

## **X9 REGISTRY FOR CHECK IMAGE TESTS**

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

**Image Test Name:** IBM Gray Contrast

**Image Test Number:** 028.00

**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*W = Withdrawn (not for use)*

*S = Superseded (not for use -  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)*

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

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

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<b>2</b>	<b>Image Test Description</b>	
<b>2.1</b>	<b>Image Test Name:</b>	IBM Gray Contrast
<b>2.2</b>	<b>Image Test XML Name:</b>	contrast
<b>2.3</b>	<b>Image Test Definition:</b>	A metric used to measure how much contrast is contained within a grayscale image.
<b>2.4</b>	<b>Image Test Applicability:</b> Check all that apply.	<input checked="" type="checkbox"/> <i>Front Image</i> <input checked="" type="checkbox"/> <i>Rear Image</i> <input type="checkbox"/> <i>B/W Image</i> <input checked="" type="checkbox"/> <i>Grayscale Image</i> <input type="checkbox"/> <i>Color Image</i>
<b>2.5</b>	<b>Intended Use:</b> Intended business use/ application, business context, and business impact when test fails.	This metric will report a failure if the measured contrast of a grayscale image is too low. If an image fails this test, it may be due to overexposure or underexposure. This metric provides a comparison between the brightest portion of the image and the darkest. If there is insufficient variance between the brightest portion of the image and the darkest, the image will prove difficult to read.
<b>2.6</b>	<b>Possible Causes for Condition Being Tested:</b>	This test will execute whenever a grayscale image is processed.
<b>2.7</b>	<b>Additional (or Repetitive) Information:</b>	This check is performed on every grayscale image processed by IQA.  The parameters associated with this metric are used to determine the image's contrast score 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: Gray Contrast Measurement**

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
contrast	Numeric		0-100	
<b>Description:</b>	This measurement measures the contrast within a grayscale image. The test will fail if the image is too bright.			
<b>Formula and/ or Algorithm:</b>	The contrast measurement represents the difference between the 64 brightest image pixels (normalized so that 255 is pure white) and the 64 darkest image pixels (also normalized so that 255 is pure white). When the difference is calculated, it is divided by 255 so that the range of contrast values is between 0 and 100. The formula used is <b><math>Contrast = (iTop64Avgdc - iBot64Avgdc) / 255</math></b> A one pixel boundary extending around the image is excluded from consideration when performing this measurement to exclude possible image boundary problems.			
<b>Additional Information:</b>				

**2.8.2 Second Image Test Result**

**Test Result Name: Gray Contrast score**

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
score	Numeric		0-100	
<b>Description:</b>	This value provides the contrast test score for the grayscale image under test.			
<b>Formula and/ or Algorithm:</b>	<p>The grayscale contrast score is generated using three user-settable values:</p> <ul style="list-style-type: none"> <li>• Grayscale Contrast LastGood</li> <li>• Grayscale Contrast FirstBad</li> <li>• Grayscale Contrast Exponent</li> </ul> <p>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.</p>			
<b>Additional Information:</b>				

<b>2.9</b>	<p><b>Test Parameters Reported</b></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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<b>2.9.1 First Test Parameter</b>				
<b>Test Parameter Name: Test Threshold</b>				
<b>Test Parameter XML Name:</b>	<b>Data Type:</b>	<b>Data Units:</b>	<b>Data Range:</b>	<b>Recommended Value(s) (Where Applicable):</b>
	Numeric	None	0-1000	700 (default)
<b>Description:</b>	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.			
<b>Additional Information:</b>	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: Gray Contrast Last Good**

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric		0-100	

**Description:**

This is the Last Good value utilized in the evaluation (“scoring”) of the contrast of the grayscale image.

**Additional Information:**

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

### 2.9.3 Third Test Parameter

**Test Parameter Name: Gray Contrast First Bad**

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric		0-100	

**Description:**

This is the First Bad value utilized in the evaluation (“scoring”) of the contrast of the grayscale image under evaluation.

