido Black is a permitted alternative.

B. AY may not be successful on all substrates and it is recommended that it be tested on similar substrates prior to application on evidentiary items.

C. Cyanoacrylate Ester (Super Glue) processing may interfere with this process.

11 Records

Friction Ridge Worksheet (LAB-FR-01)

Reagent Preparation Log (LAB-FR-06)

12 Literature References and Supporting Documentation

Atkins, Amanda L. Development of Bloody Latent Prints on Dark Surfaces. United States Army Criminal Investigation Laboratory PowerPoint.


Texas DPS Crime Laboratory, Austin Latent Print Section. Acid Yellow 7 Validation. 2014-2016. Valid-Method-SYS-LP-AcidYellow7-2016-1220
03 PRESERVATION AND DIGITAL IMAGING OF FRICITION RIDGE IMPRESSIONS

FR-03-01 LIFTING TECHNIQUES

1 Scope
Friction ridge detail that is developed by powder processing may be preserved by lifting techniques. There are three basic lifting devices: lifting tape, hinge lifters, and rubber lifters. Friction ridge detail will be photographed prior to being lifted whenever possible.

Polyethylene tape is recommended for use on curved or uneven surfaces.

2 Related Chapters
Powder Processing
Magnetic Powder Processing
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison

3 Safety
Be careful of serrated edges of tape dispensers.

4 Equipment and Materials
- Tape rolls - 1 ½”, 2”, and 4” (clear or frosted)
- Lift cards – black and white – various sizes
- Hinge Lifter sizes – 1 ½” x 1 ½”, 2” x 4”, and 4” x 4” (black, white, or clear).
- Rubber Lifter sizes – 2” x 2” to 6” x 15” (black or white).
- Pen or marker

5 Standards, Controls, and Calibration
None

6 Procedure

6.1 Tape Lift
1. Determine what size tape to use by viewing the area and size of lift and prepare the tape.
   a) Single fingers or small areas of palms or feet may be lifted with 1½” tape.
   b) Larger areas or multiple prints may require wider tapes or overlapping two or more strips of tape with the overlap being at least 1/8” in width.
   c) Tab the end of the tape roll by pulling out enough tape to fold it back on itself so as to not leave your own prints on the adhesive side.
   d) Pull tape off the roll in one continuous motion until the proper length is obtained. Stopping and starting may cause marks on the tape that will distort the print.

2. To obtain the lift:
   a) Place the lift card of contrasting color on a clean flat surface to be ready for the tape.
b) Hold one end of the tape in each hand. With one finger, secure the tape down on the surface about ¼” from the print.

c) Press finger over tape across the intended lift area. Ensure tape has completely and evenly covered intended surface eliminating as many air bubbles as possible. Rub out air bubbles with finger or very clean pencil eraser.

d) Lift the tape (and the print) off the object and place the tape on the blank side of lift card in like manner.

3. On the front of the lift card, make note of the position of the print in regards to the object from which the print was lifted.

4. Tear off tabs and mark out any prints of your own with an “X” and initials.

5. Document all lift cards with the following information:
   a) Date of the lift.
   b) Forensic Scientist’s initials.
   c) Brief description of location, including item number.
   d) Orientation of the lift, as applicable.
   e) Laboratory case number.
   f) A diagram with an “X” showing location of the lift.
   g) If multiple lifts are made of the same print, label 1st, 2nd, etc.

6.2 Hinge Lifter

1. Determine what size lifter to use by viewing the area to be lifted.

2. To obtain the lift:
   a) Peel off the separator from the adhesive side.
   b) Place the adhesive side over the print.
   c) Rub the lifter with the ball of a finger (or pencil eraser) to ensure that the powder is picked up by the adhesive and to remove any air pockets.
   d) Remove the lifter in a steady, even motion.
   e) Place the lifter on a flat surface with the adhesive side up. Form a curl at the hinge and roll the cover over the adhesive side making sure not to leave air bubbles.

3. On the black or white covers document the date, case number, initials, and item from which the print was lifted.

4. On the clear cover make note of the case number and initials.

5. The marked stars are on the side that is used for comparisons.
6.3 Rubber Lifter

1. Determine what size lifter to use by viewing the area and size of lift. (Cut lifter to size if needed).

2. To obtain the lift:
   a) Peel off the separator from the adhesive side and set aside.
   b) Place the adhesive side gently over the print.
   c) Rub the lifter with the ball of a finger (or pencil eraser) to ensure that the powder is picked up by the adhesive and to remove any air pockets. *Note: Do not rub too hard or the lifter may slip and cause the print to blur.
   d) Remove the lifter in a steady, even motion.
   e) Replace the plastic cover by starting at one edge and rolling it across to the other, ensuring there are not air bubbles left.

3. On the back document the date, case number, initials, item from which the print was lifted, brief sketch, and any other information deemed necessary.

7 Interpretation

A. All lifts made by laboratory personnel shall be retained.
B. Proceed to the Friction Ridge Comparison chapter.

8 Limitations

A. Contrast powder with card or lifter: white, gray, or fluorescent powder use a black card; black powder use a white card.
B. Tape tends to curl back on itself.
C. Limited to the size of lift made.
D. Curved surfaces cause wrinkles in the lifting medium.
E. Prints preserved with rubber lifters are in reverse position.
F. Some surfaces are not conducive to lifts being successful. If this is the case, photographs of ridge detail shall be taken.

9 Records
Friction Ridge Worksheet (LAB-FR-01)

10 Literature References and Supporting Documentation

FR-03-02  DIGITAL IMAGING OF FRICTION RIDGE IMPRESSIONS

1  Scope
To provide a digital imaging workflow for examiners that includes the use of equipment and software for image capture, image processing, preservation, and storage of evidentiary digital images.

2  Related Chapters
Lifting Techniques
Friction Ridge Comparison

3  Safety
A. Use standard precautions when handling evidentiary material.
B. Appropriate Personal Protective Equipment (PPE) should be worn depending on nature of evidence.

4  Equipment and Materials
- Professional Digital Single Lens Reflex (SLR) Camera (meet or exceed 12.3 MP 4288 x 2848 pixels specifications, such as Nikon D-90)
- Nikkor AF Micro 60 MM Lens (Macro), or equivalent
- Remote Shutter Release
- Camera Media (Memory) Cards
- Friction Ridge Envelope
- Copy Stand
- 150 watt Reflector Flood Light Bulbs (or other appropriate lighting)
- Laser or light sources
- Laboratory jacks or equivalent
- Professional Digital Scanner (meet or exceed 6400x9600 ppi specifications, such as Epson Perfection Professional Scanner V-750 with Epson Scan Scanning Software)
- Foray ADAMS (CPU, Monitor, Server, Backup) (i.e. Foray Workstation)
  - Foray ADAMS Software (Foray Image Calibrator, Grayscale FFT, and Chromatic FFT.)
  - Adobe Photoshop Software (Version 10 or higher)
  - Adobe Bridge Software
- Printer (Photo inkjet, DNP DS40, or Mini-Lab printer which meets or exceeds minimum specifications or resolution)
- Printer ink and media appropriate for printer type
- Scaling Devices

5  Procedure

5.1  Policy
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) when the image is sized 1:1, or by using existing film photographic techniques. This applies to images captured by examiners.
B. It is at the discretion of the examiner to determine:
   1. Type of preservation method to obtain the best quality image.
   2. Which multiple exposures (bracketed images) are retained as evidence. Images that are unable to be re-captured may not be deleted.
   3. If resolution attained with a submitted digital image is of sufficient quality to perform any comparative analysis.
   4. Selection of digital image processing steps.

C. Label tag/scale with case number, examiner’s/photographer’s initials, date, and description or LIMS number and place on same plane near friction ridge detail to be preserved. In instances where the above is not visible on the photo tag/scale, the information must be included on any composite printed.

D. Document the number of photographs and/or scans taken and retained for a given item on the Friction Ridge Worksheet (LAB-FR-01).

E. Original images may be temporarily stored on a memory card or in a folder before acquisition into Foray ADAMS.

F. Original and working images are stored in DIMS and are considered evidence.

G. History tracking must be enabled and is managed by Foray ADAMS where it can be retrieved and printed.

5.2 Professional Digital SLR Camera

1. Place evidence on copy stand directly under, and as close to parallel to, the camera lens as the location of the friction ridge evidence allows. The image of the subject matter should fill the view finder.

2. Photographing large or bulky evidence may require the photographer to remove the camera from the copy stand and use a tripod to preserve friction ridge evidence.

3. Proceed to Photographing Images and Acquisition into Foray ADAMS chapter.

5.3 Professional Digital Scanner

1. Place the evidence on a flatbed scanner. For photographic negatives, use the film holder attachment.

2. Proceed to Scanning Images and Acquisition into Foray ADAMS chapter.

5.4 Digital Image Processing

1. Process the working image using approved digital image processing techniques. Approved techniques include but are not limited to:
   a) Color Processing,
   b) Grayscale Conversion,
   c) Inversion,
   d) Tonal and Contrast Adjustment,
   e) Image Sharpening and Noise Reduction,
   f) Color Channel Selection and Subtraction,
   g) Fast Fourier Transform filters (FFT)
2. Proceed to Digital Image Processing in Foray ADAMS chapter. Tools that may potentially add or delete content from an image are prohibited for use. These include but are not limited to:
   a) Rubber Stamp,
   b) Airbrush,
   c) Paintbrush,
   d) Paint Bucket,
   e) Eraser, and
   f) Blur

3. Proceed to Printing Composites chapter.

4. Proceed to Creating a Contact Sheet chapter.

6 Interpretation

A. The digital image is examined for:
   1. Clarity of image (focus),
   2. Capture area (inclusion of scale),
   3. Required minimum resolution. Justification for any deviation from the recommended minimum resolution shall be documented in the case record.

B. If the digital image does not meet the above criteria, the friction ridge detail shall be re-photographed or re-scanned with adjustments made.

C. If the digital image meets the above criteria, the examiner will proceed to the Friction Ridge Comparison chapter.

7 Limitations

A. The digital capture, processing, and storage of images is limited to the equipment, materials, and software available within the department.

B. In order to maintain a resolution equal to or above 1000 pixels per inch, the area of capture is limited when utilizing a digital camera. This minimum area of capture can be calculated based on the Image Size in pixels from the camera specifications. Because of the limited capture area of a digital image, complete palm prints, foot prints, or clusters of fingerprints may need to be captured with a series of images for proper evidentiary preservation. In this case, an overall of the complete friction ridge detail should be captured, even though the resolution is less than 1000 pixels per inch. This image may or may not be suitable for comparative analysis.

C. Friction ridge detail should be reviewed after capture on the camera by the examiner to determine accurate representation and quality under magnification. Friction ridge detail preserved in these instances may not be available at a later date for re-capture.

D. Although every effort will be made to meet or exceed 1000 pixels per inch, the examiner may accept an image of lower resolution and continue with case examination as long as the print is accurately represented and of sufficient quality for analysis.

E. Assets cannot be deleted. The delete function is disabled on Foray ADAMS.
F. If processing in Default Application, Foray ADAMS will not track processing history. Users must select the icon for Adobe Photoshop. This will ensure that any processing history is recorded and saved into Foray ADAMS. Assets processed using Adobe Photoshop within the Foray ADAMS must be saved in order for a new asset to be created. Furthermore, when image processing in Foray ADAMS: do not click “OK” until after Photoshop processing of the image has been completed. Clicking ok before the image process is completed will prevent the processed image from being returned to Foray ADAMS. When processing images outside of Foray ADAMS using Adobe Photoshop, user must ensure that the History is enabled.

8 Records
Friction Ridge Worksheet (LAB-FR-01)

9 Literature References and Supporting Documentation
Texas DPS Crime Laboratory, Austin Latent Print Section. Forensic Digital Image Validation. 2007.
Texas DPS Crime Laboratory, Austin Latent Print Section. Foray Validation/Performance Check. 2009.
FR-03-03 PHOTOGRAPHED IMAGES AND ACQUISITION INTO FORAY ADAMS

1 Scope
Instructions for acquiring photographed friction ridge images into Foray ADAMS.

2 Equipment and Materials
- Camera media (memory) card
- Foray ADAMS Software
- Adobe Bridge Software

3 Instructions
3.1 Capture
1. Insert camera memory card into camera or card reader on CPU.
2. Check settings for camera: file format, white balance, ISO, lighting, f-stop, shutter speed, and focus. Also check for inclusion of scale through viewfinder.
3. Depress shutter with remote (may use Camera Control Pro, if available).
4. Remove camera media card from camera or card reader on CPU.

3.2 Adobe Bridge Browser
1. Insert memory card into card reader at Foray Workstation.
2. Open Adobe Bridge.
3. Browse for camera media card folder for captured images.
4. Select the images to be retained as evidence.
5. Close Adobe Bridge.
6. Proceed to Acquiring Images into Foray ADAMS.

