

X9 REGISTRY FOR CHECK IMAGE TESTS

CONTROLLING SPECIFICATION: ANS X9.100-40 Parts 1 & 2

Image Test Name: IBM Image Noise
Image Test Number: 025.00
Image Test Version: 00
Image Test Status: A

Where:

A = Active (approved for use)

W = Withdrawn (not for use)

*S = Superseded (not for use -
replaced by specified test)*

1	Applicant Information	
1.1	Organization Name:	IBM Corporation
1.2	Organization Address:	8501 IBM Drive MG83/202-3 Charlotte, NC 28262
1.3	Organization Web Site URL:	http://www.ibm.com

Approved by: X9 RMG for Check Image Tests March 30, 2007

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2	Image Test Description	
2.1	Image Test Name:	IBM Image Noise
2.2	Image Test XML Name:	noise
2.3	Image Test Definition:	A metric used to measure how much noise is present in a black/white image
2.4	Image Test Applicability: Check all that apply.	<input checked="" type="checkbox"/> <i>Front Image</i> <input checked="" type="checkbox"/> <i>Rear Image</i> <input checked="" type="checkbox"/> <i>B/W Image</i> <input type="checkbox"/> <i>Grayscale Image</i> <input type="checkbox"/> <i>Color Image</i>
2.5	Intended Use: Intended business use/ application, business context, and business impact when test fails.	This metric will report a failure if the image is detected as “noisy”. Noise can interfere with the readability and quality of an image.
2.6	Possible Causes for Condition Being Tested:	This test will execute whenever a black/white image is processed.
2.7	Additional (or Repetitive) Information:	This check is performed on every black/white image processed by IQA. The parameters associated with this metric are used to determine the image’s noise metric and how it compares to a previously defined threshold. Details on the way in which this measurement is derived are provided in section 2.10.

2.8 Test Results Reported

A test result is the outcome realized from executing an image test. The outcome will typically be the observed or measured value of some attribute pertaining to the image being tested.

Any dependency of a test result on an image side (front or rear), image rendition (B/W, Gray, Color), or other condition shall be fully defined in the Additional Information section.

Data types allowed are as defined in ANS X9.100-180-2006, but are typically alphabetic, numeric, alphanumeric, signed numeric (using “+” and “-” to denote sign), etc.

2.8.1 First Image Test Result

Test Result Name: Image Noise Measurement

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
raw.	Numeric			

Description: This measurement measures how “noisy” an image under examination appears.

Formula and/ or Algorithm: The image noise measurement is performed in the following manner:

1. The number of noise elements is determined in the rightmost quadrant of the image. Any image elements that have a size of less than a programmable value are flagged as being a noise element. The threshold is normalized with respect to image resolution so that the noise elements are determined by dimension rather than raw pixel count.
2. Once the number of noise elements are determined, the noise value is determined by the following formula:

$$imageNoise = \frac{(NoiseCount * (imageDPI)^2 * 4)}{(imageWidth * imageHeight)}$$

The *imageWidth* and *imageHeight* parameters for the above measurement are in units of inches.
3. This equation allows us to express the noise in a manner that is consistent over images with varying resolutions and dimensions.

Additional Information: .

2.8.2 Second Image Test Result

Test Result Name: Image Noise score

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
score	Numeric		0-100	
Description:	This value provides the image noise score for the black/white image under test.			
Formula and/ or Algorithm:	The image noise is processed using three user-settable values: <ul style="list-style-type: none">• Image Noise LastGood• Image Noise FirstBad• Image Noise Exponent This “score” is then compared to a threshold value. If the score is below the threshold, then this test parameter measurement can cause the test to fail. If the score is greater than or equal to the threshold, then the item may pass. Information on how the scoring is generated by IQA is shown in section 2.10.			
Additional Information:				

