



AuthenTec, Inc.
Personal Security for the Real World™

User Training Guide

...for the FingerLoc Sensor Module



Minutiae
047 018 287
106 021 192
070 023 210
053 024 000
073 032 230
108 032 428
091 033 174
058 039 248
108 054 402
125 059 400
099 060 400
070 061 256
048 068 340
065 070 338
104 071 358
115 075 358
041 077 096
123 079 384
063 083 064
053 091 052
028 097 052
084 100 031
050 102 044
103 106 050
117 111 046
104 118 282

Hardware Data

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User Training Guide: FingerLoc Sensor Module **2066 Rev 2.1 (20JUN00)**

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Introduction

This *FingerLoc User Training Guide* provides a very brief description of how best to place a finger on the FingerLoc™ sensor in order to capture the highest possible quality fingerprint image for the best possible identification and verification performance. Some discussion of the issues related to fingerprint image acquisition is also included.

High quality fingerprint images allow an authentication system to identify or verify an individual more quickly and with fewer errors.

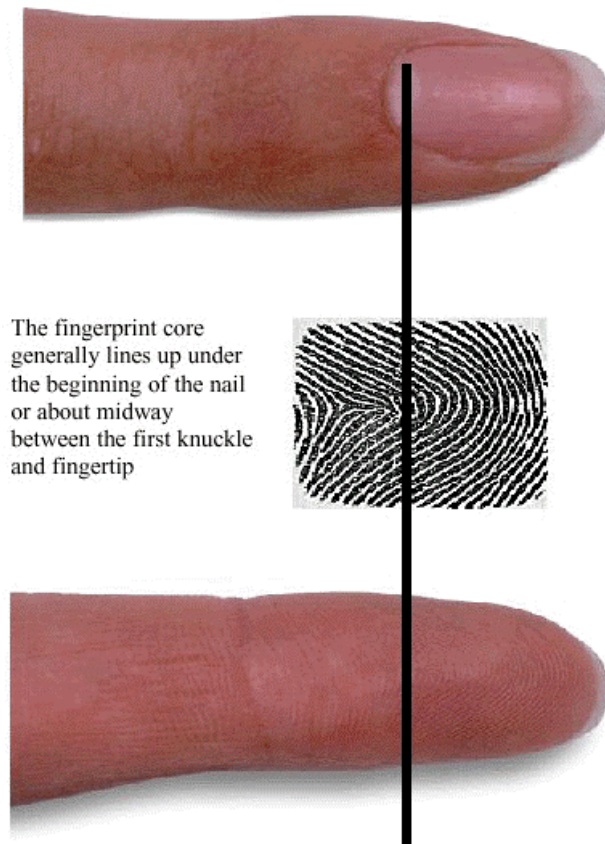
Related Documents

- ♦ *FingerLoc Sensor Module Kit User's Guide*
- ♦ *FingerLoc Aware User's Guide*

Locating the Core

As we know, a fingerprint is a characteristic pattern that is unique to the individual person bearing it. Although fingerprint patterns vary widely from type to type, each fingerprint has a small central area around which the remainder of the pattern is distributed. This central area is the “core” of the fingerprint. Typically, this core is opposite the point that the fingernail emerges from the cuticle. Illustrations of each of the seven basic fingerprint types are shown in [Appendix A: Fingerprint Types](#).

Fig: Core Alignment



The fingerprint core generally lines up under the beginning of the nail or about midway between the first knuckle and fingertip

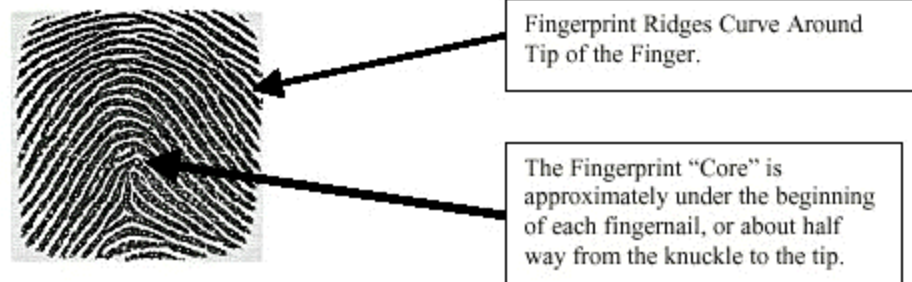


While the matching algorithm of the FingerLoc system is quite tolerant to non-optimum finger placement, centering the core on the sensor will give the best possible performance.

Find your fingerprint cores and verify that the core location of your fingerprints is approximately as described. Most fingers will follow this general rule. If your core location is very different, adjust your finger placement accordingly.

If the identification software can not find the fingerprint core, you may be able to solve this problem simply by using a different finger.

Fig: Core Identification



Fingerprint Ridges Curve Around Tip of the Finger.

The Fingerprint "Core" is approximately under the beginning of each fingernail, or about half way from the knuckle to the tip.

