NISTIR 7806

ANSI/NIST-ITL 1-2011 Requirements and Conformance Test Assertions

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September 2011

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U.S. Department of Commerce
Rebecca M. Blank, Acting Secretary

National Institute of Standards and Technology
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Reports on Computer Systems Technology

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National Institute of Standards and Technology Interagency Report
175 pages (2011)

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Abstract

The current version of the ANSI/NIST-ITL standard "Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information" is specified in two parts. Part 1, ANSI/NIST-ITL 1-2007, specifies the traditional format, and Part 2, ANSI/NIST-ITL 2-2008, specifies a NIEM-conformant XML format. Both parts have been combined into one document, which is being revised and augmented. The Computer Security Division (CSD) of NIST/ITL has developed a set of test assertions based on the requirements specified in the 4th draft of the new ANSI/NIST-ITL standard. Over twelve hundred test assertions have been identified and organized into a set of tables to assist in the development of a conformance test tool designed to test implementations of the new version of the ANSI/NIST-ITL standard for selected record types. These tables were contributed to the Conformance Testing Methodology (CTM) Working Group which was recently established by NIST/ITL to develop a CTM for the new version of the ANSI/NIST-ITL (AN-2011) standard. A ballot was conducted on a revised draft (5th draft) of the AN-2011 standard. A new draft will be developed based on the comments received as a result of this ballot. As the technical content of the AN-2011 draft standard evolves towards approval and publication, and comments on the assertion tables in this document are received, revised versions of these tables will be developed until they fully address the requirements of the approved AN-2011 standard. This publication documents the assertions developed and the terms, operands, and operators used in defining these assertions. Brief information on previous and ongoing conformance test tools development within NIST/ITL CSD is included.

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Sponsor

The work described in this document was sponsored, in part, by The Department of Homeland Security/US-VISIT Program.

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1 Introduction

1.1 Background

The ANSI/NIST-ITL standard "Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information" is used by law enforcement, intelligence, military, and homeland security organizations throughout the world. The current version of the ANSI/NIST-ITL standard is specified in two parts:

Part 1 – (ANSI/NIST-ITL 1-2007) in Traditional Format [1]

Part 2 – (ANSI/NIST-ITL 2-2008) in NIEM-conformant XML format [2]

In addition, an extension to the table of finger position codes in both parts of the standard to handle multiple-finger captures was published: ANSI/NIST-ITL 1a-2009 [3].

The standard is now in the process of being revised. Four drafts were developed as a result of two workshops that were held at NIST and comments received from subsequent drafts. A final voting version (5^{th} draft) was developed [4]. A forty-five day ballot on the 5^{th} draft closed August 31. A revised draft will be developed as a result of the ballot. Additional information on the standard and related activities can be found at the ANSI/NIST-ITL standard homepage [5].

1.2 Need for Conformance Testing to Biometric Standards

The existence of biometric standards alone is not enough to demonstrate that products meet the technical requirements specified in the standards. Conformance testing captures the technical description of a specification and measures whether an implementation faithfully implements the specification. Conformance testing provides developers, users, and purchasers with increased levels of confidence in product quality and increases the probability of successful interoperability.

The Computer Security Division (CSD) of NIST/ITL supports the development of biometric conformance testing methodology standards and other conformity assessment efforts through active technical participation in the development of biometric standards and the development of associated conformance test architectures and test suites.

1.3 NIST/ITL CSD Conformance Test Tools Developments

NIST/ITL CSD develops these conformance test tools to support users that require conformance to selected biometric standards and product developers interested in conforming to biometric standards by using the same testing tools available to users. These efforts support the possible establishment of conformity assessment programs to validate conformance to biometric standards. The following sections briefly describe previous, recent, and ongoing conformance test tool developments in support of biometric standards.

1.4 BioAPI Conformance Test Suite (CTS)

In February 2006, NIST/ITL CSD released a BioAPI Conformance Test Suite (CTS) developed to test implementations of ANSI INCITS 358-2002, the BioAPI specification. This software tool was developed to help users verify the conformance of Biometric Service Providers to the BioAPI Specification 1.1. This tool can be downloaded from the BioAPI Conformance Test Suite web page [6]. The InterNational Committee for Information Technology Standards (INCITS) Technical Committee M1- Biometrics developed a conformance testing methodology standard for this BioAPI

specification. The standard was published in 2008 as ANSI INCITS 429-2008 [7]. NIST/ITL CSD co-sponsored the development of this standard.

1.5 Conformance Test Architecture for Biometric Information Records – Beta 1.1

In August 2008, NIST/ITL CSD released a Conformance Test Architecture (CTA) for Biometric Information Records and a Conformance Test Suite (CTS) for Patron Format A data structures specified in ANSI INCITS 398-2008, "Common Biometric Exchange Formats Framework" that runs under this CTA. The CTS for Patron Format A supported by this conformance testing architecture was developed to help users determine whether binary file implementations of Biometric Information Records (BIRs) based on this Patron Format conform to the standard. NIST/ITL CSD sponsored (in INCITS M1) development of a conformance testing methodology standard for CBEFF (Common Biometric Exchange Format Framework) data structures specified in ANSI INCITS 398-2008 and submitted to INCITS M1 the test assertions and related test cases developed for the Patron Format A CTS as well as test assertions and test cases for other Patron Formats specified in the ANSI INCITS 398-2008 standard. This standard was published as ANSI INCITS 473 in 2011 [8].

1.6 Advanced Conformance Test Architecture (CTA) Beta 2.0

In August 2010, NIST/ITL CSD released an advanced Conformance Test Architecture (CTA) Beta 2.0 designed to test implementations of selected national and international biometric data interchange standards. The CTA released was accompanied by the release of four Conformance Test Suites designed to test implementations of finger minutiae and finger image data formats conforming to American National Standards developed by Technical Committee M1- Biometrics [9]. These test tools, designed to test implementations of ANSI INCITS 378, "Finger Minutiae Format for Data Interchange" and ANSI INCITS 381, "Finger Image-Based Data Interchange Format" (both for the 2004 and 2009 versions), are available from the NIST/ITL CSD conformance test tools download web page [10].

A subsequent release of a Conformance Test Suite in 2011 is a tool designed to test implementations of the second generation of the iris image data interchange format developed by Joint Technical Committee 1 of ISO and IEC Subcommittee 37 (JTC 1/SC 37) – Biometrics [11]. Two versions of this test tool are available at the NIST/ITL CSD conformance test tools download web page [10]; they are an Installer version that runs under NIST/ITL CSD CTA Beta 2.0 and the source code version. These tools were released as soon as the final draft of this international standard became technically stable. At the time of this writing the Final Draft International Standard (FDIS) ballot closed on July 27, 2011 and the FDIS was approved. The standard is not yet published.

CTSs designed to test implementations of other international data formats developed in JTC 1/SC 37 are being tested before their release and others are under development. In addition, as addressed in the following sections, NIST/ITL CSD is also supporting the ANSI/NIST ITL standards by developing conformance test tools to test implementations of both the current version (2007) and the new version under development.

1.7 Support for the ANSI/NIST- ITL 1-2007 Standard

Although a revised and augmented version of the standard is under development, the 2007 version is still widely used. NIST/ITL CSD developed a CTA/CTS (Beta version 0.4) designed to test implementations of selected Record Types of ANSI/NIST-ITL 1-2007, "Data Format for the

Interchange of Fingerprint, Facial, & Other Biometric Information – Part 1". These Record Types were considered the first-priority tier and are supported:

- Record Type 1, Transaction Information Record
- Record Type 4, High-resolution grayscale fingerprint image
- Record Type 10, Facial and SMT image
- Record Type 13, Variable-resolution latent image
- Record Type 14, Variable-resolution fingerprint image
- Record Type 17, Iris image.

Over five-hundred and thirty test assertions were implemented. The software code can be extended to support other record types as required. The conformance test tool developed to support this standard is designed to detail a transaction's level of conformance to the standard. The CTA/CTS can also be used as an analysis tool for determining which parts of the transaction (e.g., non-conformant fields, records) do not conform to the standard and to analyze the reason for their nonconformance. For unsupported Record Types only the length of the record is reported during testing, and no determination of conformance is made for these records. In addition to stating whether a file passes or fails, the messages provided include warnings and notes. The code was developed in C# under the Microsoft® .NET 4.0 Framework. Two versions of the tools are available to the public: (a) an Installer version (Beta 0.4) and (b) the source code. Both versions were released in May 2011 and are available at the same NIST/ITL CSD conformance test tools download web page [10]. NISTIR 7791, "Conformance Test Architecture and Test Suite for ANSI/NIST-ITL 1-2007" [12], includes a high-level overview of the architecture and test suite as well as software details. The code structure description is provided. A quick start user guide and a comprehensive table of the standard's requirements and the associated implemented conformance test assertions are included.

1.8 Support for the ANSI/NIST-ITL 1-2011 (AN-2011) Standard

Part of the process associated with the development of a CTA/CTS designed to test implementations of AN-2011 would include similar and extended capabilities as the test tool described in the previous section. NIST/ITL CSD revised and extended the tables of operands and operators developed for the AN-2007 CTA/CTS assertions to express the assertions derived from the requirements in the AN-2011 standard and developed requirements and assertion tables for the AN-2011 standard. These tables include, at the present time, over twelve-hundred assertions. This initial set of tables was developed based on the AN-2011 4th draft. NIST/ITL CSD contributed the requirements and assertions tables as well as the tables of terms, operands, and operators mentioned above to the Conformance Testing Methodology (CTM) Working Group which was recently established by NIST/ITL to develop a CTM for selected records types of AN-2011.

The CTM Working Group is led by NIST/ITL staff and has participation from NIST/ITL experts in conformance testing as well as experts from other US Government agencies and the private industry. The tables contained in the annexes include the terms, operands, and operators mentioned above, as well as the tables of requirements and assertions for the following sections and Record Types of the AN-2011 standard (4th draft):

- Section 5: Data Conventions
- Section 7: Information Associated with Several Record Types

- Section 8.1 Record Type-1: Transaction information record
- Section 8.4 Record Type-4: Grayscale fingerprint image
- Section 8.10Record Type-10: Facial, other body part and SMT image record
- Section 8.13 Record Type-13: Friction-ridge latent image record
- Section 8.14 Record Type-14: Fingerprint image record
- Section 8.15 Record Type-15: Palm print image record
- Section 8.17 Record Type-17: Iris image record
- Annex B: Traditional Encoding

Additionally, tables for the deprecated Record Types 3, 5, and 6 and reserved Record Types 11 and 12 are included. Implementation exceptions are identified in Annex D. The headers of the tables of requirements and assertions are based on those specified in the draft Conformance testing methodology for AN-2011 presented at the second AN-2011 Workshop, with minor changes listed below. These changes have been made to accommodate requirements and assertions from the AN-2011 standard.

As the technical content of the AN-2011 draft standard evolves towards approval and publication and comments on the assertion tables included in Annex C are received, NIST/ITL CSD staff involved in the development of the AN-2011 CTM standard plans to revise the assertion tables until they fully address the requirements in the approved and published AN-2011 standard.

Annex A - References

[1] NIST Special Publication 500-271, ANSI/NIST-ITL 1-2007 (Revision of ANSI/NIST-ITL 1-2000), American National Standard for Information Systems — Data Format for the Interchange of Fingerprint Facial, & Other Biometric Information – Part 1

[2] NIST Special Publication 500-275, ANSI/NIST-ITL 2-2008 (XML Version of ANSI/NIST-ITL 1-2007), American National Standard for Information Systems — Data Format for the Interchange of Fingerprint Facial, & Other Biometric Information – Part 2: XML Version

[3] Update to "Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information" for multiple finger capture designations ANSI/NIST ITL 1a-2009

[4] Draft NIST Special Publication 500-290, ANSI/NIST-ITL 1-2011, *Information Technology:*

American National Standard for Information Systems - Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information

http://biometrics.nist.gov/cs_links/standard/AN_2011_Voting_Version_July_2011.pdf

[5] ANSI/NIST Standard Homepage - http://www.nist.gov/itl/iad/ig/ansi_standard.cfm

[6] NIST/ITL's Biometric Application Programming Interface (BioAPI) Conformance Test Suite (CTS), http://www.nist.gov/itl/csd/biometrics/bioapicts.cfm

[7] ANSI INCITS 429:2008 Information technology - Conformance Testing Methodology for ANSI INCITS 358-2002 BioAPI Specification. Can be obtained from the ANSI eStore: http://webstore.ansi.org/

[8] ANSI INCITS 473:2011 Information Technology - Conformance Testing Methodology Standard for Patron Formats Conforming to INCITS 398-2008, Information Technology - Common Biometric Exchange Formats Framework (CBEFF)

[9] INCITS M1 – *Biometrics* Public Homepage - http://standards.incits.org/a/public/group/m1

[10] NIST/ITL CSD Biometric Conformance Test Architectures and Test Suites Downloads Web Page: http://www.nist.gov/itl/csd/biometrics/biocta_download.cfm

[11] ISO/IEC JTC1/SC 37 – *Biometrics* Public Homepage - http://www.iso.org/iso/jtc1_sc37_home

[12] Conformance Test Architecture and Test Suite for ANSI/NIST-ITL 1-2007, NISTIR 7791, June 2011, *Fernando L. Podio, Dylan Yaga, Christofer J. McGinnis* http://csrc.nist.gov/groups/ST/BiomResCenter/CTA_BETA/NISTIR_7791.pdf

Annex B – Test Assertion Syntax and Testing Levels

Test assertions are expressed according to the operators and operands found in the tables below, except for those instances where the assertion cannot be clearly or easily represented in a mathematical format. In those cases where English is used to express the assertion, the text will be contained within the < > characters.

B.1 Operators

The table below includes a complete description of the operators used throughout the requirements and assertion tables.

Table B.1 - Operator Definitions

Operator Definitions		
Operator	**Name**	**Description**
AND	Logical And	Tests if both values are true.
ELSE	Else	Combined with the IF operator to specify what expressions are evaluated when the IF expression is false.
EQ	Equal To	Tests for equality between two values.
GT	Greater Than	Tests if the first value is greater than the second value
GTE	Greater Than or Equal To	Tests if the first value is greater than or equal to the second value.
IF	Logical If	Determines if the value or expression is true or false.
IFF	IF and Only IF	Tests the bi-conditional where each of the first and second expressions implies the other.
in	Container Specification	For X in Y, selects only those X found in Y.
LT	Less Than	Tests if the first value is less than the second value.
LTE	Less Than or Equal To	Tests if the first value is less than or equal to the second value.
MO	Member Of	Tests if the value is a contained within the set.
MOD	Modulo	For X MOD Y, provides the remainder of X divided by Y.
NEQ	Not Equal To	Tests for non-equality between two values.
NOT	Negate	Negates any operator or expression that follows.
OR	Logical Or	Tests if either value is true
P:N in Q	Query	Selects the Nth occurrence of P in Q.
ST	Such That	Enforces a condition upon the specified value or expression.
THEN	Then	Combined with the IF operator to specify what expressions are evaluated when the IF expression is true.
to	Range Selection	For X to Y, selects a set of values Z ST Z GTE X AND LTE Y
#	All	Provides all valid values.
:	Data Element Selection	For X:N, selects the Nth element in X.

,	Range Concatenation	For X,Y, selects the set of values containing X and Y.
.	Field Selection	For X.Y, selects the field specified by Y in Record X.
< >	English Expression	Contains English text that could not be reasonably expressed mathematically.
{ }	Value	For {X}, provides the value of X.
[ ]	Set	The set to be tested.

B.2 Terms

The table below provides a complete description of the terms used throughout the requirements and assertion tables.

Table B.2 - Terms Used Throughout the Requirements and Assertion Tables

Term Definitions		
Term	**Name**	**Description**
Field(s)	Field	Field structure as defined by the AN 1-2011 standard.
Integers	Integer Set	Set of all integers.
NA	Not Applicable	The test or condition is not applicable.
NULL	Null	Control character with no value.
Record(s)	Record	Record structure as defined by the AN 1-2011 standard.
RS_Subfield	RS Separated Subfield	Subfield separated by the ASCII RS separator character
Subfield	US or RS Separated Subfield	Any field or information item separated by ASCII RS or US
Transaction	Transaction	Transaction structure as defined by the AN 1-2011 standard.
TRUE	True	The test always evaluates to true because the field cannot be checked against a known value.
US_Subfield	US Separated Subfield	Information Item separated by the ASCII US separator character

B.3 Operands

The table below includes a complete description of the operands (functions) used throughout the requirements and assertion tables. The parameter X may represent any combination of operands, terms, and operators.

Table B.3 - Operands Used Throughout the Requirements and Assertion Tables

Operand Definitions		
Operand	**Name**	**Description**
All(X)	All Occurrences	Returns all occurrences of X.
ASCII(X)	ASCII Values	Specifies that all values represented by X are ASCII values.
Bytes(X)	Byte Data	Returns the byte data contained in X.

Count(X)	Count Occurrences	Returns the number of occurrences of X.
DataLength(X)	Length Of (without Special Characters)	Returns the length of X without counting Special Characters (such as US, RS, FS).
FieldNumber(X)	Field Number	Returns the field number of X.
First(X)	First Occurrence	Returns the first occurrence of X.
For(X EQ A to B) {Expression(s)}	For Loop	Evaluates each Expression for the range specified by A to B.
ForEach(X) {Expression(s)}	For Each	Evaluates each Expression for every occurrence of X found.
Last(X)	Last Occurrence	Returns the last occurrence of X.
Length(X)	Length Of	Returns the length of X.
Max(X)	Maximum Value	Returns the maximum value in the set X.
MaxOccurrences(X)	Maximum Occurrences	Returns the maximum number of occurrences of X allowed by the 1-2011 standard.
MaxSize(X)	Maximum Size	Returns the maximum size of X per occurrence allowed by the 1-2011 standard.
Min(X)	Minimum Value	Returns the minimum value in the set X.
MinOccurrences(X)	Minimum Occurrences	Returns the minimum number of occurrences of X allowed by the 1-2011 standard.
MinSize(X)	Minimum Size	Returns the minimum size of X per occurrence allowed by the 1-2011 standard.
Next(X)	Next Occurrence	Returns the next occurrence of X. Only for use within ForEach Operand's Expression(s).
Pair(A,B) of X	Pair	Returns all pairs of X. Only for use as a parameter in a ForEach Operand.
ParentField(X)	Parent Field	Returns the Field that contains X.
ParentRecord(X)	Parent Record	Returns the Record that contains X.
Present(X)	Value Present	Returns TRUE if X is present, FALSE otherwise. For subfields in Traditional Encoding, the US and RS separators are always present. Therefore the Present(X) operand returns TRUE if the value between the separators is present.
Previous(X)	Previous Occurrence	Returns the previous occurrence of X. Only for use within ForEach Operand's Expression(s).
Second(X)	Second Occurrence	Returns the second occurrence of X.
Sum(X)	Summation	Returns the summation of all the values that are a member of X.
Type(X)	Record Type	Returns the Record Type of X.
Var(X) {Selection Statement}	Variable	Assigns the entity specified by the Selection Statement to the name X. The assignment is valid for the remainder of the assertion text.
XElm(X)	XML Element	Returns the XML Element with name X.

B.4 Hierarchy of Conformance Tests

Three levels of conformance testing are defined below. For each assertion included in the Tables of Requirements and Assertions in Annex C a level of conformance testing is indicated. See Table Headers in C.2 below.

Level 1 – Checking internal content

In Level 1 testing, an AN-2011 transaction(s) is checked for field-by-field, subfield-by-subfield and information item–by information item conformance with the specification of the standard, both in terms of ranges, character types, and cardinality. Since Level 1 testing can be performed by a simple field-by-field, subfield-by-subfield and information item–by information item reading of the standard and comparison to known values, and their encoding, performing this level of conformance testing only requires a transaction or a set of ANSI/NIST transactions (as opposed to a computer algorithm or a set of hardware and software). Therefore, any hardware or software components of the implementation being tested do not have to come into the possession of the testing lab. Only AN-2011 transactions created with those components need to be available.

Level 2 – Internal consistency checking

In Level 2 testing, an AN-2011 transaction(s) is checked to determine if it is internally consistent. This is achieved by relating values from one or more fields, subfields, or information items within a transaction to other values within the same transaction. Level 2 tests involve interactions between multiple values from different parts of the AN-2011 standard and sometimes from implicit assumptions that are not explicitly stated in the base standard. Thus, Level 2 tests require more complex validation than Level 1. Similar to Level 1 testing, Level 2 conformance testing only requires an AN-2011 transaction(s). To ensure that all (or almost all) possible internal consistency checks are tested, tests are performed whenever possible with a large number of transactions representing as many as possible different structural variants.

Level 3 – Content checking

A Level 3 test is intended to test whether an AN-2011 transaction under test is a faithful representation of the original biometric data and that it satisfies those requirements of the standard that are not simply a matter of syntax and format. This level of conformance testing for some requirements might be significantly difficult or even impossible to test.

The requirements and assertion tables indicate whether Level 1 or Level 2 conformance testing is required to address the assertion identified in the test assertion. Level 3 conformance tests are indicated only when necessary to show that the requirement is not currently testable or addressed.

Annex C – Tables of Requirements and Assertions for AN-2011 4th Draft

C.1 Changes in the tables from the respective AN-2007 table

The following changes have been made from equivalent tables developed for the AN-2007 version of the standard:

- Some Operators, Operands, and Terms have been modified or added to express new assertions.
- Changes have been made for requirements addressing character counts within fields. While the AN-2007 standard included special characters (0x1E and 0x1F) in the count, the AN-2011 standard does not. This is reflected in the AN-2011 tables, which do not include special characters for character counts of fields.
- The < > operator is used in the Requirements Summary column of the tables to represent text not found in the standard. This may be done in cases where the requirement is implied but not stated. The < > operator is used in the Test Assertions column to represent text that could not be expressed mathematically according to the Operators, Operands, and Terms listed in the tables in Annex A.

C.2 Table Headers

The following table headers are based on those specified in the Conformance Testing Methodology for AN-2011 (5th Draft). However, some minor changes have been made. The "Mnemonic" column was removed because the Mnemonic is now listed either in the Requirement or Assertion ID columns were appropriate. "Section" was changed to "Reference in Base Standard" to allow values other than clause numbers (such as table numbers and annexes).

The following describe the the headings of the requirements and assertions tables included below:

- **Requirement ID**: Defines a unique identifier for the requirement and associated assertion or set of assertions. It provides reference to the type of requirement (e.g., transaction, record, and field). The Requirement ID is in the form of "Type: Description" where type may be "Transaction", "Record", or "Field". For requirements found in Annex B of the AN-2011 standard, the Requirement ID is preceded by "Traditional-".
- **Reference in Base Standard**: Identifies the clause where the requirement is included in the standard. In some cases the reference includes additional information such as a Table number. This header corresponds to the Section header in the Conformance Testing Methodology for AN-2011 (5th draft), but allows references other than clause numbers (i.e., tables, annexes).

- **Requirement Summary**: Provides a summary of the requirement detailed as textual information or an interpretation of the requirement in the standard. It carries the essentials of the requirement but may not provide all the text necessary to understand it. The < > operator is used in the Requirement Summary column of the tables to represents text not found in the standard, but that may help indicate what requirement is being represented.
- **Level**: Indicates whether Level 1 or Level 2 conformance testing is required to address the assertion identified in the Assertion ID column of the same row. Level 3 conformance tests are indicated only when necessary to show that the requirement is not currently testable or addressed.
- **Status**: Reflects the status specified in the standard:
    - M: Mandatory
    - O: Optional
    - D: Dependent
    - M⇑: Mandatory if field/repeating subfield present
    - O⇑: Optional if field/repeating subfield present for the field or subfield associated with the assertion.
    - -: Varying statuses. The assertion addresses many fields or subfields of multiple statuses.
- **Assertion ID**: Defines an identifier of a specific test assertion within the set of test assertions associated with a requirement.
- **Test Assertion**: Provides, whenever possible, a mathematical equation or a procedure using the language specified by the Operators, Operands, and Terms.
    - The < > operator is used to contain plain text whenever a mathematical formula or simple procedure cannot be detailed.
- **Test Note**: Contains a number of a note included below the table. The test note may include a test procedure when the complexity of the test assertion does not allow this procedure to be included in the test assertion column. It could also include an explanatory note related to the assertion's implementation. Additionally, all exceptions (requirements specified by the standard but where the assertion is not included are listed as test notes. Finally, in instances where contradictions or perceived discrepancies are present in the standard, test notes may be used to clarify the approach taken in the assertion tables.
- **Implementation Support**: Denotes a supplier's implementation support of a particular requirement ("Y"/"N"). A note can follow the table when providing more details of implementation support (or the lack of it) is required.
- **Supported Range**: Indicates a range of values supported, especially when it is different than the full range of values specified in the standard. When an information item is specified as a single value, or does not address a range of values, a N/A should be used.

- **Test Result**: This column is used to denote the test results. For file and record-level results the results are either “Pass” or “Fail”. The field-level results should be indicated as “Ok”“Error”, “Warning” and “Note”. Explanatory notes can be added below the table.
- **Applicability**: This table header indicates which assertions differ (in values required or conditions) between Traditional and NIEM encoding. This table header does not indicate which assertions are addressed by the XML Schema and which will need to be addressed in code. Valid values are:
    - T: The assertion only applies to the Traditional encoding as described in Annex B.
    - X: The assertion only applies to the NIEM-conformant (XML) encoding as described in Annex C.
    - B: The assertion is applicable to both Traditional and NIEM (XML) encoding.
        - Following the conventions in the AN-2011 standard, test Assertions are expressed using constructs (fields, records, etc.) found in Traditional encoding (such as xx.002 for the second field of each record type). The same assertion applies for the XML elements that correspond to the Traditional constructs. For example, 10.006 in Traditional Encoding corresponds to XML Element <biom:ImageHorizontalLineLengthPixelQuantity>.
    - Some assertions reference subfields, however, NIEM encoding uses nested elements. Expression of Test Assertions that include subfields in the XML encoding requires further review. These assertions are listed with the following applicability values:
        - X* indicates that the assertion applies only to NIEM-conformant (XML) encoding.
        - B* indicates that the assertion is applicable to both Traditional and NIEM (XML) encodings.

C.3 Assertion Tables for AN-2011 4th Draft

Table C.1 - Assertions for Data Conventions

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
5: Data Conventions											
Transaction: Required Record Types	5.1, Table 1	There shall be at least one data record accompanying a Record Type-1. The Record types are listed in Table 1.	1	M	Transaction-Required Records	Present(Record ST Type(Record) EQ 1) AND Present(Record ST Type(Record) MO [2 to 99]) AND NOT MO [3,5,6,11,12,22 to 97])					T
			1	M	NIEM-Transaction-Required Records	Present(XElm(itl:PackageInformationRecord)) AND Count(Records) GTE 2					X
Transaction: Single Subject	5.1	All records in a transaction shall pertain to a single subject. Biometric data used to identify another individual requires a separate transaction.	3	M	Transaction-Single Subject	<Not tested.>	t-1				B
Transaction: Records Transmitted Together	5.1	All of the records belonging to a single transaction shall be transmitted together.	3	M	Transaction-Records Together	<Not tested.>	t-1				B
Transaction: Record Occurrences	5.1	There may be multiple records in a transaction of each record type other than Type-1.	1	M	Transaction-Record Occurrences	TRUE					B
Transaction: Size	5.2	Although the 2007 and 2008 versions of the standard stated "... there is no upper limit on the number of logical records that may be present in a file..." there was an effective upper limit due to the field size limits specified in the 2007 version (but not the 2008 version). This limit was	1	M	Transaction_Size	Count(Records in Transaction) LTE 1000					B

		3 ASCII2 characters for the information item holding the total number of records of type 2 through 99; thus an upper limit of 999 such records. With the addition of a Type-1 record, the maximum number of records in a transaction was thus restricted to 1000. This upper limit of 1000 records is maintained in this version of the standard to ensure backward compatibility with the 2007 version.										
Transaction: Reserved Records	5.3 Table 1	11 Voice Data (future) 12 Dental Record (future) 22-97 reserved for future use.	1	M	Records-Reserved	NOT Present(Records ST Type(Records) MO [11,12,22 to 97])					T
			1	M	NIEM-Records_Reserved	<An invalid record type will cause a parsing error in XML because no Record Element Tag is defined (see Table 97).>					X
Transaction: Type1-Occurrences	5.3.1	Transmissions to be exchanged are required to contain one and only one Type-1 record per transaction.	1	M	Type1_Occur_Once	Count(Records in Transaction ST Type(Record) EQ 1) EQ 1					T
			1	M	NIEM-Type1_Occur_Once	Count(XElm(itl:PackageInformationRecord)) EQ 1					X
Transaction: Type1-Record_First	5.3.1	The Type-1 record shall always be the first record within the transaction.	1	M	Type1_First	Type(First(Record in Transaction)) EQ 1					T
			1	M	NIEM-Type1_First	First(Record in Transaction) EQ XElm(itl:PackageInformationRecord)					X
Transaction: Type1- One More Record	5.3.1	At least one more record shall be present in the file.	1	M	Type1-One More Record	<See Requirement ID "Transaction: Required Record Types">	t-2				
Record: Type1-Contents	5.3.1	The Type-1 record shall provide information describing type and use or purpose for the transaction involved, a listing of each record included in the transaction, the originator or source of the physical record, and other useful and required information items.		M	Type1_Contents	<The test assertions are included under field testing for Record Type-1: Transaction Information Record.>	t-2				
Record: Type2-Contents	5.3.2	Type-2 records shall contain user-defined textual fields providing identification and descriptive information associated with the subject of the transaction.		M	Type2_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-2: User-defined descriptive text record .>	t-2				
Record: Type2-DOM/APS	5.3.2	Each entry in a Type-2 record shall have a definition and format that is listed with the Domain owner. Data contained in this record shall conform in format and content to the specifications of the domain name(s) as listed in Field 1.013 Domain name / DOM found in the Type-1	3	M	Type2_DOM/APS	<Not Tested.>	t-3				B

		record, if that field is in the transaction. The default domain is NORAM. Field 1.016 Application profile specifications / APS allows the user to indicate conformance to multiple specifications. If Field 1.016 is specified, the Type-2 record must conform to each of the application profiles.										
Transaction: Type3-Deprecated	5.3.3, Table 1	Record Type-3 shall not be contained in transactions conforming to this version of the standard.		M	Type3_Unsupported	<The test assertions are included under field testing for Record Type-3: DEPRECATED.>	t-2					
Record: Type4-Contents	5.3.4	Type-4 records were designed to convey fingerprint images captured by an Automated Fingerprint Identification System (AFIS) live-scan reader, or other image capture devices operating at a nominal scanning resolution of 500 pixels per inch (ppi). Many systems still use this record type and it will remain an integral part of the standard.		M	Type4_Contents	<The test assertions are included under field testing for Record Type-4: Grayscale fingerprint image.>	t-2					
Transaction: Type5-Deprecated	5.3.5, Table 1	Record Type-5 shall not be contained in transactions conforming to this version of the standard.		M	Type5_Unsupported	<The test assertions are included under field testing for Record Type-5: DEPRECATED.>	t-2					
Transaction: Type6-Deprecated	5.3.6, Table 1	Record Type-6 shall not be contained in transactions conforming to this version of the standard.		M	Type6_Unsupported	<The test assertions are included under field testing for Record Type-6: DEPRECATED.>	t-2					
Transaction: Type7-Contents	5.3.7	Type-7 is a legacy record type. It was intended as a temporary measure to enable the exchange of image data that would be defined by specific record types in later versions of the standard. Since some older systems still use this record type, it is included in the standard.		M	Type7_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-7: User-defined image record .>	t-2					
Record: Type8-Contents	5.3.8	Type-8 records shall be used for scanned binary or vectored signature image data. Each Type-8 record shall contain data representing the signature of the subject from whom the biometric sample is being collected and/or the operator capturing biometric data.		M	Type8_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-8: Signature image record.>	t-2					
Record: Type9-Contents	5.3.9	Type-9 records shall contain and be used to exchange minutiae or other friction ridge feature data. Each record shall represent the processed (automated and/or manual) image data from which		M	Type9_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-9: Minutiae data record .>	t-2					

		the characteristics are stated. The primary use of this record type shall be for remote searching of latent prints. New to this version of the standard is the Extended Feature Set (EFS) for latent print markups. There is also a capability to have additional vendor-specified feature sets. Workstation logs may also now be transmitted in this record type.										
Record: Type10-Contents	5.3.10, Table 54	Type-10 image records shall contain and be used to exchange textual and image data from the face, scars, marks, and tattoos (SMT). New to this version of the standard is the extension of the record type to handle images of other body parts. See Table 54 for a list of the images types possible in a Type-10 record. Textual and analytic information pertinent to the digitized image is also contained in this record type.		M	Type10_Contents	<The test assertions are included under field testing for Record Type-10: Facial, other body part and SMT image record.>	t-2				
Transaction: Type11-Reserved	5.3.11	Type-11 records are reserved for future use.		M	NA	<See Requirement ID "Transaction: Reserved Records">	t-2				
Transaction: Type12-Reserved	5.3.12	Type-12 records are reserved for future use.		M	NA	<See Requirement ID "Transaction: Reserved Records">	t-2				
Record: Type13-Contents	5.3.13	Type-13 image records shall contain and be used to exchange variable-resolution latent friction ridge image data (fingerprint, palmprint and/or plantar) together with fixed and user defined textual information fields pertinent to the digitized image. In all cases, the scanning resolution for latent images shall be at least 39.37 ppmm (1000 ppi). The variable resolution latent image data contained in the Type-13 record shall be uncompressed or may be the output from a lossless compression algorithm.		M	Type13_Contents	<The test assertions are included under field testing for Record Type-13: Friction-ridge latent image record . >	t-2				
Record: Type14-Contents	5.3.14	Type-14 image records shall contain fingerprint image data. It should be noted that as the resolution is increased, more detailed ridge and structure information becomes available in the fingerprint image. However, in all cases the scanning resolution class shall be at least 19.69		M	Type14_Contents	<The test assertions are included under field testing for Record Type-14: Fingerprint image record.>	t-2				

		ppmm (500 ppi).										
Record: Type15-Contents	5.3.9	Type-15 image records shall contain and be used to exchange palm print image data together with fixed and user-defined textual information fields pertinent to the digitized image. …in all cases the scanning resolution class shall be at least 19.69 ppmm (500 ppi) The variable-resolution palm print image data contained in the Type-15 record may be in a compressed form.		M	Type15_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-15: Palm print image record.>	t-2				
Record: Type16-Contents	5.3.9	The Type-16 image record is designed for developmental purposes and for the exchange of miscellaneous images. This record shall contain and be used to exchange image data together with textual information fields pertinent to the digitized image.		M	Type16_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-16: User-defined testing image record.>	t-2				
Record: Type17-Contents	5.3.17	Type-17 image records shall contain iris image data. Field 17.018 (Global unique identifier) from the 2007 and 2008 version of the standard has been deprecated in this version.		M	Type17_Contents	<The test assertions are included under field testing for Record Type-17: Iris image record .>	t-2				
Record: Type18-Contents	5.3.18	The Type-18 record (new to this version of the standard) shall contain and be used to exchange DNA and related data. It was developed to provide a basic level of interoperability with the draft format of the *ISO/IEC 19794-14 DNA data interchange format*. With full consideration to privacy, this standard only uses the non-coding regions of DNA. The regions of the DNA that encode phenotypic information are deliberately avoided.		M	Type18_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-18: DNA record .>	t-2				
Record: Type19-Contents	5.3.19	Type-19 image records (new to this version of the standard) shall contain and be used to exchange variable-resolution plantar print image data together with fixed and user-defined textual information fields pertinent to the digitized image. …in all cases the scanning resolution used to capture a plantar image shall be at least as great as the minimum scanning resolution of 19.69 ppmm (500 ppi). The variable-resolution plantar image data contained in the Type-		M	Type19_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-19: Plantar record.>	t-2				

		19 record may be in a compressed form.										
Record: Type20-Contents	5.3.20	The Type-20 record (new to this version of the standard) shall contain the source representation(s) from which other Record Types were derived. Typically, one source Type-20 representation is used to generate one or more representations for use in other record types. When a source representation (in a Type-20 record) is processed and the resulting representation is to be used as the source for further derivations, then the processed representation is contained in a Type-20 record. An example would be an image used for both facial (Type-10) and iris (Type-17) records. In some cases, several Type-20 records may be processed to derive a single Type-20 record.		M	Type20_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-20: Source representation record.>	t-2				
Record: Type21-Contents	5.3.21	The Type-21 record shall contain an associated context image, audio / visual recording or other related data. This information does NOT contain information used to derive biometric information contained in other records. Record Type-20 serves that function. Record Type- 21 may be used to convey contextual information, such as an image of the area where latent fingerprints were captured.		M	Type21_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-21: Associated context record.>	t-2				
Record: Type98-Contents	5.3.22	The Type-98 record shall contain security information that allows for the assurance of the authenticity and/or integrity of the transaction, including such information as binary data hashes, attributes for audit or identification purposes, and digital signatures.		M	Type98_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-98: Information assurance record.>	t-2				
Record: Type99-Contents	5.3.23	Type-99 records shall contain and be used to exchange biometric data that is not supported by other ANSI/NIST-ITL record types. This provides a basic level of interoperability and harmonization with other biometric interchange formats. This is accomplished by using a basic record structure that is conformant with *ANSI INCITS 398-2005, the Common Biometric Exchange Formats Framework (CBEFF)*		M	Type99_Contents	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-99: CBEFF biometric data record.>	t-2				

		and a biometric data block specification registered with the International Biometrics Industry Association (IBIA).									