2.9	<p>Test Parameters Reported</p> <p><i>Examples of image test parameters are threshold values used to compute a pass/fail image test flag condition, and constant values used in a formula or algorithm to compute an image test result.</i></p> <p><i>Any dependency of a test parameter on an image side (front or rear), image rendition (B/W, Gray, Color), or other condition shall be fully defined in the Additional Information section.</i></p> <p><i>Any dependency of recommended values on an image side (front or rear), image rendition (B/W, Gray, Color), or other condition shall be fully defined in the Recommended Values section.</i></p> <p><i>Data types allowed are as defined in ANS X9.100-180-2006, but are typically alphabetic, numeric, alphanumeric, signed numeric (using “+” and “-” to denote sign), etc.</i></p>
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2.9.1 First Test Parameter				
Test Parameter Name: Test Threshold				
Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	None	0-1000	700 (default)
Description:	This reported parameter is the threshold used to make the pass/fail decision. This value is settable by the user. If the calculated “score” is greater than or equal to the threshold, the test passes. If the “score” is lower than the threshold, the test fails.			
Additional Information:	This value corresponds to the value that the user sets in the IBM IQA profile that is active for this test execution. The value may be set to any floating point value between 0 and 10.0 by the user. In reporting this parameter, the value is multiplied by 100 and converted to an integer.			

2.9.2 Second Test Parameter

Test Parameter Name: Image Noise Last Good

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric			

Description: This is the Last Good value utilized in the evaluation (“scoring”) of the image noise present in the image under examination.

Additional Information: This value corresponds to the value that the user sets in the IBM IQA profile that is active for this test execution. When reporting this parameter, the value is multiplied by 100 and converted to an integer.

2.9.3 Third Test Parameter

Test Parameter Name: Image Noise First Bad

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric			

Description: This is the First Bad value utilized in the evaluation (“scoring”) of the image noise present in the image under examination.

Additional Information: This value corresponds to the value that the user sets in the IBM IQA profile that is active for this test execution. The value may be set to any floating point value between 0 and 10.0 by the user. In reporting this parameter, the value is multiplied by 100 and converted to an integer.

2.9.4 Fourth Test Parameter

Test Parameter Name: Image Noise Exponent

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
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	Numeric			
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Description:

This is the value that controls the shape of the “line” between the **Image Noise First Bad** and **Image Noise Last Good** parameters. The IBM IQA product stores this value internally as a floating point number. In reporting this parameter, the value is multiplied by 10 and converted to an integer. See section 2.10 for further descriptions.

Additional Information:

This value corresponds to the value that the user sets in the IBM IQA profile that is active for this test execution. The value may be set to any floating point value between 0 and 10.0 by the user. In reporting this parameter, the value is multiplied by 10 and converted to an integer.

