



FingerCell 2.1 Algorithm Demo

User's guide (PC version)

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1 Preface

Information about this user's guide

- **Version:** 2.1.0.0
- **Release date:** 2008-12-17

Contacts

If you face troubles while using the FingerCell Algorithm Demo, please contact Neurotechnology (support@neurotechnology.com) or your local distributor.

2 Introduction

Fingerprint identification systems have been usually developed on PC platform, although some tasks required a compact solution. Nowadays various embedded and handheld mobile devices offer enough capabilities to integrate biometrical recognition software into them.

The hardware part of an embedded system is mostly a stand-alone device that contains processor, memory, fingerprint scanner and some output display. This part can be developed according to project's specifics, or a ready-to-use device can be obtained.

Neurotechnology offers the embedded fingerprint identification technology that is suitable to develop a fast and reliable system on embedded or mobile platform.

2.1 Features

FingerCell 2.1 technology is compact, sensor-independent and cross-platform. It offers decent reliability and identification speed for various mobile or embedded devices. The FingerCell algorithm includes these proprietary solutions:

- Full tolerance to fingerprint translation, rotation and deformation.
- Ability to run on low speed processors.
- Ability to recognize a fingerprint from any part of it without any core or delta points.
- Enrollment with features generalization, that combines several samples of the same fingerprint for better quality.
- Identification (1:N) ability.
- Pre-sorting database entries using certain features for faster identification.

2.2 Algorithm

The FingerCell algorithm is similar to the VeriFinger algorithm and includes these features:

- FingerCell is **fully tolerant to fingerprint translation, rotation and deformation**. Such tolerance is achieved by our proprietary fingerprint matching algorithm.
- FingerCell **does not require the presence of fingerprint core or delta points** in the image and can recognize a fingerprint from any part of it.
- FingerCell has fingerprint enrollment with **features generalization mode**. This mode generates a collection of the generalized fingerprint features from a collection of fingerprints of the same finger. Each fingerprint image is processed and features are extracted. Then the collection of features is analyzed and combined into a single generalized features collection which is written to the database. This way, enrolled minutiae are more reliable and the fingerprint recognition quality considerably increases using this enrollment mode.
- FingerCell can use database entries which were **pre-sorted** using certain global features. Fingerprint matching is performed first with the database entries having global features most similar to those of the test fingerprint. If matching within this group yields no positive result, then the next record with most similar global features is selected, and so on until the matching is successful or the end of the database is reached. In most cases there is a good chance that the correct match will be found at the beginning of the search. As a result, the number of comparisons required to achieve fingerprint identification decreases drastically, and correspondingly, the effective matching speed increases.
- The template extraction is adapted for low speed embedded processors to provide fast image processing and feature extraction.

2.3 Why FingerCell?

The FingerCell algorithm, developed on the VeriFinger basis, is designed for embedded biometric systems developers. The algorithm has certain capabilities:

- **Reliability.** As FingerCell is intended for embedded devices, it uses a faster and less powerful fingerprint noise filtration algorithm with a slightly higher False Rejection Rate than a PC running the VeriFinger algorithm. However, the FingerCell algorithm still produces a decent level of recognition reliability, which is acceptable for embedded devices.
- **Low speed processors are supported.** For example, a 75 MHz ARM7 processor performs verification in about 2 seconds when FingerCell algorithm is used.
- **Identification ability.** As FingerCell is developed on the VeriFinger basis, it is suitable not only for fingerprint verification (1:1 matching), but also for identification (1:N matching). FingerCell can match up to **700 fingerprints per second** in 1:N identification mode on 200 MHz ARM family CPU.
- **Image processing speed.** Fingerprint image processing time is **less than 1 second** on 200 MHz ARM processor, which is acceptable for embedded systems.
- **Compact software.** Compiled code and internal data arrays require only **400 Kb of memory** and therefore can be implemented in low memory microchips, thus reducing hardware costs.
- **Portability.** FingerCell Embedded Development Kit is designed for easy implementation into very various and specific applications. The algorithm's **source code** is written in **ANSI C** and is sensor independent; therefore it can be ported to various platforms and hardware.
- **Embedded and PC-based multi-biometric capable technologies from the same vendor.** Combined with our other technologies, FingerCell could be used in developing these advanced systems:
 - Mixed embedded/PC systems, using FingerCell EDK together with VeriFinger Standard or Extended SDKs.
 - Multi-biometric embedded systems, using FingerCell EDK together with FaceCell EDK.
 - Complex multi-biometric embedded/PC systems, using a combination of FingerCell EDK, FaceCell EDK, VeriFinger SDK, VeriLook SDK and VeriEye SDK.

