



Regarding the recommended **0.90 to 1.10** density range for film written on a film writer as per the **Tech Image Tip #76**.

We all tend to forget that the background is just that, the information is in the low density lines not the background. The practicality of it is that while we would rather measure line density (micro densitometry) there is no practical way for the user to do that so they use macro densitometry to measure the background density. In effect, as long as the media manufacturers have fairly similar film contrast in their products this method of controlling background density ends up controlling line density as well. It is a compromise, but it has worked well for a long time.

The method of recording, whether traditional or digital does not have a significant bearing on the legibility of the images. The accepted density range of 0.80 to 1.20 is likely taken directly from ANSI/AIIM MS 23 - 1998 Standard Recommended Practice - Production, Inspection, and Quality Assurance of First-Generation, Silver Microforms of Documents. The above range is commonly accepted for optical filming of typical printed office documents.

The historic range for digitally written documents was based on reversal processed COM films. COM writers (imaging systems) are for the most part bi-tonal writers like the EM IMAGELINK Archive Writer but the contrast and density ranges of the media were much higher than typical camera films. The density range for full reversal COM systems as

quoted in ANSI/AIIM MS 1 - 1996 Alphanumeric Computer - Output Microfilms - Operational Practices for Inspection and Quality Control was given as a minimum 1.5 Dmax with 1.8 preferred. With a Dmin of 0.2 maximum, the delta between Dmin and Dmax was a minimum 1.30.

However, the media used in the EPM IMAGELINK Archive Writer is not designed with the same contrast and density range as that in a COM film. The system is designed to represent more of a source document (traditional or analog) imaging system.

Therefore, the more appropriate density range would be the same 0.80 to 1.20 range as noted in ANSI/AIIM MS 23. The IQ for the Archive Writer document takes into account the ability of the writer/film system to control background density even tighter than the general guidelines. This is due to a number of factors. First off, the differences in document reflectance that are seen in direct optical imaging systems have been taken away by the document scanner converting the document to a binary (bi-tonal) tiff image. Therefore, we have only 0s and 1s (on or off) pixels to deal with, no intermediate gray levels. So, the background density is simply all pixels on to get a macro density measurement.

The bottom line is that you cannot make a blanket statement on what background density should be for a digital writing system. It is dependent on the imaging elements and the contrast/density range of the media.

There are more variations in the types of unique characteristics in digital systems available compared to traditional optical systems. The wide variety of illuminants, lasers, LEDs, CRTs, eBeam recording mechanisms allow for a wide variety of media with varying contrast and background densities.

*For the EPM Document Archive Writer 4800 or the IMAGELINK i9600 Series Writers the optimum density range is 0.90 to 1.0. However, recognizing that there is some writer to writer and, processing variability, it is reasonable to let that range open up to say **0.85 to 1.15** which is still within the original source document density guideline of 0.80 to 1.20. In*

other words, the system was designed to emulate a source document system and not a COM system. Therefore it is intentional to follow the density guidelines of MS 23.

Resolution expectations are different however and should be set using requirements of digital devices such as those described in ISO 14648-1:2001 Quality control of COM recorders that generate images using a single internal display system -- Part 1: Characteristics of the software test target (available in English only)