



AuthenTec, Inc.
Personal Security for the Real World™

FingerLoc™ Sensor Kit

...for the Universal Serial Bus



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

User's Guide

2056 Rev 1.0
29JUN00



AuthenTec, Inc.
Post Office Box 2719
Melbourne, Florida 32902-2719
321-308-1300
www . authentec . com



AuthenTec welcomes your input. We try to make our publications useful, interesting, and informative, and we hope you will take the time to help us improve them. Please send any comments or suggestions by mail or e-mail.

Disclaimer of Warranty

THE SOFTWARE, INCLUDING INSTRUCTIONS FOR ITS USE, IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND. AUTHENTEC FURTHER DISCLAIMS ALL IMPLIED WARRANTIES INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK ARISING OUT OF THE USE OR PERFORMANCE OF THE SOFTWARE AND DOCUMENTATION REMAINS WITH YOU.

IN NO EVENT SHALL AUTHENTEC, ITS AUTHORS, OR ANYONE ELSE INVOLVED IN THE CREATION, PRODUCTION, OR DELIVERY OF THE SOFTWARE BE LIABLE FOR ANY DAMAGES WHATSOEVER (INCLUDING, WITHOUT LIMITATION, DAMAGE FOR LOSS OF BUSINESS PROFITS, BUSINESS INTERRUPTION, LOSS OF BUSINESS INFORMATION, OR OTHER PECUNIARY LOSS) ARISING OUT OF THE USE OF OR INABILITY TO USE THE SOFTWARE OR DOCUMENTATION, EVEN IF AUTHENTEC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. BECAUSE SOME STATES OR COUNTRIES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF LIABILITY FOR CONSEQUENTIAL OR INCIDENTAL DAMAGES, THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

U.S. Government Restricted Rights

The software and documentation are provided with RESTRICTED RIGHTS. Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer Software clause at DFARS 252.227-7013 or subparagraph (c)(1) and (2) of the Commercial Computer Software – Restricted Rights 48 CFR 52.227-19, as applicable. Manufacturer is AuthenTec, Inc., Melbourne, Florida 32901-2719. This Agreement is governed by the laws of the State of Florida.

**AuthenTec, Inc.
Post Office Box 2719
Melbourne, Florida 32902-2719
321-308-1300
www.authentec.com
apps @ authentec . com**

AuthenTec, FingerLoc, FingerLoc Aware, Dynamic Optimization, TruePrint, the AuthenTec logotype, and the phrase "Personal Security for the Real World" are trademarks or registered trademarks of AuthenTec, Inc. Microsoft and Windows 98 are registered trademarks of Microsoft Corp. SecureSuite is a trademark of I/O Software, Inc. All other trademarks are the property of their respective owners.

FingerLoc Sensor Kit User's Guide (USB) 2056 Rev 1.0 (29JUN00)

Copyright ©1998-2000 by AuthenTec, Inc. No part of this publication may be reproduced in any form or by any means without prior written permission. Printed in the United States of America.

The material in this publication is provided for information only. It is subject to change without notice. While reasonable efforts have been made to assure its accuracy, AuthenTec, Inc. assumes no liability resulting from errors or omissions in the document, or from the use of the information contained herein.

Table of Contents

INTRODUCTION	3
<i>The Technology Evaluation Kit.....</i>	<i>4</i>
<i>The Software Developer's Kit</i>	<i>5</i>
<i>The Reference Design Kit.....</i>	<i>6</i>
GETTING STARTED	7
GENERAL INFORMATION:	7
SYSTEM REQUIREMENTS:.....	8
THE FINGERLOC SENSOR INTEGRATED CIRCUIT.....	9
<i>TruePrint Technology</i>	<i>9</i>
<i>Sensor Operation.....</i>	<i>10</i>
<i>Sensor Specifications</i>	<i>10</i>
FINGERLOC INSTALLATION	11
SENSOR CALIBRATION	15
FINGERLOC AWARE	17
FOR FURTHER ASSISTANCE	17
APPENDIX A: OEM SETUP.....	18
APPENDIX B: GLOSSARY.....	19

INTRODUCTION

Thank you for your interest in the AuthenTec FingerLoc™ Sensor Kit for the Universal Serial Bus (USB). This kit is the latest version of the FingerLoc Personal Identification System. It is intended to introduce system developers and other interested users to AuthenTec's TruePrint™ advanced biometric sensing technology, and to allow developers to evaluate the integration of TruePrint capabilities into their own systems.