Record: Type1-ASCII	5.6, Table 90	Record Type-1 shall always be recorded in all encodings using the 7-bit American National Standard Code for Information Interchange (ASCII). The eighth (leftmost) bit shall contain a zero value.	1	M	Type-1-ASCII	ForEach(Field in Record ST Type(Record) EQ 1)
						{
						{Bytes(Field)} MO [0x02, 0x03, 0x1C to 0x7E]
						}
											T

	C.4.1	For compatibility with existing implementations of the standard, implementers may wish to limit content to the 128 characters that can be represented by 7-bit ASCII. Nevertheless, senders and receivers of XML packages using this standard may agree on other character sets, including international character sets.	1	M	NIEM-Type1-User Defined	TRUE	t-4				X
Transaction: Encoding-Base64	5.6	Base-64 shall be used for converting non-ASCII text into ASCII form, where required and noted in the standard.	1	M	Data-Encoding-Base-64	<Not tested.>	t-4				B
Field: Encoding-CharSets	5.6, Table 2	Field 1.015 Character encoding/DCS is an optional field that allows the user to specify an alternate character encoding… Field 1.015 Character encoding/DCS contains three information items: the character encoding set index/ CSI, the character encoding sent name/CSN, and the character encoding set version/CSV. The first two items are selected from the appropriate columns of Table 2.	3	O	Data-Encoding-CharSets	<Not tested.>	t-4				B

Table C.2 - Assertions for Implementation Domain & Application Profiles

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
6: Implementation Domain and Application Profiles											
Field: Domain	6	An implementation domain, coded in Field 1.013 Domain name / DOM of a Type-1 record as an optional field, is a group of agencies or organizations that have agreed to use preassigned data fields with specific meanings (typically in Record Type-2) for exchanging information unique to their installations. The implementation domain is usually understood to be the primary application profile of the standard.	3	O	Fields-Domain	<Not tested.>	t-3				B
Field: APS	6	Field 1.016 Application profile specifications / APS allows multiple application profiles to be referenced. The organization responsible for the profile, the profile name and its version are all mandatory for each application profile specified. A transaction must conform to each profile that is included in this field.	3	O	Fields-APS	<Not tested.>	t-3				B

Table C.3 - Assertions for Information Associated with Several Records

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
7: Information Associated with Several Records											

Field: xx.001-Record Header	7.1	The record header appears as the first field (xx.001) in each Record Type. It contains information particular to the encoding format chosen, in order to enable proper reading of the record. In Traditional encoding, this field contains the record length in bytes (including all information separators).	1	M	xx.001-First	ForEach(Record in Transaction ST Type(Record) NEQ 4 OR 8)
						{
						FieldNumber(First(Field in Record)) EQ 1
						}
											T

			1	M	NIEM-RecordCategory-First	ForEach(Record in Transaction)
						{
						First(Field in Record) EQ XElm(<biom:RecordCategoryCode>)
						
						}
											X

			1	M	xx.001-Record Header	ForEach(Record in Transaction)
						{
						{Record.001} EQ Length (Record)
						}
											T

	C.5.7, 7.1	Record Length. There is no corresponding XML element. See Section 7.1. In NIEM-conformant XML encoding, this field contains the *RecordCategoryCode*, which is the numeric representation of the Record Type.	1	M	NIEM-xx.001-Record Category	< These assertions are included under field testing for the associated record types.>	t-2				
Field: xx.999-Reserved	7.2	Field xx.999 is reserved in Record Types 10 and above for data associated with the record that is described in the other fields of the record. It is mandatory in most of these record types (It does not appear in Type-18 or Type-98).		M	xx.999-Reserved	< These assertions are included under field testing for the associated record types.>	t-2				

			1	M	xx.999-RecordTypes	ForEach(Field ST FieldNumber(Field) EQ 999)
						{
						Type(ParentRecord(Field)) GTE 10 AND NOT MO [18, 98]
						
						}
											T

			1	M	NIEM-	ForEach(Field ST Field EQ					X

					Image-RecordCategoryCode	XElm(nc:BinaryBase64Object))
						{
						{XElm(biom:RecordCategoryCode) in ParentRecord(Field)} GTE 10 AND NOT MO [18, 98]
						}					

Field: xx.002-IDC	7.3.1	Each of the records present in a transaction, with the exception of the Type-1 record, shall include a field (xx.002) containing the information designation character / IDC6. The value of the IDC shall be a sequentially assigned positive integer starting from zero and incremented by one up to a maximum of 99. IDC references are stated in Type-1 Field 1.003 Transaction content / CNT and shall be used to relate information items in the CNT field of the Type-1 record to the other records in the transaction. Two or more records may share a single IDC solely to identify and link together records that pertain to different representations of the same biometric trait.	1	M	xx.002-IDCExists	ForEach(Record ST Type(Record) NEQ 1)
						{
						Present(Record.002)
						}
											T

			1	M	NIEM-IDCExists	ForEach(Record ST Record NEQ XElm(itl:PackageInformationRecord))
						{
						Present(XElm(biom:ImageReferenceIdentification)
						}
											X

			1	M	xx.002-Second	ForEach(Record ST Type(Record) NEQ 4 OR 8)
						{
						FieldNumber(Second(Field in Record)) EQ 2
						}
											T

			1	M	NIEM- IDC-Second	ForEach(Record ST Record NEQ XElm(itl:PackageInformationRecord))
						{
						Second(Field in Record) EQ XElm(biom:ImageReferenceIdentification)
						}
											X

			2	M	xx.002-IDCSeqValues	Var(IDC_Fields)
						{
						All(Fields in Records ST Type(Records) NEQ 1 AND FieldNumber(Fields) EQ 2)
						}
						
						{First(Field in IDC_Fields)} EQ 0
						
						AND
						
						ForEach(Field in IDC_Fields)
						{
						{Field} LTE 99 AND GTE 0
						AND
						{Next(Field)} LTE <Current Maximum IDC Value> +1
											T

						}					

			1	M	NIEM-IDCSeqValues	Var(IDC_Fields)
						{
						All(XElm(biom:ImageReferenceIdentification))
						}
						
						{First(Field in IDC_Fields)} EQ 0
						
						AND
						
						ForEach(Field in IDC_Fields)
						{
						{Field} LTE 99 AND GTE 0
						AND
						{Next(Field)} LTE <Current Maximum IDC Value> +1
						
						}
											X

			2	M	xx.002-IDCRelate	<See tables in test note.>	t-5				B
				M	1.003-CNT	<These assertions are included under field testing for Record Type-1: Transaction Information Record.>	t-2				

Field: xx.002-IDCImages	7.3.1	Two or more image records may share a single IDC only when they are enhancements of a single image; such transformations shall have identical dimensions.	2	M	xx.002-SameDimension	ForEach(Pair(A,B) of Records <with matching IDC fields>)
						{
						
						{A.006} EQ {B.006}
						AND
						{A.007} EQ {B.007}
						
						}
											B

			3	M	xx.002-SameImage	<Not tested. Not feasible to test if the samples are from the same image, only that the samples come from the same type of biometric trait (see Field: xx.002-IDC)>	t-1				B
Field: xx.997-SOR	7.3, 7.3.2	…optional field xx.997 is allowed in biometric data sample Record Types 10 and above that could have the biometric sample derived from a source	1	O	xx.997-SOR-RecordTypes	ForEach(Field ST Type(Field) EQ 997) { Type(ParentRecord(Field)) GTE 10 AND NOT MO [18,21,98]					T

		representation in Record Type-20. The biometric data is stored in Field xx.999. Record Type-18 (DNA) does not contain a field xx.997, since it does not contain a field 18.999. Record Type-98 does not contain this field, since that is not a biometric data record type. Record Type-21 does not contain biometric data and thus does not include field xx.997. This field is comprised of one mandatory and one optional information item, as described below.				}					

			1	O	NIEM-SOR-RecordTypes	ForEach(Field ST Field EQ XElm(biom:SourceRepresentation))
						{
						{XElm(biom:RecordCategoryCode) in ParentRecord(Field)} GTE 10 AND NOT MO [18, 21, 98]
						}
											X

Field: xx.997-SOR-SRN	7.3, 7.3.2.1	The first information item contains the source representation number / SRN. This is mandatory for each Field xx.997. It contains an index to a particular instance of a Type-20 record in the transaction. This same index value appears in the appropriate instance of Record Type-20 as Field 20.021: Source representation number / SRN. The value of the SRN shall be a sequentially assigned positive integer starting from one and incremented by one, not to exceed 255.	2	M ⇑	xx.997-SOR-SRN	ForEach(Field ST FieldNumber(Field) EQ 997)
						{
						Present(Record in Transaction ST Type(Record) EQ 20
						AND
						{Record.021} EQ { US_Subfield:1 in Field}
						)
						
						}
											B*

			2	O	xx.997-SOR-SRN-SeqValues	Var(SOR_Fields)
						{
						All(Fields ST FieldNumber(Fields) EQ 997)
						}
						
						Var(MaxSOR){2}
						
						{US_Subfield:1 in RS_Subfield:1 in First(Field in ASC_Fields)} EQ 1
						
						AND
						
						ForEach(Field in SOR_Fields)
						{
						
						ForEach(RS_Subfield in Field)
						{
						
						{US_Subfield:1 in RS_Subfield} MO [1 to 255] AND LTE {MaxSOR}
						
						AND IF {US_Subfield:1 in RS_Subfield} EQ {MaxSOR} THEN
						Var(MaxSOR) { MaxSOR + 1}
											B*

Field:	7.3,	The second information item in Field	2	O	xx.997-	ForEach(Field ST FieldNumber(Field) EQ 997)					B*

xx.997-SOR-RSP	7.3.2.2	xx.997 is optional. It is the reference segment position / RSP. It contains the index to a particular set of segmentation coordinates of the source representation (There may be more than one segment, such as from an audio / visual recording, with different frames yielding input for separate biometric data record instances in the same transaction). This same segmentation index value appears in Record Type-20 as the reference segment position / RSP in Field 20.016: Segments / SEG. There may be up to 99 segments listed in Field 20.016, but only the segment used to produce the biometric data contained in Field xx.999 of the particular instance of Record Type-xx is identified in Field xx.997.		⇑	SOR-RSP	{
						Present(US_Subfield in 20.016 ST US_Subfield EQ {US_Subfield:2 in Field})
						)
						
						}					

			3	O	xx.997-SOR-RSP-CorrectSegment	<Not Tested. Not feasible to test if the RSP that matches was used to produce the biometric data. >	t-1				B*
			1	O	20.016-SegmentOccurences	Count(US_Subfield in 20.016) LTE 99					B*

Field: xx.995-ASC	7.3, 7.3.3	New to this version of the standard, optional field xx.995 is contained in biometric data sample Record Types 10 and above that may have instances of Record Type-21 linked to it…
		This field consists of a maximum of 255 repeating subfields, each of which contains two information items, as described below.
			1	O	xx.995-ASC-RecordTypes	ForEach(Field ST FieldNumber(Field) EQ 995)
						{
						Type(ParentRecord(Field)) GTE 10
						}
											T

			1	O	NIEM-ASC-RecordTypes	ForEach(Field ST Field EQ XElm(biom:AssociatedContext))
						{
						{XElm(biom:RecordCategoryCode) in ParentRecord(Field)} GTE 10
						}
											X

			1	O	xx.995-ASC-SubfieldOccurences	ForEach(Field ST FieldNumber(Field) EQ 995)
						{
						Count(RS_Subfields in Field) LTE 255
						}
											B*

Field: xx.995-ASC-ACN	7.3, 7.3.3.1	The first information item contains the associated context number / ACN for a particular Record Type-21. This is mandatory for each Field xx.995, when the field is used. It contains an index to a particular instance of a Type-21 record in the transaction. This same index value appears in the appropriate instance of Record Type-21 as Field 21.021: Associated context number / ACN. The value of the ACN shall be a sequentially assigned a positive integer starting from one and incremented by one, not to exceed 255.	2	M ⇑	xx.995-ASC-ACN	ForEach(Field ST FieldNumber(Field) EQ 995)
						{
						
						ForEach(RS_Subfield in Field)
						{
						Present(Record in Transaction ST Type(Record) EQ 21
						AND
						{Record.021} EQ { US_Subfield:1 in RS_Subfield}
						)
						}
						
						}
											B*

			2	O	xx.995-ASC-	Var(ASC_Fields)					B*

					ACN-SeqValues	{
						All(Fields in Transaction ST FieldNumber(Fields) EQ 995)
						}
						
						Var(MaxASC){2}
						
						{US_Subfield:1 in RS_Subfield:1 in First(Field in ASC_Fields)} EQ 1
						
						AND
						
						ForEach(Field in ASC_Fields)
						{
						
						ForEach(RS_Subfield in Field)
						{
						
						{US_Subfield:1 in RS_Subfield} MO [1 to 255] AND LTE {MaxASC}
						
						AND IF{US_Subfield:1 in RS_Subfield} EQ {MaxASC} THEN
						Var(MaxASC) { MaxASC + 1}
						
						}
						}					

Field: xx.995-ASC-ASP	7.3, 7.3.3.2	The second information item in Field xx.995 is optional. It is the associated segment position / ASP. It contains the index to a particular set of segmentation coordinates of the associated context data. This same segmentation index value appears in Record Type-21 as the associated segment position / ASP in Field 21.016: Segments / SEG. There may be up to 99 segments listed in Field 21.016, but only the relevant segment is contained in Field xx.995.	2	O ⇑	xx.995-ASC-ASP	ForEach(Field ST FieldNumber(Field) EQ 995)
						{
						Present(US_Subfield in 20.016 ST US_Subfield EQ {US_Subfield:2 in Field})
						)
						}
											B*

			3	O ⇑	xx.995-ASC-ASP-CorrectSegment	<Not Tested. Not feasible to test if the ASP that matches is the one that is relevant. >	t-1				B
			1	M	21.016-SegmentOccurences	Count(US_Subfield in 21.016) LTE 99					B*

Field: 10.039-RefNum	7.3, 7.3.4	There may be several Type-10 images of a particular part of the body. For instance, a photograph of a tattoo may cover the entire tattoo. Another may be a zoom-in shot of a portion of the tattoo. In order to link these two images, the same index	2	D	10.039-T10-DiffIDC	IF Count(Records ST Type(Records) EQ 10) GT 1 THEN
						ForEach(Pair (A,B) of Records ST Type(Records) EQ 10)
						{
						IF {A.039} EQ {B.039}
											T

		number is assigned to Field 10.039: Type-10 reference number / T10, which is new to this version of the standard. Note that these images would have different IDC values.				THEN {A.002} NEQ {B.002} }					

			2	D	NIEM-T10-DiffDC	IF
						Count(XElm(itl:PackageFacialAndSMTImageRecord)) GT 1
						THEN
						ForEach(Pair (A,B) of XElm(itl:PackageFacialAndSMTImageRecord)
						{
						IF { XElm(nc:IdentificationID) in XElm(biom:PhysicalFeatureReferenceIdentification) in A} EQ { XElm(nc:IdentificationID) in XElm(biom:PhysicalFeatureReferenceIdentification) in B}
						THEN
						{ XElm(nc:IdentificationID) in XElm(biom:ImageReferenceIdentification) in A} EQ { XElm(nc:IdentificationID) in XElm(biom:ImageReferenceIdentification) in B}
						
						}
											X

			3	D	10.039-T10-SameBodyPart	<Not Tested. Not feasible to test if the images are related to the same part of the body.>	t-1				B
Field: 14.026-SimCap	7.3, 7.3.5	In order to accommodate the emergence of technology that can simultaneously capture fingerprint images on separate platens or other technology that does not preserve the full relative position of the fingers to each other, Field 14.026: Simultaneous capture / SCF allows the user to use the same index for all images that were simultaneously captured.	3	O	14.026-SCF	<Not Tested. Not feasible to test if the images were captured simultaneously. >	t-1				B

Field: xx.902-ANN	7.4.1	New for this version of the standard, optional field xx.902 is used to store annotation, logging, or processing information associated with one or more processing algorithms or workstations. If present, this text field shall consist of one or more subfields comprised of a set of information items.	1	O	xx.902-ANN-Subfields	ForEach(Record in Transaction)
						{
						
						IF Present(Record.902) THEN
						Count(RS_Subfields in Record.902) GTE 1
						
						AND
											B*

		Four mandatory information items comprise a subfield:
		• The first information item is the GMT date and time / GMT when the processing occurred. (See Section 7.7.2.2)
		• The second information item (processing algorithm name/version / NAV) shall contain an unformatted text string of up to 64 characters identifying the name and version of the processing algorithm or workstation.
		• The third information item (algorithm owner / OWN) shall contain a text string of up to 64 characters with the contact information for the organization that owns the processing algorithm or latent workstation.
		• The fourth and final information item (process description / PRO) shall contain an unformatted text string of up to 255 characters describing a process or procedure applied to the sample in this Type-XX record.
						ForEach(RS_Subfield in Record.902)
						{
						
						Count(US_Subfields in RS_Subfield) EQ 4
						
						}
						
						}					

			1	M
				⇑
					xx.902-ANN-GMT	ForEach(Record in Transaction)
						{
						
						IF Present(Record.902) THEN
						ForEach(RS_Subfield in Record.902)
						{
						
						{US_Subfield:1 in RS_Subfield}
						MO [ValidUTC/GMT]
						
						}
						
						}
							t-6				T

			1	M ⇑	NIEM-xx.902-ANN-GMT	< The treatment of subfields for validation in the XML version requires further review.>	t-6				X*

			1	M
				⇑
					xx.902-ANN-NAV&OWN	ForEach(Record in Transaction)
						{
						
						IF Present(Record.902) THEN
						ForEach(RS_Subfield in Record.902)
						{
						
						Length(US_Subfield:2 in RS_Subfield) LTE 64
						
						AND
						
						Length(US_Subfield:3 in RS_Subfield) LTE 64
						
						}
						
						}
											B*

			1	M
				⇑
					xx.902-ANN-PRO	ForEach(Record in Transaction)
						{
						
						IF Present(Record.902) THEN
						ForEach(RS_Subfield in Record.902)
						{
											B*

						Length(US_Subfield:4 in RS_Subfield) LTE 255 } }					
Field: 9.901-ULA	7.4.2	This optional field, which is new to this version of the standard, exists only in Record Type- 9. This workstation has been extensively used and logs generated from it were routinely transmitted in Field 9.901: Universal latent workstation annotation information / ULA. This version of the standard formally includes this field to record latent processing logs formatted according to the ULW.		O	9.901-ULW	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-9: Minutiae data record.>	t-2				
Field: 98.900-ALF	7.4.3	If a user wishes to maintain a log of differences between transmissions,… may be used to indicate how and why a transaction was modified. Record Type-98 is new to this version of the standard.		O	98.900-ALF	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-98: Information assurance record.>	t-2				
Field: Comment	7.4.4	The optional Comment field appears in many record types and may be used to insert free text information. It is not reserved exclusively for log-related information but has historically often been used for this purpose. It is limited to a maximum of 126 characters.	1	O	10.038-COM-Length: 10.038	Length(10.038) LTE 126					B
			1	O	xx.020-COM-Length: [13,14].020	Length([13,14].038) LTE 126					B
			1	O	17.021-COM-Length: 17.021	Length(17.021) LTE 126					B

Field: 98.003-IA/DFO	7.5.1	The Record Type-98: Information assurance record, which is new to this version of the standard, allows special data protection procedures to ensure the integrity of the transmitted data. Field 98.003: IA data format owner / DFO and Field 98.005: IA data format type / DFT define the information assurance regime that is employed to store data in Fields 98.200-899: User-defined fields / UDF.		M	98.003-DFO	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-98: Information assurance record.>	t-2				

Field: HAS	7.5.2	Optional field xx.996, which is new to this version of the standard, is designed for use in Record types 10 and above with a Field xx.999 storing the biometric data. It is comprised of 64 characters representing hexadecimal values. Thus, each character may be a digit from "0" to "9" or a letter "A" through "F".	1	O	xx.996-HAS-RecordTypes	ForEach(Field ST FieldNumber(Field) EQ 996)
						{
						Type(ParentRecord(Field)) GTE 10
						}
											T

			1	O	NIEM-HAS-RecordTypes	ForEach(Field ST Field EQ XElm(biom:ImageHashValue))
						{
						{XElm(biom:RecordCategoryCode) in ParentRecord(Field)} GTE 10
						}
											X

			1	O	xx.996-HAS-HEX	ForEach(Field ST FieldNumber(Field) EQ 996)
						{
						Bytes(Field) MO[ASCII(0 to 9,A to F)]
						}
											B

			1	O	xx.996-HAS-Length	ForEach(Field ST FieldNumber(Field) EQ 996)
						{
						Length(Field) EQ 64
						}
											B

Field: Agency Codes	7.6, Table 19, Table53, Table66, Table67, Table71	This information appears in a variety of fields (often xx.004), and is handled the same in all such fields. The data content of this field is defined by the user and shall be in accordance with the receiving agency. In the 2007 version of the standard, these fields are comprised of one information item {destination}{originating} agency identifier / DAI or ORI. The 2008 version	1	M	1.007-DAI/ORI-Length	Length(US_Subfield:1 in 1.007) GTE 1					B*
			1	M	1.008-DAI/ORI-Length	Length(US_Subfield:1 in 1.008) GTE 1					B*
			1	M	[10,13,14,1	Length(US_Subfield:1 in [10,13,14,15,17].004)					B*

		of the standard added a second optional information item {destination} {originating} agency name / DAN or OAN, which is a text description of the organization name. It may be up to 125 characters in length. This second information item is optional for all encodings in this version of the standard and may be encoded using an alternate character encoding set (See Section 5.6).			5, 17].004-DAI/ORI-Length	GTE 1					
			1	O	1.007-DAN/OAN-Length	Length(US_Subfield:2 in 1.007) LTE 125					B*
			1	O	1.008-DAN/OAN-Length	Length(US_Subfield:2 in 1.008) LTE 125					B*
			1	O	[10,13,14,17].004-DAN/OAN-Length	Length(US_Subfield:2 in [10,13,14,17].004)) LTE 125					B*
			1	M	Fields: DAN/OAN-Value	Present(1.007,1.008, [10,13,14,17].004)					B*

Field: Device ID	7.7.1.1	The DUI shall contain a string uniquely identifying the device or source of the data. This field shall be one of:
		
		• Host PC MAC address, identified by the first character “M”, or
		• Host PC processor ID, identified by the first character “P.
		
		Fields containing the DUI are:
		-Field 9.903: Device unique identifier / DUI
		-Field 10.903: Device unique identifier / DUI
		-Field 13.903: Device unique identifier / DUI
		-Field 14.903: Device unique identifier / DUI
		-Field 15.903: Device unique identifier / DUI
		-Field 16.903: Device unique identifier / DUI
		-Field 17.017: Device unique identifier / DUI
		-Field 19.903: Device unique identifier / DUI
		-Field 20.903: Device unique identifier / DUI
		-Field 99.903: Device unique identifier / DUI
			1	O	[10,13,14].903-DUI-Format	IF(First(Byte in [10,13,14].903) EQ ASCII(M) THEN
						{
						Bytes([10,13,14].903) MO[ASCII(0 to 9, A to F)]
						
						AND
						
						Length([10,13,14].903) EQ 13
						}
						
						IF(First(Byte in [10,13,14].903) EQ ASCII(P) THEN
						{
						Length([10,13,14].903) EQ 17
						}
											B

			1	O	17.017-DUI	IF(First(Byte in 17.017) EQ ASCII (M) THEN
						{
						Bytes(17.017) MO[ASCII (0 to 9, A to F)]
						
						AND
						
						Length(17.017) EQ 13
						}
						
						IF(First(Byte in 17.017) EQ ASCII (P) THEN
						{
						Length(17.017) EQ 17
						}
											B

		The MAC address takes the form of six pairs of hexadecimal values (0 through 9 and A through F). They are represented without separators in this standard for a total of 13 characters. The processor ID may be up to 16 characters.									
Field: Make Model	7.7.1.2	The MMS contains the make, model and serial number for the capture device. It shall consist of three information items. Each information item shall be 1 to 50 characters. Any or all information items may indicate that information is unknown with the value "0". Fields containing the MMS are: -Field 9.904: Make/model/serial number -Field 10.904: Make/model/serial number -Field 13.904: Make/model/serial number -Field 14.904: Make/model/serial number -Field 15.904: Make/model/serial number -Field 16.904: Make/model/serial number -Field 17.019: Make/model/serial number -Field 19.904: Make/model/serial number -Field 20.904: Make/model/serial number -Field 99.904: Make/model/serial number	1	O	[10,13,14].904-MMS	Count(US_Subfields in [10,13,14].904) EQ 3 AND Length(US_Subfields in [10,13,14].904) LTE 50 AND GTE 1					B*
			1	O	17.019-MMS	Count(US_Subfields in 17.019) EQ 3 AND Length(US_Subfields in 17.019) LTE 50 AND GTE 1					B*
Field: Device Monitoring	7.7.1.3, Table 3	This field describes the level of human monitoring that was associated with the biometric sample capture. Alphabetic values are selected from Table 3. These are corresponding fields in the standard: -Field 10.030: Device monitoring mode / DMM -Field 14.030: Device monitoring mode / DMM -Field 15.030: Device monitoring mode / DMM -Field 16.030: Device monitoring mode / DMM -Field 17.030: Device monitoring mode / DMM -Field 19.030: Device monitoring mode / DMM	1	O	[10,14,17].030-DMM	{[10,14,17].030} MO [ASCII(CONTROLLED, ASSISTED, OBSERVED, UNATTENDED, UNKNOWN)]					B

Field: UTC	7.7.2.2	UTC has replaced GMT as the main reference time scale terminology, but the older terminology is retained in this standard for existing record types. In this standard, Field 1.014 Greenwich mean time / GMT shall be taken to mean the UTC value. Some newer record types using this format refer to the data as UTC (such as in Field 18.013: Sample collection date / SCD). This time is independent of the actual time zone where the time and date is recorded. The data is YYYYMMDDhhmmssZ, where the Z is indicates the zone description of 0 hours.		M	Fields-UTC	<This requirement applies to any field that contains a date or time value. The assertions will be applied individually for those fields. >	t-2, t-6				
Field: TIX	7.7.2.5, Table 81, Table 84	For Type-20 or Type-21 records containing video or audio, this field shall contain two information items, time index start /TIS and time index end / TIE for the start and end times of segments within a video or audio file, measured in hh:mm:ss.sss where ss.sss refers to the seconds and milliseconds. This field is comprised of one or more subfields. Each repeating subfield corresponds to a single segment, with a starting and end time as separate information items.		D	Fields-TIX	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-98: Information assurance record.>	t-2				
Field: Geographic	7.7.3, Table 53, Table 66, Table 67, Table 69, Table 70, Table 71, Table 74, Table 80, Table 81, Table 86	New to this version of the standard, this optional field (xx.998) is used in Record Types 10 and above. It specifies the coordinated universal time (UTC) and the location where the biometric sample was collected. All of this information is contained in up to fifteen information items.	1	O	xx.998-Geo-RecordTypes	ForEach(Field ST FieldNumber(Field) EQ 998) { Type(ParentRecord(Field)) GTE 10}					T

			1	O	NIEM-GEO-RecordTypes	ForEach(Field ST Field EQ XElm(biom:CaptureLocation))
						{
						{XElm(biom:RecordCategoryCode) in ParentRecord(Field)} GTE 10
						}
											X

			1	O	xx.998-Geo-Subfields	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						Count(US_Subfields in Field) LTE 15
						}
											B*

			1	O	xx.998-	ForEach(Field ST FieldNumber(Field) EQ 998)					B*

					Subfield CharType ANSU	{ Bytes(US_Subfield:1 in Field}) MO [0x30 to 0x39, 0x5A, 0x7A] AND Bytes(US_Subfield:2,5 in Field) MO [0x2B,0x2D,0x2E,0x30 to 0x39] AND Bytes(US_Subfield:3,6 in Field) MO [0x2E, 0x30 to 0x39] AND Bytes(US_Subfield:4,7,11,12 Field) MO [0x30 to 0x39] AND Bytes(US_Subfield:8 in Field) MO [0x2D, 0x30 to 0x39] AND Bytes(US_Subfield:9,10 in Field) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A] AND Present(Bytes(US_Subfield:113 to 15 in Field)					

			1	O	xx.998-CharCount	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						DataLength(Field) MO [15 to 365]
						}
											B

			1	O	xx.998-Subfield CharCount	ForEach(Field ST FieldNumber(Field) EQ 998) { Length(US_Subfield:1 in Field)) EQ 15 AND Length(US_Subfield:2,14 in Field) MO [1 to 10] AND Length(US_Subfield:3,6 in Field) MO [1 to 5] AND Length(US_Subfield:4,7 in Field) MO [1 to 2] AND Length(US_Subfield:5 in Field) MO [1 to 11] AND Length(US_Subfield:8 in Field) MO [1 to 8] AND Length(US_Subfield:9 in Field) MO [2 to 6] AND Length(US_Subfield:10 in Field) EQ 5 AND Length(US_Subfield:11,12 in Field) MO [2 to 5] AND Length(US_Subfield:13 in Field) MO [1 to 150]					B*

						AND Length(US_Subfield:15 in Field) MO [1 to 126] }					

Field: Geographic-Subfield 1	7.7.3	The first information item is mandatory. It is the coordinated universal time entry /UTE. See Section 7.7.2.2.	1	M ⇑	xx.998-Geo-UTE	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						Present(US_Subfield:1 in Field)
						
						AND
						
						{US_Subfield:1 in Field} MO [ValidUTC/GMT]
						}
							t-6				T

			1	M ⇑	NIEM-xx.998-Geo-UTE	< The treatment of subfields for validation in the XML version requires further review.>	t-6				X*

Field: Geographic-Conditional	7.7.3	The next eight information items (information items 2 through 9) comprise the Geographic Coordinate Latitude/Longitude. As a group, they are optional. However, latitude degree value / LTD and longitude degree value / LGD are co-conditional, so they shall both be present if either is present. Further, "minutes" values LTM and LGM can only be present if their corresponding "degrees" values are present. LTS and LGS can only be present if their corresponding "minutes" value is present. The other entries are optional.
		If a decimal value is used in a particular information item, the more granular information item shall be empty (e.g., if Longitude minutes equals 45.27, Longitude seconds shall be empty).
		
		The tenth, eleventh and twelfth information items are treated as a group and are optional.
		These three information items together are a coordinate which represents a location with a Universal Transverse Mercator (UTM) coordinate. If any of these three information items is present, all shall be present.
			2	-	xx.998-Geo-Cond-Subfields 2,5	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						Present{US_Subfield:2 in Field} IFF
						Present {US_Subfield:5 in Field}
						}
											B*

			2	-	xx.998-Geo-Cond-Subfields 10 to 12	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						IF Present(US_Subfield:10 OR US_Subfield:11 OR US_Subfield:12 in Field)
						THEN
						Present(US_Subfield:10 AND US_Subfield:11 AND US_Subfield:12 in Field)
						}
											B*

			2	O	xx.998-Geo-Cond-DMS	ForEach(Field ST FieldNumber(Field) EQ 998) { IF Present (US_Subfield:4 in Field) THEN Present(US_Subfield:3 in Field) AND IF Present(US_Subfield:3 in Field) THEN Present (US_Subfield:2 in Field) AND IF Present(US_Subfield:7 in Field) THEN Present (US_Subfield:6 in Field) AND IF Present(US_Subfield:6 in Field) THEN Present (US_Subfield:5 in Field)					B*

						}					

			2	O	xx.998-Geo-Cond-Decimals	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						IF {US_Subfield:2 in Field} MOD 1 NEQ 0 THEN Length(US_Subfield:3 in Field) EQ 0 AND Length(US_Subfield:4) EQ 0
						
						AND
						
						IF {US_Subfield:3 in Field} MOD 1 NEQ 0 THEN Length(US_Subfield:4 in Field) EQ 0
						
						AND
						
						IF {US_Subfield:5 in Field} MOD 1 NEQ 0 THEN Length(US_Subfield:6 in Field) EQ 0 AND Length(US_Subfield:7) EQ 0
						
						AND
						
						IF {US_Subfield:6 in Field} MOD 1 NEQ 0 THEN Length(US_Subfield:7 in Field) EQ 0
						
						}
											B*

Field: Geographic-Values-SubFields 2 to 8	7.7.3	The second information item is latitude degree value / LTD. This is a value that specifies the degree of latitude. The value shall be between -90 (inclusive) and +90 (inclusive). The third information item is latitude minute value / LTM. This is a value that specifies a minute of a degree. The value shall be between 0 (inclusive) to 60 (exclusive). The fourth information item is the latitude second value / LTS. This is a value that specifies a second of a minute. The integer shall be 0 (inclusive) to 60 (exclusive). The fifth information item is the longitude degree value / LGD. It is a value that specifies the degree of a longitude. The value shall be between -180 (inclusive) and	1	-	xx.998-Geo-Values-Sub2 to 8	ForEach(Field ST FieldNumber(Field) EQ 998) { {US_Subfield:2 in Field} GTE -90 AND LTE 90 AND {US_Subfield:3 in Field} GTE 0 AND LT 60 AND {US_Subfield:4 in Field} GTE 0 AND LT 60 AND {US_Subfield:5 in Field} GTE -180 AND LTE 180 AND {US_Subfield:6 in Field} GTE 0 AND LT 60 AND					B*

		+180 (inclusive). The sixth information item is the longitude minute value / LGM. It is a value that specifies a minute of a degree. The value shall be from 0 (inclusive) to 60 (exclusive). The seventh information item is the longitude second value / LGS. This is a value that specifies a second of a minute. The integer shall be 0 (inclusive) to 60 (exclusive). The eighth information item is elevation / ELE. It is expressed in meters. It is a numeric value. It is between -422 meters (Dead Sea) and 8848 meters (Mount Everest).				{US_Subfield:7 in Field} GTE 0 AND LT 60 AND {US_Subfield:8 in Field} GTE -422 AND LTE 8848 }					

Field: Geographic-Values-SubField 9	7.7.3, Table 4	The ninth information item is the geodetic datum code / GDC10. It is an alphanumeric value of 3 to 6 characters in length. This information item is used to indicate which coordinate system was used to represent the values in information items 2 through 7. If no entry is made in this information item, then the basis for the values entered in the first eight information items shall be WGS84, the code for the *World Geodetic Survey 1984 version - WGS 84 (G873)*. See Table 4 for values.	1	O	xx.998-Geo-Values-Sub9	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						{US_Subfield:9 in Field} MO [ASCII(AIRY, AUST, BES, BESN, CLK66, CLK80, EVER, FIS60, FIS68, GRS67, HELM, HOUG, INT, KRAS, AIRYM, EVERM, FIS60M, SA69, WGS60, WGS66, WGS72, WGS84)]
						OR
						Length(US_Subfield:9 in Field) MO [3 to 6] AND Bytes(US_Subfield:9 in Field) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]
						OR
						Length(US_Subfield:9 in Field) EQ 0
						}
							t-7				B*

Field: Geographic-Values-SubField 10	7.7.3	The tenth information item is the geographic coordinate universal transverse Mercator zone / GCM. It is an alphanumeric value of 5 characters.
		• The first two characters represent the 6° wide UTM zone. Leading zeros are included.
		• The third character is a letter designating the band of latitude.
		• The fourth and fifth characters are a pair of letters identifying one of the 100,000-meter grid squares within the grid zone (UPS area).
			1	O	xx.998-Geo-Values-Sub10	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						
						{Bytes:1 in US_Subfield:10 in Field} * 10 + {Bytes:2 in US_Subfield:10 in Field} GTE 1 AND LTE 60
						
						AND
						
						{Bytes:3 to 5 in US_Subfield:10 in Field } MO [ASCII(Cto X)] AND NOT MO [ASCII(I,O)]
						
						}
							t-8				B*

			1	O	xx.998-Geo-Sub10-ValidZone	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						{US_Subfield:10 in Field} MO [ValidZone]
						
						}
							t-8				B*

Field: Geographic-Values-SubField 11 and 12	7.7.3	The eleventh information item is the geographic coordinate universal transverse Mercator easting / GCE. It is an integer of 2-digits for 1 kilometer precision, 3-digits for 100 meter precision, 4-digits for 10 meter precision and 5-digits for 1 meter precision.
		The twelfth information item is the geographic coordinate universal transverse Mercator northing / GCN. It is an integer of 2-digits for 1 kilometer precision, 3-digits for 100 meter precision, 4-digits for 10 meter precision and 5-digits for 1 meter precision.
			2	D	xx.998-Geo-Values-Sub11,12	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						
						Length(US_Subfield:11,12 in Field) GTE 2 AND LTE 5
						
						AND
						
						Bytes(US_Subfield:11,12 in Field) MO [ASCII(0 to 9)]
						}
											B*

Field: Geographic-Values-SubField 13	7.7.3	The thirteenth information item is optional. It is the geographic reference text /GRT. This information item is an alphanumeric entry of up to 150 characters. It is a free form text describing a street address or other physical location (such as 'Corner of Washington and Madison, Geneva, NY').	1	O	xx.998-Geo-Values-Sub13	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						
						Length(US_Subfield:13 in Field) LTE 150
						
						}
											B*

Field: Geographic-Values-SubField 14	7.7.3	A fourteenth optional information item geographic coordinate other system identifier / OSI allows for other coordinate systems. This information items specifies the system identifier. It is up to 10 characters in length. Examples are:
		• MGRS (Military Grid Reference System)
		• USNG (United States National Grid)
		• GARS (Global Area Reference System)
			1	O	xx.998-Geo-Values-Sub14	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						
						Length(US_Subfield:14 in Field) LTE 10
						
						}
											B*

		• GEOREF (World Geographic Reference) • LANDMARK landmark (e.g. hydant) and position relative to the landmark.									

Field: Geographic-Values-SubField 15	7.7.3	A fifteenth optional information item is the geographic coordinate other system value / OCV. It shall only be present if OSI is present in the record. It can be up to 126 characters in length. If OSI is LANDMARK, OCV is free text and may be up to 126 characters. For details on the formatting of OCV for the other coordinate systems shown in OSI as examples, see http://earth-info.nga.mil/GandG/coordsys/grids/referencesys.html	1	D	xx.998-Geo-Values-Sub15	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						
						Length(US_Subfield:15 in Field) LTE 126
						
						}
							t-7				B*

			2	D	xx.998-Geo-Cond-OCV	ForEach(Field ST FieldNumber(Field) EQ 998)
						{
						IF Present(US_Subfield:15 in Field) THEN Present(US_Subfield:14 in Field)
						
						}
											B*

Field: Impression-Values	7.7.4.1, Table 5, 8.4.3, 8.9.3, 8.13.3, 8.14.3, 8.15.3, 8.19.3	This field contains a code from Table 5 for how the friction ridge sample was collected. It has been expanded in this version of the standard to include plantars and unknowns.		M	[4,9,13,14, 15,19].003-IMP	<The test assertions for these types vary for this requirement, and therefore included under field testing for the specific Record Types.>	t-2				
Field: FGP-Values	7.7.4.2, Table 6, 8.4.4, 8.9.5.9, 8.13.13, 8.14.13, 8.15.13, 8.19.13	This field is used in Record types dealing with friction ridges. It specifies which friction ridge biometric sample was collected. Note that for codes 1-40 and 60-84, the Table 6 specifies recommended MAXIMUM width and height. (Individual implementation domains and application profiles may use different values.) In previous versions of this standard, FGP was used for finger position, and PLP for palmprint position. They are now in one table, along with the codes added in the ANSI/NIST-ITL 1a-2009 amendment. New to this version, plantar codes are included in the table. In order to cover all of these cases, the name was changed to friction ridge generalized position / FGP.		M	4.004, 9.134, [13,14,15,19].013-FGP	<The test assertions for these types vary for this requirement, and therefore included under field testing for the specific Record Types.>	t-2				
Field: PPD Conditional	7.7.4.3	For exemplar fingerprints contained in Type-14 records, if the impression is known to be an entire joint image (EJI),	2	D	Type-14-Cond-FGP-PPD	Present(14.014) IFF Present(US_Subfield in 14.013 ST {US_Subfield} EQ 19)					B*

		full finger view (FFV), or extreme tip (TIP), then Field 14.013: Friction ridge generalized position / FGP shall be set to 19, and Field 14.014: Print position descriptors / PPD shall be specified; Field 14.015: Print position coordinates /PPC may be (optionally) specified.				AND IF Present(14.015) THEN Present(US_Subfield in 14.013 ST {US_Subfield} EQ 19)					
Field: SPD,PPC Conditional	7.7.4.3	For latent prints contained in Type-13 records, if all or part of the impression should be compared against the medial or proximal segments or the extreme tips, then Field 13.013: Friction ridge generalized position / FGP shall be set to 19, and Field 13.014: Search position descriptors / SPD shall be specified; Field 13.015: Print position coordinates / PPC may be (optionally) specified.	2	D	Type-13-Cond-FGP-SPD-PPC	Present(13.014) IFF Present(US_Subfield in 13.013 ST {US_Subfield} EQ 19) AND IF Present(13.015) THEN Present(US_Subfield in 13.013 ST {US_Subfield} EQ 19)					B*

Field: SPD,PPD Values	7.7.4.3, Table 6, Table7	The position descriptor, in Field 13.014: Search position descriptors / SPD or Field 14.014: Print position descriptors / PPD contains two mandatory information items:
		
		For a Type-13 record (latent prints), the first information item (probable decimal finger position code / PDF) (0-10, 16 or 17) is taken from Table 6. A "0" indicates that all the fingers of a possible candidate should be searched. For a Type-14 record (known exemplars), the first information item is the friction ridge generalized position / FGP. It is also taken from Table 6 with a value of 1 to 10, inclusive or 16 or 17.
		
		The second information item (finger image code / FIC) is the code taken from Table 7 to indicate the portion of the database to search. Full-length finger joint images use codes FV1 through FV4. Figure 2 is an illustration of the Entire Joint Image for a middle finger with each of the full finger views and constituent parts identified. Multiple portions of the EJI may be listed in a separate subfield.
			1	D	13.014-Subfield 1-PDF	ForEach(RS_Subfield in 13.014)
						{
						{US_Subfield:1 in RS_Subfield} MO [0 to 10, 16,17]
						}
											B*

			1	D	14.014-Subfield 1-FGP	ForEach(RS_Subfield in 14.014)
						{
						{US_Subfield:1 in RS_Subfield} MO [1 to 10, 16,17]
						}
											B*

			1	D	[13,14].014-Subfield 2-FIC	ForEach(RS_Subfield in [13,14].014)
						{
						{US_Subfield:2 in RS_Subfield} MO [ASCII(EJI,TIP,FV1,FV2,FV3,FV4,PRX,DST,MED)]
						}
											B*

Field: PPC-	7.7.4.4,	When used, Field 13.015: Print position	1	O	[13,14].015	Count(RS_Subfields in [13,14].015) MO [1 to 12]					B*

Subfield Occurrences	Table7, Table 66, Table 67	coordinates / PPC or Field 14.015: Print position coordinates / PPC shall consist of six (6) mandatory information items describing the type or portion of the image contained in this record and its location within an EJI… Individual full finger or segment definitions may be repeated as repeating sets of information items.			- PPC-Subfield Occurrences	AND
						
						ForEach(RS_Subfield in [13,14].015)
						{
						Count(US_Subfields in RS_Subfield) EQ 6
						}					

Field: PPC-Subfield 1	7.7.4.4, Table7, Table 66, Table 67	The first information item is the full finger view / FVC with values of “FV1” through “FV4”. Values of “FV1” to “FV4” specify the perspective for each full finger view. For the case of a fingertip, the first information item shall be “TIP”. FVC will contain the code “NA” if only a proximal, distal or medial segment is available.	1	M ⇑	[13,14].015 - FVC	ForEach(RS_Subfield in [13,14].015)
						{
						{US_Subfield:1 in RS_Subfield} MO [ASCII(FV1, FV2, FV3, FV4, TIP, NA)]
						}
											B*

Field: PPC-Subfield 2	7.7.4.4, Table7, Table 66, Table 67	The second information item is used to identify the location of a segment / LOS within a full finger view. LOS will contain the *not applicable* code “NA” if the image portion refers to a full finger view, tip or to the entire joint image locations. Otherwise, it shall contain “PRX”, “DST”, “MED” for a proximal, distal, or medial segment, respectively.	1	M ⇑	[13,14].015 - LOS	ForEach(RS_Subfield in [13,14].015)
						{
						{US_Subfield:2 in RS_Subfield} MO [ASCII(PRX, DST, MED, NA)]
						}
											B*

Field: PPC-Subfields 3,4	7.7.4.4, Table7, Table 66, Table 67	The third information item is the left horizontal coordinate / LHC. It is the horizontal offset in pixels to the left edge of the bounding box relative to the origin positioned in the upper left corner of the image.
		
