



# Laboratory Services

## Latent Prints

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## 1. Scope

- 1.1. This policy document establishes the general framework and analysis approach for conducting, documenting and reporting of friction ridge examination activities.
- 1.2. This Analysis Approach serves as a general outline for the sequence of friction ridge examination activities and is not intended to address all individual examination tasks.
- 1.3. The policies outlined in this document apply to all ATF Fingerprint Specialists.

## 2. Initial Review of Evidence and Supporting Documentation

- 2.1. Evaluate the examination request to confirm optimal routing through the laboratory, ensure the integrity of the evidence and establish an effective examination plan.
- 2.2. Work to resolve any inventory discrepancies prior to commencing further examination activities. Additional components received attached to or within the same proximal container (e.g. scopes, sights, bipod attachments, magazine, etc.) as a firearm do not necessarily constitute a discrepancy and should be accurately reflected in the inventory record and evidence description.

## 3. Latent Print Processing and Preservation

- 3.1. Processing techniques should progress from least destructive to most destructive with consideration for the sequential targeting of friction ridge residue components and DNA preservation.
- 3.2. Examiners should develop examination plans and strategies in conjunction with other disciplines to maximize the recovery of forensic evidence.
- 3.3. Consider the preservation of evidence for potential future examinations where reasonable and appropriate.
- 3.4. The preferred method for the preservation of friction ridge impressions is by digital image capture. Examiners are not precluded from preserving an impression by lifting, casting or other means when necessary.

## 4. Documentation, Methodology, and Conclusions



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- 4.1. Friction ridge examination documentation will be sufficient to inform another competent examiner as to what was done, when and what data was observed, noted, and relied upon to support the reported results.
- 4.2. Friction ridge impression examinations will generally be conducted in a digital environment. While examiners are not precluded from using traditional magnifying tools, observations that support reported results will, in all cases, be memorialized digitally.
- 4.3. All exam documentation will be finalized in digital format. Handwritten documentation will be digitally captured and maintained with the technical record.
- 4.4. Friction ridge data consists of the observed class and individual characteristics present in a given impression as interpreted and annotated by the examiner (1). The assessed complexity of an examination will inform the examiner as to the extent of annotations necessary to support the reported results (2).
- 4.5. Original and processed digital images of friction ridge impressions (questioned or known) intended for use in examinations are considered evidence for chain of custody tracking purposes. (3) Digital images intended to illustrate the general appearance, condition or particular aspects of an item, the overall location of a developed impression or the annotated observations of an examiner are considered to be examination documentation and part of the technical record.
- 4.6. Friction ridge impressions will be examined using the Analysis, Comparison, Evaluation and Verification (ACE-V) methodology.
- 4.7. For operational purposes, a friction ridge impression is considered to be “of value” if there is sufficient reliable data present to support a source identification conclusion (4). Friction ridge impressions assessed as not meeting this criterion are considered to be of no value.
- 4.8. Fingerprint Specialists will comply with the requirements and limitations set forth in the most current and approved *United States Department of Justice Uniform Language for Testimony and Reports for the Forensic Latent Print Discipline* (ULTR) (4).
- 4.9. Unidentified friction ridge impressions will primarily be searched against the Criminal Master File and the Civil File of the FBI’s Next Generation Identification database.



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Additional databases may be searched as the examiner deems reasonable and appropriate. Examiners may facilitate local agency database searches by providing coordination, instruction and/or digital image files to the customer.

#### References

1. **ANSI/ASB.** Standard 015. *Standard for Examining Friction Ridge Impressions*. Colorado Springs, CO : ASB, 2024. 1st Edition.
2. —. BPR 165. *Best Practice Recommendation for the Analysis of Friction Ridge Impressions*. Colorado Springs, CO : ASB, 2024. 1st Edition.
3. **ANSI National Accreditation Board.** Accreditation Requirements for Forensic Testing and Calibration. *AR 3125-ANAB*. [Online] 2023. [Cited: Nov 26, 2024.]
4. **US Department of Justice.** "Uniform Language for Testimony and Reports for the Forensic Latent Print Discipline". *Approved ULTR for the Forensic Latent Print Discipline*. [Online] 08 15, 2020. <https://www.justice.gov/olp/page/file/1284786/dl>.



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## 1. Scope

- 1.1. There are a variety of processing techniques, physical and chemical, used in the Latent Print Section to develop and enhance latent prints. The following is an overview of chemicals and reagents used; controls; reagent checks; and sequence choice. The *Appendix* contains more detailed information on the specific processes used. These processes are intended to be used by personnel who have received the training necessary to employ these methods. Examiners can determine what processing procedures are appropriate and acceptable in casework.
- 1.2. Following each applied processing technique, the evidence will be examined for friction ridge impressions. If no suitable friction ridge impressions are developed, the examiner may continue with subsequent processing techniques. If suitable friction ridge impressions are present, the examiner will preserve these impressions through digital capture.

## 2. Instrumentation and Reagents for Processing

- 2.1. The following equipment is generally used in the mixing, applying, and storing of chemical reagents: beakers, glass trays, graduated cylinders, magnetic stirrer and stirring bar, scales, squirt bottles, and storage bottles. Processes should be applied in a fume hood, and appropriate protective equipment should be worn. Development may require the use of a low-level oven or humidity chamber. An alternate light source or LASER may be necessary to visualize developed/enhanced latent prints. Refer to a specific process for the reagents needed to mix stock and working solutions.

## 3. Safety Considerations

- 3.1. The procedures in the *Appendix – Latent Print Processes* involve the use of hazardous materials. It is the responsibility of the user to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution should be exercised, and the use of personal protective equipment should be utilized to avoid exposure to dangerous chemicals. Consult the appropriate SDS for each chemical prior to use.

## 4. Procedure for Processing

- 4.1. The substance that makes up a latent print is the matrix. This can be a single substance, or a mixture. Examples include: oil, perspiration, blood, dust, etc.



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Determining how to process an item of evidence is dependent on the type of matrix and its condition.

4.2. The surface the latent print has been deposited on is the substrate. There are three general substrate types: porous, non-porous, and semi-porous. Determining how an item of evidence will be processed is dependent on the type and condition of the substrate.

4.3. It is important to maximize the development of latent prints and minimize the loss of latent print and other discipline evidence. As every situation is unique, examiners should use good judgement to determine what latent print development techniques will be used.

## 5. Quality Assurance and Controls

5.1. A control sample demonstrates the effectiveness of a reagent. The control sample will be a substance on an appropriate surface for testing the reagent. Control samples can be generated at the time of testing a reagent, or they can be produced *en masse* for routine testing. When prints are developed on the control sample, it will be noted in the case record. Results shall also be noted in the logbook when reagents are initially mixed for use and long-term storage. A positive reagent check is required for the working solution to be used in casework. If the reagent check is negative (no prints developed), a second control sample will be processed. If the second check is positive, record the results in the logbook and case notes. The working solution will not be used in casework if there is a second negative reagent check.

5.2. Working solutions are tested after preparation and prior to use – if it has been more than one day since the solution was prepared.

5.3. A control sample will be included in the cyanoacrylate fuming chamber every time evidence is processed.

5.4. The use of reagents may interfere with other forensic examinations such as: inks, paper, handwriting, indented impressions, body fluids, fibers, and paint. Examiners will be aware of how latent print processing may affect another discipline's examinations.

5.5. Follow all federal, state, and local disposal regulations.

## 6. Instrumentation for Preservation



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6.1. Foster & Freeman Digital Capture System (DCS) hardware and software, or another digital image capture system.

## 7. Procedure for Preservation

### 7.1. Image Capture

7.1.1. Each examiner will have an individual login to the image capture system.

#### 7.1.2. Images for scientific analysis

7.1.2.1. Images for scientific analysis are those used for examination purposes by subject matter experts.

7.1.2.2. Images will be captured with an identifier tag that includes a scale unless otherwise documented.

7.1.2.3. Laboratory Case information must be associated with the captured image(s).

7.1.2.4. Each image will be associated to its respective laboratory item number.

7.1.2.5. The original image(s) will remain unaltered.

7.1.2.6. Digital image processing will be done on a working copy.

7.1.2.7. Digital image processing will not misrepresent or compromise the integrity of the captured impression.

7.1.2.8. The final processed image(s) and associated digital histories will be retained.

7.1.2.9. All work done on an examiner's image will be clearly associated to the appropriate individual.

#### 7.1.3. Images for documentation purposes

7.1.3.1. Images for documentation purposes are those not used for analysis by a subject matter expert.



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7.1.3.2. The final documentation image will be retained.

