



## American National Standard for Financial Services

# ANSI X9.84-2010 (R2017)

# Biometric Information Management and Security for the Financial Services Industry



Accredited Standards Committee X9, Incorporated  
Financial Industry Standards

**Date Approved: March 31, 2010**

**Date Reaffirmed: February 14, 2017**

American National Standards Institute

American National Standards, Technical Reports and Guides developed through the Accredited Standards Committee X9, Inc., are copyrighted. Copying these documents for personal or commercial use outside X9 membership agreements is prohibited without express written permission of the Accredited Standards Committee X9, Inc. For additional information please contact ASC X9, Inc., 275 West Street, Suite 107, Annapolis, MD 21401.

## ANSI X9.84-2010 (R2017)

### Foreword

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, directly and materially affected interests have reached substantial agreement. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

**CAUTION NOTICE:** This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken to reaffirm, revise, or withdraw this standard no later than five years from the date of approval.

Published by

Accredited Standards Committee X9, Incorporated  
Financial Industry Standards  
275 West Street, Suite 107  
Annapolis, MD 21401  
[www.x9.org](http://www.x9.org)

Copyright © 2017 by Accredited Standards Committee X9, Incorporated  
All rights reserved.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior written permission of the publisher. Printed in the United States of America

## Contents

Page

1	Scope .....	17
2	Conformance.....	17
3	Normative References .....	18
4	Terms and Definitions .....	19
5	Symbols and Abbreviated Terms.....	24
6	Biometric Technology Overview .....	26
6.1	Basics.....	26
6.2	Fingerprint Biometrics .....	26
6.3	Voice Biometrics .....	27
6.4	Iris Biometrics.....	27
6.5	Retina Biometrics.....	28
6.6	Face Biometrics .....	28
6.7	Hand Geometry Biometrics.....	28
6.8	Signature Biometrics.....	29
6.9	Technology Considerations .....	29
6.9.1	Biometric System Properties.....	29
6.9.2	Universality.....	29
6.9.3	Distinctiveness .....	30
6.9.4	Accuracy .....	30
6.9.5	Performance Evaluation.....	32
7	Basic Principles of Biometric Architectures .....	34
7.1	Major Components.....	34
7.2	Data Collection Subsystem.....	35
7.3	Transmission Subsystem.....	36
7.4	Signal Processing Subsystem .....	36
7.5	Matching Subsystem.....	37
7.6	Decision Subsystem .....	38
7.7	Storage Subsystem.....	38
8	Management and Security Requirements .....	39
8.1	Applications.....	39
8.2	Core Security Requirements.....	39
8.3	Enrollment.....	39
8.3.1	Initial Enrollment.....	40
8.3.2	Re-enrollment.....	41
8.4	Verification .....	41
8.5	Identification .....	43
8.6	Transmission and Storage .....	44
8.6.1	Transmission.....	44
8.6.2	Central Data Base.....	44
8.6.3	Tokens .....	45
8.7	Termination and Archive .....	45
8.7.1	Termination .....	45
8.7.2	Archiving .....	46
8.8	Compliance and the Event Journal.....	46
9	Techniques.....	47
9.1	Extending Biometric Template Information .....	47
9.1.1	Biometric Template Attributes.....	47
9.1.2	Required Attribute Support .....	48
9.1.3	Recommended Attribute Support.....	52
9.1.4	Compact Template Attributes .....	56

**ANSI X9.84-2010 (R2017)**

9.2	Cryptographic Techniques .....	58
9.2.1	Security Architecture .....	58
9.2.2	Key Management .....	59
9.2.3	Digital Signatures .....	60
9.2.4	Encryption for Purposes of Privacy .....	60
9.3	Physical Techniques.....	61
9.3.1	Protection Mechanisms .....	61
9.3.2	Types of Attack.....	61
9.3.3	Risk Analysis .....	61
Annex A (normative)	Biometric Information Schema.....	63
A.1	Introduction.....	63
A.1.1	Transfer Formats.....	63
A.1.2	XML Namespace.....	63
A.2	Biometric Schema .....	64
A.3	Information Object Identifiers .....	69
A.4	Biometric Event Journal Schema .....	71
A.5	Compact Template Attributes.....	74
Annex B (Normative)	Security Requirements for Biometric Devices .....	77
B.1	Physical Security .....	77
B.2	General Physical Security Requirements.....	77
B.3	Security Levels .....	78
B.3.1	Security Level 1 .....	78
B.3.2	Security Level 2 .....	78
B.3.3	Security Level 3 .....	78
Annex C (Normative)	Event Journal .....	80
C.1	Management Requirements .....	80
C.2	Content Requirements .....	81
C.2.1	Enrollment .....	81
C.2.2	Verification and Identification .....	81
C.2.3	Termination.....	81
C.2.4	Transmission and Storage .....	82
Annex D (Normative)	Biometric Matching Decision Control .....	84
D.1	Policy Based Matching Decisions .....	84
D.2	Decision Control Protocol.....	84
Annex E (Normative)	Biometric Event Information Management .....	85
E.1	Biometric Event Journal .....	85
E.1.1	Event Record Signature Creation.....	86
E.1.2	Event Record Signature Verification .....	86
E.2	Event Journal Records .....	86
E.2.1	Record Types .....	86
E.2.2	Common Elements.....	87
E.3	Event Types.....	87
E.3.1	Enrollment Event.....	87
E.3.2	Enrollment Failure Event.....	88
E.3.3	Authentication Events.....	89
E.3.4	Verification Failure Event .....	90
E.3.5	Identification Failure Event .....	90
E.3.6	Termination Event .....	91
E.3.7	Addition Event .....	91
E.3.8	Deletion Event .....	91
E.3.9	Modification Event.....	92
E.3.10	Injection Event.....	92
E.3.11	Summary Record.....	93
E.3.12	Archive Event .....	93
E.3.13	Event Journal Protection .....	94
Annex F (Normative)	Biometric Validation Control Objectives .....	95

