

**NISTIR 7933**

**Requirements and  
Conformance Test Assertions for  
ANSI/NIST-ITL 1-2011  
Record Type 18 - DNA Record**

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**NIST**  
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# Requirements and Conformance Test Assertions for ANSI/NIST-ITL 1-2011 Record Type 18 - DNA Record

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## **Reports on Computer Systems Technology**

The Information Technology Laboratory (ITL) at the National Institute of Standards and Technology (NIST) promotes the U.S. economy and public welfare by providing technical leadership for the Nation's measurement and standards infrastructure. ITL develops tests, test methods, reference data, proof of concept implementations, and technical analysis to advance the development and productive use of information technology. ITL's responsibilities include the development of technical, physical, administrative, and management standards and guidelines for the cost-effective security and privacy of sensitive unclassified information in Federal computer systems. This Interagency Report discusses ITL's research, guidance, and outreach efforts in computer security, and its collaborative activities with industry, government, and academic organizations.

### **Abstract**

The Computer Security Division (CSD) of NIST/ITL develops conformance test architectures (CTAs) and test suites (CTSs) to support users that require conformance to selected biometric standards. Product developers as well as testing laboratories can also benefit from the use of these tools. This project supports the possible establishment of conformity assessment programs for biometrics and also supports NIST/ITL's Forensic Science Program by making conformance testing tools available that provide developers, users, and purchasers with increased levels of confidence in product quality and increases the probability of successful interoperability of biometrics and forensic data. One of the test tools is a CTA/CTS designed to test implementations of ANSI/NIST-ITL 1-2011 (AN-2011) "Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information" for selected Record Types based on twelve hundred test assertions previously developed. As part of the process associated with the extension of the first version of BioCTS for AN-2011, NIST/ITL/CSD's staff identified over two-hundred test assertions necessary to meet the conformance requirements for the AN-2011 Record Type 18- DNA Record. These test assertions are documented using the format specified in NIST Special Publication 500-295, "Conformance Testing Methodology for ANSI/NIST-ITL 1-2011, Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information (Release 1.0)".

### **Keywords**

ANSI/NIST-ITL 1-2011, biometrics, conformance testing, conformance test architecture, CTA, CTS, BioCTS, conformance test suite, data interchange, DNA data, Record Type 18, test assertions, testing methodology

### **Prologue**

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 associated conformance test architectures and test suites. NIST/ITL CSD develops these 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. Testing laboratories can also benefit from the use of these test tools. These efforts support the possible establishment of conformity assessment programs to validate conformance to biometric standards. This project supports NIST/ITL's Forensic Science Program by making available conformance test tools that

provide developers, users, and purchasers with increased levels of confidence in product quality and increases the probability of successful interoperability of biometrics and forensic data.

NIST/ITL CSD has developed a number of Conformance Test Architectures (CTAs) and Test Suites (CTSs) designed to test implementations of biometric technical interfaces and data interchange formats. Previous work includes a CTS designed to test implementations of the ANSI INCITS 358-2002 standard, the Biometric BioAPI specification [1], a CTS designed to test implementations of Patron Format A data structures Specified in ANSI INCITS 398-2008, Common Biometric Exchange Formats Framework (CBEFF) [2], a CTA called "CTA Beta 2.0" and CTS designed to test implementations of biometric data interchange formats developed by INCITS M1<sup>1</sup> [3], and a CTA/CTS 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 [4].

NIST/ITL CSD released a set of conformance test tools under the label “BioCTS” in 2012 and early 2013. These tools include CTAs and CTSs designed to test implementations of biometric data interchange format standards developed by ISO/IEC JTC1/SC 37<sup>2</sup> and selected PIV profiles (“BioCTS for ISO/IEC”), as well as selected Record Types within ANSI/NIST-ITL 1-2011 (AN-2011) transactions (“BioCTS for AN-2011”) [5].

### **Disclaimer**

Statements made in this paper should not be interpreted as standards, guidelines, best practices, or recommendations for specific changes to any other NIST publications.

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<sup>1</sup> InterNational Committee for Information Technology Standards Technical Committee M1- *Biometrics*

<sup>2</sup> International Standards Organization (ISO) and the International Electrotechnical Commission (IEC) Joint Technical Commission 1 – *Information Technology*/ Subcommittee 37 – *Biometrics*

## Table of Contents

<b>1</b>	<b><i>Introduction</i></b> .....	<b>1</b>
1.1	Conformance Testing to Biometric Standards .....	1
1.2	Requirements and Test Assertions for ANSI/NIST-ITL 1-2011.....	1
1.3	BioCTS for AN2011 - Conformance Test Software for AN-2011 .....	1
1.4	BioCTS AN-2011 Ongoing Work .....	2
<b>2</b>	<b><i>Test Assertions for AN-2011 Record Type 18 – DNA Record</i></b> .....	<b>3</b>
2.1	AN-2011 Record Type 18 – DNA Record.....	3
2.2	Record Type 18 Table of Requirement and Assertions.....	3
2.3	Test Assertion Syntax.....	3
2.3.1	Operators.....	3
2.3.2	Terms .....	4
2.3.3	Operands .....	5
2.4	Table of Requirements and Assertions - Table headers .....	6
	<b><i>Annex A - References</i></b> .....	<b>9</b>
	<b><i>Appendix B - Record Type-18: DNA Record Requirements and Assertions</i></b> .....	<b>10</b>
	B.1 Record Type 18 – DNA Record Requirements and Test Assertions.....	10
	B.2 Test Notes.....	37

## List of Tables

<i>Table 2.1 - Assertion Syntax: Operator Definitions</i> .....	4
<i>Table 2.2 - Assertion Syntax: Terms</i> .....	4
<i>Table 2.3 - Assertion Syntax: Operand Definitions</i> .....	5
<i>Table B.1 - Assertions for Record Type 18 - DNA Record</i> .....	10

# 1 Introduction

## 1.1 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 supports increasing levels of confidence in product quality and increases the probability of successful interoperability and data interchange. A conformance testing methodology developed in support of conformance testing, should include the conformance test requirements of a standard indicating what level of conformance testing is applicable to each requirement and should specify the conformance test assertions to be tested for the corresponding requirements. Test assertions are specifications for testing a conformance requirement in an Implementation Under Test in the form of software or procedural methods that generate the test results (also named test outcomes or test verdicts) used for assessment of the conformance requirement.

## 1.2 Requirements and Test Assertions for ANSI/NIST-ITL 1-2011

ANSI/NIST-ITL 1-2011 (AN-2011) is the latest version of the ANSI/NIST-ITL standard, and is specified in NIST Special Publication 500-290 [6]. This standard defines the content, format, and units of measurement for the electronic exchange of fingerprint, palmprint, plantar, facial/mugshot, scar, mark & tattoo (SMT), iris, deoxyribonucleic acid (DNA), and other biometric sample and forensic information that may be used in the identification or verification process of a subject. The information consists of a variety of mandatory and optional items. This information is primarily intended for interchange among criminal justice administrations or organizations that rely on automated identification systems or use other biometric and image data for identification purposes.

NIST/ITL CSD developed a set of test assertions based on the requirements specified in AN-2011 to aid in the development process for the first version of an AN-2011 CTA/CTS. Over twelve hundred test assertions for selected Record Types were identified and documented as a set of tables in NISTIR 7806 to assist in CSD's development of BioCTS [7]. These tables of requirements and the associated test assertion syntax were later adopted as part of the conformance testing methodology documented in NIST Special Publication 500-295[8].

