All you Need to Know About Hybrid Imaging

...But Were Afraid To Ask...

includes Hybrid Imaging Terms Glossary on Page 12!

hybrid: (hi’brid) anything derived from unlike sources or composed of disparate or incongruous elements; composite

VersaIMAGE Software Corporation
7600 Grand River Road, Suite 230, Brighton, MI 48114
Sales: (810) 225-9720 Support: (810) 225-9720 Fax: (810) 225-9726
SALES E-Mail: abrunner@versasoftware.com
Some Good Reasons … For Hybrid Imaging

As part of an overall AIIM study in the late 1990’s Deloitte & Touche asked users which of these six potential product improvements was the most important:

![AIIM STUDY BY DELOITTE & TOUCHE](image)

The result was an overwhelming response to micrographics with optical disks. This vote of confidence for what is now known as “hybrid” imaging is caused by users of micrographics systems who do not want to obsolete their current micrographics data base.

Billions of micrographic images have been created during the last 30+ years. The sheer volume of microfilm information available to users considering the occasional retrieval needs make bulk conversions impractical for many applications. It is more often financially unjustifiable to convert past micrographics image libraries to digital form. Also, in many cases the information on microfilm has become relatively static and retrieval needs have slowed drastically.

Today, new micrographics devices exist that allow easy “on demand” transition from microfilm “analog” image data to “digital” electronic image data. Microfilm reader printers are replaced with microfilm reader/scanners that quickly furnish wanted film images in TIFF Group-4 format to imaging network users via e-mail or fax. Today’s “ad-hoc” microfilm scanners handle all film formats. From engineering drawings (35 mm roll or aperture card) or COM and source microfiche, microfilm jackets and 16mm roll microfilm, conversion to digital high quality images takes a few seconds!

New Hybrid Imaging software:
New, hybrid imaging software exists that manages microfilm and digital electronic images in the same database! Not only does this software keep track of film images and digital images together but it contains many unique features such as:

- **Elimination of repeat microfilm look-ups!**
  (Film images are searched, scanned and stored in digital form for subsequent retrievals.
  The microfilm image address is always available for backup purposes!)

- **Roll film sequence scanning.**

- **Unattended batch or roll film scanning.**

- **Scanning of microfilm and paper images into the same digital file folders.**

- **OCR, ICR and Bar Code reading from converted microfilm (digital) images.**

- **CD pre-mastering and disc writing.**

**“Digital film” a renaissance for microfilm!**

Who remembers the 8 inch floppy disk today? Will today's CD, 5.25 inch WORM, 10 inch, 12 inch or 14 inch optical disks be readable in the year 2000 on storage systems installed then? What assurance is there that information stored digitally today is readable on any device in the year 2010?!

With the advent of today's digital information explosion, these are vital questions for any information manager to consider. Yet, in many cases, relatively little thought is given to the future retrieval of today's electronic records or to the future cost of data migration. Today, we do not know the cost involved to migrate our digital data to the next digital storage media of the future. Who is going to watch out for this data to be converted just in time? Also we do not know how often it will have to be converted in the future! Will it have to be done every five years or ten? In any case, the cost of conversion and the media cost itself will surely be significant, especially where large file volumes are present!

With digital imaging moving into the mainstream of private and business life, one can only wonder as to how many of these newly created "digital file cabinets" may be locked forever! Record retention requirements for many documents may allow destruction of some of this digital media before it is technically obsolete, but what about records that must be accessible in the future?

**The new development of hybrid digital archive microfilm systems.**

One practical solution is provided by new low cost systems entering the market place which allow the writing of digital images back onto microfilm for analog storage and retrieval at high speed using Computer Assisted
Retrieval or CAR. Thousands of pages per hour may be imaged onto digital microfilm from digital CD optical platter input!

These digital microfilm systems produce sound digital archiving solutions for today's IS managers. One of the primary benefits of digital film archive systems is that organizations can collect and manage files electronically, then migrate these files to microfilm as they age. In this way, all documents associated with a particular file can be arranged together, as with a paper folder and migrated to, and accessed from, a single roll or rolls of microfilm.

Users virtually cannot distinguish the difference between a scanned microfilm image or a scanned paper image upon arrival of these images in the user's workstation. And in case of technical obsolescence an inexpensive microfilm reader (or magnifying glass) allows the reading of digitally created microfilm back-up images!

The digitally recorded images on the microfilm are of high uniform quality, placed perfectly straight and the print quality is excellent. This film may be scanned again for digital image distribution without noticeable degradation.

Digital film may be used as a back-up image copy in the case of a break down of the digital optical system.

**HYBRID: The Perfect Tool For Records Management**

As you move into digital imaging will you require an ever increasing number of juke boxes to hold the digital information? Of course not. Jukeboxes are expensive to acquire and to maintain, especially so as the information in them ages. Naturally you will fill up your jukebox(es) with active image information that requires:

- *Fast and easy access*
- *Concurrent use*
- *Electronic routing*
- *Work flow management*

As information moves through different phases in its life cycle “hybrid” technology may perform a better job.

The rapid and increasing pace of technology results in shorter life spans for magnetic and optical disks, drives and related devices. Truly, today there is no guarantee that software and hardware will exist to read your current optical disk platters or magnetic tapes 5, 10 or 20 years from now.

As image information moves into its Retention Phase, microfilm, with its human readable images, frees the user from technological obsolescence. A microfilm reader does not require hardware and software to display an image! Microfilm is still the premiere archival storage medium! Long term film image retention provides:

- *Technology obsolescence protection*
- *Document longevity*
- *Economical storage and retrieval*

A major benefit of hybrid imaging is the fact that film images may be digitized again at any time in the future to move information back into active use again. While the conversion to active use of documents in retention is not the norm, there exist a number of applications which have multiple active life cycles. Good examples are litigation cases. Inactive records suddenly become very active, only to become inactive again after settlement or
trial. Hybrid systems utilizing digital film provide great peace of mind for corporations knowing that computer technology is not required to provide human readable document images to users.
A Practical Example...

A manufacturer delivers a new fire engine to a customer. Naturally all relevant information should, for the first six to twelve months, be on digital media. (I.e. Hard Drive, CD-R’s). Frequent concurrent use by multiple parties in the customer service, maintenance and sales departments requires digital accessibility for top customer satisfaction.

