Digital Imaging Guidelines

Synopsis: To establish the Standard Minimum Operating Guidelines for all photographic operations using digital image capture devices.

Details: In an effort to regulate the use of digital imaging technology by FBI personnel, the Photographic Operations and Imaging Services Unit (POISU) formed a committee to address the issues borne from using digital photographic technologies as an investigative tool. The committee members represented the major photographic programs within the FBI. On June 28-29, 2004, a committee meeting was held with the sole purpose of creating standard operating guidelines for Digital Photography for Capturing and Storing Digital Images. During the course of the meeting it was decided that the use of digital photography is acceptable if used in accordance with minimum guidelines established within each photographic application, discipline, or program.

SCOPE:

The following are the basic minimum guidelines for the use of digital photography technology for the capture and storage of imagery which, at the time of its creation, is reasonably and forseeably likely to be of evidentiary value. This protocol applies to any image that records an event or object personally viewable by the photographer which originates from a digital capture device and is stored in the first instance at or incident to creation on magnetic, electronic, or optical media. Stated differently, these guidelines do not permit or pertain to the use of digital cameras or imaging devices used to record events or items which are not independently (i.e. without the aid of the camera) eye-witnessed by the photographer or user before, contemporaneous to or immediately after its capture (e.g., 1) digital camera programmed for delayed time-lapse photography is left unattended and the events recorded are not independently eye-witnessed by a reliable witness for the government; 2) infrared digital imagery).\(^1\) For guidance on the use of

\(^1\) Federal Rule of Evidence (FRE) 901 imposes upon the proponent of any photograph, the burden of authenticating the images -- that is to introduce sufficient evidence to prove that the matter in question is what its proponent claims (i.e., that the photograph is a fair and accurate depiction of the defendant at the time of arrest). The most common method of meeting this burden is for the government to proffer the testimony of a witness who had personal knowledge (i.e. witnessed the matter with their own senses). See FRE 901(b)(1). The FRE rule requiring authentication as a condition precedent to admissibility conceptually overlaps with FRE 1002 which requires the introduction of an original, also colloquially known as the "Best Evidence" rule. Because photographic images are overwhelmingly sought to be introduced into evidence as the memorialization of what a witness eye-witnessed, the rule requiring "originals," like the rule of authentication is met with testimony of the eye-witness verifying the accuracy of
non-eye-witnessed applications of digital imagery, FBI personnel should contact POISU. This standard minimum operating guideline is not intended and should not be interpreted as being all-inclusive for each photographic application or circumstance. Every program should build upon this document and tailor specific guidelines that are pertinent to the mission. Once guidelines have been established, each photographic program will be addressed with the intent of creating standard operating procedures to address every aspect of digital and traditional imaging within the program.

**GENERAL GUIDING PRINCIPLE:**

To the extent possible, all general rules that apply to traditional film-based photography apply to digital photography as well. Following are operating guidelines for standard photographic situations that involve the use of a digital image capture devices. This does not mean that there will never be deviations from these guidelines. In instances where the operator must deviate from the established guidelines, he/she should document the reason for the deviation and the procedures used that fall outside of these accepted guidelines.

**STANDARD OPERATING GUIDELINES FOR DIGITAL PHOTOGRAPHY for Capturing and Storage of Digital Images:**

**BACKGROUND INFORMATION ON DIGITAL MEDIA VERSUS FILM:**

The Scientific Working Group on Imaging Technology (SWGIT) is a government, inter-agency group formed in 1997 by the FBI to develop guidelines and recommendations for use of imaging in law enforcement. Their recommendations and guidelines are intended to provide law enforcement with advice on best practices to ensure that images produced during an investigation will be admitted into court. SWGIT has noted that, generally, a single frame of standard 35mm color film is of demonstrably superior quality to its digital image against their personal recollection or memory of the event. As the Advisory Committee Note to FRE 1002 states: "The usual course is for a witness on the stand to identify the photograph or motion picture as a correct representation of events which he saw or of a scene with which he is familiar. In fact he adopts the picture as his testimony, or, in common parlance, uses the picture to illustrate his testimony. Under these circumstances, no effort is made to prove the contents of the picture, and the rule is inapplicable." In circumstances where no witness possesses personal knowledge as to the accuracy of the event or image depicted, the burden falls upon the proponent (e.g., the government) to describe the "process or system used to produce [the image] and prove that the process or system produces an accurate result." FRE 901(b)(9). This is a substantially higher and more complex burden which, in the absence of case law in a majority of jurisdictions supportive of the introduction of digital imagery, will, in the judgment of the FBI Office of the General Counsel (OGC), outweigh the benefits of its widespread unrestricted use.
imagery equivalent. Thus, it would take a digital image of approximately 18-Megapixels to equal the number of pixels contained in a standard 35 mm color film frame. Moreover, film is typically more sensitive to a wider range of light values within a single image (dynamic range), and has a better ability to accurately capture colors (color fidelity) than do most digital cameras. As a consequence, FBI personnel should understand that, when they choose to capture images with a digital camera, they are already at a disadvantage relative to film. It is for these reasons that SWGIT advises the use of film in most law enforcement applications.

