Next 3 Page(s) In Document Exempt

SENDER WILL CHECK CLASSIFICATION TOP AND BOTTOM

	UNCLASSIFIED		CONFIDENTIAL		SECRET

CENTRAL INTELLIGENCE AGENCY

OFFICIAL ROUTING SLIP

TO		DATE	INITIALS
1	[redacted]		
2			
3			
4			
5			
6			

	ACTION		DIRECT REPLY		PREPARE REPLY
	APPROVAL		DISPATCH		RECOMMENDATION
	COMMENT		FILE		RETURN
	CONCURRENCE	X	INFORMATION		SIGNATURE

Remarks:

Would you take a look at this and then we can gab about it —

FOLD HERE TO RETURN TO SENDER

FROM: NAME, ADDRESS AND PHONE NO.	DATE
[redacted]	5/28

	UNCLASSIFIED		CONFIDENTIAL		SECRET

FORM NO. 237 2-61 Use previous editions (40)

U.S. GOVERNMENT PRINTING OFFICE : 1961 O—587282

Next 1 Page(s) In Document Exempt

MEMORANDUM FOR: Mr. [redacted] 26 JUN 1968

I called [redacted] secretary and got the full text of page 18 and then retyped it. Along with the words at the end of the last two sentences, the statement in the first paragraph on [redacted] was added.

[redacted]
IHC Support Staff

From: She (with [redacted]) returned our reference material - 25 June 1968 (DATE)
ok to put this back with Rita's Vidaforit

Next 20 Page(s) In Document Exempt

Instant Television Filing And Retrieval

by HAROLD J. PODELL

Apollo Program filing system could have profound effect upon industry's storage and retrieval methods.

Of the many ominous forecasts of problems associated with the "information flood," how many solutions are available for the documentalist? The answers proposed for this problem are relatively few. Contemporary information systems analysis is emphasizing the role of the computer generated index and search capabilities as complementary to microfilm or equivalent graphic image storage systems. Within this limited framework, the current analysis of the information processing criteria is adequate. The unanswered problem, however, is how to economically store and retrieve large volumes of graphic images for an active document file.

It has been projected that 1970 annual sales for the computer industry (hardware and software) will exceed $9 billion. If the developing field of information handling systems and services (including document processing) is projected at the same rate of growth, the overall information processing industry sales will approach $10-11 billion by 1970. When integrated with the staggering size of the total 'knowledge' industry sales, the significance of information handling in 1970 comes into a clear perspective.

Will there be adequate document storage and retrieval systems available in 1970 to efficiently utilize the indexing capabilities offered by the advanced computer systems? Is it foreseeable that all of the 120 million pages of scientific information to be produced, in 1970 alone, could be readily accessible in one economical storage system? Can small and medium-size commercial users anticipate smaller versions of future document retrieval systems, that will be compatible with their pressing information demands in 1970?

To all the above questions, the answer is YES!

A new era in document handling is approaching with the accelerated development of video filing systems, using TV image storage and retrieval techniques. The forerunner of this new era of automation is the recently developed Ampex Videofile system.

In Videofile, the source hard copy documents or microfilm projections are scanned by a modified TV camera and recorded electronically on two-inch wide, up to 7,200 foot long, magnetic film, Mylar base tapes. With several hundred thousand images stored in electronic (analog signal) form and accessible for rapid viewing, this video storage system could be the answer to many of industry's growing graphic retrieval problems. Videofile-type systems should come into wide spread use well before 1970.

Harold J. Podell is Chief of the Integrated Systems Development Section of the Brown Engineering Company, Inc., Huntsville, Ala.

Piped-in music, free coffee and NCR Paper

"It's heaven, Mildred. I get two coffee breaks on my new job and they use NCR Paper business forms. 'Member that cool pink sweater Harold bought me? The one I got all smeary on a carbon paper form? That can't happen here, Mildred. All NCR Paper can do is make dreamy copies.

"Can you read them? Even the very last one — and that could be No. 12 on electric typewriters. All unsmudgeable. It's chemistry, Mildred. Do the copies last? I'll say! I found one in the files that's ancient— 1954. You don't use NCR Paper yet? Get your boss to see his forms supplier. Let him think it's his idea."

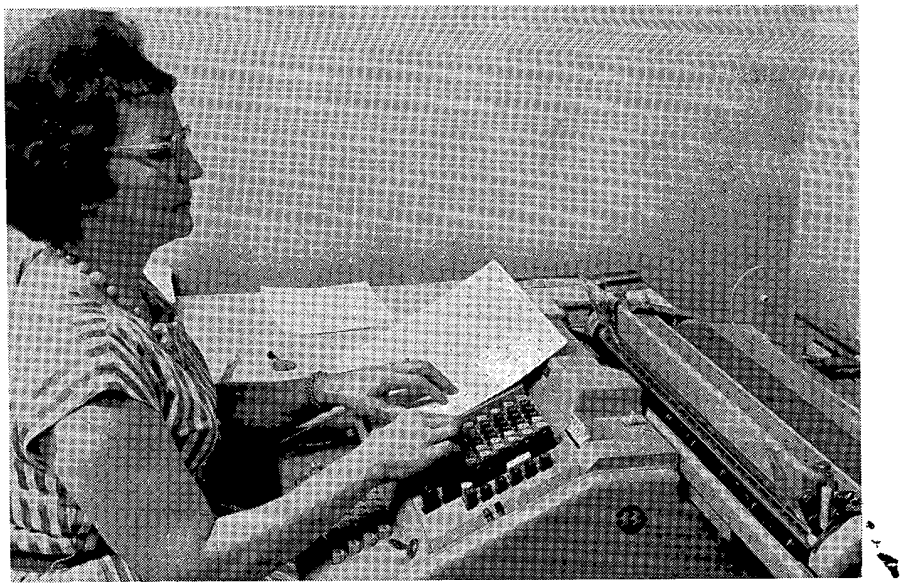
THE NATIONAL CASH REGISTER COMPANY • DAYTON, OHIO 45409

NCR

NCR *Paper* / multiple copies without carbons

CIRCLE NO. 541 ON POST CARD

New direct accounting method achieves important results for Globe Security Systems.



Data from employee's earnings record is indexed into numeric keyboard of computer.

by SOLOMON ARLAN

Savings Both In Time And Cost

Globe Security Systems, Inc., provides industry with guards and offers investigative services.

Being a service organization, payroll control is in many ways the basis for our entire successful operation. With revenues nearly tripling for the five fiscal years ending January 31, 1964, our payroll out of the headquarters has risen to some 2,500 employees.

To absorb this growth satisfactorily without increasing operating costs, we turned to an economical means of automation. By so doing, we eliminated 95 per cent of the duplication of effort that went into the preparation of weekly payrolls.

Time sheets are checked for accuracy before processing.

At the same time, we retained our basic system.

Our new procedure revolves around two Burroughs E2100 Direct Accounting Computers. The E2100 is a balance between an electronic computer and a direct-to-the answer accounting machine. In effect, it gives us computer results with accounting machine simplicity. As a result, we achieve an important economy—a carryover of methods and documents.

With conventional accounting machines, each employee's gross pay, taxes and deductions must be precalculated before processing by the equipment. This results in double calculating, once in preparation and again by the accounting machine.

On the other hand, the E2100 allows us just to enter the various rates into the machine. The calculations are performed electronically, at computer speeds. This is made possible by the E2100's memory capacity of 100 12-digit words in which are stored the factors to make the necessary payroll computations. Each of the 100 words is accessible at random through the machine's keyboard.

This is particularly important to us. Our employees are located in many locations in 18 states. Their pay rates, city or state taxes and deductions widely vary. Many of them also work overtime. Pre-calculating many of these variables, therefore, became too big a job in the face of increasing volumes.

With the E2100 this is now handled automatically. These exceptions are processed through subroutines that permit the E2100 to deviate from the norm without operator interventions. This eliminates pre-calculations, relieves the operator of decision-making, helps speed processing and improves accuracy.

At Globe, every day is payroll day. Using the cycle method, we prepare pay checks and post to earnings records four days each week.

Under the new system, earnings records, maintained on ledger cards, are removed from files when the weekly time sheets arrive from the various locations. The previous balances of earnings and taxes, plus rate of pay and exemptions, are introduced into the computer.

Without printing a single entry,

continued on page 67

Mr. Arlan is Controller of Globe Security Systems, Inc., Philadelphia, Pa.

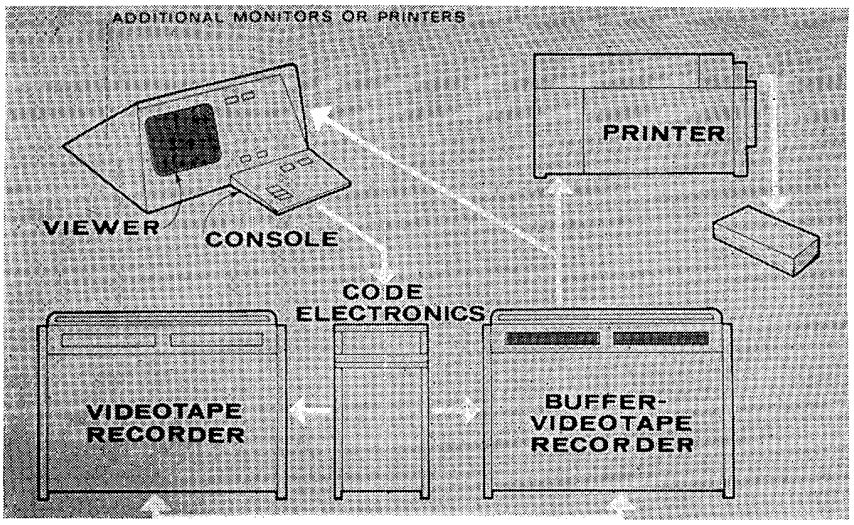
The PRINCE (Parts Reliability INformation CEnter) Program, which is operated at the George C. Marshall Space Flight Center in Huntsville, Ala., has been designated to serve as the Apollo Program Parts Information Center, according to PRINCE Manager, St. John Courtenay. This nationwide National Aeronautical Space Administration information dissemination system is coordinated in Washington, D. C., by Armand Lakner of the Apollo Reliability Program Office.

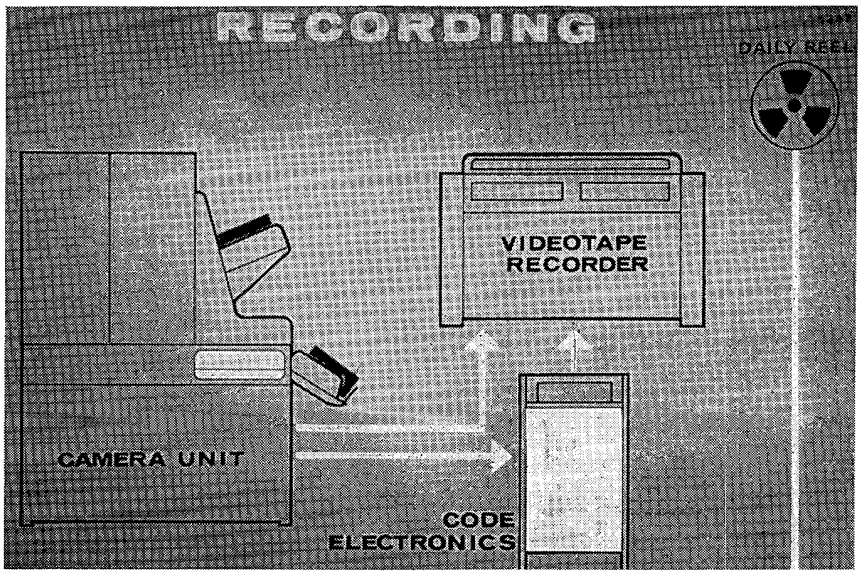
Will Satisfy Need

St. John Courtenay indicates that the Videofile system, which was selected through competitive bidding, will satisfy the pressing information storage and communications need in the Apollo Parts Information Program; it is an evolving hardware development program that offers considerable practical advantages today. The Ampex $875,000 contract with NASA, which calls for system delivery in Huntsville later this year, foreshadows the rapid development of less expensive systems for U. S. industry.

It is not necessary for the large-scale company to wait until 1970 for Videofile. For those organizations with dynamic document files

continued on page 54

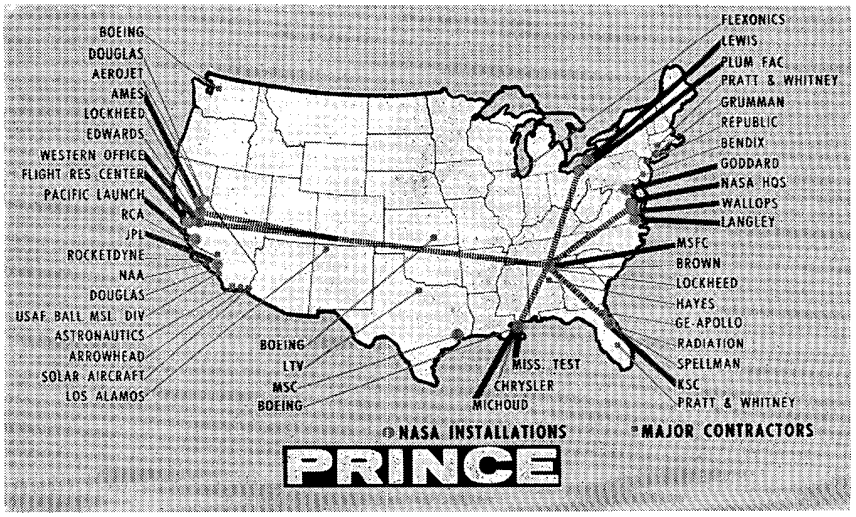




Above: Summary of Reference Process. Numbered source document is placed in the camera unit for exposure time of 1/15 sec. and then returned to source document file. Document image and assigned digital address are sent to videotape recorder. Image and its address are stored serially on reel.

Left: Recording process. Document is placed above camera where image and document number are scanned and recorded on daily video tape reel.

Below: Projected Data Transmission System for the Apollo Parts Information Center.



videofile

continued from page 21

exceeding 500,000 8½ x 11″ pages or images, Videofile offers immediate economic interest. The outstanding technological breakthrough that has been achieved by Ampex is the significant economy of electronically processing, adding, replacing and deleting images in large volume, without the traditional chemical development or tape splicing.

The physical hardware configuration of a Videofile storage system is a direct function of the users file activity and file size. No significant limitations on hardware expansion exist in the upper ranges other than basic economic considerations. It is entirely feasible that an electronic storage system of two million images can have virtually the same access time per image as one of two hundred million images. Even the low activity images can be stored off-line with relatively responsive access times.

Depending upon electronic circuitry options and video film reel sizes, several levels of access time for the first image of any given document are economically feasible:

Category

1. Priority high-volume images 20-30 sec.
2. Normal use images 1-2 min.
3. Off-line images 3-5 min.

Naturally, the volume of stored images increases with each of the above categories. A typical file distribution could be:

Category

1. 10% of the file size with 40-50% of the activity.
2. 60% of the file size with 30-40% of the activity.
3. 30% of the file size with 10-30% of the activity.

Viewing the above categories from an economic standpoint, the cost of each search decreases as the elapsed search time increases. An accurate record by document address could be maintained for each search, and with activity records being processed periodically, it would be possible to reclassify images by category. The changing and re-sequencing of image locations can be accomplished electronically on an automated basis. In this manner, the older document image files would gradually be transferred to category 2 or 3 reels.

A Videofile Configuration

The NASA PRINCE hardware configuration for the Apollo Program represents a typical system for a medium-sized commercial installation, with the capability for modular expansion to a large-scale system.

Each document is assigned a seven digit address, and image recording is performed in a chronological manner at a manual rate of 20 to 30 pages per minute or up to 700 documents per minute with automated equipment. Up to 250,000 8½ by 11″ document images can be recorded on each input reel at ⅓″ of tape per image for 90 TV lines per inch of resolution (equi-

their comment often is 'I have to buy so many different kinds of readers in order to project all this kind of microfiche. I bought a reader, and it only takes up to 4x5 or 5x8, and it doesn't do well on this or that.'

"If we are going to develop all kinds of sizes of microfiche, then we are putting the burden on the user to have all the various kinds of equipment."

Edward Schoenfeld, Manager, Contract Sales Division, DuKane Corp. "The problem isn't so much the size as it is the reduction ratio, because it is a relatively simple thing to handle all common sizes of microfiche, but it becomes a little more complex when you are dealing with different reduction ratios."

William J. Bengtson, Product Coordinator, Copyflo, Xerox Corp. "People in industry, I feel, may tend to lean toward the tab card size of microfiche. It becomes a natural in filing with microfiche mounted in aperture cards. The engineering drawing, for example, can be contained in a frame of microfilm, and then all the backup materials, bills of material, contracts, purchase orders, change notices, can all be contained in a tab size microfiche card, so that you will have the complete story in one compact file."

Alan C. Root, Business Planning Manager, Mosler, Safe Co. "One of the best ways of helping people to see what is on a microfiche will ultimately be to machine-run it up and index to a specific image in that fiche.

"The machine retrieval industry is awfully close to being able to run aperture cards out and display them. In fact, we are doing this on special systems right now.

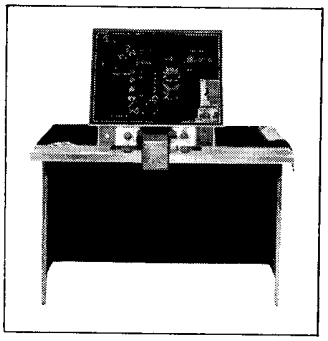
"If the dimension of fiche is the same as the aperture card, mechanically it is going to be much easier to provide equipment that will accept both. Just from the point of the sheer physical dimension of the document, it is expensive to make a machine that can take an intermixed file of aperture cards and microfiche if they have different dimensions.

"We can provide that machine much more economically if the documents are physically the same size. Also, when it comes to displaying the contents, it won't be too difficult to make a movable platen that will pick up the aperture card image and throw that onto a screen, either at point of use or remote, over closed circuit television, and use that same platen to index to a specific image on a fiche, so that you have compatibility."

Alexander Kreithen, Vice-President, Documentation Incorporated. "Adoption of the 105 x 148mm microfiche as a common microform by NASA, DOD, AEC and OTS insure its continued, expanded use, and provides an assured market for developers of equipment. It may well be that microfiche will make the century-old dream of the pocket library a reality. In the meantime, students, scientists and engineers should be made aware of the increasing volume of information available in microfiche and educated in its use." □

THIS READER-PRINTER

Has a big, bright viewing screen (18″ x 24″). Gives a choice of printout (true translucents, sharp opaques, even offset plates—in less than a minute). Handles all microfilm, including microfiche, in sizes up to 5″x8″. It's the unsurpassed Itek 18•24 Reader-Printer. To get full details call our local office or write Itek Business Products, Rochester, N. Y. 14603.
In Canada: Itek Business Products Ltd., Toronto, Canada.



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Itek Business Products, A Division of Itek Corporation

Visit our Booths 4, 5, 6, at the National Microfilm Assoc., May 11-13, Sheraton-Cleveland Hotel, Cleveland.

CIRCLE NO. 531 ON POST CARD

valent to 63 facsimile lines per inch). Fewer images can be stored if a resolution of 150 TV lines per inch is required (equivalent to 105 facsimile lines per inch). The recording process is controlled electronically (code electronics), and a TV monitor is provided for visual spot checking of recorded image quality.

After determining the appropriate document address(es), the Videofile operator punches the address number(s) on the keyboard of the retrieval console unit. The document images are displayed serially (NASA PRINCE will be using a direct print process during FY '66). The electronic control system (code electronics) can be instructed to transfer the document images to either the viewer monitor or to the printer, after temporary storage in the buffer videotape recorder (electronic buffer). NASA is using a modified A. B. Dick electrostatic printer which provides over one page per second of hard copy output. In the future, NASA is considering transmitting hard-copy of the source electronic images over transmission lines.

Well before the proverbial "information explosion" gets out of hand, it is anticipated that reasonably priced, medium-sized Videofile systems will be available for industrial and commercial use. During 1966 and 1967 the Videofile will be available at a reduced cost for medium-sized document file utilization.

The future progress of the Videofile system will most probably be directly analagous to the rapid technological advancement and accompanying price reductions of the digital computer during the last 10 years. As the price drops, there should be significant quality improvements. One of the most worthwhile near-term improvements expected is a gradual increase in output resolution to graphic arts quality of 400-500 TV lines per inch (equivalent to 280-350 facsimile lines per inch) by the use of a flying spot scanner input camera. The amount of linear inches of video tape required per image is expected to be substantially reduced therefore the increased resolution capabilities do not necessarily mean a proportional increase in space.

One important feature on the Videofile improvement horizon is that modular electronics will produce better image quality with only minor on-site electronic modifications and substitutions. Thus, the current Videofile user will benefit considerably from forthcoming state-of-the-art hardware advances. It is expected that the quality of output displays, and of the video magnetic film itself will increase considerably in the near future, complementing the trend towards super-resolution. Another important 1967-8 technological breakthrough on the horizon is the projected capability of Videofile to handle source documents in the engineering drawing size category. □

How Management Uses Closed Circuit Television

BURGEONING growth and rapid development could conceivably cause managers to lose contact with technology, communications pipelines could become too narrow, lines of authority could weaken and time lags between request and response could increase. When management finds that traditional methods of control are less effective, it must seek new tools to cope with the race against time. One such tool, closed circuit television, is used by the Space & Information Systems Div. of North American Aviation, Inc., a major contractor for the Apollo spacecraft and Saturn S-11 second stage boost vehicle. Its facilities in Southern California are dispersed over an area that extends more than 80 miles.

With the division operating 24 hours a day, its Television Operations Center provides management with a communications channel that is always available. The offices of key managers are equipped with a two-way sound system and television receiver. Roundtable discussions can be held without requiring individuals to leave their areas and managers at remote facilities may take part in conferences via microwave facilities.

In addition, experiments at remote locations can be telecast to managers to give them the information they need at the least possible time cost. Formerly, company officers and managers alike had to journey to the remote location, attend the experiment or demonstration, then journey back again, using valuable hours in travel. With closed circuit television, operations can be broadcast live or recorded on video tape for presentation at a time acceptable to all or to fit various time schedules. Instrumentation cameras, mounted in areas that might be hazardous or inaccessible, can transmit and record results on video tape as they occur. The television center uses 3M Co.'s Scotch video tape which requires no processing and can be played back immediately

DATA PROCESSING

Four channels of closed circuit television at North American Aviation's Space & Information Systems Div. can reach employees in 450 viewing locations. (See page 106.)

