



Kodak

Scanner Image Quality

Verification Using
ISO 16067-1

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Scanner IQ Verification Using ISO 16067-1

Overview

This document describes the image quality verification procedure for Kodak Alaris scanners using the ISO 16067-1 specification and test chart. This procedure can be run by any individual who is familiar with the setup and operation of the scanner and has at least 20-20 eyesight (corrected if necessary). The image quality (IQ) verification is done via visual inspection of the images in conjunction with your own image editing software to inspect portions of the scanned images. We recommend using Adobe™ Photoshop™ for this purpose. Screen shots used for reference in this guide are from Photoshop™.

Successfully completing this procedure ensures the Kodak Alaris scanner is performing within the expected range for the following IQ attributes:

- Sharpness (MTF)
- Uniformity (Light Evenness)
- Tone and Color Reproduction

The ISO 16067-1 test chart is commercially available from a number of sources. One of the most reliable sources is Applied Image, Inc. (<https://www.appliedimage.com>), a current manufacturer of these targets.

Figure 1 shows the ISO 16067-1 test chart for reflection scanners.

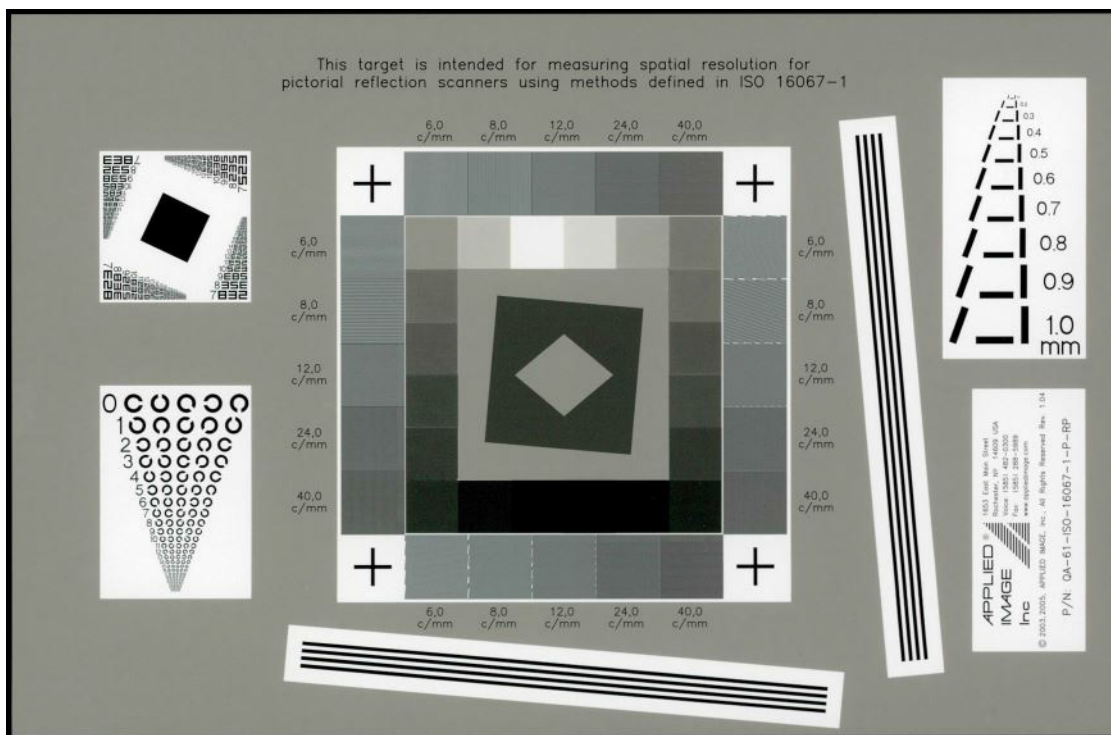


Figure 1. ISO 16067-1 Test Chart

Scanner IQ Verification Procedure

Scan Application and Settings

You should use the Kodak Alaris Scan Validation Tool (SVT) that came with your scanner to produce images for these tests.

Create a Setting Shortcut that can be used each time scanner IQ verification is performed. Refer to “Appendix A – SVT Scan Settings” on page 10 for the SVT scan settings to use for your scanner model.

Use this Setting Shortcut to scan the test chart whenever you need to verify the image quality of your scanner.

Scanning

Clean the rollers and imaging area of your scanner according to cleaning procedures in your scanner Reference Guide or User’s Guide.

