

<p style="text-align: center;">AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual</p>

TABLE OF CONTENTS

INTRODUCTION

CHAPTER 1: THE SCIENCE OF FINGERPRINTS

- 1.1 Biology**
- 1.2 Scientific Basis**

CHAPTER 2: LATENT PRINT COMPARISON

- 2.1 The Examination Process**
- 2.2 Methodology**
- 2.3 Fingerprints Defined**
- 2.4 Levels of Detail**
- 2.5 Conclusions**
- 2.6 Exclusion Guidelines**
- 2.7 Complex Latent Prints**
- 2.8 Conflict Resolution**
- 2.9 Latent Print Suitability**
- 2.10 Marking Latent Prints**
- 2.11 Documenting Duplicates**
- 2.12 Examination Errors**

CHAPTER 3: RECEIVING LATENT PRINTS

CHAPTER 4: DIGITAL IMAGING

CHAPTER 5: COURT TESTIMONY

CHAPTER 6: AFIS PROCEDURES

- 6.1 Suitability for AFIS Entry**

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

INTRODUCTION

The Latent Print Section will follow the guidelines set forth in the Forensic Science Division SOP. Supplemental requirements specific to the LP Section are contained within the LP Standard Operating Procedures Manual (SOP), the LP Technical Manual, and the LP Training Manual. These manuals combined represent guidelines for the Quality System within the LP Section.

This document specifies procedures for routine examination and analysis of latent print evidence for human identification. Within the scope of that purpose, it is intended to ensure effective and efficient use of the laboratory facilities for the benefit of all user agencies and with the ultimate goal of detection, solution, and prevention of crime. In addition, it incorporates the quality assurance elements necessary to ensure the reliability and uniformity of analyses and reported conclusions.

It is not possible to anticipate every situation that arises or to prescribe a specific course of action for every case; therefore, the Analyst must exercise good judgment based on experience and common sense. In some cases, the manual offers guidelines for analysis that must be tempered with the experience of the Analyst. However, any portion of a procedure not explicitly qualified as a guideline, e.g., by use of the word "should," may not be modified for use in casework without prior approval by the Technical Leader.

CHAPTER 1: THE SCIENCE OF FINGERPRINTS

1.1 BIOLOGY

Papillary ridges are anatomical areas of skin that include the dermal and epidermal layers of skin that cover the areas of the fingers, palms, and the soles of the feet. They are formed during fetal development and remain persistent throughout the life of the individual except through damage by scarring or disease. Friction skin ridges (papillary ridges) are not continuous formations; rather they are made up of biologically unique components, ridge units that form the appearance of linear formations. No two areas of friction skin on the hands or feet of any person, or persons, have been found to be duplicated in their minute detail.

1.2 SCIENTIFIC BASIS

There are two basic principles for the basis for identification:

- **Permanence** - Friction skin permanence is based on Embryological studies that show the friction ridge skin begins forming in the 6th week of estimated gestational age and are fully developed at approximately the 23rd week. These biological developments include the basal layer of skin which is considered the template and generating layer for all friction ridge skin growth. This layer remains unchanged throughout one's lifetime with the exception of natural expansive growth and/or damage to the basal layer that permanently alters that area of friction skin.
- **Uniqueness** - Friction skin is biologically diverse in that there is a genetic influence up until cellular differentiation. Friction ridge growth and placement takes place due to physical influences and volar pad development (epigenetic). The timing of development of the ridges with respect to volar pad regression, in combination with the forces on the skin, ensures that the minute details of the friction ridge skin cannot be duplicated. It is this basic principle, referred to as differential growth, which assures that the formations on the friction skin are biologically random and cannot be replicated.

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

CHAPTER 2: LATENT PRINT COMPARISON

2.1 THE EXAMINATION PROCESS

The purpose of an examination is to determine or exclude the source of a friction ridge impression.

The clarity of the friction ridge detail is an important part of the examination process and dictates the quality and quantity of the detail that may be present and used in determining the source of latent prints.

The degree of clarity of a latent print influences the level of tolerance that will be acceptable to the latent print analyst.

2.2 METHODOLOGY

Friction ridge print examinations are conducted by applying the methodology of analysis, comparison, and evaluation, followed by verification (ACE-V).

