

OSAC 2021-S-0035

Standard Guide for

Scanning Facial Images

Facial Identification Subcommittee
Digital Evidence/Multimedia Scientific Area Committee
Organization of Scientific Area Committees (OSAC) for Forensic Science



Draft OSAC Proposed Standard

OSAC 2021-S-0035 Standard Guide for Scanning Facial Images

Prepared by
Facial Identification Subcommittee
Version: 1.0
September 2021

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1 **1. Scope**

2 1.1 This guideline provides best practices for scanning documents containing images for
3 Facial Recognition enrollment or Facial Image Comparisons.

4 1.2 This guide is for instances in which a printed image requires capture for enrollment into a
5 Facial Recognition system or by facial examiners undertaking a facial image comparison.

6 1.3 This guide will not provide information on original image capture, printing resolution,
7 image enhancements that may have occurred prior to a facial image being printed, or
8 during preparation of a facial image for the creation of identity documents.

9 1.4 This guide acknowledges that in Appendix F of IAFIS-DOC-01078-9.3¹ the minimum
10 scanner testing requirements are provided, and notes that whilst the core capabilities and
11 attributes for a fingerprint scanner are similar, there are crucial differences for scanning
12 an optimal facial image.

13 1.5 This guide also acknowledges that there is a list of certified fingerprint scanners on the
14 Criminal Justice Information Services (CJIS) website², and notes that some of these
15 scanners are capable of gray scale and full color scanning.

16 **2. Summary of Practice**

17 2.1 Generally, modern facial images are color or black and white. These images can also be
18 found in historical documents, newspapers, Closed Circuit Television (CCTV) extracts,
19 and some security documents that print to a polycarbonate substrate. Standards for
20 scanning facial images need to reflect the variety of sources that may be encountered.

21 2.2 This guideline provides best practice for scanning documents containing facial images
22 for:

23 2.2.1 Facial Recognition enrollment, or

24 2.2.2 Facial Image Comparison.

25 2.3 A facial image scanner must be capable of producing images that exhibit good geometric
26 fidelity, sharpness, and detail rendition, with low noise characteristics. The images must
27 be true color representations of the printed facial image without creating any significant
28 artifacts, anomalies, false detail, or cosmetic image restoration effects.

29 2.4 It may be necessary to consult an Image Specialist to provide advice on the best method
30 of scanning a facial image in a document, which may have other impacting features.
31 Examples include mass produced documents (newspapers, magazines etc.) where a half-
32 tone or similar process has been used.

33 **3. Referenced Documents**

¹ IAFIS-DOC-01078-9.3 Electronic Biometric Transmissions Specification <https://www.fbibiospecs.cjis.gov/>

² <https://www.fbibiospecs.cjis.gov/certifications>

- 34 3.1 ISO 12641 - 1: 2016 Graphic technology - Prepress digital data exchange - Color targets
35 for input scanner calibration - Part 1: Color targets for input scanner calibration
- 36 3.2 ISO 12641 - 2: 2016 Graphic technology - Prepress digital data exchange - Part 2:
37 Advanced color targets for input scanner calibration
- 38 3.3 ISO 22028-1:2016 - Photography and graphic technology - Extended color encodings for
39 digital image storage, manipulation and interchange - Part 1: Architecture and
40 requirements
- 41 3.4 ANSI IT8/4-2005 Graphic Technology - Input data for characterization of 4-colour
42 process printing
- 43 3.5 IAFIS-DOC-01078-9.3: Electronic Biometric Transmissions Specification
- 44 3.6 ASTM E2825-12: Standard Guide for Forensic Image Processing
- 45 3.7 ISO 21043-2-2018 Forensic sciences - Part 2- Recognition recording collecting transport
46 and storage of items

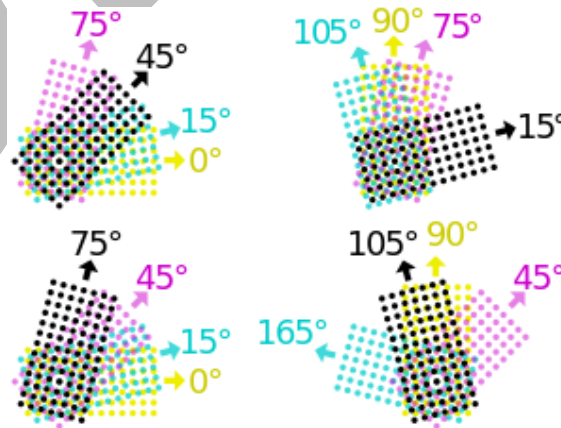
47 **4. Terminology**

48 4.1 Definitions:

49 4.1.1 **Color depth:** is the bit scale of the image, e.g., 8 bit grayscale and 24 or 48 bit
50 RGB (Red, Green, Blue).