The FingerLoc Sensor Kit is an example of a Personal Identification System, developed to familiarize evaluators with the technology, to encourage user feedback in product design, and to afford developers an opportunity to begin early design integration in order to minimize time-to-market of the production hardware and software.

As a leading participant in a growing industry, AuthenTec continues to make every effort to conform to emerging biometric API (BAPI) industry standards.

Depending on what your intent might be, you have received one of the kit groups described in the following sections.

The Technology Evaluation Kit

The low-cost, introductory-level Technology Evaluation Kit (TEK) is intended for use by potential users or developers of biometric sensing solutions, and others who wish to understand and familiarize themselves with this technology.

TEK...

The FingerLoc Technology Evaluation Kit contains:

- **FingerLoc Sensor Module** (USB version)
- **Distribution Compact Disk**

Software...

FingerLoc Aware application
FingerLoc server software, including DLLs
I/O Software's *SecureSuite*™

Publications...

Some of the documents listed below are supplied in Portable Document Format (PDF) – Adobe *Acrobat Reader*™ or some other PDF viewer is required to view them. You can download a complimentary copy of *Acrobat Reader* from **www.adobe.com**.

FingerLoc Aware User's Guide
FingerLoc Sensor User's Guide (USB version)
FingerLoc User Training Guide
SecureSuite User's Manual
ReadmePGM

- **Quick-Start Guide**

Use the *Quick-Start Guide* or see [Getting Started](#) in this document to install this kit.

The Software Developer's Kit

The Software Developer's Kit (SDK) is used by software developers who wish to create software applications that incorporate AuthenTec's advanced fingerprint detection and identification technology. This kit includes demonstration source code and various software components. It provides an API which permits developers to make high-level service calls from their applications.

SDK...

The FingerLoc Software Developer's Kit contains:

- **FingerLoc Sensor Module** (USB version)
- **Distribution Compact Disk**

Software...

FingerLoc Aware application
FingerLoc server software, including DLLs
Source code for demonstration applications
Software libraries

Publications...

Some of the documents listed below are supplied in Portable Document Format (PDF) – Adobe *Acrobat Reader*™ or some other PDF viewer is required to view them. You can download a complimentary copy of *Acrobat Reader* from **www.adobe.com**.

FingerLoc Aware User's Guide
FingerLoc Sensor User's Guide (USB version)
FingerLoc User Training Guide
Programmer's Reference Guide
ISV Installer Guide
ReadmePGM

- **Quick-Start Guide**

Use the *Quick-Start Guide* or see [Getting Started](#) in this document to install this kit.

The Reference Design Kit

Hardware developers who wish to manufacture equipment that incorporates the FingerLoc sensor IC should use the Reference Design Kit (RDK) for supporting information. The RDK includes extensive mechanical design, schematic, and photoplotter files that support the manufacture of printed wiring boards and housings for the sensor module.

RDK...

The FingerLoc Reference Design Kit contains:

- **FingerLoc Sensor Module** (USB version)
- **Distribution Compact Disc**

Software...

FingerLoc Aware application
FingerLoc server software
I/O Software *SecureSuite*™

Publications...

Some of the documents listed below are supplied in Portable Document Format (PDF) – Adobe *Acrobat Reader*™ or some other PDF viewer is required to view them. You can download a complimentary copy of *Acrobat Reader* from **www.adobe.com**.

FingerLoc Aware User's Guide
FingerLoc Sensor User's Guide (USB version)
FingerLoc User Training Guide
ISV Installer Guide
SecureSuite User's Manual
ReadmePGM
ReadmeHDW
Gerber (photoplotter) files
Hardware documentation (BOM, schematic, datasheet, jumper settings, etc.)
Housing Design Guide
Branding Diagram
Theory of Operation

- **Quick-Start Guide**

Use the *Quick-Start Guide* or see Getting Started in this document to install this kit. Additional setup information that is specific only to the RDK can be found in Appendix A.

Getting Started

With your kit you received a very brief *Quick-Start Guide* which will help you get your FingerLoc hardware and software up and running on your Pentium II personal computer as quickly as possible.