Current trends in office automation.

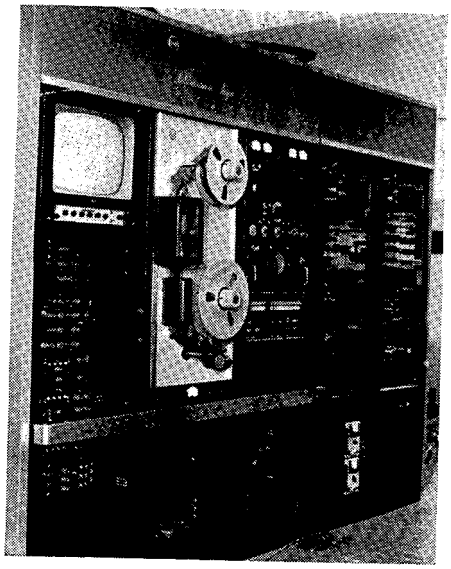
with picture and sound.

In addition, technicians at the television center transfer video taped programs onto 16 mm film via the kinescope process for showing elsewhere. Then, officials say, they can use the same video tape over and over for other programs, bringing the cost of tape use to a very low per-unit price.

Closed circuit television broadcasting of the current status of programs direct from chartrooms, or presenting problems from remote locations with immediacy, has brought a new dimension to management. The system also can be used to teach and motivate employees with programs televised for training or general information. This assures that employees at widely dispersed locations receive identical information presented with the utmost skill.

North America's television center is comparable in quality and efficiency to modern commercial television studios. The air-conditioned 11,000 sq. ft. center includes a production control room, two soundproof studios, repair and maintenance areas, writing bays, film library, projection and conference rooms, clerical space and administrative offices. In the control room are audio, video and switching control consoles. All equipment is available for both studio and remote telecasts, including cameras, video tape recorders, kinescope, special effects equipment, sets, lighting, microphone booms, remote controlled instrumentation test

Management maintains tight control over all its TV operations with audiences selected on a need-to-know basis. Audio, video and switching consoles are shown above.

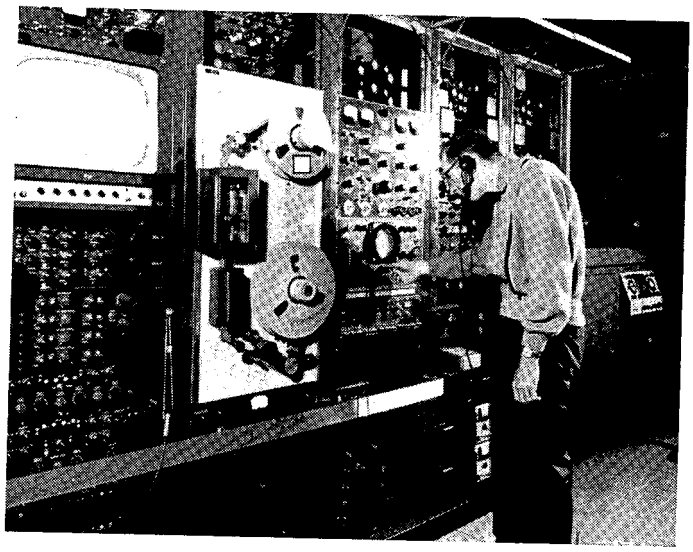


Sound and picture are recorded on video tape by this machine for immediate playback without processing of any kind. Equpiment at North American Aviation's television center is available for both studio and remote telecasts.

cameras and editing equipment.

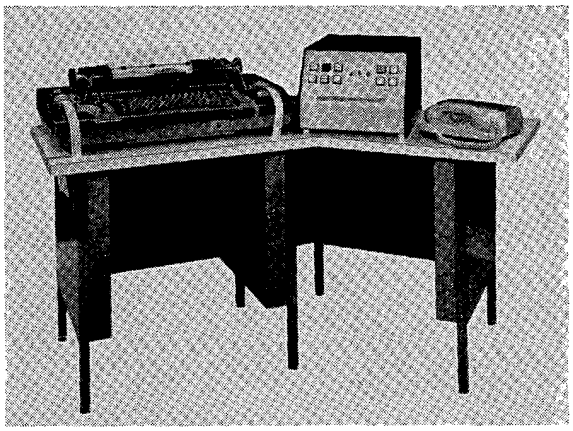
The center can telecast on four different channels to as many as 450 in-plant viewing locations although approximately 100 receivers are shuttled for specific programs. Management maintains a tight control over all TV operations and all audiences are selected on a need-to-know basis.

The Space & Information Systems Div. built its system from the ground up for use exclusively as a management and engineering tool. A study of television applications was conducted. The advantages of television were weighed against the costs involved for each application. As a result, the television system is designed to accomplish its tasks in the most economical manner. The division has established a systems design consultant group and welcomes the opportunity to discuss the merits of closed circuit television with interested firms. ●



Technician transfers video taped programs to film for showing elsewhere. Then video tapes are reused to record other programs. This reduces the cost of tape use to a low per-unit price.

Dura Data Communications Terminal



THE DURA data communications terminal is compatible with all major computer systems and will read and punch paper tape and edge-punched cards while it simultaneously types out the data. The machine, designed by Dura Business Machines, Madison Heights, Mich., operates at up to 175 words a minute on-line or off-line. It goes on-line with Data Phone or comparable equipment, and accommodates many types of systems including those where printout only is required, or just transmitting and receiving data—machines are bi-directional.

The solid state unit effectively collects and distributes data from remote locations for central processing. It has all standard features of Dura Mach 10 machines including automatic nonprint, punch control from one or two outputs and automatic input from one or two photocell sensing readers; standard typewriter keyboard, interchangeable type spheres and stationary carriage. **For More Information Circle No. 115.**

High Speed Address Labeler

THE MODEL 514, announced by Cheshire, Inc., Mundelein, Ill., will apply wide, computer-written address labels, heat transferred addresses or postage stamps, at 7500 an hour. Label forms with two, three, four or five addresses across are automatically cut and applied. The 514 also will transfer carbon address images from the reverse side of the form to mailing pieces with clear black imprints.

CHICAGO, ILL.
NEWS

E - 462,916

OCT 5 1968

The super library

Slowly and hesitantly, public libraries enter an era of electronic marvels

By JOSEPH HAAS

ONE DAY, in the rose-colored future, you will return from a hard two-hour day at work over a cool computer to the controlled environment of your home, where the world's knowledge will be at your fingertips.

An electronic console in your rec room will be your public library, news source, communications device and recreation center. This computer facility will not only carry television shows, movies, drama, ballet, opera, news and sports events on its three-dimensional color viewing screens, but it will also be linked to your local branch of the Universal Library (possibly far underground in the vicinity of Washington, D.C., although you will also be able to draw on the Moscow, London or Peking branches, if you wish).

The branch library will have stored in immense electronic brains, and immediately accessible to anyone, copies of all of the world's information — books, documents, speeches, lectures, articles, everything. It will be available to you in any manner you desire it: in fascimile form, as teleprinted data extracts, on microfilm for closed-circuit television viewing, on audio tapes, or in whatever as-yet undreamed-of forms the future holds for us.

Of course, this is science fiction. Yet bits and pieces of the dream are coming true and authorities on the coming new automated library feel certain that the dream is bound to be the inevitable reality. It has to occur, they say, because the information explosion is of such megatonnage that only an equal implosion of knowledge into electronic libraries will enable us to cope with the data fallout.

WE TALKED to several authorities on libraries to find out just what is happening in libraries today and what is possible in the near and distant future. From what they say, and their attitudes range from skeptical and cautious to daring and ambitious, great things are happening, but few libraries are making use of them yet, especially the public libraries upon which most of us in this area depend.

"The public libraries are running 10 to 15 years behind business and government, surely, and the field of general education as a whole, in the utilization of modern technology," says Walter W. Curley, library consultant and director of information services for Arthur D. Little Inc., the world-wide research and consulting organization with headquarters at Cambridge, Mass.

"One of the problems," Curley goes on, "is that public libraries have no real cost figures per unit available to them. So if I'm called to a large metropolitan library as a consultant and I recommend to a library board that they spend $200,000 to put in a computer effort, the trustees are not sure if this expense will justify itself in savings over employes' efforts.

"But after all, the public library in a community probably has as many transactions in a day as the largest department store in town. And you wouldn't see the largest department store maintaining credit, billing, accounts receivable, traffic control and so on the same way they did it years ago. Yet it's what libraries are doing."

There are exceptions, of course, or there would be no progress, but most of the work is being done by university, governmental, professional, business, and other specialized libraries, not by public libraries, although some state library systems—such as in Illinois—are finally getting around to creating networks of libraries, or library systems, to diminish duplicated effort and better to coordinate their activities.

HERE IS a sampling of some of those "exceptions" that are now forcing what progress libraries are making:

The Library of Congress this month broadened its MARC (machine readable catalog) project (to catalog on tape all new English-language publications) so that copies of these tapes will be available to any library that wants to use them. Libraries with computers then can use the tapes to create catalogs for inventory and book acquisition, and even to create unique catalogs for borrowers relevant to their specific information needs.

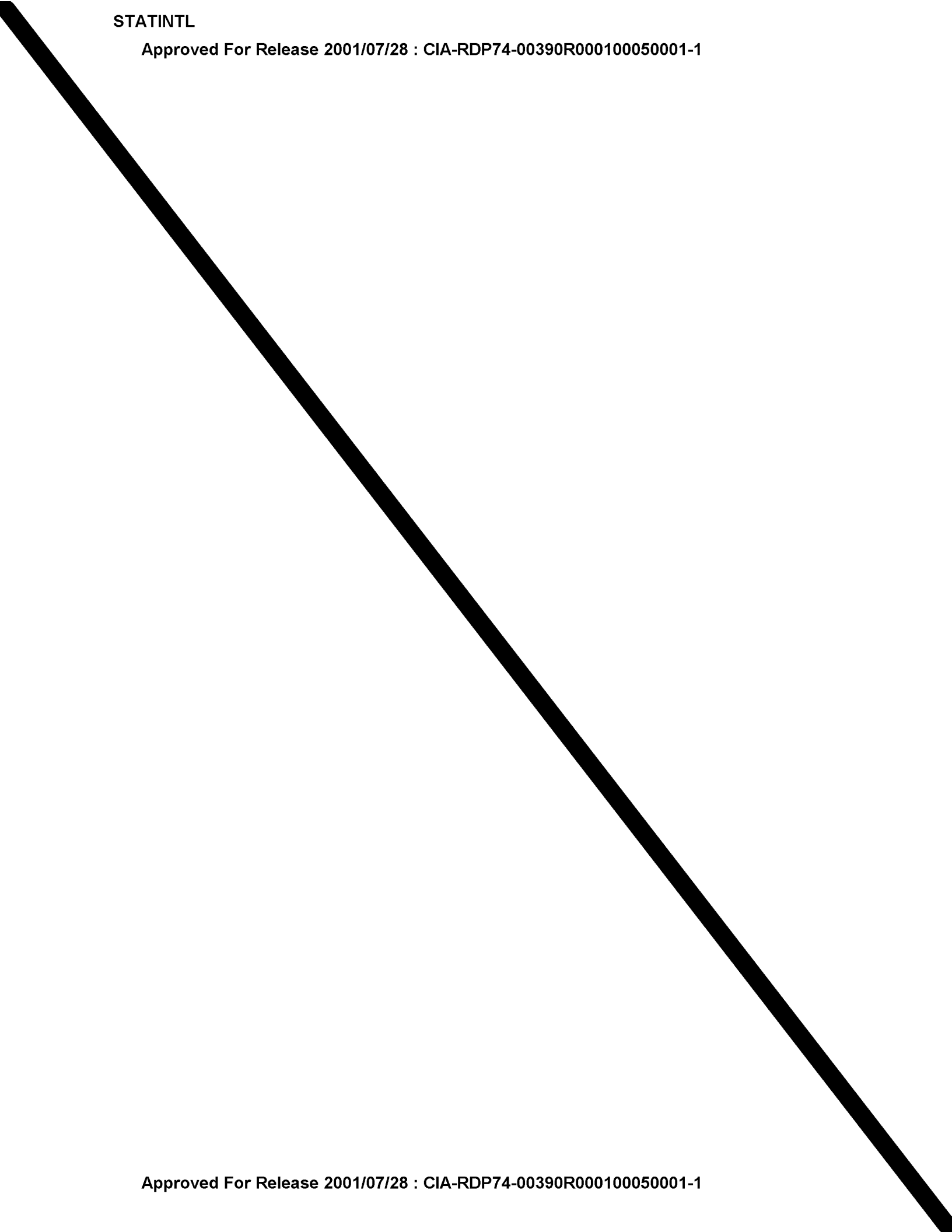
(Eventually, the Library of Congress can be expected to tackle the gigantic job of cataloging all of its material, not just the more than 30,000 new English-language titles published each year. When this is done, any computerized library will be able to use these tapes as a source of bibliographic information—author, title, subject—on just about everything in print in the English language.)

In Ontario, Canada, a library expert suggested the possiblity of creating a centralized super-library, Unilib, that would store in a computer the information from the contents of all of the province's university libraries. Teletype and photo-copy links between the universities and the central computer would enable borrowers to obtain the information they needed.

At Bell Technical Laboratories in New Jersey, employes use their machine-readable identification badges to withdraw or return books to the lab's three libraries. A computer charges the book against him, notifies him when it is overdue, checks it back into stock when it is returned, and tells a frustrated borrower who has the book he wants and when it will be returned.

The National Library of Medicine at Bethesda, Md., uses computers to create catalogs of information in reports, books, articles and so on that are relevant to a physician's or medical researcher's request for data. If he wishes copies of the material, the library has employes who operate little dodgem-type microfilming-cars that zip up and down storage files to find it and copy it on the spot so that photo facsimilies can be made and sent to him.

Continued



(One scientific publishing house has filed suit against the National Library of Medicine, charging that its facsimile reprints are a violation of copyright laws. The booming copying industry means, of course, that this is going to be a sensitive area, for libraries and other copiers, for years to come, and a congressional committee has been holding hearings for some time to attempt to find some way to update copyright laws to cope with it. One suggestion is that authors and publishers might be paid for copies made of their works the way song writers are paid each time their song is performed, live or on record.)

IBM has created for the Central Intelligence Agency a model information-storage desk-sized cabinet that has the potential of holding 20,000 volumes on microfilm or microfiche (sheets or cards of microfilm rather than strips) for instant perusal on a viewing screen.

LOCALLY, one of the most adventurous experiments is being tried at Oak Park High School. Supplied with $1,486,200 of federal Title III funds for the extension of library services, the school has installed a computer, audio-tape players and 25 electronic-console study carels in its library to create the first such random-access information facility in the country.

Theodore Johnson, the young history teacher who was put in charge of it, says this is how it works:

Each study carel has a push - button control panel that a student can use to select any of 900 audio tapes to be played for him through a set of earphones. A viewer also is included in the carel so that microfilm and other photographic materials can be used to supplement the audio material.

When the student makes his choice, the computer directs the selection of the requested taped material and electronically connects it with a high - speed recording machine that makes a copy of the material in seconds for playback to the student. Since a copy is made upon each request, as many students as there are carels can hear the same lecture at the same time, from the beginning.

Teachers from any department in the school can prepare lecture tapes or request that other recorded matter be added to the tape - storage center. It can be material that will supplement classroom instruction, or provide further instruction for slower learners.

"We can do exciting things with this," Johnson adds. "We have tapes on the sounds of history for the student who wants to cover particular areas in depth or go to original material. He can listen to such things as Franklin D. Roosevelt's first inaugural address.

"And as soon as we get the proper telephone connections made, any student with a touch-type dial phone will have access to all of this audio material at any time from his home. All he will have to do is dial the proper phone number to connect him with the random - access system and then to use the pushbutton dial to request the material he wants to hear over his phone.

And this just begins to top the possibilities of such random - access use, Johnson says. "Within the next 18 months, we hope to provide random - access, through closed - circuit television screens in study carels and classrooms, to visual materials. And perhaps this service can also be extended to other schools and libraries in the area and, eventually, to anyone who is willing to get a closed-circuit TV system. A system that can provide random - access can, quite literally, have an unlimited number of receiver points connected to it."

PROGRAMS such as these seem to poise the library on the threshold of that electronic home - library future. Opinions on just how far and how fast it will come depend upon to whom you talk.

Alphonse F. Trezza, American Library Assn. associate executive director for administrative services, is cautious. "I'm not convinced we're going to have libraries tremendously different 15 years from now than we have today," he says. "They'll look the same, and you'll still find a book on a shelf. The day when computers will replace the book is very far off. People who talk about that are talking pie - in - the - sky."

Dr. Alex Ladenson, a veteran of the backward Chicago Public Library who inherited its headaches on an interim basis as acting librarian until a successor is named to replace Miss Gertrude E. Gscheidle, eased out as librarian last year, also warns against putting all of the chips on automation at the expense of books. "You can't jump into something too fast. You've got to be sure you're going to be able to use a tool. The producers of some of these experiments tend to oversell them."

But when you talk to Curley or ALA's Don S. Culbertson, executive secretary of the information science and automation division, you hear more venturesome statements about automation and libraries.

AMONG AREAS where automation can be used now in libraries, Culbertson says, are business procedures, cataloging, circulation, acquisition, inventory control, lists of serial (periodical) holdings, patron registration and other routine bookkeeping and clerical work. "You can find much of this being done, piecemeal, throughout the country," he says.

"But when you begin talking about cataloging the information in the books themselves, and not merely the bibliographic citation... well, this cannot be done on a broad basis until technological developments bring down the costs of electronic storage very sharply. It will be a staggering task, sorting out this information so that keypunch operators can put it in the computers. Electronic scanning is still at the primitive stage; it's a long way off before scanners will be able to 'read' any print, much less cursive writing. Until then, it's up to human operators.

"And we are going to have to learn a lot more about the structure of our language before we can give the computer the minute instructions it needs to make this information retrievable. A new alphabet may have to be developed related more accurately to sounds, less arbitrary than the one we use, so it can be computer - programmed."

Despite all of the difficulties, Culberston is sold on the library of the future: that is, a national computer library linked to networks of regional libraries and to homes, electronically, for immediate retrieval of almost any kind of machine - storable material. "This is really going to come," he says firmly. "The main obstacle is how much of our national resources we can afford to put into this."

But Culbertson feels there will always be a place for books, too, as "the essential source material. It's a very efficient storage medium, especially ideal for casual reading or perusing. It has matrix access: you can go to a shelf and pull out a single book. And there will always be a place for the intimacy of sitting down under a tree in a park or beside a stream with a book."

CURLEY, the Arthur D. Little consultant who has headed numerous library studies and several public libraries and systems, isn't as optimistic about the book's future. "McLuhan says that the trend is away from books. I say that the book has to step aside, to share its role as an information source.

"A lot of people right now don't want to spend seven or eight dollars for a book. I know I wouldn't mind having a home viewer and being able to get a book on microfiche for half a buck. Some people have sentimental attachments to books — my wife's a librarian, too, and she has books all over the place. But I want information and so I read a lot of newspapers, magazines, periodicals. If I can get them cheaply through microfiche or facsimile so I can throw them away when I'm done with them, fine."

Curley, too, feels that the home information center will come one day, but he doesn't feel the library will become obsolete. "I think it will become a cultural complex, providing many of our cultural needs — films, music, books, all sorts of audio - visual material. But it's in for drastic changes.

"Instead of a library buying 50 to 100 copies of a hard - title book everyone wants, it will buy one microfilm or microfiche of it and make facsimile reprints of it for a few cents a copy. The patron can take a copy home and, when he's finished with it, throw it away. That solves much of the traffic problem for libraries.

"Many books will not even be published, the cost is becoming so prohibitive. They will be put right on microfiche. It costs about a half - dollar to prepare one, and one card can maintain 96 8½-by-11 pages of type that can be read on a viewer. The federal government issues millions of pieces of microfiche a year now instead of printing all of its reports.

Continued

"A-V, AUDIO - VISUALS, is another big aspect of the game. Some schools are just beginning to tap its potential for individual instruction.

"And some areas haven't even been touched. The printed book frightens a lot of people and others aren't capable of reading profitably, for a variety of reasons. But they can be reached, perhaps, by some of the audio - visual materials being used on limited bases now: the talking - books that are recorded for the blind and near - blind, the high - interest, low - vocabulary books with large type and big pictures, films, television."

RATHER THAN eliminating the need for librarians, who are in short supply anyway (the national shortage of librarians is estimated at upwards of 25,000), Curley feels, the librarian will be allowed to become more of a professional than he is today. And the small but growing new field of "information science," Curley believes, will be absorbed by the librarians.

The information specialist program, Curley says, is being developed in schools and universities today independent of the library field. "These are the people who learn to master the computer, who understand microcopying and the other tools of information storage and retrieval. Today the information scientist is working for Western Electric, creating an information program for them. Or he's with McGraw-Hill, the book publishing firm that is a pioneer in the micropublishing industry.

"Microcopying is one of the fastest growing fields in the United States today; three years ago it didn't even exist.

"When librarians become information specialists, they will be freed at last from all of the routine clerical drudgery. They will have time to learn to know their resources and how to store information and retrieve it from the computers. They will be available to work with patrons more closely. They will get to know their community, who is using the library and for what purpose, so the library can be scaled to its patrons' needs.

"I don't see modernization of library techniques eliminating the human element. It will be just another step toward freeing men from all of the grubby drudgery.

"I feel most people do very little thinking today — I know I feel lucky if I can get four or five hours a week to do any thinking at all, after the repetitive chores are done. That's what automation can, and should do for us: free us to realize our humanity."

And in last place,

ALTHOUGH automating the public libraries has made little progress in Illinois, and scarcely any whatever in Chicago, help is coming.

Thanks to the Illinois Library Development Act of 1965, more than 90 per cent of the public libraries in the state have merged into regional systems in the past two years. And the men and women who are trying to make these systems work are thinking automation, although the thought has not yet fathered any deeds.

As for the Chicago Public Library, that giant with 62 branches, 800,000 registered patrons, 3,700,000 volumes and a budget in excess of $9,000,000 . . . well, this is what Dr. Alex Ladenson, acting librarian, has to say about automation:

"The Chicago Public Library is way at the bottom of the automation ladder. The only strictly automated activity is our payroll, and then that's because it's handled by a city department that has computer access. We don't have that."

Gertrude Gscheidle was retired as librarian last year when the Chicago Public Library came under siege for its poor service and antiquated methods. Swept out with her were several members of the library board.