As the initial warranty period expires and the equipment “settles in” no significant activity will be encountered. After approximately 7 to 8 years many components on the truck would begin to wear out. Due to the highly customized nature of the parts a flurry of activity into the same records makes a good case for digital information again. By that time the original optical disks (CD’s) and possibly even their replacement disks (!) may be obsolete!

With hybrid technology the images are produced digitally initially for active use. After the active cycle, images are written onto digital microfilm satisfying archival and occasional user requirements. Images may be scanned from film “on demand” and faxed or e-mailed to vendors, engineers and the shop floor. The current optical or magnetic disks (CDR’s) are re-used for newly created active records saving valuable media costs.

Eight years later, when the need arises to activate all documents pertaining to a specific fire engine the user merely scans the required microfilm rolls, or portions thereof, automatically to create a new fully digital image database using the then appropriate digital storage media.

Most hybrid IMAGING APPLICATIONS are “old hat” micrographics CAR applications!

CAR (Computer Assisted Microfilm) has been, and still is today, employed in a wide variety of applications! Utilizing a computer index to find microfilm image locations is very similar to today’s image disk address retrieval in digital systems.

CAR serves all types of microforms - roll film, microfiche, jacket or aperture card. It can be used in manual, semi-automatic or fully automatic microform document storage and retrieval systems.

The Application of CAR includes:
Financial - accounts payable, purchasing, order entry, monetary transactions.

Educational - student records, library catalogs, information systems.

Banking - check processing, portfolios, signature verification, credit records.

Utilities - correspondence, document control, regulatory, requirements, engineering drawings.

Government - court records, law enforcement support systems, patent searches, technical reports, personnel files, deed recording.

Insurance - customer accounts, transaction records, claim processing.

Manufacturing - customer account files, engineering records, parts inventory, warranties, service and maintenance records

There are many combinations of microforms, indexing schemes, and special micrographics software and hardware. The use of micrographics systems can be classified in two ways:

- **Manual retrieval** involves retrieving the film address information from paper, a computer monitor or CRT terminal, manually removing the microform from its storage file and mounting it on a microform reader-printer. Using the film controls on the reader printer one manually advances or moves the film to the desired image location.

- **Automatic retrieval** involves the fully automatic communication of the film address information from a computer system to the microfilm reader-printer. This requires manual removal of the microform from its storage file and allowing the computer, more so in the case of 16 mm roll film, to automatically control the advancement of the film to the desired microfilm frame.
Questions to answer if you are planning to use hybrid imaging:

Initial Planning Stages

What kind of feasibility study is necessary to determine what hybrid applications will be required?

What requirements are needed for a proper cost justification? What Return On Investment is desired?

What is the frequency of film based and digital image retrieval?

How long do you need to retain the information in digital (active), retention (inactive) form?

When does the activity sharply decline? (This determines how long digital image information remains on-line).

Will inactive information become active again and when?

How much information will be added to the index and image data base: daily, monthly, yearly?

Who will you allow to update or delete information from the computer index data base and from the digital image file server?

How many users will be accessing information? (“Database read only” access for film based records, image delivery for digital image based and newly scanned records, index and film image retrievals for images created via on-demand film scanners)

More questions to ask ... ...about the Hybrid System!

Where are reader-printers and microfilm files located?

Does the micrographic system use manual, or automatic retrieval techniques?

- How will the number of users impact this system?
- How many microfilm scanner/printers will be required?

Do your requirements dictate using a stand-alone computer system or interfacing with your current in-house computer and what are the network traffic implications for digital images? (TIFF Group-4 paper scanned images are 25k - 35k for 200dpi, 50k - 75k for 300dpi. Add up to 50% to these figures for microfilm scanned pages for poor film image quality)

Some Questions for the Design Study...
How will you gather and organize your documents to be scanned, formulated and coded for retrieval?

What and how many *field descriptors* will be required for any particular application?

Will your documents be either batch scanned, randomly scanned and indexed, or scanned in file folder groups?

Onto what type of media will you store information that has been purged from the on-line data base? (COLD, Microfilm or COM, Digital film)

How does the user wish to look up information? Is it required for the retrieval system to have the capability of retrieving partial descriptors?

What retention periods are required? If the records are batched by retention (i.e. accounts payable), how will this determine if an entire optical disk or microform can be destroyed once the retention period has elapsed?

Does it present legal problems for the company if just the computer indices are deleted and the images are still present in the system? *(Note: Indices can be recreated!)*

How do you evaluate all the components for the HYBRID (CAR) Imaging system?

Have you considered the scanner and cameras, inclusive a digital archive system for filming digital documents, the computer system with monitors, the retrieval reader-printers and reader scanners, the optical and microfilm storage files?

- How will your personnel be trained for HYBRID Imaging?
- How will the Hybrid (CAR) imaging system be supported and maintained?

Will it be one vendor or multiple vendors?

How will diagnostics be performed on the software, computer hardware and micrographics hardware?

What kind of security provisions must be incorporated into the system?

**OPERATIONS of HYBRID CAR**
The heart of any CAR or Hybrid Imaging System is its Software! A HYBRID CAR / IMAGING Retrieval Software package must be above all easy to use.

Simple icons and commands must allow user training to be accomplished quickly and simply. The Monitor screen below shows an Accounts Payable application with an easy to use search menu.

“Partial” or “exact” search information could be entered. Data search fields should allow for “range”, “starts with”, “contains” and “wild card” searches. No fancy codes or translations should be necessary.

In this example we are looking for a Vendor named CHAMPS and we want to locate an Invoice between $2500 and $2800 sent to us in January or February, 1992. The system indicates that Eleven records were found. This is commonly called a “Hit List”, a vital component of any Hybrid CAR system. The user then has the option of listing these “hits” whereby the microfilm and, if they already exist, digital image addresses are visible on the screen.

Double clicking on the desired “hit” will either bring the digital image up on the screen or cause the automatic microfilm retrieval to begin. If a digital image is not available, the correct microfilm cartridge must be inserted. Within seconds the correct microfilm image can be viewed on the screen.

With the aid of a microfilm scanner, a digital image is created in seconds allowing “foldering”, “fax”, “E-mail”, “local” or “remote” document laser printing.