Using this guide, you will install FingerLoc Aware and other software, then attach the FingerLoc sensor module. If calibration or additional adjustment is necessary, refer to this publication, The *FingerLoc Sensor Kit User's Guide*.

Install the FingerLoc Sensor Kit in accordance with the three-step process in the *Quick Start Guide*. The necessary supporting software, drivers, and the FingerLoc Aware technology evaluation application will be automatically installed on your computer during the kit installation process.

General Information:

The ergonomic sensor module housing contains a new, all-digital FingerLoc sensor integrated circuit mounted on a printed wiring board, and equipped with a cable and USB connector. This assembly is powered directly from the Universal Serial Bus, so no external power supply is required.

Using the USB connection, the Sensor Module transmits fingerprint image data directly to the supporting PC where it becomes available to the user's biometric application.

For purposes of illustration, in this kit this process is modeled by the FingerLoc Aware application software, which uses information extracted from these images to "enroll" (register and identify) individual users. Details on the use of FingerLoc Aware can be found in the *FingerLoc Aware User's Guide* which can be found on the distribution compact disc.

System Requirements:

The minimum requirements for a personal computer system to support a FingerLoc Sensor Kit are:

- Pentium® II CPU
- 50 MB hard disc space
- 32 MB RAM
- Microsoft® Windows® 98/2000
- 800 × 600 dpi/256-color display

...and a free USB port

If your PC is not a USB machine, contact your AuthenTec representative because you need a different kit.

The FingerLoc Sensor Integrated Circuit

The FingerLoc fingerprint-imaging chip is a CMOS integrated circuit in a standard 68-pin PLCC format. The fingerprint detection area is an exposed, rectangular, active antenna array called the sensor matrix. This surface is very resistant to wear and abrasion, but it can be damaged by impacts or sharp objects, so reasonable care should be taken in handling and use. The sensor matrix is surrounded by an annular “drive ring” which generates the signal that the antenna array will detect.



ESD (Electrostatic Discharge) handling precautions are recommended if for any reason the FingerLoc sensor chip is removed from the sensor module.

TruePrint Technology

The superior acquisition rates and high reliability of the FingerLoc system are ensured by AuthenTec's unique, patented, TruePrint™ technologies:

- **Dynamic Optimization™** is a highly adaptive logical sensing mechanism that automatically adjusts during detection to improve discernment of various kinds of fingerprint features. Dynamic Optimization rejects noise and undesired artifacts – thus ensuring acquisition for even the most difficult fingerprints. More than fifteen operating parameters (such as gain and operating frequency) are managed in real-time, allowing the system to cope with an extremely wide range of skin conditions, surface contamination, and environmental situations.
- The powerful sensitivity of TruePrint permits **superior packaging**. The protective layer on the sensor detection matrix surface can be made much thicker than the average semiconductor surface coating. This robust barrier guards against abrasion, impact, and electrostatic discharge, ensuring durability and reliability in demanding real-world applications.
- TruePrint allows a **highly-integrated** sensor chip that does more with less, requiring fewer supporting components. This means lower-cost implementation and shorter time-to-market.

AuthenTec, Inc. has more than 25 patents that have been granted or are currently pending on the FingerLoc system and TruePrint technology.

Sensor Operation

TruePrint technology, the unique heart of AuthenTec's FingerLoc system, looks past the easily affected surface layer of the skin to the living layer beneath where fingerprint patterns originate. Here's how it works...

When a finger is placed on the sensor matrix, the drive ring energizes the fingerprint area, creating a tiny electrical field between the subdermal layer of the finger and the adjacent semiconductor detection area. This field mimics with great fidelity the unique configuration of the fingerprint's ridges and valleys. The antenna array measures the skin's subsurface features by sensing minute variations in the electrical field. The resulting image data is then transmitted to the supporting PC for further processing.

TruePrint thus produces an accurate, unaffected image under physical and environmental circumstances that defy the abilities of thermal, optical, and body-capacitance approaches to the problem. This allows the FingerLoc sensor to acquire difficult fingerprints that other technologies can not handle.