## 1.3 BioCTS for AN2011 - Conformance Test Software for AN-2011

The test assertions documented in NIST Special Publication 500-295 are implemented in BioCTS for AN2011 [9], which tests components of AN-2011 transactions associated with the following sections and Record Types of the AN-2011 standard:

- 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 8.10 Record 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

Transactions under test can include Record Types other than those listed above. The presence of these additional records is reported (including record length) and some conformance testing is performed on common fields for these additional record types. Releases of this tool include a Graphical User Interface (GUI) version and a Command Line Interface (CLI). They are available together with documentation and sample data from the BioCTS web site.

The GUI version allows for interactive conformance testing of transactions. The user can analyze the transaction under test in detail using expandable sections and hierarchical structure views. The tool includes an editor which allows the user to make modifications to the transaction. The CLI version can be called from the command prompt, used within a batch file, or even called from another program to provide automated conformance testing. It can be used as a stand-alone program or incorporated into part of an operational environment, allowing “Passing” transactions to move on while alerting administrators of problem transactions. The CLI version’s modes of operation include:

- Interactive: After loading the CLI, the user is prompted for input and output locations (directories/files) and output preferences.
- Single File: The user provides an input file path, an output directory path, and output preferences as parameters and flags on the command line. This will test the single input file.
- Batch File: The user provides an input directory path, an output directory path, and output preferences as parameters and flags on the command line. This will test all files within the input directory. If specified using the appropriate flag, the CLI will test the input directory recursively, testing all sub directories.

## 1.4 BioCTS AN-2011 Ongoing Work

Work continues on the development of CTSs for additional ISO/IEC standards and PIV profiles as well as additional AN-2011 Record Types and encodings. Development of a test tool for AN-2011 NIEM/XML-encoded implementations is underway. Required test assertions not evaluated by the current schema (some Level 1 test assertions and Level 2 assertions) are being implemented<sup>3</sup>. For more information on this planned work, see the tool development roadmaps included in NISTIR 7877 [10].

The NIST/ITL BioCTS team is developing additional support for multiple environments including a web-based interface (currently in pre-released testing) and a Mono version of the software (Mono is a cross-platform .NET environment available for Linux®, Mac®, and Windows®). Additional sample data and utility tools are under development as well. In addition, test assertions for AN-2011 record Type 18, DNA data have been developed and are documented below.

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<sup>3</sup> Conformance test levels (Level 1, 2, and 3 conformance testing) are defined in NIST’s Special Publication 500-295 Section 5.3 (Hierarchy of conformance tests) and are not reproduced in this publication.



## 2 Test Assertions for AN-2011 Record Type 18 – DNA Record

### 2.1 AN-2011 Record Type 18 – DNA Record

The Type-18 record (new to this version of the AN-2011 standard) is required to contain and exchange DNA 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 developed by ISO/IEC JTC 1/SC 37. The Type-18 record is required to exchange Autosomal Short Tandem Repeat (STR), X-Short Tandem Repeat (X-STR), Y-Short Tandem Repeat (Y-STR), Mitochondrial DNA (mtDNA), Pedigree, and electropherogram images of DNA data. This record type is based upon standardized and commonly used DNA analysis and data reporting conventions. With full consideration to privacy, this standard only uses the non-coding regions of DNA. The regions of the DNA that contain information on a subject's genetic characteristics or traits are deliberately avoided.

### 2.2 Record Type 18 Table of Requirement and Assertions

In preparation for extending BioCTS for AN-2011 to support conformance testing of AN-2011 Record Type 18, the BioCTS team identified over two-hundred test assertions that are necessary to meet the conformance requirements for this Record Type. The test assertions have been organized into a table of requirements and assertions following the format documented in NIST Special Publication 500-295 [8].

Table B.1, which identifies all requirements and associated test assertions for Type 18, uses the test assertion syntax documented Tables 2.1, 2.2, and 2.3 found in Section 2.3. The tables define the Operator Definitions, Terms, and Operand Definitions respectively and are also specified in NIST SP 500-295, section 5.5 - Test Assertion Syntax. They have been reproduced in their entirety in this document for consistency, although some entries in the tables may not be used in the test assertions for Record Type 18.

Table B.1 headings are also defined in NIST SP 500-295, Section 5.6 (Tables of requirements and assertions - Table headers) with the exception of Requirement number. Not all test notes included in NIST SP 500-295 apply to the Record Type 18 Table. The three test notes referred to in table B.1 are included below the table. Test Notes 2 and 6 are the same test notes found in NIST SP 500-295, Section 6.3. Test note 18 applies only to Record Type 18. Conformance test levels are defined in NIST's Special Publication 500-295 Section 5.3.

### 2.3 Test Assertion Syntax

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

#### 2.3.1 Operators

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

**Table 2.1 - Assertion Syntax: Operator Definitions**

Operator Definitions		
Operator	Name	Description
<b>AND</b>	Logical And	Tests if both values are true.
<b>ELSE</b>	Else	Combined with the IF operator to specify what expressions are evaluated when the IF expression is false.
<b>EQ</b>	Equal To	Tests for equality between two values.
<b>GT</b>	Greater Than	Tests if the first value is greater than the second value
<b>GTE</b>	Greater Than or Equal To	Tests if the first value is greater than or equal to the second value.
<b>IF</b>	Logical If	Determines if the value or expression is true or false.
<b>IFF</b>	IF and Only IF	Tests the bi-conditional where each of the first and second expressions implies the other.
<b>in</b>	Container Specification	For X in Y, selects only those X found in Y.
<b>LT</b>	Less Than	Tests if the first value is less than the second value.
<b>LTE</b>	Less Than or Equal To	Tests if the first value is less than or equal to the second value.
<b>MO</b>	Member Of	Tests if the value is a contained within the set.
<b>MOD</b>	Modulo	For X MOD Y, provides the remainder of X divided by Y.
<b>NEQ</b>	Not Equal To	Tests for non-equality between two values.
<b>NOT</b>	Negate	Negates any operator or expression that follows.
<b>OR</b>	Logical Or	Tests if either value is true
<b>P:N in Q</b>	Query	Selects the Nth occurrence of P in Q.
<b>ST</b>	Such That	Enforces a condition upon the specified value or expression.
<b>THEN</b>	Then	Combined with the IF operator to specify what expressions are evaluated when the IF expression is true.
<b>to</b>	Range Selection	For X to Y, selects a set of values Z ST Z GTE X AND LTE Y
<b>#</b>	All	Provides all valid values.
<b>:</b>	Data Element Selection	For X:N, selects the Nth element in X.
<b>,</b>	Range Concatenation	For X,Y, represents the set of values containing both X and Y.
<b>.</b>	Field Selection	For X.Y, selects the field specified by Y in Record X.
<b>&lt;&gt;</b>	English Expression	Contains English text that could not be reasonably expressed mathematically.
<b>{ }</b>	Value	For {X}, provides the value of X.
<b>[ ]</b>	Set	The set to be tested.

### 2.3.2 Terms

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

**Table 2.2 - Assertion Syntax: Terms**

Term Definitions		
Term	Name	Description
<b>Field(s)</b>	Field	Field structure as defined by the AN 1-2011 standard.
<b>InfoItem</b>	US Separated Information Item	Information Item separated by the ASCII US (0x1F) separator character

<b>Integers</b>	Integer Set	Set of all integers.
<b>NA</b>	Not Applicable	The test or condition is not applicable.
<b>Unsupported</b>	Unsupported	The requirement is not supported in this version of the CTM. This may be the result of the related conformance test requiring additional research, or the result of the test being infeasible (level 3 only).
<b>Record(s)</b>	Record	Record structure as defined by the AN 1-2011 standard.
<b>Subfield</b>	RS Separated Subfield	Subfield separated by the ASCII RS (0x1E) separator character
<b>Transaction</b>	Transaction	Transaction structure as defined by the AN 1-2011 standard.
<b>TRUE</b>	True	The test always evaluates to true because there is no defined value for testing, or there is no value for which the test will fail.