There are many variations to applications for Hybrid CAR. But a good HYBRID CAR software package will handle any application and documents be they paper, film, electronic or digital. Applications can vary from the very basic search and single descriptors to more complex document types.

These may include multi-descriptors and internal cross references to previously imported data. Here is an example of basic, simplified Hybrid CAR search and document retrieval.

The ADVANTAGES of HYBRID CAR

• Hybrid CAR (Computer Assisted Retrieval) systems software “knows” how to find images from microfilm or digital image storage systems. (Microfilm is cumbersome to retrieve without a computer index!)

• Hybrid CAR systems may scan the microfilm images after retrieval and store these digital image addresses in the same computer database, eliminating second lookups from microfilm! (Any second look-up of the same image will bring a digital scanned image onto the computer screen.)

• Hybrid CAR systems can convert microfilm to digital format in daily use. (In order to print, fax or e-mail microfilm images, reader/scanners must scan the film first, creating on-demand conversions!)

• Hybrid CAR systems may incorporate human readable digital film backup from magnetic or optical disks or tapes, fully indexed, in the desired logical film image sequence. (The film index can be written to the beginning of the film roll!)
Hybrid CAR systems allow digital image retrieval in a documents “active” cycle and film (or digital film) retrieval during “inactive” retention periods.

Hybrid CAR systems allow “activation” of film based documents to digital form in small quantities, large batches or even multiple rolls automatically!
GLOSSARY* of IMAGING and MICROGRAPHICS TERMS:

*acutance* - Objective measure of the ability of photographic material to show a sharp line of demarcation between contiguous areas receiving low and high exposures. It correlates well with subjective judgments of picture sharpness.

American Standard Code for Information Interchange (ASCII) - American National Standard binary-coding scheme consisting of 128 eight-bit patterns (7-bits plus a parity check bit) for printable characters and control of equipment functions.

analog data - Information in human readable form. It may be a duplicate, enlarged or reduced in size from the original.

ANSI - American National Standards Institute.

anti-aliasing - Blending techniques that smoothes the jagged edges of computer generated graphics and type. NOTE: A common anti-aliasing technique is to fill the pixels between the jagged ends with levels of gray (or color) to soften the edge and blend it smoothly into the background.

aperture card - Card with one or more apertures specifically designed for the mounting or insertion of microfilm before or after imaging.

aperture card scanner - Device for scanning microfilm in aperture cards. See also aperture card, reader-scanner and scanning.

applications software - Programs designed to perform a user specific job.

asynchronous transfer mode (ATM) - ITUTSS standard communications technology that will transport voice, data, video, and other digital information at high speeds over virtual circuits provided on-demand. Internally breaks the information into 48 byte data portions with a 5 byte header, giving a 53 byte packet capable of transmitting any information in the data portion. See also International Telecommunication Union - Telecommunication Standardization Sector and packet.

automatic retrieval device - Retrieval device in which all the operations, i.e., selection, positioning and projection of the appropriate microimage are carried out automatically. NOTE: To locate an image, the user interrogates an index which may be in computerized form.

background - Portion of a document, drawing, microform or print that does not include the line work, lettering or other information.

backward compatibility - Ability of software and hardware to use data produced by a previous generation of software and hardware.

bandwidth - (1) Number of hertz expressing the difference between the lower and upper limiting frequencies of a frequency band. (2) Width of a band of frequencies. (3) Maximum number of information units (bits, characters) capable of traversing a communications path per second.

bandwidth on demand - Concept in wide area networking (WAN) in which the user can dial up additional WAN bandwidth as the application warrants. It enables users to pay for only the bandwidth they use, when they use it. See also bandwidth, network, and wide area network.

bi-level image - Image in which each pixel can be represented by one bit to select between two possible tones (e.g. black and white).

blip - See image mark

block - (1) Basic layout component that corresponds to a rectangular area within a frame or a page. (2) Set such as documents, words, characters, or digits handled as a unit.

Boolean search - Search strategy for selected information that uses AND, OR, NOT functions.

browsing - (1) In micrographics, the quick examination from one frame to another on a reader screen in the processing or searching for a specific image on a multi-image microform. (2) In electronic imaging, a system's ability to find an undefined feature or set of features in a database or document in a collection.
**byte** - (1) Group of bits, processed or operating together. (2) Term used to describe one character of information. NOTE: The most common byte is eight bits long. A byte allows 256 different possible combinations of eight binary digits. See also gigabyte, kilobyte, megabyte, petabyte and terabyte.

**cache** - (pronounced "cash") Small portion of high-speed memory used for temporary storage of frequently used data. Reduces the time it would take to access data because it no longer has to be retrieved from the disk.

**microform camera** - Apparatus designed to record latent images on film (ISO). See also COM recorder, planetary camera, rotary camera and step-and-repeat camera.

**CAR** - Computer-assisted retrieval, technique that uses a computer to identify, locate, display or manipulate microforms or microimages.

**CCD** - Charge coupled device, a semiconductor that responds to light and provides electrical signals.

**CD-ROM** - See compact disk-read only memory.

**CD-ROM mastering process** - Creation of the first recording (the master) in the compact disk-read only memory replication process.

**CD-ROM premastering** - See premastering.

**CD-WORM** - See compact disk - write once read many

**COM** - Computer output microfilmer records computer data directly onto microfilm or microfiche.

**compact disk - interactive (CD-I)** - Read-only 120 mm (4.72 inch) optical disc that provides access, under interactive program control, to information such as audio, data, graphics, still images, and video.

**compact disk (CD)** - Read only optical disk available in formats for audio, data and other digital information.

**compact disk - Read only memory (CD-ROM)** Optical disk that is created by a mastering process and used for reading.

**compact disk - Write once read many (CD-WORM)** An optical disk that is written and then available for reading.

**compound document** - Document that contains information in several formats, i.e., text, graphics, and image.

**computer output to laser disk (COLD)** - Technique used to transfer computer-generated output to optical disk.

**constant angular velocity (CAV)** - Recording technique using tracks that are arranged in concentric circles which are divided radially into sectors. Using this technique the disk always spins in the disk drive at the same rate; that is, the tracks near the periphery of the disk are moving faster than the tracks near the center. Because the outside sectors are moving past the read/write heads faster, the sectors must be physically larger to hold the same amount of information as the inner sectors.

