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Draft NIST Special Publication 800-85B-4

PIV Data Model Test Guidelines

Ramaswamy Chandramouli
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Ketan Mehta
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COMPUTER SECURITY

NIST
National Institute of
Standards and Technology
U.S. Department of Commerce

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U.S. Department of Commerce
Penny Pritzker, Secretary

National Institute of Standards and Technology
Willie May, Acting Under Secretary of Commerce for Standards and Technology and Acting Director

Authority

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Reports on Computer Systems Technology

The Information Technology Laboratory (ITL) at the National Institute of Standards and Technology (NIST) promotes the U.S. economy and public welfare by providing technical leadership for the Nation's measurement and standards infrastructure. ITL develops tests, test methods, reference data, proof of concept implementations, and technical analyses to advance the development and productive use of information technology. ITL's responsibilities include the development of management, administrative, technical, and physical standards and guidelines for the cost-effective security and privacy of other than national security-related information in Federal information systems. The Special Publication 800-series reports on ITL's research, guidelines, and outreach efforts in information system security, and its collaborative activities with industry, government, and academic organizations.

Abstract

FIPS201 describes a variety of data model components as a part of the PIV logical credentials. Such components include biometric elements in the form of fingerprint information and facial imagery and security elements such as electronic keys, certificates, and signatures. FIPS201 incorporates by reference NIST Special Publication 800-73-4 (SP80073), which specifies elements related to the PIV card interface, NIST Special Publication 800-76 (SP80076), which specifies the biometric requirements, and NIST Special Publication 800-78 (SP80078), which specifies acceptable cryptographic algorithms and key sizes for PIV systems.

A robust testing framework and guidelines to provide assurance that a particular component or system is compliant with FIPS201 and supporting standards should exist to build the necessary PIV infrastructure to support common unified processes and systems for government-wide use. NIST developed test guidelines in two parts. The first part addresses test requirements for the interface to the PIV card, which are provided in NIST Special Publication 800-85A (SP80085A). The second part provides test requirements for the PIV data model and is provided in this document. This document specifies the derived test requirements, and the detailed test assertions and conformance tests for testing the PIV data model.

Keywords

BER-TLV testing; biometrics; certificate conformance test; FIPS 201; identity credential; implementation under test (IUT); PIV data model; Personal Identity Verification (PIV); smart cards

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Executive Summary

Homeland Security Presidential Directive 12 (HSPD-12) called for a new standard to be adopted governing the use of common identity credentials for physical and logical access to Federal government locations and systems. The Personal Identity Verification (PIV) standard for Federal Employees and Contractors, Federal Information Processing Standard 201 (FIPS201), was developed to establish government-wide identity credentials. Credentials are issued to individuals whose true identity has been verified and whose need for the credential has been established and authorized by proper authorities.

FIPS201 describes a variety of data model components as a part of the PIV logical credentials. Such components include biometric elements in the form of fingerprint information, facial and iris imagery, and security elements for electronic keys, certificates. FIPS201 incorporates by reference NIST Special Publication 800-73 (SP80073), which specifies elements related to the PIV card interface, NIST Special Publication 800-76 (SP80076), which specifies the biometric requirements, and NIST Special Publication 800-78 (SP80078) which details acceptable cryptographic algorithms and key sizes for PIV systems.

A robust testing framework and guidance to provide assurance that a particular component or system is compliant with FIPS201 and supporting standards should exist to build the necessary PIV infrastructure to support common unified processes and systems for government-wide use. NIST developed test guidance in two parts. The first part addresses test requirements to interface with the PIV card and is provided in SP80085A. The second part provides test requirements for the PIV data model of the PIV card and is provided in this document. This document specifies the derived test requirements, and the detailed test assertions and conformance tests for testing the PIV card's data model.

ALIGNING REVISION NUMBERS**WHAT HAPPENED TO SPECIAL PUBLICATION 800-85B REVISIONS 2 AND 3?**

Revision numbers between NIST Special Publications 800-73 and 800-85B were misaligned from the start because the initial publication of SP 800-85B did not occur until after the publication of SP 800-73, Revision 1. When SP 800-73, Revision 4 was published, SP 800-85B was updated to Revision 1 for consistency with the updates to SP 800-73. This revision number mismatch created ongoing uncertainty and confusion regarding which revision of SP 800-85B was consistent with which revision of SP 800-73. To reduce this uncertainty going forward, revision numbers 1, 2 and 3 have been skipped for SP 800-85B, and this version of SP 800-85B has been given revision number 4 (SP 800-85B-4) since this version is consistent with the updates to SP 800-73, Revision 4. Future revisions of SPs 800-73 and 800-85A will maintain the revision number consistency.

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1. Introduction

1.1 Authority

This document has been developed by the National Institute of Standards and Technology (NIST) in furtherance of its statutory responsibilities under the Federal Information Security Management Act (FISMA) of 2002, Public Law 107-347.

NIST is responsible for developing standards and guidelines, including minimum requirements, for providing adequate information security for all agency operations and assets, but such standards and guidelines shall not apply to national security systems. This recommendation is consistent with the requirements of the Office of Management and Budget (OMB) Circular A-130, Section 8b(3), Securing Agency Information Systems, as analyzed in A-130, Appendix IV: Analysis of Key Sections. Supplemental information is provided in A-130, Appendix III.

This recommendation has been prepared for use by Federal agencies. It may be used by non-governmental organizations on a voluntary basis and is not subject to copyright. Nothing in this document should be taken to contradict standards and guidelines made mandatory and binding on Federal agencies by the Secretary of Commerce under statutory authority. Nor should this recommendation be interpreted as altering or superseding the existing authorities of the Secretary of Commerce, Director of OMB, or any other Federal official.

1.2 Purpose and Scope

The Federal Information Processing Standard 201 (FIPS201) establishes a system for verifying an individual employee or contractor's identity in a reliable, secure, and interoperable manner across the Federal government. Credentials are issued to individuals whose true identity has been verified and whose need for the credential has been established and authorized by proper authorities. FIPS201 also describes a variety of authentication mechanisms, including the use of cryptographic mechanisms and biometric data belonging to cardholders.

In order to build the necessary Personal Identity Verification (PIV) infrastructure to support common unified processes and systems for government-wide use, there must be a robust testing framework to provide assurance that a particular component or system is compliant with FIPS201 and companion specifications. This test guideline document specifies the derived test requirements, detailed test assertions, and conformance tests for testing the data elements of the PIV system as per specifications laid out in FIPS201, SP80073, SP80076, and SP80078.

This document does not provide conformance tests for any other software used in the PIV system such as the back-end access control software, card issuance software, and specialized service provider software. Specifically, this document does not provide test requirements for the PIV card interface, FIPS 140-2 validation, key generation and certificate binding, cryptographic algorithms, biometric enrollment and verification processes¹, performance of biometric products, and non-PIV aspects of external biometric standards and profiles.

This document provides technical guidelines on the methodology to be used during testing applicable PIV cards, but does not provide normative guidelines on which entities will execute the tests. Also, the

¹ Testing of biometric processing performance using measures such as False Accept Rate (FAR) is described in Section 7 of SP80076.

39 test methodologies defined in this document are not designed to test business processes or to verify
40 compliance with external applicable standards. For example, this document does not provide test
41 guidelines to determine how good a user's Personal Identification Number (PIN) choice is or how
42 access rights are granted to employees.

43 **1.3 Audience and Assumptions**

44 This document is targeted at vendors and integrators of card management systems as well as the
45 entities that will conduct tests on such systems. Readers are assumed to have a working knowledge of
46 FIPS201, PIV guidelines, and applicable technologies.

47 This document will:

48 Enable developers of card management systems to design PIV card personalization modules to be
49 testable for requirements specified in FIPS201, SP80073, SP80076, and SP80078.

50 Enable developers of these systems to develop self-tests as part of the development effort.

51 Enable testers to develop tests that cover the test suite provided in this document.

52

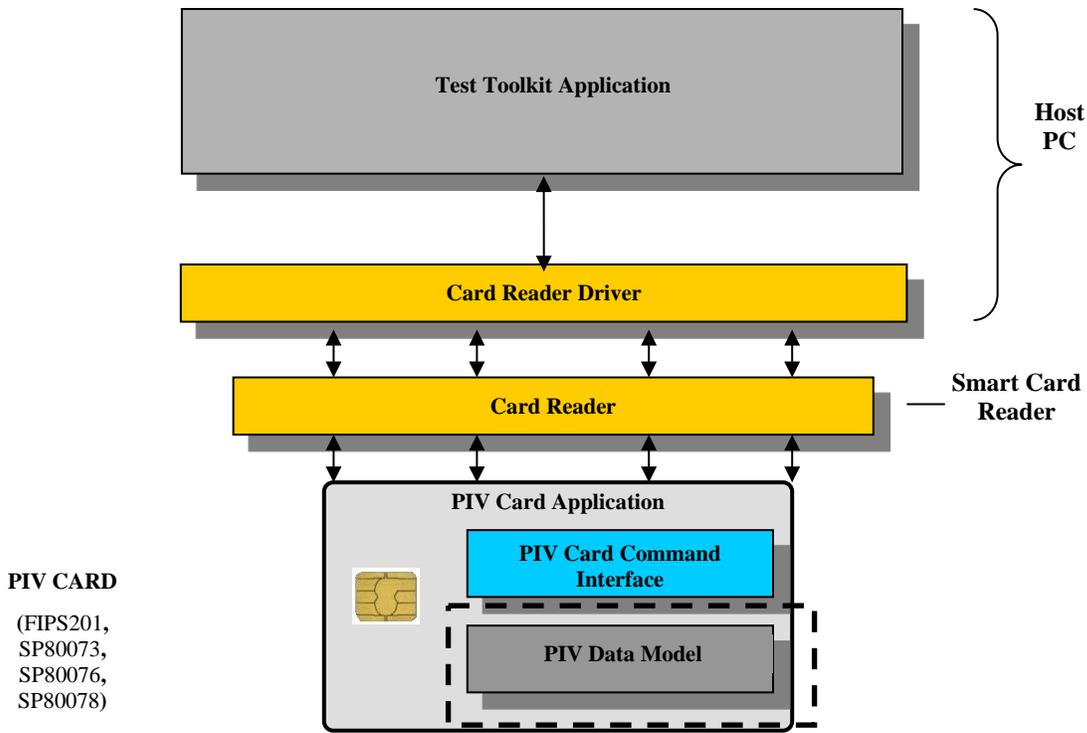
53

54 **2. Conformance Test Overview**

55 The conformance testing guidelines in this document applies to the testing of the PIV card’s data
 56 data model. The data model requirements are extracted from FIPS201, SP80073, SP80076, and SP80078.
 57 This overview section provides a high-level conformance test architecture for testing the PIV
 58 card’s data model. The conformance test architecture is confined to a personalized PIV card. In
 59 other words, the conformance test approach views the card issuance system as a “black box,”
 60 meaning that the interface of that system is opaque and its implementation details are not
 61 relevant to the testing. The PIV data model testing operates under the assumption that the PIV
 62 card being tested has already been personalized as described in Sections 2.8 and 2.9 of FIPS201.
 63 The following sections provide the details of data model testing, test architecture, test
 64 methodology, and test areas.

65 **2.1 Test Architecture**

66 The conceptual architecture for data model testing is shown in Figure 1. The conformance test in
 67 this document applies to the area highlighted with dashed lines. SP80085A addresses the writing
 68 and extracting of data from the card and subsequently, those processes are not addressed in this
 69 document.



70
71 **Figure 1: PIV Conformance Test Architecture**

72 The PIV data model defines the logical use of the on-card application space including the
 73 SP80073 Part 1 required data objects and data elements along with the size and structure of each
 74 object.

75 The PIV data model test includes the testing of the following aspects of a PIV card’s data:

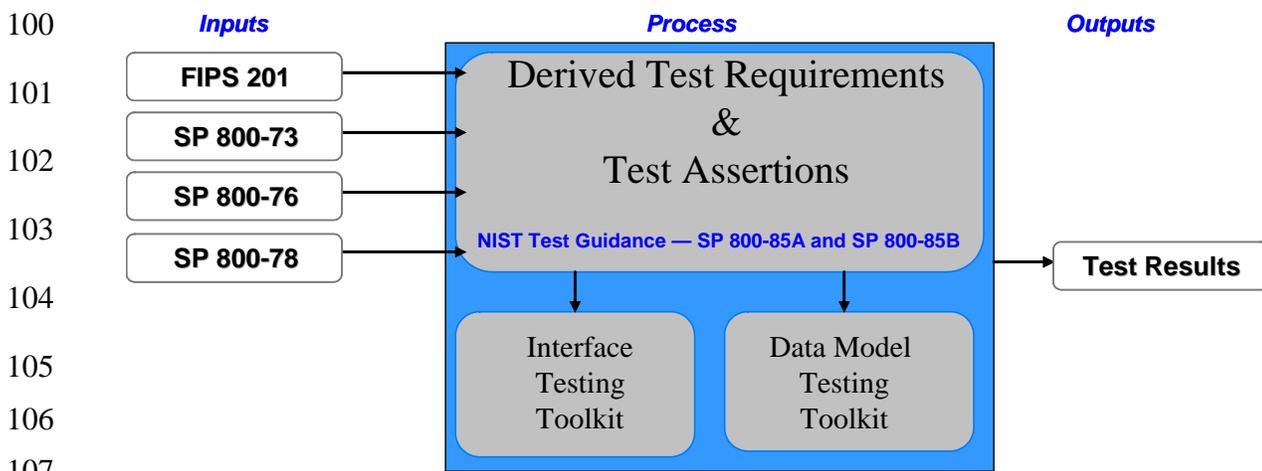
- 76 + Basic Encoding Rules Tag-Length-Value (BER-TLV) Format Conformance as per
77 Appendix A of [SP80073](#) Part 1 for all objects.
- 78 + Conformance of the Signature Block to Cryptographic Message Syntax (CMS) Signature
79 format for all signed objects.
- 80 + Conformance of the two mandatory biometric objects (Card Holder Fingerprints and
81 Facial Image), and the optional biometric iris object to the Common Biometric Exchange
82 Formats Framework (CBEFF) Header format as well as to ANSI/INCITS 378,
83 ANSI/INCITS 385, and ISO/IEC 19794-6 profiles respectively. The OCC BIT Group
84 Template shall conform to Table 7 of [SP80076](#).
- 85 + Conformance to Federal Public Key Infrastructure Policy Authority (FPKIPA) profiles
86 for all Public Key Infrastructure (PKI) Certificates.

87 2.2 Test Methodology

88 The data model testing was developed through the following two-step process:

- 89 + **Create Derived Test Requirements (DTRs)** — These are constructed from the data
90 format and content requirements in FIPS201, SP80073, SP80076, and SP80078 specifications.
- 91 + **Develop test assertions** — These provide the tests that need to be performed to test each
92 of the DTRs. The test assertions will include testing of data formats, values in the
93 individual fields, relationship among values in multiple fields and validate the
94 computations. Also, the test assertions include testing of the optional fields when they
95 are present.

96 Figure 2 depicts the test methodology adopted to provide complete guidelines for testing PIV
97 conformant products. SP80085A provides the DTRs and test assertions for the interfaces to the
98 PIV smart card and the PIV middleware. This document provides DTRs and test assertions for
99 the identity credentials stored on the PIV card.



108 **Figure 2: PIV Test Methodology**

109

110 **2.3 Test Set-up**

111 The test system consists of the following components:

- 112 + A test toolkit application software that resides on a personal computer.
- 113 + An ISO7816 and Personal Computer / Smart Card (PC/SC) compliant contact-based smart
114 card reader.
- 115 + A mechanism to input the PIN that can be transmitted to the smart card reader. Examples
116 of such mechanisms are a PIN pad or a keyboard.
- 117 + A set of test personalized PIV cards whose applications and interfaces are compliant with
118 [SP80073](#). All personalized biometric information is assumed to be collected and processed
119 by template generation and matching implementations that have been tested against
120 minimum performance qualification criteria established by NIST, OMB, and by Federal
121 agencies, as appropriate.

122 **2.4 Test Areas**

123 The test assertions in this document will validate that all PIV data objects conform to their
124 respective requirements. Conformance criteria include correct formatting and, when appropriate,
125 context specific content. Additionally, conformance will be based on correct computation of
126 content such as digital signatures. The DTRs and test assertions are designed to validate each
127 PIV data object such that the following three statements are true for the objects:

- 128 + PIV containers are formatted correctly,
- 129 + Field values are in accordance with the specifications, and
- 130 + Data consistency and value computations such as signatures are accurate.

131 Again, these requirements are not designed to test business processes or to verify external
132 compliance with applicable standards. For further clarification of the document scope, refer to
133 Section 1.2, Purpose and Scope.

134 **2.4.1 BER-TLV Format Conformance**

135 The tags and lengths in various data objects shall conform to specifications in Appendix A of
136 SP80073 Part 1. In addition some data objects may be tested for the valid values of data elements.

137 **2.4.2 Biometric Data Objects Conformance**

138 The two mandatory biometric objects, (Card Holder Fingerprints and Facial Image), and the
139 optional biometric iris object shall conform to the common CBEFF Header format as well as to
140 ANSI/INCITS 378, ANSI/INCITS 385, and ISO/IEC 19794-6 profiles respectively. The OCC
141 BIT Group Template shall conform to Table 7 of [SP80076](#).

142 **2.4.3 Digital Signature Blocks Conformance**

143 For all signed objects the fields in the signature block shall conform to the CMS syntax specified
144 in SP80073. In addition some data objects may be tested for the valid values of data elements.

145 2.4.4 PKI Certificate Profile Conformance

146 The mandatory PIV Authentication Certificate, Digital Signature, Key Management, Card
147 Authentication Certificate, and the Content Signing Certificate(s) shall conform to the certificate
148 profiles as specified in the X.509 Certificate and Certificate Revocation List (CRL) Extensions
149 Profile for the Shared Service Providers (SSP) Program (X509 Extensions).

150

151 **3. Test Methodology**

152 **3.1 Derived Test Requirements**

153 DTRs show the type of tests required based on the normative specifications in FIPS201 and
154 supporting special publications. Each DTR consists of the following:

155 **Actual statements taken/derived from the specification** — these include explicit statements
156 using the words "shall," "must," and other normative delimiters in the standard. The condition
157 statements are identified by codes starting with 'AS' followed by a running sequence.

158 **Required Vendor Information** — these include information that card vendors, card
159 management system vendors agencies or integrators are mandated to provide in their
160 documentation. The Required Vendor Information is identified by codes starting with 'VE'
161 followed by a running sequence.

162 **Required Test Procedures** — these are actions that the tester has to perform in order to satisfy
163 the requirements stated in actual condition statements. These include verifying the information
164 mandated in the "Required Vendor Information" for the condition as well as performing
165 software-based tests. Some of the required test procedures do not call explicitly for verification
166 of information in the associated "Required Vendor Information." In these instances it is
167 implicitly assumed that such information is provided by the vendor and verified by the tester.
168 The Required Test Procedures are identified by codes starting with 'TE' followed by a running
169 sequence that denotes the section in this document where they occur.

170 Validations of some DTRs are not covered by the test assertions provided in this document.
171 These DTRs require compliance of a component with an external specification or standard such
172 as the Electronic Biometric Transmission Specification. No required test procedures are
173 provided for these DTRs, and a note is added to indicate that "this assertion is externally tested."
174 The tester is required to check the vendor documentation for claimed compliance with such
175 requirements or confirm the presence of an external test/compliance certificate obtained from the
176 test organization, when applicable.

177 In some instances, testing of DTRs may not be feasible using the test methodologies described in
178 this document. For example, a test tool built on these methods cannot test the procedure by
179 which fingerprints are taken at an agency PIV installation. Most of these DTRs, however, can be
180 tested by inspection of the system description document. Where this is the case, an adequate
181 description is generally required by the VE section of the DTR. Where testing is not feasible, a
182 note is added to indicate that "this assertion is not separately tested."

183 **3.2 Test Assertions**

184 Test assertions are statements of behavior, action, or condition that can be measured or tested.
185 They provide the procedures to guide the tester in executing and managing the test. They
186 include purpose of the test, starting conditions and prerequisites, success criteria, and post-test
187 conditions, when applicable.

188 The following four sets of test assertions are included in this document —

- 189 • BER-TLV (Section 8)
- 190 • Biometric data object (Section 9)
- 191 • Signed data element (Section 10)
- 192 • PKI certificate profile (Section 11)

193 All the test assertions provided in this document come under the PIV card's data model testing
 194 and are based on DTRs in Sections 4, 5, 6, and 7. Specifically, each test assertion makes specific
 195 references to the related DTR sections. Overall there is a many-to-many relationship from the
 196 test assertions to the DTRs (i.e., one test can map to many DTRs and one DTR can map to many
 197 tests). To narrow the search space for cross references, Table 3-1 presents a cross-referencing
 198 guide showing the relevant DTR sections and test assertion sections with respect to tests.

199

Category/Classes of Test	DTR Section(s)	Test Assertion Section(s)
(1) BER-TLV	Section 4 (Derived from SP80073 Part 1)	Section 8
(2) Biometric Data	Section 5 (Derived from SP80076)	Section 9
(3) Signed Data Elements	Section 6 (Derived from FIPS201 and SP80078)	Section 10
(4) PKI Certificate Profile	Section 7 (Derived from FIPS201, SP80073 , and SP80078)	Section 11

200

Table 3-1. Cross-referencing Guide

201

202 4. BER-TLV DTRs

203 4.1 BER-TLV Testing

204 **AS04.01.01: Conformant cards shall return all the Tag-Length-Value (TLV) elements of a**
205 **container in the physical order listed for that container in this data model.**

206 VE04.01.01.01: The vendor shall specify in its documentation the format (TLV) and the content
207 of all the elements in each data container on the card.

208 VE04.01.01.02: The vendor shall specify in its documentation that the information provided
209 conforms to SP80073 Part 1.

210 TE04.01.01.01: The tester shall validate that the formatting, encoding and the content of all the
211 elements in each data container conforms to SP80073 Part 1.

212 4.2 Card Capability Container (CCC)

213 **AS04.02.01: The data model of the PIV card Application shall be identified by data model**
214 **number 0x10.**

215 VE04.02.01.01: The vendor shall specify in its documentation the tags and associated values in
216 the CCC container.

217 VE04.02.01.02: The vendor shall specify presence of the optional fields and highlight if any of
218 the deprecated data fields (Extended Application CardURL and Security Object Buffer data) are
219 present. Vendor shall also specify if 1) all mandatory data elements of the CCC, except for the
220 data model number, have a length value set to zero bytes (i.e., no value field will be supplied)
221 and 2) if optional data elements are present or absent.
222

223 TE04.02.01.01: The tester shall validate the format and the content of all the elements in CCC
224 data container on the card. Data read from the card will be validated against the vendor provided
225 data.

226 TE04.02.01.02: The tester shall validate that the registered data model value is 0x10.

227 4.3 Card Holder Unique Identifier (CHUID)

228 **AS04.03.01: The CHUID on a PIV card shall meet the following requirements:**

229 The Federal Agency Smart Credential Number (FASC-N) shall be in accordance with Technical
230 Implementation Guidance: Smart Card Enabled Physical Access Control Systems (TIG
231 SCEPACS). The Agency Code, System Code, and Credential Number of the FASC-N shall be
232 present. The credential series, individual credential issue, person identifier, organizational
233 category, organizational identifier, and person/organization association category of the FASC-N
234 shall be populated or contain all zeros.
235

236 A subset of FASC-N, the FASC-N Identifier, shall be the unique identifier as described in [TIG
237 SCEPACS, 6.6]: “The combination of an Agency Code, System Code, and Credential Number is
238 a fully qualified number that is uniquely assigned to a single individual”.

239
240 The Global Unique Identifier (GUID) field must be present, and shall include a Card Universally
241 Unique Identifier (UUID). The value of the GUID data element of the CHUID data object shall
242 be a 16-byte binary representation of a valid UUID [RFC4122]. The UUID should be version 1,
243 4, or 5, as specified in [RFC4122, Section 4.1.3]. The previously deprecated Authentication Key
244 Map data element shall not be present in the CHUID.

245
246 The optional Cardholder UUID field shall map to RFU tag 0x36. When present, the Cardholder
247 UUID shall be a 16-byte binary representation of a valid UUID, and it shall be version 1, 4, or 5,
248 as specified in [RFC4122, Section 4.1.3].

249
250 The Expiration Date shall be mapped to the reserved for future use (RFU) tag 0x35, keeping
251 that within the existing scope of the TIG SCEPACS specification. This field shall be 8 bytes in
252 length and shall be encoded in ASCII as YYYYMMDD. The expiration date shall be the same
253 as printed on the card.

254
255 VE04.03.01.01: The vendor shall specify in its documentation the format (TLV) and the content
256 of all the elements in CHUID container on the card.

257 VE04.03.01.02: The vendor shall specify presence of the optional fields and highlight any of the
258 deprecated data fields (Buffer Length, DUNS and Organization Identifier) that are present. The
259 vendor shall also indicate that the retired key map field is absent.

260
261 TE04.03.01.01: The tester shall validate the format and the content of all the elements in
262 CHUID data container on the card.

263 4.4 Off-Card Comparison Biometric Fingerprint

264 **AS04.04.01: The fingerprint data object on a PIV card is preceded with the tag value 0xBC**
265 **and the FASC-N shall be present in the CBEFF header as well as in the CBEFF signature**
266 **block. The Card UUID shall be present in the CBEFF signature block.**

267 There are no vendor requirements.

268 TE04.04.01.01: The tester shall validate that the fingerprint data follows the tag value 0xBC
269 within the container and the FASC-N is present in the CBEFF header as well as in the CBEFF
270 signature block. The Card UUID is present in the CBEFF signature block.

271 4.5 Biometric Facial Image

272 **AS04.05.01: The facial image on a PIV card is preceded with the tag value 0xBC and the**
273 **FASC-N shall be present in the CBEFF header as well as in the CBEFF signature block.**
274 **The Card UUID shall be present in the CBEFF signature block.**

275 There are no vendor requirements.

276 TE04.05.01.01: The tester shall validate that the facial image follows the tag value 0xBC within
277 the container and the FASC-N is present in the CBEFF header as well as in the CBEFF signature
278 block. The Card UUID is present in the CBEFF signature block.

279 **4.6 Security Object**

280 AS04.06.01: The message digest produced as a result of a hash function on the contents of a
281 data object shall be identical to that data object's message digest contained in the security object.

282 There are no vendor requirements.

283 TE04.06.01.01: The tester shall validate that all unsigned data objects, such as the Printed
284 Information data object, are included in the Security Object if present and that the message
285 digests for the various data objects present in the security object are identical to the message
286 digest of the data object itself.

287 **4.7 Biometric Iris**

288 **AS04.07.01: The iris image on a PIV card is preceded with the tag value 0xBC and the**
289 **FASC-N shall be present in the CBEFF header as well as in the CBEFF signature block.**
290 **The Card UUID shall be present in the CBEFF signature block.**

291 VE04.07.01.01: The vendor shall specify if the iris image is stored on the card.

292 TE04.07.01.01: The tester shall validate that the iris image follows the tag value 0xBC within
293 the container and the FASC-N is present in the CBEFF header as well as in the CBEFF signature
294 block. The Card UUID is present in the CBEFF signature block.

295 **4.8 Key History Object**

296 **AS04.08.01: The Key History Object shall meet the following requirements:**

297 The Key History object shall be present in the PIV Card Application if the PIV Card Application
298 contains any retired key management private keys, but may be present even if no such keys are
299 present in the PIV Card Application.

300 The Key History object includes two mandatory fields, keysWithOnCardCerts and
301 keysWithOffCardCerts, and one optional field, offCardCertURL.

302 The offCardCertURL field shall be present if the keysWithOffCardCerts value is greater than
303 zero and shall be absent if the values of both keysWithOnCardCerts and keysWithOffCardCerts
304 are zero. The offCardCertURL field may be present if the keysWithOffCardCerts value is zero
305 but the keysWithOnCardCerts value is greater than zero.

306 VE04.08.01.01: The vendor shall specify presence of the optional fields.

307 TE04.08.01.01: The tester shall validate the format and the contents of all the elements in Key
308 History data container on the card.

309 **4.9 Discovery Object**

310 **AS04.09.01: The Discovery Object shall meet the following requirements:**

311 PIV Card Applications that implement the pairing code shall implement the Discovery Object
312 with the first byte of the PIN Usage Policy set to 0x50, 0x58, 0x70, or 0x78.

313

314 PIV Card Applications for which both the PIV Card Application PIN and the Global PIN is
315 implemented shall have a Discovery Object with the PIN Usage Policy set to 0x60 zz, 0x68 zz,
316 0x70 zz, or 0x78 zz where zz is either 0x10 or 0x20.

317
318 PIV Card Applications for which OCC is implemented shall have a Discovery Object with the
319 first byte of the PIN Usage Policy set to 0x48, 0x58, 0x68, or 0x78.

320
321 If the first byte is set to 0x40, 0x48, 0x50, or 0x58, then the second byte is RFU and shall be set
322 to 0x00.

323
324 VE04.09.01.01: The vendor shall specify the card's PIN usage policy (Global PIN, PIV Card
325 Application PIN, Pairing Code, and OCC) in its vendor documentation.

326 TE04.09.01.01: The tester shall validate that both tag 0x4F (PIV Card Application AID) and tag
327 0x5F2F (PIN Usage Policy) data elements are present in the Discovery Object. The tester shall
328 validate the format and the contents of these data elements in the Discovery object data container
329 on the card.

330 **4.10 Biometric Information Templates (BIT) Group Template Object**

331 **AS04.10.01: The BIT Group Template Object shall meet the following requirements:**

332 VE04.10.01.01: The Vendor shall specify the presence of optional fields.

333 TE04.10.01.01: The tester shall ensure that encoding of the BIT group template is in accordance
334 with Table 7 of [SP80076](#).

335 **AS04.10.02: The BIT Group Template Object shall meet the following requirements:**

336 When OCC satisfies the PIV ACRs for PIV data object's access and command execution, both
337 the Discovery Object and the BIT Group Template data object shall be present, and bit 4 of the
338 first byte of the PIN Usage Policy shall be set.

339 There are no vendor requirements.

340 TE04.10.02.01: When the BIT Group Template is present, the tester shall ensure that bit 4 of the
341 first byte of the PIN Usage Policy is set.

342 **4.11 Secure Messaging Certificate Signer Object**

343 **AS04.11.01: The Secure Messaging Certificate Signer Object shall meet the following**
344 **requirements:**

345 The Secure Messaging Certificate Signer data object, which shall be present if the PIV card
346 supports secure messaging for non-card-management operations, contains the certificate(s)
347 needed to verify the signature of the secure messaging card verifiable certificate (CVC), as
348 specified in 800-73-4 Part 2, Section 4.1.5.

349 VE04.11.01.01: The vendor shall specify presence of the optional Intermediate CVC.

350 TE04.11.01.01: If PIV card secure messaging for non-card-management operations is enabled,
351 the tester shall ensure that the Secure Messaging Certificate Signer data object is present and

352 contains the certificate (and Intermediate CVC, if applicable) needed to verify the signature on
353 secure messaging CVC.

354 **4.12 Pairing Code Reference Data Container Object**

355 **AS04.12.01: The Pairing Code Reference Data Container Object shall meet the following**
356 **requirements:**

357 The Pairing Code Reference Data Container shall be present if the PIV card supports the virtual
358 contact interface (VCI) with the pairing mechanism. This object includes a copy of the PIV
359 card's pairing code.

360 There are no vendor requirements.

361 TE04.12.01.01: If the PIV card supports VCI with pairing, then the tester shall ensure that the
362 Pairing Code Reference Data Container is present and includes a copy of the PIV card's pairing
363 code.

364 **4.13 Unused Data Objects on the PIV Card**

365 **AS04.13.01: Data containers that are created but not used shall be set to zero-length value.**

366 VE04.13.01.01: Vendor shall state in its documentation the unused data containers on the PIV
367 card.

368 TE04.13.01.01: The tester shall confirm that all unused data containers on the card are set to a
369 zero length by performing GET DATA on the unused data objects and ensure that the length of
370 the returned objects is equal to zero (i.e., the value field is absent).

371 **5. Biometric Data DTRs**

372 **5.1 Common Header for PIV Biometric Data**

373 The assertions in this section apply to the fingerprint template, facial image, and iris image
374 stored on the PIV card. The iris image is an optional element on the PIV card and must be tested
375 if present.

376 **AS05.01.01: The CBEFF structure must comply with SP80076 Table 13, “CBEFF 377 concatenation structure.”**

378 VE05.01.01.01: The vendor shall specify the optional biometrics stored on the PIV card.

379 TE05.01.01.01: The tester shall verify that the CBEFF structure is implemented in accordance
380 with Table 13 of SP80076.

381 **AS05.01.02: The CBEFF header must comply with SP80076 Table 14, “Patron format PIV 382 specification.”**

383 No requirements for vendor.

384 TE05.01.02.01: The tester shall verify the length of the Patron Format header.

385 TE05.01.02.02: The tester shall verify the values are consistent with Table 14 “Patron format
386 PIV specification” requirements of SP80076.

387 **AS05.01.03: Multi-byte integers in the CBEFF headers shall be in big-endian byte order.**

388 VE05.01.03.01: The vendor shall document the values of the CBEFF header fields.

389 TE05.01.03.01: The tester shall compare value provided against the stored data.

390 **AS05.01.04: The Patron Header Version of the CBEFF Patron Format shall be 0x03.**

391 No requirements for vendor.

392 TE05.01.04.01: The tester shall verify that the Patron Header Version value is 0x03.

393 **AS05.01.05: The biometric data block is digitally signed but not encrypted, and this shall 394 be reflected by setting the value of the Signature Block Header (SBH) security options field 395 to b00001101.**

396 No requirements for vendor.

397 TE05.01.05.01: The tester shall verify that the SBH security option value is b00001101.

398 **AS05.01.06: For fingerprint and facial records, the Biometric Data Block (BDB) Format 399 Owner shall be 0x001B denoting M1, the INCITS Technical Committee on Biometrics and 400 for iris images, the BDB Format Owner shall be 0x0101 denoting ISO/IEC JTC 1/SC37 401 Biometrics.**

402 No requirements for vendor.

403 TE05.01.06.01: The tester shall verify that the BDB Format Owner field contains 0x001B for
404 fingerprint and facials records and contains 0x0101 for iris images.

405 **AS05.01.07: For the mandatory fingerprint template on the PIV card, the BDB Format**
406 **Type value shall be 0x0201. For the mandatory facial image on the PIV card, the BDB**
407 **Format Type value shall be 0x0501. For the optional iris image on the PIV card the BDB**
408 **Format Type value shall be 0x0009.**

409 No requirements for vendor.

410 TE05.01.07.01: The tester shall verify that the BDB Format Type field is 0x0201 for fingerprint
411 template, 0x0501 for facial image, and 0x0009 for the optional iris image if present.

412 **AS05.01.08: The Creation Date in the PIV Patron Format (see Row 7 in Table 14 of**
413 **SP80076) shall be the date of acquisition of the parent sample, encoded in eight bytes using a**
414 **binary representation of "YYYYMMDDhhmmssZ". Each pair of characters (for example,**
415 **"DD") is coded in 8 bits as an unsigned integer where the last byte is the binary**
416 **representation of the ASCII character Z which is included to indicate that the time is**
417 **represented in Coordinated Universal Time (UTC). The field "hh" shall code a 24 hour**
418 **clock value.**

419 No requirements for vendor.

420 TE05.01.08.01: The tester shall verify the date field is in compliance with the assertion.

421 **AS05.01.09: The Validity Period in the PIV Patron Format (Row 8 in Table 14 of SP80076)**
422 **contains two dates.**

423 No requirements for vendor.

424 TE05.01.09.01: The tester shall verify that the headers contain two dates in compliance with the
425 assertion.

426 **AS05.01.10: Biometric Type field within the PIV Patron Format shall be 0x000008 for the**
427 **fingerprint templates, 0x000002 for facial images, and 0x000010 for the iris images. The**
428 **value for other biometric modalities shall be that given in CBEFF, 5.2.1.5. For modalities**
429 **not listed there the value shall be 0x0.**

430 No requirements for vendor.

431 TE05.01.10.01: The tester shall verify that the Biometric Type field contains 0x000008 for
432 fingerprint templates, 0x000002 for facial images, and 0x000010 for the iris images.

433 **AS05.01.11: The Biometric Data Type field within the PIV Patron Format shall be**
434 **b100xxxxx for the fingerprint templates, b001xxxxx for the facial images, and b010xxxxx**
435 **for the iris images.**

436 No requirements for vendor.

437 TE05.01.11.01: The tester shall verify that the Biometric Data Type field within the PIV Patron
438 Format is b100xxxxx for the fingerprint templates, b001xxxxx for the facial images, and
439 b010xxxxx for the iris images.

440 **AS05.01.12: For all biometric data stored on a PIV Card the quality value shall be a signed**
441 **integer between -2 and 100 per the text of INCITS 358. A value of -2 shall denote that**
442 **assignment was not supported by the implementation; a value of -1 shall indicate that an**
443 **attempt to compute a quality value failed. Values from 0 to 100 shall indicate an increased**
444 **expectation that the sample will ultimately lead to a successful match. The zero value**
445 **required by FACESTD shall be coded in this CBEFF field as -2.**

446 VE05.01.12.01: The vendor shall provide the quality values for the biometric data.

447 TE05.01.12.01: The tester shall verify that the value of Biometric Data Quality is between -2
448 and 100 for the fingerprint templates, facial images, and iris images.

449 **AS05.01.13: The Creator field in the PIV Patron Format contains 18 bytes of which the**
450 **first $K \leq 17$ bytes shall be printable ASCII characters, and the first of the remaining 18-K**
451 **shall be a null terminator (zero).**

452 VE05.01.13.01: The vendor shall provide the value of Creator field.

453 TE05.01.13.01: The tester shall verify that the Creator field in the PIV Patron Format contains
454 18 bytes of which the first $K \leq 17$ bytes is printable ASCII characters, and the first of the
455 remaining 18-K is a null terminator (zero).

456 **AS05.01.14: The FASC-N field in the PIV Patron Format shall contain the 25 bytes of the**
457 **FASC-N component of the CHUID identifier.**

458 VE05.01.14.01: The vendor shall provide the value for FASC-N.

459 TE05.01.14.01: The tester shall verify that the FASC-N field in the PIV Patron Format shall
460 contain the 25 bytes of the FASC-N component of the CHUID identifier.

461 Note: This field may be filled with zeroes in the one exceptional case where PIV registration
462 images are being stored before a FASC-N has been assigned. In such instances, the digital
463 signature shall be regenerated once the FASC-N is known.

464 **AS05.01.15: The “Reserved for future use” field in the PIV Patron Format shall contain**
465 **0x00000000.**

466 No requirement for vendor.

467 TE05.01.15.01: The tester shall verify the “Reserved for future use” field is 0x00000000.

468 **5.2 Off-Card Comparison Fingerprint Template Stored on PIV Card**

469 **AS05.02.01: Both fingers’ template records shall be wrapped in a single CBEFF structure**
470 **prior to storage on the PIV card.**

471 VE05.02.01.01: The vendor shall specify in its documentation the CBEFF structure is
472 constructed in accordance with this assertion.

473 TE05.02.01.01: The tester shall parse the biometric data container to verify this assertion.

474 Note: The CBEFF structure itself is tested in later assertions.

475 **AS05.02.02: The fingerprint templates stored on the card are compliant to the MINUSTD**
476 **profile specified in SP80076, Table 6, INCITS 378 profile for PIV card templates.**

477 VE05.02.02.01: The vendor shall specify in its documentation that the template generator
478 generates templates in accordance with MINUSTD.

