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The Conversion of Electronic Records to Microfilm

Introduction

Using the Kodak Document Archive Writer i9620 (DAW) and/or the Staude SMA 51 File Converter (SMA 51), the State Archives of North Carolina is able to offer a fee-based service that enables state and local government agencies to convert scanned images or "born digital" records—those created solely in digital form—to archival microfilm for low-cost, long-term storage and access.

The State Archives offers this service because microfilm processed in accordance with archival standards is a stable, low-risk medium that can enhance the survivability of digital files over time. Digital files are a series of 1s and 0s that need to be mounted onto hardware loaded with the correct software to make them readable to the human eye, whereas microfilm can always be read by the human eye, and is therefore protected from technological obsolescence. In addition, quality microfilm can also be used to recreate digital files should the original digital files become corrupted or destroyed.

The State Archives will only work on projects that support its primary mission to collect, to preserve, and to make available for public use historical and evidential materials relating to North Carolina. In addition, there are several technical factors that should be taken into account prior to considering digital files ready for conversion to microfilm. In order to ensure that a conversion project is properly designed, it is important for agencies to consult with their assigned records management analyst and Imaging Unit staff at the earliest stages of the project. Contact information for records management analysts can be found on our website. The Imaging Unit Supervisor, Chris Meekins, can be reached at (919) 814-6870 or chris.meekins@ncdcr.gov.

The State Archives requires that the management of scanned records follow quality assurance and quality control measures established through procedural documentation, the use of audit trails, and audits as utilized by the submitting agency pursuant to recommendations in the DCR publications **"Guidelines for Managing Trustworthy Digital Public Records"** and **"Sample Electronic Records and Imaging Policy for Use by Local and State Agencies."** These documents are located on our website. The guidelines should be consulted by any government agency that is considering the implementation of a digital imaging system, regardless of the need to convert scanned images to microfilm. Additional technical resources are included at the end of this document.

Conversion Options: Kodak Document Archive Writer i9620 (DAW) and Staude SMA 51 File Converter (SMA 51)

While the DAW and the SMA 51 both convert digital images to microfilm, there are important differences between the two machines in several aspects of the conversion process. These are outlined in Appendix A: DAW and SMA 51 Requirements. It will be important for agencies to know which machine will be used for each project, as this will impact the project specifications. Imaging Unit staff can provide additional information on which machine best suits each project. All projects will need to meet universal project requirements outlined below.

Requirements for Submissions

Because microfilm created using the DAW or SMA 51 is intended to preserve records of enduring value to the highest archival standards, the State Archives has set the following minimum requirements for the submission of electronic files.

Records Eligible for Conversion

The records that are most suitable for conversion from images to microfilm are (as indicated by the applicable records retention schedule):

- Records that are of permanent or long-term value.
- Records that have a high likelihood of being used in litigation. An agency may suffer adverse financial and legal consequences if they are unable to produce records needed during litigation at a remote point in the future.
- Records that are subject to statutory or other requirements, which require secure off-site storage.

Image Resolution

- Images must have a minimum resolution of 300 dpi. The DAW and SMA 51 will convert documents with higher dpi values, but this will not result in the production of better microfilm and is generally not recommended.

Image Format

- Images must be an uncompressed TIFF, PDF, or PDF/A. Agencies maintaining other file formats should explore the use of file conversion software.

- Images that have been converted from another format to PDF or TIFF formats should have embedded fonts. Any conversion process should be thoroughly tested and documented as part of the procedural documentation and audit trails associated with the project.

Image Quality

- If using a flatbed scanner for image capture, images should be cropped to reduce excessive, surrounding space, but should retain a small border to show that the entire document has been captured.

- Because image quality is controlled at the point of scanning, it is recommended that scanners be checked for proper resolution using "AIIM Scanner Test Chart #2" as outlined in *Recommended Practice for Quality Control of Image Scanners*, ANSI/AIIM Standard MS44-1998 (R1993). Scanners should also come with resolution targets included in their software. For more information about standard resolution targets for your scanner, please consult the vendor.

