Guide to the Optical Imaging Rules

1. Introduction

This guide advises government agencies about the selection, purchase, implementation, and use of optical imaging systems. It includes recommendations and standards that have been developed by a wide range of organizations, both technical and end-user. This guide is designed to help government agencies acquire optical imaging systems that meet existing legal and operational requirements. Use of this guide will not guarantee an optical imaging system's integrity, but it will help demonstrate the users' good faith in employing the best existing standards in this field.

This guide is not a replacement for the Optical Imaging Rules (PDF) that were promulgated under the Records Media Act (Public Act 116 of 1992, amended 2001). Rather, it should be used in conjunction with the Rules when making decisions regarding the use of optical imaging systems for public records. The creators of this guide recognize the timely and fast-changing nature of information technology. Therefore, this guide is a living document, subject to change and improvement, like the technology it discusses.

Optical imaging systems are computer-based systems that store digitally-encoded images of paper or microform documents. These systems provide image retrieval and distribution on demand. They are an alternative to paper or microfilm record-keeping systems. Optical imaging systems should not be confused with electronic document management systems (EDMS). EDMS may store and provide access to digital images, but they often have many additional features such as workflow, version control and secure access.

Optical imaging systems pose special retention issues for government agencies, because the technology makes the long-term and archival retention of records extremely complicated. In fact, optical imaging technology is not designed to be a record retention device. Rather, it is intended to deal with active and short-term access to records. This is why the Optical Imaging Rules and this guide recommend that optical imaging technology be used for active record-keeping and not for the long-term storage of records.

2. The Records Media Act

Under the Records Media Act, Michigan government agencies (both state and local government) may officially reproduce public records by using one of four technologies: photocopying, photographing, microfilming and digital imaging. All digital images must be stored on optical disks according to this law. The legislation also mandates the promulgation of Administrative Rules to regulate the use of digital imaging technology. This guide is designed to assist government agencies with complying with those Administrative Rules.

3. Summary of the Optical Imaging Rules [1]

The following descriptions summarize each rule (Optical Imaging Rules [PDF]) and provide additional information that will help agencies understand and implement the requirements of the rules. A list of referenced documents and the addresses for obtaining them are at the end of this guide.

Rule 1. States that Public Act 116 of 1992, amended 2001 mandated the promulgation of these rules. It also introduces the intent of the rules. Agencies that are considering new optical imaging applications should educate themselves about the consequences of using this technology. The Association for Information and Image Management (AIIM) technical report entitled, "The Use of Optical Disks for Public Records" (AIIM TR25) addresses issues such as scanner performance, image resolution, image indexing, storage media, record retention requirements, hardware and software dependence, system design, and authentication. AIIM TR 25 is a good educational tool that agencies can use to learn about to optical imaging technology.

In addition, the AIIM technical report entitled, "Electronic Imaging Request for Proposal (RFP) Guidelines" (AIIM TR27) can assist agencies in the development of an RFP or an Invitation to Bid (ITB) for an optical imaging system. The report addresses issues such as project planning, budget analysis, cost justification, technical and functional requirements, and vendor evaluation. It also contains a sample RFP that agencies can use as a model.

Rule 2. Provides definitions of many terms used in the rules. Technical terms appearing in the rules have the same meaning as defined in the AIIM technical report entitled, "Glossary of Imaging Technology" (AIIM TR2).

Rule 3. Requires agencies to conduct a needs analysis before purchasing an optical imaging system. Optical imaging systems are very popular and are heavily promoted by vendors. A needs analysis will help agencies determine if they have a recordkeeping problem, and if so, whether an optical imaging system is an appropriate solution. It is possible that the recordkeeping system the agency wants to replace could be improved with tools other than an expensive imaging system. For example:

The agency may be retaining records that should have been purged long ago, because the agency has not followed its Retention and Disposal Schedule.
Maybe the files in question need to be reorganized and indexed to improve access.
Problematic records may be voluminous and rarely used, but have a 100 year retention period, and therefore, need to be microfilmed.
It is possible that adequate time was not invested in preparing records for microfilming, or that the agency's microfilm was not processed properly, and therefore is hard to use.
A well-reasoned needs analysis will help agencies decide whether or not acquiring an optical imaging system will improve the efficiency and accessibility of the agency's recordkeeping system. It should also identify some of the hidden costs associated with implementing an imaging system. Such costs may include:

The cost of converting records in the old recordkeeping system into the optical imaging system.
The cost of future system upgrades and record migrations.
The cost of staff training.
The cost of daily system maintenance.
In most cases, these costs are inevitable and substantial.