**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 the desired value 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: Gray Contrast Exponent**

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric			
<b>Description:</b>	This is the value that controls the shape of the “line” between the <b>Gray Contrast First Bad</b> and <b>Gray Contrast Last Good</b> 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.			
<b>Additional Information:</b>	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:**

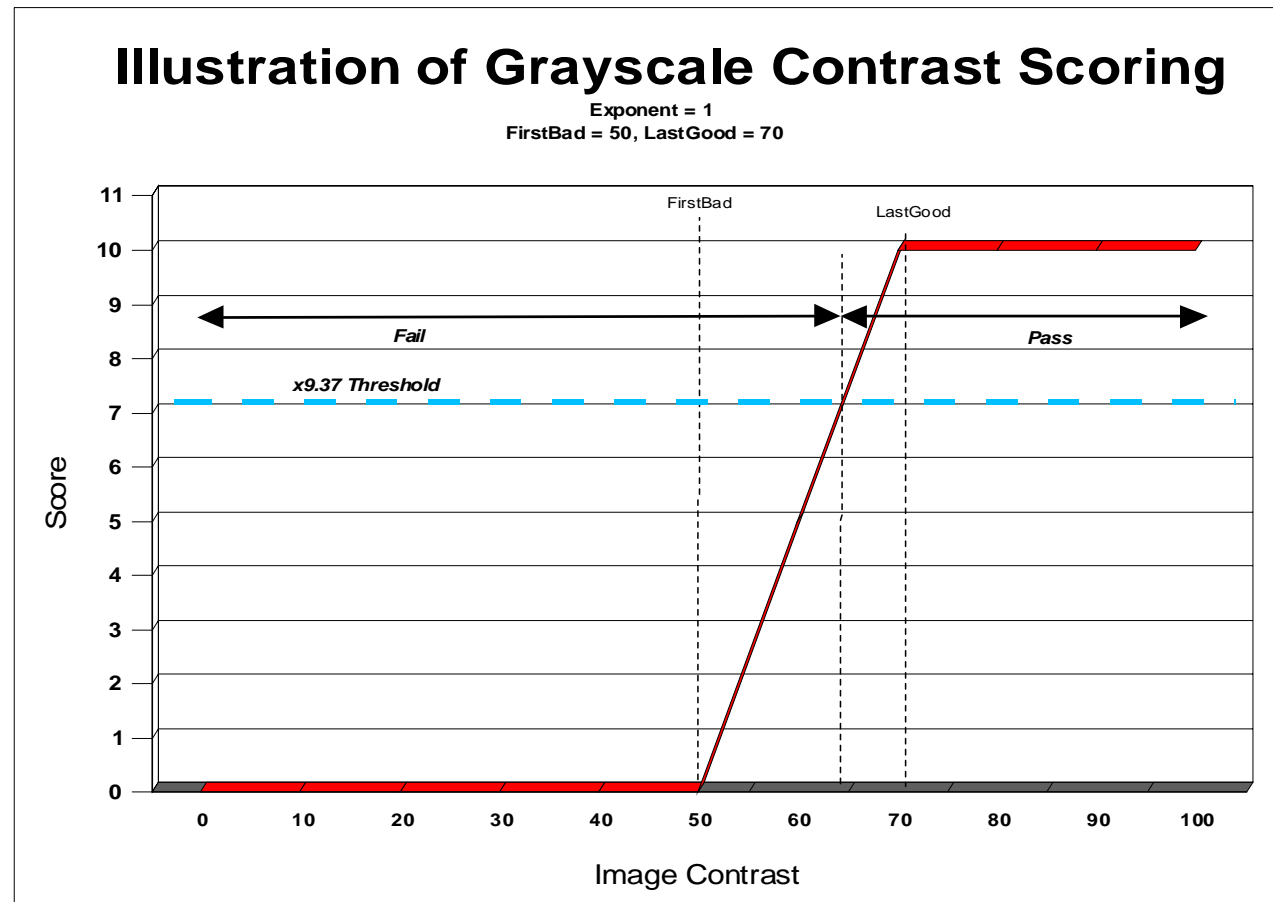
The Image Test Flag (see ANS X9.100-40-1-2006 for details) will convey one of the following four test conditions:

