



Admissibility of Digitally Scanned Images

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Admissibility of Digitally Scanned Images

Executive Summary

The Best Evidence Rule requires that the original document (Exhibit A) be admitted into evidence if it is available.¹ Unless it is fraudulent, the original writing becomes primary evidence and is admissible without objection.² A “duplicate”³ or copy of a document, produced by methods ensuring accuracy and precision, is given the same status as an original unless there is a question as to its authenticity.⁴ If there is no question as to the authenticity of the duplicate, the duplicate is “admissible to the same extent as the original”.⁵ *This rationale applies to every document, no matter how it is duplicated.*

Every duplicate image, no matter whether it is photocopied, faxed, scanned, or compressed through lossless, lossy or visually lossless compression is not an *exact* image of the original paper document. It is an *approximation* of the original image. Photocopies do not capture each and every dot on the page of the original; neither do documents that are faxed, scanned or compressed and printed. The lossless method will preserve each and every dot of the scanned image. The visually lossless method will recognize a pattern and store the pattern once; however, if there is an extra dot in a pattern later in the document, it will not reproduce that extra dot onto the electronic image. Like the lossless method, no visually perceptible dots are lost *after* the scanning process. Lastly, the lossy method will output a document that has visually perceptible loss. For documents imaged through a lossless or visually lossless compression scheme, the context of the documents is not changed in any way, shape or form. The only difference is that lossless stores and reproduces every dot, and visually lossless stores a recognized pattern once and remembers where that pattern needs to go on a page. This does not impact upon the evidentiary use of the document. The authenticity of duplicates, which are an accurate reflection of the original documents, is accepted as evidence in most state and federal courts. The Federal Rules of Evidence do not require that a duplicate be exact. The legal standard involves a showing of “authenticity” and whether the “techniques [used] accurately reproduce the original.”⁶ A digitally scanned image meets the threshold definition requirements of a duplicate. Therefore, it should be admissible unless there is a question as to its authenticity.

¹ See Fed. R. Evid. 1002.

² *Id.*

³ See Fed. R. Evid. 1001(4).

⁴ See Fed. R. Evid. 1003.

⁵ *Id.*

⁶ Compare Fed. R. Evid. 1001(4) and 1003.

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Technical Background – Data Compression Types

Photocopy Duplicates: Courts often admit photocopy duplicates into evidence. Photocopies (Exhibit B) are made by placing the original document into a copy machine and creating an electrostatic image. The copy machine cannot capture every dot on the original page and during the photocopying process pixels are lost. The tools needed to reproduce an image with exacting precision would be extremely impractical or impossible to manufacture. The image is then transferred to paper. Image quality is also affected by the original quality of the document, i.e. the original document may be a pencil, which is not easily copied. Likewise, the image can be adjusted by reducing or enlarging the original and by lightening or darkening the original. Furthermore, the image can degrade when copies are made from copies. Each successive copy will lose more pixels. All photocopies *approximate* the original because not every dot is reproduced; however, the higher the “dots per inch” (dpi) the better the *approximation* to the original image.

Data Compression Duplicates: Data compression enables devices to store and transmit data in a cost effective manner. The goal of data compression is to represent information as accurately as possible using the fewest number of bits. “Data compression methods rely on removal of predictable structure from a data stream. If any portion of the data stream is predictable, that portion need not be stored.”⁷ “The degree of compression is therefore dependent on having a good model of prediction for the data to be compressed. All data compression methods include such a model, at least implicitly.”⁸

For example, Chris and Paul are on the telephone and Paul is asking Chris to draw squares on a piece of paper. They know that a square has 4 sides of equal length, and that they could save time and effort by simply providing the length of one side of the square. In this case, as in compression, no information is lost. They know that they can extrapolate the other three sides without losing information. This is data compression; they know the length of one side of the square and store this measurement in their brains just once.

Image compression can be divided into three categories. The first, the degrading lossy method, i.e. Joint Photographic Experts Group (JPEG) and Moving Picture Experts Group (MPEG), introduces perceptible changes to the image. Second, the non-degrading lossless compression method introduces no changes whatsoever to the image, i.e. TIFF Group IV. Third, the non-degrading visually lossless compression method introduces no visually perceptible changes to the image. Each compression method will be discussed in turn below.

