

## X9 REGISTRY FOR CHECK IMAGE TESTS

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

**Image Test Name:** IBM Darkness  
**Image Test Number:** 026.00  
**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*W = Withdrawn (not for use)*

*S = Superseded (not for use -  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:	<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 Darkness
<b>2.2</b>	<b>Image Test XML Name:</b>	darkness
<b>2.3</b>	<b>Image Test Definition:</b>	A metric used to quantify the darkness of a black/white image. Images that are either too dark or too light will fail the test.
<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 checked="" type="checkbox"/> <i>B/W Image</i> <input 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 darkness of an image falls outside of an acceptable range. If the document is either too dark or too light, then the image may be unreadable, resulting in additional processing time and expense to correct the situation.
<b>2.6</b>	<b>Possible Causes for Condition Being Tested:</b>	
<b>2.7</b>	<b>Additional (or Repetitive) Information:</b>	<p>This check is performed on every image, unless the test is deselected by the invocation of the analysis function.</p> <p>An example of the XML output generated by IQA for this metric is shown below:</p> <pre>&lt;darkness&gt;   &lt;raw&gt;0.106&lt;/raw&gt;   &lt;score&gt;10.0&lt;/score&gt;   &lt;lightscore&gt;10.0&lt;/lightscore&gt;   &lt;darkscore&gt;10.0&lt;/darkscore&gt; &lt;/darkness&gt;</pre> <p>The parameters associated with this metric are used to compare the darkness associated with an image with the values preprogrammed into the user settings. Details on the way in which this measurement is derived are provided in section 2.10.</p>

**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: Raw**

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
raw	Numeric		0 through 100	
<b>Description:</b>	This value provides the number of pixels of the black/white image that are black (in percentage).			
<b>Formula and/ or Algorithm:</b>	This value is derived by taking the total number of black pixels in an image and dividing that number by the total number of pixels in the image. The number is then expressed as a percentage.			
<b>Additional Information:</b>	The software internally has this scaled on a 0-1 scale. The internal result is multiplied by 100 and converted to an integer for reporting.			

**2.8.2 Second Image Test Result**

**Test Result Name: Brightness Score**

<b>Test Result XML Name:</b>	<b>Data Type:</b>	<b>Data Units:</b>	<b>Data Range:</b>	<b>Margin of Error (in Data Units) (Where Applicable):</b>
score	Numeric	None	0 through 1000	
<b>Description:</b>	This value provides the image test score for this specific item. This parameter is the score generated by taking the lower value of the “Too light” and “Too dark” metrics.			
<b>Formula and/ or Algorithm:</b>	This value is calculated by taking the minimum value of the <b>lightscore</b> and <b>darkscore</b> scores that are described in sections 2.8.3 and 2.8.4.			
<b>Additional Information:</b>				

**2.8.3 Third Image Test Result**

**Test Result Name: Light Score**

<b>Test Result XML Name:</b>	<b>Data Type:</b>	<b>Data Units:</b>	<b>Data Range:</b>	<b>Margin of Error (in Data Units) (Where Applicable):</b>
lightscore	Numeric	None	0 through 1000	

**Description:** The “lightscore” value is the test score that is performed to ensure that the image is not too light to be considered a good image.

**Formula and/ or Algorithm:**

The lightscore is generated by using the computed “raw” pixel density as a coordinate on the chart shown in section 2.10. The image lightscore is evaluated using three user-settable values:

- Black/White Darkness Low LastGood
- Black/White Darkness Low FirstBad
- Black/White Darkness Low Exponent

Once we have the “raw” score, we use this value to determine both the “lightscore” and the “darkscore”.

The parameters used for the test are user-settable. The specific parameters used may be set differently for the front or back of the image under test. If the “lightscore” value is below the threshold (with a default value of 7, the image is too dark and the test will fail due to the image being too dark.

Note that once the value for pixel density is greater than the value of the Black/White Darkness Low LastGood parameter, the “lightscore” value will stay at its highest. This measurement is *only* for checking that the image is too light.

**Additional Information:**

**2.8.4 Fourth Image Test Result**

**Test Result Name: Dark Score**

Test Result XML Name:	Data Type:	Data Units:	Data Range:	Margin of Error (in Data Units) (Where Applicable):
darkscore	Numeric	None	0 through 1000	

<b>Description:</b>	The “darkscore” value is the test score that is performed to ensure that the image is not too dark to be considered a good image.
<b>Formula and/ or Algorithm:</b>	<p>The darkscore is generated by using the computed “raw” pixel density as a coordinate on the chart shown in section 2.10.</p> <p>The image darkscore is evaluated using three user-settable values:</p> <ul style="list-style-type: none"> <li>• Black/White Darkness High LastGood</li> <li>• Black/White Darkness High FirstBad</li> <li>• Black/White Darkness High Exponent</li> </ul> <p>Once we have the “raw” score, we use this value to determine both the “lightscore” and the “darkscore”.</p> <p>The parameters used for the test are user-settable. The specific parameters used may be set differently for the front or back of the image under test. If the “darkscore” value is below the threshold (with a default value of 7, the image is too dark and the test will fail due to the image being too dark.</p> <p>Note that once the value for pixel density is less than the value of the Black/White Darkness High LastGood parameter, the “darkscore” value will stay at its highest. This measurement is <i>only</i> for checking that the image is too dark.</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 used internally by the image quality analysis software is multiplied by 100 and converted to an integer.			

