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**Level 1 and Level 2 Test Assertions for INICTS 1749-D Part 5 - Conformance Testing Methodology  
for INCITS 385, Face Recognition Format for Data Interchange**

**Technical Contribution by National Biometric Security Project**

NBSP would like to recommend that the following set of assertions be used as the Level 1 and Level 2 assertions for INCITS 1749-D Part 5 - Conformance Testing Methodology for INCITS 385, Face Recognition Format for Data Interchange

Test	Section	Field	Operator	Operands	Footnote	References	Level
	<b>Facial Header</b>						
1		Format Identifier	EQ	0x46414300		Table 2, 5.4.1	1
2		Version	EQ	0x30313000		Table 2, 5.4.2	1
3		Record Length	C	See Note	1	Table 2, 5.4.3	2
3.1		Record Length	EQ	Total Bytes Read		Table 2, 5.4.3	2
3.2		Record Length	EQ	Total Bytes Expected	2	Table 2, 5.4.3	2
4		Number of Facial Images	EQ	1 - 65535		Table 2, 5.4.4	1
	<b>Facial Data</b>						
	<b>Facial Information</b>						
5		Image Length	C	See Note	3	5.5.1	2
5.1		Image Length	EQ	Total Image Bytes Read		5.5.1	2
5.2		Image Length	EQ	Total Image Bytes Expected	4	5.5.1	2
6		Number of Feature Points	EQ	0 - 65535		5.5.2	1
7		Gender	EQ	0 - 3		Table 3, 5.5.3	1
8		Eye Color	EQ	0x0 - 0x3, 0x10, 0x12, 0x20, 0x22, 0xFF		Table 4, 5.5.4	1
9		Hair Color	EQ	0x0 - 0x6, 0x10, 0x13 - 0x16, 0x20, 0x30, 0x40, 0xFF		Table 5, 5.5.5	1
10		Feature Mask	EQ	0x00 - 0xFFFF	5	Table 6, 5.5.6	1
10.1		Feature Mask	C	See Note	6	Table 6, 5.5.6	2
11		Expression	EQ	0 - 7, 32768 - 65535	7	Table 7	1
11.1		Expression	C	See Note	8	Table 7, 7.2.3	2
12		Pose Angle Yaw By	EQ	0 - 181		5.5.8.1	1
13		Pose Angle Pitch Bp	EQ	0 - 181		5.5.8.2	1
14		Pose Angle Roll Br	EQ	0 - 181		5.5.8.3	1
15		Pose Angle Uncertainty Uy	EQ	0 - 181		5.5.9	1
16		Pose Angel Uncertainty Up	EQ	0 - 181		5.5.9	1
17		Pose Angle Uncertainty Ur	EQ	0 - 181		5.5.9	1
	<b>Feature Point(s)</b>						
18		Feature Type	EQ	1		Table 9	1
19		Feature Point	EQ	See Note	9	Table 9	1

20		Horizontal Position X	EQ	$1 - \{Width\}$		Table 9	2
20.1		First (right) eye position	C	$0.375 * \{Width\} - 1$	10	Figure 9, 9.2.3	2
20.2		Second (left) eye position	C	$0.625 * \{Width\} - 1$	10	Figure 9, 9.2.3	2
21		Vertical Position Y	EQ	$1 - \{Height\}$		Table 9	2
21.1		First (right) eye position	C	$0.60 * \{Width\}$	10	Figure 9, 9.2.3	2
21.2		Second (left) eye position	C	$0.60 * \{Width\}$	10	Figure 9, 9.2.3	2
22		Reserved	EQ	0		Table 9	1
	<b>Image Information</b>						
23		Face Image Type	EQ	0 - 3		Table 10, 5.7.1	1
24		Image Data Type	EQ	0, 1		Table 11, 5.7.2	1
25		Width	C	See note	11	Figure 9, 5.7.3, 8.3, 9.2.4	2
26		Height	C	See note	12	Table 14, Figure 9, 5.7.4, 9.2.4	2
27		Color Space	EQ	0 - 4, 128 - 255		Table 12, 5.7.5	1
27.1		Color Space	C	See Note	13	Table 12, 7.4.3.3	2
28		Source Type	EQ	0 - 7, 128 - 255	14	Table 13, 5.7.6	1
29		Device Type	EQ	0 - 65535		5.7.7	1
30		Quality	EQ	0		5.7.8	1
	<b>Image Data</b>						
31		Image Marker	EQ	See Note	15	5.8.1	1
32		Image Data Length	EQ	Total Data Bytes Read	16	5.8.1	2

## Footnotes

### 1 {Record Length}

Minimum JPEG {Image Data} Block = Start Of Image (SOI) + Frame Header + End Of Image (EOI) [ref. 10918-1 / Figure B.2, Table B.2]

Minimum JPEG {Image Data} Block = 2 + 11 + 2 bytes [ref. 10918-1 / Table B.2]

Minimum JPEG {Image Data} Block = 15 bytes

Minimum JPEG2000 {Image Data} Block = JP2 Signature box + Profile box + Image Header box + Contiguous Codestream box [ref. 15444-1 / Figure I-1 and Table I-2]

Minimum JPEG2000 {Image Data} Block = 12 + 8 + 35 + 16 bytes [ref. 15444-1 / Annex I]

Minimum JPEG2000 {Image Data} Block = 71 bytes

Therefore, Minimum {Image Data} Block Length = 15 bytes

Minimum {Record Length} = {Facial Header} Block + {Facial Information} Block + {Image Information} Block + Minimum {Image Data} Block Length

Minimum {Record Length} = 14 + 20 + 12 + 15 = 61 bytes

Maximum {Record Length} = 4 bytes = 0xFFFFFFFF =  $2^{32}-1$

### 2 {Total Bytes Expected}

The following calculation will be evaluated once the Image Data Block for the last Facial Image has been parsed successfully (not having reached an End-of-File marker prematurely). In the event that End-of-File marker is reached prematurely this will be marked as having failed, but no value of {Total Bytes Expected} will be produced.

