

Department of Forensic Science

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**FORENSIC PHOTOGRAPHY SECTION
PROCEDURES MANUAL
OF
FORENSIC SCIENCE**

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1 INTRODUCTION

- 1.1 The Forensic Photography Section examines a wide variety of evidence types. This manual consists of the procedures most routinely used to photographically preserve evidence submitted to the section.
- 1.2 Every case is unique and must be evaluated by the individual photographer. Not all possible situations that may be encountered in casework can be appropriately covered in a procedure manual nor can all possible variations to a described procedure be included. It is always the examiner's responsibility to choose the best approach for each case, particularly for evidence not routinely encountered. It is expected that the requestor, assigned examiner, supervisors, and/or the Physical Evidence Program Manager will be consulted for extraordinary procedures and that deviations from existing procedures shall occur in accordance with the Quality Manual (QM).
- 1.3 Worksheets are provided as controlled forms and should be used as designed. Photographers are reminded to take appropriate notes which will allow for another photographer/supervisor to evaluate the data, interpret the results, come to the same conclusions, and be able to repeat the analysis under conditions as close as possible to the original.
- 1.4 Forensic Scientists conducting latent print photography shall follow the applicable procedures in this manual.
- 1.5 Due to chemical processes utilized by varying sections, evidence submitted to the Forensic Photography Section should be evaluated and the necessary images captured as soon as possible to avoid any degradation of the evidence.
- 1.6 As described in the QM, no unsealed evidence in the process of being examined will remain in short term storage more than 30 days.

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2 EQUIPMENT MAINTENANCE

2.1 Purpose

The purpose of this section is to describe a procedure to ensure that a digital capture system is operating properly.

2.2 Scope

All equipment is to be maintained in accordance with the manufacturer's specifications and recommendations as per operating and warranty manuals.

2.3 Limitations

All workstations within the Forensic Photography Sections will be password protected and these password(s) will remain confidential within the respective section(s).

A unique user name and password is assigned to each photographer/examiner for the Mideo LATENTWORKS software. The Mideo passwords shall remain confidential with the assigned user.

Each piece of equipment requiring a resolution test shall be uniquely identified.

2.4 Safety

None for this procedure.

2.5 Procedures

2.5.1 All equipment and maintenance is to be documented in the appropriate log book located in each respective laboratory. In the event that repairs or modifications are performed on equipment, a system check will be performed before the system or any of its components are utilized for casework purposes. This system check as well as repairs will be documented and maintained within each respective laboratory.

2.5.1.1 A system check shall include but is not limited to the following:

- Successful capture of an image to the storage medium used by the camera.
- Successful download of the image onto a computer
- If using Adobe Photoshop CS for image processing ensure the history log is configured as outlined in 5.4.2.1.
- Perform a printer test/evaluation per the manufacturer's specifications which may include nozzle check, head alignment, and head cleaning on any printer serviced.

2.5.2 Testing Digital Camera System Resolution for Latent Print Photography

2.5.2.1 The Scientific Working Group for Imaging Technology (SWGIT) and Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST) guidelines specify that latent prints shall be captured at 1000 pixels per inch (ppi) at 1:1 as the minimum nominal resolution.

2.5.2.2 A nominal resolution of 1000 ppi corresponds to an achievable resolution of approximately 9.8-13 cycles per millimeter. A test target within this range would be sufficient for use in this procedure.

2.5.2.3 Every camera and lens configuration used to capture latent print images shall be evaluated utilizing this procedure prior to it being put into use for casework.

- 2.5.2.4 Consult the manufacturer's specifications to determine the effective pixels for the camera and the field of view necessary to achieve a minimum of 1000 ppi.