### 2.3.3 Operands

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

**Table 2.3 - Assertion Syntax: Operand Definitions**

<b>Operand Definitions</b>		
<b>Operand</b>	<b>Name</b>	<b>Description</b>
<b>All(X)</b>	All Occurrences	Returns all occurrences of X.
<b>ASCII(X)</b>	ASCII Values	Specifies that all values represented by X are ASCII values. Ex. ASCII(a) is 0x61
<b>Bytes(X)</b>	Byte Data	Returns the set of bytes contained in X.
<b>Count(X)</b>	Count Occurrences	Returns the number of occurrences of X.
<b>DataLength(X)</b>	Length Of (without Special Characters)	Returns the length of X without counting the characters ASCII( US, RS, FS).
<b>FieldNumber(X)</b>	Field Number	Returns the field number of X.
<b>First(X)</b>	First Occurrence	Returns the first occurrence of X.
<b>For(X EQ A to B) {Expression(s)}</b>	For Loop	Evaluates each Expression for the range specified by A to B.
<b>ForEach(X) {Expression(s)}</b>	For Each	Evaluates each Expression for every occurrence of X found.
<b>Last(X)</b>	Last Occurrence	Returns the last occurrence of X.
<b>Length(X)</b>	Length Of	Returns the length of X.
<b>Max(X)</b>	Maximum Value	Returns the maximum value in the set X.
<b>Min(X)</b>	Minimum Value	Returns the minimum value in the set X.
<b>Next(X)</b>	Next Occurrence	Returns the next occurrence of X. Only for use within ForEach Operand's Expression(s).
<b>Pair(A,B) of X</b>	Pair	Returns all pairs of X. Only for use as a parameter in a ForEach Operand.
<b>ParentField(X)</b>	Parent Field	Returns the Field that contains X.
<b>ParentRecord(X)</b>	Parent Record	Returns the Record that contains X.
<b>Present(X)</b>	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.
<b>Previous(X)</b>	Previous Occurrence	Returns the previous occurrence of X. Only for use within ForEach Operand's Expression(s).
<b>Second(X)</b>	Second Occurrence	Returns the second occurrence of X.
<b>Type(X)</b>	Record Type	Returns the Record Type of X.
<b>Var(X) {Selection Statement}</b>	Variable	Assigns the entity specified by the Selection Statement to the name X. The assignment is valid for the remainder of the assertion text.
<b>XElm(X)</b>	XML Element	Returns the XML Element with name X.

## 2.4 Table of Requirements and Assertions - Table headers

The following describe the headings of the tables of requirements and assertions found in Annex B:

- **Requirement # and ID:** Defines a unique requirement number and a unique identifier for the requirement and associated assertion or set of assertions. For Record Type requirements, the Requirement # is in the form RTN.M, where N is the Record Type and M is the sequential number of the requirement. If additional requirements must be entered in the future, the new requirement number will be specified using an additional number, as in RTN.M.A, where A is the additional number. The Requirement ID provides reference to the type of requirement (e.g., transaction, record, and field), and 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”.
- **Ref. in Base Std. (Reference in Base Standard):** Identifies the clause (or section) where the requirement is included in the AN-2011 standard. In some cases the reference includes additional information such as a Table number.
- **Requirement Summary:** Provides a summary of the requirement detailed as textual information or an interpretation of the requirement in the standard. It provides 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 represent 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 AN-2011 standard:
  - M: Mandatory
  - O: Optional
  - D: Dependent
  - M†: Mandatory within the optional field/subfield
  - O†: Optional within the optional field/subfield

- -: 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 the ID of the test note. Test notes provide additional information related to the assertion and are included below the tables.
- **Imp. Support (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.
- **Applicable to (T, X, B, B\* or X\*) – (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 of AN-2011.
  - X: The assertion only applies to the NIEM-conformant (XML) encoding as described in Annex C of AN-2011.
  - 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.

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## Appendix B - Record Type-18: DNA Record Requirements and Assertions

### B.1 Record Type 18 – DNA Record Requirements and Test Assertions

Table B.1 - Assertions for Record Type 18 - DNA Record

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)	
<b>8.18: Record Type-18: DNA record</b>												
<b>RT18.1 - Field: Type18-Subfield Occurrence</b>	Table 79	<Table 79 specifies which fields contain subfields as well as the number of occurrences permitted.>	1	M	NIEM-Type18-Cardinality-SubElements	<The Type-18 table in Annex G of the base standard specifies the type and number of sub elements required for each field.>					X	
			1	M	18.[001 to 010, 012 to 015, 017, 020, 022, 993, 998]-SubfieldCount	Count(Subfields in 18.[001 to 010, 012 to 015, 017, 020, 022, 993, 998]) EQ 1					T	
			1	M	18.[001, 002, 004, 005, 007, 008, 012 to 014, 020, 022, 993]-InfoltemCount	Count(Infoltems in Subfield:1 in 18.[ 001, 002, 004, 005, 007, 008, 012 to 014, 020, 022, 993]) EQ 1					T	
			1	M	18.003-InfoltemCount	Count(Infoltems in 18.003) MO [1 to 7]						T
			1	M	18.006-InfoltemCo	Count(Infoltems in 18.006) MO [1 to 8]						



Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
					unt						
			1	O	18.009-InfoItemCount	Count(InfoItems in 18.009) MO [4 to 7]					T
			1	M	18.010-InfoItemCount	Count(InfoItems in 18.010) MO [1, 2]					T
			1	M	18.011-InfoItemCount	Foreach(Subfield in 18.011) { Count(InfoItems in Subfield) EQ 1 }					T
			1	M	18.015-InfoItemCount	Count(InfoItems in 18.015) MO [2 to 5]					T
			1	D	18.016-SubfieldCount	Count(Subfields in 18.016) GTE 1					T
			1	D	18.016-InfoItemCount	ForEach(Subfield in 18.016) { Count(InfoItems in Subfield) MO [6 to 15] }					T
			1	D	18.017-InfoItemCount	Count(InfoItems in 18.017) EQ 8					T
			1	D	18.018-SubfieldCount	Count(Subfields in 18.018) GTE 1					T
			1	D	18.018-InfoItemCount	Foreach(Subfield in 18.018) { Count(InfoItems in Subfield) GTE 1 }					T
			1	D	18.019-SubfieldCount	Count(Subfields in 18.019) GTE 1					T
			1	D	18.019-	Foreach(Subfield in 18.019)					T

Req. # - ID	Ref. in Base Std.	Requirement Summary	Level	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>										
				InfoltemCount	{ Count(Infoltems in Subfield) MO [4 to 5] }					
			1	D	18.021-SubfieldCount	Count(Subfields in 18.021) GTE 1				T
			1	D	18.021-InfoltemCount	Foreach(Subfield in 18.021) { Count(Infoltems in Subfield) EQ 3 }				T
			1	D	18.023-SubfieldCount	Count(Subfields in 18.023) GTE 1				T
			1	D	18.023-InfoltemCount	Foreach(Subfield in 18.023) { Count(Infoltems in Subfield) MO [4 to 5] }				T
			1	O	18.902-SubfieldCount	Count(Subfields in 18.902) GTE 1				T
			1	O	18.902-InfoltemCount	ForEach(Subfield in 18.902) { Count(Infoltems in Subfield) EQ 4 }				T
			1	O	18.995-SubfieldCount	Count(Subfields in 17.995) MO [1 to 255]				T
			1	O	18.995-InfoltemCount	ForEach(Subfield in 17.995) { Count(Infoltems in Subfield) MO [1,2] }				T
			-	O	18.998-Subfields	<See Requirement ID: " <a href="#">Field: Geographic</a> ">	t-2			
<b>RT18.2 - Field:</b>	Table 79	<Table 79 specifies the Condition Code for each field.>	1	-	[18.001 to 18.006,	Present(18.001 to 18.006, 18.010, 18.011, 18.013 to 18.015)				B