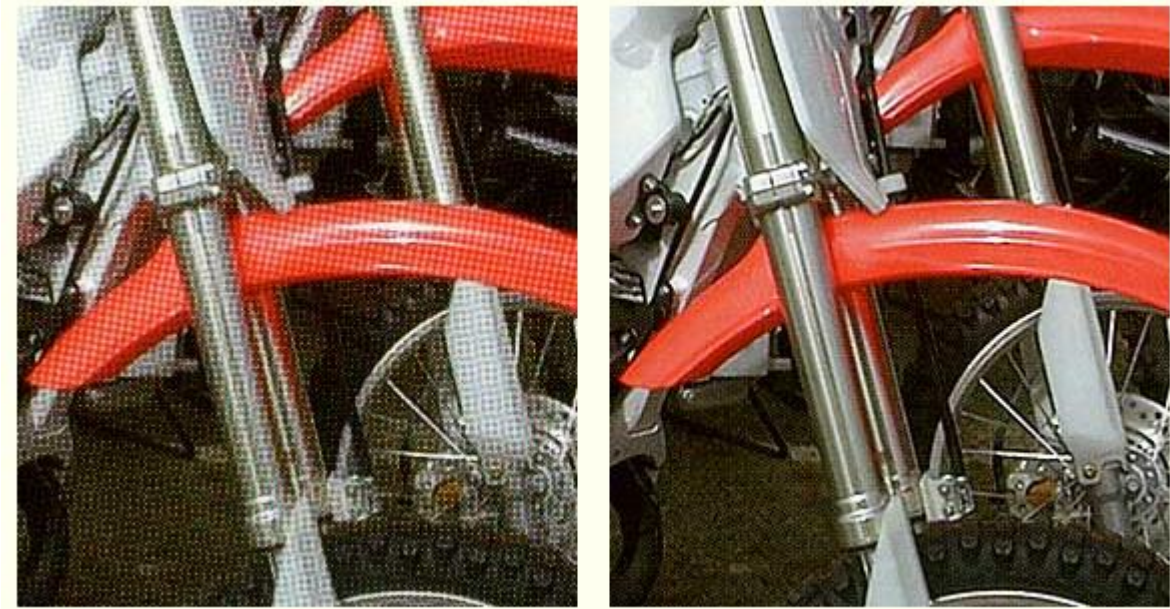
51 4.1.2 **CMYK:** is a color gamut spectrum widely used in printing. CMYK stands for
52 Cyan, Magenta, Yellow, and Black.

53 4.1.3 **Descreen:** The array of dots used in the halftone or desktop printing processes are
54 called a “screen” where the color dots are placed at different angles, and a
55 scanning software option can be used to minimize the screen pattern by use of a
56 screen frequency filter algorithm. This filter is called a Descreen option setting.



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Examples of screening angles in CMYK printing:



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62 Descreen not used (image magnified)

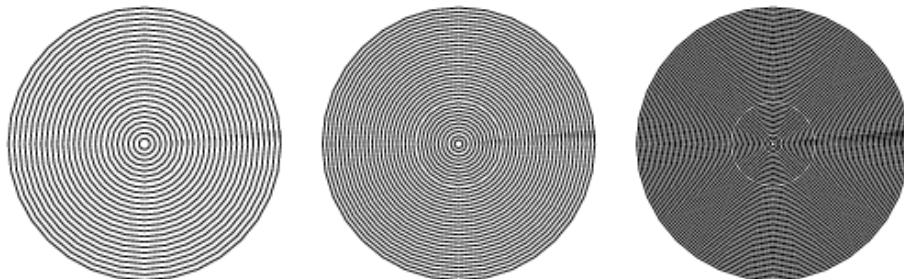
63 Descreen used (image magnified)

64 **4.1.4 Dots per inch (DPI):** In printing, DPI refers to the resolution setting of the printer
 65 and resolution capture for printed media. For example, a 1200 DPI resolution
 66 printer will deposit a much higher density of ink per inch than a 300 DPI printer.
 67 Use of DPI as a resolution term when scanning printed media will enable the use
 68 of post-scanning descreen software enhancement to more accurately reproduce the
 69 original artwork or image.

70 **4.1.5 Lamina:** A clear/low opacity sheet of film or security designed film that is sealed
 71 onto a substrate by cold or hot adhesion.

72 **4.1.6 Lines per inch (LPI).** A term in the resolution setting of scanner software used
 73 for scanning original artwork for printing.

74 **4.1.7 Moiré:** A moiré pattern occurs when a scene or an object that is being scanned
 75 contains repetitive details (such as lines, circles, dots, etc.) that exceed the sensor
 76 resolution. As a result, many scanners produce a moiré pattern that is not visible
 77 in the physical item being scanned.



79 The illustrations above show a number of concentric circles plotted with a
80 range of uniform spacing. Note the phantom lines and curves that appear³.

81 **4.1.8 Pixels per inch (PPI):** Measurements of the pixel density of an electronic image
82 device, such as a computer monitor or camera. For example, a 1200 PPI image
83 will produce a higher quality image than a 300 PPI image. Use of PPI as a
84 resolution term is generally used with digitally captured images (i.e.,
85 photography).

86 **4.1.9 Printed Image:** A printed image is the production of a digital image onto a
87 substrate by a direct or indirect printing process.

88 **4.1.10 RGB:** A color gamut spectrum that stands for the color channels red, green, and
89 blue. An example of the use of RGB is in the bit depth range where 48-bit refers
90 to 16-bits per color channel, i.e., 16 Red, 16 Green, 16 Blue.