## 7.2. Image Storage

7.2.1. All digital files will be uploaded to FireTOSS or recorded on a write-once recordable CD or DVD.

7.2.1.1. Only one laboratory case will be recorded on a CD or DVD.

7.2.1.2. The CD or DVD will have the following information labeled on them.

- Laboratory case number
- Date files were recorded
- Handwritten initials of examiner

## 8. Quality Assurance and Controls

8.1. Copies of these images, or a reference to where the original images are stored, will be included in the case jacket for examination documentation purposes.

## 9. References

9.1. *Appendix – Latent Print Processes*

9.2. *Foster & Freeman DCS operating manuals*

9.3. Scientific Working Group Imaging Technology, *Section 11: Best Practices for Documenting Image Enhancement*, version 1.3 2010.01.15





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## 1. 1,2-Indanedione

1,2-Indanedione is a reagent for revealing latent print impressions on paper and raw wood based products. It reacts with the amino acids contained in human sweat.

### Stock and Working Solutions

#### Zinc Chloride Stock Solution

- 0.1 g zinc chloride
- 4.0 ml ethyl acetate
- 1.0 ml glacial acetic acid

#### 1,2-Indanedione Working Solution - *add in order; otherwise, solution will be unstable and become cloudy*

- 0.25 g 1,2-Indanedione
- 45 ml ethyl acetate
- 45 ml methanol
- 10 ml glacial acetic acid
- 1.0 ml Zinc Chloride Stock Solution
- 1.0 L HFE7100\*

\*HFE7100 can be replaced with an equal amount of petroleum ether

### Shelf life

- Stock Solution: 6 months
- Working Solution: at least 3 months

### Storage

- Stock Solution: dark glass bottle
- Working Solution: dark glass bottle

### Procedure

1. Spray, dip, or paint 1,2-Indanedione working solution onto evidence.  
*Note: it is not recommended to dip the evidence if DNA swabbing has been requested.*
2. Allow to air dry.
3. Place evidence into low level oven at approximately 100° Celsius for 10 minutes.
4. Visualize fluorescing latent prints with orange goggles using an alternate light source with blue/green light or 532 nm laser.



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## 2. 1,8-Diazafluoren-9-one (DFO)

DFO is an analog reagent for revealing latent print impressions on paper and raw wood-based products. It reacts with the amino acids contained in human sweat.

### Stock and Working Solutions

DFO Stock Solution – Thoroughly dissolve DFO in methanol and acidic acid.

1.0 g DFO  
200 ml methanol  
40 ml glacial acetic acid  
200 ml ethyl acetate

### Working Solution

60 ml Stock Solution  
50 ml acetone  
50 ml xylene  
10 ml propanol  
830 ml of petroleum ether and stir

### Shelf life

Stock Solution: more than 6 months  
Working Solution: more than 6 months

### Storage

Stock Solution: dark glass bottle  
Working Solution: dark glass bottle

### Procedure

1. Spray, dip, or paint DFO working solution onto evidence.  
*Note: it is not recommended to dip the evidence if DNA swabbing has been requested.*
2. Allow to air dry.
3. Place evidence into low level oven at approximately 100° Celsius for 10 minutes.
4. Visualize fluorescence markings using alternate light source with blue/green light or 532 nm laser.



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### 3. Amido Black

Amido black, or naphthalene black 10B, is a protein indicator particularly sensitive to those proteins present in blood. While other techniques for the enhancement of blood impressions are available, they may pose serious health hazards or display a reaction for short durations. Amido black is a safer, permanent procedure which can be used on porous or non-porous surfaces. Amido black does prevent subsequent serological examination and therefore may only be used after serological examination of the evidence. However, Amido black can be applied after cyanoacrylate fuming in many cases (see McCarthy and Grieve, 1989).

#### Ways to Fix Blood Prior to Processing

1. Bake the item at 100° C for 30 minutes. Heat-sensitive items may be baked at a lower temperature for a longer time.
2. Submerge the item in the following solution: 20 g 5-Sulfosalicylic acid dissolved in 1000 ml distilled water for 3-5 minutes.
3. For dried blood, soak the item in methanol for at least 10 minutes.

#### Working Solutions

##### Amido Black (Methanol Base) Working Solution

Dissolve 2.0 g of amido black 10B in 100 ml of glacial acetic acid.  
Add 900 ml of methanol and thoroughly mix.

##### 1<sup>st</sup> Rinse

Mix 100 ml of glacial acetic acid with 900 ml of methanol.

##### 2<sup>nd</sup> Rinse

Distilled (or tap) water.

#### Shelf life

Working Solution: indefinite

#### Storage

Working Solution: dark glass bottle

#### Procedure

1. Place the amido black 10B working solution into a tray large enough to accommodate the item being processed.
2. Completely immerse the item being processed for 30 seconds to 1 minute. The solution should be agitated before as well as during the evidence application.
3. 1<sup>st</sup> Rinse.
4. 2<sup>nd</sup> Rinse.



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#### 4. Ardrox

Ardrox P133D is an industrial penetrant manufactured by Ardrox, Limited of Canada, as 970 P10, and available in the United States from Radiatronics, Inc., of Overland Park, Kansas. The stain was developed to detect small fractures in construction materials and possesses certain properties that can be successfully utilized in latent print processing. Ardrox P133D readily penetrates and remains in minute openings, yet is easily rinsed from surrounding surfaces, and is highly luminescent with long wave, ultraviolet light excitation.

The examiner can choose from four preparations of Ardrox solutions. The preparation chosen is primarily dependent on the reaction of the substrate to the solvent used for dilution of the Ardrox. A 1% or 2% Ardrox in methanol or isopropanol is productive for most surfaces, with 1% Ardrox in methanol being the preferred preparation for most applications.

Substrates that react with the methanol preparation can be treated with either the Freon or Methyl Ethyl Ketone (MEK) preparation. Freon is expensive and not readily available - MEK can be used when the substrate reacts with the other solvents. MEK based preparations can also be used on items when the substrate does not react with other solvents. Undiluted Ardrox can also be used to process items when the substrate reacts with the solvents.

#### Working Solutions

##### Methanol/Isopropanol

Mix 5.0 ml of Ardrox with 500 ml of methanol or isopropanol.

##### Alternate Formula

Mix 1.0 ml of Ardrox with 40 ml of methanol.

Add 60 ml of petroleum ether.

While the 40% methanol solution may cause some substrate damage, many surfaces, such as semi-porous items, benefit from the reduced alcohol mixture.

##### MEK

Mix 1.0 ml of Ardrox in 9.0 ml of isopropanol.

Add 15 ml of methyl ethyl ketone.

Add 75 ml of distilled water and mix.

##### Undiluted Ardrox

No preparation required.



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#### Shelf life

Working Solution: up to 6 months

#### Storage

Working Solution: dark glass bottle

#### Procedure

Ardrox methanol, isopropanol, and petroleum ether formulas application:

1. Apply the solution to the item to be processed by immersion or squirt bottle.
2. Allow the solution to remain on the item for several minutes to ensure proper adherence of the Ardrox to the cyanoacrylate developed impressions.
3. Before rinsing, examine the item using the appropriate light source to determine if background staining has occurred. If not, proceed with the examination and record all observed impressions.
4. If background staining is observed and prevents adequate photographic preservation expose the item to a light tap water rinse.
5. Allow the item to dry completely and examine with the appropriate light source.

Undiluted Ardrox application:

1. Completely cover the item to be processed with undiluted Ardrox by immersion or by squirt bottle.
  2. Allow the liquid to remain on the item for about ten minutes.
  3. Rinse the item under tap water until no yellow color remains.
  4. Allow the item to dry and examine with the appropriate light source.
- 1.

#### 5. Basic Yellow 40

Basic Yellow 40 (also known as BY40, Panacryl Brilliant Flavine 10 GFF, or Maxilon Flavine 10 GFF) is a supplemental processing procedure designed to enhance faint or indistinct impressions developed by cyanoacrylate fuming. The excitation spectrum for Basic Yellow 40 is broad, with a maximum at approximately 445 nm. The emission spectrum is relatively narrow, with a maximum at approximately 495 nm.