⁷ *Technical Overview of Cartesian Perceptual Compression* (1998-1999) at <http://www.cartesianinc.com/Tech/tech-overview.html#modeling>.

⁸ *Id.*

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Lossy Methods

Lossy compression is a data compression technique in which some amount of data is lost. "In lossy data compression, the decompressed data need not be exactly the same as the original data. Often, it suffices to have a reasonably close approximation."⁹ "Lossy compression technologies attempt to eliminate redundant or unnecessary information" such as individual dots.¹⁰ Lossy compression does not delete entire words or change the context of a document. Like the example of duplicating the square above, it merely extrapolates the length of the other three sides. Paul and Chris have to round the measurement of the square at some level, i.e. is it 1 meter, or 1.1 meters, or 1.099 meters or 1.099999999999 meters, etc. In a perfect world, they could be infinitely precise with the measurements, to an infinite degree. However, in the interest of saving time and sanity, they have to round off the measurement at some level. Images further degrade when they have been compressed, uncompressed and recompressed in succession, because they are losing pixels in each iteration. Some examples of this method are facsimiles, scanned images and JPEG.

Scanned Images: "Imaged" or "scanned documents" are created by running the original paper copy through a scanner that is connected to a computer. The scanner stores the image as an electronic representation of the original image. The electronic representation is a series of dots that closely approximate the original image. Because it is an approximation, the precision by which the image is represented is reduced to some degree.

In order to maintain a manageable file size, most people scan documents at 200 to 300 dpi. "While the resolution is adequate to fully reproduce the image, *some dots from the original will not be reflected in the duplicate*. While this may seem to be a major obstacle, other technologies such as microfilm or other duplication methods also fail to reproduce every dot contained in the original, but generally reproduce enough dots so that the image appears complete and readable. In fact, the quality of a digitized image may exceed the quality of a microfilm image."¹¹

Of course, the higher the dpi, the better the approximation of the imaged document to the original paper documents. Once they are scanned all images lose information; however, this information does not change the content or meaning of the document. The information that is lost is visually imperceptible to the eye, in that minuscule dots are lost. All documents that are scanned are inherently lossy, because they must first be scanned and will lose information during the scanning process.

⁹ Nam Phamdo, *Theory of Data Compression* at <http://www.data-compression.com/theory.html>.

¹⁰ See Webopedia at http://www.pcwebopaedia.com/lossy_compression.htm.

¹¹ Skupsky, D., *Legal Status of Optical Disk and Electronic Imaging Systems*, 1993 (emphasis added).

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Facsimile: The Comité Consultatif International Téléphonique et Télégraphique (CCITT) is an organization that sets international communications standards. CCITT has defined many important standards for data communications, including the protocol for faxing documents. Group 3 is the “universal protocol for sending fax documents across telephone lines.” Facsimiles (Exhibit C) are created through a two-step process. First, the original document is digitized by a scanner, which then generates a bitmap in a manner identical to the methods used in a scanned document.¹² At 300 dpi resolution, “a letter-size page will comprise some one million bytes of data. Because of the large quantity of data thus derived, a second stage of compression is typically applied to the image. When the process is reversed through decompression and printing, *the resulting image is not identical to the original because the scanning process introduces quantization error.*”¹³

JPEG: JPEG is a lossy compression technique for color images. “Although it can reduce files sizes to about 5% of their normal size, some detail is lost in the compression.”¹⁴ “JPEG is lossy because it is subject to round off errors in various calculations. Round off errors alone are nearly always too small to be seen, but they will accumulate if you put the image through multiple cycles of compression.”¹⁵

Additionally, as with other degrading compression methods, loss accumulates with repeated compression/decompression. “In general, recompressing an altered image loses more information. Hence it's important to minimize the number of generations of JPEG compression between initial and final versions of an image.”¹⁶ Unfortunately, visually lossless images have acquired a bad reputation due to compression methods, such as JPEG, which introduce *perceptible* changes to the image.