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
<b>Type18-CondCode</b>					18.010, 18.011, 18.013 to 18.015]-Mandatory CondCode						
			1	-	[18.024 to 18.199, 18.901, 18.903 to 18.992, 18.994, 18.996, 18.997, 18.999]-Reserved	NOT Present(18.024 to 18.199, 18.901, 18.903 to 18.992, 18.994, 18.996, 18.997, 18.999)					B
<b>RT18.3 - Record: 18.007 Dependent</b>	Table 79, 8.18.7	This field is mandatory if the value of DSD is equal to 1.	2	D	18.007-CondCode Dependent	IF {Infoltem:1 in 18.005} EQ 1 THEN Present(18.007)					B
<b>RT18.4 - Record: 18.008 Dependent</b>	Table 79, 8.18.8	This field is optional and ... is only filled in if DSD = 1.	2	D	18.008-CondCode Dependent	IF Present(18.008), THEN {Infoltem:1 in 18.005} EQ 1					B
<b>RT18.5 - Record: 18.016 Dependent</b>	Table 79, 8.18.16	This optional field ... is only present if Field 18.011: Sample typing information / STI has a subfield with the value 0.	2	D	18.016-CondCode Dependent	IF Present(18.016), THEN Present(Subfield in 18.011 ST {Infoltem:1 in Subfield} EQ 0)					B
<b>RT18.6 - Record: 18.017 Dependent</b>	Table 79, 8.18.17	This is an optional field...This field is only present if Field 18.011: Sample typing information / STI has a subfield with the value 1.	2	D	18.017-CondCode Dependent	IF Present(18.017), THEN Present(Subfield in 18.011 ST {Infoltem:1 in Subfield} EQ 1)					B
<b>RT18.7 - Record: 18.018</b>	Table 79, 8.18.18	This optional field ... is only present if Field 18.011: Sample typing information / STI has a subfield with the value 4.	2	D	18.018-CondCode Dependent	IF Present(18.018), THEN Present(Subfield in 18.011 ST {Infoltem:1 in Subfield} EQ 4)					B

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
<b>Dependent</b>											
<b>RT18.8 - Record: 18.019 Dependent</b>	Table 79, 8.18.19	This optional field ... is only present if Field 18.011: Sample typing information / STI has a subfield with the value 2.	2	D	18.019-CondCode Dependent	IF Present(18.019), THEN Present(Subfield in 18.011 ST {Infoltem:1 in Subfield} EQ 2)					B
<b>RT18.9 - Record: 18.021 Dependent</b>	Table 79, 8.18.21	This field is only present if Field 18.020: DNA genotype distribution / DGD has a Value.	2	D	18.021-CondCode Dependent	IF Present(18.021) THEN Present(18.020) AND DataLength(18.020) GT 0					B
<b>RT18.10 - Record: 18.023 Dependent</b>	Table 79, 8.18.23	This optional field ... is only present if Field 18.011: Sample typing information / STI has a subfield with the value 3.	2	D	18.023-CondCode Dependent	IF Present(18.023), THEN Present(Subfield in 18.011 ST {Infoltem:1 in Subfield} EQ 3)					B
<b>RT18.11 - Field: Type18-CharType</b>	8.18, Table 79	<Table 79 specifies the Character Type for each field that contains no subfields.>	1	-	18.[001, 002,005, 007, 008, 020]-CharType	Bytes(18.[001, 002, 005, 007, 008, 020]) MO [0x30 to 0x39]					B
			1	-	18.[012, 022]-CharType	TRUE					B
			1	M	18.004-CharType	<See Requirement ID: " <a href="#">Field: Source Agency</a> ".>	t-2				
			1	M	18.013-CharType	Bytes(18.013) MO [0x30 to 0x39]					T
			1	M	NIEM-18.013-CharType	Bytes(18.013) MO [0x30 to 0x39, 0x2D]					X
			1	M	18.014-CharType	Bytes(18.014) MO [0x30 to 0x39]					T
			1	M	NIEM-18.014-CharType	Bytes(18.014) MO [0x30 to 0x39, 0x2D]					X
			1	O	18.993-CharType	<See Requirement ID: " <a href="#">Field: Source Agency Name</a> ".>	t-2				

Req. # - ID	Ref. in Base Std.	Requirement Summary	Level	Status	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)		
<b>8.18: Record Type-18: DNA record</b>													
<b>RT18.12 - Field: Type17-Subfield CharType</b>	8.17, Table 75	<Table 75 specifies the Character Type for each subfield.>	1	M	18.003-UTY-CharType	Bytes(Infoltem:1 in 18.003) MO [0x30 to 0x39]						B*	
			1	D	18.003-LTY-CharType	Bytes(Infoltem:2 in 18.003) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A]						B*	
			1	D	18.003-ACC-CharType	Bytes(Infoltem:3 in 18.003) MO [0x30 to 0x39, 0x44, 0x4D, 0x4E, 0x4F, 0x2C]						T	
			1	D	NIEM-18.003-ACC-CharType	Bytes(XElm(biom:DNALaboratoryAccreditationLevelCode) MO [0x30 to 0x39] OR Bytes(XElm(biom:DNALaboratoryAccreditationScopeCode) MO [0x44, 0x4D, 0x4E, 0x4F, 0x2C]						B*	
			1	O	18.003-[NOO, POC, ION]-CharType	TRUE							B*
			1	O	18.003-CSC-CharType	Bytes(Infoltem:6 in 18.003) MO [0x20, 0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A]							T
			1	O	NIEM-18.003-CSC-CharType	Bytes(XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha2Code)) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A] OR Bytes(XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha3Code)) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A] OR Bytes(XElm(biom:DNALaboratoryProcessingCountryISO3166NumericCode)) MO [0x30 to 0x39]							X
			1	-	18.006-[DSD,DRA, SDS]-CharType	Bytes(Infoltem:1, 7, 8 in 18.006) MO [0x30 to 0x39]							

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	O	18.006-[EGP, LLC]-CharType	TRUE					B*
			1	O	18.006-GID-CharType	Bytes(Infoltem:2 in 18.006) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A]					B*
			1	O	18.006-[DLC,DOB]-CharType	Bytes(Infoltem:3,4 in 18.006) MO [0x30 to 0x39]					T
			1	O	NIEM-18.006-[DLC,DOB]-CharType	Bytes(XElm(nc:PersonBirthDate), XElm(biom:DNADonorLastContactDate)) MO [0x30 to 0x39, 0x2D]					X
			1	-	18.009-[PID, PMI, SID, PCM]-CharType	TRUE					B*
			1	M	18.009-PMS-CharType	Bytes(Infoltem:3 in 18.009) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A]					B*
			1	O	18.009-[FID,MID]-CharType	Bytes(Infoltem:5, 6 in 18.009) MO [0x30 to 0x39]					B*
			1	M	18.010-SCT-CharType	Bytes(Infoltem:1 in 18.010) MO [0x30 to 0x39]					B*
			1	O	18.010-SMO-CharType	Bytes(Infoltem:2 in 18.010) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A]					B*
			1	M	18.011-CharType	ForEach(SubField in 18.011) { Bytes(Infoltem:1 in SubField) MO [0x30 to 0x39] }					B*
			1	-	18.015-[PTP, RES]-	Bytes(Infoltem:1, 2 in 18.015) MO [0x30 to 0x39]					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