File Naming

Because the DAW and SMA 51 create a linear medium (microfilm) from a group of images, complying with file-naming requirements is critical to the production of quality and useful microfilm. The computers associated with the DAW and SMA 51 sort images prior to film production. The retrieval of the images on microfilm will be difficult if they are not sorted as anticipated. Not all computers sort lists the same way. It is critical that files sent for conversion adhere to the "Best Practices for File Naming" guidelines produced by the Archives and Records Section. The guidelines are available on our website.

Additional requirements for file naming are below. Examples of file naming schema are included in Appendix B: File Naming Considerations for DAW and SMA 51.

- File names should be no longer than 25 characters and must be alphanumeric with no special characters. Allowable characters in file and folder names include letters, numbers, and underscores.

- Do not leave blank spaces in the file name.

- When using numbers, make sure that the number of characters is consistent to ensure that these are accurately sorted by the computer. For example:

    10.tif

100.tif

2.tif

are not sorted correctly, whereas the following files are:

002.tif

010.tif

100.tif

Folder Structure and Image Marks

Just as using file-naming conventions is important to the production of quality microfilm with the DAW and SMA 51, folder structure also plays a critical role in converting electronic images to microfilm. The DAW and SMA 51 cannot accommodate deep file structures, e.g. multiple levels of hierarchy, when converting the images to microfilm. Some important guidelines for suitable folder structures include:

- Do not submit empty folders for filming. If the DAW or SMA 51 encounters an empty folder, it interrupts the conversion process.
- There are also limitations as to how many levels into a folder structure the DAW and SMA 51 will go.
    - Single-page TIFFs [i.e., one image per file name] may be no more than two folders from the root (e.g. folder, subfolder, and image).
- Agencies with electronic files utilizing folder structures that do not conform to the above guidelines may still utilize the DAW or SMA 51 ***provided*** they flatten the folder structure to meet the guidelines prior to transferring the images to the Archives and Records Section.
- To support high-speed information retrieval, the DAW and SMA 51 can produce image marks on the microfilm according to the hierarchical structure in which the images are submitted. If a government agency is interested in utilizing this feature, it will be incumbent upon the agency to purchase/support the associated equipment. Before relying on image mark retrieval, one should be aware that this technology could become obsolete.

Indexing

Each reel of film produced by the DAW or SMA 51 should be indexed, either by means of a self-index or an externally-created index. Page numbering, chronological order, alphabetical order, or any other readily apparent organizational system inherent in the submitted images will self-index a reel of microfilm. Lacking that, an agency may submit an external index for inclusion on the microfilm.

Agencies may create a database to serve as an external index for submitted information when, for example, the files do not follow chronological or numerical order (e.g. case files that are not completed in numerical sequence). However, utilization of an external index will require the agency to either maintain the index permanently in-house or to submit a printout or images of the printout at the end of the project to be included on the last reel of the project.

The use of an external electronic index without submitting a copy to be converted to microfilm is not recommended because it counteracts one of the primary benefits of creating microfilm from digital content—protection from technological obsolescence.

Targeting

Targets are used to identify the records being filmed, to serve as finding aids to those records, to conduct quality assurance tests on the film, and to provide the certification needed to ensure that the filmed records will be accepted in court in lieu of the original records.

In order for each reel to be appropriately targeted:

- State agency submissions must include the full name of the submitting agency, with all of the organizational layers named; the record's item number from an active records schedule; title of the records: the date, page, or other range of content information for each reel; and a digital image of any external indexes.
- Local agency submissions must include the name of the submitting county or municipality; the name of the board, council, department, or agency; the title of the records; the date, page, or other range of content information for each reel; and a digital image of any indexes.