System integrators are individuals or firms that conduct needs assessments. They also design and implement systems using components from various manufacturers best suited to user requirements. They can provide ongoing training, support, and upgrades for the systems they design and install. System integrators are likely to recommend solutions that are based on standards that are open rather than proprietary. (See Rule #6 for more information about open systems.)

Rule 4. Allows government agencies to digitally image public records that they work with. However, it provides that if a public record has a retention period of more than 10 years, or has archival value, as identified on an approved Retention and Disposal Schedule, the record must also be retained on a human-readable storage medium. Human-readable storage media are paper, microfilm or microfiche. There are many digital imaging products on the market that allow an agency to simultaneously create a digital image and a microfilm image. Agencies that must retain human-readable security copies may want to investigate these products.

If agencies are required to retain human-readable copies, it is important that these records be well-organized and accessible. This may be accomplished through indexing or other file management practices. The Records and Forms Management Division, Department of Management and Budget, can assist state government agencies, and the State Archives of Michigan can assist local government agencies, with the development of an appropriate and efficient record-keeping system for electronic and human-readable public records.

Rule 5. Requires that all records related to an optical imaging system be inventoried on an approved Retention and Disposal Schedule. According to Michigan law, no public record may be destroyed without the authorization of an approved Retention and Disposal Schedule. Retention and Disposal Schedules are inventories of all records created, acquired and used by a government agency during the course of the agency's regular business. Retention and Disposal Schedules identify how long records must be retained to satisfy administrative, fiscal, legal and historical requirements. Retention periods are based not upon the method by which the record is created, but rather upon the legal, fiscal, administrative, and historical value of the information contained in the record. In addition to the fact that it is a requirement, it is beneficial to have an approved Retention and Disposal Schedule for records that will be digitally imaged because:

The agency knows if it is required to retain human-readable copies.
The schedule may authorize the agency to destroy the original records after they have been digitally imaged.

The agency knows how long it must retain the digital images and when they can be purged, which in the long-run will reduce migration costs.
Destroying records in accordance with a schedule reduces the agency's potential liability in a lawsuit or an audit, and makes the record-keeping system more efficient.
The agency knows if and when to transfer its records to the State Archives.
Rule 6. Requires optical imaging systems to use nonproprietary file formats. This reduces the agency's dependency upon the manufacturer of the imaging system for continued information accessibility. This is also why the rule prohibits the use of an encrypted software source code. The rule also requires that lossless compression be used by the imaging system. This ensures that no information about the digital image is lost when it is shrunk to save storage space.

An "open system" solution is one in which the hardware and software components are purchased from different vendors and integrated into a single system by a consultant known as a systems integrator. The open systems approach provides a maximum amount of choice to the system developer and the "end user" of the optical imaging system. Software used in an open system is "portable," which means that it can be moved to a variety of hardware platforms. The software is also "scalable," which means that a system can be sized to handle small volumes of users and records, as well as larger volumes. Open systems can be scaled up with limited disruptions to operations, including the maintenance of records.

Rule 7. Requires a comprehensive migration strategy. Computer hardware and software change at a very rapid pace, and as a result computer systems must be upgraded over time. It is essential that public records not be abandoned by obsolete hardware and software when a computer system is upgraded. A migration strategy will guide the movement of records from one generation of technology to another, as well as allow the re-creation of access tools and necessary functionality of the records' use. Migration strategies should be able to maintain the operability of the technology through upgrades of equipment and source codes, and be able to transfer the images, index and other data to the next version of technology. A migration strategy must be developed before new technology is selected. This will ensure that the new technology is capable of retaining information from the older imaging system. "Systems documentation" must describe the migration strategy, so the process can be tracked if there are questions in the future about migration accuracy.

Agencies must know how long they are required to retain public records. This can by done by referring to the agencies' approved Retention and Disposal Schedule. The retention period prescribed by the Schedule will inform the agency as to which public records stored on the imaging system must be migrated to the upgraded technology.