Adjust the side guides on the input tray to ensure the ISO 16067-1 test chart is straight, prior to scanning. Scan the test chart with the scanner front camera, using the SVT Setting Shortcut you created.

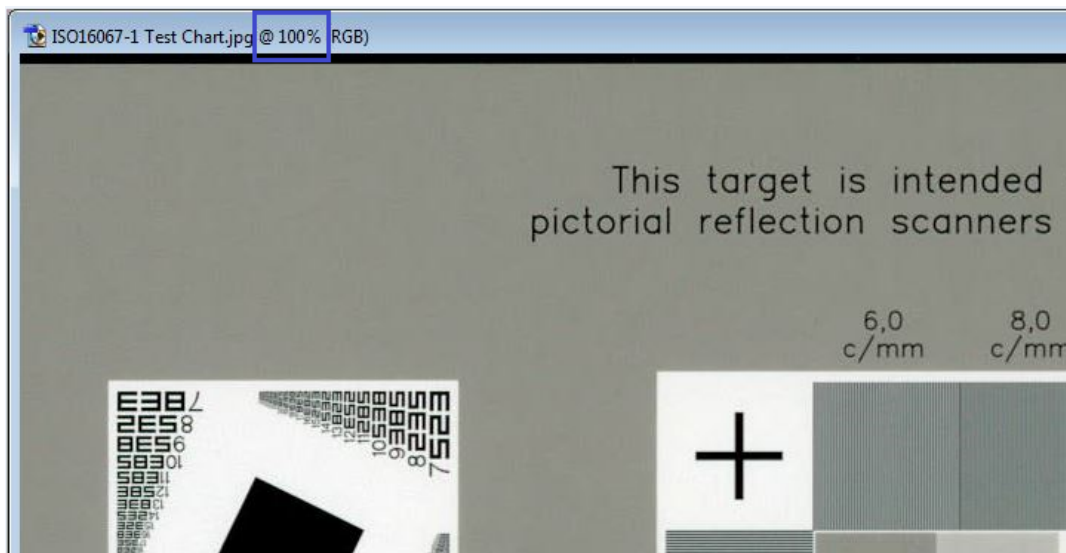
Flip the test chart over and scan it on the rear camera.

The images of the test chart should be oriented as shown in Figure 1. If they are not, re-orient the test chart and scan again on the appropriate camera.

You may discard images of the blank, back sides of the test target.

Verification

Open the image with your image editing software. Examine the image at 1:1 magnification (e.g., 100% in Photoshop™, as shown in Figure 2).



Verify image sharpness

For Sharpness (MTF) Verification you will use two targets from the test chart.

Use the R.I.T. Alphanumeric Target: Rotate the image as needed and record the line number of the smallest row of text that can be correctly resolved in each of the four corners of this target. See Figure 3.

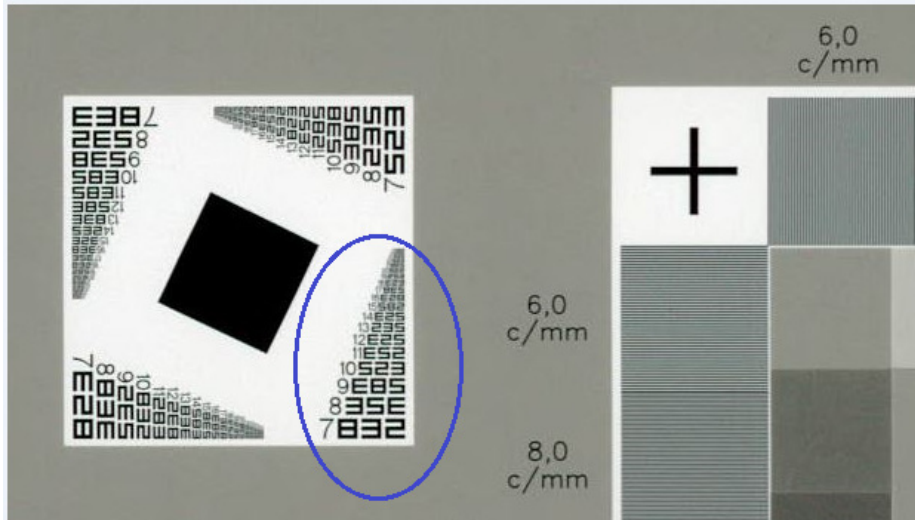


Figure 3. R.I.T. Alphanumeric Target, with lower right section circled.