3.3 Acquiring Images into Foray ADAMS
1. Open Foray ADAMS.
2. Click File/Acquire from Folder.
3. Browse for camera memory card and select all images.
4. Click Open.
5. Fill in the acquisition information boxes. You will need information from the submission form to complete these entries.
6. Acquire assets.
7. Once acquisition is complete, click OK.
8. Images have now been acquired into Foray ADAMS.
9. Visually check to see if the images were acquired into Foray ADAMS.
10. Delete images from the media card.
11. Continue to *Digital Image Processing in Foray ADAMS* chapter.

**Note:** If images are acquired into the wrong folder, select the images to be moved and click Tools → move asset to asset folder. Select new or existing folder, as applicable. Change the prefix to LP or FR, enter the case number, and click OK.
FR-03-04   SCANNING IMAGES AND ACQUISITION INTO FORAY ADAMS

1  Scope
Instructions for scanning and acquiring images into Foray ADAMS.

2  Equipment and Materials
- Professional Digital Scanner
- Foray ADAMS Software

3  Instructions
Create new folder titled “Temp Scan” onto the desktop.

3.1 Scanning Images
1. Open Epson Scan. Epson Scan dialog will open
2. Check settings (Res 1200, etc.)
3. Click Preview
4. Select area to be scanned
5. Click Scan (Note: images will automatically calibrate at 1200 ppi)
6. Create a new folder within the Temp Scan folder titled with unique laboratory case number
7. Save image into appropriate case folder
8. Repeat steps for additional scans
9. Once scanning is complete, continue to Acquiring Images into Foray ADAMS

3.2 Acquiring Images into Foray ADAMS
1. Open Foray ADAMS
2. Click File/Acquire from Folder
3. Browse for appropriate case folder within the Temp Scan folder and select all scans
4. Click Open
5. Complete acquisition info dialog using the appropriate case information
6. Acquire assets
7. Once acquisition is complete, click OK
8. Scans have now been acquired into Foray ADAMS
9. Visually check to see if the images were acquired into Foray ADAMS
10. Delete the contents of the Temp Scan folder
11. Continue to Digital Image Processing in Foray ADAMS chapter.
FR-03-05  DIGITAL IMAGE PROCESSING IN FORAY ADAMS

1  Scope
Instructions for digital image processing of preserved friction ridge impressions..

2  Equipment and Materials

- Foray ADAMS Software
- Adobe Photoshop Software (APS)
- Adobe Bridge Software

3  Instructions

3.1 Digital Image Processing Steps Using Foray ADAMS

1. Open Foray ADAMS.
2. Open Asset Folder.
3. Select Asset for digital processing.
4. Rotate image, flip horizontal or vertical, if desired.
5. Calibrate image using Image Calibrator Icon. Calibration is not necessary for images that have been scanned.
6. Click Save.

3.2 Common Foray Shortcuts

F5 – Refresh the images viewed in Foray ADAMS. The original image will be followed by the processed image.

3.3 Digital Image Processing Steps Using Adobe Photoshop

A. Decide if image should be processed as TIFF or as RAW. If processing image as RAW, then proceed to step B. If processing as TIFF, then proceed to step C.

B. Click Photoshop icon and process as RAW.

1. Dialog box will appear. Do not click Return until the image has been digitally processed and saved.
2. Adobe Photoshop Camera RAW Viewer dialog will open.
3. Make adjustments, as needed, to exposure, white balance, shadows, and highlights.
4. Click Open; the image will open in APS.
5. Calibrate the image if not previously calibrated in Foray ADAMS.
6. Perform digital image processing steps.
7. Save as TIFF with no compression and close image by clicking the X on the top right of the window.
8. Click Return for the dialog box mentioned in step 1.
9. This will create a new processed asset with a new Asset ID.
10. Proceed to Printing Composites chapter.
C. Click Photoshop Icon and process as TIFF

1. Dialog box will appear. Do not click Return until the image has been digitally processed and saved.
2. Asset will open in APS
3. Perform digital image processing steps.
4. Close image in APS by clicking the X on the top right of the window.
5. Save changes
6. Click Return for the dialog mentioned in step 1.
7. This will create a new processed asset with a new Asset ID.
8. Proceed to *Printing Composites* chapter.

### 3.4 Common Adobe Photoshop Shortcuts

- **Alt Ctrl Z** Go back one level
- **Alt Ctrl I** Image size dialog
- **Ctrl (+)** Zoom in
- **Ctrl (-)** Zoom out
- **Ctrl T** Transform tool
- **Ctrl 0** Fit to screen/window
- **Ctrl D** Deselect
- **C** Crop tool
- **F** Toggle between screen views
- **V** Move tool
- **T** Type tool
- **Tab** Tool Bar & Side menu on/off
- **Shift + Tab** Side menu on/off
FR-03-06 PRINTING COMPOSITES

1 Scope
Instructions for printing composites.

2 Equipment and Materials
- Foray ADAMS Software
- Adobe Photoshop Software (APS)
- Printer (Photo inkjet, DNP DS40, or Mini-Lab printer which meets or exceeds minimum specifications or resolution)
- Printer ink and media appropriate for printer type

3 Policy
3.1 Composite Components
A. Laboratory case number
B. Date composite printed
C. Examiner initials
D. Unique Asset ID
E. Scale or Photo Tag
   1. If created by a friction ridge forensic scientist, the scale will include case number, item number, examiner initials, and date the photograph was captured.
   2. If required elements are present on the scale and observed in the photograph, they are not required to be typed on the composite.
F. Enlargements (optional)
   1. Enlargements, as well as 1:1 representations, may be included on the composites.
   2. The images may be re-sized and cropped and may not fully represent all areas of captured image.

4 Instructions
1. Open Foray ADAMS.
2. Search for specific laboratory case number and open folder.
3. Select asset for printing composite.
4. Click APS icon.
5. Dialog box will appear in Foray ADAMS. Close by clicking X on the top right of the window.
6. Asset will open in APS.
7. In APS, click on File/New to create new document.
8. Dialog box will open, select size at 300 Res.
9. Click OK.
10. Arrange windows.
11. Open Image Size window (shortcut \texttt{Alt Ctrl I}): Resample must be checked and then change Image Size of asset to 300 Res (for 1:1).


13. Change Image Size of asset to calibrated size by using shortcut \texttt{Alt Ctrl Z} (or go back one level in History).

14. Open Image Size window (shortcut \texttt{Alt Ctrl I}): Resample must remain checked and change Image Size of asset to 1500 Res (for 5:1).

15. Crop selected image.

16. Select Move tool (\texttt{v}) and move asset to composite for 5:1.

17. Select Type tool (\texttt{t}) and type in required elements.

18. If using enlargements, type in 1:1 (1x) and scale for enlargement.

19. Print composite.

20. Close New Document by clicking the X on the top right of the window.

21. Close asset in APS by clicking the X on the top right of the window (Do not save changes).
FR-03-07 CREATING A CONTACT SHEET

1 Scope
Instructions for creating a contact sheet to keep in the case record.

2 Equipment and Materials
- Foray ADAMS Software
- Printer (Photo inkjet, DNP DS40, or Mini-Lab printer which meets or exceeds minimum specifications or resolution)
- Printer ink and media appropriate for printer type

3 Instructions

3.1 Foray ADAMS
1. Open Foray ADAMS.
2. Search for specific case folder.
3. Select all images to include on contact sheet.
5. Select number of assets per page (suggest 20 per page).
6. Click OK.
7. Printer dialog box will open.
8. Ensure that desired printer is selected.

3.2 ADAMS Web
1. Open Adams Web.
2. Search for the specific case folder or select from home page.
3. Click on Assets in the top left corner.
4. Select all images to include on contact sheet.
5. Click on Reports in the top left corner.
6. Select Contact Sheet.
7. Select number of assets per page (suggest 20 per page).
8. Click OK.
9. Select Print.
10. Printer dialog box will open.
11. Ensure that desired printer is selected.
12. Print.
3.3 Submitted Digital Images using Adobe Bridge

1. Insert submitted CD/DVD.
2. Open Adobe Bridge.
3. Select all images to include on contact sheet.
4. In the top right corner, select Output.
5. Under Template tab, select 4x5 or 5x8 Contact Sheet.
6. Select Letter with dimensions 8.5x11.
7. Add text for header: case number, item number, examiner initials, and date.
8. Preview images.
9. Select Print.
10. Printer dialog box will open.
11. Ensure that desired printer is selected.
12. Print.
FR-03-08 COMBINING MULTIPLE PHOTOGRAPHS TO REDUCE BACKGROUNDS

1 Scope
By combining luminescent and non-luminescent images of preserved friction ridge impressions with complicated backgrounds, the friction ridge forensic scientist can drastically reduce the background interference which can lead to an increase in contrast versus traditional contrast adjustments in Adobe Photoshop. Luminescent images are visualized using a laser or light source. Non-luminescent images are visualized using ambient lighting.

2 Related Chapters
Digital Imaging of Friction Ridge Impressions
Photographing Images and Acquisition into Foray ADAMS

3 Safety
A. Use standard precautions when handling evidentiary material.
B. Appropriate Personal Protective Equipment (PPE) should be worn depending on nature of evidence.
C. Wear the appropriate protective eye wear when viewing evidence under alternate light sources.

4 Equipment and Materials
- Professional Digital Single Lens Reflex (SLR) Camera (meet or exceed 12.3 MP 4288 x 2848 pixels specifications, such as Nikon D-90)
- Nikkor AF Micro 60 MM Lens (Macro), or equivalent
- Remote Shutter Release
- Camera Media (Memory) Cards
- Friction Ridge Envelope
- Copy Stand
- 150 watt Reflector Flood Light Bulbs (or other appropriate lighting)
- Laser or light sources (LS)
- Laboratory jacks or equivalent
- Foray ADAMS Software
- Adobe Photoshop (APS) Software
- Adobe Bridge Software
- Printer (Photo inkjet, DNP DS40, or Mini-Lab printer which meets or exceeds minimum specifications or resolution)
- Printer ink and media appropriate for printer type
- Scaling Devices

5 Standards, Controls, and Calibration
None
6 Procedure

1. Capture friction ridge image with digital camera with appropriate LS lighting technique. This is referred to as the LS image.
   a) **DO NOT move the evidence or camera after the photograph**
   b) **If evidence is moved, start over and repeat procedure**

2. Turn off the LS and turn on the ambient lighting (overhead lighting)
   a) **Leave the orange filter on the camera**
   b) **Remember to mitigate hot spots caused by overhead lighting**

3. Capture the friction ridge image with digital camera and ambient lighting. This is referred to as the non-LS/ambient light image.

4. Make adjustments for proper exposure
   a) **Only use the shutter to adjust exposure**
   b) **Do not use the aperture to adjust exposure**

5. Acquire the LS image(s) and non-LS image(s) into Foray ADAMS

6. Open the non-LS/ambient light image in RAW [not in TIFF]

7. Adjust Shadows/Highlights as appropriate in Camera Raw view

8. Invert and save image in Foray ADAMS

9. Open the saved non-LS/ambient light image

10. Click “Return” and go back to Foray ADAMS

11. Open LS image in RAW [not in TIFF]

12. Adjust Shadows/Highlights as appropriate in Camera Raw view

13. Separate the two windows in Adobe Photoshop

14. Drag non-LS/ambient light image on to the LS image [Note: do not drag from the title bar; drag from the middle of the image. Make sure the images overlay before proceeding.]

15. Close the non-LS/ambient light image

16. Adjust non-LS/ambient light layer opacity [Note: This tends to fall in the range of 30% to 85% to obtain the best result. Adjust until the ridge detail becomes clear but the background begins to fade. The image will likely have a blue/green or teal appearance.]

17. Click on Image, Mode, and then select Grayscale. When prompted, select Flatten image [Discard color layer].

18. Invert image. This step will show the improvement of the background removal. If necessary go to the History and repeat from Step 15 and adjust the opacity to get optimum results.

19. Continue processing as normal and save final image
20. Calibrate the final processed image in Foray ADAMS (not required to calibrate the non-LS/ambient light image).
   
a) Track all changes in the history of the images in Foray ADAMS (both images must be acquired). The images must be opened as RAW files (not TIFF) and the opacity adjustment can be repeated if necessary.

b) Both original RAW files of the LS and non-LS/ambient light images are saved in Foray ADAMS as well as the complete history for both of the processed images. This can be repeated by another examiner at a later date.

7 Limitations

A. The digital capture, processing, and storage of images is limited to the equipment, materials and software available within the department.

B. The procedure is not always successful on paper items. Ink, stamps, and thick lines present on paper items can prevent the latent print residue from soaking into the surface making it difficult for the background to fade or disappear. Routine digital image processing using Adobe Photoshop may be more appropriate.

8 Records

Friction Ridge Worksheet (LAB-FR-01)

9 Literature References and Supporting Documentation


04 EXEMPLARS
FR-04-01 SUBMITTED FRICTION RIDGE EXEMPLARS

1 Scope
Fingerprint and palm print exemplars are often submitted as evidence for comparison purposes. These exemplars may be retained along with any preserved friction ridge evidence.

2 Related Chapters
Friction Ridge Comparison

3 Safety
If submitted exemplars appear to have blood or any other body fluids on them, gloves should be worn. The exemplars should be sealed in plastic and marked with a biohazard label.

