

# Automated Fingerprint Identification System (AFIS)

**T**he AFIS is a computer-based system for cataloging, searching, matching, and storing known finger and palm prints, latent prints, and related demographic data. It is able to acquire, digitize, process, store, and retrieve known finger and palm print images from arrest and applicant records, and latent finger and palm evidence images. The AFIS compares finger and palm prints and locates possible matches based on corresponding minutiae (ridge endings and bifurcations). Known finger and palm prints processing is done to establish positive identification and for creating/updating criminal history records. Latent finger and palm prints can be searched against the known records for potential matches, and saved for search against all incoming records. As the State's central repository for fingerprint records associated with arrests, the AFIS interfaces with the FBI's Next Generation Identification System (NGI). It gives Wisconsin law enforcement agencies access to nationwide criminal justice information.

## **I. American National Standards Institute/National Institute of Standards and Technology (ANSI/NIST) Record**

Finger and palm prints of subjects arrested or taken into custody at booking facilities throughout the state are typically captured electronically with a livescan device. This electronic capture creates an ANSI/NIST record which is the electronic format used by the state and FBI for processing arrest and applicant record in the AFIS. The ANSI/NIST record includes:

<b>Type-1 Record</b>	<b>Transaction Record – File Header</b>
<b>Type-2 Record</b>	<b>User Defined Text Record</b>
<b>Type-4 Record</b>	<b>High Resolution Gray Scale Record</b>
<b>Type-7 Record</b>	<b>User Defined Image Record</b>
<b>Type-10 Record</b>	<b>Facial Image Record</b>
<b>Type-13 Record</b>	<b>Variable Resolution Latent Image Record</b>
<b>Type-14 Record</b>	<b>Variable Resolution Ten Print Image Record</b>

## Type-15 Record    Variable Resolution Palm Print Image Record

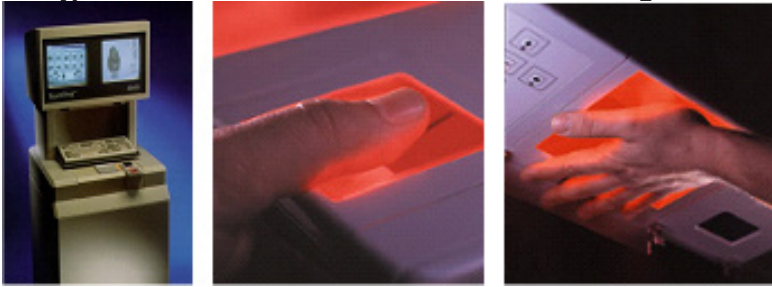


Fig. 15-1 AFIS terminal

Finger Scan

Palm Scan

## II. Image Capture – Taking Legible Fingerprints and Palm Prints

"Fingerprints" is a general term for the friction ridge skin located on the hands and feet of every person. Friction ridge skin consists of raised ridges and valleys on the gripping surface of the hands and feet. In fingers and toes, these ridges form patterns of loops, whorls, and arches. These patterns are the result of the flow of the ridges, and are formed in utero. The ridges split (bifurcate) and terminate (end) in random ways; the location and spatial relationships of these changes in the ridges are different in every finger and palm print, and are what makes them unique and identifiable. A good fingerprint image is an image that provides sufficient data to accurately identify the pattern and the changes on the ridges.

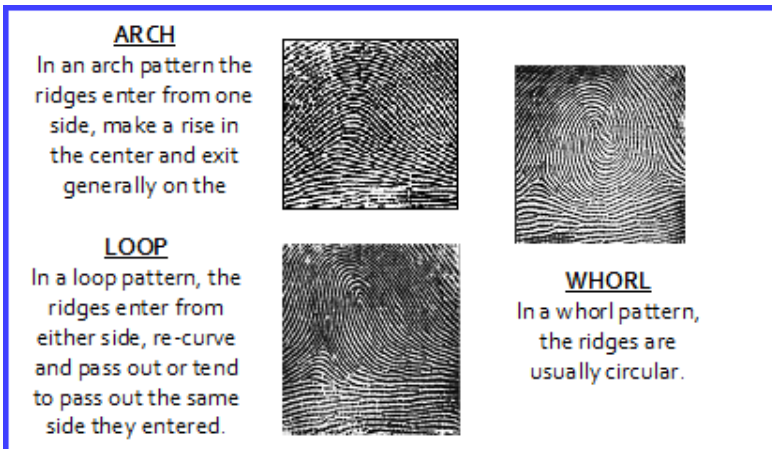


Fig. 15-2 Fingerprint Ridge Patterns

When capturing prints for a fingerprint card, there are two types of impressions. The first is called a **rolled** impression. These are the ten individually collected impressions in the upper half of the collection area. They are referred to as rolled impressions because the fingers are rolled nail-to-nail (side-to-side) to obtain all available ridge detail.