479 TE05.02.02.01: The tester shall verify that the resultant template is in compliance with the
480 assertion.

481 **AS05.02.03: The Format Identifier of the General Header Record shall be 0x464D5200.**

482 No requirements for vendor.

483 TE05.02.03.01: The tester shall verify that the Format Identifier value is 0x464D5200.

484 **AS05.02.04: The Version Number of the General Record Header shall be 0x20323000.**

485 No requirements for vendor.

486 TE05.02.04.01: The tester shall verify that the Version Number is 0x20323000.

487 **AS05.02.05: The Record Length of the General Record Header shall be $26 \leq L \leq 1574$.**

488 VE05.02.01 The vendor shall specify the length of the entire container which includes CBEFF
489 wrapped record.

490 TE05.02.05.01: The tester shall verify that the Record Length of the General Record Header is
491 $26 \leq L \leq 1574$.

492 **AS05.02.06: Both of the two fields ("Owner" and "Type") of the CBEFF Product**
493 **Identifier shall be > 0 (non-zero).**

494 VE05.02.06.01: The vendor shall provide the Owner and Type of CBEFF product identifier.

495 TE05.02.06.01: The tester shall verify that the both of the two fields ("Owner" and "Type") of
496 the CBEFF Product Identifier are > 0 (non-zero).

497 **AS05.02.07: The Capture Equipment Compliance of the General Record Header shall be**
498 **1000b.**

499 No requirements for vendor

500 TE05.02.07.01: The tester shall verify the Capture Equipment Compliance value is 1000b.

501 **AS05.02.08: The Capture Equipment ID of the General Record Header is > 0 .**

502 VE05.02.08.01: The vendor shall specify the Capture Equipment ID value.

503 TE05.02.08.01: The tester shall verify the Capture Equipment ID of the General Record Header
504 is > 0 .

505 **AS05.02.09: The width on Size of Scanned Image in X Direction shall be the larger of the**
506 **widths of the two input images. Similarly, the height on Size of Scanned Image in Y**
507 **Direction shall be the larger of the heights of the two input images.**

508 VE05.02.09.01: The vendor shall report width and height of the images whose fingerprint
509 templates are stored on the card.

510 TE05.02.09.01: The tester shall verify that the width on Size of Scanned Image in X Direction is
511 the larger of the widths of the two input images and the height on Size of Scanned Image in Y
512 Direction is the larger of the heights of the two input images.

513 **AS05.02.10: The X (horizontal) and Y (vertical) resolutions shall be 197.**

514 No requirements for vendor

515 TE05.02.10.01: The tester shall verify that the X (horizontal) and Y (vertical) resolutions are
516 197.

517 **AS05.02.11: The Number of Views of the General Header Record shall be 2.**

518 No requirements for vendor

519 TE05.02.11.01: The tester shall verify the Number of Views value is 2.

520 **AS05.02.12: The Reserved Byte of the General Header Record shall be 0.**

521 No requirements for vendor

522 TE05.02.12.01: The tester shall verify the Reserved Byte value is 0.

523 **AS05.02.13: The View Number of the Single Finger View Record shall be 0.**

524 No requirements for vendor

525 TE05.02.13.01: The tester shall verify the View Number value of the Single Finger View
526 Record is 0.

527 **AS05.02.14: The Impression Type of the Single Finger View Record shall be either 0 or 2.**

528 VE05.02.14.01: The vendor shall specify if the live or non-live scan images were used.

529 TE05.02.14.01: The tester shall verify the value is either 0 or 2 and is consistent with vendor
530 reporting.

531 **AS05.02.15: The quality value of captured fingerprint images shall be 20, 40, 60, 80, 100,**
532 **254, or 255.**

533 VE05.02.15.01: The vendor shall specify the procedure used to calculate the quality value. The
534 vendor shall also specify the value in the Finger Quality field.

535 TE05.02.15.01: The tester shall verify that the quality value of captured fingerprint images shall
536 be 20, 40, 60, 80, 100, 254, or 255.

537 Note: A value of "255" shall be assigned when fingerprints are temporarily unusable for
538 matching. A value of "254" shall be assigned when the fingerprints are permanently unusable.

539 **AS05.02.16: The Number of Minutiae of Single Finger View Record is between 0 and 128.**

540 No requirements for vendor.

541 TE05.02.16.01: The tester shall verify the Number of Minutiae is between 0 and 128.

542 **AS05.02.17: Fingerprint templates shall be limited to minutiae of types "ridge ending" and**
543 **"ridge bifurcation" unless it is not possible to reliably distinguish between a ridge ending**
544 **and a bifurcation, in which case the category of "other" shall be assigned and encoded as**
545 **00b.**

546 No requirements for vendor.

547 TE05.02.17.01: The tester shall verify that the Minutiae Type is 00b, 01b, or 10b.

548 **AS05.02.18: All coordinates and angles for fingerprint minutiae shall be recorded with**
549 **respect to the original finger image. They shall not be recorded with respect to any image**
550 **processing sub-image(s) created during the template creation process.**

551 VE05.02.18.01: The vendor shall specify in its documentation that the template generator
552 generates templates in accordance with this assertion.

553 Note: This assertion is externally tested.

554 **AS05.02.19: The mandatory value for Extended Data Block Length for MINUSTD**
555 **template shall be zero.**

556 No requirements for vendor.

557 TE05.02.19.01: The tester shall verify that the value of Extended Data Block Length is zero.

558 **5.3 Facial Image Stored on PIV Card**

559 **AS05.03.01: All facial images must conform to the requirements in SP80076 Table 12,**
560 **"INCITS 385 Profile for PIV Facial Images."**

561 VE05.03.01.01: The vendor shall include documentation of the procedure by which facial
562 images are enrolled.

563 TE05.03.01.01: The tester shall review the documentation to verify compliance with the
564 assertion.

565 **AS05.03.02: The Format Identifier of the Facial Header shall be 0x46414300.**

566 No requirements for vendor.

567 TE05.03.02.01: The tester shall verify that the Format Identifier value is 0x46414300.

568 **AS05.03.03: The Version Number of the Facial Header shall be 0x30313000.**

569 No requirements for vendor.

570 TE05.03.03.01: The tester shall verify that the Version Number is 0x30313000.

571 **AS05.03.04: The Record Length of the Facial Header shall fit within the container size**
572 **limits specified in [800-73].**

573 No requirements for vendor.

574 TE05.03.04.01: The tester shall verify that the Record Length of the Facial fits within the
575 container size limits specified in [800-73].

576 **AS05.03.05: The Number of Facial Images of the Facial Header shall be ≥ 1 and the most**
577 **recent image shall appear first and serve as the default provided to the application.**

578 No requirements for vendor.

579 TE05.03.05.01: The tester shall verify that the Number of Facial Images of the Facial Header is
580 ≥ 1 and that the most recent image appears first and serve as the default provided to the
581 application.

582 **AS05.03.06: The Number of Feature Points for the facial image shall be ≥ 0 .**

583 No requirements for vendor.

584 TE05.03.06.01: The tester shall verify that the Number of Feature Points for the facial image is
585 ≥ 0 .

586 **AS05.03.07: The Facial Image Type shall be 1.**

587 No requirements for vendor.

588 TE05.03.07.01: The tester shall verify that the Facial Image Type is 1.

589 **AS05.03.08: The Image Data Type shall be 0 or 1.**

590 No requirements for vendor.

591 TE05.03.08.01: The tester shall verify that the Image Data Type is 0 or 1.

592 Note: Both whole-image and single-region-of-interest (ROI) compression are permitted. 800-76
593 recommends that newly collected facial image should be compressed using ISO/IEC 15444 (i.e.,
594 JPEG 2000).

595 **AS05.03.09: The Image Color Space of the facial image shall be 1 and shall be converted to**
596 **the sRGB color space.**

597 No requirements for vendor.

598 TE05.03.09.01: The tester shall verify that the Image Color Space of the facial image is 1 and is
599 converted to the sRGB color space.

600 **AS05.03.10: The Source Type of the facial image shall be 2 or 6.**

601 No requirements for vendor.

602 TE05.03.10.01: The tester shall verify that the Source Type of the facial image is 2 or 6.

603 **AS05.03.11: Facial images shall be compressed using a compression ratio no higher than**
604 **15:1. However, when facial images are stored on PIV cards, JPEG 2000 shall be used with**

605 **ROI compression in which the innermost region shall be centered on the face and**
606 **compressed at no more than 24:1.**

607 VE05.03.11.01: The vendor shall include documentation of the procedure by which facial
608 images are enrolled.

609 TE05.03.11.01: This assertion is externally tested.

610 **5.4 On-Card Comparison**

611 **AS05.04.01: The Biometric Information Templates (BITs) Group Template shall conform**
612 **to the specifications in SP80076 section 5.5.1.**

613 VE05.04.01.01: The vendor shall specify in its documentation the process flow of how the
614 Biometric Information Templates (BITs) are generated.

615 TE05.04.01.01: The tester shall verify that the resultant BITs is in compliance with the
616 assertion.

617 **AS05.04.02: The Number of BITs (tag 0x02) (corresponding to the number of fingers that**
618 **follow) in the BIT Group Template shall be 2, one for each finger.**

619 No requirements for vendor.

620 TE05.04.02.01: The tester shall verify that the value for Number of Fingers is 2 in tag 0x02.

621 **AS05.04.03: The Reference data qualifier used by VERIFY (tag 0x83) for the first finger**
622 **shall be '96'.**

623 No requirements for vendor.

624 TE05.04.03.01: The tester shall verify that the Reference data qualifier used by VERIFY (tag
625 0x83) for the first finger is '96'.

626 **AS05.04.04: The Reference data qualifier used by VERIFY (tag 0x83) for the second finger**
627 **shall be '97'.**

628 No requirements for vendor.

629 TE05.04.04.01: The tester shall verify that the Reference data qualifier used by VERIFY (tag
630 0x83) for the second finger is '97'.

631 **AS05.04.05: The Biometric type (tag 0x81) for the first and second finger shall be 08.**

632 No requirements for vendor.

633 TE05.04.05.01: The tester shall verify that the Biometric type (tag 0x81) for the first and second
634 finger is 08.

635 **AS05.04.06: The BHT's Biometric subtype (tag 0x82) uses values for the first and second**
636 **finger from ISO/IEC 19784-3:2007 (not CARD-MIN).**

637 No requirements for vendor.

638 TE05.04.06.01: The tester shall verify that the subtype values for the first and second finger
639 match the values identified in [SP80076](#) Table 8.

640 **AS05.04.07: The CBEFF BDB format owner (tag 0x87) for the first and second finger shall**
641 **be set to 0101.**

642 No requirements for vendor.

643 TE05.04.07.01: The tester shall verify that the CBEFF BDB format owner (tag 0x87) for the
644 first and second finger is set to 0101.

645 **AS05.04.08: The CBEFF BDB format type (tag 0x88) for the first and second finger shall**
646 **be set to 0005.**

647 No requirements for vendor.

648 TE05.04.08.01: The tester shall verify that the CBEFF BDB format type (tag 0x88) for the first
649 and second finger is set to 0005.

650 **AS05.04.09: Biometric Matching algorithm parameters [CARD-Min table 14] tag 83 shall**
651 **NOT be present for the first and second finger.**

652 No requirements for vendor.

653 TE05.04.09.01: The tester shall verify that TAG 83 is not present in the Biometric Matching
654 parameters for the first and second finger.

655 **5.5 Iris Image Stored on PIV Card**

656 **AS05.05.01: All iris images must conform to the requirements in SP80076 Table 9,**
657 **“ISO/IEC 19794-6 profile for iris images stored on PIV Cards”**

658 VE05.05.01.01: The vendor shall include documentation of the procedure by which iris images
659 are enrolled.

660 TE05.05.01.01: The tester shall review the documentation to verify compliance with the
661 assertion.

662 **AS05.05.02: The Format identifier of the Iris General Header shall be 0x49495200.**

663 No requirements for vendor.

664 TE05.05.02.01: The tester shall verify that the Format identifier of the Iris General Header is
665 0x49495200.

666 **AS05.05.03: The Version number of the Iris General Header shall be 0x30323000.**

667 No requirements for vendor.

668 TE05.05.03.01: The tester shall verify that the Version number of the Iris General Header is
669 0x30323000.

670 **AS05.05.04: The Length of record of the Iris General Header must be less than or equal to**
671 **size specified in 800-73-4 and JPEG 2000 compressed iris image implementations shall be**
672 **executed with a bit rate input value that corresponds to the 3Kilobyte target result.**

673 No requirements for vendor.

674 TE05.05.04.01: The tester shall verify that the Length of record of the Iris General Header is
675 less than or equal to size specified in 800-73-4 and JPEG 2000 compressed iris image
676 implementations are executed with a bit rate input value that corresponds to the 3Kilobyte target
677 result.

678 **AS05.05.05: The Number of iris representations of the Iris General Header shall be 1 or 2.**

679 No requirements for vendor.

680 TE05.05.05.01: The tester shall verify that the Number of iris representations of the Iris General
681 Header is 1 or 2.

682 **AS05.05.06: The Certification flag of the Iris General Header shall be 0x00.**

683 No requirements for vendor.

684 TE05.05.06.01: The tester shall verify that the Certification flag of the Iris General Header is
685 0x00.

686 **AS05.05.07: The Number of eyes represented shall be 1 or 2.**

687 No requirements for vendor.

688 TE05.05.07.01: The tester shall verify that the Number of eyes represented is 1 or 2.

689 **AS05.05.08: The Capture date and time shall be 2011 onwards.**

690 No requirements for vendor.

691 TE05.05.08.01: The tester shall verify that the Capture date and time is 2011 onwards.

692 **AS05.05.09: The Representation number shall be 1 and then, optionally 2.**

693 No requirements for vendor.

694 TE05.05.09.01: The tester shall verify that the Representation number is 1 and then, optionally
695 2.

696 **AS05.05.10: The Eye label shall be 1 for left eye and 2 for right eye. If camera does not**
697 **estimate automatically, then these shall be manually assigned.**

698 No requirements for vendor.

699 TE05.05.10.01: The tester shall verify that the Eye label is 1 for left eye and 2 for right eye. If
700 camera does not estimate automatically, then these are manually assigned.

701 **AS05.05.11: The Image type shall be image type 7 with (0,6R 0,2R) margins.**

702 No requirements for vendor.

- 703 TE05.05.11.01: The tester shall verify that the Image type is type 7 with (0,6R 0,2R) margins.
- 704 **AS05.05.12: The Image format shall be 10 = 0x0A and the compression algorithm and**
705 **encoding shall be mono JPEG 2000.**
- 706 No requirements for vendor.
- 707 TE05.05.12.01: The tester shall verify that the Image format is 10 = 0x0A and the compression
708 algorithm and encoding is mono JPEG 2000.
- 709 **AS05.05.13: The Iris image properties bit field shall be (Bits 1-2: 01 or 10), (Bits 3-4: 01 or**
710 **10), (Bits 5-6: 01 and scan type shall be progressive), and (Bits 7-8: 01 and the compression**
711 **history shall be “none”).**
- 712 No requirements for vendor.
- 713 TE05.05.13.01: The tester shall verify that the Iris image properties bit field is (Bits 1-2: 01 or
714 10), (Bits 3-4: 01 or 10), (Bits 5-6: 01 and scan type shall be progressive), and (Bits 7-8: 01 and
715 the compression history shall be “none”).
- 716 Note: Bit 1 is the least significant bit and Bit 8 is the most significant.
- 717 **AS05.05.14: The Image width (image width, W) shall be $288 \leq W \leq 448$.**
- 718 No requirements for vendor.
- 719 TE05.05.14.01: The tester shall verify that the Image width (image width, W) is $288 \leq W \leq 448$.
- 720 **AS05.05.15: The Image height (image height, H) shall be $216 \leq H \leq 336$.**
- 721 No requirements for vendor.
- 722 TE05.05.15.01: The tester shall verify that the Image height (image height, H) is $216 \leq H \leq$
723 336 .
- 724 **AS05.05.16: The Bit depth shall be 8.**
- 725 No requirements for vendor.
- 726 TE05.05.16.01: The tester shall verify that the Bit depth is 8.
- 727 Note: Bit depth is in bits per pixel and shall not be used to indicate compression level.
- 728 **AS05.05.17: The Iris centre, lowest X shall be (W/2 for W odd, else), highest X shall be**
729 **(W/2+1 for W even), lowest Y shall be (H/2 for H odd, else), and highest Y shall be (W/2+1**
730 **for H even).**
- 731 No requirements for vendor.
- 732 TE05.05.17.01: The tester shall verify that the Iris centre, lowest X is (W/2 for W odd, else),
733 highest X is (W/2+1 for W even), lowest Y is (H/2 for H odd, else), and highest Y is (W/2+1 for
734 H even).
- 735 **AS05.05.18: The Iris diameter, lowest shall be $D \geq 160$ and the highest shall be $D \leq 280$.**
- 736 No requirements for vendor.

737 TE05.05.18.01: The tester shall verify that the Iris diameter, lowest is $D \geq 160$ and the highest is
738 $D \leq 280$.

739 **6. Signed Data Elements DTRs**

740 **6.1 Card Holder Unique Identifier**

741 **6.1.1 Asymmetric Signature Conformance**

742 **AS06.01.01: The CHUID data object shall contain an Asymmetric digital signature of the**
743 **CHUID object, which has been encoded as a Cryptographic Message Syntax external**
744 **digital signature as defined in RFC 5652.**

745 No requirement for vendor.

746 TE06.01.01.01: The tester shall validate that the CHUID data object contains a digital signature
747 and has been formatted correctly as a CMS external signature as defined in RFC 5652.

748 **AS06.01.02: The digital signature is implemented as a SignedData Type.**

749 No requirement for vendor.

750 TE06.01.02.01: The tester shall validate that the CMS external digital signature has been
751 implemented as a SignedData type.

752 **AS06.01.03: The value of the version field of the SignedData content type shall be v3.**

753 No requirement for vendor.

754 TE06.01.03.01: The tester shall validate the version of the SignedData type is version 3.

755 **AS06.01.04: The digestAlgorithms field of the SignedData content type shall be in**
756 **accordance with Table 3-2 of SP80078.**

757 No requirement for vendor.

758 TE06.01.04.01: The tester shall validate that the digest algorithm is in accordance with Table 3-2
759 of SP80078.

760 **AS06.01.05: The eContentType of the encapContentInfo shall be id-PIV-**
761 **CHUIDSecurityObject (OID = 2.16.840.1.101.3.6.1).**

762 No requirement for vendor.

763 TE06.01.05.01: The tester shall validate that eContentType of the encapContentInfo asserts the
764 id-PIV-CHUIDSecurityObject OID.

765 **AS06.01.06: The encapContentInfo of the SignedData content type shall omit the eContent**
766 **field.**

767 No requirement for vendor.

768 TE06.01.06.01: The tester shall validate that the eContent field has been omitted from the
769 encapContentInfo.

770 **AS06.01.07: The certificates field shall include only a single X.509 certificate which is used**
771 **to verify the signature in the SignerInfo field.**

772 No requirement for vendor.

773 TE06.01.07.01: The tester shall validate that there is a single X.509 certificate in the certificates
774 field that can verify the digital signature in the SignerInfo.

775 **AS06.01.08: The crls field from the SignedData content type shall be omitted.**

776 No requirement for vendor.

777 TE06.01.08.01: The tester shall validate that the crls field has been omitted from the SignedData.

778 **AS06.01.09: The SignerInfos in the SignedData content type shall contain only a single**
779 **SignerInfo type.**

780 No requirement for vendor.

781 TE06.01.09.01: The tester shall validate that only a single SignerInfo exists in the SignedData.

782 **AS06.01.10: The SignerInfo type shall use the issuerAndSerialNumber choice for the**
783 **SignerIdentifier and this shall correspond to the issuer and serialNumber fields found in**
784 **the X.509 certificate for the entity that signed the CHUID.**

785 No requirement for vendor.

786 TE06.01.10.01: The tester shall validate that the issuerAndSerialNumber choice has been used
787 for the SignerIdentifier and it corresponds to the issuer and serialNumber fields found in the
788 X.509 certificate for the entity that signed the CHUID.

789 **AS06.01.11: The SignerInfo type shall specify a digestAlgorithm in accordance with Table**
790 **3-2 of SP 800-78.**

791 No requirement for vendor.

792 TE06.01.11.01: The tester shall validate that the digest algorithm is in accordance with Table 3-
793 2.

794 **AS06.01.12: The signedAttrs of the SignerInfo shall include the MessageDigest (OID =**
795 **1.2.840.113549.1.9.4) attribute containing the hash computed over the concatenated content**
796 **of the CHUID, excluding the asymmetric signature field and the optional Buffer Length**
797 **field (if present).**

798 No requirement for vendor.

799 TE06.01.12.01: The tester shall validate the presence of a MessageDigest attribute in the signed
800 attributes.

801 TE06.01.12.02: The tester shall validate the value of the MessageDigest attribute against the
802 hash of the concatenated content of the CHUID, excluding the asymmetric signature field and
803 the optional Buffer Length field (if present).

804 **AS06.01.13: The signedAttrs of the SignerInfo shall include the pivSigner-DN (OID =**
805 **2.16.840.1.101.3.6.5) attribute containing the subject name that appears in the X.509**
806 **certificate for the entity that signed the CHUID.**

807 No requirement for vendor.

808 TE06.01.13.01: The tester shall validate the presence of a pivSigner-DN attribute in the signed
809 attributes.

810 TE06.01.13.02: The tester shall validate the value of the pivSigner-DN attribute is the same as
811 the subject name that appears in the certificate that signed the CHUID.

812

813 **AS06.01.14: The signatureAlgorithm field specified in the SignerInfo field for RSA with**
814 **PKCS #1 v1.5 padding, the signatureAlgorithm field shall specify the rsaEncryption OID**
815 **(as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the**
816 **signatureAlgorithm shall be in accordance with Table 3-3 of [SP80078](#).**

817 No requirement for vendor.

818 TE06.01.14.01: The tester shall validate that the signature algorithm value for RSA with PKCS
819 #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for
820 ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of
821 [SP80078](#).

822 **AS06.01.15: The SignedData content type shall include the digital signature.**

823 No requirement for vendor.

824 TE06.01.15.01: The tester shall validate that the SignedData content type includes the digital
825 signature corresponding to the CHUID.

826 **6.1.2 Certificate that signs the CHUID**

827 Note: This requirement is not tested separately and is tested as part of Section 7.7: X.509
828 Certificate for Content Signing.

829

830 **6.2 Biometric Fingerprint for Off-Card Comparison**

831 **6.2.1 Asymmetric Signature Conformance**

832 **AS06.02.01: The CBEFF_SIGNATURE_BLOCK shall be encoded as a Cryptographic**
833 **Message Syntax external digital signature as defined in RFC 5652.**

834 No requirement for vendor.

835 TE06.02.01.01: The tester shall validate that the digital signature in the
836 CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as
837 defined in RFC 5652.

838 **AS06.02.02: The digital signature is implemented as a SignedData Type.**

839 No requirement for vendor.

840 TE06.02.02.01: The tester shall validate that the CMS external digital signature has been
841 implemented as a SignedData type.

842 **AS06.02.03: The value of the version field of the SignedData content type shall be v3.**

843 No requirement for vendor.

844 TE06.02.03.01: The tester shall validate the version of the SignedData type is version 3.

845 **AS06.02.04: The digestAlgorithms field of the SignedData content type shall be in
846 accordance with Table 3-2 of SP80078.**

847 No requirement for vendor.

848 TE06.02.04.01: The tester shall validate that the digest algorithm is in accordance with Table 3-2
849 of SP80078.

850 **AS06.02.05: The eContentType of the encapContentInfo shall be id-PIV-biometricObject
851 (OID = 2.16.840.1.101.3.6.2).**

852 No requirement for vendor.

853 TE06.02.05.01: The tester shall validate that eContentType of the encapContentInfo asserts the
854 id-PIV-biometricObject OID.

855 **AS06.02.06: The encapContentInfo of the SignedData content type shall omit the eContent
856 field.**

857 No requirement for vendor.

858 TE06.02.06.01: The tester shall validate that the eContent field has been omitted from the
859 encapContentInfo.

860 **AS06.02.07: If the signature on the biometric fingerprint was generated with a different
861 key as the signature on the CHUID, the certificates field shall include only a single
862 certificate in the SignerInfo field which can be used to verify the signature; else the
863 certificates field shall be omitted.**

864 VE06.02.07.01: The vendor shall state whether or not the same certificate was used to sign the
865 CHUID and the Biometrics.

866 TE06.02.07.01: The tester shall validate that there is a single X.509 certificate in the certificates
867 field that can verify the digital signature in the SignerInfo.

868 TE06.02.07.02: If the certificates field is omitted, the tester shall validate that the certificate in
869 the SignedData for the CHUID can verify the digital signature in the SignerInfo.

870 **AS06.02.08: The crls field from the SignedData content type shall be omitted.**

871 No requirement for vendor.

872 TE06.02.08.01: The tester shall validate that the crls field has been omitted from the SignedData.

873 **AS06.02.09: The signerInfos in the SignedData content type shall contain only a single**
874 **SignerInfo type.**

875 No requirement for vendor.

876 TE06.02.09.01: The tester shall validate that only a single SignerInfo exists in the SignedData.

877 **AS06.02.10: The SignerInfo type shall use the issuerAndSerialNumber choice for the**
878 **SignerIdentifier and this shall correspond to the issuer and serialNumber fields found in**
879 **the X.509 certificate for the entity that signed the biometric data.**

880 No requirement for vendor.

881 TE06.02.10.01: The tester shall validate that the issuerAndSerialNumber choice has been used
882 for the SignerIdentifier and it corresponds to the to the issuer and serialNumber fields found in
883 the X.509 certificate for the entity that signed the biometric data.

884 **AS06.02.11: The SignerInfo type shall specify a digestAlgorithm in accordance with Table**
885 **3-2 of SP80078.**

886 No requirement for vendor.

887 TE06.02.11.01: The tester shall validate that the digest algorithm in the SignerInfo is in
888 accordance with Table 3-2 of SP80078.

889 **AS06.02.12: The signedAttrs of the SignerInfo shall include the MessageDigest (OID =**
890 **1.2.840.113549.1.9.4) attribute containing the hash of the concatenated CBEFF_HEADER**
891 **and the STD_BIOMETRIC_RECORD.**

892 No requirement for vendor.

893 TE06.02.12.01: The tester shall validate the presence of a MessageDigest attribute in the signed
894 attributes.

895 TE06.02.12.02: The tester shall validate the value of the MessageDigest attribute against the
896 hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.

897 **AS06.02.13: The signedAttrs of the SignerInfo shall include the pivSigner-DN (OID =**
898 **2.16.840.1.101.3.6.5) attribute containing the subject name that appears in the X.509**
899 **certificate for the entity that signed the biometric fingerprint data.**

900 No requirement for vendor.

901 TE06.02.13.01: The tester shall validate the presence of a pivSigner-DN attribute in the signed
902 attributes.

903 TE06.02.13.02: The tester shall validate the value of the pivSigner-DN attribute is the same as
904 the subject name that appears in the certificate that signed the biometric data.

905 **AS06.02.14: The signedAttrs of the SignerInfo shall include the pivFASC-N (OID =**
906 **2.16.840.1.101.3.6.6) attribute containing the FASC-N of the PIV card.**

907 No requirement for vendor.

908 TE06.02.14.01: The tester shall validate the presence of a pivFASC-N attribute in the signed
909 attributes.

910 TE06.02.14.02: The tester shall validate the value of the pivFASC-N attribute is the same as the
911 FASC-N that is present in the CHUID.

912 **AS06.02.15: The signatureAlgorithm field specified in the SignerInfo field for RSA with
913 PKCS #1 v1.5 padding, the signatureAlgorithm field shall specify the rsaEncryption OID
914 (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the
915 signatureAlgorithm shall be in accordance with Table 3-3 of [SP80078](#).**

916 No requirement for vendor.

917 TE06.02.15.01: The tester shall validate that the signature algorithm value for RSA with PKCS
918 #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for
919 ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of
920 [SP80078](#).

921 **AS06.02.16: The SignedData content type shall include the digital signature.**

922 No requirement for vendor.

923 TE06.02.16.01: The tester shall validate that the SignedData content type includes the digital
924 signature corresponding to the signed biometric data.

925 **AS06.02.17: The signedAttrs of the SignerInfo shall include an entryUUID (OID =
926 1.3.6.1.1.16.4) attribute [FRC4530] containing the 16-byte representation of the Card UUID
927 value that appears in the GUID data element of the PIV card's CHUID data element.**

928 No requirement for vendor.

929 TE06.02.17.01: The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4)
930 attribute in the signed attributes.

931 TE06.02.17.02: The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4)
932 attribute is the same as the 16-byte representation of the Card UUID value that appears in the
933 GUID data element of the PIV card's CHUID data element.

934 **6.2.2 Certificate that signs the biometric fingerprint**

935 Note: This requirement is not tested separately and is tested as part of Section 7.7: X.509
936 Certificate for Content Signing.

937

938 **6.3 Biometric Facial Image**

939 **6.3.1 Asymmetric Signature Conformance**

940 **AS06.03.01: The CBEFF_SIGNATURE_BLOCK shall be encoded as a Cryptographic
941 Message Syntax external digital signature as defined in RFC 5652.**

942 No requirement for vendor.

943 TE06.03.01.01: The tester shall validate that the digital signature in the
944 CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as
945 defined in RFC 5652.

946 **AS06.03.02: The digital signature is implemented as a SignedData Type.**

947 No requirement for vendor.

948 TE06.03.02.01: The tester shall validate that the CMS external digital signature has been
949 implemented as a SignedData type.

950 **AS06.03.03: The value of the version field of the SignedData content type shall be v3.**

951 No requirement for vendor.

952 TE06.03.03.01: The tester shall validate the version of the SignedData type is version 3.

953 **AS06.03.04: The digestAlgorithms field of the SignedData content type shall be in
954 accordance with Table 3-2 of SP80078.**

955 No requirement for vendor.

956 TE06.03.04.01: The tester shall validate that the digest algorithm is in accordance with Table 3-2
957 of SP80078.

958 **AS06.03.05: The eContentType of the encapContentInfo shall be id-PIV-biometricObject
959 (OID = 2.16.840.1.101.3.6.2).**

960 No requirement for vendor.

961 TE06.03.05.01: The tester shall validate that eContentType of the encapContentInfo asserts the
962 id-PIV-biometricObject OID.

963 **AS06.03.06: The encapContentInfo of the SignedData content type shall omit the eContent
964 field.**

965 No requirement for vendor.

966 TE06.03.06.01: The tester shall validate that the eContent field has been omitted from the
967 encapContentInfo.

968 **AS06.03.07: If the signature on the biometric facial image was generated with a different
969 key as the signature on the CHUID, the certificates field shall include only a single
970 certificate in the SignerInfo field which can be used to verify the signature; else the
971 certificates field shall be omitted.**

972 No requirement for vendor.

973 TE06.03.07.01: The tester shall validate that there is a single X.509 certificate in the certificates
974 field that can verify the digital signature in the SignerInfo.

975 TE06.03.07.02: If the certificates field is omitted, the tester shall validate that the certificate in
976 the SignedData for the CHUID can verify the digital signature in the SignerInfo.

- 977 **AS06.03.08: The crls field from the SignedData content type shall be omitted.**
978 No requirement for vendor.
979 TE06.03.08.01: The tester shall validate that the crls field has been omitted from the SignedData.
- 980 **AS06.03.09: The signerInfos in the SignedData content type shall contain only a single
981 SignerInfo type.**
982 No requirement for vendor.
983 TE06.03.09.01: The tester shall validate that only a single SignerInfo exists in the SignedData.
- 984 **AS06.03.10: The SignerInfo type shall use the issuerAndSerialNumber choice for the
985 SignerIdentifier and this shall correspond to the issuer and serialNumber fields found in
986 the X.509 certificate for the entity that signed the biometric data.**
987 No requirement for vendor.
988 TE06.03.10.01: The tester shall validate that the issuerAndSerialNumber choice has been used
989 for the SignerIdentifier and it corresponds to the issuer and serialNumber fields found in the
990 X.509 certificate for the entity that signed the biometric data.
- 991 **AS06.03.11: The SignerInfo type shall specify a digestAlgorithm in accordance with Table
992 3-2 of SP80078.**
993 No requirement for vendor.
994 TE06.03.11.01: The tester shall validate that the digest algorithm in the SignerInfo is in
995 accordance with Table 3-2 of SP80078.
- 996 **AS06.03.12: The signedAttrs of the SignerInfo shall include the MessageDigest (OID =
997 1.2.840.113549.1.9.4) attribute containing the hash of the concatenated CBEFF_HEADER
998 and the STD_BIOMETRIC_RECORD.**
999 No requirement for vendor.
1000 TE06.03.12.01: The tester shall validate the presence of a MessageDigest attribute in the signed
1001 attributes.
1002 TE06.03.12.02: The tester shall validate the value of the MessageDigest attribute against the
1003 hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.
- 1004 **AS06.03.13: The signedAttrs of the SignerInfo shall include the pivSigner-DN (OID =
1005 2.16.840.1.101.3.6.5) attribute containing the subject name that appears in the X.509
1006 certificate for the entity that signed the biometric data.**
1007 No requirement for vendor.
1008 TE06.03.13.01: The tester shall validate the presence of a pivSigner-DN attribute in the signed
1009 attributes.
1010 TE06.03.13.02: The tester shall validate the value of the pivSigner-DN attribute is the same as
1011 the subject name that appears in the certificate that signed the biometric data.

1012 **AS06.03.14: The signedAttrs of the SignerInfo shall include the pivFASC-N (OID =**
1013 **2.16.840.1.101.3.6.6) attribute containing the FASC-N of the PIV card.**

1014 No requirement for vendor.

1015 TE06.03.14.01: The tester shall validate the presence of a pivFASC-N attribute in the signed
1016 attributes.

1017 TE06.03.14.02: The tester shall validate the value of the pivFASC-N attribute is the same as the
1018 FASC-N that is present in the CHUID.

1019 **AS06.03.15: The signatureAlgorithm field specified in the SignerInfo field for RSA with**
1020 **PKCS #1 v1.5 padding, the signatureAlgorithm field shall specify the rsaEncryption OID**
1021 **(as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the**
1022 **signatureAlgorithm shall be in accordance with Table 3-3 of [SP80078](#).**

1023 No requirement for vendor.

1024 TE06.03.15.01: The tester shall validate that the signature algorithm value for RSA with PKCS
1025 #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for
1026 ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of
1027 [SP80078](#).

1028 **AS06.03.16: The SignedData content type shall include the digital signature.**

1029 No requirement for vendor.

1030 TE06.03.16.01: The tester shall validate that the SignedData content type includes the digital
1031 signature corresponding to the signed biometric data.

1032 **AS06.03.17: The signedAttrs of the SignerInfo shall include an entryUUID (OID =**
1033 **1.3.6.1.1.16.4) attribute [FRC4530] containing the 16-byte representation of the Card UUID**
1034 **value that appears in the GUID data element of the PIV card's CHUID data element.**

1035 No requirement for vendor.

1036 TE06.03.17.01: The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4)
1037 attribute in the signed attributes.

1038 TE06.03.17.02: The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4)
1039 attribute is the same as the 16-byte representation of the Card UUID value that appears in the
1040 GUID data element of the PIV card's CHUID data element.

1041 **6.3.2 Certificate that signs the biometric facial image**

1042 Note: This requirement is not tested separately and is tested as part of Section 7.7: X.509
1043 Certificate for Content Signing.

1044

1045 **6.4 Security Object**

1046 **6.4.1 Data Integrity Check**

1047 **AS06.04.01: The message digest produced as a result of a hash function on the contents of a**
1048 **data object buffer shall be identical to that data object's message digest contained in the**
1049 **security object.**

1050 There are no vendor requirements.

1051 TE06.04.01.01: The tester shall validate that the message digests for the various data objects
1052 present in the security object are identical to the message digest of the data object itself.

1053 **6.4.2 Asymmetric Signature Conformance**

1054 **AS06.04.02: The security object buffer shall contain an asymmetric digital signature as**
1055 **specified in RFC (5652).**

1056 There are no vendor requirements.

1057 TE06.04.02.01: The tester shall validate that the digital signature has been formatted correctly as
1058 a CMS signature as defined in RFC (5652).

1059 **AS06.04.03: The digital signature is implemented as a SignedData Type.**

1060 There are no vendor requirements.

1061 TE06.04.03.01: The tester shall validate that the CMS digital signature has been implemented as
1062 a SignedData type.

1063 **AS06.04.04: The value of the version field of the SignedData content type shall be v3.**

1064 There are no vendor requirements.

1065 TE06.04.04.01: The tester shall validate the version of the SignedData type is version 3.

1066 **AS06.04.05: The digestAlgorithms field of the SignedData content type shall be in**
1067 **accordance with Table 3-2 of SP80078.**

1068 No requirement for vendor.

1069 TE06.04.05.01: The tester shall validate that the digest algorithm value is in accordance with
1070 Table 3-2 of SP80078.

1071 **AS06.04.06: The eContentType of the encapContentInfo shall be id-icao-ldsSecurityObject**
1072 **(OID = 1.3.27.1.1.1).**

1073 No requirement for vendor.

1074 TE06.04.06.01: The tester shall validate that eContentType of the encapContentInfo asserts the
1075 id-icao-ldsSecurityObject OID.

- 1076 **AS06.04.07: The eContent of the encapContentsInfo field shall contain the encoded**
1077 **contents of the ldsSecurity object.**
- 1078 No requirement for vendor.
- 1079 TE06.04.07.01: The tester shall validate that eContent of the encapContentInfo contains the
1080 contents of the ldsSecurity object.
- 1081 **AS06.04.08: The certificates field shall be omitted since it is included in the CHUID.**
- 1082 No requirement for vendor.
- 1083 TE06.04.08.01: The tester shall validate that the certificates field has been omitted from the
1084 SignedData.
- 1085 **AS06.04.09: The digestAlgorithm field specified in the SignerInfo field is the same as in**
1086 **accordance with Table 3-2 of SP80078.**
- 1087 No requirement for vendor.
- 1088 TE06.04.09.01: The tester shall validate that the digest algorithm in the SignerInfo is in
1089 accordance with Table 3-2 of SP80078.
- 1090 **AS06.04.10: The signatureAlgorithm field specified in the SignerInfo field for RSA with**
1091 **PKCS #1 v1.5 padding, the signatureAlgorithm field shall specify the rsaEncryption OID**
1092 **(as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the**
1093 **signatureAlgorithm shall be in accordance with Table 3-3 of [SP80078](#).**
- 1094 No requirement for vendor.
- 1095 TE06.04.10.01: The tester shall validate that the signature algorithm value for RSA with PKCS
1096 #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for
1097 ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of
1098 [SP80078](#).
- 1099 **AS06.04.11: The SignedData content type shall include the digital signature.**
- 1100 No requirement for vendor.
- 1101 TE06.04.11.01: The tester shall validate that the SignedData content type includes the digital
1102 signature corresponding to the signed security object.
- 1103 **6.4.3 Certificate that signs the Security Object**
- 1104 Note: This requirement is not tested separately and is tested as part of Section 7.7: X.509
1105 Certificate for Content Signing.
- 1106

1107 **6.5 Biometric Iris**

1108 **6.5.1 Asymmetric Signature Conformance**

1109 **AS06.05.01: The CBEFF_SIGNATURE_BLOCK shall be encoded as a Cryptographic**
1110 **Message Syntax external digital signature as defined in RFC 5652.**

1111 No requirement for vendor.

1112 TE06.05.01.01: The tester shall validate that the digital signature in the
1113 CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as
1114 defined in RFC 5652.

1115 **AS06.05.02: The digital signature is implemented as a SignedData Type.**

1116 No requirement for vendor.

1117 TE06.05.02.01: The tester shall validate that the CMS external digital signature has been
1118 implemented as a SignedData type.