2.10 Image Test Flag Pass/Fail Criteria:

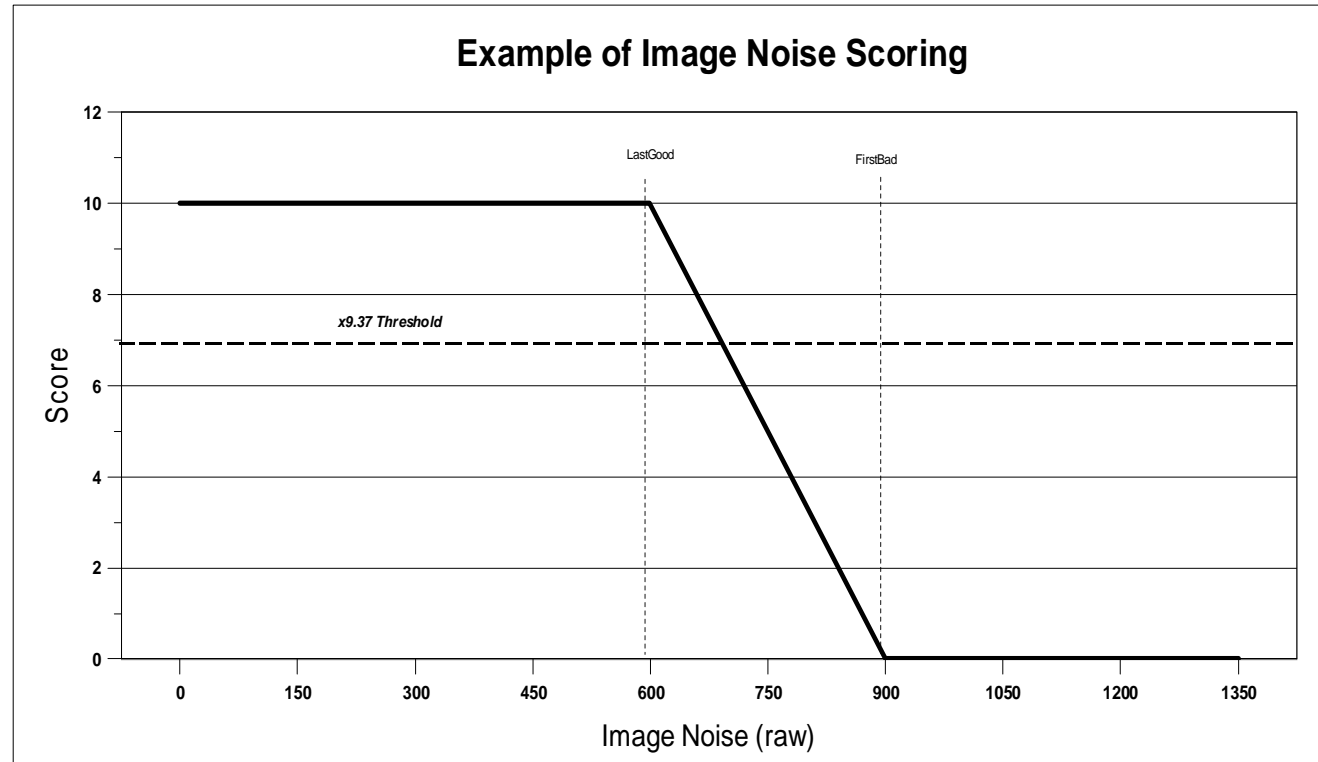
The Image Test Flag (see ANS X9.100-40-1-2006 for details) will convey one of the following four test conditions:

- Condition not tested
- Condition tested and result = fail
- Condition tested and result = pass
- Condition tested and result=indeterminate

The software will *always* report this result for a valid image. There will be two possible results:

- *Condition tested and result = fail*
This test will **fail** when the noise score is less than the user-defined x9.37 threshold value.
- *Condition tested and result = pass*
This test will **pass** when the noise score is greater than the user-defined x9.37 threshold value.

The chart below shows the way in which the test score is derived.



In the chart above, the items that the user can set are:

- X9.37 threshold (set to 7.0 in this example)
- LastGood (set to 600 in this example)
- FirstBad (set to 900 square inch in this example)
- The Exponent in this case (which controls the shape of the line between the LastGood and FirstBad parameters) is set to '1'.
- Any item that has a "raw" Image Noise measurement of between 0 and about 700 will pass the test with