91 **4.1.11 Samples per inch (SPI):** A generic term that can include of DPI, LPI, and PPI.
92 SPI is the measurement of the resolution, in particular the number of individual
93 samples that are taken in the space of one linear inch. Scanner software may not
94 allow for the use of SPI during image capture.

95 **4.1.12 Substrate:** A substrate in printing terms is a form of media on which a printed
96 image is produced. A substrate, as referred to in this guideline includes gloss or
97 matte paper, plastic, sensitized material, or polycarbonate.

98 5. Scanning Overview

99 **5.1** There are various scanning devices (auto-feed, sheet feed, flatbeds), software, physical
100 media type, color calibration targets, calibrated reference target, and other processes that
101 can be used to produce a digital facial image from physical media.

102 **5.2** Be cautious using fingerprint scanners for scanning color images avoiding:

103 **5.2.1** Having to recalibrate the scanner from a grayscale calibration target for
104 fingerprints to color calibration target for facial images.

105 **5.2.2** Incorrectly scanning a facial image with fingerprint scanner settings, such as
106 scanning in grayscale instead of color.

107 **5.3** To achieve optimal results, the scanner selected should be:

108 **5.3.1** A flatbed device in order to minimize target item movement. Scanners with auto-
109 feed trays should not be considered unless there is a mechanism for securing and
110 flattening an item in situ on the scanning bed.

111 **5.3.2** Calibrated regularly.

³ <http://mathworld.wolfram.com/MoirePattern.html>

112 5.3.3 Have optional scanner settings, such as descreen turned off to prevent unwanted
113 and unnecessary image processing.

114 6. Scanner Testing and Calibration

115 6.1 To assess whether a scanner is capable of producing good quality images, the following
116 scanner attributes and capabilities should be considered:

117 6.1.1 Good geometric fidelity (linearity and geometric accuracy)

118 6.1.2 Sharpness

119 6.1.3 Detail rendition

120 6.1.4 Gray-level and color uniformity

121 6.1.5 Gray-scale and color dynamic range

122 6.1.6 Low noise characteristics (signal-to-noise ratio)

123 6.1.7 The output images are true representations of the item being scanned without
124 creating any significant artifacts, anomalies, false detail, or cosmetic image
125 restoration effects.

126 6.2 In Appendix F of IAFIS-DOC-01078-9.3 there is guidance on the testing parameters and
127 requirements for the following tests for fingerprint scanners that are also applicable for
128 testing color image scanners:

129 6.3 Linearity

130 6.4 Geometric accuracy

131 6.5 Spatial frequency response

132 6.6 Signal-to-noise ratio

133 6.6.1 It is important to note that section 2.5 Gray-Level Uniformity of Appendix F in
134 IAFIS-DOC-01078-9.3 is not relevant for testing parameters for color image
135 scanners. For more information on Appendix F of IAFIS-DOC-01078-9.3 see
136 Appendix 2: IQS Appendix F Summary.

137 6.7 For testing color image scanners, a Color Calibration Target card is the initial step in
138 identifying and managing a scanners capability for color management and output
139 accuracy. As facial images are generally produced in color, the calibration target should
140 incorporate color scales, a gray scale, and a calibrated measurement area. The

141 recommended content of a color calibration target is outlined in ANSI IT8/4-2005⁴,
142 which is compliant with ISO standard 12641 parts 1 and 2.⁵

143 6.8 The minimum testing parameters in an IT8 calibration target card for reflection scanning
144 are:

145 6.8.1 264 color patches including rows for hue, chroma, and lightness, and columns for
146 RGB and CMYK

147 6.8.2 24 stepped gray scale

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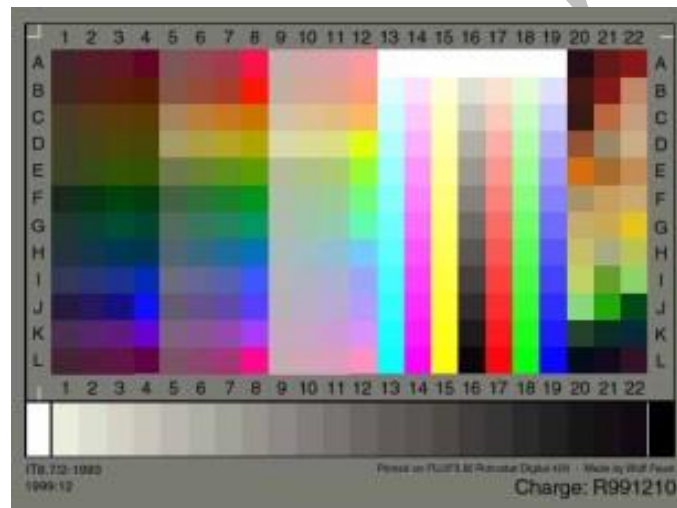
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161 **Example of an IT8 calibration target**

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163 6.9 Scanner systems may incorporate calibration software and target reference profiles, or
164 have automated calibration, and if not, calibration software can be purchased
165 commercially. Scanner calibration software also typically includes measurement targets
166 for the scanner attributes outlined in point 5.2.

167 6.10 Whilst use of a calibration target card will assist in determining the scanner capabilities
168 and limitations, the target cards can also assist in routinely determining a scanners
169 performance and color management.