- **Analysis** – The first step of the ACE-V method, which is the assessment of an impression to determine suitability for comparison. Analysis includes consideration of the anatomical source of the print, the deposition pressure, distortion present, the matrix, substrate, and the development medium.
- **Comparison** – The step following analysis is the observation of two or more impressions to determine the existence of discrepancies, dissimilarities, or similarities. This phase progresses systematically and sequentially until all available ridge detail has been compared and events shared by both impressions are accounted for, and any differences are noted.
- **Evaluation** – In the third step of the ACE method, the analyst assesses the quality and quantity of the corresponding ridge features in the two prints and reaches a conclusion. The clarity and uniqueness of the ridge features determines the weight to be given them in this phase of the examination.

Verification – The verification step is performed by a second analyst to ensure that all conclusions are well supported by the data.

2.3 FINGERPRINTS DEFINED

‘Latent print’ is a general term used to define accidental or unintentional impressions, visible and invisible, which may have evidentiary value. When the friction skin area of the palmar or plantar regions of the body touch a surface, a reproduction of the ridge detail from the skin may be deposited on the surface, either by transfer of residue, or by impression into soft, pliable material, such as putty.

Known prints are exemplars of friction skin from a known source that are recorded electronically, photographically, by ink, or by any another medium. Examples of known prints:

- Ten print / palm print cards recorded by a law enforcement agency
- Elimination print submissions
- Prints obtained from the Medical Examiner’s Office (serve as both known and unknown)

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

2.4 LEVELS OF DETAIL

Impressions made from friction skin exhibit distinctive features which can be grouped into three levels of detail:

First Level Detail: The general overall direction of ridge flow in a print. First level detail may include, but is not limited to defined classification patterns. The ridge flow itself is not considered to be unique, and cannot be used alone in making identifications or exclusions.

Second Level Detail: The path of a specific ridge, and includes the starting point of a ridge, the path taken by the ridge, the length of the ridge path, and where the ridge path terminates. The ridge path and its length with terminations are considered unique, as are sequences and configurations of a series of ridge paths.

Third Level Detail: The shapes of the ridge structures, encompassing the edges, textures, and pore positions of the ridge. The features of third level detail are unique.

First, second, and third level detail can also describe other features, such as creases, scars, incipient ridges, and other imperfections of the skin, which reproduce in the print.

2.5 CONCLUSIONS

A comparison of two friction ridge prints will result in the analyst reaching one of the following three conclusions: Identification, Exclusion, or Inconclusive.

- **Identification** is the result of the comparison of two friction ridge impressions containing sufficient quality (clarity) and quantity of friction ridge detail in agreement. Identification occurs when a latent print analyst, trained to competency, determines that two friction ridge impressions originated from the same source.
- **Exclusion** is the determination that two friction ridge prints did not originate from the same source due to sufficient quality and quantity of information in disagreement.
- **Inconclusive** results when a definitive conclusion cannot be reached due to one of the following reasons:
 1. Insufficient agreement exists between the latent print and known print
 2. Inability to locate corresponding detail due to ambiguity
 3. Exemplars not fully recorded in the area needed for comparison

2.6 Exclusion Guidelines

Analysts should be able to reach a reliable exclusion by meeting the following conditions:

- A. Determine the anatomical source of the latent print beyond a reasonable doubt.
- B. Determine the orientation of the latent print beyond a reasonable doubt.
- C. Identify a clear and reliable target group.

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

- D. Conduct a thorough search of the latent print ensuring compelling inconsistency with the known prints.

An analyst can reliably exclude an individual in a comparison only when all of the above conditions have been met. If any one of the conditions cannot be met beyond a reasonable doubt, an individual cannot be reliably excluded and therefore inconclusive is a more appropriate conclusion.

2.7 COMPLEX LATENT PRINTS

A latent print is considered complex when distortion, lack of contrast, background interference, or other factors make the visualization of minutiae or the determination of orientation or anatomical source difficult.

Complex latent prints are captured in Photoshop and enhanced as necessary to improve visualization of features prior to comparison.

Analysts will use an enhanced image of the complex print to perform a thorough analysis, marking visible minutiae, tracing ridges, indicating creases, isolating indistinct areas, and other marks, as desired, to show how the latent print was interpreted prior to comparison. The image with all analytical markings will be preserved regardless of the final conclusion.

2.8 CONFLICT RESOLUTION

All conflicts between analysts regarding an analytical aspect of an examination will be documented in the case record. All emails, charts, images, and documented observations will be preserved in the case record.