Making Contact

Using the Full Fingerprint

Capture the full area of the fingerprint by contacting the FingerLoc sensor with the finger placed flat on the sensor, as shown below, as opposed to presenting only the tip of the finger.

The fingertip alone contains insufficient image data for a high-quality fingerprint. The ridges in this area are mostly parallel lines, with few distinct *minutiae* from which to construct an identification template. It is unlikely that the image management algorithm will actually permit enrollment, but if it does, such a feature-poor environment can lead to False Acceptance errors.

Fig: Correct Finger Placement



Fig: Incorrect Finger Placement



Lay the finger down flat, lightly but firmly on the sensor. This results in minimal distortion of the skin. If the finger is pulled or pushed left or right, forward or back, the image is distorted and the fingerprint quality is reduced.

Note: Do not roll the finger as you might when taking a traditional ink-and-paper image! Keep the finger flat and motionless against the sensor detection surface during the imaging process.

Orienting the Finger

The FingerLoc Sensor Module is equipped with a molded finger guide to assist you in placing your finger on the sensor in the correct orientation. Ideally, the finger should approach the sensor with an alignment of zero degrees, as shown in the following illustration.

The FingerLoc matching algorithm can tolerate non-optimum entry angles up to $\pm 15^\circ$, but the performance of the matching algorithm may be affected by this misalignment.

Fig: Incorrect Finger Alignment



Fig: Correct Finger Alignment



Centering the Core

In some cases, if the core of the fingerprint is not visible in the image on the screen, the software may incorrectly reject a registered user. In this case, simply lift the finger and replace it on the sensor with the core more closely centered on the sensor. The matching process should then be performed correctly.

During enrollment, you will be asked to lift and replace your finger on the sensor several times. The performance of the matcher can be improved by taking care to place the finger in slightly different locations on the sensor for each one of the enrollment placements. This gives the matcher the opportunity to create a composite image of the finger, including more area than can be seen in a single view.

The FingerLoc Aware Application

Individual fingerprint enrollment is the first procedure required when operating any fingerprint system. Enrollment consists of sampling and storing fingerprint images with the identity of the individual they match.

During the *FingerLoc Aware* enrollment operation, the individual enters an identifying name, then places a finger on the sensor a number of times, as prompted. After a good quality fingerprint is sampled, the fingerprint feature template is stored on the supporting computer using the individual's name as an identification tag. Once enrolled, these stored fingerprints and features can be retrieved at any time from storage by the system and compared with a live fingerprint on the sensor to verify or identify the individual.

Refer to the *FingerLoc Aware User's Guide* for detailed information on how to use this program.

Identification Errors

The biometric industry generally uses two principal criteria to assess the performance of a given identification system. These are:

- ◆ **False Acceptance Rate (FAR)** – The FAR is the measurement of the probability that a biometric system will incorrectly identify an individual. Statistically, the chance that two individuals will have identical fingerprints is about one septillion to one.
- ◆ **False Rejection Rate (FRR)** – The FRR is the measurement of the probability that a biometric system will fail to identify an individual who is properly enrolled.

False Acceptance

In biometric systems in general, *false acceptance* errors are the less frequent of the two problems. In the case of the FingerLoc sensor, false acceptance is extremely rare, and so far always the result of a bad enrollment.

False Rejection

For various reasons, *false rejection* errors are much more frequently encountered in biometric systems. In the case of the FingerLoc sensor, false rejection sometimes occurs when the core of the fingerprint is not present or is grossly misplaced on the sensor detection surface. Lift the finger, then replace it with more care in positioning to solve this problem.

Other causes of false rejection errors might be contamination of the sensor surface. In addition, physiological processes such as dermatitis, disease, aging, and calluses can obscure fingerprints. They can be mechanically damaged – worn smooth, contaminated by dirt, etched by chemicals, or even burned or scarred. The reduction of skin tone and elasticity due to collagen loss in the aging process also contributes to a general deterioration of the skin.

Most of these adverse factors do not greatly affect the performance of the FingerLoc sensor because rather than interacting with the outer layer of the skin it operates below the surface, in the subdermal layer.

For Further Help

If you have any questions about using your Evaluation Kit or would like to discuss specific applications, please contact the AuthenTec, Inc. Applications Department by phone at (407) 308-1300, or by Email at apps@authentec.com.

Appendix A: Fingerprint Types

The fingerprint images in this section were downloaded from the web site of the U.S. Federal Bureau of Investigation. Notice that although the overall patterns vary widely from type to type, each fingerprint has a central area around which the remainder of the pattern is distributed. This central area is the “core” of the fingerprint.

Best performance is achieved when the core of the fingerprint is placed in the center of the sensor detection surface.