As usual in Chicago whenever a city agency comes under fire for not doing the job, a study was begun to learn how to improve the city's public library system. William C. Hartmann, the architect and civic leader who heads so many of these efforts for Mayor Daley, was named to head a citizen's committee to examine the library's problems. The actual work of the survey will be directed by Dr. Lowell A. Martin, former dean of the Columbia and Rutgers schools of library service, who has been commuting here in recent weeks and, starting this month, began to serve a three-month stretch at the Chicago Public Library.

The study will go into the potentials for improvement of service, through automation and other means, Dr. Ladenson says, as well as into remodeling of its Central Library at Randolph and Michigan. "My view is that we can preserve the essential monumental features of the building — that is, the central staircase and the priceless mosaics—while we can drive piles around the staircase and build up. We need a more functional building, but we must preserve what needs to be preserved."

Actually, its very backwardness may offer the Chicago Public Library the chance to move to the forefront in library services. Conceivably, if the money is provided, the Chicago Public Library could vault right out of depression-era service into the vanguard of automation.

But that's not its only problem. Under Miss Gscheidle and the former library boards, the library was allowed to limp along with a budget level created in 1935, the depth of the Depression.

That's when number of government agencies in the state adopted a "pegged" levy of taxation to provide a more stable financial base in that parlous time. However, when times got better, every other agency in the state except the Chicago Public Library went instead to a fixed tax rate that follows the rise in property valuation.

Every other community in the state today is permitted to levy 1.2 mills per each dollar of assessed valuation for library purposes. But Chicago, Dr. Ladenson says, is stuck with its 1935 levy rate. If it could levy the 1.2 mills, it could raise $13,500,000 a year instead of its current budget of $9,000,000.

"We spent $2.82 a year per capita in 1966," Dr. Ladenson says. "That makes us the next to the lowest among the 10 largest libraries in the country. That's why we're going to the legislature next year to ask to have our method of appropriation altered."

THE MOST PROGRESSIVE development in Illinois public libraries in recent years was the creation of library systems. Under the 1965 act, the state legislature voted funds to finance the creation of a network of library systems to improve service.

Today there are 18 such sytems in the state, most of them linking town, village and city libraries within certain regional areas. An exception is the Chicago Public Library, which is given an additional $1,500,000 a year in state funds (over and above its $9,000,000 budget) to function as a consolidated system in itself.

The Chicago Public Library is given another $100,000 each year, too, to serve as one of the four Reference and Research (R & R) centers for the systems network. The other centers are the Illinois State Library in Springfield, the Southern Illinois University Library in Carbondale, and the University of Illinois Library, Urbana.

The systems began operating in January, 1967, and their first step was to permit interlibrary loans among libraries in a system. If a system's libraries can't fill a borrower's request, the system can ask the R & R center in its area for the material.

Dr. Ladenson says, "Work was started last spring on a teletype system among the R & R centers to accelerate service of these requests. It should be in action soon now."

ONE OF the larger systems in the Chicago area is the Suburban Library System with offices in Western Springs. Its main storage libraries are Oak Park and Park Forest and it includes member libraries from Schiller Park to the Indiana border.

Continued

Lester Steffel, SLS executive director, said the books the system purchases are merged into the Oak Park and Park Forest collections, which are available then to the entire system.

"We operate two delivery vans that travel among the system's libraries to service requests for books. On an average—and we're just getting started, really—it takes from six to 10 days from the time we're notified of a request until it can be delivered to a patron's library.

"Of course, we're looking toward automation. Enough of the libraries in the system have just approved financing a study by the Illinois Institute of Technology on the feasibility of creating a computer catalog of the titles we have in our collections. If it looks promising, we might set up a pilot program to test it.

"We're also creating a collection of microfilmed periodicals with a reader-printer machine so we can make facsimiles of material requested by patrons. That's experimental now."

GERALD M. BORN is resources co-ordinator for the North Suburban Library System with offices in Morton Grove. It has 28 member libraries, including Evanston (its main storage library), Waukegan, Skokie, Glenview, Wilmette, Winnetka, Des Plaines and Glenview. Born reports:

"We're studying the possibility of assigning certain libraries in the system with certain subjects in which to develop specialized libraries. This should lessen duplication of purchasing, as well as broaden and improve the system's collection in areas such as poetry, the physical sciences, and other areas where a local library tends to be weak."

As for automation plans, both Stoffel and Born felt that this definitely must come to enable the systems to provide the best and fastest service at the lowest cost.

AMPEX

VIDEOFILE®
Information System

System description

VIDEOFILE INFORMATION SYSTEM

A Revolutionary Concept of Electronic Information Management

Enormous numbers of documents, large storage areas, multiple users and high activity bring monumental challenges to information management. Manual or semi-automatic methods of handling these large collections of documents are inefficient and costly. Successfully meeting this challenge is a revolutionary concept of information management based on television-type electronic images—the Videofile Information System.

The Videofile System converts paper documents into television-type electronic images. The electronic images, with identifying addresses, are automatically filed and stored in compressed form on magnetic tape. A small number of easily stored reels of magnetic video tape can hold an entire large collection of documents. Any individual document page image can be automatically retrieved, looked at in its original size, purged, reorganized with other images, instantly moved to various locations, even reproduced back into a paper document. Recalled document images are displayed as images on a television screen (soft copies) or reproduced as printed pages (hard copies). Since the document images are in electronic form, filing and retrieval can be performed remotely from the central file.

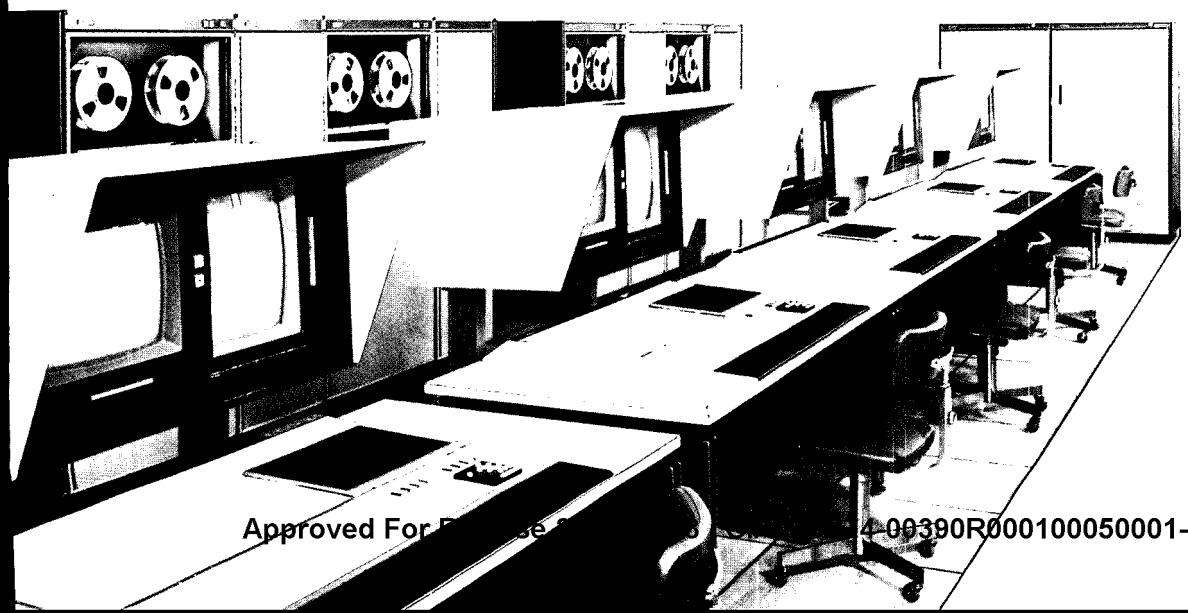
The right file organization technique provides a key to efficient information management. The Videofile Information System is capable of using almost any type of file organization that is possible with paper and file cabinets, but in a much more effective and efficient manner. The particular file organization used in a specific Videofile System application is selected to insure an optimum match between the requirements of the customer and the capabilities of the Videofile System. The unique capability of magnetic tape to record, reproduce, and erase information allows the use of the most efficient and effective type of file organization.

A Videofile System brings a wide degree of automation to file operations ranging from fast filing and automatic retrieval to the potential elimination of all paper document flow. It is built up from basic modules, making it flexible and adaptable for solving many information management problems.

The basic modules are:

- Filing—Filing Section
- Storing
  - Permanent—Videotape Section
  - Temporary—Buffer Section
- Viewing—Display Section
- Printing—Printer Section
- Executive Control—System Control Section

By combining these modules together in the appropriate network, three basic functions can be executed: (1) a filing function which creates images of pages, files them on tape at the proper location and stores them in a minimum space, (2) a copying function which allows image transfers, sorting, reorganization, and other document processing activities, and (3) a retrieval function which provides a television image or a paper copy of any filed document to the user. Since master document images are handled electronically, each of these modes offers many benefits to the Videofile System user. The document image is never out-of-file; a copy of the document is always available for the user. Since documents are not pulled from the file for retrieval, the opportunity for mistakes when refiling is eliminated. By eliminating these file problems, the Videofile Information System provides file integrity and control—essential to an effective information management system.

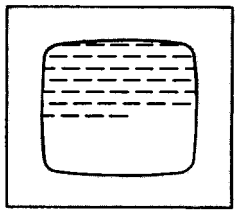


A Unique Approach: Changing Documents into Images on Magnetic Tape

The sophisticated information management capabilities of the Videofile Information System are based on the ability to convert documents into compact images on magnetic tape. This conversion process is achieved by using conventional television techniques in an unconventional manner. The Videofile System is technically unique in two ways: the number of scan lines in a picture (framed) and the ability to record and store images frame-by-frame.

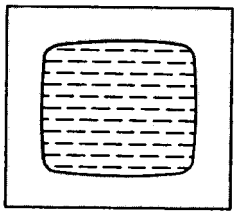
Creating the Document Image

When the document is placed on the illuminated platen in a Videofile System Filing Section, a lens focuses an optical image of that document on a photosensitive surface similar to that in a TV camera. An electron beam sweeps across this tube surface, following a pattern as depicted in Figure A. Each one of the sweeps is identified as a "scan line." A signal is generated proportional to the whiteness, blackness, or shade of grey of the picture. By the time the beam has sequentially swept across the picture area from the top of the picture to the bottom, it has created an electronic image of the original paper document. This process of scanning one complete document image constitutes one Videofile System *frame*.



Electronic image of document is created by scanning the optical image focused on the photosensitive surface of the camera tube.

FIGURE A



Number of lines in a picture determines readability. Commercial television has 525 lines in each picture. Videofile has 1280 lines in each picture.

Storing the Document Image

The electronic image of the document created in the File Section is stored on magnetic tape as a series of nearly perpendicular tracks across the tape. These transverse tracks are shown by dashed lines in the illustration (Figure B). Also shown are the address track for identifying the particular frame and the control track for accurate positioning of the tape. Document image tracks are made by rapidly rotating heads. The address and control tracks are made by stationary heads. All of the tracks are stored on 2" wide magnetic tape with the address track along one edge and the control track along the other edge. The image area reduction is on the order of 140 to 1.

Tape Format and Image Size

The Videofile Information System can be set up to handle 8½" x 11" documents or it can be set up for 8½" x 14" documents. The following table summarizes principal tape storage parameters.

Frame Size	1280/15
Maximum Document Size	8½" x 14"
Scan Lines	1280
Write or Copy Time	1/15 sec.
Linear Tape Length per Frame	1/3 inch
Address Format*	19 N 12 A/N
Maximum Documents per Reel (4800 ft.—12½ inch diam.)	166,600

*N=numeric characters
A/N=alpha-numeric characters

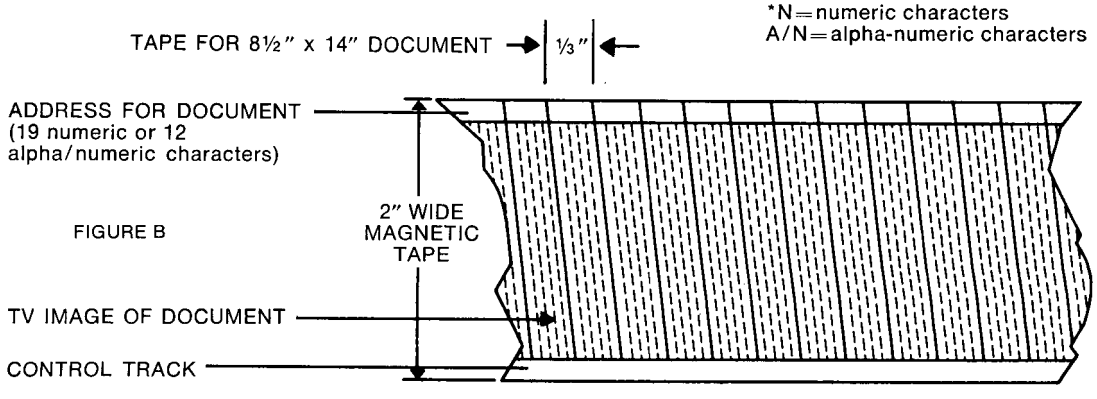


FIGURE B

HOW DOCUMENTS ARE RECORDED ON MAGNETIC TAPE

Organizing the File

One of the most complex areas in information management is file organization. The amount and frequency of filing operations and the amount of retrieval and document processing activity contribute to the selection of a particular file organization. The Videofile Information System with its unique capability of moving document images around quickly and easily can be used for a great variety of file organization formats. Although many variants in file organization exist, the two extremes are represented by random order and ascending order files.

Random Order Files

Random order files are created when pages are filed as they are received. A random file order is particularly suited to applications where there is high filing activity and low retrieval activity. The capability for handling high filing activity is due to filing documents one after another with no tape search. Documents are progressively written in the first available (empty) frame on tape. The illustration (Figure C) shows how random file organization is created. Because there is little or no file order, tapes with random file order must be searched from end-to-end.

Two more unique capabilities of the Videofile Information System make this end-to-end search efficient: multiple simultaneous searches and high search speed. Seven multiple simultaneous searches can be conducted at any given time (optionally, 40 multiple simultaneous searches). These searches can be conducted on seven Videotape Sections at a speed of 380 inches per second. (Computer tape drives generally vary from 75 ips to 150 ips.)

Operationally, this means that the Videofile Information System can look at nearly 1.2 million pages in less than 3 minutes and can find pages matching 7 (optionally 40) addresses. Imagine a file clerk looking through every page in 400 file drawers to conduct such a search—in 3 minutes time.

FIGURE C

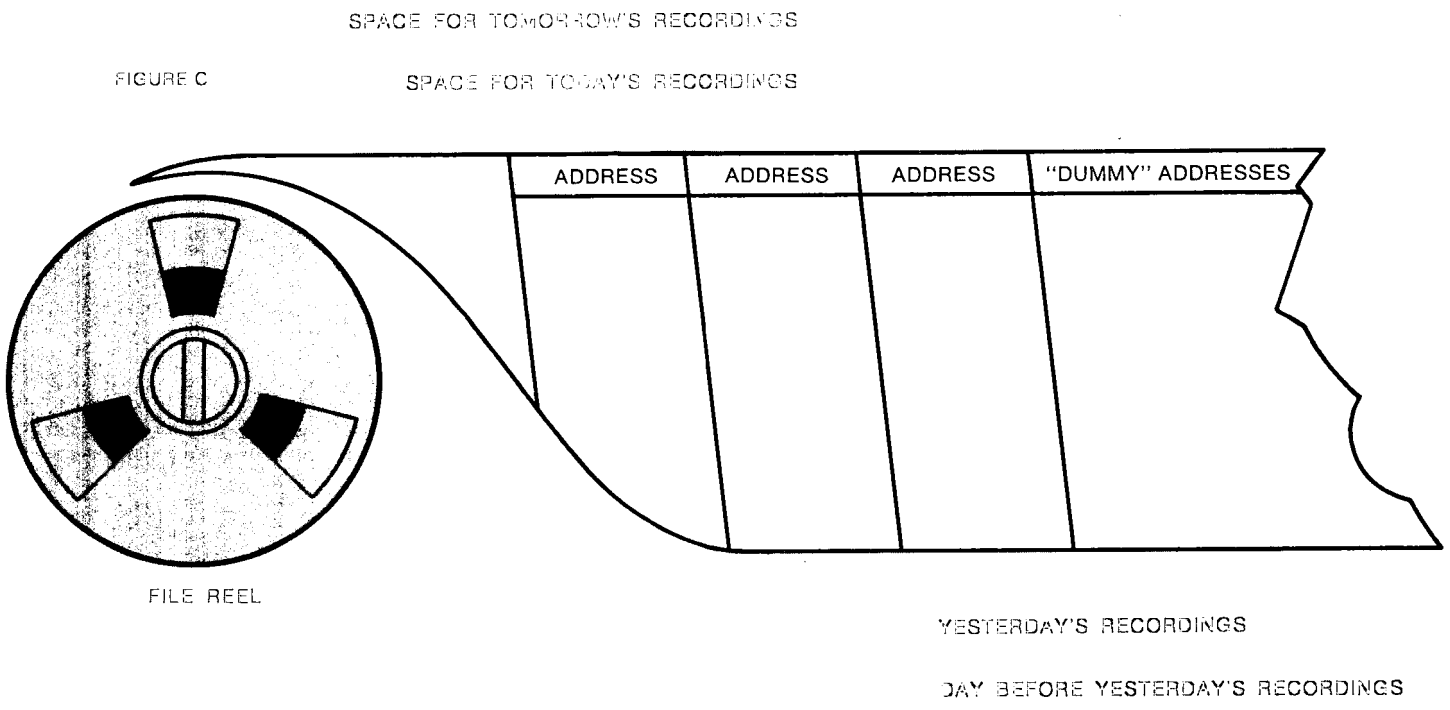
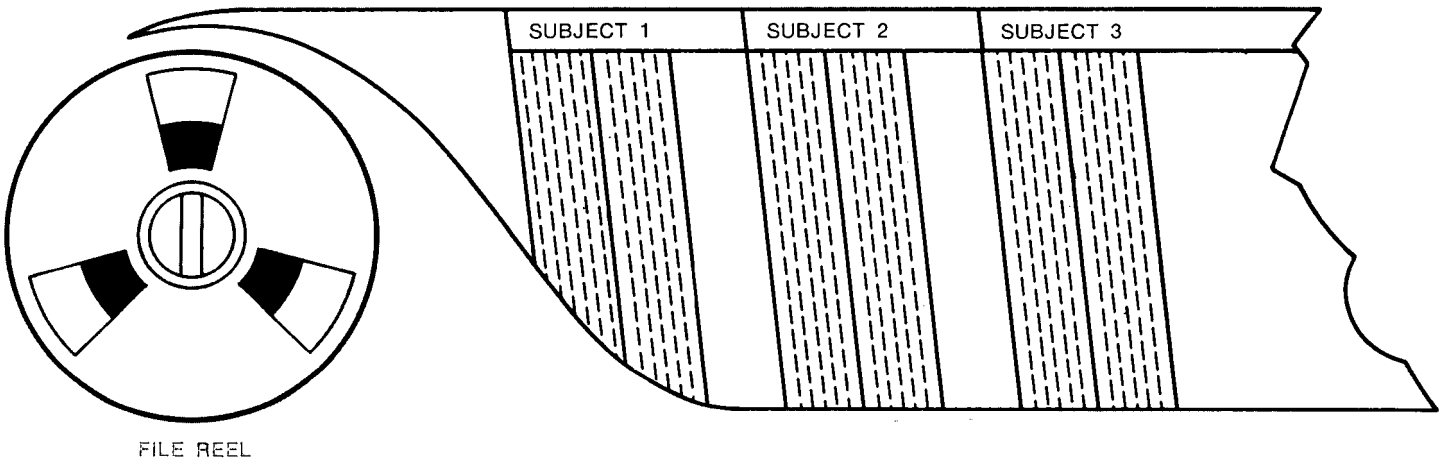


FIGURE D

MAGNETIC FILE FOLDER



ASCENDING ORDER FILING (FILE FOLDER)

Ascending Order Files

Ascending order files are created when documents are kept in progressive, although not necessarily consecutive, address order. It is a file organization technique that is particularly suited to applications that require document pages of similar subject matter to be filed in the same specific location on tape. Its principal operational advantage is that a single search can be made directly to the location of the desired collection of information. All of the material on file has been stored in this one location. Because the file has been organized in this manner, a single search retrieves all of the pages related to the search argument. Random ordered files would require a separate search for each single page in a collection of documents matching the search argument. The actual address order written on tape may be in ascending order over the entire address message or, more commonly, the order may depend only on some significant digits of the address with the remaining less significant address characters being random.

Ascending order tapes may contain multiple page documents, or "file folders," in which at least a portion of the order address is common to all pages. To set up such folders, segments of tape are pre-written with the "common address" to set aside a group of frames for documents with that common address. The beginning of each new common address series (or folder) is uniquely identified to facilitate retrieval of the entire group of documents with a single address entry. File folders are normally set up to provide for the subsequent addition of new material with the "common address" after the tape file is established. A random order overflow bucket is provided at the end of such tapes for "folders" that become full. Multiple page documents are treated in the same manner as folders, but no extra space for future additions is provided.

The illustration (Figure D) shows how ascending order file folder organization is created. Because there is a known address order, ascending order tapes can be searched in a "directional" manner. Multiple simultaneous search at high search speed makes directional search efficient. Operationally, this means that an ascending order Videofile Information System could find seven folders—perhaps averaging 25 pages each, or 175 pages, in a 1.2 million page library in approximately 65 seconds.

Videofile Information System Sections

Since each filing application differs from every other application, Videofile Systems must be tailored to fit various requirements. To meet this variety of needs, a series of modular building blocks have been designed. The next few pages briefly describe each building block.

Filing Section

The Filing Section of the Videofile System is the basic document input section. Its function is to convert document pages into electronic video images, suitable for processing by the Videofile System.

The Filing Section contains a high resolution television camera, optics to focus the desired image on the camera tube, and a lighting system to light the image. The most advanced television camera technology is used to achieve very high resolution of documents.

The address keyboard, indicator lights, and a platen system for holding paper documents are integral parts of this section. For address verification an address display device can be mounted near the keyboard to display address characters as they are entered. After the operator places the document on the platen and enters the address, the document is electronically filed. This action is then complete: no further processing or development is needed, as with film or microfilm systems.