4 Equipment and Materials
Friction Ridge Envelope

5 Standards, Controls, and Calibration
None

6 Procedure
1. Label the exemplars with lab case number, the LIMS item number, and forensic scientist’s initials. Check that all prints are in proper sequence and order.
2. Compare with prints per case request.
3. Retain original or quality copy in case record if used for comparison.
4. In some instances, the individual’s name may be missing or illegible on the exemplars.
   a) Compare to exemplars for the DPS SID number that bear the individual’s name or alias, if available.
   b) If no exemplars are available, compare the right or left thumb from the submitted exemplars to the corresponding thumb of the driver’s license or identification card thumbprints to ensure the correct exemplars have been obtained.
   c) Verification by another examiner must be performed.
   d) If exemplars, driver’s license records, or identification card records are not available, use the name listed on the Laboratory Submission Form (LAB-201) or contact the submitting agency.

7 Interpretation
The submitted exemplars are used for direct comparison to suitable latent, patent, or plastic prints preserved in the case. These exemplars may also be used to compare to other exemplars.

8 Limitations
Submitted exemplars may be of insufficient quality to perform a complete examination.
9 Records

Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)
Laboratory Submission Form (LAB-201)
FR-04-02  FRICTION RIDGE EXEMPLARS CRIME RECORDS

1 Scope
DPS Crime Records maintains a growing database of exemplars that are submitted to DPS for both criminal and non-criminal purposes. These exemplars are available for comparison purposes in cases submitted to the DPS Crime Laboratory System. Both fingerprints and palm prints are available to print for comparison purposes from the archive database. Access to the database is secure and managed by DPS Crime Records.

2 Related Chapters
Friction Ridge Comparison

3 Equipment and Materials
Friction Ridge Envelope

4 Standards, Controls, and Calibration
None

5 Procedure
   1. From the computerized criminal history (CCH), obtain the state identification number (SID) for individuals to be compared.
   2. Print relevant fingerprint or palm print exemplars, as needed, from the database terminal in the Friction Ridge/ AFIS Section. If there are no exemplars for the provided SID number or if the copies from the database are poor quality, obtain the master card from Crime Records.
      a) The master card may also be uploaded to DIMS and used for comparison purposes at the discretion of the primary forensic scientist and any reviewer.
   3. In some instances, the individual’s name may be missing from the fingerprint exemplars.
      a) Compare to additional exemplars for the provided SID number that bear the individual’s name or alias, if available.
      b) If additional exemplars are not available, compare the right or left thumb from the exemplars to the corresponding thumb of the driver’s license or identification card thumbprints to ensure the correct exemplars have been obtained.
      c) Verification by another examiner must be performed.
   4. Stamp all printed CJIS records “For Official Use Only”.
   5. Label with lab case number and forensic scientist’s initials.
   6. Check that all prints are in proper sequence and order.
   7. Compare with prints per case request.
   8. Retain original or quality copy in case record.

6 Interpretation
The exemplars are used for direct comparison to suitable latent, patent, or plastic prints preserved in the case. These exemplars may also be used to compare to other exemplars.
7 Limitations
   A. Exemplars on file may be of insufficient quality to perform a complete examination.
   B. Regional laboratories may not have access to some exemplars and must request the exemplars through the Austin Laboratory Friction Ridge section.
   C. All laboratories must follow the rules and regulations outlined in the CJIS Security Policy.

8 Records
Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)

9 Literature References and Supporting Documentation

FR-04-03 COLLECTION OF FRICTION RIDGE EXEMPLARS FROM LIVING SUBJECTS

1 Scope
Procedures to record and reproduce friction ridge skin ensure the quality of the fingerprint patterns. Rolled prints are utilized because they capture the full pattern area, including deltas and cores. Plain prints are taken to verify the sequence of the rolled prints and because they may more closely represent actual chance impressions located at crime scenes.

2 Related Chapters
Friction Ridge Comparison

3 Safety
Gloves should be worn in instances where open wounds, sores, or visible infections are present.

4 Equipment and Materials
- Flat, smooth surface
- Black fingerprint ink
- Ink roller
- Card or paper holder
- Fingerprint cards or copy paper
- Ceramic ink pad
- Adhesive retabs
- Supplies for cleanup
- Special spoons for abnormal conditions
- Friction Ridge Envelope

5 Standards, Controls, and Calibration
All friction ridge exemplars collected from a living subject shall contain the following information:

A. Name, date of birth, and signature of the subject being printed,
B. Date prints taken, and
C. Signature of individual taking the prints.

6 Procedure
If possible, ensure the area of friction ridge skin to be recorded is clean prior to collection of exemplars.

6.1 Fingerprints
1. Use a ceramic ink pad or place ink on a flat surface and spread it out with a roller until the surface is covered with a thin, even layer of ink.
2. Special care should be taken when applying ink. Too much ink will cause the prints to smear; too little ink will make them light and incomplete.
3. The fingers should be rolled from nail to nail over the inked surface taking special care to include a portion of the finger below the first joint flexure crease and the entire pattern area of the first joint. Start with the right hand and finish with the left.
4. If using fingerprints cards, roll the fingers in the appropriate box marked on the card. Apply even pressure during this process to avoid smearing or smudging. Roll the fingers away from the thumb and the thumbs toward the body.

5. If prints are taken using regular paper with no markings, include finger number, hand, and other notations as applicable.

6. Roll the ink on the flat surface again and take the plain impressions for both hands following the same sequence procedures with right and left hands. Fingers should be held straight out and together when placed on card. Take plain impressions of the thumbs.

7. If bandaged or broken appendage and in certain instances of deformity, there should be an attempt to record a complete set of prints. When prints cannot be taken, there must be notations made on the card explaining the reason.

### 6.2 Palm Prints

1. Apply ink directly to outstretched palm with roller taking care to get ink on all appendages and lower heel of palm.

2. Place paper or palm print card on a tubular apparatus or convex surface.

3. Starting with the tips of the fingers, apply to tubular apparatus or convex surface and roll forward until entire palm is captured on the paper.

4. Record the outer edge of the hypothenar area of the palm ("writers" palm) by having the subject hold their hand in a position to apply ink and transfer it to paper.

5. Record the outer edge of the thenar area of the palm (thumb side) by having the subject hold their hand in a position to apply ink and transfer it to paper.

### 6.3 Footprints

1. Apply ink to soles of the feet with roller taking care to include all appendages.

2. Place sole of foot on an appropriately sized sheet of paper.

### 6.4 Major Case Prints

In addition to the rolled and plain impressions on the fingerprint card, major case prints should include:

- A. Palm prints, impressions of the hypothenar and thenar sides of the palms,
- B. Complete rolled impressions of the fingers, including the medial and proximal phalangeal pattern zones, and
- C. Fingertip impressions rolled from the center of the finger to the nail and from one side to the other.

### 7 Interpretation

If the collection of exemplars fails to record sufficient quality of ridge detail for a complete examination, reprinting of the subject should be performed.

### 8 Limitations

Limitations exist when the person being printed has an injury (permanent or temporary) or deformity that prevents a complete set of prints being taken.
9  Records
Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)

10  Literature References and Supporting Documentation
FR-04-04 COLLECTION OF FRICTION RIDGE EXEMPLAR FROM DECEASED SUBJECTS

1 Scope

Printing a deceased subject is typically performed to establish or confirm identity. Since the deceased subject may not be available for additional printing, it is best to obtain as many sets of exemplars as necessary in order to have a complete recording of the friction ridge skin.

2 Related Chapters

Friction Ridge Comparison

3 Safety

- Always wear gloves to avoid contamination.
- Exemplars from deceased subjects should be sealed in plastic and marked with a biohazard label.

4 Equipment and Materials

- Flat, smooth surface
- Black fingerprint ink
- Ink roller
- Fingerprint cards or paper
- Adhesive retabs
- Bone cutters, forceps, and scalpels
- Spoons
- Alcohol wipes
- Mikrosil or Accutrans
- Friction Ridge Envelope
- Camera
- Scale

5 Standards, Controls, and Calibration

None

6 Procedure

A. If the hands are in reasonably good condition, obtaining quality prints is usually accomplished by straightening the digits and flattening the palm. It is possible to “break” the rigor by straightening the digits using force. The hands can then be printed using the same procedures outlined in the Collection of Friction Ridge Exemplars from Living Subjects chapter.

B. If breaking rigor is difficult or ineffective, it may be necessary for the hands to be removed from the deceased by the medical examiner so that they may be processed in the laboratory. The printer should be aware that legal restrictions exist and only legally designated people should perform this activity.

C. Photography may be used to capture ridge detail. A scale with necessary identifying data must be included in the photograph.
D. The primary difficulty encountered in printing the deceased is the deep wrinkling or creasing of fingers and palms. This can often be overcome by stretching the skin tight if the skin is still flexible.

E. The skin containing ridge detail may become separated from the underlying tissue. It should be collected and processed immediately.

F. Occasionally, the skin can be obtained by manually removing the skin from the internal tissue and bone. Prints may be recorded by securing the skin around a gloved finger or palm and printing following standard procedures.

G. If the condition of the skin is such that standard procedures fail to produce the desired results, the fingers or hands may be severed. If the fingers are severed from the hand, they should be placed in individual containers and properly labeled.

7 Interpretation

A. Fully documented quality exemplars are extremely important for comparison purposes. They can provide all areas of friction ridge detail necessary to reach a definitive conclusion.

B. If the collection of exemplars fails to record sufficient quality for a complete examination, reprinting of the subject should be performed, if possible.

8 Limitations

Due to the range and degree of degradation of friction skin that can occur with deceased individuals, it may not be possible to obtain a quality set of exemplars.

9 Records

Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)

10 Literature References and Supporting Documentation

05 COMPARISON

FR-05-01 FRICTION RIDGE COMPARISON

1 Scope

These procedures establish unifying documentation for the methodology used in the examination of friction ridge detail by the Friction Ridge section. Friction ridge examinations are conducted by forensic scientists using the Analysis, Comparison, Evaluation, and Verification (ACE-V) Methodology which includes both qualitative and quantitative aspects. These procedures are intended to assist in the examination and documentation of friction ridge detail and resulting conclusions. These procedures are to be used in conjunction with applicable laboratory policies, good laboratory practice, and proper scientific methodology.

2 Related Chapters/Documents

Report Writing Guidelines

Case Review

Instructions for Friction Ridge Worksheet

Instructions for Friction Ridge Comparison Worksheet

Digital Imaging of Friction Ridge Impressions

AFIS Database Searches

AFIS Manual: AFIS/Friction Ridge Case Workflow

CLS Manual: Review of Laboratory Records

3 Safety

Lifts, casts, or exemplars that contain possible blood or other body fluids should be sealed in plastic and marked with a biohazard label.

Ridge Pointers/Counters have sharp ends; handle with caution.

4 Equipment and Materials

- Fingerprint Magnifier
- Ridge Pointers/Counters
- Foray ADAMS
- Friction Ridge Envelope

5 Standards, Controls, and Calibration

None
6 Procedure

6.1 Analysis

A. Analysis includes the assessment of the impression to determine its value based on level 1, 2, and 3 friction ridge details. This assessment is affected by many factors including: anatomical aspects, transfer conditions, transfer media, substrate, development techniques, preservation techniques, and environmental conditions.

1. Level 1 is not sufficient for identification purposes and may not be sufficient for exclusion purposes. This level may include: general ridge flow, pattern configuration, core and delta location, distinction of finger versus palm, and other information enabling orientation. Level one detail can also describe the general directions and positions of other features such as creases, scars, incipient ridges, or other imperfections.

2. Level 2 is used in conjunction with level one detail to enable identification and exclusion. This level may include: ridge endings, bifurcations, dots, continuous ridges, or combinations thereof. Second level details of creases, scars, incipient ridges, or other imperfections describe the actual path of the friction ridges to include the starting position, the path the ridge takes, the length of the path, and where the path stops. Second level details of other features cannot exist without first level details of the same features.

3. Level 3 is used in conjunction with levels one and two detail to enable identification and exclusion. This level may include: ridge width and shape, pores, edge contour, and other permanent details. Third level details of creases, scars, incipient ridges, and other imperfections are the morphologies or shapes within their structures and cannot exist without first and second levels of detail of the same features.

B. Analyze friction ridge impressions by observing aspects of the three levels of friction ridge detail based on the quality of features (clarity of the observed features), the quantity of features (amount of features and area), the specificity of features (rarity), and their relationship.

C. Criteria to determine suitability of friction ridge impressions

1. Suitability determinations must be based on objective and demonstrable data and will be analyzed according to the suitability criteria.

2. Suitability Criteria: Seven clear Level 2 detail plus at least two of the following:
   a) Observable orientation
   b) Observable anatomical source
   c) At least one focal point
   d) At least one region of distinct and reliable friction ridge detail to serve as a target group

3. 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.

4. The reporting forensic scientist will document the reasoning and how their 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.
D. If the suitability criteria is not met, then the print is determined **Not Suitable for Identification**.
   1. Further analysis is discontinued.
   2. Proceed to the **Suitability Review** chapter.