					CharType						
			1	-	18.015-[PRF, SUP, DPC]-CharType	TRUE					B*
			1	M	18.016-[DST, DLR, ALL, LAI, PCDT, KID]-CharType	ForEach(SubField in 18.016) { Bytes(Infoltem: 1 to 5, 12 in SubField) MO [0x30 to 0x39] }					B*
			1	D	18.016-[AL1, AL2, AL3]-CharType	ForEach(SubField in 18.016) { Bytes(Infoltem: 6 to 8 in SubField) MO [0x30 to 0x39, 0x2E] }					B*
			1	-	18.016-[BID, ECR, LCR, KNM, KMF, KDS]-CharType	TRUE					B*
			1	M	18.017-[MT1, MT2]-CharType	Bytes(Infoltem: 1, 2 in 18.017) MO [0x20, 0x41 to 0x5A, 0x61 to 0x7A, 0x2D]					B*
			1	M	18.017-[BSP, BEP, BCA, BCG, BCC, BCT]-CharType	Bytes(Infoltem: 3 to 8 in 18.017) MO [0x30 to 0x39]					B*
			1	M	18.018-CharType	TRUE					B*
			1	M	18.019-[EIR, EST, IDD]-CharType	TRUE					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	-	18.019-[ELPD, EPS]-CharType	ForEach(SubField in 18.019) { Bytes(Infoltem: 4,5 in SubField) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A, 0x2B, 0x2F, 0x3D] }					B*
			1	M	18.021-GLR-CharType	ForEach(SubField in 18.021) { Bytes(Infoltem:1 in SubField) MO [0x30 to 0x39] }					B*
			1	M	18.021-ALP-CharType	ForEach(SubField in 18.021) { Bytes(Infoltem:2 in SubField) MO [0x2C, 0x2E, 0x30 to 0x39] }					B*
			1	M	18.021-GNW-CharType	ForEach(SubField in 18.021) { Bytes(Infoltem:3 in SubField) MO [0x2E, 0x30 to 0x39] }					B*
			1	M	18.023-[LIR, LST, LDD]-CharType	TRUE					B*
			1	-	18.023-[LEPD, LES]-CharType	ForEach(SubField in 18.023) { Bytes(Infoltem: 4,5 in SubField) MO [0x30 to 0x39, 0x41 to 0x5A, 0x61 to 0x7A, 0x2B, 0x2F, 0x3D] }					B*
			1	M	18.902-[NAV, OWN, PRO]-CharType	TRUE					B*



Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	M	18.902-GMT-CharType	ForEach(Subfield in 18.902) { Bytes(Infoltem:1 in Subfield) MO [0x30 to 0x39,0x5A] }					T
			1	M	NIEM-18.902-GMT-CharType	Bytes(XElm(biom:ProcessUTCDate) in 18.902) MO [0x30 to 0x39, 0x3A, 0x54, 0x5A]					X
			1	-	18.995-[ACN, ASP]-CharType	Bytes(All(Infoltem:1,2 in 18.995)) MO [0x30 to 0x39]					B*
			-	-	18.998-[UTE, LTD,LTM, LTS, LGD, LGM, LGS, ELE, GDC, GCM, GCE, GCN, GRT, OSI, OCV]-CharType	<See Requirement ID: " <a href="#">Field: Geographic</a> ">	t-2				
<b>RT18.13 - Field: Type18-CharCount</b>	Table 79	<Table 79 specifies the Character Count for each field that contains no subfields.>	1	M	18.001-CharCount	DataLength(18.001) MO [1 to 8]					T
			1	M	NIEM-18.001-CharCount	Length(18.001) EQ 2					X
			1	M	18.002-CharCount	DataLength(18.002) EQ 1 OR 2					B
			1	M	18.004-CharCount	<See Requirement ID: " <a href="#">Field: Source Agency</a> ">	t-2				
			1	M	18.005-CharCount	DataLength(18.005) EQ 1					B
			1	D	18.007-CharCount	DataLength(18.007) EQ 1					B

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	D	18.008-CharCount	DataLength(18.008) EQ 1					B
			1	O	18.012-CharCount	DataLegnth(18.012) MO [1 to 255]					B
			1	M	18.013-CharCount	DataLegnth(18.013) EQ 8					B
			1	M	NIEM-18.013-CharCount	DataLegnth(18.013) EQ 10					B
			1	M	18.014-CharCount	DataLegnth(18.014) EQ 8					B
			1	M	NIEM-18.014-CharCount	DataLegnth(18.014) EQ 10					B
			1	O	18.020-CharCount	DataLegnth(18.020) EQ 1					B
			1	O	18.022-CharCount	DataLegnth(18.022) MO [1 to 126]					B
			1	O	18.993-CharCount	<See Requirment ID: " <a href="#">Field: Source Agency Name</a> ".>	t-2				
<b>RT18.14 - Field: Type19-Subfield CharCount</b>	Table 79	<Table 79 specifies the Character Count for each subfield.>	1	-	18.003-[UTY, LTY]-CharCount	Length(Infoltem:1,2 in 18.003) EQ 1					B*
			1	D	18.003-ACC-CharCount	Length(Infoltem:3 in 18.003) MO [1 to 35]					T
			1	D	NIEM-18.003-ACC-CharCount	Length(XElm(biom:DNALaboratoryAccreditationLevelCode) MO [1 to 3] AND Length(XElm(biom:DNALaboratoryAccreditationScopeCode) EQ 1					X
			1	O	18.003-NOO-CharCount	Length(Infoltem:4 in 18.003)) GTE 1					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	O	18.003-POC-CharCount	Length(Infoltem:5 in 18.003)) MO [1 to 200]					B*
			1	O	18.003-CSC-CharCount	Length(Infoltem:6 in 18.003)) MO [2, 3]					T
			1	O	18.003-CSC-CharCount	Length(XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha2Code)) EQ 2 OR Length(XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha3Code)) EQ 3 OR Length(XElm(biom:DNALaboratoryProcessingCountryISO3166NumericCode)) EQ 3					X
			1	O	18.003-ION-CharCount	Length(Infoltem:7 in 18.003)) MO [1 to 100]					B*
			1	-	18.006-[DSD,GID,DRA,SDS]-CharCount	Length(Infoltem:1,2,6,8 in 18.006) EQ 1					B*
			1	-	18.006-[DLC,DLB]-CharCount	Length(Infoltem:3,4 in 18.006) EQ 8	t-6				T
			1	O	NIEM-18.006-[DLC,DLB]-CharCount	Length(XElm(nc:PersonBirthDate), XElm(biom:DNADonorLastContactDate) in 18.006) EQ 10	t-6				X
			1	O	18.006-EGP-CharCount	Length(Infoltem:5 in 18.006) MO [1 to 50]					B*
			1	O	18.006-LLC-CharCount	Length(Infoltem:7 in 18.006) MO [1 to 4000]					B*
			1	M	18.009-[PID,SID]-	Length(Infoltem:1, 4 in 18.009) MO [1 to 24]					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
					CharCount						
			1	M	18.009-PMI-CharCount	Legnth(Infoltem:2 in 18.009) MO [1 to 6]					B*
			1	M	18.009-PMS-CharCount	Legnth(Infoltem:3 in 18.009) EQ 1					B*
			1	O	18.009-[FID,MID]-CharCount	Legnth(Infoltem:5,6 in 18.009) MO [1 to 3]					B*
			1	O	18.009-PCM-CharCount	Legnth(Infoltem:7 in 18.009) MO [1 to 2000]					B*
			1	M	18.010-SCT-CharCount	Legnth(Infoltem:1 in 18.010) MO [1 to 2]					B*
			1	O	18.010-SMO-CharCount	Legnth(Infoltem:2 in 18.010) EQ 2					B*
			1	M	18.011-CharCount	Legnth(All(Infoltems in 18.011)) EQ 1					B*
			1	M	18.015-PTP-CharCount	Legnth(Infoltem:1 in 18.015) EQ 1					B*
			1	O	18.015-RES-CharCount	Legnth(Infoltem:2 in 18.015) MO [1,2]					B*
			1	M	18.015-PRF-CharCount	Legnth(Infoltem:3 in 18.015) MO [1 to 64]					B*
			1	O	18.015-[SUP,DPC]-CharCount	Legnth(Infoltem:5,6 in 18.015) MO [1 to 100]					B*
			1	M	18.016-	ForEach(SubField in 18.016)					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