Sensor Specifications

Response time: <1 second, at a frame rate of greater than 5 frames/sec

Physical specifications:

Array density
Image resolution

Dynamic range

Active detection area 0.5 in
(c. 13mm) square
128 × 128 pixels
250 DPI (actual)
...up to 1024 (interpolated)
8-bit gray scale equivalent

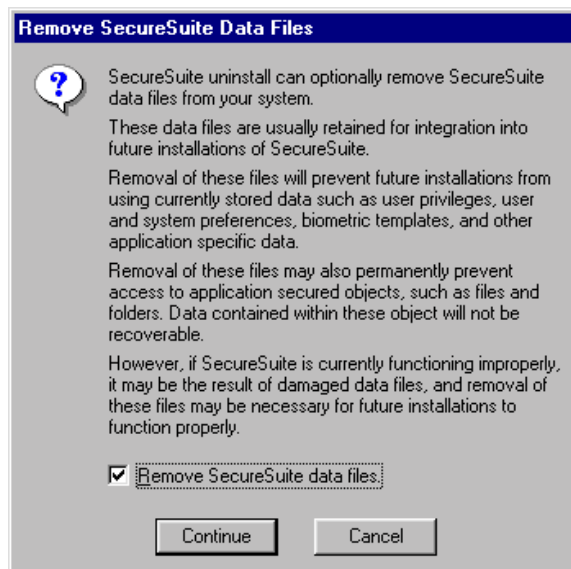
Installation

Because FingerLoc software is developed using only the latest tools from Microsoft, we strongly recommend that the user review the web-based Microsoft knowledge base for known problems, especially those related to the Universal Serial Bus (USB). To do this, conduct a keyword search on “USB” at:

<http://www.microsoft.com/technet/support/searchkb.asp>

1 Remove Existing Software...

To avoid potential software conflict problems, if **any** biometric or related security software exists on this computer, regardless of vendor, **uninstall** it using the **Add/Remove Programs** utility in the Windows Control Panel before proceeding. If the following screen appears during the removal process, select **Remove SecureSuite data files**, then click **Continue**.



When all previous biometric or security software has been removed, proceed with the FingerLoc software installation.

2 Install the FingerLoc Software Suite...

Insert the FingerLoc distribution compact disc. The installation program will automatically start, invoking the Installer Window. The options available through this window are:

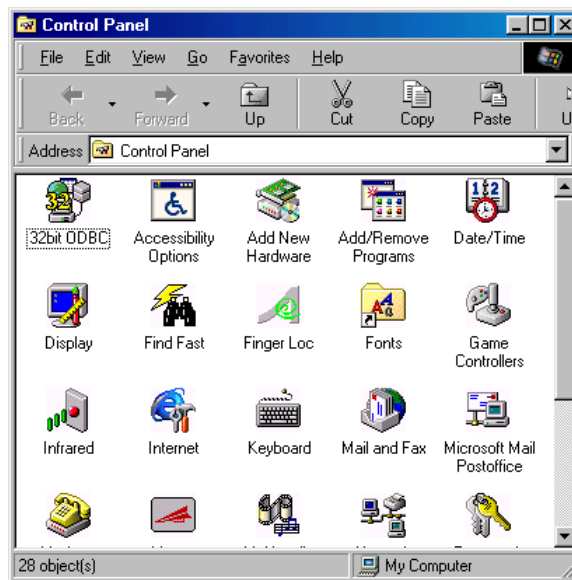
- **View the README File** – read any late-breaking information or cautions.

- **Install the FingerLoc Software**
- **Browse this Compact Disc** – view the contents of the compact disc in a window
- **Exit** – Return to the Windows desktop

Select **Install the FingerLoc Software**. The FingerLoc Aware program will be automatically installed on your computer. When this process is complete, click **Finish** to proceed.

Depending on the setup of your particular computer, you may be prompted at this point for a restart.