**Fig. 15-3** Rolled and Plain Impressions

The second type of fingerprint impressions are called **plain** impressions; these are also referred to as “slaps” or “flats.” These impressions are located in the four boxes at the bottom of the fingerprint card. These are not rolled, but are laid down in a single up-and-down motion. The fingers of each hand are printed simultaneously at a forty-five degree angle to ensure proper positioning. Plain impressions are used to verify the sequence and accuracy of the rolled impressions.

### **Basic Fingerprinting Equipment**

Fingerprints can be recorded with any of the following materials:

- Livescan – Electronic capture of fingerprints and palm prints. For a list of FBI Certified livescan and cardscan devices go to <https://www.fbibiospecs.cjis.gov/Certifications>. Agencies should follow the Electronic Biometric Transmission Specifications Manual (EBTS).

- Black Printers Ink or Porelon Pads (contains a built-in ink supply) and an 8 x 8 standard paper fingerprint card (WI DJ-LE-24, FD-249 criminal card or FD-258 applicant card).
- Postmortem Kit (Special equipment or fingerprint spoon used when fingerprinting deceased subjects or those with deformities. This can be used with fingerprint card strips or retabs. If using the ink and paper method, retabs may be used to reprint fingerprints (can only use one per fingerprint block).

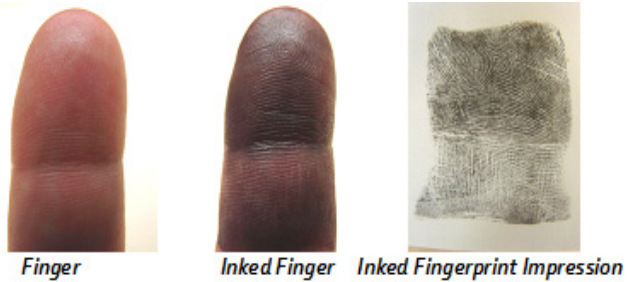
### **Suggestions for Taking Legible Fingerprints**

- Ensure that the person collecting the prints has been trained to use the proper techniques and procedures for taking legible fingerprints.
- Recommended height for the fingerprint capture device is thirty-nine inches from the floor. This will allow the forearm of an average adult to be parallel to the floor, which is the best position to roll fingerprints. If the fingerprinting device is not at this height, additional care must be taken as the fingers may rise off the device, causing incomplete capture of the ridge detail.
  - Fingers and palms must be clean and dry. Fingers/palms can be wiped with alcohol pads and dried to prevent interference from perspiration.
  - An individual's occupation or age may cause difficulty in capturing clear fingerprint images. If an excessive amount of creases/wrinkles are present in the images, use a softening agent (lotion) or ridge builder to enhance the ridge detail.

### **Steps for Fingerprinting**

- The individual being printed should stand to the right and rear of the person taking the fingerprints and directly in front of the fingerprint stand at forearm's length from the fingerprinting device.
- Encourage the individual being fingerprinted to relax and look at some distant object which may distract them from what you are doing.
- Grasp the individual's right hand at the base of the thumb

with your right hand. Guide the finger being printed with your left hand, cupping your hand over the individual's other fingers.



**Fig. 15-4** Finger Inking for Impression

- If using the ink and paper method, roll the finger on the inking plate or porelon pad so the entire fingerprint area is evenly covered with ink. The ink should be rolled from nail-to-nail and from crease of the first joint to the tip of the finger as seen in the pictures above. Using the right amount of ink is of vital importance. Too little ink and the impression will be too light. Too much ink and the fine details will run together.
- To collect rolled impressions, the side of the finger is placed upon the paper fingerprint card (in the correct space) or the livescan platen, and the finger is rolled across in an even and controlled manner to the other side of the finger, capturing the detail from the tip to the first joint. Lift each finger up and away after rolling to avoid smudging. Generally, the weight of the finger is all the pressure needed to clearly record the fingerprint.
- In order to take advantage of the natural movement of the forearm, the hand should be rotated from the more difficult position to the easiest position. This requires that the thumbs be rolled toward and the fingers away from the center of the individual's body. This process relieves strain and leaves the fingers relaxed when rolling so that they may be lifted easily without the danger of slip, which smudges and blurs the fingerprints.
- If using the ink and paper method and a rolled impression

is not acceptable, you may use an adhesive retab to cover that fingerprint. (No more than one retab per finger block is permitted.) For livescan, the image can be deleted and retaken.