2.4 Specifications

Enrollment time	< 1 second
Enrollment time in features generalization mode	< 3 seconds
Verification time	0.5 seconds
Matching speed	up to 700 fingerprints/second
Template size	300 - 600 bytes
Memory required for code and data arrays	400 kilobytes

You should note, that these specifications were determined on device with 200 MHz ARM family processor.

2.5 Supported Fingerprint Scanners

The following fingerprint scanners are supported:

Fingerprint scanner model	Description
U.are.U 2000S	<ul style="list-style-type: none"> • Description: The U.are.U 2000 fingerprint scanner is a self-contained sensor for capturing a fingerprint and communicating the digital image to PC via USB interface. The on-board electronics control image capture, self-calibration, and the Plug-n-Play USB interface. • Manufacturer: DigitalPersona, Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
DigitalPersona U.are.U 4000S / U.are.U 4000B	<ul style="list-style-type: none"> • Description: The U.are.U 4000 fingerprint sensor is designed to work with PC via USB port. It has slim design and small form factor. The on-board electronics control image capture, latent fingerprint rejection, self-calibration, and the Plug-n-Play USB interface. • Manufacturer: DigitalPersona, Inc. • Connection: USB • Resolution: 512 dpi • Supported OS: Microsoft Windows (32bit)
DigitalPersona U.are.U Fingerprint Keyboard	<ul style="list-style-type: none"> • Description: This is 104-key Windows compatible keyboard with a built-in U.are.U 4000 fingerprint sensor. The keyboard requires two connections: PS/2 connection for keyboard functioning and USB for fingerprint scanner. • Manufacturer: DigitalPersona, Inc. • Connection: PS/2 and USB • Resolution: 512 dpi • Supported OS: Microsoft Windows (32bit)
DigitalPersona U.are.U 4000 Fingerprint Module	<ul style="list-style-type: none"> • Description: The U.are.U 4000 Module is a small fingerprint scanner designed for integration into OEM equipment where fingerprint authentication is needed. • Manufacturer: DigitalPersona, Inc. • Connection: USB • Resolution: 512 dpi • Supported OS: Microsoft Windows (32bit)
Cross Match Verifier 300 Classic	<ul style="list-style-type: none"> • Description: This scanner is intended for professional use. It operates via USB port. • Manufacturer: Cross Match Technologies Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Cross Match Verifier 300 LC	<ul style="list-style-type: none"> • Description: Verifier 300 LC (Lexan Case) features light weight (less than 0.5 kg). It operates via USB port. • Manufacturer: Cross Match Technologies Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)

Cross Match Verifier 300 LC 2.0	<ul style="list-style-type: none"> • Description: An improved version of Verifier 300 LC. Features (see page 2) faster frame rate and an I/R filter to improve ambient light rejection. • Manufacturer: Cross Match Technologies Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Cross Match Verifier 310	<ul style="list-style-type: none"> • Description: This scanner allows to scan two flat fingerprints simultaneously or one rolled fingerprint. • Manufacturer: Cross Match Technologies Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Futronic FS80	<ul style="list-style-type: none"> • Manufacturer: Futronic Technology Co. Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit and 64bit), Linux (32 bit)
Futronic eFAM (FS84)	<ul style="list-style-type: none"> • Description: Futronic eFAM provides immediate embedded solution to customers for various kinds of application using fingerprint technology. The scanner can be connected to the host computer using ethernet interface. 2-sensor input and 2-output control signal are available for external device control. Electric lock or other electric device can be activated by eFAM using these output control signals. • Manufacturer: Futronic Technology Co. Ltd. • Connection: Ethernet • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit and 64bit), Linux (32 bit and 64 bit), Mac OS X
Futronic FS88	<ul style="list-style-type: none"> • Description: The scanner is an enhanced version of Futronic FS80 scanner. This scanner was certified by FBI to be compliant with PIV-071006 Image Quality Specification for Singer Finger Reader. The FS88 scanner includes an electronic circuit for live finger detection. • Manufacturer: Futronic Technology Co. Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit and 64bit), Linux (32 bit)
NITGEN enBioScan-F	<ul style="list-style-type: none"> • Description: The scanner meets FBI's Integrated AFIS Image Quality Specifications (see page 3) (IQS) and is able to scan wet fingers. • Manufacturer: NITGEN Co., Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
NITGEN Fingkey Hamster	<ul style="list-style-type: none"> • Manufacturer: NITGEN Co., Ltd. • Connection: USB 1.1 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)