**ANSI X9.84-2010 (R2017)**

F.1	Introduction .....	95
F.2	Environmental Controls.....	96
F.2.1	Security Policy.....	96
F.2.2	Security Organization.....	97
F.2.3	Asset Classification and Management.....	97
F.2.4	Personnel Security.....	98
F.2.5	Physical and Environmental Security .....	98
F.2.6	Operations Management .....	99
F.2.7	System Access Management .....	100
F.2.8	Systems Development and Maintenance .....	101
F.2.9	Business Continuity Management .....	102
F.2.10	Monitoring and Compliance .....	103
F.2.11	Event Journaling .....	104
F.3	Key Management Life Cycle Controls .....	106
F.3.1	Key Generation .....	106
F.3.2	Key Distribution.....	106
F.3.3	Key Loading/Insertion .....	107
F.3.4	Key Storage .....	107
F.3.5	Key Usage.....	108
F.3.6	Key Renewal.....	108
F.3.7	Key Backup and Recovery.....	108
F.3.8	Key Archival .....	108
F.3.9	Key Revocation and Destruction.....	109
F.3.10	Cryptographic Device Life Cycle Controls .....	109
F.4	Biometric Information Life Cycle Controls.....	111
F.4.1	Enrollment.....	111
F.4.2	Template Life Cycle .....	112
F.4.3	Verification and Identification Process Controls .....	113
F.4.4	Biometric Device Life Cycle Controls.....	114
F.4.5	Integrated Circuit Card (ICC) Life Cycle Controls.....	116
Annex G (Normative)	ISO 8583 Messages .....	119
G.1	Background .....	119
G.2	Biometric Authentication .....	120
G.2.1	Authentication Request.....	120
G.2.2	Authentication Response.....	120
G.3	Composite Data Elements .....	122
G.3.1	Structure.....	122
G.3.2	Dataset Identifiers .....	122
G.3.3	Dataset Length.....	123
G.3.4	Dataset Bit Maps (DBM) .....	123
G.3.5	Sub-elements .....	123
G.4	Data Elements.....	124
G.4.1	Data Element Directory.....	124
G.4.2	Verification Data (bit 49) .....	124
G.5	Message Protocol .....	125
G.5.1	General .....	125
G.5.2	Mandatory and Conditional Data Elements .....	125
G.6	Verification Messages.....	126
G.6.1	Verification Description .....	126
G.6.2	Verification Message Rules .....	126
G.6.3	Verification Message Type Identifiers.....	127
G.6.4	Verification Mandatory and Conditional Data Elements .....	127
G.6.5	Verification Message Flows .....	129
G.7	Code Listings .....	129
G.7.1	Composite Data Element Dataset Identifier Allocations .....	129
G.7.2	Function Codes (bit 24).....	129
G.7.3	Address Verification Result Codes (bits 49-72).....	130
G.8	Data Elements In Bit Number Order .....	131