					[DST,ALL,LA I,PCDT]-CharCount	{ Legnth(Infoltem:1,3,4,5 in SubField) EQ 1 }					
			1	M	18.016-[DLR, KID]-CharCount	ForEach(SubField in 18.016) { Legnth(Infoltem:2,12 in SubField) MO [1 to 3] }					B*
			1	D	18.016-[AL1, AL2, AL3]-CharCount	ForEach(SubField in 18.016) { Legnth(Infoltem:6,7,8 in SubField) MO [1 to 4] }					B*
			1	-	18.016-[BID, KNM, KMF]-CharCount	ForEach(SubField in 18.016) { Legnth(Infoltem:9,13,14 in SubField) MO [1 to 32] }					B*
			1	O	18.016-[ECR,LCR]-CharCount	ForEach(SubField in 18.016) { Legnth(Infoltem:10,11 in SubField) MO [1 to 8] }					B*
			1	D	18.016-KDS-CharCount	ForEach(SubField in 18.016) { Legnth(Infoltem:15 in SubField) MO [1 to 128] }					B*
			1	M	18.017-MT1-CharCount	Legnth(Infoltem:1 in 18.017) MO [546 to 646]					B*
			1	M	18.017-MT1-CharCount	Legnth(Infoltem:2 in 18.017) MO [576 to 976]					B*
			1	M	18.017-[BSP, BEP]-CharCount	Legnth(Infoltem:3,4 in 18.017) MO [1 to 5]					B*
			1	M	18.017-[BCA, BCG,	Legnth(Infoltem:5,6,7,8 in 18.017) MO [1,2]					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

					BCC, BCT]-CharCount						
			1	M	18.018-CharCount	TRUE					B*
			1	M	18.019-EIR-CharCount	ForEach(SubField in 18.019) { Legnth(Infoltem:1 in SubField) MO [1 to 8] }					B*
			1	M	18.019-EST-CharCount	ForEach(SubField in 18.019) { Legnth(Infoltem:2 in SubField) MO [1 to 4] }					B*
			1	M	18.019-IDD-CharCount	ForEach(SubField in 18.019) { Legnth(Infoltem:3 in SubField) MO [1 to 200] }					B*
			1	-	18.019-[ELPD, EPS]-CharCount	ForEach(SubField in 18.019) { Legnth(Infoltem:4,5 in SubField) GTE 2 }					B*
			1	M	18.021-GLR-CharCount	ForEach(SubField in 18.021) { Legnth(Infoltem:1 in SubField) MO [1 to 3] }					B*
			1	M	18.021-ALP-CharCount	ForEach(SubField in 18.021) { Legnth(Infoltem:2 in SubField) MO [3 to 9] }					B*
			1	M	18.021-GNW-CharCount	ForEach(SubField in 18.021) { Legnth(Infoltem:3 in SubField) MO [1 to 5] }					B*
			1	M	18.023-LIR-CharCount	ForEach(SubField in 18.023) { Legnth(Infoltem:1 in SubField) MO [1 to 8] }					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
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**8.18: Record Type-18: DNA record**

						}					
			1	M	18.023-LST-CharCount	ForEach(SubField in 18.023) { Legnth(InfoItem:2 in SubField) MO [1 to 4] }					B*
			1	M	18.023-LDD-CharCount	ForEach(SubField in 18.023) { Legnth(InfoItem:3 in SubField) MO [1 to 200] }					B*
			1	-	18.023-[LEPD,LES]-CharCount	ForEach(SubField in 18.023) { Legnth(InfoItem:4,5 in SubField) GTE 2 }					B*
			1	M	18.902-[NAV,OWN]-CharCount	ForEach(Subfield in 18.902) { Length(InfoItem:2,3 in Subfield) MO [1 to 64] }					T
			1	M	18.902-PRO-CharCount	ForEach(Subfield in 18.902) { Length(InfoItem:4 in Subfield)) MO [1 to 255] }					T
			1	M	18.902-GMT-CharCount	ForEach(SubField in 18.902) { Length(InfoItem:1 in SubField) EQ 15 }	t-6				T
			1	M	NIEM-18.902-GMT-CharCount	Length(XElm(biom:ProcessUTCDate) in 18.902) EQ 20	t-6				X
			1	M	18.995-ACN-CharCount	ForEach(Subfield in 18.995) { Length(InfoItem:1 in Subfield) MO [1 to 3] }					B*
			1	O	18.995-ASP-	ForEach(Subfield in 18.995) {					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
					CharCount	Length(Infoltem:2 in Subfield) MO [1,2]					
			-	O	18.998-[UTE, LTD,LTM, LTS, LGD, LGM, LGS, ELE, GDC, GCM, GCE, GCN, GRT, OSI, OCV]-CharCount	<See Requirement ID: " <a href="#">Field: Geographic</a> ">	t-2				
<b>RT18.15 - Field: Type18-Field Occurrence</b>	Table 79	<Table 79 specifies the Field Occurrence for each field.>	1	-	18.[024 to 199,901,903 to 992, 994, 996, 997, 999]-Occurrence	Count(18.[ 024 to 199,901,903 to 992, 994, 996, 997, 999]) EQ 0					B
			1	M	87.[001 to 006, 010, 011, 013 to 015]-Occurrence	Count(18.[ 001 to 006, 010, 011, 013 to 015]) EQ 1					B
			1	-	18.[007 to 009, 012, 016 to 023, 902, 993, 995, 998]-Occurrence	Count(18.[ 007 to 009, 012, 016 to 023, 902, 993, 995, 998]) LTE 1					
<b>RT18.16 - Field: 18.001-Record Header Value</b>	8.18.1, Table 79	Field 18.001 Record header. In Traditional encoding, this field contains the record length in bytes (including all information separators)		M	18.001-Record Header	<See Requirement ID " <a href="#">Field: xx.001-Record Header</a> ">	t-2				
	8.18.1, C.10.16	The XML name for the Type-18 record is <itl:PackageDNAREcord>, and its	1	M	NIEM-18.001-	ForEach(XElm(itl:PackageDNAREcord) {					X



Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
		<biom:RecordCategoryCode> element shall have a value of "18".			Value	{XElm(biom:RecordCategoryCode)} EQ ASCII(18)}					
<b>RT18.17 - Field: 18.002-Information Designation Character Value</b>	8.18.2, Table 79, 7.3.1	This mandatory field shall contain the IDC assigned to this Type-18 record as listed in the information item IDC for this record in Field 1.003 Transaction content/CNT.		M	18.002-IDC	<See Requirement IDs " <a href="#">Field: xx.002-IDC</a> " and " <a href="#">Field: 1.003-Transaction Content Subfield 2 IDC Matches</a> " >	t-2				
<b>RT18.18 - Field: 18.003-DNA Laboratory Setting Value</b>	8.18.3, Table 79	<Table 79 lists the valid values for DLS.>	1	M	18.003-UTY-Value	{Infoltem:1 in 18.003} MO [1 to 4]					B*
			1	D	18.003-LTY-Value	{Infoltem:2 in 18.003} MO [ASCII(G,I,O,U)]					B*
			1	D	18.003-ACC-Value	<Parse Infoltem:3 in 18.003 into strings separated by commas.> Count(<strings>) MO [1 to 6] AND ForEach(<string>) { <Number at start of string> MO [0 to 6, 255] AND IF <Number at start of string> EQ 255 THEN Length(string) EQ 3 ELSE IF <Number at start of string> EQ 0 THEN Length(string) EQ 1 ELSE <Number at start of string followed by string of N,M,D,O (non-repeating, length 1 to 4)> }				T	
			1	D	NIEM-18.003-ACC-Value	ForEach(XElm(biom:DNALaboratoryAccreditation)) { {XElm(biom:DNALaboratoryAccreditationLevelCode)} MO [0 to 6, 255]					