1119 **AS06.05.03: The value of the version field of the SignedData content type shall be v3.**

1120 No requirement for vendor.

1121 TE06.05.03.01: The tester shall validate the version of the SignedData type is version 3.

1122 **AS06.05.04: The digestAlgorithms field of the SignedData content type shall be in**
1123 **accordance with Table 3-2 of SP80078.**

1124 No requirement for vendor.

1125 TE06.05.04.01: The tester shall validate that the digest algorithm is in accordance with Table 3-2
1126 of SP80078.

1127 **AS06.05.05: The eContentType of the encapContentInfo shall be id-PIV-biometricObject**
1128 **(OID = 2.16.840.1.101.3.6.2).**

1129 No requirement for vendor.

1130 TE06.05.05.01: The tester shall validate that eContentType of the encapContentInfo asserts the
1131 id-PIV-biometricObject OID.

1132 **AS06.05.06: The encapContentInfo of the SignedData content type shall omit the eContent**
1133 **field.**

1134 No requirement for vendor.

1135 TE06.05.06.01: The tester shall validate that the eContent field has been omitted from the
1136 encapContentInfo.

1137 **AS06.05.07: If the signature on the biometric iris was generated with a different key as the**
1138 **signature on the CHUID, the certificates field shall include only a single certificate in the**
1139 **SignerInfo field which can be used to verify the signature; else the certificates field shall be**
1140 **omitted.**

1141 VE06.05.07.01: The vendor shall state whether or not the same certificate was used to sign the
1142 CHUID and the Biometrics.

1143 TE06.05.07.01: The tester shall validate that there is a single X.509 certificate in the certificates
1144 field that can verify the digital signature in the SignerInfo.

1145 TE06.05.07.02: If the certificates field is omitted, the tester shall validate that the certificate in
1146 the SignedData for the CHUID can verify the digital signature in the SignerInfo.

1147 **AS06.05.08: The crls field from the SignedData content type shall be omitted.**

1148 No requirement for vendor.

1149 TE06.05.08.01: The tester shall validate that the crls field has been omitted from the SignedData.

1150 **AS06.05.09: The signerInfos in the SignedData content type shall contain only a single**
1151 **SignerInfo type.**

1152 No requirement for vendor.

1153 TE06.05.09.01: The tester shall validate that only a single SignerInfo exists in the SignedData.

1154 **AS06.05.10: The SignerInfo type shall use the issuerAndSerialNumber choice for the**
1155 **SignerIdentifier and this shall correspond to the issuer and serialNumber fields found in**
1156 **the X.509 certificate for the entity that signed the biometric data.**

1157 No requirement for vendor.

1158 TE06.05.10.01: The tester shall validate that the issuerAndSerialNumber choice has been used
1159 for the SignerIdentifier and it corresponds to the to the issuer and serialNumber fields found in
1160 the X.509 certificate for the entity that signed the biometric data.

1161 **AS06.05.11: The SignerInfo type shall specify a digestAlgorithm in accordance with Table**
1162 **3-2 of SP80078.**

1163 No requirement for vendor.

1164 TE06.05.11.01: The tester shall validate that the digest algorithm in the SignerInfo is in
1165 accordance with Table 3-2 of SP80078.

1166 **AS06.05.12: The signedAttrs of the SignerInfo shall include the MessageDigest (OID =**
1167 **1.2.840.113549.1.9.4) attribute containing the hash of the concatenated CBEFF_HEADER**
1168 **and the STD_BIOMETRIC_RECORD.**

1169 No requirement for vendor.

1170 TE06.05.12.01: The tester shall validate the presence of a MessageDigest attribute in the signed
1171 attributes.

- 1172 TE06.05.12.02: The tester shall validate the value of the MessageDigest attribute against the
1173 hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.
- 1174 **AS06.05.13: The signedAttrs of the SignerInfo shall include the pivSigner-DN (OID =**
1175 **2.16.840.1.101.3.6.5) attribute containing the subject name that appears in the X.509**
1176 **certificate for the entity that signed the biometric iris data.**
- 1177 No requirement for vendor.
- 1178 TE06.05.13.01: The tester shall validate the presence of a pivSigner-DN attribute in the signed
1179 attributes.
- 1180 TE06.05.13.02: The tester shall validate the value of the pivSigner-DN attribute is the same as
1181 the subject name that appears in the certificate that signed the biometric data.
- 1182 **AS06.05.14: The signedAttrs of the SignerInfo shall include the pivFASC-N (OID =**
1183 **2.16.840.1.101.3.6.6) attribute containing the FASC-N of the PIV card.**
- 1184 No requirement for vendor.
- 1185 TE06.05.14.01: The tester shall validate the presence of a pivFASC-N attribute in the signed
1186 attributes.
- 1187 TE06.05.14.02: The tester shall validate the value of the pivFASC-N attribute is the same as the
1188 FASC-N that is present in the CHUID.
- 1189 **AS06.05.15: The signatureAlgorithm field specified in the SignerInfo field for RSA with**
1190 **PKCS #1 v1.5 padding, the signatureAlgorithm field shall specify the rsaEncryption OID**
1191 **(as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the**
1192 **signatureAlgorithm shall be in accordance with Table 3-3 of [SP80078](#).**
- 1193 No requirement for vendor.
- 1194 TE06.05.15.01: The tester shall validate that the signature algorithm value for RSA with PKCS
1195 #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for
1196 ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of
1197 [SP80078](#).
- 1198 **AS06.05.16: The SignedData content type shall include the digital signature.**
- 1199 No requirement for vendor.
- 1200 TE06.05.16.01: The tester shall validate that the SignedData content type includes the digital
1201 signature corresponding to the signed biometric data.
- 1202 **AS06.05.17: The signedAttrs of the SignerInfo shall include an entryUUID (OID =**
1203 **1.3.6.1.1.16.4) attribute [FRC4530] containing the 16-byte representation of the Card UUID**
1204 **value that appears in the GUID data element of the PIV card's CHUID data element.**
- 1205 No requirement for vendor.
- 1206 TE06.05.17.01: The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4)
1207 attribute in the signed attributes.

1208 TE06.05.17.02: The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4)
1209 attribute is the same as the 16-byte representation of the Card UUID value that appears in the
1210 GUID data element of the PIV card's CHUID data element.

1211 **6.5.2 Certificate that signs the biometric iris**

1212 Note: This requirement is not tested separately and is tested as part of Section 7.7: X.509
1213 Certificate for Content Signing.

1214 **7. PKI Certificate Profile DTRs**

1215 **7.1 PIV Authentication Certificate**

1216 **7.1.1 Certificate Profile Conformance**

1217 **AS07.01.01: The signature field in the certificate shall specify an algorithm from Table 3-3**
1218 **of SP80078 in the AlgorithmIdentifier (other than sha1WithRSAEncryption).**

1219 VE07.01.01.01: The vendor shall specify in its documentation the algorithms used to sign
1220 certificates issued.

1221 TE07.01.01.01: The tester shall validate that the signature algorithm of the certificate is listed in
1222 Table 3-3 of SP80078 and is not sha1WithRSAEncryption.

1223 **AS07.01.02: If Rivest Shamir Adleman (RSA) with Probabilistic Signature Scheme (PSS)**
1224 **padding is used, the parameters field of the AlgorithmIdentifier type shall assert Secure**
1225 **Hash Algorithm (SHA) 256 (OID = 2.16.840.1.101.3.4.2.1). For the other RSA algorithms,**
1226 **the parameters field is populated with NULL. For Elliptic Curve Digital Signature**
1227 **Algorithm (ECDSA), the parameters field is absent.**

1228 VE07.01.02.01: The vendor shall specify in its documentation the permitted values of the
1229 AlgorithmIdentifier field based on the signature algorithm used to sign certificates issued.

1230 TE07.01.02.01: The tester shall validate that the correctness of the values of the
1231 AlgorithmIdentifier fields.

1232 **AS07.01.03: The subjectPublicKeyInfo field shall assert an algorithm in the**
1233 **AlgorithmIdentifier in accordance with Table 3-4 of SP80078.**

1234 VE07.01.03.01: The vendor shall specify in its documentation the applicable algorithms that can
1235 be used to generate PIV authentication keys.

1236 TE07.01.03.01: The tester shall validate that the algorithm used to generate PIV authentication
1237 keys are in accordance with Table 3-4 of SP80078.

1238 **AS07.01.04: If the public key algorithm is Elliptic Curve, then the parameters field**
1239 **contains the namedCurve choice populated with the appropriate OID from Table 3-5 of**
1240 **SP80078.**

1241 VE07.01.04.01: The vendor shall specify in its documentation the allowed values of the
1242 parameters field of the algorithm of the subjectPublicKeyInfo field as part of the PIV
1243 authentication certificate profile. These values shall be based on the algorithm used to generate
1244 the key pair.

1245 TE07.01.04.01: The tester shall validate the correctness of the values of the parameters field of
1246 the algorithm of the subjectPublicKeyInfo field in the PIV authentication certificate issued by the
1247 vendor.

1248 **AS07.01.05: The keyUsage extension shall assert only the digitalSignature bit. No other bits**
1249 **shall be asserted.**

1250 VE07.01.05.01: The vendor shall specify in its documentation the assertion of the
1251 digitalSignature bit in the keyUsage extension as part of the PIV authentication certificate
1252 profile.

1253 TE07.01.05.01: The tester shall validate the assertion of the digitalSignature bit in the keyUsage
1254 extension in the PIV authentication certificate issued by the vendor.

1255 **AS07.01.06: The policyIdentifier field in the certificatePolicies must assert id-fpki-**
1256 **common-authentication (OID = 2.16.840.1.101.3.2.1.3.13).**

1257 VE07.01.06.01: The vendor shall specify in its documentation the inclusion of the
1258 certificatePolicies extension which asserts the id-fki-common-authentication OID as part of the
1259 PIV authentication certificate profile.

1260 TE07.01.06.01: The tester shall validate the presence of the id-fki-common-authentication OID
1261 in the certificatePolicies extension in the PIV authentication certificate issued by the vendor.

1262 **AS07.01.07: The authorityInfoAccess field shall contain an id-ad-ocsp accessMethod. The**
1263 **access location uses the Uniform Resource Identifier (URI) name form to specify the**
1264 **location of a Hypertext Transfer Protocol (HTTP) accessible Online Certificate Status**
1265 **Protocol (OCSP) Server distributing status information for this certificate.**

1266 VE07.01.07.01: The vendor shall specify in its documentation the inclusion of an id-ad-ocsp
1267 accessMethod in the authorityInfoAccess extension as part of the PIV authentication certificate
1268 profile. Additionally, the accessLocation for this accessMethod uses the URI name form to
1269 specify the location of an HTTP accessible OCSP server.

1270 TE07.01.07.01: The tester shall validate the presence of an id-ad-ocsp accessMethod in the
1271 authorityInfoAccess extension in the PIV authentication certificate issued by the vendor. The
1272 tester shall also validate that the accessLocation for this accessMethod uses the URI name form
1273 and points to an HTTP accessible OCSP server.

1274 **AS07.01.08: The FASC-N and Card UUID shall be populated in the subjectAltName**
1275 **extension using the pivFASC-N attribute (OID = 2.16.840.1.101.3.6.6) for the FASC-N and**
1276 **URI for the Card UUID.**

1277 No requirements for vendor.

1278 TE07.01.08.01: The tester shall validate that the FASC-N and Card UUID in the
1279 subjectAltName field in the PIV authentication certificate is the same as the FASC-N and Card
1280 UUID present in the CHUID in the PIV card. The tester shall validate that no other name forms
1281 appear in the subjectAltName extension.

1282 **AS07.01.09: The piv-interim extension (OID = 2.16.840.1.101.3.6.9.1) shall be present and**
1283 **contain an interim_indicator field which is populated with a Boolean value. This extension**
1284 **is not critical.**

1285 VE07.01.09.01: The vendor shall specify in its documentation the use of this extension as part
1286 of the PIV authentication certificate profile.

1287 TE07.01.09.01: The tester shall validate that the piv-interim extension is present in the PIV
1288 authentication certificate issued by the vendor.

1289 **AS07.01.10: The cRLDistributionPoints field shall contain a URI that uses HTTP and**
1290 **must point to a file that has an extension of “.crl” that contains the DER encoded CRL (see**
1291 **RFC 2585) for status information about the certificate.**

1292 VE07.01.10.01: The vendor shall specify in its documentation the inclusion of a URI in the
1293 cRLDistributionPoints field that uses HTTP.

1294 TE07.01.10.01: The tester shall verify that the cRLDistributionPoints field shall contain a URI
1295 that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded
1296 CRL (see RFC 2585) for status information on the PIV authentication certificate.

1297 **AS07.01.11: The authorityInfoAccess field shall contain an id-ad-caIssuers**
1298 **(1.3.6.1.5.5.7.48.2) accessMethod. The access location shall use a URI using HTTP and**
1299 **points to a file that has an extension of “.p7c” containing a certs-only CMS message (see**
1300 **RFC 3851).**

1301 No requirements for vendor.

1302 TE07.01.11.01: The tester shall validate that the authorityInfoAccess field contains an id-ad-
1303 caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and
1304 points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC
1305 3851).

1306

1307 **7.1.2 Key Pair and Certificate Conformance**

1308 **AS07.01.12: The size of the public key for PIV authentication certificate shall be in**
1309 **accordance with Table 3-1of SP80078.**

1310 VE07.01.12.01: The vendor shall specify in its documentation the allowable public key size to
1311 be used while generating PIV authentication keys.

1312 TE07.01.12.01: The tester shall validate that the public key size is in accordance with Table 3-1
1313 of SP80078.

1314 **AS07.01.13: The public key present in the PIV authentication certificate correspond to the**
1315 **PIV authentication private key.**

1316 No requirement for vendor.

1317 TE07.01.13.01: The tester shall validate that the public key present in the PIV authentication
1318 certificate is part of the key pair corresponding to the private key on the PIV card.

1319 **AS07.01.14: The FASC-N in the subjectAltName field in the PIV authentication certificate**
1320 **is the same as the FASC-N present in the CHUID and the Card UUID is the same value as**
1321 **in the GUID, present in the CHUID.**

1322 No requirement for vendor.

1323 TE07.01.14.01: The tester shall validate that the FASC-N in the subjectAltName field in the PIV
1324 authentication certificate is the same as the FASC-N present in the CHUID in the PIV card.

1325 TE07.01.14.02: The tester shall validate that the Card UUID present in the subjectAltName field
1326 is the same as the Card UUID in the CHUID in the PIV card.

1327 **AS07.01.15: The expiration of the PIV authentication certificate is not beyond the**
1328 **expiration of the CHUID.**

1329 No requirement for vendor.

1330 TE07.01.15.01: The tester shall validate that the expiration of the PIV authentication certificate
1331 is not beyond the expiration of the CHUID in the PIV card.

1332 **AS07.01.16: If the public key algorithm is RSA, the exponent shall be equal to 65,537.**

1333 VE07.01.16.01: The vendor shall specify in its documentation the size of the exponent permitted
1334 while generating an RSA key pair for PIV authentication.

1335 TE07.01.16.01: The tester shall validate that the RSA public key exponent size is equal to
1336 65,537.

1337 **7.2 Digital Signature Certificate**

1338 **7.2.1 Certificate Profile Conformance**

1339 **AS07.02.01: The signature field in the certificate shall specify an algorithm from Table 3-3**
1340 **of SP80078 in the AlgorithmIdentifier (other than sha1WithRSAEncryption).**

1341 VE07.02.01.01: The vendor shall specify in its documentation the algorithms used to sign
1342 certificates issued.

1343 TE07.02.01.01: The tester shall validate that the signature algorithm of the certificate is listed in
1344 Table 3-3 of SP80078 and is not sha1WithRSAEncryption.

1345 **AS07.02.02: If RSA with PSS padding is used, the parameters field of the**
1346 **AlgorithmIdentifier type shall assert SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other**
1347 **RSA algorithms, the parameters field is populated with NULL. For ECDSA, the**
1348 **parameters field is absent.**

1349 VE07.02.02.01: The vendor shall specify in its documentation the permitted values of the
1350 AlgorithmIdentifier field based on the signature algorithm used to sign certificates issued.

1351 TE07.02.02.01: The tester shall validate that the correctness of the values of the
1352 AlgorithmIdentifier fields.

1353 **AS07.02.03: The subjectPublicKeyInfo field shall assert an algorithm in the**
1354 **AlgorithmIdentifier in accordance with Table 3-4 of SP80078.**

1355 VE07.02.03.01: The vendor shall specify in its documentation the applicable algorithms that can
1356 be used to generate digital signature keys.

1357 TE07.02.03.01: The tester shall validate that the algorithm used to generate digital signature
1358 keys are in accordance with Table 3-4 of SP80078.

1359 **AS07.02.04: If the public key algorithm is Elliptic Curve, then the parameters field**
1360 **contains the namedCurve choice populated with the appropriate OID from Table 3-5 of**
1361 **SP80078.**

1362 VE07.02.04.01: The vendor shall specify in its documentation the allowed values of the
1363 parameters field of the algorithm of the subjectPublicKeyInfo field as part of the digital signature
1364 certificate profile. These values shall be based on the algorithm used to generate the key pair.

1365 TE07.02.04.01: The tester shall validate the correctness of the values of the parameters field of
1366 the algorithm of the subjectPublicKeyInfo field in the digital signature certificate issued by the
1367 vendor.

1368 **AS07.02.05: The keyUsage extension shall assert both the digitalSignature and**
1369 **nonRepudiation bits. No other bits shall be asserted.**

1370 VE07.02.05.01: The vendor shall specify in its documentation the assertion of the
1371 digitalSignature bit and the nonRepudiation bit in the keyUsage extension as part of the digital
1372 signature certificate profile.

1373 TE07.02.05.01: The tester shall validate the assertion of the digitalSignature bit and the
1374 nonRepudiation bit in the keyUsage extension in the digital signature certificate issued by the
1375 vendor.

1376 **AS07.02.06: The policyIdentifier field in the certificatePolicies must assert one of the**
1377 **following: id-fpki-common-hardware (OID = 2.16.840.1.101.3.2.1.3.7) or id-fpki-common-**
1378 **High (OID = 2.16.840.1.101.3.2.1.3.16).²**

1379 VE07.02.06.01: The vendor shall specify in its documentation the inclusion of the
1380 certificatePolicies extension which asserts one of the following OIDs as part of the Digital
1381 Signature certificate profile: the id-fpki-common-hardware or id-fpki-common-High.

1382 TE07.02.06.01: The tester shall validate the presence of one of the following OIDs in the
1383 certificatePolicies extension in the Digital Signature certificate issued by the vendor: the id-fpki-
1384 common-hardware or id-fpki-common-High.

1385 **AS07.02.07: The cRLDistributionPoints field shall contain a URI that uses HTTP and**
1386 **must point to a file that has an extension of “.crl” that contains the DER encoded CRL (see**
1387 **RFC 2585) for status information about the certificate.**

1388 VE07.02.07.01: The vendor shall specify in its documentation the inclusion of a URI in the
1389 cRLDistributionPoints field that uses HTTP.

1390 TE07.02.07.01: The tester shall verify that the cRLDistributionPoints field shall contain a URI
1391 that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded
1392 CRL (see RFC 2585) for status information on the Digital signature certificate.

1393 **AS07.02.08: The authorityInfoAccess field shall contain an id-ad-caIssuers**
1394 **(1.3.6.1.5.5.7.48.2) accessMethod. The access location shall use a URI using HTTP and**
1395 **points to a file that has an extension of “.p7c” containing a certs-only CMS message (see**
1396 **RFC 3851).**

1397 No requirements for vendor.

1398 TE07.02.08.01: The tester shall validate that the authorityInfoAccess field contains an id-ad-
1399 caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and
1400 points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC
1401 3851).
1402

1403 7.2.2 Key Pair and Certificate Conformance

1404 **AS07.02.09: The size of the public key for digital signature certificate shall be in**
1405 **accordance with Table 3-1 of SP80078.**

1406 VE07.02.09.01: The vendor shall specify in its documentation the allowable public key size to
1407 be used while generating digital signature keys.

1408 TE07.02.09.01: The tester shall validate that the public key size is in accordance with Table 3-1
1409 of SP80078.

² This test is not applicable to legacy PKIs.

1410 **AS07.02.10: The public key present in the digital signature certificate corresponds to the**
1411 **digital signature private key.**

1412 No requirement for vendor.

1413 TE07.02.10.01: The tester shall validate that the public key present in the digital signature
1414 certificate is part of the key pair corresponding to the private key on the PIV card.

1415 **AS07.02.11: The expiration of the digital signature certificate is not beyond the expiration**
1416 **of the CHUID.**

1417 No requirement for vendor.

1418 TE07.02.11.01: The tester shall validate that the expiration of the digital signature certificate is
1419 not beyond the expiration of the CHUID in the PIV card.

1420 **AS07.02.12: If the public key algorithm is RSA, the exponent shall be equal to 65,537.**

1421 VE07.02.12.01: The vendor shall specify in its documentation the size of the exponent permitted
1422 while generating an RSA key pair for digital signatures.

1423 TE07.02.12.01: The tester shall validate that the RSA public key exponent size is equal to
1424 65,537.

1425

1426 **7.3 Key Management Certificate**

1427 **7.3.1 Certificate Profile Conformance**

1428 **AS07.03.01: The signature field in the certificate shall specify an algorithm from Table 3-3**
1429 **of SP80078 in the AlgorithmIdentifier (other than sha1WithRSAEncryption).**

1430 VE07.03.01.01: The vendor shall specify in its documentation the algorithms used to sign
1431 certificates issued.

1432 TE07.03.01.01: The tester shall validate that the signature algorithm of the certificate is listed in
1433 Table 3-3 of SP80078 and is not sha1WithRSAEncryption.

1434 **AS07.03.02: If RSA with PSS padding is used, the parameters field of the**
1435 **AlgorithmIdentifier type shall assert SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other**
1436 **RSA algorithms, the parameters field is populated with NULL. For ECDSA, the**
1437 **parameters field is absent.**

1438 VE07.03.02.01: The vendor shall specify in its documentation the permitted values of the
1439 AlgorithmIdentifier field based on the signature algorithm used to sign certificates issued.

1440 TE07.03.02.01: The tester shall validate that the correctness of the values of the
1441 AlgorithmIdentifier fields.

1442 **AS07.03.03: The subjectPublicKeyInfo field shall assert an algorithm in the**
1443 **AlgorithmIdentifier in accordance with Table 3-4 of SP80078.**

1444 VE07.03.03.01: The vendor shall specify in its documentation the applicable algorithms that can
1445 be used to generate key management keys.

1446 TE07.03.03.01: The tester shall validate that the algorithm used to generate key management
1447 keys are in accordance with Table 3-4 of SP80078.

1448 **AS07.03.04: If the public key algorithm is Elliptic Curve, then the parameters field**
1449 **contains the namedCurve choice populated with the appropriate OID from Table 3-5 of**
1450 **SP80078.**

1451 VE07.03.04.01: The vendor shall specify in its documentation the allowed values of the
1452 parameters field of the algorithm of the subjectPublicKeyInfo field as part of the key
1453 management certificate profile. These values shall be based on the algorithm used to generate the
1454 key pair.

1455 TE07.03.04.01: The tester shall validate the correctness of the values of the parameters field of
1456 the algorithm of the subjectPublicKeyInfo field in the key management certificate issued by the
1457 vendor.

1458 **AS07.03.05: If the public key algorithm is RSA, then the keyUsage extension shall only**
1459 **assert the keyEncipherment bit.**

1460 VE07.03.05.01: The vendor shall specify in its documentation that certificates corresponding to
1461 RSA keys assert only the keyEncipherment bit in the keyUsage extension.

1462 TE07.03.05.01: The tester shall validate that certificates corresponding to RSA keys assert only
1463 the keyEncipherment bit in the keyUsage extension.

1464 **AS07.03.06: If the public key algorithm is Elliptic Curve, then the keyUsage extension shall**
1465 **only assert the keyAgreement bit.**

1466 VE07.03.06.01: The vendor shall specify in its documentation that certificates corresponding to
1467 elliptic curve keys assert only the keyAgreement bit in the keyUsage extension.

1468 TE07.03.06.01: The tester shall validate that certificates corresponding to elliptic curve keys
1469 assert only the keyAgreement bit in the keyUsage extension.

1470 **AS07.03.07: The policyIdentifier field in the certificatePolicies must assert one of the**
1471 **following: id-fpki-common-policy (OID = 2.16.840.1.101.3.2.1.3.6), id-fpki-common-**
1472 **hardware (OID = 2.16.840.1.101.3.2.1.3.7), or id-fpki-common-High (OID =**
1473 **2.16.840.1.101.3.2.1.3.16).³**

1474 VE07.03.07.01: The vendor shall specify in its documentation the inclusion of the
1475 certificatePolicies extension which asserts one of the following OIDs as part of the Key
1476 Management certificate profile: the id-fpki-common-policy, id-fpki-common-hardware, or id-
1477 fpki-common-High.

1478 TE07.03.07.01: The tester shall validate the presence of one of the following OIDs in the
1479 certificatePolicies extension in the Key Management certificate issued by the vendor: the id-fpki-
1480 common-policy, id-fpki-common-hardware, or id-fpki-common-High.

1481 **AS07.03.08: The cRLDistributionPoints field shall contain a URI that uses HTTP and**
1482 **must point to a file that has an extension of “.crl” that contains the DER encoded CRL (see**
1483 **RFC 2585) for status information about the certificate.**

1484 VE07.03.08.01: The vendor shall specify in its documentation the inclusion of a URI in the
1485 cRLDistributionPoints field that uses HTTP.

1486 TE07.03.08.01: The tester shall verify that the cRLDistributionPoints field shall contain a URI
1487 that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded
1488 CRL (see RFC 2585) for status information on the Key management certificate.

1489 **AS07.03.09: The authorityInfoAccess field shall contain an id-ad-caIssuers**
1490 **(1.3.6.1.5.5.7.48.2) accessMethod. The access location shall use a URI using HTTP and**
1491 **points to a file that has an extension of “.p7c” containing a certs-only CMS message (see**
1492 **RFC 3851).**

1493 No requirements for vendor.

1494 TE07.03.09.01: The tester shall validate that the authorityInfoAccess field contains an id-ad-
1495 caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and
1496 points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC
1497 3851).

1498

³ This test is not applicable to legacy PKIs

1499 **7.3.2 Key Pair and Certificate Conformance**

1500 **AS07.03.10: The size of the public key for key management shall be in accordance with**
1501 **Table 3-1 of SP80078.**

1502 VE07.03.10.01: The vendor shall specify in its documentation the allowable public key size to
1503 be used while generating key management keys.

1504 TE07.03.10.01: The tester shall validate that the public key size is in accordance with Table 3-1
1505 of SP80078.

1506 **AS07.03.11: The public key present in the key management certificate corresponds to the**
1507 **key management private key.**

1508 No requirement for vendor.

1509 TE07.03.11.01: The tester shall validate that the public key present in the key management
1510 certificate is part of the key pair corresponding to the private key on the PIV card.

1511 **AS07.03.12: If the public key algorithm is RSA, the exponent shall be equal to 65,537.**

1512 VE07.03.12.01: The vendor shall specify in its documentation the size of the exponent permitted
1513 while generating an RSA key pair for key management.

1514 TE07.03.12.01: The tester shall validate that the RSA public key exponent size is equal to
1515 65,537.

1516

1517 **7.4 Card Authentication Certificate**

1518 **7.4.1 Certificate Profile Conformance**

1519 **AS07.04.01: The signature field in the certificate shall specify an algorithm from Table 3-3**
1520 **of SP80078 in the AlgorithmIdentifier (other than sha1WithRSAEncryption).**

1521 VE07.04.01.01: The vendor shall specify in its documentation the algorithms used to sign
1522 certificates issued.

1523 TE07.04.01.01: The tester shall validate that the signature algorithm of the certificate is listed in
1524 Table 3-3 of SP80078 and is not sha1WithRSAEncryption.

1525 **AS07.04.02: If RSA with PSS padding is used, the parameters field of the**
1526 **AlgorithmIdentifier type shall assert SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the**
1527 **other RSA algorithms, the parameters field is populated with NULL. For ECDSA, the**
1528 **parameters field is absent.**

1529 VE07.04.02.01: The vendor shall specify in its documentation the permitted values of the
1530 AlgorithmIdentifier field based on the signature algorithm used to sign certificates issued.

1531 TE07.04.02.01: The tester shall validate that the correctness of the values of the
1532 AlgorithmIdentifier fields.

1533 **AS07.04.03: The subjectPublicKeyInfo field shall assert an algorithm in the**
1534 **AlgorithmIdentifier in accordance with Table 3-4 of SP80078.**

1535 VE07.04.03.01: The vendor shall specify in its documentation the applicable algorithms that can
1536 be used to generate card authentication keys.

1537 TE07.04.03.01: The tester shall validate that the algorithm used to generate card authentication
1538 keys are in accordance with Table 3-4 of SP80078.

1539 **AS07.04.04: If the public key algorithm is Elliptic Curve, then the parameters field**
1540 **contains the namedCurve choice populated with the appropriate OID from Table 3-5 of**
1541 **SP80078.**

1542 VE07.04.04.01: The vendor shall specify in its documentation the allowed values of the
1543 parameters field of the algorithm of the subjectPublicKeyInfo field as part of the card
1544 authentication certificate profile. These values shall be based on the algorithm used to generate
1545 the key pair.

1546 TE07.04.04.01: The tester shall validate the correctness of the values of the parameters field of
1547 the algorithm of the subjectPublicKeyInfo field in the card authentication certificate issued by
1548 the vendor.

1549 **AS07.04.05: The keyUsage extension shall assert only the digitalSignature bit. No other bits**
1550 **shall be asserted.**

1551 VE07.04.05.01: The vendor shall specify in its documentation the assertion of the
1552 digitalSignature bit in the keyUsage extension as part of the card authentication certificate
1553 profile.

- 1554 TE07.04.05.01: The tester shall validate the assertion of the digitalSignature bit in the keyUsage
1555 extension in the card authentication certificate issued by the vendor.
- 1556 **AS07.04.06: The policyIdentifier field in the certificatePolicies must assert id-fpki-
1557 common-cardAuth (OID = 2.16.840.1.101.3.2.1.3.17).**
- 1558 VE07.04.06.01: The vendor shall specify in its documentation that the policyIdentifier field in
1559 certificatePolicies asserts the id-fpki-common-cardAuth OID.
- 1560 TE07.04.06.01: The tester shall validate the policyIdentifier field in certificatePolicies has
1561 asserted the id-fpki-common-cardAuth OID.
- 1562 **AS07.04.07: The extKeyUsage extension shall assert id-PIV-cardAuth (OID =
1563 2.16.840.1.101.3.6.8). This extension is critical.**
- 1564 VE07.04.07.01: The vendor shall specify in its documentation that the extKeyUsage extension
1565 asserts the id-PIV-cardAuth OID.
- 1566 TE07.04.07.01: The tester shall validate the extKeyUsage is present, is marked as critical, asserts
1567 the id-PIV-cardAuth OID, and does not assert any other OIDs.
- 1568 **AS07.04.08: The authorityInfoAccess field shall contain an id-ad-ocsp accessMethod. The
1569 access location uses the URI name form to specify the location of an HTTP accessible
1570 OCSP Server distributing status information for this certificate.**
- 1571 VE07.04.08.01: The vendor shall specify in its documentation the inclusion of an id-ad-ocsp
1572 accessMethod in the authorityInfoAccess extension as part of the card authentication certificate
1573 profile. Additionally, the accessLocation for this accessMethod uses the URI name form to
1574 specify the location of an HTTP accessible OCSP server.
- 1575 TE07.04.08.01: The tester shall validate the presence of an id-ad-ocsp accessMethod in the
1576 authorityInfoAccess extension in the card authentication certificate issued by the vendor. The
1577 tester shall also validate that the accessLocation for this accessMethod uses the URI name form
1578 and points to an HTTP accessible OCSP server.
- 1579 **AS07.04.09: The FASC-N and Card UUID shall be populated in the subjectAltName
1580 extension using the pivFASC-N attribute (OID = 2.16.840.1.101.3.6.6) for the FASC-N and
1581 URI for the Card UUID.**
- 1582 No requirements for vendor.
- 1583 TE07.04.09.01: The tester shall validate that the FASC-N and Card UUID in the subjectAltName
1584 field in the Card authentication certificate is the same as the FASC-N and Card UUID present in
1585 the CHUID in the PIV card. The tester shall validate that no other name forms appear in the
1586 subjectAltName extension.
- 1587 **AS07.04.10: The piv-interim extension (OID = 2.16.840.1.101.3.6.9.1) shall be present
1588 contain an interim_indicator field which is populated with a Boolean value. This extension
1589 is not critical.**
- 1590 VE07.04.10.01: The vendor shall specify in its documentation the use of this extension as part
1591 of the card authentication certificate profile.

1592 TE07.04.10.01: The tester shall validate that the piv-interim extension is present in the card
1593 authentication certificate issued by the vendor.

1594 **AS07.04.11: The cRLDistributionPoints field shall contain a URI that uses HTTP and**
1595 **must point to a file that has an extension of “.crl” that contains the DER encoded CRL (see**
1596 **RFC 2585) for status information about the certificate.**

1597 VE07.04.11.01: The vendor shall specify in its documentation the inclusion of a URI in the
1598 cRLDistributionPoints field that uses HTTP.

1599 TE07.04.11.01: The tester shall verify that the cRLDistributionPoints field shall contain a URI
1600 that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded
1601 CRL (see RFC 2585) for status information on the Card authentication certificate.

1602 **AS07.04.12: The authorityInfoAccess field shall contain an id-ad-caIssuers**
1603 **(1.3.6.1.5.5.7.48.2) accessMethod. The access location shall use a URI using HTTP and**
1604 **points to a file that has an extension of “.p7c” containing a certs-only CMS message (see**
1605 **RFC 3851).**

1606 No requirements for vendor.

1607 TE07.04.12.01: The tester shall validate that the authorityInfoAccess field contains an id-ad-
1608 caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and
1609 points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC
1610 3851).

1611 **7.4.2 Key Pair and Certificate Conformance**

1612 **AS07.04.13: The size of the public key for card authentication shall be in accordance with**
1613 **Table 3-1 of SP80078.**

1614 VE07.04.13.01: The vendor shall specify in its documentation the allowable public key size to
1615 be used while generating card authentication keys.

1616 TE07.04.13.01: The tester shall validate that the public key size is in accordance with Table 3-1
1617 of SP80078.

1618 **AS07.04.14: The public key present in the card authentication certificate correspond to the**
1619 **card authentication private key.**

1620 No requirement for vendor.

1621 TE07.04.14.01: The tester shall validate that the public key present in the card authentication
1622 certificate is part of the key pair corresponding to the private key on the PIV card.

1623 **AS07.04.15: The FASC-N in the subjectAltName field in the Card authentication certificate**
1624 **is the same as the FASC-N present in the CHUID and the Card UUID is the same value as**
1625 **in the GUID, present in the CHUID.**

1626 No requirement for vendor.

1627 TE07.04.15.01: The tester shall validate that the FASC-N in the subjectAltName field in the
1628 Card authentication certificate is the same as the FASC-N present in the CHUID in the PIV card.

1629 TE07.04.15.02: The tester shall validate that the Card UUID present in the subjectAltName field
1630 is the same as the Card UUID in the CHUID in the PIV card.

1631 **AS07.04.16: If the public key algorithm is RSA, the exponent shall be equal to 65,537.**

1632 VE07.04.16.01: The vendor shall specify in its documentation the size of the exponent permitted
1633 while generating an RSA key pair for card authentication.

1634 TE07.04.16.01: The tester shall validate that the RSA public key exponent size is equal to
1635 65,537.

1636

1637 **7.5 Secure Messaging Card Verifiable Certificate**

1638 **7.5.1 Certificate Profile Conformance**

1639 **AS07.05.01: The signature field in the certificate shall be in accordance with Table 15 of**
1640 **Part 2 in [SP80073](#) and shall contain either an ECDSA signature, using P-256 if the**
1641 **CardHolderPublicKey is P-256 or P-384 if the CardHolderPublicKey is P-384.**

1642 VE07.05.01.01: The vendor shall specify in its documentation the algorithms used to sign
1643 certificates issued.

1644 TE07.05.01.01: The tester shall validate that signature field in the certificate is in accordance
1645 with Table 15 of Part 2 in [SP80073](#) and contains either an ECDSA signature using P-256 if the
1646 CardHolderPublicKey is P-256 or P-384 if the CardHolderPublicKey is P-384.

1647 **AS07.05.02: The CardHolderPublicKey data object shall assert an algorithm in the**
1648 **Algorithm OID in accordance with Table 15 of [SP80073](#) Part 2.**

1649 VE07.05.02.01: The vendor shall specify in its documentation the applicable algorithms that can
1650 be used to generate card authentication keys.

1651 TE07.05.02.01: The tester shall validate that the algorithm used to generate card authentication
1652 keys are in accordance with Table 15 of [SP80073](#) Part 2.

1653 **AS07.05.03: The Credential Profile Identifier of the secure messaging CVC shall be 0x80.**

1654 No requirements for vendor.

1655 TE07.05.03.01: The tester shall verify that the Credential Profile Identifier of the secure
1656 messaging CVC is 0x80.

1657 **AS07.05.04: The Issuer Identification Number of the secure messaging CVC shall be the**
1658 **leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to**
1659 **verify the signature. If the public key needed to verify the signature on the secure**
1660 **messaging CVC appears in an Intermediate CVC, then value shall be the value of the**
1661 **Subject Identifier in the Intermediate CVC.**

1662 No requirements for the vendor.

1663 TE07.05.04.01: The tester shall verify that the Issuer Identification Number of the secure
1664 messaging CVC is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing
1665 certificate needed to verify the signature.

1666 TE07.05.04.02: The tester shall verify that if the public key needed to verify the signature on the
1667 secure messaging CVC appears in an Intermediate CVC, then the Issuer Identification Number
1668 shall be the value of the Subject Identifier in the Intermediate CVC.

1669 **AS07.05.05: The Role Identifier of the secure messaging CVC shall be 0x00 for card-**
1670 **application key CVC.**

1671 No requirements for vendor.

1672 TE07.05.05.01: The tester shall verify that the Role Identifier of the secure messaging CVC is
1673 0x00 for card-application key CVC.

1674 **AS07.05.06: The Subject Identifier of the secure messaging CVC shall be the same 16-byte**
1675 **binary representation of the Card UUID value in the GUID field of the CHUID.**

1676 No requirements for vendor.

1677 TE07.05.06.01: The tester shall validate that the Subject Identifier of the secure messaging
1678 CVC is same 16-byte binary representation of the Card UUID value in the GUID field of the
1679 CHUID.

1680

1681 **7.5.2 Key Pair and Certificate Conformance**

1682 **AS07.05.07: If the PIV Card Application supports the virtual contact interface [\[SP80073\]](#)**
1683 **and the digital signature key, the key management key, or any of the retired key**
1684 **management keys are elliptic curve keys corresponding to Curve P-384, then the PIV**
1685 **Secure Messaging key shall use P-384, otherwise it may use P-256 or P-384.**

1686 No requirements for vendor.

1687 TE07.05.07.01: The tester shall validate that the Secure Messaging key size is in accordance
1688 with the interfaces supported by the card and the keys that are present on the card.

1689 **AS07.05.08: The PIV card shall store a corresponding secure messaging CVC to support**
1690 **validation of the public key by the relying party. The format for the secure messaging**
1691 **CVC shall be as specified in [SP80073](#) Part 2, Section 4.1.5.**

1692 No requirements for vendor.

1693 TE07.05.08.01: This test is not tested separately and tested throughout Section 11.5: Secure
1694 Messaging Card Verifiable Certificate.