- Plain impressions are printed last, at the bottom of the card. The technician simultaneously places the individual's four fingers, keeping the fingers together, on the surface of the fingerprint card or the fingerprinting device at a forty-five degree angle in order to capture all four fingers in the allotted space. Repeat this process for both hands. Print each thumb individually in their allotted space (both thumbs can be printed simultaneously to prevent mix-up).
- If using the ink and paper method, complete the information at the top of the fingerprint card. If using livescan, complete the required information.

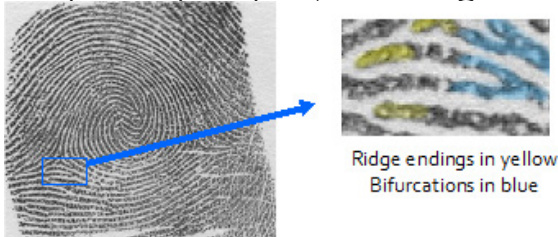
### **Additional Information for Livescan Collection**

- **Always make sure the livescan platen is clean and scratch free.**  
A build up of oils, dirt, and old prints on the glass platen and a scratched or damaged platen can cause the captured image to be of poor quality.
- **Always center the finger when rolling.**  
This will ensure that the image is in the middle of the fingerprint block and thus will allow capture of the most ridge detail.
- **Always leave the livescan image quality and sequential settings turned on.**  
This will ensure that the fingerprint images that are being captured are the best quality possible and that they are in the correct position on the fingerprint card. Ignoring the quality or sequence warnings on your device, may result in rejection of your record and may result in a request for recollection.
- **Always view the images on screen during capture for clarity and orientation of prints. Too much pressure and/or not enough pressure** can alter the image of the captured print. The livescan operator should also check to confirm the rolled impression is oriented upright and not tilted.
- **Always roll fingers from nail-to-nail.**  
This will ensure that as much ridge detail as possible is captured. This also will increase the likelihood of a possible match on an AFIS search for both ten prints and latent prints.

- **Always make sure that the livescan equipment receives regular cleanings, maintenance, calibration, and is in compliance with current standards for image compression.**

### III. Image Quality

Obtaining high quality impressions on finger and palm print cards can be best achieved through continued practice combined with the right equipment, its proper installation, and knowledge of how to use it. Each fingerprint and/or palm print coming into the state's AFIS goes to an automated coder that places minutiae markers on ridge endings and bifurcations. Accurate placement of these markers depends on the clarity/quality of the image. Proper placement of these minutiae markers increases search accuracy for all types of AFIS searches. The types of searches performed on the state's AFIS today includes ten print-to-ten print, ten print-to-unsolved latent, palm print-to-unsolved latent, unsolved latent finger-to-ten print, unsolved latent palm-to-palm print, and 2-Finger Fast-ID.



**Fig. 15-5** Example of proper marker placement

Booking officers should always review each finger and palm print image during the capture process to ensure that only high quality prints are submitted to the Wisconsin Department of Justice (DOJ). A high quality AFIS database will aid law enforcement in solving more crime. The following fingerprint images are examples of high quality, clear, completely rolled prints. The ridges are clearly defined, with good contrast, and the prints are evenly rolled.



**Fig. 15-6** High Quality Rolled Print Example

**Finger and palm print images of low quality and clarity may be rejected, and recollection may be required to insert the record into the AFIS.**

Additionally, when fingerprint images are taken improperly and are either smudged or not fully rolled from nail-to-nail, the AFIS coder may place false minutiae on the image which could alter the search results. It is critical that each minutiae marker is accurately set to increase the chances of a match both against known individuals and latent prints. The more information that is stored accurately within the AFIS database, the higher the probability a match may be made.





**Print  
Not Fully  
Rolled Nail  
to Nail**



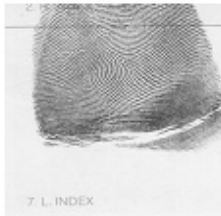
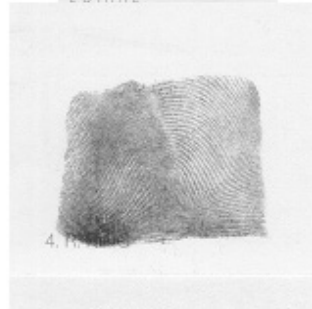
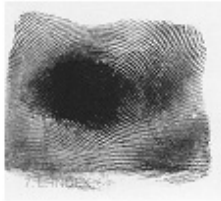
**Incomplete  
Ridge  
Detail**



**Too much  
Ink and/or  
Pressure  
When  
Rolling**



**Finger  
Orientation  
or  
Placement  
Incorrect**



**Poorly  
Captured  
Livescan  
Images**



**Fig. 15-7** Poor Quality Fingerprint Images

During an AFIS ten print search, the AFIS matcher only compares the minutiae markers and the fingerprint pattern. The two images below show a whorl pattern and its minutiae

mapping. It is very important that each ridge within the fingerprint pattern is clear and distinct to allow the AFIS coder to plot each minutiae marker accurately and to establish the pattern type.