NITGEN Fingkey Hamster II	<ul style="list-style-type: none"> • Manufacturer: NITGEN Co., Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
SecuGen Hamster scanner III	<ul style="list-style-type: none"> • Manufacturer: SecuGen Corporation • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
SecuGen Hamster scanner Plus	<ul style="list-style-type: none"> • Manufacturer: SecuGen Corporation • Connection: USB 1.1 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
SecuGen Hamster scanner IV	<ul style="list-style-type: none"> • Manufacturer: SecuGen Corporation • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Dermalog ZF1	<ul style="list-style-type: none"> • Description: The scanner is able to detect fake fingers and to scan both dry and wet fingerprints. • Manufacturer: DERMALOG Identification Systems GmbH • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
BioLink U-Match MatchBook v.3.5	<ul style="list-style-type: none"> • Manufacturer: BioLink Solutions • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
Testech Bio-i	<ul style="list-style-type: none"> • Manufacturer: Testech, Inc. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Startek FM200 scanner	<ul style="list-style-type: none"> • Manufacturer: Startek Engineering Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X
Tacoma CMOS Scanner	<ul style="list-style-type: none"> • Manufacturer: Tacoma Technology Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X

Fujitsu MBF200		<ul style="list-style-type: none"> • Manufacturer: Tacoma Technology Inc. and Fujitsu Microelectronics America, Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32bit and 64bit), Mac OS X
Identix 2080	DFR	<ul style="list-style-type: none"> • Manufacturer: Identix Inc. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Identix 2090	DFR	<ul style="list-style-type: none"> • Description: This scanner is intended for professional use. The image output is in USB digital and RS-170 analog video formats. • Manufacturer: Identix Inc. • Connection: USB, Analog (RS-170) • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Identix 2100	DFR	<ul style="list-style-type: none"> • Manufacturer: Identix Inc. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
TST Biometrics BiRD 3		<ul style="list-style-type: none"> • Description: TST Biometrics offers its <i>touchless sensor technology</i> that allows to scan a finger without physical contact with a fingerprint sensor. The BiRD 3 sensor is available as desktop scanner, on-wall mounted scanner and as OEM components. Optionally, a 5V AC powered heating device could be included for operating in cold environment. • Manufacturer: TST Biometrics • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Digent FD1000	Izzix	<ul style="list-style-type: none"> • Manufacturer: Digent Co. Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
UPEK TouchChip TCRU1C		<ul style="list-style-type: none"> • Description: This scanner is built on the TouchChip Silicon Fingerprint Sensor. It communicates PC via USB port. • Manufacturer: UPEK, Inc. • Connection: USB 1.1 • Resolution: 508 dpi • Supported OS: Microsoft Windows (32bit)
UPEK TouchChip TCRU2C		<ul style="list-style-type: none"> • Manufacturer: UPEK, Inc. • Connection: USB 1.1 • Resolution: 508 dpi • Supported OS: Microsoft Windows (32bit)

Green Bit DactyScan 26	<ul style="list-style-type: none"> • Manufacturer: Green Bit S.p.A. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Hongda S680	<ul style="list-style-type: none"> • Description: This scanner allows to scan rolled fingerprints. A plastic lid can be mounted on top of sensor for more comfortable flat fingerprint scanning. • Manufacturer: Hongda Opto-Electron Co., Ltd. • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Jstac Athena 210	<ul style="list-style-type: none"> • Manufacturer: Jstac Corporation • Connection: USB 2.0 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
BiometriKa FX 2000	<ul style="list-style-type: none"> • Description: BiometriKa FX 2000 desktop fingerprint scanner is intended for using with PC. Scanner communicates PC via USB interface. FX 2000 contains 32 bit RISC processor for encrypting fingerprint data, controlling scanner operations and other operations. • Manufacturer: BiometriKa srl • Connection: USB • Resolution: 569 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
BiometriKa FX 3000	<ul style="list-style-type: none"> • Manufacturer: BiometriKa srl • Connection: USB • Resolution: 569 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
BiometriKa HiScan	<ul style="list-style-type: none"> • Manufacturer: BiometriKa srl • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Lumidigm Venus Series sensors	<ul style="list-style-type: none"> • Manufacturer: Lumidigm, Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
Dakty Fingerprint NAOS-A	<ul style="list-style-type: none"> • Description: A fiber optic fingerprint sensor with live finger detection using human body capacitance, blood oxygen presence and pulse measuring. • Manufacturer: Dakty GmbH • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)