1695 **AS07.05.09: The Public Key present in the secure messaging CVC corresponds to the**
1696 **Secure Messaging private key.**

1697 No requirements for vendor.

1698 TE07.05.09.01: The tester shall validate that the public key present in the CVC is part of the
1699 key pair corresponding to the secure messaging private key on the PIV card.

1700 **AS07.05.10: The public key required to verify the digital signature of the secure messaging**
1701 **CVC is an ECC key. It shall be provided in either an X.509 Certificate for Content Signing**
1702 **or an Intermediate CVC. If the public key required to verify the digital signature of the**
1703 **secure messaging CVC is provided in an Intermediate CVC, then the format of the**
1704 **Intermediate CVC shall be as specified in Table 16 of [SP80073](#) Part 2, Section 4.1.5, and**
1705 **the public key required to verify the digital signature of the Intermediate CVC shall be**
1706 **provided in an X.509 Certificate for Content Signing.**

1707 No requirements for vendor

1708 TE07.05.10.01: The tester shall validate that the public key is either an X.509 Certificate for
1709 Content Signing or an Intermediate CVC. If it is provided in an Intermediate CVC, then the
1710 format of the Intermediate CVC shall be as specified in Table 16 of SP80073 Part 2, Section
1711 4.1.5, and the public key required to verify the digital signature of the Intermediate CVC shall be
1712 provided in an X.509 Certificate for Content Signing.

1713 **AS07.05.11: The X.509 Certificate for Content Signing needed to verify the digital**
1714 **signature of a secure messaging CVC or Intermediate CVC of a valid PIV card shall not be**
1715 **expired.**

1716 No requirements for vendor.

1717 TE07.05.11.01: The tester shall validate that the X.509 Certificate for Content Signing needed to
1718 verify the digital signature of a secure messaging CVC or Intermediate CVC of a valid PIV card
1719 does not be expired.

1720 **AS07.05.12: The Public Key object of the secure messaging CVC shall be encoded in tag**
1721 **0x86 with a value of 04||X||Y, where X and Y are the coordinates of the point on the curve.**

1722 No requirements for vendor.

1723 TE07.05.12.01: The tester shall verify that the Public Key object of the secure messaging CVC
1724 is encoded in tag 0x86 with a value of 04||X||Y, where X and Y are the coordinates of the point
1725 on the curve.

1726

1727

- 1728 **7.6 Intermediate Card Verifiable Certificate (CVC)**
- 1729 **7.6.1 Certificate Profile Conformance**
- 1730 **AS07.06.01: The signature field in the certificate shall be in accordance with Table 16 of**
1731 **Part 2 in SP80073 and shall contain an algorithm for RSA with SHA-256 and PKCS #1**
1732 **v1.5 padding.**
- 1733 VE07.06.01.01: The vendor shall specify in its documentation the algorithms used to sign
1734 certificates issued.
- 1735 TE07.06.01.01: The tester shall validate that the signature field in the certificate is in accordance
1736 with Table 16 of Part 2 in SP80073 and contains an algorithm for RSA with SHA-256 and PKCS
1737 #1 v1.5 padding.
- 1738 **AS07.06.02: The CardHolderPublicKey data object shall assert an algorithm in the**
1739 **AlgorithmOID in accordance with Table 16 of [SP80073](#) Part 2.**
- 1740 VE07.06.02.01: The vendor shall specify in its documentation the applicable algorithms that can
1741 be used to generate card authentication keys.
- 1742 TE07.06.02.01: The tester shall validate that the algorithm used to generate card authentication
1743 keys are in accordance with Table 16 of [SP80073](#) Part 2.
- 1744 **AS07.06.03: The Intermediate Card Verifiable Certificate shall have a tag value of 0x7F21.**
- 1745 VE07.06.03.01: The vendor shall specify in its document the tag value for the Card Verifiable
1746 Certificate.
- 1747 TE07.06.03.01: The tester shall verify that the tag value of the Intermediate CVC is 0x7F21.
- 1748 **AS07.06.04: The Credential Profile Identifier of the Intermediate CVC shall be 0x80.**
- 1749 No requirements for vendor.
- 1750 TE07.06.04.01: The tester shall verify that the Credential Profile Identifier of the Intermediate
1751 CVC is 0x80.
- 1752 **AS07.06.05: The Issuer Identification Number of the Intermediate CVC shall be the**
1753 **leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to**
1754 **verify the signature on the Intermediate CVC.**
- 1755 No requirements for the vendor.
- 1756 TE07.06.05.01: The tester shall verify that the Issuer Identification Number of the Intermediate
1757 CVC is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed
1758 to verify the signature.
- 1759 **AS07.06.06: The Subject Identifier of the Intermediate CVC shall be the leftmost 8 bytes**
1760 **of the SHA-1 hash of the Public Key object.**
- 1761 No requirements for the vendor.

1762 TE07.06.06.01: The tester shall verify that the Subject Identifier of the Intermediate CVC is the
1763 leftmost 8 bytes of the SHA-1 hash of the Public Key object.

1764 **AS07.06.07: The Algorithm OID of the Intermediate CVC shall be either**
1765 **0x2A8648CE3D030107 for ECDH (Curve P-256) or 0x2B81040022 for ECDH (Curve P-**
1766 **384).**

1767 VE07.06.07.01: The vendor shall specify in its documentation the Algorithm OID of the
1768 Intermediate CVC.

1769 TE07.06.07.01: The tester shall verify that the Algorithm OID of the Intermediate CVC is either
1770 0x2A8648CE3D030107 for ECDH (Curve P-256) or 0x2B81040022 for ECDH (Curve P-384).

1771 **AS07.06.08: The Role Identifier of the Intermediate CVC shall be 0x12 for card-**
1772 **application root CVC.**

1773 No requirements for vendor.

1774 TE07.06.08.01: The tester shall verify that the Role Identifier of the Intermediate CVC is 0x12
1775 for card-application root CVC.

1776 **7.6.2 Key Pair and Certificate Conformance**

1777 **AS07.06.09: The X.509 Certificate for Content Signing needed to verify the digital**
1778 **signature of a secure messaging CVC or Intermediate CVC of a valid PIV card shall not be**
1779 **expired.**

1780 No requirements for vendor.

1781 TE07.06.09.01: The tester shall validate that the X.509 Certificate for Content Signing needed to
1782 verify the digital signature of a secure messaging CVC or Intermediate CVC of a valid PIV card
1783 is not expire.

1784 **AS07.06.10: The Public Key object of the Intermediate CVC shall be encoded in tag 0x86**
1785 **with a value of 04||X||Y, where X and Y are the coordinates of the point on the curve.**

1786 No requirements for vendor.

1787 TE07.06.10.01: The tester shall verify that the Public Key object of the Intermediate CVC is
1788 encoded in tag 0x86 with a value of 04||X||Y, where X and Y are the coordinates of the point on
1789 the curve.

1790 **AS07.06.11: The public key in the Intermediate CVC used to verify the signature on the**
1791 **secure messaging CVC shall conform to Table 16 [SP80073](#) Part 2, Section 4.1.5.**

1792 No requirements for vendor.

1793 TE07.06.11.01: The tester shall verify that the public key in the Intermediate CVC used to
1794 verify the signature on the secure messaging CVC shall conform to Table 16 SP80073 Part 2,
1795 Section 4.1.5.

1796 **7.7 X.509 Certificate for Content Signing**

1797 **7.7.1 Certificate Profile Conformance**

1798 **AS07.07.01: The signature field in the certificate shall specify an algorithm from Table 3-3**
1799 **of SP80078 in the AlgorithmIdentifier (other than sha1WithRSAEncryption).**

1800 VE07.07.01.01: The vendor shall specify in its documentation the algorithms used to sign
1801 certificates issued.

1802 TE07.07.01.01: The tester shall validate that the signature algorithm of the certificate is listed in
1803 Table 3-3 of SP80078 and is not sha1WithRSAEncryption.

1804 **AS07.07.02: If RSA with PSS padding is used, the parameters field of the**
1805 **AlgorithmIdentifier type shall assert SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other**
1806 **RSA algorithms, the parameters field is populated with NULL. For ECDSA, the**
1807 **parameters field is absent.**

1808 VE07.07.02.01: The vendor shall specify in its documentation the permitted values of the
1809 AlgorithmIdentifier field based on the signature algorithm used to sign certificates issued.

1810 TE07.07.02.01: The tester shall validate that the correctness of the values of the
1811 AlgorithmIdentifier fields.

1812 **AS07.07.03: The subjectPublicKeyInfo field shall assert an algorithm in the**
1813 **AlgorithmIdentifier in accordance with Table 3-4 of SP80078.**

1814 VE07.07.03.01: The vendor shall specify in its documentation the applicable algorithms that can
1815 be used to generate the X.509 Certificate for Content Signing.

1816 TE07.07.03.01: The tester shall validate that the algorithm used to generate the X.509
1817 Certificate for Content Signing are in accordance with Table 3-4 of SP80078.

1818 **AS07.07.04: If the public key algorithm is Elliptic Curve, then the parameters field**
1819 **contains the namedCurve choice populated with the appropriate OID from Table 3-5 of**
1820 **SP80078.**

1821 VE07.07.04.01: The vendor shall specify in its documentation the allowed values of the
1822 parameters field of the algorithm of the subjectPublicKeyInfo field as part of the X.509
1823 Certificate for Content Signing profile. These values shall be based on the algorithm used to
1824 generate the key pair.

1825 TE07.07.04.01: The tester shall validate the correctness of the values of the parameters field of
1826 the algorithm of the subjectPublicKeyInfo field in the X.509 Certificate for Content Signing
1827 issued by the vendor.

1828 **AS07.07.05: The keyUsage extension shall assert both the digitalSignature and**
1829 **nonRepudiation bits. No other bits shall be asserted.**

1830 VE07.07.05.01: The vendor shall specify in its documentation the assertion of the
1831 digitalSignature bit and the nonRepudiation bit in the keyUsage extension as part of the X.509
1832 Certificate for Content Signing profile.

1833 TE07.07.05.01: The tester shall validate the assertion of the digitalSignature bit and the
1834 nonRepudiation bit in the keyUsage extension in the X.509 Certificate for Content Signing
1835 issued by the vendor.

1836 **AS07.07.06: For signatures created before October 15, 2015, the public key required to**
1837 **verify the digital signature shall be provided in the certificates field of the CMS external**
1838 **digital signature in a content signing certificate, which shall be an X.509 digital signature**
1839 **certificate issued under the id-fpki-common-hardware, the public key required to verify**
1840 **the digital signature shall be provided in the certificates field of the CMS external digital**
1841 **signature in a content signing certificate, which shall be an X.509 digital signature**
1842 **certificate issued under the id-fpki-common-piv-contentSigning policy of [COMMON]. The**
1843 **content signing certificate shall also include an extended key usage (extKeyUsage)**
1844 **extension asserting id-PIV-content-signing.**

1845 No requirements for vendor.

1846 TE07.07.06.01: The tester shall validate that the signatures created before October 15, 2015, the
1847 public key required to verify the digital signature is provided in the certificates field of the CMS
1848 external digital signature in a content signing certificate, which is an X.509 digital signature
1849 certificate issued under the id-fpki-common-hardware, the public key required to verify the
1850 digital signature shall be provided in the certificates field of the CMS external digital signature in
1851 a content signing certificate, which is an X.509 digital signature certificate issued under the id-
1852 fpki-common-piv-contentSigning policy of [COMMON]. The content signing certificate also
1853 includes an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing.

1854 **AS07.07.07: The cRLDistributionPoints field shall contain a URI that uses HTTP and**
1855 **must point to a file that has an extension of “.crl” that contains the DER encoded CRL (see**
1856 **RFC 2585) for status information about the certificate.**

1857 VE07.07.07.01: The vendor shall specify in its documentation the inclusion of a URI in the
1858 cRLDistributionPoints field that uses HTTP.

1859 TE07.07.07.01: The tester shall verify that the cRLDistributionPoints field shall contain a URI
1860 that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded
1861 CRL (see RFC 2585) for status information on the X.509 Certificate for Content Signing.

1862 **AS07.07.08: The authorityInfoAccess field shall contain an id-ad-caIssuers**
1863 **(1.3.6.1.5.5.7.48.2) accessMethod. The access location shall use a URI using HTTP and**
1864 **points to a file that has an extension of “.p7c” containing a certs-only CMS message (see**
1865 **RFC 3851).No requirements for vendor.**

1866 TE07.07.08.01: The tester shall validate that the authorityInfoAccess field contains an id-ad-
1867 caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and
1868 points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC
1869 3851).

1870

1871 **7.7.2 Key Pair and Certificate Conformance**

1872 **AS07.07.09: The size of the public key for X.509 Certificate for Content Signing shall be in**
1873 **accordance with Table 3-2 of SP80078.**

1874 VE07.07.09.01: The vendor shall specify in its documentation the allowable public key size to
1875 be used for signing PIV data objects.

1876 TE07.07.09.01: The tester shall validate that the public key size is in accordance with Table 3-2
1877 2of SP80078.

1878 **AS07.07.10: If the public key algorithm is RSA, the exponent shall be equal to 65,537.**

1879 No requirements for vendor.

1880 TE07.07.10.01: The tester shall validate that the RSA public key exponent size is equal to
1881 65,537.

1882 **AS07.07.11: The X.509 Certificate for Content Signing shall not be expired.**

1883 No requirement for vendor.

1884 TE07.07.11.01: The tester shall verify that the X.509 Certificate for Content Signing is not
1885 expired.

1886 **8. BER-TLV Test Assertions**

1887 Assumptions:

1.0	<p>When the length of the value field is between 0 and 127 bytes, the length field consists of a single byte where bit 8 is set to 0 and bits 7 to 1 encode the number of bytes in the value field.</p> <p>When the length of the value field is greater than 127 bytes, the length field consists of two or more bytes. The first byte is '81', '82', '83' or '84' where the low order nibble of each of these possible first-byte values (1, 2, 3, or 4 respectively) encodes the number of subsequent and remaining bytes in the length field. These subsequent and remaining bytes are taken together in order to be a big-endian integer encoding the number of bytes in the value field. Table 8-1 shows the encoding of the length field.</p>
1.1	Except for the Discovery Object tag and the BIT Group Template, each BER-TLV tag is encoded as three bytes.
1.2	Each data object returned is appended with a 2 byte status word.
1.3	All variable length value fields can have zero lengths, which will result in a tag length field being immediately followed by the next tag, if applicable.
1.4	The final byte of the command string can be set to 0x00 to retrieve an entire data object regardless of the size of that object.

1888

Number of Bytes in the Length Field	First Byte	Subsequent Bytes	Length of the Value Field
1 byte	'00' to '7F'	None	0 to 127
2 byte	'81'	'00' to 'FF'	0 to 255
3 byte	'82'	'0000' to 'FFFF'	0 to 65,535
4 byte	'83'	'000000' to 'FFFFFF'	0 to 16,777,215
5 byte	'84'	'00000000' to 'FFFFFFFF'	0 to 4,294,967,295

1889

Table 8-1. Encoding of Length Field1890 **8.1 “Card Capabilities Container” Data Object**

Purpose	Confirms that the CCC of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.02.01

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CCC is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>>. 2. Set OID := <<CCC (2.16.840.1.101.3.7.1.219.0)>>. 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	<ol style="list-style-type: none"> 1. The registered data model element is present and has a value of 0x10. 2. All mandatory tags in CCC table are present and may not have a value field. 3. The values of the available tags conform with the vendor provided data.

1891

1892 **8.2 CHUID Data Object**

Purpose	Confirms that the CHUID of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.03.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	<ol style="list-style-type: none"> 1. All mandatory tags in CHUID table are present. 2. The Agency Code, System Code, and Credential Number of the FASC-N are present. The credential series, individual credential issue, person identifier, organizational category, organizational identifier, and person/organization association category of the FASC-N are populated

	<p>or contain all zeros.</p> <ol style="list-style-type: none"> 3. Expiration date is encoded as YYYYMMDD and its date-value is within the next six years. 4. The Global Unique Identification number (GUID) includes a Card Universally Unique Identifier (UUID) as described in 800-73-4 Part 1 Section 3.4.1. 5. If the CHUID contains the optional Cardholder UUID, then the data element shall be in accordance with 800 73-4 Part 1 Section 3.4.2. 6. The retired key map field is absent.
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1895 **8.3 “X.509 Certificate for PIV Authentication” Data Object**

Purpose	Confirms that the X.509 Certificate for PIV Authentication of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073. Part 1
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid X.509 certificate for PIV authentication object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in “X.509 Certificate for PIV Authentication” table are present.

1896

1897 **8.4 Off-Card Comparison “Card Holder Fingerprints” Data Object**

Purpose	Confirms that the “Card Holder Fingerprints” data object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073, Part 1
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.04.01

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	<ol style="list-style-type: none"> 1. All mandatory tags in “Card Holder Fingerprints” table are present. 2. The fingerprint data is nested in tag value 0xBC.

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1899

8.5 “Printed Information” Data Object

Purpose	Confirms that the “Printed Information” Data Object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid printed information is stored on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Printed Information (2.16.840.1.101.3.7.2.48.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in “Printed Information” table are present.

1900

1901 **8.6 “Card Holder Facial Image” Data Object**

Purpose	Confirms that the “Card Holder Facial Image” data object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.05.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	<ol style="list-style-type: none"> 1. All mandatory tags in “Card Holder Facial Image” table are present. 2. The facial image data is nested in tag value 0xBC

1902 **8.7 “X.509 Certificate for Digital Signature” Data Object**

Purpose	Confirms that the X.509 Certificate for Digital Signature of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1 Appendix A 2. AS04.01.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid X.509 certificate for digital signature object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <p>4. Read and parse the byte array in accordance with BER-TLV format.</p>
Expected Result(s)	All mandatory tags in “X.509 Certificate for Digital Signature” table are present.

1903

1904 **8.8 “X.509 Certificate for Key Management” Data Object**

Purpose	Confirms that the X.509 Certificate for Key Management of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid X.509 certificate for key management object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in “X.509 Certificate for Key Management” table are present.

1905

1906 **8.9 “X.509 Certificate for Card Authentication” Data Object**

Purpose	Confirms that the X.509 Certificate for Card Authentication of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid X.509 certificate for card authentication object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in "X.509 Certificate for Card Authentication" table are present.

1907

1908 **8.10 "Security Object" Data Object**

Purpose	Confirms that the "Security Object" data object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1 2. AS04.01.01 3. AS04.06.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format. 5. Parse the tag 0xBA to extract the Data Groups to Container ID mapping instances. 6. Verify that all unsigned data objects, such as the Printed Information data object, are included in the Security Object if present and that the message digests for the various data objects present in the security object are identical to the message digest of the data object itself 7. Verify that the PIV data containers exist on the card by selecting each container.
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 4: All mandatory tags in “Security Object” table are present. 2. From Step 6: All unsigned data objects (if present) are included in the Security Object and the message digests are identical to the message digest of the actual data object. 3. From Step 7: Verify that all data containers found in the mapping are actually present in the card by performing a select on each container and expecting '90 00' in all cases.

1909

1910 **8.11 “Discovery Object” Data Object**

Purpose	Confirms that the Discovery Object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073, Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Part 1, Appendix A 2. AS04.01.01 3. AS04.09.01 4. AS04.10.02
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Discovery Object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Discover Object (2.16.840.1.101.3.7.2.96.80)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle

	<ul style="list-style-type: none"> • (IN) OID • (OUT) data <p>4. Read and parse the byte array in accordance with BER-TLV format.</p>
Expected Result(s)	<ol style="list-style-type: none"> 1. All mandatory tags in the Discovery Object are present, specifically both tag 0x4F (PIV Card Application AID) and tag 0x5F2F (PIN Usage Policy). 2. The values of the tags conform with the vendor provided data. 3. The PIN usage policy matches the card capabilities provided by the vendor documentation. Associated optional data objects are present when the PIN usage policy asserts an optional capability (i.e., OCC, global PIN and pairing code) 4. From step 4, '90 00' is returned.

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1912

1913 **8.12 “Card Holder Iris Images” Data Object**

Purpose	Confirms that the “Card Holder Iris Images” data object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073, Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.07.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	<ol style="list-style-type: none"> 1. All mandatory tags in “Card Holder Iris Images” table are present. 2. The iris data is nested in tag value 0xBC

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1916 **8.13 “Retired X.509 Certificate for Key Management” Data Object(s)**

Purpose	Confirms that the Retire X.509 Certificate(s) for Key Management of the PIV Card Application conform to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Retired X.509 certificate for key management object is present on the PIV card.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Retired Key Management Certificate (2.16.840.1.101.3.7.2.16.1–2.16.840.1.101.3.7.2.16.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format 5. Using the public key in the retired certificate key management certificate, issue a challenge to the corresponding private key on the card.
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 4: All mandatory tags in “Retired X.509 Certificate for Key Management” table are present. 2. From Step 5: The responses to all challenges to the associated private (retired) key matches.

1917

1918 **8.14 “Key History” Data Object**

Purpose	Confirms that the Key History of the PIV Card Application conforms to the logical requirements in Section 3.3.7 of SP80073 Part 1 and the PIV data model requirements as per Appendix A of 800-73-4 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.08.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A Key History object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	Step 1: Set cardHandle := <<valid card handle>>

	<p>Step 2: Set OID := <<Key History Object (2.16.840.1.101.3.7.2.96.96)>></p> <p>Step 3: Call pivGetData w/</p> <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data <p>Step 4: Read and parse the byte array in accordance with BER-TLV format.</p> <p style="padding-left: 40px;">If keysWithOnCardCerts = 0 and keysWithOffCardCerts > 0</p> <p style="padding-left: 80px;">Read the certificate(s) and key references (pairs) from the vendor provided URL file. For each key reference value in the range (0x95 - keysWithOffCardCerts + 1) through 0x95, verify that the provided URL file includes that key reference, issue a challenge for that key reference, and verify the response using the public key from the corresponding certificate from the provided URL file.</p> <p style="padding-left: 40px;">If keysWithOnCardCerts > 0 and keyWithOffCardCerts = 0</p> <p style="padding-left: 80px;">For each key reference value in the range 0x82 through (0x82 + keysWithOnCardCerts - 1), read the certificates from the card. Issue a <u>challenge</u> and verify response for each retired private key.</p> <p style="padding-left: 40px;">If keysWithOnCardCerts > 0 and keyWithOffCardCerts > 0</p> <p style="padding-left: 80px;">For each key reference value in the range 0x82 through (0x82 + keysWithOnCardCerts - 1) and in the range (0x95 - keysWithOffCardCerts + 1) through 0x95, verify that the provided URL file includes that key reference, issue a challenge for that key reference, and verify the response using the public key from the corresponding certificate from the provided URL file.</p>
Expected Result(s)	<p>1. Step 4: All mandatory tags in “Key History Object” table are present. And the values associated with keysWithOnCardCerts > 0 and keyWithOffCardCerts are consistent with the data on the card based on the details in step 4.</p>

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1920 **8.15 “Biometric Information Templates Group Template” Data Object**

Purpose	Confirms that the Biometric Information Templates Group Template of the PIV Card Application conforms to the PIV data model requirements
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	as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.10.01
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid BIT Group Template data object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Biometric Information Templates Group Template (2.16.840.1.101.3.7.2.16.22)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in “BIT Group Template” table are present.

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1922 **8.16 “Secure Messaging Certificate Signer” Data Object**

Purpose	Confirms that the Secure Messaging Certificate Signer data object of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1, Appendix A 2. AS04.01.01 3. AS04.11.01
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Secure Messaging Certificate Signer data object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected	All mandatory tags in “Secure Messaging Certificate Signer” table are

Result(s)	present.
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1924 **8.17 “Pairing Code Reference Data Container” Data Object**

Purpose	Confirms that the Pairing Code Reference Data Container of the PIV Card Application conforms to the PIV data model requirements as per Appendix A of SP80073 Part 1.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 1 2. AS04.01.01 3. AS04.12.01
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Pairing Code Reference Data Container data object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Pairing Code Reference Data Container (2.16.840.1.101.3.7.2.16.24)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Read and parse the byte array in accordance with BER-TLV format.
Expected Result(s)	All mandatory tags in “Pairing Code Reference Data Container” table are present.

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1927 **8.18 Unused Data Objects on the PIV Card**

Purpose	Confirms that data objects that are created but not used shall be set to zero-length value.
Reference(s)	<ol style="list-style-type: none"> 4. SP80073 Part 1 5. AS04.01.01 6. AS04.13.01
Precondition	<ol style="list-style-type: none"> 5. A valid PIV card is inserted into the contact reader. 6. A valid PC/SC connection exists between the test application and the contact reader. 7. The test application is currently connected to the card application which is accessible through card handle.

Test Steps	<ol style="list-style-type: none">1. Set cardHandle := <<valid card handle>>2. Set OID := <<Vendor Supply Unused Data Objects on the PIV Card (OID Variable)>>3. Call pivGetData w/<ul style="list-style-type: none">• (IN) cardHandle• (IN) OID• (OUT) data8. Read and parse the byte array in accordance with BER-TLV format.9. Repeat steps 1 - 4 for all unused data objects
Expected Result(s)	For step 9: Each data containers that is created but not personalized returns the container's tag and length (L = 0x00). The value field is absent.

1928 **9. Biometric Data Object Test Assertions**

1929 The test assertions documented in this section relate to test specification of the Off-Card
 1930 Comparison Fingerprint and Facial Image. It specifies the test cases on conformance to the
 1931 common CBEFF Patron Format (Table 15 of SP80076) as well the corresponding INCITS 378
 1932 minutiae template profile (for On-Card fingerprint Minutia, Table 6 of SP80076) and INCITS 385
 1933 (for a Facial Image profile).

1934 **9.1 CBEFF Patron Format for Off-Card Comparison Fingerprint Template**

1935 **9.1.1 CBEFF Structure for Fingerprint Template**

Purpose	Validates that the CBEFF structure generated complies with SP80076 Table 13, “CBEFF concatenation structure”.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 13. 2. AS05.01.01 3. AS05.01.03
Precondition(s)	<ol style="list-style-type: none"> 1. All templates have been generated and stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. A valid Card Holder Fingerprints object is present on the PIV card. 6. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the BDB Length field of CBEFF Header. 5. Extract the SB Length field of CBEFF Header.
Expected Result(s)	<ol style="list-style-type: none"> 1. From step 4: BDB Length field is non-zero and the recorded length matches the actual length. 2. From step 5: SB Length field is non-zero and the recorded length matches the actual length. 3. The Card Holder Fingerprint object length is equal to CBEFF Header length + BDB Length + SB Length.

1936 **9.1.2 CBEFF Header for Off-Card Comparison Fingerprint Template**

1937 **9.1.2.1 Patron Header Version**

Purpose	Validates that the CBEFF field “Patron Header Version” complies with SP80076 Table 14, “Patron Format PIV Specification”
References(s)	1. SP80076, Table 14.

	<ol style="list-style-type: none"> 2. AS05.01.02 3. AS05.01.04
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Patron Header Version field (based on its position) in CBEFF Header.
Expected Result(s)	From Step 4: The Patron Header Version field has a value of 0x03.

1938 9.1.2.2 SBH Security Option

Purpose	Validates that the biometric data block on the PIV card is digitally signed but not encrypted.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.05
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the SBH Security Option field (based on its position) in CBEFF Header.
Expected Result(s)	From Step 4: The SBH Security Options field has a value of b00001101.

1939 **9.1.2.3 BDB Format Owner Values**

Purpose	Validates that BDB Format Owner is set to a value of 0x001B denoting M1, the INCITS Technical Committee on Biometrics.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.06
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Owner field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Owner field has a value of 0x001B.

1940 **9.1.2.4 BDB Format Type**

Purpose	Validates that for mandatory fingerprint minutiae template data stored on a PIV card, the BDB Format Type is set to a value of 0x0201.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.07
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Type field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Type field has a value of 0x0201.

1941 **9.1.2.5 Biometric Creation Date**

Purpose	Validates that the creation date in the PIV Patron Format is encoded in 8 bytes using a binary representation of “YYYYMMDDhhmmssZ”.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14. 2. AS05.01.02 3. AS05.01.03 4. AS05.03.08
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Creation Date field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Creation Date is in the YYYYMMDDhhmmssZ format.

1942 **9.1.2.6 Validity Period Dates**

Purpose	Validates that the Validity Period in the PIV Patron Format contains two dates encoded in the same format as expected in 9.1.2.5 above.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14 2. AS05.01.02 3. AS05.01.03 4. AS05.01.09

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Validity Period field (based on its position) in CBEFF Header.
Expected Result(s)	The Validity Period contains two dates and each is encoded in the YYYYMMDDhhmmssZ format.

1943 9.1.2.7 Biometric Type Values

Purpose	Validates that Biometric Type has the value 0x000008
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.10
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Type field (based on its position) in CBEFF Header.
Expected Result(s)	The value of the Biometric Type field for the fingerprint template is 0x000008

1944 **9.1.2.8 Biometric Data Type**

Purpose	Validates that for the mandatory minutia PIV card templates, the CBEFF biometric data type encoding value shall be b100xxxxx, which corresponds to biometric data that has been processed.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.11
Precondition(s)	<ol style="list-style-type: none"> 1. All required sample finger images have been recorded. 2. All templates have been generated and stored on the PIV card. 3. A valid PIV card is inserted into the contact reader. 4. A valid PC/SC connection exists between the test application and the contact reader. 5. The test application is currently connected to the card application which is accessible through card handle. 6. A valid Card Holder Fingerprints object is present on the PIV card. 7. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Type field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Type field has a value of b100xxxxx.

1945 **9.1.2.9 Biometric Data Quality**

Purpose	Validates that the biometric data quality field carries valid values
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.12
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Quality field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Quality field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Quality field has a value between -2 and 100.

1946 **9.1.2.10 Creator Field Value**

Purpose	Validates that the Creator field in the PIV Patron Format contains 18 bytes of which the first K <= 17 bytes shall be ASCII characters, and the first of the remaining 18-K shall be a null terminator (zero).
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.13
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Creator field (based on its position) in CBEFF Header. Start the following procedure at the first byte of the Creator field: <ol style="list-style-type: none"> 5. For bytes 0 to 16, check if byte represents an ASCII character <ul style="list-style-type: none"> If yes, continue. Else, check if zero. If no, fail. Else iterate through remaining bytes in field and fail if non-zero. 6. For bytes 17 through the end of the field, iterate through all bytes and fail if non-zero

Expected Result(s)	Procedure completes without failing.
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1947 **9.1.2.11 FASC-N Value**

Purpose	The FASC-N field in the PIV Patron Format shall contain the 25 bytes of the FASC-N component of the CHUID identifier.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.14
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the FASC-N field of CBEFF Header. 5. Set cardHandle := <<valid card handle>> 6. Set OID := <<Card Holder Unique Identifier (2.16.840.1.101.3.7.2.48.0)>> 7. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 8. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the FASC-N field (based on its position) in CBEFF Header.
Expected Result(s)	The FASC-N field in CBEFF header is the same as the one extracted from the CHUID.

1948 **9.1.2.12 Reserved Field Value**

Purpose	Validates that the “Reserved for Future Use” field is equal to 0x00000000.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.15

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the "Reserved for Future Use" field (based on its position) in CBEFF Header.
Expected Result(s)	The field has a value of 0x00000000.

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1951 **9.2 CBEFF Patron Format for Facial Image**1952 **9.2.1 CBEFF Structure for Facial Image**

Purpose	Validates that the CBEFF structure generated complies with SP80076 Table 13, “CBEFF concatenation structure”.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 13. 2. AS05.01.01 3. AS05.01.03
Precondition(s)	<ol style="list-style-type: none"> 1. All templates have been generated and stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. A valid Card Holder Facial Image object is present on the PIV card. 6. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the BDB Length field of CBEFF Header. 5. Extract the SB Length field of CBEFF Header.
Expected Result(s)	<ol style="list-style-type: none"> 1. From step 4: BDB Length field is non-zero and the recorded length matches the actual length. 2. From step 5: SB Length field is non-zero and the recorded length matches the actual length. 3. The Card Holder Facial Image object length is equal to CBEFF Header length + BDB Length + SB Length.

1953 **9.2.2 CBEFF Header for Facial Image**1954 **9.2.2.1 Patron Header Version**

Purpose	Validates that the CBEFF field “Patron Header Version” complies with SP80076 Table 14, “Patron Format PIV Specification”
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14. 2. AS05.01.02 3. AS05.01.04

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Patron Header Version field (based on its position) in CBEFF Header.
Expected Result(s)	The Patron Header Version field has a value of 0x03.

1955 **9.2.2.2 SBH Security Option**

Purpose	Validates that the biometric data block on the PIV card is digitally signed but not encrypted.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.05
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the SBH Security Option field (based on its position) in CBEFF Header.
Expected Result(s)	The SBH Security Options field has a value of b00001101.

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1958 **9.2.2.3 BDB Format Owner Values**

Purpose	Validates that BDB Format Owner is set to a value of 0x001B denoting M1, the INCITS Technical Committee on Biometrics.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.06
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Owner field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Owner field has a value of 0x001B.

1959 **9.2.2.4 BDB Format Type**

Purpose	Validates that for mandatory facial image data stored on a PIV card, the BDB Format Type is set to a value of 0x0501.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.07
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Type field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Type field has a value of 0x0501.

1960 **9.2.2.5 Biometric Creation Date**

Purpose	Validates that the creation date in the PIV Patron Format is encoded in 8 bytes using a binary representation of “YYYYMMDDhhmmssZ”.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14. 2. AS05.01.02 3. AS05.01.03 4. AS05.01.08
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Creation Date field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Creation Date is in the YYYYMMDDhhmmssZ format.

1961 **9.2.2.6 Validity Period Dates**

Purpose	Validates that the Validity Period in the PIV Patron Format contains two dates encoded in the same format as expected in 9.2.2.5 above.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14 2. AS05.01.02 3. AS05.01.03 4. AS05.01.09

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Validity Period field (based on its position) in CBEFF Header.
Expected Result(s)	The Validity Period contains two dates and each is encoded in the YYYYMMDDhhmmssZ format.

1962 9.2.2.7 Biometric Type Values

Purpose	Validates that Biometric Type has the value 0x000002
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.10
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Type field (based on its position) in CBEFF Header.
Expected Result(s)	The value of the Biometric Type field for the facial image is 0x000002

1963 **9.2.2.8 Biometric Data Type**

Purpose	Validates that the CBEFF biometric data type encoding value shall be b001xxxxx, which corresponds to the raw biometric data.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.11
Precondition(s)	<ol style="list-style-type: none"> 1. All required sample finger images have been recorded. 2. All templates have been generated and stored on the PIV card. 3. A valid PIV card is inserted into the contact reader. 4. A valid PC/SC connection exists between the test application and the contact reader. 5. The test application is currently connected to the card application which is accessible through card handle. 6. A valid Card Holder Facial Image object is present on the PIV card. 7. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Type field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Type field has a value of b001xxxxx.

1964 **9.2.2.9 Biometric Data Quality**

Purpose	Validates that the biometric data quality field carries valid values
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.12
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Quality field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Quality field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Quality field is -2 or 0 - 100.

1965 **9.2.2.10 Creator Field Value**

Purpose	Validates that the Creator field in the PIV Patron Format contains 18 bytes of which the first K <= 17 bytes shall be ASCII characters, and the first of the remaining 18-K shall be a null terminator (zero).
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.13
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Creator field (based on its position) in CBEFF Header. Start the following procedure at the first byte of the Creator field: <ol style="list-style-type: none"> 5. For bytes 0 to 16, check if byte represents an ASCII character <ul style="list-style-type: none"> If yes, continue. Else, check if zero. If no, fail. Else iterate through remaining bytes in field and fail if non-zero. 6. For bytes 17 through the end of the field, iterate through all bytes and fail if non-zero

Expected Result(s)	Procedure completes without failing.
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1969 **9.2.2.11 FASC-N Value**

Purpose	The FASC-N field in the PIV Patron Format shall contain the 25 bytes of the FASC-N component of the CHUID identifier.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.14
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the FASC-N field of CBEFF Header. 5. Set cardHandle := <<valid card handle>> 6. Set OID := <<Card Holder Unique Identifier (2.16.840.1.101.3.7.2.48.0)>> 7. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 8. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the FASC-N field (based on its position) in CBEFF Header.
Expected Result(s)	The FASC-N field in CBEFF header is the same as the one extracted from the CHUID.

1970 **9.2.2.12 Reserved Field Value**

Purpose	Validates that the “Reserved for Future Use” field is equal to 0x00000000.
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References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.15
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Facial Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the "Reserved for Future Use" field (based on its position) in CBEFF Header.
Expected Result(s)	The field has a value of 0x00000000.

1971

1972 **9.3 CBEFF Patron Format for Iris Image**1973 **9.3.1 CBEFF Structure for Iris Image**

Purpose	Validates that the CBEFF structure generated complies with SP80076 Table 13, "CBEFF concatenation structure".
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 13. 2. AS05.01.01 3. AS05.01.03
Precondition(s)	<ol style="list-style-type: none"> 1. All templates have been generated and stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. A valid Card Holder Iris Image object is present on the PIV card. 6. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data

	<ol style="list-style-type: none"> 4. Extract the BDB Length field of CBEFF Header. 5. Extract the SB Length field of CBEFF Header.
Expected Result(s)	<ol style="list-style-type: none"> 1. From step 4: BDB Length field is non-zero and the recorded length matches the actual length. 2. From step 5: SB Length field is non-zero and the recorded length matches the actual length. 3. The Card Holder Facial Image object length is equal to CBEFF Header length + BDB Length + SB Length.

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1975 9.3.2 CBEFF Header for Iris Image

1976 9.3.2.1 Patron Header Version

Purpose	Validates that the CBEFF field “Patron Header Version” complies with SP80076 Table 14, “Patron Format PIV Specification”
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14. 2. AS05.01.02 3. AS05.01.04
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Patron Header Version field (based on its position) in CBEFF Header.
Expected Result(s)	The Patron Header Version field has a value of 0x03.

1977 9.3.2.2 SBH Security Option

Purpose	Validates that the biometric data block on the PIV card is digitally signed but not encrypted.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.05

Precondition(s)	<ol style="list-style-type: none"> 6. A valid PIV card is inserted into the contact reader. 7. A valid PC/SC connection exists between the test application and the contact reader. 8. The test application is currently connected to the card application which is accessible through card handle. 9. A valid Card Holder Iris Image object is present on the PIV card. 10. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the SBH Security Option field (based on its position) in CBEFF Header.
Expected Result(s)	The SBH Security Options field has a value of b00001101.

1978 9.3.2.3 BDB Format Owner Values

Purpose	Validates that BDB Format Owner is set to a value of 0x0101 denoting ISO/IEC JTC 1/SC37 Biometrics.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.06
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Owner field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Owner field has a value of 0x0101.

1979 **9.3.2.4 BDB Format Type**

Purpose	Validates that for optional iris image data stored on a PIV card, the BDB Format Type is set to a value of 0x0009.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.07
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the BDB Format Type field (based on its position) in CBEFF Header.
Expected Result(s)	The BDB Format Type field has a value of 0x0009.

1980 **9.3.2.5 Biometric Creation Date**

Purpose	Validates that the creation date in the PIV Patron Format is encoded in 8 bytes using a binary representation of “YYYYMMDDhhmmssZ”.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14. 2. AS05.01.02 3. AS05.01.03 4. AS05.01.08
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <p>4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Creation Date field (based on its position) in CBEFF Header.</p>
Expected Result(s)	The Biometric Creation Date is in the YYYYMMDDhhmmssZ format.