**AVOID LOSSEY COMPRESSION DIGITAL IMAGERY WHEN POSSIBLE:**

SWGIT also advises against the use of lossey compression when shooting digital images, because lossey compression (most frequently utilized in digital cameras using the JPEG standard) further reduces the quality of information contained in the data file which generates and comprises the captured image. This loss of quality happens because compression is the process of removing information from an image that the camera manufacturer (or more accurately the writer of the digital algorithm used in the camera) has decided is less important to retain than other parts or aspects of the image. Frequently, this means that fine variations in color across a surface may be eliminated to make the image data file smaller and therefore easier to store or transmit. In other situations, lossey compression can introduce artifacts into an image, such as "blocks" that were not present in the original scene, but which are now fixed in the image. In certain circumstances, these "blocks" may obscure information in an image, making it harder for the viewer to see "through" them. The impact of such obfuscation can be significant if the image is later required to undergo forensic image analysis.

For these and other reasons, POISU and the Forensic Audio, Video and Image Analysis Unit (FAVIAU) strongly advise against the use of lossey compression (JPEG) when capturing digital photographs. However, POISU and FAVIAU recognize that many digital cameras currently in the field do not allow the user to record images in anything other than JPEG. In such circumstances, photographers may be able to compensate for the negative impact of lossey compression by:

I. Adjusting their digital camera's capture settings to the "highest quality possible".

II. Because many digital cameras give the user the ability to select the output size of their files, FBI photographers and users should select the largest possible picture size (i.e., most pixels) so that the most data possible can be recorded. When images are recorded at the largest possible image size and highest quality setting (or lossless), more data and fine detail is captured, making it possible to capture and produce a better quality image.

III. In situations where you cannot capture images that are both large and uncompressed, it is recommended that a smaller image be captured, with little or no compression, rather than the other way around. This suggestion is based on the argument that by selecting a smaller image size,
you are merely changing the resolution at which you capture an image (and are in control of that resolution), whereas with more compression, the control over what is lost is left to the camera software (i.e., not in your control).

1. **CAPTURE**

a. **Best Quality Settings:** Capture of imagery should be obtained using the best quality available as dictated by the circumstance of the equipment and situation at hand (see Background on Digital Versus Film in above section).

b. **Verified Date & Time Settings:** Prior to the commencement of a new photographic assignment, the user should ensure that the correct date and time are set on the capture device, if that option is available. The correct date and time should be checked and verified each time new or recharged batteries are inserted into the camera. The correct date and time should be verified before each use even if the user has NOT selected to have the date and time imprinted on each image because the date and time of creation of each image (as set in the camera) is frequently imbedded into the data file which comprises each captured image.

c. **Format Camera Media Prior to Each Assignment:** Best practice dictates that prior to photographing any assignment, the storage media should be formatted to begin with a “clean slate.” Formatting of digital camera storage media should only be done in the camera in which the media will be used. If that option is not available, imagery relating to different investigations or subject matters should be kept separate from each other by the best means possible. Typically, it is recommended that each assignment be recorded to separate media (e.g. one SONY memory stick per subject matter or case). Digital cameras commonly create a serial N+1 indexing system and embed each image number into the data file comprising each image. Today, it is not uncommon for defense counsel to request copies of the electronic data files which comprise the digital images. With little effort, defense counsel may quickly determine that images received in discovery were generated out of sequence and demand interim generated images even if unrelated to the prosecution of their cases.

e. **Photo Log Recommended:** Just as in film-based photography, a written photographic log should be maintained for all evidentiary images recorded. The numbering of the log should correspond to the file number and date and time of the image. Best practice dictates that for each new session, the camera image file numbering sequence should be reset to 1 (one) if possible.
f. **Non-Deletion of Images:** To preserve the integrity of the photographic process, there should be **NO** deletion of images during the course of the mission/investigation; this includes the last image captured. Images that were inadvertently taken or are of poor quality should be noted on the photographic log and left intact on the storage media to preserve the continuity of the session.