170 7. Scanner Calibration

171 7.1 Scanner calibration is different to camera calibration in that scanners generally operate
172 with:

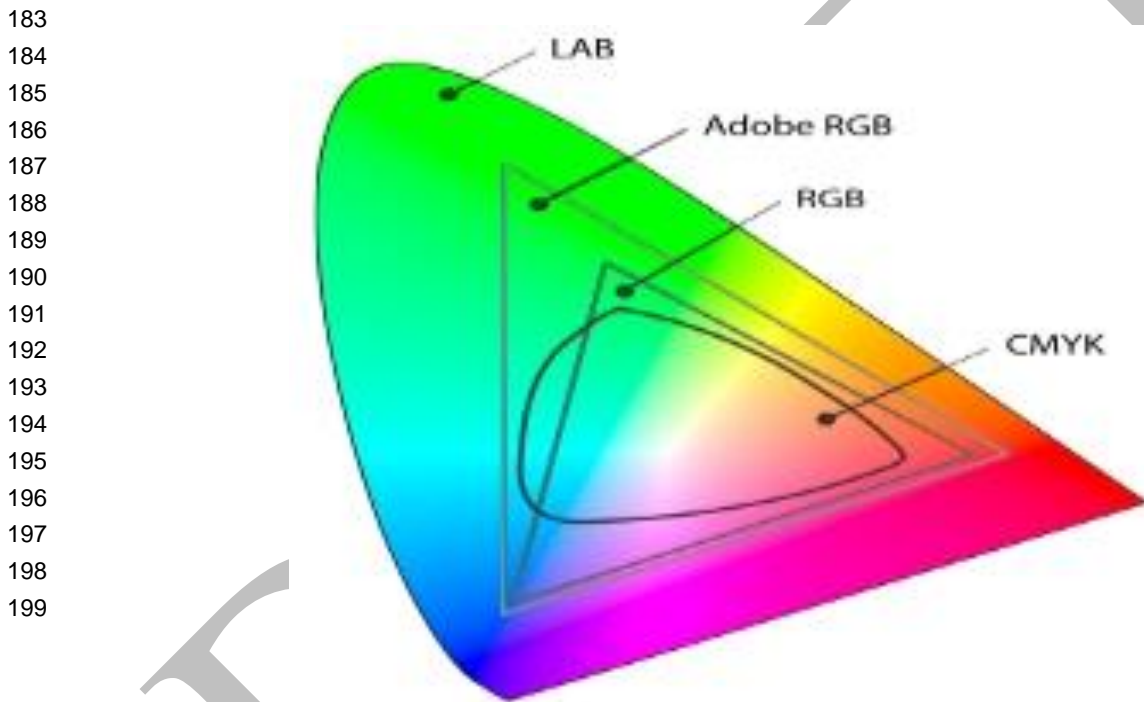
⁴ ANSI IT8/4-2005 Graphic Technology - Input data for characterization of 4-colour process printing

⁵ ISO 12641 - 1: 2016 Graphic technology - Prepress digital data exchange - Color targets for input scanner calibration, Part 1: Color targets for input scanner calibration and Part 2: Advanced color targets for input scanner calibration

- 173 7.1.1 Almost constant conditions
- 174 7.1.2 Constant light source
- 175 7.1.3 A fixed color temperature
- 176 7.1.4 A relatively constant distance between the object and the sensor; as well as
- 177 absolutes between the object and sensor.

178 7.2 Depending on the scanning device and calibration software, there may be a choice of
 179 different color gamut spectrums such as RGB, CMYK, Adobe RGB, sRGB, etc. for
 180 color management or color sync workflow.

181 7.3 The following image is an example of the differences between color gamut spectrums
 182 with LAB being relative to the color spectrum visible by the human eye.



203 **Example of differences between color gamuts**

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 205 7.4 After running the scanner calibration process, the software will compare the result with
 206 the system calibration profile and will either make or suggest recommended corrections.

207 7.5 A Scanner Calibration Profile will be then be generated, which can be used as an image
 208 collection reference for the scanned image. It can also be used for comparative
 209 assessment purposes over the life of the scanner, and against other devices where color
 210 management or color syncing is required, such as monitors, printers, and imaging
 211 software.

212 7.6 The use of a calibration target and calibration profile will not improve the accuracy of
 213 low range scanner products.

- 214 7.7 It is essential that in testing the output of scanning products that there is a human
215 assessment of the scanner output for color and image accuracy.
- 216 7.8 For more information on scanner calibration and testing see Appendix 1: Scanning
217 Procedures.

218
219 **8. Recommended Scanning Process**

220 8.1 Once it has been determined that the scanner is accurately reproducing the color
221 calibration target card and reference facial image, the scanner can now be used
222 operationally.