Length = 14

For j = 1 : {Number of Facial Images}

Length = Length + 32 + {Number of Feature Points} \* 8 + {Image Data} Block Length

END

{Total Bytes Expected} = Length

### 3 {Image Length}

Minimum {Image Length} = 32 + {Image Data} Block  
Maximum {Image Length} = 0xFFFFFFFF - {Facial Header} Block  
Maximum {Image Length} = 0xFFFFFFFF - 0xE  
Maximum {Image Length} = 0xFFFFFFFF1

IF {Image Data Type} = 0 THEN  
    Minimum {Image Length} = {Facial Information} Block + {Image Information} Block + Minimum JPEG {Image Data} Block  
    Minimum {Image Length} = 20 + 12 + 15 = 47  
ENDIF

IF {Image Data Type} = 1 THEN  
    Minimum {Image Length} = {Facial Information} Block + {Image Information} Block + Minimum JPEG2000 {Image Data} Block  
    Minimum {Image Length} = 20 + 12 + 71 = 103  
ENDIF

### 4 {Total Image Bytes Expected}

The following calculation will be evaluated once the {Image Data} Block for the last Facial Image has been parsed successfully (not having reached an End-of-File marker prematurely). In the event that an End-of-File marker is reached prematurely this test will be marked as having failed, but no value of {Total Image Bytes Expected} will be produced.

{Total Image Bytes Expected} = 32 + {Number of Feature Points} \* 8 + {Image Data} Block Length

### 5 {Feature Mask}

The Feature Mask is a bit mask of 3 bytes with bits 12-23 currently reserved.  
Thus 0xFFF is the maximum value.

Some combinations of bits may be inappropriate (if the least significant bit is set high to indicate that all bits in the mask count)

Examples might include bit 5 and bit 9 both high, since a blink should not be detectable if the subject has both left and right eye-patches.

These issues are not obvious, however, and should not be used to make an absolute declaration of conformance so they are ignored here

**6 {Feature Mask}**

IF {Face Image Type} = 1 OR {Face Image Type} = 2 THEN Bit 5 of {Feature Mask} EQ 0

**7 {Expression}**

Note that values 0 - 7 have specific meaning from Table 7, and 32768 - 65535 are vendor defined values

Note that Table 7 does not specify anything about values from 8 - 255, so it is assumed that they are also reserved, along with 256 - 32767

**8 {Expression}**

IF {Face Image Type} = 1 OR {Face Image Type} = 2 THEN {Expression} EQ 1 - 7

**9 {Feature Point}**

Valid range for specific Feature Point(s)

Major value	Minor value	Range
2	1 - 14	33 - 46
3	1 - 14	49 - 62
4	1 - 6	65 - 70
5	1 - 4	81 - 84
6	1 - 4	97 - 100
7	1	113
8	1 - 10	129 - 138

9	1 – 15	145 – 159
10	1 - 10	161 – 170
11	1 – 5	177 – 181
12	1 – 4	193 - 196

## 10 {Eyes Centre}

IF {Face Image Type} = 2 THEN check eye centres were position correctly

First (right) eye position X-coordinate =  $0.375 * \{\text{Width}\} - 1$

Second (left) eye position X-coordinate =  $0.625 * \{\text{Width}\} - 1$

Y-coordinate for both eyes =  $0.6 * \{\text{Width}\}$

## 11 {Width}

The minimum (Image Width : Head Width) ratio is 7:4

IF {Face Image Type} = 1 THEN minimum {Width} = minimum Head Width / 4 \* 7

IF {Face Image Type} = 1 THEN minimum {Width} = 180 / 4 \* 7

IF {Face Image Type} = 1 THEN {Width} GE 315

IF {Face Image Type} = 2 THEN {Width} GE 240

## 12 {Height}

IF {Face Image Type} = 2 THEN {Height} EQ {Width} / 0.75

IF {Face Image Type} = 2 THEN {Height} GE 320

## 13 {Color Space}

IF {Face Image Type} = 1 OR {Face Image Type} = 2 THEN {Color Space} EQ 1 - 3

**14 {Source Type}**

Note that values 0 - 7 have specific meaning from Table 13, but 128 - 255 are vendor defined. Values 8 - 127 are reserved.

**15 {Image Marker}**

IF {Image Data Type} = 0 THEN Start of Image Marker = 0xFFDB (JPEG)

IF {Image Data Type} = 1 THEN Start of Image Marker = 0x0000 000C 6A50 2020 0D0A 870A (JPEG2000)

**16 {Image Data Length}**

{Image Data} Block = {Facial Data} Block - {Facial Information} Block - {Facial Feature} Block(s) - {Image Information} Block