**constant linear velocity (CLV)** - Recording technique using a single track that spirals from the center of the disk to its circumference. The track is divided into sectors of equal physical size. Using this technique, the disk drive constantly varies the rate at which the disk is spinning so that as the read head moves toward the outside of the disk, the disk spin rate slows down. Because the length of track passing under the head per unit of time remains constant (the constant linear velocity), the data transfer rate remains constant, and the density of information in the track remains optimum.

**Consultative Committee for International Telegraph and Telephone (CCITT)** - Obsolete designation. See International Telecommunication Union - Telecommunication Standardization Sector.

**contrast** - (1) In electronic imaging, ratio of on pixel brightness to off pixel brightness. NOTE: The off pixel brightness is not zero but rather the reflection of the ambient light by the background of the display. the greater the ambient light, the greater the contrast must be to result in the perceived contrast ratio. (N) (2) In micrographics, expression of the relationship between the high and low brightness of a subject or between the high and low density of a photographic image. NOTE: Sometimes called modulation

**database** - (1) Collection of digitally stored data records. (2) Collection of data elements within records, within files, that have relationships with other records within other files.
database management system (DBMS) - Set of programs designed to organize, store and retrieve machine-readable information from a computer-maintained database or data bank.

data compression - Conversion of a digital image to a lower number of bits for storage. For example, a series of Os or is could be counted and replaced with a code that represents the number of Os or is in that position. See also algorithm, data decompression, Group 3, Group 4 and Huffman coding.

data decompression - The regeneration of a bitmap from a compressed representation. See also data compression, Group 3, Group 4 and Huffman coding.

data rate - Speed of a data-transfer process, normally expressed in bits per second or bytes per second. See also binary digit, byte, and data.

density - (1) The relation of amount of text to non-text areas on a document. (2) In electronic imaging, the number of bits in a given area of the recording medium. (3) In micrographics, relatively opaque, area of the film images that are darker than normal.

diazo - thermal-Photographic material containing sensitized layers composed of diazonium salts that react with couplers, when developed by the application of heat.

digital - Use of binary code to store information. "Information" can be text in a binary code, e.g., ASCII, or images in bit-mapped form or sound in a sampled digital form or video. NOTE: Recording information digitally has many advantages over its analog counterpart, mainly ease in manipulation and accuracy in transmission.

digitize - Use of a scanner to convert documents to digitally coded electronic images.

digitizer - Device for the digitization of a document. NOTE: This term is often used, by extension, to refer to a device that allows both the scanning and the actual digitization of the document.

digital to analog converter (DIA) - generic term for any device that changes digital (binary) pluses into continuous wave (analog) signals. NOTE: Modems are DIA converters.

direct-read-after-write (DRAW) - Process of reading and checking the recorded information automatically after writing (recording), normally in the next revolution of the disk.

direct-read-during-write (DRDW) - Process of reading and checking the recorded information automatically as it is written (recorded), in the same revolution of the disk.

dithering - Scanning technique to simulate digital gray areas by intermixing black and white pixels. NOTE: Dithering creates the illusion of a continuous-tone image.

dots per inch (dpi) - Measure of output device resolution and quality, e.g., number of pixels per inch on a display device. Measures the number of dots horizontally and vertically.

dots per millimeter (dpm) - Measure of resolution, e.g., number of pixels per millimeter on a display device.

document interchange format - Rules for representing documents for the purpose of interchange.

document retrieval systems - System that searches, finds and presents to the user a specified document or a complete copy of the document instead of just a citation or reference.

driver - Software program that allows the operating system to communicate with a peripheral device. See also operating system, peripheral equipment, and software.

duplex - (1) In micrographics, a method of recording on roll microfilm in one exposure the images of the front and back of a document. The microimages appear side by side across the width of the microfilm


electronic image management (EIM) - Coordinated use of all the electronic imaging techniques for capturing, recording, processing, storing, transferring, and using images. See also digital image, document, electronic imaging, and image.


electronic data interchange (EDI) - Method of exchanging information as data, formatted for computer processing, rather than formatted as human-readable documents.


electronic image - Digital representation of a document.

electronic image gray scaling - Activity outside or in scanning that accurately senses, differentiates and encodes intermediate shades between black and white in photographs and half tones.
**electronic mail** - Software that enables systems to send messages to one another and to be signaled when messages are received.

**electronic printing** - Printing using a laser beam and toner to reproduce computer-generated type of images on paper.

**emulsion side** - Side of a photographic film, plate or paper on which the emulsion is coated. In silver film it is typically the dull side. The converse of base side.

**emulsion speed** - Quantitative measure of the sensitivity of a photographic emulsion utilized to determine the correct exposure.

**encryption** - Security measure involving scrambling or transforming digitized data into a coded form by means of an algorithm. NOTE: Encryption requires a key for decoding.

**endorser** - Camera accessory that automatically stamps documents as they are filmed.

**enlargement ratio** - Relationship between the dimensions of a hardcopy and the corresponding dimensions of the microimage. Example: an enlargement ratio is expressed as 24:1.

**erasable programmable read only memory (EPROM)** - Read only memory in which data can be erased by ultraviolet light or other means and data can be reprogrammed with appropriate voltage pulses. See also programmable read-only memory.

**error correction code (ECC)** - Method of data recovery that allows for the full recovery of a single physical block of data or 2,048 bytes. NOTE: It is used by the CD-ROM drive and during CD-ROM premastering.

**error detection and correction (EDAC)** - Operation that includes all phases of identifying and dealing with data errors, including direct-read-after-write and error correction codes.

**ethernet** - Particular implementation of a bus-type local area network that communicates at 10 megabits per second.

**exposure latitude** - Permissible change in camera exposure without significant effect on image quality. NOTE: The change is affected by the definition of image quality, the usable extent of the sensitometric curve and the subject luminance range (contrast).

**facsimile** - (1) Exact copy of a document. (2) Process by which a document is scanned, converted into electrical signals, transmitted and recorded or displayed as a copy of the original.

**fiber distributed data interface (FDDI)** - Optical fiber token-ring network with highly reliable data transfer, active link monitoring, station management, large-bandwidth capabilities (100 Mbps transmission rate) and survivability features. NOTE: FDDI is defined by four ANSI standards.

**file** - (1) Collection of records; an organized collection of information directed toward some purpose. (2) Data stored for processing by a computer or computer-output microfilmer.