**ANSI X9.84-2010 (R2017)**

Annex H (Informative) Data Flow Diagrams .....	133
H.1 Local Process, Remote Match .....	133
H.2 Remote Process, Remote Match .....	133
H.3 Optional Adaptation .....	133
H.4 Local Enrollment, Store Raw Biometric Data .....	134
H.5 Local Enrollment, Store Processed Biometric Data .....	134
H.6 Optional Distribution of Templates .....	134
H.7 Optional Distribution to Token .....	134
H.8 Remote Enrollment, Store Raw Biometric Data .....	134
H.9 Remote Enrollment, Store Processed Biometric Data .....	134
H.10 Remote Enrollment, Process and Store Biometric Data .....	134
H.11 Token-based Verification.....	135
H.12 Optional Token-based Adaptation.....	135
H.13 Personal Authentication, Self-contained System .....	135
Annex I (Informative) Biometric Enrollment .....	136
I.1 Identification Criteria for an Individual .....	136
I.2 Quality Check and Verification of Matchability .....	137
Annex J (Informative) Security Considerations .....	138
J.1 Registration of Individual Using False Identity .....	138
J.2 Fraud Susceptibility within Data Collection “Synthetic Attack” .....	138
J.3 Protection of the Data.....	139
J.3.1 Injection of False/Replayed Biometric Data .....	139
J.3.2 Search for Match Between Chosen Sample And Templates .....	140
J.3.3 Search for Match Between Pairs Of Templates .....	140
J.4 Modification of Verification Result .....	141
J.5 False Match versus False Non-Match.....	141
J.5.1 Improper Threshold Settings.....	143
J.5.2 Improper Device Calibration.....	143
J.5.3 Illicit Device or System Performance.....	143
J.6 Scores and Thresholds .....	143
J.6.1 Hillclimbing Attack .....	143
J.6.2 Update and Adaptation.....	144
J.7 Single versus Multi-Factor Authentication .....	145
J.8 Testing .....	146
J.9 Open versus Closed Systems .....	147
J.10 Compromise/Loss of Biometric Data.....	149
J.11 Data Compression.....	149
J.12 System Circumvention .....	149
Annex K (Informative) Public Acceptance and Policy Considerations.....	150
Annex L (Informative) Comparison of Other Biometric Standards .....	151
L.1 Overview.....	151
L.2 Organizations .....	151
L.2.1 ISO .....	152
L.2.2 JTC1 .....	152
L.2.3 ANSI .....	153
L.2.4 ASC X9.....	153
L.2.5 INCITS.....	154
L.2.6 IETF.....	155
L.2.7 OASIS.....	155
L.2.8 BioAPI.....	156
L.2.9 Biometric Consortium .....	156
L.2.10 NIST .....	156
L.3 Biometric Applications .....	157
L.4 Security Requirements .....	159
L.5 Biometric Security.....	159
L.6 Validation Control Objectives .....	160

L.7	Security and Interoperability .....	161
	Annex M (Informative) Business Cases .....	163
M.1	Cash Desks, Drawers, and Safes .....	163
M.2	Check Fraud Detection .....	163
M.3	Check Fraud Prevention .....	164
M.4	Branch Crime Prevention .....	164
M.5	Credit Card Activation .....	164
M.6	Cardless ATM and POS .....	164
	Bibliography .....	166

## List of Figures

Figure 1	Major Components of a Generalized Biometric Architecture .....	35
Figure 2	Environmental Context for a Biometric System .....	35
Figure 3	Enrollment Model .....	40
Figure 4	Verification Model .....	42
Figure 5	Identification Model .....	43
Figure 6	Distribution Model .....	44
Figure 7	Token Verification Model .....	45
Figure 8	Security Architectures .....	58
Figure G. 1—	Dataset identifiers 01-70 .....	123
Figure G. 2—	Dataset identifiers 71-FE .....	123
Figure G. 3—	Verification message flow .....	129
Figure L. 1-	Standards Organizations .....	151
Figure L. 2-	BioAPI Specification .....	158
Figure L. 3—	Biometric Object .....	160
Figure L. 4-	Biometric Architecture .....	161

## List of Tables

Table G. 1—	Biometric verification request .....	120
Table G. 2—	Biometric identification request .....	120
Table G. 3—	Example biometric authentication request .....	120
Table G. 4—	Response code .....	121
Table G. 5—	Identification response with data .....	121
Table G. 6—	Biometric authentication result codes .....	121
Table G. 7—	Data element directory .....	124
Table G. 8—	Verification request data .....	124
Table G. 9—	Verification results data .....	125
Table G. 10—	Data element condition codes .....	126
Table G. 11—	Verification message type identifiers .....	127
Table G. 12—	Verification mandatory and conditional data elements .....	127
Table G. 13—	Composite dataset identifier allocations .....	129
Table G. 14—	Function codes .....	129
Table G. 15—	Address verification result codes .....	131
Table G. 16—	Data elements in bit number order .....	131
Table J.1	Closed versus Open Systems .....	148

## ANSI X9.84-2010 (R2017)

### Introduction

Business practice has changed with the introduction of computer-based technologies. The substitution of electronic transactions for their paper-based predecessors has reduced costs and improved efficiency. Trillions of dollars in funds and securities are transferred daily by telephone, wire services, and other electronic communication mechanisms. The high value or sheer volume of such transactions within an open environment exposes the financial community and its customers to potentially severe risks from accidental or deliberate alteration, substitution or destruction of data. Interconnected networks, and the increased number and sophistication of malicious adversaries compound this risk.

The inevitable advent of electronic communications across uncontrolled public networks, such as the Internet, is also increasing risk to the financial industry. The necessity to expand business operations onto these environments has elevated the awareness for strong identification and authentication and created the need for alternate forms of identification and authentication. The financial community is responding to these needs.

Biometrics, the “something you are” identity factor, has come of age, and includes such technologies as finger image, voice identification, eye scan, facial image, and the like. The cost of biometric technology has been decreasing while the reliability has been increasing, and both are now acceptable and viable for the financial industry.

This Standard, ANSI X9.84-2010, *Biometrics Management and Security*, describes the cryptographic requirements, techniques, protocols and syntax for storage and transfer of biometric information, and for using biometrics as an identification mechanism and authentication mechanism for secure remote electronic access or local physical access controls for the financial services, or other industries.