223 8.2 The following scanner settings should be applied for all image capture:

224 8.2.1 Following scanner adjustment or enhancement options should **not** be selected as
225 any enhancements should occur after scanning:

226 8.2.1.1 Auto photo orientation

227 8.2.1.2 Unsharp Mask

228 8.2.1.3 Descreening (unless print screening angle can be identified)

229 8.2.1.4 Color Restoration

230 8.2.1.5 Brightness

231 8.2.1.6 Contrast

232 8.2.1.7 Backlight Correction

233 8.2.1.8 Optical Character Recognition, including text enhancement

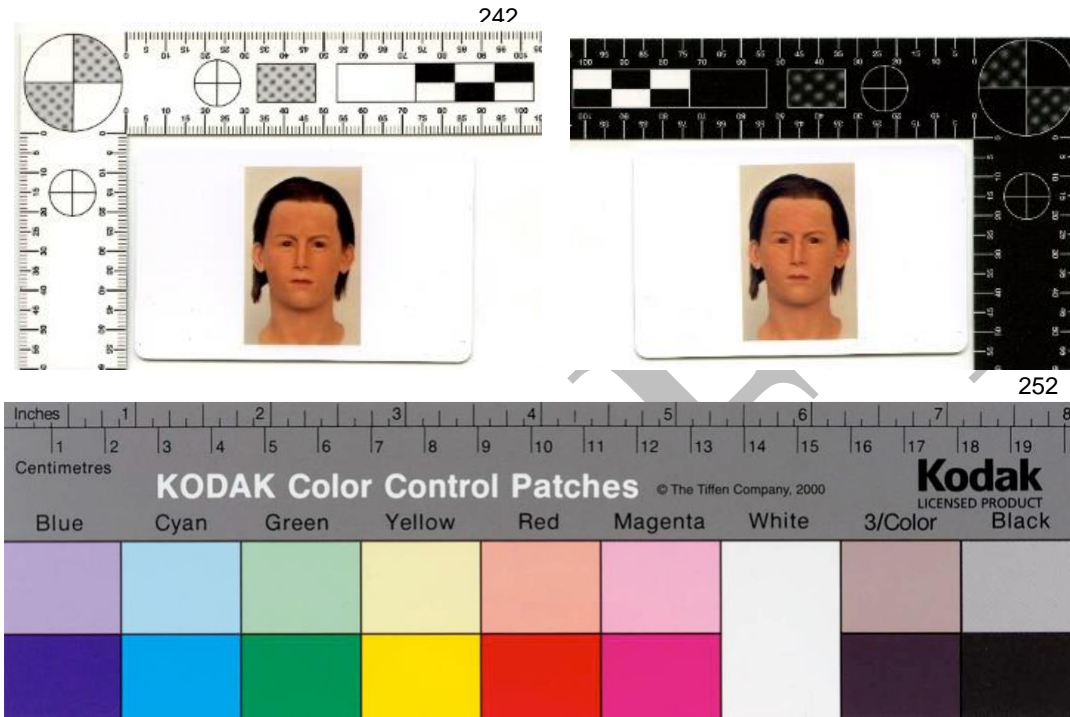
234 8.2.2 100% scan with ratio setting 1:1

235 8.2.3 Lossless output format (TIFF, PNG, etc.)

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237 **9. Calibrated Reference Targets**

238 9.1 A calibrated reference target (IEEE Standard 167A-1995) includes measurements to
239 accurately reflect the dimensions of the item being scanned. Reference targets should
240 border the item being scanned without encroaching into the area of the item being
241 scanned.



261 **Examples of reference target cards**

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263 9.2 In the scanner preview, use the marquee tool or similar tool to select the target item and
264 the reference target card for scanning. Scanning of the complete item with reference card
265 to create a master image file is generally required for evidentiary purposes and chain of
266 custody requirements.

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268 **10. Facial Recognition Minimum Recommended Scanning Resolution Settings**

269 10.1 In addition to the above settings, the minimum recommended scanning practices for
270 Facial Recognition enrollment are:

| ITEM TO BE SCANNED | BIT DEPTH MINIMUM | DPI MINIMUM | COLOR CHANNEL |
|---------------------------|--------------------------|--------------------|----------------------|
| Colored prints | 24 bit | 300 | RGB |
| Black and White prints | 16 bit | 300 | Grayscale |
| | 24 bit | 300 | RGB |

271 10.2 If image is to be scanned for the purposes of both Face Recognition and Facial
272 Comparison, it is recommended that the minimum recommended scanning practices for
273 Facial Comparison are used.

274 **11. Facial Comparison Minimum Recommended Scanning Resolution Settings**

275 11.1 To capture images suitable for facial comparison, the following additional scanning
276 practices should be used:

| ITEM TO BE SCANNED | BIT DEPTH MINIMUM | DPI MINIMUM | COLOR CHANNEL |
|---------------------------|--------------------------|--------------------|--|
| Colored prints | 24 bit | 600 | RGB |
| Black and White prints | 16 bit | 1200 recommended | Grayscale (May not capture all gray tones) |
| | 24 bit | | RGB (Use of RGB enables all gray tones to be captured) |

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278 **12. Image Recording and Processing**

279 12.1 It is recommended best practice that any image processing occur after scanning.