Fig: Coring the Three Most Common Fingerprint Types

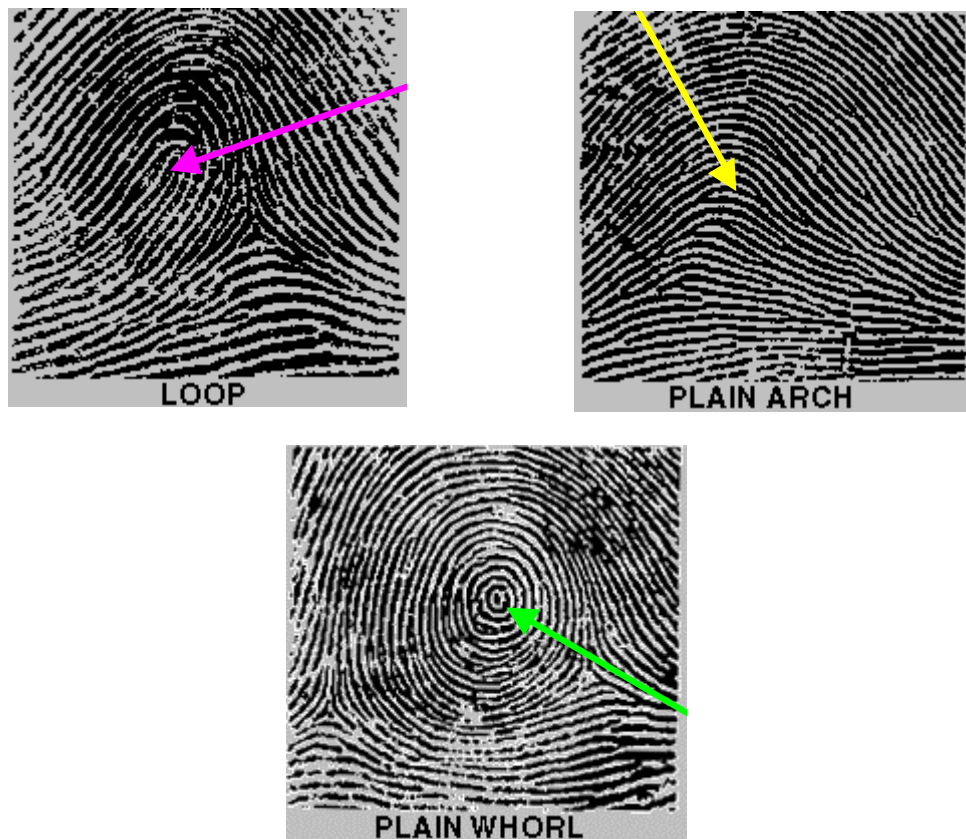
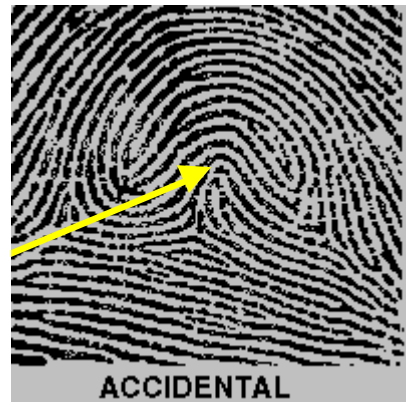
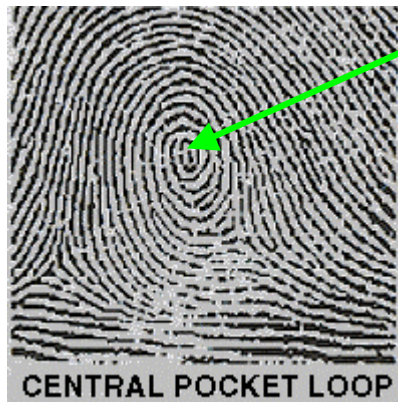
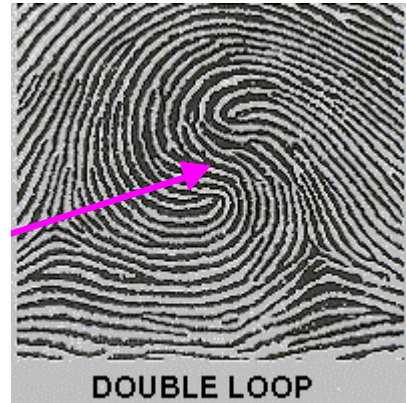
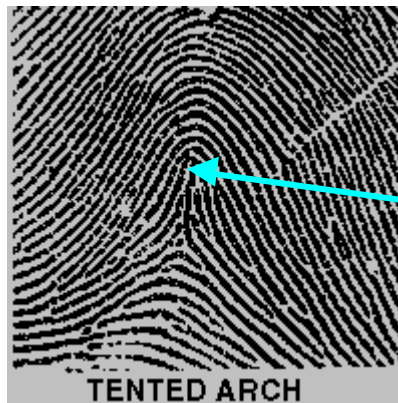


Fig: Coring Less Common Fingerprint Types



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