1981 **9.3.2.6 Validity Period Dates**

Purpose	Validates that the Validity Period in the PIV Patron Format contains two dates encoded in the same format as expected in 9.3.2.5 above.
References(s)	<ol style="list-style-type: none"> 1. SP80076, Table 14 2. AS05.01.02 3. AS05.01.03 4. AS05.01.09
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Validity Period field (based on its position) in CBEFF Header.
Expected Result(s)	The Validity Period contains two dates and each is encoded in the YYYYMMDDhhmmssZ format.

1982 **9.3.2.7 Biometric Type Values**

Purpose	Validates that Biometric Type has the value 0x000010.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.10
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.

Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Type field (based on its position) in CBEFF Header.
Expected Result(s)	The value of the Biometric Type field for the iris image is 0x000010.

1983 **9.3.2.8 Biometric Data Type**

Purpose	Validates that the CBEFF biometric data type encoding value shall be b010xxxxx, which corresponds to the raw biometric data.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.11
Precondition(s)	<ol style="list-style-type: none"> 1. All required sample finger images have been recorded. 2. All templates have been generated and stored on the PIV card. 3. A valid PIV card is inserted into the contact reader. 4. A valid PC/SC connection exists between the test application and the contact reader. 5. The test application is currently connected to the card application which is accessible through card handle. 6. A valid Card Holder Iris Image object is present on the PIV card. 7. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Type field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Type field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Type field has a value of b010xxxxx.

1984 **9.3.2.9 Biometric Data Quality**

Purpose	Validates that the biometric data quality field carries valid values
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.12

Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the Biometric Data Quality field of CBEFF Header. 5. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Biometric Data Quality field (based on its position) in CBEFF Header.
Expected Result(s)	The Biometric Data Quality field is -2 and 100.

1985 **9.3.2.10 Creator Field Value**

Purpose	Validates that the Creator field in the PIV Patron Format contains 18 bytes of which the first K <= 17 bytes shall be ASCII characters, and the first of the remaining 18-K shall be a null terminator (zero).
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.13
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the Creator field (based on its position) in CBEFF Header. Start the following procedure at the first byte of the Creator field: 5. For bytes 0 to 16, check if byte represents an ASCII character

	<p>If yes, continue. Else, check if zero. If no, fail. Else iterate through remaining bytes in field and fail if non-zero.</p> <p>6. For bytes 17 through the end of the field, iterate through all bytes and fail if non-zero</p>
Expected Result(s)	Procedure completes without failing.

1986 **9.3.2.11 FASC-N Value**

Purpose	The FASC-N field in the PIV Patron Format shall contain the 25 bytes of the FASC-N component of the CHUID identifier.
References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.14
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the FASC-N field of CBEFF Header. 5. Set cardHandle := <<valid card handle>> 6. Set OID := <<Card Holder Unique Identifier (2.16.840.1.101.3.7.2.48.0)>> 7. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 8. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the FASC-N field (based on its position) in CBEFF Header.
Expected Result(s)	The FASC-N field in CBEFF header is the same as the one extracted from the CHUID.

1987 **9.3.2.12 Reserved Field Value**

Purpose	Validates that the “Reserved for Future Use” field is equal to 0x00000000.
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References(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS05.01.02 3. AS05.01.03 4. AS05.01.15
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Iris Image object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, extract the first 88 bytes (CBEFF Header) and read the "Reserved for Future Use" field (based on its position) in CBEFF Header.
Expected Result(s)	The field has a value of 0x00000000.

1988

1989

1990

1991 **9.4 Off-Card Comparison Fingerprint Template**1992 **9.4.1 General Record Header Conformance**

Purpose	Verify that the General Record Header of the fingerprint template conforms to specifications in Table 6 of SP80076.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 6 2. AS05.01.03 3. AS05.02.01 4. AS05.02.02 5. AS05.02.03 6. AS05.02.04 7. AS05.02.05 8. AS05.02.06 9. AS05.02.07 10. AS05.02.08 11. AS05.02.09 12. AS05.02.10 13. AS05.02.11 14. AS05.02.12
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, parse the first 88 bytes (CBEFF Header) to obtain the BDB and SB lengths and then continue on to parse the General Record Header of the BDB <ol style="list-style-type: none"> a. Extract contents of Format Identifier. b. Extract contents of Version Number. c. Extract contents of Record Length field. d. Extract contents of CBEFF Product Identifier Owner e. Extract contents of CBEFF Product Identifier Type f. Extract contents of Capture Equipment Compliance field. g. Extract contents of Capture Equipment ID h. Extract contents of "Scanned Image in X Direction" field i. Extract contents of "Scanned Image in Y Direction" field j. Extract contents of X (horizontal) resolution. k. Extract contents of Y (vertical) resolution. l. Extract contents of "Number of Finger Views" field. m. Extract contents of Reserved Byte.

Expected Result(s)	<p>The expected values for each of the fields parsed in Step 4 above are given below:</p> <ol style="list-style-type: none"> a. Format Identifier has a value 0x4646D5200 b. Version Number has a value of 0x20323030 c. Record Length has value of $26 \leq L \leq 1574$ d. & e. Both these fields shall be > 0 (non-zero). The two most significant bytes shall identify the vendor while the least two significant bytes identifier the version number of the minutiae detection algorithm. f. Capture Equipment Compliance has a value of 1000b g. Capture Equipment ID has a value of > 0. h. Width of the Size of Scanned Image in x direction is the larger of the widths of the two input i. Height of the Size of Scanned Image in y direction is the larger of the heights of the two input images. j & k. X and Y resolution has a value of 197 l. Number of Finger Views is 2 m. Reserved Byte value is zero
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1993 **9.4.2 View Header Conformance**

Purpose	Verify that the View Header of the BDB conforms to specifications in Table 6 of SP80076.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 6 2. AS05.01.03 3. AS05.02.13 4. AS05.02.14 5. AS05.02.15 6. AS05.02.16
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.

<p>Test Scenario</p>	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, parse the first 88 bytes (CBEFF Header) to obtain the BDB length and then continue on to parse the View Header of the BDB <ol style="list-style-type: none"> a. Extract contents of View Number. b. Extract contents of Impression Type. c. Extract contents of Finger Quality. d. Extract contents of Number of Minutiae. 5. Repeat steps 4a through 4f for the second view header.
<p>Expected Result(s)</p>	<p>For Step 4:</p> <ol style="list-style-type: none"> a. View Number shall be 0 if there is only one minutiae record for a finger. b. Impression Type is 0 or 2. c. Finger Quality value shall be between 20, 40, 60, 80, 100, 254, or 255. d. Number of Minutiae value shall be $0 \leq M \leq 128$. <p>For Step 5: The expected values for each of the fields are the same as in step 4.</p>

1994 **9.4.3 Fingerprint Minutiae Data Records**

<p>Purpose</p>	<p>Verify that each instance of Fingerprint Minutiae data records conforms to specifications in Table 6 of SP80076.</p>
<p>Reference(s)</p>	<ol style="list-style-type: none"> 1. SP80076, Table 6 2. AS05.02.17 3. AS05.02.19
<p>Precondition(s)</p>	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid Card Holder Fingerprints object is present on the PIV card. 5. Security conditions to read the object are met.
<p>Test Scenario</p>	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0xBC, parse the first 88 bytes (CBEFF Header) to obtain the BDB length and then continue on to parse the Minutiae data instances following

	<p>the View Header of the BDB.</p> <p>a. Extract contents of Minutiae Type.</p> <p>b. Extract contents of Extended Block Length.</p> <p>5. Repeat steps 4a to 4b for each Minutiae Data instance.</p>
Expected Result(s)	<p>The expected values for each of the fields parsed in Step 4 and 5 above are given below:</p> <p>a. Minutiae Type value shall be 01b, 10b, or 00b.</p> <p>b. Extended Data Block Length shall be 0</p>

1995

1996 **9.5 On-Card Comparison**

1997 **9.5.1 BIT Group Template data conformance for on-card comparison**

Purpose	Verify that the BIT group template follows the specifications as defined in section 5.3 and in Table 7 of SP80076.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 7 2. AS05.04.01 3. AS05.04.02 4. AS05.04.03 5. AS05.04.04 6. AS05.04.05 7. AS05.04.06 8. AS05.04.07 9. AS05.04.08 10. AS05.04.09 11. AS04.10.01
Precondition(s)	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid BIT Group Template data object is present on the PIV card. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Biometric Information Templates Group Template (2.16.840.1.101.3.7.2.16.22)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value field for tag 0x7F61 <ol style="list-style-type: none"> a. Extract contents of Biometric Header Template b. Extract contents of Number of BIT's in group c. Extract contents of Reference data qualifier used by VERIFY d. Extract contents of BHT biometric type e. Extract contents of Biometric subtype f. Extract contents of BHT CBEFF BDB format owner

	<p>g. Extract contents of BHT CBEFF format type</p> <p>h. Extract contents of Biometric matching algorithm Tag 83</p>
Expected Result(s)	<p>For Step 4:</p> <p>a. BHT is in accordance with Table 7 in SP80076</p> <p>b. number of BIT's in group (fingers) has the value of '2', one for each finger</p> <p>c. value of Reference data qualifier is '96' for first finger and '97' for the second finger</p> <p>d. value for BHT Biometric type for first and second finger has the value of '08'</p> <p>e. value of Biometric subtype correctly matches SP800-76 Table 8 (Column B)</p> <p>f. value for the BHT CBEFF BDB format owner for the first and second finger is '0101'</p> <p>g. value for BHT CBEFF BDB format type for the first and second finger is '00 05'</p> <p>h. value for Biometric matching algorithm subfield Tag 83 for the first and second finger, should not be present</p>

1998

1999

2000 **9.6 Facial Image**2001 **9.6.1 Facial Image Header Conformance**

Purpose	Verify that the Record Header of the facial image is conformant to the PIV profile presented in Table 12 of SP80076.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 12 2. AS05.03.01 3. AS05.03.02 4. AS05.03.03 5. AS05.03.04 6. AS05.03.05 7. AS05.03.06
Precondition(s)	<ol style="list-style-type: none"> 1. All required sample facial image is stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the contents of Facial Image Header Record. 5. Extract contents of Format Identifier. 6. Extract contents of Version Number. 7. Extract contents of Number of Facial Images. 8. Extract contents of Number of Feature Points. 9. Extract contents of Record Length.
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 5: Format Identifier has a value 0x46414300. 2. From Step 6: Version Number has a value of 0x30313000. 4. From Step 7: Number of Facial Images value is ≥ 1. 5. From Step 8: Number of Feature Points is ≥ 0. 6. From Step 9: Record Length fits within container size limits specified in 800-73.

2002 **9.6.2 Facial Image Data Conformance**

Purpose	Verify that the Facial Image Instance is conformant to the PIV profile presented in Table 12 of SP80076.
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Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 12 2. AS05.03.01 3. AS05.03.07 4. AS05.03.08 5. AS05.03.09 6. AS05.03.10
Precondition(s)	<ol style="list-style-type: none"> 1. All required sample facial image is stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the contents of Facial Image Instance Record 5. Extract contents of Facial Image Type. 6. Extract contents of Image Data Type. 7. Extract contents of Image Color Space. 8. Extract contents of Source Type.
Expected Result(s)	<ol style="list-style-type: none"> 1. Step 5: Facial Image Type is 1. 2. Step 6: Image Data Type is 0 or 1. 3. Step 7: Image Color Space is 1. 4. Step 8: Source Type is 2 or 6.

2003

2004 **9.7 Iris Image**2005 **9.7.1 Iris Image Profile**

Purpose	Verify that the data recorded of the iris image is conformant to the PIV profile presented in Table 9 of SP80076-2.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076-2, Table 9 2. AS05.05.01 3. AS05.05.02 4. AS05.05.03 5. AS05.05.04 6. AS05.05.05 7. AS05.05.06 8. AS05.05.07

Precondition(s)	<ol style="list-style-type: none"> 1. All required sample iris images are stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the contents of Iris General Header. 5. Extract contents of Format identifier. 6. Extract contents of Version number. 7. Extract contents of Length of record 8. Extract contents of Number of iris representations 9. Extract contents of Certification flag 10. Extract contents of Number of eyes represented.
Expected Result(s)	<p>Compare profile with SP800-76 Table 9 to validate appropriate information is present to include:</p> <ol style="list-style-type: none"> 1. Step 5: Format identifier is 0x49495200. 2. Step 6: Version number is 0x30323000. 3. Step 7: Length of record is 3K for each iris. 4. Step 8: Number of iris representation is 1 or 2. 5. Step 9: Certification flag is 0x00. 6. Step 10: Number of eyes represented is 1 or 2

2006

2007 **9.7.2 Iris Image Data Conformance**

Purpose	Verify that the iris instance is conformant to the PIV profile presented in Table 12 of SP80076.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076, Table 12 2. AS05.05.08 3. AS05.05.09 4. AS05.05.10 5. AS05.05.11 6. AS05.05.12 7. AS05.05.13 8. AS05.05.14 9. AS05.05.15 10. AS05.05.16 11. AS05.05.17 12. AS05.05.18

Precondition(s)	<ol style="list-style-type: none"> 1. All required sample iris images are stored on the PIV card. 2. A valid PIV card is inserted into the contact reader. 3. A valid PC/SC connection exists between the test application and the contact reader. 4. The test application is currently connected to the card application which is accessible through card handle. 5. Security conditions to read the object are met.
Test Scenario	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the contents of Iris representation header and image data 5. Extract contents of Capture date and time. 6. Extract contents of Representation number. 7. Extract contents of Eye label. 8. Extract contents of Image type. 9. Extract contents of Image format. 10. Extract contents of Iris image properties bit field. 11. Extract contents of Image width, W. 12. Extract contents of Image height, H. 13. Extract contents of Bit depth. 14. Extract contents of Iris centre, lowest X. 15. Extract contents of Iris centre, highest X. 16. Extract contents of Iris centre, lowest Y. 17. Extract contents of Iris centre, highest Y. 18. Extract contents of Iris diameter, lowest. 19. Extract contents of Iris diameter, highest.

Expected Result(s)	<p>Compare profile with SP800-76 Table 9 to validate appropriate information is present to include:</p> <ol style="list-style-type: none"> 1. Step 5: Capture date and time is 2011 onwards. 2. Step 6: Representation number is 1 and then, optionally, 2. 3. Step 7: Eye label is 1 or 2. 4. Step 8: Image type is 7. 5. Step 9: Image format is 10 = 0x0A 6. Step 10: Iris image properties bit field is (Bits 1-2: 01 or 10), (Bits 3-4: 01 or 10), (Bits 5-6: 01 and scan type shall be progressive), and (Bits 7-8: 01 and the compression history shall be “none”). 7. Step 11: Image width, W is $288 \leq W \leq 448$. 8. Step 12: Image height, H is $216 \leq H \leq 336$. 9. Step 13: Bit depth is 8. 10. Step 14: Iris centre, lowest X is (W/2 for W odd, else). 11. Step 15: Iris centre, highest X is (W/2+1 for W even). 12. Step 16: Iris centre, lowest Y is (H/2 for H odd, else). 13. Step 17: Iris centre, highest Y is (H/2+1 for H even). 14. Step 18: Iris diameter, lowest is $D \geq 160$. 15. Step 19: Iris diameter, highest is $D \leq 280$.
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2008

2009

2010 **10. Signed Data Elements Test Assertions**2011 **10.1 Card Holder Unique Identifier (CHUID)**2012 **10.1.1 Signature Block Contents**2013 **10.1.1.1 Verify presence of CMS SignedData asymmetric digital signature**

Purpose	Confirms that the CHUID buffer contains an asymmetric digital signature implemented as a SignedData type in accordance with the Cryptographic Message Syntax as defined in RFC 5652.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.01.01 3. AS06.01.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the obtained CHUID and extract the contents from the asymmetric digital signature field (i.e. Tag 0x3E) 5. Process the contents of the digital signature
Expected Result(s)	The CHUID buffer contains an asymmetric digital signature that is implemented as a SignedData type and is encoded as a CMS external signature according to RFC 5652.

2014

2015 **10.1.1.2 Verify version in SignedData**

Purpose	Confirms that the version of the SignedData content type is 3.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.01.03
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the version field contents from the asymmetric signature of the CHUID
Expected Result(s)	The value of the version field of the SignedData is 3.

2016

2017 **10.1.1.3 Verify digest Algorithm in SignedData**

Purpose	Confirm that the digestAlgorithms field of the SignedData content type is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.01.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the digestAlgorithms field contents from the asymmetric digital signature of the CHUID 5. Extract the certificates field contents from the asymmetric signature of the CHUID 6. From the certificate obtained, extract the subjectPublicKeyInfo->subjectPublicKey 7. Compute the size of the signer's public key 8. Match the digest algorithm with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the CHUID. 9.
Expected Result(s)	The digestAlgorithms field value of the SignedData is in accordance with Table 3-2 of SP80078.

2018

2019

2020 **10.1.1.4 Verify contents of encapContentInfo**

Purpose	Confirms that the eContentType of the encapContentInfo is id-PIV-CHUIDSecurityObject and the eContent field of the encapContentInfo is omitted.
Reference(s)	1. SP80073 , Section 3.1.2.1 2. AS06.01.05 3. AS06.01.06
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract and parse the encapContentInfo field contents from the asymmetric digital signature of the CHUID
Expected Result(s)	The eContent field has been omitted and the eContentType asserts id-piv-CHUIDSecurityObject in encapContentInfo.

2021

2022 **10.1.1.5 Verify crls field omission**

Purpose	Confirm that the crls field from the SignedData content type is omitted.
Reference(s)	1. SP80073 , Section 3.1.2.1 2. AS06.01.08
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the crls field contents from the asymmetric digital signature of the CHUID

Expected Result(s)	The crls field is omitted from the SignedData.
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2023

2024 **10.1.1.6 Verify contents of signerInfos**

Purpose	Confirms that the signerInfos in the SignedData is populated with a single SignerInfo.
Reference(s)	1. SP80073 , Section 3.1.2.1 2. AS06.01.09
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfos field contents from the asymmetric digital signature of the CHUID
Expected Result(s)	The signerInfos field in the SignedData contains a single SignerInfo.

2025

2026 **10.1.1.7 Verify Signer Identifier in SignerInfo**

Purpose	Confirms that the SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice.
Reference(s)	1. SP80073 Part 1, Section 3.1.2.1 2. AS06.01.10
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the signerInfo->signerIdentifier field contents from the asymmetric signature of the CHUID 5. Extract the certificates field contents from the asymmetric signature of the CHUID 6. Extract the issuer and serialNumber fields from the certificate obtained in the previous step
Expected Result(s)	The SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice and it corresponds to the issuer and serialNumber fields found in the X.509 certificate of the signer.

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10.1.1.8 Verify Digest Algorithm in SignerInfo

Purpose	Confirm that the digestAlgorithm field of the SignerInfo is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.01.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->digestAlgorithm field contents from the asymmetric digital signature of the CHUID 5. Extract the certificate field contents from the asymmetric signature of the CHUID 6. From the certificate obtained, extract the subjectPublicKeyInfo->subjectPublicKey 7. Compute the size of the signer's public key 8. Match the digest algorithm with the Table 3-2 of SP80078 based on the public key algorithm and size used to sign the CHUID 9. Extract the digestAlgorithms field contents from the asymmetric digital signature of the CHUID i.e. SignedData

Expected Result(s)	The digestAlgorithm field value of the SignerInfo is in accordance with Table 3-2 of SP80078 and it matches the value present in the digestAlgorithms field of the SignedData.
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10.1.1.9 Verify message digest signed attribute in SignerInfo

Purpose	Confirms that the signedAttrs of the SignerInfo includes a message digest attribute containing the hash computed over the concatenated contents of the CHUID, excluding the asymmetric signature field and the Buffer Length field (if present).
Reference(s)	1. SP80073 , Section 3.1.2.1 2. AS06.01.12
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the asymmetric signature field of the CHUID to locate the message digest attribute (OID=1.2.840.113549.1.9.4) and its corresponding attribute value 5. Extract the SignerInfo->digestAlgorithm field contents from the asymmetric digital signature of the CHUID 6. Using the digest Algorithm obtained in the previous step, calculate the hash of the concatenated contents of the CHUID, excluding the asymmetric digital signature field and the Buffer Length field, if present.
Expected Result(s)	The value of the hash obtained from the message digest attribute of the signedAttrs of the SignerInfo is identical to that obtained after hashing the concatenated contents of the CHUID, excluding the asymmetric digital signature field and the Buffer Length field, if present.

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10.1.1.10 Verify PIV signer distinguished name

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivSigner-DN attribute containing the subject name that appears in the X.509 certificate for the entity that signed the CHUID.
Reference(s)	1. SP80073 , Section 3.1.2.1 2. AS06.01.13

Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the asymmetric signature field of the CHUID to locate the pivSigner-DN attribute (OID=2.16.840.1.101.3.6.5) 5. Extract the certificates field contents from the asymmetric signature of the CHUID. 6. Extract the subject DN from the certificate obtained in the previous step
Expected Result(s)	The value of the subject DN obtained from the certificate in the certificates field in the SignedData is identical to that obtained from the pivSigner-DN attribute of the signedAttrs of the SignerInfo.

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2034 **10.1.1.11 Verify signature algorithm in SignerInfo**

Purpose	Confirms that the signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078 .
Reference(s)	<ol style="list-style-type: none"> 1. SP80078 , Section 3.2.1 2. AS06.01.14
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the CHUID's SignerInfo->signatureAlgorithm field contents.

Expected Result(s)	The signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078 .
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2036 **10.1.1.12 Verify digital signature**

Purpose	Confirms that the signature in the SignerInfo corresponds to the signed CHUID
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.01.07 3. AS06.01.15
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the certificates field contents from the asymmetric signature of the CHUID. 5. Extract the asymmetric signature contents from the CHUID 6. Using the certificate extracted, verify the SignedData located in the asymmetric signature field of the CHUID.
Expected Result(s)	The certificates field in the SignedData contains a single certificate that can be used to verify the digital signature in the SignerInfo.

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2038 **10.2 Off-Card Comparison Biometric Fingerprint**2039 **10.2.1 Signature Block Contents**2040 **10.2.1.1 Verify presence of CMS SignedData asymmetric digital signature**

Purpose	Confirms that the CBEFF_SIGNATURE_BLOCK is implemented as a SignedData type and is encoded as a Cryptographic Message Syntax external digital signature as defined in RFC 5652
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.01 3. AS06.02.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. Security conditions to read the object are met.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the obtained biometric and extract the contents from the asymmetric digital signature field (i.e. from the CBEFF_SIGNATURE_BLOCK) 5. Process the contents of the digital signature
Expected Result(s)	The CBEFF_SIGNATURE_BLOCK is present in the biometric CBEFF structure containing an asymmetric digital signature that is implemented as a SignedData type according to RFC 5652.

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2042 **10.2.1.2 Verify version in SignedData**

Purpose	Confirms that the version of the SignedData content type is v3.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.03
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the version field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present)
Expected Result(s)	The value of the version field of the SignedData is v3.

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2044 **10.2.1.3 Verify digest Algorithm in SignedData**

Purpose	Confirm that the digestAlgorithms field of the SignedData content type is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078 , Section 3.2.1 2. AS06.02.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist (step 5), then call pivGetData with the OID for the CHUID and extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the fingerprint biometric

Expected Result(s)	The digestAlgorithms field value of the SignedData is in accordance with Table 3-2 of SP80078.
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2046 **10.2.1.4 Verify contents of encapContentInfo**

Purpose	Confirms that the eContentType of the encapContentInfo is id-PIV-biometricObject and the eContent field of the encapContentInfo is omitted.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.05 3. AS06.02.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract and parse the encapContentInfo field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The eContent field has been omitted and the eContentType asserts id-piv-biometricObject in encapContentInfo.

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2048 **10.2.1.5 Verify crls field omission**

Purpose	Confirm that the crls field from the SignedData content type is omitted.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle

	<ul style="list-style-type: none"> • (IN) OID • (OUT) data <p>4. Extract the crls field contents from the CBEFF_SIGNATURE_BLOCK</p>
Expected Result(s)	The crls field is omitted from the SignedData.

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2050 **10.2.1.6 Verify contents of signerInfos**

Purpose	Confirms that the signerInfos in the SignedData is populated with a single SignerInfo.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfos field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The signerInfos field in the SignedData contains a single SignerInfo.

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2052 **10.2.1.7 Verify Signer Identifier in SignerInfo**

Purpose	Confirms that the SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>>

	<ol style="list-style-type: none"> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the signerInfo->SignerIdentifier field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. Extract the issuer and serialNumber fields from the certificate obtained in the previous step
Expected Result(s)	The SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice which corresponds to the issuer and serialNumber fields found in the X.509 certificate of the signer.

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2054 **10.2.1.8 Verify Digest Algorithm in SignerInfo**

Purpose	Confirm that the digestAlgorithm field of the SignerInfo is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.02.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->digestAlgorithm field from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist (step 5), then extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field),

	<p>extract the subjectPublicKeyInfo->subjectPublicKey</p> <ol style="list-style-type: none"> 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the biometric fingerprint 10. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The digestAlgorithm field value of the SignerInfo is in accordance with Table 3-2 of SP80078 and it matches the value present in the digestAlgorithms field of the SignedData.

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2056 **10.2.1.9 Verify message digest signed attribute in SignerInfo**

Purpose	Confirms that the signedAttrs of the SignerInfo includes a message digest attribute containing the hash computed over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.02.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the message digest attribute (OID=1.2.840.113549.1.9.4) and its corresponding attribute value 5. Extract the SignerInfo->digestAlgorithm field contents from the CBEFF_SIGNATURE_BLOCK 6. Using the digest Algorithm obtained in the previous step, compute the hash over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Expected Result(s)	The value of the hash obtained from the message digest attribute of the signedAttrs of the SignerInfo is identical to that obtained after hashing the concatenated contents of the Fingerprint Object buffer, excluding the CBEFF_SIGNATURE_BLOCK.

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2058 **10.2.1.10 Verify PIV signer distinguished name**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivSigner-DN attribute containing the subject name that appears in the X.509 certificate for the entity that signed the biometrics.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.02.13
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo-> signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivSigner-DN attribute (OID=2.16.840.1.101.3.6.5) 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. Extract the subject DN from the certificate obtained in the previous step
Expected Result(s)	The value of the subject DN obtained from the certificate in the certificates field in the SignedData is identical to that obtained from the pivSigner-DN attribute of the signedAttrs of the SignerInfo.

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2060 **10.2.1.11 Verify FASC-N**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivFASC-N attribute whose value matches the value of the FASC-N in the CHUID of the PIV card.
Reference(s)	<ol style="list-style-type: none"> 1. SP 80076 2. AS06.02.14
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application

	<p>which is accessible through card handle.</p> <p>4. A valid card holder fingerprint object is present on the PIV card.</p> <p>5. A valid CHUID object is present on the PIV card.</p>
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivFASC-N attribute (OID=2.16.840.1.101.3.6.6) and its corresponding attribute value 5. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the FASC-N
Expected Result(s)	A pivFASC-N attribute exists in the signedAttrs of the SignerInfo and its value matches the FASC-N present in the CHUID of the PIV card.

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10.2.1.12 Verify signature algorithm in SignerInfo

Purpose	Confirms that the signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP 80078 .
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.02.15
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->signatureAlgorithm field
Expected Result(s)	The signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP 80078 .

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2064 **10.2.1.13 Verify digital signature**

Purpose	Confirms that the signature in the SignerInfo corresponds to the signed biometric
Reference(s)	<ol style="list-style-type: none"> 1. SP 80073, Section 3.1.2.1 2. AS06.02.07 3. AS06.02.16
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>> 3. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK. If this field is omitted then extract the certificate from the CHUID signature 4. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 5. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 6. Extract the digital signature string from CBEFF_SIGNATURE_BLOCK. 7. Using the certificate extracted either from the CBEFF_SIGNATURE_BLOCK or the CHUID asymmetric signature, verify the signature on the biometric
Expected Result(s)	The certificates field in the SignedData contains a single certificate that can be used to verify the digital signature in the SignerInfo. If the certificates field is omitted, then the certificates field of the SignedData

	for the CHUID contains the certificate that can be used to verify the digital signature.
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2066 **10.2.1.14 Verify entryUUID**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the entryUUID (OID = 1.3.6.1.1.16.4) attribute and that it is the same value as the Card UUID in the GUID data element of the PIV card's CHUID data object.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.02.17
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder fingerprint object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Card Holder Fingerprints (2.16.840.1.101.3.7.2.96.16)>></code> 3. Call <code>pivGetData</code> with the following parameters <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Parse the <code>SignerInfo->signedAttrs</code> field contents from the <code>CBEFF_SIGNATURE_BLOCK</code> to locate the <code>entryUUID</code> attribute and its corresponding attribute value 5. Set <code>OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>></code> 6. Call <code>pivGetData</code> with the following parameters <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 7. Parse the CHUID and extract the GUID
Expected Result(s)	An entryUUID (OID = 1.3.6.1.1.16.4) attribute exists in the signedAttrs of the SignerInfo and its value matches the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.

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2069 **10.3 Biometric Facial Image**2070 **10.3.1 Signature Block Contents**2071 **10.3.1.1 Verify presence of CMS SignedData asymmetric digital signature**

Purpose	Confirms that the CBEFF_SIGNATURE_BLOCK is implemented as a SignedData type and is encoded as a Cryptographic Message Syntax external digital signature as defined in RFC 5652
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.03.01 3. AS06.03.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. Security conditions to read the object are met.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the obtained biometric and extract the contents from the asymmetric digital signature field (i.e. from the CBEFF_SIGNATURE_BLOCK) 5. Process the contents of the digital signature
Expected Result(s)	The CBEFF_SIGNATURE_BLOCK is present in the biometric CBEFF structure containing an asymmetric digital signature that is implemented as a SignedData type according to RFC 5652.

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2073 **10.3.1.2 Verify version in SignedData**

Purpose	Confirms that the version of the SignedData content type is v3.
Reference(s)	<ol style="list-style-type: none"> 1. SP 80076 2. AS06.03.03
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the version field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present)
Expected Result(s)	The value of the version field of the SignedData is v3.

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2075 **10.3.1.3 Verify digest Algorithm in SignedData**

Purpose	Confirm that the digestAlgorithms field of the SignedData content type is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.03.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK (step 5) does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the biometric facial image (from step 8)

Expected Result(s)	The digestAlgorithms field value of the SignedData is in accordance with Table 3-2 of SP80078.
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2077 **10.3.1.4 Verify contents of encapContentInfo**

Purpose	Confirms that the eContentType of the encapContentInfo is id-PIV-biometricObject and the eContent field of the encapContentInfo is omitted.
Reference(s)	1. SP80076 2. AS06.03.05 3. AS06.03.06
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract and parse the encapContentInfo field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The eContent field has been omitted and the eContentType asserts id-piv-biometricObject in encapContentInfo.

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2079 **10.3.1.5 Verify crls field omission**

Purpose	Confirm that the crls field from the SignedData content type is omitted.
Reference(s)	1. SP80076 2. AS06.03.08
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ • (IN) cardHandle

	<ul style="list-style-type: none"> • (IN) OID • (OUT) data <p>4. Extract the crls field contents from the CBEFF_SIGNATURE_BLOCK</p>
Expected Result(s)	The crls field is omitted from the SignedData.

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2081 **10.3.1.6 Verify contents of signerInfos**

Purpose	Confirms that the signerInfos in the SignedData is populated with a single SignerInfo.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.03.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfos field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The signerInfos field in the SignedData contains a single SignerInfo.

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2083 **10.3.1.7 Verify Signer Identifier in SignerInfo**

Purpose	Confirms that the SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.03.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>>

	<ol style="list-style-type: none"> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the signerInfo->SignerIdentifier field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. Extract the issuer and serialNumber fields from the certificate obtained in the previous step
Expected Result(s)	The SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice which corresponds to the issuer and serialNumber fields found in the X.509 certificate of the signer.

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10.3.1.8 Verify Digest Algorithm in SignerInfo

Purpose	Confirm that the digestAlgorithm field of the SignerInfo is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.03.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->digestAlgorithm field from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist(step 5), then extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 to an entry in Table 3-2 of SP80078 based on the public key algorithm and size used to sign the biometric facial image 10. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The digestAlgorithm field value of the SignerInfo is in accordance with Table 3-2 of SP80078 and it matches the value present in the digestAlgorithms field of the SignedData.

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10.3.1.9 Verify message digest signed attribute in SignerInfo

Purpose	Confirms that the signedAttrs of the SignerInfo includes a message digest attribute containing the hash computed over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.03.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <ol style="list-style-type: none"> 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the message digest attribute (OID=1.2.840.113549.1.9.4) and its corresponding attribute value 5. Extract the SignerInfo->digestAlgorithm field contents from the CBEFF_SIGNATURE_BLOCK 6. Using the digest Algorithm obtained in the previous step, compute the hash over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Expected Result(s)	The value of the hash obtained from the message digest attribute of the signedAttrs of the SignerInfo is identical to that obtained after hashing the concatenated contents of the CBEFF_HEADER and the STD_BIOMETRIC_RECORD

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2089 **10.3.1.10 Verify PIV signer distinguished name**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivSigner-DN attribute containing the subject name that appears in the X.509 certificate for the entity that signed the biometrics.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.03.13
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivSigner-DN attribute (OID=2.16.840.1.101.3.6.5) 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. Extract the subject DN from the certificate obtained in the previous step
Expected	The value of the subject DN obtained from the certificate in the certificates field in the SignedData is identical to that obtained from the

Result(s)	pivSigner-DN attribute of the signedAttrs of the SignerInfo.
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2091 **10.3.1.11 Verify FASC-N**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivFASC-N attribute whose value matches the value of the FASC-N in the CHUID of the PIV card.
Reference(s)	1. SP80076 2. AS06.03.14
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivFASC-N attribute (OID=2.16.840.1.101.3.6.6) and its corresponding attribute value 5. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the FASC-N
Expected Result(s)	A pivFASC-N attribute exists in the signedAttrs of the SignerInfo and its value matches the FASC-N present in the CHUID of the PIV card.

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2093 **10.3.1.12 Verify signature algorithm in SignerInfo**

Purpose	Confirms that the signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP 80078 .
Reference(s)	1. SP80078, Section 3.2.1 2. AS06.03.15

Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->signatureAlgorithm field contents.
Expected Result(s)	The signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP 80078 .

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10.3.1.13 Verify digital signature

Purpose	Confirms that the signature in the SignerInfo corresponds to the signed biometric
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.03.07 3. AS06.03.16
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image is present on the PIV card. 5. A valid CHUID is present on the PIV card.

<p>Test Steps</p>	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK. If this field is omitted then extract the certificate from the CHUID signature 4. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 5. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data <ol style="list-style-type: none"> a. Extract the certificates field contents from the asymmetric signature of the CHUID. 6. Using the certificate extracted either from the CBEFF_SIGNATURE_BLOCK or the CHUID asymmetric signature, verify the signature on the biometric
<p>Expected Result(s)</p>	<p>The certificates field in the SignedData contains a single certificate that can be used to verify the digital signature in the SignerInfo. If the certificates field is omitted, then the certificates field of the SignedData for the CHUID contains the certificate that can be used to verify the digital signature.</p>

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2097 **10.3.1.14 Verify entryUUID**

<p>Purpose</p>	<p>Confirms that the signedAttrs of the SignerInfo includes the entryUUID (OID = 1.3.6.1.1.16.4) attribute and that it is the same value as the Card UUID in the GUID data element of the PIV card's CHUID data object.</p>
<p>Reference(s)</p>	<ol style="list-style-type: none"> 1. SP80076 2. AS06.03.17
<p>Precondition</p>	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder facial image object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Facial Image (2.16.840.1.101.3.7.2.96.48)>> 3. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the entryUUID attribute and its corresponding attribute value 5. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the GUID
Expected Result(s)	<p>An entryUUID (OID = 1.3.6.1.1.16.4) attribute exists in the signedAttrs of the SignerInfo and its value matches the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.</p>

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2100 **10.4 Security Object**2101 **10.4.1 Data Integrity**2102 **10.4.1.1 Verify integrity of data element hashes**

Purpose	Confirms the integrity of the hashes of the data elements of the PIV card present in the security object.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 1.8.5 2. AS06.04.01
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the card. 5. Valid objects whose hashes are referenced in the security object are present on the card. 6. Security conditions to read the object are met.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Identify the various data elements that are part of the security object by parsing the Mapping of Data Group (DG) to ContainerID (i.e. TAG 0xBA) 5. Extract the ldsSecurityObject from the eContent field of the Security Object Asymmetric Signature (i.e. TAG 0xBB) 6. Call pivGetData for all those data elements that are present in the mapping obtained from step 4 7. Compute the hash for each data element and verify that it matches the hash value present in the ldsSecurityObject
Expected Result(s)	The actual hash of the data elements on the PIV card are identical to their corresponding hash values present in the security object.

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2104 **10.4.2 Signature Block Contents**2105 **10.4.2.1 Verify presence of CMS SignedData asymmetric digital signature**

Purpose	Confirms that the security object data object contains an asymmetric digital signature, implemented as a SignedData type in accordance with RFC 5652.
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Reference(s)	<ol style="list-style-type: none"> AS06.04.02 AS06.04.03
Precondition	<ol style="list-style-type: none"> A valid PIV card is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle. A valid security object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set cardHandle := <<valid card handle>> Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> Call pivGetData w/ <ul style="list-style-type: none"> (IN) cardHandle (IN) OID (OUT) data Parse the obtained security object and extract the contents from the asymmetric digital signature field (i.e. TAG 0xBB) Process the contents of the digital signature
Expected Result(s)	The security object is present in the security object data object and contains an asymmetric digital signature that is implemented as a SignedData type according to RFC 5652.

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2107 **10.4.2.2 Verify version in SignedData**

Purpose	Confirms that the version of the SignedData content type is v3.
Reference(s)	<ol style="list-style-type: none"> AS06.04.04
Precondition	<ol style="list-style-type: none"> A valid PIV card is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle. A valid security object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set cardHandle := <<valid card handle>> Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> Call pivGetData w/ <ul style="list-style-type: none"> (IN) cardHandle (IN) OID (OUT) data Extract the version field contents from the asymmetric signature of the Security Object (i.e. TAG 0xBB)
Expected Result(s)	The value of the version field of the SignedData is v3.

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2109 **10.4.2.3 Verify digest Algorithm in SignedData**

Purpose	Confirm that the digestAlgorithms field of the SignedData content type is in accordance with Tables 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.04.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the digestAlgorithms field contents from the Security Object 5. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 6. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Extract the certificates field contents from the asymmetric signature of the CHUID 8. From the certificate obtained (from the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 9. Compute the size of the signer's public key 10. Match the digest algorithm obtained from step 4 with Table 3-6 of SP80078 10. Match the digest algorithm obtained from step 4 to an entry of Table 3-2 of SP80078 based on the public key algorithm (step 8) and size (step 9)
Expected Result(s)	The digestAlgorithms field value of the SignedData is in accordance with Tables 3-2 of SP80078.

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2111 **10.4.2.4 Verify contents of encapContentInfo**

Purpose	Confirms that the eContentType of the encapContentInfo is id-icao-ldsSecurityObject and the eContent field of the encapContentInfo
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	contains the contents of the ldsSecurity object.
Reference(s)	1. AS06.04.06 2. AS06.04.07
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract and parse the encapContentInfo field contents from the security object
Expected Result(s)	The eContent field contains a correctly formatted ldsSecurityobject and the eContentType asserts id-icao-ldsSecurityObject in encapContentInfo.

2112

2113 **10.4.2.5 Verify certificates field omission**

Purpose	Confirm that the certificates field from the SignedData content type is omitted.
Reference(s)	1. AS06.04.08
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card..
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the certificates field contents from the security object
Expected Result(s)	The certificates field is omitted from the SignedData.