		The fourth information item is the right horizontal coordinate / RHC. It is the horizontal offset in pixels to the right edge of the bounding box relative to the origin positioned in the upper left corner of the image.
			2	M ⇑	13.015-LHC,RHC	ForEach(RS_Subfield in 13.015)
						{
						{US_Subfield:3,4 in RS_Subfield} GTE 1 AND LTE {13.006}
						}
											B*

			2	M ⇑	14.015-LHC,RHC	ForEach(RS_Subfield in 14.015)
						{
						{US_Subfield:3,4 in RS_Subfield} GTE 1 AND LTE {14.006}
						}
											B*

Field: PPC-Subfields 5,6	7.7.4.4, Table7, Table 66, Table 67	The fifth information item is the top vertical coordinate / TVC is the vertical offset
		(pixel counts down) to the top of the bounding box.
			2	M ⇑	13.015-TVC,BVC	ForEach(RS_Subfield in 13.015)
						{
						{US_Subfield:5,6 in RS_Subfield} GTE 1 AND LTE {13.007}
						}
											B*

		The sixth information item is the bottom vertical coordinate / BVC. It is the vertical offset from the upper left corner of the image down to the bottom of the bounding box. It is counted in pixels.	2	M ⇑	14.015-TVC,BVC	ForEach(RS_Subfield in 14.015)
						{
						{US_Subfield:5,6 in RS_Subfield} GTE 1 AND LTE {14.007}
						}
											B*

Field: SAP Conditional	7.7.5, 8.10.13	SAP codes are mandatory in Type-10 records with a face image, optional in Type-14 records, and optional in Type-17 records… The Subject Acquisition Profile (SAP) is a mandatory field when Field 10.003: Image type / IMT contains "FACE". Otherwise, it shall not be entered.	2	D	10.013-SAP Conditional	Present(10.013) IFF {10.003} EQ ASCII (FACE)					B
Field: SAP Values	7.7.5.1, Table 8	Field 10.013: Subject acquisition profile / SAP is used to indicate the SAP level code for face as indicated in Table 8. The SAP codes 32, 42 and 52 are new to this version of the standard.	1	D	10.013-SAP Values	{10.013} MO [0,1,10-15,20,30,32,40,42,50-52]					B
Field: SAP-Level Requirements	7.7.5.1.1 to 7.7.5.1.10, Table 9, Annex E	<Sections 7.7.5.1.1 to 7.7.5.1.10 describe requirements for the image for various SAP Levels.>	3	D	10.013-SAP Levels	<Not Tested. Determining the condition under which the image was captured to verify the SAP Level is not feasible at this time.>	t-9				
Field: FAP Values	7.7.5.2, Table 10	The profile levels for fingerprint acquisition are optional and are based upon those listed in the *Mobile ID Best Practice Recommendation.* They are entered in Field 14.031: Subject acquisition profile – fingerprint / FAP, which is new to this version of the standard.	1	O	14.031-FAP Values	{14.031} MO [10,20,30,40,50,60]					B
Field: FAP-Level Requirements	7.7.5.2, Table 10	<Section 7.7.5.2 and Table 10 describe requirements for the image for various FAP Levels.>	3	O	14.031-SAP Levels	<Not Tested. Determining the condition under which the image was captured to verify the FAP Level is not feasible at this time.>	t-9				
Field: IAP Values	7.7.5.3, Table 71	The profile levels for iris acquisition, which are new to this version of the standard, are optional and are based upon those listed in the *Mobile ID Best Practice Recommendation (BPR)* (See Annex G: Bibliography) . They are entered in Field 17.031: Subject acquisition profile – iris / IAP.	1	O	17.031-IAP Values	{17.031} MO [20,30,40]					B
Field: IAP-Level	7.7.5.3	<Section 7.7.5.3 describes requirements for the image for various IAP Levels.>	3	M	17.031-IAP Levels	<Not Tested. Determining the condition under which the image was captured to verify the IAP	t-9				

Requirements						Level is not feasible at this time.>					
Field: Resolution Tolerance	7.7.6.1, 7.7.6.3, Table 11	For Appendix F certified devices, resolution accuracy shall not vary more than 1% from the class resolution. A class resolution of 19.69 ppmm (500 ppi) has a lower bound of 19.49 ppmm (495ppi) and an upper bound of 19.89 ppmm (505ppi). For Personal Identity Verification (PIV) certified devices with fingerprint subject application profile (FAP) Levels 10 to 40 only resolution accuracy shall not vary more than 2% from the class Resolution. For example, a class resolution of 19.69 ppmm (500 ppi) has a lower bound of 19.30 ppmm (490ppi) and an upper bound of 20.08 ppmm (510ppi). Tolerance requirements shall apply to the class and nominal resolution requirements throughout this document. This transmitting resolution does not have to be the same as the scanning resolution. However, the transmitting resolution shall be within the range of permissible resolution values for that record type.	1	M	Field-Resolution Tolerance	<This requirement specifies a tolerance for all resolution values expressed throughout the standard. If there is a resolution requirement for a type, the resolution must follow the 1% or 2% tolerance as described in the standard. This requirement will be applied to each applicable resolution requirement.>	t-2				
Field: Image-Coordinates	7.7.6.2	Each image formatted in accordance with this standard shall appear to have been captured in an upright position and approximately centered horizontally in the field of view…	3	M	Images-Coordinates	<Not directly tested, but this convention is used when testing for conformance in each of the assertions related to images>	t-2				
Field: NSR Conditional	7.7.6.2.1, Table 11	If Type-4 records are included in the transaction, Field 1.011 Native scanning resolution / NSR contains five characters specifying the native scanning resolution in pixels per millimeter. It is expressed as two numeric characters followed by a decimal point and two more numeric characters (e.g. 19.69). This field is set to “00.00” if no Type-4 records are present in the transaction. With the deprecation of Record Types-3, 5 and 6, NSR only directly	1	M	1.011-NSR-Length	Length(1.011) EQ 5					B
			1	M	1.011-NSR-Values	Bytes:1,2,4,5 in 1.011 MO [0 to 9] AND Byte: 3 in 1.011 EQ “.”					B
			2	M	1.011-NSR-Conditional	IF NOT Present(Record ST Type(Record) EQ 4) THEN {1.011} EQ 00.00					T
			2	M	NIEM-NSR-Conditional	IF NOT Present(XElm(itl:PackageHighResolutionGrayScaleImageRecord)) THEN					X

		applies to Record Type-4 in this version of the standard. New to this version of the standard, NSR does not apply to Type-7 records, unless specified as such by an implementation domain. Record Type-14 shall be used if scanning a fingerprint image at the 1000 ppi class or above. It can also be used for the 500 ppi class.Record Type-4 shall not be used for anything but the 500 ppi class.				{XElm(biom:NativeScanningResolutionValue) in XElm(itl:PackageInformationRecord)} EQ 00.00					
			2	M	1.011-NSR-Type4 500 ppi Only	{1.011} GTE 19.30 AND LTE 20.08					B
Field: Exemplar Scan Resolution	7.7.6.2.1	Exemplar images shall have a minimum class scanning resolution of 500 ppi. The migration path to higher scanning resolutions for image capturing devices with a native scanning resolution of the 500 ppi class shall be at a rate of 100% of the current native scanning resolution. Capture devices with native scanning resolutions not in step with this migration path shall provide (through subsampling, scaling, or interpolating downward) a nominal resolution that matches the next lower interval in the migration path. For example, a device with native scanning resolution of 47.24 ppmm (1200 ppi) shall provide a class resolution of 39.37 ppmm (1000 ppi). The scanner resolution is specified for Record Types 14, 15, 16, 17, 19 and 20 using Scanned horizontal pixel scale / SHPS (See Section 7.7.8.7) and Scanned vertical pixel scale / SVPS (See Section 7.7.8.8). These Record Types can handle all resolutions, and are thus called variable-resolution image records.	2	M	Fields-Exemplar Valid Scan Resolutions	<Scanning resolutions for Record Types 14,15,16,17,19 and 20 must migrate at a rate of 100% with a minimum of 500 ppi. These assertions are included under field testing for the specific Record Types.>	t-2				

Field: Latent Resolution	7.7.6.2.2, 7.7.6.1	Latent images should have a minimum class scanning resolution of 1000 ppi. Record Type-13 specifies resolution using Scanned horizontal pixel scale / SHPS (See Section 7.7.8.7) and Scanned vertical pixel scale / SVPS (See Section 7.7.8.8). Record Type-13 can handle all resolutions, and is thus called a variable-resolution image record.	2	M	Fields-Latent Valid Scan Resolutions	IF {13.008} EQ 1 THEN
						{13.016} AND {13.017} GTE 990
						AND
						IF {13.008} EQ 2 THEN
						{13.016} AND {13.017} GTE
						390
											B

		…, resolution accuracy shall not vary more than 1% from the class resolution.									
Field: Transmitting Resolution Required	7.7.6.3	Each image to be exchanged shall have a specific resolution associated with the transmitted data. This transmitting resolution does not have to be the same as the scanning resolution. However, the transmitting resolution shall be within the range of permissible resolution values for that record type.		M	Fields-Tx Resolution Required Type4	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Type4 NTR	7.7.6.3.1	Field 1.012 Nominal resolution / NTR shall specify the transmitting resolution in pixels per millimeter. It is expressed as two numeric characters followed by a decimal point and two more numeric characters (e.g. 19.69). The transmitting resolution shall be within the range 19.30 ppmm (490 ppi) to 20.08 ppmm (510 ppi) for a Type-4 record . This range reflects the 2% deviance from 500 ppi allowed for PIV certified devices. (SeeTable 11). For example, a sensor that scans natively at 508 ppi would list both NSR and NTR as 20 ppmm (= 508 ppi). These images should not be sampled down to exactly 500 ppi. This field is set to “00.00” if no Type-4 records are present in the transaction. Given that the transmitting resolution shall not be greater than the scanning resolution, images meant for identification applications, such as those from Appendix F certified devices (See Table 11) are restricted to a 1% deviance from 500 ppi.	1	M	1.012-NTR-Length	Length(1.012) EQ 5					B
			1	M	1.012-NTR-Values	Bytes:1,2,4,5 in 1.012 MO [0 to 9] AND Byte: 3 in 1.012 EQ “.”					B
			2	M	1.012-NTR-Conditional	IF NOT Present(Record ST Type(Record) EQ 4) THEN {1.012} EQ 00.00					T
			2	M	NIEM-NTR-Conditional	IF NOT Present(XElm(itl:PackageHighResolutionGrayScaleImageRecord)) THEN {XElm(biom:NominalTransmittingResolutionValue) in XElm(itl:PackageInformationRecord)} EQ 00.00					X
			2	M	1.012-NTR 500 ppi	{1.012} GTE 19.30 AND LTE 20.08					B
			2	M	1.012-NTR LTE NSR	{1.012} LTE {1.011}					B
Field: Variable Resolution THPS,TVPS	7.7.6.3.2	For variable-resolution friction ridge images (those in Record Types 13, 14, 15, 19 and possibly in Record Types 16 and 20), the transmitting resolution shall be at least as great as the class resolution of 500 ppi. There is no upper limit on the variable-resolution rate for transmission. However, the transmitting resolution shall not be greater than the scanning resolution. For variable resolution records, the Transmitted horizontal pixel		M	Fields-VarResolution	<The test assertions are included under field testing for the respective record types.>	t-2				

		scale / THPS and the Transmitted vertical pixel scale / TVPS shall be specified. (See Section 7.7.8).									

Field: Sample Quality Occurrences	7.7.7	Many of the Record Types contain optional quality metric information. In addition to the three information items described here, the field may contain other information items. Each of the information items is contained in a set. Multiple sets of information items may be present, each indicating a different quality algorithm, up to a maximum of 9 times. Fields using this structure are:
		-Field 9.135: M1 friction ridge quality data / FQD
		-Field 9.316: EFS friction ridge quality metric / FQM
		-Field 10.024: Subject quality score / SQS
		-Field 13.024: Latent quality metric / LQM
		-Field 14.023: Segmentation quality metric / SQM
		-Field 14.024: Fingerprint quality metric / FQM
		-Field 15.024: Friction ridge quality metric / FQM
		-Field 16.024: User-defined image quality metric / FQM
		-Field 17.024: Image quality score / IQS
		-Field 19.024: Friction ridge - plantar print quality metric / FQM
		-Field 99.102: Biometric data quality / BDQ
			1	-	Fields-Sample Quality Subfield Occurrences	ForEach(Field in [9.135,9.316,10.024,13.024,14.023,14.024,15.024,16.024,17.024,19.024, 99.102])
						{
						Count(RS_Subfields) LTE 9
						}
											B*

Field: Sample Quality Subfield 1	7.7.7	The first information item shall be a quantitative expression of the predicted matching performance of the biometric sample, which is a quality value / QVU. This information item shall contain the integer image quality score between 0 and 100 (inclusive) assigned to the image data by a quality algorithm19. Higher values Partindicate better quality. An entry of “255” shall indicate a failed attempt to calculate a quality score. An entry of
		“254” shall indicate that no attempt to calculate a quality score was made.
			1	-	Fields-Sample Quality QVU	ForEach(Field in [9.135,9.316,10.024, 16.024,17.024, 99.102])
						{
						ForEach(RS_Subfield in Field)
						{
						{US_Subfield:1 in RS_Subfield} MO [0 to 100, 254,255]
						}
						}
						
						AND
						
						ForEach(Field in [13.024, 14.023, 14.024, 15.024, 19.024])
						{
											B*

						ForEach(RS_Subfield in Field)
						{
						{US_Subfield:2 in RS_Subfield} MO [0 to 100, 254,255]
						}
						}					

Field: Sample Quality Subfield 2	7.7.7	A second information item shall specify the ID of the vendor of the quality algorithm used to calculate the quality score, which is an algorithm vendor identification / QAV. This 4-digit hex value (See Section 5.5 Character types) is assigned by IBIA and expressed as four characters. The IBIA maintains the Vendor Registry of CBEFF
		Biometric Organizations that map the value in this field to a registered organization.
			1	-	Fields-Sample Quality QAV	ForEach(Field in [9.135,9.316,10.024, 16.024,17.024, 99.102])
						{
						
						ForEach(RS_Subfield in Field)
						{
						{US_Subfield:2 in RS_Subfield} MO [IBIA Vendor Registry]
						
						AND
						
						Length(US_Subfield:2 in RS_Subfield) EQ 4
						
						AND
						
						Bytes(US_Subfield:2 in RS_Subfield) MO [ASCII(A to F, 0 to 9)]
						
						}
						}
						
						AND
						
						ForEach(Field in [13.024, 14.023, 14.024, 15.024, 19.024])
						ForEach(RS_Subfield in Field)
						{
						{US_Subfield:3 in RS_Subfield} MO [IBIA Vendor Registry]
						
						AND
						
						Length(US_Subfield:3 in RS_Subfield) EQ 4
						
						AND
						
						Bytes(US_Subfield:3 in RS_Subfield) MO [ASCII(A to F, 0 to 9)]
						
						}
						}
							t-10				B*

Field: Sample Quality Subfield 3	7.7.7	A third information item shall specify a numeric product code assigned by the vendor of the quality algorithm, which may be registered with the IBIA, but registration is not required. This is the algorithm product identification / QAP that indicates which of the vendor's algorithms was used in the calculation of the quality score. This information item contains the integer product code and should be within the range 1 to 65,534.	1	-	Fields-Sample Quality QAP	ForEach(Field in [9.135,9.316,10.024,13.024,14.023,14.024,15.024,16.024,17.024,19.024, 99.102]) { ForEach(RS_Subfield in Field) { {US_Subfield:3 in RS_Subfield} MO [1 to 65,534] } } AND ForEach(Field in [13.024, 14.023, 14.024, 15.024, 19.024]) { ForEach(RS_Subfield in Field) { {US_Subfield:4 in RS_Subfield} MO [1 to 65,534] } }					B*
Field: Sample Quality Additional Subfield	7.7.7, 8.13.19, Table 66, 8.14.22, 8.14.23, Table 67, 8.15.17, Table69, 8.19.18 Table 80	In addition to the three information items described here, the field may contain other information items.	1	-		ForEach(RS_Subfield in 13.024) { {US_Subfield:1 in RS_Subfield)} MO [0 to 38, 40 to 50, 60 to 79, 81 to 84] } AND ForEach(Field in [14.023,14.024]) { ForEach(RS_Subfield in Field) { {US_Subfield:1 in RS_Subfield} MO [1 to 10, 16, 17] } } AND ForEach(RS_Subfield in 15.024) { {US_Subfield:1 in RS_Subfield} MO [20 to 38, 81					B*

						to 84]
						}
						
						AND
						
						ForEach(RS_Subfield in 19.024)
						{
						{US_Subfield:1 in RS_Subfield} MO [60 to 77]
						}					

Field: Image HLL Value	7.7.8.1	The number of pixels contained on a single horizontal line of the image. The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.	1	M	[4,8].006-HLL	{[4,8].006} GTE 10 AND LTE 65534					B
			1	M	9.128-HLL	{9.128} GTE 10 AND LTE 99,999					B
			1	M	xx.006-HLL	{[10,13 to 17,19,20].006} GTE 10 AND LTE 99,999					B
Field: Image HLL Metadata	7.7.8.1	<HLL should be checked against the image metadata to test for conformance.>		M	Fields-HLL Metadata	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image Size	7.7.8.1	The total image size (HLL times VLL) shall not that can be accommodated in Field xx.001 for Traditional encoding.	2	M	xx.006,007-Image Size	{[4,8,10,13 to 17,19,20].006} * {[4,8,10,13 to 17,19,20].007} LTE {[4,8,10,13 to 17,19,20].001}					B
			2	M	9.128,129-Image Size	{9.128} *{9.129} LTE {9.001}					B
Field: Image VLL Value	7.7.8.2	The number of horizontal lines contained in the image. The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.	1	M	[4,8].007-VLL	{[4,8].007} GTE 10 AND LTE 65,534					B
			1	M	xx.007-VLL	{[10,13 to 17,19,20].007} GTE 10 AND LTE 99,999					B
Field: Image	7.7.8.2	<VLL should be checked against the image		M	Fields-VLL	<The test assertions are included under field	t-2				

VLL Metadata		metadata to test for conformance.>			Metadata	testing for the respective record types.>					
Field: Image SLC Value	7.7.8.3, Table 24, Table 53, Table 66, Table 71, Table 80, Table 81	The image sampling frequency (pixel density). <Tables related to each Record Type provide constraints on the value of SLC.>	1	M	9.130-SLC	{9.130} MO [0,1,2]					B
			1	M	xx.008-SLC	{[10,13 to 17,19,20].008} MO [0,1,2]					B
Field: Image SLC Metadata	7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and the quotient of THPS/TVPS shall provide the pixel aspect ratio. <SLC should be checked against the image metadata to test for conformance.>		M	Fields-SLC Metadata	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image THPS Value	7.7.8.4, Table 24, Table 53, Table 66, Table 71, Table 80, Table 81	<Tables related to each Record Type provide constraints on the value of THPS.>	1	M	9.131-THPS	{9.131} GTE 1 AND LTE 99,999					B
			1	M	xx.009-THPS	{[10,13 to 17,19,20].009} GTE 1 AND LTE 99,999					B
Field: Image THPS Metadata	7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the pixel aspect ratio, up to 5 digits. <THPS should be checked against the image metadata to test for conformance.>		M	Fields-THPS Metadata	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image TVPS Value	7.7.8.5, Table 24, Table 53, Table 66, Table 71, Table 80, Table	<Tables related to each Record Type provide constraints on the value of TVPS.>	1	M	9.132-TVPS	{9.132} GTE 1 AND LTE 99,999					B
			1	M	xx.010-TVPS	{[10,13 to 17,19,20].010} GTE 1 AND LTE 99,999					B

	81										
Field: Image TVPS Metadata	7.7.8.5	This is the integer pixel density used in the vertical direction of the image if SLC has a value of “1” or “2”. If SLC has a value of “0”, this information item shall contain the vertical component of the pixel aspect ratio, up to 5 digits. <TVPS should be checked against the image metadata to test for conformance.>		M	Fields-TVPS Metadata	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image BPX Value	7.7.8.6, 7.7.9	Some record types have a mandatory field Bits per pixel / BPX. This contains the number of bits used to represent a pixel. This field shall contain an entry of “8” for normal grayscale values of “0” to “255”. Any entry in this field greater than “8” shall represent a grayscale pixel with increased proportion. A maximum of 2 digits is allowed for this field. Regardless of the compression algorithm used, the image shall be represented as an array of n rows by m columns by at least 8-bit pixels. Each pixel in a gray-scale image shall be represented by eight or more bits.	1	M	xx.012-BPX	{[13 to 17,19,20].012} GTE 8 AND LTE 99					B
Field: Image BPX Metadata	7.7.8.6	<BPX should be checked against the image metadata to test for conformance.>		M	Fields-BPX Metadata	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image SHPS Value	7.7.8.7	The horizontal pixel density used for the scanning of the original image / impression providing that the SLC field contains a “1” or “2”. Otherwise, this shall indicate the horizontal component of the pixel aspect ratio, up to 4 digits. This field is used if the transmission pixel scale differs from the original image scale, as listed in Transmitted horizontal pixel scale / THPS . Note that density is directly related to resolution.	1	O	xx.016-SHPS	{[10,13,14,15,16,19].016} GTE 1 AND LTE 9,999					B
			1	O	17.022	{17.022} GTE 1 AND LTE 9,999					B
			1	O	20.017	{20.017} GTE 1 AND LTE 9,999					B
Field: Image SVPS Value	7.7.8.8	The vertical pixel density used for the scanning of the original image / impression providing that the SLC field contains a “1” or “2”. Otherwise, this shall indicate the vertical component of the pixel aspect ratio, up to 4 digits. This field	1	O	xx.017-SVPS	{[10,13,14,15,16,19].017} GTE 1 AND LTE 9,999					B
			1	O	17.023	{17.023} GTE 1 AND LTE 9,999					B
			1	O	20.018	{20.018} GTE 1 AND LTE 9,999					B

		is used if the transmission pixel scale differs from the original image scale, as listed in Transmitted vertical pixel scale /TVPS . Note that density is directly related to resolution.										
Field: Image Bit Depth Value	7.7.9	Regardless of the compression algorithm used, the image shall be represented as an array of n rows by m columns by at least 8-bit pixels. Each pixel in a gray-scale image shall be represented by eight or more bits.		M	Fields-Image Compression	<See Requirement ID "Field: Image BPX Value">	t-2					
Field: Image Format	7.7.9	Color images shall be represented as a series of sequential samples of a red, green, and blue intensity for each pixel. (Other color spaces are also possible. See Section 7.7.10.3). The image shall be organized in row-major order, with the lowest address corresponding to the upper left corner of the image. If the image is captured in grayscale, then only the luminance component shall be compressed and transmitted.	3	M	Fields-Image Format	<Not Tested. The actual image data is not tested; only metadata.>	t-1					B
Field: Image JFIF	7.7.9	For JPEG, the data shall be formatted in accordance with the *JPEG File Interchange Format, Version 1.02 (JFIF).*		M	Fields-Image JFIF	<This requirement applies to all instances where a JPEG image format is used. The test assertions are included under field testing for the respective record types.>	t-2					
Field: Image Compression Algorithm Value	7.7.9.1, Table 12	For each of these fields, the entry corresponds to the appropriate *Label* entry in Table 12: -Field 13.011: Compression algorithm / CGA -Field 14.011: Compression algorithm / CGA -Field 15.011: Compression algorithm / CGA -Field 16.011: Compression algorithm / CGA (when containing a friction ridge image) -Field 17.011: Compression algorithm / CGA -Field 19.011: Compression algorithm / CGA -Field 20.011: Compression algorithm /CGA (when containing a friction ridge image)	1	M	[13 to 17,19,20].011 Values	{[13 to 17,19,20].011} MO [ASCII(NONE, WSQ20, JPEGB,JPEGL, JP2,JP2L,PNG)]						B
Field: Image Compressio	7.7.9.1	<CGA should be checked against the image metadata to test for		M	Fields-CGA Metadata	<The test assertions are included under field testing for the respective record types.>	t-2					

n Algorithm Metadata		conformance.>									
Field: Image WSQ 3.1	7.7.9.1	Only version 3.1 or higher shall be used for compressing grayscale fingerprint data at 500 ppi class with a platen area of 2 inches or greater in height. WSQ shall not be used for other than the 500 ppi class.		M	Fields-Image WSQ 3.1 Only	<This requirement applies to all instances where the WSQ image format is used. The test assertions are included under field testing for the respective record types.>	t-2				
Field: Type17 Compressio n	7.7.9.2	For iris images, images may be uncompressed or compressed. The compression code shall be one of the following, entered in Field 17.011: Compression algorithm / CGA: - NONE – An entry of “NONE” indicates that the data contained in this record is uncompressed. - PNG – This supports lossless compression. PNG is formally standardized (*ISO/IEC 15444*) and implementations are freely available25 (libpng). -JP2 and JP2L - As with other biometrics, while lossless compression is preferred, iris images can be lossy-compressed. The image type (Field 17.032: Iris storage format / ISF) should be selected appropriately, and the compression ratio should be set to satisfy some known quantified storage or transmission bandwidth limitation. The baseline JPEG algorithm (*ISO/IEC 10918*) is not acceptable for iris images and shall not be used. It has been shown that false match rates increase due to the presence of tiling artifacts. While JPEG was allowed in prior versions of this standard for iris compression, it is not allowed for this version. Implementers may want to support JPEG decoding for handling legacy images.	1	M	17.011-CGA	{17.011} MO [ASCII(NONE, JP2,JP2L,PNG)]					B
Field: Type10 Compressio n	7.7.9.4	For non-facial images conveyed in Record Type-10, Field 10.011: Compression algorithm/ CGA may be set to any value in Table 12, except WSQ20.	1	M	10.011-CGA	IF {10.003} NEQ ASCII(FACE) THEN {10.011} MO [ASCII(NONE, JPEGB,JPEGL, JP2,JP2L,PNG)]	t-98				B
Field: Type16	7.7.9.4	Non-friction ridge images contained in Record Type-16 shall specify the file		M	16.011-CGA	<The test assertions for this type may not be supported in this version of the CTM. If they are	t-2				

Compression		extension (suffix) corresponding to the compression used, such as OOG, JPG, WAV, and PNG in Field 16.011: Compression algorithm / CGA. A value of "NONE" indicates that the data is uncompressed.				supported, they are included under field testing for Record Type-16: User-defined testing image record. >					
Field: Image CSP Value	7.7.10.3, Table 13	Several image record types have a field Color space / CSP. It shall contain an entry from the CODE column of Table 13. If the color image type cannot be determined, an entry of "RGB" shall be entered in this field.	1	M	10.012-CSP	{10.012} MO [ASCII(UNK, GRAY, RGB, SRGB, YCC, SYCC)]					B
			1	M	xx.013-CSP	{[16,17,20].013} MO [ASCII(UNK, GRAY, RGB, SRGB, YCC, SYCC)]					B
Field: Image ECL Value	7.7.11, Table 14	This information appears in Field 10.027: Subject eye color / SEC and in Field 17.020: Eye color / ECL. The eye color describes the eye color of the subject as seen in the image. If unusual or unnatural, such as is the case when colored contact lenses are present and the 'real' eye color cannot be ascertained, then the color shall be labeled as "XXX". For near infra-red (NIR) images, if this field is entered, it shall be 'XXX'. Values for these fields shall be the alphabetic entries in the "Attribute code" column of Table 14.	1	-	10.027,17.020-EyeColor	{10.027} AND {17.020} MO [ASCII(BLK, BLU, BRO, GRY,GRN,HAZ,MAR,MUL, PNK, XXX)]					B
Field: Image-Paths	7.8	Several Record Types define open paths (also called contours or polylines) and / or closed paths (polygons) on an image… An open path is a series of connected line segments that do not close or overlap. A closed path (polygon) completes a circuit. The closed path side defined by the last vertex and the first vertex shall complete the polygon. A polygon shall have at least 3 vertices. The contours in Record Type-17: Iris image record can be a circle or ellipse. A circle only requires 2 points to define it (See Table 16). There are two different approaches to the paths in this standard. The 2007 and 2008 version of the standard used paths for Field 14.025: Alternate finger segment position(s) / ASEG. That approach has been retained in this version for all paths except in the		-	Fields-Image-Paths	<The test assertions are included under field testing for the respective record types.>	t-2				

		Extended Feature Set (EFS) of Record Type-9.									
Field: Image-EFS Paths	7.8.1, Table 26	The vertices for paths in the EFS Type-9 records are defined in a single information item27 for each of the following fields (See Table 26 Type-9 Fields for EFS). If multiple paths are present, they are stored within separate subfields. Each vertex is expressed as an (X,Y) pair of positive integers in units of 10 micrometers (0.01mm). The Extended Feature Set used in the Record Type-9: Minutiae data record was developed as a separate encoding structure that has been incorporated into this standard. In order to avoid conflicts with systems that had already programmed using the EFS method of specifying paths, that structure is retained in this standard. EFS fields using closed paths, and requiring at least 3 vertices, are: • Field 9.300: EFS region of interest / ROI • Field 9.324: EFS distinctive features / DIS • Field 9.357: EFS local quality issues / LQI An open path is a series of connected points in which there is not an implicit connection between the last and first vertices. Within EFS, open paths are used in Field 9.373: EFS ridge path segments / RPS.		-	Fields-Image-EFS Paths	<The test assertions are included under field testing for the respective record types.>	t-2				
Field: Image-Other Paths	7.8.2, Tables 15 to 18	The first information item is dependent upon the Record Type. The horizontal offsets (X) are the pixel counts to the right, and the vertical offsets (Y) are the pixel counts down from the origin.		-	Fields-Image-Other Paths	<The test assertions are included under field testing for the respective record types.>	t-2				

Table C.4 - Assertions for Record Type 1- Transaction Information Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	XML, Trad, Both
8.1: Record Type-1: Transaction Information Record											
Transaction: Type1 Mandatory	8.1	Record Type-1 is mandatory. Only one Type-1 record is present per transaction.		M	Type1-Mandatory	<See Requirement ID "Transaction: Type1-Occurrences">	t-2				
Record: Type1-Fields ASCII	8.1	All of the fields in the Type-1 record shall be recorded using the 7-bit ASCII code		M	Type1-Fields ASCII	<See Requirement ID "Record: Type1-ASCII">	t-2				
Field: Type1-Subfield Occurrence	Table 19	<Table 19 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	M	Type1-Subfields Zero	Count(Subfields in 1.[001, 002, 004 to 006, 009 to 012, 014]) EQ 0					B*
			1	M	1.003-Subfields	Count(RS_Subfields in 1.003) GTE 2 AND Count(US_Subfields in 1.003) EQ 2 * Count(RS_Subfields in 1.003) AND Count(RS_Subfields in 1.003) EQ 1 + {US_Subfield:2 in RS_Subfield:1 in 1.003}					B*
			1	M	1.007-Subfields	Count(US_Subfields in 1.007) EQ 1 OR 2					B*
			1	M	1.008-Subfields	Count(US_Subfields in 1.008) EQ 1 OR 2					B*
			1	O	1.013-Subfields	Count(US_Subfields in 1.013) EQ 1 OR 2					B*
			1	O	1.015-Subfields	Count(US_Subfields in 1.015) MO [1 to 3]					B*
			1	O	1.016-Subfields	Count(RS_Subfields in 1.016) LTE 99 AND Count(US_Subfields in 1.016) EQ 3 * Count(RS_Subfields in 1.016)					B*
Field: Type1-	Table 19	<Table 19 specifies the Condition Code for	1	M	Type1-	Present(1.001 to 1.005, 1.007 to 1.009, 1.011,					B

CondCode		each field.>			Mandatory CondCode	1.012)						
Field: Type1-CharType	Table 19	<Table 19 specifies the Character Type for each field.>		-	Type1-Char Type	<See Requirement ID "Record: Type1-ASCII">	t-2					
Field: Type1-CharCount	Table 19	<Table 19 specifies the Character Count for each field that contains no subfields.>	1	M	1.001-CharCount	DataLength(1.001) GTE 1						B
			1	M	1.002-CharCount	DataLength(1.002) EQ 4						B
			1	M	1.004-CharCount	DataLength(1.004) GTE 1 AND LTE 16						B
			1	M	1.005-CharCount	DataLength(1.005) EQ 8						B
			1	O	1.006-CharCount	DataLength(1.006) EQ 1						B
			1	M	1.009-CharCount	DataLength(1.009) GTE 1						B
			1	O	1.010-CharCount	DataLength(1.010) GTE 1						B
			1	M	1.011-CharCount	DataLength(1.011) EQ 5						B
			1	M	1.012-CharCount	DataLength(1.012) EQ 5						B
			1	O	1.014-CharCount	DataLength(1.014) EQ 15						B
Field: Type1-Subfield CharCount	Table 19	<Table 19 specifies the Character Count for each subfield.>	1	M	1.003-Subfield CharCount	Length(US_Subfield:1 in 1.003) EQ 1 AND Length(US_Subfield:2 in 1.003) GTE 1 AND LTE 3 AND ForEach(RS_Subfield in 1.003 ST RS_Subfield NOT RS_Subfield:1 in 1.003) { Length(US_Subfield:1,2 in RS_Subfield) GTE 1 AND LTE 2 }						B*
			1	M	1.007-Subfield CharCount	ForEach(US_Subfield in 1.007) { Length(US_Subfield) GTE 1 }						B*
			1	M	1.008-Subfield	ForEach(US_Subfield in 1.008) {						B*

					CharCount	Length(US_Subfield) GTE 1 }						
			1	O	1.013-Subfield CharCount	ForEach(US_Subfield in 1.013) { Length(US_Subfield) GTE 1 }						B*
			1	O	1.015-Subfield CharCount	Length(US_Subfield:1 in 1.015) GTE 1 AND LTE 3 AND Length(US_Subfield:2,3 in 1.015) GTE 1 AND LTE 16						B*
			1	O	1.016-Subfields	ForEach(RS_Subfield in 1.016) { Length(US_Subfield:1,2,3 in RS_SUbfield) GTE 1 AND LTE 126 }						B*
Field: Type1-Field Occurrence	Table 19	<Table 19 specifies the Field Occurrence for each field.>	1	M	1.001-Occurrence	Count(1.001) EQ 1						B
			1	M	1.002-Occurrence	Count(1.002) EQ 1						B
			1	M	1.003-Occurrence	Count(1.003) EQ 1						B
			1	M	1.004-Occurrence	Count(1.004) EQ 1						B
			1	M	1.005-Occurrence	Count(1.005) EQ 1						B
			1	O	1.006-Occurrence	Count(1.006) LTE 1						B
			1	M	1.007-Occurrence	Count(1.007) EQ 1						B
			1	M	1.008-Occurrence	Count(1.008) EQ 1						B
			1	M	1.009-Occurrence	Count(1.009) EQ 1						B
			1	O	1.010-Occurrence	Count(1.010) LTE 1						B
			1	M	1.011-Occurrence	Count(1.011) EQ 1						B
			1	M	1.012-Occurrence	Count(1.012) EQ 1						B
			1	O	1.013-Occurrence	Count(1.013) LTE 1						B
			1	O	1.014-Occurrence	Count(1.014) LTE 1						B

			1	O	1.015-Occurrence	Count(1.015) LTE 1						B
			1	O	1.016-Occurrence	Count(1.016) LTE 1						B
Field: 1.001-Record Header Value	8.1.1, Table 19, 7.1	Field 1.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)	2	M	1.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2					
	8.1.1, C.10.1	The XML name for the Type-1 record is <itl:PackageInformationRecord>, and its <biom:RecordCategoryCode> element shall have a value of 01.	1	M	NIEM-1.001-Record Header	ForEach(XElm(itl:PackageInformationRecord) { {XElm(biom:RecordCategoryCode)} EQ ASCII(01) }						X
Field: 1.002-Version Number Value	8.1.2, Table 19	This mandatory four-character ASCII value shall be used to specify the current version number of the standard implemented by the software or system creating the transaction. The format of this field shall consist of four numeric characters. The first two characters shall specify the major version number. The last two characters shall be used to specify the minor revision number. This version of the standard has the entry "0500"	1	M	1.002-VER	{1.002} EQ ASCII(0500)						B
Field: 1.003-Transaction Content Subfields	8.1.3, Table 19	This mandatory field shall list and identify each of the records in the transaction by record type and its IDC value. It also specifies the order in which the remaining records shall appear in the file. It shall consist of two or more subfields. The first subfield shall relate to this Type-1 Transaction record.		M	1.003-Subfields	<See Requirement ID "Field: Type1-Subfield Occurrence" and "Field: xx.002-IDC">	t-2					
Field: 1.003-Transaction Content Subfield 1 REC Value	8.1.3, Table 19	The first information item (record category code / REC) within this subfield shall be "1". This indicates that the first record in the transaction is a Type-1 record consisting of header information.	1	M	1.003-Subfield1 REC	{US_Subfield:1 in RS_Subfield:1 in 1.003} EQ 1						B*
Field: 1.003-Transaction Content Subfield 1 CRC	8.1.3, Table 19	The second information item of this subfield (content record count / CRC) shall be the sum of the Type-2 through Type-99 records contained in this transaction. This number is also equal to	2	M	1.003-Subfield1 CRC	{US_Subfield:2 in 1.003} EQ Count(Records in Transaction ST Type(Records)						B*

Value		the count of the remaining subfields of Field 1.003 Transaction content / CNT. The maximum value for CRC is 999.				MO [2 to 99]) EQ Count(RS_Subfields in 1.003} - 1					

Field: 1.003-Transaction Content Subfield 2 REC Value	8.1.3, Table 19, Table 1	Each of the remaining subfields of Field 1.003 Transaction content / CNT corresponds to a single Type-2 through Type-99 record contained in the transaction. Two information items shall comprise each of these subfields: The first information item (record category code / REC), shall contain a number chosen from the "record identifier" column of Table 1.	1	M	1.003-Subfield2 REC	ForEach(RS_Subfield in 1.003 ST RS_Subfield NOT RS_Subfield:1 in 1.003)
						{
						
						{US_Subfield:1 in RS_Subfield} MO [2,4,7 to 10, 13 to 21, 98,99]
						
						AND
						
						Present(Record in Transaction ST Type(Record) EQ {US_Subfield:1 in RS_Subfield}
						
						}
											B*

Field: 1.003-Transaction Content Subfield 2 IDC Value	8.1.3, Table 19	The second information item (information designation character / IDC) shall be an integer equal to or greater than zero and less than or equal to 99. See Section 7.3.1.	1	M	1.003-Subfield2 IDC	ForEach(RS_Subfield in 1.003 ST NOT RS_Subfield:1 in 1.003)
						{
						
						{US_Subfield:2 in RS_Subfield} MO [0 to 99]
						
						}
											B*

Field: 1.003-Transaction Content Subfield 2 IDC Matches	8.1.3, Table 19, 7.3.1	IDC references are stated in Type-1 Field 1.003 Transaction content / CNT and shall be used to relate information items in the CNT field of the Type-1 record to the other records in the transaction.	2	M	1.003-Subfield 2 IDC Matches	ForEach(RS_Subfield in 1.003 ST NOT RS_Subfield:1 in 1.003)
						{
						Present(Record ST Type(Record) EQ {US_Subfield:1 in RS_Subfield} AND Record.002 EQ
						{US_Subfield:2 in RS_Subfield})
						
						}
											B*

Field: 1.004-Type of Transaction Value	8.1.4, Table 19	This mandatory field shall contain an identifier, which designates the type of transaction and subsequent processing that this transaction should be given. This shall be a maximum of 16 alphabetic characters. The TOT shall be in accordance with definitions provided by the receiving agency.) Earlier versions of this standard specifically restricted the character length of TOT to 4 characters.	1	M	1.004-TOT	TRUE					B
Field: 1.005-Local Date	8.1.5, Table 19,	This mandatory field shall contain the local date that the transaction was	1	M	1.005-DAT	{1.005} MO [ValidLocalDate]	t-6				T
			1	M	NIEM-	ForEach(XElm(itl:PackageInformationRecord))	t-6				X

Value	7.7.2.3	submitted. The local date is recorded as YYYYMMDD. Note that this may be a different date than the corresponding GMT, due to time zone differences.			1.005-DAT	{
						{XElm(nc:Date) in XElm(biom:TransactionDate)}
						MO [NIEM-ValidLocalDate]
						}					

Field: 1.006-Priority Value	8.1.6, Table 19	This optional field shall contain a single information character to designate the urgency with which a response is desired. The values shall range from 1 to 9, with 1 denoting the highest priority. The default value shall be defined by the agency receiving the transaction.	1	O	1.006-PRY	{1.006} MO [1 to 9]					B
Field: 1.007-Destination Agency Value	8.1.7, Table 19	This mandatory field shall contain the identifier of the administration or organization designated to receive the transmission. The size and data content of this field shall be user-defined and in accordance with the receiving agency.		M	1.007-DES	<See Requirement ID "Field: Agency Codes">	t-2				
Field: 1.008-Originating Agency Value	8.1.8, Table 19	This mandatory field shall contain the identifier of the administration or organization originating the transaction. The size and data content of this field shall be user-defined and in accordance with the receiving agency.		M	1.008-ORG	<See Requirement ID "Field: Agency Codes">	t-2				
Field: 1.009-Transaction Control Number Value	8.1.9, Table 19	This mandatory field shall contain the transaction control number as assigned by the originating agency. A unique alphanumeric control number shall be assigned to each transaction. For any transaction that requires a response, the respondent shall refer to this number in communicating with the originating agency.	1	M	1.009-TCN	TRUE					B
Field: 1.010-Transaction Control Reference Value	8.1.10, Table 19	This optional field shall be used for responses that refer to the TCN of a previous transaction involving an inquiry or other action that required a response.	1	O	1.010-TCR	TRUE					B
Field: 1.011-Native Scanning Resolution Value	8.1.11, Table 19	This mandatory field shall be set to "00.00" if there are no Type-4 records in the transaction. When there are Type-4 records present, this field is used to specify the native scanning resolution of the friction ridge image capture device. This field shall specify the resolution in pixels per millimeter. The resolution shall be expressed as two numeric characters		M	1.011-NSR	<See Requirement IDs "Field: NSR Conditional".>	t-2				

		followed by a decimal point and two more numeric characters.										
Field: 1.012-Nominal Resolution Value	8.1.12, Table 19	This mandatory field shall be set to "00.00" if there are no Type-4 records in the transaction. When there are Type-4 records present, this field specifies the nominal resolution for the image(s) being exchanged. This field shall specify the resolution in pixels per millimeter. The resolution shall be within the range 19.30 ppmm (490 ppi) to 20.08 ppmm (510 ppi).		M	1.012-NTR	<See Requirement ID "Field: Type4 NTR>	t-2					
Field: 1.013-Domain Name Value	8.1.13, Table 19	The mandatory first information item (domain name / DNM) will uniquely identify the agency, entity, or implementation used for formatting the fields in the Type-2 record. The default value for the field shall be the North American Domain implementation (NORAM). An optional second information item (domain version number / DVN) shall contain the unique version of the particular implementation, such as 7.02.	1	O	1.013-DOM	TRUE					B*	
Field: 1.013-Domain Name Occurs Once	8.1.13,	The domain name may only appear once within a transaction.		O	1.013-DOM-Occurs Once	<See Requirement ID "Field: Type1-Field Occurrence">	t-2					
Field: 1.014-Greenwich Mean Time Value	8.1.14, Table 19	This optional field provides a mechanism for expressing the date and time in terms of universal Greenwich Mean Time (GMT) units.	1	O	1.014-GMT	{1.014} MO [ValidUTC/GMT]	t-6				T	
			1	O	NIEM-1.014-GMT	ForEach(XElm(itl:PackageInformationRecord)) { {XElm(nc:DateTime) in XElm(biom:TransactionUTCDate)} MO [NIEM-ValidUTC/GMT] }	t-6				X	
Field: 1.015-Character Encoding Subfield 1 CSI Value	8.1.15, Table 19, Table 2	The first information item (character encoding index / CSI) is the three character identifier for the index number that references an associated character encoding. See the "Character encoding index" column of Table 2 for the valid values for this information item.	1	M ⇑	1.015-DCS-CSI	{US_Subfield:1 in 1.015} MO [0,2 to 4, 128 to 999]					B*	
Field: 1.015-	8.1.15,	The second information item (character	2	M	1.015-DCS-	IF {US_Subfield:1 in 1.015} EQ 0 THEN					B*	

Character Encoding Subfield 2 CSN Value	Table 19, Table 2	encoding name / CSN) shall be the "Character encoding name" associated with that index number, taken from Table 2.			CSN	{US_Subfield:2 in 1.015} EQ ASCII(ASCII) AND IF {US_Subfield:1 in 1.015} EQ 2 THEN {US_Subfield:2 in 1.015} EQ ASCII(UTF-16) AND IF {US_Subfield:1 in 1.015} EQ 3 THEN {US_Subfield :2in 1.015} EQ ASCII(UTF-8) AND IF {US_Subfield:1 in 1.015} EQ 4 THEN {US_Subfield:2 in 1.015} EQ ASCII(UTF-32)					
Field: 1.015-Character Encoding Subfield 3 CSV Value	8.1.15, Table 19, Table 2	The optional third information item (character encoding version / CSV) is the specific version of the character encoding used. In the case of the use of UTF-8, the third optional information item may be used to hold the specific version used, so that the display terminal can be switched to the correct font family.	1	O ⇑	1.015-DCS-CSV	TRUE					B*
Field: 1.015-Character Encoding User Defined		This optional field specifies the character encoding that may appear within this transaction for data with the character type listed as "U" or 'user-defined' in the record format tables.	3	O	1.015-DCS-User Defined Encoding	<Not Tested.>	t-1, t-4				B
Field: 1.016-Application Profile Specifications Value	8.1.16, Table 19	There may be multiple subfields, each designating an application profile to which this transaction conforms Each subfield shall consist of three mandatory information items: The first information item (application profile organization / APO) will uniquely identify the agency or entity responsible for the specification. The second information item (application profile name / APN) shall contain the name of the specification. The third information item (application profile version number / APV) shall	1	O	1.016-APS	TRUE					B*

		contain the specific version of the specification.									
Field: 1.016-Application Profile Specifications Compliance	8.1.16	If multiple Application Profile Specifications are included in this field, the specifications must be compatible with each other: this transaction must be in compliance with all of the cited specifications. See Section 6.	3	O	1.016	<Not Tested.>	t-1, t-3				B

Table C.5 - Assertions for Record Type 3 - Deprecated

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.3: Record Type-3: DEPRECATED											

Transaction: Type3 Zero Occurrences	8.3	No instances of Record Type-3 shall be included in a transaction conformant with this version of the standard.	2	M	Type3-Zero Occurrences	ForEach(Record in Transaction)
						{
						Type(Record) NEQ 3
						}
											T

			2	M	NIEM-Type3-Zero Occurrences	<An invalid record type will cause a parsing error in XML because no Record Element Tag is defined (see Table 97).>					X

Table C.6 - Assertions for Record Type 4 - Grayscale Fingerprint Image

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.4: Record Type-4: Grayscale fingerprint image											
Record: Type4 Scan Resolution 500ppi	8.4	The Type-4 record is based on the use of a captured fingerprint image obtained using a class scanning resolution of 500 ppi. (See Section 7.7.6). It shall not be used for other than 500 ppi. class images.		M	Type4-Scan Resolution 500ppi	<See Requirement ID "Field: Type4 NTR">	t-2				
Record: Type4 Image Compression WSQ	8.4	All images shall be compressed using WSQ.		M	Type4-CGA WSQ Only	<See Requirement IDs "Field: 4.008-Compression Algorithm Value" and "Field: 4.009-Image Data Valid">.	t-2				
Field: Type4-CondCode	Table 21, Table 95	<Table 21 specifies the Condition Code for each field.>	1	M	Type4-Mandatory CondCode	Present(4.001 to 4.009)					B
Field: Type4-CharType	Table 21, Table 95	Traditional format requires the data in binary form (not text) with a fixed byte length.	3	M	Type4-Char Type	<Not tested directly, but Type 4 is parsed as unnumbered binary data for Traditional encoding>.	t-13				T
Field: Type4-ByteCount	Table 21, Table 95	<Table 95 specifies the Byte Count for each field.>	1	M	4.001-ByteCount	Length(4.001) EQ 4					T

			1	M	NIEM-4.001-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord))
						{
						Length(XElm(biom:RecordCategoryCode) EQ 2
						}
											X

			1	M	4.002-ByteCount	Length(4.002) EQ 1					T

			1	M	NIEM-4.002-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord))
						{
						Length(XElm(nc:IdentificationID) in XElm(biom:ImageReferenceIdentification)) EQ 1 OR 2
						}
											X

			1	M	4.003-ByteCount	Length(4.003) EQ 1					T
			1	M	NIEM-4.003-	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord))					X