Lossless Compression

Lossless refers to data compression techniques in which no data is lost. The compression used in standard Group 4 TIFF files (Exhibit D) is another example of lossless compression. Lossless compression reconstructs the original scanned version of the image exactly. For example, an original document is scanned and stored. Through lossless compression the image is reproduced, dot by dot, exactly as each dot is perceived by the imaging. Lossless compression

¹² See Webopedia at <http://www.pcwebopedia.com/CCITT.htm>.

¹³ *Technical Overview of Cartesian Perceptual Compression* (1998-1999) at <http://www.cartesianinc.com/Tech/tech-overview.html#modeling> (emphasis added).

¹⁴ See Webopedia at <http://www.pcwebopedia.com/JPEG.htm>.

¹⁵ JPEG Image Compression FAQ, Part 1/2 at <http://www.cis.ohio-state.edu/hypertext/faq/usenet/jpeg-faq/part1/faq-doc-13.html>.

¹⁶ *Id.*

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techniques cannot reduce the amount of data needed to represent the image to the same degree as lossy or visually lossless compression.¹⁷ Hence the name “lossless” – images are reproduced exactly as they appeared on the original, minus any dots lost in the scanning process, and are without “loss.”

Visually Lossless Non-Degrading Images

Since lossless compression cannot reduce the amount of data needed to represent the image to the same degree as lossy compression, to achieve greater compression one must use a visually lossless compression technique. Visually lossless refers to data compression techniques in which a scant amount of data is lost. It is important to note that the minute amount of data that is lost is *visually imperceptible*.

Non-degrading lossy or visually lossless (Exhibit E) compression technology attempts to eliminate redundant or unnecessary information, such as dots. Visually lossless compression produces a document that visually appears to be the same, but has minute differences.¹⁸ For example, an original document is scanned and stored. Through visually lossless compression the document is reproduced. However, instead of storing dot for dot, the compression scheme looks at the document and finds repeating patterns. Returning to the example of the duplicating the square, mentioned above, Paul is now asking Chris to draw several squares, triangles and circles on a page. Every now and then one of the squares to be duplicated has a single side with a line 0.5 millimeter longer than the others. They could save even more time in their duplicating process by just ignoring the 0.5 millimeter difference and calling it a square because the difference was probably an error in the original drawing of the square anyway. Even if it was not an error, a 0.5 millimeter extension on the line is pretty much imperceptible to a person looking at the picture.

This would work in document imaging as follows. The small letter “a” appears 50 times on the page of the original document. The visually lossless software will then store the small letter “a” *once* and use it again and again to replace the other 49 occurrences of the letter “a” on the page of the original document. If the last letter “a” on the page has an extra dot on the tail of the character, the extra dot will not be there when the character is printed. Why? Because the “a” that was stored in the system was not the one with the extra dot on the tail. The human eye *will not* perceive this minute detail. The name “visually lossless” arises from the fact that the human eye will not perceive these microscopic details.

¹⁷ See Webopedia at http://www.pcwebopaedia.com/lossless_compression.htm.

¹⁸ See Webopedia at http://www.pcwebopaedia.com/lossy_compression.htm.

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Legal Background - The Federal Rules of Evidence

In order to better understand the admissibility of images produced through data compression, one must understand the Federal Rules of Evidence, and how all copies of documents, no matter how the documents are copied or imaged, are admitted as evidence.

Hearsay: Hearsay is defined as a statement, made out of court, offered in court for the truth of the matter asserted.¹⁹ Hearsay objections can be applied to all types of documentary evidence; they are not unique to digital images. Standards for admitting business records despite the rule against hearsay evidence focus judicial attention on inherent reliability. The business records exception to the hearsay rule recognizes that certain records were created and relied upon in the regular course of business.²⁰ Therefore, the business records *prepared in the usual course of business* possess a certain circumstantial probability of trustworthiness and should be received in evidence. “It should be noted that computer business records prepared for litigation ordinarily are not admissible under the Business Records Act or Rule 803(6) because they fail the test of being ‘created for motives that tend to assure accuracy.’ *United States v. Sanders*, 749 F.2d 195, 198 (5th Cir. 1984).”²¹