**file server** - In local area networks, allows users to share and thereby conserve the cost of peripherals (printers, modems, scanners) and to likewise share software. The file server is a device on the LAN where the shared software is stored.

**film unit** - That part of a microfilm camera which contains the film, film-advance mechanism and, in some microfilm cameras, the lens.

**firmware** - Prewritten programs stored in read-only memory (ROM) circuits.

**flat-bed scanner** - Device for scanning that has a flat surface for input material. Used in applications for scanning bound material.

**frame** - That area of the film on which radiant energy can fall during a single exposure

**G (giga)** - Abbreviation denoting 1 billion units.

**gigabyte (GB)** - Unit of measure, approximately one billion bytes, expressed as 1,000 megabytes, 1,000,000,000 bytes, 100 bytes or 230 bytes.

**graphic COM recorder (graphic COM)** - Recorder that generates both text and graphics
**graphical user interface (GUI)** - Software that allows users to interact with a computer on the basis of graphics rather than text and menu. GUIs are based on graphical icons that represent program functions rather than typed commands.

**gray scale** - (1) In electronic imaging, capability to display varying levels of gray and usually represented as a number, such as 16 levels of gray. The gray levels are created by varying the strength of the electron beam. The higher the level of grayscale, the smoother the transition from light to dark. (N) (2) In photography, array of adjacent neutral density areas varying by a predetermined rate or step from black to white and used to expose film to determine its sensitometric curve. Synonymous with gray wedge and step tablet.

**Group 3-CCITT** - Classification of digital facsimile devices which operate at one-minute speeds and use run-length coding of image material to perform redundancy reduction. These machines can also use bandwidth compression to enhance speed. *See also* International Telegraph and Telephone Consultative Committee.

**Group 4-CCITT** - Classification of high-speed (56K bps) facsimile machines that require error free communications lines and more extensive compression than Group 3. *See also* International Telegraph and Telephone Consultative Committee.

**heat-developing film** - Type of film in which the image is developed by heat. *See also* dry-process silver film and vesicular film.

**hertz (Hz)** - Measure of frequency or bandwidth; the same as cycles per second.

**holography** - Method of recording images on microfilm by splitting a laser beam into two components, one of which is directed toward the object or scene and the other (the reference wave) toward the film. When the reference and hood object waves meet again at the film, certain interference patterns develop and are the means of recording the image. The image can be viewed by passing laser light through the processed film.

**horizontal mode** - (1) Arrangement of images on roll microfilm in which the lines of print or writing are parallel to the length of the film for horizontal script and perpendicular for vertical script. (2) Arrangement of images on a microfiche in which the first microimage is in the top left-hand corner of the grid pattern and succeeding microimages appear in sequence from left to right and in rows from top to bottom (ISO). Synonymous with comic mode, orientation B and landscape.

**Huffman coding** - Data compression technique that assigns shorter bit sequences to frequently occurring symbols and longer bit sequences to less frequent symbols. *See also* International Telegraph and Telephone Consultative Committee, Group 3 and Group 4.

**ICR** - See intelligent character recognition.

**image** - (1) In micrographics, the representation of information produced by radiation (ISO). (2) In electronic imaging, digital representation of a document.

**image conversion** - (1) In micrographics, the operation or function of transferring or reproducing microimages from one stage in a microfilm system to the next. (2) In electronic imaging, the operation of converting a human readable image on paper or a microform to a bit-map.

**image count retrieval** - Method of retrieving uncoded microimages by counting the leading edges of the microimages. NOTE: The leading edge of an image on a microfilm is the first edge of the image to enter the film gate of a reader when the film advances.

**image-enabled** - Addition of electronic imaging capabilities through software at any data processing terminal, workstation, or microcomputer. *See also* electronic image, shrink-wrapped, and software.

**image mark** - Optical mark, usually rectangular, within the recording area below and/or above the image on a roll of microfilm; used for counting and aiding in the retrieval of images or frames automatically. Multisize image marks may be small, medium or large to designate "page, chapter or book," respectively, for search and retrieval of document images. Synonymous with document mark and blip mark.
image mark channel - Specified position or location along a roll of microfilm, within the recording area, below or above the image on a roll of microfilm, for recording an image mark to be used in counting or location an image frame. Synonymous with document mark channel.

input device - Any device, such as a CRT/keyboard, OCR scanner or mouse that converts data into electronic signals for processing on a computer system.

input/output (I/O) channel - Component in a computer system that handles the transfer of data between main storage and peripheral equipment.

integrated information system - Information system that combines two or more technologies or subsystems, e.g., CD-ROM and microcomputer.

intelligent character recognition (ICR) - Advanced form of OCR technology that may include capabilities such as learning fonts during processing or using context to strengthen probabilities of correct recognition. See also optical character recognition.

intelligent scanner - Scanner with additional capabilities, such as the ability to recognize characters (OCR), symbols, etc., automatically or a scanner that can "learn" to recognize commonly used patterns or symbols and other image processing, (i.e., dithering, edge detection, bar code detection). See also scanner.

International Telegraph and Telephone Consultative Committee - International organization that develops international communication standards. See also Group 1, Group 2, Group 3 and Group 4.

integrated services digital network (ISDN) - Integrated digital network in which the same time-division switches and digital transmission paths are used to establish connections for different services. NOTE: A key feature is the ability to provide several services over one pair of the existing telephone wires from a telephone switching center to a residence or business. For example, this "Basic Rate Interface (BRI)" service includes, on a single pair of wires, two bearer "B" channels each capable of carrying an independent voice conversation or 64 kbps of data, plus a 16 kbps packet switched data "D" channel that is used to control the connections on the base channels and for other services such as alarms, meter reading, or other low-volume data. Such services include telephone, data, electronic mail, and facsimile. See also broadband integrated services digital network.

ISO - International Organization for Standardization.

(microfilm) jacket - Flat, transparent, flexible carrier formed by affixing a support sheet to a thin emulsion sheet, forming one or more film channels, made to hold one or more pieces of imaged microfilm and with a heading area.

Joint Bi-level Image Group (JBIG) - Algorithm standard under development by a CCITT/ISO Committee for a bi-tonal compression algorithm which has potential applications in database management systems that are composed of black and white half-toned photos and text. NOTE: JBIG's goal is to be lossless.

jukebox - Automated device for housing multiple optical disks and one or more read/write drives.