E. If the suitability criteria is met, then the print is determined **Suitable for Identification**.
   1. Document anatomical source based on observations during analysis (e.g., FP, PP, etc.) and possible orientation (designate with arrow).
   2. The presence of level 1, level 2, and level 3 friction ridge details may also be documented.
   3. The analysis may be documented as a narrative on bench notes or on a composite or other enlargement by marking the orientation indicators and friction ridge features observed. Alternative forms of documenting analysis are acceptable.
   4. Proceed to the **Suitability Review** chapter.
   5. Proceed to comparison section.

### 6.2 Comparison

A. If the analysis phase provides indicators as to the probable anatomical area and orientation of the print, a side-by-side comparison with the appropriate area of the exemplar is initially conducted. However, in the absence of these indicators, it is the responsibility of the forensic scientist to compare all available anatomical areas and possible orientations of the print to the exemplars. The reporting forensic scientist may consult with other forensic scientists as to the indicators in question.

B. Comparisons may occur between a print and exemplar, a print and print, or an exemplar and exemplar.

C. If there are no exemplars or no relevant exemplars to compare:
   1. Document “Not Compared” on the appropriate worksheet.
   2. Forward the image(s) to the AFIS Section for an automated search. Follow the **AFIS Database Searches** chapter, and **AFIS/Friction Ridge Case Workflow** in the AFIS Manual.

D. If there are exemplars to compare:
   1. A target group of friction ridge features observed during the analysis phase is selected and searched within the corresponding area of the other impression.
   2. Using all levels of friction ridge detail available, conduct side-by-side observations to determine whether two impressions are in agreement or disagreement based upon features, ridge sequence, and spatial relationships within the tolerances of clarity and distortion.
   3. When required, select additional target groups of features observed during the analysis phase and/or re-orient the print and compare with the exemplars.
   4. Corresponding ridge features will be documented on a composite or other enlargement by marking the friction ridge detail observed in agreement.
   5. Observation of agreement or disagreement between the impressions initiates the evaluation phase.
6. In some cases, the forensic scientist may reassess suitability and determine the impression **Not Suitable for Identification** with documented justification and discontinue further comparison and evaluation.

E. If comparisons are performed but a conclusion is not reached:
   1. Document “Incomplete Comparison” on the appropriate worksheet.

F. Proceed to Evaluation section.

**6.3 Evaluation**

Once the examination progresses from the comparison phase to the evaluation phase, it is determined whether the information is sufficient to decide whether the unknown impression is from a different source (**Excluded**), from the same source (**Identified**) as the compared impression, or is Inconclusive (due to exemplars/due to latent, patent, plastic print/due to not meeting the exclusion criteria). These conclusions are described below.

A. Exclusion

Exclusion is the conclusion that there are sufficient features in disagreement between two areas of friction ridge impressions to conclude the two impressions did not originate from the same source. Exclusion of a subject can only be reached if all relevant comparable anatomical areas are represented and legible in the exemplars. Notes and reports shall clearly state that the exclusion refers to the subject.

1. Criteria to determine exclusion:
   An exclusion conclusion is reached when the print meets or exceeds the exclusion criteria. The print must have, at a minimum:
   
   a) **Observable orientation**
   b) **Observable anatomical source**
   c) **At least one focal point**
   d) **At least two regions of distinct and reliable friction ridge detail to serve as a target group**

2. A print that does not meet the exclusion criteria may be excluded if the following conditions are met:
   
   a) *Print (A) is Identified to Print (B) that does meet the exclusion criteria, and*
   b) *Print (A) to Print (B) identification is verified, and*
   c) *Print (B), that does meet the exclusion criteria, is compared to an individual resulting in an exclusion conclusion, and*
   d) *The exclusion conclusion is verified.*

3. When prints have been determined to not be in agreement:
   
   a) **Document on the appropriate worksheet:**
      
      i. *Indicate Exclude, Excluded, or EXC and [subject name].*
      
      ii. *Date of Exclusion.*
   
   b) *Continue to compare the print to other exemplars in the case, if available, or*
   
   c) *Discontinue comparison, and*
B. Identification

Identification is the conclusion that two friction ridge impressions originated from the same source due to sufficient features in agreement, and the forensic scientist would not expect to see the same arrangement of details repeated in an impression that came from a different source. When prints have been determined to be in agreement:

1. The evaluation is documented with the friction ridge detail that was used to support identification on a composite or other enlargement by marking the friction ridge detail observed in agreement.

2. Document on the photograph or composite containing the identified print:
   a) Indicate ID, anatomical source and subject identified
   b) Indicate anatomical orientation of the print with a mark:
      i. For a finger or toe impression, the mark will be a half circle with the top of the circle pointing in the same direction as the tip of the finger or toe.
      ii. For a joint impression, the mark will be two lines parallel with each other with the image in between.
      iii. For a palm or sole impression, the mark will be two lines at right angle with right angle pointing in the same direction of the hypothenar area of the palm or sole or as appropriate.

3. Document on the exemplar used for comparison and identification:
   a) Indicate ID and [date of conclusion]

4. Document on the appropriate worksheet
   a) Indicate ID and [anatomical source and subject], followed by the [Verification Criteria (VC)]

5. Further comparison of an identified print to remaining individuals in a case is not required.

6. Proceed to verification section.

C. Inconclusive - Due to Exemplars (Incomplete)

An inconclusive conclusion may result when a print cannot be identified or excluded due to an absence of complete and legible exemplars (e.g., poor quality prints and/or lack of comparable areas). In such an instance, the inconclusive conclusion means that the impression needs to be reexamined using clearly and completely recorded exemplars in order for a definitive conclusion to be reached. This conclusion is based only on the clarity and quantity of the exemplars, regardless if corresponding features have been located in agreement between the print and the exemplar.

When no definitive conclusion can be reached based on the absence of complete, legible and relevant exemplars:

1. Document on the appropriate worksheet
   a) Indicate Inconclusive, or INC, due to [reason]
   b) Date of Inconclusive - Due to Exemplars.
2. The print may be compared to other exemplars.
3. Forward the image(s) to the AFIS Section for an automated search. Follow the AFIS Database Searches chapter in this manual, and the AFIS/Friction Ridge Case Workflow in the AFIS Manual.

D. Inconclusive - Due to Latent, Patent, Plastic Print (Unable to Identify or Exclude)

An inconclusive conclusion may also result when corresponding features are observed but are not sufficient to identify and dissimilar features may be observed but are not sufficient to exclude. In either case, the inconclusive conclusion means that the unknown impression was neither identified nor excluded as originating from the same source. This inconclusive conclusion means the submission of additional exemplars will not assist in determining identification or exclusion.

When no definitive conclusion can be reached when corresponding features are observed, but are not sufficient to identify, and dissimilar features may be observed, but are not sufficient to exclude:

1. Document on the appropriate worksheet:
   a) Indicate Inconclusive due to [reason]
   b) Date of Inconclusive - Due to Latent, Patent, Plastic Print.
2. The print may be compared to other exemplars.
3. Proceed to Verification section.

E. Inconclusive - Due to Latent, Patent, Plastic Print (Unable to Exclude)

An inconclusive conclusion may also result when the print does not meet the established Exclusion Criteria and no corresponding features are observed. In this situation, all comparison efforts for available exemplars have been exhausted and all relevant exemplars are present in order to perform a thorough comparison. This inconclusive conclusion means that a reliable and repeatable conclusion is unable to be established with the quantity and clarity of friction ridge detail present.

When a definitive exclusion conclusion cannot be reached and all relevant exemplars are available and a thorough comparison has been performed:

1. Document on the appropriate worksheet:
   a) Indicate Inconclusive due to “does not meet the Exclusion Criteria”
   b) Date of Inconclusive – Does Not Meet the Exclusion Criteria.
2. The print may be compared to other exemplars.
3. Forward the image(s) to the AFIS Section for an automated search. Follow the AFIS Database Searches chapter, and AFIS/Friction Ridge Case Workflow in the AFIS Manual.

F. Print(s) reanalyzed as Not Suitable following comparisons:

1. There must be justification documented on the composite(s).
2. This change in analysis will be suitability reviewed.
6.4 Verification

A. All identification conclusions must be verified.

B. Exclusion and inconclusive conclusions do not require verification if the print results in an identification.

C. All conclusions for unidentified prints must be verified.

D. Verification(s) must be performed prior to releasing information.

E. Verification(s) must be completed prior to generation of laboratory report.

F. The worksheet, photograph and/or composite, and exemplars are submitted to another forensic scientist who is authorized to perform independent casework in friction ridge comparisons.

G. **Verification Criteria (VC)** – This determines the number of verifications required prior to reporting a conclusion.

1. **Criteria Requiring Single Verification:**
   a) *Print to Exemplar Identification with Verification Criteria of eleven or more*
   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 Exemplars (Incomplete)*
   e) *Exclusion*
   f) *Exemplar to Exemplar Identification*
   g) *Print to Print Identification conclusion with Verification Criteria of eleven or more*

2. **Criteria Requiring Double Verification:**
   a) *Print to Exemplar Identification with Verification Criteria of ten or fewer*
   b) *Print to Print Identification with Verification Criteria of ten or fewer*

H. Verifying forensic scientist(s) will perform independent analysis, comparison, and evaluation.

I. The worksheet, photograph and/or composite, and exemplars will be reviewed for proper description and documentation.

J. If the verifying forensic scientist(s) concurs with reporting forensic scientist's conclusion, the verifying forensic scientist(s) will document as follows:

1. Initials placed on the worksheet next to the listed comparison result and at the top under “Verification” along with the date verified.
2. Initials on the photograph and/or composite and exemplars used for comparison.

K. **Interlaboratory Verification(s)** – DPS Laboratories may request verification(s) from another DPS Laboratory. The requesting DPS Laboratory should forward the relevant worksheet(s), composite(s), and exemplar(s) to the verifying DPS Laboratory.

   **Note:** If evidence such as lift cards or submitted exemplars are forwarded, the transfer must be tracked in LIMS.
L. Once required verification(s) is completed:
   1. Proceed to the Report Writing Guidelines chapter. The conclusion will be formulated into a report for distribution.
   2. Preliminary results may be released to customer after verification and after results have been technically reviewed.
      a) The verification and technical review of the preliminary results will be documented in LIMS.

M. In the event that the verifying forensic scientist(s) does not concur with the reporting forensic scientist’s conclusion and a consensus cannot be reached, then the reporting forensic scientist’s immediate supervisor and/or Quality Manager must be notified and oversee the resolution.
   1. The immediate supervisor cannot act as moderator if they were involved in the test or review process.
   2. The verifying forensic scientist shall document the initial verification result and any additional notes for each relevant interpretation/opinion, and initial/date the relevant examination documentation.
   3. The verifying forensic scientist shall return the materials to the reporting examiner for additional review. Additional discussion shall occur as necessary.
   4. If a consensus cannot be reached, the reporting forensic scientist will forward the materials to the supervisor and/or Quality Manager for resolution.
   5. Additional examination(s) and/or forensic scientist(s) may be used to assist the reporting and verifying forensic scientists in their resolution and the observations must be documented.
   6. Based on the consideration of additional information, the reporting forensic scientist or verifying forensic scientist may change his/her interpretation/opinion. The reporting forensic scientist must never be pressured, forced, or told to change his/her interpretation/opinion to agree with the interpretation/opinion of another individual.
   7. If the reporting or verifying forensic scientist changes his/her interpretation/opinion, all changes will be tracked. The case notes will be updated with documentation including the forensic scientist’s initials, date, and updated conclusion.
   8. If, at the end of the resolution process, the reporting forensic scientist and all verifying forensic scientists cannot reach a unanimous consensus for the final interpretation/opinion, then the interpretation/opinion must be reported as inconclusive due to lack of examiner consensus in accordance with the review resolution process described in Review of Laboratory Records in the CLS Manual.
      a) See the Report Writing Guidelines chapter in this manual for the appropriate reporting statement.
6.5 Consultation

A. Consultations that occur during the analysis and comparison phase will be documented and retained in the case record. This includes, but is not limited to, discussions related to suitability, anatomical source, or orientation.

B. Significant consultation that is necessary for a forensic scientist to reach a conclusion during evaluation must be documented by all participating parties and retained in the case record. Verification of a conclusion shall be performed by a forensic scientist that did not participate in this consultation.

6.6 Interpretation

A. If an impression is divided into two or more parts caused by natural breaks, unnatural breaks, or simultaneous impressions, and all parts can stand alone as Suitable for Identification when viewed separately:
   1. The forensic scientist may separately examine each portion, or
   2. The forensic scientist may jointly examine the whole impression if it is the opinion of the forensic scientist that the parts of the impression were made or left at the same time and there exists description and documentation to justify.

B. If an impression is divided into two or more parts caused by natural breaks, unnatural breaks, or simultaneous impressions, and all parts, cannot stand alone as Suitable for Identification when viewed separately:
   1. The forensic scientist may determine the prints Not Suitable for Identification, or
   2. The forensic scientist may combine relevant parts to be considered as one if it is the opinion of the examiner that both parts of the impression were made or left at the same time and there exists description and documentation to justify.

7 Limitations

A. Friction ridge impressions will be compared to available submitted exemplars or those on file at DPS for individuals listed in the case, taking into consideration the customer’s request and case information. If an FBI UCN is provided, the AFIS Supervisor can assist in obtaining exemplars.