280 12.2 There are guidelines and recommended best practices for recording of images and
281 image processing such as:

282 12.2.1 ISO 21043-1-2018, Part 2 ⁶

283 12.2.2 ASTM E2825-12 ⁷

⁶ ISO 21043-2-2018 Forensic sciences - Part 2- Recognition recording collecting transport and storage of items

⁷ ASTM E2825-12: Standard Guide for Forensic Image Processing

- 284 12.2.3 Documents published by the Scientific Working Group Imaging Technology
285 (SWGIT)^{8, 9, 10}
- 286 12.2.4 The basic image enhancement techniques for facial images after scanning as
287 per SWGIT document Section 11, include:
- 288 12.2.4.1 Cropping
- 289 12.2.4.2 Brightness and contrast adjustment, including dodging and burning
- 290 12.3 Resizing
- 291 12.3.1 Image rotation/inversion (normalization)
- 292 12.3.2 Color balancing or color correction
- 293 12.4 For images to be used for enrollment into Facial Recognition, refer to FISWG Standard
294 Practice/Guide for Image Processing to Improve Automated Facial Recognition Search
295 Performance, which provides information on the recommended image processing
296 techniques and procedural steps for Facial recognition searches.¹¹
- 297 12.5 Additional image enhancement techniques, using software such as Adobe Photoshop
298 and PaintShop Pro, include but not limited to:
- 299 12.5.1 Descreen¹²
- 300 12.5.2 Remove moiré
- 301 **13. Obtaining a Facial Image from an Identity Document**
- 302 13.1. Identity documents such as passports and identity cards issued since 2005 may
303 contain a chip with details of the document or biometrics such as a digital record of
304 the facial image or fingerprint.
- 305 13.2. When the facial image needs to be captured from the identity document containing
306 a chip, it is highly recommended the digital image record be extracted from the chip
307 by specialized equipment and software (passport/identity reader or Mobile APP)
308 that is compliant with International Civil Aviation Organization (ICAO) document
309 9303 Machine Readable Travel Documents.

⁸ SWGIT Section 5 Guidelines for Image Processing.pdf

⁹ SWGIT Section 11 Best Practices for Documenting Image Enhancement.pdf

¹⁰ SWGIT Section 13 Best Practices for Maintaining the Integrity of Digital Images and Digital Video

¹¹ FISWG Standard Practice/Guide for Image Processing to Improve Automated Facial Recognition Search Performance

¹² http://www.descreen.net/eng/help/descreen/home/descreen_manual.htm



Examples of Passport/identity reader and Mobile applications

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- 13.3. Where there is no chip within the document or if equipment and software is not available to extract the digital image record, the printed facial image in the security document will need to be scanned.
- 13.4. The initial step to scanning a printed facial image from a security document is to determine whether there is a security lamina or clear/low opacity film over the facial image.
- 13.4.1. If there is no lamina/film or if there is only a clear film present, the scanning processes described in section 6 should be undertaken.
- 13.4.2. If there is a low opacity film present, there is little that can be done to minimize the effects of the film opacity. The scanning processes described in section 6 should be undertaken and the scanning operator may need to consider image processing to mitigate the opacity effect.
- 13.4.3. If there is a security lamina present, in addition to the scanning processes described in section 6, the insertion of clear plastic film(s) (such as overhead projector sheets) between the glass scanning bed and the document can assist in preventing the diffraction of security feature(s), and will enable a cleaner/more accurate scan of the facial image. If diffractive or moiré patterns appear in the scan and output image, it may be necessary to increase the amount of clear plastic film(s) being used or offset their position. It should be noted that depending on the location of the security features, it may not be possible to totally prevent the security features diffraction from obscuring part of the face.

Appendix 1

Scanning Procedures

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343 The frequency of scanner calibration is dependent on laboratory accreditation requirements,
344 frequency of use, scanner location and maintenance, use of optional settings, and the level of
345 output quality required.

346 Whilst it is preferable that a scanner is calibrated prior to every scan, it is not always practicable.
347 If a scanner is well maintained, kept dust-free, is installed in a room with regulated temperature,
348 and all pre-scan options such as descreen or unsharp mask are turned off, the scanner may only
349 need yearly calibration or calibrated on a regular basis consistent with laboratory accreditation
350 requirements.

351 The following steps for scanner calibration describe the basic process:

- 352 1. Reset scanner settings to factory default, e.g., all scanner adjustment and enhancement
353 options are de-selected.
- 354 2. Clean glass scanning bed/platen with a soft, lint-free cloth and a small amount of fluid
355 using a mixture of 1-part vinegar to 3-parts water, or other agency approved solution.
- 356 3. Once glass scanning bed/platen is dry, place IT8 calibration target card on glass scanning
357 bed/platen.
- 358 4. Locate the scanner software tool for scanner calibration.
- 359 5. Run the scanner calibration process.
- 360 6. The software will automatically generate and update scanner calibration profile.
- 361 7. Scan the IT8 target card at 600 DPI with a 100% 1:1 scan ratio to produce an output
362 image for assessment.
- 363 8. Compare the scanner output image to the physical IT8 calibration target card to identify
364 whether there are any image quality issues present to determine whether the scanner has
365 been able to accurately reproduce the color, grayscale, or brightness/contrast of the
366 content, size, and measurements within the target card.
- 367 9. Scan a printed reference facial image at 600 DPI with a 100% 1:1 scan ratio to produce a
368 real-life output image for assessment.
- 369 10. Compare the new scanner output image to the physical printed reference facial image to
370 identify whether there are any image quality issues present to determine whether the
371 scanner has been able to accurately reproduce the printed reference.
- 372 11. It should be noted that depending on the printing process used to produce the reference
373 facial image, there may appear to be image quality issues, when in fact the scanner has
374 reproduced evidence of the printing process. For example, if the printed reference facial
375 image is produced using a four-color inkjet printer, the output image may have the

376 appearance of pixilation when it is actually the individual color droplets from the inkjet
377 printing visible when the image is viewed at 100%. For more information on potential
378 printing effects in a scanned image, refer to FISWG Guide to the Effects of Printing
379 Methods on Facial Images used for Comparisons.