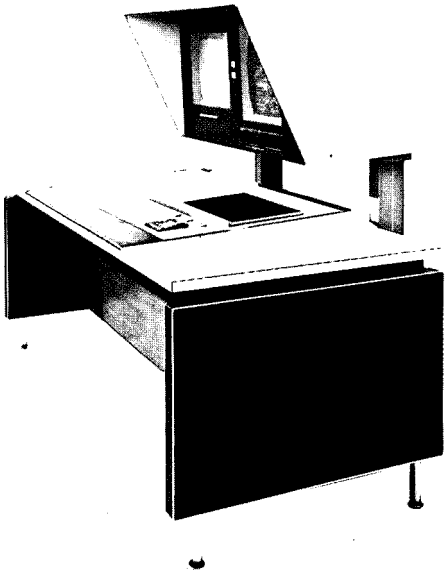
Two basic keyboard types are available in the Filing Sections. One style provides 26 alpha and 10 numeric characters plus various control keys for initiating the required system functions. The other style provides 10 numeric characters plus the functional control keys.

Standard Filing Sections are available in a version to accommodate a maximum paper document size of 8½" x 11" or a version for 8½" x 14" size paper.

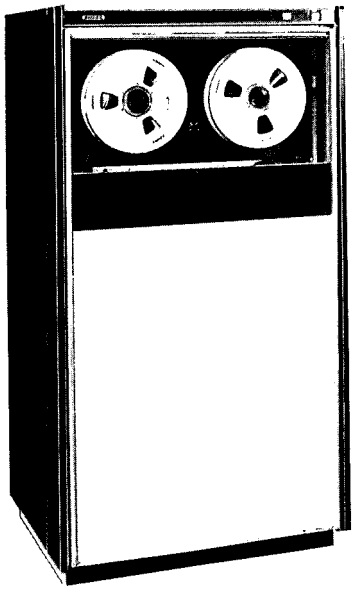
Tape Section

The Tape Section is the basic Videofile System storage unit. It converts the video image and its address into a magnetic tape recording and has the inverse capability of retrieving or playing back the recorded document image. Tape can be transported at two speeds: 380 inches per second to search a tape for a particular address in either forward or reverse direction, and 5 inches per second for reading, writing or erasing video and address information in the forward direction only.

There are three related but distinct recording operations in the Tape Section: (1) video image, (2) digital address, and (3) control track. The video image is a frequency modulated recording occupying approximately 1¾" of the 2" wide tape. The video head velocity is approximately 1,500 inches per second, perpendicular to the length of the tape. The digital address is recorded in a longitudinal track on one edge of the tape. An NRZ format is used with a packing density of approximately 620 bits per inch. The control track is written in a track on the opposite edge of the tape from the address track. It consists of a series of short pulses (a few microseconds) written at a rate of 240 pulses per second at 5 ips. The control track is used to synchronize the passage of the tape with system timing and to align the video tracks with the passage of the video heads.



Filing Sections are human engineered to provide an easy, natural work flow. The location of operating controls, indicators, and the platen minimizes fatigue during operation of the equipment. The input display monitor shown is optional.



The Tape Section is a marriage between computer tape drives and video tape transports. However, Videofile System address search is 21 times faster than digital tape drives.

Buffer Section

The Videofile Buffer Section serves as a temporary image storage and/or speed change device in a Videofile System. The function performed during a particular system operating period will generally be one of the following:

(1) A number of pages from a Filing Section can be assembled in a buffer, then recorded on tape in one segment. Thus, the Tape Section need make only one search in order to write the entire group of pages.

(2) Pages recalled from file tapes can be assembled in a buffer, then read out repeatedly for continuous display on a monitor.

(3) Where hard copy is required of a Videofile System image, the buffer provides the necessary speed match between the high speed equipment in the system and the lower speed printer.

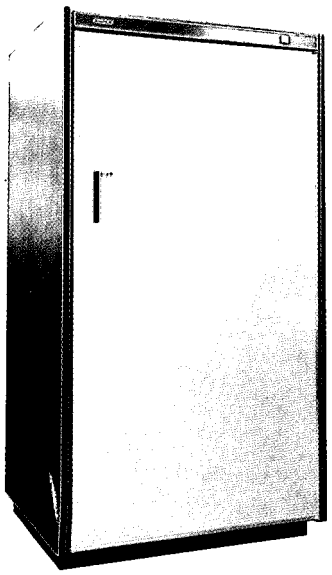
Buffer Sections are available in one, two, or four divisions which are capable of storing 50, 25 or 12 standard 1280/15 frames respectively. Reading or writing operations are performed at a 1/15 second rate per frame. For printed hard copy retrieval, the buffer reading rate is reduced 48 to 1 to match the slower printer operating rate. The recording medium of the buffer is a 24 inch diameter aluminum disc, plated with a very smooth magnetic coating of nickel cobalt. This disc is driven by a servo controlled DC motor. The buffer heads are indexed to the desired track location by a stepping motor. Each division of the Buffer Section has two heads. Where frames are recorded or reproduced sequentially, the heads are alternately indexed, one head indexing while the other is recording or reproducing. This allows the input to, or output from, the buffer to be continuous.

Display Section

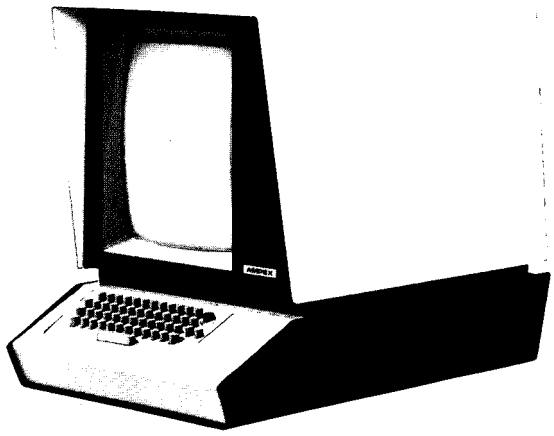
The Display Section serves as a visual output device for the Videofile System. Its function is to convert electronic video images into document images on a monitor in a manner similar to the function of a television receiver. The Display Section contains a high resolution monitor for document viewing, including a mask to provide the proper aspect ratio for the documents. Included in the section are a keyboard for entering requests (similar to the filing keyboard), status indicator lights, and necessary power supplies for operation of the section. An optional requested address display can be provided.

The monitor size and mask will depend on the page size used. 1280/15 Display Sections are available in two versions: one for displaying 8½ x 11 inch pages at full size, the other for 8½ by 14 inch pages at reduced size (both viewed with their long dimensions vertical).

The face of the monitor tube incorporates a light filter/anti-glare material to allow its use in office areas with normal illumination levels. Satisfactory document image contrast can be obtained with light levels from overhead lighting ranging up to 90 foot candles.



The Buffer Section utilizes a unique head-to-disc contact recording system. Videofile System disc buffers can record over 6,500 picture information points (or bits) per track inch.



Display sections are of the desk configuration but special versions (without keyboard) are available on a pedestal mount to work in conjunction with filing sections.

Printer Section

The Printer Section of the Videofile System is an electrostatic printer which transforms electronic video images into document images on paper (hard copies). Documents for printout are collected in a buffer before being fed to the printer. The transfer from buffer to printer doesn't begin until either the buffer is full, or a designated interval of time has elapsed since last writing an image in the buffer. During this transfer, the operating speed of the buffer is slowed down by a factor of 48:1 to match the speed of the Printer Section.

Paper drawn and cut from a roll stored in the printer is charged by high voltage electrodes. The paper passes over a special cathode ray tube with a fiber optic face. An electron beam is deflected across the faceplate causing the paper's electrostatic charge to be dissipated in proportion to the light intensity levels of the image line. Paper motion is synchronized with the buffer scan so that each line of the video image is reproduced as the paper passes the CRT.

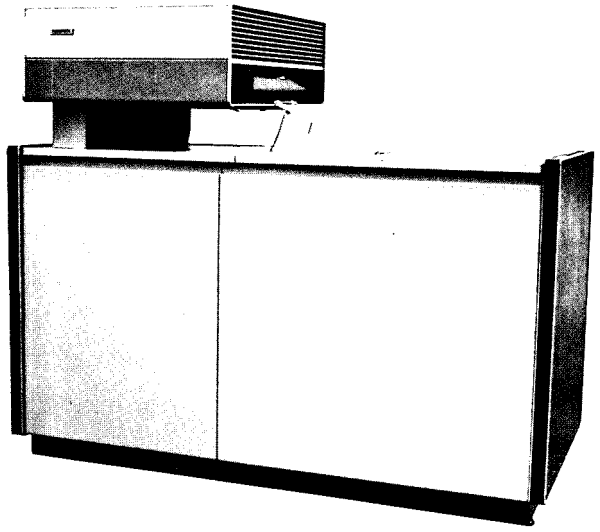
A fine toner powder is next applied which adheres to the surface of the paper in accordance with the remaining charge pattern. This "develops" the image and it only remains to "fix" the image by the application of heat that melts the particles of toner onto the surface of the paper.

After initial warm-up, the printer will produce a print in less than 25 seconds. This includes the full time required from the cutting of the sheet of paper until the delivery of the printed document to the output tray. The throughput rate is 3.2 seconds per 1280 / 15 page. Thus, a print buffer filled to capacity can feed its entire contents into the printer in only 2⅔ minutes.

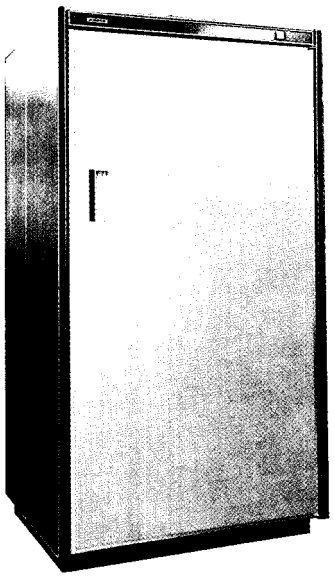
System Control Section

The System Control Section is the unit which directs the interaction of the other sections in a pre-determined manner. It has six principal elements: the controller, the controller input/output system, a sync generator, master power control system, a paper tape reader and a teletype unit. The controller input/output system is a bi-directional communications channel between the system controller and the other system sections. Operational commands are sent from the controller to other sections and operational status reports are sent from these sections back to the controller. The Control Section uses a set of operating instructions which may be entered from a paper tape or card reader.

A sync generator is the System Control Section master clock and provides all of the timing pulses for the video circuitry. The master power control system sequences the application of power to the sections in a pre-determined sequence during system start-up. A teletype unit provides the communication channel between the controller and the System librarian.



The Printer Section allows the requester's identification to be printed on the sheet so that it can be delivered to the requester. This is done at the same time that the video image is transferred to the print buffer.



The System Control Section contains a logic distribution system which inter-connects all Videofile System sections, and a small general purpose computer which controls the entire system by time share.

The Videofile System in Operation

All six building blocks, the File Section, Buffer Section, Display Section, Printer, and System Control Center, are used in varied combinations to build a complete Videofile Document Storage and Retrieval System for any particular need. Basic to any Videofile Information System, however, are three operations: Filing, Copying and Retrieval.

Filing

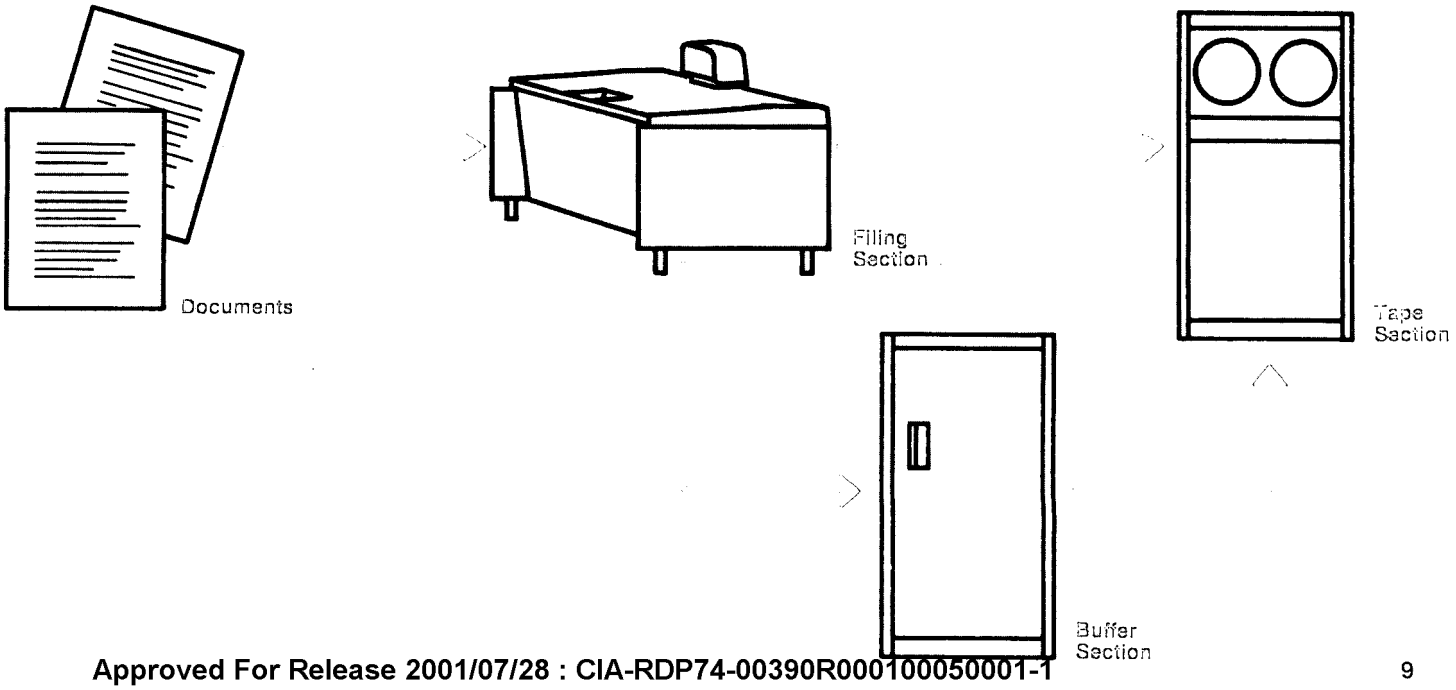
The document and document address to be filed enter the Videofile System at the Filing Section where they are translated into video images and digital address information for storing in the Tape Section. The address is entered through the keyboard and the document is placed on the platen for filing. There are two ways in which the image and address are placed on magnetic tape: direct filing and buffer filing.

Direct Filing

Filing directly from a File Section to a tape mounted in a Tape Section is possible when a minimum amount of tape search is required. This condition may occur when documents are filed in random file order or in ascending file order (with no large address gaps from one page to the next) and when simultaneous recall from the filing tape is not required. Direct filing may be made either to a master file tape (the permanent library of document images) or to a work tape (a temporary storage tape for document images). The contents of the work tape are subsequently copied to the master file tape library at a later time.

Buffer Filing

A Buffer Section is useful during a filing operation when a tape search is required. The Buffer Section serves to collect document images at the operator's pace and then place them on tape (independently of operator action). Buffer filing is also utilized when the file tape is being used for retrieval requests. As with direct filing, buffer filing can be made directly to the master file or to a work tape.



Copying

Copying, the transfer of document images from one Tape Section to another, transforms the Videofile System from a filing system into a working file system. Files can be purged, transferred, sorted, and refiled—all electronically. These transfer operations may be categorized in three main types of copying: selective copy, sorting, and complete copy.

Selective Copy

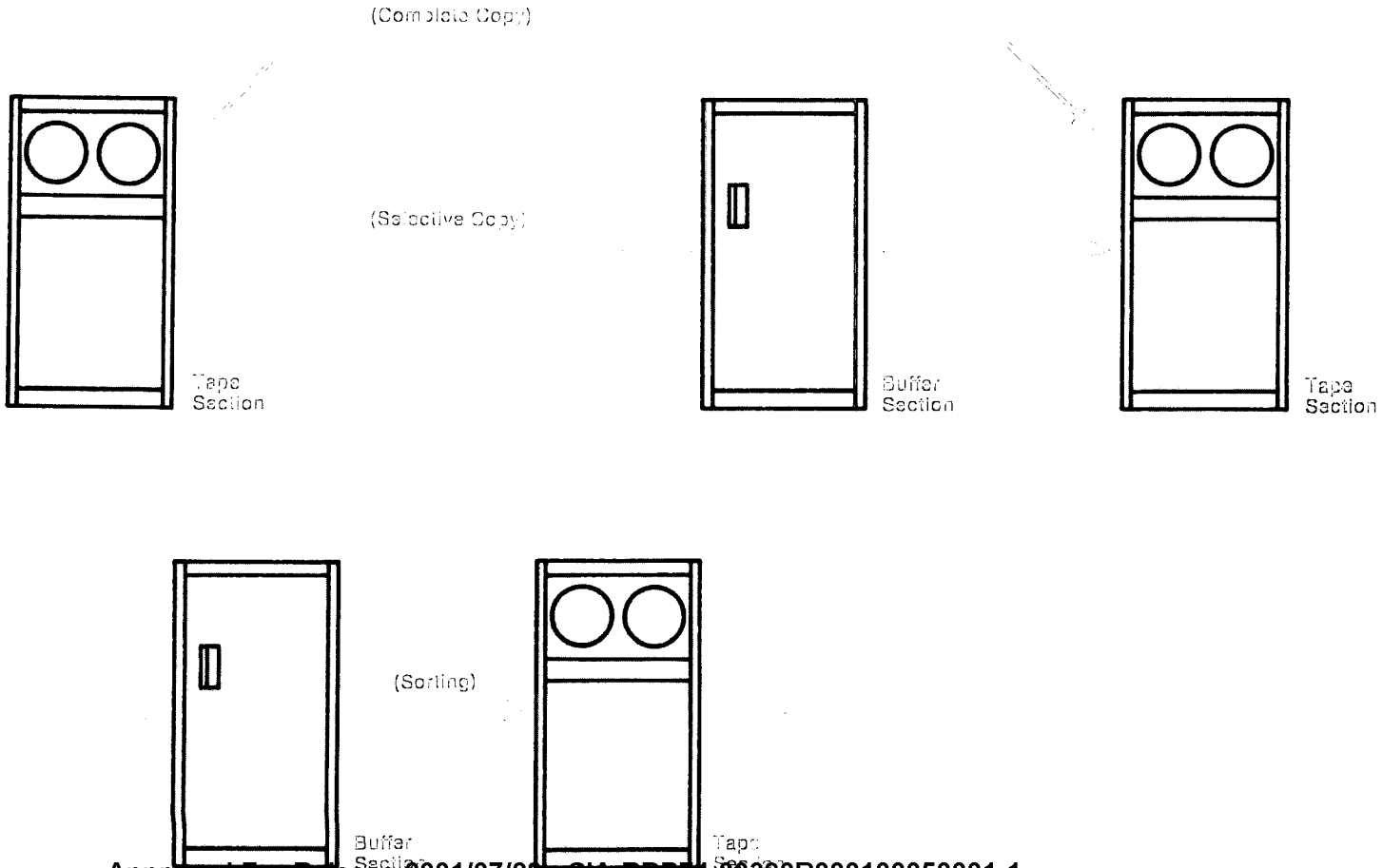
Selected documents may be transferred from one tape to another. The documents to be copied are first located on the original tape, transferred from that tape to a buffer, and then transferred from the buffer to the appropriate positions in the second tape.
Selective copy is most effectively used when the addresses on both tapes are in ascending order. Three general types of operation can effectively use selective copy: (1) transfer from a work tape to master file tape, (2) transferring from a master file tape to a recall work tape, and (3) purging inactive documents from master tape to an archival tape.

Sorting

If the addresses on a tape to be selectively copied are random in order, a sorting operation (changing the order of documents in the transfer) may often decrease the time required to complete the selective copy functions. Such a random order tape could, for example, be the result of writing documents onto a work tape in order of arrival—not in file order. The sorting operation would then be used during the transfer of the documents from the work tape to a master file arranged in ascending order.

Complete Copy

Often a complete duplicate of a tape, with no additions or deletions, is required instead of a selective type of copy. Security tapes, for example, may be produced from master file tapes. This operation is automatic upon command and requires the use of two Tape Sections, one installed with the tape to be copied and the other with a blank tape.



AMPEX

October 1, 1970

Edward F. Preston
Assistant Commissioner, Administration
Internal Revenue Service

Dear Mr. Preston:

The adequate maintenance of records is an essential but sometimes painful requirement for large organizations like your own.

HUD-FHA faced this problem in bringing together all active documents on their five million insured home mortgages. These files were previously stored in upright filing cabinets in a Washington warehouse. Now FHA space requirements will shrink by almost 15 times. Their Videofile System frees time, people, and space for more productive work.

The system will operate on a 5 day, 24 hour basis providing documents for legal review, financial analysis, program analysis and other administrative functions. High priority requests can be filled in a few minutes.

These and other benefits are available because of the advanced technology of the Ampex Videofile System which electronically stores and selectively retrieves large volumes of graphic and printed matter. The Videofile Information System brings together the technology of video tape recording and computer indexing. It does for document handling what the computer does for accounting.

A Videofile Information System will be demonstrated at the Twin Bridges Marriott from October 13 through 16. You and your staff are cordially invited to see a demonstration of this unique system for updating, storing, and distributing active document files. If possible, please advise us of your intention so that we may provide a demonstration more appropriate to your organization.