B. Suitability determinations are always open to the scrutiny of others.

C. Due to the flexibility of friction ridge skin, the motion and/or pressure of touching friction ridge skin to a surface, and the condition of the surface being touched, variations in appearances and/or distortion of the friction ridge skin may be present in the recovered print. The quality of a recovered print is dependent on the conditions in which it was deposited. These combined factors may contribute to misinterpretation of the friction ridge impression, and as a result, may have an inherent low risk of yielding a false negative conclusion.

8 Records

AFIS Comparison Worksheet (LAB-AF-04)
Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)
Laboratory Information Sheet (LAB-403, LAB-404)
9 Literature References and Supporting Documentation

Ashbaugh DR. Quantitative-Qualitative Friction Ridge Analysis. 1999.


FR-05-02  AFIS DATABASE SEARCHES

1 Scope
To establish standard workflow procedures for forensic scientists to utilize when submitting a case for a potential AFIS database search. The forensic scientist will follow standard casework procedure up to and including comparing any suitable prints to individuals listed on the submission form for comparison. Cases with unidentified suitable prints will be submitted for an AFIS examination, except in instances where the prints are considered not eligible for an AFIS search. If one or more of the following applies to an unidentified print, the print may not be searched by the AFIS Forensic Scientist:

1. Inconclusive conclusions with level 2 features marked in common with an exemplar print
2. Palm prints that aren’t searched when all fingerprints have been identified and there are no palm print exemplars on file for the individual
3. Once the maximum number of prints are searched and there are remaining unidentified prints in the case

2 Related Chapters/Documents
Report Writing Guidelines
Physical Evidence Examination
Digital Imaging of Friction Ridge Impressions
Friction Ridge Comparison
AFIS Manual:
- Standard Abbreviations and Definitions
- AFIS Examination
- AFIS/Friction Ridge Case Workflow

3 Procedure
3.1 Consultations
A. Consultations may occur at the request of the forensic scientist
B. Austin Crime Laboratory
   1. Create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.
   2. Contact the AFIS supervisor or AFIS forensic scientist designee and request a consultation.
   3. Provide an unmarked composite for the consultation.
   4. The AFIS supervisor or assigned AFIS forensic scientist will document the AFIS suitability on the composite and have the conclusion technically reviewed.
   5. The technical review will be documented in LIMS. An AFIS Activity Sheet (LAB-AF-02) will not be filled out if all prints are NS/AF.
   6. The Friction Ridge forensic scientist will document the AFIS suitability determination on the appropriate friction ridge discipline worksheet.
7. If the print(s) meets the criteria for an AFIS search, the case will be forwarded to the AFIS section.

8. If the print(s) does not meet the criteria for an AFIS search, proceed to **After Technical Review of the AFIS Search Request** section.

C. Garland/Lubbock/Weslaco Crime Laboratories

1. Create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.

2. Contact the AFIS section supervisor or AFIS forensic scientist designee and request a consultation.

3. The consultation will be performed electronically.

4. The AFIS section supervisor or assigned AFIS forensic scientist will determine the AFIS suitability and have the conclusion technically reviewed.

5. The technical review will be documented in LIMS.

6. The Friction Ridge forensic scientist will document the AFIS suitability determination on the worksheet.

7. If the print(s) meets the criteria for an AFIS search, the case will be forwarded to the AFIS section.

8. If the print(s) does not meet the criteria for an AFIS search, proceed to **After Technical Review of the AFIS Search Request** section.

### 3.2 Submitting AFIS Database Searches

A. The following workflow will be used when submitting unidentified suitable prints in a new case or if additional unidentified suitable prints are observed/developed in a supplemental request, to the AFIS section. The forensic scientist may submit all of the unidentified suitable prints in a case or a subset selected by the forensic scientist.

B. Austin Crime Laboratory

1. Create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.

2. Edit the description of the case folder to FR/AFIS Folder.

3. If any of the images submitted to AFIS via the internal AFIS connection are calibrated with centimeters (cm) instead of inches, and the scale isn't clearly labeled with cm, the forensic scientist must create a Laboratory Information Sheet (LAB-403, LAB-404) stating the following images are calibrated with cm and list the asset IDs corresponding to those images. It will be printed and placed in the FR/AFIS folder.

C. Garland/Lubbock/Weslaco Crime Laboratories

1. Create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.

2. The forensic scientist will create a submission form and email it to the Austin Evidence Coordination Section. If original submission form(s) are not in the LIMS Imaging Module, the forensic scientist will include a copy with their submission form.
3. If any of the images submitted to AFIS via the internal AFIS connection are calibrated with centimeters (cm) instead of inches, and the scale isn’t clearly labeled with cm, the forensic scientist must list on the submission form that the following images are calibrated with cm and list the asset IDs corresponding to those images.

D. Forensic scientists in all laboratories will submit the images via the internal AFIS connection.

1. Open the case folder in Adams Web and click on Assets icon.
2. Select the assets to be exported.
3. In the Export Options window, make the following selections:
   a) **File Name Options**: Unique ID
   b) **Image Conversion Options**: Do Not Convert Format (Default Setting)
   c) **Convert to greyscale**: No (Default Setting)
   d) **Include a Watermark**: No (Default Setting)
   e) **Do not enter a password**
4. Once selections are made, click OK and the assets will be exported.
5. Logout of Adams Web.
6. Open Downloads folder and select the folder corresponding to the case number.
7. Check that all assets are present, in TIF format, and named with asset ID.
8. Return to viewing the folder icon and leave this window open.
9. Open Foray drive in a new window so that folders for each lab are displayed.
10. Left click and drag the case folder from the original window to the folder in the second window which corresponds to the FR forensic scientist’s laboratory location.
11. Delete the folder from the Downloads folder after the file has been moved.
12. Delete the case folder from the Foray drive once it is empty.

E. If the internal AFIS connection is unavailable and a case must be submitted to AFIS, the following procedure will be followed:

1. Austin Crime Laboratory
   a) The forensic scientist will create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.
   b) The forensic scientist will edit the description of the case folder to “FR/AFIS Folder” in LIMS.
   c) The forensic scientist will place composites of the prints to be examined for AFIS entry in the AFIS Search Request envelope in the Friction Ridge Envelope. Composites must contain a 1:1 image of the print and an enlargement at a minimum of 4:1.
   d) The forensic scientist will barcode the FR/AFIS Folder along with the Friction Ridge Envelope to the AFIS Search request location in the FR File Vault. It is not necessary to seal the Friction Ridge Envelope.
2. Garland/Lubbock/Weslaco Crime Laboratories
   a) The forensic scientist will create an AFIS Search request in LIMS as a related request to the Friction Ridge Examination request and relate the offense.
   b) The forensic scientist will submit the following via Evidence Coordination at the Austin Crime Laboratory:
      i. Laboratory Submission Form - For additional submissions, previously assigned case numbers should be listed as appropriate (if the original submission form is not scanned into LIMS, include a copy).
      ii. Properly labeled composites representing prints to be analyzed for AFIS entry.
         - Composites must contain a 1:1 image of the print and an enlargement at a minimum of 4:1.
         - Composites are considered examination records (work product/representation/depiction of the evidence image or lift).

3.3 Submitting AFIS Database Searches for Supplemental Requests
A. If an AFIS-TLI, FBI-ULM, DHS reverse hit, DoD reverse hit, or if the agency calls in an AFIS Search request on a case with a previously issued Latent Print/Friction Ridge Examination Laboratory Report, the following procedure will be followed:
B. Austin Crime Laboratory
   1. For reverse hits, the AFIS forensic scientist will obtain the case folder, Latent Print/Friction Ridge Envelope, and exemplars, and transfer them to the FR forensic scientist.
   2. For agency request, the FR forensic scientist will obtain the case folder and Latent Print/Friction Ridge Envelope. The folder description will be updated in LIMS.
   3. The FR forensic scientist will create the Friction Ridge Examination request in LIMS and then create the AFIS Search request as a related request and relate the offense. The assets will be submitted following the same instructions as for original case submission via the internal AFIS connection.
C. Garland/Lubbock/Weslaco Crime Laboratories
   1. For reverse hits, the AFIS forensic scientist will obtain the case folder, Latent Print/Friction Ridge Envelope, and exemplars, and contact the assigned FR forensic scientist via email. The FR forensic scientist will create the Friction Ridge Examination request and then create the AFIS Search request as a related request and relate the offense.
   2. For agency request, the FR forensic scientist will create the Friction Ridge Examination request and then create the AFIS Search request in LIMS as a related request and relate the offense.
   3. The assets will be submitted following the same instructions as for original case submission via the internal AFIS connection.
3.4 Additional Evidence

A. If additional evidence is submitted for a case worked under the previous workflow and all of the following conditions are met, proceed to B.
   1. Suitable prints were developed on the original evidence
   2. The customer was given the option for an AFIS search
   3. No suitable prints are observed or developed on the additional evidence

B. Contact the customer and ask if it is necessary to submit the previously preserved prints to AFIS.
   1. If NO, no further action is needed, proceed to the Report Writing Guidelines chapter
   2. If YES, document the AFIS request from the customer in the case record, and
      a) Follow current workflow, sending prints to AFIS
      b) Relate old evidence to the request and proceed to the Report Writing Guidelines chapter

3.5 After Technical Review of the AFIS Search Request

A. Negative results or if all of the prints do not meet the criteria for an AFIS search

   Responsibility of Laboratory Submitting AFIS Database Search:
   1. If comparisons were performed, proceed to the Friction Ridge Comparison chapter.
   2. If no comparisons were performed, proceed to the Report Writing Guidelines chapter.

B. Positive results

   Responsibility of Laboratory Submitting AFIS Database Search:
   1. Obtain candidate information from the case record.
      a) Austin Crime Laboratory – review and initial AFIS Layout Sheet(s) (LAB-AF-01).
      b) Garland/Lubbock/Weslaco Crime Laboratories – review, print, and initial Requestor Notes from LIMS.
   2. Proceed to the Friction Ridge Comparison chapter for comparison of all unidentified suitable prints to exemplars of generated candidate(s).
   4. Return composites to Friction Ridge Envelope and file in secure storage area.

3.6 After AFIS Searches

The AFIS Section will be notified if additional identifications necessitate the deletion of prints from any unsolved databases in which they are registered.

4 Interpretation

A. Cases with no suspects and evidence not requiring the application of development techniques should be sent directly to Texas DPS Austin Crime Laboratory AFIS Section.

B. The laboratory requesting AFIS database searches is responsible for reporting the results of the AFIS examinations.
C. Prints in the Unsolved Latent Database may be removed if the statute of limitations expires or if they have been identified.

D. Supplemental reports will follow this workflow and use the appropriate supplemental reporting statements.

5 Limitations

A. Prints that are suitable for identification may not meet the criteria for AFIS entry.

B. Prints that are determined not suitable for identification by the reporting forensic scientist will not be forwarded to the AFIS Section.

C. To avoid confusion, images submitted to AFIS should contain only one print. If multiple prints can only be preserved in a single image, the FR forensic scientist will communicate to the AFIS forensic scientist which prints they are requesting be analyzed for an automated search and document the consultation.

6 Records

AFIS Activity Sheet (LAB-AF-02)
Friction Ridge Worksheet (LAB-FR-01)
Friction Ridge Comparison Worksheet (LAB-FR-04)
Laboratory Information Sheet (LAB-403, LAB-404)
Requestor Notes from LIMS
FR-05-03 INSTRUCTIONS FOR FRICTION RIDGE WORKSHEET

1 General Instructions
The information requested on this worksheet is used to document friction ridge examination of submitted evidence, preservation of prints observed and/or developed, analysis of preserved prints, friction ridge comparison results, and results from automated searches and/or name(s) submitted for comparison to previously unidentified friction ridge evidence. Multiple worksheet pages may be used and all information must be entered on the form. The form is available electronically to facilitate completion on a computer. Additional notes can be made on Laboratory Information Sheets (LAB-403, LAB-404) or in LIMS.

2 Case Information (Required)
A. Case # – Indicate the unique laboratory case number.
B. Examiner – Field completed by forensic scientist working the case with the forensic scientist’s initials.
C. Page Numbers – Field automatically populated and updated when worksheet is printed.
D. Dates – This field will reflect date case started and date worksheet was opened and/or printed. Indicate the [date started] (either date evidence opened for the case or the date when examinations actually began) by either selecting the date from electronic calendar or manually enter the date. The second date automatically populates when the worksheet is opened. The range of dates will be the same if opened and completed on the same day.
E. Evidence Review (completed by the reviewer) – Include the reviewer’s handwritten initials and the date the review was completed at the top of the worksheet and initials by the evidence reviewed.
F. Suitability Review (completed by the reviewer) – Include the reviewer’s handwritten initials and the date the review was completed at the top of the worksheet.
G. Verification (completed by the verifier) – Include the initials of the forensic scientist(s) and the date the verification was completed at the top of the worksheet and initials by the comparison result.
H. AFIS Hit, FBI Hit, DHS Hit, and DoD Hit – Indicate in the appropriate box(es) the results of automated searches performed by the AFIS Section.
I. Additional Evidence – Indicate in this box if any evidence listed on the form is from an additional evidence submission.