The examiner can choose from multiple preparations of BY40 solutions. The preparation of choice is primarily dependent upon the reaction of the substrate to the solvent used. A 0.2% BY40 in denatured ethanol or methanol, weight to volume, is productive for most surfaces. Aqueous BY40 solutions should be used when methanol or other organic solvents will be destructive to the surface being treated.



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#### Working Solutions

##### Denatured Ethanol or Methanol Formula

Dissolve 0.2 g of Basic Yellow 40 in 100 ml of denatured ethanol or methanol.

##### Aqueous Formula

1.0 g Basic Yellow 40  
2.0 ml Photo-Flo  
1000 ml water

##### Petroleum Ether Carrier Formula

###### Stock Solution

100 mg BY40 dissolved in 60 ml propanol and 40 ml acetonitrile

###### Working Solution

5.0 ml stock solution mixed in 100 ml petroleum ether

#### Shelf life

Stock Solution: up to 6 months

Working Solution: up to 6 months

#### Storage

Stock Solution: dark glass bottle

Working Solution: dark glass bottle

#### Procedure

1. Apply the BY40 solution to the item of evidence by immersion or using a squirt bottle or aerosolized spray and allow to dry completely.
2. Examine the item using a laser or other alternate light source. Appropriate wavelengths are: 415 or 440 nm, but excitation can also occur with long wave UV. Use yellow or orange filter goggles to visualize any impressions.

#### 6. Cyanoacrylate Ester (Superglue) Fuming

Cyanoacrylate vapor, ethyl or methyl cyanoacrylate, polymerizes with some latent print impressions to produce a white residue. The contrast of developed fingerprints may sometimes be improved by the application of fluorescent dyes and/or powders.



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#### Working Solution

Liquid cyanoacrylate ester (superglue).

#### Shelf life

Working Solution: indefinite

#### Storage

Working Solution: original container

#### Procedure

1. Place evidence in the superglue chamber. When appropriate, hang items or place loose items in processing baskets.
2. Place enough superglue to cover the bottom surface of an aluminum dish then place it on the heating element in the superglue chamber.
3. Close and secure the chamber door.
4. Start the automatic cycle.
5. Remove evidence once the chamber door unlocks.

### 7. Gentian Violet

Gentian violet (crystal violet) is a sensitive stain which reacts with epithelial cells and other portions of latent print residue transferred upon surface contact. The presence of sebum appears to serve as an excellent transfer medium for sloughed epidermal cells and as a result, gentian violet is usually effective on surfaces which readily hold the deposited sebum, such as the adhesive side of tapes. The high sensitivity of gentian violet produces an immediate reaction upon skin contact; therefore, leak proof gloves are required for examinations. Accidental staining of the skin is relatively harmless; however, discoloration usually remains on the skin until “worn” off by the normal sloughing of skin cells.

#### Working Solution

Dissolve 1.0 g of Gentian Violet in 1000 ml of distilled water.

#### Shelf life

Working Solution: indefinite

#### Storage

Working Solution: dark glass bottle





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#### Procedure

1. Fill a tray large enough to accommodate the item being processed with enough working solution to cover the item.
2. While agitating, immerse the item being processed completely for approximately 30 seconds.
3. Rinse the item under a gentle flow of tap water until all excess staining is removed.
4. Record any observed impressions.

Note: The above steps may be repeated until optimum contrast is reached.

#### 8. Iodine Fuming

Iodine is a sensitive indicator of various fatty oils which are often present in latent print residue. Iodine is absorbed by the oily material which assumes the reddish-brown color. While absorption is quite rapid and can be most pronounced, no chemical change occurs to either substance. When exposure to the iodine ceases, the oily material releases the iodine molecules slowly. The color begins to fade and after several hours, the iodine may be completely dissipated. Return exposure will most often repeat the process while maintained exposure prevents dissipation. Generally, iodine dissipates with no trace of exposure or damage to the article.

Iodine is effective with relatively fresh oil deposits, but for those older than two weeks, the reaction may not occur or be too faint for recognition. A chemical breakdown of the oily material appears to inhibit absorption. Iodine is normally not destructive and may detect deposits with insufficient amino acids for effective ninhydrin reaction.

Iodine is toxic and very corrosive to nearly all metals. It can be used to process nearly all types of surfaces but is normally used with porous items.

#### Shelf Life

iodine crystals - indefinite

#### Storage

original container

#### Procedures

Iodine is most effectively utilized with vapors from sublimating crystals. Direct contact of iodine crystals to actual items should be avoided. Sublimation occurs at low temperature, but heat accelerates the action. Confined vapors provide for the best reaction and the least health risk.



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1. Fuming Cabinet: Cabinets which permit adequate space for evidentiary items, fume containment, and gentle heat to accelerate sublimation are sometimes used. While there are commercially available cabinets, one can be easily constructed of wood and glass which may be more effective and less susceptible to the corrosive nature of iodine vapor.
2. Iodine Fuming Gun: Large or immobile items can also be processed with direct iodine vapor from a source most commonly called an iodine fuming gun. This device creates vapors within a tube which are directed toward the surface to be examined by forced air movement. This can be accomplished by using a compressed air source. Because the residue is exposed to the vapors for a brief duration, any iodine absorbed is released immediately demanding prompt preservation. Iodine fuming guns are readily available from nearly all suppliers, but also may be simply assembled using Gooch or thistle tubes, rubber stoppers, and tubing.
3. Zip Lock Plastic Bag: A highly practical alternative to a fuming cabinet is a zip lock transparent plastic bag. A small amount of iodine crystals are poured into the bag, the item is inserted, and the bag sealed. The bag containing the crystals are held between the fingers or grabbed by the hand to provide additional heat to hasten sublimation. The bag may be periodically shaken to improve the distribution of iodine vapors, but close contact of crystals to the item should be minimized. Oily latents will discolor within minutes.

All iodine developed latent print impressions are transitory and once removed from exposure to the iodine fumes must be preserved as quickly as possible using appropriate photographic reservation techniques.

#### 9. LASER and Alternate Light Source Examination

Scientific instrumentation for the visualization of natural and chemical luminescence of latent print impressions on physical evidence.

##### Procedure

1. Check instrument connection to electrical source.
2. Activate power and light source.
3. Select light source filter frequency (ALS).
4. Direct light wand towards evidence.
5. While wearing filter goggles, open the shutter and examine evidence for latent print luminescence. Close shutter when finished.



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## 10. Ninhydrin

Ninhydrin, or tri-keto-hydrindene hydrate, is an extremely sensitive indicator of alpha-amino acids, proteins, peptides, and polypeptides. The reaction produces a violet to blue-violet coloring of these substances and is effective with older deposits with even minute amounts of amino acids. While ninhydrin can be used on any surface, normally processing is confined to porous items which have not subsequently become water-soaked or do not contain inherent animal proteins.

### Working Solutions

#### Alternate Petroleum Ether Formula

1. Dissolve 5.0 g of ninhydrin crystals in 30 ml of methanol
2. Add 40 ml of isopropanol
3. Add 930 ml of petroleum ether

### Acetone Formula

Dissolve 6.0 g of ninhydrin in 1.0 L of acetone

### HFE-7100 Formula

1. Using a magnetic stirrer, dissolve 5.0 g of ninhydrin crystals in 45 ml of ethanol
2. Add 2.0 ml of ethyl acetate
3. Add 5.0 ml of acetic acid solution
4. Add 1.0 L of 3M Novec™ HFE-7100

### Shelf life

Working Solution: up to 1 year

### Storage

Working Solution: dark glass bottle

### Procedure

#### Dipping (preferred method of application)

1. In a tray large enough to accommodate the evidence, pour enough working solution to cover all the items.
2. Completely immerse each item to be processed in the working solution until the item is completely saturated, usually five seconds or less. The item can be manipulated using tongs or forceps.
3. Remove and allow the item to dry completely.
4. Place the item in the heat/humidity chamber at no greater than 80 degrees centigrade and between 60% and 80% relative humidity.
5. Check the item periodically to monitor the impression development.



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#### Alternate application methods

Brushing, Spraying, or use of a squirt bottle

Larger items that will not fit conveniently into processing trays should be painted with the ninhydrin solution using a soft bristle brush. Two-inch to four-inch nylon paintbrushes are adequate. Care must be taken to apply an even and thorough amount to all surfaces. Applying ninhydrin via aerosolized spray cans or squirt bottles to items of evidence is also permissible.