					ByteCount	{ Length(XElm(biom:FingerprintImageImpressionCaptureCategoryCode)) EQ 1 OR 2 }						
			1	M	4.004-ByteCount	Length(4.004) EQ 6						T
			1	M	NIEM-4.004-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(All(XElm(biom:FingerPositionCode) in XElm(biom:FingerprintImagePosition))) MO [1 to 3] }						X
			1	M	4.005-ByteCount	Length(4.005) EQ 1						T
			1	M	NIEM-4.005-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(XElm(biom:CaptureResolutionCode) in XElm(biom:ImageCaptureDetail)) EQ 1 }						X
			1	M	4.006-ByteCount	Length(4.006) EQ 2						T
			1	M	NIEM-4.006-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(XElm(biom:ImageHorizontalLineLengthPixelQuantity)) MO [2 to 5] }						X
			1	M	4.007-ByteCount	Length(4.007) EQ 2						T
			1	M	NIEM-4.007-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(XElm(biom:ImageVerticalLineLengthPixelQuantity)) MO [2 to 5] }						X
			1	M	4.008-ByteCount	Length(4.008) EQ 1						T
			1	M	NIEM-4.008-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(XElm(biom:ImageCompressionAlgorithmCode)) EQ 1 }						X
			2	M	4.009-	Length(4.009) EQ {4.001} – 18						T

					ByteCount							
			1	M	NIEM-4.009-ByteCount	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord)) { Length(XElm(nc:BinaryBase64Object)) GTE 1 }						X
Field: 4.001-Record Header Value	8.4.1, Table 21, 7.1	Field 4.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	4.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2					
	8.4.1, C.10.4	The XML name for the Type-4 record is <itl:PackageHighResolutionGrayscaleImageRecord>, and its <biom:RecordCategoryCode> element shall have a value of "04".	1	M	NIEM-4.001-Record Header	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord) { {XElm(biom:RecordCategoryCode)} EQ ASCII(04) }						X
Field: 4.002-Information Designation Character Value	8.4.2, Table 21, 7.3.1	This mandatory field shall be the IDC of this Type-4 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	4.002-IDC	<See Requirement IDs "Field: xx.002-IDC and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2					
Field: 4.003-Impression Type Value	8.4.3 Table 21, 7.7.4.1	This mandatory field shall indicate the manner by which the fingerprint was obtained. See Section 7.7.4.1 for details.	1	M	4.003-IMP	{4.003} MO [0 to 3, 8, 20 to 29, 36 to 39]						B
Field: 4.004-Friction Ridge Generalized Position Value	8.4.4, Table 21, Table 6, 7.7.4.2	This mandatory field shall contain the decimal code number corresponding to the finger position and shall be taken from Table 6 (only finger numbers 0-10 apply to Type-4). Up to five additional finger positions shall be referenced by entering the alternate finger positions using the same format. If fewer than five finger position references are to be used, the unused position references shall be filled with 255. Six values shall be entered in each record.	1	M	4.004-FGP	Bytes(4.004) MO [0x00 to 0x0A, 0xFF]						T
			1	M	NIEM-4.004-FGP	ForEach(XElm(itl:PackageHighResolutionGrayscaleImageRecord) { {All(XElm(biom:FingerPositionCode) in XElm(biom:FingerprintImagePosition))} MO [0 to 10, 255] }						X
Field: 4.005-Image Scanning Resolution Value	8.4.5, Table 21	The mandatory ISR field relates to the *scanning* resolution of this image. Previous versions of this standard stated that 0 in this field represents the 'minimum scanning resolution.' The minimum scanning resolution was defined in ANSI/NIST-ITL 1-2007 as "19.69 ppmm plus or minus 0.20 ppmm (500 ppi plus or minus 5 ppi)." Therefore, if the image scanning resolution corresponds to the Appendix F certification level (See	2	M	4.005-ISR	IF {1.011} LTE 19.49 OR GTE 19.89 THEN {4.005} EQ 1 ELSE {4.005} EQ 0						B

		Table 11 Class resolutions with maximum variance), a 0 shall be entered in this field. A value of 1 is entered if the actual scanning resolution (outside of the Appendix F certification range) is specified in Field 1.011 Native scanning resolution / NSR.										
Field: 4.006-Horizontal Line Length Value	8.4.6, Table 21	This mandatory field shall contain the number of pixels on a single horizontal line of the transmitted image.		M	4.006-HLL	<See Requirement ID "Field: Image HLL Value">	t-2					
Field: 4.006-Horizontal Line Length Metadata	8.4.6, Table 21, WSQ Standard	<The HLL is verified by checking the image metadata if compression is used. >	2	M	4.006-HLL WSQ Metadata	IF {4.008} EQ 1 THEN {4.006} EQ {Image Width-WSQ}	t-11					B
Field: 4.007-Vertical Line Length Value	8.4.7, Table 21	This mandatory field shall contain the number of pixels on a single horizontal line of the transmitted image.		M	4.007-VLL	<See Requirement ID "Field: Image VLL Value">						
Field: 4.007-Vertical Line Length Metadata	8.4.7, Table 21	<The VLL is verified by checking the image metadata if compression is used.>	2	M	4.007-VLL WSQ Metadata	IF {4.008} EQ 1 THEN {4.007} EQ {Image Height-WSQ}	t-11					B
Field: 4.008-Compression Algorithm Value	8.4, 8.4.8, Table 21	All images shall be compressed using WSQ. This is a mandatory field, used to specify the type of compression algorithm used. A zero denotes no compression. Otherwise, the contents shall be a number allocated to the particular compression technique used by the interchange parties. The specific code for each algorithm can be found in Table 12.	1	M	4.008-CGA	{4.008} EQ 0 OR 1	t-98					
Field: 4.008-Compression Algorithm Metadata	8.4.8, Table 21	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	4.008-CGA WSQ Metadata	IF {4.008} EQ 1 THEN Present(SOI-WSQ)	t-11					B
Field: 4.009-Image Data Valid	8.4.9	This is a mandatory field. Each pixel of the uncompressed grayscale image shall be quantized to eight bits (256 gray levels) contained in a single byte. For the exchange of an uncompressed binary image, eight pixels shall be left justified and packed into a single unsigned byte. The most significant bit of the byte shall	2	M	4.009-DATA Uncompressed Valid	IF {4.008} EQ 0 THEN Length(4.009) EQ {4.006} * {4.007}						B
			2	M	4.009-DATA WSQ Valid	IF {4.008} EQ 1 THEN Present(SOI-WSQ,SOF-WSQ,SOB-WSQ,EOI-WSQ)	t-11					B

		be the first of the eight pixels scanned. If compression is used, the pixel data shall be compressed in accordance with the compression technique specified in the Field 4.008: Compression algorithm / CGA / BCA.									
Field: 4.009-Image WSQ Version 3.1	8.4.9, 7.7.9.1	Wavelet Scalar Quantization (WSQ) shall be used for compressing grayscale friction ridge data at 500 ppi class. Only version 3.1 or higher shall be used for compressing grayscale fingerprint data at 500 ppi class with a platen area of 2 inches or greater in height. WSQ shall not be used for other than the 500 ppi class.	2	M	4.009-DATA WSQ Version	IF {4.008} EQ 1 THEN {Encoder Version } EQ 2	t-11				B

Table C.7 - Assertions for Record Type 5 - Deprecated

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.5: Record Type-5: DEPRECATED											

Transaction: Type5 Zero Occurrences	8.5	No instances of Record Type-5 shall be included in a transaction conformant with this version of the standard.	2	M	Type5-Zero Occurrences	ForEach(Record in Transaction)
						{
						Type(Record) NEQ 5
						}
											T

			2	M	NIEM-Type5-Zero Occurrences	<An invalid record type will cause a parsing error in XML because no Record Element Tag is defined (see Table 97).>					X

Table C.8 - Assertions for Record Type 6 - Deprecated

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.6: Record Type-6: DEPRECATED											

Transaction: Type6 Zero Occurrences	8.6	No instances of Record Type-6 shall be included in a transaction conformant with this version of the standard.	2	M	Type6-Zero Occurrences	ForEach(Record in Transaction)
						{
						Type(Record) NEQ 6
						}
											T

			2	M	NIEM-Type6-Zero Occurrences	<An invalid record type will cause a parsing error in XML because no Record Element Tag is defined (see Table 97).>					X

Table C.9 - Assertions for Record Type 10 - Facial, Other Body Parts & SMT Image Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.10: Record Type-10: Facial, other body part and SMT image record											
Field: Type10-Subfield Occurrence	Table 53	<Table 53 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	M	Type10-Subfields Zero	Count(Subfields in 10.[001 to 003, 005 to 013, 016, 017, 020, 021, 027, 030, 031, 038, 039, 903, 996, 999]) EQ 0					T
			1	M	10.004-Subfields	Count(US_Subfields in 10.004) EQ 1 OR 2					T
			1	D	10.014-Subfields	Count(US_Subfields in 10.014) EQ 4 OR 5					T
			1	D	10.018-Subfields	Count(US_Subfields in 10.018) EQ 3					T
			1	D	10.019-Subfields	Count(US_Subfields in 10.019) MO [1 to 3]					T
			1	D	10.023-Subfields	IF {US_Subfield:1 in 10.023} EQ ASCII(VENDOR) THEN Count(US_Subfields in 10.023) EQ 1 OR 2 ELSE Count(US_Subfields in 10.023) EQ 1					T

			1	D	10.024-Subfields	Count(RS_Subfields in 10.024) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 10.024)
						{
						Count(US_Subfields in RS_Subfield) EQ 3
						}
											T

			1	D	10.025-Subfields	Count(US_Subfields in 10.025) MO [3 to 6]					T
			1	D	10.026-Subfields	Count(US_Subfields in 10.026) MO [1 to 50]					T
			1	D	10.028-Subfields	Count(US_Subfields in 10.028) EQ 1 OR 2					T
			1	D	10.029-Subfields	Count(RS_Subfields in 10.029) MO [1 to 88] AND					T

						ForEach(RS_Subfield in 10.029)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}					

			1	D	10.032-Subfields	Count(RS_Subfields in 10.032) MO [1 to 88]
						
						AND
						
						ForEach(RS_Subfield in 10.032)
						{
						Count(US_Subfields in RS_Subfield) EQ 5
						}
											T

			1	D	10.033-Subfields	Count(RS_Subfields in 10.033) MO [1 to 12]
						
						AND
						
						ForEach(RS_Subfield in 10.033)
						{
						Count(US_Subfields in RS_Subfield) EQ 2 +
						2*{US_Subfield:2 in RS_Subfield}
						}
											T

			1	D	10.040-Subfields	Count(US_Subfields in 10.040) MO [1 to 3]					T
			1	D	10.041-Subfields	Count(US_Subfields in 10.041) EQ 2					T

			2	D	10.042-Subfields	Count(RS_Subfields in 10.042) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 10.042)
						{
						Present(US_Subfield:2,3 in RS_Subfield)
						IFF
						{US_Subfield:1 in RS_Subfield} MO
						[ASCII(TATTOO, CHEMICAL, BRANDED, CUT)]
						THEN
						
						AND
						
						IF {US_Subfield:1 in RS_Subfield} MO
						[ASCII(TATTOO, CHEMICAL, BRANDED, CUT)]
						THEN
						Count(US_Subfields in RS_Subfield) MO [3,4]
						ELSE
						Count(US_Subfields in RS_Subfield) EQ 1
											T

						}					

			2	D	10.043-Subfields	Count(RS_Subfields in 10.043) EQ Count(RS_Subfields in 10.042)
						AND
						ForEach(RS_Subfield in 10.043)
						{
						Count(US_Subfields in RS_Subfield) MO [1 to 6]
						}
											T

			1	O	10.044-Subfields	Count(US_Subfields in 10.044) MO [1 to 18]					T

			2	D	10.045-Subfields	Count(RS_Subfields in 10.045) MO [1 to 16]
						
						AND
						
						ForEach(RS_Subfield in 10.045)
						{
						Count(US_Subfields in RS_Subfield) EQ 3 + 2*{
						US_Subfield:3 in RS_Subfield}
						}
											T

			1	O	10.902-Subfields	Count(RS_Subfields in 10.902) GTE 1
						
						AND
						
						ForEach(RS_Subfield in 10.902)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	10.904-Subfields	Count(US_Subfields in 10.904) EQ 3					T

			1	O	10.995-Subfields	Count(RS_Subfields in 10.995) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 10.995)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

			1	O	10.997-Subfields	Count(RS_Subfields in 10.997) MO [1 to 255] AND ForEach(RS_Subfield in 10.997) {					T

						Count(US_Subfields in RS_Subfield) EQ 1 OR 2 }						
				O	10.998-Subfields	<See Requirement ID: "Field: Geographic-Conditional">	t-2					
Field: Type10-CondCode	Table 53	<Table 53 specifies the Condition Code for each field.>	1	M	Type10-CondCode	Present(10.001 to 10.012, 10.999) AND NOT Present(10.015,10.022, 10.034 to 10.037,10.046 to 10.199, 10.901, 10.905 to 10.994)						B
Field: 10.013-SAP CondCode Dependent	Table 53, 8.10.13	The Subject Acquisition Profile (SAP) is a mandatory field when Field 10.003: Image type / IMT contains "FACE". Otherwise, it shall not be entered.		D	10.013-CondCode Dependent	<See Requirement ID: "Field: SAP Conditional">	t-2					
Field: 10.014-FIP CondCode Dependent	Table 53, 8.10.14	If the face image (IMT = 'FACE') contains more than one face, or is not cropped to a "head only" or "head and shoulders" composition, this optional field contains offsets to the location of the bounding box of the face of the subject within a larger image. This field is only appropriate for images that do not comply with SAP Levels 30, 40, 50 or 51, because those images shall be cropped to a "head only" or "head and shoulders"composition.	2	D	10.014-CondCode Dependent	IF Present(10.014) THEN {10.003} EQ ASCII(FACE) AND {10.013} NOT MO [30,40,50,51]						B
Field: 10.018-DIST CondCode Dependent	Table 53, 8.10.17	This optional field (which can be used only if IMT is 'FACE')…	2	D	10.018-CondCode Dependent	IF Present(10.018) THEN {10.003} EQ ASCII(FACE)						B
Field: 10.019-LAF CondCode Dependent	Table 53, 8.10.18	This optional field …is only applicable to face images (IMT = 'FACE').	2	D	10.019-CondCode Dependent	IF Present(10.019) THEN {10.003} EQ ASCII(FACE)						B
Field: 10.020-POS CondCode Dependent	Table 53, 8.10.19	This optional field is to be used for the exchange of facial image data	2	D	10.020-CondCode Dependent	IF Present(10.020) THEN {10.003} EQ ASCII(FACE)						B
Field: 10.021-POA CondCode Dependent	Table 53, 8.10.20	This shall only be used for the exchange of facial image data (IMT = 'FACE'). It may be used if Field 10.020: Subject pose / POS contains an "A" to indicate an angled pose of the subject. The field shall not be used if the entry in POS is an "F", "R", "L"	2	D	10.021-CondCode Dependent	IF Present(10.021) THEN {10.003} EQ ASCII(FACE) AND {10.020} EQ ASCII(A)						B

		or “D”.									
Field: 10.023-PAS CondCode Dependent	Table 53, 8.10.21	This field is mandatory if the SAP entry (Field 10.013: Subject acquisition profile / SAP) is “40” or greater for face image records. (IMT=FACE only).	2	D	10.023-CondCode Dependent	IF {10.013} GTE 40 THEN Present(10.023)					B
Field: 10.024-SQS CondCode Dependent	Table 53, 8.10.22	This optional field shall specify quality score data for facial images (IMT = 'FACE')	2	D	10.024-CondCode Dependent	IF Present(10.024) THEN {10.003} EQ ASCII(FACE)					B
Field: 10.025-SPA CondCode Dependent	Table 53, 8.10.23	This field shall be present when Field 10.020: Subject pose / POS contains a “D” to indicate a set of determined 3D pose angles of the same subject for a facial image (IMT = 'FACE'). If the entry in POS is an “F”, “L”, “R” or “D”, this field shall not be used	2	D	10.025-CondCode Dependent	IF Present(10.025) THEN {10.003} EQ ASCII(FACE) AND {10.020} EQ ASCII(D)					B
Field: 10.026-SXS CondCode Dependent	Table 53, 8.10.24	This field is mandatory if the SAP entry for a facial image (Field 10.013: Subject acquisition profile / SAP) is 40, 50 or 51. (IMT=FACE only). In other cases, this field is optional for facial images.	2	D	10.026-CondCode Dependent	IF {10.013} MO [40,50,51] AND {10.003} EQ ASCII(FACE) THEN Present(10.026)					B
Field: 10.027-SEC CondCode Dependent	Table 53, 8.10.25	This field is mandatory if the SAP entry (Field 10.013: Subject acquisition profile / SAP) is “40” or greater. For other facial images (IMT = 'FACE'), the field is optional.	2	D	10.027-CondCode Dependent	IF {10.013} GTE 40 AND {10.003} EQ ASCII(FACE) THEN Present(10.027)					B
Field: 10.028-SHC CondCode Dependent	Table 53, 8.10.26	This field is mandatory if the SAP entry (Field 10.013: Subject acquisition profile / SAP) is “40” or greater. For other facial image s(IMT = 'FACE'), it is optional.	2	D	10.028-CondCode Dependent	IF {10.013} GTE 40 AND {10.003} EQ ASCII(FACE) THEN Present(10.028)					B
Field: 10.029-FFP CondCode Dependent	Table 53, 8.10.27	The optional field shall be used for the exchange of facial image data (IMT = 'FACE') feature points or landmarks.	2	D	10.029-CondCode Dependent	IF Present(10.029) THEN {10.003} EQ ASCII(FACE)					B
Field: 10.031-TMC CondCode Dependent	Table 53, 8.10.29	This optional field describes the specific facial (IMT = 'FACE') feature points	2	D	10.031-CondCode Dependent	IF Present(10.031) THEN {10.003} EQ ASCII(FACE)					B
Field: 10.032-3DF CondCode Dependent	Table 53, 8.10.30	The optional field shall describe …facial feature points of the captured facial image(IMT = 'FACE').	2	D	10.032-CondCode Dependent	IF Present(10.032) THEN {10.003} EQ ASCII(FACE)					B
Field: 10.033-FEC CondCode	Table 53, 8.10.31, 8.10.29	…refers to a specific contour on the face (IMT = 'FACE')	2	D	10.033-CondCode Dependent	IF Present(10.033) THEN {10.003} EQ ASCII(FACE) AND {10.031} EQ 5					B

Dependent		Field 10.031: This optional field describes the specific facial (IMT= 'FACE') feature points contained in Field 10.029: 2d Facial feature points/ FFP and if level 5, contours shall be contained in Field 10.033: Feature contours/ FEC.									
Field: 10.039-T10 CondCode Dependent	Table 53, 8.10.33	This field shall not be used if there are no multiple images of the same SMT or body part in the transaction	2	D	10.039-CondCode Dependent	IF Present(10.039) THEN Count(Records ST Type(Record) EQ 10) GTE 2					T
			2	M	NIEM- T10-CondCode Dependent	IF Present(XElm(biom:PhysicalFeatureReferenceIdentification) THEN Count(XElm(itl:PackageFacialAndSMTImageRecord)) GTE 2					X
Field: 10.040-SMT CondCode Dependent	Table 53, 8.10.34	This field shall be used only when Field 10.003: Image type / IMT = "SCAR", "MARK", or "TATTOO". It is not used for other images	2	D	10.040-CondCode Dependent	IF Present(10.040) THEN {1.003} MO [ASCII(SCAR,MARK,TATTOO)]					B
Field: 10.041-SMS CondCode Dependent	Table 53, 8.10.35	This field shall be used only when Field 10.003: Image type / IMT ="SCAR", "MARK", or "TATTOO".	2	D	10.041-CondCode Dependent	IF Present(10.041) THEN {1.003} MO [ASCII(SCAR,MARK,TATTOO)]					B
Field: 10.042-SMD CondCode Dependent	Table 53, 8.10.36	This field shall be used only when Field 10.003: Image type /IMT = "SCAR", "MARK", or "TATTOO".	2	D	10.042-CondCode Dependent	IF Present(10.042) THEN {1.003} MO [ASCII(SCAR,MARK,TATTOO)]					B
Field: 10.043-COL CondCode Dependent	Table 53, 8.10.37	This optional field shall contain one subfield corresponding to each subfield contained in Field 10.042: SMT descriptors / SMD	2	D	10.043-CondCode Dependent	IF Present(10.043) THEN Present(10.042)					B
Field: 10.045-OCC CondCode Dependent	Table 53, 8.10.37	This optional field defines …the image of the face (IMT = 'FACE').	2	D	10.045-CondCode Dependent	IF Present(10.045) THEN {10.003} EQ ASCII(FACE)					B
Field: Type10-CharType	8.10, Table 53	<Table 53 specifies the Character Type for each field that contains no subfields. Note that even though some Character Types are listed as U (user defined), they may still have character type limitations defined in the standard text. >	1	-	Type10-CharType N	Bytes(10.[001,002,005 to 010, 013,016,017,031,039]) MO [0x30 to 0x39]					B
			1	-	Type10-CharType A	Bytes(10.[011,012,020,027,030]) MO [0x41 to 0x5A, 0x61 to 0x7A]					B
			1	-	Type10-CharType U	Present(Bytes(10.042) AND {10.026} MO[0x41 to 0x5A, 0x61 to 0x7A]					B
			1	M	10.003-CharType AS	Bytes(10.003) MO [0x2D, 0x41 to 0x5A, 0x61 to 0x7A]					B
			1	D	10.021-	Bytes(10.021) MO [0x2B,0x2D,0x30 to 0x39]					B

					CharType NS							
			1	D	10.025-CharType N_US	Bytes(10.025) MO [0x1F, 0x2B, 0x2D, 0x30 to 0x39]						B
			1	O	10.038-CharType Text ANS	Bytes(10.038) MO [0x20, 0x7E]						B
			1	O	10.903-CharType Text ANS	Bytes(10.903) MO [0x20, 0x7E]						B
			1	O	10.996-CharType H	Bytes(10.996) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]						B
			1	M	10.999-CharType B	Present(Bytes(10.999))						B
Field: Type10-Subfield CharType		<Table 53 specifies the Character Type for each subfield.>	1	M	10.004-Subfield CharType U	Present(Bytes(US_Subfields:1,2 in 10.004)						B*
			1	D	10.014-Subfield CharType AN	Bytes(US_Subfields:1 to 4 in 10.014) MO [0x30 to 0x39] AND Bytes(US_Subfields:5 in 10.014) MO [0x41 to 0x5A, 0x61 to 0x7A]						B*
			1	M	10.018-Subfield CharType A	Bytes(All(US_Subfields in 10.018)) MO [0x41 to 0x5A, 0x61 to 0x7A]						B*
			1	D	10.019-Subfield CharType A	Bytes(All(US_Subfields in 10.019)) MO [0x41 to 0x5A, 0x61 to 0x7A]						B*
			1	D	10.023-Subfield CharType ASU	Bytes(US_Subfields:1 in 10.023) MO [0x30, 0x32, 0x41 to 0x5A, 0x61 to 0x7A] AND Present(Bytes(US_Subfields:2 in 10.023))						B*
			1	D	10.024-Subfield CharType NH	ForEach(RS_Subfield in 10.024) { Bytes(US_Subfields:1,3 in RS_Subfield) MO [0x30 to 0x39] AND Bytes(US_Subfields:2 in RS_Subfield) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66] }						B*
			1	D	10.026-Subfield CharType U-A	Bytes(All(US_Subfields in 10.018)) MO [0x41 to 0x5A, 0x61 to 0x7A]						B*
			1	D	10.028-	Bytes(All(US_Subfields in 10.028)) MO [0x41 to						B*

					Subfield CharType A	0x5A, 0x61 to 0x7A]						

			1	D	10.029-Subfield CharType ANS	ForEach(RS_Subfield in 10.029)
						{
						Bytes(US_Subfields:1,3,4 in RS_Subfield) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:2 in RS_Subfield) MO [0x2E, 0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	D	10.032-Subfield CharType ANS	ForEach(RS_Subfield in 10.032)
						{
						Bytes(US_Subfields:1,3,4 in RS_Subfield) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:2 in RS_Subfield) MO [0x2E, 0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	D	10.033-Subfield CharType AN	ForEach(RS_Subfield in 10.033)
						{
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x41 to 0x5A, 0x61 to 0x7A]
						AND
						Bytes(US_Subfield:2 in RS_Subfield) MO [0x30 to 0x39]
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Bytes(US_Subfield) MO [0x30 to 0x39]
						}
						}
											B*

			1	D	10.040-Subfield CharType AN	Bytes(All(US_Subfields in 10.040)) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]					B*
			1	D	10.041-Subfield CharType N	Bytes(All(US_Subfields in 10.041)) MO [0x30 to 0x39]					B*

			1	D	10.042-Subfield CharType AU	ForEach(RS_Subfield in 10.042)
						{
						Bytes(US_Subfields:1 to 3 in RS_Subfield) MO [0x41 to 0x46, 0x61 to 0x66]
						AND
						Present(Bytes(US_Subfields:4 in RS_Subfield))
						}
											B*

			1	D	10.043-	Bytes(All(US_Subfields in 10.043)) MO [0x41 to					B*

					Subfield CharType A	0x46, 0x61 to 0x66]					
			1	O	10.044-Subfield CharType	Bytes(All(US_Subfields in 10.044)) MO [0x41 to 0x46, 0x61 to 0x66]					B*

			1	D	10.045-Subfield CharType AN	ForEach(RS_Subfield in 10.045)
						{
						Bytes(US_Subfields:1,2 in RS_Subfield) MO [0x41 to 0x5A, 0x61 to 0x7A]
						AND
						Bytes(US_Subfield:3 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Bytes(US_Subfield) MO [0x30 to 0x39]
						}
						}
											B*

			1	O	10.902-Subfield CharType U	ForEach(RS_Subfield in 10.902)
						{
						Present(Bytes(US_Subfields:2 to 4 in RS_Subfield))
						AND
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39,0x5A]
						}
											B*

			1	O	10.904-Subfield CharType U	Present(Bytes(All(US_Subfields in 10.904)))					B*
			1	O	10.995-Subfield CharType N	Bytes(All(US_Subfields in 10.995)) MO [0x30 to 0x39]					B*
			1	O	10.997-Subfield CharType N	Bytes(All(US_Subfields in 10.997)) MO [0x30 to 0x39]					B*
				O	10.998-Subfield CharType ANSU	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type10-CharCount	Table 53	<Table 53 specifies the Character Count for each field that contains no subfields.>	1	M	10.001-CharCount	DataLength(10.001) GTE 1					B
			1	M	10.002-CharCount	DataLength(10.002) EQ 1 OR 2					B
			1	M	10.003-CharCount	DataLength(10.003) MO [1 to 11]					B

			1	M	10.005-CharCount	DataLength(10.005) EQ 8						B
			1	M	10.006-CharCount	DataLength(10.006) MO [2 to 5]						B
			1	M	10.007-CharCount	DataLength(10.007) MO [2 to 5]						B
			1	M	10.008-CharCount	DataLength(10.008) EQ 1						B
			1	M	10.009-CharCount	DataLength(10.009) MO [1 to 5]						B
			1	M	10.010-CharCount	DataLength(10.010) MO [1 to 5]						B
			1	M	10.011-CharCount	DataLength(10.011) MO [3 to 5]						B
			1	M	10.012-CharCount	DataLength(10.012) MO [3 to 4]						B
			1	D	10.013-CharCount	DataLength(10.013) MO [1 to 3]						B
			1	O	10.016-CharCount	DataLength(10.016) MO [1 to 4]						B
			1	O	10.017-CharCount	DataLength(10.017) MO [1 to 4]						B
			1	D	10.019-CharCount	DataLength(10.019) MO [1 to 3]						B
			1	D	10.020-CharCount	DataLength(10.020) EQ 1						B
			1	D	10.021-CharCount	DataLength(10.021) MO [1 to 4]						B
			1	D	10.027-CharCount	DataLength(10.027) EQ 3						B
			1	O	10.030-CharCount	DataLength(10.030) MO [7 to 10]						B
			1	D	10.031-CharCount	DataLength(10.031) MO [1 to 3]						B
			1	O	10.038-CharCount	DataLength(10.038) MO [1 to 126]						B
			1	D	10.039-CharCount	DataLength(10.039) MO [1 to 3]						B
			1	O	10.903-CharCount	DataLength(10.903) MO [13 to 16]						B
			1	O	10.996-CharCount	DataLength(10.996) EQ 64						B
				O	10.998-	<See Requirement ID: "Field: Geographic">	t-2					

					CharCount						
Field: Type10-Subfield CharCount	Table 53	<Table 53 specifies the Character Count for each subfield.>	1	M	10.004-Subfield CharCount	Length(All(US_Subfields in 10.004)) GTE 1					B*
			1	D	10.014-Subfield CharCount	Length(US_Subfield:1 to 4 in 10.014) MO [1 to 5] AND Length(US_Subfield:5 in 10.014) EQ 1					B*
			1	D	10.018-Subfield CharCount	Length(US_Subfield:1 in 10.018) MO [6 to 10] AND Length(US_Subfield:2 in 10.018) EQ 1 AND Length(Last(US_Subfield in 10.018)) MO [4 to 8]					B*
			1	D	10.019-Subfield CharCount	Length(All(US_Subfields in 10.019) EQ 1					B*
			1	D	10.023-Subfield CharCount	Length(US_Subfield:1 in 10.023) MO [6 to 13] AND Length(US_Subfield:2 in 10.023) MO [1 to 64]					B*

			1	D	10.024-Subfield CharCount	ForEach(RS_Subfield in 10.024)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 4
						AND
						Length(Last(US_Subfield in RS_Subfield)) MO [1 to 5]
						}
											B*

			1	D	10.026-Subfield CharCount	Length(All(US_Subfields in 10.026)) MO [3 to 20]					B*
			1	D	10.028-Subfield CharCount	Length(All(US_Subfields in 10.028)) EQ 3					B*

			1	D	10.029-Subfield CharCount	ForEach(RS_Subfield in 10.029)
						{
						Length(US_Subfield:1 in RS_Subfield) EQ 1
						AND
						Length(US_Subfield:2 in RS_Subfield) MO [3 to 5]
						AND
						Length(US_Subfields:3,4 in RS_Subfield)) MO [1 to 5]
						}
											B*

			1	D	10.032-Subfield CharCount	ForEach(RS_Subfield in 10.032) { Length(US_Subfield:1 in RS_Subfield) EQ 1					B*

						AND Length(US_Subfield:2 in RS_Subfield) MO [3, 4] AND Length(US_Subfields:3 to 5 in RS_Subfield)) MO [1 to 5] }					

			1	D	10.033-Subfield CharCount	ForEach(RS_Subfield in 10.033)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [4 to 14]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	D	10.040-Subfield CharCount	Length(All(US_Subfields in 10.040)) MO [3 to 10]					B*
			1	D	10.041-Subfield CharCount	Length(US_Subfields:1,2 in 10.041)) MO [1 to 3]					B*

			1	D	10.042-Subfield CharCount	ForEach(RS_Subfield in 10.042)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [3 to 20]
						AND
						Length(US_Subfield:2 in RS_Subfield) MO [4 to 8]
						AND
						Length(US_Subfield:3 in RS_Subfield)) MO [3 to 9]
						AND
						Length(US_Subfield:4 in RS_Subfield)) MO [1 to 256]
						}
											B*

			1	D	10.043-Subfield CharCount	Length(All(US_Subfields in 10.043)) MO [3 to 7]					B*
			1	O	10.044-Subfield CharCount	Length(All(US_Subfields in 10.044)) MO [3 to 11]					B*
			1	D	10.045-Subfield CharCount	ForEach(RS_Subfield in 10.045) { Length(US_Subfield:1,2 in RS_Subfield) EQ 1					B*

						AND
						Length(US_Subfield:3 in RS_Subfield) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}					

			1	O	10.902-Subfield CharCount	ForEach(RS_Subfield in 10.902)
						{
						Length(US_Subfield:1 in RS_Subfield) EQ 15
						AND
						Length(US_Subfields:2,3 in RS_Subfield) MO [1 to 64]
						AND
						Length(US_Subfield:4 in RS_Subfield)) MO [1 to 255]
						}
											B*

			1	O	10.904-Subfield CharCount	Length(All(US_Subfields in 10.904)) MO [1 to 50]					B*

			1	O	10.995-Subfield CharCount	ForEach(RS_Subfield in 10.995)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

			1	O	10.997-Subfield CharCount	ForEach(RS_Subfield in 10.997)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

				O	10.998-Subfield CharCount	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type10-Field Occurrence	Table 53	<Table 53 specifies the Field Occurrence for each field.>	12	-	Type10-Occurrence Zero	Count(10.[015 ,022, 046 to 199,901,905 to 994]) EQ 0					B
			1	M	Type10-Occurrence One	Count(10.[001 to 012, 999]) EQ 1					B
			1	-	Type10-Occurrence One or	Count(10.[013,014,016 to 021,023 to 033,038 to 045, 902 to 904, 995 to 998) LTE 1					B

					Fewer						
Field: 10.001-Record Header Value	8.10.1, Table 53, 7.1	Field 10.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	10.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2				
	8.10.1, C.10.8	The XML name for the Type-10 record is <itl:PackageFacialAndSMTImageRecord>, and its <biom:RecordCategoryCode> element shall have a value of "10".	1	M	NIEM-10.001-Record Header	ForEach(itl:PackageFacialAndSMTImageRecord) { {XElm(biom:RecordCategoryCode)} EQ ASCII(10) }					X
Field: 10.002-Information Designation Character Value	8.10.2, Table 53, 7.3.1	This mandatory field shall be the IDC of this Type-10 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	10.002-IDC	<See Requirement IDs "Field: xx.002-IDC and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2				
Field: 10.003-Image Type Value	8.10.3, Table 53, Table 54	This mandatory field shall be used to indicate the type of image contained in this record. It shall contain a character string from the "Image Code" column of Table 54: Type-10 image types to indicate the appropriate image type.	1	M	10.003-IMT	{10.003} MO [ASCII(SCAR,TATTOO,FACE,MARK,FRONTAL-C,REAR-C,FRONTAL-N,REAR-N,TORSO-BACK,TORSO-FRONT,CONDITION,MISSING,OTHER,CHEST,FEET, HANDS-PALM,HANDS-BACK,GENITALS,BUTTOCKS,RIGHT LEG, LEFT LEG, RIGHT ARM, LEFT ARM)]	t-1				B
Field: 10.004-Originating Agency Value	8.10.4, 7.6	The data content of this field is defined by the user and shall be in accordance with the receiving agency.		M	10.004-ORG	<See Requirement ID "Field: Agency Codes" >	t-2				
Field: 10.005-Photo Capture Date Value	8.10.5, 7.7.2.3	This mandatory field shall contain the date that the image contained in the record was captured.	1	M	10.005-PCD	{10.005} MO [ValidLocalDate]	t-6				T
			1	M	NIEM-10.005-PCD	ForEach(XElm(itl:PackageFacialAndSMTImageRecord)) { {XElm(nc:Date) in XElm(biom:CaptureDate)} MO [NIEM-ValidLocalDate] }	t-6				X
Field: 10.006-Horizontal Line Length Value	8.10.6, Table 53, 7.7.8.1	The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	10.006-HLL	<See Requirement ID "Field: Image HLL Value" >	t-2				
Field: 10.006-Horizontal Line Length	8.10.6, Table 53, 7.7.8.1	<The HLLis verified by checking the image metadata if compression is used.>	2	M	10.006-HLL Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {10.006} EQ {ImageWidth-JPEGB,JPEGL}	t-11				B

Metadata			2	M	10.006-HLL Metadata JP2, JP2L	IF {10.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {10.006} EQ {ImageWidth-JP2,JP2L}	t-11				B
			2	M	10.006-HLL Metadata PNG	IF {10.011} EQ ASCII(PNG) THEN {10.006} EQ {ImageWidth-PNG}	t-11				B
Field: 10.007-Vertical Line Length Value	8.10.7, Table 53, 7.7.8.2	The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	10.007-VLL	<See Requirement ID "Field: Image VLL Value" >	t-2				
Field: 10.007-Vertical Line Length Metadata	8.10.7, Table 53, 7.7.8.2	<The VLLis verified by checking the image metadata if compression is used.>	2	M	10.007-VLL Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {10.007} EQ {ImageHeight-JPEGB,JPEGL}	t-11				B
			2	M	10.007-VLL Metadata JP2, JP2L	IF {10.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {10.007} EQ {ImageHeight-JP2,JP2L}	t-11				B
			2	M	10.007-VLL Metadata PNG	IF {10.011} EQ ASCII(PNG) THEN {10.007} EQ {ImageHeight-PNG}	t-11				B
Field: 10.008-Scale Units Value	8.10.8, Table 53, 7.7.8.3	<Table 53 lists the value constraints for SLC>		M	10.008-SLC	<See Requirement ID "Field: Image SLC Value" >	t-2				
Field: 10.008-Scale Units Metadata	8.10.8, Table 53, 7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and the quotient of THPS/TVPS shall provide the pixel aspect ratio. <The SLC is verified by checking the image metadata if compression is used.>	2	M	10.008-SLC Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {10.008} EQ {SamplingUnits-JPEGB,JPEGL}	t-11				B
				M	10.008-SLC Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	10.008-SLC Metadata PNG	IF {10.011} EQ ASCII(PNG) THEN IF {10.008} EQ 1 OR 2 THEN { SamplingUnits-PNG} EQ 1, ELSE IF {10.008} EQ 0 THEN { SamplingUnits-PNG} EQ 0	t-11				B
Field: 10.009-Transmitted Horizontal Pixel Scale Value	8.10.9, Table 53, 7.7.8.4	<Table 53 lists the value constraints for THPS.>		M	10.009-THPS	<See Requirement ID "Field: Image THPS Value" >	t-2				
Field: 10.009-Transmitted Horizontal Pixel Scale	8.10.9, Table 53, 7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the	2	M	10.009-THPS Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {10.008} EQ 1 OR 2 THEN {10.009} EQ {HorizontalDensity-JPEGB,JPEGL}	t-11				B

Metadata		pixel aspect ratio, up to 5 digits. <The THPS is verified by checking the image metadata if compression is used.>		M	10.009-THPS Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	10.009-THPS Metadata PNG	IF {10.011} EQ ASCII(PNG) AND {10.008} EQ 1 THEN {10.009} EQ {HorizontalDensity-PNG} * 0.0254 (meters/inch), ELSE IF 10.011} EQ ASCII(PNG) AND {10.008} EQ 2 THEN {10.009} EQ {HorizontalDensity-PNG} * 0.01 (meters/cm)	t-11				B
			2	M	10.009-THPS Aspect Ratio Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {10.008} NEQ 1 OR 2 THEN {10.009}/{10.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11				B
				M	10.009-THPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	10.009-THPS Aspect Ratio Metadata PNG	IF {10.011} EQ ASCII(PNG) AND {10.008} NEQ 1 OR 2 THEN {10.009}/{10.010} EQ {HorizontalDensity-PNG} / {VerticalDensity-PNG}	t-11				B
Field: 10.010-Transmitted Vertical Pixel Scale Value	8.10.10, Table 53, 7.7.8.5	<Table 53 lists the value constraints for TVPS.>		M	10.010-TVPS	<See Requirement ID "Field: Image TVPS Value" >	t-2				
Field: 10.010-Transmitted Vertical Pixel Scale Metadata	8.10.10, Table 53, 7.7.8.5	This is the integer pixel density used in the Vertical direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the Vertical component of the pixel aspect ratio, up to 5 digits. <The TVPS is verified by checking the image metadata if compression is used.>	2	M	10.010-TVPS Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {10.008} EQ 1 OR 2 THEN {10.010} EQ {VerticalDensity-JPEGB,JPEGL}	t-11				B
					10.010-TVPS Metadata JP2, JP2L	<Not Tested.>	t-12				B

			2	M	10.010-TVPS Metadata PNG	IF {10.011} EQ ASCII(PNG) AND {10.008} EQ 1 THEN {10.010} EQ {VerticalDensity-PNG} * 0.0254 (meters/inch), ELSE IF 10.011} EQ ASCII(PNG) AND {10.008} EQ 2 THEN {10.010} EQ {VerticalDensity-PNG} * 0.01 (meters/cm)	t-11				B
			2	M	10.010-TVPS Aspect Ratio Metadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {10.008} NEQ 1 OR 2 THEN {10.009}/{10.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11				B
				M	10.010-TVPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	10.010-TVPS Aspect Ratio Metadata PNG	IF {10.011} EQ ASCII(PNG) AND {10.008} NEQ 1 OR 2 THEN {10.009}/{10.010} EQ { HorizontalDensity - PNG} / {VerticalDensity-PNG}	t-11				B
Field: 10.011-Compression Algorithm Value	8.10.11, Table 53, 7.7.9.3, 7.7.9.4	For non-facial images conveyed in Record Type-10 Field 10.011: Compression algorithm / CGA may be set to any value in Table 12, except WSQ20.		M	10.011-CGA	<See Requirement ID: "Field: Type10 Compression">	t-2, t-98				
Field: 10.011-Compression Algorithm Metadata	8.10.11, Table 53	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	10.011-CGAMetadata JPEGB, JPEGL	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(SOI -JPEG,JPEGL)	t-11				B
			2	M	10.011-CGA Metadata JP2, JP2L	IF {10.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox)	t-11				B
			2	M	10.011-CGA Metadata PNG	IF {10.011} EQ ASCII(PNG) THEN Present(PNGSig)					B
Field: 10.012-Color Space Value	8.10.12, Table 53, 7.7.10	Table 13 lists the codes and their descriptions for each of the available color spaces used within this standard. All other color spaces are to be marked as		M	10.012-CSP	<See Requirement ID: "Field: Image CSP Value>	t-2				

		undefined.										
Field: 10.013-Subject Acquisition Profile Value	8.10.13, Table 53, 7.7.5.1	<Table 53 lists the value constraints for SAP.>		D	10.013-SAP	<See Requirement ID: "Field: SAP Values">	t-2				
Field: 10.013-Subject Acquisition Profile Conditional	8.10.13, 7.7.5	The Subject Acquisition Profile (SAP) is a mandatory field when Field 10.003: Image type / IMT contains "FACE". Otherwise, it shall not be entered.		D	10.013-SAP Conditional	<See Requirement ID: "Field: SAP Conditional">	t-2				
Field: 10.014-Face Image Position Value	8.10.14, Table 53	<Table 53 lists the value constraints for FIP.>	2	M ⇑	10.014-FIP-Value Subfield 1	{US_Subfield:1 in 10.014} GTE 1 AND LTE {10.006}					B*
			2	M ⇑	10.014-FIP-Value Subfield 2	{US_Subfield:2 in 10.014} GTE 1 AND LTE {10.006}					B*
			2	M ⇑	10.014-FIP-Value Subfield 3	{US_Subfield:3 in 10.014)} GTE 1 AND LTE {10.007}					B*
			2	M ⇑	10.014-FIP-Value Subfield 4	{US_Subfield:4 in 10.014)} GT {US_Subfield:3 in 10.014} AND LTE {10.007}					B*
			2	O ⇑	10.014-FIP-Value Subfield 5	{US_Subfield:5 in 10.014)} MO [ASCII(S,H,F,N,X)]					B*
Field: 10.014- Face Image Position Conditional	8.10.14	This field is only appropriate for images that do not comply with SAP Levels 30, 40, 50 or 51.		D	10.014-FIP Conditional	<See Requirement ID: "Field: 10.014-FIP CondCode Dependent">	t-2				
Field: 10.015-Reserved	Table 53	Reserved for future useonly by ANSI/NIST-ITL.		-	10.015-Reserved	<See Requirement ID: "Field: Type10-CondCode>.	t-2				
Field: 10.016-Scanned Horizontal Pixel Scale Value	8.10.15, Table 53	<Table 53 lists the value constraints for SHPS.>		O	10.016-SHPS	<See Requirement ID: "Field: Image SHPS Value">	t-2				
Field: 10.017-Scanned Verticall Pixel Scale	8.10.15, Table 53	<Table 53 lists the value constraints for SVPS.>		O	10.017-SVPS	<See Requirement ID: "Field: Image SVPS Value">	t-2				

Value											
Field: 10.018- Distortion Value	8.10.17, Table 53	<Table 53 lists the value constraints for DIST.>	1	M ⇑	10.018- DIST- Value Subfield 1	{US_Subfield:1 in 10.018} MO [ASCII(Barrel, Inflated, Pincushion)]					B*
			1	M ⇑	10.018- DIST- Value Subfield 2	{US_Subfield:2 in 10.018} EQ ASCII(E) OR ASCII(C)					B*
			1	M ⇑	10.018- DIST- Value Subfield 3	{US_Subfield:3 in 10.018)} MO [ASCII(Mild,Moderate,Severe)]					B*
Field: 10.019- Lighting Artifacts Value	8.10.18, Table 53	<Table 53 lists the value constraints for LAF.>	1	D	10.019-LAF	{10.019} MO [ASCII(F,H,R)]					B
Field: 10.020- Subject Pose Value	8.10.19, Table 56	When included, this field shall contain one character code selected from Table 56 to describe the pose of the subject.	1	D	10.020-POS	{10.020} MO [ASCII(F,R,L,A,D)]					B
Field: YAW POA Opposite	8.10.19	Note that the offset angle in Field 10.021: Pose offset angle / POA is opposite from the yaw angle in Field 10.025 as indicated by a minus sign.	2	D	Fields- YAW POA Opposite	IF Present(US_Subfield:4 in 10.025) THEN {10.021} EQ { US_Subfield:4 in 10.025} * -1					B*
Field: 10.021- Pose Offset Angle Value	8.10.20, Table 53	When included, this field shall contain one character code selected from Table 56 to describe the pose of the subject.	1	D	10.021- POA	{10.021} GTE -180 AND LTE 180					B
Field: 10.022- Deprecated	Table 53	Not to be used in new transactions.		-	10.022- Deprecated	<See Requirement ID: "Field: Type10-CondCode>.	t-2				
Field: 10.023- Photo Acquisition Source Value	8.10.21, Table 53, Table 57	When included, the first information item in this field shall contain an attribute code selected from Table 57 to describe the source of captured image data.	1	M ⇑	10.023-PAS	{US_Subfield:1 in 10.023} MO [ASCII(UNSPECIFIED, UNKOWN PHOTO, DIGITAL CAMERA, SCANNER, UNKNOWN VIDEO, ANALOG VIDEO, DIGITAL VIDEO, VENDOR, TYPE20)]					B*
Field: 10.023- Photo Acquisition Source VENDOR	8.10.21, Table 53, Table 57	When "VENDOR" is specified, a second information item may be entered with up to 64 characters to describe the specific source.		D	10.023-PAS VENDOR	<See Requirement ID: "Field: Type10-Subfield Occurrence" and "Field: Type10-Subfield CharCount.>	t-2				
Field: 10.023- Photo Acquisition	8.10.21, Table 53, Table 57	When "Type-20" is selected, then Field 10.997: Source representation / SOR shall be contained in this record, and the corresponding Record Type-20 shall be	2	D	10.023-PAS Type-20	IF {US_Subfield:1 in 10.023} EQ ASCII(TYPE20) THEN Present(10.997) AND Present(Record ST Type(Record) EQ 20)					B*

Source Type-20		included in the transaction.										
Field: 10.024-Subject Quality Scores Type-20	8.10.22, Table 53, 7.7.7	<Table 53 lists the value constraints for SQS.>		D	10.024-SQS	<See Requirement ID: "Field: Sample Quality Subfield 1" and "Field: Sample Quality Subfield 2" and "Field: Sample Quality Subfield 3".>	t-2					
Field: 10.025-Subject Pose Angles Value	8.10.23, Table 53	<Table 53 lists the value constraints for SPA.>	1	M ⇑	10.025-SPA- Value Subfield 1	{US_Subfield:1 in 10.025} GTE -180 AND LTE 180						B*
			1	M ⇑	10.025-SPA- Value Subfield 2	{US_Subfield:2 in 10.025} GTE -90 AND LTE 90						B*
			1	M ⇑	10.025-SPA- Value Subfield 3	{US_Subfield:3 in 10.025)} GTE -180 AND LTE 180						B*
			1	O ⇑	10.025-SPA- Value Subfield 4 to 6	{US_Subfields:4 to 6 in 10.025)} GTE 0 AND LTE 90						B*
Field: 10.026-Subject Facial Description Value	8.10.24, Table 53, Table 58	The value should be selected from the "Attribute code" column of Table 58.		D	10.026-SXS	<Cannot check for values because the standard allows user-defined Alphabetic Text. See Requirement ID: "Field: Type10-Subfield CharType" and "Field: Type10-Subfield CharCount">	t-2					
Field: 10.027-Subject Eye Color Value	8.10.25, Table 53, Table 14	<Table 53 lists the value constraints for SEC.>		D	10.027-SEC	<See Requirement ID: "Field: Image ECL Value">.	t-2					
Field: 10.028-Subject Hair Color Value	8.10.26, Table 53, Table 59	<Table 53 lists the value constraints for SHC.> When the subject is predominantly bald, but hair color is discernible, then the appropriate hair color attribute code shall follow "BAL" in a second entry. For streaked hair, use "STR" in the first entry; use the second entry to describe the principal color of the hair.	1	M ⇑	10.028-SHC	{US_Subfield:1 in 10.028} MO [ASCII(XXX, BAL, BLK, BLN, BRO, GRY, RED, SDY, WHI, BLU, GRN, ONG, PNK, PLE, STR)] AND {US_Subfield:2 in 10.028} MO [ASCII(XXX, BLK, BLN, BRO, GRY, RED, SDY, WHI, BLU, GRN, ONG, PNK, PLE)]						B*
Field: 10.029- 2D Facial Feature Points Value	8.10.27, Table 53	<Table 53 lists the value constraints for FFP.> The first information item, feature point type / FPT is a one character value. It is	1	M ⇑	10.029-FFP-Value Subfield 1	ForEach(RS_Subfield in 10.029) { {US_Subfield:1 in RS_Subfield} EQ 1 OR 2 }						B*
			2	M	10.029-FFP-	ForEach(RS_Subfield in 10.029)						B*

		mandatory. It shall be either
		1 = Denoting an MPEG4 Feature point.
		2 = Anthropometric landmark. (This is new to this version).
		