Biometrics can be used for human identification and authentication for physical and logical access. Logical access can include access to applications, services, or entitlements. This standard promotes the integration of biometrics into the financial industry. It positions biometric technology to strengthen public key infrastructures (PKI) for higher identification and authentication by providing stronger methods as well as multi-factor authentication. In addition, this Standard allows continuous reassurance that the entity about to generate a digital signature is, in fact, the person authorized to access the private key.

The success of a biometric system with the public is based on a number of factors:

- Convenience and ease of use
- Level of apparent security
- Performance
- Non-invasiveness

These factors differ among the available biometric technologies. Fingerprint, face identification, speech identification, and verification of written signatures all appear to be well accepted, with only a small number of people concerned about abuse by law enforcement or other organizations.

Privacy considerations regarding the use of biometrics are an important issue and the reader is encouraged to investigate if any relevant statutes govern the use of biometrics in the locale(s) of the deployment. The use of some biometric technologies has raised objections due to religious beliefs. Others have been thought to be intrusive because their use requires physical interaction. If raw biometric data will be stored in the system, user agreement may need to be obtained prior to or during enrollment. Besides, biometric protection policy may be disclosed to address privacy or legal concerns.

The authentication systems discussed in this standard are those for a closed user groups in which the group



**ANSI X9.84-2010 (R2017)**

members have agreed to use biometric identification or perform identification themselves. Such agreements might be explicit (e.g. service agreement) or implicit (e.g. entering a facility indicating a clear intent to conduct a transaction). Such systems that will be used to monitor an indefinite number of people are excluded from the scope of this technical report.

The techniques specified in this Standard are designed to maintain the integrity and confidentiality of biometric information and provide authentication. However, this standard does not guarantee that a particular implementation is secure. It is the responsibility of the financial institution to put an overall process in place with the necessary controls to ensure that the process is securely implemented. Furthermore, the controls should include the application of appropriate audit tests in order to verify compliance with this standard.

This standard assumes that the identity of the individual is recognized as part of the transaction process and that the use of the biometric is solely for the purpose of facilitating a financial transaction.

The techniques specified in this Standard are designed to maintain the integrity and confidentiality of biometric information and provide strong authentication. However, the Standard does not guarantee that a particular implementation is secure. It is the responsibility of the financial institution to put an overall process in place with the necessary controls to ensure that the process is securely implemented. Furthermore, the controls should include the application of appropriate audit tests in order to verify compliance with this Standard.

NOTE The user's attention is called to the possibility that compliance with this technical report may require use of an invention covered by patent rights.

By publication of this technical report, no position is taken with respect to the validity of this claim or of any patent rights in connection therewith. The patent holder has, however, filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license. Details may be obtained from the standards developer.

Suggestions for the improvement or revision of this Standard are welcome. They should be sent to the X9 Committee Secretariat, Accredited Standards Committee X9 Incorporated, Financial Industry Standards, 275 West Street, Suite 107, Annapolis MD 21401.

This Standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Financial Services, X9. Committee approval of the Standard does not necessarily imply that all the committee members voted for its approval.

At the time this standard was published, the X9 committee had the following members:

- Roy DeCicco, X9 Chairman
- Vincent DeSantis, X9 Vice-Chairman
- Steve Stevens, Executive Director
- Janet Busch, Program Manager

<i>Organization Represented</i> .....	<i>Representative</i>
ACI Worldwide .....	Doug Grote
ACI Worldwide .....	Cindy Rink
American Bankers Association .....	Tom Judd
American Bankers Association .....	Diane C. Poole
American Express Company .....	Ted Peirce
Apriva .....	Len Sutton
Bank of America .....	Andi Coleman
Bank of America .....	Daniel Welch
Certicom Corporation.....	Daniel Brown
Citigroup, Inc.....	Mark Clancy
Citigroup, Inc.....	Michael Knorr
Citigroup, Inc.....	Karla McKenna
Citigroup, Inc.....	Chii-Ren Tsai