Batching Records for Transfer

Ideally, the submitting state government agency should batch its jobs to match the number of images that will fit on a reel of microfilm. Refer to the following requirements for batching records for transfer using either the DAW or SMA 51:

- Only one record series or one item number from a records retention schedule should be placed in a batch.
- No files or documents should be split between batches.
- The submitting agency must retain a copy of all files submitted to the State Archives until the agency has been notified that the transfer to microfilm has been successfully completed.
- Size of batch will vary based on reduction ratio for the reel and machine used for conversion. Contact Imaging Unit staff to verify number of images that will fit on each roll of film. Additional details concerning factors that impact reel sizes can be found in Appendix C: Reel Size Considerations for DAW and SMA 51

Transferring Files for Conversion

Once records are batched and ready for transfer to the Archives and Records Section for conversion, the records management analyst assigned to your agency can assist with the transfer protocol, including providing information on authentication of files for transfer.

Additional Resources and References

Additional information on best practices in recording electronic images on microfilm is available from the Property Records Industry Association (PRIA) at http://www.pria.us/, which offers a publication of Recording Electronic Images on Roll Microfilm Best Practices: http://www.pria.us/files/public/Committees/Business_Process_Procedures/Archival_Backup/Recording_Digitized072407-FINAL.pdf

Appendix A-DAW and SMA 51 Requirements

DAW

While the DAW accurately reproduces electronic files bi-tonally—in pure black and white—and can film in landscape or portrait mode, (16mm) there are some limitations with this equipment.

- It converts TIFF images only.
- It cannot accurately reproduce grayscale digital images, such as photographs, or documents that require the capture of faint or very fine lines, such as light or faded handwriting.
- It produces 16mm film which is most suitable for use with documents that are letter-, legal-, and ledger-sized (or B-size).
- Agencies with images of larger format documents (sizes C, D, or E) will require use of the SMA 51 to preserve these images on 35mm microfilm.

SMA 51

Though the SMA 51 has fewer limitations, some projects are better suited for the DAW.

- The SMA 51 can convert TIFF, PDF, and PDF/A files.
- It produces 16mm microfilm (portrait mode only) for documents that are letter-, legal-, and ledger-sized (or B-size), and 35 mm microfilm for larger sized documents (sizes C, D, or E).
- It accurately reproduces both bi-tonal (black and white) and grayscale images and is able to capture fine lines such as faded handwriting.

Appendix B-File Naming Considerations for DAW and SMA 51

As mentioned in the "File Naming" section, it is critical for retrieval and sorting purposes that files sent for conversion adhere to the "Best Practices for File Naming" guidelines available on our website. In addition, file names can be converted to annotations on film. These annotations provide an additional, eye-legible reference for each image converted to film. As with other aspects of image conversion, each machine has some limitations on how the file names may be converted to annotations on the film. If an agency is interested in film annotations, please contact the State Archives to receive a recommendation for which machine will work best for the project. Below are some details on how each machine creates annotations from a file naming structure.

DAW File Naming

The DAW uses very simple file-naming structures, mainly numbers and decimal points and letters, but not enough to spell out whole words (i.e. 00362.0001, 00362.00001.0001 or ABC.0001.0001, etc). When images with complex file names are submitted for conversion on the DAW, the file names will automatically be simplified and renamed during the conversion process. File names as written by the DAW are divided into as many as four fields (i.e. 0000.0000.0000.0000). The number of fields is determined by the depth and complexity of the file structure. The total characters for all four fields cannot exceed 12 and the maximum number of characters per one field cannot exceed nine.

For example:

A 2,000 page Deed Book is submitted with the files named **2012_Book_362_0001** through **2012_Book_362_2000**. This is a simple "Page level" grouping (i.e., Root folder containing many single-page tiffs). The DAW will automatically simplify the file name down to two fields of no more than 12 total characters (e.g. 000000.000000 or 000.0000 or 0000.0000, etc.). The first field will be a fixed value (e.g. 362, 0362, 00362, etc.) and the second field represents each subsequent image (e.g. 0001, 0002, 0003, etc.). The number of characters in the second field must be able to accommodate the number of images being put to film (if 2,000 images are being put to film the character width for the second field must be at least four characters long).