Additional formulas are available for use (commercial and manual preparation) and are widely accepted.

#### 11. Physical Developer

Physical developer is a product devised specifically for the examination of wetted or water-soaked porous items. This technique is a method which utilizes silver nitrate in an unstable ferrous/ferric redox solution in combination with a detergent solution. Although this technique was developed for water-soaked items, it can be used on any porous item – water soaked or not.

Water soaked or wetted papers rarely contain enough amino acids or salts for effective examination with normal porous surface processes. Components in sweat are either completely removed or diffused throughout the surface. Under optimum conditions when greasy or oily impressions remain on the surface and fiber swell does not create traps for overall painting, magnetic powder will adhere to the residue. Since physical developer is an immersion process of high sensitivity, the reagent penetrates the porous material to detect any lipids which may be present. This reaction with residue other than palmar sweat increases the usefulness of physical developer as a post-treatment to items processed with ninhydrin. Physical developer is a somewhat complicated procedure when initially attempted but can be efficiently incorporated as an examination technique by batch processing eligible items.

Physical developer requires special care and exact adherence to procedures. Some glassware and utensils must be dedicated to the technique and reagent contamination must be avoided.

#### Stock and Working Solutions

Pre-made solutions from a vendor are acceptable.

##### Solution 1 – Maleic Acid Prewash

1. Pour 1000 ml of distilled water into a 1500 ml beaker
2. Add 25 g of maleic acid and a large magnetic stir bar rinsed with distilled water



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3. Stir with a magnetic stirrer until all solids are dissolved

#### Solution 2 – Buffered Ferrous/Ferric Redox Solutions

1. Pour 1000 ml of distilled water into a 1500 ml beaker
2. Rinse a large magnetic stir bar with distilled water and place in the beaker
3. Add the following chemicals in the order given making sure each chemical is fully dissolved before adding the next:
  - 30 g of ferric nitrate
  - 80 g of ferrous ammonium sulfate
  - 20 g of citric acid

Stir until all chemicals are dissolved and then stir an additional five minutes.

#### Solution 3 – Stock Detergent Solution

1. Pour 1000 ml of distilled water into a 1500 ml beaker containing a large magnetic stir bar previously rinsed with distilled water
2. Add 3.0 g of n-Dodecylamine Acetate and stir with a magnetic stirrer.
3. Add 4.0 g of Synperonic N
4. Stir for thirty minutes
5. Pour the solution into a 1000 ml glass bottle, including undissolved material

#### Solution 4 – Silver Nitrate

1. Pour 50 ml of distilled water into a 100 ml beaker
2. Add 10 g of silver nitrate and stir for one minute

If using a magnetic stir bar, rinse with distilled water. The chlorine in tap water would combine with the silver nitrate and form a milky colored solution (silver chloride), rendering the solution unusable. Never use tap water for any of the working solutions.

#### Redox Working Solution

(must be combined in the order listed; mix in a beaker on a stirring device)

1. 1000 ml of Solution 2 (ferric redox)
2. 40 ml of Solution 3 (detergent)
3. 50 ml of Solution 4 (silver nitrate)
4. Mix for 3 – 5 minutes then place solution in a tray for processing.

#### Bleach Solution

1. The bleach solution is made by diluting household bleach at a ratio of 1:1 with tap water

#### Shelf life

Solution 1: indefinite

Solution 3: indefinite

Redox working solution: mix as needed

Solution 2: indefinite

Solution 4: indefinite

Bleach solution: mix as needed



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#### Storage

Solution 1: clear or dark glass bottles  
Solution 3: clear or dark glass bottles

Solution 2: clear or dark glass bottles  
Solution 4: dark bottles

#### Procedure

##### Step 1 – Maleic Acid Prewash:

1. Pour enough maleic acid prewash to cover the item that is being processed into a glass tray.
2. Immerse the item in the solution for at least five minutes, or until bubbles are no longer given off.

##### Step 2 – Redox Working Solution:

1. Pour enough Redox Working Solution to cover the items being processed into a glass tray.
2. Drain the items of excess prewash.
3. Immerse the items in the working solution and gently rock the tray.
4. Keep the items separated and be careful not to crease or handle the items extensively.
5. The processing time will vary from 5 to 15 minutes. It is important to monitor the development very closely to avoid over processing and obliteration of weaker impressions. Remove the item when optimum contrast is observed.

##### Step 3 – Water Rinse:

1. Fill a glass tray with enough tap water to cover the processed items.
2. Place processed items into the water rinse and agitate to remove the Redox Working Solution.
3. Continue until items are not releasing Redox Working Solution into the water.

##### Step 4 – Bleach Solution (optional – should be used when trying to improve the contrast of darker impressions):

1. Place the item in bleach solution for approximately 15 seconds.
2. Rinse the item under running tap water for at least one minute.

##### Step 5 – Drying:

1. Allow the items to air dry on a flat surface. The items may be blotted carefully to speed the drying process taking care with fragile evidence.

## 12. Powders

Fingerprint powders and particulate developers are very fine particles with an affinity for moisture. Palmar sweat, grease, oil, and most contaminants that coat the surface of friction ridge skin possess sufficient moisture and viscosity to attract and bind the fine



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particles together. Contact between friction ridge skin and a non-porous surface will sometimes result in a transfer of the skin coating to that surface. The non-absorbency of the surface prevents penetration by the deposited moisture. All fingerprint powders and particulate developers are indiscriminate in adhesion to moisture. Surfaces coated with residue in addition to suspected latent prints will attract powders and particulate developers throughout the surface.

The most effective agent in terms of adherence to moisture, non-adherence to dry surfaces, particle size, shape, uniformity, and intensity of color is carbon. Black powders generally produce the best results. Other colored powders may be required due to the substrate encountered but should be restricted to absolute necessity.

Magnetic powders are powder-coated, fine iron filings subject to magnetic attraction. These adhere to moisture to a lesser degree than carbon powders but can be applied with less destructive force to the surface.

Particulate developers are substances which produce extremely fine particle residue upon burning. Materials with a high hydrocarbon content such as camphor, pine knots, or crumbled masking tape burn slowly and release soot in large quantities. Fine particulate carbon soot adheres extremely well to more viscous moisture while heat from the flame softens the residue. White or light-colored soot may be produced by burning magnesium ribbon.

Most commercial black fingerprint powders have a high carbon base. According to the manufacturer's particular formula and production methods, the carbon base may be from a variety of sources, including lamp black, bone, or wood charcoal. Ground carbon alone cannot match the adhesion ability of fine particle carbon soot, but commercial powders contain milled carbon of highly uniform size and shape along with additional ingredients to preserve the milled condition and retard air moisture absorption.

No specific preparations are needed as the powders and materials being used are available commercially prepared.

DNA collection should always be a consideration when using powder. It is recommended to remove a small amount of powder from the container for use, and then throwing it away when finished. Single-use powders and brushes are commercially available and should be used as needed in casework.

Shelf life  
indefinite

Storage  
original containers





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## Procedure

### Nonmagnetic Powders

1. Remove the needed amount of powder from the storage container.
2. Dip the tip of the brush bristles into the powder.
3. Tap the excess powder onto the surface of the item being processed and begin to brush.
4. Brush in the direction of developing ridges.
5. Slowly build powder onto ridges and stop when there is sufficient development.

### Magnetic Powders

1. Remove the needed amount of powder from the storage container.
2. Place magna wand, with magnet engaged, into the powder.
3. Move the wand in a circular motion over the surface of the item being processed. The powder should touch the surface, never the wand.
4. Once development has occurred, release the attached powder back into the pile removed from the storage container.

## 13. Rhodamine 6G

Rhodamine 6G is a supplemental processing procedure designed to enhance faint or indistinct impressions developed by superglue fuming. Rhodamine 6G has an affinity for adhesion to polymerized latent impressions even at levels below visual observation. Excitation of Rhodamine 6G with the 488 nm, 510 nm, 514.5 nm, or 532 nm lines of the laser produces extremely bright fluorescence at about 550 nm.

### Stock and Working Solutions

#### Petroleum Ether Carrier Formula

Stock Solution: dissolve 1.0 g Rhodamine 6G in 1000 ml of methanol.