A consultation between two analysts involving questions about an analysis or comparison requires no additional documentation. Discussions concerning the anatomical source, pattern type, orientation, etc. are examples of a consultation.

A conflict involves a difference of opinion between two analysts regarding a latent print examination. The analysts will work together to resolve the difference by the following method:

1. The two analysts will meet and discuss each other's observations, reviewing charts and images together, in order to come to an agreement.
2. If no agreement can be reached, the examination print(s) will be sent to three additional examiners in order to reach a consensus.
3. The request should be handled blindly, i.e., the additional examiners should be sent unmarked and unenhanced images of the examination prints with no case numbers or laboratory numbers attached.
4. The final decision will be based on the consensus of all involved analysts. If no clear consensus is reached, the original examiner's conclusion will stand, unless it is an unverified identification.
5. When a latent print, marked for identification and unverified, is the subject of the conflict, the final decision will be by consensus. If no consensus can be reached, the examiner will change the conclusion to 'inconclusive' or 'not suitable', and line out the markings on the lift card or photo and initial them.
6. The analyst requesting the consensus will be responsible for attaching all documentation to the case record in LIMS. This includes adding all necessary documentation to the charts and email

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responses (Lab number, Item Number and identifying information for known prints in the case of a comparison).

The Technical Leader and Supervisor will be notified when there has been an erroneous identification, erroneous exclusion, or a suitability determination that resulted in a missed identification. If such an error involves casework performed by the Supervisor who is currently serving as the Technical Leader, then the Assistant Laboratory Manager will be notified.

2.9 LATENT PRINT SUITABILITY

A latent print is deemed suitable for comparison through a complete analysis of all visible features within the print, prior to the comparison phase. A latent print will be considered suitable for comparison when there are a minimum of eight discernible minutiae **AND** one or more of the following are present:

- Discernible distal orientation
- At least one focal point (e.g. core, delta, crease, scar)
- At least one region of considerable size

Other significant detail, such as clear incipient detail, scar detail, or small groupings of minutia with high clarity contribute to the determination of suitability for comparison; therefore, latent prints that do not meet the above-listed criteria may be marked as suitable for comparison at the discretion of the case examiner.

2.10 MARKING LATENT PRINTS

The analyst conducting a latent comparison will write an item number on each photograph, on the front and back of each lift card, and initial each item examined. In addition, all suitable latent prints on each latent-bearing item (lift card or photograph) will be marked with a capital letter designation marked in blue.

The item number will correspond with the LIMS item number and a sequential number i.e. 14.1, 14.2, etc. and marked in blue.

The analyst will, in the event of identification, write the name and unique identifying number of the person identified on the lift card, photograph, copy or other latent-bearing item. This will be marked in blue.

The initials and employee's number making the identification will be marked in red.

The following symbols will be added near the identified latent and will be marked in red:

- A half circle over the top of the latent in the event of a finger latent identification.
- Lines drawn parallel on both sides of the latent in the event of a phalange (joint) identification.
- A vertical line drawn along the hypothenar area and a connecting line drawn along the base in the event of a palm latent identification.
- If the location of the identified latent print on the card / image is such that drawing the required symbol would mean marking over another suitable latent print, then a small arrow can be used in lieu of the usual symbol.

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

- The Latent Print Examiner verifying identifications will place their initials along with “√ID” and will be marked in green.

Once analytical markings are made on a latent lift card or photo by an analyst, it becomes examination documentation and must have the lab number and the analyst's handwritten initials written on the side containing the markings.

2.11 DOCUMENTING DUPLICATES

‘Duplicate’ refers to a latent print created by a single touch of a surface, but lifted or photographed more than once.

Each latent print deemed suitable for comparison, whether duplicate or not, must be given a letter designation; however, the latent print analyst will document the results of their comparison of only one instance of each particular latent print. Duplicate latent prints will be documented as a duplicate with references in the results block of the worksheet and in the report.

Duplicates will not be subject to verification.

Analysts will determine, based on clarity and completeness, which latent print will be compared, and which ones will be documented as duplicates.

Duplicate latent prints will not count toward the final tally of identified latent prints, but will be counted as an examination in LIMS.

2.12 EXAMINATION ERRORS

The following types of errors, encountered in friction ridge examination, will be tracked by the supervisor or the technical leader.

Erroneous Identifications (Class I Error):

An erroneous identification is the marking of a latent print as having originated from a particular known source when, in fact, the print did not come from that source.