So in this example;

2012_Book_362_0001; 2012_Book_362_0002; 2012_Book_362_0003**;**2012_Book_362_2000 will become simplified to 0362.0001, 0362.0002, 0362.0003, . . .0362.2000**.**

For more complex file structures, such as “document level” groupings (two-tier folder structure), “folder level” groupings (three-tier folder structure), and folders containing many multi-page tiff images, the number of fields in the file name will expand to accommodate the added levels.

For example:

Adoption records for a given county are submitted for conversion. Under the root folder (e.g. 1999_Adoptions) there are 50 folders each representing a different adoption and labeled alphabetically by child (Adams, Brown, Davis, etc.). Additionally, within each of those folders are several images of documents for each child.

So the images are sent in with the following file names for example;

1999_Adoptions_Adams_0001, 1999_Adoptions_Adams_0002 . . .

1999_Adoptions_Brown_0001, 1999_Adoptions_Brown_0002 . . .

1999_Adoptions_Davis_00001, 1999_Adoptions_Davis_0002 . . .

During the conversion process, the DAW will simplify the file names to something similar to the following;

1999.0001.0001; 1999.0001.00002; 1999.0001.0003 (the first field will be a fixed representation of the year 1999, the second field 0001 will be a fixed representation representing the “Adams” folder, and the third field .0001, .0002, .0003 will represent each sequential image within the “Adams” folder.

1999.0002.0001, 1999.0002.00002, 1999.0002.0003 (the first field will be a fixed representation of the year 1999, the second field .0002 will be a fixed representation representing the “Brown” folder, and the third field .0001, .0002, .0003 will represent each sequential image within the “Brown” folder.

1999.0003.0001, 1999.0003.00002, 1999.0003.0003 (the first field will be a fixed representation of the year 1999, the second field .0003 will be a fixed representation representing the “Davis” folder, and the third field .0001, .0002, .0003 will represent each sequential image within the “Davis” folder.

SMA 51 File Naming

Under most circumstances the SMA 51 can use complex file-naming structures, such as underscores or full words, when using file names to create annotations on the film. In those cases the film annotation will mirror the file name. The exceptions to this are when the project involves multi-page tiffs or multi-page PDFs.

For Example:

The same adoption records mentioned in the DAW example are submitted for conversion except now instead of the documents being single-page tiffs, all of the images in each child's folder are grouped into multi-page tiffs.

When the multi-page tiff "1999_Adoptions_Adams_0001" is converted to film, each page within that multi-page tiff will have the exact same file name as the first page of that multi-page tiff. So instead of each image in the "Adams" being named sequentially 1999_Adoptions_Adams_0001; 1999_Adoptions_Adams_0002; . . . 1999_Adoptions_Adams_0200; etc., they will all be named 1999_Adoptions_Adams_0001.

Appendix C-Reel Size Considerations for DAW and SMA 51

DAW

- Approximately 2,400 300-dpi images of letter-sized documents will fit on a standard reel of **16mm microfilm in portrait mode (comic)** with a minimum 28x reduction ratio.

  Examples:

  1,400 letter-sized documents + 500 legal-sized

  2,400 letter-sized documents

  1,600 legal-sized documents

  1,350 ledger-sized documents

- Approximately 1,900 300-dpi images of letter-sized documents will fit on a standard reel of **16mm microfilm in landscape mode (cine)** with a 24x-27x reduction ratio.

SMA 51

- Approximately 2,700 300-dpi images of letter-, legal-, and ledger-sized documents will fit on a standard reel of **16mm microfilm in portrait mode (comic)**.
- Approximately 900 300-dpi images of letter-, legal-, and ledger-sized documents will fit on a standard reel of **35mm microfilm in portrait mode (comic)**.
- Approximately 600 300-dpi images of oversized documents will fit on a standard reel of **35mm microfilm in landscape mode (cine)**; including maps and large books.