		The second information item, feature point code / FPC is 3 to 5 characters. If FPT is 1, this information item shall be "A.B" with A and B defined in Section 8.10.27.1 and illustrated in Figure 12. If FPT is 2, the codes are entered as shown in the "Feature Point ID" column of Table 61. This is one to four alphabetic characters.
				⇑	Value Subfield 2	{
						IF({US_Subfield:1 in RS_Subfield} EQ 1 THEN
						
						{US_Subfield:2 in RS_Subfield} MO [Figure 11, Figure 12]
						
						ELSE
						
						{US_Subfield:2 in RS_Subfield} MO [Table 61]
						
						}					

			1	M ⇑	10.029-FFP-Value Subfield 3	ForEach(RS_Subfield in 10.029)
						{
						{US_Subfield:3 in RS_Subfield} GTE 1 AND LTE {10.006}
						}
											B*

			1	M ⇑	10.029-FFP-Value Subfield 4	ForEach(RS_Subfield in 10.029)
						{
						{US_Subfield:4 in RS_Subfield} GTE 1 AND LTE {10.007}
						}
											B*

Field: 10.030-Device Monitoring Mode Value	8.10.28, Table 53,	<Table 53 lists the value constraints for DMM.>		O	10.030-DMM	<See Requirement ID: "Field: Device Monitoring">.	t-2				
Field: 10.031-Tiered Markup Collection Value	8.10.29, Table 53,	<Table 53 lists the value constraints for TMC.>	1	D	10.031-TMC	{10.031} MO [1 to 5, 100 to 999]					B

Field: 10.032- 3D Facial Feature Points Value	8.10.30, Table 53	<Table 53 lists the value constraints for 3DF.>
		
		The first information item, feature point type / FPT is a one character value. It is mandatory. It shall be either
		1 = Denoting an MPEG4 Feature point, but using a Z coordinate
		2 = Anthropometric landmark, with a Z coordinate.
		
		The second information item, feature point code / FPC is 3 to 5 characters. If FPT is 1, this information item shall be "A.B" with A and B defined in
			1	M ⇑	10.032-3DF- Value Subfield 1	ForEach(RS_Subfield in 10.032)
						{
						{US_Subfield:1 in RS_Subfield} EQ 1 OR 2
						}
											B*

			2	M ⇑	10.032-3DF- Value Subfield 2	ForEach(RS_Subfield in 10.032)
						{
						IF({US_Subfield:1 in RS_Subfield} EQ 1 THEN
						
						{US_Subfield:2 in RS_Subfield} MO [Figure 11, Figure 12]
						
						ELSE
						
						{US_Subfield:2 in RS_Subfield} MO [Table 61]
											B*

		Section 8.10.27.1 and illustrated in Figure 12. If FPT is 2, the codes are entered as shown in the "Feature Point ID" column of Table 61. This is one to four alphabetic characters.				}						
			1	M ⇑	10.032-3DF- Value Subfield 3	ForEach(RS_Subfield in 10.032) { {US_Subfield:3 in RS_Subfield} GTE 1 AND LTE {10.006} }						B*
			1	M ⇑	10.032-3DF- Value Subfield 4	ForEach(RS_Subfield in 10.032) { {US_Subfield:4 in RS_Subfield} GTE 1 AND LTE {10.007} }						B*
			1	M ⇑	10.032-3DF- Value Subfield 5	ForEach(RS_Subfield in 10.032) { {US_Subfield:5 in RS_Subfield} GTE 1 AND LTE 65534 }						B*
Field: 10.033-Feature Contours Value	8.10.31, Table 53. Table 15	<Table 53 lists the value constraints for3DF.>	1	M ⇑	10.033-FEC- Value Subfield 1	ForEach(RS_Subfield in 10.033) { {US_Subfield:1 in RS_Subfield} MO [ASCII(eyetop, eyebottom, upperliptop, upperlipbottom, lowerliptop, lowerlipbottom, rightnostril, leftnostril, lefteyebrow, righteyebrow, chin, faceoutline] }						B*
			1	M ⇑	10.033-FEC- Value Subfield 2	ForEach(RS_Subfield in 10.033) { {US_Subfield:2 in RS_Subfield} MO [3 to 99] }						B*
			1	M ⇑	10.033-FEC- Value Subfield Pair	ForEach(RS_Subfield in 10.033) { For(X EQ 3 to {US_Subfield:2 in RS_Subfield}) { IF X MOD 2 EQ 0 {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {10.007} ELSE {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {10.006} } }						B*
Field: 10.034 to 10.037-Reserved	Table 53	Reserved for future useonly by ANSI/NIST-ITL.		-	10.034 to 10.037-Reserved	<See Requirement ID: "Field: Type10-CondCode>.	t-2					
Field: 10.038-Comment	8.10.32, 7.4.4 Table 53	<Table 53 lists the value constraints for COM.>		O	10.038-COM	<See Requirement ID: "Field: Comment">.	t-2					

Value											
Field: 10.039- Type-10 Reference Number Value	8.10.33, Table 53	<Table 53 lists the value constraints for T10.>	1	D	10.039-T10	{10.039} MO [1 to 255]					B

Field: 10.040- NCIC SMT Code Value	8.10.34, Table 53, Table 98	<Table 53 lists the value constraints for SMT.>	1	D	10.040-T10	ForEach(US_Subfield in 10.040)
						{
						{US_Subfield} MO [Table 98]
						}
											B*

Field: 10.041- SMT Size Value	8.10.35, Table 53	<Table 53 lists the value constraints for SMS.>	1	D	10.041-SMS	ForEach(US_Subfield in 10.041)
						{
						{US_Subfield} GTE 1 AND MO[Integers]
						}
											B*

Field: 10.042- SMT Descriptors Value	8.10.36, Table 53, Table 54, Table 63	<Table 53 lists the value constraints for SMD.>	1	M ⇑	10.042-SMD- Value Subfield 1	ForEach(RS_Subfield in 10.042)
						{
						{US_Subfield:1 in RS_Subfield} MO [ASCII(SCAR,PIERCING, TATTOO, CHEMICAL, BRANDED, CUT)]
						}
											B*

			1	D	10.042-SMD- Value Subfield 2	ForEach(RS_Subfield in 10.042)
						{
						{US_Subfield:2 in RS_Subfield} MO [ASCII(Human, Animal, Plant, Flag, Object, Abstract, Symbol, Other)]
						}
											B*

			2	D	10.042-SMD- Value Subfield 3	ForEach(RS_Subfield in 10.042)
						{
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(HUMAN)
						THEN
						{US_Subfield:3 in RS_Subfield} MO [ASCII(MFACE,FFACE, ABFACE, MBODY, FBODY, ABBODY, ROLES, SPORT, MBPART, FBPART, ABBPART, MHUMAN, SKULL)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(ANIMAL)
						THEN
						{US_Subfield:3 in RS_Subfield} MO [ASCII(CAT, DOG, DOMESTIC, VICIOUS, HORSE, WILD, SNAKE, DRAGON, BIRD, INSECT, ABSTRACT, PARTS, MANIMAL)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ
											B*

						ASCII(PLANT)
						THEN
						{US_Subfield:3 in RS_Subfield} MO
						[ASCII(NARCOTICS, REDFL, BLUEFL, YELFL, DRAW, ROSE, TULIP, LILY, MPLANT)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(FLAG)
						THEN
						{US_Subfield:3 in RS_Subfield} MO [ASCII(USA, STATE, NAZI, CONFED, BRIT, MFLAG)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(Object)
						THEN
						{US_Subfield:3 in RS_Subfield} MO [ASCII(FIRE, WEAP,PLANE,VESSEL,TRAIN,VEHICLE,MYTH,SPORT,NATURE, MOBJECTS)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(Abstract)
						THEN
						{US_Subfield:3 in RS_Subfield} MO
						[ASCII(FIGURE, SLEEVE, BRACE, ANKLET, NECKLC, SHIRT, BODBND, HEDBND, MABSTRACT)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(Symbol)
						THEN
						{US_Subfield:3 in RS_Subfield} MO
						[ASCII(NATION, POLITIC, MILITARY, FRATERNAL, PROFESS, GANG, MSYMBOLS)]
						ELSE
						IF {US_Subfield:2 in RS_Subfield} EQ ASCII(OTHER)
						THEN
						{US_Subfield:3 in RS_Subfield} MO
						[ASCII(WORDING, FREEFRM, MISC)]
						}					

			1	D	10.042-SMD- Value Subfield 4	TRUE					B*
Field: 10.042- SMT Descriptors Subfields Dependent	8.10.36, Table 53	…does not apply to scars and marks.		D	10.042-Subfields Dependent	<See Requirement ID: "Field: Type10-Subfield Occurrence" >	t-2				
Field:	8.10.37,	<Table 53 lists the value constraints for	1	-	10.043-	ForEach(US_Subfield in 10.043)					B*

10.043-Tattoo Color Value	Table 53	COL.>			COL- Value	{
						{US_Subfield} MO [BLACK, BROWN, GRAY, BLUE, GREEN, ORANGE, PURPLE, RED, YELLOW, WHITE, MULTI, OUTLINE]
						}					

Field: 10.044-Image Transform Value	8.10.38, Table 53, Table 65	<Table 53 lists the value constraints for ITX.>	1	M ⇑	10.044-ITX-Value	ForEach(US_Subfield in 10.044)
						{
						{US_Subfield} MO [AGE, AXIS, COLORSHIFT, CONTRAST, CROP, DIST, DOWNSAMPLE, GRAY, ILLUM, IMGFUSE, INTERPOLATE, MULTCOMP, MULTIVIEW, POSE, ROTATE, SNIR, SUPERRES, WHITE]
						}
											B*

Field: 10.045-Occlusions Value	8.10.30, Table 17, Table 18	<Table 53 lists the value constraints for OCC.>	1	M ⇑	10.045-OCC- Value Subfield 1	ForEach(RS_Subfield in 10.045)
						{
						{US_Subfield:1 in RS_Subfield} MO [ASCII(T, I, L, S)]
						}
											B*

			1	M ⇑	10.045-OCC- Value Subfield 2	ForEach(RS_Subfield in 10.045)
						{
						{US_Subfield:2 in RS_Subfield} MO [ASCII(H,S,C,R,O)]
						}
											B*

			1	M ⇑	10.045-OCC- Value Subfield 3	ForEach(RS_Subfield in 10.045)
						{
						{US_Subfield:3 in RS_Subfield} GTE 2 AND LTE 99
						}
											B*

			1	M ⇑	10.045-OCC- Value Subfield Pairs	ForEach(RS_Subfield in 10.045)
						{
						For(X EQ 1 to (US_Subfield:3 in RS_Subfield})
						{
						IF X MOD 2 EQ 0
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {10.007}
						ELSE
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {10.006}
						}
						}
											B*

Field: 10.046 to 10.199-Reserved	Table 53	Reserved for future useonly by ANSI/NIST-ITL.		-	10.046 to 10.199-Reserved	<See Requirement ID: "Field: Type10-CondCode>.	t-2				
Field: 10.200 to 10.900-User Defined	Table 53	User Defined Fields	-	-	10.200 to 10.900-User Defined	TRUE					B

Field: 10.901 Reserved	Table 53	Reserved for future useonly by ANSI/NIST-ITL.		-	10.901-Reserved	<See Requirement ID: "Field: Type10-CondCode>.	t-2					
Field: 10.902-Annotated Information Value	8.10.41, Table 53	This is an optional field, listing the operations performed on the original source in order to prepare it for inclusion in a biometric record type. See Section 7.4.1.		O	10.902-ANN-Value	<See Requirement ID: "Field: xx.902-ANN" >.	t-2					
Field: 10.903-Device Unique Identifier Value	8.10.42, Table 53	This is an optional field. See Section 7.7.1.1.		O	10.903-DUI Value	<See Requirement ID: "Field: Device ID" >.	t-2					
Field: 10.904-Make/Model/Serial Number Value	8.10.43, Table 53	This is an optional field. See Section 7.7.1.2.		O	10.904-MMS Value	<See Requirement ID: "Field: Make Model" >.	t-2					
Field: 10.905 to 10.994-Reserved	Table 53	Reserved for future useonly by ANSI/NIST-ITL.		-	10.905 to 10.994-Reserved	<See Requirement ID: "Field: Type10-CondCode>.	t-2					
Field: 10.995-Associated Context Value	8.10.44, Table 53	See Section 7.3.3		O	10.995-ASC Value	<See Requirement IDs: "Field: xx.995-ASC" and "Field: xx.995-ASC-ACN" and "Field: xx.995-ASC-ASP">.	t-2					
Field: 10.996-Hash Value	8.10.45, Table 53	See Section 7.5.2		O	10.996-HAS Value	<See Requirement ID: "Field: HAS">	t-2					
Field: 10.997-Source Representation Value	8.10.46, Table 53	See Section 7.3.2		O	10.997-SOR Value	<See Requirement IDs: "Field: xx.997-SOR" and "Field: xx.997-SOR-SRN" and "Field: xx.997-SOR-RSP">.	t-2					
Field: 10.998-Geographic Sample Acquisition Location Value	8.10.47, Table 53	See Section 7.7.3		O	10.998-GEO Value	<See Requirement IDs: "Field: Geographic", "Field: Geographic-Conditional", "Field: Geographic-Subfield 1" through "Field: Geographic-Values-SubField 15" >.	t-2					
Field: 10.999-Image Data Valid	8.10.48, 7.7.9.4, Table 53	This is a mandatory field contains the image. For non-facial images conveyed in Record	2	M	10.999-DATA Uncompressed Valid	IF {10.011} EQ ASCII(NONE) THEN Length(10.999) EQ 10.006} * {10.007}						B

		Type-10, Field 10.011: Compression algorithm/ CGA may be set to any value in Table 12, except WSQ20. <The image metadata is checked for validity.>	2	M	10.999-DATA JPEG-JPEGL Valid	IF {10.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(JFIF, SOI-JPEGB,JPEGL, SOF-JPEGB,JPEGL, EOI-JPEG, JPEGL)	t-11				B
			2	M	10.999-DATA JP2-JP2L Valid	IF {10.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox, HeadBox, ImgBox)	t-11				B
			2	M	10.999-DATA PNG Valid	IF {10.011} EQ ASCII(PNG) THEN Present(PNGSig, IHDR, IDAT, IEND)					B

Table C.10 - Assertions for Record Type 11 - Reserved for Voice

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.11: Record Type-11: Reserved for voice											
Transaction: Type11 Zero Occurrences	8.11	Reserved for voice. A committee was established at the second Workshop for this version of the standard, held March 1-3, 2011 to develop specifications for this record type.		M	Type11-Zero Occurrences	<See Requirement ID "Transaction: Reserved Records">	t-2				

Table C.11 - Assertions for Record Type 12 - Reserved for Dental Records

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.12: Record Type-12: Reserved for dental records											
Transaction: Type12 Zero Occurrences	8.12	Reserved for dental records. A committee was established at the second Workshop for this version of the standard, held March 1-3, 2011 to develop specifications for this record type.		M	Type12-Zero Occurrences	<See Requirement ID "Transaction: Reserved Records">	t-2				

Table C.12 - Assertions for Record Type 13 - Friction-Ridge Latent Image Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.13: Record Type-13: Friction-ridge latent image record											
Field: Type13-Subfield Occurenece	Table 66	<Table 66 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	-	Type13-Subfields Zero	Count(Subfields in 13.[001 to 003, 005 to 012, 016, 017, 020, 903, 996, 999]) EQ 0					T
			1	M	13.004-Subfields	Count(US_Subfields in 13.004) EQ 1 OR 2					T
			1	M	13.013-Subfields	Count(US_Subfields in 13.013) MO [1 to 6]					T

			1	D	13.014-Subfields	Count(RS_Subfields in 13.014) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 13.014)
						{
						Count(US_Subfields in RS_Subfield) EQ 2
						}
											T

				D	13.015-Subfields	<See Requirement ID: "Field: PPC-Subfield Occurrences">	t-2				

			1	O	13.024-Subfields	Count(RS_Subfields in 13.024) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 13.024)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	13.902-Subfields	Count (RS_Subfields in 13.902) GTE 1
						
						AND
						
						ForEach(RS_Subfield in 13.902)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	13.904-	Count(US_Subfields in 13.904) EQ 3					T

					Subfields						

			1	O	13.995-Subfields	Count(RS_Subfields in 13.995) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 13.995)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

			1	O	13.997-Subfields	Count(RS_Subfields in 13.997) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 13.997)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

				O	13.998-Subfields	<See Requirement ID: "Field: Geographic-Conditional">	t-2				
Field: Type13-CondCode	Table 66	<Table 66 specifies the Condition Code for each field.>	1	-	Type13-CondCode	Present(13.001 to 13.013, 13.999) AND NOT Present(13.018, 13.019, 13.021 to 13.023, 13.025 to 13.199, 13.901, 13.905 to 13.994)					B
Field: 13.014-Search Position Descriptors Dependent	Table 66, 8.13.14	This field shall be present if and only if the finger position code "19" appears in Field 13.013: Friction ridge generalized position / FGP.		D	13.014-CondCode Dependent	<See Requirement ID: "Field: SPD,PPC Conditional">	t-2				
Field: 13.015-Print Position Coordinates Dependent	Table 53, 8.13.14	This field may be present if and only if the finger position code "19" appears in Field 13.013: Friction ridge generalized position / FGP.		D	13.015-CondCode Dependent	<See Requirement ID: "Field: SPD,PPC Conditional">	t-2				
Field: Type13-CharType	8.13, Table 66	<Table 66 specifies the Character Type for each field that contains no subfields. Note that even though some Character Types are listed as U (user defined), they may still have character type limitations defined in the standard text. >	1	-	Type13-CharType N	Bytes(13.[001,002,003, 005 to 010, 012, 016, 017]) MO [0x30 to 0x39]					B
			1	-	Type13-CharType A	Bytes(13.011) MO [0x41 to 0x5A, 0x61 to 0x7A]					B
			1	-	Type13-CharType U	Present(Bytes(13.020)					B
			1	O	13.903-CharType Text ANS	Bytes(10.903) MO [0x20, 0x7E]					B

			1	O	13.996-CharType H	Bytes(10.996) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]					B
Field: Type13-Subfield CharType	8.13, Table 66	<Table 66 specifies the Character Type for each subfield.>	1	M	13.004-Subfield CharType U	Present(Bytes(US_Subfields:1,2 in 13.004)					B*
			1	M	13.013-Subfield CharType N	Bytes(All(US_Subfields in 13.013)) MO [0x30 to 0x39]					B*

			1	D	13.014-Subfield CharType AN	ForEach(RS_Subfield in 13.014)
						{
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfield:2 in RS_Subfield) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]
						}
											B*

			1	D	13.015-Subfield CharType AN	ForEach(RS_Subfield in 13.015)
						{
						Bytes(US_Subfields:1,2 in RS_Subfield)) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]
						AND
						Bytes(US_Subfields:3 to 6 in RS_Subfield)) MO [0x30 to 0x39]
						}
											B*

			1	O	13.024-Subfield CharType HN	ForEach(RS_Subfield in 13.024)
						{
						Bytes(US_Subfields:1,2,4 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:3 in RS_Subfield)) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	O	13.902-Subfield CharType ANU	ForEach(RS_Subfield in 13.902)
						{
						Present(Bytes(US_Subfields:2 to 4 in RS_Subfield))
						AND
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39, 0x5A]
						}
											B*

			1	O	13.904-Subfield CharType U	Present(Bytes(All(US_Subfields in 13.904)))					B*
			1	O	13.995-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 13.995)) MO [0x30 to 0x39]					B*

			1	O	13.997-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 13.997)) MO [0x30 to 0x39]						B*
				O	13.998-Subfield CharType ANSU	<See Requirement ID: "Field: Geographic">	t-2					
Field: Type13-CharCount	Table 66	<Table 66 specifies the Character Count for each field that contains no subfields.>	1	M	13.001-CharCount	DataLength(13.001) GTE 1						B
			1	M	13.002-CharCount	DataLength(13.002) EQ 1 OR 2						B
			1	M	13.003-CharCount	DataLength(13.003) EQ 1 OR 2						B
			1	M	13.005-CharCount	DataLength(13.005) EQ 8						B
			1	M	13.006-CharCount	DataLength(13.006) MO [2 to 5]						B
			1	M	13.007-CharCount	DataLength(13.007) MO [2 to 5]						B
			1	M	13.008-CharCount	DataLength(13.008) EQ 1						B
			1	M	13.009-CharCount	DataLength(13.009) MO [1 to 5]						B
			1	M	13.010-CharCount	DataLength(13.010) MO [1 to 5]						B
			1	M	13.011-CharCount	DataLength(13.011) MO [3 to 5]						B
			1	M	13.012-CharCount	DataLength(13.012) EQ 1 OR 2						B
			1	O	13.016-CharCount	DataLength(13.016) MO [1 to 4]						B
			1	O	13.017-CharCount	DataLength(13.017) MO [1 to 4]						B
			1	O	13.020-CharCount	DataLength(13.020) MO [1 to 126]						B
			1	O	13.903-CharCount	DataLength(13.903) MO [13 to 16]						B
			1	O	13.996-CharCount	DataLength(13.995) EQ 64						B
			1	M	13.999-CharCount	DataLength(13.999) GTE 1						B
Field: Type13-	Table 66	<Table 66 specifies the Character Count for each subfield.>	2	M	13.004-Subfield	Length(All(US_Subfields in 13.004)) GTE 1						B*

Subfield CharCount					CharCount						
			2	M	13.013-Subfield CharCount	Length(All(US_Subfields in 13.013)) EQ 1 OR 2					B*

			1	D	13.014-Subfield CharCount	ForEach(RS_Subfield in 13.014)
						{
						Length(US_Subfield:1 in RS_Subfield) EQ 1 OR 2
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 3
						}
											B*

			1	D	13.015-Subfield CharCount	ForEach(RS_Subfield in 13.015)
						{
						Length(US_Subfields:1,2 in RS_Subfield)) EQ 2 OR 3
						AND
						Length(US_Subfields:3 to 6 in RS_Subfield)) MO [1 to 5]
						}
											B*

			1	O	13.024-Subfield CharCount	ForEach(RS_Subfield in 13.024)
						{
						Length(US_Subfield:1 in RS_Subfield)) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield)) MO [1 to 3]
						AND
						Length(US_Subfields:3 in RS_Subfield)) EQ 4
						AND
						Length(US_Subfields:4 in RS_Subfield)) MO [1 to 5]
						}
											B*

			1	O	13.902-Subfield CharCount	ForEach(RS_Subfield in 13.902)
						{
						Length(US_Subfield:1 in RS_Subfield) EQ 15
						AND
						Length(US_Subfields:2,3 in RS_Subfield) MO [1 to 64]
						AND
						Length(US_Subfield:4 in RS_Subfield)) MO [1 to 255]
						}
											B*

			1	O	13.904-Subfield CharCount	Length(All(US_Subfields in 13.904)) MO [1 to 50]					B*
			1	O	13.995-	ForEach(RS_Subfield in 13.995)					B*

					Subfield CharCount	{ Length(US_Subfield:1 in RS_Subfield) MO [1 to 3] AND Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2 }						
			1	O	13.997-Subfield CharCount	ForEach(RS_Subfield in 13.997) { Length(US_Subfield:2 in RS_Subfield) MO [1 to 3] AND Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2 }						B*
				O	13.998-Subfield CharCount	<See Requirement ID: "Field: Geographic">	t-2					
Field: Type13-Field Occurrence	Table 66	<Table 66 specifies the Field Occurrence for each field.>	1	-	Type13-Occurrence Zero	Count(13.[016, 017, 021 to 023, 025 to 199,901,905 to 994]) EQ 0						B
			1	M	Type13-Occurrence One	Count(13.[001 to 013, 999]) EQ 1						B
			1	-	Type13-Occurrence One or Fewer	Count(13.[014 to 017,020, ,024, 902 to 904, 995 to 998) LTE 1						B
Field: 13.001-Record Header Value	8.13.1, Table 66, 7.1	Field 13.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	13.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2					
	8.13.1, C.10.11	The XML name for the Type-13 record is <itl:PackageLatentImageRecord>, and its <biom:RecordCategoryCode> element shall have a value of "13".	1	M	NIEM-13.001-Record Header	ForEach(itl:PackageLatentImageRecord) { {XElm(biom:RecordCategoryCode)} EQ ASCII(13) }						X
Field: 13.002-Information Designation Character Value	8.13.2, Table 66, 7.3.1	This mandatory field shall be the IDC of this Type-13 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	13.002-IDC	<See Requirement IDs "Field: xx.002-IDC and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2					
Field: 13.003-Impression Type Value	8.13.3, Table 66, 7.7.4.1	This mandatory field shall indicate the manner by which the latent print was obtained. See Section 7.7.4.1 for details. Valid values are 4 through 7, 12 through 15 and 32 through 39.	1	M	13.003-IMP	{13.003} MO [4 to 7, 12 to 15, 32 to 39]						B
Field: 13.004-	8.13.4, 7.6	This is a mandatory field. See Section 7.6 for details.		M	13.004-ORG	<See Requirement ID "Field: Agency Codes" >	t-2					

Originating Agency Value												
Field: 13.005-Latent Capture Date Value	8.13.5, 7.7.2.3	This mandatory field shall contain the date that the latent biometric data contained in the record was captured.	1	M	13.005-LCD	{13.005} MO [ValidLocalDate]	t-6				T
			1	M	NIEM-13.005-LCD	ForEach(XElm(itl:PackageLatentImageRecord)) { {XElm(nc:Date) in XElm(biom:CaptureDate)} MO [NIEM-ValidLocalDate] }	t-6				X
Field: 13.006-Horizontal Line Length Value	8.13.6, Table 66, 7.7.8.1	The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	13.006-HLL	<See Requirement ID "Field: Image HLL Value" >	t-2				
Field: 13.006-Horizontal Line Length Metadata	8.13.6, Table 66, 7.7.8.1	<The HLL is verified by checking the image metadata if compression is used.>	2	M	13.006-HLL Metadata JPEGL	IF {13.011} EQ ASCII(JPEGL) THEN {13.006} EQ {ImageWidth-JPEGB,JPEGL}	t-11				B
			2	M	13.006-HLL Metadata JP2L	IF {13.011} EQ ASCII(JP2L) THEN {13.006} EQ {ImageWidth-JP2,JP2L}	t-11				B
			2	M	13.006-HLL Metadata PNG	IF {13.011} EQ ASCII(PNG) THEN {13.006} EQ {ImageWidth-PNG}	t-11				B
			2	M	13.006-HLL Metadata WSQ	IF {13.011} EQ ASCII(WSQ20) THEN {13.006} EQ {ImageWidth-WSQ}	t-11				B
Field: 13.007-Vertical Line Length Value	8.13.7, Table 66, 7.7.8.2	The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	13.007-VLL	<See Requirement ID "Field: Image VLL Value" >	t-2				
Field: 13.007-Vertical Line Length Metadata	8.13.7, Table 66, 7.7.8.2	<The VLL is verified by checking the image metadata if compression is used.>	2	M	13.007-VLL Metadata JPEGL	IF {13.011} EQ ASCII (JPEGL) THEN {13.007} EQ {ImageHeight-JPEGB,JPEGL}	t-11				B
			2	M	13.007-VLL Metadata JP2L	IF {13.011} EQ ASCII(JP2L) THEN {13.007} EQ {ImageHeight-JP2,JP2L}	t-11				B
			2	M	13.007-VLL Metadata PNG	IF {13.011} EQ ASCII(PNG) THEN {13.007} EQ {ImageHeight-PNG}	t-11				B
			2	M	13.007-VLL Metadata WSQ	IF {13.011} EQ ASCII(WSQ20) THEN {13.007} EQ {ImageHeight-WSQ}	t-11				B
Field: 13.008-Scale	8.13.8, Table 66,	<Table 66 lists the value constraints for SLC>		M	13.008-SLC	<See Requirement ID "Field: Image SLC Value" >	t-2				

Units Value	7.7.8.3											
Field: 13.008-Scale Units Metadata	8.13.8, Table 66, 7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and the quotient of THPS/TVPS shall provide the pixel aspect ratio. <The SLC is verified by checking the image metadata if compression is used.>	2	M	13.008-SLC Metadata JPEGL	IF {13.011} EQ ASCII(JPEGL) THEN {13.008} EQ {SamplingUnits-JPEGB,JPEGL}	t-11				B
			2	M	13.008-SLC Metadata JP2L	<Not Tested.>	t-12				B
			2	M	13.008-SLC Metadata PNG	IF {13.011} EQ ASCII(PNG) THEN IF {13.008} EQ 1 OR 2 THEN { SamplingUnits-PNG} EQ 1, ELSE IF {13.008} EQ 0 THEN { SamplingUnits-PNG} EQ 0	t-11				B
				M	13.008-SLC Metadata WSQ	<Not Tested.>	t-12				B
Field: 13.009-Transmitted Horizontal Pixel Scale Value	8.13.9, Table 66, 7.7.8.4	<Table 66 lists the value constraints for THPS.>		M	13.009-THPS	<See Requirement ID "Field: Image THPS Value" >	t-2				
Field: 13.009-Transmitted Horizontal Pixel Scale Metadata	8.13.9, Table 66, 7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the pixel aspect ratio, up to 5 digits. <The THPS is verified by checking the image metadata if compression is used.>	2	M	13.009-THPS Metadata JPEGL	IF {13.011} EQ ASCII(JPEGL) AND {13.008} EQ 1 OR 2 THEN {13.009} EQ {HorizontalDensity-JPEGB,JPEGL}	t-11				B
				M	13.009-THPS Metadata JP2L	<Not Tested.>	t-12				B
			2	M	13.009-THPS Metadata PNG	IF {13.011} EQ ASCII(PNG) AND {13.008} EQ 1 THEN {13.009} EQ {HorizontalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {13.011} EQ ASCII(PNG) AND {13.008} EQ 2 THEN {13.009} EQ {HorizontalDensity-PNG} * 0.01 (meters/cm)	t-11				B
				M	13.009-THPS Metadata WSQ	<Not Tested.>	t-12				B
			2	M	13.009-THPS Aspect Ratio Metadata JPEGL	IF {13.011} EQ ASCII(JPEGL) AND {13.008} NEQ 1 OR 2 THEN {13.009}/{13.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11				B

				M	13.009-THPS Aspect Ratio Metadata JP2L	<Not Tested.>	t-12					B
			2	M	13.009-THPS Aspect Ratio Metadata PNG	IF {13.011} EQ ASCII(PNG) AND {13.008} NEQ 1 OR 2 THEN {13.009}/{13.010} EQ {HorizontalDensity-PNG} / {VerticalDensity-PNG}	t-11					B
				M	13.009-THPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12					B
Field: 13.010-Transmitted Vertical Pixel Scale Value	8.13.10, Table 66, 7.7.8.5	<Table 66 lists the value constraints for TVPS.>		M	13.010-TVPS	<See Requirement ID "Field: Image TVPS Value" >	t-2					
Field: 13.010-Transmitted Vertical Pixel Scale Metadata	8.13.10, Table 66, 7.7.8.5	This is the integer pixel density used in the Vertical direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the Vertical component of the pixel aspect ratio, up to 5 digits. <The TVPS is verified by checking the image metadata if compression is used.>	2	M	13.010-TVPS Metadata JPEGL	IF {13.011} EQ ASCII(JPEGL) AND {13.008} EQ 1 OR 2 THEN {13.010} EQ {VerticalDensity-JPEGB,JPEGL}	t-11					B
				M	13.010-TVPS Metadata JP2L	<Not Tested.>	t-12					B
			2	M	13.010-TVPS Metadata PNG	IF {13.011} EQ ASCII(PNG) AND {13.008} EQ 1 THEN {13.010} EQ {VerticalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {13.011} EQ ASCII(PNG) AND {13.008} EQ 2 THEN {13.010} EQ {VerticalDensity-PNG} * 0.01 (meters/cm)	t-11					B
				M	13.010-TVPS Metadata WSQ	<Not Tested.>	t-12					B
			2	M	13.010-TVPS	IF {13.011} EQ ASCII(JPEGL) AND {13.008} NEQ 1 OR 2	t-11					B

					Aspect Ratio Metadata JPEGL	THEN {13.009}/{13.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}					
				M	13.010-TVPS Aspect Ratio Metadata JP2L	<Not Tested.>	t-12				B
			2	M	13.010-TVPS Aspect Ratio Metadata PNG	IF {13.011} EQ ASCII(PNG) AND {13.008} NEQ 1 OR 2 THEN {13.009}/{13.010} EQ { HorizontalDensity -PNG} / {VerticalDensity-PNG}	t-11				B
				M	13.010-TVPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12				B
Field: 13.011-Compression Algorithm Value	8.13.11, Table 66, 7.7.9.1, 5.3.13	For each of these fields, the entry corresponds to the appropriate *Label* entry in Table 12: Field 13.011: Compression algorithm / CGA. The variable-resolution for latent image data contained in the Type-13 record shall be uncompressed or may be the output from a lossless compression algorithm.	1	M	13.011-CGA	{13.011} MO [ASCII(NONE, JPEGL, JP2L, PNG, WSQ)]	t-98				B
Field: 13.011-Compression Algorithm Metadata	8.13.11, Table 66	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	13.011-CGAMetadata JPEGL	IF {13.011} EQ ASCII(JPEGL) THEN Present(SOI -JPEG,JPEGL)	t-11				B
			2	M	13.011-CGA Metadata JP2L	IF {13.011} EQ ASCII(JP2L) THEN Present(SigBox)	t-11				B
			2	M	13.011-CGA Metadata PNG	IF {13.011} EQ ASCII(PNG) THEN Present(PNGSig)	t-11				B
			2	M	13.011-CGA Metadata WSQ	IF {13.011} EQ ASCII(WSQ20) THEN Present(SOI-WSQ)	t-11				B
Field: 13.012-Bits Per Pixel	8.13.12, Table 66, 7.7.8.6	This field shall contain an entry of "8" for normal grayscale values of "0" to "255". Any entry in this field greater than "8"		M	13.012-BPX	<See Requirement ID "Field: Image BPX Value" >	t-2				

Value		shall represent a grayscale pixel with increased proportion.									
Field: 13.012- Bits Per Pixel Metadata	8.13.12, Table 66	<The BPX is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	13.012-BPX Metadata JPEGL	{13.012} EQ {BPX-JPEG, JPEGL}	t-11				B
			2	M	13.012-BPX Metadata JP2L	{13.012} EQ {BPX-JP2,JP2L}	t-11				B
			2	M	13.012-BPX Metadata PNG	{13.012} EQ {BPX-PNG}	t-11				B
				M	13.012-BPX Metadata WSQ	<Not Tested.>	t-12				B
Field: 13.013- Friction Ridge Generalized Position Value	8.13.13, Table 66, 7.7.4.2, Table 6	See Section 7.7.4.2 and Table 6 for details.	1	M	13.013-FGP Value	{13.013} MO [0 to 38, 40 to 50, 60 to 79, 81 to 84]					B
Field: 13.013- Friction Ridge Generalized Position Conditional	8.13.13, Table 66	If code 19 is used, fields 13.014 and 13.015 shall be used.		M	13.013-FGP Conditional	<See Requirement ID: "Field: SPD,PPC Conditional">	t-2				
Field: 13.014- Search Position Descriptors Value	8.13.14, Table 66, 7.7.4.3	…described in Section 7.7.4.3		D	13.014-SPD Value	<See Requirement ID: "Field: SPD,PPD Values">	t-2				
Field: 13.014- Search Position Descriptors Conditional	8.13.14, Table 66	This field shall be present if and only if the finger position code "19" appears in Field 13.013: Friction ridge generalized position / FGP.		D	13.014-SPD Conditional	<See Requirement ID: "Field: SPD,PPC Conditional">	t-2				
Field: 13.015-Print Position Coordinates Value	8.13.15, Table 66, 7.7.4.4	See section 7.7.4.4		D	13.015-PPC Value	<See Requirement IDs: "Field: PPC-Subfield 1" through "Field: PPC-Subfields 5,6".>	t-2				
Field:	8.13.15,	This field may be present if and only if the		D	13.015-PPC	<See Requirement ID: "Field: SPD,PPC	t-2				

13.015- Print Position Coordinates Conditional	Table 66	finger position code “19” appears in Field 13.013: Friction ridge generalized position / FGP.			Conditional	Conditional”>						
Field: 13.016- Scanned Horizontal Pixel Scale Value	8.13.16, Table 66, 7.7.8.7	See section 7.7.8 for details.		O	13.016- SHPS Value	<See Requirement IDs: “Field: Image SHPS Value”>	t-2					
Field: 13.017- Scanned Vertical Pixel Scale Value	8.13.17, Table 66, 7.7.8.8	See section 7.7.8 for details.		O	13.016- SVPS Value	<See Requirement IDs: “Field: Image SVPS Value”>	t-2					
Field: 13.018, 13.019- Reserved	Table 66	Reserved for future useonly by ANSI/NIST-ITL.		-	13.018, 13.019- Reserved	<See Requirement ID: “Field: Type13-CondCode>.	t-2					
Field: 13.020- Comment Value	8.13.17, Table 66, 7.4.4	See section 7.4.4 for details.		O	13.020- COM Value	<See Requirement ID: “Field: Comment>.	t-2					
Field: 13.021, 13.023- Reserved	Table 66	Reserved for future useonly by ANSI/NIST-ITL.		-	13.021, 13.023- Reserved	<See Requirement ID: “Field: Type13-CondCode>.	t-2					
Field: 13.024- Latent Quality Metric Value	Table 66, Table 6, 8.13.19	The first information item shall be the friction ridge code/ FRC. See Section 7.7.7 for a description of the remaining three information items.		O	13.024- LQM Value	<See Requirement IDs: “Field: Sample Quality Subfield 1”, “Field: Sample Quality Subfield 2”, “Field: Sample Quality Subfield 3”, “Field: Sample Quality Additional Subfield”>.	t-2					
Field: 13.025, 13.199- Reserved	Table 66	Reserved for future useonly by ANSI/NIST-ITL.		-	13.025, 13.199- Reserved	<See Requirement ID: “Field: Type13-CondCode>.	t-2					
Field: 13.200 to 13.900- User Defined	Table 66	User Defined Fields		-	13.200 to 13.900- User Defined	TRUE						B
Field: 13.901- Reserved	Table 66	Reserved for future useonly by ANSI/NIST-ITL.		-	13.901- Reserved	<See Requirement ID: “Field: Type13-CondCode>.	t-2					
Field:	8.13.21,	This is an optional field, listing the		O	13.902-	<See Requirement ID: “Field: xx.902-ANN” >.	t-2					