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
						AND IF {XElm(biom:DNALaboratoryAccreditationLevelCode)} EQ 0 OR 255 THEN Count(XElm(biom:DNALaboratoryAccreditationScopeCode)) EQ 0 ELSE Bytes in {XElm(biom:DNALaboratoryAccreditationScopeCode)} MO ASCII(N,M,D,O) }					
			1	O	18.003-[NOO,POC,ION]-Value	TRUE					B*
			1	O	18.003-CSC-Value	{Infoltem:6 in 18.003} MO <Alpha2, Alpha3, and Numeric Values from ISO-3166-1.>					T
			1	O	NIEM-18.003-CSC-Value	{XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha2Code)} MO <Alpha2 Values from ISO-3166-1.> OR {XElm(biom:DNALaboratoryProcessingCountryISO3166Alpha3Code)} MO <Alpha3 Values from ISO-3166-1.> OR {XElm(biom:DNALaboratoryProcessingCountryISO3166NumericCode)} MO <Numeric Values from ISO-3166-1.>					X
<b>RT18.19 - Field: 18.003-DNA Laboratory Setting Dependent</b>	8.18.3	The second information item is the lab type / LTY. It is mandatory if the value for UTY is 1 or 2. It is not entered otherwise. The third information item is the accreditation information / ACC. It is	1	D	18.003-Dependent LTY	Present(Infoltem:2 in 18.003) IFF {Infoltem:1 in 18.003} MO [1,2]					B*
			1	D	18.003-Dependent ACC	Present(Infoltem:3 in 18.003) IFF {Infoltem:1 in 18.003} MO [1,2]					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
<b>Values</b>		mandatory if the value for UTY is 1 or 2. It shall not be entered otherwise.									
<b>RT18.20 - Field: 18.004-Source Agency Value</b>	8.18.4	This is a mandatory field. See Section 7.6 for details.	1	M	18.004-Value	<See Requirement ID: " <a href="#">Field: Source Agency</a> ".>	t-2				
<b>RT18.21 - Field: 18.005-Number Of Analyses Flag Value</b>	8.18.5	<Table 79 lists the valid values for NAL.>	1	M	18.005-Value	{18.005} EQ 0 OR 1					B
<b>RT18.22 - Field: 18.006-Sample Donor Information Value</b>	8.18.6	<Table 79 lists valid values for SDI.>	1	M	18.006-DSD-Value	{Infoltem:1 in 18.006} MO [0 to 2]					B*
			1	O	18.006-GID-Value	{Infoltem:2 in 18.006} MO [ASCII(M,F,U)]					B*
			1	O	18.006-[DLC,DOB]-Value	{Infoltem:3,4 in 18.006} MO [ValidLocalDate]	t-6				T
			1	O	NIEM-18.006-[DLC,DOB]-Value	{XElm(nc:PersonBirthDate,biom:DNADonorLastContactDate)}MO [NIEM-ValidLocalDate]	t-6				X
			1	O	18.006-[EGP, LLC]-Value	TRUE					B*
			1	D	18.006-DRA-Value	{Infoltem:6 in 18.006} MO [0 to 2]					B*
			1	O	18.006-SDS-Value	{Infoltem:8 in 18.006} MO [0 to 2]					B*
<b>RT18.23 - Field: 18.006-</b>	8.18.6	This information item shall be entered only if DSD=0.	1	D	18.006-Dependent-DSD	Present(Infoltem:6 in 18.006) IFF {Infoltem:1 in 18.006} EQ 0					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
Sample Donor Information Dependent Value											
RT18.24 - Field: 18.007-Claimed Or Purported Relationship Value	8.18.7	<Table 79 lists valid values for COPR.>	1	D	18.007-Value	{18.007} MO [1 to 7]					B
RT18.25 - Field: 18.007-Claimed Or Purported Relationship Dependent Value	8.18.7	This field is mandatory if the value for DSD is equal to 1.	1	D	18.007-Dependent	IF {Infoltem:1 in 18.006} EQ 1, Then Present (18.007)					B
RT18.26 - Field: 18.008-Validated Relationship Value	8.18.8	<Table 79 lists valid values for VRS.>	1	D	18.008-Value	{18.008} MO [1 to 7]					B
RT18.27 - Field: 18.008-Validated Relationship Dependent Value	8.18.8	This field is optional and...is only filled in if DSD = 1.	1	D	18.008-Dependent	IF Present (18.008), Then {Infoltem:1 in 18.006} EQ 1					B
RT18.28 - Field:	8.18.9	<Table 79 lists valid values for PED.>	1	-	18.009-[PID, PMI,	TRUE					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
18.009- Pedigree Information Value					SID, FID, MID, PCM]- Value						
			1	M	18.009- PMS-Value	{Infoltem:3 in 18.009} MO [ASCII(K, U)]				B*	
RT18.29 - Field: 18.010- Sample Type Value	8.18.10	<Table 79 lists valid values for STY.>	1	M	18.010- SCT-Value	{Infoltem:1 in 18.010} MO [0 to 11]					B*
			1	O	18.010- SMO-Value	{Infoltem:2 in 18.010} MO [ASCII(NS, WB, BP)]					B*
RT18.30 - Field: 18.011- Sample Typing Information Value	8.18.11	<Table 79 lists valid values for STI.>	1	M	18.011- Value	ForEach(SubField in 18.011) { {Infoltem:1 in SubField} MO [0 to 4] }					B*
RT18.31 - Field: 18.012- Sample Collection Method Value	8.18.12	<Table 79 lists valid values for SCM.>	1	O	18.012- Value	TRUE					B
RT18.32 - Field: 18.013- Sample Collection Date Value	8.18.13	<Table 79 lists valid values for SCD.>	1	M	18.013- Value	{18.013} MO [ValidUTC/GMT]	t-6				T
			1	M	NIEM- 18.013- Value	{18.013} MO [NIEM-ValidUTC/GMT]	t-6				X
RT18.33 - Field: 18.014- Profile Storage Date	8.18.14	<Table 79 lists valid values for PSD.>	1	M	18.014- Value	{18.014} MO [ValidUTC/GMT]	t-6				T
			1	M	NIEM- 18.014- Value	{18.014} MO [NIEM-ValidUTC/GMT]	t-6				X

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)	
<b>8.18: Record Type-18: DNA record</b>												
<b>Value</b>												
<b>RT18.34 - Field: 18.015-DNA Profile Data Value</b>	8.18.15	<Table 79 lists valid values for DPD.>	1	M	18.015-PTP-Value	{Infoltem:1 in 18.015} MO [0,1]					B*	
			1	O	18.015-RES-Value	{Infoltem:2 in 18.015} MO [0,10]					B*	
			1	-	18.015-[PRF,SUP,DPC]-Value	TRUE						B*
<b>RT18.35 - Field: 18.016-Autosomal STR, X-STR and Y-STR Value</b>	8.18.16	<Table 79 lists the value constraints for STR.>	1	M	18.016-DST-Value	ForEach(SubField in 18.016) { {Infoltem:1 in SubField} MO [0,1,2] }						B*
			1	M	18.016-DLR-Value	ForEach(SubField in 18.016) { {Infoltem:2 in SubField} MO [1 to 200] }						B*
			1	M	18.016-[ALL, LAI, PCDT]-Value	ForEach(SubField in 18.016) { {Infoltem:3,4,5 in SubField} MO [0,1] }						B*
			1	D	18.016-[AL1,AL2,AL3]-Value	ForEach(SubField in 18.016) { {Infoltem:6,7,8 in SubField} GTE 0 AND IF Present(ASCII(.) in Infoltem: 6,7,8 in SubField) Then Count(<number digits following> ASCII(.) in Infoltem: 6,7,8 in SubField) EQ 1 }	t-18					B*
			1	-	18.016-[BID,ECR,LCR,KNM,KM]	TRUE						