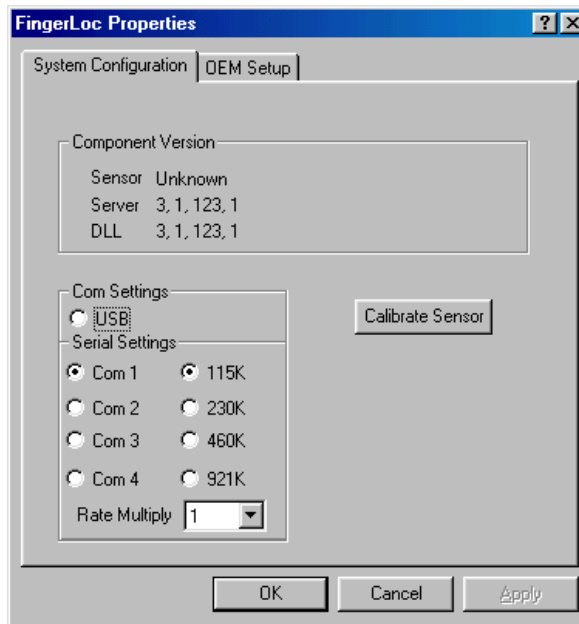
When the Windows desktop is again available, click the Windows **Start** button, then **Settings**, then **Control Panel** to open the Windows Control Panel, as seen in the following illustration.



Find the **FingerLoc** icon in the “Control Panel” screen that appears, and double-click it to display the “FingerLoc Properties” screen.

Note: The **OEM Setup** tab seen here is for use by RDK developers only. It may not be present in TEK and SDK installations. RDK users should see [Appendix A](#) for additional information.

The “FingerLoc Properties” screen will come up with the **USB** button in the **Com Settings** field selected. If not, click it to enable USB communications.



Click **OK** to proceed.

3 Attach the Sensor Module...

Plug the cable connector of the FingerLoc sensor module into an available USB port on your PC. The Universal Serial Bus communication protocol supports “hot plugging”, so it is not necessary to turn the PC OFF - but if it is turned OFF, turn it ON and allow it to boot after you plug in the cable.

Windows will automatically detect the FingerLoc sensor module as a USB device. Click **Next** to continue.



Windows will automatically locate the default USB driver file that was placed on the hard drive during the installation of the software.

Click **Finish** on the final screen to complete the installation of the USB driver. This completes the FingerLoc sensor module hardware and software installation process.

The AuthenTec FingerLoc Sensor Module, its supporting software, and FingerLoc Aware are now ready for use!

Sensor Calibration

The FingerLoc sensor automatically recalibrates itself each time the computer is rebooted. This process serves to adjust the detection parameters so that the sensor triggers properly when a finger is placed on it and, of equal importance, does not trigger inadvertently when no finger is present on the detection surface.

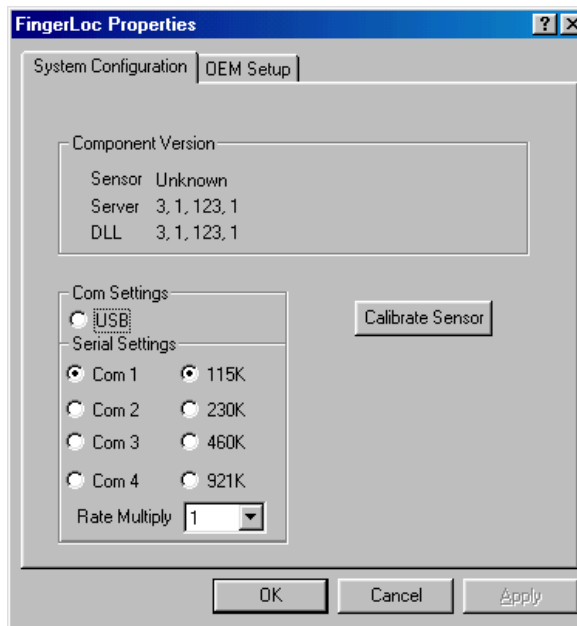
The FingerLoc software also automatically recalibrates the sensor every 30 minutes – the detection functions are sensitive to local environmental conditions such as temperature and humidity, and may drift over time – this automatic adjustment is particularly important when the computer is only restarted at long intervals.

The sensor should be recalibrated under the following conditions:

- If the FingerLoc Aware display screen shows bar patterns when no finger is present, indicating that the sensor is triggering inadvertently
- If no image appears on the display screen within a few seconds of placing a finger on the sensor detection surface
- When the communication protocol is changed - for example from conventional serial to USB.

The sensor can also be manually calibrated at any time. Use the following procedure:

- a. Click the Windows **Start** button, then **Settings**, then **Control Panel** to open the Windows Control Panel. Find the **FingerLoc** icon and double-click it to display the “FingerLoc Properties” screen, as shown below.