id3 Image	Certis	<ul style="list-style-type: none"> • Description: An Atmel FingerChip based scanner with a sweeping thermal sensor. • Manufacturer: id3 Semiconductors • Connection: USB 1.1 • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)
CS-Pass Fingerprint Sensor	USB	<ul style="list-style-type: none"> • Description: The CS-Pass USB Fingerprint Sensor is based on AuthenTec AES4000 sensor. It is suitable for PC and mobile devices, including battery powered devices. The sensor can be customized for specific projects. • Manufacturer: BiometriCS Ltd. • Connection: USB • Resolution: 250 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X
EntréPad AES2501B		<ul style="list-style-type: none"> • Manufacturer: AuthenTec, Inc. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit)
EntréPad AES4000		<ul style="list-style-type: none"> • Description: The AES4000 fingerprint sensor is suitable for PC and mobile devices. Sensor's small size and low power is ideally suited for battery powered devices. • Manufacturer: AuthenTec, Inc. • Connection: USB • Resolution: 250 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X
FingerLoc AF-S2		<ul style="list-style-type: none"> • Description: The AF-S2 fingerprint sensor is suitable for the embedded devices. • Manufacturer: AuthenTec, Inc. • Connection: USB • Resolution: 250 dpi • Supported OS: Microsoft Windows (32bit), Linux (32 bit and 64 bit), Mac OS X
LTT-C500 Fingerprint Sensor		<ul style="list-style-type: none"> • Manufacturer: LighTuning Technology Inc. • Connection: USB • Resolution: 508 dpi • Supported OS: Microsoft Windows (32bit)
Atmel FingerChip		<ul style="list-style-type: none"> • Description: Please note, that Atmel FingerChip is a whole family of fingerprint sensors. Probably, chip dimensions and image capture area could be different from the presented specifications. Anyway, Neurotechnology's software could be used with any chip from the FingerChip family. • Manufacturer: Atmel Corp. • Connection: USB • Resolution: 500 dpi • Supported OS: Microsoft Windows (32bit)

Zvetco P4000	Verifi	<ul style="list-style-type: none">• Description: An USB 2.0 scanner based on AES4000 capacitive sensor.• Manufacturer: Zvetco Biometrics• Connection: USB 2.0• Resolution: 508 dpi• Supported OS: Microsoft Windows (32bit)
Zvetco P5000	Verifi	<ul style="list-style-type: none">• Description: A FIPS-201 compliant USB 2.0 fingerprint scanner. The scanner is based on the UPEK TCR1 capacitive sensor, that is also used in TCRU1C fingerprint scanner. P5000 scanner is rugged and scratch resistant. Scanner's sensor has protective coating that is able to withstand more than 10 million touches.• Manufacturer: Zvetco Biometrics• Connection: USB 2.0• Resolution: 508 dpi• Supported OS: Microsoft Windows (32bit)

3 Using Algorithm Demo Application

FingerCell algorithm demo is menu-driven software designed with intention to give the potential user a possibility to test our fingerprint image processing and recognition engine in action on PC. Using FingerCell algorithm demo application mainly involves running fingerprint enrollment, enrollment with features generalization, verification and identification procedures, described below. Neurotechnology FingerCell algorithm demo application also allows calculate ROC (receiver operating characteristic) with custom database. For more information see ROC calculation (see page 12).

3.1 Fingerprint Input

FingerCell algorithm demo allows reading fingerprints from all supported scanners (see page 3). Before using scanner please install scanner driver provided in demo drivers directory.

FingerCell algorithm demo software allows reading fingerprint images from image files (either *.bmp, *.wsq or *.tif). There is a collection of sample fingerprint images (in *.bmp format) available for download from Neurotechnology web site (<http://www.neurotechnology.com/download.html>).

Fingerprint enrollment

For the fingerprint enrollment demonstration, select "Mode»Enrollment" from the menu. Then, open file(s) or scan a fingerprint. To stop long enrollment operation choose "File»Stop".

Note: When working with big number of image files file list can be created for later use.

Fingerprint enrollment with features generalization

For the fingerprint enrollment with features generalization demonstration, select "Mode»Enrollment with generalization" mode from the menu. Generalization requires multiple images. Image count can be changed in Tools»Options.... Then open multiple files or scan multiple images.