#### Working Solution:

##### Mix in order:

- 3.0 ml stock solution
- 15 ml acetone
- 10 ml acetonitrile
- 15 ml methanol
- 32 ml isopropanol
- 925 ml petroleum ether

#### Methanol/Isopropanol Formula

Dissolve 0.1 g of Rhodamine 6G in 1000 ml of methanol or isopropanol.





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#### Aqueous Formula

Dissolve 0.1 g of Rhodamine 6G in 1000 ml of distilled water.

#### Shelf life

Stock Solution: indefinite

Working Solutions: up to 6 months

#### Storage

Stock Solution: dark glass bottle

Working Solution: dark glass bottle

#### Procedure

1. Apply the solution to the item of evidence by using a squirt bottle or immersion.
2. Allow to dry completely.
3. Examine the item using a laser or other alternate light source.

#### 14. Silver Nitrate

Silver nitrate reacts with sodium and potassium chloride in palmar sweat to form silver chloride, a compound more photosensitive than silver nitrate. With certain surfaces, such as raw or unfinished wood and wax impregnated papers silver nitrate is one of the most effective processing techniques available. However, this procedure is particularly destructive. Silver nitrate does not yield consistently high success on porous items, is expensive, and prohibits effective laser examinations and therefore should be avoided when processing routine paper or porous items.

#### Working Solutions

##### Raw wood

1. Mix 5.0 g of silver nitrate in 100 ml of distilled water and stir until the crystals are completely dissolved.
2. Add 1.0 ml of glacial acetic acid and completely mix.

##### Wax Impregnated Papers

1. Mix 3.0 g of silver nitrate in 10 ml of distilled water and stir until the crystals are completely dissolved.
2. Add 90 ml of ethanol and 1.0 ml of glacial acetic acid and mix completely.

##### Flare/dynamite wrapper type papers

1. Dissolve completely 6.0 g of silver nitrate in 10 ml of distilled water and add 100 ml of ethanol.



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2. Dissolve completely 6.0 g of silver nitrate in 10 ml of distilled water and add 100 ml of methanol.
3. Dissolve completely 6.0 g of silver nitrate in 10 ml of distilled water and add 100 ml of isopropanol.
4. The ethanol solution (step 1 above), is then mixed with the methanol solution (step 2 above) and then mixed the isopropanol solution (step 3 above).

#### Shelf life

Working Solutions: up to 1 year

#### Storage

Working Solutions: dark glass bottles

#### Procedure

1. Apply the appropriate silver nitrate solution to the item of evidence by dipping or brushing.
2. Dry the item completely.
3. Expose the item to high-intensity light or sunlight.
4. Silver chloride impressions will darken and when less than optimum intensity is reached the item must be removed from the light source and covered to prevent overdevelopment.

#### 15. Small Particle Reagent (SPR)

Small particle reagent was devised and refined by the British Home Office as an effective procedure for processing wet surfaces. Both porous and non-porous, which are wet at the time of the latent deposit and those that become wet after deposit, seldom retain sufficient water-soluble material for conventional processing methods. Non-porous items which have been allowed to dry offer some potential if the deposit contains non-water-soluble oily matter. However, the drying process lessens the possibility of adequate adhesion for powders or particulate.

SPR is very effective in the secondary treatment of cyanoacrylate ester developed impressions by adhering to faint impressions generally better than powders. Molybdenum disulfide is produced in various particle sizes. Smaller particle size is the most effective.

#### Stock and Working Solutions

##### Surfactant Stock Solution

1. Dissolve 8.0 ml of Tergitol 7 in 500 ml of distilled water.  
This will make approximately 10 L of working solution.

##### SPR Suspension Working Solution



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1. Add 10 g of molybdenum disulfide to 5.0 ml of the Surfactant Stock Solution stirring slowly.
2. Continue to stir until the mixture is of a creamy consistency and free of any dry powder.
3. Stir in 900 ml of distilled water.

#### Shelf life

Stock Solution: indefinite

Working Solution: up to 6 months

#### Storage

Stock Solution: dark bottle

Working Solution: bottle

#### Procedure

##### Immersion Technique

1. Shake the working solution well and place in a shallow tray. Pour in enough solution to cover the item being processed.
2. Stir again before placing the item into the solution.
3. Place the item being processed into the solution.
4. Allow the item to remain in the suspension long enough for the molybdenum particles to settle on the item (approximately 30 seconds).
5. Turn the item and leave for an additional 30 seconds.
6. Continue, repeating stems 4 and 5 above until all surfaces of the item have been exposed to the solution.
7. Place the item into a tray of tap water and rock until the excess SPR is removed.
8. Allow the item to dry.

##### Spray Bottle Application

1. Using a spray bottle, disperse enough SPR to cover the item.
2. Wash off excess SPR by running the item under a slow flow of tap water.
3. Allow the item to dry.

#### 16. Sticky-Side Powder

The use of powder suspensions to develop impressions on the sticky side of tapes and labels has proven to be an effective alternative to the gentian violet technique.

#### Working Solutions

##### Alternate Black Powder

1. Dilute Liqui-Nox™ 50:50 with tap water.



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2. Add approximately 1 tsp. black powder to the Liqui-Nox™ solution and stir until the mixture is the consistency of shaving cream.

#### Ash Gray Powder

1. Add approximately 1 tsp. Ash Gray powder to Photo-Flo™ 200 or Photo-Flo™ 600 and stir until the mixture is the consistency of thin paint.

Commercially available preparations (i.e., Wetwop™)

#### Shelf life

Working Solution: Alternate Black and Ash Gray – mix as need  
commercial preparation –indefinite

#### Storage

Working Solution: Alternate Black and Ash Gray – N/A  
commercial preparation – original container

#### Procedure

1. Cover the item being processed in the working suspension. This can be done by immersion or using a soft paint brush.
2. Allow the suspension to remain on the item for 10 seconds to 1 minute.
3. Rinse the evidence with a gently flow of cold tap water.
4. Repeat until optimum contrast is reached.

### 17. Sudan Black

Sudan Black is a dye which stains fatty components of sebaceous sweat to produce a blue-black image. The formulation contains solid particles of dye as well as dye in solution. It is less sensitive than some other processes for latent fingerprint detection but is of particular use on surfaces which are contaminated with, for example, grease, foodstuffs or dried deposits of soft drinks. It will also enhance super glue developed fingerprints.

#### Working Solution

1. Place 15 g of Sudan Black B into a clean 2 L glass beaker
2. Add 1000 ml of ethanol and stir
3. Add 500 ml of distilled water and stir

Note: not all of the Sudan black B will dissolve

#### Shelf life

Working Solution: indefinite



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#### Storage

Working Solution: glass bottle

#### Procedure

1. Ensure that any visible latent prints have been recorded before treatment with Sudan Black.
2. Shake container of working solution well and pour enough to cover the item of evidence into a clean, dry glass tray.
3. Immerse the item in the working solution for approximately 2 minutes.
4. Rinse slowly under cold running tap water until excess dye has been removed from the background.
5. Allow item to dry at room temperature (heating is not recommended).

### 18. Thermal Layer Removal

Latent print processing of thermal coated papers presents an issue due to the paper turning dark after contact with solvents and acids. Pre-treatment of the paper allows for contrast after applying various processing techniques. The thermal layer removal solution has no adverse effect on the non-thermal side, latent print processing techniques, or DNA recovery.

#### Working Solution

1. 90% petroleum ether
2. 10% (200 proof) ethanol

Note: Ensure the glassware used is well cleaned and rinsed with methanol. Allow to dry.

Combine and stir using magnetic stirrer for 1 minute. Cover top of mixing glassware with plastic wrap prior to stirring to prevent evaporation and splashing of the solution.

#### Shelf life

Working Solution: mix as needed

#### Storage

Working Solution: glass bottle

#### Procedure

1. Place working solution in the well cleaned dry glass tray.
2. Submerge the thermal paper into the solution and soak for 30 seconds, gently agitating the tray at least twice for a few seconds during the 30 seconds to ensure removal of the thermal coating from the paper.
3. Remove the paper and place on a paper towel to blot and remove residual coating; let air dry.



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4. Process sheets of paper individually to prevent contamination with the thermal coating residue.
5. Discard working solution when the thermal layer coating is noticed in the solution.
6. Continue processing with additional porous techniques.