*Fingerprint Image*



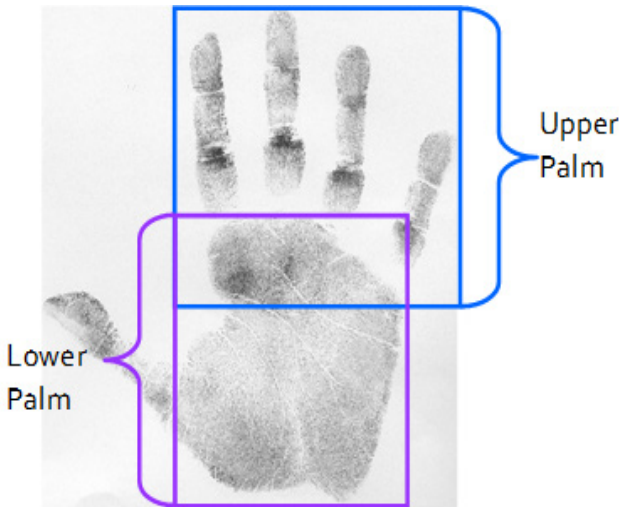
*Minutiae Mapping*

**Fig. 15-8** Clear and Distinct Image Mapping

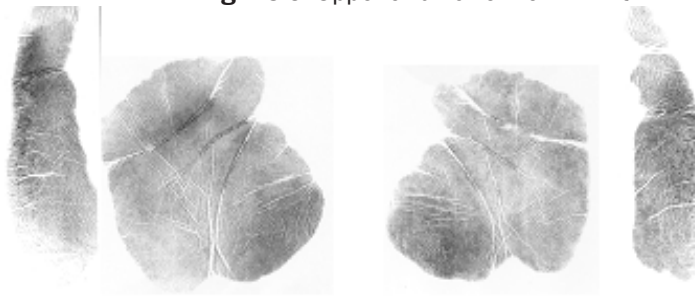
### IV. Palm Prints

The state's AFIS has the capability to allow for the capture, search and storage of palm prints. This capability allows for unknown latent palm prints collected from crime scenes to be searched against a known AFIS palm print database. Roughly 30% of latent prints captured from a crime scene are from the palm area of the hand. The techniques used in palm print identification are the same as those used for fingerprint identification. At each arrest, **finger and palm prints** should be captured if possible.

The American National Standard for Information Systems - Data Format for the Interchange of Fingerprint, Facial, and Scar Mark & Tattoo (SMT) Information (ANSI/NIST-ITL 1-2000) has set national standards for the electronic capture and transmission of palm prints, and the Wisconsin DOJ requires that these standards be met. The Federal Bureau of Investigation now requires the submission of "upper palms," consisting of the fingers, finger joints and palm area directly beneath the fingers for submission to their database. While Wisconsin does not require upper palms, our system can accept them and transmit them to the FBI. The Wisconsin Department of Justice will only accept an electronic palm print record if it is sent in conjunction with a ten-print record from the same individual.



**Fig. 15-9** Upper and Lower Palm Print



**Left Writer's & Lower Palm    Right Writer's & Lower Palm**

**Fig. 15-10** Left and Right Writer's Palm Prints

A major problem with taking a good set of **lower palm** print images on a livescan is that often the center or cupped part of the palm is not adequately printed. The operator must ensure that they apply enough gentle pressure on the center of the back of the hand to capture more of this detail. If pressure is not applied to this area then the image that is being captured will be missing a large portion of ridge detail that could be used for positive identification.

The **writer's palm** is helpful in forgery and fraud investigations since the side of the hand comes into contact with the item. When capturing this area on the livescan, start with the palm of the hand flat on the platen and then roll the hand up towards

the little finger side of the hand, about 45 degrees. You should be able to see ridge detail in the captured image on the livescan monitor. If you do not see ridge detail then you have rotated the hand too much and will need to re-capture the image.