**ANSI X9.84-2010 (R2017)**

Citigroup, Inc. ....	Gary Word
CUSIP Service Bureau.....	Gerard Faulkner
CUSIP Service Bureau.....	James Taylor
Deluxe Corporation .....	John FitzPatrick
Deluxe Corporation .....	Ralph Stolp
Diebold, Inc. ....	Anne Bayonnet
Diebold, Inc. ....	Bruce Chapa
Discover Financial Services .....	Dave Irwin
Discover Financial Services .....	Deana Morrow
Federal Reserve Bank .....	Deb Hjortland
Federal Reserve Bank .....	Claudia Swendseid
First Data Corporation.....	Todd Nuzum
First Data Corporation.....	Rick Van Luvender
Fiserv.....	Bud Beattie
Fiserv.....	Kevin Finn
Fiserv.....	Lori Hood
Fiserv.....	Dan Otten
Fiserv.....	Skip Smith
FIX Protocol Ltd .....	Jim Northey
FSTC, Financial Services Technology Consortium .....	Christine Nautiyal
FSTC, Financial Services Technology Consortium .....	Daniel Schutzer
FSTC, Financial Services Technology Consortium .....	Michael Versace
Harland Clarke .....	John McCleary
Hewlett Packard.....	Larry Hines
Hewlett Packard.....	Gary Lefkowitz
IBM Corporation.....	Todd Arnold
IFSA .....	Dexter Holt
IFSA .....	Dan Taylor
Ingenico.....	Alexandre Hellequin
Ingenico.....	Steve McKibben
Ingenico.....	John Spence
J.P. Morgan Chase & Co .....	Robert Blair
J.P. Morgan Chase & Co .....	Roy DeCicco
J.P. Morgan Chase & Co .....	Edward Koslow
J.P. Morgan Chase & Co .....	Jackie Pagan
J.P. Morgan Chase & Co .....	Charita Wamack
Key Innovations.....	Scott Spiker
Key Innovations.....	Paul Walters
KPMG LLP .....	Mark Lundin
MagTek, Inc. ....	Terry Benson
MagTek, Inc. ....	Jeff Duncan
MagTek, Inc. ....	Mimi Hart
MasterCard International.....	Mark Kamers
Merchant Advisory Group .....	Dodd Roberts
Metavante Image Solutions .....	Stephen Gibson-Saxty
NACHA The Electronic Payments Association .....	Nancy Grant
National Association of Convenience Stores .....	Michael Davis
National Association of Convenience Stores .....	Alan Thiemann
National Security Agency .....	Paul Timmel
NCR Corporation.....	David Norris
NCR Corporation.....	Steve Stevens
RMG-SWIFT .....	Jamie Shay
RouteOne .....	Mark Leonard
SWIFT/Pan Americas.....	Jean-Marie Eloy
SWIFT/Pan Americas.....	James Wills
The Clearing House .....	Vincent DeSantis
U.S. Bank .....	Brian Fickling

**ANSI X9.84-2010 (R2017)**

U.S. Bank.....	Gregg Walker
University Bank.....	Stephen Ranzini
University Bank.....	Michael Talley
VeriFone, Inc. ....	David Ezell
VeriFone, Inc. ....	Dave Faoro
VeriFone, Inc. ....	Allison Holland
VeriFone, Inc. ....	Doug Manchester
VeriFone, Inc. ....	Brad McGuinness
VeriFone, Inc. ....	Brenda Watlington
VISA.....	Brian Hamilton
VISA.....	John Sheets
VISA.....	Richard Sweeney
Wells Fargo Bank .....	Andrew Garner
Wells Fargo Bank .....	Mike McCormick
Wells Fargo Bank .....	Mike Rudolph
Wells Fargo Bank .....	Mark Tiggas
Wincor Nixdorf Inc .....	Ramesh Arunashalam
XBRL US, Inc.....	Mark Bolgiano

At the time this standard was approved, the X9F subcommittee on Data and Information Security had the following members:

Richard Sweeney, X9F Chair  
Sandra Lambert, X9F Vice Chair

<i>Organization Represented</i>	<i>Representative</i>
ACI Worldwide .....	Doug Grote
ACI Worldwide .....	Julie Samson
ACI Worldwide .....	Sid Sidner
American Bankers Association .....	Tom Judd
American Express Company .....	William J. Gray
American Express Company .....	Vicky Sammons
Bank of America.....	Dion Bellamy
Bank of America.....	Terrelle Carswell
Bank of America.....	Andi Coleman
Bank of America.....	Todd Inskeep
Bank of America.....	John McGraw
Bank of America.....	Chris Schrick
Bank of America.....	Daniel Welch
Certicom Corporation.....	Daniel Brown
Certicom Corporation.....	John O. Goyo
Certicom Corporation.....	Sandra Lambert
Certicom Corporation.....	Scott Vanstone
Citigroup, Inc.....	Mark Clancy
Citigroup, Inc.....	Susan Rhodes
Citigroup, Inc.....	Gary Word
Communications Security Establishment .....	Alan Poplove
Communications Security Establishment .....	Bridget Walshe
Cryptographic Assurance Services LLC .....	Ralph Poore
Cryptographic Assurance Services LLC .....	Jeff Stapleton
CUSIP Service Bureau .....	Scott Preiss
CUSIP Service Bureau .....	James Taylor
DeLap LLP .....	Steve Case
DeLap LLP .....	Darlene Kargel
Deluxe Corporation .....	John FitzPatrick
Deluxe Corporation .....	Ralph Stolp
Depository Trust and Clearing Corporation .....	Robert Palatnick