3 Examination Information
3.1 Notes
A. Document name(s) of individual(s) compared and exemplars used during comparisons (submitted, on file at DPS, obtained from the FBI, DHS, or DoD).
1. For submitted exemplars, this shall include the LIMS item number and name.
2. For exemplars on file at DPS, this shall include the name and SID number.
3. For exemplars obtained from the FBI, this shall include the name and FBI UCN.
4. For exemplars obtained from the DHS, this shall include the name and DHS FIN/EID.
5. For exemplars obtained from the DoD, this shall include the name and DoD TCN.
   B. Document individual(s) not compared when exemplars are not available.
   C. Additional notes are at the discretion of the forensic scientist.

3.2 Evidence Description (Required)
   A. **LIMS #** – Indicate item number generated by LIMS during itemization of evidence.
   B. **Description** – Indicate description of evidence examined.
   C. **Visual Examination (VE)** – Indicate with a check mark (✓) a visual examination was performed prior to processing.

3.3 Processing Techniques/Series and Preservation (as applicable)
   A. **Processing Techniques** – Using the drop down menu, the forensic scientist should select the processing technique(s) utilized and list them in the order used. Forensic scientist must indicate with a check mark (✓) in box which technique(s) were used to process the evidence. If clarification of the order is necessary, the forensic scientist will document this on the worksheet or bench notes.
      - SG – view test print placed inside fuming chamber
      - FD – view log for preparation, testing, and shelf-life
      - LS – view test print
      - IF – view test print
      - IND – view log for preparation, testing, and shelf-life
      - DFO – view log for preparation, testing, and shelf-life
      - NIN – view log for preparation, testing, and shelf-life
      - AB – view log for preparation, testing, and shelf-life
      - SSP – view test print placed on adhesive surface
      - GV – view test print placed on adhesive surface
      - ORO – view test print
      - BP – not required
      - AY – view log for preparation, testing, and shelf-life
   
   B. **Controls** – A plus symbol (+) will indicate that controls were used to document that the development technique(s) worked; the chemicals used were properly prepared, tested positive, and within the range of the noted shelf-life; and the light source performed as intended.
      - SG – view test print placed inside fuming chamber
      - FD – view log for preparation, testing, and shelf-life
      - LS – view test print
      - IF – view test print
      - IND – view log for preparation, testing, and shelf-life
      - DFO – view log for preparation, testing, and shelf-life
      - NIN – view log for preparation, testing, and shelf-life
      - AB – view log for preparation, testing, and shelf-life
      - SSP – view test print placed on adhesive surface
      - GV – view test print placed on adhesive surface
      - ORO – view test print
      - BP – not required
      - AY – view log for preparation, testing, and shelf-life
   
   C. **Preserved** – Using the drop down menu, the forensic scientist should select the technique(s) utilized and indicate in the box(es) the number of photographs taken, scans made, or lifts collected from each item.

3.4 Analysis (as applicable)
   A. Indicate the number of suitable (S) latent/patent/plastic prints observed, developed or further developed, and preserved on each item examined.
   B. Indicate the anatomical source (AS) for each suitable print. The anatomical source may be described as FP, PP, tip, side, joint, toe, sole, delta, core, continuous ridges, pattern area, or unknown.
C. Indicate the presence or absence of non-suitable (NS) latent/patent/plastic prints observed, developed or further developed, and preserved on each item examined with a Y (yes) or N (no).

3.5 **AFIS Results (as applicable)**

A. **NS/AF** – Indicate with a check mark (✓) if the print does not meet the criteria for an AFIS search.

B. **AFIS SR** – Indicate with a check mark (✓) if the print was searched in the state AFIS database; if the print was not identified, it will be registered in the AFIS Unsolved Latent Database (ULDB).

C. **FBI SR** – Indicate with a check mark (✓) if the print was searched in the FBI database.

D. **FBI ST** – Indicate with a check mark (✓) if the print was registered in the FBI Unsolved Latent File (ULF).

E. **DHS SR** – Indicate with a check mark (✓) if the print was searched in the DHS database; if the print was not identified, it will be registered in the DHS IDENT Unsolved Latent File.

F. **DoD SR** – Indicate with a check mark (✓) if the print was searched in the DoD database; if the print was not identified, it will be registered in the DoD Unsolved Latent File.

3.6 **Comparison Results (as applicable)**

Indicate results as follows with required wording in italics:

A. For suitable prints identified, indicate ID, [print designation], [subject name], and [verification criteria].

B. For suitable prints excluded to exemplars compared, indicate EXC, Exclude or Excluded.

C. For Inconclusive due to latent, patent, or plastic print (any reason), indicate INC or Inconclusive and [reason(s)].

D. For Inconclusive due to exemplars, indicate INC or Inconclusive due to [reason(s)].

4 **Records**

Laboratory Information Sheets (LAB-403, LAB-404)

Friction Ridge Worksheet (LAB-FR-01)

AFIS Layout Sheet (LAB-AF-01)

Requestor Notes from LIMS
FR-05-04 INSTRUCTIONS FOR FRICTION RIDGE COMPARISON WORKSHEET

1 General Instructions

The information requested on this worksheet is used to document friction ridge comparison of and/or AFIS results for previously unidentified friction ridge evidence to the following:

- Additional submitted exemplars
- Additional submitted name(s) for comparison
- Unreported automated searches
- Reverse hits

Multiple worksheet pages may be used and all information must be entered on the form. The form is available electronically to facilitate completion on a computer. Additional notes can be made on Laboratory Information Sheets (LAB-403, LAB 404) or in LIMS.

2 Case Information (Required)

A. Case # – Indicate the unique laboratory case number.

B. Examiner – Field completed by forensic scientist working the case with the forensic scientist’s initials.

C. Page Numbers – Field automatically populated and updated when worksheet is printed.

D. Dates – This field will reflect date case started and date work sheet was opened and/or printed. Indicate the [date started] (either date evidence opened for the case or the date when examinations actually began) by either selecting the date from electronic calendar or manually enter the date. The second date automatically populates when the worksheet is open. The range of dates will be the same if opened and completed on the same day.

E. Suitability Review (completed by the reviewer) – Include the reviewer’s handwritten initials and the date the review was completed at the top of the worksheet.

F. Verification (completed by the verifier) – Include the initials of the forensic scientist(s) and the date the verification was completed at the top of the worksheet, and initials by the comparison result.

G. AFIS Hit, FBI Hit, DHS Hit, and DoD Hit – Indicate in the appropriate box(es), as applicable, the results of automated searches performed by the AFIS Section.

H. Additional Evidence – Indicate in this box if any evidence listed on the form is from an additional evidence submission.

3 Examination Information

3.1 Notes

A. Document name(s) of individual(s) compared and exemplars used during comparisons (submitted, on file at DPS, or obtained from the FBI, DHS, or DoD).

1. For submitted exemplars, this shall include the LIMS item number and name.
2. For exemplars on file at DPS, this shall include the name and SID number.
3. For exemplars obtained from the FBI, this shall include the name and FBI UCN.
4. For exemplars obtained from the DHS, this shall include the name and DHS FIN/EID.
5. For exemplars obtained from the DoD, this shall include the name and DoD TCN.

B. Document individual(s) not compared when exemplars are not available.
C. Additional notes are at the discretion of the forensic scientist.

3.2 Evidence Description (Required)
A. **LIMS #** – Indicate the item number generated by LIMS during itemization of evidence.
B. **Description** – Indicate a description of evidence examined.

3.3 Analysis (as applicable)
A. Indicate the number of suitable (S) latent/patent/plastic prints observed on each item examined.
B. Indicate the anatomical source (AS) for each suitable print. The anatomical source may be described as FP, PP, tip, side, joint, toe, sole, delta, core, continuous ridges, pattern area, or unknown.
C. Indicate the presence or absence of non-suitable (NS) latent/patent/plastic prints observed on each item examined with a Y (yes) or N (no).

3.4 AFIS Results (as applicable)
A. **NS/AF** – Indicate with a check mark (✓) if the print does not meet the criteria for an AFIS search.
B. **AFIS SR** – Indicate with a check mark (✓) if the print was searched in the state AFIS database; if the print was not identified, it will be registered in the AFIS Unsolved Latent Database (ULDB).
C. **FBI SR** – Indicate with a check mark (✓) if the print was searched in the FBI database.
D. **FBI ST** – Indicate with a check mark (✓) if the print was registered in the FBI Unsolved Latent File (ULF).
E. **DHS SR** – Indicate with a check mark (✓) if the print was searched in the DHS database; if the print was not identified, it will be registered in the DHS IDENT Unsolved Latent File.
F. **DoD SR** – Indicate with a check mark (✓) if the print was searched in the DoD database; if the print was not identified, it will be registered in the DoD Unsolved Latent File.

3.5 Comparison Results (as applicable) – Indicate results as follows with required wording in italics:
A. For suitable prints identified, indicate ID, [print designation], [subject name], and [verification criteria].
B. For suitable prints excluded to exemplars compared, indicate EXC, Exclude or Excluded.
C. For Inconclusive due to latent, patent, plastic print (any reason), indicate INC or Inconclusive and [reason(s)].
D. For Inconclusive due to exemplars, indicate INC or Inconclusive due to [reason(s)].
4 Records

Laboratory Information Sheets (LAB-403, LAB-404)
Friction Ridge Comparison Worksheet (LAB-FR-04)
AFIS Layout Sheet (LAB-AF-01)
Requestor Notes from LIMS
06 EQUIPMENT WORK INSTRUCTIONS

FR-06-01 CARON 6105 FINGERPRINT DEVELOPMENT CHAMBER

1 Scope
Instructions for the operation of the Caron 6105 Fingerprint Development Chamber used for accelerating the development of prints after treatment with IND, DFO, and Ninhydrin.

2 Related Chapters/Documents
Equipment
Ninhydrin Processing
DFO (1,8-Diazafluoren-9-one) Processing
IND (1,2-Indanedione) Processing
CLS Manual: Laboratory Equipment

3 Safety
A. The unit is capable of reaching temperatures that could result in burns. Always wear protective clothing when accessing the unit. Use caution when opening the outer door.
B. Use eye protection, gloves and aprons if exposure to hazardous materials could occur.
C. Disconnect all power before performing maintenance.
D. Do not put more than 5 lbs on top of unit.

4 Equipment and Materials
Caron 6105 Fingerprint Development Chamber

5 Standards, Controls, and Calibration
A. New chambers will be validated or verified following procedures in the CLS Manual.
B. After repairs, an appropriate chemically treated test print is used as a performance check to determine if the humidity chamber is operating as expected.
   1. A positive result is indicated by the print being developed.
   2. Repairs and performance checks are documented on the Equipment Log (LAB-405).

6 Instructions
A. Water Connection
   1. Fill Carboy 4 Liter water bottle mounted on secured holder on the side of chamber with distilled, reverse osmosis or deionized water (as needed). The bottle cap must have a weep hole to work properly and the water supply must gravity drain, or
   2. Plumb the water drain connection to a facility drain. Connect the water inlet to a water supply. This chamber requires distilled, reverse osmosis or deionized water.

B. Start Up
   1. Turn on unit by pressing power switch.
   2. The ‘power on’ indicator light, temperature, and timer displays will illuminate. Air should be gently circulating.
C. Temperature Controller
1. Change Temperature Set Point. Use the up and down arrow push-buttons to obtain the desired temperature set point (red upper display).
2. The temperature is displayed in degrees Celsius (°C).
   a)  IND: 100°C
   b)  DFO: 100°C
   c)  Ninhydrin: 80°C

D. Humidity Controller
1. Enable or disable humidity by pressing humidity control switch on or off, respectively.
   a)  IND: enabled (recommended) or disabled
   b)  DFO: disabled
   c)  Ninhydrin: enabled
2. Change humidity set point. Use the up and down arrow push-buttons to obtain the desired humidity set point (red upper display). The relative humidity is displayed in %.
   a)  IND: 60% (when enabled)
   b)  Ninhydrin: 70%

E. Countdown Timer Controller
1. Set total countdown time to desired value using the four up and down arrow buttons.
   a)  IND: 10 Minutes
   b)  DFO: 10 Minutes
   c)  Ninhydrin: 5 Minutes
2. Open chamber door and place evidence inside chamber on shelf or attach evidence with evidence clips on hanging bars.
3. Press the start button to start digital countdown timer.
4. When the time remaining reaches 0:00, the alarm will buzz and the display turns red for 3 seconds.
5. Open chamber door and remove evidence.
6. Close chamber door.
7. Press the stop button to turn alarm off; the time remaining resets to the total countdown time previously set.

F. Viewing Light
Turn on the light switch to illuminate the interior of the cabinet (as needed).
G. Controller Parameters

1. For diagnostic purposes (as needed). Pressing the advance button on bottom left corner of temperature and humidity controller will display the amount of time (in percent) that the heaters are on.