2114

2115 **10.4.2.6 Verify Digest Algorithm in SignerInfo**

Purpose	Confirm that the digestAlgorithm field of the SignerInfo is in accordance with Tables 3-6 and 3-2 of SP80078.
Reference(s)	1. AS06.04.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->digestAlgorithm field from the security object 5. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 6. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Extract the certificates field contents from the asymmetric signature of the CHUID 8. From the certificate obtained (from the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 9. Compute the size of the signer's public key 10. Match the digest algorithm obtained from step 4 with Table 3-6 of SP80078 11. Match the digest algorithm obtained from step 4 to an entry in Table 3-2 based on the public key algorithm (step 8) and size (step 9) used to sign the security object 11. Extract the digestAlgorithms field contents from the security object's SignedData
Expected Result(s)	The digestAlgorithm field value of the SignerInfo is in accordance with Tables 3-6 and 3-2 of SP80078 and it matches the value present in the digestAlgorithms field of the SignedData.

2116

2117

2118 **10.4.2.7 Verify signature algorithm in SignerInfo**

Purpose	Confirms that the signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078.
Reference(s)	1. SP80078, Section 3.2.1 2. AS06.04.10
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	1. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>> 2. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 3. From the signature block (TAG 0xBB), match the SignerInfo->signatureAlgorithm field contents to an entry in Table 3-3 of SP80078
Expected Result(s)	The signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078.

2119

2120 **10.4.2.8 Verify digital signature**

Purpose	Confirms that the signature in the SignerInfo corresponds to the signed security object and that it is signed with the certificate that is used to sign the CHUID.
Reference(s)	1. SP80073 2. AS06.04.11
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid security object is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Security Object (2.16.840.1.101.3.7.2.144.0)>>

	<ol style="list-style-type: none"> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the contents of the Security Object asymmetric signature (TAG 0xBB) 5. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 6. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Extract the certificates field contents from the asymmetric signature of the CHUID. 8. Using the certificate extracted from the CHUID asymmetric signature block, verify the signature of the security object
<p>Expected Result(s)</p>	<p>The certificates field of the SignedData for the CHUID contains the certificate that can be used to verify the digital signature on the security object.</p>

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2122

2123 **10.5 Biometric Iris**2124 **10.5.1 Signature Block Contents**2125 **10.5.1.1 Verify presence of CMS SignedData asymmetric digital signature**

Purpose	Confirms that the CBEFF_SIGNATURE_BLOCK is implemented as a SignedData type and is encoded as a Cryptographic Message Syntax external digital signature as defined in RFC 5652
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.05.01 3. AS06.05.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. Security conditions to read the object are met.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the obtained biometric and extract the contents from the asymmetric digital signature field (i.e. from the CBEFF_SIGNATURE_BLOCK) 5. Process the contents of the digital signature
Expected Result(s)	The CBEFF_SIGNATURE_BLOCK is present in the biometric CBEFF structure containing an asymmetric digital signature that is implemented as a SignedData type according to RFC 5652.

2126

2127 **10.5.1.2 Verify version in SignedData**

Purpose	Confirms that the version of the SignedData content type is v3.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.05.03
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the version field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present)
Expected Result(s)	The value of the version field of the SignedData is v3.

2128

2129 **10.5.1.3 Verify digest Algorithm in SignedData**

Purpose	Confirm that the digestAlgorithms field of the SignedData content type is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078 , Section 3.2.1 2. AS06.05.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. A valid CHUID is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist (step 5), then call pivGetData with the OID for the CHUID and extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the iris biometric
Expected Result(s)	The digestAlgorithms field value of the SignedData is in accordance with Table 3-2 of SP80078.

2130

2131 **10.5.1.4 Verify contents of encapContentInfo**

Purpose	Confirms that the eContentType of the encapContentInfo is id-PIV-biometricObject and the eContent field of the encapContentInfo is omitted.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.05.05 3. AS06.05.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract and parse the encapContentInfo field contents

	from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The eContent field has been omitted and the eContentType asserts id-piv-biometricObject in encapContentInfo.

2132

2133 **10.5.1.5 Verify crls field omission**

Purpose	Confirm that the crls field from the SignedData content type is omitted.
Reference(s)	1. SP80076 2. AS06.05.08
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the crls field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The crls field is omitted from the SignedData.

2134

2135 **10.5.1.6 Verify contents of signerInfos**

Purpose	Confirms that the signerInfos in the SignedData is populated with a single SignerInfo.
Reference(s)	1. SP80076 2. AS06.05.09
Precondition	1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card.
Test Steps	1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <p>4. Extract the SignerInfos field contents from the CBEFF_SIGNATURE_BLOCK</p>
Expected Result(s)	The signerInfos field in the SignedData contains a single SignerInfo.

2136

2137 **10.5.1.7 Verify Signer Identifier in SignerInfo**

Purpose	Confirms that the SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice.
Reference(s)	<ol style="list-style-type: none"> 1. SP80076 2. AS06.05.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the signerInfo->SignerIdentifier field contents from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the asymmetric signature of the CHUID 7. Extract the issuer and serialNumber fields from the certificate obtained in the previous step
Expected Result(s)	The SignerIdentifier in the SignerInfo uses the issuerAndSerialNumber choice which corresponds to the issuer and serialNumber fields found in the X.509 certificate of the signer.

2138

2139 **10.5.1.8 Verify Digest Algorithm in SignerInfo**

Purpose	Confirm that the digestAlgorithm field of the SignerInfo is in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.05.11

Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->digestAlgorithm field from the CBEFF_SIGNATURE_BLOCK 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK (if present) 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist (step 5), then extract the certificates field contents from the asymmetric signature of the CHUID 7. From the certificate obtained (either from the CBEFF_SIGNATURE_BLOCK or the CHUID signature field), extract the subjectPublicKeyInfo->subjectPublicKey 8. Compute the size of the signer's public key 9. Match the digest algorithm obtained from step 4 with Table 3-2 of SP80078 based on the public key algorithm and size used to sign the biometric iris 12. Extract the digestAlgorithms field contents from the CBEFF_SIGNATURE_BLOCK
Expected Result(s)	The digestAlgorithm field value of the SignerInfo is in accordance with Table 3-2 of SP80078 and it matches the value present in the digestAlgorithms field of the SignedData.

2140

2141 **10.5.1.9 Verify message digest signed attribute in SignerInfo**

Purpose	Confirms that the signedAttrs of the SignerInfo includes a message digest attribute containing the hash computed over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.05.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris

	<pre>(2.16.840.1.101.3.7.2.16.21)>></pre> <ol style="list-style-type: none"> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the message digest attribute (OID=1.2.840.113549.1.9.4) and its corresponding attribute value 5. Extract the SignerInfo->digestAlgorithm field contents from the CBEFF_SIGNATURE_BLOCK 6. Using the digest Algorithm obtained in the previous step, compute the hash over the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD
Expected Result(s)	The value of the hash obtained from the message digest attribute of the signedAttrs of the SignerInfo is identical to that obtained after hashing the concatenated contents of the Iris Object buffer, excluding the CBEFF_SIGNATURE_BLOCK.

2142

2143 **10.5.1.10 Verify PIV signer distinguished name**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivSigner-DN attribute containing the subject name that appears in the X.509 certificate for the entity that signed the biometrics.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.05.13
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivSigner-DN attribute (OID=2.16.840.1.101.3.6.5) 5. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK 6. If a certificate extracted from the certificates field of the CBEFF_SIGNATURE_BLOCK does not exist, then extract the certificates field contents from the

	<p>asymmetric signature of the CHUID</p> <p>7. Extract the subject DN from the certificate obtained in the previous step</p>
Expected Result(s)	The value of the subject DN obtained from the certificate in the certificates field in the SignedData is identical to that obtained from the pivSigner-DN attribute of the signedAttrs of the SignerInfo.

2144

2145 **10.5.1.11 Verify FASC-N**

Purpose	Confirms that the signedAttrs of the SignerInfo includes the pivFASC-N attribute whose value matches the value of the FASC-N in the CHUID of the PIV card.
Reference(s)	<ol style="list-style-type: none"> SP80076 AS06.05.14
Precondition	<ol style="list-style-type: none"> A valid PIV card is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle. A valid card holder iris image is present on the PIV card. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set cardHandle := <<valid card handle>> Set OID := <<Cardholder Fingerprints (2.16.840.1.101.3.7.2.16.21)>> Call pivGetData with the following parameters <ul style="list-style-type: none"> (IN) cardHandle (IN) OID (OUT) data Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the pivFASC-N attribute (OID=2.16.840.1.101.3.6.6) and its corresponding attribute value Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> Call pivGetData with the following parameters <ul style="list-style-type: none"> (IN) cardHandle (IN) OID (OUT) data Parse the CHUID and extract the FASC-N
Expected Result(s)	A pivFASC-N attribute exists in the signedAttrs of the SignerInfo and its value matches the FASC-N present in the CHUID of the PIV card.

2146

2147 **10.5.1.12 Verify signature algorithm in SignerInfo**

Purpose	Confirms that the signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption
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	OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS06.05.15
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. A valid CHUID object is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the SignerInfo->signatureAlgorithm field
Expected Result(s)	The signatureAlgorithm field specified in the SignerInfo field for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm shall be in accordance with Table 3-3 of SP80078.

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10.5.1.13 Verify digital signature

Purpose	Confirms that the signature in the SignerInfo corresponds to the signed biometric
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Section 3.1.2.1 2. AS06.05.07 3. AS06.05.16
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image is present on the PIV card. 5. A valid CHUID object is present on the PIV card.

<p>Test Steps</p>	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Cardholder Iris Images (2.16.840.1.101.3.7.2.16.21)>> 3. Extract the certificates field contents from the CBEFF_SIGNATURE_BLOCK. If this field is omitted then extract the certificate from the CHUID signature 4. Set OID := <<CHUID (2.16.840.1.101.3.7.2.48.0)>> 5. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 6. Extract the digital signature string from CBEFF_SIGNATURE_BLOCK. 7. Using the certificate extracted either from the CBEFF_SIGNATURE_BLOCK or the CHUID asymmetric signature, verify the signature on the biometric
<p>Expected Result(s)</p>	<p>The certificates field in the SignedData contains a single certificate that can be used to verify the digital signature in the SignerInfo. If the certificates field is omitted, then the certificates field of the SignedData for the CHUID contains the certificate that can be used to verify the digital signature.</p>

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2151 **10.5.1.14 Verify entryUUID**

<p>Purpose</p>	<p>Confirms that the signedAttrs of the SignerInfo includes the entryUUID (OID = 1.3.6.1.1.16.4) attribute and that it is the same value as the Card UUID in the GUID data element of the PIV card’s CHUID data object.</p>
<p>Reference(s)</p>	<ol style="list-style-type: none"> 1. SP80076 2. AS06.05.17
<p>Precondition</p>	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A valid card holder iris image object is present on the PIV card. 5. A valid CHUID object is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Holder Iris Image (2.16.840.1.101.3.7.2.16.21)>> 3. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the SignerInfo->signedAttrs field contents from the CBEFF_SIGNATURE_BLOCK to locate the entryUUID attribute and its corresponding attribute value 5. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the GUID
Expected Result(s)	<p>An entryUUID (OID = 1.3.6.1.1.16.4) attribute exists in the signedAttrs of the SignerInfo and its value matches the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.</p>

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2155 11. PKI Certificate Profile Test Assertions

2156 11.1 PIV Authentication Certificate

2157 11.1.1 SP 800-78 Algorithms Conformance

2158 11.1.1.1 Verify signature algorithm

Purpose	Confirms that the proper signature algorithm has been used to sign the certificate as specified in Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.01.01 3. AS07.01.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract signature->algorithm field value from the certificate
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 4: The signatureAlgorithm value is in accordance with Table 3-3 of SP80078 2. From Step 4: If the algorithm value is id-RSASSA-PSS, verify that the signature->parameters field is populated with SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other RSA algorithms, the parameters field is populated with NULL. For ECDSA, the parameters field is absent.

2159

2160

2161 11.1.1.2 Verify subject public key algorithm

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 3-4 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.01.03

	3. AS07.01.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Match the algorithm value to the Table 3-4 of SP80078 6. If the algorithm is Elliptic Curve, ensure that one of the approved curves is used and the OID is populated in the subjectPublicKeyInfo->algorithm->parameters->namedCurve field from Table 3-5 of SP80078. The parameters field may contain NULL to indicate that parameters are inherited. <p>Note: - If the RSA algorithm is used, the subjectPublicKeyInfo->algorithm->parameters field shall be NULL</p>
Expected Result(s)	The PIV authentication key is generated using an allowed asymmetric key algorithm.

2162

2163 **11.1.1.3 Verify public key size**

Purpose	Verifies that the key size requirements are in accordance with Table 3-1 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.01.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>>

	<ol style="list-style-type: none"> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate 6. Match the key size to Table 3-1 of SP80078
Expected Result(s)	The key sizes used are in accordance with Table 3-1 of SP80078.

2164

2165 **11.1.2 Data Integrity Checks**

2166 **11.1.2.1 Verify key usage extension**

Purpose	Confirms that the PIV authentication certificate asserts the appropriate purpose of the key.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.01.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value of the keyUsage extension field from the certificate
Expected Result(s)	The digitalSignature bit has been set. No other bits have been set.

2167

2168 **11.1.2.2 Verify id-fpki-common-authentication OID**

Purpose	Confirms that the PIV Authentication certificate asserts the id-fpki-common-authentication OID.
Reference(s)	<ol style="list-style-type: none"> 1. AS07.01.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader.

	<ol style="list-style-type: none"> 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract certificatePolicies->policyIdentifier extension field values from the certificate
Expected Result(s)	A policyIdentifier field in the certificatePolicies extension asserts id-fpki-common-authentication.

2169

2170

11.1.2.3 Verify authority information access extension

Purpose	Confirms the authority information access extension is populated with the location to the OCSP Server that provides status information for this certificate.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.01.07
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the AuthorityInfoAccess->accessMethod and AuthorityInfoAccess->accessLocation extension fields from the certificate
Expected Result(s)	An accessMethod containing id-ad-ocsp is present. The accessLocation for this AccessMethod is of type uniformResourceIdentifier and that the

	scheme is “http” (not “https”).
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2171

2172 **11.1.2.4 Verify interim status extension**

Purpose	Confirms that the piv-interim extension is present in the certificate.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Appendix B 2. AS07.01.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ul style="list-style-type: none"> • Set cardHandle := <<valid card handle>> • Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> • Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data • Extract the piv-interim extension in the certificate
Expected Result(s)	The piv-interim extension is present and contains the interim_indicator field which is of type BOOLEAN.

2173

2174 **11.1.2.5 Verify asymmetric key pair**

Purpose	Confirms that the public key that exists in the certificate corresponds to the private key on the card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 5.2.1 2. AS07.01.13
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Take an arbitrary stream of data 2. Hash the data using a hash algorithm 3. Set cardHandle := <<valid card handle>> 4. Set authenticators := <<valid authenticator>> 5. Call pivLogIntoCardApplication <ul style="list-style-type: none"> • (IN) cardHandle

	<ul style="list-style-type: none"> • (IN) authenticators <ol style="list-style-type: none"> 6. Set keyReference := <<key reference for PIV Authentication Key i.e. 9A>> 7. Set algorithmIdentifier := <<identifier of the algorithm to be used for the cryptographic operation>> 8. Set algorithmInput := <<hashed data from Step 2>> 9. Call pivCrypt with the following parameters <ul style="list-style-type: none"> • (IN) keyReference • (IN) algorithmIdentifier • (IN) algorithmInput • (OUT) algorithmOutput 10. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 11. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 12. Verify the signature in algorithmOutput (step 9) with subjectPublicKeyInfo->subjectPublicKey from the certificate
Expected Result(s)	The private key corresponds to the public key contained in the certificate as the signature verification succeeds.

2175

2176 **11.1.2.6 Verify FASC-N and Card UUID**

Purpose	Confirms that the FASC-N and Card UUID in the subjectAltName field in the PIV authentication certificate is the same as the FASC-N and Card UUID present in the CHUID in the PIV card. This test shall also validate that no other name forms appear in the subjectAltName extension.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.01.08 3. AS07.01.14
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData with the following parameters

	<ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data <ol style="list-style-type: none"> 4. Extract the GeneralNames field from the subjectAltName extension in the certificate 5. Parse the different GeneralName fields 6. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 7. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 8. Parse the CHUID and extract the FASC-N 9. Parse the CHUID and extract the GUID
Expected Result(s)	<p>Step 8: A GeneralName field exists that contains an otherName with a type-id asserting the pivFASC-N OID. The value field of this otherName contains the FASC-N for the cardholder which matches the FASC-N obtained from parsing the CHUID.</p> <p>Step 9: A GeneralName field exists that contain a URI asserting a Card UUID as specified by [RFC4122, Section 3] that matches the GUID value in the CHUID.</p> <p>Note: No other name forms appear in the subjectAltName extension</p>

2177

2178 **11.1.2.7 Verify expiration dates consistency**

Purpose	Confirms that the expiration date of the PIV authentication certificate is not past the expiration date of the PIV card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 4.2.2 2. AS07.01.15
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract validity->notAfter->utcTime field value from

	<p>the certificate</p> <ol style="list-style-type: none"> 5. Set OID := << CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the expiration date
Expected Result(s)	The expiration date of the PIV authentication certificate is not beyond the expiration date of the CHUID i.e. the PIV card.

2179

2180 **11.1.2.8 Verify RSA exponent**

Purpose	For RSA keys, confirms that the exponent of the RSA asymmetric key for PIV authentication is equal to 65,537.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.01.16
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate. 5. Parse the exponent from the extracted public key
Expected Result(s)	The exponent of the RSA asymmetric key for PIV authentication is equal to 65,537.

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2182 **11.1.2.9 Verify HTTP URI in cRLDistributionPoints extension field**

Purpose	Confirms that the URI in the cRLDistributionPoints extension field uses HTTP.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.01.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader.

	<ol style="list-style-type: none"> 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the cRLDistributionPoints extension fields from the certificate
Expected Result(s)	The URI is present with the “HTTP” scheme and points only to files with “.crl” extensions.

2183

2184 **11.1.2.10 Verify HTTP URI in authorityInfoAccess extension field**

Purpose	Confirms that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.01.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Authentication Certificate (2.16.840.1.101.3.7.2.1.1)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the AuthorityInfoAccess->accessMethod and AuthorityInfoAccess->accessLocation extension fields from the certificate
Expected Result(s)	The authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using

	HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
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2188 **11.2 Digital Signature Certificate**2189 **11.2.1 SP 800-78 Algorithm Conformance**2190 **11.2.1.1 Verify signature algorithm**

Purpose	Confirms that the proper signature algorithm has been used to sign the certificate as specified in Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.02.01 3. AS07.02.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract signature->algorithm field value from the certificate
Expected Result(s)	From Step 4: The signatureAlgorithm value is in accordance with Table 3-3 of SP80078. If the algorithm value is id-RSASSA-PSS, verify that the signature->parameters field is populated with SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other RSA algorithms, the parameters field is populated with NULL. For ECDSA, the parameters field is absent.

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2193 **11.2.1.2 Verify subject public key algorithm**

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 3-4 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.02.03 3. AS07.02.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader.

	<ol style="list-style-type: none"> 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Match the algorithm value to the Table 3-4 of SP80078 6. If the algorithm is Elliptic Curve, ensure that one of the approved curves is used and the OID is populated in the subjectPublicKeyInfo->algorithm->parameters->namedCurve field from Table 3-5 of SP80078. The parameters field may contain NULL to indicate that parameters are inherited. <p>Note: - If the RSA algorithm is used, the subjectPublicKeyInfo->algorithm->parameters field shall be NULL</p>
Expected Result(s)	The digital signature key is generated using an allowed asymmetric key algorithm.

2194

2195

11.2.1.3 Verify public key size

Purpose	Verifies that the key size requirements are in accordance with Table 3-1 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.02.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <ol style="list-style-type: none"> 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate 6. Match the key size to Table 3-1 of SP80078
Expected Result(s)	The key sizes requirements are in accordance with Table 3-1 of SP80078.

2196

2197 **11.2.2 Data Integrity Checks**2198 **11.2.2.1 Verify key usage extension**

Purpose	Confirms that the digital signature certificate asserts the appropriate purpose of the key contained in the certificate.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.02.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value of the keyUsage extension field from the certificate
Expected Result(s)	The digitalSignature and nonRepudiation bits have been set.

2199

2200 **11.2.2.2 Verify asymmetric key pair**

Purpose	Confirms that the public key that exists in the certificate corresponds to the private key on the card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 5.2.1 2. AS07.02.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application

	<p>which is accessible through card handle.</p> <p>4. A digital signature key and corresponding certificate are present on the PIV card.</p>
Test Steps	<ol style="list-style-type: none"> 1. Take an arbitrary stream of data 2. Hash the data using a hash algorithm 3. Set cardHandle := <<valid card handle>> 4. Set authenticators := <<valid authenticator>> 5. Call pivLogIntoCardApplication <ul style="list-style-type: none"> • (IN) cardHandle • (IN) authenticators 6. Set keyReference := <<key reference for Digital Signature Key i.e. 9C>> 7. Set algorithmIdentifier := <<identifier of the algorithm to be used for the cryptographic operation>> 8. Set algorithmInput := <<hashed data from Step 2>> 9. Call pivCrypt with the following parameters <ul style="list-style-type: none"> • (IN) keyReference • (IN) algorithmIdentifier • (IN) algorithmInput • (OUT) algorithmOutput 10. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 11. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 12. Verify the signature from step 9 algorithmOutput with subjectPublicKeyInfo->subjectPublicKey from the certificate
Expected Result(s)	The private key corresponds to the public key contained in the certificate as the signature verification succeeds.

2201

2202 **11.2.2.3 Verify expiration dates consistency**

Purpose	Confirms that the expiration date of the digital signature certificate is not past the expiration date of the PIV card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 4.2.2 2. AS07.02.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card. 5. A valid CHUID is present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<PIV Digital Signature certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract validity->notAfter->utcTime field value from the certificate 5. Set OID := << CHUID (2.16.840.1.103.3.7.2.48.0)>> 6. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 7. Parse the CHUID and extract the expiration date
Expected Result(s)	The expiration date of the digital signature certificate is not beyond the expiration date of the CHUID i.e. the PIV card.

2203

2204 **11.2.2.4 Verify RSA exponent**

Purpose	For RSA keys, confirm that the exponent of the RSA asymmetric key for digital signature is equal to 65,537.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.02.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate. 5. Parse the exponent from the extracted public key
Expected Result(s)	The exponent of the RSA asymmetric key for digital signature is equal to 65,537.

2205

2206 **11.2.2.5 Verify the policyIdentifier field in the certificatePolicies**

Purpose	Confirms that the Digital Signature certificate asserts one of the following OIDs as part of the Digital Signature certificate profile: the id-fpki-common-hardware or id-fpki-common-High.
Reference(s)	1. AS07.02.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A Digital Signature key and corresponding certificate is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract certificatePolicies->policyIdentifier extension field values from the certificate
Expected Result(s)	A policyIdentifier field in the certificatePolicies extension asserts one of the following: id-fpki-common-hardware or id-fpki-common-High.

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2208 **11.2.2.6 Verify HTTP URI in cRLDistributionPoints extension field**

Purpose	Confirms that the URI in the cRLDistributionPoints extension field uses HTTP.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.02.07
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <p>4. Extract the <code>cRLDistributionPoints</code> extension fields from the certificate</p>
Expected Result(s)	The URI is present with the “HTTP” scheme and points only to files with “.crl” extensions.

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2210 **11.2.2.7 Verify HTTP URI in authorityInfoAccess extension field**

Purpose	Confirms that the <code>authorityInfoAccess</code> field contains an <code>id-ad-caIssuers</code> (1.3.6.1.5.5.7.48.2) <code>accessMethod</code> and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.02.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Digital Signature Certificate (2.16.840.1.101.3.7.2.1.0)>></code> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Extract the <code>AuthorityInfoAccess->accessMethod</code> and <code>AuthorityInfoAccess->accessLocation</code> extension fields from the certificate
Expected Result(s)	The <code>authorityInfoAccess</code> field contains an <code>id-ad-caIssuers</code> (1.3.6.1.5.5.7.48.2) <code>accessMethod</code> and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).

2211 **11.3 Key Management Certificate**2212 **11.3.1 SP 800-78 Algorithm Conformance**2213 **11.3.1.1 Verify signature algorithm**

Purpose	Confirms that the proper signature algorithm has been used to sign the certificate as specified in Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.03.01 3. AS07.03.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract signature->algorithm field value from the certificate
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 4: The signatureAlgorithm value is in accordance with Table 3-3 of SP80078. 2. From Step 4: If the algorithm value is id-RSASSA-PSS, verify that the signature->parameters field is populated with SHA-256 (OID = 2.16.840.1.101.3.4.2.1). For the other RSA algorithms, the parameters field is populated with NULL. For ECDSA, the parameters field is absent.

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2216 **11.3.1.2 Verify subject public key algorithm**

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 3-4 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.03.03 3. AS07.03.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and

	<p>the contact reader.</p> <ol style="list-style-type: none"> The test application is currently connected to the card application which is accessible through card handle. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set cardHandle := <<valid card handle>> Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> Call pivGetData w/ <ul style="list-style-type: none"> (IN) cardHandle (IN) OID (OUT) data Extract subjectPublicKeyInfo->algorithm->algorithm field value Match the algorithm value to the Table 3-4 of SP80078 If the algorithm is Elliptic Curve, ensure that one of the approved curves is used and the OID is populated in the subjectPublicKeyInfo->algorithm->parameters->namedCurve field from Table 3-5 of SP80078. The parameters field may contain NULL to indicate that parameters are inherited. <p>Note: - If the RSA public key algorithm is used, the subjectPublicKeyInfo->algorithm->parameters field shall be NULL</p>
Expected Result(s)	The key management key is generated using an allowed asymmetric key algorithm.

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2218 **11.3.1.3 Verify public key size**

Purpose	Verifies that the key size requirements are in accordance with Table 3-1 of SP80078.
Reference(s)	<ol style="list-style-type: none"> SP80078, Section 3.1 AS07.03.10
Precondition	<ol style="list-style-type: none"> A valid PIV card is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set cardHandle := <<valid card handle>> Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> Call pivGetData w/ <ul style="list-style-type: none"> (IN) cardHandle (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <ol style="list-style-type: none"> 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate 6. Match the key size to Table 3-1 of SP80078 <p>Note: - Since ECDH does not have any size restrictions based on dates, this test case does not apply to keys generated using these algorithms.</p>
Expected Result(s)	The key sizes used are in accordance with Table 3-1 of SP80078.

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2220 **11.3.2 Data Integrity Checks**

2221 **11.3.2.1 Verify key usage extension**

Purpose	Confirms that the digital signature certificate asserts the appropriate purpose of the key contained in the certificate.
Reference(s)	<ol style="list-style-type: none"> 1. AS07.03.05 2. AS07.03.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value of the keyUsage extension field from the certificate
Expected Result(s)	If the public key algorithm is RSA, then the keyUsage extension shall only assert the keyEncipherment bit. If the algorithm is Elliptic Curve key, then the keyUsage extension shall only assert the keyAgreement bit.

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2223 **11.3.2.2 Verify asymmetric key pair**

Purpose	Confirms that the public key that exists in the certificate corresponds to
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	the private key on the card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 5.2.1 2. AS07.03.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Take an arbitrary stream of data 2. Hash the data using a hash algorithm 3. Set cardHandle := <<valid card handle>> 4. Set authenticators := <<valid authenticator>> 5. Call pivLogIntoCardApplication <ul style="list-style-type: none"> • (IN) cardHandle • (IN) authenticators 6. Set keyReference := <<key reference for Key Management Key i.e. 9D>> 7. Set algorithmIdentifier := <<identifier of the algorithm to be used for the cryptographic operation>> 8. Set algorithmInput := <<hashed data from Step 2>> 9. Call pivCrypt with the following parameters <ul style="list-style-type: none"> • (IN) keyReference • (IN) algorithmIdentifier • (IN) algorithmInput • (OUT) algorithmOutput 10. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 11. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 12. Verify the signature from step 9 (algorithmOutput) with subjectPublicKeyInfo->subjectPublicKey from the certificate
Expected Result(s)	The private key corresponds to the public key contained in the certificate as the signature verification succeeds.

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11.3.2.3 Verify RSA exponent

Purpose	For RSA keys, confirms that the exponent of the RSA asymmetric key for digital signature is equal to 65,537.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.03.12

Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A digital signature key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate. 5. Parse the exponent from the extracted public key
Expected Result(s)	The exponent of the RSA asymmetric key for key management is equal to 65,537.

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11.3.2.4 Verify the policyIdentifier field in the certificatePolicies

Purpose	Confirms that the Key Management certificate asserts one of the following OIDs as part of the Key Management certificate profile: the id-fpki-common-policy, id-fpki-common-hardware, or id-fpki-common-High.
Reference(s)	<ol style="list-style-type: none"> 1. AS07.03.07
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A Key Management key and corresponding certificate is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract certificatePolicies->policyIdentifier extension field values from the certificate
Expected Result(s)	A policyIdentifier field in the certificatePolicies extension asserts one of the following: id-fpki-common-policy, id-fpki-common-hardware, or id-

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	fpki-common-High.
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11.3.2.5 Verify HTTP URI in cRLDistributionPoints extension field

Purpose	Confirms that the URI in the cRLDistributionPoints extension field uses HTTP.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.03.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A key management key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the cRLDistributionPoints extension fields from the certificate
Expected Result(s)	The URI is present with the “HTTP” scheme and points only to files with “.crl” extensions.

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11.3.2.6 Verify HTTP URI in authorityInfoAccess extension field

Purpose	Confirms that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.03.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A key management key and corresponding certificate are present on the PIV card.

Test Steps	<ol style="list-style-type: none">1. Set cardHandle := <<valid card handle>>2. Set OID := <<Key Management Certificate (2.16.840.1.101.3.7.2.1.2)>>3. Call pivGetData w/<ul style="list-style-type: none">• (IN) cardHandle• (IN) OID• (OUT) data4. Extract the AuthorityInfoAccess->accessMethod and AuthorityInfoAccess->accessLocation extension fields from the certificate
Expected Result(s)	The authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).

2232 **11.4 Card Authentication Certificate**2233 **11.4.1 SP 800-78 Algorithm Conformance**2234 **11.4.1.1 Verify signature algorithm**

Purpose	Confirms that the proper signature algorithm has been used to sign the certificate as specified in Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.04.01 3. AS07.04.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>></code> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Extract <code>signature->algorithm</code> field value from the certificate
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 4: The <code>signatureAlgorithm</code> value is in accordance with Table 3-3 of SP80078 2. From Step 4: If the algorithm value is <code>id-RSASSA-PSS</code>, verify that the <code>signature->parameters</code> field is populated with <code>SHA-256</code> (OID = <code>2.16.840.1.101.3.4.2.1</code>). For the other RSA algorithms, the parameters field is populated with <code>NULL</code>. For <code>ECDSA</code>, the parameters field is absent.

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2236 **11.4.1.2 Verify subject public key algorithm**

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 3-4 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.04.03 3. AS07.04.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle.

	4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Match the algorithm value to the Table 3-4 of SP80078 6. If the algorithm is Elliptic Curve, ensure that one of the approved curves is used and the OID is populated in the subjectPublicKeyInfo->algorithm->parameters->namedCurve field from Table 3-5 of SP80078. The parameters field may contain NULL to indicate that parameters are inherited. <p>Note: - If the RSA algorithm is used, the subjectPublicKeyInfo->algorithm->parameters field shall be NULL</p>
Expected Result(s)	The card authentication key is generated using the allowed asymmetric key algorithm.

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11.4.1.3 Verify public key size

Purpose	Verifies that the key size requirements are in accordance with Table 3-1 of SP80078
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.04.13
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract subjectPublicKeyInfo->algorithm->algorithm field value 5. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate 6. Match the key size to Table 3-1 of SP80078
Expected Result(s)	The key sizes used are in accordance with Table 3-1 of SP80078.

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2240 **11.4.2 Data Integrity Checks**2241 **11.4.2.1 Verify key usage extension**

Purpose	Confirms that the card authentication certificate asserts the appropriate purpose of the key.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the value of the keyUsage extension field from the certificate
Expected Result(s)	The digitalSignature bit has been set. No other bits have been set.

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2243 **11.4.2.2 Verify id-fpki-common-cardAuth OID**

Purpose	Confirms that the card authentication certificate asserts the id-fpki-
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	common-cardAuth OID.
Reference(s)	1. AS07.04.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A PIV authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract certificatePolicies->policyIdentifier extension field values from the certificate
Expected Result(s)	A policyIdentifier field in the certificatePolicies extension asserts id-fpki-common-cardAuth.

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11.4.2.3 Verify extended key usage extension

Purpose	Confirms that the extKeyUsage in the card authentication certificate is present, is marked as critical, asserts the id-PIV-cardAuth OID, and does not assert any other OID.s
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.07
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract all KeyPurposeId fields from the extended key usage extension from the certificate
Expected Result(s)	The extKeyUsage is present, is marked as critical, asserts the id-PIV-

	cardAuth OID, and does not assert any other OIDs.
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11.4.2.4 Verify authority information access extension

Purpose	Confirms the authority information access extension is populated with the location to the OCSP Server that provides status information for this certificate.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the AuthorityInfoAccess->accessMethod and AuthorityInfoAccess->accessLocation extension fields from the certificate
Expected Result(s)	An accessMethod containing id-ad-ocsp is present. The accessLocation for this AccessMethod is of type uniformResourceIdentifier and that the scheme is “http” (not “https”).

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11.4.2.5 Verify interim status extension

Purpose	Confirms that the piv-interim extension is present in the certificate.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Appendix B 2. AS07.04.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.

Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the piv-interim extension in the certificate
Expected Result(s)	The piv-interim extension is present and contains the interim_indicator field which is of type BOOLEAN.

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11.4.2.6 Verify asymmetric key pair

Purpose	Confirms that the public key that exists in the certificate corresponds to the private key on the card.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 5.2.1 2. AS07.04.14
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Take an arbitrary stream of data 2. Hash the data using a hash algorithm 3. Set cardHandle := <<valid card handle>> 4. Set authenticators := <<valid authenticator>> 5. Call pivLogIntoCardApplication <ul style="list-style-type: none"> • (IN) cardHandle • (IN) authenticators 6. Set keyReference := <<key reference for card Authentication Key i.e. 9E>> 7. Set algorithmIdentifier := <<identifier of the algorithm to be used for the cryptographic operation>> 8. Set algorithmInput := <<hashed data from Step 2>> 9. Call pivCrypt with the following parameters <ul style="list-style-type: none"> • (IN) keyReference • (IN) algorithmIdentifier • (IN) algorithmInput • (OUT) algorithmOutput 10. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 11. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 12. Verify the signature from step 9 (algorithmOutput)with subjectPublicKeyInfo->subjectPublicKey from the certificate
Expected Result(s)	The private key corresponds to the public key contained in the

	certificate as the signature verification succeeds.
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11.4.2.7 Verify FASC-N and Card UUID

Purpose	Confirms that the FASC-N and Card UUID in the subjectAltName field in the Card authentication certificate is the same as the FASC-N and Card UUID present in the CHUID in the PIV card. This test shall also validate that no other name forms appear in the subjectAltName extension
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.09 3. AS07.04.15
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the GeneralNames field from the subjectAltName extension in the certificate 5. Parse the different GeneralName fields 6. Set OID := <<CHUID (2.16.840.1.103.3.7.2.48.0)>> 7. Call pivGetData with the following parameters <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 8. Parse the CHUID and extract the FASC-N 9. Parse the CHUID and extract the GUID
Expected Result(s)	<p>Step 8: A GeneralName field exists that contains an otherName with a type-id asserting the pivFASC-N OID. The value field of this otherName contains the FASC-N for the cardholder which matches the FASC-N obtained from parsing the CHUID.</p> <p>Step 9: A GeneralName field exists that contain a URI asserting a UUID as specified by [RFC4122, Section 3] that matches the GUID value in the CHUID.</p> <p>Note: No other name forms appear in the subjectAltName extension.</p>

2254

2255 **11.4.2.8 Verify RSA exponent**

Purpose	For RSA keys, confirms that the exponent of the RSA asymmetric key for card authentication is equal to 65,537.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.04.16
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate. 5. Parse the exponent from the extracted public key.
Expected Result(s)	The exponent of the RSA asymmetric key for card authentication is equal to 65,537.

2256

2257 **11.4.2.9 Verify HTTP URI in cRLDistributionPoints extension field**

Purpose	Confirms that the URI in the cRLDistributionPoints extension field uses HTTP.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID

	<ul style="list-style-type: none"> • (OUT) data <p>4. Extract the <code>cRLDistributionPoints</code> extension fields from the certificate</p>
Expected Result(s)	The URI is present with the “HTTP” scheme and points only to files with “.crl” extensions.

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2259 **11.4.2.10 Verify HTTP URI in authorityInfoAccess extension field**

Purpose	Confirms that the <code>authorityInfoAccess</code> field contains an <code>id-ad-caIssuers</code> (1.3.6.1.5.5.7.48.2) <code>accessMethod</code> and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.04.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A card authentication key and corresponding certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Card Authentication Certificate (2.16.840.1.101.3.7.2.5.0)>></code> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Extract the <code>AuthorityInfoAccess->accessMethod</code> and <code>AuthorityInfoAccess->accessLocation</code> extension fields from the certificate
Expected Result(s)	The <code>authorityInfoAccess</code> field contains an <code>id-ad-caIssuers</code> (1.3.6.1.5.5.7.48.2) <code>accessMethod</code> and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).