Sincerely yours,

M. J. O'Connell

M. J. O'Connell
Manager, Federal Systems
Ampex, Videofile Division

Ampex Corporation • 7222 Forty-Seventh Street • Chevy Chase, Maryland 20015
Telephone (301) 652-1881 • TWX: 710-824-0409

Retrieval

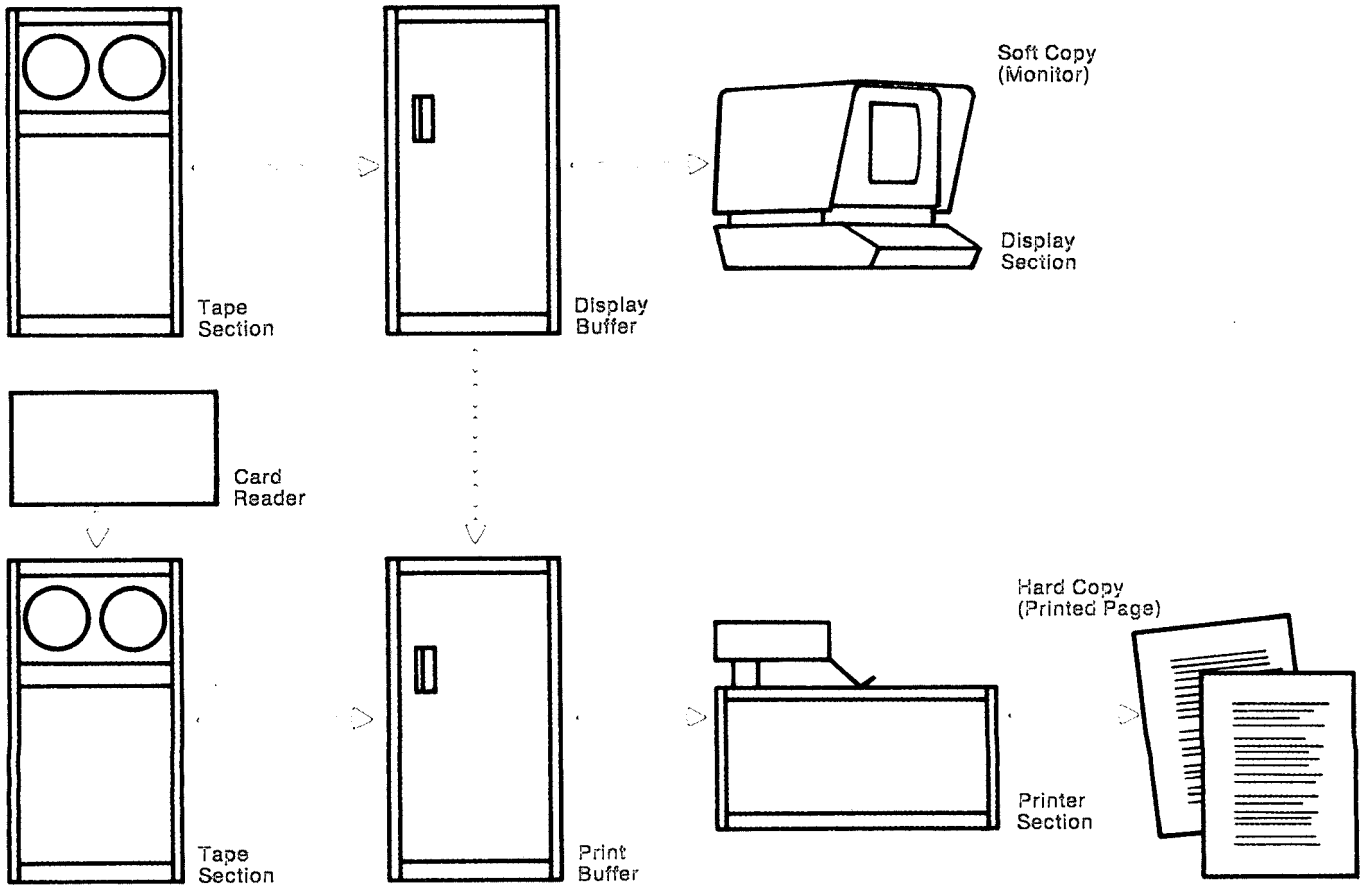
Retrieval of documents from the Videofile Information System is accomplished by converting magnetic images stored on tape into a readable form. Recalled images are transferred to a Buffer Section. For continuous display of soft copy, transference is made to a "display" buffer. A "print" buffer is used for hard copy printing. Soft copy is generally used when a substantial number of file references are concentrated in specific operating locations. Hard copy on the other hand is used when file references from specific locations are minimal (and by people who do not have access to a Display Section).

Soft Copy

A soft copy is retrieved by entering the document address on a Display Section keyboard (which is similar to a File Section keyboard). After the "display" button is pushed, the request for soft display is entered in the Videofile Information System. If the tape is mounted on a Tape Section, a tape search is made and the requested document image (or images) is transferred to a Buffer Section. If the tape is not mounted, the System Control Section notifies the librarian that a tape must be mounted. Once mounted, the tape search is completed and the images are transferred to a Buffer Section.
The first image appears on the Display Section after the requested documents have been gathered by the buffer. The file requester can then "browse" through the documents in the buffer. The browsing of a file can be made in both forward and backward directions. If a hard copy of a particular page or set of pages is desired, the "print" button is pushed. This transfers the displayed image from the display buffer to the print buffer for later printing. For proper routing, the requester's identification can be added to the hard copy. Pushing the "release" button clears the images from the buffer and allows the next request to be entered.

Hard Copy

Hard copy requests are, generally, initiated with punched EDP cards. The card reader serves to enter both a requested address and any requester's identification that may be needed. Tapes are selected and searched in the same manner as for soft copy.
Requested document images are loaded into a "print" buffer. Upon receiving a complete buffer load or after the passage of a specific time interval, the print Buffer Section is slowed, feeding images to the Printer Section which prints out the hard copies. Later, during the shift when the hard copies are needed, they are distributed to the proper requester by means of the requester's identification printed on the hard copy.



Videofile Information System Glossary

Address: Digital recording of an identifying number by means of which a document is located. May also contain numbers assigned to automate updating, reorganization, or purging.

Ascending Order Files Documents filed in a predetermined sequence by writing related documents at a place on the tape associated with that particular subject or by writing documents in some other definite order. Contrast Random Order Files.

Browse To review at the viewer's own pace (in forward or backward direction) a number of document images, for example, a file folder, on a Display Section.

Buffer Section A temporary storage device (multitrack disc recorder) for holding a number of video images. Used to:
(a) Repeat individual video images for continuous display on a monitor.
(b) Hold several file documents, then place them on tape independently of operator action.
(c) Match speed and timing between standard system operating rates and those of its input and output devices.

Copying The process of transferring document images (usually thru a buffer) from one Tape Section to another Tape Section within the Videofile System. Whole files or just selected documents may be transferred. A document sorting operation may be performed during a selected document transfer.

Display Section Contains a high resolution monitor for viewing the document, and a keyboard with its associated logic elements for entering the document address.

File Folder In Videofile System terms, a portion of a file tape associated with a particular subject and containing all the documents and space for future documents related to that subject.

Filing The process of entering documents into the Videofile System. The documents are stored as video images and stored on magnetic tape.

Filing Section The portion of the Videofile System where documents are entered. Includes a high resolution camera and a keyboard with its associated logic elements for entering the document address. The output of the Filing Section is video images and address signals.

Frame In video tape terms, one complete scanned "picture" or document. The number of scan lines in a Frame determines the maximum useable document size.

Hard Copy A printed paper copy of a document being stored on tape in the Videofile System.

Image An electrical analog (video signal) of a page resulting from a scanning process in the Filing Section.

Master File In Videofile System terms, the primary collection of magnetic tapes which contain the main document image store.

Monitor A device using a cathode ray tube which translates a video image of a page into a viewable display (soft copy).

Off Line Tapes Reel of tape in the Videofile System not mounted permanently on a particular tape transport throughout an operating shift.

On Line Tapes Reel of tape in the Videofile System assigned to and mounted on a particular tape transport throughout an operating shift.

Printer Section An electrostatic device for converting the video signal of a page into a high resolution printed (hard) copy.

Random Order Files Documents filed in the order in which they are received or in some other manner without respect to subject matter. Contrast Ordered Filing.

Resolution A measure of how readable a document is when retrieved from a Videofile System. In technical terms, it is the amount of resolvable detail in a video picture.

Retrieval The process of recalling documents from the Videofile System. Retrieval may be made in Hard or Soft copy form.

Search The act of locating images by means of identifying addresses. The search may be in either forward or rewind direction and is usually carried out at high speed.

Soft Copy An image on a Monitor of a document retrieved from tape in the Videofile System.

System Control Section A device for controlling the interaction of the various sections.

Tape Section A magnetic tape recorder and associated circuitry to place and retrieve document images and their associated address information on two-inch-wide magnetic tape.

Work Tape Tapes on which documents or files are temporarily stored. They may be created from File Sections for subsequent transfer to Master Tapes or created by selectively copying Master Tapes into temporary tapes to provide on line retrieval. Keeping a small percentage of current files in work tapes can usually handle a high percentage of all recall activity.

AMPEX
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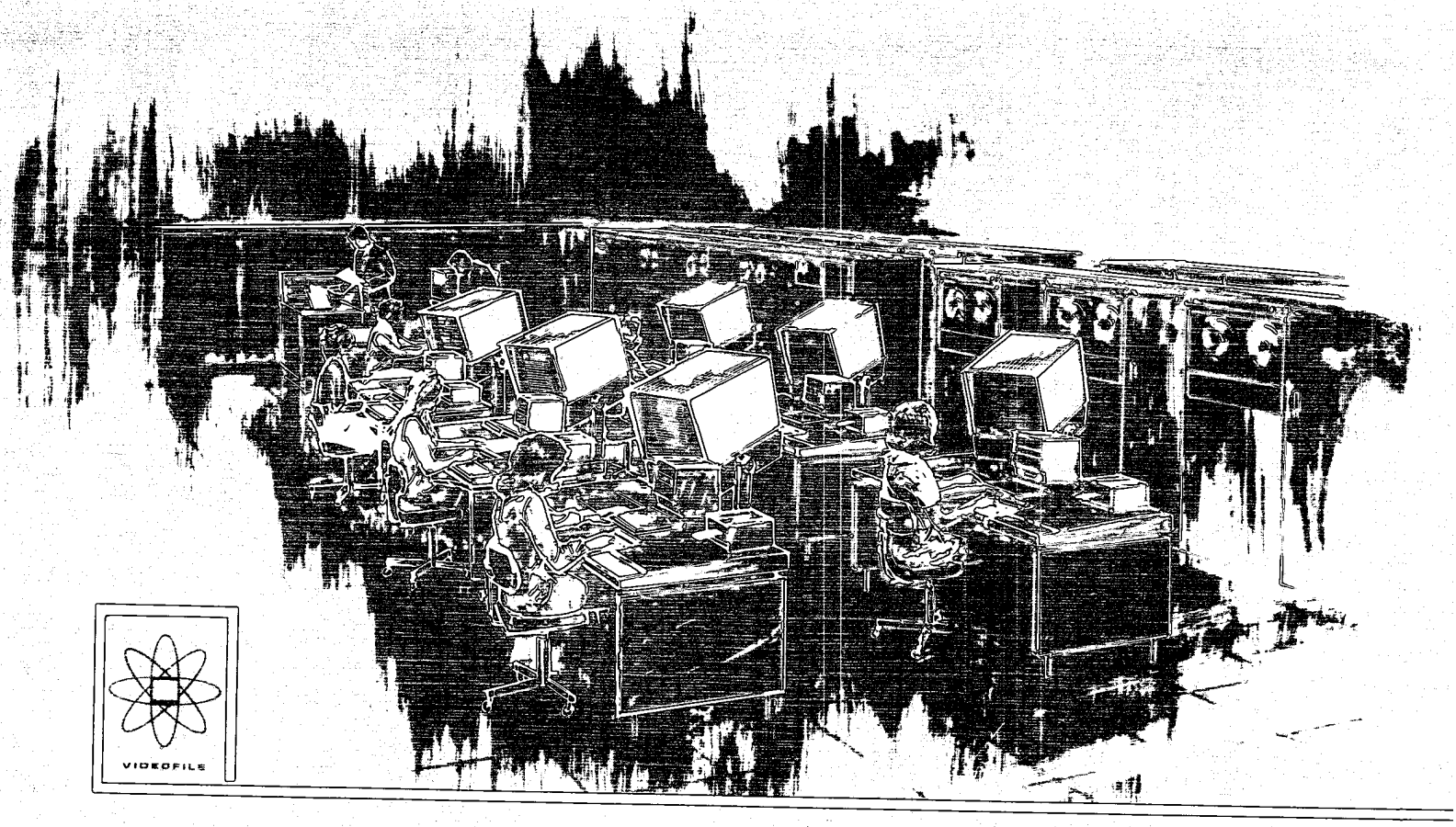


VIDEOFILE SYSTEM

AMERICAN NATIONAL
INSURANCE COMPANY

VIDEOFILE SYSTEM
AMERICAN NATIONAL INSURANCE COMPANY

INTRODUCTION

The following paper has been written by American National Insurance Company to provide a general description of the Ampex Videofile* Information System which has been installed at the American National headquarters in Galveston to automate the storage and retrieval of the graphic records in their Ordinary and Industrial insurance files. The paper also describes the manner in which the Videofile System works hand-in-hand with the American National data processing computers to rapidly provide each individual user with the proper combination of EDP and graphic data to accomplish his insurance processing function.

The system complement of standard Videofile modular units and control programs described here are those selected to best suit the needs of the American National application. In addition, certain optional features have been selected where they further enhance the system's ability to interact with the end-user's unique requirements -- these optional features have been italicized in the text.

* *Videofile is a Registered T.M. of AMPEX Corporation*

A GENERAL SYSTEM DESCRIPTION

Videofile, developed by the Ampex Corporation, is an automated document storage and retrieval system. Videofile is not in competition with data processing by computer, but each system is used in conjunction with the other, each complimenting the other. Data processing concerns itself with data in a digital form, while Videofile is storage and retrieval of data in graphic form.

The Videofile system of document storage and retrieval utilizes videotape, which is the same videotape used in television recording. (See Figure No. 1). Images of documents may be recorded on videotape, recalled to a monitor for viewing, additional document images may be filed on the tape, images previously filed to videotape may be deleted or replaced, and hard copy print can be obtained on any image filed on tape. Videotape recorded images may be filed (1) chronologically, or (2) by file folder method. American National will use the file folder method in putting application files on tape, which reserves folder space for later filing.

Digital coding or indexing is recorded on one edge of the tape, and is used by the system in locating the file folder or document for additional filing, recall, etc.

The many system advantages of automated document storage and retrieval make it ideal for large active files. Therefore, our first and most obvious use of the system is to automate the Ordinary and Industrial application files. If all of our present Ordinary and Industrial application files on inforce and with value policies were already on tape, we would have about a 300-reel tape library, not including security tape records.

200 reels Ordinary - 2,000,000 files

100 reels Industrial - 4,000,000 files

After installation and check-out of the Videofile system we will begin converting application files to tape. The conversion effort will begin with the current or latest application files and progress to the older application files. At the same time, all new business being issued will be recorded on tape.

VIDEOTAPE

Videotape is magnetic tape similar to that used in computer operations. The tape is 2 inches wide and reel lengths can vary up to approximately 4800 feet.

Videotape can best be described by dividing it into two sections, address track and image area. The address track is the top portion of the tape, approximately 1/4 inch in width, that is used to record indexing data or file location. The system has the ability to read the data recorded in the address track and act on it according to a prescribed application. The address track allows 19 positions of coding to be input for every document filed and a 20th position which is automatically coded by the system. The image area is the area beginning just below the address track that is used to record the television image of the documents.

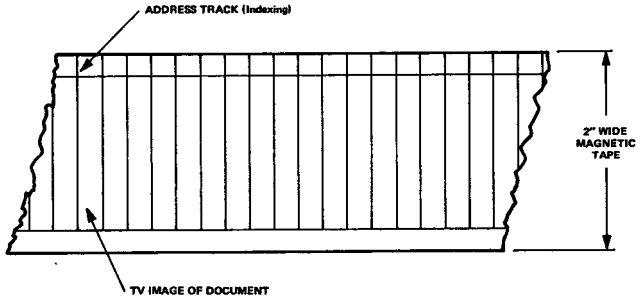


FIGURE 1

VIDEOTAPE RECORDS

It is helpful in any discussion of the American National Videofile System to understand the basic tape records required. A flow chart is attached which illustrates the various tapes required and the relationship between each tape record.

FILING

Four basic types of filing are used in our system:

1. **Ordinary New Business and Pending Issue Filing**

   All Ordinary new business filing will be filed to both the Temporary Master (Offsite Security) and the On-Site Security Tapes. A *double buffer dump* will be used in this filing mode;

   (1) The first dump will be to the temporary master and will cause all documents filed to be transferred from the buffer to the temporary master.

   (2) The second dump is to the On-Site Security and is selective so that *temporary documents specifically coded will not file to this tape.* The On-Site Security will be a duplicate of the Temporary Master except that the On-Site Security will not contain any temporary documents.

   New business filing will include all documents received for first underwriter handling and all subsequent documents received within approximately 30 days after the receipt of the application.

   A worksheet for underwriting purposes will be part of each application file. Computer issued cases will have a worksheet or a similar form indicating action taken. Cases not issued by the computer and referred to Underwriting will output on Underwriter's Worksheet which when used by the underwriter will be filed on videotape to become a part of the application file. If subsequent underwriter handling of a file is required, another worksheet will be output by the S/360 pending file. Subsequent worksheets, when filed on videotape, will overlay, or replace, the previous worksheet.

2. **Industrial New Business Filing**

   Industrial new business documents will be filed directly to Off-Site and On-Site Security Masters in a double buffer dump filing mode. Since Industrial New Business is filed after policy issue, there will be no "temporary" items on the identical security tape records created. Also applications which were rejected, postponed, or filed incomplete will not be on videotape records, as are the Ordinary non-issues.

3. **Post Issue Filing**

   All documents received for files on a working master will be considered post issue filing. These documents

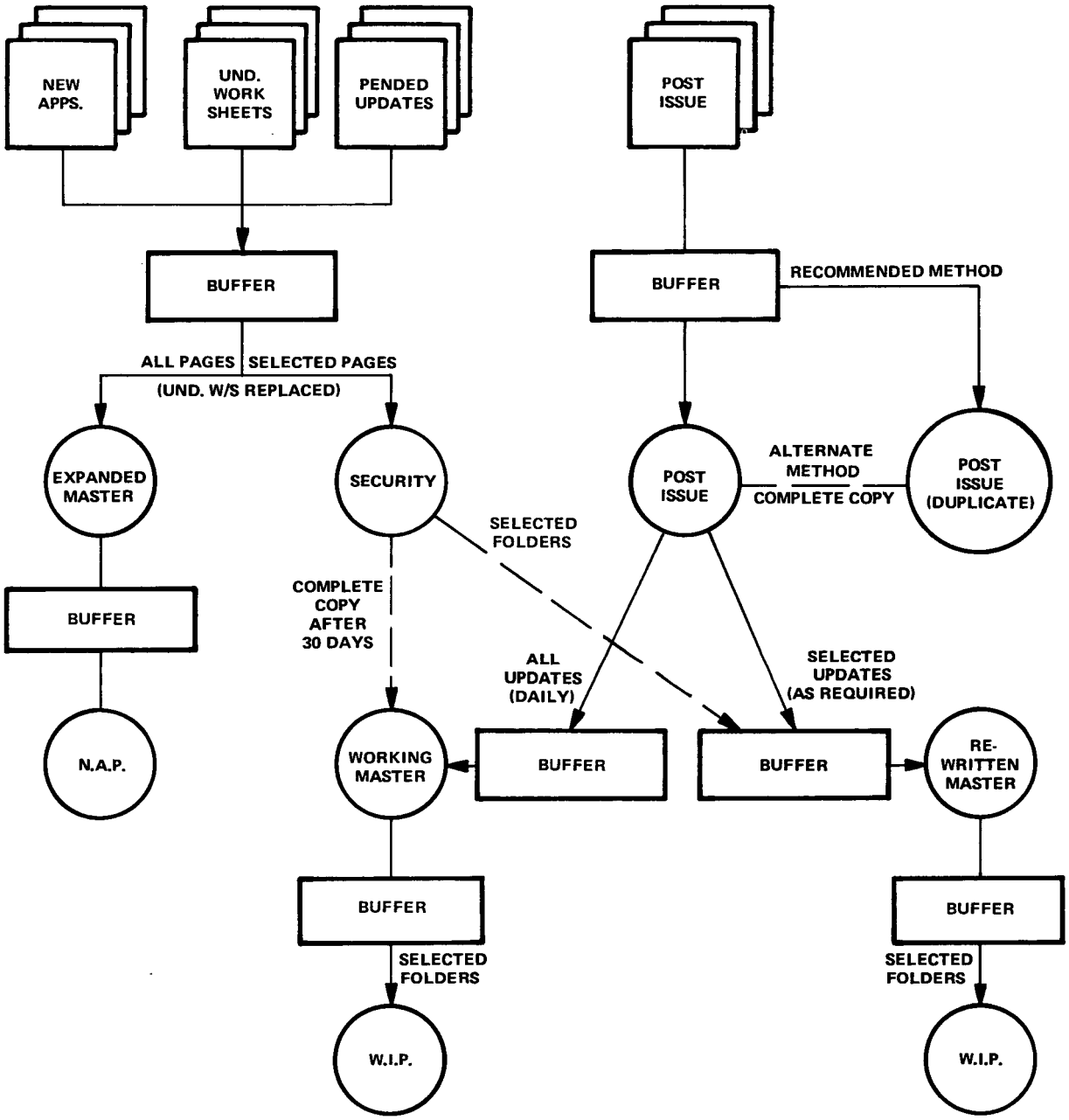


FIGURE 2

(both for Ordinary and Industrial files) will be filed to a post issue tape and then copied to the appropriate files on the working masters. Only working master tapes will be up-dated with post issue. The post issue tapes, after being copied to the working masters, will be stored as a separate security record.

4. **Conversion Filing**

All files in force or with value (both Ordinary and Industrial) will be filed direct to On-Site and Off-Site Security Tapes. The Security Tapes will be copied tape to tape creating working masters.

RECALL

A file may be recalled to one or more monitor stations when the reel on which the file is recorded is mounted on one of the tape drives. It is obviously impossible to maintain all of the working library on line for random access, therefore, work tapes are prepared on the off shift and maintained on line each day. It is also advantageous to use work tapes for recall to improve the average access time. Average access on recall has a direct relationship to the total tape length searched, and since work tapes may be prepared in much shorter lengths than the original library tape, the recall rates are considerably faster.

Two types of work tapes are planned – an Underwriter Work Tape of pending application files, and a Work In Process Tape of policy application files retrieved from the master tape library.

UNDERWRITER WORK TAPES

Underwriter work tapes are prepared daily to provide recall on all pending issue files on which underwriter attention is required. A system 360 pending file program will determine those cases requiring attention and will output a punch card for each file. The punch cards will be processed in the Videofile Department to locate and copy the file images from the Standard 3600 foot security tapes to shorter work tapes. (See the chart on the next page). No filing is done to work tapes, making them available 100% of the time for recall. THe system 360 program will also provide information to the underwriter in the form of a worksheet and punch card on files requiring his attention.

WORK IN PROCESS TAPE

The Work In Process Tape is a work tape of files from the working master tapes. Daily requests for application files from the videotape library are made in the form of punch cards, which are routed to the Videofile Department. Punch cards for the Work In Process tape are used to pre-address the work tape, which is then run against the appropriate working master tapes to copy the requested files on the work tape.

The W.I.P. tape will be prepared daily on the off shift, and will be made up of the following groups of files:

1. Files called out to a previous W.I.P. tape that have not been used by a requestor, and which have been on the work tape for less than the specified maximum number of work days.