Foundation: Once the hearsay hurdle has been overcome, a foundation must be laid. Laying a foundation is the practice or requirement of introducing evidence of things necessary to make further evidence relevant, material or competent.²² In the case of business records, one must prove that the business records are what they purport to be, that is, records prepared in the ordinary course of business. Since business records are not normally self-proving, a foundation must be laid by calling the custodian of records to the stand to testify. For the business records to be admissible, the following foundational facts must be established through either the custodian of the records or another qualified witness: (1) the records must have been made or transmitted by a person with knowledge at or near the time of the incident recorded; and (2) the record must have been kept in the course of a regularly conducted business activity.²³ “[B]ecause electronic files are particularly susceptible to purposeful or accidental alteration, or incorrect processing, laying a foundation for their admission must be done with particular care. Proper control over creation and maintenance of these files can be crucial in overcoming objections that will be raised in the courtroom.”²⁴ Once a foundation has been laid, the document must be authenticated.

¹⁹ See Fed. R. Evid. 802.

²⁰ See Fed. R. Evid. 803(6).

²¹ U.S. Dept. of Justice, *Admissibility of Electronically Filed Federal Records as Evidence* (1991).

²² *Blacks Law Dictionary* (Bryan Garner, Becky McDaniel and David Shultz eds., 7th ed. 1999).

²³ See *Kennedy v. Los Angeles Police Dept.*, 901 F.2d 702, 717 (9th Cir. 1990).

²⁴ See *supra* note 18.

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Authentication: Every tangible item offered as evidence is subject to a challenge regarding its genuineness. “The requirement of authentication or identification as a condition precedent to admissibility is satisfied by evidence sufficient to support a finding that the matter in question is what its proponent claims.”²⁵ In other words, authentication is the process of proving that a document is what it purports to be, and that the proffered writing is not a forgery. All documents must be authenticated, whether they are originals or duplicates.²⁶

Best Evidence & Originals: A document will be placed into one of two categories: it is either an original, or a duplicate. The “best evidence rule” requires that an original writing, recording or photograph be used before a secondary source can be admitted.²⁷ The original must be presented unless a satisfactory reason is presented for the unavailability of the original.

The Federal Rules of Evidence define “writings and recordings” as consisting of “letters, words, or numbers, or their equivalent, set down by handwriting, typewriting, printing, photostating, photographing, magnetic impulse, mechanical or electronic recording, or other form of data compilation.”²⁸ “Original” is defined as “the writing or recording itself or any counterpart intended to have the same effect by a person executing or issuing it.” If data are stored in a computer or similar device, any printout or other output readable by sight, shown to reflect the data accurately, is an ‘original.’”²⁹ The original document becomes primary evidence and is admissible without objection. Like hearsay objections, best evidence objections can be applied to all types of documentary evidence; they are not unique to digital images.

Duplicates: If the original document is unavailable, a duplicate may be entered into evidence, provided that the unavailability of the original document is adequately explained. A “duplicate” is defined as a “counterpart produced by the same impression as the original, or from the same matrix, or by means of photography, including enlargements and miniatures, or by mechanical or **electronic re-recording**, or by chemical reproduction, or **by other equivalent techniques** which accurately reproduces the original.”³⁰ The definition of duplicates describes “copies” produced by methods possessing an accuracy that virtually eliminates the possibility of error. Copies thus produced are given the status of originals in large measure by Rule 1003.³¹

²⁵ See Fed. R. Evid. 901(a).

²⁶ Some documents are “self-authenticating.” The following documents are considered self-authenticating and extrinsic evidence of authenticity is not a condition precedent to admissibility: (1) Domestic public documents under seal; (2) Domestic public documents not under seal; (3) Foreign public documents; (4) Certified copies of public records; (5) Official publications; (6) Newspapers and periodicals; (7) Trade inscriptions and the like; (8) Acknowledged documents; (9) Commercial paper and related documents; and (10) Presumptions under Acts of Congress. Fed. R. Evid. 902(1)-(10).