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## 1. Scope

- 1.1. These guidelines will ensure that Laboratory Services case records contain examination documentation that support the reported findings in a way that in the absence of the primary examiner, another qualified examiner in the discipline or supervisor could evaluate what was done and interpret the data.
- 1.2. These guidelines establish the methodology used in the examination of friction ridge skin impressions.
- 1.3. These guidelines establish the acceptable conclusions that can be reached from the comparison of friction ridge skin impressions.
- 1.4. It is applicable to all case records generated by Laboratory Services fingerprint specialists.
  - 1.4.1. *Appendix – Glossary of Symbols and Terms*
  - 1.4.2. *Department of Justice Uniform Language for Testimony and Reports for the Forensic Latent Print Discipline*

## 2. Procedure for Documentation

- 2.1. Latent print examination documentation will include photographs, sketches, diagrams, video, photocopies, or other visual aids used to document the latent print examination. Observations will also include specific information on the sequence of developmental processes.
  - 2.1.1. The date each activity was performed will be documented.
- 2.2. The documentation of component separation applies to all types of evidence processed.
  - 2.2.1. If a component is not separated, the exhibit number and reason will be documented.
  - 2.2.2. The exhibit number for any items where components are separated prior to processing (i.e. grips, tape, etc.) will be documented.
  - 2.2.3. Processing results will be noted for all components of an item of evidence.
- 2.3. When a latent print suitable for source identification is developed and captured, recorded observations will indicate which procedure resulted in the developed print. All latent



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prints suitable for source identification will be photographically captured and tracked in StarLIMS. In addition to being used for examination documentation, latent print images are considered evidence and will be maintained in the ATF Laboratory.

2.4. When multiple latent prints that are suitable for source identification are developed on an item of evidence, all the developed latent prints suitable for source identification will be compared to the submitted known exemplars.

2.4.1. In cases that involve an exceptionally high number of latent prints suitable for source identification, the examiner may work with the first line supervisor to determine when a sufficient number of comparisons have been completed.

2.4.2. The case record will clearly document this decision.

2.5. Captures of latent prints suitable for source identification will be marked according to the *Appendix – Glossary of Symbols and Terms*. These markings are considered preliminary and are subject to change as the examiner moves through the analysis, comparisons, and evaluation processes.

2.6. Information about the orientation and position of the latent print on the item of evidence will be included in the case record. This information may be recorded through a narrative description, photographs, or diagrams.

2.7. A latent print is considered “captured” at the point the image is uniquely identified.

2.7.1. If a latent print that is not suitable for source identification is photographed with a latent print that is suitable for source identification, the latent print not suitable for source identification will be marked as such.

2.7.2. When multiple latent prints which are not suitable for source identification are photographed along with latent prints that are suitable for source identification (i.e., a sheet of paper with two latent prints suitable for source identification and multiple latent prints not suitable for source identification), a note that the latent prints not marked are considered not suitable for source identification will be made in the case notes.

2.8. At least one copy of each known exemplar will be retained in the latent print case record.

### 3. Procedure for Methodology

#### 3.1. Analysis



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- 3.1.1. Examination of friction ridge skin detail conducted to determine suitability for identification. Factors to be considered include but are not limited to: the quality (clarity) of the impression, the quantity of detail present and the anatomical source.

### 3.2. Comparison

- 3.2.1. The direct or side-by-side examination of friction ridge detail to determine whether the information in the impressions is in agreement based on similarity, sequence and spatial relationship.
- 3.2.2. For source identifications, the examiner will document the data relied upon.

### 3.3. Evaluation

- 3.3.1. Formulation of a conclusion based on the analysis and comparison of friction ridge impressions.

### 3.4. Verification

- 3.4.1. All reported comparison conclusions will be verified.
- 3.4.2. The verifying examiner will document the method of verification (i.e. photographs, on screen, etc.).
- 3.4.3. All comparison conclusions will note the latent print Exhibit number(s) and exemplar exhibit number(s).
- 3.4.4. All comparison conclusions will be noted with the personal identifier and date by the verifying examiner.
- 3.4.5. The verifying examiner will document the data relied upon to support their conclusion of source identification.
  - 3.4.5.1. This documentation will be retained in the technical record.

## 4. Conclusions

### 4.1. Source Identification

- 4.1.1. 'Source Identification' is an examiner's conclusion that two friction ridge skin impressions originated from the same source. This conclusion is an examiner's opinion that the observed friction ridge skin features are in sufficient correspondence such that the



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examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.

4.1.2. The basis for a ‘source identification’ conclusion is an examiner’s opinion that the observed corresponding friction ridge skin features provide extremely strong support for the proposition that the two impressions came from the same source and extremely weak support for the proposition that the impressions came from different sources.

4.1.3. A source identification is the statement of an examiner’s opinion (an inductive inference) that the probability that the two impressions were made by different sources is so small that it is negligible.

#### 4.2. Source Exclusion

4.2.1. ‘Source exclusion’ is an examiner’s conclusion that two friction ridge skin impressions did not originate from the same source.

4.2.2. The basis for a ‘source exclusion’ an examiner’s opinion that the observed friction ridge skin features are in sufficient disagreement and provide extremely strong support for the proposition that the two impressions came from different sources and extremely weak or no support for the proposition that the two impressions came from the same source.

#### 4.3. Inconclusive

4.3.1. ‘Inconclusive’ is an examiner’s conclusion that there is insufficient quantity and/or clarity of corresponding friction ridge skin features between two impressions such that the examiner is unable to identify or exclude the two impressions as originating from the same source.

4.3.2. The basis for an ‘inconclusive’ opinion is that a ‘source identification’ or ‘source exclusion’ cannot be made due to insufficient information in either of the two impressions examined.

#### 4.4. Qualifications and Limitations of Latent Print Examinations

4.4.1. A conclusion provided during testimony or in a report is ultimately an examiner’s decision and is not based on a statistically-derived or verified measurement or comparison to all other friction ridge skin impression features. Therefore, an examiner shall not:



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- assert that a ‘source identification’ or a ‘source exclusion’ conclusion is based on the ‘uniqueness’ of an item of evidence in nature;
- use the terms ‘individualize’ or ‘individualization’ when describing a source conclusion;
- assert that two friction ridge skin impressions originated from the same source to the exclusion of all other sources.

- 4.4.1.1. These assertions may wrongly imply that a source conclusion is based on a statistically-derived or verified measurement or comparison to all other friction ridge skin impression features in the world’s population, rather than an examiner’s expert opinion.
- 4.4.2. An examiner shall not assert that latent print examination is infallible or has a zero error rate.
- 4.4.3. An examiner shall not provide a conclusion that includes a statistic or numerical degree of probability except when based on relevant and appropriate data.
- 4.4.4. An examiner shall not cite the number of latent print examinations performed in his or her career as a direct measure for the accuracy of a proffered conclusion. An examiner may cite the number of forensic latent print examinations performed in his or her career for the purpose of establishing, defending, or describing his or her qualifications or experience.
- 4.4.5. An examiner shall not assert that two friction ridge skin impressions originated from the same source with absolute or 100% certainty; or use the expressions ‘reasonable degree of scientific certainty,’ ‘reasonable scientific certainty,’ or similar assertions of reasonable certainty in either reports or testimony unless required to do so by a judge or applicable law.
5. Differences of Opinion and Conflict Resolution
- 5.1. Differences of opinion will be resolved through inter-examiner discussion whenever possible. Differences of opinion are an expected part of the examination, verification, and review process, and should not be considered criticism or taken in a negative way. The Section Chief (or designee) is responsible for mediating conflicts that are not resolved through inter-examiner discussions.
- 5.1.1. When differences of opinion in suitability or source conclusion occur, the verifying examiner shall:
- document their opinion(s) in the case record (documentation may include charts, text, and/or narrative),



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- with the exception of potentially erroneous identifications, return the case record to the original examiner, and
- in instances of potentially erroneous identifications, alert the Section Chief.

5.1.1.1. The examiner and verifier may meet to discuss their differing opinions and the examiner may opt to report out the more conservative conclusion when the verifying examiner is in agreement.

5.1.1.2. Additional documentation created during the resolution of differences in opinion shall be added to the case record. This shall include documentation of how the difference was resolved.

5.1.1.3. If matters are not resolved at this level, the verifying examiner will bring the case to the Section Chief (or designee) for mediation.

5.2. Mediation shall occur when a difference of opinion cannot be resolved through inter-examiner discussion, at which point it is considered a conflict.