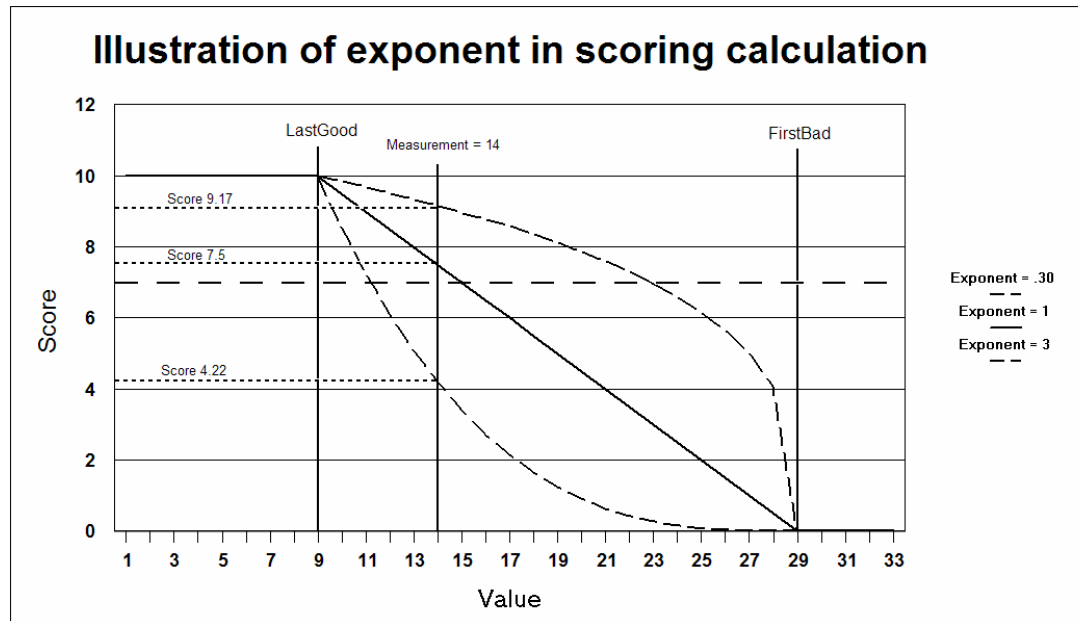
the given parameters.

In addition to the items shown above, the shape line between the LastGood and FirstBad elements may be set by the Exponent value.

The "Last Good" parameter is the point beyond which the judgment of the measurement results begins to decrease from a "10.0". The "First Bad" parameter beyond which the measurement results will be a "0.0". The "direction" from "Last Good" to "First Bad" is determined by the relative size of the two parameters. If the "LastGood" is less than "First Bad", then the score will get worse as its measurement grows from the "LastGood" measurement point. If "FirstBad" is less than "LastGood", then the score will get better as its measurement grows from the "FirstBad" measurement point.

The scoring of items with values that fall between the relevant "LastGood" and "FirstBad" values is performed in two steps:

- The first step generates the preliminary score, which is a linear interpolation between the LastGood and FirstBad elements. This preliminary score is normalized to a value of between 0 and 1.
- After the preliminary score is calculated, it is finalized by raising that score to the value of the Exponent and multiplied by 10 to yield the final result. This results in a curved shape of the score. An example of this scoring method is shown in the following diagram:



		<p>For this example, we have a “LastGood” value of 9 and a “FirstBad” value of 29. If the user selects an exponent value for this measurement of ‘1’, we see the linear slope between the “LastGood” point and the “FirstBad” point. If the exponent is other than 1, we see an exponential curve between the two points. For this particular example, with a measured value of 14, we score the result as 9.17 with an exponent value of .3. It scores as a 7.5 with an exponent value of 1, and it scores 4.22 with an exponent value of 3. If the score value is at or above the x9.37Threshold value of 7, then the test is graded as a pass. If the score value is below the x9.37Threshold, then the test is graded as a fail.</p>
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3	Restrictions & Intellectual Property	
3.1	Are there any known restrictions in the use of the submitted check image test and related technology (technical, performance, legal, business, platform, etc.)?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes - <i>please provide details:</i>
3.2	Are proprietary Intellectual Property (IP) rights in the form of Patents associated with the description and use of the submitted check image test?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes – <i>Please provide patent and/or patent application numbers and indicate who owns the IP. Also provide evidence that the patent holder agrees to comply with the X9 Procedures including the X9 patent policy:</i>
3.3	Are proprietary Intellectual Property (IP) rights in the form of proprietary material and/or other intellectual property (e.g. specific to a vendor tool, device, or product) associated with the description and use of the submitted check image test?	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes – <i>Please provide evidence that the owner agrees to provide the Proprietary IP Holder Statement contained in Annex B of ANS X9.100-40-2006 Part 2:</i>

Notice: By accepting a check image test for registration, ASC X9 is not endorsing, certifying validity, certifying performance, nor providing any warranty for the registered check image test. The organization using the test shall determine which test(s) to use based on their own business needs, perceived benefit, and validation/assessment of any test results provided by the check image test supplier, their own testing, or a third party.