**ANSI X9.84-2010 (R2017)**

Diebold, Inc.....	Anne Bayonnet
Diebold, Inc.....	Bruce Chapa
Diebold, Inc.....	Laura Drozda
Diebold, Inc.....	Scott Harroff
Diebold, Inc.....	Jessica Wapole
Discover Financial Services .....	Julie Shaw
Entrust, Inc. ....	Sharon Boeyen
Entrust, Inc. ....	Miles Smid
Federal Reserve Bank.....	Darin Contini
Federal Reserve Bank.....	Pieralberto Deganello
Federal Reserve Bank.....	Deb Hjortland
Federal Reserve Bank.....	Mike Ram
Ferris and Associates, Inc. ....	J. Martin Ferris
First Data Corporation .....	Lisa Curry
First Data Corporation .....	Lilik Kazaryan
First Data Corporation .....	Todd Nuzum
First Data Corporation .....	Scott Quinn
First Data Corporation .....	Andrea Stallings
First Data Corporation .....	Rick Van Luvender
Fiserv.....	Bud Beattie
Fiserv.....	Mary Bland
Fiserv.....	Kevin Finn
Fiserv.....	Dennis Freiburg
Fiserv.....	Dan Otten
FSTC, Financial Services Technology Consortium.....	Christine Nautiyal
FSTC, Financial Services Technology Consortium.....	Daniel Schutzer
FSTC, Financial Services Technology Consortium.....	Michael Versace
Futurex .....	Greg Schmid
GEOBRIDGE Corporation.....	Jason Way
Harland Clarke.....	Joseph Filer
Harland Clarke.....	John McCleary
Harland Clarke.....	John Petrie
Heartland Payment Systems.....	Roger Cody
Heartland Payment Systems.....	Glenda Preen
Hewlett Packard .....	Larry Hines
Hewlett Packard .....	Susan Langford
Hewlett Packard .....	Gary Lefkowitz
Hypercom .....	Mohammed Arif
Hypercom .....	Gary Zempich
IBM Corporation .....	Todd Arnold
IBM Corporation .....	Michael Kelly
IFSA.....	Dexter Holt
InfoGard Laboratories .....	Doug Biggs
InfoGard Laboratories .....	Ken Kolstad
Ingenico .....	Alexandre Hellequin
Ingenico .....	John Spence
J.P. Morgan Chase & Co.....	Robert Blair
J.P. Morgan Chase & Co.....	Edward Koslow
J.P. Morgan Chase & Co.....	Kathleen Krupa
J.P. Morgan Chase & Co.....	Donna Meagher
J.P. Morgan Chase & Co.....	Jackie Pagan
J.P. Morgan Chase & Co.....	Shawn Shifflett
Key Innovations .....	Scott Spiker
KPMG LLP.....	Mark Lundin
MagTek, Inc.....	Terry Benson
MagTek, Inc.....	Jeff Duncan
MagTek, Inc.....	Mimi Hart

**ANSI X9.84-2010 (R2017)**

MasterCard International .....	Jeanne Moore
MasterCard International .....	Michael Ward
Merchant Advisory Group .....	Dodd Roberts
Metavante Image Solutions .....	Ron Schultz
National Institute of Standards and Technology .....	Elaine Barker
National Institute of Standards and Technology .....	Lawrence Bassham III
National Institute of Standards and Technology .....	William Burr
National Institute of Standards and Technology .....	Lily Chen
National Institute of Standards and Technology .....	David Cooper
National Institute of Standards and Technology .....	Morris Dworkin
National Institute of Standards and Technology .....	Randall Easter
National Institute of Standards and Technology .....	Sharon Keller
National Institute of Standards and Technology .....	John Kelsey
National Institute of Standards and Technology .....	Annabelle Lee
National Institute of Standards and Technology .....	Fernando Podio
National Security Agency .....	Mike Boyle
National Security Agency .....	Greg Gilbert
National Security Agency .....	Tim Havighurst
National Security Agency .....	Paul Timmel
National Security Agency .....	Debby Wallner
NCR Corporation .....	Charlie Harrow
NCR Corporation .....	Ali Lowden
NCR Corporation .....	David Norris
NCR Corporation .....	Ron Rogers
NCR Corporation .....	Steve Stevens
NCR Corporation .....	Ally Whytock
NTRU Cryptosystems, Inc. ....	Nick Howgrave-Graham
NTRU Cryptosystems, Inc. ....	Ari Singer
NTRU Cryptosystems, Inc. ....	William Whyte
Pitney Bowes, Inc. ....	Andrei Obrea
Pitney Bowes, Inc. ....	Leon Pintsov
Pitney Bowes, Inc. ....	Rick Ryan
Rosetta Technologies .....	Jim Maher
Rosetta Technologies .....	Paul Malinowski
RSA, The Security Division of EMC .....	James Randall
RSA, The Security Division of EMC .....	Steve Schmalz
Surety, Inc. ....	Dimitrios Andivahis
Surety, Inc. ....	Tom Klaff
Thales e-Security, Inc. ....	Colette Broadway
Thales e-Security, Inc. ....	Jose Diaz
Thales e-Security, Inc. ....	Tim Fox
Thales e-Security, Inc. ....	James Torjussen
The Clearing House .....	Vincent DeSantis
The Clearing House .....	Henry Farrar
The Clearing House .....	Susan Long
U.S. Bank .....	Glenn Marshall
U.S. Bank .....	Peter Skirvin
U.S. Bank .....	Robert Thomas
Unisys Corporation .....	David J. Concannon
Unisys Corporation .....	Navnit Shah
University Bank .....	Stephen Ranzini
University Bank .....	Michael Talley
VeriFone, Inc. ....	John Barrowman
VeriFone, Inc. ....	David Ezell
VeriFone, Inc. ....	Dave Faoro
VeriFone, Inc. ....	Doug Manchester
VeriFone, Inc. ....	Brad McGuinness
VeriFone, Inc. ....	Brenda Watlington