2. Files previously written on a W.I.P. tape that have been *retained on the work*

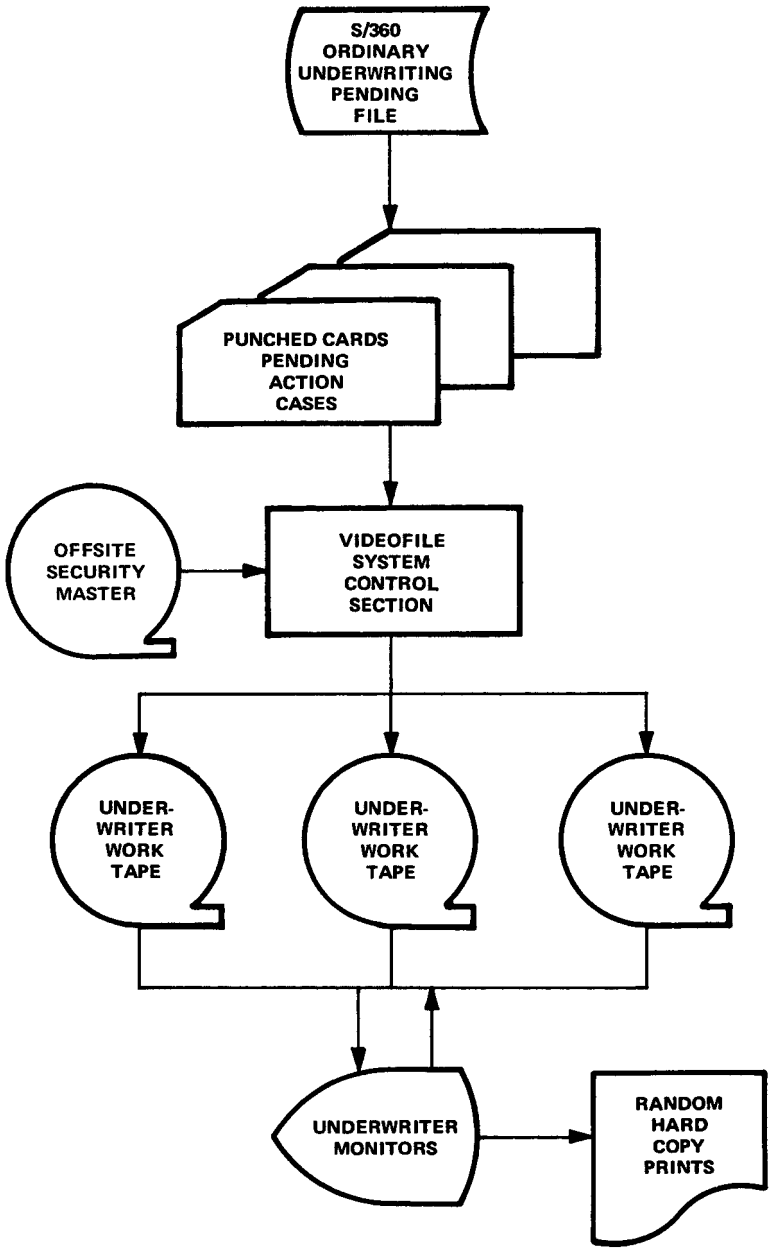


FIGURE 3

tape through use of a "retain" key on the requestor's monitor.

3. Today's new request for application files.

Work tapes are "on line" during the day shift and are available to all monitor stations for recall. A routing code will be used to direct the request from the monitors to the specific work tape.

All requests for hard copy will be made from a monitor station through the use of the print button on the monitor. The hard copy will print out on one of the system printers located in the Videofile Department, and will indicate a monitor station identification number for routing of the requested copies.

PRIORITY RECALL

When there is a need to look at a file not on one of the work tapes, and it is not possible to wait until the following day, a priority request may be made. This means that the reel of videotape on which the requested file is recorded must be obtained from the library and mounted on an available tape drive. Each such request will require 5 or 10 minutes. Obviously, priority requests should be kept to a minimum.

PRINT FOR ISSUE

When filing new application items, "1" code in position No. 11 of the address track indicates documents on which a hard copy is required for policy make up. A special mode or print program will be scheduled at night to produce the required hard copy for cases approved that day.

A System 360-Program will output punched cards each day on all cases approved for issue which will be used in the Videofile "Print For Issue" mode to select the coded images for printing. Hard copy for policy make up will be delivered from the Videofile Department to the department responsible for policy preparation, and will be available each morning.

VIDEOFILE EQUIPMENT

In order to understand how the Videofile System operates, a general understanding of the basic systems equipment is necessary. The following is a brief description of the basic hardware units used in the Videofile System.

Input Console (*Filing Station*)

An input console is used to convert source documents to video images. The input console contains the Vidicon Camera or original document scanning device, a display unit which displays the document being filed, a ten key numeric adding machine type keyboard, and an address verification display.

Documents are placed on the platen, face down, similar to the operation of electrostatic copiers. The document on the platen is displayed on the filing console monitor. The address data is keyed in by transcribing the data from the monitor screen. The address data keyed in is displayed in the address display on the filing console. A visual verification is made between the document display and the address display. The file button is depressed and the document image along with the address are filed to a buffer which when full will "dump" to the proper videotape.

Buffer

A buffer is an intermediate storage device used to store document images and addresses until the system is ready to process them.

Videofile Tape Recorder

The videofile Tape Recorder is very similar to the magnetic tape drives used in computer operation. The Videotape recorder has two fundamental modes of operation; record or write, in which documents and their addresses are added, purged, updated or replaced, reproduced or read; in which a requested file is located and read out to a buffer.

Video Monitor

Certain departments in the Home Office will have Video Monitors that will be for visual access to files stored on Videotape.

The monitors will be connected by coaxial cable to the central Videofile processing area and will be used for recall purposes much in the same manner as the IBM 2260 remote terminals.

The monitors have a 17 inch (diagonal) screen which displays images stored on videotape on a Cathode Ray Tube (Television). All monitors are equipped with keyboards for entering the necessary data for recall of a particular file. Some monitors have both keyboards and card readers for this purpose. Every monitor, in addition to address entry devices, will be equipped with certain functional controls which will allow the person operating the monitor station to adjust the contrast and brightness of the picture and to browse from one document to another within a file.

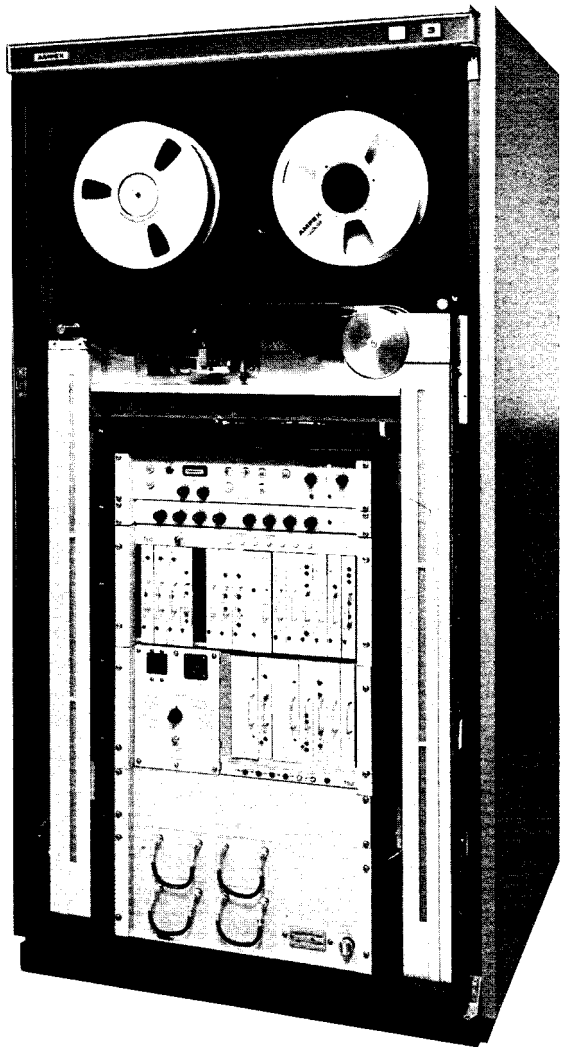


FIGURE 4

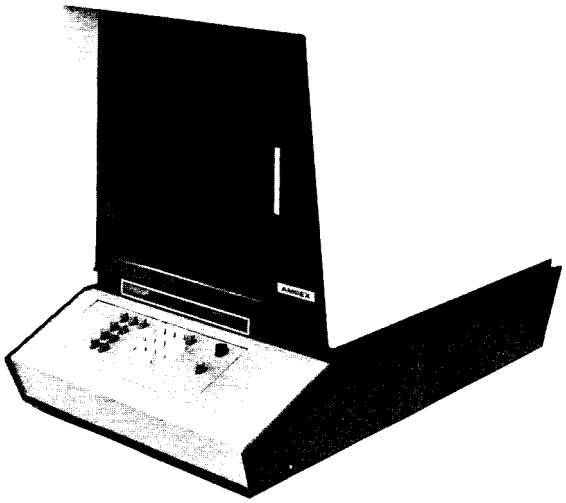


FIGURE 5

Each monitor has an assigned 12-page buffer. When recall is made from a monitor station for a particular file, the Videofile Recorder on which the tape is mounted that contains the requested file, will search for the file. When the file is located, the Videotape Recorder will read out the images from the tape to the buffer associated with the requesting monitor. The images on the tape remain undisturbed, and after the read-out, the system is released for other activities. The file when stored in the monitor buffer may then be viewed on the monitor screen. Because of the intermediate buffer storage, any number of persons at separate monitor locations may view the same file at the same time.

Monitor buffers have a twelve page capacity. There is changeable control on the monitor to call out the first twelve documents in a folder, the second twelve, the third twelve, etc.

Only one image will appear on the monitor screen at a time. When the browse button is used, the image on the screen will fade out and the next document in the file will appear. The browse feature will operate both forward and backward within a file.

Printers and Hard Copies

There will be hard copy printers located in the Videofile Department which will produce electrostatic copies of documents stored on videotape. All hard copies will be output on these printers.

Hard copy may be produced by the use of print buttons located at the monitor stations. Depressing the print button on the monitor will cause a hard copy of the image on the monitor screen to be output on a printer in the Videofile Department.

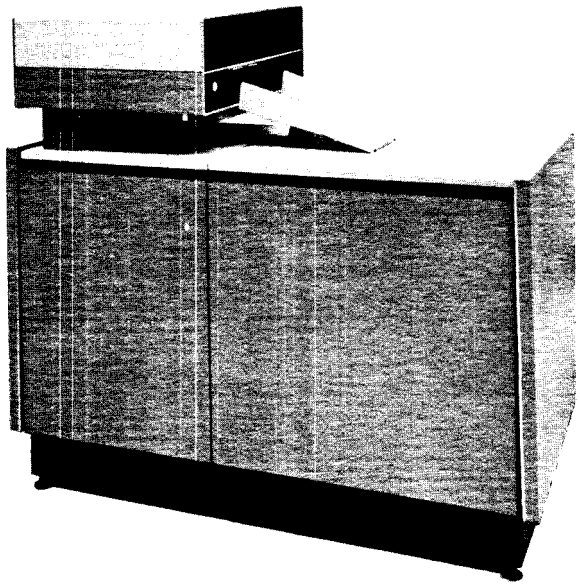


FIGURE 6

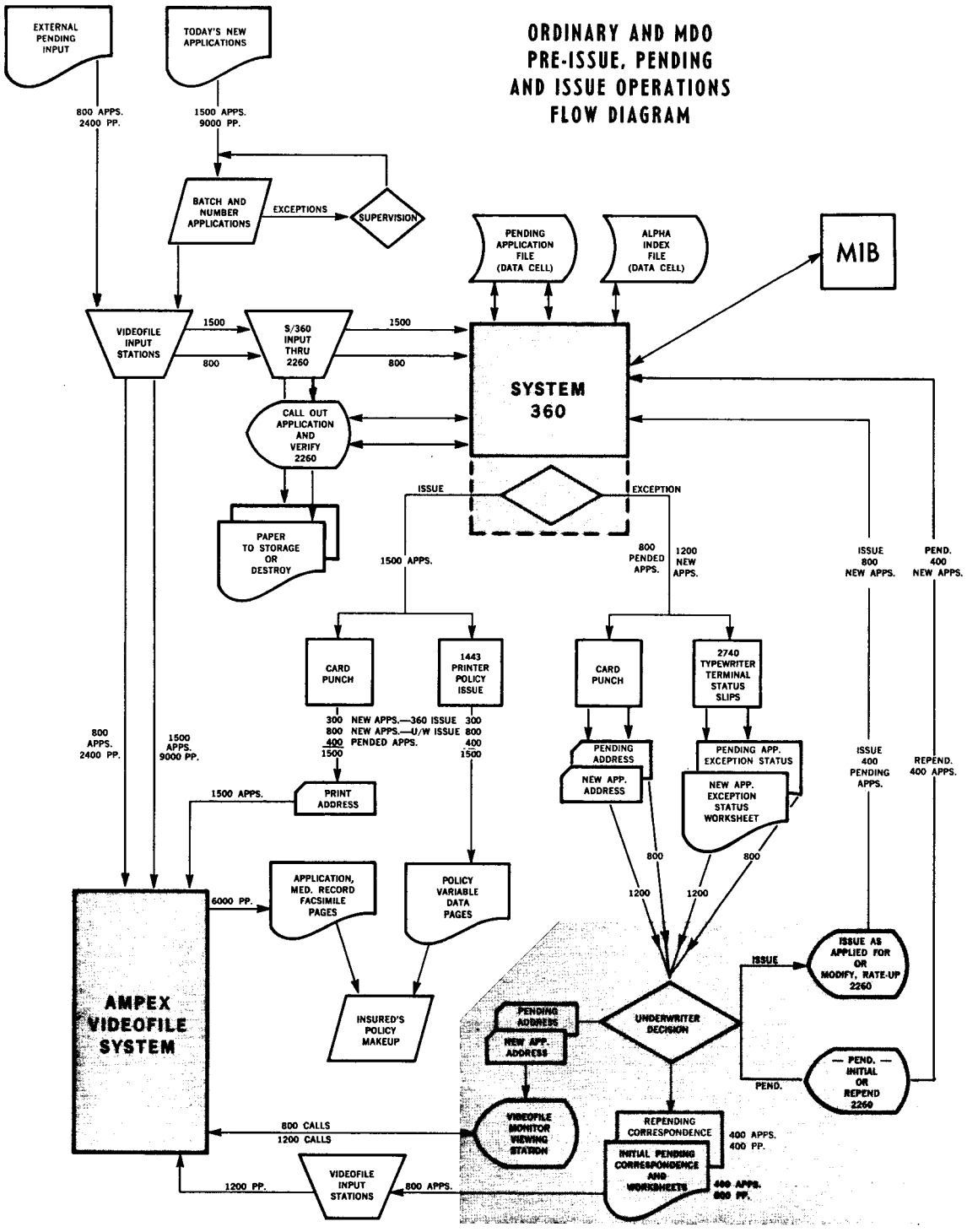
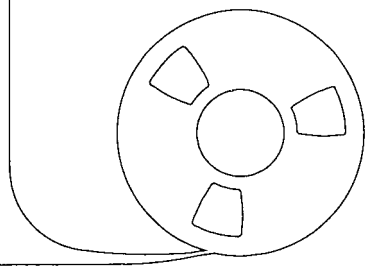


FIGURE 6A

VIDEOFILE*



Document Storage and Retrieval System

System Components

*T.M. Ampex Corporation

VIDEOFILE document storage and retrieval system

Automated Filing Systems for Modern Business and Industry

Ampex Corporation, leader in magnetic tape technology, presents a revolutionary new method of automated filing called Videofile Document Filing and Retrieval System. The Videofile System offers instant television filing of the actual documents themselves; no translation into an electronic computer language is necessary. Once filed, retrieving the document is quick and easy. It can be reproduced as a printed page (a hard copy) or viewed as an image on a television screen (a soft copy). The average time to find a document in a typical Videofile System: under one minute.

Images or printed copies can be available at more than one location at the same time. Especially important, the actual document is never out of the file: it is located, copied instantaneously for viewing or printing, but not otherwise disturbed. This eliminates the chance of losing it, or the inconvenience of waiting for someone else to finish looking at a particular file. Updating files is done at the push of the button. The technology permitting automated updating is the Electronic Editor from Ampex which is used for many special frame by frame animation effects and insertions in television broadcasts.

Videofile Filing System . . . the first automated system

- *Records documents and files on magnetic tape, the most flexible storage*
- *optionally, at distant locations.* • *Printed copies are available in minutes,*
- *to, or deleted without disturbing existing documents or file organization.*
- *Reduces costs . . . a Videofile System can cut costs up to 50 per cent over*

UNDERSTANDING THE VIDEOFILE SYSTEM

The Videofile System is a new concept, but has its roots in Ampex's long established television tape recording and computer technologies. To understand how a Videofile System can be used to solve your filing problems, two important concepts are fundamental: Frame sizes as used in television tape recording, and the two basic systems of file organization.

FRAME SIZE

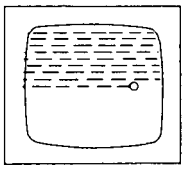
In its filing operation, the Videofile System photographs each document with a television camera or scanner and records it electronically on magnetic tape as a television picture or image. Each picture occupies one television frame. Television pictures are made up of a series of lines called television scanning lines. The number of lines in a given picture provides a rough measure of the resolution, or the amount of detail that can be clearly read. This has led Ampex to establish initially two different television frame sizes for displaying different size documents, just as there are various frame sizes in microfilm. The accompanying table and diagram illustrate this and other fundamental relationships of document size and resolution in Videofile filing.

RECORDING A DOCUMENT

In recording a document on magnetic tape, two-inch-wide tape is used, with the top ¼ inch being used for identity numbers, the document's "address." Each address can be made up of 18 numeric or 12 alpha-numeric characters, which often allows extra space for cross reference or other special information. The actual television image is recorded as a series of magnetic tracks made transversely across the tape as shown by the dashed lines in the illustration. For each picture a certain linear length of tape is used depending on the frame size required for the particular application. This in turn determines the number of documents that can be recorded on a given size reel of tape. The last column in the table shows this relationship.

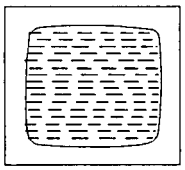
SAVINGS IN FLOOR SPACE

Another important advantage of Videofile Systems is the great savings in file storage space over conventional files. As an illustration, seven reels of video tape, each 21¼ x 14 inches in diameter can store over 1¾ million documents. With conventional filing, this would require approximately 150 four-drawer filing cabinets. This savings in floor space is approximately the same as that afforded by archival storage on microfilm reels, and considerably greater than that afforded by aperture cards. The difference between the Videofile System and archival microfilm reel systems is its functional flexibility. This permits individual documents to be filed by subject wth related documents at the same place on the tape, just as they are in file folders in conventional cabinets. Updating is equally flexible and is directly analogous to removing or inserting documents in a file folder.

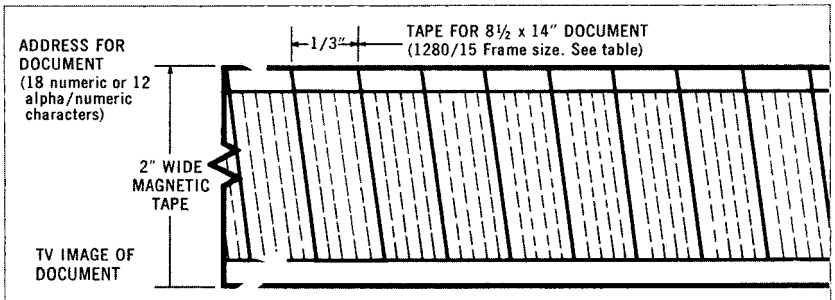


Television picture is created by spot which moves to create lines.

HOW TELEVISION PICTURES ARE MADE



Number of lines in a picture determines readability. Commercial television has 525 lines in each picture.



HOW PICTURES ARE RECORDED ON MAGNETIC TAPE

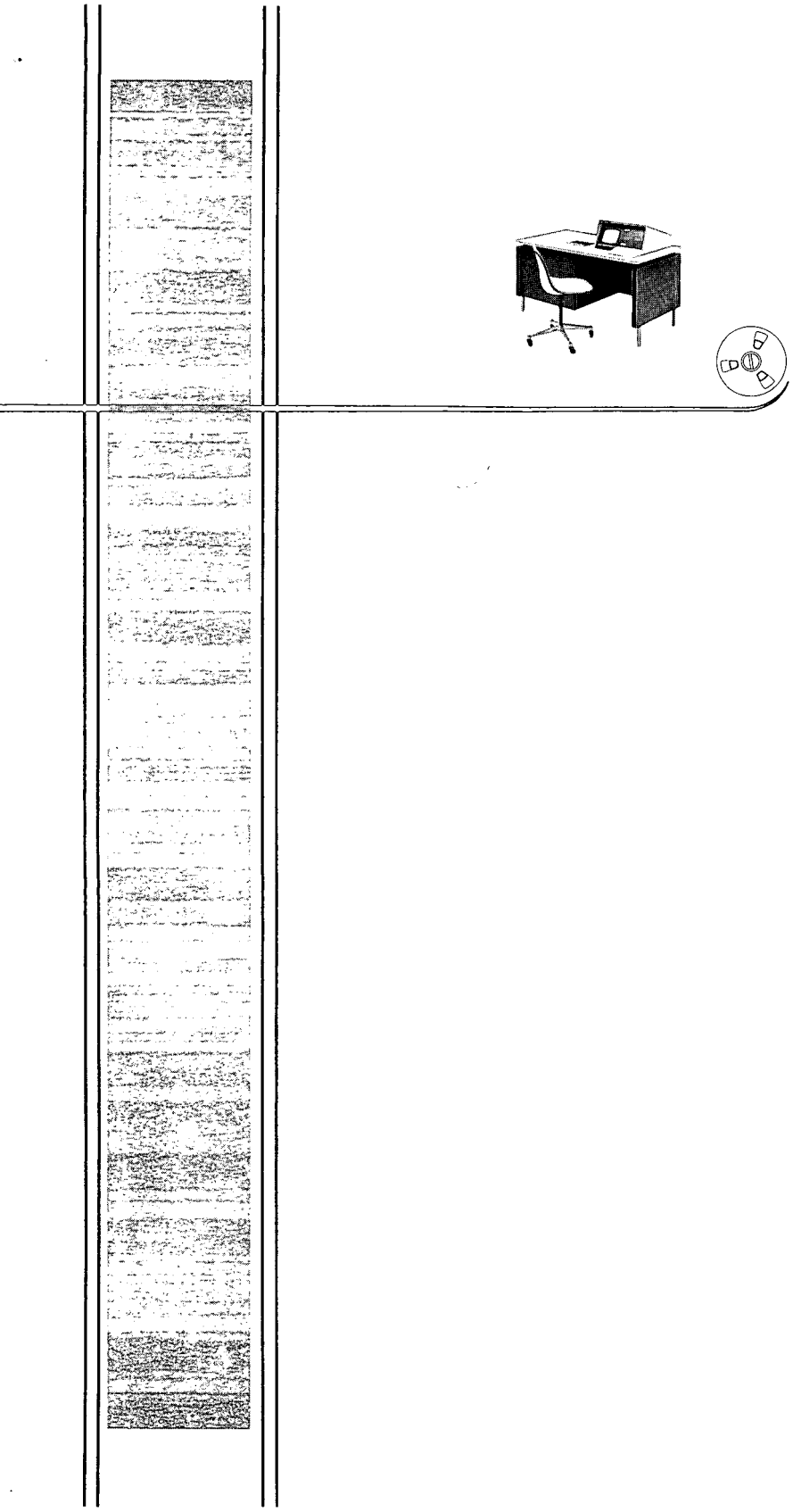
FRAME SIZE, RESOLUTION & CAPACITY RELATIONSHIPS

FRAME SIZES	MAXIMUM DOCUMENT SIZE PER FRAME*	LINEAR TAPE LENGTH PER FRAME	DOCUMENTS PER REEL		
			14" DIAM	10½" DIAM	8" DIAM
640/30 Frame	5½ x 8½"	1/6 Inch	500,000	250,000	125,000
1280/15 Frame	8½ x 14"	1/3 Inch	250,000	125,000	62,500

*To resolve 10-point (or larger) type.

to offer all these major advantages:

medium. • Files are instantly available—typically within a minute—anywhere in the building or too. • Automates both the retrieval and the filing process. • Files are easily updated, added • Compactness...fits into one room, yet can store several million documents. conventional systems. • Documents are never out of file, can't be lost or misfiled.