13.902-Annotated Information Value	Table 66	operations performed on the original source in order to prepare it for inclusion in a biometric record type. See Section 7.4.1.			ANN-Value							
Field: 13.903-Device Unique Identifier Value	8.13.22, Table 66	This is an optional field. See Section 7.7.1.1.		O	13.903-DUI Value	<See Requirement ID: "Field: Device ID" >.	t-2					
Field: 13.904-Make/Model/Serial Number Value	8.13.23, Table 66	This is an optional field. See Section 7.7.1.2.		O	13.904-MMS Value	<See Requirement ID: "Field: Make Model" >.	t-2					
Field: 13.905, 13.994-Reserved	Table 66	Reserved for future useonly by ANSI/NIST-ITL.		-	13.905, 13.994-Reserved	<See Requirement ID: "Field: Type13-CondCode>.	t-2					
Field: 13.995-Associated Context Value	8.13.24, Table 66	See Section 7.3.3		O	13.995-ASC Value	<See Requirement IDs: "Field: xx.995-ASC" and "Field: xx.995-ASC-ACN" and "Field: xx.995-ASC-ASP">.	t-2					
Field: 13.996-Hash Value	8.13.25, Table 66	See Section 7.5.2		O	13.996-HAS Value	<See Requirement ID: "Field: HAS">	t-2					
Field: 13.997-Source Representation Value	8.13.26, Table 66	See Section 7.3.2		O	13.997-SOR Value	<See Requirement IDs: "Field: xx.997-SOR" and "Field: xx.997-SOR-SRN" and "Field: xx.997-SOR-RSP">.	t-2					
Field: 13.998-Geographic Sample Acquisition Location Value	8.13.27, Table 66	See Section 7.7.3		O	13.998-GEO Value	<See Requirement IDs: "Field: Geographic", "Field: Geographic-Conditional", "Field: Geographic-Subfield 1" through "Field: Geographic-Values-SubField 15" >.	t-2					
Field: 13.999-Image Data Valid	8.13.28, Table 66	This is a mandatory field contains the image. <The image metadata is checked for validity.>	2	M	13.999-DATA Uncompressed Valid	IF {13.011} EQ ASCII(NONE) THEN Length(13.999) EQ 13.006} * {13.007}						B
			2	M	13.999-DATA	IF {13.011} EQ ASCII(JPEGL) THEN Present(JFIF,	t-11					B

					JPEGL Valid	SOI-JPEGB,JPEGL, SOF-JPEGB,JPEGL, EOI-JPEG, JPEGL)					
			2	M	13.999-DATA JP2L Valid	IF {13.011} EQ ASCII(JP2L) THEN Present(SigBox, HeadBox, ImgBox)	t-11				B
			2	M	13.999-DATA PNG Valid	IF {13.011} EQ ASCII(PNG) THEN Present(PNGSig, IHDR, IDAT, IEND)	t-11				B
			2	M	13.999-DATA WSQ Valid	IF {13.999} EQ ASCII(WSQ20) THEN Present(SOI-WSQ,SOF-WSQ,SOB-WSQ,EOI-WSQ)	t-11				B
Field: 13.999-Image WSQ Version 3.1	7.7.9.1	Only version 3.1 or higher shall be used for compressing grayscale fingerprint data at 500 ppi class with a platen area of 2 inches or greater in height. WSQ shall not be used for other than the 500 ppi class.	2	M	13.999-DATA WSQ Version	IF {13.011} EQ ASCII(WSQ20) THEN {Encoder Version } EQ 2	t-11				B

Table C.13 - Assertions for Record Type 14 - Fingerprint Image Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.14: Record Type-14: Fingerprint image record											
Record: Type14-Fingerprint Type	8.14	The Type-14 record shall contain and be used to exchange exemplar fingerprint image data, such as a rolled tenprint, an identification flat, or a complete friction ridge exemplar. All fingerprint impressions shall be acquired from a card, a single or multiple-finger flat-capture device, contactless fingerprint sensor that outputs 2D fingerprint images, or a live-scan device. Captured images may be transmitted to agencies that will automatically extract the desired feature information from the images for matching purposes.	3	M	Type14-Fingerprint Type	<Not Tested. It is not feasible to test if the image represents an exemplar fingerprint or how the image was acquired.>	t-1				B
Field: Type14-Subfield Occurrence	Table 67	<Table 67 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	-	Type14-Subfields Zero	Count(Subfields in 14.[001 to 003, 005 to 012, 016, 017, 020, 026, 027, 030, 031, 903, 996, 999]) EQ 0					T
			1	M	14.004-Subfields	Count(US_Subfields in 14.004) EQ 1 OR 2					T
			1	M	14.013-Subfields	Count(US_Subfields in 14.013) EQ 1					T
			1	D	14.014-Subfields	Count(US_Subfields in 14.014) EQ 2					T
				D	14.015-Subfields	<See Requirement ID: "Field: PPC-Subfield Occurrences">	t-2				

			1	O	14.018-Subfields	Count(RS_Subfields in 14.018) MO [1 to 4]
						
						AND
						
						ForEach(RS_Subfield in 14.018)
						{
						Count(US_Subfields in RS_Subfield) EQ 2
						}
											T

			1	D	14.021-	Count(RS_Subfields in 14.021) MO [1 to 4]					T

					Subfields	AND
						
						ForEach(RS_Subfield in 14.021)
						{
						Count(US_Subfields in RS_Subfield) EQ 5
						}					

			1	O	14.022-Subfields	Count(RS_Subfields in 14.022) MO [1 to 4]
						
						AND
						
						ForEach(RS_Subfield in 14.022)
						{
						Count(US_Subfields in RS_Subfield) EQ 2
						}
											T

			1	O	14.023-Subfields	Count(RS_Subfields in 14.023) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 14.023)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	14.024-Subfields	Count(RS_Subfields in 14.024) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 14.024)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	14.025-Subfields	Count(RS_Subfields in 14.025) MO [1 to 4]
						
						AND
						
						ForEach(RS_Subfield in 14.025)
						{
						Count(US_Subfields in RS_Subfield) EQ 2 +
						2*{US_Subfield:2 in RS_Subfield}
						}
											T

			1	O	14.902-Subfields	Count(RS_Subfields in 14.902) GTE 1 AND ForEach(RS_Subfield in 14.902) { Count(US_Subfields in RS_Subfield) EQ 4					T

						}					
			1	O	14.904-Subfields	Count(US_Subfields in 14.904) EQ 3					T

			1	O	14.995-Subfields	Count(RS_Subfields in 14.995) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 14.995)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

			1	O	14.997-Subfields	Count(RS_Subfields in 14.997) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 14.997)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

				O	14.998-Subfields	<See Requirement ID: "Field: Geographic-Conditional">	t-2				
Field: Type14-CondCode	Table 67	<Table 67 specifies the Condition Code for each field.>	1	-	Type14-CondCode	Present(14.001 to 14.013, 14.999) AND NOT Present(14.019, 14.028, 14.029, 14.032 to 14.199, 14.901, 14.905 to 14.994)					B
Field: 14.014-Print Position Descriptors Dependent	Table 67, 8.14.14	This field shall be present if and only if the finger position code "19" appears in Field 14.013: Friction ridge generalized position / FGP.		D	14.014-CondCode Dependent	<See Requirement ID: "Field: PPD Conditional">	t-2				
Field: 14.015-Print Position Coordinates Dependent	Table 67, 8.14.15	This field may be present if and only if the finger position code "19" appears in Field 14.013: Friction ridge generalized position / FGP.		D	14.015-CondCode Dependent	<See Requirement ID: "Field: PPD Conditional">	t-2				
Field: 14.021-Finger Segment Position Dependent	Table 67, 8.14.20	This optional field shall contain offsets to the locations of image segments containing the individual fingers within the flat images of simultaneous fingers from each hand or the two simultaneous thumbs. (FGP = 13, 14, 15 or 40-50 from Table 6 as entered in Field 14.013: Friction ridge generalized position / FGP).	2	D	14.021-CondCode Dependent	IF {US_Subfield:1 in RS_Subfield:1 in 14.013} MO [13 to 15, 40 to 50] THEN Present(14.021)					B*

Field: 14.027-Stitched Image Flag Dependent	Table 67, 8.14.20	This field signifies that images captured separately were stitched together to form a single image. This field is mandatory if an image has been stitched, and the value shall be set to 'Y'. Otherwise, this field shall not appear in the record.	3	D	14.027-CondCode Dependent	<Not Tested. It is not feasible to detect if the image was stitched.>	t-1				B
Field: Type14-CharType	8.14, Table 67	<Table 67 specifies the Character Type for each field that contains no subfields.>	1	-	Type14-CharType N	Bytes(14.[001,002,003, 005 to 010, 012, 016, 017, 026, 031]) MO [0x30 to 0x39]					B
			1	-	Type14-CharType A	Bytes(14.[011, 027, 030]) [0x41 to 0x5A, 0x61 to 0x7A]					B
			1	-	Type14-CharType U	Present(Bytes(14.020)					B
			1	O	14.020-CharType ANS	Bytes(14.020) MO [0x20, 0x7E]					B
			1	O	14.903-CharType Text ANS	Bytes{14.903} MO [0x20, 0x7E]					B
			1	O	14.996-CharType H	Bytes(10.996) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]					B
Field: Type14-Subfield CharType	8.14, Table 67	<Table 67 specifies the Character Type for each subfield.>	1	M	14.004-Subfield CharType U	Present(Bytes(US_Subfields:1,2 in 14.004)					B*
			1	M	14.013-Subfield CharType N	Bytes(All(US_Subfields in 14.013)) MO [0x30 to 0x39]					B*

			1	D	14.014-Subfield CharType AN	ForEach(RS_Subfield in 14.014)
						{
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfield:2 in RS_Subfield) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]
						}
											B*

			1	D	14.015-Subfield CharType AN	ForEach(RS_Subfield in 14.015)
						{
						Bytes(US_Subfields:1 in RS_Subfield)) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]
						AND
						Bytes(US_Subfields:2 in RS_Subfield)) MO [0x41 to 0x5A, 0x61 to 0x7A]
						AND
						Bytes(US_Subfields:3 to 6 in RS_Subfield)) MO [0x30 to 0x39]
						}
											B*

			1	O	14.018-	ForEach(RS_Subfield in 14.018)					B*

					Subfield CharType AN	{
						Bytes(US_Subfields:1 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:2 in RS_Subfield)) MO [0x41 to 0x5A, 0x61 to 0x7A]
						}					

			1	D	14.021-Subfield CharType N	Bytes(All(US_Subfields in 14.021)) MO [0x30 to 0x39]					B*
			1	O	14.022-Subfield CharType N	Bytes(All(US_Subfields in 14.022)) MO [0x30 to 0x39]					B*

			1	O	14.023-Subfield CharType HN	ForEach(RS_Subfield in 14.023)
						{
						Bytes(US_Subfields:1,2,4 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:3 in RS_Subfield)) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	O	14.024-Subfield CharType HN	ForEach(RS_Subfield in 14.024)
						{
						Bytes(US_Subfields:1,2,4 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:3 in RS_Subfield)) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	O	14.025-Subfield CharType N	Bytes(All(US_Subfields in 14.025)) MO [0x30 to 0x39]					B*

			1	O	14.902-Subfield CharType ANU	ForEach(RS_Subfield in 14.902)
						{
						Present(Bytes(US_Subfields:2 to 4 in RS_Subfield))
						AND
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39,0x5A]
						}
											B*

			1	O	14.904-Subfield CharType U	Present(Bytes(All(US_Subfields in 14.904)))					B*
			1	O	14.995-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 14.995)) MO [0x30 to 0x39]					B*

			1	O	14.997-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 14.997)) MO [0x30 to 0x39]						B*
				O	14.998-Subfield CharType ANSU	<See Requirement ID: "Field: Geographic">	t-2					
Field: Type14-CharCount	Table 67	<Table 67 specifies the Character Count for each field that contains no subfields.>	1	M	14.001-CharCount	DataLength(14.001) GTE 1						B
			1	M	14.002-CharCount	DataLength(14.002) EQ 1 OR 2						B
			1	M	14.003-CharCount	DataLength(14.003) EQ 1 OR 2						B
			1	M	14.005-CharCount	DataLength(14.005) EQ 8						B
			1	M	14.006-CharCount	DataLength(14.006) MO [2 to 5]						B
			1	M	14.007-CharCount	DataLength(14.007) MO [2 to 5]						B
			1	M	14.008-CharCount	DataLength(14.008) EQ 1						B
			1	M	14.009-CharCount	DataLength(14.009) MO [1 to 5]						B
			1	M	14.010-CharCount	DataLength(14.010) MO [1 to 5]						B
			1	M	14.011-CharCount	DataLength(14.011) MO [3 to 5]						B
			1	M	14.012-CharCount	DataLength(14.012) EQ 1 OR 2						B
			1	O	14.016-CharCount	DataLength(14.016) MO [1 to 4]						B
			1	O	14.017-CharCount	DataLength(14.017) MO [1 to 4]						B
			1	O	14.020-CharCount	DataLength(14.020) MO [1 to 126]						B
			1	O	14.026-CharCount	DataLength(14.026) MO [1 to 3]						B
			1	D	14.027-CharCount	DataLength(14.027) EQ 1						B
			1	O	14.030-CharCount	DataLength(14.030) MO [8 to 10]						B
			1	O	14.031-CharCount	DataLength(14.031) EQ 2						B

			1	O	14.903-CharCount	DataLength(14.903) MO [13 to 16]					B
			1	O	14.996-CharCount	DataLength(14.995) EQ 64					B
			1	M	14.999-CharCount	DataLength(14.999) GTE 1					B
Field: Type14-Subfield CharCount	Table 67	<Table 67 specifies the Character Count for each subfield.>	1	M	14.004-Subfield CharCount	Length(All(US_Subfields in 14.004)) GTE 1					B*
			1	M	14.013-Subfield CharCount	Length(All(US_Subfields in 14.013)) EQ 1 OR 2					B*
			1	D	14.014-Subfield CharCount	Length(US_Subfield:1 in 14.014) EQ 1 OR 2 AND Length(US_Subfield:2 in 14.014) EQ 3					B*

			1	D	14.015-Subfield CharCount	ForEach(RS_Subfield in 14.015)
						{
						Length(US_Subfields:1 in RS_Subfield) EQ 2 OR 3
						AND
						Length(US_Subfields:2 in RS_Subfield) EQ 3
						AND
						Length(US_Subfields:3 to 6 in RS_Subfield) MO [1 to 5]
						}
											B*

			1	O	14.018-Subfield CharCount	ForEach(RS_Subfield in 14.018)
						{
						Length(US_Subfields:1 in RS_Subfield) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield) EQ 2
						}
											B*

			1	D	14.021-Subfield CharCount	ForEach(RS_Subfield in 14.021)
						{
						Length(US_Subfields:1 in RS_Subfield) EQ 1 OR 2
						AND
						Length(US_Subfields:2 to 5 in RS_Subfield) MO [1 to 5]
						}
											B*

			1	O	14.022-Subfield CharCount	ForEach(RS_Subfield in 14.022) { Length(US_Subfields:1 in RS_Subfield) EQ 1 OR 2 AND					B*

						Length(US_Subfields:2 to 5 in RS_Subfield)) MO [1 to 3] }					

			1	O	14.023-Subfield CharCount	ForEach(RS_Subfield in 14.023)
						{
						Length(US_Subfields:1 in RS_Subfield) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfields:3 in RS_Subfield) EQ 4
						AND
						Length(US_Subfields:4 in RS_Subfield) MO [1 to 5]
						
						}
											B*

			1	O	14.024-Subfield CharCount	ForEach(RS_Subfield in 14.024)
						{
						Length(US_Subfield:1 in RS_Subfield) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfields:3 in RS_Subfield) EQ 4
						AND
						Length(US_Subfields:4 in RS_Subfield) MO [1 to 5]
						}
											B*

			1	O	14.025-Subfield CharCount	ForEach(RS_Subfield in 14.025)
						{
						Length(US_Subfields:1,2 in RS_Subfield) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	14.902-Subfield CharCount	ForEach(RS_Subfield in 14.902) { Length(US_Subfield:1 in RS_Subfield) EQ 15 AND Length(US_Subfields:2,3 in RS_Subfield) MO [1					B*

						to 64] AND Length(US_Subfield:4 in RS_Subfield) MO [1 to 255] }					
			1	O	14.904-Subfield CharCount	Length(All(US_Subfields in 14.904) MO [1 to 50]					B*

			1	O	14.995-Subfield CharCount	ForEach(RS_Subfield in 14.995)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

			1	O	14.997-Subfield CharCount	ForEach(RS_Subfield in 14.997)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

				O	14.998-Subfield CharCount	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type14-Field Occurrence	Table 67	<Table 67 specifies the Field Occurrence for each field.>	1	-	Type14-Occurrence Zero	Count(14.[019 ,028, 029, 032 to 199,901,905 to 994]) EQ 0					B
			1	M	Type14-Occurrence One	Count(14.[001 to 013, 999]) EQ 1					B
			1	-	Type14-Occurrence One or Fewer	Count(14.[014 to 018,020 to 027,030, 031, 902 to 904, 995 to 998) LTE 1					B
Field: 14.001-Record Header Value	8.14.1, Table 67, 7.1	Field 14.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	14.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2				

	8.14.1, C.10.12	The XML name for the Type-14 record is <itl:PackageFingerprintImageRecord>, and its <biom:RecordCategoryCode> element shall
		have a value of "14".
			1	M	NIEM-14.001-Record Header	ForEach(XElm(itl:PackageFingerprintImageRecord)
						{
						{XElm(biom:RecordCategoryCode)} EQ ASCII(14)
						}
											X

Field: 14.002-Information Designation	8.14.2, Table 67, 7.3.1	This mandatory field shall be the IDC of this Type-14 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	14.002-IDC	<See Requirement IDs "Field: xx.002-IDC "and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2				

Character Value											
Field: 14.003-Impression Type Value	8.14.3, Table 67, 7.7.4.1	This mandatory field shall indicate the manner by which the latent print was obtained. See Section 7.7.4.1 for details. <Table 67 lists the valid values for IMP.>	1	M	14.003-IMP	{14.003} MO [0 to 3, 8, 20 to 29]					B
Field: 14.004-Originating Agency Value	8.14.4, 7.6	This is a mandatory field. See Section 7.6 for details.		M	14.004-ORG	<See Requirement ID "Field: Agency Codes" >	t-2				
Field: 14.005-Fingerprint Capture Date Value	8.14.5, 7.7.2.3	This mandatory field shall contain the date that the fingerprint data contained in the record was captured.	1	M	14.005-FCD	{14.005} MO [ValidLocalDate]	t-6				T

			1	M	NIEM-14.005-FCD	ForEach(XElm(itl:PackageFingerprintRecord))
						{
						{XElm(nc:Date) in XElm(biom:CaptureDate)} MO [NIEM-ValidLocalDate]
						}
							t-6				X

Field: 14.006-Horizontal Line Length Value	8.14.6, Table 67, 7.7.8.1	The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	14.006-HLL	<See Requirement ID "Field: Image HLL Value" >	t-2				
Field: 14.006-Horizontal Line Length Metadata	8.14.6, Table 67, 7.7.8.1	<The HLL is verified by checking the image metadata if compression is used.>	2	M	14.006-HLL Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {14.006} EQ {ImageWidth-JPEGB,JPEGL}	t-11				B
			2	M	14.006-HLL Metadata JP2,JP2L	IF {14.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {14.006} EQ {ImageWidth-JP2,JP2L}	t-11				B
			2	M	14.006-HLL Metadata PNG	IF {14.011} EQ ASCII(PNG) THEN {14.006} EQ {ImageWidth-PNG}	t-11				B
			2	M	14.006-HLL Metadata WSQ	IF {14.011} EQ ASCII(WSQ20) THEN {14.006} EQ {ImageWidth-WSQ}	t-11				B
Field: 14.007-Vertical Line Length Value	8.14.7, Table 67, 7.7.8.2	The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	14.007-VLL	<See Requirement ID "Field: Image VLL Value" >	t-2				
Field: 14.007-Vertical Line Length	8.14.7, Table 67, 7.7.8.2	<The VLL is verified by checking the image metadata if compression is used.>	2	M	14.007-VLL Metadata JPEGB, JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {14.007} EQ {ImageHeight-JPEGB,JPEGL}	t-11				B

Metadata			2	M	14.007-VLL Metadata JP2, JP2L	IF {14.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {14.007} EQ {ImageHeight-JP2,JP2L}	t-11				B
			2	M	14.007-VLL Metadata PNG	IF {14.011} EQ ASCII(PNG) THEN {14.007} EQ {ImageHeight-PNG}	t-11				B
			2	M	14.006-VLL Metadata WSQ	IF {14.011} EQ ASCII(WSQ20) THEN {14.007} EQ {ImageHeight-WSQ}	t-11				B
Field: 14.008-Scale Units Value	8.14.8, Table 67, 7.7.8.3	<Table 67 lists the value constraints for SLC>		M	14.008-SLC	<See Requirement ID "Field: Image SLC Value" >	t-2				
Field: 14.008-Scale Units Metadata	8.14.8, Table 67, 7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and the quotient of THPS/TVPS shall provide the pixel aspect ratio. <The SLC is verified by checking the image metadata if compression is used.>	2	M	14.008-SLC Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {14.008} EQ {SamplingUnits-JPEGB,JPEGL}	t-11				B
					14.008-SLC Metadata JP2,JP2L	<Not Tested.>	t-12				B
			2	M	14.008-SLC Metadata PNG	IF {14.011} EQ ASCII(PNG) THEN IF {14.008} EQ 1 OR 2 THEN { SamplingUnits-PNG} EQ 1, ELSE IF {14.008} EQ 0 THEN { SamplingUnits-PNG} EQ 0	t-11				B
					14.008-SLC Metadata WSQ	<Not Tested.>	t-12				B
Field: 14.009-Transmitted Horizontal Pixel Scale Value	8.14.9, Table 67, 7.7.8.4	<Table 67 lists the value constraints for THPS.>		M	14.009-THPS	<See Requirement ID "Field: Image THPS Value" >	t-2				
Field: 14.009-Transmitted Horizontal Pixel Scale Metadata	8.14.9, Table 67, 7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the pixel aspect ratio, up to 5 digits. <The THPS is verified by checking the image metadata if compression is used.>	2	M	14.009-THPS Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {14.008} EQ 1 OR 2 THEN {14.009} EQ {HorizontalDensity-JPEGB,JPEGL}	t-11				B
					14.009-THPS Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	14.009-THPS Metadata PNG	IF {14.011} EQ ASCII(PNG) AND {14.008} EQ 1 THEN {14.009} EQ {HorizontalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {14.011} EQ ASCII(PNG) AND {14.008} EQ	t-11				B

						2 THEN {14.009} EQ {HorizontalDensity-PNG} * 0.01 (meters/cm)					
					14.009-THPS Metadata WSQ	<Not Tested.>	t-12				B
			2	M	14.009-THPS Aspect Ratio Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {14.008} NEQ 1 OR 2 THEN {14.009}/{14.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11				B
					14.009-THPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	14.009-THPS Aspect Ratio Metadata PNG	IF {14.011} EQ ASCII(PNG) AND {14.008} NEQ 1 OR 2 THEN {14.009}/{14.010} EQ {HorizontalDensity-PNG} / {VerticalDensity-PNG}	t-11				B
					14.009-THPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12				B
Field: 14.010-Transmitted Vertical Pixel Scale Value	8.14.10, Table 67, 7.7.8.5	<Table 67 lists the value constraints for TVPS.>		M	14.010-TVPS	<See Requirement ID "Field: Image TVPS Value" >	t-2				
Field: 14.010-Transmitted Vertical Pixel Scale Metadata	8.14.10, Table 67, 7.7.8.5	This is the integer pixel density used in the Vertical direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the Vertical component of the pixel aspect ratio, up to 5 digits. <The TVPS is verified by checking the	2	M	14.010-TVPS Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND{14.008} EQ 1 OR2 THEN {14.010} EQ {VerticalDensity-JPEGB,JPEGL}	t-11				B
					14.010-TVPS Metadata	<Not Tested.>	t-12				B

		image metadata if compression is used.>			JP2, JP2L						
			2	M	14.010-TVPS Metadata PNG	IF {14.011} EQ ASCII(PNG)) AND {14.008} EQ 1 THEN {14.010} EQ {VerticalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {14.011} EQ ASCII(PNG)) AND {14.008} EQ 2 THEN {14.010} EQ {VerticalDensity-PNG} * 0.01 (meters/cm)	t-11				B
					14.010-TVPS Metadata WSQ	<Not Tested.>	t-12				B
			2	M	14.010-TVPS Aspect Ratio Metadata JPEGB,JPEGL	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {14.008} NEQ 1 OR 2 THEN {14.009}/{14.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11				B
					14.010-TVPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	14.010-TVPS Aspect Ratio Metadata PNG	IF {14.011} EQ ASCII(PNG) AND{14.008} NEQ 1 OR 2 THEN {14.009}/{14.010} EQ {HorizontalDensity -PNG} / {VerticalDensity-PNG}	t-11				B
					14.010-TVPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12				B
Field: 14.011-Compression Algorithm Value	8.14.11, Table 67, 7.7.9.1	For each of these fields, the entry corresponds to the appropriate *Label* entry in Table 12: Field 14.011: Compression algorithm / CGA.	1	M	14.011-CGA	{14.011} MO [ASCII(NONE, JPEGB, JPEGL, JP2, JP2L, PNG, WSQ)]	t-98				B
Field: 14.011-Compressio	8.14.11, Table 67	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	14.011-CGAMetadata	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(SOI -JPEG,JPEGL)	t-11				B

n Algorithm Metadata					JPEGB,JPEGL							
			2	M	14.011-CGA Metadata JP2, JP2L	IF {14.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox)	t-11					B
			2	M	14.011-CGA Metadata PNG	IF {14.011} EQ ASCII(PNG) THEN Present(PNGSig)	t-11					B
			2	M	14.011-CGA Metadata WSQ	IF {14.011} EQ ASCII(WSQ20) THEN Present(SOI-WSQ)	t-11					B
Field: 14.012-Bits Per Pixel Value	8.14.12, Table 67, 7.7.8.6	This field shall contain an entry of "8" for normal grayscale values of "0" to "255". Any entry in this field greater than "8" shall represent a grayscale pixel with increased proportion.		M	14.012-BPX	<See Requirement ID "Field: Image BPX Value" >	t-2					
Field: 14.012- Bits Per Pixel Metadata	8.14.12, Table 67	<The BPX is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	14.012-BPX Metadata JPEGB,JPEGL	{14.012} EQ {BPX-JPEG, JPEGL}	t-11					B
			2	M	14.012-BPX Metadata JP2, JP2L	{14.012} EQ {BPX-JP2,JP2L}	t-11					B
			2	M	14.012-BPX Metadata PNG	{14.012} EQ {BPX-PNG}	t-11					B
					14.012-BPX Metadata WSQ	<Not Tested.>	t-12					B
Field: 14.013-Friction Ridge Generalized Position Value	8.14.13, Table 67, 7.7.4.2, Table 6	See Section 7.7.4.2 for details.	1	M	14.013-FGP Value	{14.013} MO [1 to 19, 33 to 36, 40 to 50]						B
Field: 14.014-Search Position Descriptors Value	8.14.14, Table 67, 7.7.4.3	…described in Section 7.7.4.3		D	14.014-PPD Value	<See Requirement ID: "Field: SPD,PPD Values">	t-2					
Field: 14.014-Search Position	8.14.14, Table 67	This field shall be present if and only if the finger position code "19" appears in Field 14.013: Friction ridge generalized position / FGP.		D	14.014-PPD Conditional	<See Requirement ID: "Field: PPD Conditional">	t-2					

Descriptors Conditional											
Field: 14.015-Print Position Coordinates Value	8.14.15, Table 67, 7.7.4.4	See section 7.7.4.4		D	14.015-PPC Value	<See Requirement IDs: "Field: PPC-Subfield 1" through "Field: PPC-Subfields 5,6".>	t-2				
Field: 14.015- Print Position Coordinates Conditional	8.14.15, Table 67	This field may be present if and only if the finger position code "19" appears in Field 14.013: Friction ridge generalized position / FGP.		D	14.015-PPC Conditional	<See Requirement ID: "Field: SPD,PPC Conditional">	t-2				
Field: 14.016- Scanned Horizontal Pixel Scale Value	8.14.16, Table 67, 7.7.8.7	See section 7.7.8 for details.		O	14.016-SHPS Value	<See Requirement IDs: "Field: Image SHPS Value">	t-2				
Field: 14.017- Scanned Vertical Pixel Scale Value	8.14.17, Table 67, 7.7.8.8	See section 7.7.8 for details.		O	14.016-SVPS Value	<See Requirement IDs: "Field: Image SVPS Value">	t-2				

Field: 14.018- Amputated Or Bandaged Value	8.14.18, Table 67, Table 68	<Table 67 lists the value constraints for AMP.>	1	M ⇑	14.018-Subfield 1-FGP	ForEach(RS_Subfield in 14.018)
						{
						{US_Subfield:1 in RS_Subfield} MO [1 to 10, 16,17]
						}
											B*

			1	M ⇑	14.018-Subfield 2-FMC	ForEach(RS_Subfield in 14.018)
						{
						{US_Subfield:2 in RS_Subfield} MO [ASCII(XX,UP)]
						}
											B*

Field: 14.019- Reserved	Table 67	Reserved for future useonly by ANSI/NIST-ITL.		-	14.019-Reserved	<See Requirement ID: "Field: Type14-CondCode>.	t-2				
Field: 14.020- Comment Value	8.14.19, Table 67, 7.4.4	See section 7.4.4 for details.		O	14.020-COM	<See Requirement ID: "Field: Comment>.	t-2				

Field: 14.021- Fingerprint Segment Position	8.14.20, Table 67, Table 6	<Table 67 lists the value constraints for SEG.>	1	M ⇑	14.021-Subfield 1-FGP	ForEach(RS_Subfield in 14.021)
						{
						{US_Subfield:1 in RS_Subfield} MO [1 to 10, 16,17]
						}
											B*

Value			2	M ⇑	14.021-Subfield 2-LHC	ForEach(RS_Subfield in 14.021)
						{
						{US_Subfield:2 in RS_Subfield} LTE {14.006}
						}
											B*

			2	M ⇑	14.021-Subfield 3-LHC	ForEach(RS_Subfield in 14.021)
						{
						{US_Subfield:3 in RS_Subfield} LTE {14.006} AND GTE {US_Subfield:2 in 14.021}
						}
											B*

			2	M ⇑	14.021-Subfield 4-LHC	ForEach(RS_Subfield in 14.021)
						{
						{US_Subfield:4 in RS_Subfield} LTE {14.007}
						}
											B*

			2	M ⇑	14.021-Subfield 5-LHC	ForEach(RS_Subfield in 14.021)
						{
						{US_Subfield:2 in RS_Subfield} LTE {14.007} AND GTE {US_Subfield:4 in 14.021}
						}
											B*

Field: 14.021-Fingerprint Segment Position Conditional	8.14.15, Table 67	This optional field shall contain offsets to the locations of image segments containing the individual fingers within the flat images of simultaneous fingers from each hand or the two simultaneous thumbs. (FGP = 13, 14, 15 or 40-50 from Table 6 as entered in Field 14.013: Friction ridge generalized position / FGP).		D	14.021-SEG Conditional	<See Requirement ID: "Field: 14.021-Finger Segment Position Dependent">	t-2				

Field: 14.022-NIST Quality Metric Value	8.14.21, Table 67, Table 6	<Table 67 lists the value constraints for NQM.>	1	M ⇑	14.022-Subfield 1-FGP	ForEach(RS_Subfield in 14.022)
						{
						{US_Subfield:1 in RS_Subfield} MO [1 to 10, 16,17]
						}
											B*

			1	M ⇑	14.022-Subfield 2-IQS	ForEach(RS_Subfield in 14.022)
						{
						{US_Subfield:2 in RS_Subfield} MO [1 to 5, 254, 255]
						}
											B*

Field: 14.023-Segmentation Qualtiy Metric Value	8.14.22, Table 67, Table 6	<Table 67 lists the value constraints for SQM.>		M ⇑	14.023-SQM	<See Requirement ID: "Field: Sample Quality Occurrences", "Field: Sample Quality Subfield 1", "Field: Sample Quality Subfield 2", and "Field: Sample Quality Subfield 3".>	t-2				
Field: 14.024-Finger Quality	8.14.23, Table 67, Table 6	<Table 67 lists the value constraints for FQM.>		O	14.024-FQM	<See Requirement ID: "Field: Sample Quality Occurrences", "Field: Sample Quality Subfield 1", "Field: Sample Quality Subfield 2", and "Field: Sample Quality Subfield 3".>	t-2				

Metric Value											

Field: 14.025-Alternate Finger Segment Position(s) Value	8.14.24, Table 67, Table 6	<Table 67 lists the value constraints for ASEG.>	1	M ⇑	14.025-Subfield 1 - FGP	ForEach(RS_Subfield in 14.025)
						{
						{US_Subfield:1 in RS_Subfield} MO [1 to 10, 16, 17]
						}
											B*

			1	M ⇑	14.025-Subfield 2-NOP	ForEach(RS_Subfield in 14.025)
						{
						{US_Subfield:2 in RS_Subfield} MO [3 to 99]
						}
											B*

			2	M ⇑	14.025-Subfield Pair	ForEach(RS_Subfield in 14.025)
						{
						For(X EQ 3 to {US_Subfield:2 in RS_Subfield})
						{
						IF X MOD 2 EQ 0
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {14.007}
						ELSE
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {14.006}
						}
						}
											B*

Field: 14.025-Alternate Finger Segment Position(s) Polygon	8.14.24, Table 67, Section 7.8	The order of the vertices shall be in their consecutive order around the perimeter of the polygon, either clockwise or counterclockwise.	2	O	14.025-ASEG Order	<Angle.Direction.First EQ ((X,Y).1 To (X,Y).2).Angle.Direction; ((X,Y).2 To N-1 to (X,Y).3 To N).Angle.Direction EQ Angle.Direction.First; ((X,Y).N To (X,Y).1).Angle.Direction EQ Angle.Direction.First.>					B*
		No two vertices may occupy the same location.	2	O	14.025-ASEG Polygon	<Each Vertex (X, Y) is unique>					B*
		The polygon side defined by the last vertex and the first vertex shall complete the polygon. The polygon shall be a simple, plane figure with no sides crossing and no interior holes.	2	O	14.025-ASEG Polygon	<Not Tested.>	t-14				
Field: 14.026-Simultaneous Capture Value	8.14.25, Table 67	<Table 67 lists the value constraints for SCF.>	1	O	14.026-SCF	{14.026} MO [1 to 255]					B
Field: 14.027-Stitched	8.14.26, Table 67	<Table 67 lists the value constraints for SCF.>	1	D	14.027-SIF	{14.027} EQ ASCII(Y)					B

Image Flag Value												
Field: 14.027-Stitched Image Flag Conditional	8.14.26, Table 67	This field signifies that images captured separately were stitched together to form a single image. This field is mandatory if an image has been stitched, and the value shall be set to 'Y'. Otherwise, this field shall not appear in the record.		D	14.027-SIF Conditional	<See Requirement ID: "Field: 14.027-Stitched Image Flag Dependent">	t-2				
Field: 14.028, 14.029-Reserved	Table 67	Reserved for future useonly by ANSI/NIST-ITL.		-	14.028, 14.029 Reserved	<See Requirement ID: "Field: Type14-CondCode>.	t-2				
Field: 14.030-Device Monitoring Mode Value	8.14.27, Table 67	<Table 67 lists the value constraints for DMM.>	1	O	14.030-DMM	{14.030} MO ASCII(CONTROLLED, ASSISTED, OBSERVED, UNATTENDED, UNKNOWN)					B
Field: 14.031-Subject Acquisition Profile-Fingerprint Value	8.14.28, Table 67	<Table 67 lists the value constraints for FAP.>	1	O	14.031-FAP	{14.031} MO [10, 20, 30, 40, 45, 50, 60]					B
Field: 14.032 to 14.199-Reserved	Table 67	Reserved for future useonly by ANSI/NIST-ITL.		-	14.032 to 14.199 Reserved	<See Requirement ID: "Field: Type14-CondCode>.	t-2				
Field: 14.200 to 14.900-User Defined	Table 67	User Defined Fields		-	14.200 to 14.900-User Defined	TRUE					B
Field: 14.901-Reserved	Table 67	Reserved for future useonly by ANSI/NIST-ITL.		-	14.901-Reserved	<See Requirement ID: "Field: Type14-CondCode>.	t-2				
Field: 14.902-Annotated Information Value	8.14.30, Table 67	This is an optional field, listing the operations performed on the original source in order to prepare it for inclusion in a biometric record type. See Section 7.4.1.		O	14.902-ANN-Value	<See Requirement ID: "Field: xx.902-ANN" >.	t-2				
Field: 14.903-Device Unique Identifier Value	8.14.31, Table 67	This is an optional field. See Section 7.7.1.1.		O	14.903-DUI Value	<See Requirement ID: "Field: Device ID" >.	t-2				
Field:	8.14.32,	This is an optional field. See Section		O	14.904-	<See Requirement ID: "Field: Make Model" >.	t-2				

14.904-Make/Model/Serial Number Value	Table 67	7.7.1.2.			MMS Value						
Field: 14.905, 14.994-Reserved	Table 67	Reserved for future useonly by ANSI/NIST-ITL.		-	14.905, 14.994-Reserved	<See Requirement ID: "Field: Type14-CondCode>.	t-2				
Field: 14.995-Associated Context Value	8.14.33, Table 67	See Section 7.3.3		O	14.995-ASC Value	<See Requirement IDs: "Field: xx.995-ASC" and "Field: xx.995-ASC-ACN" and "Field: xx.995-ASC-ASP">.	t-2				
Field: 14.996-Hash Value	8.14.34, Table 67	See Section 7.5.2		O	14.996-HAS Value	<See Requirement ID: "Field: HAS">	t-2				
Field: 14.997-Source Representation Value	8.14.35, Table 67	See Section 7.3.2		O	14.997-SOR Value	<See Requirement IDs: "Field: xx.997-SOR" and "Field: xx.997-SOR-SRN" and "Field: xx.997-SOR-RSP">.	t-2				
Field: 14.998-Geographic Sample Acquisition Location Value	8.14.36, Table 67	See Section 7.7.3		O	14.998-GEO Value	<See Requirement IDs: "Field: Geographic", "Field: Geographic-Conditional", "Field: Geographic-Subfield 1" through "Field: Geographic-Values-SubField 15" >.	t-2				
Field: 14.999-Image Data Valid	8.14.37, Table 67	This is a mandatory field contains the image. <The image metadata is checked for validity.>	2	M	14.999-DATA Uncompressed Valid	IF {14.011} EQ ASCII(NONE) THEN Length(14.999) EQ 14.006} * {14.007}					B
			2	M	14.999-DATA JPEGB,JPEGL Valid	IF {14.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(JFIF, SOI-JPEGB,JPEGL, SOF-JPEGB,JPEGL, EOI-JPEG, JPEGL)	t-11				B
			2	M	14.999-DATA JP2,JP2L Valid	IF {14.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox, HeadBox, ImgBox)	t-11				B
			2	M	14.999-DATA PNG Valid	IF {14.011} EQ ASCII(PNG) THEN Present(PNGSig, IHDR,	t-11				B

						IDAT, IEND)					
			2	M	14.999-DATA WSQ Valid	IF {14.999} EQ ASCII(WSQ20) THEN Present(SOI-WSQ,SOF-WSQ,SOB-WSQ,EOI-WSQ)	t-11				B
Field: 14.999-Image WSQ Version 3.1	7.7.9.1	Only version 3.1 or higher shall be used for compressing grayscale fingerprint data at 500 ppi class with a platen area of 2 inches or greater in height. WSQ shall not be used for other than the 500 ppi class.	2	M	14.999-DATA WSQ Version	IF {14.011} EQ ASCII(WSQ20) THEN {Encoder Version } EQ 2	t-11				B

Table C.14 - Assertions for Record Type 15 - Palm Print Image Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.15: Record Type-15: Palm print image record											
Record: Type15-Palm Print Image	8.15	The Type-15 record shall contain and be used to exchange palm print image data together with fixed and user-defined textual information fields pertinent to the digitized image. The image data shall be acquired directly from a subject using a live-scan device, a palmprint card, or other media that contains the subject using a live-scan device, aag	3	M	Type15-Palm Print Image	<Not Tested. It is not feasible to test if the image represents a palm print or how the image was captured.>	t-1				B
Record: Type15-Palm Print Area	8.15	Any method used to acquire the palm print images shall be capable of capturing a set of images for each hand. This set may include the writerl be capable of capturing a set of	3	M	Type15-Palm Print Area	<Not Tested. It is not feasible to test which area of the palm is represented in the image.>	t-1				B

		and the entire area of the full palm extending from the wrist bracelet to the tips of the fingers as one or two scanned images. (See Figure 1) If two images are used to represent the full palm, the lower image shall extend from the wrist bracelet to the top of the interdigital area (third finger joint) and shall include the thenar, and hypothenar areas of the palm. The upper image shall extend from the bottom of the interdigital area to the upper tips of the fingers. This provides an adequate amount of overlap between the two images.										
Field: Type15-Subfield Occurence	Table 69	<Table 69 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	-	Type15-Subfields Zero	Count(Subfields in 15.[001 to 003, 005 to 013, 016, 017, 020, 030, 903, 996, 999]) EQ 0					T
			1	M	15.004-Subfields	Count(US_Subfields in 15.004) EQ 1 OR 2					T

			1	O	15.024-Subfields	Count(RS_Subfields in 15.024) MO [1 to 9]
						
						AND
						
						ForEach(RS_Subfield in 15.024)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

				O	15.902-Subfields	Count(RS_Subfields in 15.902) GTE 1
						
						AND
						
						ForEach(RS_Subfield in 15.902)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	15.904-Subfields	Count(US_Subfields in 15.904) EQ 3					T
			1	O	15.995-Subfields	Count(RS_Subfields in 15.995) MO [1 to 255] AND ForEach(RS_Subfield in 15.995) { Count(US_Subfields in RS_Subfield) EQ 1 OR 2					T