Fingerprint Verification

Select "Mode»Verification" and open two files or scan two images.

Fingerprint Identification

For the fingerprint identification demonstration, select "Mode»Identification" from the menu. Then open file(s) or scan an image.

After the identification FingerCell will output the record names of the most similar fingerprint together with the similarity criterion (to see all matching result select "Show all results" in "Options" dialog box) and various characteristics of the recognition process.

To stop lengthy enrollment or identification operations choose "File»Stop".

Note: When working with big number of image files the file list can be created for later use.

3.2 Menu System

File menu can be used to load fingerprint images from *.bmp, *.wsq and *.tif files ("Open...") or to load a list of fingerprint image files ("Open file list..."). File lists can be created, edited or saved in File list editor ("Tools»File list editor..." menu). To

read image from scanner simply place a finger on it.

Fingerprint images loaded from files or scanned from a scanner can be saved to *.bmp files ("File»Save..."). Filtered image (shown in the right part of the application window) can be saved using "File»Save right...".

Use "File»Stop" to stop current operation (file list, identification, etc.). "Stop" button can be used for the same purpose.

Use "File»Exit" to end the application.

In "Mode" menu current operation mode can be changed.

In "View" menu images and fingerprint features display mode can be changed.

"Tools" menu contains these commands:

- "File list editor" - starts File list editor.
- "Clear database" - clears database.
- "Clear main log" - clears the contents of the Main log.
- "Clear scanner log" - clears the contents of the Scanner log.
- "Calculate ROC" - calculates ROC with enrolled fingerprints. ROC calculation is done using current options. For more information see ROC calculation (see page 12).
- "Options..." - opens an "Options" dialog, which allows changing several important features of the demo application, namely fingerprint image resolution and finger identifiers generated from files and scanner. Resolution is initially set to 500 dpi (suitable fingerprint images with optimum resolution; sample files are available for download at Neurotechnology web site <http://www.neurotechnology.com/download.html>).
- "Options..." - opens a FingerCell options dialog, which allows changing Neurotechnology fingerprint recognition algorithm parameters: allowed fingerprint matching false acceptance ratio (in percents), allowed finger relative rotation (in degrees), fingerprints matching speed mode and other parameters.

"Help»About..." - displays FingerCell information.

3.3 Main Window

The main Neurotechnology FingerCell algorithm demo window contains a menu bar at the top, and five child windows. In the top left window, the original fingerprint image is displayed, in the top right window, the same image after the image filtering/processing/feature extraction is shown with features and their directions marked in red by circles and lines. Also singular points (orange) can be shown; see View menu. In the bottom-left window, enrollment and recognition information (enrolled/recognized file name, fingerprint processing and matching times, number of samples matched, etc.) is displayed. In the bottom center window, scanner log is displayed. In the bottom right window, individual matching scores between different fingerprints (in identification mode) are displayed.

3.4 ROC Calculation

Neurotechnology FingerCell algorithm demo application allows ROC (Receiver Operating Characteristic) calculation from enrolled fingerprints. ROC shows the dependence of false rejection rate (FRR) on the false acceptance rate (FAR).

The false acceptance rate (FAR) is the probability that a impostor presenting its verification data is falsely recognized as the lawful owner of the reference data.

The false rejection rate (FRR) indicates the probability for the lawful owner of the reference data to be falsely rejected when presenting his verification data.

To start ROC calculation fingerprints must be enrolled first and next "Tools»Calculate ROC" menu chosen. Window with chart will be shown after calculation.

ROC is calculated using current settings. Please check feature extraction and matching settings in options ("Tools»VeriFinger Options...") before starting enrolling fingerprints and ROC calculation.

Important

For correct ROC calculation fingerprint from same finger must have same "Finger ID" and fingerprints from different fingers must have different "Finger ID". By default "Finger ID" is "Scanner name date time". Such "Finger ID" is not suitable for ROC calculation because it can assign different "Finger ID" for same finger. "Finger ID" can be entered manually for each scanned or read fingerprint (by checking "Tools»Options»Prompt for info").

"Finger ID" examples:

- Left hand 1 finger
- Left hand 2 finger
- Right hand 2 finger
- ...

There are three **ROC calculations options**:

1. Minimal
2. Half
3. Full

It can be chosen from "Tools»Options...". "Full" mode is slower but more accurate.

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