Note: The **OEM Setup** tab seen here may not be present in TEK and SDK installations. RDK users should see [Appendix A](#) for additional information.

- b. Click the **System Configuration** tab. With no finger on the sensor, click **Calibrate Sensor**, wait a few seconds, then click **OK** to close the screen. The FingerLoc sensor is now calibrated.

Caution: The FingerLoc system will not perform calibration properly if the sensor’s detection surface is touched during this process.

FingerLoc Aware

Double-click the Aware icon on your desktop to start the application...



Refer to the *FingerLoc Aware User's Guide* on the compact disc for additional information.

FingerLoc Aware can:

- Display FingerLoc fingerprint images
- Enroll new users
- Extract fingerprint templates and store them in a local database
- Match live fingerprints against the local database using AuthenTec's proprietary matching algorithms

Store images in **.BMP** graphic format (Windows bitmaps) for future reference, or to transfer into the user's own algorithm or other third-party software for fingerprint match testing

For Further Assistance

Troubleshooting FingerLoc Aware and the FingerLoc Sensor Kit

Most of the problems experienced by users of FingerLoc Aware and the FingerLoc Sensor Kit result from errors in connecting the hardware or installing the software. Check to be sure that the cable is properly connected and that the system is powered up. If necessary, uninstall the FingerLoc software suite (using the "Add/Remove Programs" facility in the Windows Control Panel) and reinstall it.

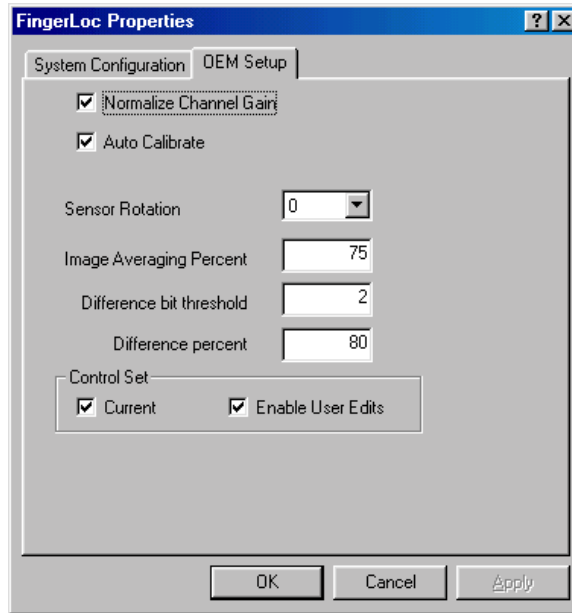
Be sure to read the **ReadmePGM.txt** file on the compact disc supplied with your FingerLoc Sensor kit. Known bugs, late-breaking news, work-arounds, and other discrepancies are documented in this file.

Customer Support

If you have any questions, or if you encounter a problem during installation or use you can obtain technical support by contacting AuthenTec Applications Engineering by e-mail at apps@authentec.com, or by telephone at 321-308-1300. Telephone support is available Monday through Friday, from 8 A.M. to 4 P.M. Eastern Standard Time.

Appendix A: OEM Setup

The Reference Design Kit (RDK) version of the FingerLoc software contains additional tools for OEM developers. The **OEM Setup** tab on the “FingerLoc Properties” screen is shown in the following illustration. It contains functions that may be useful to the developer.



Of these, only the following three should be changed by the developer:

- **Auto Calibrate** – Check or uncheck this box to toggle automatic calibration when the computer is restarted. Uncheck only if the OEM has supplied some other means of calibration.
- **Sensor Rotation** – Use this list box to select a finger approach angle to the sensor other than the default **0**, which indicates that the approach is to the side of the IC that contains Pin 1. The selections in the list increment around the IC in 90-degree steps.
- **Enable User Edits** – Check or uncheck this box in the Control Set field to toggle access to the system’s serial communication (Com) port settings. The developer might wish to prohibit Com port changes for security reasons.