						}						
			1	O	15.997-Subfields	Count(RS_Subfields in 15.997) MO [1 to 255] AND ForEach(RS_Subfield in 15.997) { Count(US_Subfields in RS_Subfield) EQ 1 OR 2 }						T
				O	15.998-Subfields	<See Requirement ID: "Field: Geographic-Conditional">	t-2					
Field: Type15-CondCode	Table 69	<Table 69 specifies the Condition Code for each field.>	1	-	Type15-CondCode	Present(15.001 to 15.013, 15.999) AND NOT Present(15.014, 15.015, 15.018, 15.019, 15.021 to 15.023, 15.025 to 15.029, 15.031 to 15.199, 15.901, 15.905 to 15.994)						B
Field: Type15-CharType	8.15, Table 69	<Table 69 specifies the Character Type for each field that contains no subfields.>	1	-	Type15-CharType N	Bytes(15.[001 to 003, 005 to 010, 012, 013, 016, 017]) MO [0x30 to 0x39]						B
			1	-	Type15-CharType A	Bytes(15.030) [0x41 to 0x5A, 0x61 to 0x7A]						B
			1	-	Type15-CharType U	Present(Bytes(15. 020))						B
			1	M	15.011-CharType AN	Bytes(15.011) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]						B
			1	O	15.025-CharType NS	Bytes(15.025) MO [0x1E, 0x1F, 0x30 to 0x39]						B
			1	O	15.903-CharType Text ANS	Bytes{15.903} MO [0x20, 0x7E]						B
			1	O	15.996-CharType H	Bytes(10.996) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]						B
Field: Type15-Subfield CharType	8.15, Table 69	<Table 69 specifies the Character Type for each subfield.>	1	M	15.004-Subfield CharType U	Present(Bytes(US_Subfields:1,2 in 15.004)						B*
			1	O	15.024-Subfield CharType HN	ForEach(RS_Subfield in 15.024) { Bytes(US_Subfields:1,2,4 in RS_Subfield)) MO [0x30 to 0x39] AND Bytes(US_Subfields:3 in RS_Subfield)) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]						B*

						}					

			1	O	15.902-Subfield CharType ANU	ForEach(RS_Subfield in 15.902)
						{
						Present(Bytes(US_Subfields:2 to 4 in RS_Subfield))
						AND
						Bytes(US_Subfield:1 in RS_Subfield) MO [0x30 to 0x39,0x5A]
						}
											B*

			1	O	15.904-Subfield CharType U	Present(Bytes(All(US_Subfields in 15.904)))					B*
			1	O	15.995-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 15.995)) MO [0x30 to 0x39]					B*
			1	O	15.997-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 15.997)) MO [0x30 to 0x39]					B*
				O	15.998-Subfield CharType ANSU	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type15-CharCount	Table 69	<Table 69 specifies the Character Count for each field that contains no subfields.>	1	M	15.001-CharCount	DataLength(15.001) GTE 1					B
			1	M	15.002-CharCount	DataLength(15.002) EQ 1 OR 2					B
			1	M	15.003-CharCount	DataLength(15.003) EQ 2					B
			1	M	15.005-CharCount	DataLength(15.005) EQ 8					B
			1	M	15.006-CharCount	DataLength(15.006) MO [2 to 5]					B
			1	M	15.007-CharCount	DataLength(15.007) MO [2 to 5]					B
			1	M	15.008-CharCount	DataLength(15.008) EQ 1					B
			1	M	15.009-CharCount	DataLength(15.009) MO [1 to 5]					B
			1	M	15.010-CharCount	DataLength(15.010) MO [1 to 5]					B
			1	M	15.011-CharCount	DataLength(15.011) MO [3 to 5]					B
			1	M	15.012-CharCount	DataLength(15.012) EQ 1 OR 2					B

			1	M	15.013-CharCount	DataLength(15.013) EQ 2						B
			1	O	15.016-CharCount	DataLength(15.016) MO [1 to 4]						B
			1	O	15.017-CharCount	DataLength(15.017) MO [1 to 4]						B
			1	O	15.020-CharCount	DataLength(15.020) MO [1 to 126]						B
			1	O	15.030-CharCount	DataLength(15.030) MO [8 to 10]						B
			1	O	15.903-CharCount	DataLength(15.903) MO [13 to 16]						B
			1	O	15.996-CharCount	DataLength(15.995) EQ 64						B
			1	M	15.999-CharCount	DataLength(15.999) GTE 1						B
Field: Type15-Subfield CharCount	Table 69	<Table 69 specifies the Character Count for each subfield.>	1	M	15.004-Subfield CharCount	Length(All(US_Subfields in 15.004)) GTE 1						B*
			1	O	15.024-Subfield CharCount	ForEach(RS_Subfield in 15.024) { Length(US_Subfield:1 in RS_Subfield)) EQ 1 OR 2 AND Length(US_Subfields:2 in RS_Subfield)) MO [1 to 3] AND Length(US_Subfields:3 in RS_Subfield)) EQ 4 AND Length(US_Subfields:4 in RS_Subfield)) MO [1 to 5] }						B*
			1	O	15.902-Subfield CharCount	ForEach(RS_Subfield in 15.902) { Length(US_Subfield:1 in RS_Subfield) EQ 15 AND Length(US_Subfields:2,3 in RS_Subfield) MO [1 to 64] AND Length(US_Subfield:4 in RS_Subfield)) MO [1 to 255] }						B*
			1	O	15.904-Subfield CharCount	Length(All(US_Subfields in 15.904)) MO [1 to 50]						B*
			1	O	15.995-	ForEach(RS_Subfield in 15.995)						B*

					Subfield CharCount	{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}					

			1	O	15.997-Subfield CharCount	ForEach(RS_Subfield in 15.997)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

				O	15.998-Subfield CharCount	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type15-Field Occurrence	Table 69	<Table 69 specifies the Field Occurrence for each field.>	1	-	Type15-Occurrence Zero	Count(15.[014, 015, 018, 019, 021 to 023, 025 to 029, 031 to 199,901,905 to 994]) EQ 0					B
			1	M	Type15-Occurrence One	Count(15.[001 to 013, 999]) EQ 1					B
			1	-	Type15-Occurrence One or Fewer	Count(15.[016, 017, 020, 024, 030, 902 to 904, 995 to 998) LTE 1					B
Field: 15.001-Record Header Value	8.15.1, Table 69, 7.1	Field 15.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	15.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2				

	8.15.1, C.10.13	The XML name for the Type-15 record is <itl:PackagePalmpprintImageRecord>, and its <biom:RecordCategoryCode> element shall
		have a value of "15".
			1	M	NIEM-15.001-Record Header	ForEach(XElm(itl:PackagePalmprintImageRecord)
						{
						{XElm(biom:RecordCategoryCode) EQ ASCII(15)
						}
											X

Field: 15.002-Information Designation Character Value	8.15.2, Table 69, 7.3.1	This mandatory field shall be the IDC of this Type-15 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	15.002-IDC	<See Requirement IDs "Field: xx.002-IDC "and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2				
Field: 15.003-Impression Type Value	8.15.3, Table 69, 7.7.4.1, Table 5	This mandatory field shall indicate the manner by which the latent print was obtained. See Section 7.7.4.1 for details. <Table 69 lists the valid values for IMP.>	1	M	15.003-IMP	{15.003} EQ 10 OR 11					B
Field:	8.15.4,	This is a mandatory field. See Section 7.6		M	15.004-	<See Requirement ID "Field: Agency Codes" >	t-2				

15.004-Originating Agency Value	7.6	for details.			ORG							
Field: 15.005-Palmprint Capture Date Value	8.15.5, 7.7.2.3	This mandatory field shall contain the date that the fingerprint data contained in the record was captured.	1	M	15.005-PCD	{15.005} MO [ValidLocalDate]	t-6					T
			1	M	NIEM-15.005-PCD	ForEach(XElm(itl:PackagePalmprintRecord)) { {XElm(nc:Date) in XElm(biom:CaptureDate)} MO [NIEM-ValidLocalDate] }	t-6					X
Field: 15.006-Horizontal Line Length Value	8.15.6, Table 69, 7.7.8.1	The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	15.006-HLL	<See Requirement ID "Field: Image HLL Value" >	t-2					
Field: 15.006-Horizontal Line Length Metadata	8.15.6, Table 69, 7.7.8.1	<The HLL is verified by checking the image metadata if compression is used.>	2	M	15.006-HLL Metadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {15.006} EQ {ImageWidth-JPEGB,JPEGL}	t-11					B
			2	M	15.006-HLL Metadata JP2,JP2L	IF {15.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {15.006} EQ {ImageWidth-JP2,JP2L}	t-11					B
			2	M	15.006-HLL Metadata PNG	IF {15.011} EQ ASCII(PNG) THEN {15.006} EQ {ImageWidth-PNG}	t-11					B
			2	M	15.006-HLL Metadata WSQ	IF {15.011} EQ ASCII(WSQ20) THEN {15.006} EQ {ImageWidth-WSQ}	t-11					B
Field: 15.007-Vertical Line Length Value	8.15.7, Table 69, 7.7.8.2	The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	15.007-VLL	<See Requirement ID "Field: Image VLL Value" >	t-2					
Field: 15.007-Vertical Line Length Metadata	8.15.7, Table 69, 7.7.8.2	<The VLL is verified by checking the image metadata if compression is used.>	2	M	15.007-VLL Metadata JPEGB, JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {15.007} EQ {ImageHeight-JPEGB,JPEGL}	t-11					B
			2	M	15.007-VLL Metadata JP2, JP2L	IF {15.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {15.007} EQ {ImageHeight-JP2,JP2L}	t-11					B
			2	M	15.007-VLL Metadata PNG	IF {15.011} EQ ASCII(PNG) THEN {15.007} EQ {ImageHeight-PNG}	t-11					B
			2	M	15.006-VLL Metadata WSQ	IF {15.011} EQ ASCII(WSQ20) THEN {15.007} EQ {ImageHeight-WSQ}	t-11					B

Field: 15.008-Scale Units Value	8.15.8, Table 69, 7.7.8.3	<Table 69 lists the value constraints for SLC>		M	15.008-SLC	<See Requirement ID "Field: Image SLC Value" >	t-2					
Field: 15.008-Scale Units Metadata	8.15.8, Table 69, 7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and the quotient of THPS/TVPS shall provide the pixel aspect ratio. <The SLC is verified by checking the image metadata if compression is used.>	2	M	15.008-SLC Metadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN {15.008} EQ {SamplingUnits-JPEGB,JPEGL}	t-11					B
					15.008-SLC Metadata JP2,JP2L	<Not Tested.>	t-12					B
			2	M	15.008-SLC Metadata PNG	IF {15.011} EQ ASCII(PNG) THEN IF {15.008} EQ 1 OR 2 THEN { SamplingUnits-PNG} EQ 1, ELSE IF {15.008} EQ 0 THEN { SamplingUnits-PNG} EQ 0	t-11					B
					15.008-SLC Metadata WSQ	<Not Tested.>	t-12					B
Field: 15.009-Transmitted Horizontal Pixel Scale Value	8.15.9, Table 69, 7.7.8.4	<Table 69 lists the value constraints for THPS.>		M	15.009-THPS	<See Requirement ID "Field: Image THPS Value" >	t-2					
Field: 15.009-Transmitted Horizontal Pixel Scale Metadata	8.15.9, Table 69, 7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the pixel aspect ratio, up to 5 digits. <The THPS is verified by checking the image metadata if compression is used.>	2	M	15.009-THPS Metadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {15.008} EQ 1 OR 2 THEN {15.009} EQ {HorizontalDensity-JPEGB,JPEGL}	t-11					B
					15.009-THPS Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	15.009-THPS Metadata PNG	IF {15.011} EQ ASCII(PNG) AND {15.008} EQ 1 THEN {15.009} EQ {HorizontalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {15.011} EQ ASCII(PNG) AND {15.008} EQ 2 THEN {15.009} EQ {HorizontalDensity-PNG} * 0.01 (meters/cm)	t-11					B
					15.009-THPS Metadata WSQ	<Not Tested.>	t-12					B
			2	M	15.009-THPS	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {15.008} NEQ 1 OR 2	t-11					B

					Aspect Ratio Metadata JPEGB,JPEGL	THEN {15.009}/{15.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}					
					15.009-THPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	15.009-THPS Aspect Ratio Metadata PNG	IF {15.011} EQ ASCII(PNG) AND {15.008} NEQ 1 OR 2 THEN {15.009}/{15.010} EQ {HorizontalDensity-PNG} / {VerticalDensity-PNG}	t-11					B
					15.009-THPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12					B
Field: 15.010-Transmitted Vertical Pixel Scale Value	8.15.10, Table 69, 7.7.8.5	<Table 69 lists the value constraints for TVPS.>		M	15.010-TVPS	<See Requirement ID "Field: Image TVPS Value" >	t-2					
Field: 15.010-Transmitted Vertical Pixel Scale Metadata	8.15.10, Table 69, 7.7.8.5	This is the integer pixel density used in the Vertical direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the Vertical component of the pixel aspect ratio, up to 5 digits. <The TVPS is verified by checking the image metadata if compression is used.>	2	M	15.010-TVPS Metadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {15.008} EQ 1 OR 2 THEN {15.010} EQ {VerticalDensity-JPEGB,JPEGL}	t-11					B
					15.010-TVPS Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	15.010-TVPS Metadata PNG	IF {15.011} EQ ASCII(PNG) AND {15.008} EQ 1 THEN {15.010} EQ {VerticalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {15.011} EQ ASCII(PNG) AND {15.008} EQ 2 THEN {15.010} EQ {VerticalDensity-PNG} * 0.01 (meters/cm)	t-11					B

					15.010-TVPS Metadata WSQ	<Not Tested.>	t-12					B
			2	M	15.010-TVPS Aspect Ratio Metadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) AND {15.008} NEQ 1 OR 2 THEN {15.009}/{15.010} EQ {HorizontalDensity-JPEGB,JPEGL} / {VerticalDensity-JPEGB,JPEGL}	t-11					B
					15.010-TVPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	15.010-TVPS Aspect Ratio Metadata PNG	IF {15.011} EQ ASCII(PNG) AND {15.008} NEQ 1 OR 2 THEN {15.009}/{15.010} EQ { HorizontalDensity -PNG} / {VerticalDensity-PNG}	t-11					B
					15.010-TVPS Aspect Ratio Metadata WSQ	<Not Tested.>	t-12					B
Field: 15.011-Compression Algorithm Value	8.15.11, Table 69, 7.7.9.1	For each of these fields, the entry corresponds to the appropriate *Label* entry in Table 12: Field 15.011: Compression algorithm / CGA.	1	M	15.011-CGA	{15.011} MO [ASCII(NONE, JPEGB, JPEGL, JP2, JP2L, PNG, WSQ)]	t-98					B
Field: 15.011-Compression Algorithm Metadata	8.15.11, Table 69	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	15.011-CGAMetadata JPEGB,JPEGL	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(SOI -JPEG,JPEGL)	t-11					B
			2	M	15.011-CGA Metadata JP2, JP2L	IF {15.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox)	t-11					B
			2	M	15.011-CGA Metadata PNG	IF {15.011} EQ ASCII(PNG) THEN Present(PNGSig)	t-11					B
			2	M	15.011-CGA	IF {15.011} EQ ASCII(WSQ20) THEN	t-11					B

					Metadata WSQ	Present(SOI-WSQ)						
Field: 15.012-Bits Per Pixel Value	8.15.12, Table 69, 7.7.8.6	This field shall contain an entry of “8” for normal grayscale values of “0” to “255”. Any entry in this field greater than “8” shall represent a grayscale pixel with increased proportion.		M	15.012-BPX	<See Requirement ID “Field: Image BPX Value” >	t-2					
Field: 15.012- Bits Per Pixel Metadata	8.15.12, Table 69	<The BPX is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	15.012-BPX Metadata JPEGB,JPEGL	{15.012} EQ {BPX-JPEG, JPEGL}	t-11					B
			2	M	15.012-BPX Metadata JP2, JP2L	{15.012} EQ {BPX-JP2,JP2L}	t-11					B
			2	M	15.012-BPX Metadata PNG	{15.012} EQ {BPX-PNG}	t-11					B
					15.012-BPX Metadata WSQ	<Not Tested.>	t-12					B
Field: 15.013-Friction Ridge Generalized Position Value	8.15.13, Table 69, 7.7.4.2, Table 6	See Section 7.7.4.2 for details.	1	M	15.013-FGP Value	{15.013} MO [20 to 38, 81 to 84]						B
Field: 15.014, 15.015-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.014, 15.015 Reserved	<See Requirement ID: “Field: Type15-CondCode>.	t-2					
Field: 15.016-Scanned Horizontal Pixel Scale Value	8.15.14, Table 69, 7.7.8.7	See section 7.7.8 for details.		O	15.016-SHPS Value	<See Requirement IDs: “Field: Image SHPS Value”>	t-2					
Field: 15.017-Scanned Vertical Pixel Scale Value	8.15.15, Table 69, 7.7.8.8	See section 7.7.8 for details.		O	15.016-SVPS Value	<See Requirement IDs: “Field: Image SVPS Value”>	t-2					
Field: 15.018, 15.019-	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.018, 15.019 Reserved	<See Requirement ID: “Field: Type15-CondCode>.	t-2					

Reserved											
Field: 15.020-Comment Value	8.15.16, Table 69, 7.4.4	See section 7.4.4 for details.		O	15.020-COM	<See Requirement ID: "Field: Comment>.	t-2				
Field: 15.021 to 15.023-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.021 to 15.023 Reserved	<See Requirement ID: "Field: Type15-CondCode>.	t-2				
Field: 15.024-Palm Quality Metric Value	8.15.17, Table 69, Table 6	<Table 69 lists the value constraints for PQM.>		O	15.024-PQM	<See Requirement IDs: "Field: Sample Quality Occurrences", to "Field: Sample Quality Additional Subfield".>	t-2				
Field: 15.025 to 15.029-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.025 to 15.029 Reserved	<See Requirement ID: "Field: Type15-CondCode>.	t-2				
Field: 15.030-Device Monitoring Mode Value	8.15.27, Table 69	<Table 69 lists the value constraints for DMM.>	1	O	15.030-DMM	{15.030} MO ASCII(CONTROLLED, ASSISTED, OBSERVED, UNATTENDED, UNKNOWN)					B
Field: 15.031 to 15.199-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.031 to 15.199 Reserved	<See Requirement ID: "Field: Type15-CondCode>.	t-2				
Field: 15.200 to 15.900-User Defined	Table 69	User Defined Fields		-	15.200 to 15.900-User Defined	TRUE					B
Field: 15.901-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.901-Reserved	<See Requirement ID: "Field: Type15-CondCode>.	t-2				
Field: 15.902-Annotated Information Value	8.15.20, Table 69	This is an optional field, listing the operations performed on the original source in order to prepare it for inclusion in a biometric record type. See Section 7.4.1.		O	15.902-ANN-Value	<See Requirement ID: "Field: xx.902-ANN" >.	t-2				
Field: 15.903-Device Unique Identifier Value	8.15.31, Table 69	This is an optional field. See Section 7.7.1.1.		O	15.903-DUI Value	<See Requirement ID: "Field: Device ID" >.	t-2				
Field: 15.904-Make/Model/Serial	8.15.32, Table 69	This is an optional field. See Section 7.7.1.2.		O	15.904-MMS Value	<See Requirement ID: "Field: Make Model" >.	t-2				

Number Value											
Field: 15.905, 15.994-Reserved	Table 69	Reserved for future useonly by ANSI/NIST-ITL.		-	15.905, 15.994-Reserved	<See Requirement ID: "Field: Type15-CondCode>.	t-2				
Field: 15.995-Associated Context Value	8.15.33, Table 69	See Section 7.3.3		O	15.995-ASC Value	<See Requirement IDs: "Field: xx.995-ASC" and "Field: xx.995-ASC-ACN" and "Field: xx.995-ASC-ASP">.	t-2				
Field: 15.996-Hash Value	8.15.34, Table 69	See Section 7.5.2		O	15.996-HAS Value	<See Requirement ID: "Field: HAS">	t-2				
Field: 15.997-Source Representation Value	8.15.35, Table 69	See Section 7.3.2		O	15.997-SOR Value	<See Requirement IDs: "Field: xx.997-SOR" and "Field: xx.997-SOR-SRN" and "Field: xx.997-SOR-RSP">.	t-2				
Field: 15.998-Geographic Sample Acquisition Location Value	8.15.36, Table 69	See Section 7.7.3		O	15.998-GEO Value	<See Requirement IDs: "Field: Geographic", "Field: Geographic-Conditional", "Field: Geographic-Subfield 1" through "Field: Geographic-Values-SubField 15" >.	t-2				
Field: 15.999-Image Data Valid	8.15.37, Table 69	This is a mandatory field contains the image. <The image metadata is checked for validity.>	2	M	15.999-DATA Uncompressed Valid	IF {15.011} EQ ASCII(NONE) THEN Length(15.999) EQ 15.006} * {15.007}					B
			2	M	15.999-DATA JPEGB,JPEGL Valid	IF {15.011} EQ ASCII(JPEGB) OR ASCII(JPEGL) THEN Present(JFIF, SOI-JPEGB,JPEGL, SOF-JPEGB,JPEGL, EOI-JPEG, JPEGL)	t-11				B
			2	M	15.999-DATA JP2,JP2L Valid	IF {15.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox, HeadBox, ImgBox)	t-11				B
			2	M	15.999-DATA PNG Valid	IF {15.011} EQ ASCII(PNG) THEN Present(PNGSig, IHDR, IDAT, IEND)	t-11				B
			2	M	15.999-	IF {15.999} EQ ASCII(WSQ20) THEN	t-11				B

					DATA WSQ Valid	Present(SOI-WSQ,SOF-WSQ,SOB-WSQ,EOI-WSQ)					
Field: 15.999-Image WSQ Version 3.1	7.7.9.1	Only version 3.1 or higher shall be used for compressing grayscale fingerprint data at 500 ppi class with a platen area of 2 inches or greater in height. WSQ shall not be used for other than the 500 ppi class.	2	M	15.999-DATA WSQ Version	IF {15.011} EQ ASCII(WSQ20) THEN {Encoder Version } EQ 2	t-11				B

Table C.15 - Assertions for Record Type 17 - Iris Image Record

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
8.17: Record Type-17: Iris image record											
Field: Type17-Subfield Occurrence	Table 71	<Table 71 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	-	Type17-Subfields Zero	Count(Subfields in 17.[001 to 003, 005 to 015, 017, 020 to 023, 026, 030 to 032, 040, 041, 996]) EQ 0					T
			1	M	17.004-Subfields	Count(US_Subfields in 17.004) EQ 1 OR 2					T
			1	O	17.016-Subfields	Count(US_Subfields in 17.016) EQ 3					T
			1	O	17.019-Subfields	Count(US_Subfields in 17.019) EQ 3					T

			1	O	17.024-Subfields	Count(RS_Subfields in 17.024) MO [1 to 9]
						AND
						ForEach(RS_Subfield in 17.024)
						{
						Count(US_Subfields in RS_Subfield) EQ 3
						}
											T

			1	M	17.025-Subfields	IF {US_Subfield:1 in 17.025} EQ ASCII(DEFINED) THEN
						Count(US_Subfields in 17.025) EQ 3
						ELSE
						Count(US_Subfields in 17.025) EQ 1
						}
											T

			1	O	17.033-Subfields	Count(US_Subfields in 17.033) EQ 2 + 2*{US_Subfield:2 in 17.033} }					T
			1	O	17.034-Subfields	Count(US_Subfields in 17.034) EQ 2 + 2*{US_Subfield:2 in 17.034} }					T
			1	O	17.035-Subfields	Count(US_Subfields in 17.035) EQ 2 + 2*{ US_Subfield:2 in 17.035} }					T
			1	O	17.036-Subfields	Count(US_Subfields in 17.036) EQ 2 + 2*{ US_Subfield:2 in 17.036} }					T
			1	O	17.037-	Count(US_Subfields in 17.037) EQ 3 +					T

					Subfields	2*{US_Subfield:3 in 17.037)} }					

			1	O	17.902-Subfields	Count(RS_Subfields in 17.902) GTE 1
						
						AND
						
						ForEach(RS_Subfield in 17.902)
						{
						Count(US_Subfields in RS_Subfield) EQ 4
						}
											T

			1	O	17.995-Subfields	Count(RS_Subfields in 17.995) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 17.995)
						{
						Count(US_Subfields in RS_Subfield) EQ 2OR 3
						}
											T

			1	O	17.997-Subfields	Count(RS_Subfields in 17.997) MO [1 to 255]
						
						AND
						
						ForEach(RS_Subfield in 17.997)
						{
						Count(US_Subfields in RS_Subfield) EQ 1 OR 2
						}
											T

				O	17.998-Subfields	<See Requirement ID: "Field: Geographic-Conditional">	t-2				
Field: Type17-CondCode	Table 71	<Table 71 specifies the Condition Code for each field.>	1	-	Type17-CondCode	Present(17.001 to 17.013, 17.025, 17.032, 17.999) AND NOT Present(17.018, 17.027 to 17.029, 17.038, 17.039, 17.042 to 17.199, 17.901, 17.903 to 17.994)					B
Field: 17.015-Rotation Uncertainty Dependent	Table 71, 8.17.15	This field is mandatory if Field 17.014: Rotation angle of eye / RAE is present.	2	D	17.015-CondCode Dependent	IF Present(17.014) THEN Present(17.015)					B
Field: Type17-CharType	8.17, Table 71	<Table 71 specifies the Character Type for each field that contains no subfields.>	1	-	Type17-CharType N	Bytes(17.[001,002,003, 005 to 010, 012, 022, 023, 026, 031, 032, 040, 041]) MO [0x30 to 0x39]					B
			1	-	Type17-CharType A	Bytes(17.[013, 020, 030]) MO [0x41 to 0x5A, 0x61 to 0x7A]					B

			1	-	Type17-CharType AN	Bytes(17.[011, 014, 015]) [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]					B
			1	O	17.017-CharType ANS	Bytes(17.017) MO [0x20, 0x7E]					B
			1	O	17.996-CharType H	Bytes(10.996) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]					B
Field: Type17-Subfield CharType	8.17, Table 71	<Table 71 specifies the Character Type for each subfield.>	1	M	17.004-Subfield CharType U	Present(Bytes(US_Subfields:1,2 in 17.004)					B*
			1	O	17.016-Subfield CharType N	Bytes(All(US_Subfields in 17.016)) MO [0x30 to 0x39]					B*
			1	O	17.019-Subfield CharType U	Present(Bytes(US_Subfields:1 to 3 in 17.019)					B*

			1	O	17.024-Subfield CharType HN	ForEach(RS_Subfield in 17.024)
						{
						Bytes(US_Subfields:1,3 in RS_Subfield)) MO [0x30 to 0x39]
						AND
						Bytes(US_Subfields:2 in RS_Subfield)) MO [0x30 to 0x39,0x41 to 0x46, 0x61 to 0x66]
						}
											B*

			1	M	17.025-Subfield CharType AN	Bytes(US_Subfields:1 in 17.025)) MO [0x41 to 0x5A, 0x61 to 0x7A]] AND Bytes(US_Subfields:2,3 in 17.025)) MO [0x30 to 0x39]					B*

			1	M	17.033-Subfield CharType AN	Bytes(US_Subfields:1 in 17.033)) MO [0x41 to 0x5A, 0x61 to 0x7A]]
						For(X EQ 2 to Count(US_Subfields in 17.033))
						{
						Bytes(US_Subfield:X in 17.033) MO [0x30 to 0x39]
						}
											B*

			1	O	17.034-Subfield CharType AN	Bytes(US_Subfields:1 in 17.034)) MO [0x41 to 0x5A, 0x61 to 0x7A]]
						For(X EQ 2 to Count(US_Subfields in 17.034))
						{
						Bytes(US_Subfield:X in 17.034) MO [0x30 to 0x39]
						}
											B*

			1	O	17.035-Subfield CharType AN	Bytes(US_Subfields:1 in 17.035)) MO [0x41 to 0x5A, 0x61 to 0x7A]]
						For(X EQ 2 to Count(US_Subfields in 17.035))
						{
						Bytes(US_Subfield:X in 17.035) MO [0x30 to 0x39]
						}
											B*

			1	O	17.036-Subfield CharType AN	Bytes(US_Subfields:1 in 17.036)) MO [0x41 to 0x5A, 0x61 to 0x7A]]
						For(X EQ 2 to Count(US_Subfields in 17.036))
						{
						Bytes(US_Subfield:X in 17.036) MO [0x30 to 0x39]
						}
											B*

			1	O	17.037-Subfield CharType AN	ForEach(RS_Subfield in 17.037)
						{
						Bytes(US_Subfields:1,2 in RS_Subfield)) MO [0x41 to 0x5A, 0x61 to 0x7A]]
						AND
						For(X EQ 3 to Count(US_Subfields in RS_Subfield))
						{
						Bytes(US_Subfield:X in RS_Subfield) MO [0x30 to 0x39]
						}
						}
											B*

			1	O	17.995-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 17.995)) MO [0x30 to 0x39]					B*
			1	O	17.997-Subfield CharType N	Bytes(All(US_Subfields:1,2 in 17.997)) MO [0x30 to 0x39]					B*
				O	17.998-Subfield CharType ANSU	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type17-CharCount	Table 71	<Table 71 specifies the Character Count for each field that contains no subfields.>	1	M	17.001-CharCount	DataLength(17.001) GTE 1					B
			1	M	17.002-CharCount	DataLength(17.002) EQ 1 OR 2					B
			1	M	17.003-CharCount	DataLength(17.003) EQ 1					B
			1	M	17.005-	DataLength(17.005) EQ 8					B

					CharCount							
			1	M	17.006-CharCount	DataLength(17.006) MO [2 to 5]						B
			1	M	17.007-CharCount	DataLength(17.007) MO [2 to 5]						B
			1	M	17.008-CharCount	DataLength(17.008) EQ 1						B
			1	M	17.009-CharCount	DataLength(17.009) MO [1 to 5]						B
			1	M	17.010-CharCount	DataLength(17.010) MO [1 to 5]						B
			1	M	17.011-CharCount	DataLength(17.011) MO [3 to 4]						B
			1	M	17.012-CharCount	DataLength(17.012) EQ 1 OR 2						B
			1	M	17.013-CharCount	DataLength(17.013) MO [3 to 4]						B
			1	O	17.014-CharCount	DataLength(17.014) MO [1 to 5]						B
			1	D	17.015-CharCount	DataLength(17.015) MO [1 to 5]						B
			1	O	17.017-CharCount	DataLength(17.017) MO [13 to 16]						B
			1	O	17.020-CharCount	DataLength(17.020) EQ 3						B
			1	O	17.021-CharCount	DataLength(17.021) MO [1 to 126]						B
			1	O	17.022-CharCount	DataLength(17.022) MO [1 to 4]						B
			1	O	17.023-CharCount	DataLength(17.023) MO [1 to 4]						B
			1	O	17.026-CharCount	DataLength(17.026) MO [2 to 4]						B
			1	O	17.030-CharCount	DataLength(17.030) MO [7 to 10]						B
			1	O	17.031-CharCount	DataLength(17.031) EQ 2						B
			1	M	17.032-CharCount	DataLength(17.032) MO [7 to 10]						B
			1	O	17.040-CharCount	DataLength(17.040) MO [1 to 7]						B
			1	O	17.041-CharCount	DataLength(17.041) EQ 1 OR 2						B

			1	O	17.996-CharCount	DataLength(17.995) EQ 64					B
			1	M	17.999-CharCount	DataLength(17.999) GTE 1					B
Field: Type17-Subfield CharCount	Table 71	<Table 71 specifies the Character Count for each subfield.>	1	M	17.004-Subfield CharCount	Length(All(US_Subfields in 17.004)) GTE 1					B*
			1	O	17.016-Subfield CharCount	Length(All(US_Subfields in 17.016)) EQ 1					B*
			1	O	17.019-Subfield CharCount	Length(All(US_Subfields in 17.019)) MO [1 to 50]					B*

			1	O	17.024-Subfield CharCount	ForEach(RS_Subfield in 17.024)
						{
						Length(US_Subfields:1 in RS_Subfield)) MO [1 to 3]
						AND
						Length(US_Subfields:2 in RS_Subfield)) EQ 4
						AND
						Length(US_Subfields:3 in RS_Subfield)) MO [1 to 5]
						
						}
											B*

			1	M	17.025-Subfield CharCount	ForEach(RS_Subfield in 17.025)
						{
						Length(US_Subfields:1 in RS_Subfield)) MO [3 to 9]
						AND
						Length(US_Subfields:2,3 in RS_Subfield)) EQ 3
						}
											B*

			1	O	17.023-Subfield CharCount	ForEach(RS_Subfield in 17.023)
						{
						Length(US_Subfields:1 in RS_Subfield)) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield)) MO [1 to 3]
						AND
						Length(US_Subfields:3 in RS_Subfield)) EQ 4
						AND
						Length(US_Subfields:4 in RS_Subfield)) MO [1 to 5]
						
						}
											B*

			1	O	17.024-Subfield CharCount	ForEach(RS_Subfield in 17.024)
						{
						Length(US_Subfield:1 in RS_Subfield)) EQ 1 OR 2
						AND
						Length(US_Subfields:2 in RS_Subfield)) MO [1 to 3]
						AND
						Length(US_Subfields:3 in RS_Subfield)) EQ 4
						AND
						Length(US_Subfields:4 in RS_Subfield)) MO [1 to 5]
						}
											B*

			1	O	17.025-Subfield CharCount	ForEach(RS_Subfield in 17.025)
						{
						Length(US_Subfields:1,2 in RS_Subfield)) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	17.033-Subfield CharCount	ForEach(RS_Subfield in 17.033)
						{
						Length(US_Subfields:1 in RS_Subfield)) EQ 1
						AND
						Length(US_Subfields:2 in RS_Subfield)) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	17.034-Subfield CharCount	ForEach(RS_Subfield in 17.034) { Length(US_Subfields:1 in RS_Subfield)) EQ 1 AND Length(US_Subfields:2 in RS_Subfield)) EQ 1 OR 2 AND ForEach(<additional US_Subfield in RS_Subfield>)					B*

						{
						Length(US_Subfield) MO [1 to 5]
						}
						}					

			1	O	17.035-Subfield CharCount	ForEach(RS_Subfield in 17.035)
						{
						Length(US_Subfields:1 in RS_Subfield)) EQ 1
						AND
						Length(US_Subfields:2 in RS_Subfield)) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	17.036-Subfield CharCount	ForEach(RS_Subfield in 17.036)
						{
						Length(US_Subfields:1 in RS_Subfield)) EQ 1
						AND
						Length(US_Subfields:2 in RS_Subfield)) EQ 1 OR 2
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	17.037-Subfield CharCount	ForEach(RS_Subfield in 17.037)
						{
						Length(US_Subfields:1,2 in RS_Subfield)) EQ 1
						AND
						Length(US_Subfields:3 in RS_Subfield)) MO [1 to 3]
						AND
						ForEach(<additional US_Subfield in RS_Subfield>)
						{
						Length(US_Subfield) MO [1 to 5]
						}
						}
											B*

			1	O	17.902-Subfield CharCount	ForEach(RS_Subfield in 17.902) { Length(US_Subfield:1 in RS_Subfield) EQ 15 AND					B*

						Length(US_Subfields:2,3 in RS_Subfield) MO [1 to 64] AND Length(US_Subfield:4 in RS_Subfield)) MO [1 to 255] }					

			1	O	17.995-Subfield CharCount	ForEach(RS_Subfield in 17.995)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

			1	O	17.997-Subfield CharCount	ForEach(RS_Subfield in 17.997)
						{
						Length(US_Subfield:1 in RS_Subfield) MO [1 to 3]
						AND
						Length(US_Subfield:2 in RS_Subfield) EQ 1 OR 2
						}
											B*

				O	17.998-Subfield CharCount	<See Requirement ID: "Field: Geographic">	t-2				
Field: Type17-Field Occurrence	Table 71	<Table 71 specifies the Field Occurrence for each field.>	1	-	Type17-Occurrence Zero	Count(17.[018 ,027 to 029, 038, 039, 042 to 199,901,903 to 994]) EQ 0					B
			1	M	Type17-Occurrence One	Count(17.[001 to 013, 025, 032, 999]) EQ 1					B
			1	-	Type14-Occurrence One or Fewer	Count(17.[014 to 017,019 to 024,026, 030, 031, 033 to 037, 040, 041, 902, 995 to 998) LTE 1					B
Field: 17.001-Record Header Value	8.17.1, Table 71, 7.1	Field 17.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	17.001-Record Header	<See Requirement ID "Field: xx.001-Record Header">	t-2				

	8.17.1, C.10.15	The XML name for the Type-17 record is <itl:PackageIrisImageRecord>, and its <biom:RecordCategoryCode> element shall have a value of "17".	1	M	NIEM-17.001-Record Header	ForEach(XElm(itl:PackageIrisImageRecord)
						{
						{XElm(biom:RecordCategoryCode)} EQ ASCII(17)
						}
											X

Field: 17.002-Information Designation Character	8.17.2, Table 71, 7.3.1	This mandatory field shall be the IDC of this Type-17 record as found in the information item IDC of Field 1.003 Transaction content/CNT.		M	17.002-IDC	<See Requirement IDs "Field: xx.002-IDC" and "Field: 1.003-Transaction Content Subfield 2 IDC Matches" >	t-2				

Value											
Field: 17.003-Eye Label Value	8.17.3, Table 71, 7.7.4.1	<Table 71 lists the valid values for ELR.>	1	M	17.003-ELR	{17.003} MO [0 to 2]					B
Field: 17.004-Originating Agency Value	8.17.4, 7.6	This is a mandatory field. See Section 7.6 for details.		M	17.004-ORG	<See Requirement ID "Field: Agency Codes" >	t-2				
Field: 17.005-Iris Capture Date Value	8.17.5, 7.7.2.3	This mandatory field shall contain the date that the iris biometric data contained in the record was captured.	1	M	17.005-ICD	{17.005} MO [ValidLocalDate]	t-6				T

			1	M	NIEM-17.005-ICD	ForEach(XElm(itl:PackageIrisImageRecord))
						{
						{XElm(nc:Date) in XElm(biom:CaptureDate)} MO [NIEM-ValidLocalDate]
						}
							t-6				X

Field: 17.006-Horizontal Line Length Value	8.17.6, Table 71, 7.7.8.1	The maximum horizontal size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	17.006-HLL	<See Requirement ID "Field: Image HLL Value" >	t-2				
Field: 17.006-Horizontal Line Length Metadata	8.17.6, Table 71, 7.7.8.1	<The HLL is verified by checking the image metadata if compression is used.>	2	M	17.006-HLL Metadata JP2,JP2L	IF {17.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {17.006} EQ {ImageWidth-JP2,JP2L}	t-11				B
			2	M	17.006-HLL Metadata PNG	IF {17.011} EQ ASCII(PNG) THEN {17.006} EQ {ImageWidth-PNG}	t-11				B
Field: 17.007-Vertical Line Length Value	8.17.7, Table 71, 7.7.8.2	The maximum vertical size is limited to 65,534 pixels in Record Types-4 and 8, and to 99,999 for other record types. The minimum value is 10 pixels.		M	17.007-VLL	<See Requirement ID "Field: Image VLL Value" >	t-2				
Field: 17.007-Vertical Line Length Metadata	8.17.7, Table 71, 7.7.8.2	<The VLL is verified by checking the image metadata if compression is used.>	2	M	17.007-VLL Metadata JP2, JP2L	IF {17.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN {17.007} EQ {ImageHeight-JP2,JP2L}	t-11				B
			2	M	17.007-VLL Metadata PNG	IF {17.011} EQ ASCII(PNG) THEN {17.007} EQ {ImageHeight-PNG}	t-11				B
Field: 17.008-Scale Units Value	8.17.8, Table 71, 7.7.8.3	<Table 71 lists the value constraints for SLC>		M	17.008-SLC	<See Requirement ID "Field: Image SLC Value" >	t-2				
Field: 17.008-Scale Units Metadata	8.17.8, Table 71, 7.7.8.3	A value of "1" shall indicate pixels per inch. A value of "2" shall indicate pixels per centimeter. A value of "0" in this field indicates that no scale is provided, and			17.008-SLC Metadata JP2,JP2L	<Not Tested.>	t-12				B
			2	M	17.008-SLC Metadata	IF {17.011} EQ ASCII(PNG) THEN IF {17.008} EQ 1 OR 2 THEN { SamplingUnits-	t-11				B

		the quotient of THPS/TVPS shall provide the pixel aspect ratio. <The SLC is verified by checking the image metadata if compression is used.>			PNG	PNG} EQ 1, ELSE IF {17.008} EQ 0 THEN { SamplingUnits-PNG} EQ 0					
Field: 17.009-Transmitted Horizontal Pixel Scale Value	8.17.9, Table 71, 7.7.8.4	<Table 71 lists the value constraints for THPS.>		M	17.009-THPS	<See Requirement ID "Field: Image THPS Value" >	t-2					
Field: 17.009-Transmitted Horizontal Pixel Scale Metadata	8.17.9, Table 71, 7.7.8.4	This is the integer pixel density used in the horizontal direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the horizontal component of the pixel aspect ratio, up to 5 digits. <The THPS is verified by checking the image metadata if compression is used.>			17.009-THPS Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	17.009-THPS Metadata PNG	IF {17.011} EQ ASCII(PNG) AND {17.008} EQ 1 THEN {17.009} EQ {HorizontalDensity-PNG} * 0.0254 (meters/inch) ELSE IF {17.011} EQ ASCII(PNG) AND {17.008} EQ 2 THEN {17.009} EQ {HorizontalDensity-PNG} * 0.01 (meters/cm)	t-11					B
					17.009-THPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	17.009-THPS Aspect Ratio Metadata PNG	IF {17.011} EQ ASCII(PNG) AND {17.008} NEQ 1 OR 2 THEN {17.009}/{17.010} EQ {HorizontalDensity-PNG} / {VerticalDensity-PNG}	t-11					B
Field: 17.010-Transmitted Vertical Pixel Scale Value	8.17.10, Table 71, 7.7.8.5	<Table 71 lists the value constraints for TVPS.>		M	17.010-TVPS	<See Requirement ID "Field: Image TVPS Value" >	t-2					
Field: 17.010-Transmitted Vertical Pixel Scale	8.17.10, Table 71, 7.7.8.5	This is the integer pixel density used in the Vertical direction of the image if SLC has a value of "1" or "2". If SLC has a value of "0", this information item shall contain the Vertical component of the			17.010-TVPS Metadata JP2, JP2L	<Not Tested.>	t-12					B
			2	M	17.010-	IF {17.011} EQ ASCII(PNG) AND {17.008} EQ 1	t-11					B

Metadata		pixel aspect ratio, up to 5 digits. <The TVPS is verified by checking the image metadata if compression is used.>			TVPS Metadata PNG	THEN {17.010} EQ {VerticalDensity-PNG} * 0.0254 (meters/inch), ELSE IF {17.011} EQ ASCII(PNG) AND {17.008} EQ 2 THEN {17.010} EQ {VerticalDensity-PNG} * 0.01 (meters/cm)					
					17.010-TVPS Aspect Ratio Metadata JP2, JP2L	<Not Tested.>	t-12				B
			2	M	17.010-TVPS Aspect Ratio Metadata PNG	IF {17.011} EQ ASCII(PNG) AND {17.008} NEQ 1 OR 2 THEN {17.009}/{17.010} EQ { HorizontalDensity - PNG} / {VerticalDensity-PNG}	t-11				B
Field: 17.011-Compression Algorithm Value	8.17.11, Table 71, 7.7.9.1	For each of these fields, the entry corresponds to the appropriate *Label* entry in Table 12: Field 17.011: Compression algorithm / CGA.		M	17.011-CGA	<See Requirement ID "Field: Type17 Compression".>	t-2				
Field: 17.011-Compression Algorithm Metadata	8.17.11, Table 71	<The CGA is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	17.011-CGA Metadata JP2, JP2L	IF {17.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox)	t-11				B
			2	M	17.011-CGA Metadata PNG	IF {17.011} EQ ASCII(PNG) THEN Present(PNGSig)	t-11				B
Field: 17.012-Bits Per Pixel Value	8.17.12, Table 71, 7.7.8.6	This field shall contain an entry of "8" for normal grayscale values of "0" to "255". Any entry in this field greater than "8" shall represent a grayscale pixel with increased proportion.		M	17.012-BPX	<See Requirement ID "Field: Image BPX Value" >	t-2				
Field: 17.012- Bits Per Pixel Metadata	8.17.12, Table 71	<The BPX is verified by checking the image metadata for the compression type signature if compression is used.>	2	M	17.012-BPX Metadata JP2, JP2L	{17.012} EQ {BPX-JP2,JP2L}	t-11				B
			2	M	17.012-BPX Metadata PNG	{17.012} EQ {BPX-PNG}	t-11				B
Field: 17.013-Color Space Value	8.17.13, Table 71, 7.7.10	Table 13 lists the codes and their descriptions for each of the available color spaces used within this standard. All other color spaces are to be marked as undefined.		M	17.013-CSP	<See Requirement ID: "Field: Image CSP Value".>	t-2				

