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Understanding Microform Scanning

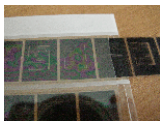
The title says Microform because Microform is the term that is used to describe all three formats of film based analog archival medium. Microform consists of three main formats each with many variations. Most all microform starts out as 16mm or 35mm roll film and is formatted to fit in microfiche or aperture card format. The exception is Computer Output Microform and AB Dick Fiche.

Examples of the types of microform and papers describing the technology and history of the process of capturing microform can be found on our site at http://www.pimage.com/standards.htm

Microform Formats

Microfilm: This format comes in 16mm and 35mm roll format of various lengths and a few types of cartridges.

Microfiche: This is a derivative of microfilm where they cut the film into strips and load it into jackets, very similar to the way your local Photomat would return your 35mm camera film in those little sleeves with 6 pictur negatives in a sleeve. This format allowed the agency to group documents by content and affix a title bar at the top to speed access to an individual case file or customer file.



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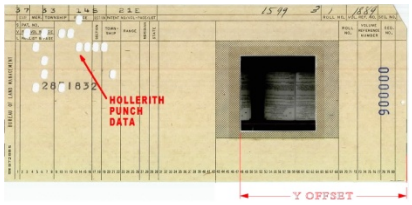
Aperture Card: This is most commonly used for 35mm microfilmed engineering drawings, but there are some rare instances of 16mm filmed documents in app card format: App cards can be punched with Hollerith data to allow for automated indexing of content, similar to the old computer punch cards.



Microfilm Creation

Microfilm is challenging to capture because the original can have many problems unknown to the vendor or the customer. An archive can be quite large and with the exception of a few agencies almost nobody performs 100% QA of their microfilm. The process of creating microfilm is a blind process, meaning that the operator that is filming the pages has no feedback to tell them if they successfully captured the document legibly. Much like taking a picture with a camera on film, you have no idea if it is in focus, if the subject is cropped, if your finger was in the way or if the aperture or shutter speed were correct for the setting. Microfilm creation had all of these same problems. When the Photomat processed your camera film, they could have the temperature or chemical mix wrong, they could have neglected to wash all of the chemicals off or worse someone could have opened the door to the darkroom. These symptoms also affect microfilm processing. Microfilm must also be stored in a environment of 55F and 30%RH or it will start to degrade, it makes scanning the medium or even assessing an archive a significant challenge. A collection of microfilm experiencing vinegar syndrome can have reels that have turned into a solid “hockey puck.” A vendor not experienced with these filming errors can quickly find themselves in a world of trouble with an improperly stored collection of microform.

Challenges in Scanning Microfilm

The two biggest challenges are detecting where a frame is and dynamically adjusting for density (light and dark frames) If you are not able to do both you will have content that is present and legible on the film but not present or legible on the scans.

Microfilm scanning has been around for at least 15 years, but saw notable improvements in 2001, 2008 and 2013.

In 2001 Nextscan created their first scanner that was finally able to capture film in grayscale at a reasonable speed. This allowed service bureaus to offer grayscale scanning to properly account for most changes in frame density. Generally light and dark frames can be captured in grayscale without rescanning where prior to this monochrome scanning was the only option and it was common to drop

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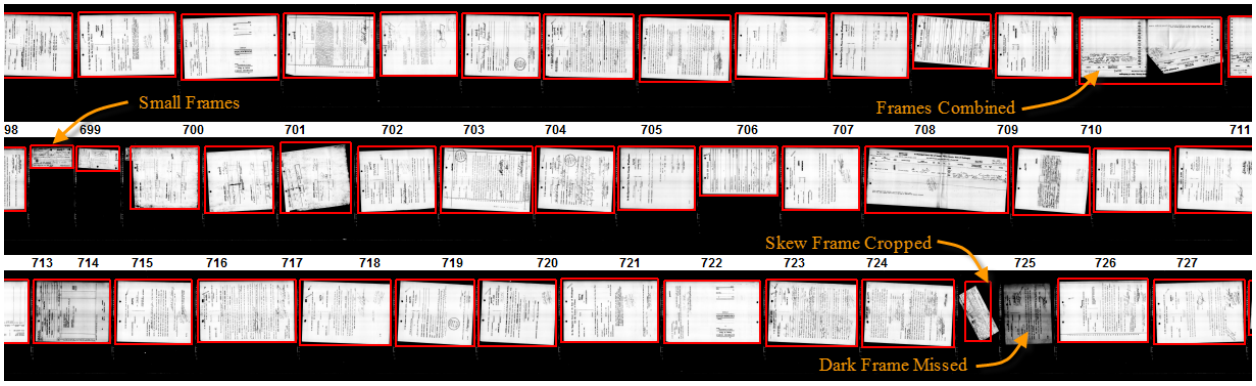
light signatures, date stamps and very dark or light frames associated with filming errors. All three manufactures followed suit.