5.3. The Section Chief (or designee) mediating the conflict shall assess the extent and complexity of the issue and determine the appropriate form of mediation to resolve the conflict.

5.3.1. Mediation may include one or more of the following:

- independent examination by additional examiner(s),
- consensus decision,
- blind testing, or
- external agency review.

5.3.2. If the original examiner disagrees with the mediation results, it will be documented (to include the reason for the disagreement) in the case file. In place of a conclusion, it must include the statement, "No consensus conclusion reached; differing opinions occurred during the comparison of the (item number) which could not be resolved."

5.3.3. If an erroneous identification conclusion is confirmed by a Section Chief, the case shall be re-assigned to another examiner and corrective action shall be taken.

#### 5.4. Independent Examination

5.4.1. Documentation shall include all examiner suitability decisions or source conclusions, dates, outcomes of discussions between examiners, and changes in suitability decisions or conclusions.



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5.4.2. The outcome of mediations handled by a designee shall be turned over to the Section Chief for review prior to a report being issued.

#### 5.5. Consensus Decisions

5.5.1. Shall include 3 or 5 examiners (not to include the original examiner or the verifying examiner).

5.5.2. All examiners shall conduct independent analysis and comparison of the impressions.

5.5.3. All members of the group (to include original and verifying examiners) shall be given the opportunity to review all documentation and discuss their results.

5.5.4. A consensus decision is reached when the conclusion is determined to be supported by observed data and no member of the group opposes the reporting decision.

#### 5.6. Blind Testing

5.6.1. The latent and known exemplars shall be provided to an examiner who has no prior involvement in the case. Analysis or comparison results from the previous examinations shall not be provided.

5.6.2. The examiner shall conduct an independent analysis. If the impression is suitable for source identification, a comparison of the impression to the provided known exemplars shall be conducted. All documentation and results shall be submitted to the Section Chief (or designee).

#### 5.7. External Agency Review

5.7.1. External Agency review must be completed by an agency which follows similar procedures. The Section Chiefs must agree that an external agency review is appropriate and that their procedures are comparable.

5.7.2. The reviewing agency shall submit a report of analysis determinations and comparison results, if any, as well as documentation created during the examination to the Section Chief (or designee) assigned to mediate the conflict.





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- 5.7.3. The mediating Section Chief (or designee) shall review the report and documentation and determine if any additional mediation is needed before adding it to the case record.



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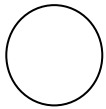
## Appendix

### Symbol

### Description

Ø

(Source) identification

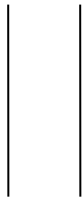


Latent print indicator  
(fingerprint / palm print / footprint)



print

Latent fingerprint indicator / latent toe  
indicator

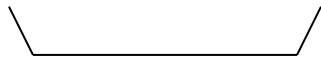


Lower joint indicator

LJ

Non-Ø

Source exclusion



PP

Palm print indicator / footprint indicator

POS? / PP

Palm print / footprint indicator with  
unknown orientation



### **Abbreviations/Terms**

### **Description**

AB	Amido Black
ACE-V	Scientific methodology used to perform latent print comparison: Analysis, Comparison, Evaluation, Verification
AFIS	Automated Fingerprint Identification System
ALS	Alternate Light Source
AR	Arch
BICP	Bi-chromatic Powder
BP	Black Powder
BR	Blue Ray
BY40 or BY#40	Basic Yellow 40
CA or CAE	Cyanoacrylate Ester
Cal	Caliber
CR	Central Receiving
CS-16	Crime Scope Alternate Light Source
CV	Crystal Violet
DFO	1,8-Diazafluoren-9-one
DNP	Did Not Process
DOA	Date of arrest
DOB	Date of birth
ER	Evidence Room
Ex. or Exh.	Exhibit
EXCL	(Source) Exclusion
FB	Forensic Biologist
FC	Forensic Chemist
FLS	Forensic Light Source



FP

Fingerprint

**Abbreviations/Terms****Description**

FRD

Friction Ridge Detail

FTE

Firearm Toolmark Examiner

GV

Gentian Violet

H/C

Hand carried

IAFIS

Integrated Automated Fingerprint  
Identification System

I + I or I/I

Inked Print to Inked Print comparison

I + L or I/L

Inked Print to Latent Print comparison

ID#

Identification finger number

IN

ATF Investigation number

INC

Inconclusive

IND

1,2 Indanedione

INK

Inked prints

INV

Inventory

IR

Infrared Light Imaging

Joints

Finger phalange sections

KP

Known prints

L[1/2/3]D

Level [1/2/3] detail

LASER (LAS)

Light amplification by stimulated emission  
of radiation

LFP

Latent fingerprint

LFPP

Left Palm Print

LFPS

Latent Fingerprint Section

LJ

Lower joint

LOV

Latent print(s) of value

LP

Latent print



LPE

Latent Print Examiner

**Abbreviations/Terms****Description**

LPP

Latent palm print

LS

Live Scan *or* Left slant loop

Mag(s)

Magazine(s)

MCP

Major Case Prints also known as Complete  
Friction Ridge Exemplars

MPB

Magnetic Powder Black

MPG

Magnetic Powder Grey

MPW

Magnetic Powder White

NAP

No Additional Packaging

NC

Not compared

Neg

Negative

NFP

No further processing

NGI

Next Generation Identification

NIN

Ninhydrin

NLD

No latents developed

NLOV

No latents of value

NRC

No removable components

NSSI

Not Suitable for Source Identification

NV

No value

PCC

Potential Comparison Candidate

PD

Physical developer

Pen Pack

Penitentiary Record Packet

PP

Palm print

QDE

Questioned Document Examiner

R6G

Rhodamine 6G

Rec'd

Received

RS

Right slant loop



RTPP

Right Palm Print

RUV

Reflected Ultraviolet Light Imaging

**Abbreviations/Terms**

**Description**

SCCNI

Sealed Container(s), Contents Not  
Inventoried

S/N or SN

Serial number

SG

Superglue

SOP

See other photo (image)

SRL

Superglue/Rhodamine 6G/Laser

SRLN

Superglue/Rhodamine 6G/Laser/Ninhydrin

SSI

Suitable for Source Identification

SSPB

Sticky-side powder black

SSPW

Sticky-side powder white

TTSN

Transferor's Transaction Serial Number

UCN

Universal Control Number

VER

Verification / Verified

VIS

Visual exam

VL

Visible light

WH

Whorl

WL

White light



## 1. Scope

### 1.1. This document establishes the acceptable reporting of:

- Fingerprint / palm print exemplars;
- Processing results;
- Next Generation Identification results; and
- Conclusions for the comparison of friction ridge skin impressions.

It is applicable to all Laboratory Services Forensic Science Laboratories.

## 2. Fingerprint / Palm Print Exemplars

- 2.1. When fingerprint and/or palm print records are received, or downloaded, they will be described using the name of the subject printed on the record (if present) and the UCN (Universal Control Number).
- 2.2. If fingerprint or palm print records are received, or downloaded, without an agency exhibit number, the submitter will be notified by the report of the assigned laboratory (LIMS) number.
- 2.3. When fingerprint or palm print records are downloaded, examiners will request that contributors submit current fingerprint or palm print records prior to any request for testimony to confirm that they originate from a common source. Additionally, the examiner will advise that the current records need to have been recorded and signed by an individual who will also need to be available to testify to that record.

## 3. Reporting Processing Results

- 3.1. Latent print examination reports will clearly describe which items of evidence were processed for latent prints and the results of the processing. Additionally, the results must address any exhibits that were not examined/processed for latent prints.
- 3.2. The processing results for all components of an item of evidence will be unambiguous (e.g. One (1) latent fingerprint suitable for source identification was developed on Exhibit 1, an ammunition magazine. No latent prints suitable for source identification were developed on Exhibit 1, a pistol.)

### 3.2.1. Identifiable Latent Prints Developed

- 3.2.1.1. When identifiable latent prints are developed, the report will communicate the number developed and captured on each exhibit. The examiner will sub-



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designate each latent print in LIMS. An example of this would be: two identifiable latent prints were developed on Exhibit 5 and sub-designated as Exhibits 5.1 and 5.2.

### 3.2.2. No Latent Prints and/or No Identifiable Latent Prints Developed

3.2.2.1. When an item of evidence has been processed for latent prints and no latent prints or no identifiable latent prints are developed, the result will be clearly communicated in the laboratory report.