K - (1) Abbreviation denoting 1 thousand units. (2) $k$ is shorthand for the prefix kilo (1,000), as in kilometers.

KB - See kilobyte.

Kbyte - See kilobyte.

kilobit - One thousand data bits. Often expressed as Kbits or Kb.

kilobyte (KB) (Kbyte) - Unit of measure, approximately one thousand bytes, expressed as 1,000 bytes, 1 KByte.

LAN - See local area networks.

land and groove - Physical feature of optical disks, applied during manufacture, which defines track locations. NOTE: Some systems record in the grooves and use the lands between the groves as separators. Other systems record on the lands between the grooves and use the unaltered groove to determine position.

landscape orientation - Mode of rendering an image in which the vertical dimension of the presentation is smaller than the horizontal dimension. Contrast with portrait orientation. See also horizontal mode.

laser disk - See optical disk.

latent image - Image that becomes visible as a result of processing.

LED - See light-emitting diode.
library - See jukebox.
lines per inch (or mm) - (1) In electronic imaging, the number of scanning or recording lines per unit length measured perpendicular to the direction of scanning. (2) For micrographics, see resolving power and spurious resolution.
local area network (LAN) - Data communication network of connected devices within a small area, such as a building or group of buildings.
light-emitting diode (LED) printer - Nonimpact page printer in which a row of light-emitting diodes are used to form a latent image on a photoconductive drum. The image is developed by electrophotography. See also electrostatic process and light-emitting diode.
lossless compression - Any compression algorithm that is capable of recalling all of the original information of a compressed image. See also algorithm, data compression, data decompression, lossy compression, original, and image.
lossy compression - Any compression algorithm that loses some of the original information during compression, so that the decompressed data is only an approximation of the original. Especially useful in image compression, where details that are not perceptible, or are minimally perceptible, to the human eye can be eliminated, normally with a dramatic increase in compression. See also algorithm, data compression, data decompression, lossless compression, original, and image.
LPM - Lines per minute.

mastering process - Creation of the first recording (the master) in the CD-ROM replication process. See also compact disk-read only memory and master.
megabyte (MB) - Unit of measure, approximately one million bytes, expressed as 1,000 kilobytes, 1,000,000 bytes.
megahertz (Mhz) - Million cycles per second.
MICR - See magnetic ink character recognition.
micro - (1) In the metric system, prefix meaning one-millionth, as in micrometer (one-millionth of a meter). (2) Generally, a prefix meaning "small". (3) In photofabrication, involving at least one dimension less than 0.0508 mm (0.002 inch).
microfacsimile - Transmission and/or reception of microimages via facsimile communication. See also facsimile.
microimage scanner - Unit that digitizes microimages.
MICR reader/sorter - Device that interprets magnetic ink characters and translates them to digital information which can be understood by a computer; also sorts the original document based on the unique symbols. Generally used in connection with bank checks.
multimedia - Combination of graphics, images, sound, animation and video in a single presentation software program or single presentation system.
National Institute of Standards and Technology microcopy resolution test chart - Chart containing a graded series of blocks of lines and spaces used for determining the optical performance of microfilm equipment and the resolution characteristics of materials used in microrecording.
negative-appearing image - Image in which the lines and characters appear light against a dark background.

network architecture - Philosophy and organizational concept for enabling communications between data processing equipment at multiple locations. Network architecture specifies the processors and terminals and defines the protocols and software that must be used to accomplish data communications.

network control program - Interface routine that coordinates the communications pathway and user programs on the host computer.
numbering device - Device used to number automatically microimages and/or documents during microfilming.
object oriented program (OOP) - Programming which views programs as a collection of autonomous agents called objects. Each object is responsible for specific tasks.
OCR-B - International standard set of characters

OCR indexing - Technique that recognizes lettering, numerals and other characters and converts them to ASCII (attributes of a document) for subsequent retrieval.

OEM - See original equipment manufacturer.

office document architecture (ODA) - Architecture which can be used to describe a large variety of documents. It allows open interchange of documents in processable (revisable) form, formatted (page image) form or both. NOTE: Documents may contain character coded text, raster graphics images and geometric graphic (vector) images and is being extended to include audio and dynamic images. Extensions will also provide for hypermedia.

open document architecture (ODA) - Specific standardized architecture for compound document representation.

open system - System that allows users unimpeded access to information.

optical character recognition (OCR) - Technique by which characters can be machine-identified then converted into computer processable codes (e.g., ASCII, EBCDIC, etc.).

optical disk - Medium that will accept and retain information in the form of marks in a recording layer, that can be read with an optical beam. See also compact disk-read only memory, rewritable optical disk and write-once read-many optical disk.

optical memory - Memory in which data are recorded and/or read by optical means.

optical scanning - Technique to recognize printed or written data and generate a digital representation for storage, transmission, etc.

optical storage - Optical storage system that use light-specifically light generated by lasers to record and/or retrieve information.

page description language (PDL) - Allows an application program to control the format of text and graphics on the printed page.

pel (deprecated) - Abbreviation for pixel. See pixel.

permanent record - Permanent records are any records determined by the appropriate public records authority to have sufficient value to warrant their permanent retention and continued preservation.

petabyte (PB) - Unit of measure, approximately one quadrillion bytes, expressed as 1,000 terabytes, 1,000,000,000,000,000 bytes.

picture element (pixel) - Smallest element of a digital image.

polling - Method of controlling the sequence of transmission by terminals on a multipoint line by requiring each terminal to wait until the controlling processor requests it to transmit.

premaster - Intermediate recording from which a master will be created.

premastering - (1) Includes the conversion of digital code, the addition of error correction codes and the intelligent preprocessing of the data records. (2) Phase of CD-ROM production in which machine-readable and bit-stream data are converted to the CD format. See also compact disk-read only memory and premaster.

ppm - Pages per minute.

programmable read-only memory (PROM) - Semiconductor device for storing information such as programs. NOTE: Generally a PROM is a write-once device; once the information has been written (programmed), it cannot be altered. See also erasable programmable read only-memory (EPROM).