380 12. Undertake agency approved image recording procedures and image processing
381 techniques.

382
383 The following URL references show examples of commercial solutions for scanner calibration.
384 These are included as references only and not any endorsement of any commercial product for
385 scanner calibration.

- 386 • https://www.silverfast.com/PDF/printer_calibration_review_en.pdf
- 387 • <https://www.silverfast.com/download/docs/SF-IT8-en.pdf>
- 388 • https://www.silverfast.com/PDF/Epson_V800_long_en.pdf
- 389 • https://www.silverfast.com/download/docu/manual.complete_en_2006-11-27.pdf

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DRAFT

Appendix 2

IQS Appendix F Summary: As NIST has evolved the Electronic Biometric Transmission Standard (EBTS) they have included guidelines for fingerprint scanners. All sections are extracted from IAFIS-DOC-01078-9.3: Electronic Biometric Transmissions Specification¹³

IQS Appendix F

These test procedures will be used by the FBI principally for certification of fingerprint systems; they may also be used in acceptance testing and in performance capability demonstrations as an indication of capability to perform. Equipment shall be tested to meet the requirements in normal operating modes, e.g., scanners shall not be tested at slower-than-normal operating speeds in an attempt to meet geometric accuracy specifications. A vendor may recommend alternate testing methods if the test procedures given in this appendix are not applicable or cannot be applied to the particular system under test.¹⁴

For the purpose of this document, the key section in Appendix F is this: **“they may also be used in acceptance testing and in performance capability demonstrations as an indication of capability to perform.”** It is acknowledged that scanning black and white fingerprint images is different than scanning color facial images, the core and basic capabilities of the scanner are still critical to scan a quality resultant facial image.

Scope and Purpose

The fingerprint scanner must be capable of producing images that exhibit good geometric fidelity, sharpness, detail rendition, gray-level uniformity, and gray-scale dynamic range, with low noise characteristics. The images must be true representations of the input fingerprints without creating any significant artifacts, anomalies, false detail, or cosmetic image restoration effects.

2.1 Linearity

Requirement:

When measuring a stepped series of uniform target reflectance patches (e.g., step tablet) that substantially cover the scanner’s gray range, the average value of each patch shall be within 7.65 gray-levels of a linear, least squares regression line fitted between target reflectance patch values (independent variable) and scanner output gray-levels (dependent variable).

2.2 Geometric Accuracy

Requirement (across-bar):

When scanning a multiple, parallel bar target, in both vertical bar and horizontal bar orientations, the absolute value of the difference between the actual distance across parallel target bars and the corresponding distance measured in the image shall not exceed the following values for at least 99% of the tested cases in each print block measurement area and in each of the two orthogonal directions.

¹³ https://www.fbibiospecs.cjis.gov/Document/Get?fileName=EBTS_v9.1_Final.pdf

¹⁴ https://www.fbibiospecs.cjis.gov/Document/Get?fileName=EBTS_v9.1_Final.pdf

2.3 Spatial Frequency Response

Requirements:

The spatial frequency response shall be measured using a continuous tone sine wave target denoted as Modulation Transfer Function (MTF) measurement unless the scanner cannot obtain adequate tonal response from this target, in which case a bi-tonal bar target shall be used to measure the spatial frequency response, denoted as Contrast Transfer Function (CTF) measurement. When measuring the sine wave MTF, it shall meet or exceed the minimum modulation values given in Table F-2 in both the detector row and detector column directions and over any region of the scanner's field of view. When measuring the bar CTF, it shall meet or exceed the minimum modulation values defined by equation 2-1 or equation 2-2 (whichever applies) in both the detector row and detector column directions and over any region of the scanner's field of view. CTF values computed from equations 2-1 and 2-2 for nominal test frequencies are given in Table F-3. None of the MTF or CTF modulation values measured at specification spatial frequencies shall exceed 1.05.

2.4 Signal-to-Noise Ratio

Requirement:

The white signal-to-noise ratio and black signal-to-noise ratio shall each be greater than or equal to 125 in at least 97% of respective cases within each print block measurement area.

2.5 Gray-Level Uniformity

Requirement – adjacent row, column uniformity:

At least 99% of the average gray-levels between every two adjacent quarter-inch-long rows and 99% between every two adjacent quarter-inch-long columns within each imaged print block area shall not differ by more than 1.0 gray-levels when scanning a uniform low-reflectance target and shall not differ by more than 2.0 gray-levels when scanning a uniform high-reflectance target.