When another examiner, usually the verifying examiner, discovers what is believed to be a true erroneous identification and an administrative error has been ruled out, the technical leader and the section supervisor will be notified immediately.

The technical leader will examine the latent and exemplar and verify that the identification is erroneous. If the erroneous ID involves the technical leader, the section supervisor or a latent print examiner with the lowest employee number will examine the latent and exemplar and verify it is an erroneous ID.

An examiner who verifies an erroneous identification will have also committed a Class I error.

Erroneous Exclusions (Class II Error):

An erroneous exclusion is the incorrect conclusion that two friction ridge impressions did not originate from the same source.

Inconclusive is not considered a missed identification.

<p style="text-align: center;">AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual</p>

Suitability Determination (Class III Error)

A latent print that is considered unsuitable for comparison by an analyst but demonstrated to meet the criteria for suitability and subsequently identified is a class III error. This may be deemed equal to a class II error if an analyst has repeatedly committed this type of error over the course of a year, or if it is discovered after the report is published.

The technical leader and supervisor will be notified when there has been an erroneous identification, erroneous exclusion, or a suitability determination that resulted in a missed identification. If such an error involves casework performed by the supervisor who is currently serving as the technical leader, then the assistant laboratory manager will be notified

CHAPTER 3: RECEIVING LATENT PRINTS

Latent and CD packets received by the LP Section are entered into LIMS via the Web Prelog as an ADM submission assignment.

Latent envelopes will be initialed by the receiver, verifying the number of lifts or photos match the number appearing on the front of the envelope.

Latent prints will be examined to determine AFIS suitability, placing an "A" in the upper right of the latent envelope. If suitable, it will then be filed in the AFIS drawer awaiting AFIS entry. The packets can remain there in an open and unsealed condition until AFIS inquiries are conducted, not to exceed a period of 24 months from receipt.

Latent packets that do not contain AFIS suitable prints will have the "ADM" assignment administratively closed in LIMS and then filed as per section guidelines.

All latent and CD packets received will have a proper seal over the envelope flap along with the date and initials of the impounder. If a packet is received without an initial seal the receiving person will seal the envelope with evidence tape, initial, and date it. The original seal will not be broken or disturbed by LPS personnel.

CHAPTER 4: DIGITAL IMAGING

Latent print personnel can utilize scanning equipment and imaging software in order to capture, enhance, and preserve images of friction ridge prints for analytical purposes.

Whenever a latent print is captured digitally for the purpose of suitability analysis or for preparing a chart, the image will be preserved and placed in the LIMS case file.

Images saved in LIMS will have at the minimum, the unique identifying case number, the employees initials, the date the image was prepared, and the number of the latent print items. In the event of a charted comparison, there should be adequate identifying information listed to indicate the source of the known print (e.g. name, APD #, finger/palm).

Current versions of Photoshop are approved for use in capturing and enhancing digital images of latent prints. Analysts can use tools that affect the tonal value of an image, such as **Brightness and Contrast**,

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

Levels, Dodging and Burning, or Curves tools. They can also use software tools within Photoshop that effectively improve contrast for visualization of a latent print, such as **Channel Mixer, Black and White, Invert**, etc.

Additional tools and actions can be used in the digital processing and enhancement of the latent print, such as:

- Rotating the image
- Changing the color mode i.e. RGB to Grayscale
- Enlarging or reducing the size of the image
- Cropping an area of the original image
- Selecting and enhancing a portion of the image

Analysts will not use, or overuse, any process in a way that will cause any loss of relevant detail.

Analysts will not use Artistic or Stylistic filters or processes on a latent print image (Emboss, Smudge stick, etc.).

Analysts will not utilize a filter or process they are not familiar with, the effect of which they cannot explain, or one in which they have not received training.

It is recommended to capture latent prints for analysis/examination at a minimum of 1000 ppi, and use native resolutions of their scanners (1200) whenever possible.

Analysts can document or be ready to explain the processes they use in capturing and enhancing a latent print image, and be able to duplicate what they have done to a reasonable degree.

CHAPTER 5: COURT TESTIMONY

In legal proceedings the duties of all latent print personnel will include:

- Pre-Trial Conference with prosecutor (s) when requested
- Provide examination documentation to prosecutors when requested
- Meet with defense counsel when Forensic Division criteria have been met
- Notifying the court liaison or the prosecutor of any expected time off

The court appearance, pre-trial conference, etc. will be documented in the Activity Log of LIMS

In-court examinations of new latent prints are not permitted.