Nikon D800/810 36.3 megapixel FX format

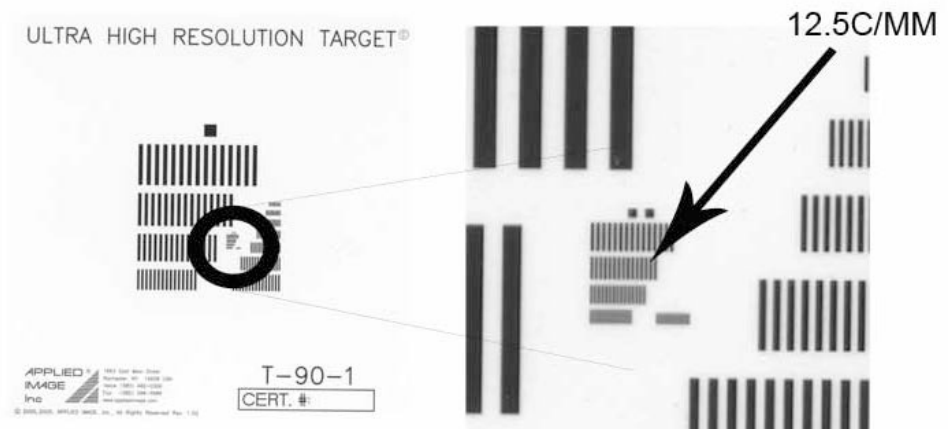
Large = 7360 x 4912 pixels
 Medium = 5520 x 3680 pixels
 Small = 3680 x 2456 pixels

- 2.5.2.5 Divide the pixel resolution by 1000 to determine the area of coverage in which the camera should be capable of capturing at 1000 ppi.

Nikon D800/810

Large = 7.36 inches x 4.91 inches
 Medium = 5.52 inches x 3.68 inches
 Small = 3.68 inches x 2.45 inches

- 2.5.2.6 Use a template (or frame) to the exact dimension of this area of coverage.
- 2.5.2.7 Place the template on a flat surface with a flat scale inside the area bounded by the template.
- 2.5.2.8 Mount the camera on a tripod or copy stand above the template. Ensure the camera focal plane is parallel with the template.
- 2.5.2.9 While looking through the viewfinder, adjust the height of the camera to fill the frame with the template, while keeping the image in sharp focus with the camera set to manual focus and manual exposure. If focus cannot be accomplished for this lens, then the 1000 ppi standard cannot be met and the test should be terminated for that lens.
- 2.5.2.10 The height between the camera and the subject is the maximum distance to provide 1000 ppi resolution.
- 2.5.2.11 Replace the template with the resolution test target. Ensure the tests bars are in a vertical orientation.
- 2.5.2.12 Capture an image file using the file format used for latent print image capture, TIFF.
- 2.5.2.13 Open and view the image in Adobe Photoshop CS or Mideo LATENTWORKS.
- 2.5.2.14 View the region which depicts 12.5 cycles per mm using the workstation monitor.



- 2.5.2.15 Zoom in on the image so that individual pixels are visible. If the camera has accurately captured 12.5 cycles per mm, then it should be possible to distinguish the dark and light line pairs in this region. It should not be necessary to use image post processing to improve the visibility of the line pairs.
- 2.5.2.16 If the 15 dark and 14 light lines can be visually verified (counted) then the camera system configuration can sample at 12.5 cycles per mm in the vertical direction and meets or exceeds the 1000 ppi standard.
- 2.5.2.17 If line count numbers do not match, then the camera system is not acceptable for latent print capture. Resolution may be increased by decreasing the field of view (decreasing the distance of camera back to item).
- 2.5.2.18 Rotate the chart 90 degrees to measure the horizontal resolution. In some cases the resolving power of the camera may be lower in one direction. Therefore, the shorter of the two distance determined should be recorded and used.
- 2.5.2.19 This procedure shall be done annually for each camera system and documented in the equipment maintenance log.
- 2.5.2.20 The image shall be saved to a CD/DVD and stored in the maintenance log or saved electronically with the file location documented in the maintenance log. The file shall be named appropriately to allow the image to be traced back to a specific piece of equipment.
- 2.5.3 Testing Scanner Resolution for Latent Print Imaging
- 2.5.3.1 Set the scanner to capture at 1000 ppi 24 bit color or Gray Scale 8 bit.
- 2.5.3.2 Place the test chart on the scanner platen with the top of the chart at the top of the scanning region. This will allow the user to measure the resolution in the horizontal aspect.
- 2.5.3.3 Save the file as a TIFF and open it with Adobe Photoshop CS or Mideo LATENTWORKS.
- 2.5.3.4 Zoom in on the region that depicts 12.5 cycles per mm so that individual pixels are visible. If the scanner has accurately captured 12.5 cycles per mm, then it should be possible to distinguish the dark and light lines pairs in this region. It should not be necessary to improve the visibility of the line pairs.
- 2.5.3.5 If the 15 dark and 14 light lines can be visually verified (counted) then the scanner can sample at 12.5 cycles per mm in the horizontal direction and meets or exceeds the 1000 ppi standard.
- 2.5.3.6 Rotate the chart 90 degrees and repeat to verify the scanner's vertical resolution of 12.5 cycles per millimeter and that it meets or exceeds the 1000 ppi standard.
- 2.5.3.7 Some scanners exhibit higher achievable resolution in the center of the scan area. It may be appropriate to retest at different locations on the scanner.
- 2.5.3.8 This procedure shall be done annually for each scanner utilized to capture latent print images and documented in the equipment maintenance log.
- 2.5.3.9 The image shall be saved to a CD/DVD and stored in the maintenance log or saved electronically with the file location documented in the maintenance log. The file shall be named appropriately to allow the image to be traced back to a specific piece of equipment.