ORGANIZING THE FILE

The inherent characteristics of magnetic tape which allow for very compact storage (high packing density) plus the ability to update whole documents (electronic editing) permit great flexibility in applying Videofile System automation to your present filing system. Basically, filing systems fall into either of two fundamental types of organization. These are ordered filing and random filing, depending on whether the documents are first arranged into subject files and then filed, or whether they are filed as received. With either type of filing, indexing is similar, by subject or number, or a combination of both.

ORDERED FILING

With ordered filing, all the information on a particular subject is filed at the same place (address) in the magnetic tape. During retrieval, a request for the subject file (one or more documents) is dialed into the system, and the reel of tape is searched. When the file is located, the document images in this file are electronically copied into a temporary picture storage device (a buffer), allowing the Master File to continue its search for other files. The requestor can now browse through the entire file he has requested. Individual documents can be selected, while browsing, for printed reproduction (hard copy) as desired. Insurance company policy files, department store charge slip files, personnel files, and similar information files lend themselves to this type of organization. The important consideration here is that **ordered filing is slower on filing than random filing, but faster on retrieval.** If fast access is required, ordered filing is the choice.

RANDOM FILING

With random filing, each new document is added at the end of previously-recorded documents. Books, technical manuals, dated reports, and similar libraries of materials often lend themselves to this type of file organization, particularly when a computer or other external indexing system is used.

When retrieving, subject addresses are entered into the system in batches. The recorder then searches the entire tape to be sure it has located all documents concerning each subject. As each document is located, it is stored in a temporary storage unit (buffer) as above, until the search is complete. Document images stored in the buffer can now be reproduced by a printer (hard copies) for distribution to the requestors. In those few

applications of random filing requiring soft copies, the document images stored in the buffer can be displayed on a monitor. The important thing to remember is: **Random filing results in faster filing but slower retrieval.** If fast access is not required, or if filing must be done quickly, then a random file is the choice.

COMBINED RANDOM and ORDERED FILING

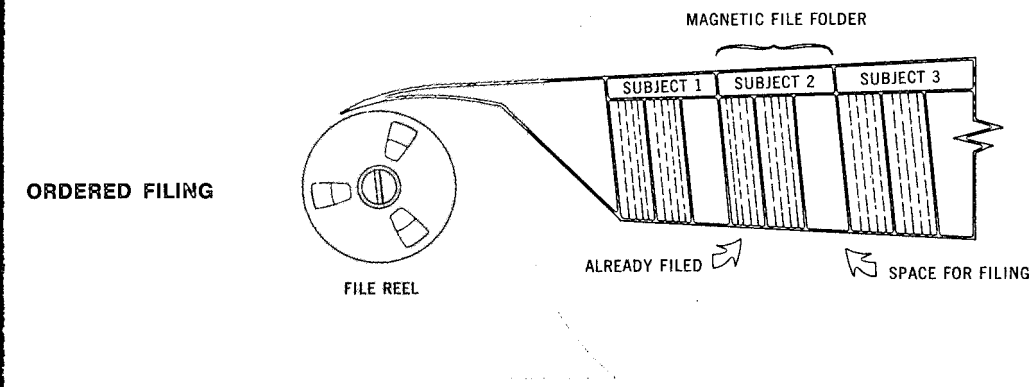
Most files represent some sort of combination between random and ordered filing. Ordered files, for example, may be indexed to main subject heads, but within the file folder, each document is inserted randomly, as it is received.

UPDATING and FILE EXPANSION

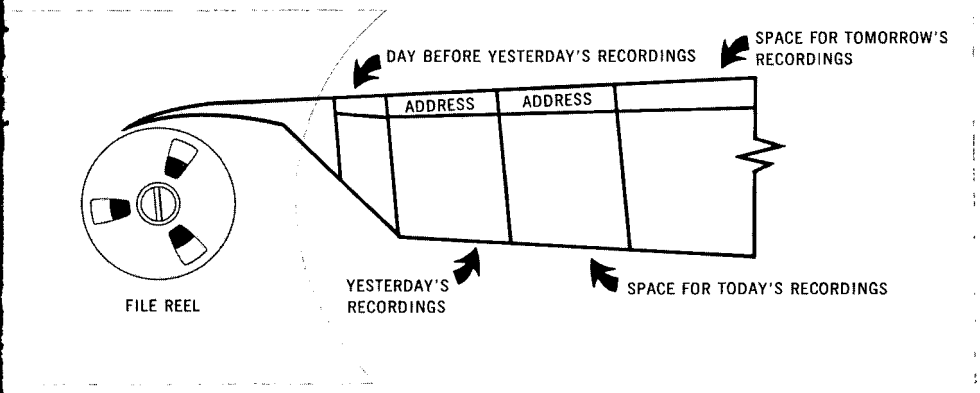
When organizing a Videofile System, its functional flexibility makes it easy to plan for expansion to take care of new documents as they are received in ordered files. The technique is quite similar to conventional file drawers, in which new documents are simply added to each file folder as they come in. Even when an unexpectedly large number of new documents needs to be filed in a particular file folder, the Videofile System can easily handle them. The entire file folder or section of the file is simply rerecorded either at another place on the reel where there is more room, or the entire reel is rerecorded to provide more space not only in this file folder, but any others which may be approaching the full point. By means of a special "marker" placed in the address block for a file, the system can automatically provide a warning that a given file is becoming filled up and requires more space. If necessary, a new "file cabinet," another reel of tape, is added to handle the overflow.

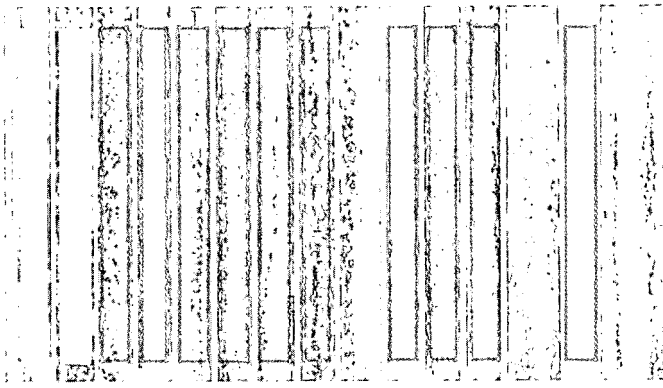
VIDEOFILE SYSTEM MODULES

Since each filing application differs from every other application, Videofile Systems must be tailored to fit the various requirements. To meet this variety of needs, a series of modular building blocks have been designed. These building blocks can be combined in an almost infinite variety of configurations. The following gatefold describes each building block in summary fashion and outlines the choices and decisions that must be made in planning a Videofile System in order to provide the proper system flow for a given application.



ORDERED FILING

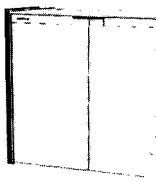




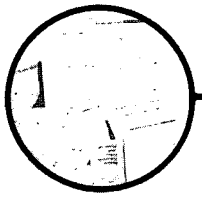
RANDOM FILING

FLOW CHART FILING

FILING STATION



BUFFER STATI



DOCUMENTS FOR FILING

Documents enter the system here. The size of the document determines the frame size required. The maximum size indicated is sufficient to resolve 10-point type and normal weight pencil lines. Standard systems handle any one document size in any one frame size.

Frame Size	Maximum Document Size (in.)
640/30	5½ x 8½
1280/15	8½ x 14

REMOTE FILE INTERCONNECTION TERMINAL **R**

MACHINE READABLE ADDRESSING STATION

ADDRESSED DOCUMENTS

AUTOMATIC FILING STATION

VIDEO IMAGES & ADDRESS SIGNALS

AUTOMATIC FILING

MANUAL FILING

MACHINE READABLE ADDRESSING STATION

Function:
Operator addresses documents by imprinting a machine readable address directly on the documents, or preparing EAM cards or paper tape.

Standard Options:
Controlled font print head.
Punched EAM cards.
Punched paper tape.

Optional Additions:
Keystroke verification.

Typical Operating Rate:
Operator limited. Average rate about 2 characters per sec.

AUTOMATIC FILING STATIONS

Function:
Generates television image and address signal for each document. Documents are moved past the television camera and addresses are read automatically.

Standard Options:
Cut sheets up to 8½ x 14 inches with controlled font address reader.
16 or 35 mm roll microfilm with synchronized puched cards or paper tape address reader.
Fan Fold paper with synchronized punched card or paper tape address reader.

Typical Operating Rate:
45 seconds to load File Buffer Station to capacity.

SMALL CAPACITY TEMPORARY STORAGE

MANUAL FILING STATION

VIDEO IMAGES & ADDRESS SIGNALS

MANUAL FILING STATION

Function:
Generates a television image and an address signal for each document. An operator places each document in front of the television camera and manually enters each document address on a keyboard.

Standard Options:
Cut sheets up to 8½ x 14 inches with 10-key numeric address keyboard.
16 or 35 mm roll microfilm; 16 or 35 mm aperture cards; or microfiche with 10-key numeric address keyboard.

Optional Additions:
Address Display
Monitor Display
Keystroke verification
Alpha-numeric keyboard
Address modulator for writing composite video and address signals.

Typical Operating Rate:
Operator limited at about 4 pages per minute.

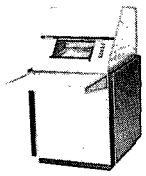
FILING STATIONS

FILING STATIONS — As the documents enter the system, the first choice is one of automatic or manual filing. Automatic filing normally requires an operator to preaddress documents in machine readable form before the automatic filing operation, except in those few cases where documents are already preaddressed. In manual filing, an operator combines address entry and document filing [illegible] documents are not preaddressed and time is available at later stations to permit either immediate updating of the Master File or temporary storage at the instant the operator presses the file button. Automatic filing is used with preaddressed documents or when later stations are normally in use for other purposes (i.e., Master File has all stations tied up for retrieval purposes so that none are available for intermediate storage). In this case, [illegible] automatic filing to speed up filing operation when stations are free.

INT

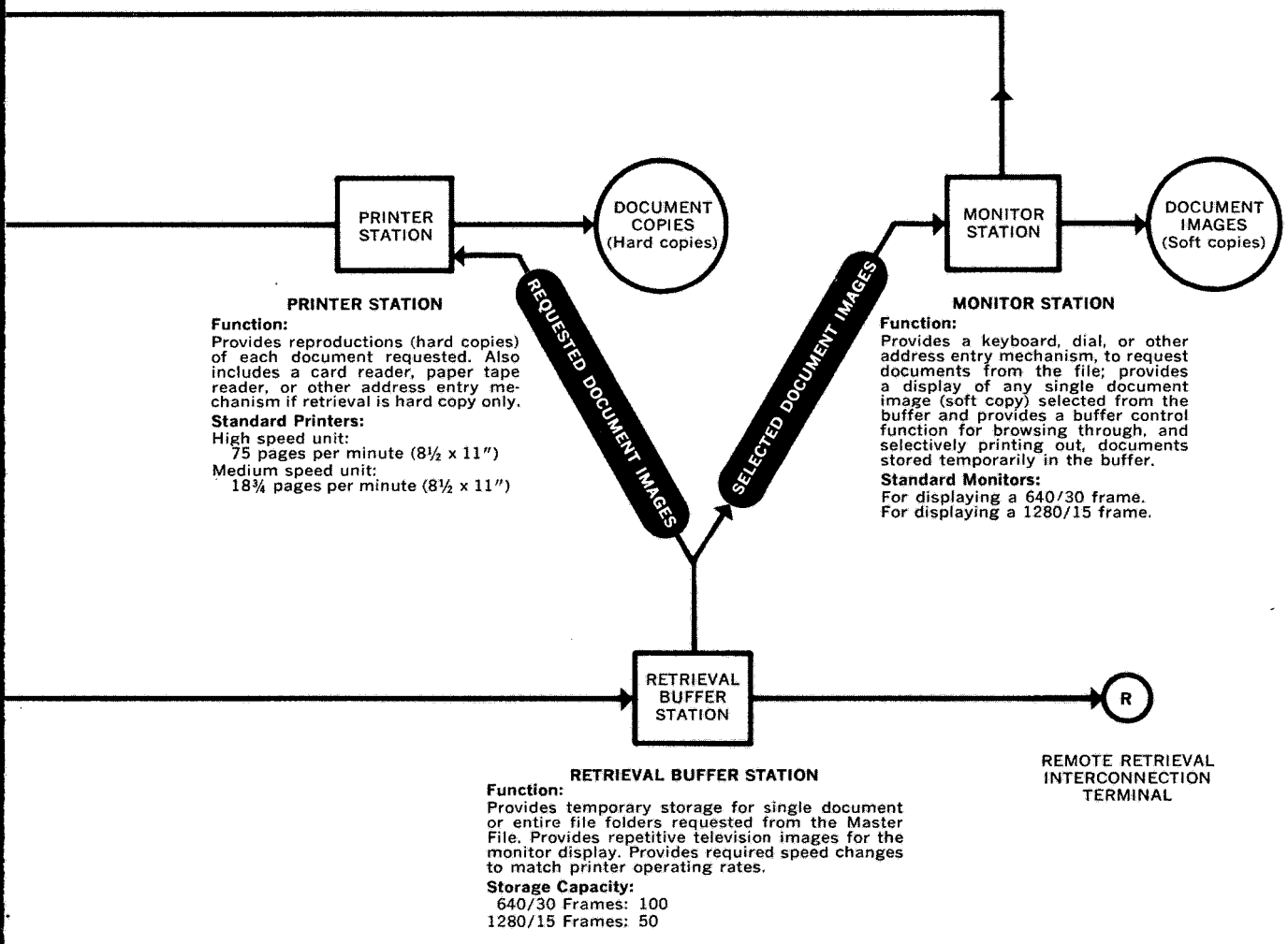
INTERMEDIATE STORA
The output of the filing stati
and address signal for ultimat
ter File. For manual filing, wh
free, updating is done immed
ual File Station directly to th
other cases of both manual a
intermediate storage is requi
the Master File.

The amount of intermediate



PRINTER STATION

MONITOR STATION



PRINTER STATION

Function:
Provides reproductions (hard copies) of each document requested. Also includes a card reader, paper tape reader, or other address entry mechanism if retrieval is hard copy only.

Standard Printers:
High speed unit:
75 pages per minute (8½ x 11")
Medium speed unit:
18¾ pages per minute (8½ x 11")

MONITOR STATION

Function:
Provides a keyboard, dial, or other address entry mechanism, to request documents from the file; provides a display of any single document image (soft copy) selected from the buffer and provides a buffer control function for browsing through, and selectively printing out, documents stored temporarily in the buffer.

Standard Monitors:
For displaying a 640/30 frame.
For displaying a 1280/15 frame.

RETRIEVAL BUFFER STATION

Function:
Provides temporary storage for single document or entire file folders requested from the Master File. Provides repetitive television images for the monitor display. Provides required speed changes to match printer operating rates.

Storage Capacity:
640/30 Frames: 100
1280/15 Frames: 50

REMOTE RETRIEVAL INTERCONNECTION TERMINAL

RETRIEVAL STATIONS

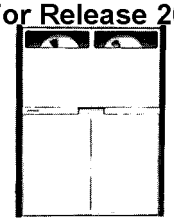
choice. If fast access is not required, or if filing must of necessity be done quickly, a random file would be the choice.

Access times shown above are for five 15-page "file folders" to be retrieved from a 5-million page **Ordered** file stored in 1280/15 size frames on 3600-foot on-line reels, and five 15-page file folders to be retreived in one batch from a **Random** file with 3600-foot reels stored off-line.

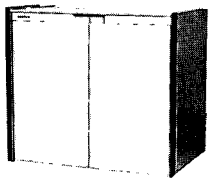
RETRIEVAL STATIONS — Documents can be retrieved from the Master File in either of two ways: as images on a television monitor (soft copies) or as printed pages (hard copies), or both. Requests for documents come from a **Printer Station** or a **Monitor Station** using a keyboard, dial or similar device. One document or an entire file folder can be requested from the Master File. When the document image or images are located in the Master File they are transferred instantaneously to Retrieval Buffer Station so that the Master File is free to handle other requests.

Images are then transferred to the Printer Station or Monitor Station for viewing or print out. At a Monitor Station the requestor can visually browse through the file folder stored in the **Retrieval Buffer** Station. If he finds a document he wishes to have in hard copy form, he can have the printer make a copy of the image displayed on his monitor.

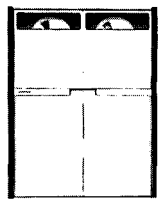
ON



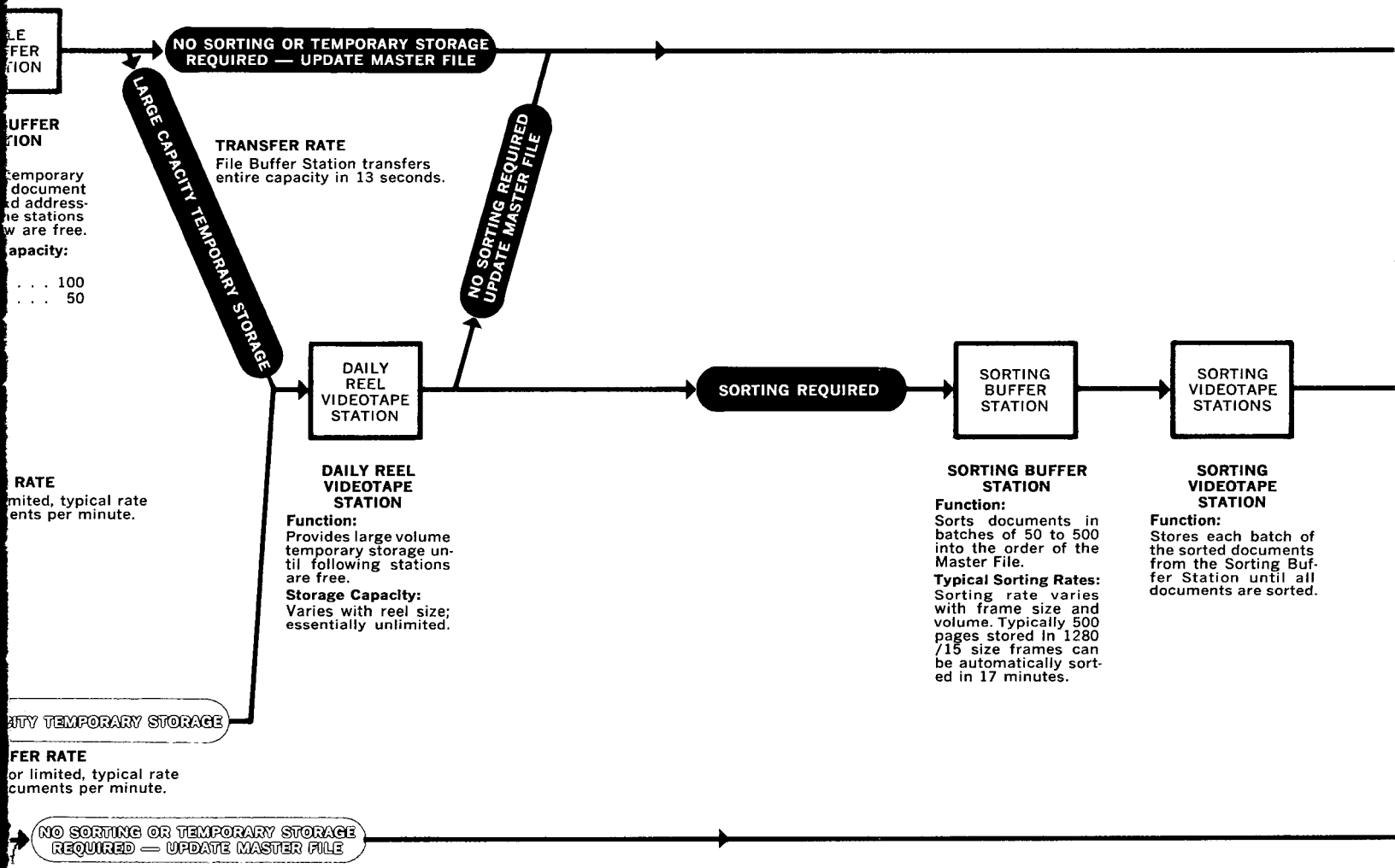
VIDEOTAPE STATION



BUFFER STATION



VIDEOTAPE STATION



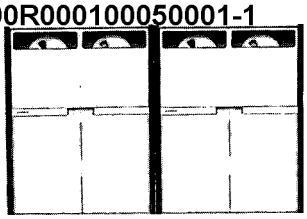
ERMEDIATE STORAGE STATIONS

GE STATIONS — ons is a video image e storage in the Mas- en the Master File is iately from the Man- e Master File. In all and automatic filing, red before updating

e storage depends on several factors. If the Master File is tied up only for short periods of time, the small capacity of the **File Buffer Station** will provide sufficient storage until the Master File is free. When free, updating takes place directly from the File Buffer Station without additional storage. If the Master File is tied up for extended periods of time, then additional intermediate storage is required. In this case, the Automatic Station (automatic filing) or the Manual File Station (manual filing) is transferred to the **Daily Reel Videotape Station.** When the Master File is free, the output of the Daily Reel Videotape Station can then be transferred directly to the Master File.