Use the Answer Key in “Appendix B – Sharpness Tables” on page 11 to determine if the patterns recognized in the visual inspection are correct.

Compare the line numbers obtained by visual inspection to the criteria specified in “Appendix C – IQ Performance Criteria” on page 12 for your scanner model.

Use the “Landholt-C” test pattern: See Figure 4 for the Landholt-C test pattern. Record the line number of the smallest pattern that can be correctly resolved.

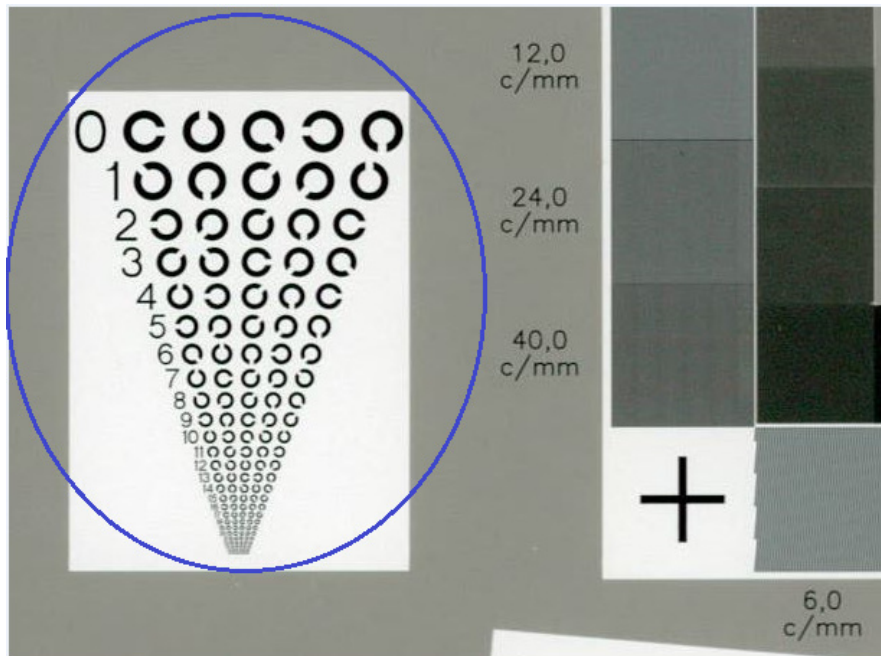


Figure 4. Landholt-C test pattern

Use the Answer Key in “Appendix B – Sharpness Tables” on page 11 to determine if the Opening Position of all five “C” elements in the line in the visual inspection are correct.

Compare the line number obtained by visual inspection to the criteria specified in “Appendix C – IQ Performance Criteria” on page 12.

For each of the five areas, use the Photoshop™ Rectangular Marquis Tool (or similar, in your software) to draw a region approximately 0.300 x 0.300 inches. Figure 6 shows the tool and where to find region size.

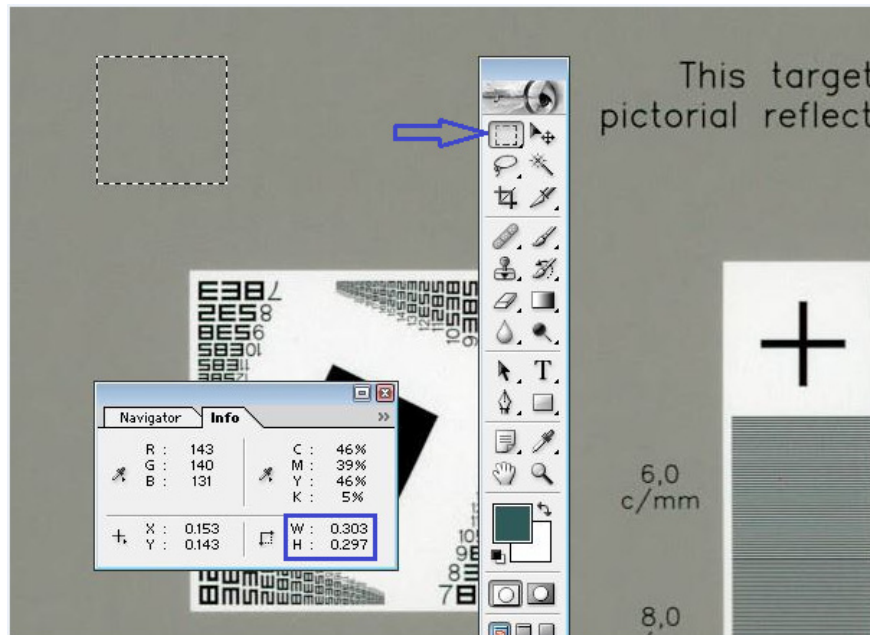


Figure 6. Region (dashed line), Marquis Tool (arrow), and size of region.