2.6 REFERENCES

SWGFAST -- The guidelines set forth by the Scientific Working Group on Friction Ridge Analysis, Study and technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

SWGIT – The guidelines set forth by the Scientific Working Group for Imaging Technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging. Owner’s Manuals and User’s Manuals should be referenced for equipment operating instructions.

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3 EXAMINATION OF EVIDENCE

3.1 Purpose

This section addresses the examination of all submitted evidence.

3.2 Scope

This procedure applies to all types of submitted evidence per the QM.

The following equipment and materials may be utilized:

- Low power magnifier
- Light sources
- Protective gear

3.3 Limitations

Gloves (latex, nitrile or an equivalent) must be worn to prevent evidence loss, cross-transfer, contamination and/or deleterious change.

3.4 Safety

It is recommended that protective gloves, eye wear, and laboratory coats be worn when a foreign substance is present since it may carry the potential of blood borne pathogens or chemical hazards.

3.5 Procedures

Perform steps in the appropriate order, and document findings in case notes as necessary.

3.5.1 Visually inspect the submitted evidence.

3.5.2 Conduct a physical inspection for the presence of foreign substances such as dirt or residue. If the inspection reveals the presence of substances or conditions that interfere with the capture process, the assigned examiner should be notified and the finding documented by utilizing an MFR.

3.6 References

Owner's Manuals, User's Manuals, and vendor specific manuals should be referenced for equipment operating instructions.

4 CAPTURE OF DIGITAL IMAGES

4.1 Purpose

The purpose of this section is to describe the proper method of capturing evidentiary material with the use of digital technology.

4.2 Scope

This procedure applies to the capture of images utilizing digital cameras and scanners for the Latent Print Section.

4.3 Materials and Equipment

Materials and equipment utilized may include all or some of the following, as determined necessary by the photographer, based on the evidence submitted.

- Digital cameras
- Lenses
- Scales
- Scanners
- Filters
- Appropriate light sources
- Cabling appropriate for the equipment used
- Appropriate output media and printers
- A variety of storage media
- Monitors

4.4 Limitations

4.4.1 Images of latent prints intended for comparison purposes shall be captured at a minimum of 1000 ppi.

Images of exemplars intended for comparison purposes shall be captured at 500 ppi. It is acceptable to capture the individual finger at 1000 ppi if necessary due to the quality of the impression.

Images for Impression examination (tire and shoe) shall be captured at TIFF Large for maximum ppi. It is acceptable to capture small areas at 1000 ppi if necessary due to the quality of the impression.

4.4.2 Single Lens Reflex cameras with macro lenses or flatbed scanners shall be used for capture of friction ridge images.

4.5 Safety

Protective eyewear for Alternate Light Source (ALS), gloves, and laboratory coats

4.6 Procedures

4.6.1 Determine and locate the Area of Interest (AOI). If a discrepancy exists, i.e., the AOI cannot be located or multiple AOIs are observed, contact the assigned examiner or the appropriate supervisor for additional information.

4.6.2 A scale marked with the FS Lab #, Item #, and examiner's and/or photographer's initials shall be included in each digitally captured image, except for fingerprint exemplars. An "L" shaped scale should be used for shoe and tire impressions.

4.6.2.1 Place the scale in the same plane as, and as close as possible to, the AOI without obscuring detail.

- 4.6.2.2 If an area smaller than the marked scale is captured an additional image shall be captured depicting the same area but with a field of view large enough to include all information documented on the marked scale.

Example: A latent palm print is captured with the scale including all required information. A second image of the same palm print is captured but of a smaller area (zoomed in) which includes part of the scale but not all information written on the scale.