2. Press the Infinity ∞/Home button to return to the original display.

7 Maintenance

1. Clean interior chamber (as needed).

2. Check drains for blockage (as needed).

3. See Maintenance Section, Caron 6105 Fingerprint Development Chamber, Operations Manual, page 14, for further information (as needed).

8 Limitations

A. The chamber must be located in a dry, clean, and level area. Allow a 2 inch clearance from the back of chamber for proper air circulation.

B. Rubber stopper should be installed on the exhaust port on the backside of the chamber.

C. Maximum shelf load is 22lbs per shelf.

D. The chamber drops in temperature slowly. For faster recovery time when lowering the temperature, open the door. To lower the humidity, open the door or rear vent.

E. The chamber will only control temperature and humidity within the specified range:
   1. Temperature Range: 40°C to 100°C Celsius
   2. Humidity Range: 60 to 80% Relative Humidity (of specified temperature range)

F. If the low water level alarm light is on, the chamber will not control humidity.

G. The timer only sounds for three seconds.

H. The physical size of the inside of the chamber is small. Large items may not fit in the chamber and an iron may need to be used to accelerate the development of prints.

9 Records

Equipment Log (LAB-405)

Validation Form (LAB-408a)

Performance Verification Form (LAB-408b)

10 Literature References and Supporting Documentation

Caron 6105 Fingerprint Development Chamber Operations Manual. 6105I001_revD.doc. 04-04-08.
FR-06-02 COHERENT TRACER

1 Scope
The Coherent TracER is used in the examination of prints after treatment with fluorescent dye stains and powders. Luminescence of prints may also occur without the use of chemical processing techniques and may be viewed with the Coherent TracER. The Coherent TracER is an air cooled optically-pumped semiconductor (OPS) laser which emits 532 nm radiation with adjustable output from 0 to 6.4 watts.

2 Related Chapters/Documents
Equipment
Powder Processing
Magnetic Powder Processing
DFO (1,8-Diazafluoren-9-one) Processing
Rhodamine 6G Fluorescent Dye Processing
RAM Fluorescent Dye Processing
Fluorescent Gentian Violet Processing
IND (1,2-Indanedione) Processing
Acid Yellow 7 (AY) Processing
CLS Manual: Laboratory Equipment

3 Safety
A. Avoid eye or prolonged skin exposure to direct or scattered radiation.
B. Always wear proper eye protection (laser safety glasses) when operating the TracER. Direct eye contact with the output beam can cause serious eye damage and possible blindness. Do not look directly into the beam even with proper eye protection.
C. User should monitor the aim of the hand piece.
D. Exercise caution when examining reflective surfaces to avoid the reflection of the laser light into the eyes.
E. Exercise caution when using solvents in the area of the laser.
F. Do not excessively bend or pull the fiber light umbilical cable (excessive tight bends less than 15 cm radius can damage and possibly ignite the fiber).

4 Equipment and Materials
Coherent TracER

5 Standards, Controls, and Calibration
A. New light sources will be validated or verified following procedures in the CLS Manual.
B. Following repairs, refer to Equipment chapter.
6 Instructions

A. Turn On, Front Panel Control

1. Verify the LASER ON/OFF key switch is in the off position.

2. Turn the POWER ON/OFF switch on the front panel of the power supply to the on position.

3. Ensure the hand piece LASER CONTROL is selected to “F.P.” for front panel control and turn power adjust knob fully counter clockwise.

4. Ensure the hand piece is pointed at an intended target and turn the LASER ON/OFF keyswitch to the on position. After 5 seconds the shutter will open and you will hear a click.

5. Using the hand piece trigger, press the trigger to emit the requested laser emission.

6. The front panel displays zero until there is actual energy. Set the front panel display to the desired output power using the front panel POWER ADJUST knob.

B. Turn On, Hand Piece Control

1. Verify the LASER ON/OFF key switch is in the off position.

2. Turn the POWER ON/OFF switch on the front panel of the power supply to the on position.

3. Ensure the hand piece LASER CONTROL is selected to “H.P.” for hand piece control.

4. On the hand piece, select the preset HI or LOW power option.

5. Ensure the hand piece is pointed at an intended target and turn the LASER ON/OFF keyswitch to the on position. After 20 seconds the shutter will open and you will hear a click. (If the hand piece trigger is enabled, the system will emit laser energy within 5 seconds after the LASER ON/OFF key switch is turned to the on position.)

6. Using the hand piece trigger, press the trigger to emit the requested laser emission.

C. Turn Off (Whether utilizing front panel or hand piece control)

1. Ensure that the trigger is set to off position so that no laser light is emitting from the hand piece.

2. Set the LASER ON/OFF key switch to the off position. The key can be removed to prevent accidental turn on.

3. Set the POWER ON/OFF switch to the off position. The AC power cord or battery module can be detached from the system to prevent accidental turn on.

7 Maintenance

Normal maintenance includes keeping the light source clean. Refer to Section 5, Maintenance and Service, of the Coherent TracER Operator's Manual for further information.
8 Limitations
   A. Operates at a fixed wavelength.
   B. In order for internal fans to function efficiently, a 10 cm (4in.) clearance should be observed on both the fan inlet and exhaust ports.
   C. Due to the battery management system, only the internal fan will be operational during the first 30 seconds from an off to a POWER ON state.
   D. Be mindful of the heat given off from the LASER when viewing fragile evidence such as black tar heroin and plastic trash bags.

9 Records
   Equipment Log (LAB-405)
   Validation Form (LAB-408a)
   Performance Verification Form (LAB-408b)

10 Literature References and Supporting Documentation
FR-06-03 FISHER HAMILTON FORENSICS CABINET

1 Scope
The Fisher Hamilton Forensics Cabinets are utilized for Cyanoacrylate Ester (Super Glue) processing of physical evidence. Each Forensics Cabinet provides ducted fuming chambers to provide protection for laboratory personnel from dangerous fumes and odors generated during the treatment of evidentiary materials.

2 Related Chapters/Documents
Equipment
Cyanoacrylate Ester (Super Glue) Processing
CLS Manual: Laboratory Equipment

3 Safety
A. Observe standard laboratory safety practices, including use of Personal Protective Equipment.
B. Use caution when opening and closing the air-flow damper. Electrical cords pass through for routing heating apparatus for each chamber.
C. Hydrogen cyanide gas is produced when heated above 400° F.
D. The flash point for HOT STUFF – Original (Red Label) is 176° F to 200° F.

4 Equipment and Materials
- Fisher Hamilton Forensics Cabinet
- Aluminum weigh dish
- Cyanoacrylate Ester (Super Glue)
- Heating apparatus
- Hanging rods and hooks

5 Standards, Controls, and Calibration
A. New cabinets will be validated or verified following procedures in the CLS Manual.
B. After repairs, complete a performance check by placing a test print within the chamber.
   1. A positive result is indicated if prints are developed during fuming.
   2. Repairs and performance checks are documented on the Equipment Log (LAB-405).

6 Instructions
1. Open air-flow damper in chamber before access to allow purging of chamber and to aid in opening door to chamber.
2. Turn on heating apparatus and light.
3. Insert evidence into a clean chamber.
4. Place a test print within the chamber.
5. Place a small container of steaming water into the chamber, introducing humidity as an accelerator.
6. Close the door to chamber and close air-flow damper allowing heat and humidity to build.

7. Open the door and place an appropriate amount of Cyanoacrylate Ester in aluminum weigh dish on pre-heated heating apparatus. Close door to chamber.

8. After evidence is properly exposed, turn off light and heating apparatus and open air-flow damper to evacuate the chamber with the door closed for approximately 5 minutes prior to removing evidence.

9. Air-flow dampers should be closed when not in use.

7 Maintenance

1. Clean glass and chamber interiors as needed. Laminate clad interior surfaces and glass door panels may be cleaned with solvents as recommended by developing agent manufacturer. Avoid solvent contact on window glazing and vent port grommets.

2. Replace lamps by unscrewing interior glass globe from lamp housing as needed.

3. Wipe down exterior spills as soon as possible.

4. Verify proper airflow volumes as needed using airflow meter.
   - Minimum Air Flow - 13 CFM (Bench-top Unit 950P200).
   - Minimum Air Flow - 31 CFM (Full Height Unit 950P201).

5. Replace ‘v’-seal door gaskets as necessary.

6. Lubricate dampers as required for smooth operation.

7. Periodically inspect electrical cords for signs of wear at points of contact with air flow damper.

8 Limitations

A. Fuming times may vary accordingly with size of chamber, condition and surface of substrate, relative humidity, and heating apparatus used.

B. Large items may not fit in the chamber.

C. Each chamber includes a vapor-proof incandescent light. Do not use bulbs in excess of 100 Watts.

D. Screens of mesh/fabric may be placed in front of exhaust vent to prevent loss of small evidentiary materials.

9 Records

Equipment Log (LAB-405)
Validation Form (LAB-408a)
Performance Verification Form (LAB-408b)
10 Literature References and Supporting Documentation


FR-06-04 AIR SCIENCE FUMING CHAMBER

1 Scope

Instructions for the operation of the Air Science Safefume 72XL Cyanoacrylate Fuming Chamber used for the development of prints. The Safefume 72XL Cyanoacrylate Fuming Chamber protects personnel from the hazardous fumes generated from Cyanoacrylate. The Safefume automates the Cyanoacrylate Ester (Super Glue) processing by controlling and monitoring the hotplate, humidity, door lock, internal circulation fan, and purge cycle. The touch control also displays the cycle time, lights, and filter condition.

2 Related Chapters/Documents

Equipment

Cyanoacrylate Ester (Super Glue) Processing

CLS Manual: Laboratory Equipment

3 Safety

A. Observe standard laboratory safety practices. Wear proper protective equipment when processing items: lab coat, gloves, and safety glasses (goggles).

B. Do not attempt to open door until purge cycle is complete.

C. The hot plate inside the chamber is capable of reaching temperatures that could result in burns.

D. Disconnect power supply before removing filter access cover, or before attempting inspection and repairs to the chamber.

E. Dirty filters may contain dangerous materials. The use of a respirator is advised for persons removing filters.

F. Caution while replacing compact fluorescent lamps installed in chamber.

4 Equipment and Materials

- Air Science Safefume 72XL Cyanoacrylate Fuming Chamber
- Hot plate
- Circulating fan
- Humidifier
- Hanging rods, hooks, and shelves
- Filters
- Aluminum dish
- Cyanoacrylate Ester (Super Glue)

5 Standards, Controls, and Calibration

A. New chambers will be validated or verified following procedures in the CLS Manual.

B. After repair, complete a performance check by placing a test print on a non-porous substrate and placing it inside the fuming chamber.
   1. A positive result is indicated by the print being developed.
   2. Repairs and performance checks are documented on the Equipment Log (LAB-405).
6 Instructions

6.1 Operation

1. Turn power on.
2. Check settings (see Initial Setup section).
   a) It is recommended that the relative humidity (RH) set point be adjusted to 45%. This will allow the processing time cycle to begin within approximately five minutes of starting the process.
   b) The RH set point may be adjusted to 25%, 45%, 55%, 65%, and 80%, as needed.
3. Open chamber door and place items to be processed inside chamber either by suspending on hanging rods or shelves or standing on shelves or on chamber walls so all areas are exposed to fumes.
4. Place control test print within chamber.
5. Check water level in humidifier. If low, add distilled or deionized water.
6. Place desired amount of Cyanoacrylate Ester (Super Glue) in an aluminum dish and put the dish on the hot plate. (Do not put Cyanoacrylate directly on the hotplate.)
7. Close chamber door.
8. Press start. (The fuming run time will begin after the set point humidity level is reached). A flashlight may be used to monitor the control test print and view the processing of the evidence from outside the chamber.
9. At any time, the purge cycle can be activated to evacuate fumes from the chamber by pressing stop. Otherwise, at the end of the cycle the chamber will automatically purge itself. The purge cycle takes 5 minutes.
10. When cycle is complete, an alarm will sound until doors are opened.
11. Open chamber door.
12. Check control test print. If test print(s) developed, proceed to step 13. If test print(s) did not develop, repeat steps 3 through 10.
13. Document the batch date, set point RH, and result of the control test print on the Friction Ridge Worksheet (LAB-FR-01) for each use.
14. Remove items.

6.2 Initial Setup

1. Set humidity level to 80% relative humidity (default setting).
2. Set fuming run time to 15 minutes (default setting).

7 Maintenance

A. General Guidelines
1. General cleaning and inspection is recommended every 6 months.
2. Filter change-out and complete inspection & calibration is recommended every 12 months.
B. Specific Instructions

1. General Cleaning
   a) *Wipe down the unit with only soapy water.*
   b) *Upon first use, the application of Rain-X to the interior glass doors will help to maintain a cleaner inner chamber.*
   c) *Wipe down the inner chamber occasionally and reapply as necessary.*

2. Replace humidifier wick/filter as needed.

3. Filter Change Out: Pre-filters (main pre-filter and circulation fan pre-filter) and main carbon filter.
   a) *Follow recommended service schedule.*
   b) *Alarm will alert the operator when the filter needs changing.*

4. Humidifier
   a) *Add distilled or deionized water as needed.*
   b) *Change every few uses.*

5. Replace compact fluorescent lamps as needed.

8 Limitations

A. Fuming times may vary accordingly with the condition and surface of substrate.

B. Fuming cycle will not start unless door is closed and until the humidity reaches the set point.

C. Low amounts of Cyanoacrylate Ester (Super Glue) added to the dish may not allow the heating element to provide fumes for the entire 15 minute heating cycle.