Rule 8. Requires adequate indexing. Otherwise, it will be extremely difficult to access the public records stored by the optical imaging system. There are many acceptable methods for indexing digital images and human-readable security copies, and agencies must investigate which will satisfy their needs. It is very important to document indexing

procedures and the index's structure, as well as to migrate the index as the images are migrated to a new computer system.

To help ensure the integrity of long-term and archival records stored by an optical imaging system, staff members should perform a visual quality evaluation of each index entry and scanned image before writing the digital image to the optical storage disk. Overall system quality control is best when the scanned image is temporarily stored on alternative media, permitting corrections through rescans as needed. Depending on the system's configuration, corrections may be performed at the scanner capture station or at designated inspection/rescan workstations. Training and supervision of the operations staff is a key factor in maintaining acceptable image and index quality.

A routine scanning quality test, as outlined in the standard entitled, "Recommended Practice for Quality Control of Image Scanners" (AIIM MS44), should be performed on a weekly or monthly basis.

Rule 9. Concerns error detection. Digital imaging technology uses two methods within the Error Detection and Correction system to minimize digital image recording and retrieval errors. The first method uses error correction codes to detect and correct data errors automatically. The second employs correction code software to determine if and when the utilization of error correction codes is approaching a critical point. Monitoring error correction status information provides an audit trail to measure the progress and degree of disk degradation. Tracking error correction trends will indicate an appropriate timetable for recopying disks.

AIIM has developed a standardized methodology entitled, "Media Error Monitoring and Reporting Techniques for Verification of Stored Data on Optical Digital Data Disks" (AIIM MS59) for reporting the error rate data to the operating system for user evaluations.

The "Write and Verify" command, available within the Small Computer System Interface (SCSI), is valuable for assessing how accurately the scanned information is transferred from the central processing unit of the computer to the optical storage disk. "Write and Verify" requires verification from the system that the digital image is correctly written to the disk and provides protection for continued access to records.

Rule 10. Addresses disk standards. Public Act 116 of 1992 allows agencies to store digital images only on optical disks. The rules require that agencies use WORM (Write Once Read Many) optical disks because images cannot be altered or deleted after they have been saved on WORM disks. WORM disks assist in protecting and authenticating the information that is stored on them. There are many types of optical disks on the market. CD-ROMs (Compact Disk Read Only Memory) and CD-Rs (Compact Disk Recordable) are types of WORM disks. However, CD-Es (Compact Disk Erasable) and CD-RWs (Compact Disk Rewritable) are not WORM disks. Files on these types of disks can be edited and deleted, making authentication difficult.

Rule 11. Prescribes labeling requirements. Optical storage disks must be properly labeled to ensure that they are identifiable and not misplaced. In addition, information about the files stored on the disks and their format will assist users who are attempting to access the digital images.

Rule 12. Concerns storage standards. Even in an optimum environment, optical storage disks are susceptible to deterioration. Adverse storage conditions, especially high humidity, can cause rapid deterioration of the media. Optical storage disks should never be stored in direct sunlight, nor placed near sources of heat.

Since the disks are affected by dust, debris and fingerprints, plastic cartridges should never be removed, and the cartridge shutter should never be opened.

Rule 13. Governs backup copies. Agencies should create backup storage copies of their digital images and indexes and store them off-site in case of an emergency. Backup disks can prevent the loss of valuable data if the system goes down or becomes inoperable due to a fire, tornado, flood or other disaster.

Rule 14. Addresses scanner testing. It is very important to test scanners on a regular basis to ensure that they are working properly and are producing quality images. Agencies need to have procedures for testing their scanner. It is also important to properly prepare records for scanning, so a quality image can be produced. This may require unfolding the record and removing staples. If possible, records of a similar size and color or shade should be scanned together so the scanner will not need to be adjusted and tested after each scan.