4.6.3 Camera capture for latent prints

- 4.6.3.1 Utilize a camera that has the achievable resolution verified by the procedure in Section 2.5.3

- 4.6.3.2 The best practice is to fill the frame with the print. If not filling the frame then the maximum field of view to allow for the image to be 1000 ppi should be used, based upon the procedure outlined in Section 2.5.3.

4.6.4 Camera capture for shoe and tire impressions

- 4.6.4.1 The best practice is to fill the frame with the impression.

4.6.5 Scanner capture for latent prints

- 4.6.5.1 Scan the selected AOI at 16 or 24-bit color or 8-bit grayscale at 1000 ppi.

- 4.6.6 Digital image capture not associated with latent print evidence may be accomplished with settings and equipment deemed appropriate by the photographer to meet the request of the assigned examiner.

- 4.6.7 In cases that involve an ALS, the appropriate wavelength and filters will be chosen to obtain the optimal quality of the image.

- 4.6.8 The original image shall be captured in TIFF file format.

- 4.6.9 AOIs captured for the Latent Print Section shall be uploaded to the Mideo database. If multiple versions of an AOI are captured, only one version needs to be uploaded.

- 4.6.9.1 Areas of interest captured shall be uploaded to the Mideo database.

- 4.6.9.2 Latent print images shall be saved in the Latents Folder.

- 4.6.9.3 Each image is a separate file.

- 4.6.9.4 The file name shall be the FS Lab # followed by a dash and then the P# (combination of the Item # and the Latent #) assigned by the examiner prior to capture.

- 4.6.9.5 Images that are not latent prints shall be saved in the appropriate folder, i.e., exemplars in the Evidence folder and overall images in the Common Folder. The file name shall include the FS Lab #.

4.7 References

SWGFAST -- The guidelines set forth by the Scientific Working Group on Friction Ridge Analysis, Study and technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

SWGIT – The guidelines set forth by the Scientific Working Group for Imaging Technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

Owner's Manuals, User's Manuals and vendor specific manuals should be referenced for equipment operating instructions.

Blitzer, Herbert L., and Jack Jacobia. Forensic Digital Imaging and Photography. San Diego: Academic Press, 2002.

Davies, Adrian, and Phil Fennessy. Digital Imaging for Photographers. 4th ed. Oxford: Focal Press, 2001.

Madisetti, Vijay K., and Douglas B. Williams, eds. The Digital Signal Processing Handbook. N.p.: CRC Press LLC, 1998.

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5 DIGITAL IMAGE PROCESSING

5.1 Purpose

The purpose of this section is to describe the proper method to improve and clarify the visual appearance of digital images and to prepare images for additional forensic analysis.

5.2 Scope

The degree to which procedures used in image processing should be documented will depend on the intended end use of the image.

5.3 Materials and Equipment

The computer hardware will be determined at the discretion of the Forensic Photographer or Forensic Scientist and will be based upon the type and attributes of the digital image(s) and the requirements of the processing operation(s) to be performed. The computer hardware should have storage, processing and display capabilities that can handle uncompressed data. At the discretion of the Forensic Photographer or Forensic Scientist and the requirements of the evidence, the equipment and materials used may include, but are not limited to, the following:

- Workstation(s)
- Card readers
- Cables
- Monitors

5.4 Limitations

5.4.1 Processing shall be done in a way to preserve the original image.

5.4.2 Processing steps are documented, either via automated history log associated with the processing software or hand written logs documenting each step.

5.4.2.1 Adobe Photoshop CS history log options shall be set as follows:

- Choose Edit > Preferences > General
- Check the “History Log” option (a checkmark must appear in the check box to enable the History Log)
- Select “Metadata” for “Save Log Items To” option
- Select “Detailed” option for the “Edit Log Items”
- Click OK to save settings

5.4.3 Exploratory processing operations not incorporated in the final image do not need to be documented.

5.4.4 The end results of the processing, the clarified image, is saved.

5.5 Safety

None for this procedure

5.6 Procedures

5.6.1 Based on the information provided in reference to the AOI, select the appropriate digital processing technique(s) to apply to the images. Due to the many scenarios available, it is at the discretion of the Forensic Photographer or Forensic Scientist to determine the appropriate processes and order of these processes to be applied.