### 2.9.2 Second Test Parameter

**Test Parameter Name: Darkness Low Last Good**

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	Pixel Density	0-1000	

**Description:** This is the Last Good value utilized in the evaluation (“*scoring*”) of the image darkness for the image being tested. If the pixel density (expressed as (DarkPixels/TotalPixels)) is greater than this value, then the “score” for the image for the lightscore value will be 10.0.

**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 1. In reporting this parameter, the value is multiplied by 1000 and converted to an integer. The values used for front and back images are independent and may be set to different values by the user.

### 2.9.3 Third Test Parameter

**Test Parameter Name: Darkness Low FirstBad**

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	Pixel Density	0-1000	

**Description:** This is First Bad value utilized in the evaluation (“*scoring*”) of the image darkness for the image being tested. If the pixel density (expressed as (DarkPixels/TotalPixels)) is less than this value, then the “score” for the image for the lightscore value will be a 0.0.

**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 1. In reporting this parameter, the value is multiplied by 1000 and converted to an integer. The values used for front and back images are independent and may be set to different values by the user.



#### 2.9.4 Fourth Test Parameter

##### Test Parameter Name: Darkness Low Exponent

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	None		
<b>Description:</b>	This is the value that controls the shape of the “line” between the <b>Streak First Bad</b> and <b>Streak Last Good</b> parameters. The IBM IQA product stores this value internally as a floating point number. When 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. The values used for front and back images are independent and may be set to different values by the user.			

#### 2.9.5 Fifth Test Parameter

##### Test Parameter Name: Darkness High Last Good

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	Pixel Density	0-1000	
<b>Description:</b>	This is the Last Good value utilized in the evaluation (“scoring”) of the image darkness for the image being tested. If the pixel density (expressed as (DarkPixels/TotalPixels)) is less than this value, then the “score” for the image for the darkscore value will be 10.0.			
<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 1. In reporting this parameter, the value is multiplied by 1000 and converted to an integer. The values used for front and back images are independent and may be set to different values by the user.			

### 2.9.6 Sixth Test Parameter

#### Test Parameter Name: Darkness High FirstBad

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	Pixel Density	0-1000	
<b>Description:</b>	This is the First Bad value utilized in the evaluation (“scoring”) of the image darkness for the image being tested. If the pixel density (expressed as (DarkPixels/TotalPixels)) is greater than this value, then the “score” for the image for the lightscore value will be 0.0.			
<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 1. In reporting this parameter, the value is multiplied by 1000 and converted to an integer. The values used for front and back images are independent and may be set to different values by the user.			

### 2.9.7 Seventh Test Parameter

#### Test Parameter Name: Darkness High Exponent

Test Parameter XML Name:	Data Type:	Data Units:	Data Range:	Recommended Value(s) (Where Applicable):
	Numeric	None		100 (default)
<b>Description:</b>	This is the value that controls the shape of the “line” between the <b>Darkness High First Bad</b> and <b>Darkness High Last Good</b> parameters. The IBM IQA product stores this value internally as a floating point number. When 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. The values used for front and back images are independent and may be set to different values by the user.			