- 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 grayscale contrast score is less than the point at which the x9.37 Threshold line crosses the “score” line (shown in red).
- *Condition tested and result = pass*  
This test will **pass** when the grayscale contrast score is greater than or equal to the point at which the x9.37 Threshold line crosses the “score” line.

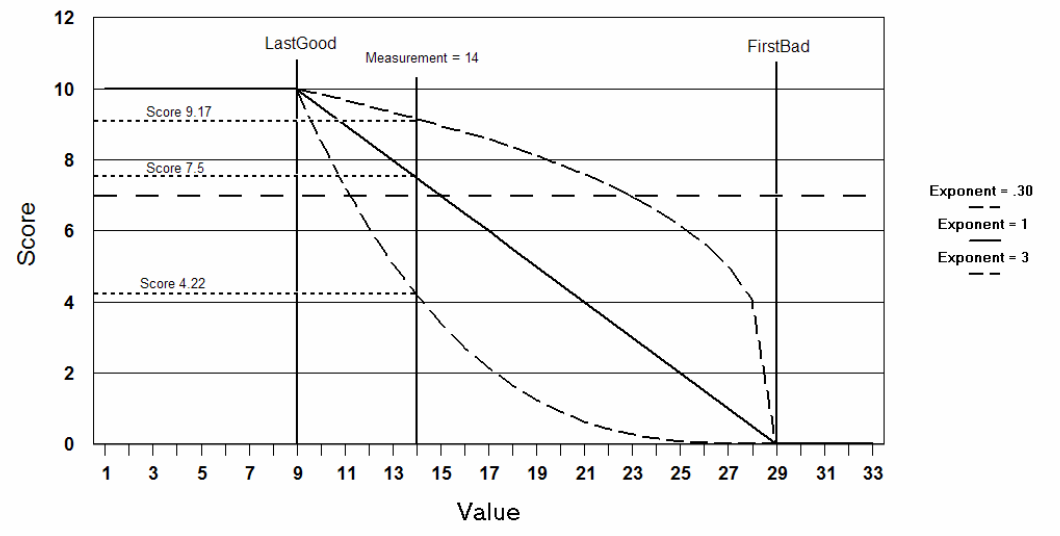
The chart below shows the way in which the test score is derived.





		<p>In the chart above, the items that the user can set are:</p> <ul style="list-style-type: none"><li>• X9.37 threshold (<i>set to 7.0 in this example</i>)</li><li>• LastGood (<i>set to 70 in this example</i>)</li><li>• FirstBad (<i>set to 50 square inch in this example</i>)</li><li>• The Exponent in this case (which controls the shape of the line between the LastGood and FirstBad parameters) is set to '1'.</li><li>• Any item that has an image contrast measurement of between about 63 and 100 will pass the test with the given parameters. The test will be scored as a "pass" whenever the area measurement size is within this passing region.</li></ul> <p>In addition to the items shown above, the shape line between the LastGood and FirstBad elements may be set by the Exponent value.</p> <p>The "Last Good" parameter is the point below 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.</p> <p>The scoring of items with values that fall between the relevant "LastGood" and "FirstBad" values is performed in two steps:</p> <ul style="list-style-type: none"><li>• 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.</li><li>• 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:</li></ul>
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## Illustration of exponent in scoring calculation



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  $x_{9.37}$ Threshold value of 7, then the test is graded as a “pass”. If the score value is below the  $x_{9.37}$ Threshold, then the test is graded as a “fail”.

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.