**ANSI X9.84-2010 (R2017)**

VISA .....	Leon Fell
VISA .....	Tara Kissoon
VISA .....	Chackan Lai
VISA .....	Stoddard Lambertson
VISA .....	Chris McDaniel
VISA .....	John Sheets
VISA .....	Richard Sweeney
VISA .....	Johan (Hans) Van Tilburg
Voltage Security, Inc. ....	Luther Martin
Voltage Security, Inc. ....	Terence Spies
Wells Fargo Bank .....	Mick Bauer
Wells Fargo Bank .....	Jason Buck
Wells Fargo Bank .....	Andrew Garner
Wells Fargo Bank .....	Jeff Jacoby
Wells Fargo Bank .....	Brian Keltner
Wells Fargo Bank .....	Israel Laracuente
Wells Fargo Bank .....	Eric Lengvenis
Wells Fargo Bank .....	Mike McCormick
Wells Fargo Bank .....	David Naelon
Wells Fargo Bank .....	Doug Pelton
Wells Fargo Bank .....	Chuck Perry
Wells Fargo Bank .....	Keith Ross
Wells Fargo Bank .....	Mike Rudolph
Wells Fargo Bank .....	Ruven Schwartz
Wells Fargo Bank .....	Craig Shorter
Wells Fargo Bank .....	Tony Stieber
Wincor Nixdorf Inc .....	Ramesh Arunashalam
Wincor Nixdorf Inc .....	Saul Caprio
Wincor Nixdorf Inc .....	Joerg-Peter Dohrs
Wincor Nixdorf Inc .....	Matthias Runowski
Wincor Nixdorf Inc .....	Adam Sandoval
Wincor Nixdorf Inc .....	Michael Waechter

Under ASC X9, Inc. procedures, a working group may be established to address specific segments of work under the ASC X9 Committee or one of its subcommittees. A working group exists only to develop standard(s) or guideline(s) in a specific area and is then disbanded. The individual experts are listed with their affiliated organizations. However, this does not imply that the organization has approved the content of the standard or guideline. (Note: Per X9 policy, company names of non-member participants are listed only if, at the time of publication, the X9 Secretariat received an original signed release permitting such company names to appear in print.)

The X9F4 Cryptographic Protocols and Application Security group which developed this standard had the following members:

At the time this standard was approved, the X9F4 Cryptographic Protocol and Application Security working group which developed this standard had the following active members:

Jeff Stapleton, X9F4 Chair  
 Sandra Lambert, X9F4 Vice Chair  
 Mike Rudolph, X9.84 Editor

<i>Organization Represented</i>	<i>Representative</i>
Bank of America .....	Andi Coleman
Certicom Corporation .....	Sandra Lambert
Certicom Corporation .....	Scott Vanstone
Cryptographic Assurance Services LLC .....	Ralph Poore
Cryptographic Assurance Services LLC .....	Jeff Stapleton

**ANSI X9.84-2010 (R2017)**

DeLap LLP .....	Steve Case
DeLap LLP .....	Darlene Kargel
Diebold, Inc. ....	Anne Bayonnet
Diebold, Inc. ....	Bruce Chapa
Diebold, Inc. ....	Scott Harroff
Diebold, Inc. ....	Jessica Wapole
Discover Financial Services .....	Julie Shaw
Entrust, Inc. ....	Sharon Boeyen
Entrust, Inc. ....	Sheila Brand
Entrust, Inc. ....	Miles Smid
Ernst and Young .....	Keith Sollers
Federal Reserve Bank .....	Darin Contini
Federal Reserve Bank .....	Pieralberto Deganello
Federal Reserve Bank .....	Deb Hjortland
Federal Reserve Bank .....	Mike Ram
First Data Corporation.....	Lilik Kazaryan
First Data Corporation.....	Brian Kean
First Data Corporation.....	Todd Nuzum
Fiserv .....	Dennis Freiburg
Fiserv .....	Dan Otten
FSTC, Financial Services Technology Consortium .....	Christine Nautiyal
FSTC, Financial Services Technology Consortium .....	Michael Versace
Futurex .....	Greg Schmid
GEOBRIDGE Corporation .....	Jason Way
Harland Clarke .....	John McCleary
Harland Clarke .....	John Petrie
Hewlett Packard .....	Larry Hines
Hypercom.....	Mohammed Arif
Hypercom.....	Gary Zempich
IBM Corporation .....	Todd Arnold
IBM Corporation .....	Phillip Griffin
IBM Corporation .....	Michael Kelly
IFSA .....	Dexter Holt
InfoGard Laboratories .....	Doug Biggs
InfoGard Laboratories .....	Ken Kolstad
Ingenico.....	Alexandre Hellequin
Ingenico.....	John Spence
J.P. Morgan Chase & Co .....	Sean Croston
J.P. Morgan Chase & Co .....	Leonid Vayner
KPMG LLP .....	Mark Lundin
MagTek, Inc. ....	Terry Benson
Merchant Advisory Group .....	Dodd Roberts
National Institute of Standards and Technology .....	Elaine Barker
National Institute of Standards and Technology .....	Lily Chen
National Security Agency.....	Greg Gilbert
National Security Agency.....	Tim Havighurst
National Security Agency.....	Paul Timmel
NCR Corporation .....	Charlie Harrow
NCR Corporation .....	Steve Stevens
NTRU Cryptosystems, Inc. ....	Ari Singer
NTRU Cryptosystems, Inc. ....	William Whyte
RSA, The Security Division of EMC.....	James Randall
Sun Microsystems PS.....	Joel Weise
Surety, Inc. ....	Dimitrios Andivahis
Thales e-Security, Inc. ....	Tim Fox
Thales e-Security, Inc. ....	James Torjussen
Transaction Network Services, Inc. ....	Kevin Gateman
Transaction Network Services, Inc. ....	Luc Saaka