Rule 15. Addresses image resolution. A digitized image consists of black and white dots or picture elements (pixels) measured in dots per inch (dpi). The higher the dpi, the higher the legibility of the reproduced image. Images scanned at higher dpi rates, use more storage space on the disk and may require longer scanning times. The selection of scanning density involves a trade-off between image clarity, storage capacity, and speed. When selecting a scanner, ask the vendor to perform a quality test on a broad sampling of documents at various dpi settings so that an appropriate end-to-end throughput rate and resolution can be determined. The display resolution of the inspection/verification monitor and printer should match the scanning density of the document scanner. When scanning continuous tone images, such as photographs, maps and illustrations, use gray scale or color imaging technology. The AIIM technical report entitled, "Resolution as it Relates to Photographic and Electronic Imaging" (AIIM TR26) will help agencies select an appropriate scanning resolution. It also provides sample targets.

Rule 16. Requires audit trails. When acquiring optical imaging systems, agencies should ensure that they are capable of providing audit trails and system security. Effective audit trails can automatically detect who had access to the system, whether staff followed existing procedures, or whether fraud or unauthorized acts occurred or are suspected. Software is available for keystroke monitoring, time and date stamping, virus detection, and other controls that can be built into the design of the system.

Rule 17. Prescribes the role of a system administrator. System administrators are responsible for directing system planning, acquisition, training, maintenance, annual system reviews, and system conversion. It is very important to have one person who can coordinate these and other activities related to the optical imaging system. The system administrator must ensure that systems documentation is created, maintained, and kept up-to-date. In addition, it is the system administrator's responsibility to have the agency's Retention and Disposal Schedule updated to include the optical imaging system and all records related to its operation.

Rule 18. Addresses safeguards against abandoning records in obsolete technology. Agencies cannot risk losing access to their optical imaging system if their vendor goes out of business or fails to provide continued support of the product line. By requiring the vendor to place the source codes in an escrow account, the risk to the agency is minimized. The agency will only have access to the source codes if the vendor cannot provide the necessary technical support This protects sensitive vendor information from public disclosure. In addition, the vendor contract should require the vendor to inform the agency about any upgrades or changes to the optical imaging system or pending cessation of the product line or technical support.

Rule 19. Requires an annual review of the optical imaging system. Agencies need to conduct annual reviews of their optical imaging systems to ensure that all hardware and software are operating properly and still satisfy the agency's technical needs. The annual review should ensure that all necessary procedures are in place and are documented, and should ensure that procedures are followed as a normal course of business. In addition, the annual review should ensure that all records (indexes, master, backup and human-readable security copies) remain accessible and usable.

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[1] Significant portions of this section of the guide have been adapted from the Alabama Department of Archives and History, "Guidelines for the Use of Digital Imaging Technologies for Long-Term Government Records in Alabama," April 1997.

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4. Answers to Frequently Asked Questions about the Optical Imaging Rules

1. What are optical storage disks, and how are they different from digital imaging technology?

> Optical disks are a type of storage medium. Any electronic information can be stored on an optical disk, regardless of how it is created. Optical disks have a large storage capacity, they provide random access to information, and they are a relatively durable electronic storage medium. Computer systems that use optical disks can have very fast processing speeds and can allow multiple users simultaneous access to the same information. However, if only one computer terminal is attached to the computer system (versus a network of computers), only one person will have access to the records at a given time, and this access will be reduced by time spent imaging records.

2. What is imaging technology, and how does it relate to optical disks?

> Imaging is a process by which a paper, microfilm, photograph, or photocopied record is reproduced (by a scanner) and is turned into a digital image file. The imaging process can create a photographic image of the record, or it can be accomplished through optical character recognition (OCR). OCR is a process by which the scanner and the software read the record and interpret the letters on the page, thereby reproducing the content of the record (but not a photographic image) into the digital file. Both imaging processes are acceptable according to the rules, as long as they produce an accurate reproduction of the record. However, both processes allow the user to physically alter the content and appearance of the record. As a result, agencies must document how they created the digital image (and how they followed policies for image creation), if they need to authenticate or certify the image. In other words, the process of image creation will be analyzed when a court of law attempts to authenticate the record. Technically, digital images can be stored on any type of electronic media; however the Records Media Act mandates that Michigan government agencies to store digital images only on optical disks.