quality control - (1) Planned systematic activities necessary to ensure that media, a component, module or system conforms to established technical requirements. (2) All actions that are taken to ensure that a development or organization delivers products that meet performance requirements and adhere to standards and procedures. (3) Policy, procedures and systematic actions established in an enterprise for the purpose of providing and maintaining some degree of confidence in data integrity and accuracy throughout the life cycle of the data, which includes input, update, manipulation and output. See also quality assurance.
quality index - Subjective relationship between legibility of printed text and the resolution pattern resolved in a microimage. NOTE: Used to predetermine camera/microfilm requirements to ensure legibility in the resulting microimages.

random access memory (RAM) - Semiconductor memory circuits that hold programs and data during use in a computer system.

raster - Description of a rectangular or square array formed by a number of horizontal scan lines comprising a number of picture elements. The number of scan lines establishes the vertical dimension of the array and the number of picture elements forms vertical rows which establish the horizontal dimension of the array.

raster image - Image formed by a set of pixels arranged in a grid pattern, often called a bit-map or bit-mapped image. See also bit-map, bitmapped image, and pixel.

raster image processor (RIP) - Processor that converts a file containing text and graphics into a bit map.

raster COM (R-COM) - Device that produces microforms from any computer-managed pixel image storage device.

raster scan - Method of generating or recording the elements of a display image via a line-by-line sweep across the entire display surface, e.g., the generation of a picture on a television screen.

raster to vector conversion - Changing of an electronic image from a raster to a vector format. See also raster, raster data, raster graphics, rasterization and vector data

reader-printer - (l) Device that serves both as a reader and a printer and implies the provision of a viewing screen large enough to display a full-size or nearly full-size image of the original document. NOTE: Reader/printers are usually designed for image and print sizes up to 11 inches by 17 inches (approximately)

reader-scanner - Device that scans an image on a microform and produces a bit stream (digital) output which can subsequently be displayed or printed locally or at a remote location.

read-only memory (ROM) - Memory that contains prewritten programs or data. NOTE: The content of ROM is permanent; the content of random access memory (RAM) is volatile.

realtime - Operating mode under which receiving and processing the data and returning the results occurs so quickly that it guides physical processes or interacts instantaneously with a user.

rear-projection reader - Readers in which the enlarged image is projected onto a translucent screen from the side opposite that from which the image is viewed.

recording density - (1) Number of bits in a single linear track measured per unit of length of the recording medium. (2) Number of bits recorded per unit area.

reduction ratio - Relationship between the dimensions of a microimage and the corresponding dimensions of the original. Example: a reduction ratio is expressed as 1:24.

resolution - (1) Relative degree of an image's visual acuity. See also acuity and image. (2) In electronic imaging, specific pattern and number of pixels sampled. See also pixel. (3) Measure of capability to delineate picture detail. (4) In micrographics, the ability of a photographic system to record fine detail.

resolution test chart - Chart containing a number of increasingly smaller resolution test patterns. The pattern is a set of horizontal and vertical lines of specific size and spacing. NOTE: The NIST Microcopy Resolution Test Chart 1010a is generally used in micrographics.

retrieval coding - Techniques for retrieving specific images or data from microfilm. See also code line, flash indexing, image mark, odometer indexing and sequential numbering retrieval.

retrieval mark - Line, document mark (blip) or other mark recorded adjacent to the frame and used for automatic retrieval on appropriate equipment.

rewritable optical disk - optical disk on which data is recorded. The data in specified areas can subsequently be deleted and other data can be recorded.

ROM - See read-only memory.

rotary camera - Camera used for rotary filming.
RS-232-C - Electrical standard for connecting computer devices for transmission of information one bit at a time (serially), normally implemented through a 25 pin connector in which up to 17 pins are defined. Most often used for transmissions from 100 to 20,000 bits per second.

scaling - Technique using an algorithm to convert a bit-map of one density into a bit-map of another density. NOTE: Scaling usually involves enlarging or contracting an image.

scanner - Device that converts a document into binary (digital code by detecting and measuring the intensity of light reflected from paper or transmitted through microfilm. See also binary code and document.

scanning - (1) In electronic imaging, conversion of human-readable images from paper or microform into a stream of numeric values, called a bit-mapped image. See also bit-map. (2) In electronic imaging, OCR scanning is the conversion of printed or other symbolic information from paper or microform into ASCII code. See also handprint character recognition, intelligent character recognition and optical character recognition. (3) In micrographics, movement of an image on a reader screen in a direction perpendicular to the direction of roll-film transport. (4) The systematic examination of data.

SCSI - See small computer system interface.

second-generation microfilm - Microfilm copy made from the camera film.

sector - Smallest addressable unit of an optical disk's track.

sequential indexer - Device that automatically stamps numbers on documents as part of the microfilming operation.

SGML - See standard generalized markup language.

simplex - Method of recording images one by one in which a single frame appears within the usable width of the microfilm (ISO). See also image arrangement.

skewing - Image condition resulting from physical distortion inherent to a monitor or from errors in document scanning or filming.

small computer system interface (SCSI) - (pronounced "scuzzy") Industry standard for connecting peripheral devices and their controllers to a microprocessor. NOTE: The SCSI defines both hardware and software standards for communication between a host computer and a peripheral.

speckling - Extraneous dots that appear on an imaged document. NOTE: Speckling may result from the presence of dirt on the hardcopy, from an improper scanner setting or from a noisy transmission channel.

standard generalized markup language (SGML) - Language for document representation that formalizes markup and frees it of system and processing dependencies.

storage capacity - Amount of data that can be contained in an information holding device or main memory, generally expressed in terms of bytes, characters or words.


switched network - Multipoint communications pathway with circuit-switching capabilities, e.g., the telephone network, telex, and TWX.

structured query language (SQL) - Language understood by relational database systems that allows users to communicate with the system and formulate requests for data.

super video graphics array (SVGA) - Extension to the VGA display technology for IBM compatible PCs, supported by various vendors, using the same basic techniques as IBM defined for VGA, but allowing a resolution of more than 640 × 480 pixels and/or supporting more than 16 colors. See also cathode ray tube, display, pixel, resolution, and video graphics array.

synchronous optical network (SONET) - Interface standard for synchronous 2.46 Gbps optical fiber transmission. NOTE: SONET, developed by the Exchange Carriers Standards Association, is built on a data rate of 51.840 Mbps, called OC-1 (optical carrier 1). The SONET hierarchy builds on multiples of OC-1, up to and including OC-48 for an equivalent bandwidth of 2.48832 Gbps.

tag image file format (TIFF) - Standardized header or tag that defines the exact data structure of the associated image.
**terabyte (TB)** - Unit of measure, approximately one trillion bytes, expressed as 1,000 gigabytes, 1,000,000,000,000 bytes.