²⁷ See Fed. R. Evid. 1002.

²⁸ See Fed. R. Evid. 1001(1).

²⁹ See Fed. R. Evid. 1001(3).

³⁰ *Id.* at 1001(4) (emphasis added).

³¹ See Fed. R. Evid. 1001 Advisory Committee Notes, 1972 Proposed Rules.

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Pursuant to Fed. R. Evid. 1003, duplicates are admissible, to the same extent as an original unless:

- (a) a genuine question is raised as to the authenticity of the original; or
- (b) in the circumstances it would be unfair to admit the duplicate in lieu of the original.³²

The potential for fraud exists with all copies, no matter how the original document is duplicated.

³² See Fed. R. Evid. 1003.

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Digitally Scanned and Compressed Images Are Admissible

Unfortunately, the legal authority regarding the admissibility of digitally-scanned images reproduced through compression, whether lossless or visually lossless, is virtually non-existent. The rules for authentication of computer-generated evidence are evolving from rules that apply to documents whose only existence was always on paper. Therefore, the application of rules of evidence to computer-generated images requires an exercise in analogizing computer-related processes to those that pre-dated the computer's ability to reproduce images. The rules remain the same for admitting photocopies and their electronically compressed and imaged counterparts.

The Rules of Evidence apply to all documents, no matter how they are imaged and/or compressed: Before any document may be admitted the "Best Evidence" Rule, Fed. R. Evid. 1002, requires it to be classified as either an original or a duplicate. Categorizing the document determines its admissibility as evidence. Regardless of its classification, *a duplicate document, no matter how it is duplicated, should be admitted if the litigants do not question its authenticity.*³³

Initial Evidentiary Hurdles: In order to have computer generated documents introduced as evidence at trial, no matter how they are imaged or compressed, one must first overcome the hearsay objection. In most cases, the business records exception will apply to any documents created during the ordinary course of business. Second, a foundation must be laid. The custodian of records will have to testify that (1) the original document was made or transmitted by a person with knowledge at or near the time of the incident recorded; and (2) the original document has been kept in the course of a regularly conducted business activity. Third, the document must be authenticated. Best evidence requires that the original document be used. If the original is unavailable and its unavailability is sufficiently explained, a copy can be used in lieu of the original. If the authenticity of the document is not challenged, the document will be admitted into evidence. However, opposing counsel can challenge the authenticity of the document and object to introduction of the document into evidence. First, counsel could object because the document is a fake or a forgery.³⁴ In this instance, counsel would most likely have the author of the document testify that in fact, that is what he or she composed. Second, counsel could object on the grounds that the copies are not accurate reflections of the originals, because the technology used to replicate the original lost some of the information in the course of processing the document. "Even when accuracy is not conceded, courts routinely accept

³³ See Fed. R. Evid. 1003. See also, *United States v. Stockton*, 968 F.2d 715, 719 (1992) (photograph of DEA agents' notes admitted as a duplicate image).

³⁴ This issue will not be addressed fully in this memorandum, because it does not concern the issue of admitting duplicates of documents generated through modern day technology.

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duplicates as a convenience to the court and the parties unless there are persuasive reasons for rejecting the evidence.”³⁵

All duplicates lose a certain amount of information during the duplication process: Duplicate images are produced through a variety of methods. Some antiquated methods of duplication, such as photocopies, are commonly admitted into evidence.³⁶ Since the advent of the photocopy machine, greater strides have been made with technology for imaging and storing original documents, including facsimile machines, TIFF imaging, and the compression of digital images for storage and reprint.

All duplicated documents lose some amount of information from the original. Photocopies and facsimiles have long been received by the courts as an acceptable duplicate as long as there is no dispute as to the authenticity of the document.³⁷ Moreover, photocopying is a visually lossless process; dots on the page are lost, but there is no perceptual loss. A copy made from a copy made from a copy, and so on, degrades the quality of the image with each copy that is made from the preceding copy. That is because with each reproduction of the copy more dots are lost, so the dots steadily decrease with each successive copy. With photocopies, as well as all duplicate copies, manually altering the document is possible either through redacting information with “white-out” and recopying or performing a “cut-and-paste job.” As long as there is no dispute as to the material contents of the document, i.e. that it has been altered or is a forgery, it is admitted into evidence. The authenticated copy is admitted into evidence even if it is a poor copy and/or has lost dots, the absence of which is visually imperceptible.