2. **STORAGE**

The following guidelines for storage and archiving of digital imagery are intended solely for images that are captured by FBI personnel and do not apply to cameras, storage media, or any other digital image or device that has been obtained as a result of a search and seizure or electronic surveillance activity/operation. Any item meeting this criteria should be handled as digital evidence and processed by appropriately trained persons familiar with SOPs for Digital Evidence.

a. With the exception of capture devices that write directly to optical media (e.g. SONY Digital Camera with internal CDR capability), the internal removable/reusable storage media is not to be considered the permanent storage platform for archiving original images. In most instances, the interim storage media internal to the digital capture device was neither designed for or intended to serve as a final or permanent record of the captured image and may be subject to over-writing, alteration or corruption while residing in that medium.

b. As soon as practicable after the photographic assignment is complete, the original image files should be downloaded to an optical storage device such as a write-once CD-R or DVD.

   i. Image files should be downloaded to a new blank CD/DVD via one of the following approved methods:

      1. Remove the media from the camera and use a stand-alone CD/DVD writer which is capable of directly reading the digital camera's media (e.g. CD writer which has ports for Sony memory sticks or CompactFlash, etc). **THIS IS THE OPTIMAL METHOD FOR TRANSFER AND ARCHIVAL TO PERMANENT STORAGE.**

      2. Insert the media into a reader that is attached to a computer and download the files directly to the CD/DVD. Users should avoid using computers which are also programmed with image manipulation software (e.g. Adobe Photoshop) for this purpose as some such software is known to have default settings which will may impact and override the default features native to your camera's image data file. If the subject camera came with the manufacturer's software...
which controls the download and write CD process, it may be preferential to use that software, but users should closely examine the reference material to determine the impact of such software settings.

3. Download the images to a folder on a computer hard drive and write to the CD/DVD (this option should only be used when computer interface from media to CD will not allow for a successful write session.)

ii. The write session and CD/DVD should be closed and/or finalized to prevent the addition to or changing of files after the initial writing session. Multiple writing sessions are not permitted on a single CD/DVD.

iii. The image files should be viewed from the written CD/DVD to ensure that the files were successfully downloaded. Only upon successful verification should the camera storage media be reformatted for future use.

c. Upon completion of the successful write session, the images on the disc will be considered the ORIGINAL for purposes of evidence storage and accountability.

d. Prior to making copies, the ORIGINAL should be labeled with the case file number, date, and photographer’s initials. As a best practice, the disc should be labeled using a permanent felt tip pen specifically manufactured for labeling optical media, using the outer edge of the disc as the proper area to record the label information.

e. To further identify the ORIGINAL disc, the volume/serial number imprinted on the disc hub should be recorded on the 1A, photographic log, and any other location deemed appropriate.

f. Using the same recording method as stated above, a second download of the originals should be created and labeled as the BACKUP OF ORIGINAL along with the case file number and date.

g. Once labeled, the ORIGINAL should be enclosed in the 1A envelope; the BACKUP OF ORIGINAL should be placed in a separate envelope and attached to the 1A as the designated backup to be used for creation of additional working copies. The original should only be used for courtroom purposes.

2 Some “Sharpie” permanent markers use chemicals which have been known to impregnate the surface of disc media and corrupt stored files over time.
h. A number of copies sufficient to support case requirements should then be created and subsequently labeled as WORKING COPY along with the case file number and date. It is recommended that the WORKING COPY label reference the case file number and a brief warning: "WORKING COPY ONLY - NOT TO BE USED AS EVIDENCE. SEE ORIGINAL DISC [volume/serial number]" These working copies shall be used for viewing, managing and printing of the image files during investigation. The output (printing or display) of images for trial or evidence introduction should be produced from the ORIGINAL disc.

3. TRAINING

Personnel not familiar with the skills necessary to perform the above stated operating guidelines should ensure that they receive proper training from their program managers to maintain consistency with stated policies and guidelines.

There exists a wide array of digital capture devices of varying quality possessing a range of options and settings. FBI personnel using digital imagery should find, read and preserve for later reference (and possible production at trial) all manufacturer instruction manuals and references associated with such devices PRIOR TO USE.

Oversight of all photographic programs and policies is the responsibility of the POISU. Any development of additional guidelines dealing with photographic operations should be coordinated with POISU personnel to maintain consistency with existing policies.

4. DEVIATIONS

Any deviations from the guidelines described herein must be approved by POISU management prior to engaging in the deviated activity.