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2262 **11.5 Secure Messaging Card Verifiable Certificate**2263 **11.5.1 Secure Messaging CVC Profile Conformance**2264 **11.5.1.1 Validate General CVC Format**

Purpose	Ensure expected behavior of initial secure messaging protocol establishment.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078 2. SP80073, part 2, Section 4

	<ol style="list-style-type: none"> 3. AS07.05.06 4. AS07.05.10 5. AS07.05.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A secure messaging key and corresponding card verifiable certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. (Create Secure Messaging Channel) Send the GENERAL AUTHENTICATE command <ul style="list-style-type: none"> • CLA is set to: <ul style="list-style-type: none"> - '00' if command chaining is not needed or - '10' if command chaining is used. (The last chain of the command sets CLA to '00') • P1, algorithm reference, is set to '27', or '2E' • P2, key reference, is set to '03' indicating the PIV Secure Messaging Key 2. Verify that the control byte returned by the PIV card is 0x10 to ensure protocol was executed successfully according to input parameters 3. Perform public key validation of CVC CardHolderPublicKeyDataObject, where the domain parameters are those of Curve P-256 if P1 is '27' and those of Curve P-384 if P1 is '2E'. 4. Create CVC and ensure the Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID 5. If the CVC is not signed with an Intermediate CVC skip this step and moved to Step 6. If the CVC is signed with an Intermediate CVC Verify the Signature on Intermediate CVC signer's signature in CVC. The Intermediate CVC is available within the Secure Messaging Certificate Signer data object using GETDATA <OID=2.16.840.1.101.3.7.2.16.23> 6. Verify Signature on content signer's signature in CVC. The X.509 Certificate for Content Signing shall also include an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing. The X.509 Certificate for Content Signing is available within the Secure Messaging Certificate Signer data object using GETDATA <OID=2.16.840.1.101.3.7.2.16.23>. 7. Parse the notBefore and notAfter values of the validity field and verify that the X.509 Certificate for Content Signing does not expire
Expected Result(s)	<ol style="list-style-type: none"> 1. PIV card responds with control byte, nonce, authentication cryptogram, encrypted GUID, and confidential CVC 2. The control byte returned by the PIV card is 0x10

	<ol style="list-style-type: none"> 3. Value matches expected result detailed in the "Value" column of table 13 in SP80073 Part 2 4. The Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID 5. The Intermediate CVC signing certificate is available within the Secure Messaging Certificate Signer data object. 6. The X.509 Certificate for Content Signing includes an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing. 7. The expiration date for the X.509 Certificate for Content Signing is set to never expire
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11.5.1.2 Verify Secure Messaging CVC Profile

Purpose	Ensure expected behavior of the defined elements within the secure messaging CVC certificate.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078 2. SP80073, part 2, Section 4 3. AS07.05.03 4. AS07.05.04 5. AS07.05.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A secure messaging key and corresponding card verifiable certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. (Create Secure Messaging Channel) Send the GENERAL AUTHENTICATE command <ul style="list-style-type: none"> • CLA is set to: <ul style="list-style-type: none"> - '00' if command chaining is not needed or - '10' if command chaining is used. (The last chain of the command sets CLA to '00') • P1, algorithm reference, is set to '27', or '2E' • P2, key reference, is set to '03' indicating the PIV Secure Messaging Key 2. Verify that the control byte returned by the PIV card is 0x10 to ensure protocol was executed successfully according to input parameters 3. Perform public key validation of CVC CardHolderPublicKeyDataObject, where the domain parameters are those of Curve P-256 if P1 is '27' and those of Curve P-384 if P1 is '2E'. 4. Create CVC and ensure the Subject Identifier is same 16-byte binary representation of the Card UUID value

	<p>in the GUID field of the CHUID</p> <ol style="list-style-type: none"> 5. Extract the tag value of the secure messaging CVC 6. Extract the Credential Profile Identifier 7. Parse the subjectKeyIdentifier and extract the Issuer Identification Number 8. Extract the Role Identifier
Expected Result(s)	<ol style="list-style-type: none"> 1. PIV card responds with control byte, nonce, authentication cryptogram, encrypted GUID, and confidential CVC 2. The control byte returned by the PIV card is 0x10 3. Value matches expected result detailed in the "Value" column of table 13 in SP80073 Part 2 4. The Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID 5. The Secure Messaging CVC will have a tag value of 0x7F21 when Subject Identifier contains a 16-byte GUID and shall be 0x7F22 when the length of Subject Identifier is 0 6. The Credential Profile Identifier is 0x80 7a. The Issuer Identification Number is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to verify the signature 7b. If the public key needed to verify the signature on the secure messaging CVC appears in an Intermediate CVC then the Issuer Identification Number shall be the value of the Subject Identifier in the Intermediate CVC 8. The Role Identifier is 0x00 for card-application key CVC

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11.5.2 Algorithm Conformance

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11.5.2.1 Verify signature algorithm

Purpose	Confirms that the signature field in the certificate is in accordance with Table 15 of Part 2 in SP80073 and contains either an ECDSA signature using P-256 if the CardHolderPublicKey is P-256 or P-384 if the CardHolderPublicKey is P-384.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Part 2 Table 15 2. AS07.05.01 3. AS07.05.10
Precondition	<ol style="list-style-type: none"> 1. A valid piv card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application

	<p>which is accessible through card handle.</p> <p>4. A secure messaging key and corresponding card verifiable certificate are present on the PIV card.</p>
Test Steps	<ol style="list-style-type: none"> 1. (Create Secure Messaging Channel) Send the GENERAL AUTHENTICATE command <ul style="list-style-type: none"> • CLA is set to: <ul style="list-style-type: none"> - '00' if command chaining is not needed or - '10' if command chaining is used. (The last chain of the command sets CLA to '00') • P1, algorithm reference, is set to '27', or '2E' • P2, key reference, is set to '03' indicating the PIV Authentication Key 2. Verify that the control byte returned by the PIV card is 0x10 to ensure protocol was executed successfully according to input parameters 3. Create CVC and ensure the Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID 4. Extract Digital Signature->algorithm field value from the CVC
Expected Result(s)	<ol style="list-style-type: none"> 1. PIV card responds with control byte, nonce, authentication cryptogram, encrypted GUID, and confidential CVC 2. The control byte returned by the PIV card is 0x10 3. The Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID 4. The signatureAlgorithm value is in accordance with Table 15 of Part 2 in SP80073. The AlgorithmIdentifier OID is 1.2.840.10045.4.3.2 for ECDSA with SHA-256 (Cipher Suite 2) or 1.2.840.10045.4.3.3 for ECDSA with SHA-384 (Cipher Suite 7). For both algorithms, the parameters field is absent.

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11.5.2.2 Verify subject public key algorithm

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 15 of SP80073 Part 2.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 2 Section 4.1.5 2. AS07.05.02 3. AS07.05.12
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A secure messaging key and corresponding card verifiable

	certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> (Create Secure Messaging Channel) Send the GENERAL AUTHENTICATE command <ul style="list-style-type: none"> CLA is set to: <ul style="list-style-type: none"> '00' if command chaining is not needed or '10' if command chaining is used. (The last chain of the command sets CLA to '00') P1, algorithm reference, is set to '27', or '2E' P2, key reference, is set to '03' indicating the Secure Messaging Key Verify that the control byte returned by the PIV card is 0x10 to ensure protocol was executed successfully according to input parameters Create CVC and ensure the Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID Extract CVC CardHolderPublicKeyDataObject->algorithm OID->algorithm OID value Extract the Public Key object
Expected Result(s)	<ol style="list-style-type: none"> PIV card responds with control byte, nonce, authentication cryptogram, encrypted GUID, and confidential CVC The control byte returned by the PIV card is 0x10 The Subject Identifier is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID Verify appropriate value for the implementation: <ul style="list-style-type: none"> 0x2A8648CE3D030107 for ECDH (Curve P-256) for CS2 0x2B81040022 for ECDH (Curve P-384) for CS7 The Public Key object is encoded in tag 0x86 with a value of 04 X Y, where X and Y are the coordinates of the point on the curve.

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11.5.2.3 Secure Messaging Cipher Suite Implementation

Purpose	Ensure that secure messaging algorithms are supported and that the proper cipher suite is in use according to key strength.
Reference(s)	<ol style="list-style-type: none"> SP80078 Part 1, Section C.3 AS07.05.07 AS07.05.10
Precondition	<ol style="list-style-type: none"> A valid PIV card that supports secure messaging is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle.

	5. A secure messaging key and corresponding card verifiable certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Send SELECT card command with, <ol style="list-style-type: none"> 1. AID == A0 00 00 03 08 00 00 10 00 01 00 2. Parse the returned APT 3. Identify the cryptographic algorithms supported within the AC tag. If '27' is present proceed to step 4. If '27' is not present in the AC tag, the test is complemented 4. Set OID := <<valid OID>> (Repeat this for all implemented objects in the following set - X.509 Certificate for Digital Signature, X.509 Certificate for Key Management, 20 retired X.509 Certificates for Key Management) 5. Create data reference 6. Call pivGetData w/ (each data object identified in step 4) <ol style="list-style-type: none"> (IN) cardHandle (IN) OID (IN) oidLength (OUT) data (INOUT) DataLength 7. Examine SubjectPublicKeyInfo of each returned certificate. Ensure that the AlgorithmIdentifier is not an elliptic Curve P-384 algorithm identifier. For the digital signature certificate, the key management certificate and retired key management certificate, the OID shall not be 1.2.840.10045.4.2.1.
Expected Result(s)	<ol style="list-style-type: none"> 1. Returns with status_word of PIV_OK and initialized applicationProperties reference 2. If the PIV card supports secure messaging the 27 and/or 2E algorithms are returned within the AC tag of the APT 3. None of the certificates shall contain ECC keys with a P-384 curve.

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2275 **11.5.3 Data Integrity Checks**2276 **11.5.3.1 Verify asymmetric key pair**

Purpose	Confirms that the public key that exists in the certificate corresponds to the private key on the card.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073 Part 2 Section 4.1.4 2. AS07.05.09
Precondition	1. A valid PIV card that supports secure messaging is inserted into the contact reader.

	<ol style="list-style-type: none"> 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. A secure messaging key and corresponding card verifiable certificate are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. (Create Secure Messaging Channel) Send the GENERAL AUTHENTICATE command <ul style="list-style-type: none"> • CLA is set to: <ul style="list-style-type: none"> • '00' if command chaining is not needed or • '10' if command chaining is used. (The last chain of the command sets CLA to '00') • P1, algorithm reference, is set to '27', or '2E' • P2, key reference, is set to '03' indicating the PIV Authentication Key 2. Verify that the control byte returned by the PIV card is 0x10 to ensure protocol was executed successfully according to input parameters 3. Perform public key validation of CVC CardHolderPublicKeyDataObject, where the domain parameters are those of Curve P-256 if P1 is '27' and those of Curve P-384 if P1 is '2E'. Compute key confirmation key per SP80073 part 2, section 4.1.6.
Expected Result(s)	<ol style="list-style-type: none"> 1. PIV card responds with control byte, nonce, authentication cryptogram, encrypted GUID, and confidential CVC 2. The control byte returned by the PIV card is 0x10 3. Value matches expected result detailed in the "Value" column of table 13 in SP80073 Part 2. Executed successful key confirmation using key confirmation key and authentication cryptogram returned in step 1.

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2280 11.6 Intermediate Card Verifiable Certificate

2281 11.6.1 Intermediate CVC Profile Conformance

2282 11.6.1.1 Validate General CVC Format

Purpose	Ensure that the general Intermediate CVC format is in accordance with SP80073 Part 2, Section 4
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, part 2, Section 4 2. AS07.06.09
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader.

	<ol style="list-style-type: none"> 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding Intermediate CVC are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the Intermediate CVC 5. Extract signature->algorithm field value from the certificate 6. Perform public key validation of the Intermediate CVC CardHolderPublicKeyDataObject, where the domain parameters are those of Curve P-256 if P1 is '27' and those of Curve P-384 if P1 is '2E'. 7. Ensure the Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 8. Verify signature on content signer's signature in the Intermediate CVC. The X.509 Certificate for Content Signing shall also include an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing. The X.509 Certificate for Content Signing is available within the Secure Messaging Certificate Signer data object using GETDATA <OID=2.16.840.1.101.3.7.2.16.23>. 9. Parse the notBefore and notAfter values of the validity field and verify that the X.509 Certificate for Content Signing does not expire
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 6: Value matches expected result detailed in the "Value" column of table 13 in SP80073 Part 2 2. From Step 7: The Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 3. From Step 8: The X.509 Certificate for Content Signing includes an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing. 4. From Step 9: The expiration date for the X.509 Certificate for Content Signing is set to never expire

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11.6.1.2 Verify Intermediate CVC Profile

Purpose	Ensure expected behavior of the defined elements within the Intermediate CVC profile.
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Reference(s)	<ol style="list-style-type: none"> 1. SP80073, part 2, Section 4 2. AS07.06.03 3. AS07.06.04 4. AS07.06.05 5. AS07.06.06 6. AS07.06.07 7. AS07.06.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding Intermediate CVC are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the Intermediate CVC 5. Perform public key validation of CVC CardHolderPublicKeyDataObject, where the domain parameters are those of Curve P-256 if P1 is '27' and those of Curve P-384 if P1 is '2E'. 6. Ensure the Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 7. Extract the tag value of the Intermediate CVC 8. Extract the Credential Profile Identifier 9. Parse the subjectKeyIdentifier and extract the Issuer Identification Number 10. Extract the Algorithm OID of the Intermediate CVC 11. Extract the Role Identifier
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 5: Value matches expected result detailed in the "Value" column of table 13 in SP80073 Part 2 2. From Step 6: The Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 3. From Step 7: The Intermediate CVC will have a tag value of 0x7F21 4. From Step 8: The Credential Profile Identifier is 0x80 5. From Step 9: The Issuer Identification Number is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to verify the

	<p>signature</p> <p>6. From Step 10: The Algorithm OID of the Intermediate CVC is 0x2A8648CE3D030107 for ECDH (Curve P-256) or 0x2B81040022 for ECDH (Curve P-384)</p> <p>7. From Step 11: The Role Identifier is 0x12 for card-application root CVC.</p>
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2286 **11.6.2 Algorithm Conformance**2287 **11.6.2.1 Verify signature algorithm**

Purpose	Confirms that the signature field in the certificate is in accordance with Table 16 of Part 2 in SP80073 and contains an algorithm for RSA with SHA-256 and PKCS #1 v1.5 padding.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Part 2 Table 16 2. AS07.06.01 3. AS07.06.11
Precondition	<ol style="list-style-type: none"> 1. A valid piv card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding Intermediate CVC are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the Intermediate CVC 5. Ensure the Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 6. Extract Digital Signature->algorithm field value from the Intermediate CVC
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 5: The Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 2. From Step 6: The signatureAlgorithm value is in accordance with Table 16 of Part 2 in SP80073. The AlgorithmIdentifier OID is 1.2.840.113549.1.1.11 for RSA with SHA-256 and PKCS #1 V1.5 padding. The parameters field shall be NULL.

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2289 **11.6.2.2 Verify subject public key algorithm**

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 16 of SP80073 Part 2.
Reference(s)	<ol style="list-style-type: none"> 1. SP80073, Part 2 Table 16 2. AS07.06.02 3. AS07.06.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card that supports secure messaging is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding Intermediate CVC are present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the Intermediate CVC 5. Ensure the Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 6. Extract CVC CardHolderPublicKeyDataObject->algorithm OID->algorithm OID value 7. Extract the Public Key object
Expected Result(s)	<ol style="list-style-type: none"> 1. From Step 5: The Subject Identifier is the leftmost 8 bytes of the SHA-1 hash of the Public Key object 2. From Step 6: Verify appropriate value for the implementation: <ul style="list-style-type: none"> • 0x2A8648CE3D030107 for ECDH (Curve P-256) for CS2 • 0x2B81040022 for ECDH (Curve P-384) for CS7 3. From Step 7: The Public Key object is encoded in tag 0x86 with a value of 04 X Y, where X and Y are the coordinates of the point on the curve

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2292 **11.7 X.509 Certificate for Content Signing**2293 **11.7.1 Algorithm Conformance**2294 **11.7.1.1 Verify signature algorithm**

Purpose	Confirms that the proper signature algorithm has been used to sign the certificate as specified in Table 3-3 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.07.01 3. AS07.07.02
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>></code> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Parse the X.509 Certificate for Content Signing 5. Extract <code>signature->algorithm</code> field value from the certificate
Expected Result(s)	The <code>signatureAlgorithm</code> value is in accordance with Table 3-3 of SP80078. If the algorithm value is <code>id-RSASSA-PSS</code> , verify that the <code>signature->parameters</code> field is populated with <code>SHA-256</code> (OID = 2.16.840.1.101.3.4.2.1). For the other RSA algorithms, the parameters field is populated with <code>NULL</code> . For <code>ECDSA</code> , the parameters field is absent.

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2296 **11.7.1.2 Verify subject public key algorithm**

Purpose	Confirms that the public key algorithm used for generating the keys is as specified in Table 3-4 of SP80078.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.2.1 2. AS07.07.03 3. AS07.07.04
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and

	<p>the contact reader.</p> <ol style="list-style-type: none"> The test application is currently connected to the card application which is accessible through card handle. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set <code>cardHandle</code> := <<valid card handle>> Set <code>OID</code> := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> (IN) <code>cardHandle</code> (IN) <code>OID</code> (OUT) <code>data</code> Parse the X.509 Certificate for Content Signing Extract <code>subjectPublicKeyInfo->algorithm->algorithm</code> field value Match the algorithm value to the Table 3-4 of SP80078 If the algorithm is Elliptic Curve, ensure that one of the approved curves is used and the <code>OID</code> is populated in the <code>subjectPublicKeyInfo->algorithm->parameters->namedCurve</code> field from Table 3-5 of SP80078. The <code>parameters</code> field may contain <code>NULL</code> to indicate that parameters are inherited. <p>Note: - If the RSA algorithm is used, the <code>subjectPublicKeyInfo->algorithm->parameters</code> field shall be <code>NULL</code></p>
Expected Result(s)	The X.509 Certificate for Content Signing is generated using an allowed asymmetric key algorithm.

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11.7.1.3 Verify public key size

Purpose	Verifies that the key size requirements are in accordance with Table 3-2 of SP80078.
Reference(s)	<ol style="list-style-type: none"> SP80078, Table 3-2 AS07.07.09
Precondition	<ol style="list-style-type: none"> A valid PIV card is inserted into the contact reader. A valid PC/SC connection exists between the test application and the contact reader. The test application is currently connected to the card application which is accessible through card handle. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> Set <code>cardHandle</code> := <<valid card handle>> Set <code>OID</code> := <<Secure Messaging Certificate Signer

	<pre>(2.16.840.1.101.3.7.2.16.23)>></pre> <ol style="list-style-type: none"> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Parse the X.509 Certificate for Content Signing 5. Extract <code>subjectPublicKeyInfo->algorithm->algorithm</code> field value 6. Extract the <code>subjectPublicKeyInfo->subjectPublicKey</code> from the certificate 7. Match the key size to Table 3-1 of SP80078
Expected Result(s)	The key sizes requirements are in accordance with Table 3-2 of SP80078.

2299

2300 **11.7.2 Data Integrity Checks**2301 **11.7.2.1 Verify key usage extension**

Purpose	Confirms that the X.509 Certificate for Content Signing asserts the appropriate purpose of the key contained in the certificate.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.07.05
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle</code> := <<valid card handle>> 2. Set <code>OID</code> := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Parse the X.509 Certificate for Content Signing 5. Extract the value of the <code>keyUsage</code> extension field from the certificate
Expected Result(s)	The <code>digitalSignature</code> and <code>nonRepudiation</code> bits have been set and no other <code>keyUsage</code> bits are set.

2302

2303 **11.7.2.2 Verify expiration dates consistency**

Purpose	Confirms that the expiration date of the X.509 Certificate for Content Signing is not expired.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Section 4.2.2 2. AS07.07.11
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card. 5. A valid CHUID is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>></code> 3. Call <code>pivGetData</code> w/ <ul style="list-style-type: none"> • (IN) <code>cardHandle</code> • (IN) <code>OID</code> • (OUT) <code>data</code> 4. Parse the X.509 Certificate for Content Signing 5. Extract <code>validity->notAfter->utcTime</code> field value from the certificate
Expected Result(s)	The X.509 Certificate for Content Signing is not expired.

2304

2305 **11.7.2.3 Verify RSA exponent**

Purpose	For RSA keys, confirm that the exponent of the RSA asymmetric key for the X.509 Certificate for Content Signing is equal to 65,537.
Reference(s)	<ol style="list-style-type: none"> 1. SP80078, Section 3.1 2. AS07.07.10
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set <code>cardHandle := <<valid card handle>></code> 2. Set <code>OID := <<Secure Messaging Certificate Signer</code>

	<p>(2.16.840.1.101.3.7.2.16.23)>></p> <ol style="list-style-type: none"> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the X.509 Certificate for Content Signing 5. Extract the subjectPublicKeyInfo->subjectPublicKey from the certificate. 6. Parse the exponent from the extracted public key
Expected Result(s)	The exponent of the RSA asymmetric key for the X.509 Certificate for Content Signing is equal to 65,537.

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11.7.2.4 Verify the policyIdentifier field in the certificatePolicies

Purpose	Confirms that the policyIdentifier field in the certificatePolicies extension of the X.509 Certificate for Content Signing asserts the id-fpki-common-piv-contentSigning policy of [COMMON] (OID = 2.16.840.1.101.3.2.1.3.39) and it include an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing.
Reference(s)	<ol style="list-style-type: none"> 1. FIPS201, Appendix B 2. AS07.07.06
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the X.509 Certificate for Content Signing 5. Extract certificatePolicies->policyIdentifier extension field values from the certificate 6. Extract all KeyPurposeId fields from the extended keyUsage extension
Expected Result(s)	A policyIdentifier field in the certificatePolicies extension asserts the id-fpki-common-piv-contentSigning policy of [COMMON] (OID = 2.16.840.1.101.3.2.1.3.39) and the extended key usage (extKeyUsage)

	extension will assert the id-PIV-content-signing.
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2309 **11.7.2.5 Verify HTTP URI in cRLDistributionPoints extension field**

Purpose	Confirms that the URI in the cRLDistributionPoints extension field uses HTTP.
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.07.07
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle. 4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the X.509 Certificate for Content Signing 5. Extract the cRLDistributionPoints extension fields from the certificate
Expected Result(s)	The URI is present with the “HTTP” scheme and points only to files with “.crl” extensions.

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2311 **11.7.2.6 Verify HTTP URI in authorityInfoAccess extension field**

Purpose	Confirms that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
Reference(s)	<ol style="list-style-type: none"> 1. X.509 Certificate Policy for the U.S. Federal PKI Common Policy Framework [COMMON] 2. AS07.07.08
Precondition	<ol style="list-style-type: none"> 1. A valid PIV card is inserted into the contact reader. 2. A valid PC/SC connection exists between the test application and the contact reader. 3. The test application is currently connected to the card application which is accessible through card handle.

	4. The Secure Messaging Certificate Signer data object and corresponding X.509 Certificate for Content Signing is present on the PIV card.
Test Steps	<ol style="list-style-type: none"> 1. Set cardHandle := <<valid card handle>> 2. Set OID := <<Secure Messaging Certificate Signer (2.16.840.1.101.3.7.2.16.23)>> 3. Call pivGetData w/ <ul style="list-style-type: none"> • (IN) cardHandle • (IN) OID • (OUT) data 4. Parse the X.509 Certificate for Content Signing 5. Extract the AuthorityInfoAccess->accessMethod and AuthorityInfoAccess->accessLocation extension fields from the certificate
Expected Result(s)	The authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod and the access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).

2312 **Appendix A—DTRs to Test Assertion Mapping**

2313 The following table provides an association between the Required Test Procedures in DTRs in
 2314 Sections 4, 5, 6, and 7 (those that can be electronically tested) and the test assertions in Sections 8, 9,
 2315 10, and 11.

2316 **A.1 BER-TLV Mapping**

DTR from Section 4	Test Assertion from Section 8	DTR Description
TE04.01.01.01	8.1 “Card Capabilities Container “Data Object 8.2 “Card Holder Unique Identifier” Data Object 8.3 “X.509 Certificate for PIV Authentication” Data Object 8.4 “Off-Card Comparison Card Holder Fingerprints” Data Object 8.5 “Printed Information” Data Object 8.6 “Card Holder Facial Image” Data Object 8.7 “X.509 Certificate for Digital Signature” Data Object 8.8 “X.509 Certificate for Key Management” Data Object 8.9 “X.509 Certificate for Card Authentication” Data Object 8.10 “Security Object Data Object 8.11 “Discovery” Data Object 8.12 “Card Holder Iris Images” Data Object 8.13 Retired X.509 Certificate for Key Management” Data Object 8.15 “Biotmetric Information Templates Group Template” Data Object 8.16 “Secure Messaging Certificate Signer” Data Object 8.17 “Pairing Code Reference Data Container” Data Object 8.18 Unused Data Objects on the PIV Card	The tester shall validate that the formatting, encoding and the content of all the elements in each data container conforms to SP80073 Part 1.

DTR from Section 4	Test Assertion from Section 8	DTR Description
TE04.02.01.01	8.1 “Card Capabilities Container” Data Object	The tester shall validate the format and the content of all the elements in CCC data container on the card.
TE04.02.01.02	8.1 “Card Capabilities Container” Data Object	The tester shall validate that the registered data model value is 0x10.
TE04.03.01.01	8.2 “Cardholder Unique Identifier” Data Object	The tester shall validate the format and the content of all the elements in CHUID data container on the card.
TE04.04.01.01	8.4 “Cardholder Fingerprint” Data Object	The tester shall validate that the fingerprint data follows the tag value 0xBC within the container and the FASC-N is present in the CBEFF header as well as in the CBEFF signature block. The Card UUID is present in the CBEFF signature block.
TE04.05.01.01	8.6 “Cardholder Facial Image” Data Object	The tester shall validate that the facial image follows the tag value 0xBC within the container and the FASC-N is present in the CBEFF header as well as in the CBEFF signature block. The Card UUID is present in the CBEFF signature block.
TE04.06.01.01	8.10 “Security Object” Data Object	The tester shall validate that all unsigned data objects, such as the Printed Information data object, are included in the Security Object if present and that the message digests for the various data objects present in the security object are identical to the message digest of the data object itself.
TE04.07.01.01	8.12 “Card Holder Iris Images” Data Object	The tester shall validate that the iris image follows the tag value 0xBC within the container and the FASC-N is present in the CBEFF header as well as in the CBEFF signature block. The Card UUID is present in the CBEFF signature block.
TE04.08.01.01	8.14 “Key History” Data Object	The tester shall validate the format and the contents of all the elements in Key History data container on the card.
TE04.09.01.01	8.11 “Discovery” Data Object	The tester shall validate that both tag 0x4F (PIV Card Application AID) and tag 0x5F2F (PIN Usage Policy) data elements are present in the Discovery Object. The tester shall validate the format and the contents of these data elements in the Discovery object data container on the card.
TE04.10.01.01	8.15 “Biometric Information Templates Group Template” Data Object 9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall ensure that encoding of the BIT group template is in accordance with Table 7 of SP80076.
TE04.10.01.02	8.11 “Discovery Object” Data Object	When the BIT Group Template is present, the tester shall ensure that bit 4 of the first byte of the PIN Usage Policy is set.

DTR from Section 4	Test Assertion from Section 8	DTR Description
TE04.11.01.01	8.16 “Secure Messaging Certificate Signer” Data Object	If PIV card secure messaging for non-card-management operations is enabled, the tester shall ensure that the Secure Messaging Certificate Signer data object is present and contains the certificate (and Intermediate CVC, if applicable) needed to verify the signature on secure messaging CVC.
TE04.12.01.01	8.17 “Pairing Code Reference Data Container” Data Object	If the PIV card supports VCI with pairing, then the tester shall ensure that the Pairing Code Reference Data Container is present and includes a copy of the PIV card’s pairing code.
TE04.13.01.01	8.18 Unused Data Objects on the PIV Card	The tester shall confirm that all unused data containers on the card are set to a zero length by performing GET DATA on the unused data objects and ensure that the length of the returned objects is equal to zero (i.e., the value field is absent).

2317 A.2 Biometric Data Mapping

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.01.01.01	9.1.1 CBEFF Structure for Fingerprint Template 9.2.1 CBEFF Structure for Facial Image 9.3.1 CBEFF Structure for Iris Image	The tester shall verify that the CBEFF structure is implemented in accordance with Table 13 of SP80076.
TE05.01.02.01	9.1.2 CBEFF Header for Fingerprint Template 9.2.2 CBEFF Header for Facial Image 9.3.2 CBEFF Header for Iris Image	The tester shall verify the length of the Patron Format header.
TE05.01.02.02	9.1.2 CBEFF Header for Fingerprint Template 9.2.2 CBEFF Header for Facial Image 9.3.2 CBEFF Header for Iris Image	The tester shall verify the values are consistent with Table 14 “Patron format PIV specification” requirements of SP80076.

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.01.03.01	9.1.1 CBEFF Structure for Off-Card Comparison Fingerprint Template 9.2.1 CBEFF Structure for Facial Image 9.3.1 CBEFF Structure for Iris Image 9.4.1 General Record Header Conformance 9.4.2 View Header Conformance	The tester shall compare value provided against the stored data.
TE05.01.04.01	9.1.2.1 Patron Header Version 9.2.2.1 Patron Header Version 9.3.2.1 Patron Header Version	The tester shall verify that the Patron Header Version value is 0x03.
TE05.01.05.01	9.1.2.2 SBH Security Option 9.2.2.2 SBH Security Option 9.3.2.2 SBH Security Option	The tester shall verify that the SBH security option value is b00001101.
TE05.01.06.01	9.1.2.3 BDB Format Owner Values 9.2.2.3 BDB Format Owner Values 9.3.2.3 BDB Format Owner	The tester shall verify that the BDB Format Owner field contains 0x001B for fingerprint and facials records and contains 0x0101 for iris images.
TE05.01.07.01	9.1.2.4 BDB Format Type 9.2.2.4 BDB Format Type 9.3.2.4 BDB Format Type	The tester shall verify that the BDB Format Type field is 0x0201 for fingerprint template, 0x0501 for facial image, and 0x0009 for the optional iris image if present.
TE05.01.08.01	9.1.2.5 Biometric Creation Date 9.2.2.5 Biometric Creation Date 9.3.2.5 Biometric Creation Date	The tester shall verify the date field is in compliance with the assertion.
TE05.01.09.01	9.1.2.6 Validity Period Dates 9.2.2.6 Validity Period Dates 9.3.2.6 Validity Period Dates	The tester shall verify that the headers contain two dates in compliance with the assertion.

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.01.10.01	9.1.2.7 Biometric Type Values 9.2.2.7 Biometric Type Values 9.3.2.7 Biometric Type Values	The tester shall verify that the Biometric Type field contains 0x000008 for fingerprint templates, 0x000002 for facial images, and 0x000010 for the iris images.
TE05.01.11.01	9.1.2.8 Biometric Data Type 9.2.2.8 Biometric Data Type 9.3.2.8 Biometric Data Type	The tester shall verify that the Biometric Data Type field within the PIV Patron Format is b100xxxxx for the fingerprint templates, b001xxxxx for the facial images, and b010xxxxx for the iris images.
TE05.01.12.01	9.1.2.9 Biometric Data Quality 9.2.2.9 Biometric Data Quality 9.3.2.9 Biometric Data Quality	The tester shall verify that the value of Biometric Data Quality is between -2 and 100 for the fingerprint templates, facial images, and iris images.
TE05.01.13.01	9.1.2.10 Creator Field Value 9.2.2.10 Creator Field Value 9.3.2.10 Creator Field Value	The tester shall verify that the Creator field in the PIV Patron Format contains 18 bytes of which the first $K \leq 17$ bytes is printable ASCII characters, and the first of the remaining 18-K is a null terminator (zero).
TE05.01.14.01	9.1.2.11 FASC-N Value 9.2.2.11 FASC-N Value 9.3.2.11 FASC-N Value	The tester shall verify that the FASC-N field in the PIV Patron Format shall contain the 25 bytes of the FASC-N component of the CHUID identifier. Note: This field may be filled with zeroes in the one exceptional case where PIV registration images are being stored before a FASC-N has been assigned. In such instances, the digital signature shall be regenerated once the FASC-N is known.
TE05.01.15.01	9.1.2.12 Reserved Field Value 9.2.2.12 Reserved Field Value 9.3.2.12 Reserved Field Value	The tester shall verify the “Reserved for future use” field is 0x00000000.
TE05.02.01.01	9.4.1 General Record Header Conformance	The tester shall parse the biometric data container to verify this assertion. Note: The CBEFF structure itself is tested in later assertions.
TE05.02.02.01	9.4.1 General Record Header Conformance	The tester shall verify that the resultant template is in compliance with the assertion.
TE05.02.03.01	9.4.1 General Record Header Conformance	The tester shall verify that the Format Identifier value is 0x464D5200.
TE05.02.04.01	9.4.1 General Record Header Conformance	The tester shall verify that the Version Number is 0x20323000.
TE05.02.05.01	9.4.1 General Record Header Conformance	The tester shall verify that the Record Length of the General Record Header is $26 \leq L \leq 1574$.

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.02.06.01	9.4.1 General Record Header Conformance	The tester shall verify that the both of the two fields ("Owner" and "Type") of the CBEFF Product Identifier are > 0 (non-zero).
TE05.02.07.01	9.4.1 General Record Header Conformance	The tester shall verify the Capture Equipment Compliance value is 1000b.
TE05.02.08.01	9.4.1 General Record Header Conformance	The tester shall verify the Capture Equipment ID of the General Record Header is > 0.
TE05.02.09.01	9.4.1 General Record Header Conformance	The tester shall verify that the width on Size of Scanned Image in X Direction is the larger of the widths of the two input images and the height on Size of Scanned Image in Y Direction is the larger of the heights of the two input images.
TE05.02.10.01	9.4.1 General Record Header Conformance	The tester shall verify that the X (horizontal) and Y (vertical) resolutions are 197.
TE05.02.11.01	9.4.1 General Record Header Conformance	The tester shall verify the Number of Views value is 2.
TE05.02.12.01	9.4.1 General Record Header Conformance	The tester shall verify the Reserved Byte value is 0.
TE05.02.13.01	9.4.2 View Header Conformance	The tester shall verify the View Number value of the Single Finger View Record is 0.
TE05.02.14.01	9.4.2 View Header Conformance	The tester shall verify the value is either 0 or 2 and is consistent with vendor reporting.
TE05.02.15.01	9.4.2 View Header Conformance	The tester shall verify that the quality value of captured fingerprint images shall be 20, 40, 60, 80, 100, 254, or 255. Note: A value of "255" shall be assigned when fingerprints are temporarily unusable for matching. A value of "254" shall be assigned when the fingerprints are permanently unusable.
TE05.02.16.01	9.4.2 View Header Conformance	The tester shall verify the Number of Minutiae is between 0 and 128.
TE05.02.17.01	9.4.3 Fingerprint Minutiae Data Records	The tester shall verify that the Minutiae Type is 00b, 01b, or 10b.
TE05.02.19.01	9.4.3 Fingerprint Minutiae Data Records	The tester shall verify that the value of Extended Data Block Length is zero.
TE05.03.01.01	9.6.1 Facial Image Data Conformance 9.6.2 Facial Image Header Conformance	The tester shall review the documentation to verify compliance with the assertion.
TE05.03.02.01	9.6.1 Facial Image Data Conformance	The tester shall verify that the Format Identifier value is 0x46414300.
TE05.03.03.01	9.6.1 Facial Image Data Conformance	The tester shall verify that the Version Number is 0x30313000.
TE05.03.04.01	9.6.1 Facial Image Data Conformance	The tester shall verify that the Record Length of the Facial fits within the container size limits specified in [800-73].

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.03.05.01	9.6.1 Facial Image Data Conformance	The tester shall verify that the Number of Facial Images of the Facial Header is ≥ 1 and that the most recent image appears first and serve as the default provided to the application.
TE05.03.06.01	9.6.1 Facial Image Data Conformance	The tester shall verify that the Number of Feature Points for the facial image is ≥ 0 .
TE05.03.07.01	9.6.2 Facial Image Header Conformance	The tester shall verify that the Facial Image Type is 1.
TE05.03.08.01	9.6.2 Facial Image Header Conformance	The tester shall verify that the Image Data Type is 0 or 1. Note: Both whole-image and single-region-of-interest (ROI) compression are permitted. 800-76 recommends that newly collected facial image should be compressed using ISO/IEC 15444 (i.e., JPEG 2000).
TE05.03.09.01	9.6.2 Facial Image Header Conformance	The tester shall verify that the Image Color Space of the facial image is 1 and is converted to the sRGB color space.
TE05.03.10.01	9.6.2 Facial Image Header Conformance	The tester shall verify that the Source Type of the facial image is 2 or 6.
TE05.04.01.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the resultant BITs is in compliance with the assertion.
TE05.04.02.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the value for Number of Fingers is 2 in tag 0x02.
TE05.04.03.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the Reference data qualifier used by VERIFY (tag 0x83) for the first finger is '96'.
TE05.04.04.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the Reference data qualifier used by VERIFY (tag 0x83) for the second finger is '97'.
TE05.04.05.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the Biometric type (tag 0x81) for the first and second finger is 08.
TE05.04.06.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the subtype values for the first and second finger match the values identified in SP80076 Table 8.
TE05.04.07.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the CBEFF BDB format owner (tag 0x87) for the first and second finger is set to 0101.
TE05.04.08.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that the CBEFF BDB format type (tag 0x88) for the first and second finger is set to 0005.
TE05.04.09.01	9.5.1 BIT Group Template data conformance for on-card comparison	The tester shall verify that TAG 83 is not present in the Biometric Matching parameters for the first and second finger.
TE05.05.01.01	9.7.1 Iris Image Profile	The tester shall review the documentation to verify compliance with the assertion.

DTR from Section 5	Test Assertion from Section 9	DTR Description
TE05.05.02.01	9.7.1 Iris Image Profile	The tester shall verify that the Format identifier of the Iris General Header is 0x49495200.
TE05.05.03.01	9.7.1 Iris Image Profile	The tester shall verify that the Version number of the Iris General Header is 0x30323000.
TE05.05.04.01	9.7.1 Iris Image Profile	The tester shall verify that the Length of record of the Iris General Header is less than or equal to size specified in 800-73-4 and JPEG 2000 compressed iris image implementations are executed with a bit rate input value that corresponds to the 3Kilobyte target result.
TE05.05.05.01	9.7.1 Iris Image Profile	The tester shall verify that the Number of iris representations of the Iris General Header is 1 or 2.
TE05.05.06.01	9.7.1 Iris Image Profile	The tester shall verify that the Certification flag of the Iris General Header is 0x00.
TE05.05.07.01	9.7.1 Iris Image Profile	The tester shall verify that the Number of eyes represented is 1 or 2.
TE05.05.08.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Capture date and time is 2011 onwards.
TE05.05.09.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Representation number is 1 and then, optionally 2.
TE05.05.10.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Eye label is 1 for left eye and 2 for right eye. If camera does not estimate automatically, then these are manually assigned.
TE05.05.11.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Image type is type 7 with (0,6R 0,2R) margins.
TE05.05.12.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Image format is 10 = 0x0A and the compression algorithm and encoding is mono JPEG 2000.
TE05.05.13.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Iris image properties bit field is (Bits 1-2: 01 or 10), (Bits 3-4: 01 or 10), (Bits 5-6: 01 and scan type shall be progressive), and (Bits 7-8: 01 and the compression history shall be "none"). Note: Bit 1 is the least significant bit and Bit 8 is the most significant.
TE05.05.14.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Image width (image width, W) is $288 \leq W \leq 448$.
TE05.05.15.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Image height (image height, H) is $216 \leq H \leq 336$.
TE05.05.16.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Bit depth is 8. Note: Bit depth is in bits per pixel and shall not be used to indicate compression level.
TE05.05.17.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Iris centre, lowest X is (W/2 for W odd, else), highest X is (W/2+1 for W even), lowest Y is (H/2 for H odd, else), and highest Y is (H/2+1 for H even).
TE05.05.18.01	9.7.2 Iris Image Data Conformance	The tester shall verify that the Iris diameter, lowest is $D \geq 160$ and the highest is $D \leq 280$.