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
					F,KDS]-Value						
			1	M	18.016-KID-Value	ForEach(SubField in 18.016) { {Infoltem:12 in SubField} MO [0 to 999] }					B*
<b>RT18.36 - Field: 18.016-Autosomal STR, X-STR and Y-STR Dependent Value</b>		<p>“The sixth information item shall have a value if ALL is 1. It shall be empty if ALL is 0.”</p> <p>“The seventh information item is conditional upon the value of ALL being 1. It may appear only if AL1 is used. “</p> <p>“The eighth information item is optional but shall not appear unless ALL = 1. The information item allele call 3 / AL3 shall only appear if information items AL1 and AL2 are present”</p> <p>“KNM shall be entered if KID = 0”</p> <p>“KMF shall be entered if KID = 0”</p> <p>“KDS shall be entered if KID = 0”</p>	1	D	18.016-Dependent-AL1	ForEach(SubField in 18.016) { IF {Infoltem:3 in SubField} EQ 1, Then Present(Infoltem:6 in SubField) AND IF {Infoltem:3 in SubField} EQ 0, Then NOT Present(Infoltem:6 in SubField) }					B*
			1	D	18.016-Dependent-AL2	ForEach(SubField in 18.016) { IF NOT Present(Infoltem:6 in SubField) Then NOT Present(Infoltem:7 in SubField) ELSE IF {Infoltem:3 in SubField} EQ 1, Then Present(Infoltem:7 in SubField) AND IF {Infoltem:3 in SubField} EQ 0, Then NOT Present(Infoltem:7 in SubField) }					B*
			1	D	18.016-Dependent-AL3	ForEach(SubField in 18.016) { IF NOT Present(Infoltem:6,7 in SubField) Then NOT Present(Infoltem:8 in SubField) ELSE IF {Infoltem:3 in SubField} EQ 1, Then Present(Infoltem:8 in SubField) AND IF {Infoltem:3 in SubField} EQ 0, Then NOT Present(Infoltem:8 in SubField) }					B*

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
			1	D	18.016-Dependent-[KNM, KMF, KDS]	} ForEach(SubField in 18.016) { IF {Infoltem:12 in SubField} EQ 0 Then Present(Infoltem:13,14,15 in SubField) }					B*
<b>RT18.37 - Field: 18.017-Mitochondrial DNA Data Value</b>	8.18.17	<Table 79 lists the value constraints for DMD.>	1	M	18.017-[MT1,MT2]-Value	All(Bytes(Infoltem:1,2 in 18.017)) MO [ASCII(R,Y,M,K,S,W,H,B,V,D,N,-,A,G,C,T)]					B*
			1	M	18.017-[BSP,BCA,B CG,BCC,BCT]-Value	{Infoltem:3,5,6,7,8 in 18.017} GTE 0 AND MO [Integers]					B*
			2	M	18.017-BEP-Value	{Infoltem:4 in 18.017} GT {Infoltem:3 in 18.017} GT 0 AND MO[Integers]					
<b>RT18.38 - Field: 18.018-DNA User-Defined Profile Data Value</b>	8.18.18	<Table 79 lists the value constraints for UDP.>	1	M	18.018-Value	TRUE					B
<b>RT18.39 - Field: 18.019-Electropherogram Description Value</b>	8.18.19	<Table 79 lists the value constraints for EPD.>	1	-	18.019-Value	TRUE					B*
<b>RT18.40 - Field: 18.020-DNA Genotype Distribution Value</b>	8.18.20	<Table 79 lists the value constraints for DGD.>	1	O	18.020-Value	{18.020} EQ 0 OR 1					B



Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
<b>RT18.41 - Field: 18.021- DNA Genotype Allele Pair Value</b>	8.18.21	<Table 79 lists the value constraints for GAP.>	1	M	18.021-GLR-Value	ForEach(SubField in 18.021) { {Infoltem:1 in SubField} MO [1 to 200] }					B*
			1	M	18.021-ALP-Value	ForEach(SubField in 18.021) { Count(<numbers separated by commas> in Infoltem:2 in SubField) EQ 2 AND ForEach (<number separated by comma in Infoltem:2 in SubField>) { <number> GTE 0 AND IF Present(ASCII(.) in <number>) Then Count(<digits after> ASCII(.) in <number>) EQ 1 } }					B*
			1	M	18.021-GNW-Value	ForEach(SubField in 18.021) { {Infoltem:3 in SubField} GTE 0 AND LTE 1 AND IF Present(ASCII(.) in Infoltem:3 in SubField) Then Count(<digits after> ASCII(.) in Infoltem:3 in SubField) MO [1 to 3] }					
<b>RT18.42 - Field: 18.022- Comment Value</b>	8.18.22	<Table 79 lists the value constraints for COM.>	1	O	18.022-Value	TRUE					B
<b>RT18.43 - Field: 18.023 Electropherogram Ladder Value</b>	8.18.23	<Table 79 lists the value constraints for EPL.>	1	M	18.023-Value	TRUE					B*
<b>RT18.44 - Field: 18.200</b>	8.18.24	User Defined Fields	-	-	18.200 to 18.900-	TRUE					B

Req. # - ID	Ref. in Base Std.	Requirement Summary	L	S	Assertion ID	Test Assertion	Test Note	Imp. Support	Supported Range	Test Result	Applicable to (T, X, B, B*, or X*)
<b>8.18: Record Type-18: DNA record</b>											
to 18.900-User Defined Value					Value						
RT18.45 - Field: 18.902- Annotated Information Value	8.18.25	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	18.902-[GMT, NAV, OWN, PRO]-Value	<See Requirement ID: " <a href="#">Field: xx.902-ANN</a> " >.	t-2				
RT18.46 - Field: 18.993- Source Agency Name Value	8.18.26	This is an optional field. It may contain up to 125 Unicode characters.		O	18.993-Value	<See Requirement ID: " <a href="#">Field: Source Agency Name</a> ".>	t-2				
RT18.47 - Field: 18.995- Associated Context Value	8.18.27	See Section 7.3.3		O	18.995-[ACN, ASP]-Value	<See Requirement IDs: " <a href="#">Field: xx.995-ASC</a> " and " <a href="#">Field: xx.995-ASC-ACN</a> " and " <a href="#">Field: xx.995-ASC-ASP</a> ".>	t-2				
RT18.48 - Field: 18.998- Geographic Sample Acquisition Location Value	8.18.28	See Section 7.7.3		O	18.998-[UTE, LTD, LTM, LTS, LGD, LGM, LGS, ELE, GDC, GCM, GCE, GCN, GRT, OSI, OCV]-Value	<See Requirement IDs: " <a href="#">Field: Geographic</a> ", " <a href="#">Field: Geographic</a> ", " <a href="#">Field: Geographic-Subfield 1</a> " through " <a href="#">Field: Geographic-Values-SubField 15</a> " >.	t-2				

## B.2 Test Notes

The following test notes provide clarification of the assertion text provided in the Test Assertion column of Table B.1. Only test notes relevant to Type 18 Record Type are included:

- t-2. The assertions for this requirement are listed in another section of the table or in another table of NIST SP 500-295 as described in the “Test Assertion” column.
- 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, YYYY-MM, or YYYY.
- t-18. Table 79 in NIST SP 500-290 lists possible values as 'integer > 0; or real number with one digit to the right of the decimal'. Negative integer values are a subset of real numbers, and would conflict with the requirement “integer > 0”. For the pertinent test assertion in the table, negative values are not considered part of the valid value range.