Another commonly admissible document, the image produced by a facsimile machine, is the product of compression technology used to store images. Fax machines commonly transmit documents by sending a digitized version of an original document over telephone wires. Another fax machine at the receiving end converts the digitized information into a reproduction of the original. Like photocopies, courts routinely accept the admissibility of facsimile documents. Given that facsimile documents are the result of an analog-to-digital conversion, and all analog-to-digital conversions are inherently lossy, these documents are, in fact, lossy reconstructions of the original images (hence the name “facsimile”). Anyone who has misread a telephone number on a low-resolution fax is aware of the lossiness of such images.

Like photocopies, facsimiles are susceptible to external changes. It is possible to alter a document considerably before it is faxed. The fear of such alterations creates doubts regarding the authenticity of the faxed document. Although the faxed product is reputed to be an exact

³⁵ Weinstein’s Federal Evidence, § 6-1003 (2002) (footnote omitted).

³⁶ See, Fed. R. Evid. 1003 & 1001(4).

³⁷ See, Fed. R. Evid. 1003.

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replica of the originally transmitted document, the original document itself could be a “cut-and-paste job,” appearing to be one whole document when faxed. For changes to go undetected, the document need only be photocopied and faxed. As long as there is no dispute as to its material contents, the document is admitted into evidence, even if it is a poor facsimile and/or has lost dots, the absence of which is visually imperceptible.

With a lossless scheme, an image is scanned and dots are lost through the scanning process. However, once the image is compressed and decompressed the image will be an exact duplicate of the scanned image.

Similarly, with a visually lossless compression scheme no visually perceptible dots are lost after the image has been scanned. The only types of dots that are lost are “extraneous information,” i.e. the extra dot on the tail end of the 50th letter “a” or the extra 0.5 millimeter on the side of the square. However, the eye does not perceive this change, and the original scanned document appears to be the very same as the visually lossless document.

Lastly, when a lossy compression scheme is used the image can lose dots when it is compressed and uncompressed, and the duplicate image can be noticeably different to the eye.

It is, of course, crucial to use a non-degrading method for document image processing applications. Degrading methods, such as those based on eliminating high-frequency information (smoothing methods, discrete cosine transform methods such as JPEG, etc.) are not appropriate, as the process of compression and decompression perceptibly degrades the image beyond the degradation introduced by the digitization process itself. Repeated rounds of compression and decompression with such methods can further degrade the image.³⁸

Since the scanning process itself introduces some error, there is no reason to prefer a lossless method over some other non-degrading visually lossless method. With visually lossless compression there is no perceptible distinction between the reconstructed image and the original. Because visually lossless compression takes into account perceptual factors, the reconstructed image is perceptually indistinguishable from the original.³⁹

Document processing inevitably introduces some error into the image, regardless of whether the second-stage compression method itself introduces any error. As long as the overall error is *perceptually benign*, this is not a problem, as this benign error does not affect the content and therefore the authenticity of the document. Indeed, the compression stage itself could introduce

³⁸ See *supra* note 18.

³⁹ *Id.*

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error, as long as there are no perceptible artifacts of this error. Whether you copy a document using a scanner, copier, or fax machine, the reproduction is inherently lossy to some degree. This is because these methods must *approximate* the original image.⁴⁰ A scanner or a fax machine approximates because each has to translate the image into a fixed number of 1's and 0's. The photocopy machine approximates because the little balls of ink it uses to copy the image are of a fixed size that is larger than the microscopic curves and specks of ink on the original paper. So technically both of these are "physically" lossy, in light of the fact that they cannot reproduce the *exact* image because of physical limitations of the equipment.