NOTES:

- Center region will need to be smaller.
- Avoid areas with streaks, dust, or other marks when drawing each region. Clean the scanner and rescan the test chart if necessary.

Use the Histogram feature of your photo editing software to get the values of the five regions.

Select **Image >Histogram** to access the Histogram Tool in Photoshop™, as shown in Figure 7.

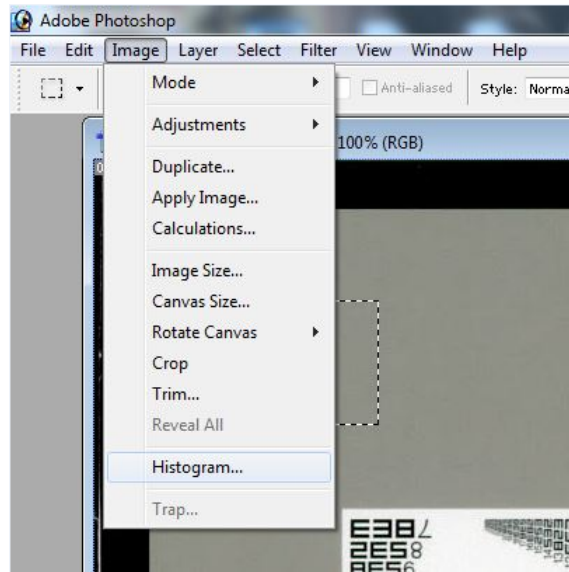


Figure 7. Accessing the Photoshop™ Histogram Tool.

Record the value displayed in the Mean field (see Figure 8), rounding to the nearest integer.

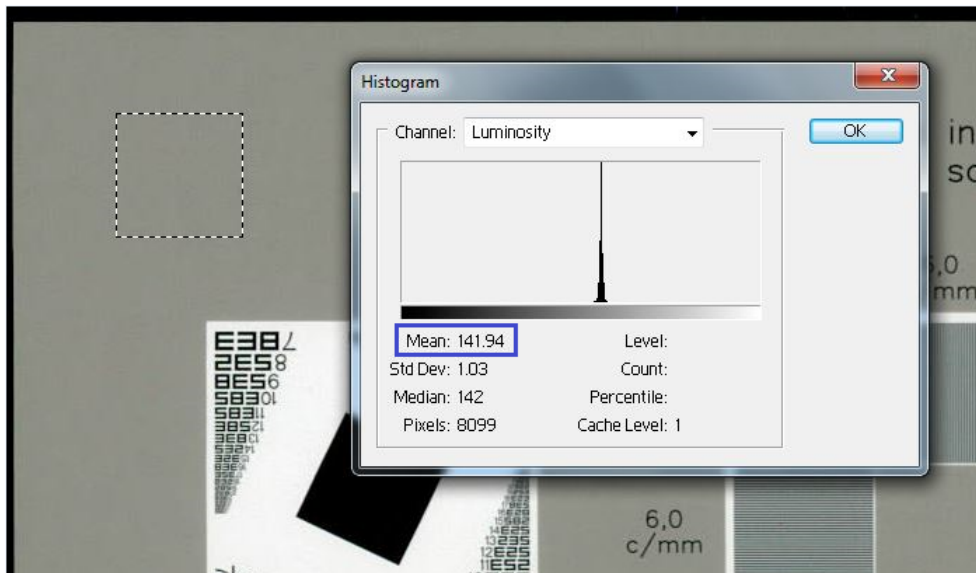


Figure 8. Luminosity reported by Photoshop™.

Compare the values for all five areas to the values specified in “Appendix C – IQ Performance Criteria” on page 12.

Verify image tone and color reproduction

For Tone and Color Reproduction Verification, you will record the values from the three outlined areas in Figure 9.