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A.3 CHUID Mapping

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.01.01.01	10.1.1.1 Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the CHUID data object contains a digital signature and has been formatted correctly as a CMS external signature as defined in RFC 5652.
TE06.01.02.01	10.1.1.1 Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the CMS external digital signature has been implemented as a SignedData type.
TE06.01.03.01	10.1.1.2 Verify version in SignedData	The tester shall validate the version of the SignedData type is version 3.
TE06.01.04.01	10.1.1.3 Verify digest Algorithm in SignedData	The tester shall validate that the digest algorithm is in accordance with Table 3-2 of SP80078.
TE06.01.05.01	10.1.1.4 Verify contents of encapContentInfo	The tester shall validate that eContentType of the encapContentInfo asserts the id-PIV-CHUIDSecurityObject OID.
TE06.01.06.01	10.1.1.4 Verify contents of encapContentInfo	The tester shall validate that the eContent field has been omitted from the encapContentInfo.
TE06.01.07.01	10.2.1.13 Verify digital signature	The tester shall validate that there is a single X.509 certificate in the certificates field that can verify the digital signature in the SignerInfo.
TE06.01.08.01	10.1.1.5 Verify crls field omission	The tester shall validate that the crls field has been omitted from the SignedData.
TE06.01.09.01	10.1.1.6 Verify contents of signerInfos	The tester shall validate that only a single SignerInfo exists in the SignedData.
TE06.01.10.01	10.1.1.7 Verify Signer Identifier in SignerInfo	The tester shall validate that the issuerAndSerialNumber choice has been used for the SignerIdentifier.
TE06.01.11.01	10.1.1.8 Verify Digest Algorithm in SignerInfo	The tester shall validate that the digest algorithm is in accordance with Table 3-2.
TE06.01.12.01	10.1.1.9 Verify message digest signed attribute in SignerInfo	The tester shall validate the presence of a MessageDigest attribute in the signed attributes.
TE06.01.12.02	10.1.1.9 Verify message digest signed attribute in SignerInfo	The tester shall validate the value of the MessageDigest attribute against the hash of the concatenated content of the CHUID, excluding the asymmetric signature field.
TE06.01.13.01	10.1.1.10 Verify PIV signer distinguished name	The tester shall validate the presence of a pivSigner-DN attribute in the signed attributes
TE06.01.13.02	10.1.1.10 Verify PIV signer distinguished name	The tester shall validate the value of the pivSigner-DN attribute is the same as the subject name that appears in the certificate that signed the CHUID

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.01.14.01	10.1.1.11 Verify signature algorithm in SignerInfo	The tester shall validate that the signature algorithm value for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of SP80078.
TE06.01.15.01	10.1.1.12 Verify digital signature	The tester shall validate that the SignedData content type includes the digital signature corresponding to the CHUID

2319 A.4 Biometric Fingerprint for Off-Card Comparison Mapping

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.02.01.01	10.2.1.1: Verify presence of CMS SignedData	The tester shall validate that the digital signature in the CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as defined in RFC 5652.
TE06.02.02.01	10.2.1.1: Verify presence of CMS SignedData	The tester shall validate that the CMS external digital signature has been implemented as a SignedData type.
TE06.02.03.01	10.2.1.2: Verify version in SignedData	The tester shall validate the version of the SignedData type is version 3.
TE06.02.04.01	10.2.1.3: Verify digest Algorithm in SignedData	The tester shall validate that the digest algorithm is in accordance with Table 3-2 of SP80078.
TE06.02.05.01	10.2.1.4: Verify contents of encapContentInfo	The tester shall validate that eContentType of the encapContentInfo asserts the id-PIV-biometricObject OID.
TE06.02.06.01	10.2.1.4: Verify contents of encapContentInfo	The tester shall validate that the eContent field has been omitted from the encapContentInfo.
TE06.02.07.01	10.2.1.13: Verify digital signature	The tester shall validate that there is a single X.509 certificate in the certificates field that can verify the digital signature in the SignerInfo.
TE06.02.07.02	10.2.1.13: Verify digital signature	If the certificates field is omitted, the tester shall validate that the certificate in the SignedData for the CHUID can verify the digital signature in the SignerInfo.
TE06.02.08.01	10.2.1.5: Verify crls field omission	The tester shall validate that the crls field has been omitted from the SignedData.
TE06.02.09.01	10.2.1.6: Verify contents of signerInfos	The tester shall validate that only a single SignerInfo exists in the SignedData.
TE06.02.10.01	10.2.1.7: Verify Signer Identifier in SignerInfo	The tester shall validate that the issuerAndSerialNumber choice has been used for the SignerIdentifier.

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.02.11.01	10.2.1.8: Verify Digest Algorithm in SignerInfo	The tester shall validate that the digest algorithm in the SignerInfo is in accordance with Table 3-2 of SP80078.
TE06.02.12.01	10.2.1.9: Verify message digest signed attribute in SignerInfo	The tester shall validate the presence of a MessageDigest attribute in the signed attributes.
TE06.02.12.02	10.2.1.9: Verify message digest signed attribute in SignerInfo	The tester shall validate the value of the MessageDigest attribute against the hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.
TE06.02.13.01	10.2.1.10: Verify PIV signer distinguished name	The tester shall validate the presence of a pivSigner-DN attribute in the signed attributes.
TE06.02.13.02	10.2.1.10: Verify PIV signer distinguished name	The tester shall validate the value of the pivSigner-DN attribute is the same as the subject name that appears in the certificate that signed the biometric data.
TE06.02.14.01	10.2.1.11: Verify FASC-N	The tester shall validate the presence of a pivFASC-N attribute in the signed attributes.
TE06.02.14.02	10.2.1.11: Verify FASC-N	The tester shall validate the value of the pivFASC-N attribute is the same as the FASC-N that is present in the CHUID.
TE06.02.15.01	10.2.1.12: Verify signature algorithm in SignerInfo	The tester shall validate that the signature algorithm value for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of SP80078.
TE06.02.16.01	10.2.1.13: Verify digital signature	The tester shall validate that the SignedData content type includes the digital signature corresponding to the signed biometric data.
TE06.02.17.01	10.2.1.14 Verify entryUUID	The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4) attribute in the signed attributes.
TE06.02.17.02	10.2.1.14 Verify entryUUID	The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4) attribute is the same as the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.

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A.5 Biometric Facial Image Mapping

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.03.01.01	10.3.1.1: Verify presence of CMS SignedData	The tester shall validate that the digital signature in the CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as defined in RFC 5652.

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.03.02.01	10.3.1.1: Verify presence of CMS SignedData	The tester shall validate that the CMS external digital signature has been implemented as a SignedData type.
TE06.03.03.01	10.3.1.2: Verify version in SignedData	The tester shall validate the version of the SignedData type is version 3.
TE06.03.04.01	10.3.1.3: Verify digest Algorithm in SignedData	The tester shall validate that the digest algorithm is in accordance with Table 3-2 of SP80078.
TE06.03.05.01	10.3.1.4: Verify contents of encapContentInfo	The tester shall validate that eContentType of the encapContentInfo asserts the id-PIV-biometricObject OID.
TE06.03.06.01	10.3.1.4: Verify contents of encapContentInfo	The tester shall validate that the eContent field has been omitted from the encapContentInfo.
TE06.03.07.01	10.3.1.13: Verify digital signature	The tester shall validate that there is a single X.509 certificate in the certificates field that can verify the digital signature in the SignerInfo.
TE06.03.07.02	10.3.1.13: Verify digital signature	If the certificates field is omitted, the tester shall validate that the certificate in the SignedData for the CHUID can verify the digital signature in the SignerInfo.
TE06.03.08.01	10.3.1.5: Verify crls field omission	The tester shall validate that the crls field has been omitted from the SignedData.
TE06.03.09.01	10.3.1.6: Verify contents of signerInfos	The tester shall validate that only a single SignerInfo exists in the SignedData.
TE06.03.10.01	10.3.1.7: Verify Signer Identifier in SignerInfo	The tester shall validate that the issuerAndSerialNumber choice has been used for the SignerIdentifier.
TE06.03.11.01	10.3.1.8: Verify Digest Algorithm in SignerInfo	The tester shall validate that the digest algorithm in the SignerInfo is in accordance with Table 3-2 of SP80078.
TE06.03.12.01	10.3.1.9: Verify message digest signed attribute in SignerInfo	The tester shall validate the presence of a MessageDigest attribute in the signed attributes.
TE06.03.12.02	10.3.1.9: Verify message digest signed attribute in SignerInfo	The tester shall validate the value of the MessageDigest attribute against the hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.
TE06.03.13.01	10.3.1.10: Verify PIV signer distinguished name	The tester shall validate the presence of a pivSigner-DN attribute in the signed attributes.
TE06.03.13.02	10.3.1.10: Verify PIV signer distinguished name	The tester shall validate the value of the pivSigner-DN attribute is the same as the subject name that appears in the certificate that signed the biometric data.
TE06.03.14.01	10.3.1.11: Verify FASC-N	The tester shall validate the presence of a pivFASC-N attribute in the signed attributes.
TE06.03.14.02	10.3.1.11: Verify FASC-N	The tester shall validate the value of the pivFASC-N attribute is the same as the FASC-N that is present in

DTR from Section 6	Test Assertion from Section 10	DTR Description
		the CHUID.
TE06.03.15.01	10.3.1.12: Verify signature algorithm in SignerInfo	The tester shall validate that the signature algorithm value for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of SP80078.
TE06.03.16.01	10.3.1.13: Verify digital signature	The tester shall validate that the SignedData content type includes the digital signature corresponding to the signed biometric data.
TE06.03.17.01	10.3.1.14 Verify entryUUID	The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4) attribute in the signed attributes.
TE06.03.17.02	10.3.1.14 Verify entryUUID	The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4) attribute is the same as the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.

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A.6 Security Object Mapping

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.04.01.01	10.4.1.1: Verify integrity of data element hashes	The tester shall validate that the message digests for the various data objects present in the security object are identical to the message digest of the data object itself.
TE06.04.02.01	10.4.2.1: Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the digital signature has been formatted correctly as a CMS signature as defined in RFC (5652).
TE06.04.03.01	10.4.2.1: Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the CMS digital signature has been implemented as a SignedData type.
TE06.04.04.01	10.4.2.2: Verify version in SignedData	The tester shall validate the version of the SignedData type is version 3.
TE06.04.05.01	10.4.2.3: Verify digest Algorithm in SignedData	The tester shall validate that the digest algorithm value is in accordance with Table 3-2 of SP80078.
TE06.04.06.01	10.4.2.4: Verify contents of encapContentInfo	The tester shall validate that eContentType of the encapContentInfo asserts the id-icao-ldsSecurityObject OID.
TE06.04.07.01	10.4.2.4: Verify contents of encapContentInfo	The tester shall validate that eContent of the encapContentInfo contains the contents of the ldsSecurity object.
TE06.04.08.01	10.4.2.5: Verify certificates field omission	The tester shall validate that the certificates field has been omitted from the SignedData.
TE06.04.09.01	10.4.2.6: Verify Digest	The tester shall validate that the digest algorithm in

DTR from Section 6	Test Assertion from Section 10	DTR Description
	Algorithm in SignerInfo	the SignerInfo is in accordance with Table 3-2 of SP80078.
TE06.04.10.01	10.4.2.7: Verify signature algorithm in SignerInfo	The tester shall validate that the signature algorithm value for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of SP80078.
TE06.04.11.01	10.4.2.8: Verify digital signature	The tester shall validate that the SignedData content type includes the digital signature corresponding to the signed security object.

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A.7 Biometric Iris Mapping

DTR from Section 6	Test Assertion from Section 10	DTR Description
TE06.05.01.01	10.5.1.1 Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the digital signature in the CBEFF_SIGNATURE_BLOCK has been formatted correctly as a CMS external signature as defined in RFC 5652.
TE06.05.02.01	10.5.1.1 Verify presence of CMS SignedData asymmetric digital signature	The tester shall validate that the CMS external digital signature has been implemented as a SignedData type.
TE06.05.03.01	10.5.1.2 Verify version in SignedData	The tester shall validate the version of the SignedData type is version 3.
TE06.05.04.01	10.5.1.3 Verify digest Algorithm in SignedData	The tester shall validate that the digest algorithm is in accordance with Table 3-2 of SP80078.
TE06.05.05.01	10.5.1.4 Verify contents of encapContentInfo	The tester shall validate that eContentType of the encapContentInfo asserts the id-PIV-biometricObject OID.
TE06.05.06.01	10.5.1.4 Verify contents of encapContentInfo	The tester shall validate that the eContent field has been omitted from the encapContentInfo.
TE06.05.07.01	10.5.1.13 Verify digital signature	The tester shall validate that there is a single X.509 certificate in the certificates field that can verify the digital signature in the SignerInfo.
TE06.05.07.02	10.5.1.13 Verify digital signature	If the certificates field is omitted, the tester shall validate that the certificate in the SignedData for the CHUID can verify the digital signature in the SignerInfo.
TE06.05.08.01	10.5.1.5 Verify crls field omission	The tester shall validate that the crls field has been omitted from the SignedData.
TE06.05.09.01	10.5.1.6 Verify contents of signerInfos	The tester shall validate that only a single SignerInfo exists in the SignedData.
TE06.05.10.01	10.5.1.7 Verify Signer Identifier in SignerInfo	The tester shall validate that the issuerAndSerialNumber choice has been used for the SignerIdentifier and it corresponds to the to the issuer

DTR from Section 6	Test Assertion from Section 10	DTR Description
		and serialNumber fields found in the X.509 certificate for the entity that signed the biometric data.
TE06.05.11.01	10.5.1.8 Verify Digest Algorithm in SignerInfo	The tester shall validate that the digest algorithm in the SignerInfo is in accordance with Table 3-2 of SP80078.
TE06.05.12.01	10.5.1.9 Verify message digest signed attribute in SignerInfo	The tester shall validate the presence of a MessageDigest attribute in the signed attributes.
TE06.05.12.02	10.5.1.9 Verify message digest signed attribute in SignerInfo	The tester shall validate the value of the MessageDigest attribute against the hash of the concatenated CBEFF_HEADER and the STD_BIOMETRIC_RECORD.
TE06.05.13.01	10.5.1.10 Verify PIV signer distinguished name	The tester shall validate the presence of a pivSigner-DN attribute in the signed attributes.
TE06.05.13.02	10.5.1.10 Verify PIV signer distinguished name	The tester shall validate the value of the pivSigner-DN attribute is the same as the subject name that appears in the certificate that signed the biometric data.
TE06.05.14.01	10.5.1.11 Verify FASC-N	The tester shall validate the presence of a pivFASC-N attribute in the signed attributes.
TE06.05.14.02	10.5.1.11 Verify FASC-N	The tester shall validate the value of the pivFASC-N attribute is the same as the FASC-N that is present in the CHUID.
TE06.05.15.01	10.5.1.12 Verify signature algorithm in SignerInfo	The tester shall validate that the signature algorithm value for RSA with PKCS #1 v1.5 padding specifies the rsaEncryption OID (as per Section 3.2 of RFC 3370) and for ECDSA and RSA with PSS padding, the signatureAlgorithm is in accordance with Table 3-3 of SP80078.
TE06.05.16.01	10.5.1.13 Verify digital signature	The tester shall validate that the SignedData content type includes the digital signature corresponding to the signed biometric data.
TE06.05.17.01	10.5.1.14 Verify entryUUID	The tester shall validate the presence of an entryUUID (OID = 1.3.6.1.1.16.4) attribute in the signed attributes.
TE06.05.17.02	10.5.1.14 Verify entryUUID	The tester shall validate the value of the entryUUID (OID = 1.3.6.1.1.16.4) attribute is the same as the 16-byte representation of the Card UUID value that appears in the GUID data element of the PIV card's CHUID data element.

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A.8 PIV Authentication Certificate Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
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DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.01.01.01	11.1.1.1: Verify signature algorithm	The tester shall validate that the signature algorithm of the certificate is listed in Table 3-3 of SP80078 and is not sha1WithRSAEncryption.
TE07.01.02.01	11.1.1.1: Verify signature algorithm	The tester shall validate that the correctness of the values of the AlgorithmIdentifier fields.
TE07.01.03.01	11.1.1.2: Verify subject public key algorithm	The tester shall validate that the algorithm used to generate PIV authentication keys are in accordance with Table 3-4 of SP 800-78.
TE07.01.04.01	11.1.1.2: Verify subject public key algorithm	The tester shall validate the correctness of the values of the parameters field of the algorithm of the subjectPublicKeyInfo field in the PIV authentication certificate issued by the vendor.
TE07.01.05.01	11.1.2.1 Verify key usage extension	The tester shall validate the assertion of the digitalSignature bit in the keyUsage extension in the PIV authentication certificate issued by the vendor.
TE07.01.06.01	11.1.2.2 Verify id-fpki-common-authentication OID	The tester shall validate the presence of the id-fki-common-authentication OID in the certificatePolicies extension in the PIV authentication certificate issued by the vendor.
TE07.01.07.01	11.1.2.3 Verify authority information access extension	The tester shall validate the presence of an id-ad-ocsp accessMethod in the authorityInfoAccess extension in the PIV authentication certificate issued by the vendor. The tester shall also validate that the accessLocation for this accessMethod uses the URI name form and points to an HTTP accessible OCSP server.
TE07.01.08.01	11.1.2.6 Verify FASC-N and Card UUID	The tester shall validate that the FASC-N and Card UUID in the subjectAltName field in the PIV authentication certificate is the same as the FASC-N and Card UUID present in the CHUID in the PIV card. The tester shall validate that no other name forms appear in the subjectAltName extension.
TE07.01.09.01	11.1.2.4 Verify interim status extension	The tester shall validate that the piv-interim extension is present in the PIV authentication certificate issued by the vendor.
TE07.01.10.01	11.1.2.9 Verify HTTP URI in cRLDistributionPoints extension field	The tester shall verify that the cRLDistributionPoints field shall contain a URI that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded CRL (see RFC 2585) for status information on the PIV authentication certificate.
TE07.01.11.01	11.1.2.10 Verify HTTP URI in authorityInfoAccess extension field	The tester shall validate that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
TE07.01.12.01	11.1.1.3 Verify public key size	The tester shall validate that the public key size is in accordance with Table 3-1 of SP80078.

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.01.13.01	11.1.2.5 Verify asymmetric key pair	The tester shall validate that the public key present in the PIV authentication certificate is part of the key pair corresponding to the private key on the PIV card.
TE07.01.14.01	11.1.2.6 Verify FASC-N and Card UUID	The tester shall validate that the FASC-N in the subjectAltName field in the PIV authentication certificate is the same as the FASC-N present in the CHUID in the PIV card.
TE07.01.14.02	11.1.2.6 Verify FASC-N and Card UUID	The tester shall validate that the Card UUID present in the subjectAltName field is the same as the Card UUID in the CHUID in the PIV card.
TE07.01.15.01	11.1.2.7 Verify expiration dates consistency	The tester shall validate that the expiration of the PIV authentication certificate is not beyond the expiration of the CHUID in the PIV card.
TE07.01.16.01	11.1.2.8 Verify RSA exponent	The tester shall validate that the RSA public key exponent size is equal to 65,537.

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A.9 Digital Signature Certificate Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.02.01.01	11.2.1.1: Verify signature algorithm	The tester shall validate that the signature algorithm of the certificate is listed in Table 3-3 of SP80078 and is not sha1WithRSAEncryption.
TE07.02.02.01	11.2.1.1: Verify signature algorithm	The tester shall validate that the correctness of the values of the AlgorithmIdentifier fields.
TE07.02.03.01	11.2.1.2: Verify subject public key algorithm	The tester shall validate that the algorithm used to generate digital signature keys are in accordance with Table 3-4 of SP80078.
TE07.02.04.01	11.2.1.2: Verify subject public key algorithm	The tester shall validate the correctness of the values of the parameters field of the algorithm of the subjectPublicKeyInfo field in the digital signature certificate issued by the vendor.
TE07.02.05.01	11.2.2.1 Verify key usage extension	The tester shall validate the assertion of the digitalSignature bit and the nonRepudiation bit in the keyUsage extension in the digital signature certificate issued by the vendor.
TE07.02.06.01	11.2.2.5 Verify the policyIdentifier field in the certificatePolicies	The tester shall validate the presence of one of the following OIDs in the certificatePolicies extension in the Digital Signature certificate issued by the vendor: the id-fpki-common-hardware or id-fpki-common-High.
TE07.02.07.01	11.2.2.6 Verify HTTP URI in cRLDistributionPoints extension field	The tester shall verify that the cRLDistributionPoints field shall contain a URI that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded CRL (see RFC 2585) for status information on the Digital signature certificate.

TE07.02.08.01	11.2.2.7 Verify HTTP URI in authorityInfoAccess extension field	The tester shall validate that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
TE07.02.09.01	11.2.1.3 Verify public key size	The tester shall validate that the public key size is in accordance with Table 3-1 of SP80078.
TE07.02.10.01	11.2.2.2 Verify asymmetric key pair	The tester shall validate that the public key present in the digital signature certificate is part of the key pair corresponding to the private key on the PIV card.
TE07.02.11.01	11.2.2.3 Verify expiration dates consistency	The tester shall validate that the expiration of the digital signature certificate is not beyond the expiration of the CHUID in the PIV card.
TE07.02.12.01	11.2.2.4 Verify RSA exponent	The tester shall validate that the RSA public key exponent size is equal to 65,537.

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A.10 Key Management Certificate Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.03.01.01	11.3.1.1 Verify signature algorithm	The tester shall validate that the signature algorithm of the certificate is listed in Table 3-3 of SP80078 and is not sha1WithRSAEncryption.
TE07.03.02.01	11.3.1.1 Verify signature algorithm	The tester shall validate that the correctness of the values of the AlgorithmIdentifier fields.
TE07.03.03.01	11.3.1.2 Verify subject public key algorithm	The tester shall validate that the algorithm used to generate key management keys are in accordance with Table 3-4 of SP80078.
TE07.03.04.01	11.3.1.2 Verify subject public key algorithm	The tester shall validate the correctness of the values of the parameters field of the algorithm of the subjectPublicKeyInfo field in the key management certificate issued by the vendor.
TE07.03.05.01	11.3.2.1 Verify key usage extension	The tester shall validate that certificates corresponding to RSA keys assert only the keyEncipherment bit in the keyUsage extension.
TE07.03.06.01	11.3.2.1 Verify key usage extension	The tester shall validate that certificates corresponding to elliptic curve keys assert only the keyAgreement bit in the keyUsage extension.
TE07.03.07.01	11.3.2.4 Verify the policyIdentifier field in the certificatePolicies	The tester shall validate the presence of one of the following OIDs in the certificatePolicies extension in the Key Management certificate issued by the vendor: the id-fpki-common-policy, id-fpki-common-hardware, or id-fpki-common-High.
TE07.03.08.01	11.3.2.5 Verify HTTP URI in cRLDistributionPoints extension field	The tester shall verify that the cRLDistributionPoints field shall contain a URI that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded CRL (see RFC 2585) for status information on the Key management certificate.

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.03.09.01	11.3.2.6 Verify HTTP URI in authorityInfoAccess extension field	The tester shall validate that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
TE07.03.10.01	11.3.1.3 Verify public key size	The tester shall validate that the public key size is in accordance with Table 3-1 of SP80078.
TE07.03.11.01	11.3.2.2 Verify asymmetric key pair	The tester shall validate that the public key present in the key management certificate is part of the key pair corresponding to the private key on the PIV card.
TE07.03.12.01	11.3.2.3 Verify RSA exponent	The tester shall validate that the RSA public key exponent size is equal to 65,537.

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A.11 Card Authentication Certificate Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.04.01.01	11.4.1.1 Verify signature algorithm	The tester shall validate that the signature algorithm of the certificate is listed in Table 3-3 of SP80078 and is not sha1WithRSAEncryption.
TE07.04.02.01	11.4.1.1 Verify signature algorithm	The tester shall validate that the correctness of the values of the AlgorithmIdentifier fields.
TE07.04.03.01	11.4.1.2 Verify subject public key algorithm	The tester shall validate that the algorithm used to generate card authentication keys are in accordance with Table 3-4 of SP80078.
TE07.04.04.01	11.4.1.2 Verify subject public key algorithm	The tester shall validate the correctness of the values of the parameters field of the algorithm of the subjectPublicKeyInfo field in the card authentication certificate issued by the vendor.
TE07.04.05.01	11.4.2.1 Verify key usage extension	The tester shall validate the assertion of the digitalSignature bit in the keyUsage extension in the card authentication certificate issued by the vendor.
TE07.04.06.01	11.4.2.2 Verify id-fpki-common-cardAuth OID	The tester shall validate the policyIdentifier field in certificatePolicies has asserted the id-fpki-common-cardAuth OID.
TE07.04.07.01	11.4.2.3 Verify extended key usage extension	The tester shall validate the extKeyUsage is present, is marked as critical, asserts the id-PIV-cardAuth OID, and does not assert any other OIDs.
TE07.04.08.01	11.4.2.4 Verify authority information access extension	The tester shall validate the presence of an id-ad-ocsp accessMethod in the authorityInfoAccess extension in the card authentication certificate issued by the vendor. The tester shall also validate that the accessLocation for this accessMethod uses the URI name form and points to an HTTP accessible OCSP server.

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.04.09.01	11.4.2.7 Verify FASC-N and Card UUID	The tester shall validate that the FASC-N and Card UUID in the subjectAltName field in the Card authentication certificate is the same as the FASC-N and Card UUID present in the CHUID in the PIV card. The tester shall validate that no other name forms appear in the subjectAltName extension.
TE07.04.10.01	11.4.2.5 Verify interim status extension	The tester shall validate that the piv-interim extension is present in the card authentication certificate issued by the vendor.
TE07.04.11.01	11.4.2.9 Verify HTTP URI in cRLDistributionPoints extension field	The tester shall verify that the cRLDistributionPoints field shall contain a URI that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded CRL (see RFC 2585) for status information on the Card authentication certificate.
TE07.04.12.01	11.4.2.10 Verify HTTP URI in authorityInfoAccess extension field	The tester shall validate that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
TE07.04.13.01	11.4.1.3 Verify public key size	The tester shall validate that the public key size is in accordance with Table 3-1 of SP80078.
TE07.04.14.01	11.4.2.6 Verify asymmetric key pair	The tester shall validate that the public key present in the card authentication certificate is part of the key pair corresponding to the private key on the PIV card.
TE07.04.15.01	11.4.2.7 Verify FASC-N and Card UUID	The tester shall validate that the FASC-N in the subjectAltName field in the Card authentication certificate is the same as the FASC-N present in the CHUID in the PIV card.
TE07.04.15.02	11.4.2.7 Verify FASC-N and Card UUID	The tester shall validate that the Card UUID present in the subjectAltName field is the same as the Card UUID in the CHUID in the PIV card.
TE07.04.16.01	11.4.2.8 Verify RSA exponent	The tester shall validate that the RSA public key exponent size is equal to 65,537.

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2329 A.12 Secure Messaging Card Verifiable Certificate (CVC) Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.05.01.01	11.5.2.1 Verify signature algorithm	The tester shall validate that signature field in the certificate is in accordance with Table 15 of Part 2 in SP80073 and contains either an ECDSA signature using P-256 if the CardHolderPublicKey is P-256 or P-384 if the CardHolderPublicKey is P-384.
TE07.05.02.01	11.5.2.2 Verify subject public key algorithm	The tester shall validate that the algorithm used to generate card authentication keys are in accordance

DTR from Section 7	Test Assertion from Section 11	DTR Description
		with Table 15 of SP80073 Part 2.
TE07.05.03.01	11.5.1.2 Verify Secure Messaging CVC Profile	The tester shall verify that the Credential Profile Identifier of the secure messaging CVC is 0x80.
TE07.05.04.01	11.5.1.2 Verify Secure Messaging CVC Profile	The tester shall verify that the Issuer Identification Number of the secure messaging CVC is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to verify the signature.
TE07.05.04.02	11.5.1.2 Verify Secure Messaging CVC Profile	The tester shall verify that if the public key needed to verify the signature on the secure messaging CVC appears in an Intermediate CVC, then the Issuer Identification Number shall be the value of the Subject Identifier in the Intermediate CVC.
TE07.05.05.01	11.5.1.2 Verify Secure Messaging CVC Profile	The tester shall verify that the Role Identifier of the secure messaging CVC is 0x00 for card-application key CVC.
TE07.05.06.01	11.5.1.1 Validate General CVC Format	The tester shall validate that the Subject Identifier of the secure messaging CVC is same 16-byte binary representation of the Card UUID value in the GUID field of the CHUID.
TE07.05.07.01	11.5.2.3 Secure Messaging Cipher Suite Implementation	The tester shall validate that the Secure Messaging key size is in accordance with the interfaces supported by the card and the keys that are present on the card.
TE07.05.09.01	11.5.3.1 Verify asymmetric key pair	The tester shall validate that the public key present in the CVC is part of the key pair corresponding to the secure messaging private key on the PIV card.
TE07.05.10.01	11.5.1.1 Validate General CVC Format 11.5.2.1 Verify signature algorithm 11.5.2.3 Secure Messaging Cipher Suite Implementation	The tester shall validate that the public key is either an X.509 Certificate for Content Signing or an Intermediate CVC. If it is provided in an Intermediate CVC, then the format of the Intermediate CVC shall be as specified in Table 16 of SP80073 Part 2, Section 4.1.5, and the public key required to verify the digital signature of the Intermediate CVC shall be provided in an X.509 Certificate for Content Signing.
TE07.05.11.01	11.5.1.1 Validate General CVC Format	The tester shall validate that the X.509 Certificate for Content Signing needed to verify the digital signature of a secure messaging CVC or Intermediate CVC of a valid PIV card does not be expired.
TE07.05.12.01	11.5.2.2 Verify subject public key algorithm	The tester shall verify that the Public Key object of the secure messaging CVC is encoded in tag 0x86 with a value of 04 X Y, where X and Y are the coordinates of the point on the curve.

2330 A.13 Intermediate Card Verifiable Certificate (CVC) Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.06.01.01	11.6.2.1 Verify signature	The tester shall validate that the signature field in the

DTR from Section 7	Test Assertion from Section 11	DTR Description
	algorithm	certificate is in accordance with Table 16 of Part 2 in SP80073 and contains an algorithm for RSA with SHA-256 and PKCS #1 v1.5 padding.
TE07.06.02.01	11.6.2.2 Verify subject public key algorithm	The tester shall validate that the algorithm used to generate card authentication keys are in accordance with Table 16 of SP80073 Part 2.
TE07.06.03.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the tag value of the Intermediate CVC is 0x7F21.
TE07.06.04.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the Credential Profile Identifier of the Intermediate CVC is 0x80.
TE07.06.05.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the Issuer Identification Number of the Intermediate CVC is the leftmost 8 bytes of the subjectKeyIdentifier in the content signing certificate needed to verify the signature.
TE07.06.06.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the Subject Identifier of the Intermediate CVC is the leftmost 8 bytes of the SHA-1 hash of the Public Key object.
TE07.06.07.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the Algorithm OID of the Intermediate CVC is either 0x2A8648CE3D030107 for ECDH (Curve P-256) or 0x2B81040022 for ECDH (Curve P-384).
TE07.06.08.01	11.6.1.2 Verify Intermediate CVC Profile	The tester shall verify that the Role Identifier of the Intermediate CVC is 0x12 for card-application root CVC.
TE07.06.09.01	11.6.1.1 Validate General CVC Format	The tester shall validate that the X.509 Certificate for Content Signing needed to verify the digital signature of a secure messaging CVC or Intermediate CVC of a valid PIV card is not expire.
TE07.06.10.01	11.6.2.2 Verify subject public key algorithm	The tester shall verify that the Public Key object of the Intermediate CVC is encoded in tag 0x86 with a value of 04 X Y, where X and Y are the coordinates of the point on the curve.
TE07.06.11.01	11.6.2.1 Verify signature algorithm	The tester shall verify that the public key in the Intermediate CVC used to verify the signature on the secure messaging CVC shall conform to Table 16 SP80073 Part 2, Section 4.1.5.

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A.14 X.509 Certificate for Content Signing Mapping

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.07.01.01	11.7.1.1 Verify signature algorithm	The tester shall validate that the signature algorithm of the certificate is listed in Table 3-3 of SP80078 and is not sha1WithRSAEncryption.
TE07.07.02.01	11.7.1.1 Verify signature algorithm	The tester shall validate that the correctness of the values of the AlgorithmIdentifier fields.

DTR from Section 7	Test Assertion from Section 11	DTR Description
TE07.07.03.01	11.7.1.2 Verify subject public key algorithm	The tester shall validate that the algorithm used to generate the X.509 Certificate for Content Signing are in accordance with Table 3-4 of SP80078.
TE07.07.04.01	11.7.1.2 Verify subject public key algorithm	The tester shall validate the correctness of the values of the parameters field of the algorithm of the subjectPublicKeyInfo field in the X.509 Certificate for Content Signing issued by the vendor.
TE07.07.05.01	11.7.2.1 Verify key usage extension	The tester shall validate the assertion of the digitalSignature bit and the nonRepudiation bit in the keyUsage extension in the X.509 Certificate for Content Signing issued by the vendor.
TE07.07.06.01	11.7.2.4 Verify the policyIdentifier field in the certificatePolicies	The tester shall validate that the signatures created before October 15, 2015, the public key required to verify the digital signature is provided in the certificates field of the CMS external digital signature in a content signing certificate, which is an X.509 digital signature certificate issued under the id-fpki-common-hardware, the public key required to verify the digital signature shall be provided in the certificates field of the CMS external digital signature in a content signing certificate, which is an X.509 digital signature certificate issued under the id-fpki-common-piv-contentSigning policy of [COMMON]. The content signing certificate also includes an extended key usage (extKeyUsage) extension asserting id-PIV-content-signing.
TE07.07.07.01	11.7.2.5 Verify HTTP URI in cRLDistributionPoints extension field	The tester shall verify that the cRLDistributionPoints field shall contain a URI that uses HTTP and points to a file that has an extension of “.crl” containing the DER encoded CRL (see RFC 2585) for status information on the X.509 Certificate for Content Signing.
TE07.07.08.01	11.7.2.6 Verify HTTP URI in authorityInfoAccess extension field	The tester shall validate that the authorityInfoAccess field contains an id-ad-caIssuers (1.3.6.1.5.5.7.48.2) accessMethod. The access location is a URI using HTTP and points to a file that has an extension of “.p7c” containing a certs-only CMS message (see RFC 3851).
TE07.07.09.01	11.7.1.3 Verify public key size	The tester shall validate that the public key size is in accordance with Table 3-2 of SP80078.
TE07.07.10.01	11.7.2.3 Verify RSA exponent	The tester shall validate that the RSA public key exponent size is equal to 65,537.
TE07.07.11.01	11.7.2.2 Verify expiration dates consistency	The tester shall verify that the X.509 Certificate for Content Signing is not expired.

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Appendix B—Bibliography

Citation Code	Document
SP80073	NIST Special Publication 800-73-4, Interfaces for Personal Identity Verification, May 2013 or as amended. (See http://csrc.nist.gov)
SP80076	NIST Special Publication 800-76-2, Biometric Data Specification for Personal Identity Verification, July 2012 or as amended. (See http://csrc.nist.gov)
SP80078	Draft NIST Special Publication 800-78-4, Cryptographic Algorithms and Key Sizes for Personal Identity Verification, May 2013 or as amended. (See http://csrc.nist.gov)
SP80085A	NIST Special Publication 800-85A-2, PIV Card Application and Middleware Interface Test Guidelines, July 2010 or as amended. (See http://csrc.nist.gov)
FIPS201	FIPS 201-2, Personal Identity Verification (PIV) National Institute of Standards and Technology), September 2013. (See http://csrc.nist.gov)
FINGSTD	INCITS 381-2004, American National Standard for Information Technology - Finger Image-Based Data Interchange Format.
HSPD12	HSPD 12, Policy for a Common Identification Standard for Federal Employees and Contractors, August 27, 2004. (See http://www.dhs.gov/homeland-security-presidential-directive-12)
MINUSTD	INCITS 378-2004, American National Standard for Information Technology - Finger Minutiae Format for Data Interchange.
FACESTD	INCITS 385-2004, American National Standard for Information Technology - Face Recognition Format for Data Interchange.
CBEFF	INCITS 398-2005, American National Standard for Information Technology - Common Biometric Exchange Formats Framework (CBEFF).
EBTS	AFIS-DOC-01078-9.1 CJIS-RS-0010 (V9.4) – Electronic Biometric Transmission Specification, Criminal Justice Information Services, Federal Bureau of Investigation, Department of Justice, May 25, 2010. Implementers should consult https://www.fbibiospecs.org/ or request the full EBTS documentation from the FBI..
IRISSTD	ISO/IEC 19794-6:2011 Information technology -- Biometric data interchange formats -- Part 6: Iris image data This document revises and replaces the 2005 iris standard. Published September 29, 2011. This standard is being amended, with publication expected 2014. The amendment does two things: It establishes conformance tests for 19794-6 iris records and, in support of that, clarifies the Image Type 7 appearance requirements. In particular it emphasizes that the sclera shall be masked. The title of the amendment is: Information Technology — Biometric data interchange formats — Part 6: Iris image format - Amendment 1: Conformance testing methodologies.
ISO7816	ISO/IEC 7816 (Parts 4, 5, 6, 8, and 9), Information technology — Identification cards — Integrated circuit(s) cards with contacts.
TIG SCEPACS	<i>Technical Implementation Guidance: Smart Card Enabled Physical Access Control Systems</i> , Version 2.2, The Government Smart Card Interagency Advisory Board's Physical Security Interagency Interoperability Working Group, July 27, 2004. (see

Citation Code	Document
	https://www.idmanagement.gov/sites/default/files/documents/TIG_SCEPACS_v2.2_0.pdf
X509	X.509 Certificate Policy.
X509 Extensions	X.509 Certificate and Certificate Revocation List (CRL) Extensions Profile for the Shared Service Providers (SSP) Program, January 7, 2008.

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2335 **Appendix C—Glossary of Terms and Acronyms**2336 **C.1 Glossary of Terms**

Term	Meaning
Offline Test	Offline tests use previously captured images as inputs to core biometric implementations. Such tests are repeatable and can readily be scaled to very large populations and large numbers of competing products. They institute a level-playing field and produce robust estimates of the core biometric power of an algorithm. This style of testing is particularly suited to interoperability testing of a fingerprint template (see [ISOSWAP]).
Scenario Test	Scenario testing is intended to mimic an operational application and simultaneously institute controls on the procedures. Scenario testing requires members of a human test population to transact with biometric sensors. Scenario tests are appropriate for capturing and assessing the effects of interactions human users have with biometric sensors and interfaces.
Operational Test	Operational tests involve a deployed system and are usually conducted to measure in-the-field performance and user-system interaction effects. Such tests require the members of a human test population to transact with biometric sensors. False acceptance rates may not be measurable, depending on the controls instituted.
Interoperability Test	Interoperability tests measure the performance associated with the use of standardized biometric data records in a multiple vendor environment. It involves the production of the templates by N enrollment products and authentication of these against images processed by M others.
Template Matcher	In the PIV context a matcher is a software library providing for the comparison of images conformant to FINGSTD and templates conformant to MINUSTD. The output of the matcher, a similarity score, will be the basis of accept or reject decision.
Template Generator	In the PIV context a template generator is a software library providing facilities for the conversion of images conformant to FINGSTD to templates conformant to MINUSTD for storage on the PIV card.

2337 **C.2 Acronyms**

2338	ANSI	American National Standards Institute
2339	BDB	Biometric Data Block
2340	BER-TLV	Basic Encoding Rules Tag-Length-Value
2341	CBEFF	Common Biometric Exchange Formats Framework
2342	CCC	Card Capability Container
2343	CHUID	Cardholder Unique Identifier
2344	CMS	Cryptographic Message Syntax
2345	CRL	Certificate Revocation List
2346	DTR	Derived Test Requirement

2347	ECDSA	Elliptic Curve Digital Signature Algorithm
2348	FICC	Federal Identity Credentialing Committee
2349	FIPS	Federal Information Processing Standards
2350	FISMA	Federal Information Security Management Act
2351	GUID	Global Unique Identification Number
2352	HSPD	Homeland Security Presidential Directive
2353	HTTP	Hypertext Transfer Protocol
2354	INCITS	International Committee for Information Technology Standards
2355	ITL	Information Technology Laboratory
2356	NIST	National Institute of Standards and Technology
2357	OCSP	Online Certificate Status Protocol
2358	OMB	Office of Management and Budget
2359	PC/SC	Personal Computer/Smart Card
2360	PIN	Personal Identification Number
2361	PIV	Personal Identity Verification
2362	PKI	Public Key Infrastructure
2363	PSS	Probabilistic Signature Scheme
2364	RSA	Rivest Shamir Adleman
2365	SBH	Signature Block Header
2366		
2367	SHA	Secure Hash Algorithm
2368	SP	Special Publication
2369	SSP	Shared Service Providers
2370	TIG SCEPACS	Technical Implementation Guidance Smart Card Enabled Physical Access
2371		Control System
2372	URI	Uniform Resource Identifier
2373		