Finally, the proof is in the pudding. Compare Exhibit A, the original document, to Exhibit B, the photocopied document. The photocopied document appears "lighter" in color and has visually perceptible changes, such as a loss in sharpness of the photographs, as well as a loss in sharpness of the "gray scale" box to the left of each photograph. Now compare the original to Exhibit C, the faxed copy. Again, there are visually perceptible changes, such as (1) the letters are "fuzzy," (2) the letters are compressed in order to fit into the faxable area, (3) there is a fax line heading at the top of the page, and (4) the photographs are not discernable. Now compare Exhibit D, the lossless TIFF image of the document, to the original. There are virtually no perceptible changes. Next, compare Exhibit E, the visually lossless document, to the original. Again, there are virtually no perceptible visual changes. In fact, upon comparing the lossless Exhibit D to the visually lossless Exhibit E, the two look remarkably similar and, to these writers, are impossible to distinguish.

Remedial Measures: Prior to the advent of the widespread use of computers, the presumption was that any documentary evidence would exist on paper and authentication lay in the testimony of the document's author or in verification of a signature.⁴¹ Like all other documents, laying a foundation for the admissibility of records produced by an information technology system requires a showing that the records are authentic and genuine. In particular, printouts of the records must be shown to be accurate representations of the original documents used to create them.

If counsel questions the digitally imaged authenticity of the duplicate documents or fails to enter into a stipulation regarding the authenticity of the documents, then the custodian of records for the business must be called to testify as to the authenticity of the collection of documents. Additionally, a systems analyst may be called to testify regarding the compression

⁴⁰ See 31 Wright, *et al.*, Wright & Miller Federal Practice and Procedure § 7167 (2000), "The question is whether the scanner or other device is an 'equivalent technique which accurately reproduces the original.' . . . [W]here data in a computer is copied onto storage media, such as a disc, it is a duplicate of the data copied. This is because the computer has created a 'counterpart produced by electronic re-recording or by equivalent technique which accurately reproduces the original.' The stored data is not an original under Rule 1001(3) because the data on the disc is not 'readable by sight.'"

⁴¹ David Bender, *Computer Evidence Law: Scope and Structure*, 1 Computer/L.J. 699, 714 (1979).

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of the data and the quality of the images produced. Further, a witness may be called to testify regarding the procedures for inputting the information into the computer. Lastly, it may be necessary to produce the originals to the court to prove that the data has not been altered in any way and that the processing of the images has not materially altered the contents of the writings.⁴² In summary, as long as the parties “provide sufficient facts to warrant a finding that the records are trustworthy and the opposing party is afforded an opportunity to inquire into the accuracy thereof and how the records were maintained and produced, a proper foundation has been established.”⁴³

⁴² See *United States v. Coleman Beeler*, 62 F. Supp. 2d 136, 149 (D. Me. 1999) (admitted enhanced version of surveillance tape which adjusted the contrast and brightness of the images and enlarged portions of the still frames).

⁴³ *United States v. Briscoe*, 896 F.2d 1476, 1494-95 (7th Cir. 1990), citing *United States v. Croft*, 750 F. 2d 1354, 1365 n.7 (7th Cir. 1984).

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Conclusion

“There is no reason to be concerned that well-designed electronic records systems present any new problems with admissibility of electronic records under the rules of evidence.”⁴⁴ The advance of technology is pushing one of our oldest legal concepts to its limit. The concept of an “original” document is quickly becoming an anachronism. In most areas of the law involving any type of document, the requirement of an original document has been basic doctrine – until now. Fear of fraud, together with the desire for authenticity, have supported this requirement of “originality.” In earlier times, it was a relatively simple task for an expert to distinguish between the authentic and the phony. Now, technology has eroded the ability to determine what is original or authentic, and even experts can have difficulty in detecting tampering. As a result, technological innovations in the imaging of documents and the compression of documents for storage may hasten the demise of rules that mandate “originality.”

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⁴⁴ Perritt, Henry, H. Jr., *Symposium: Electronic Records Management and Archives*, 53 U. Pitt. L. Rev, 963, 998 (1992).

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