*Poor Capture*



*Good Capture*

**Fig. 15-11** Poor and Good Capture Examples

### V. Wisconsin DOJ and FBI Search Requests

When a law enforcement agency has a **rush** case involving individuals of questionable identity, submission of a fingerprint record to the Wisconsin DOJ and the FBI is a quick way to see if the subject has an existing record within the AFIS or NGI system. While this may not positively identify someone, it will let you know if they have a record under the name that was given or a record under a different name by fingerprint comparison.

#### **Search of Wisconsin State Files**

Before submitting the search, agencies must contact the Madison Crime Laboratory's AFIS Section (608-266-2031) to let the staff know to expect a **rush** search request and to ensure that it is handled in a timely manner. Search requests are available during standard Wisconsin State Crime Laboratory working hours: M-F; 7:45a to 4:30p. The AFIS Identification Technicians will complete a name check with Criminal History and a fingerprint search through the AFIS. Search results

should be available the day the request was made, but may be delayed if the request was made at the end of the day, outside of business hours, if the submitted record is of poor quality, or if there is high system volume or system maintenance.

## Livescan/Cardscan Electronic Submission

When calling in a rush search request, please provide the following information to the AFIS Identification Technician to aid in the processing of your record: Agency name, phone number, point of contact, the subjects name, DOB, and sex/race, the date and time the record was submitted and the Transaction Control Number (TCN) of the record being sent to the AFIS. This number is issued by the livescan or cardscan device.

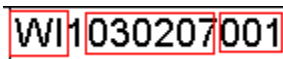
The image shows the Transaction Control Number (TCN) WI1030207001. Each character of the TCN is enclosed in a red rectangular box, and the entire sequence is enclosed in a larger red rectangular box.

Fig. 15-12 Example TCN

**WI** (Agency Identifier); **1** (Device Number); **030207** (Creation Date); **001** (Sequential Number that recycles each day)

The TCN can be found by opening the record on the livescan/cardscan device after capture of the prints. This number is needed to locate the record within the AFIS workflow. Names are only used for Criminal History searches. All electronic submissions are sent to the FBI for search once the search of the state's files has been completed. These results will be returned to the contributing agency.

## Email Submission

The AFIS Section can accept search requests submitted via email. Emails should be sent to [dojcrimelabafis@doj.state.wi.us](mailto:dojcrimelabafis@doj.state.wi.us). Please include a contact name and phone number for the staff to use if there are any issues and/or with results. The email should also contain the subject's full name, date of birth, and sex/race.

Fingerprint cards may be emailed for search purposes.

Fingerprint cards must be scanned at a minimum of 600 ppi, and should be submitted as a PDF or JPEG file format. Cards saved as TIFFs or BMPs will also be accepted. Please contact the AFIS Section at the above email if you need to use a different file type (due to file size limits on email) or for additional clarification.

### **Search of FBI's Files**

Requests for a query of name and fingerprints against the FBI database are handled by the Special Processing Center (SPC) in Clarksburg, West Virginia. They are available 24 hours a day, 7 days a week. You do not need to call ahead, but if you want to or have questions, the number is 304-625-5584. The turnaround time for results is 2 to 4 hours.

### **Email Requests**

Agencies may email fingerprint search requests to the SPC at SPC@LEO.GOV . Fingerprint cards must be scanned at 600 dpi/ppi and saved as either a PDF or JPEG. Along with the fingerprint card, please provide the following information: Agency name, address, ORI number, phone and fax number, point of contact, and the subject's descriptive data (name, DOB). If the agency does not have a LEO email account, the results will be faxed to the agency.

### **Fax Requests**

Requests for a query of name and fingerprints against the FBI database other than by electronic submissions are handled via fax through the SPC.

Fax submissions require a cover sheet including the following information: A statement that you are looking for an existing record on the subject and/or fingerprints, agency name, phone and fax numbers, point of contact, and the subject's descriptive data (name, DOB). Cover sheets are limited to one subject per sheet. Search requests for additional subjects should be sent in separate transactions.

You will need to provide one photocopy of the ten print card at 100% and one photocopy of the card at 129% on super-fine resolution if possible. This can be accomplished by rotating the fingerprint card on the photocopier to capture the fingerprint impressions only. All fingerprint images (rolled and slaps) will fit on an 8 ½ X 11 sheet of paper for faxing purposes. The subject's name and DOB must be written on the enlarged copy. Fax the one-to-one copy of the ten print card(s), along with the copy at 129%, and the cover sheet to the FBI Special Processing Center at 304-625-5587.

**NOTE: Some photographs in this chapter are used courtesy of MorphoTrak**

# Notes