Requirement – pixel-to-pixel uniformity:

For at least 99.9% of all pixels within every independent 0.25 by 0.25 inch area located within each imaged print block area, no individual pixel's gray-level shall vary from the average by more than 22.0 gray-levels when scanning a uniform high-reflectance target and shall not vary from the average by more than 8.0 gray-levels when scanning a uniform low-reflectance target.

Requirement – small area uniformity:

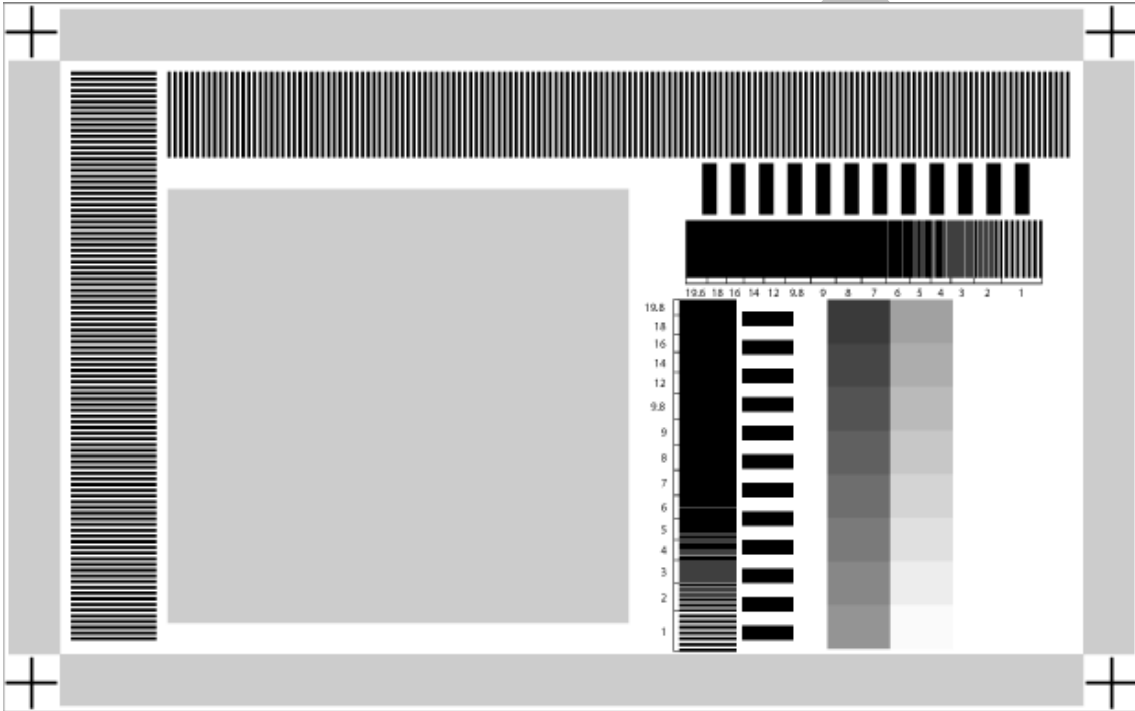
For every two independent 0.25 by 0.25 inch areas located within each imaged print block area, the average gray-levels of the two areas shall not differ by more than 12 gray-levels when scanning a uniform high-reflectance target and shall not differ by more than 3.0 gray-levels when scanning a uniform low-reflectance target.

407 All of these tests utilize a specific target which is placed on the scanner after which the specific
408 tests are run on the resultant scanned images:¹⁵

Catalog Part No: **QA-74-P-RM**

Product Name: **FBI Mitre Scanner Image Quality Test (SIQT) Chart**

Drawing / Photo of part:



The above image is an approximate representation of the actual product.
Specifications are subject to change without
notice.

General Description: This chart is used for evaluation of reflective fingerprint scanners. Test elements contained on this chart can be used for tests as described in, *Test Procedures for Verifying IAFIS Image Quality Requirements for Fingerprint Scanners and Printers*. 15

Image Description: The test chart includes the following items.

¹⁵ [https://www.appliedimage.com/files/VCX2do/QA-74 FBI Mitre Fingerprint Scanner Test QA-74_spec_v1-04.pdf](https://www.appliedimage.com/files/VCX2do/QA-74%20FBI%20Mitre%20Fingerprint%20Scanner%20Test%20QA-74_spec_v1-04.pdf)

- Sixteen stepped density patches (7 x 11 mm each)
- Resolution bar patterns ranging in frequency from 1.0 to 19.6 cycle per mm, one each in horizontal and vertical orientation
- Reference bars 2.5 x 10 mm (horizontal and vertical, adjacent to resolution groups for geometric accuracy)
- Horizontal and vertical Ronchi patterns (1 cycle per mm for geometric accuracy)
- Mid-scale density patches along each chart-edge (grey areas for uniformity)
- Large mid-scale patch, 75 x 80 mm (grey area for uniformity)

409

410 This guideline does not assume that an agency would actually attempt to execute the Appendix F
411 tests, but is included to show the applicability and usage of selecting and using a scanner which
412 has passed Appendix F.

413

414 All scanners which have passed Appendix F and been certified by CJIS can be found at:

415 <https://www.fbibiospecs.cjis.gov/Certifications>