3. My paper or microfilm filing system is not very efficient. Will imaging improve my ability to access information?

> Proper indexing of images can allow simple search and retrieval of information, but good indexing is not guaranteed by the use of an imaging system. "Digital imaging and optical media applications cannot solve access problems stemming from inefficient manual or computerized information systems and practices; indeed, these applications may exacerbate existing deficiencies."[2] In fact, it can cost more time and money to index records for digital imaging than for microfilm because a series of microfilm images can have a single index entry, while each digital image must have its own index entry. However, both digital imaging and microfilm applications rely on high quality preparation work for a high quality product. Time must be invested at the beginning of an imaging project to ensure easy access to information.

4. Are optical disks a good long-term storage medium?

Despite the claimed durability of the physical disk media (many vendors claim they will last about 100 years), optical disks are by no means an ideal storage medium for the long-term and archival retention of electronic records. "While open reel tape drives can access almost any open reel tape, an optical disk can only be read by the system that created that disk. Hence, once a manufacturer moves from one system to another, there is an excellent chance that one will not be able to use the new system to gain access to the disk that was created on the older system."[3] Any electronic media used to store records with long-term or archival value will need to be continuously migrated and/or refreshed using future technology. "Laying the groundwork for near certain future migration involves planning and budgeting from the point at which the original system is acquired."[4]

5. Why would an optical disk not be the ideal medium for storing long-term or archival records?

The major storage concern about optical disks is the rapid pace of technological change. Software and hardware manufacturers improve their products and put new versions of their products on the market approximately every six months. As a result, hardware and software often becomes obsolete within five to ten years of purchase. The hardware and software may still operate after this time, but it will be very difficult to repair if it breaks down. Furthermore, manufacturers rarely design their newest product to be compatible with more than one previous generation of hardware or software. As a result, information that is stored on an optical disk today, may not be readable on technology that is created three years from now even if the vendor has not changed. "A commitment to digital imaging of information and its storage on optical disk links the agency to a technological evolution that it does not control."[5]

6. Do these rules (.PDF) allow agencies to use digital images as the sole storage format for long-term or archival records?

Digital imaging technology can be used to reproduce and store any and all public records. However, if the record has a retention period of more than ten years or archival value, digital images may not be the sole storage format. Paper and microfilm are much better long-term storage mediums, thus agencies must keep records in these human-readable storage formats for security purposes. However, imaging technology can be ideal for the active management, access and storage of short-term records. Thus, if the record does not have long-term value (ten year retention or archival), digital images may be the sole storage format. This regulation will protect valuable information, and allow maximum utilization of the new technology.

7. According to the rules, will every optical imaging system be audited?

No. Agencies are required by the rules to conduct an annual review of their systems to ensure that they are functioning properly and that all activities are documented. However, if there is a reason to suspect that an agency has violated the rules, and as a result, records

with archival value are in jeopardy of destruction, the system may be audited in an effort to protect valuable information.

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[2] National Archives and Records Administration and National Association of Government Archives and Records Administrators, "Digital Imaging and Optical Media Storage Systems: Guidelines for State and Local Government Agencies," (December 1991): 16.

[3] Fynnette L. Eaton, "The National Archives and Electronic Records for Preservation," Preservation of Electronic Formats & Electronic Formats for Preservation, ed. Janice Mohlenrich, Fort Atkinson, Wisconsin: Highsmith Press, (1993): 46.

[4] National Archives and Records Administration and National Association of Government Archives and Records Administrators: 15.

[5] Ibid.

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6. Additional Resources

The following organizations and institutions can provide government agencies with additional information about optical imaging systems.

Association for Information and Image Management (AIIM)
1100 Wayne Avenue
Silver Spring, Maryland 20910
(301) 587-8202
http://www.aiim.org/

Association of Records Managers and Administrators, Inc. (ARMA International)
4200 Somerset Drive, Suite 215
Prairie Village, Kansas 66208
(800) 422-2762
http://www.arma.org/

National Archives and Records Administration
7th Street and Pennsylvania Avenue, NW
Washington, DC 20408
http://www.nara.gov/

National Association of Government Archives and Records Administrators
http://www.nagara.org/

Records and Forms Management Division
Office of Support Services
Department of Management and Budget
P.O. Box 30026
Lansing, Michigan 48909
(517) 335-9132

State Archives of Michigan
Michigan Historical Center
Department of History, Arts and Libraries
702 W. Kalamazoo St.
Lansing, Michigan 48918-1837
(517) 373-1408
http://www.michiganhistory.org