Field: 17.014-Rotation Angle of Eye Value	8.17.14, Table 71	The in-plane eye rotation angle shall be recorded as angle = round (65536 * angle / 360) modulo 65536. The value "FFFF" indicates rotation angle of eye is undefined. <Table 71 lists the value constraints for RAE.>	1	O	17.014-RAE	{17.014} MO [0 to 65535] OR EQ ASCII(FFFF)					B
Field: 17.015-Rotation Uncertainty Value	8.17.15, Table 71	The rotation uncertainty is non-negative and equal to [round (65536 * uncertainty / 180)]. The uncertainty is measured in degrees and is the absolute value of maximum error. The value "FFFF" indicates uncertainty is undefined. <Table 71 lists the value constraints for RAU.>	1	D	17.014-RAU	{17.015} MO [0 to 65535] OR EQ ASCII(FFFF)					B
Field: 17.015-Rotation Uncertainty Conditional	8.17.15, Table 71	This optional field shall indicate the uncertainty in the in-plane eye rotation given in Field 17.014: Rotation angle of eye / RAE. This field is mandatory if Field 17.014: Rotation angle of eye / RAE is present.		D	17.014-RAU Conditional	<See Requirement ID: "Field: 17.015-Rotation Uncertainty Dependent".>	t-2				
Field: 17.016-Image Property Code Value	8.17.16, Table 71	<Table 71 lists the value constraints for IPC.>	1	O	17.016-IPC	{US_Subfield:1,2 in 17.016} MO [0 to 2] AND {US_Subfield:3 in 17.016} EQ 0 OR 1					B*
Field: 17.017-Device Unique Value	8.17.17, Table 71	See Section 7.7.1.1 for details. <Table 71 lists the value constraints for DUI.>		O	17.017-DUI	<See Requirement ID: "Field: Device ID".>	t-2				
Field: 17.018-Deprecated	Table 71	Deprecated; See ANSI/NIST-ITL 1-2007 for a description of this field. Not to be used for any new transactions.		-	17.019-Deprecated	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.019-Make/Model/Serial Number Value	8.17.18, 7.7.1.2, Table 71	See Section 7.7.1.2 for details. <Table 71 lists the value constraints for MMS.>		O	17.019-MMS	<See Requirement ID: "Field: Make Model".>	t-2				
Field: 17.020-Eye Color Value	8.17.19, 7.7.11, Table 71, Table 14	See Section 7.7.11 and Table 14 for details on entering values to this field. <Table 71 lists the value constraints for ECL.>		O	17.020-ECL	<See Requirement ID: "Field: Image ECL Value".>	t-2				

Field: 17.021-Comment Value	8.17.20, Table 71, 7.4.4	See section 7.4.4 for details.		O	17.021-COM	<See Requirement ID: "Field: Comment>.	t-2				
Field: 17.022-Scanned Horizontal Pixel Scale Value	8.17.21, 7.7.8.7, 7.4.4	See section 7.7.8.7 for details.		O	17.021-SHPS	<See Requirement ID: "Field: Image SHPS Value".>	t-2				
Field: 17.023-Scanned Vertical Pixel Scale Value	8.17.22, 7.7.8.8, 7.4.4	See section 7.7.8.8 for details.		O	17.021-SVPS	<See Requirement ID: "Field: Image SVPS Value".>	t-2				
Field: 17.024-Image Quality Score Value	8.17.23, Table 71	<Table 71 lists the value constraints for IQS.>		O	17.024-IQS	<See Requirement ID: "Field: Sample Quality Occurrences", "Field: Sample Quality Subfield 1", "Field: Sample Quality Subfield 2"' "Field: Sample Quality Subfield 3".>	t-2				
Field: 17.025-Effective Acquisition Spectrum Value	8.17.24, Table 71, Table 72	<Table 71 lists the value constraints for EAS.>	1	M	17.025-EAS	{US_Subfield:1 in 17.025} MO [ASCII(NIR, DEFINED, VIS, RED, UNDEFINED)] AND {US_Subfields:2,3 in 17.025} MO [500 to 999]					B*
Field: 17.025-Effective Acquisition Spectrum Conditional Subfields	8.17.24, Table 71, Table 72	The second and third information items are conditional upon the value of SPV. These values are mandatory only when SPV = "DEFINED"; otherwise, they are not used.		M	17.025-EAS Conditional Subfields	<See Requirement ID: "Field: Type17-Subfield Occurrence".>	t-2				
Field: 17.026-Iris Diameter Value	8.17.25, Table 71, Table 72	<Table 71 lists the value constraints for IRD.>	1	O	17.026-IRD	{17.026} MO [10 to 9999]					B
Field: 17.027-17.029 Reserved	Table 71	Reserved for future useonly by ANSI/NIST-ITL.		-	17.027 to 17.029 Reserved	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.030-Device Monitoring	8.17.26, 7.7.1.3, Table 71, Table 3	See Section 7.7.1.3 for details. <Table 71 lists the value constraints for DMM.>		O	17.030-DMM	<See Requirement ID: "Field: Device Monitoring" >.	t-2				

Mode Value											
Field: 17.031-Subject Acquisition Profile-Iris Value	8.17.27	<Table 71 lists the value constraints for IAP.>		O	17.031-IAP	<See Requirement ID: "Field: IAP Values" >.	t-2				
Field: 17.032-Iris Storage Format Value	8.17.28	<Table 71 lists the value constraints for ISF.>	1	M	17.032-ISF	{17.032} MO [1 to 3, 7]					B
Field: 17.033-Iris Pupil Boundary Value	8.17.29, Table 71, Table 16	<Table 71 lists the value constraints for IPB.>	1	M ⇑	17.033-Subfield 1 - BYC	{US_Subfield:1 in 17.033} MO [ASCII(C,E,P)]					B*
			1	M ⇑	17.033-Subfield 2-NOP	{US_Subfield:2 in 17.033} MO [2 to 99]					B*

			1	M ⇑	17.033-Subfield Pair	For(X EQ 3 to {US_Subfield:2 in 17.033})
						{
						IF X MOD 2 EQ 0
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.007}
						ELSE
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.006}
						}
											B*

Field: 17.034-Iris Sclera Boundary Value	8.17.30, Table 71, Table 16	<Table 71 lists the value constraints for ISB.>	1	M ⇑	17.034-Subfield 1 - BYC	{US_Subfield:1 in 17.034} MO [ASCII(C,E,P)]					B*
			1	M ⇑	17.034-Subfield 2-NOP	{US_Subfield:2 in 17.034} MO [2 to 99]					B*

			1	M ⇑	17.034-Subfield Pair	For(X EQ 3 to {US_Subfield:2 in 17.034})
						{
						IF X MOD 2 EQ 0
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.007}
						ELSE
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.006}
						}
											B*

Field: 17.035-	8.17.31, Table 71,	<Table 71 lists the value constraints for UEB.>	1	M ⇑	17.035-Subfield 1 -	{US_Subfield:1 in 17.035} MO [ASCII(C,E,P)]					B*

Upper Eyelid Boundary Value	Table 16				BYC							
			1	M ⇑	17.035-Subfield 2-NOP	{US_Subfield:2 in 17.035} MO [2 to 99]						B*
			1	M ⇑	17.035-Subfield Pair	For(X EQ 3 to {US_Subfield:2 in 17.035}) { IF X MOD 2 EQ 0 {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.007} ELSE {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.006} }						B*
Field: 17.036-Lower Eyelid Boundary Value	8.17.32, Table 71, Table 16	<Table 71 lists the value constraints for LEB.>	1	M ⇑	17.036-Subfield 1 - BYC	{US_Subfield:1 in 17.036} MO [ASCII(C,E,P)]						B*
			1	M ⇑	17.036-Subfield 2-NOP	{US_Subfield:2 in 17.036} MO [2 to 99]						B*
			1	M ⇑	17.036-Subfield Pair	For(X EQ 3 to {US_Subfield:2 in 17.036}) { IF X MOD 2 EQ 0 {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.007} ELSE {US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.006} }						B*
Field: 17.037-Non-Eyulid Occlusions Value	8.17.33, Table 71, Table 17, Table 18	<Table 71 lists the value constraints for NEO.>	1	M ⇑	17.037-Subfield 1 - BYC	ForEach(RS_Subfield in 17.037) { {US_Subfield:1 in RS_Subfield} MO [ASCII(T,I,L,S)] }						B*
			1	M ⇑	17.037-Subfield 2-NOP	ForEach(RS_Subfield in 17.037) { {US_Subfield:2 in RS_Subfield} MO [ASCII(L,S,C,R,O)] }						B*
			1	M ⇑	17.037-Subfield 2-NOP	ForEach(RS_Subfield in 17.037) { {US_Subfield:3 in RS_Subfield} MO [3 to 99] }						B*
			1	M	17.037-	ForEach(RS_Subfield in 17.037)						B*

				⇑	Subfield Pair	{
						For(X EQ 4 to {US_Subfield:2 in RS_Subfield})
						{
						IF X MOD 2 EQ 0
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.006}
						ELSE
						{US_Subfield:X in RS_Subfield} GTE 1 AND LTE {17.007}
						}
						}					

Field: 17.038, 17.039 Reserved	Table 71	Reserved for future useonly by ANSI/NIST-ITL.		-	17.038,17.039 Reserved	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.040-Range Value	8.17.34, Table 71	<Table 71 lists the value constraints for RAN.>	1	O	17.040-RAN	{17.040} MO [Integers]					B
Field: 17.041-Frontal Gaze Value	8.17.35, Table 71	<Table 71 lists the value constraints for GAZ.>	1	O	17.041-GAZ	{17.041} MO [0 to 90]					B
Field: 17.042 to 17.199 Reserved	Table 71	Reserved for future useonly by ANSI/NIST-ITL.		-	17.042 to 17.199 Reserved	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.200 to 17.900-User Defined	Table 71	User Defined Fields		-	17.200 to 17.900-User Defined	TRUE					B
Field: 17.901 Reserved	Table 71	Reserved for future useonly by ANSI/NIST-ITL.		-	17.901 Reserved	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.902-Annotated Information Value	8.17.37, Table 71, 7.4.1	This is an optional field, listing the operations performed on the original source in order to prepare it for inclusion in a biometric record type. See Section 7.4.1.		O	17.902-ANN-Value	<See Requirement ID: "Field: xx.902-ANN" >.	t-2				
Field: 17.903 to 17.994 Reserved	Table 71	Reserved for future useonly by ANSI/NIST-ITL.		-	17.903 to 17.994 Reserved	<See Requirement ID: "Field: Type17-CondCode>.	t-2				
Field: 17.995-Associated Context Value	8.17.38, Table 71	See Section 7.3.3		O	17.995-ASC Value	<See Requirement IDs: "Field: xx.995-ASC" and "Field: xx.995-ASC-ACN" and "Field: xx.995-ASC-ASP">.	t-2				
Field:	8.17.39,	See Section 7.5.2		O	17.996-HAS	<See Requirement ID: "Field: HAS">	t-2				

17.996-Hash Value	Table 71				Value						
Field: 17.997-Source Representation Value	8.17.40, Table 71	See Section 7.3.2		O	17.997-SOR Value	<See Requirement IDs: "Field: xx.997-SOR" and "Field: xx.997-SOR-SRN" and "Field: xx.997-SOR-RSP">.	t-2				
Field: 17.998-Geographic Sample Acquisition Location Value	8.17.41, Table 71	See Section 7.7.3		O	17.998-GEO Value	<See Requirement IDs: "Field: Geographic", "Field: Geographic-Conditional", "Field: Geographic-Subfield 1" through "Field: Geographic-Values-SubField 15" >.	t-2				
Field: 17.999-Image Data Valid	8.17.42, Table 71	This is a mandatory field contains the image. <The image metadata is checked for validity.>	2	M	17.999-DATA Uncompressed Valid	IF {17.011} EQ ASCII(NONE) THEN Length(17.999) EQ 17.006} * {17.007}					B
			2	M	17.999-DATA JP2,JP2L Valid	IF {17.011} EQ ASCII(JP2) OR ASCII(JP2L) THEN Present(SigBox, HeadBox, ImgBox)	t-11				B
			2	M	17.999-DATA PNG Valid	IF {17.011} EQ ASCII(PNG) THEN Present(PNGSig, IHDR, IDAT, IEND)	t-11				B

Table C.16 - Assertions for Annex B - Traditional Encoding

Requirement ID	Reference in Base Standard	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Implementation Support	Supported Range	Test Result	Applicability
Annex B: Traditional Encoding											
Traditional-Field: xx.001-Length, First	Annex B	The first field in all records shall be labeled as field "1" and contain the length in bytes of the record.		M	Traditional: xx.001-Length, First	<See Requirement ID: "Field: xx.001-Record Header".>	t-2				
Traditional-Field: xx.002-IDC	Annex B	With the exception of the Type-1 record (See Section 8.1), the second field shall be labeled as field Type-1 record (See ed as field ueesignation character (IDC). See Section 7.3.1.		M	Traditional: xx.002-IDC	<See Requirement ID: "Field: xx.002-IDC".>	t-2				
Traditional-Record: Type1-7-bit ASCII	Annex B	The data in the Type-1 record shall always be recorded in variable length fields using the 7-bit American Standard Code for Information Interchange (ASCII) as described in *ISO/IEC 646*56. For purposes of compatibility, the eighth (leftmost) bit shall contain a value of zero. All field numbers and information separators shall be recorded in 7-bit ASCII as described in *ISO/IEC 646*.		M	Traditional: Type-1-ASCII	<See Requirement ID: "Record: Type1-ASCII">	t-2				
Traditional-Field: xx.001, xx.002, xx.999 Ordered	Annex B	Textual fields in Record Types 10-99 may occur in any order after the first two fields and contain the information as described for that particular numbered field, except for field 999, which shall be the concluding field, when it is included in a record.		M	Traditional: xx.001-First	<See Requirement ID: "Field: xx.001-Record Header".>	t-2				
				M	Traditional: xx.002-Second	<See Requirement ID: "Field: xx.002-IDC".>	t-2				

			1	M	Traditional: xx.999-Last	ForEach(Record in Transaction ST Type(Record) NEQ 4 OR 8)
						{
						FieldNumber(Last(Field in Record)) EQ 999
						}
											T

Traditional-Transaction: Separators	Annex B, Table 90	In the Type-1, Type-2, Type-9 through Type-99 records, information is delimited by the four ASCII information separators. The delimited information may be items	1	M	Traditional: Separators FS	ForEach(Record in Transaction ST Type(Record) MO [1,2,9 to 99])
						{
						Last(Byte in Record) EQ 0x1C
						}
											T

		within a field or subfield, fields within a logical record, or multiple occurrences of subfields.	1	M	Traditional: Separators GS	<Not directly tested. The GS separator is used when parsing fields within a record.>	t-13				
			1	M	Traditional: Separators RS,US	<Not directly tested. The RS and US separators are used when parsing subfields and information items.>	t-13				
Traditional-Transaction: FS Separator	Annex B	Multiple records within a transaction are separated by the "FS" character, which signals the end of a logical record.		M	Traditional: FS Separator	<See Requirement ID: "Traditional-Transaction: Separators".>	t-2				
Traditional-Transaction: US, RS, GS, Separators	Annex B	The "USe x Bonal-Transaction: US, RS, iple items within a field or subfield; the "RShin a field or subfield; the , ipleSeparatorsated the "GSeleSeparatorsated ated ; the , ipleSeparatorsa		M	Traditional: US, RS, GS Separators	<See Requirement ID: "Traditional-Transaction: Separators".>	t-2				
Traditional-Transaction: Data Length Minimum	B.1	Each information item, subfield, field, and logical record shall contain one or more bytes of data	1	M	Traditional: Data Length Minimum	<This assertion is testing during the Character Count and Byte Length testing for each Record Type, which test for 1 byte of data at a minimum. See the following Type-10 Requirement ID's as an example: Field: Type10-CharCount and Field: Type10-Subfield CharCount .>	t-2				
Traditional-Transaction: Big-Endian	B.1.1	Within a file, the order for transmission of both the ASCII and the binary representations of bytes shall be most significant byte first and least significant byte last otherwise referred to as Big-Endian format. Within a byte, the order of transmission shall be the most significant bit first and the least significant bit last.	2	M	Traditional: Data Big-Endian	<Not directly tested. However, the parsing methods use the Big-Endian format when processing transactions.>	t-13				
Traditional-Transaction: Date Format	B.1.2	Dates shall appear as eight digits in the format YYYYMMDD. The YYYY characters shall represent the year of the transaction; the MM characters shall be the tens and units values of the month; and the DD characters shall be the day in the month.	1	M	Traditional: Date Format	<This assertion is tested for each field or subfield that requires a date entry. For example, see Requirement ID "Field: 1.005-Local Date Value".>	t-2				

Traditional-Field: Agency Code Subfield 2	B.1.3	The 2007 version of the standard included only the first information item in agency code fields (See Section 7.6). New to this version, a second, optional, information item is allowed in Traditional encoding in order to maintain consistency with the 2008 version of the standard.		M	Traditional: Agency Code Subfield 2	<See Requirement ID: "Field: Agency Codes".>					
Traditional-Transaction: GMT/UTC	B.1.4	GMT/UTC shall be represented as YYYYMMDDHHMMSSZ, a 15-character string that is the concatenation of the date with the time and concludes with the character nal enco YYYY characters shall represent the year of the transaction. The MM characters shall be the tens and units values of the month. The DD characters shall be the tens and units values of the day of the month. The HH characters represent the hour; the MM the minute; and the SS represents the second.		M	Traditional: GMT/UTC	<This assertion is tested for each field or subfield that requires a GMT/UTC entry. For example, see Requirement ID "Field: Geographic-Subfield 1".>	t-2				
Traditional-Transaction: Field Numbering	B.1.5	For the Type-1, Type-2, Type-9 through Type-99 records, each information field that is used shall be numbered in accordance with this standard. The format for each field shall consist of the logical record type number followed by a period rmat for each field followed by a colon al record type number followed by a pepriate to that field. The field number may be any one to nine-digit number occurring between the period field. The colon may be any one to nine-digit number occurring betweeneld number. This implies that a field number of y one to nine-digit numberand shall be interpreted in the same manner as a field number of "2.000000123:.	1	M	Traditional: Field Numbering	<Not directly tested. However, the parsing methods use the described format when processing transactions.>	t-13				

Traditional-Record: Types 1,2,9 ASCII	B.1.5	Logical Type-1, Type-2, and Type-9 records contain only ASCII textual data fields. The ASCII File Separator ment ID a fields. The (signifying the end of the logical record or transaction) shall follow the last byte of ASCII information and shall be included in the length of the record.		M	Traditional: Type1-ASCII	<See Requirement ID: "Record: Type1-ASCII".>	t-2				

			1	M	Traditional: Types 2,9-ASCII	ForEach(Field in Record ST Type(Record) EQ 2 OR 9)
						{
						{Bytes(Field)} MO [0x02, 0x03, 0x1C to 0x7E]
						}
											T

				M	Traditional: Types 1,2,9-FS Separator	<See Requirement ID: "Traditional-Transaction: Separators".>	t-2				
Traditional-Record: Types 4,8 Binary	B.1.5	The Record Type-4: Grayscale fingerprint image and the Record Type-8: Signature image record contain only binary data recorded as ordered fixed-length binary fields. The entire length of the record shall be recorded in the first four-byte binary field of each record. For these binary records, neither the record number with its period, nor the field identifier number and its following colon, shall be recorded. Furthermore, as all the field lengths of these six records are either fixed and specified, none of the four separato characters ("US", "RS"," GS", or "FS") shall be interpreted as anything other than binary data. For these binary records, the "FS" character shall not be used as a record separator or transaction terminating character.		M	Traditional: Type4-Binary	<See Requirement ID: "Field: Type4-CharType".>	t-2				
				M	Traditional: Type8-Binary	<The test assertions for this type may not be supported in this version of the CTM. If they are supported, they are included under field testing for Record Type-8: Signature image record.>	t-2				
Traditional-Record: Types 10 to 99 Format	B.1.5	The Type-10 through Type-99 records combine ASCII fields with a single binary sample field. Each ASCII field contains a numeric field identifier and its descriptive data. When Field 999 is present in a record it shall appear as the last entry in the record and shall contain the data placed immediately following the colon (er and its descriptive data. When record length field shall contain the length of the		M	Traditional: Types 10 to 99, xx.999 last	<See Requirement ID: "Traditional-Field: xx.001, xx.002, xx.999 Ordered" .>	t-2				
				M	Traditional: Types 10 to 99, Record Length	<See Requirement ID: "Field: xx.001-Record Header".>	t-2				
				M	Traditional: Types 10 to 99, FS Separator	<See Requirement ID: "Traditional-Transaction: Separators".>	t-2				

		record. The ASCII File Separator "FS"control character shall follow the last byte of the compressed or uncompressed sample data. The "FS" character shall signify the end of the logical record or transaction and shall be included as part of the record length.									
Traditional-Transaction: Base 64	B.1.5	The Base-64 encoding scheme (See Annex A: Character encoding information) shall be used for converting non-ASCII text into ASCII form. The field number including the period and colon, for example II text into ASCII form. The "US", "RS", "GS", and "FS" information separators shall appear in the transaction as 7-bit ASCII characters without conversion to Base-64 encoding.			Traditional: Base 64	<Not tested.>	t-4				
Traditional-Transaction: Encoding Sets	B.1.6	In order to effect data and transaction interchanges between non-English speaking or foreign-based agencies, a technique is available to encode information using character encoding sets other than 7-bit ASCII.			Traditional: Additional Encoding Sets	<Not Tested.>	t-4				
Traditional-Field: 1.001 Record Header	B.2.1	Field 1.001 Record header shall begin with d header ecordode is renamed UTF-16, a record including every character of every field contained in the record and the information separators. The cter of every field contained in the record and theng setsField 1.001 from the next field.		M	Traditional: 1.001-Record Length	<See Requirement ID "Field: xx.001-Record Header">	t-2				
				M	Traditional: 1.001-GS Separator	<See Requirement ID: "Traditional-Transaction: Separators".>	t-2				
Traditional-Field: 1.005 Date Format	B.2.1	The year, month, and day values in Field 1.005 Date / DAT are concatenated "YYYYMMDD"		M	Traditional: 1.005-Date Format	<See Requirement ID "Field: 1.005-Local Date Value".>	t-2				
Traditional-Field: 1.013 DOM	B.2.1	In Field 1.013 Domain name / DOM, the default is "1.013:NORAM'US''GS'"			Traditional: 1.013-DOM	<Not Tested.>	t-3				
Traditional-	B.2.1	Immediately following the last		M	Traditional:	<See Requirement ID: "Traditional-Transaction:	t-2				

Transaction: FS Separator Replaces GS		information item in the Type-1 record (See Section 8.1), an tFSFSn 8.1 following the last information item in the from the next logical record. This "FS" character shall replace the "GS" character that is normally used between information fields. This is the case with all Record Types.			FS Replaces GS	Separators".>					
Traditional-Record: Type4-Fields Fixed	B.2.2	The order of fields for Type-4 records is fixed. All fields and data in this record type shall be recorded as binary information.	2	M	Traditional: Type4 Fields Fixed	<Not tested directly, but Type 4 is parsed as unnumbered binary data>.	t-13				
Traditional-Record: Type7-Requirements TBD	B.2.3	<This section contains requirements regarding Type-7 records. If this type is supported by the CTM, the requirements will be added.>		-	Traditional: Type7 Assertions TBD	<This section contains requirements regarding Type-7 records. If this type is supported by the CTM, the assertions will be added.>	t-15				
Traditional-Record: Type8-Requirements TBD	B.2.4	<This section contains requirements regarding Type-8 records. If this type is supported by the CTM, the requirements will be added.>		-	Traditional: Type8 Assertions TBD	<This section contains requirements regarding Type-8 records. If this type is supported by the CTM, the assertions will be added.>	t-15				
Traditional-Record: Type9-Requirements TBD	B.2.5	<This section contains requirements regarding Type-9 records. If this type is supported by the CTM, the requirements will be added.>		-	Traditional: Type9 Assertions TBD	<This section contains requirements regarding Type-9 records. If this type is supported by the CTM, the assertions will be added.>	t-15				
Traditional-Fields 10.029, 10.032 Feature Points	B.2.6	For facial feature points (Field 10.029: 2D Facial feature points / FFP and Field 10.032: 3D facial feature points/ 3DF), the first information item is followed by "US" separator character. The second information item is feature point code, followed by "US". The third is the X coordinate, followed by USem is feature point code, followed byrtedal Field 10.032, the fifth information item is the Z coordinate. Each feature block shall		O	Traditional: 10.029, 10.032 Feature Points	<See Requirement IDs: "Field: 10.029- 2D Facial Feature Points Value" and "Field: 10.032- 3D Facial Feature Points Value".>	t-2				

		be separated by the tRSn item is the Z coordi									
Traditional-Transaction: Type11-Reserved	B.2.7	This Record Type is reserved for future use as Voice data.		M	Traditional: Type11-Reserved	<See Requirement ID: "Transaction: Reserved Records".>	t-2				
Traditional-Transaction: Type12-Reserved	B.2.8	This Record Type is reserved for future use as Dental data.		M	Traditional: Type12-Reserved	<See Requirement ID: "Transaction: Reserved Records".>	t-2				
Traditional-Field: 13.014 RS Separated	B.2.9	For Field 13.014: Search position descriptors / SPD, multiple portions of the EJI may be listed and separated by the "RS" character.		M	Traditional: 13.014-RS Separated	<See Requirement ID: "Field: SPD,PPD Values .>	t-2				
Traditional-Field: 13.015 Subfields	B.2.9	For Field Field 13.015: Print position coordinates / PPC, the six information items within the field are separated by five sUS PPCDDental data.SUblock shall belowed by tedal definitions may be repeated as subfields separated by the dRSblock shall		M	Traditional: 13.015-Subfields	<See Requirement ID: "Field: PPC-Subfield Occurrences".>	t-2				
Traditional-Field: 13.024 Subfields	B.2.9	Field Field 13.024: Latent quality metric / LQM may contain one or more subfields, each consisting of four information items separated by the"US" character. The subfield may be repeated for each latent image and quality algorithm used, separated by the "RS" character.		M	Traditional: 13.024-Subfields	<See Requirement IDs: "Field: Sample Quality Occurrences" to "Field: Sample Quality Additional Subfield".>	t-2				
Traditional-Field: 14.025 Format	B.2.10	Field 14.025: Alternate finger segment position(s) / ASEG shall consist of one to four subfields. Each subfield shall consist of a finger number between 1 and 10, or 16 or 17; the total number of vertices of the polygon encompassing the finger; and the set of consecutive vertices. Each vertex shall be represented as horizontal and vertical pixel offsets relative to the origin positioned in the upper left corner		M	Traditional: 14.025-Format	<See Requirement ID: "Field: 14.025-Alternate Finger Segment Position(s) Value" and "Field: Type14-Subfield Occurrence".>	t-2				

		of the image. The horizontal offsets (X) are the pixel counts to the right, and the vertical offsets (Y) are the pixel counts down from the origin. A minimum of three points is required to describe a finger location. A rom the origin. A minimum of three points is required to describe a finger location. A uUSed to describe ainimum of three points is requir number, the number of vertices, each X coordinate, and each Y coordinate. Subfields representing each finger are delimited by the g each fingerd each Y coo									
Traditional-Field: 19.018 Requirements TBD	B.2.15	Field 19.018: Friction ridge - plantar segment position(s) / FSP shall consist of one to four subfields. Each subfield shall consist of a plantar number between 1 and 10, the total number of vertices of the polygon encompassing the plantar, and the set of consecutive vertices. Each vertex shall be represented as horizontal and vertical pixel offsets relative to the origin positioned in the upper left corner of the image. The horizontal offsets (X) are the pixel counts to the right, and the vertical offsets (Y) are the pixel counts down from the origin. A minimum of three points is required to describe a plantar location. A “USom the origin. A minimum of three points is required to dethe number of vertices, each X coordinate, and each Y coordinate. Subfields representing each plantar are delimited by the orSinate, and each Y coor		-	Traditional: 19.018 Assertions TBD	<This section contains requirements regarding Type-19 records. If this type is supported by the CTM, the assertions will be added.>	t-15				

C.4 Test Notes

The following test notes provide clarification of the assertion text included in the Test Assertion columns. The test notes contain various types of information including:

- Additional information to help clarify complex assertions such as image metadata and IDC comparisons.
- Explanations of decisions made when the base standard is not clear or contains possible discrepancies.
- "Exception" which refers to any AN-2011 requirement that does not have an associated assertion defined in this document.

t-1. Semantic (Level 3) assertions are not included in the tables except to intentionally clarify that the assertion is L3. An explanation may be given explaining why the assertion is considered L3.
t-2. The assertions for this requirement are listed in another section of a table as described in the "Test Assertion" column.
t-3. Assertions related to Domain Names and Application Profile Specifications are not addressed in the tables.
t-4. Assertions related to Character Sets other than 7-bit ASCII or binary are not addressed in the tables.
t-5. Refer to the IDC tables below to determine the test output based upon the types being compared for matching IDCs.

Table C-16 - IDC ID Location Comparison

IDC: ID Location Comparison			
Record Type	**Field 10.003**	**Biometric**	**Field For Comparison ID**
4	NA	FINGER	Byte 1 of 4.004
10	FACE	FACE	NA
10	SCAR	SCAR	(1,1) of 10.040
10	MARK	MARK	(1,1) of 10.040
10	TATTOO	TATTOO	(1,1) of 10.040
13	NA	FINGER	(1,1) of 13.013
14	NA	FINGER	(1,1) of 14.013
17	NA	IRIS	17.003 IF 17.003 = 1 Or 2

Table C-17 - IDC Comparison Results

IDC: Comparison Results			
First Record	**Second Record**	**Comparison IDs**	**Result**
FINGER	FINGER	Same	Ok
FINGER	FINGER	Different	Error

FINGER	NEQFINGER	NA	Error
FACE	FACE	NA	Ok
FACE	NEQ FACE	NA	Error
IRIS	IRIS	Both = 1 Or Both = 2	Ok
IRIS	IRIS	Not (Both = 1 Or Both = 2)	Error
IRIS	NEQ IRIS	NA	Error
SCAR	SCAR	Same	Ok
SCAR	SCAR	Different	Warning
SCAR	MARK Or TATTOO	Same or Different	Warning
SCAR	FINGER, FACE Or IRIS	NA	Error
MARK	MARK	Same	Ok
MARK	MARK	Different	Warning
MARK	SCAR Or TATTOO	Same or Different	Warning
MARK	FINGER, FACE Or IRIS	NA	Error
TATTOO	TATTOO	Same	Ok
TATTOO	TATTOO	Different	Warning
TATTOO	SCAR Or MARK	Same or Different	Warning
TATTOO	FINGER, FACE Or IRIS	NA	Error

t-6. UTC has replaced GMT. Date and time are defined in section 7.7.2 of the standard. The set of values ValidUTC/GMT is described in section 7.7.2.2 of the standard and is always less than the current date and time. ValidUTC/GMT is in the form YYYYMMDDHHMMSSZ; NIEM-ValidUTC/GMT is in the form YYYY-MM-DDThh:mm:ssZ. The ValidLocalDate is in the form YYYYMMDD; NIEM-ValidLocalDate is in the form YYYY-MM-DD.

t-7. Assertions for alternate coordinate systems are not included in the tables.

t-8. Refer to http://earth-info.nga.mil/GandG/coordsys/grids/utm.html to determine valid values for the band of latitude and grid zone. There are possible discrepancies in the AN-2011 standard regarding the 10th information item for field xx.998. While the standard states that the coordinates are UTM (defined only for the area between 84N and 80S), it also allows values outside of UTM.

However, allowing these extraneous values which are valid in UPS causes problems with the formatting such as the band of latitude, which doesn't exist for those values. Therefore, this draft of the AN-2011 Assertion Tables does not allow values A,B,Y, and Z for the 10th information item.

t-9. L2 and L3 assertions associated with SAP, FAP, and IAP are not included in the tables. Some of the assertions, such as determining the conditions under which the samples were collected to ensure the SAP, FAP, or IAP levels, are not feasible to test at this time.

t-10. IBIA Vendor Registry is a registry of CBEFF Biometric Organizations that map the value QAV to a registered organization. The assertions will accept any values, as the standard does not require that the value be registered with IBIA.

t-11. All image-related assertions associated with compressed image types are tested against the image metadata only and not against the image itself. Features of each of the image type's metadata are defined in the "Image Metadata" table below. Combining the "Term" with the "Image Type" gives the specific implementation. For example, {Image Height-PNG} is equivalent to "2nd parameter of the IHDR chunk". Also, IHDR means Image Header Chunk, so the full definition becomes "2nd parameter of the Image Header Chunk in a PNG image." Note that for NIEM encoding, the image data must first be converted from Base-64.

Table C-18 - Image Metadata

Image Metadata		
Term	Image Type(s)	Implementation
Image Width	JPEG, JPEGL	4th parameter of the Frame Header not counting the SOF marker
	JP2, JP2L	2nd parameter of Image Header box
	PNG	1st parameter of IHDR chunk
	WSQ	5th parameter of SOF not counting the SOF marker
Image Height	JPEG, JPEGL	3rd parameter of the Frame Header not counting the SOF marker
	JP2, JP2L	1st parameter of Image Header box
	PNG	2nd parameter of IHDR chunk
	WSQ	4th parameter of SOF not counting the SOF marker
Sampling Units	JPEG, JPEGL	4th parameter in JFIF Header not counting the APP0 Marker
	JP2, JP2L	Undefined
	PNG	3rd parameter of PHYS chunk
	WSQ	Undefined
Horizontal Density	JPEG, JPEGL	5th parameter in JFIF Header not counting the APP0 Marker
	JP2, JP2L	Undefined
	PNG	1st parameter in PHYS Chunk
	WSQ	Undefined
Vertical Density	JPEG, JPEGL	6th parameter in JFIF Header not counting the APP0 Marker
	JP2, JP2L	Undefined

	PNG	2nd parameter in PHYS Chunk
	WSQ	Undefined
BPX	JPEG, JPEGL	2nd parameter of the Frame Header not counting the SOF marker
	JP2, JP2L	7 LSB of 4th parameter of ImgBox + 1 if 4th parameter of ImgBox is not 255
	PNG	3rd parameter of IHDR chunk
	WSQ	Undefined
CSP	JPEG, JPEGL	Undefined
	JP2, JP2L	4th parameter of Colour Specification box
	PNG	4th parameter of IHDR chunk
	WSQ	Undefined
Encoder Version	WSQ	10th parameter of SOF not counting the SOF marker
SOI	JPEG, JPEGL	Start of JPEG type image.
	WSQ	Start of WSQ image.
SOF	JPEG, JPEGL	Start of frame in a JPEG type image.
	WSQ	Start of WSQ image.
EOI	JPEG, JPEGL	End of a JPEG type image.
	WSQ	End of WSQ image.
SOB	WSQ	Start of block in a WSQ image.
SigBox	JP2,JP2L	Signature Box that marks the start of a JP2 type image.
HeadBox	JP2,JP2L	Header Box in a JP2 type image.
ImgBox	JP2, JP2L	Image Header Box in a JP2 type image.
PNGSig	PNG	Signature of a PNG image.
IHDR	PNG	Image Header Chunk in a PNG image.
IDAT	PNG	Image Data Chunk in a PNG image.
IEND	PNG	Image End Chunk in a PNG image.
JFIF Header	JPEG, JPEGL	Frame for specifying JPEG type image metadata. Its inclusion is required by the standard.
PHYS Chunk	PNG	An optional Chunk in a PNG image that may be used if present to verify image attributes.

t-12. The image metadata required to implement the assertion is not defined in the image standard documentation.

t-13. The assertion is addressed during parsing.

t-14. Further research is needed to determine the feasibility of testing for ASEG requirements related to the polygon structure.

t-15. These requirements are related to record types currently not supported.

t-98. There are some discrepancies in the 4th draft of the standard regarding compression algorithms for various record types. For Type-4 records, Table 21 and section 8.4.8 state that the value can be 0 to 6 (any compression algorithm) while section 8.4 states that "All images shall be compressed using WSQ". The assertions only allow WSQ and uncompressed types (values 0 and 1). For

Type 10, section 7.7.9.3 does not define which compression algorithms are valid for facial images. The assertions allow all compression algorithms (except WSQ) for facial images. For Types 13 and 14, section 7.7.9.1 indicates that WSQ shall be used for grayscale friction ridges at 500 ppi. It does not specify if any other types may be used. Also, section 5.3.13 specifies that Type-13 should only allow uncompressed and lossless compression. The assertions will support WSQ and lossless for Type 13, and will allow any compression for Type 14. For Type 17, the section 7.7.9.2 clearly states that the baseline JPEG algorithm may not be used. The assertions will support compression algorithms specified by Table 71: NONE, PNG, JP2, and JP2L. The assertions will be modified later on according to the content of the 5th draft.

t-99. Further research is needed to determine the assertions required to test for conformance to this requirement.

Annex D: Exceptions Table

An "exception" refers to any AN-2011 requirement that does not have an associated assertion defined in this document. Table C.1 identifies and provides justification for all exceptions present in the tables.

Table D.1 - Exceptions Table

Exception	Section	Requirement Summary	Justification
Domain Names / Application Profile Specifications	5.3.2	Data contained in this record shall conform in format and content to the specifications of the domain name(s) as listed in Field 1.013 Domain name / DOM found in the Type-1 record, if that field is in the transaction. The default domain is NORAM. Field 1.016 Application profile specifications / APS allows the user to indicate conformance to multiple specifications. If Field 1.016 is specified, the Type-2 record must conform to each of the application profiles. A DOM or APS reference uniquely identifies data contents and formats. Each domain and application profile shall have a point of contact responsible for maintaining this list. The contact shall serve as a registrar and maintain a repository including documentation for all of its common and user-specific Type-2 data fields. As additional fields are required by specific agencies for their own applications, new fields and definitions may be registered and reserved to have a specific meaning. When this occurs, the domain or application profile registrar is responsible for registering a single definition for each number used by different members of the domain or application profile .	The format and content of the record are defined by the DOM or APS. Each DOM and APS has related record-content definitions that may be updated. The evolving nature of the DOM and APS definitions and nature of using registrars makes testing for conformance via the CTS very difficult.
	6	An implementation domain, coded in Field 1.013 Domain name / DOM of a Type-1 record as an optional field, is a group of agencies or organizations that have agreed to use preassigned data fields with specific meanings (typically in Record Type-2) for exchanging information unique to their installations. The implementation domain is usually understood to be the primary application profile of the standard. New to this version of the standard, Field 1.016 Application profile specifications / APS allows multiple application profiles to be referenced. The organization responsible for the profile, the profile name and its version are all mandatory for each application profile specified. A transaction must conform to each profile that is included in this field. It is possible to use Field 1.016 and / or Field 1.013.	Since the "transaction must conform to each profile" included in the field, and those profiles are defined by the listed agency, the CTS would have to retrieve the latest requirements from the agency. Also, testing that all specified DOM and APS have the same definitions for fields, subfields, and information items is not

		A specified implementation domain and specified application profiles must all have the same definition for fields, subfields and information items that are contained in the transaction.	feasible.
Alternate Character Sets	5.6, Table 2	Field 1.015 Character encoding/DCS is an optional field that allows the user to specify an alternate character encoding… Field 1.015 Character encoding/DCS contains three information items: the character encoding set index/ CSI, the character encoding sent name/CSN, and the character encoding set version/CSV. The first two items are selected from the appropriate columns of Table 2.	Table 2 lists ASCII, UTF-16, UTF-8, and UTF-32 as possible encodings. However, the table also allows "User-defined" character encoding sets. Testing for conformance to user-defined character encoding sets is not feasible for the CTS. Further research is needed to support Character sets other than 7-bit ASCII.
Alternate Coordinate System	7.7.3, Table 4	The ninth information item is the geodetic datum code / GDC10. It is an alphanumeric value of 3 to 6 characters in length. This information item is used to indicate which coordinate system was used to represent the values in information items 2 through 7. If no entry is made in this information item, then the basis for the values entered in the first eight information items shall be WGS84, the code for the *World Geodetic Survey 1984 version - WGS 84 (G873).* See Table 4 for values.	Table 4 lists 22 coordinate systems and the option to include "Other" types as well. It is not feasible for the CTS to test conformance to all coordinate systems, specifically those that are listed by the user under "Other".
	7.7.3	A fourteenth optional information item geographic coordinate other system identifier / OSI allows for other coordinate systems. This information items specifies the system identifier. It is up to 10 characters in length. Examples are: • MGRS (Military Grid Reference System) • USNG (United States National Grid) • GARS (Global Area Reference System) • GEOREF (World Geographic Reference) • LANDMARK (e.g. hydrant) and position relative to the landmark. A fifteenth optional information item, is the geographic coordinate other system value / OCV. It shall only be present if OSI is present in the record. It can be up to 126 characters in length. If OSI is LANDMARK, OCV is free text and may be up to 126 characters. For details on the formatting of OCV for the other coordinate	While some examples are listed (MGRS, USNG, GARS, GEOREF, LANDMARK), there may be others that are not listed. It is not feasible for the CTS to test conformance to these coordinate systems, specifically those that may be included but are not listed as examples.

		systems shown in OSI as examples, see http://earth-info.nga.mil/GandG/coordsys/grids/referencesys.html	
Subject Acquisition Profiles SAP/FAP/IAP	7.7.5, Table 8, Table 9, Table 10	A subject acquisition profile is used to describe a set of characteristics concerning the capture of the biometric sample. These profiles have mnemonics SAP for face, FAP for fingerprints and IAP for iris records.	It is not feasible to test if the image was captured under the conditions specified by the SAP, FAP or IAP level as defined in Tables 8, 9 and 10. However, the fields will be tested for valid level values.
Open and Closed Paths	7.8	Several Record Types define open paths (also called contours or polylines) and / or closed paths (polygons) on an image. They are comprised of a set of vertices. For each, the order of the vertices shall be in their consecutive order along the length of the path, either clockwise or counterclockwise. (A straight line of only two points may start at either end). A path may not have any sides crossing. No two vertices shall occupy the same position. There may be up to 99 vertices. An open path is a series of connected line segments that do not close or overlap. A closed path (polygon) completes a circuit. The closed path side defined by the last vertex and the first vertex shall complete the polygon. A polygon shall have at least 3 vertices. The contours in Record Type-17: Iris image record can be a circle or ellipse. A circle only requires 2 points to define it (See Table 16). There are two different approaches to the paths in this standard. The 2007 and 2008 version of the standard used paths for Field 14.025: Alternate finger segment position(s) / ASEG. That approach has been retained in this version for all paths except in the Extended Feature Set (EFS) of Record Type-9. The EFS adopted an approach expressing the path in a single information item, which is different than that used in other record types.	Further research is needed to determine the feasibility of testing for: -simple, plane figure -no sides crossing -no interior holes