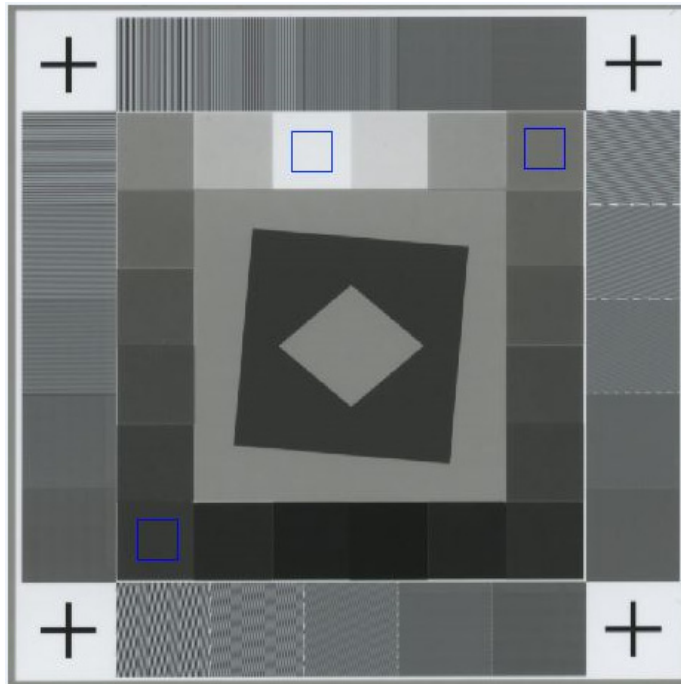


Figure 9. Areas for Verification.

For each area, use the Photoshop™ Rectangular Marquis Tool or a similar tool in your software to draw a region approximately 0.150 x 0.150 inches. See Figure 10.

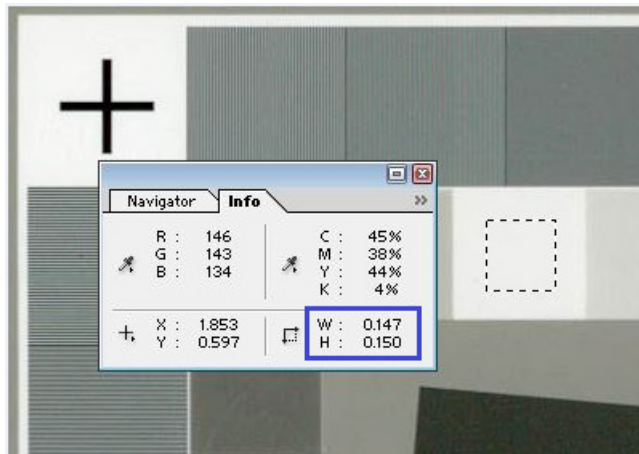


Figure 10. Region and size of region.

Use the Histogram feature of your software to find the values of the three regions. Record the value displayed in the Mean field, rounding to the nearest integer.

Compare the values for all three areas to the values specified in “Appendix C – IQ Performance Criteria” on page 12 for your scanner model.

Other Testing Considerations

Test operator differences: Differences exist from operator to operator when performing visual assessments.

Scanner cleanliness: Contamination within the scanner can adversely affect the test results. Clean the scanner thoroughly prior to scanning the test chart for these verifications.

Test chart condition: Contamination of the test chart can also affect test results. Periodically examine the test chart for dirt, marks, and scratches. Replace the test chart if necessary.

Store the test chart in a protected environment away from light when not in use, such as within a folder inside a file cabinet.

Environmental factors: Computer monitor resolution and lighting conditions can also factor into the results of the Sharpness Verification.

Extremes in temperature and humidity can affect the properties of the test chart, which can adversely affect the test results. Avoid these conditions if possible when scanning the test chart for IQ verification.

Appendix A – SVT Scan Settings

i5xx0 Series Scanners

Create a new Setting Shortcut within Scan Validation Tool (SVT) for the IQ Verification testing.

1. Make a copy of the shortcut named “Color Perfect Page Document” by highlighting the shortcut and clicking “Save As...” at the top of the window. Name the new shortcut something meaningful, e.g., “Scanner IQ Verification” and click “Save.”
2. Modify the settings for the new shortcut to make sure they match the values shown below. (If your scanner has additional settings, set the feature to “None” or “Off.”) Click on “Settings >” to access the settings on individual tabs.