Comparisons of inked prints to inked prints are permitted in order to verify identity (confirmation examinations).

CHAPTER 6: AFIS PROCEDURES

Latent prints not identified during the initial search, which meet the criteria, will be entered into the Unsolved Latent Database (ULDB). The report will indicate that latent prints have been registered in the ULDB.

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

Latent prints from crimes against person's cases will be given priority for AFIS entry.

Each latent print to be searched as an AFIS inquiry will be logged into the stats portion of LIMS.

Finger or palm print records entered into the system solely for training purposes will be clearly marked as TEST material.

Latent print inquiries are purged from any AFIS system when the statutes of limitations have expired.

Viable Candidate results made from an AFIS inquiry will be documented by attaching the image and candidate information screenshots from AFIS into the case record in LIMS.

AFIS SYSTEMS

CAFIS (Local):

The latent print supervisor is the designated CAFIS operations manager.

AFIS suitable latent prints will first be entered into CAFIS unless otherwise directed.

When a viable candidate is indicated from a TLI (Ten-Print to Latent Inquiry) return, the latent print analyst is responsible for deleting the transaction.

In the event of a TLI from an outside agency, the submitting agency will be notified via email of the viable candidate and that the latent transaction in AFIS was deleted. The candidate information and image screenshots will be attached to the email.

All CAFIS direct entries and associations will be entered in the LIMS AFIS stats panel.

All TLI associations will be updated in the LIMS AFIS stats panel.

Whenever the AFIS technician cannot determine whether the image on the screen is a viable candidate, they can consult with a latent print examiner, making a note in the case record.

The operator will specify one of the following crime types. The standardized listing will be in capital letters and periods will not be used.

BOV is the abbreviation that will be used for burglary of vehicle offenses.

BOR is the abbreviation that will be used burglary of residence offenses.

BNR is the abbreviation that will be used for burglary of non-residence offenses.

AUTO THEFT will be used for any auto theft.

DRUG OFFENSE will be used for any drug related offenses.

WEAPONS will be used for any weapons related offenses.

ROBBERY will be used for any robbery related offenses.

DEATH INV will be used for any death related offense except **murder**.

FORGERY will be used for any forgery or falsified information offenses.

SEXUAL ASSAULT will be used for any sexual assault offense not involving a child.

S ASSAULT CHILD will be used for any sexual assault offense involving a child.

AUSTIN POLICE DEPARTMENT Latent Print Section Technical Manual

CRIM MIS will be used for any criminal mischief or vandalism offenses.

THEFT will be used for any theft offense other than auto theft.

UC PROP will be used for any property crime that doesn't fit any one of the other categories – add details in comments.

UC PER will be used for any person crime that doesn't fit any of the other categories – add details in the comments.

ARSON will be used for any arson offense.

ASSAULT will be used for any assault offenses.

MURDER will be used for any murder.

AFIS (State)

The State AFIS system will be used to search latent prints from persons crimes, at the discretion of the examiner assigned. All State AFIS inquiries, whether direct entry or TLI, will be recorded in-the State AFIS Logbook. The State AFIS system will be searched only after the local AFIS system has been searched.

Each examiner is responsible for checking their own TLI's in the State AFIS.

NGI (Federal)

Latent prints that have previously been searched through the local and State AFIS systems with no viable candidates may then be searched in the Federal NGI (Next Generation Identification) system using the Universal Latent Workstation (ULW) software.

Each examiner will manage their own NGI inquiries.

NGI inquiries and TLI viable candidates will be entered into the LIMS AFIS Stats.

6.1 SUITABILITY FOR AFIS ENTRY

All latent prints received by the LP Section will be evaluated for AFIS suitability when first received.

AFIS suitability is determined by several factors which can include clarity and quality of the impression; the surface the impression was developed on or lifted from and the amount of minutiae present.

Images lacking clarity and quantity of friction ridge detail would not make a good candidate for an AFIS inquiry.

Latent images from the tip or extreme edge of a finger would not make a good candidate for a State AFIS inquiry.

Interpretation of what is suitable for AFIS inquiry is based on the experience and judgment of the LPS employee conducting the inquiry.

Latent prints that are not suitable for AFIS entry can be suitable for identification purposes.