- 5.6.2 Based on the information provided in reference to the AOI, select the appropriate digital processing technique(s) to apply to the images.
 - 5.6.2.1 Common digital image processing techniques include but are not limited to, brightness and contrast adjustment, levels adjustment, sharpening, color channel processing, and resizing.
- 5.6.3 Document each step taken and the order they were performed, and if applicable, the appropriate settings used. This documentation can be in the form of printouts that can be produced from a software program, e.g., the history log from Adobe Photoshop CS. It is required to save these logs with each image in digital form, e.g., Meta data.
- 5.6.4 Save the image(s) in a .TIFF file format, or other lossless compression format.

5.7 References

SWGIT – The guidelines set forth by the Scientific Working Group for Imaging Technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

SWGFAST –The guidelines set forth by the Scientific Working Group on Friction Ridge Analysis, Study and Technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

Owner’s Manuals and User’s Manuals should be referenced for equipment operating instructions.

Blitzer, Herbert L., and Jack Jacobia. Forensic Digital Imaging and Photography. San Diego: Academic Press, 2002.

Castleman Kenneth R. Digital Image Processing. Upper Saddle River, New Jersey: Prentice Hall, Inc., 1996.

Davies, Adrian, and Phil Fennessy. Digital Imaging for Photographers. 4th ed. Oxford: Focal Press, 2001.

Russ, John C. The Image Processing Handbook. 2nd ed. Boca Raton, FL: CRC Press, 1995.

6 SUBMITTED IMAGE EVIDENCE

6.1 Purpose

To provide images as requested on a RFLE as printed photographs or digital media (CD/DVD) from submitted evidence.

6.2 Scope

This procedure applies to removable digital storage media including, but not limited to, compact flash cards, PCMCIA cards I & II, SDI cards, smart media, memory sticks, floppy diskettes, Zip disks, Jaz disks, Compact discs (CD), Digital versatile discs (DVD), Mini digital versatile discs, and digital cameras.

6.3 Materials and Equipment

Equipment may include some or all of the following, as determined by the Forensic Photographer or Forensic Scientist, based on the evidence submitted and the specific analysis requested.

- Workstation
- DVD and/or CD drive(s)
- DVD and/or CD burner
- External hard drive

6.4 Limitations

Each employee who receives evidence on non-Commonwealth of Virginia (COV) owned removable media will be issued a separate account with extremely restricted network privileges.

Removable media includes, but is not limited to, CD, DVD, SD cards, or USB drives. The IT staff should be consulted if assistance is needed related to the definition of removable media.

Prior to putting the media into a COV networked computer the employee will verify the virus signature file on the computer is the latest available from the vendor.

The employee will then log into the network with the restricted account and run a full virus scan on the contents of the media.

- Open “Computer”, right click on the “D:” drive and select “scan for threats”

If the scan indicates that the media is “clean”, the employee will log in with their normal user account and proceed with examination.

If the scan indicates the media is “not clean”, the employee will contact the IT staff for guidance.

6.5 Safety

None for this procedure

6.6 Procedures

6.6.1 If images of latent prints are uploaded for analysis, they shall be saved in the Mideo database Latents folder in the appropriate FS Lab # folder.

6.6.2 Determine if the type of evidence and request exceeds the scope of the Forensic Photography Section; if so, contact the Digital & Multimedia Evidence Section for assistance. If it is determined that the type of evidence and request does not exceed the scope, proceed with the analysis.

- 6.6.2.1 Floppy diskettes, MD formatted Minidisks, and some memory sticks will typically have a built-in mechanism such as a switch or tab that can be enabled to render it as “read-only”. Verify that the media is in “read-only” mode; if not, enable it.
- 6.6.3 A hash algorithm will be performed on the digital media before and after the copy/duplicate to ensure the integrity of the evidence is intact. The results of the hashes will be saved within the case file under the FS Lab #.
 - 6.6.3.1 The hash value of the files on the digital media shall be compared to the hash value of the files after transfer. Identical values indicate the files are the same and it is acceptable to proceed with examinations. If the values are not the same, notify the section supervisor and do not proceed with examinations. It is recommended to use the saved screen shots, which contain the hash values, to accomplish the comparison.
 - 6.6.3.2 It is not required to perform a hash on the media if the images will be uploaded to the Mideo database. A hash for each image imported is automatically recorded in the history log.

6.7 References

Owner’s Manuals, User’s Manuals and vendor specific manuals should be referenced for equipment instructions.