The other values and parameters on the **OEM Setup** tab are intended for use with future versions of the sensor, or they support specialized installation procedures. **Do not change them without specific instruction from AuthenTec!**

Appendix B: Glossary

The entries in this list are technical terms of art, acronyms, and abbreviations, many or all of which can be found in AuthenTec publications.

acquisition	The accurate capture of the physical geometry of a fingerprint, suitable for processing by identification software
AFIS	<u>A</u> utomated <u>F</u> ingerprint <u>I</u> dentification <u>S</u> ystem
API	<u>A</u> pplication <u>P</u> rogram <u>I</u> nterface
ASIC	<u>A</u> pplication- <u>S</u> pecific <u>I</u> ntegrated <u>C</u> ircuit
ATM	<u>A</u> utomatic <u>T</u> eller <u>M</u> achine
BAPI	<u>B</u> iometrics <u>A</u> pplication <u>P</u> rogram <u>I</u> nterface
BIT	<u>B</u> uilt- <u>I</u> n <u>T</u> est
biometrics	The study of measurable biological characteristics, such as fingerprints, retinal patterns, facial configurations, voice qualities, and others
bit	<u>b</u> inary digit (a 1 or a 0)
capacitance	The property of an electrical non-conductor that permits the storage of energy
Caution	In a technical document, a Caution is information that describes a situation that could result in damage to the system hardware or software. See also Note and Warning .
CD-ROM	<u>C</u> ompact <u>D</u> isc – <u>R</u> ead <u>O</u> nly <u>M</u> emory. CD-ROM is the technology – a compact disc goes into a CD-ROM drive
chip	A casual term for an integrated circuit
corium	Synonym for dermis
CPU	<u>C</u> entral <u>P</u> rocessing <u>U</u> nit
CMOS	Complementary Metal-Oxide Semiconductor
cutaneous	Of, relating to, or affecting the skin
cuticle	The outermost layer of skin, mainly comprised of epidermis
cutis	Synonym for dermis
dactyl- or dactylo-dactylography	Combination form, “relating to fingers” The study of fingerprints and fingerprinting for the purpose of identification
dermatology	A branch of science dealing with the structure and function of the skin
dermis	The sensitive, vascular, inner mesodermic layer of the skin, also called corium or cutis .
DDS	Direct Digital Synthesis
DLL	Dynamic Link Library
DPI	Dots Per Inch
DRAM	Dynamic Random Access Memory

enroll	To learn the characteristics of a user's fingerprint and store an identification template of it in a database.
epidermis	The outer, non-vascular, non-sensitive layer of the skin, overlying the dermis . The most superficial layer of the skin.
ESD	Electrostatic Discharge
forensic friction skin	Belonging in, used in, or suitable to a court of law The traction-producing skin of the palmar (hand) or plantar (foot) surfaces that exhibit the characteristic ridges and valleys of the fingerprint
HA-API	Human Authentication Application Programming Interface – an initiative of the U.S. Department of Defense intended to, “Expand the use of biometrics by allowing the interchangeability of biometric technologies within a broad range of applications”
Hertz	A unit of frequency equal to one cycle per second
IC	Integrated Circuit
K	Kilobyte – one kilobyte is equal to 1,024 bytes
LSB	Least Significant Bit
MB	Megabyte - one megabyte is equal to 1,048,576 bytes or 1,024 kilobytes
minutia	A unique identifying feature in a given fingerprint. Plural is “minutiae”.
MSB	Most Significant Bit
Note	In a technical document, a Note is information that is of more than ordinary interest. See also Caution and Warning .
PC	Personal Computer Printed Circuit
PCB	Printed Circuit Board (deprecated, prefer PWB) Polychlorinated Biphenyls
pel	See pixel
PIN	Personal Identification Number
pixel	picture element – a single dot on the screen; the smallest possible image unit
PLCC	Plastic Leadless/Leaded Chip Carrier
PWB	Printed Wiring Board
RDK	Reference Design Kit
Rx	Receive, as an electrical signal
SDK	Software Developer's Kit
subcutaneous	Beneath the skin
TBD	To Be Determined/Developed



AuthenTec, Inc.
Personal Security for the Real World™

TEK	Technology Evaluation Kit
Tx	Transmit, as an electrical signal
ultrasound	Vibrations of the same physical nature as sound, but with frequencies above the range of human hearing (c. 20,000 Hertz)
USB	Universal Serial Bus
VAR	Value-Added Reseller
Warning	In a technical document, a Warning is information that describes a situation that could potentially result in injury or death to a human operator. See also Note and Caution

AuthenTec, Inc.
Personal security for the real world