**text file** - Files of human-readable data that are stored as a series of ASCII characters, that can be used by many utility programs other than the specific program for/by which they were created.

**threshold** - Setting, generally used in scanning, that determines whether a particular section of the document is white or black.

**throughput** - (1) In micrographics, the rate at which documents can be processed through a microfilm camera. (2) Number of film frames, amount of film, etc., output by a computer-output microfilmer, processor, etc. (3) In electronic imaging, the time required in a scanning system, to convert hardcopy to digital form.

**TIFF** - See tagged image file format.

**tiling** - Means of handling large electronic images by storing and managing pieces of imagery (generally rectangular) so that the original image plane is completely covered (or tiled) by these pieces.

**transmission speed** - Rate at which information is passed through communications channels, generally measured in bits per second.

**turnkey system** - Integrated configuration of preselected hardware and prewritten software designed to accomplish a particular information processing task.

**twip** - Unit of measure used in displays and printing. One twentieth of a point, or nominally 1/1440 inch. See also point.

**twisted-pair** - Two insulated copper wires twisted around each other to reduce induction (thus interference) from one wire to the other. NOTE: Several sets of twisted pair wires may be enclosed in a single cable. Twisted pair cable is the most common type of transmission medium over short distances.

**ultrafiche** - Microfiche with images reduced more than 1:90. See also high reduction, microfiche and ultrahigh reduction.

**unitize** - (1) To separate a roll of microfilm into individual frames or group of frames and insert them in a carrier, e.g., aperture cards, jackets. (2) To microfilm on one or more microfiche a unit of information, such as a report, a specification, periodical, etc.

**universal camera** - Special microfilm camera that can handle 16-, 35- and 105-mm film.

**UNIX** - Computer operating system developed by Bell Labs with variants supported on a wide range of systems by numerous of vendors.

**updatable microform** - Microfilm medium to which additional images can be added at any time. See also jacket and updatable microfilm.

**VAR** - Value-added reseller.

**vector data** - Digital description of an image stored as a series of points and mathematical functions to describe the geometric figure, i.e., line, circle, arc, etc.

**vectorization** - Processing such that alphanumeric characters, lines, drawings or sketches are converted from raster code to vectors.

**vector to raster conversion** - Changing of an electronic image from vector to a raster format. See also raster, raster data, raster graphics, rasterization and vector data.

**video disk** - Rigid, random access storage medium for analog or digital information written and/or read by a laser; see also optical disk.

**VGA** - See video graphics array.

**video graphics array** - Display standard, initially established by IBM for the PS/2, with 640 x 480 addressable pixels and support for 16 colors at a time. NOTE: After the program mapped to a 16 color palate to send the data to the display adapter, the adapter converted the digital signal to analog to send to the display itself. The VGA standard also calls for support for programs that use the earlier EGA and CGA display standards.

**wide area network (WAN)** - Communications network that links broad geographic areas.
**workflow** - In imaging software, a program that queues, tracks and otherwise manages documents and collections of documents as they progress from entry into the system, through various departments in the organization, to its final destination.

**workstation** - Basic physical unit of a system which may be comprised of such hardware features as a display, keyboard, mouse and media drives(s).

**write-once, read-many (WORM)** - Digital optical disk on which data is recorded by the user once and can be read many times.

**xerography** - Formation of a latent electrostatic image by action of light on a photoconducting insulating surface. NOTE: The latent image may be made visual by a number of methods, such as applying charged pigmented powders or liquids that are attracted to the latent image. The particles either directly or by transfer may be applied and fixed to a suitable medium.

**zoom** - To enlarge the presentation size of information (such as text or images) displayed on a workstation monitor.

**zoom lens** - Lens with movable optical elements that can retain an object in focus, while changing the lens focal length. Consequently, the size of the object can be varied, while the camera or reader remains in the same position.

*Note: Certain sections of this Glossary were compiled and reprinted with permission of Mr. Don Avedon, Chairman of the AIIM Terminology Committee.
What We Do in Hybrid Imaging...

VersaIMAGE Software Corp. specializes in the replacement of outdated legacy CAR systems with “State of the Art”, Windows based CAR systems that are also digital Imaging Systems (hybrid). This is now possible, because CAR systems may be “image enabled” when digital imaging is desirable in conjunction with microfilm records.

The “image enabling” feature allows microfilm CAR application software to also manage and distribute scanned electronic images. This way, true "hybrid" document management solutions are created giving the users the best of both worlds:

Archival quality, fast image retrieval with multiple user access, a document retrieval audit trail and quick image distribution via electronic networks.

End users virtually cannot distinguish the difference between a scanned microfilm image or a scanned paper image upon arrival of these images in the users work station.

Our Flagship Imaging Products:

VersaCAR and VersaIMAGE offer the ultimate in Versatility!

- **VersaCAR** is a full featured Windows CAR Software product using Microsoft Access or SQL databases.

- **VersaIMAGE** upgrades VersaCAR and adapts to many different sources of image and data input. Images from paper scanners, microfilm scanners and other imaging systems are matched with data from Mainframe, Mini and Micro computers. Images and data can be verified, matched, corrected if necessary and exported to VersaIMAGE databases, CD writers or other Imaging systems. Foreign index data imports easily into appropriate index fields in any sequence and in operator selected order. VersaIMAGE allows easy implementation of new applications with little or no restriction on record size, number of fields and field structure. The Microsoft ACCESS and SQL databases are versatile, widely accepted in the industry and allows very powerful search criteria.
Batch microfilming and/or scanning modes with or without bar code recognition from paper or image is available. Microfilm retrieval with automatic or manual scanning modes complement paper scanning and image retrieval capabilities. Digital image backup to create archival “digital film” is available routinely today and VersaIMAGE has extensive data/image import and export facilities to satisfy most any requirement. These and many more beneficial features, often not offered by other imaging vendors, keeps VersaIMAGE ahead of its class!