Manufacturers’ websites

Best Practices for Seizing Electronic Evidence a Pocket Guide for First Responders. 3rd ed. Washington, D.C.: U.S. Department of Homeland Security, United States Secret Service.

SWGIT – The guidelines set forth by the Scientific Working Group for Imaging Technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

7 PRINTING AND OUTPUT OF RESULTS

7.1 Purpose

The purpose of this section is to describe the proper procedure for the accurate printing and storage of images.

7.2 Scope

This procedure applies to images captured or processed by the Photography Section or Forensic Scientist.

7.3 Materials and Equipment

The following equipment and materials may be utilized:

- Printers
- Software

7.4 Limitations

7.4.1 An evidential CD/DVD containing the original, unrecoverable images in the Mideo database shall be made.

7.4.1.1 This CD/DVD shall be designated as DM1 (additional numbers may be used as necessary for multiple CDs/DVDs associated with the request) and treated as evidence.

7.4.1.2 If the DM is created by someone other than the case examiner a chain of custody for the transfer will be recorded on the Photography Request Form (DFS 100-F120).

7.4.2 The image shall not be re-sampled when making enlargements for latent print comparison purposes. When using Adobe Photoshop CS a checkmark must appear in the box to the left of the word Resample.

7.5 Safety

None for this procedure

7.6 Procedures

7.6.1 Convert file to requested or desired dpi.

7.6.1.1 Print latent print images on the Epson 3800/4880 printer or a printer capable of equivalent quality using the optimum setting and/or printing preferences.

7.6.2 Resize image to the requested or desired size (e.g., 1:1, 5X)

7.6.3 Print image(s)

7.6.4 Ensure that the proper identifiers are present within and/or on each printout

7.7 References

SWGFAST - The guidelines set forth by the Scientific Working Group on Friction Ridge Analysis, Study and technology are standards that are generally accepted in the Forensic Science community and shall be adhered to as they pertain to digital imaging.

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Davies, Adrian, and Phil Fennessy. Digital Imaging for Photographers. 4th ed. Oxford: Focal Press, 2001.

Russ, John C. The Image Processing Handbook. 2nd ed. Boca Raton, FL: CRC Press, 1995.

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8 ABBREVIATIONS

The following is a list of abbreviations and acronyms commonly used by examiners in the Forensic Photography and Latent Print Sections. This list has been generated to assist in the interpretation of case file notes and is not a standardized list of required abbreviations. The abbreviations are appropriate written in either lower or upper case and they are appropriate with or without punctuation such as periods. Common chemical formulas, chemical, mathematical and shorthand abbreviations are equally acceptable and will not be listed here.

Admin	Administration
AFIS	Automated Fingerprint Identification System
AOI	Area of interest
BMP	Bit mapped
B/W	Black and White
CCD	Charged Couple Device
CD	Compact disc
CD-R	Recordable compact disc
CD-RW	Re-recordable compact disc
CMYK	Cyan, Magenta, Yellow & Black
Cont	Continued
CCW	Counter clockwise
Config	Configuration
Dig	Digital
DPI	Dots per inch
DVD	Digital video disc
DVR	Digital video recorder
DX	Drug Section
F	f-Stop
Freq	Frequency
FX	Firearm/Toolmark Section
GB	Gigabyte
Hash	Hashing function, mathematical calculation
HD	High density
IMG	Image
IMP	Impression Section
Imp	Impression
IR	Infrared
ISO	International Standards Organization
.jpeg	graphics file format
LP	Latent Print
LX	Latent Print Section
MC	Memory card
MicD	Micro drive
MD	Mini-disc
MFR	Memorandum for Record
No.	Number
Ppi	Pixels per inch
PSD	Photo Shop Document
QD	Questioned Documents
Mb	Mega Bite
Ram	Random Access Memory
RAW	Binary file without a specified format
RGB	Red, Green & Blue
Rom	Read-only memory
PFF	Proprietary file format
S/N	Serial number

SBB	Sealed brown box
SBPB	Sealed brown paper bag
SE	Evidence Receiving (Security)
SPLB	Sealed plastic bag
SWB	Sealed white box
SWPB	Sealed white paper bag
SWEN	Sealed white envelope
SX	Forensic Biology
SYEN	Sealed yellow envelope
.tiff	Graphics file format
TE	Trace Evidence Section
TTL	Through the lens
UV	Ultra Violet
TX	Toxicology Section
XMP	eXtensible Metadata Platform

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