D. The unit will only maintain the set humidity level to within +/- 5% variance.

E. Physical volume of chamber is fixed. Extremely large items may not fit in the chamber or may not fit through the chamber door.

F. Circulation fan may cause evidentiary material to move around while fan is on. Evidentiary material should be secured on hanging rods or on shelves.

G. The RH inside the chamber may be higher than the selected RH set point selected. This value is simply the set point at which the processing time cycle will begin.

H. The commercially purchased humidifier will need to be monitored with use for the ability to produce and increase the humidity in the chamber.

I. The Cyanoacrylate Ester (Super Glue) developed print is partially fixed, but excessive rubbing or handling may diminish print.
9 Records
Friction Ridge Worksheet (LAB-FR-01)
Equipment Log (LAB-405)
Validation Form (LAB-408a)
Performance Verification Form (LAB-408b)

10 Literature References and Supporting Documentation
Air Science SafeFume Product PDF Download.
**FR-06-05  SPEX CRIMESCOPE**

1 **Scope**

The SPEX CrimeScope CS-16-500-15F (CrimeScope) is a light source used for enhancing observation and photography of friction ridge evidence. The CrimeScope uses a 500 Watt xenon arc lamp and consists of 15 filter wheel wavelength selections. The CrimeScope has three defined uses within the friction ridge discipline: fluorescence, absorption, and as an intense white light source.

2 **Related Chapters/Documents**

   Equipment
   Powder Processing
   Magnetic Powder Processing
   Ninhydrin Processing
   DFO (1,8-Diazafluoren-9-one) Processing
   Cyanoacrylate Ester (Super Glue) Processing
   Rhodamine 6G Fluorescent Dye Processing
   RAM Fluorescent Dye Processing
   Gentian Violet Processing
   Fluorescent Gentian Violet Processing
   Sticky Side Powder Processing
   Amido Black Processing
   IND (1,2-Indanedione) Processing
   Oil Red O (ORO) Processing
   Acid Yellow 7 (AY7) Processing

   CLS Manual: Laboratory Equipment

3 **Safety**

   A. Light source emits high-intensity UV, VIS (visible), and IR light. Exposure to these types of radiation, even reflected or diffused, can result in serious, and sometimes irreversible, eye and skin injuries.

   B. Make sure to not block the intake and exhaust fans on the rear panel.

   C. If the lamp fails to turn on, or it bursts, immediately leave the room. Allow at least 10 minutes before returning to the work area.

   D. Set intensity control at fully clockwise position (0% intensity) when not in use, when changing wavelengths, or when changing goggles.

   E. Never aim the light guide at anyone.

   F. Do not look directly into the light guide or optical ports.
G. Always wear protective goggles when operating the CrimeScope based on the following minimum manufacturer recommendations:
   1. 350-400 – clear UV or yellow
   2. 400-445 – yellow
   3. 445-515 – orange
   4. 515-575 – red
   5. 000 – clear UV at minimum, but orange is recommended for eye comfort
   6. 600-670 – clear UV

H. Wear personal protective equipment. This includes but is not limited to gloves, lab coat, and eye protection.

I. Do not leave equipment on and unattended.

J. Excessive bending, over-bending, kinking of the light guide can cause damage to the light guide.

K. Explosion hazard: Do not operate in an explosive atmosphere, in the presence of flammable gases or fumes.

L. Risk of electric shock: Do not remove the instrument cover as this should only be done by qualified service personnel.

M. Fire hazard: Do not leave open the IR side-port, and do not leave the IR fiber guide attached when not in use.

N. Fire hazard: Caution with the interaction of the light with various substrates and chemical reagents.

4 Equipment and Materials

SPEX CrimeScope CS-16-500-15F

5 Standards, Controls, and Calibration

A. New light sources will be validated or verified following procedures in the CLS Manual.

B. Following repairs, refer to Equipment chapter.

6 Instructions

6.1 Setup

1. Remove from carrying case, verify that both power switches are in off position, and set the light intensity to minimum intensity (fully clockwise).

2. Install power cord.

3. Remove front cap and connect the UV-VIS liquid light guide and remote controller cable.

4. Aim the light guide towards the ground away from users/viewers.

6.2 Start-up

1. Set the back switch to the “on” position then turn the front switch to the “on” position.

2. Slowly open the intensity control shutter. Rotate the collimator for wide angle or focused spot-size. The wavelength is visible on the front of the instrument.
6.3 Use

1. Operate light source in a dark to semi-darkened room to view fluorescent prints.
2. Choose an appropriate wavelength by selecting up or down on the front of the instrument or using the buttons on the UV-VIS liquid light guide remote control.
3. Adjust the Downward Shift for filter fine tuning as appropriate for the subject. The Downward Shift range is from 0-20.
4. Change protective eye wear according to the filter wheel wavelength selected.
5. Upon selection of optimum filter wheel wavelength, apply appropriate camera lens filter: yellow15, orange, or red23A. Filter stacking of like filters is permissible.
6. Document on the Friction Ridge Worksheet (LAB-FR-01) filter wheel wavelength, Downward Shift (if other than 0), and camera lens filter used when photographing friction ridge evidence.

6.4 Shut–down

1. Ensure the intensity control is turned fully clockwise.
2. Set the front switch to the “off” position, and allow the unit to cool down for a minimum of 5 minutes.
3. Set the back switch to the “off” position.
4. Remove and coil up the UV-VIS liquid light guide. (Recommended in order to maintain clean optics on UV-VIS liquid light guide)

7 Maintenance

Normal maintenance includes keeping the equipment clean. Refer to Section 4, Maintenance, of the CrimeScope CS-16-500 Operation Manual for further information.

8 Troubleshooting

Refer to Section 11, Troubleshooting & Service, of the CrimeScope CS-16-500 Operation Manual for further information.

9 Limitations

A. The CrimeScope sits on four rubber feet that will wobble if not placed on flat stable surface. Utilize the flexible arm to secure liquid light guide to control aim and movement of radiation.
B. Intensity of CrimeScope is lower than Coherent TracER.
C. Fifteen filter wheel wavelength selections are available and designated by the manufacturer as the center wavelength ± (margin of error) 8 as the following: 350, 415, 445, 455, 475, CSS, 495, 515, 535, 555, 575, 600, 630, 670, and 000.
D. Downward Shift adjustments allow for an estimate of the wavelength applied, and the actual shift in the center wavelength is not displayed. The actual shift in nm is approximately 2/3 of the display value.
E. The intense high energy light source may cause objects such as thin plastics that are in the light energy path to heat, melt, or disfigure.
F. Evaluation of filter wheel wavelength selections and camera lens filter combinations are subjective due to the amount of fluorescence observed and/or substrate background conditions. The “best” considered filter wheel wavelength selection and camera lens filter combination may vary from user to user. Different filter wheel wavelength and camera lens filter combinations may be applied and used.

10 Records

Friction Ridge Worksheet (LAB-FR-01)

Equipment Log (LAB-405)

Validation Form (LAB-408a)

Performance Verification Form (LAB-408b)

11 Literature References and Supporting Documentation


SPEX Forensics. FLS-RUVIS Applications: Wavelengths and Uses. SPEX Forensics Poster.

FR-06-06  AIR SCIENCE FINGERPRINT DEVELOPMENT CHAMBER

1 Scope
Instructions for the operation of the Air Science SafeDevelop Fingerprint Development Chamber used for accelerating the development of prints after processing with IND, DFO, and Ninhydrin.

2 Related Chapters/Documents
Equipment
Ninhydrin Processing
DFO (1,8-Diazafluoren-9-one) Processing
IND (1,2-Indanedione) Processing
CLS Manual: Laboratory Equipment

3 Safety
A. The unit is capable of reaching temperatures that could result in burns. Always wear protective clothing when accessing the unit. Use caution when opening the outer door.
B. Use eye protection, gloves, and aprons if exposure to hazardous materials could occur.
C. When performing maintenance and before removing top/back panel, disconnect all power.
D. Do not put more than 5 lbs on top of unit.
E. To immediately turn off temperature controller, humidity controller, digital timer, and internal electronic components, press emergency stop. To turn power back to electronic components, pull on emergency stop button.
F. It is recommended to press the test button of the GFCI if the unit was not used for a while.

4 Equipment and Materials
Air Science SafeDevelop Fingerprint Development Chamber

5 Standards, Controls, and Calibration
A. New chambers will be validated or verified following procedures in the CLS Manual.
B. After repairs, an appropriate chemically treated test print is used as a performance check to determine if the humidity chamber is operating as expected.
   1. A positive result is indicated by the print being developed.
   2. Repairs and performance checks are documented on the Equipment Log (LAB-405).

6 Instructions
A. Water Connections
   1. Plumb the water drains connection to a facility drain. There are 2 drain ports located at the bottom of back side of the chamber. Make sure that both drain ports are connected to fittings with tubes.
   2. Mount the universal carboy holder on the side of the unit. Connect tubing with fitting to carboy and fill carboy and install the other end of tube containing fitting to top inlet port located in the back of the unit. Use tap water.
B. Start Up
   1. Ensure the water connections are properly made and the exhaust vent is properly closed.
   2. Turn on unit by pressing power switch.
   3. The temperature and timer displays will illuminate. Air should be gently circulating.

C. Temperature Controller
   1. Change the Temperature Set Point. Use the up and down arrow buttons to obtain the desired temperature set point.
   2. The temperature is displayed in degrees Celsius (°C).
      a) Ninhydrin: 80°C
      b) DFO: 100°C
      c) IND: 100°C

D. Humidity Controller
   1. Enable humidity control by turning the profile select switch to Ninhydrin. This fills the steam generator with water.
      a) Ninhydrin: 70%
      b) IND: 60%
   2. Disable humidity control by turning the profile select switch to DFO. This will drain the steam generator.
      a) DFO: disabled

E. Countdown Timer Controller
   1. Set total countdown time to desired value using the four up and down arrow buttons.
      a) Ninhydrin: 5 minutes
      b) DFO: 10 minutes
      c) IND: 10 minutes
   2. Open chamber door and place evidence inside chamber on shelf or attach evidence with evidence clips on hanging bars.
   3. Press the start button.
   4. When the time remaining reaches 0:00, the alarm will buzz.
   5. Press the reset button at any time to stop the countdown.
   6. Open chamber door and remove evidence.
   7. Close chamber door.
   8. Press the reset button to turn off the buzzer, and the time remaining will reset the total countdown time.
7 Maintenance
   1. Normal maintenance includes keeping the equipment clean. Routine cleaning of chambers is not considered maintenance.
   2. Refill the water carboy with tap water (as needed)
   3. Check drains for blockage (as needed)

8 Brief Troubleshooting
   A. Unit will not turn on
      1. Is the unit plugged in?
      2. Is the Emergency Stop button pressed?
   B. Unit will not reach temperature set point
      1. Is the set point within the unit specification range?
      2. Is the rear vent closed?
      3. Is the door closed and latched?
      4. Can air flow freely throughout the chamber? Inhibited air flow can trip the over temperature safety device. Remove airflow obstructions and let stabilize for 30 minutes.
   C. Unit will not reach humidity set point
      1. Is the rear vent closed?
      2. Is the door closed and latched?
      3. Is the low water level alarm light on?
      4. Is there adequate water supply?
      5. Can air flow freely throughout the chamber?
      6. Is the humidity set point within the unit specification range?
   D. Low water alarm light stays lit
      1. Is there adequate water being supplied to the chamber?
      2. Are there any air traps in the line?
      3. Are you using Tap water? (Distilled water will cause the light to stay lit)
      4. If using a carboy or other reservoir, is there a weep hole to allow free flow?
      5. Make sure that supply water tube coming from carboy is not bent.

9 Limitations
   A. Requires tap water. Distilled water will cause the Low Water Level Alarm light to stay on and will not control humidity.
   B. When first turning on, the chamber takes time to reach desired temperature and humidity.
   C. Water carboy empties very quickly/chamber provides a lot of output of water. Have to refill carboy often.
D. Humidity quickly lowers below desired setting when door is opened and takes time to reach desired setting.

E. The chamber will only control temperature and humidity within a specified range:
   1. Temperature Range: 40°C to 100°C
   2. Humidity Range: 40 to 65% RH (temperature range 40°C to 80°C)

F. The chamber must be located in a dry, clean, and level area. Allow a 2 inch clearance from the back of the chamber for proper air circulation.

G. Rubber stopper should be installed on the exhaust port on the backside of the chamber.

H. The physical size of the inside of the chamber is small. Large items may not fit in the chamber and an iron may need to be used to accelerate the development of prints.

10 Records

   Equipment Log (LAB-405)
   Validation Form (LAB-408a)
   Performance Verification Form (LAB-408b)

11 Literature References and Supporting Documentation

   Air Science Model SD-34S Fingerprint Development Chamber User Manual
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