In 2008 Nextscan deployed a ribbon format where the entire microform was scanned unaltered as a single uncompressed grayscale file. Prior to the ribbon format, the frame detection was performed by the scanning device in software or hardware and there was a significant probability that it would miss a frame altogether. This required many hours of QA review and limited the speed of the scanner. The ribbon format allowed the frame detection to occur in software on a server. The results are reviewed and adjusted by an operator visually, eliminating any chance of a missed frame. It also allowed the scanners to run at full speed. The two other manufactures reluctantly followed suit. An example of the auditing screen used to verify frame detection follows with some common frame detection errors.



In 2013 Nextscan release JpegXR compression in their ribbon files. Prior to this, a single roll of film would span more than 40Gb of space since the ribbon file was uncompressed grayscale data. While it was technically feasible to deliver these ribbon files to a customer it was logistically impossible to justify the storage cost. Not one customer over the 6 year span chose to archive their ribbon files. JpegXR allows for lossless compression of the ribbon file down to 4Gb and lossy compressions much smaller. The advantage is that the scanning service bureau does not need to review the frame detection process as the customer can review and correct for it on demand. Since film is infrequently accessed it is not cost effective to review every reel for frame detection. Delivering a ribbon file allows the customer to adjust gamma for the few frames that are not able to be displayed in 8bit grayscale.

In 2014 the next big thing is offering scanning in higher bit depths beyond 8 bit. With the proper camera type we are capable of scanning microform at up to 12bit. An 8bit scan can support only 256 shades of gray, while a 12bit can support 4096 shades of gray. This is important if a customer has a large number of density problems in their film and in particular if the frames are very dark at the top and very light at the bottom. An example of the advantage of >8bit scanning is provided below:

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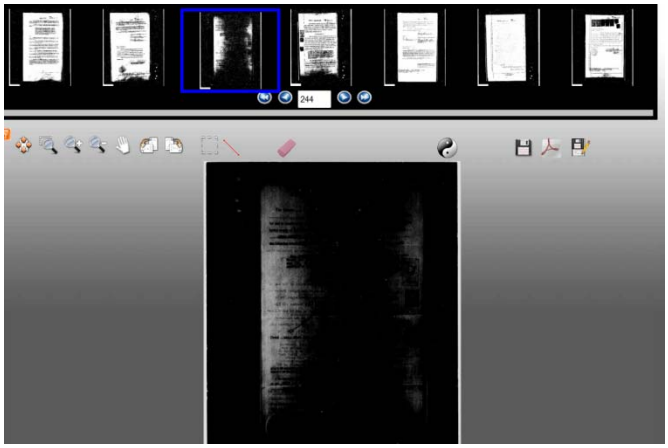
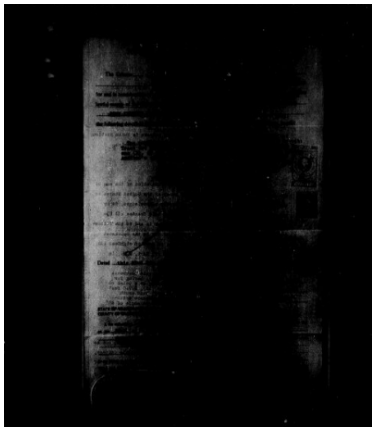
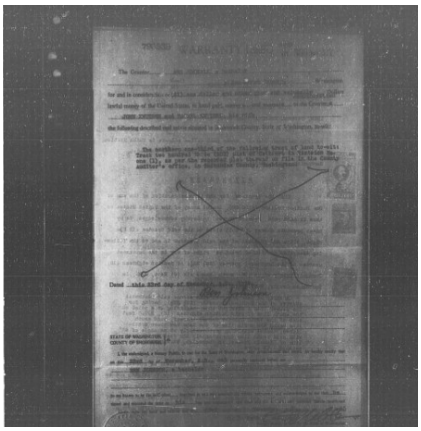


8 Bit Scan

12bit Scan after Adjustment





As you can see from the example above it is very common to have a single frame in one reel or even a single frame in a thousand reels to contain a filming error. If the vendor is not able to recognize these errors and correct for them, the agency will find a subset of their data is illegible. By reviewing film for these film creation errors we can rescan the reel in 12bit or slipstream just a section of film into the ribbon to insure that the digital data is as legible as the original.

Scanning speeds over the years

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A 100ft roll of 16mm microfilm would take just over an hour in monochrome back in 1999. In grayscale it could take close to 2hrs. Currently the fastest device can scan the same roll in 12bit grayscale in just about 2.5 minutes. Since JpegXR ribbon files eliminate the need to review frame detection, vendors are able to offer much lower rates and many agencies are finally able to cost justify the conversion of their archives.