Home Page

1. Input document is: Two Sided

General Tab

2. Scan as: Color (24-bit)
3. Document type: Text with Graphics
4. Media type: Plain Paper
5. Resolution: 300 dpi
6. Compression type: None

Size Tab

7. Document: Automatically Detect
8. Image: Entire Document
9. Border: None
10. Post scan rotation: None

Adjust Tab

11. Brightness and Contrast: None
12. Color Balance: None
13. Sharpen: None
14. Background Smoothing: None

Enhance Tab

15. Hole Fill: Off (unchecked)
16. Image Edge Fill (Color): None
17. Streak Filter: Off (unchecked)
18. Color Dropout: None

Detect Tab

19. Blank Image Deletion: None
20. Barcode Reading: Off (unchecked)

Multifeed Tab (“Device >”)

21. Ultrasonic Detection Sensitivity: None

3. Click “OK” when done, then confirm your changes by clicking “Yes.”

Appendix B – Sharpness Tables

The ISO 16067-1 Answer Key table below lists the correct values for each line number of the R.I.T. Alpha-Numeric Target and the Landholt “C” test pattern. The correct values are shown in gray shading. The term “line number” used throughout this document is shown as the first column in the table, and is labeled “Group #.”

Group #	Effective sampling frequency (dpi)	Line width (opening size - mm)	Landholt “C” Answer Key						R.I.T. Alpha-Numeric Target Answer Key			
			Effective frequency (cycles / mm)	Left Feature Opening Position (degrees CCW)	2 nd Feature Opening Position (degrees CCW)	Middle Feature Opening Position (degrees CCW)	4 th Feature Opening Position (degrees CCW)	Right Feature Opening Position (degrees CCW)	Upper left	Upper right	Lower left	Lower right
0	50.8	0.500	1.00	0	90	315	180	270				
1	55.8	0.455	1.10	135	270	45	225	90				
2	66.0	0.385	1.30	180	225	45	270	0				
3	71.1	0.357	1.40	45	135	0	225	315				
4	81.2	0.313	1.60	90	180	45	270	0				
5	91.4	0.278	1.80	180	225	45	225	270				
6	102	0.250	2.00	315	90	270	180	225				
7	112	0.227	2.20	90	0	45	225	135	8E3	523	E28	832
8	127	0.200	2.50	135	225	45	270	315	532	235	83E	35E
9	142	0.179	2.79	180	270	0	225	45	538	385	2E5	E85
10	163	0.156	3.21	90	180	315	135	90	E85	538	832	523
11	183	0.139	3.60	270	45	180	270	180	E85	285	283	E52
12	203	0.125	4.00	315	135	90	315	225	58E	E52	2E8	E25
13	229	0.111	4.50	45	90	0	180	270	83E	823	83E	235
14	254	0.100	5.00	225	270	135	90	315	2E5	532	583	E25
15	300	0.086	5.8	135	225	90	315	45	32E	253	8E5	582
16	320	0.079	6.3	180	225	45	315	270	3E8	E82	E85	E28
17	360	0.070	7.1	0	90	315	180	45	35E	8E5	3E8	8E5
18	400	0.063	7.9	45	135	0	225	315	2E8	E38	E52	E23
19	450	0.056	8.9	315	180	270	135	0	582	235	235	253
20	510	0.050	10	270	0	90	135	270	832	8E5	8E5	5E2
21	580	0.044	11	0	90	315	180	270	3E8	83E	83E	8E5
22	650	0.039	13	315	45	135	0	135	5E2	832	832	523
23	730	0.035	14	90	270	225	45	180	832	523	52E	523
24	820	0.031	16	135	315	180	90	90	532	35E	35E	E25
25	910	0.028	18	0	90	315	180	270	583	32E	32E	3E8

Appendix C – IQ Performance Criteria

This appendix specifies the passing criteria of each IQ attribute, defined either as a value to be met or as an acceptable performance range. Passing the criteria in this table ensures the scanner meets its intended performance requirements and is equivalent to its original factory specifications.

The criteria listed for Uniformity and Tone and Color Reproduction account for normal scanner-to-scanner variation and account for variability (manufacturing tolerances) of the ISO 16067-1 test charts. The criteria for the visual assessments in the Sharpness Verification do not account for operator-to-operator differences.

i5xx0 Series Scanners

Sharpness (MTF)

R.I.T. Alphanumeric Target:

Upper Left: Must correctly resolve line 15 (32E)

Upper Right: Must correctly resolve line 15 (253)

Lower Left: Must correctly resolve line 15 (8E5)

Lower Right: Must correctly resolve line 15 (582)

Landholt-C test pattern:

Must correctly resolve line 15 (135, 225, 90, 315, 45)

Uniformity (Light Evenness)

Mean Luminosity Values

All regions should be within 15 values of each other.

All regions should be in range 125-155.

Tone and Color Reproduction

Mean Luminosity Values

White patch: Value should be in range 220-250.

Grey patch: Value should be in range 102-132.

Black patch: Value should be in range 13-53.