## 4. Next Generation Identification (NGI):

4.1. In addition to reporting the search results, the laboratory report must communicate the exhibit designation of all the fingerprint(s) and/or palm print(s) that were searched against the database.

## 5. Comparison conclusions

5.1. The following interpretation scale, in italics below, will be included as an appendix to comparative reports.

***The following descriptions are meant to provide context to the opinions reached in this report. Not every type of conclusion may be applicable in every report.***

***Source Identification*** (i.e., *Identified*) is an examiner's conclusion that two friction ridge skin impressions originated from the same source. This conclusion is an examiner's opinion that the observed friction ridge skin features are in sufficient correspondence such that the examiner would not expect to see the same arrangement of features repeated in an impression that came from a different source and insufficient friction ridge skin features in disagreement to conclude that the impressions came from different sources.

*The basis for a source identification conclusion is an examiner's opinion that the observed corresponding friction ridge skin features provide extremely strong support for the proposition that the two impressions came from the same source and extremely weak support for the proposition that the impressions came from different sources.*

*A source identification is the statement of an examiner's opinion (an inductive inference) that the probability that the two impressions were made by different sources is so small that it is negligible.*

***Source Exclusion*** (i.e., *Excluded*) is an examiner's conclusion that two friction ridge skin impressions did not originate from the same source.





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*The basis for a source exclusion conclusion is an examiner's opinion that the observed friction ridge skin features are in sufficient disagreement and provide extremely strong support for the proposition that the two impressions came from different sources and extremely weak or no support for the proposition that the two impressions came from the same source.*

***Inconclusive*** is an examiner's conclusion that there is insufficient quantity and/or clarity of corresponding friction ridge skin features between two impressions such that the examiner is unable to identify or exclude the two impressions as originating from the same source.

*The basis for an inconclusive opinion is that a source identification or source exclusion cannot be made due to insufficient information in either of the two impressions examined.*



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## 1. Scope

1.1. This policy and procedure guideline establishes the process for conducting searches of friction ridge skin impressions in Automated Biometric Identification Systems. It is applicable to all Laboratory Services Forensic Science Laboratories.

1.1.1. The primary system used by ATF laboratory examiners is the Federal Bureau of Investigation's Next Generation Identification (FBI-NGI) database.

1.1.2. Examiners may submit searches to the Department of Homeland Security's Office of Biometric Identity Management (OBIM) IDENT database.

## 2. Instrumentation

2.1. The equipment for conducting a search of the NGI database includes a networked computer equipped with approved Universal Latent Workstation software (ULW) and access to the Law Enforcement Enterprise Portal.

2.2. Electronic mail will be used to request OBIM-IDENT searches.

## 3. Procedure

3.1. At a minimum, examiners are responsible for searching unidentified latent prints containing a core and/or delta with at least eight (8) Level II features against the NGI database.

3.1.1. Search files generated in ULW require the following:

- Proper file type (e.g., .jpg, .tiff, .bmp)
- 500 ppi or 1000 ppi resolution
- 8-bit grayscale
- A 1:1 image ratio (i.e., a digital measurement of one inch object in the image will result in a reading of approximately 1 inch)
- Accurate interpretation of friction ridge source and orientation

Depending on the search and impression type, search files may require the following:

- Accurate ridge counts and core / delta placement when applicable
- Accurate interpretation of possible fingerprint patterns
- Correct enhancement of the ridge detail displaying darker ridges with lighter furrows.
- Accurate type, location and directional marking of Level II details



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A minimum of five (5) candidates will be requested for NGI searches.

3.2. The case record will document which latent prints are/are not searched and include a justification for not searching any latent prints otherwise suitable for source identification (e.g., large number of suitable latent prints developed, due to extreme distortion, etc.).

3.2.1. This information will be communicated to the customer in a general manner in the Examination/Analysis and Interpretation of Results section of the laboratory report.

3.2.2. The case record and report will state which database(s) was/were searched.

3.3. Search parameters and search results will be included in the case record.

3.4. The examiner will submit an IRQ (Image Request) and download the relevant fingerprint and/or palm print record of the individual identified after conducting an NGI database search. This will allow the examiner to compare any additional latent prints in the case and serve as documentation for the data relied upon to reach a source identification conclusion.

3.4.1. Additional enrollment event records may be requested from CJIS as needed.

3.4.1.1. Additional records used for comparison purposes must be clearly designated by the Biometric Set Identifier (BSI) and retained in the case record.

3.4.2. Case documentation will clearly indicate the specific record(s) used to reach a source identification conclusion.

3.5. A copy of downloaded NGI records will be retained in the case record.

3.5.1. The downloaded record will be given a designated laboratory (LIMS) number.

3.5.2. Unidentified latent prints that remain after comparisons to the downloaded fingerprint/palm print record(s), may be searched in other available and relevant databases and/or compared to any additional fingerprint/palm print records submitted to the laboratory for comparisons.

3.6. The database search results will be included in the case record and laboratory report.

3.7. Examiners may register unidentified latent prints to the FBI-NGI's Unsolved Latent File (ULF) for searching against incoming known records.



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- 3.7.1. The registration of a latent print in the ULF must be communicated to the customer in the Examination/Analysis and Interpretation of Results section of the laboratory report.
- 3.7.2. Incoming Unsolved Latent Matches (ULM's) will be compared and evaluated by the primary examiner or one designated by the Section Chief if the primary examiner is not available.
- 3.7.3. ULM comparisons resulting in a source exclusion conclusion do not need to be communicated to the customer.
- 3.7.4. ULM comparisons resulting in a source identification conclusion will be communicated to the customer in accordance with *ATF-LS-7.8 Reporting of results*, and the associated latent print will be removed from the ULF.
- 3.7.5. The basis for an inconclusive ULM conclusion will be communicated to the customer. Additional records will be requested as needed, unless the basis for the inconclusive decision is due to the quality of the latent print.
- 3.7.6. In all instances, the ULM file and documentation of the conclusion will be retained in the case record.
- 3.8. OBIM-IDENT searches will meet the Department of Homeland Security's established criteria.
- 3.8.1. Searches will be sent via electronic mail to [REDACTED]
- 3.8.1.1. Refer to the ATF-OST-LS-Latent Print Teams site for the current list of DHS individuals that must be 'CC' on the search request.
- 3.8.1.2. The ATF-OST-LS-Latent Print Teams site will host the most current version of the "Latent Case Submittal" form that must be included with a search request.
- 3.8.2. Latent print images must meet the following criteria:
- .JPG, .TIF, or .PNG format;
  - 500ppi or 1000ppi;
  - scale present unless proper justification is provided.
  - 8-bit gray scale.



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3.9. NGI searches not resulting in a source identification conclusion will be reported as negative search results in laboratory reports.

3.10. Digital images of all unidentified latent prints may be released to the customer upon request. Examiners may choose to provide AFIS-formatted images in lieu of original images for this purpose after coordination with the customer.

3.10.1. The ATF-OST-LS-Latent Print Teams site will host the most current version of the electronic mail template that should be uploaded into the Communication Log upon release of digital images to the customer.

#### 4. References

4.1. Universal Latent Workstation User Manual.

4.2. Universal Latent Workstation Version 6.6.7 Supplemental Instructions. [https://fbibiospecs.fbi.gov/filerepository/latent/ulw\\_6\\_6\\_7\\_supplemental\\_april\\_2017.pdf/view](https://fbibiospecs.fbi.gov/filerepository/latent/ulw_6_6_7_supplemental_april_2017.pdf/view)

4.3. FBI Next Generation Identification Latent Best Practices. [https://fbibiospecs.fbi.gov/filerepository/latent/latent\\_best\\_practices\\_110915.pdf/view](https://fbibiospecs.fbi.gov/filerepository/latent/latent_best_practices_110915.pdf/view)

4.4. FBI Next Generation Identification Latent Fingerprint Search Strategies. [https://fbibiospecs.fbi.gov/filerepository/latent/latent\\_search\\_strategies\\_110515.pdf/view](https://fbibiospecs.fbi.gov/filerepository/latent/latent_search_strategies_110515.pdf/view)

4.5. Electronic Biometric Transmission Specification (EBTS). Ver. 11.1, US Department of Justice, Federal Bureau of Investigation CJIS Division, 2022.