**ANSI X9.84-2010 (R2017)**

Transaction Network Services, Inc.....	Travis Lee
U.S. Bank .....	Peter Skirvin
U.S. Bank .....	Rush Wilson
Unisys Corporation .....	David J. Concannon
University Bank.....	Stephen Ranzini
University Bank.....	Michael Talley
VeriFone, Inc. ....	Dave Faoro
VeriFone, Inc. ....	Doug Manchester
VISA .....	Leon Fell
VISA .....	Tara Kissoon
VISA .....	Chackan Lai
VISA .....	Chris McDaniel
VISA .....	Richard Sweeney
VISA .....	Johan (Hans) Van Tilburg
Voltage Security, Inc. ....	Luther Martin
Wells Fargo Bank .....	Mick Bauer
Wells Fargo Bank .....	Jeff Jacoby
Wells Fargo Bank .....	Brian Keltner
Wells Fargo Bank .....	Eric Lengvenis
Wells Fargo Bank .....	Mike McCormick
Wells Fargo Bank .....	David Naelon
Wells Fargo Bank .....	Doug Pelton
Wells Fargo Bank .....	Mike Rudolph
Wells Fargo Bank .....	Ruven Schwartz
Wincor Nixdorf Inc .....	Matthias Runowski

The X9F4 Working Group had the following liaison relationships:

<u>Liaison Organization</u>	<u>Representative</u>
ISO TC68 Subcommittee 2 Security And General Banking Operations..... • Working Group 10 Biometric Information Security	Michael Versace (chair) Phillip H. Griffin (vice chair) Mike McCormick (US expert)
ISO JCT1 Subcommittee 27 Information Security Techniques.....	Phillip H. Griffin (liaison)
ISO JCT1 Subcommittee 37 Biometrics.....	Brian Rose (liaison)



# Biometric Information Management and Security for the Financial Services Industry

## 1 Scope

This Standard describes the security framework for using biometrics for authentication of individuals in financial services. It introduces the types of biometric technologies and addresses issues concerning their application. This Standard also describes the architectures for implementation, specifies the minimum security requirements for effective management, and provides control objectives and recommendations suitable for use by a professional practitioner. Within the scope of this Standard the following topics are addressed:

- Security for the collection, distribution, and processing, of biometric data, encompassing data integrity, authenticity, and non-repudiation.
- Management of biometric data across its life cycle comprised of the enrollment, transmission and storage, verification, identification, and termination processes.
- Usage of biometric technology, including one-to-one and one-to-many matching, for the identification and authentication of banking customers and employees.
- Application of biometric technology for internal and external, as well as logical and physical access control.
- Encapsulation<sup>1</sup> and cryptographic protection of biometric information for security, interoperability, and data confidentiality..
- Secure transmission and storage of biometric information during its life cycle.
- Security of the physical hardware used throughout the biometric data life cycle.
- Cryptographic techniques for data integrity, authenticity, and data confidentiality of biometric information.
- Validation of credentials presented at enrollment to support authentication as required by risk management;
- Surveillance to protect the financial institution and its customers;

Items considered out of scope and not addressed in this Standard include the following:

- The individual's privacy and ownership of biometric information.
- Specific techniques for data collection, signal processing, and matching of biometric data, and the biometric matching decision-making process;
- Usage of biometric technology for non-authentication convenience applications such as speech recognition, user interaction, and anonymous access control.

Although this Standard does not address specific requirements and limitations of business application employing biometric technology, other standards may address these topics.

## 2 Conformance

A biometric authentication system may claim compliance to this standard if the implementation satisfies the management and security requirements identified in §8 *Management and Security Requirements*.

---

<sup>1</sup> Analogous to the ANSI PIN Block, refer to ANSI X9.8 and ISO 9564 PIN Management and Security standards.