**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:

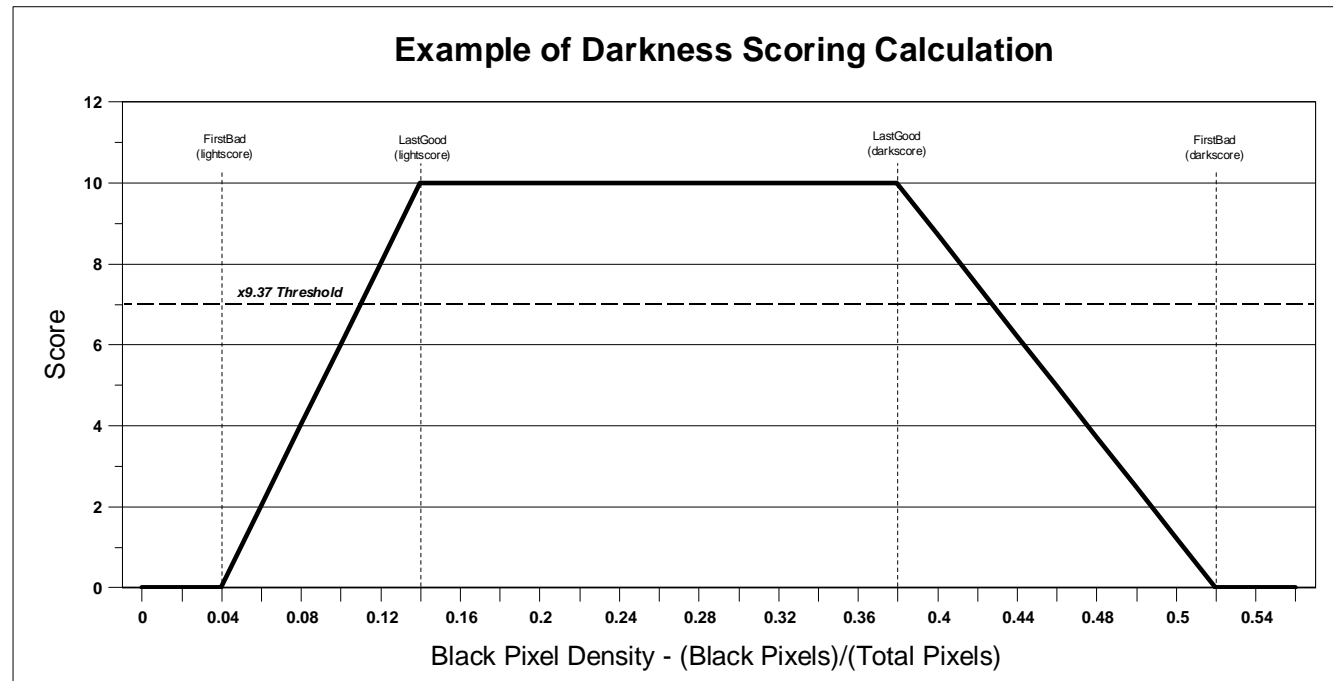
- Condition not tested
- Condition tested and result = fail
- Condition tested and result = pass
- Condition tested and result=indeterminate

Please describe clearly the specific criteria used to determine the pass/fail condition for the Image Test Flag in terms of the defined test results and applicable parameters.

The software will report this result when the user has opted to execute this test. There will be two possible results:

- *Condition tested and result = fail*  
This test will **fail** when the size of the image being tested is outside the range of previously determined good values. The values are variable and are settable by the user.
- *Condition tested and result = pass*  
This test will **pass** when the size of the image being tested is within the range of previously determined good values

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)
- Darkness Low FirstBad (set to 0.04 in this example)
- Darkness Low LastGood (set to 0.14 in this example)
- Darkness High LastGood (set to 0.38 in this example)
- Darkness High FirstBad (set to 0.52 in this example).
- The Exponent in both of these cases (which controls the shape of the line between the LastGood and FirstBad parameters) is set to '1'.
- Any item that has a black pixel density of between about inches will pass the test with the given

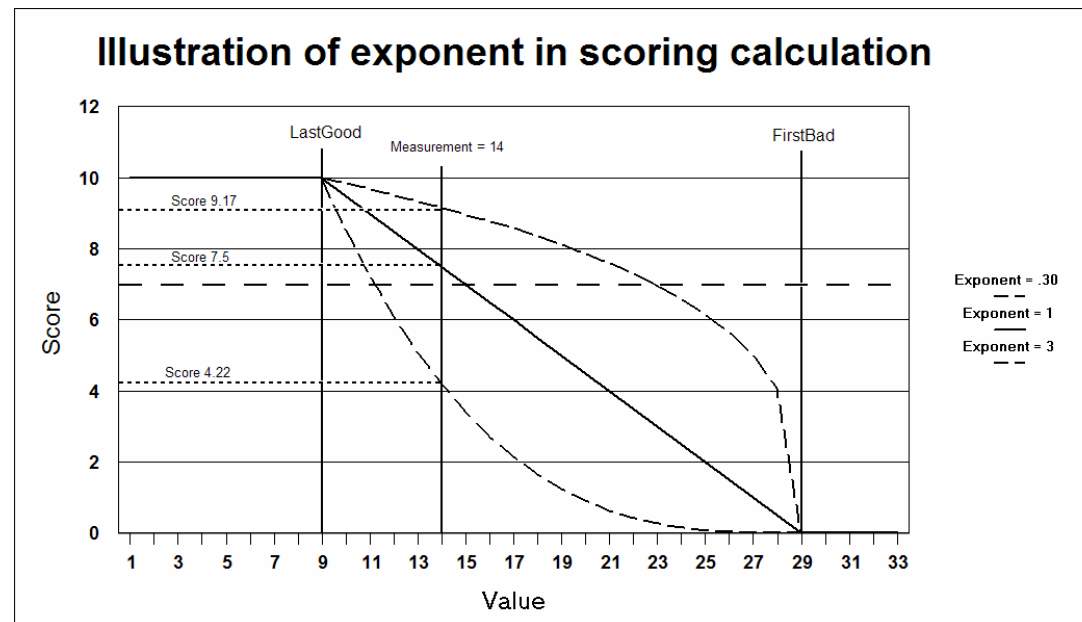
parameters. The test will be scored as a “pass” whenever the image size is within the passing region.

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 <b>pass</b>. If the score value is below the x9.37Threshold, then the test is graded as a <b>fail</b>.</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.