SORTING STATIONS

SORTING STATIONS — Sorting may be required before updating the Master File. (Random files by definition do not use sorting.) In large files with frequent updating, sorting will speed the updating of the Master File. If the Master File has heavy usage during the day for retrieval of documents, files can be sorted in the **Sorting Buffer Station** and stored temporarily in the **Sorting Videotape Station** for updating on a later shift. Sorting rates depend on frame size and volume. If sorting is required, the entire output of the filing station must first be stored in the Daily Reel Videotape Station.



MASTER FILE STATION

UNSORTED UPDATE FROM INTERMEDIATE STORAGE STATIONS

UPDATE RATE
For typical file described below:
Random Master File: 80 seconds maximum
Ordered Master File: 8.2 hours

SORTED UPDATE FROM SORTING STATIONS

UPDATE RATE
For typical file described below:
4.1 hours

UNSORTED UPDATE FROM MANUAL FILING STATION

UPDATE RATE
For typical file described below:
Random Master File: 2 hours
Ordered Master File: 8.2 hours

MASTER FILE VIDEOTAPE STATION

Function:

The main file center for the Videofile system. Video images of each document are stored on reels of Videotape. The size and number of reels are determined by file organization, file size and file activity requirements.

File Organization Alternatives

Ordered Files
Random Files
Combinations of both

File Reel Size and Quantity Considerations:

File Size & Frame Size	File Reel Size (feet) & Number of File Reels		
	7200	3600	1800
500,000 page file			
640/30 frames	1	2	4
1280/15 frames	2	4	8
5,000,000 page file			
640/30 frames	10	20	39
1280/15 frames	20	39	78
25,000,000 page file			
640/30 frames	49	97	193
1280/15 frames	97	193	386

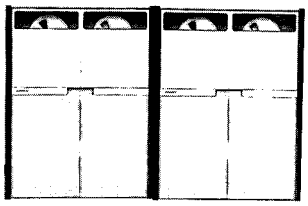
File Reel "On Line"-"Off Line" Status:

File reels may be on line, off line, or combinations of both depending on the requirements of a particular application. On-line means one recorder for each reel, permitting immediate use without loading time.

UPDATING MASTER FILES

UPDATING MASTER FILES — Updating rates depend on file size, reel size, frame size, whether sorted or unsorted, and file organization (ordered or random). In general, random files are very fast to update, but very slow to retrieve. Ordered files are slower to update, but much faster to retrieve. Update rates shown above are to update 500 pages in a 5 million page file, stored on-line (one recorder for each reel) on 3600 foot reels in 1280/15 size frames.

FLOW CHART RETRIEVAL



MASTER FILE STATION

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1280/15 frames	20	39	78
25,000,000 page file			
640/30 frames	49	97	193
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File Reel "On Line"-"Off Line" Status:

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MONITOR STATION REQUESTS FOR DOCUMENTS

HARD COPY REQUESTS FOR DOCUMENTS

REQUESTED DOCUMENT IMAGES

ACCESS TIMES

Total time to retrieve five "file folders" as described in the typical file outlined below:
Random Master File: 2.1 hours
Ordered Master File: 5 minutes
(1 min per request)

ACCESS TIMES — Access time to retrieve documents from the Master File is a function of file organization (random or ordered), file size, frame size, batch size, reel size and on-line or off-line status (on-line means one recorder for each reel, permitting immediate use, without loading time).

Random filing, which permits extremely fast filing, is very slow on retrieval. Ordered filing which is quite slow on filing is very fast on retrieval. This is the fundamental choice in selecting a Videofile System. If fast access is required then an ordered Master File is the

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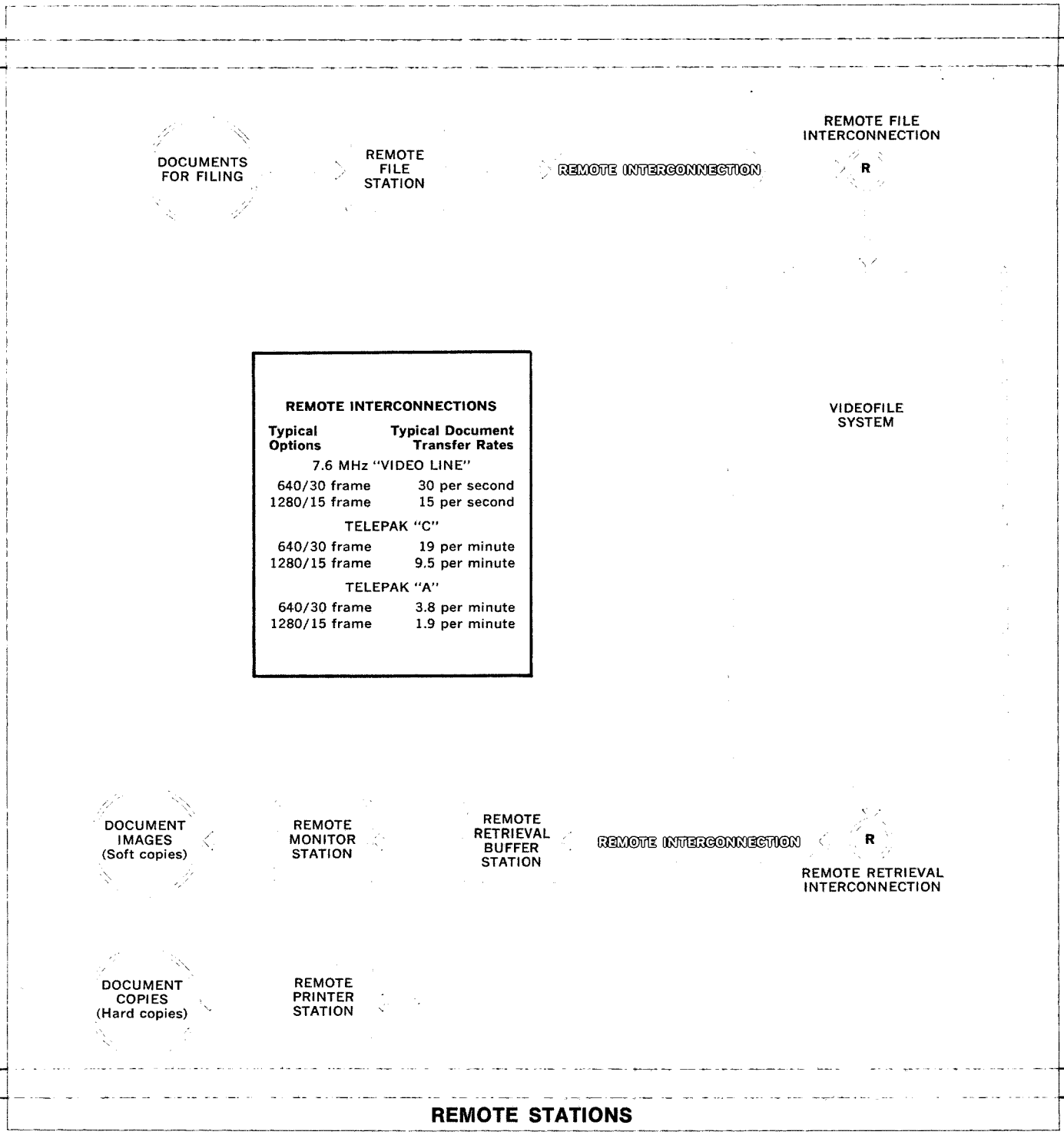
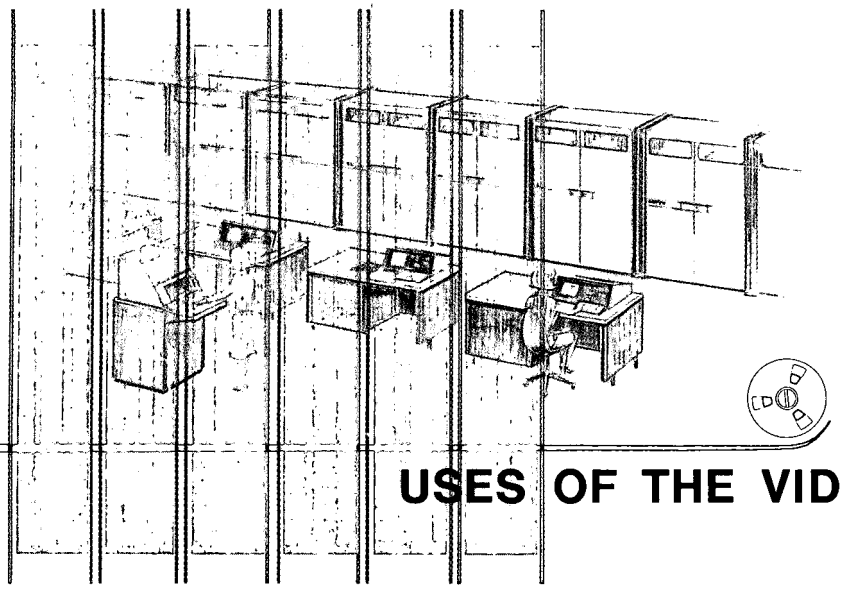
REMOTE STATIONS



REMOTE STATIONS

REMOTE STATIONS — It is possible to employ a special 7.6 MHz "Video Line" for interconnecting remote file stations and remote retrieval stations to a Videofile system. In some applications, depending on distance and type of service, it may be possible to employ commercially available "Telepak" services. Transfer rates depend upon the particular service selected. Typical rates for the various frame sizes and interconnecting services are shown in the table above. Buffer Stations may be required at remote locations and within the Videofile system to provide speed



USES OF THE VIDEOFILE SYSTEM

Existing files of many types can benefit from the complete automation provided by a Videofile System. The most immediate applications are those large files with heavy daily usage found in the following areas:

Banking Files	**Charge Account Files**	**Transportation Files**
Insurance Records	**Credit Files**	**Medical Records**
Title Insurance Film	**Employee Records**	**Research Libraries**
Criminal Files	**Motor Vehicle Records**	**Personnel Files**
Court Records	**Birth and Death Records**	**Intelligence Files**

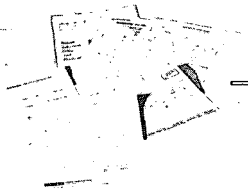
INDUSTRIAL CREDIT FILES

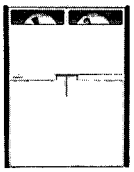
A typical application of the Videofile System is the industrial credit files of a large commercial bank. These files contain information about many local and national corporations, including annual reports, financial statements, news releases, product literature and similar information. Total documents in the file are about four million with an expected expansion to five million.

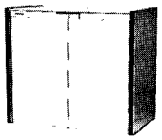
Based on the detailed flow diagrams of the preceding pages, here is how Videofile System Building Blocks are used to tailor-make a system to economically meet the requirements dictated by the nature of the business, the file organization and the day-to-day usage.

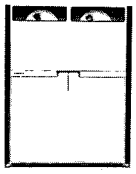
INDUSTRIAL CREDIT FILES

FILING









MANUAL FILING STATION

DAILY REEL VIDEOTAPE STATION

SORTING BUFFER STATION

SORTING VIDEOTAPE STATION

The documents to be filed are printed reports, annual financial statements, newspaper clippings, correspondence and similar information (many with pencil notations which must be reproduced). These documents make up industrial credit files, organized by a corporate account number, consisting of 8 digits. On an average day, 1500 new documents enter the system. These arrive without addresses, and in no pre-determined order. They are 8½ x 11 inches, so a 1280/15 frame size was chosen.

At this station, an operator enters an address for each document and simultaneously records the document image. This takes about ¼ minute per document or 6 hours for 1500 documents. Filing is done during the day shift.

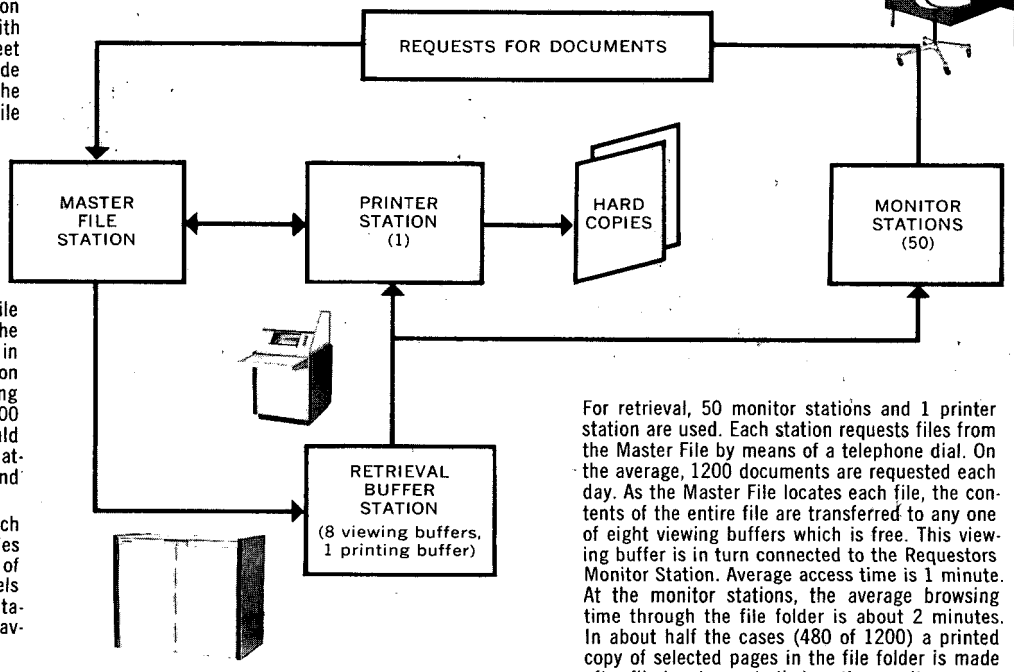
Manual filing was chosen for 2 reasons: documents are not preaddressed (making an operator necessary for entering the address whether manual or automatic filing is used); and secondly, time is available at an intermediate storage station to accept the document image and address at the instant the operator presses the file button.

Intermediate storage is required because the Master File is in use during the day shift for retrieval. A Daily Reel Videotape Station was chosen over a File Buffer Station for intermediate storage because an entire day's filing of 1500 documents must be stored and the capacity of a File Buffer Station is limited to only 50 documents of this frame size.

Sorting is used to cut updating time of the Master File from 25 hours to 7 hours. To perform sorting, the Sorting Buffer Station receives batches of 50 random order documents from the Daily Reel Videotape Station, sorts them into ascending account number order (to match the order of the Master File), then transfers these sorted document batches into the Sorting Videotape Station until 30 batches (entire day's new documents for filing) have been sorted. The entire cycle to sort 1500 documents and to store them on the Sorting Videotape Station is one hour. Sorting is done on the second shift.

RETRIEVAL

The Master File contains 400,000 files, each containing an average of 10 pages. These are all on-line, on 40 file recorders, each with a reel of tape 3600 feet long. An allowance is made for 25% expansion in the tape allocated to each file folder.



Updating the Master File Station each day with the 1500 documents stored in Sorting Videotape Section requires 7 hours (updating the Master File with 1500 unsorted documents would require 25 hours). Updating is done on the second shift.

"On-line" status of each Master File Reel provides an average access time of 1 minute. Any three reels can be searched simultaneously providing 1440 average accesses per day.

For retrieval, 50 monitor stations and 1 printer station are used. Each station requests files from the Master File by means of a telephone dial. On the average, 1200 documents are requested each day. As the Master File locates each file, the contents of the entire file are transferred to any one of eight viewing buffers which is free. This viewing buffer is in turn connected to the Requestors Monitor Station. Average access time is 1 minute. At the monitor stations, the average browsing time through the file folder is about 2 minutes. In about half the cases (480 of 1200) a printed copy of selected pages in the file folder is made after file has been studied on the monitor screen.

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Ferrite Cores

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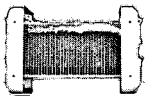
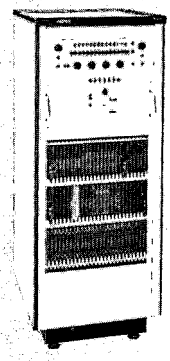
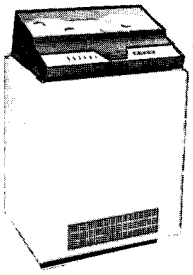


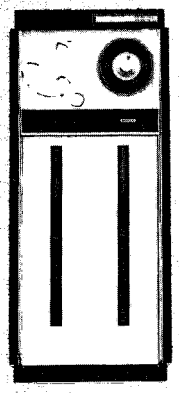
Core Memory Stacks



Core Memory Systems

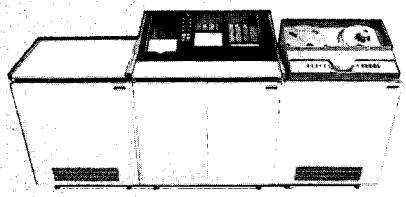


Moderate-speed Digital Tape Drives and Systems

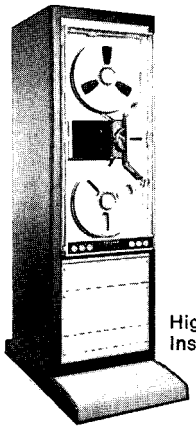


High-speed Digital Tape Drives and Systems

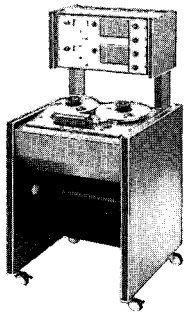
Document Storage and Retrieval Systems



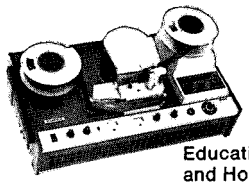
Data Conversion Systems



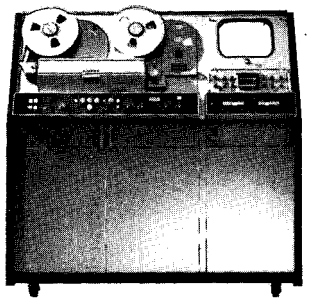
High-performance Instrumentation Recorders



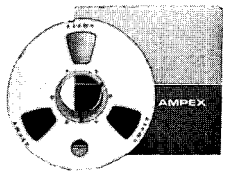
Professional, Educational and High-fidelity Audio Recorders



Educational Closed-circuit and Home Videotape Recorders



Color Broadcast Videotape Recorders



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VIDEOFILE INFORMATION SYSTEMS

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VIDEOFILE SYSTEM

The Videofile system is a document storage system capable of storing very large document collections in a greatly reduced space and yet allows rapid retrieval of any desired document.

Documents are stored in the form of a video image recorded on magnetic tape along with an identifying address which allows the search of the tape for a particular image.

A visual display or a hard copy of the image can be rapidly obtained at any time on command of an operator. A single Videofile system can provide multiple input and output sections to allow simultaneous filing and recall from the same file.

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GENERAL CONCEPTS

Videofile is a System designed to store and recall images of large document collections. A library of documents can be stored in a very small volume, yet filing flexibility is maintained. An identifying address is stored with each document image allowing rapid automatic retrieval of filed documents. Recalled document images can be displayed on a monitor (soft copy) for temporary use, or printed on paper (hard copy) for permanent retrieval.

High resolution television cameras are used to create electronic images which may then be sorted on magnetic tape using television recording techniques. A digital address identifying each image is also stored on the magnetic tape. The electronic images recovered from tape may be displayed on high resolution television monitors or may be reproduced on paper by an electrostatic printer.

From an operational viewpoint, a Videofile System can be assembled to do one or a combination of the following functional activities. This functional list includes the establishment of "file folders" on the magnetic tape storage media and to recall documents from such folders as soon as they have been established. It is possible to add documents to the folders as time passes, as well as purge documents from the folders as required. When recalling filed information from folders, the entire contents may be requested or selected portions of the folder may be obtained. When documents have been requested for viewing, it is also possible to select specific pages from the requested collection and cause the system to provide printed copies of the selected pages. Magnetic tape files organized into "file folders" can also be created with "buckets" to handle the overflow from unusually large folders.

Many files lend themselves to an organization in some other manner than file folders. To meet such needs, systems can be set up to progressively record documents on tape simply by placing each page as presented for filing in the next empty frame space. Thus, files may be set up such that there is an order to the tape addresses or they can even be in random sequence.

The System is able to conduct searches for one address or many during either the filing and/or recall activities. In conducting these searches, it is also possible to search for documents within a range of limits established for the search. The order of documents in the file may periodically

be rearranged to predetermined patterns as required by file operation.

In order to perform these functions, a Videofile System uses a group of modular building blocks which are assembled into varying system configurations to meet the variety of System needs. A brief summary of these various building blocks is contained in this Brochure.

BASIC VIDEOFILE ADVANTAGES

The preceding Videofile System summary should make it evident that this is a modular system - modular in hardware and modular in functional abilities - which can be tailored to automate a great variety of document storage and retrieval problems. Videofile advantages include:

The entering of information into a Videofile System is fast. After a document is positioned on the platen of a Filing Section, a maximum of 1/15 second is required to create the television image. The only keystroking that might be required is that of entering the identifying address.

The recording of a Videofile System "electronic image" is in final form and occurs as the picture is taken. There is no chemical processing required nor any follow-on "setting" steps to be taken.

A reel of magnetic tape, as used in Videofile, can be partially recorded, used immediately, then added to at will. Magnetic tape could be considered somewhat in the category of having your cake and being able to eat it at the same time - a recording is permanent until it is desired to change it, then it can be changed immediately.

Through "soft copy" techniques, a file can be taken to the requester, the requester does not have to go to the file; yet there is only one central file - just one file to be updated.

Electronic compensation techniques in the high resolution television camera can automatically correct for a range of background, color, and density variations when "taking a picture".

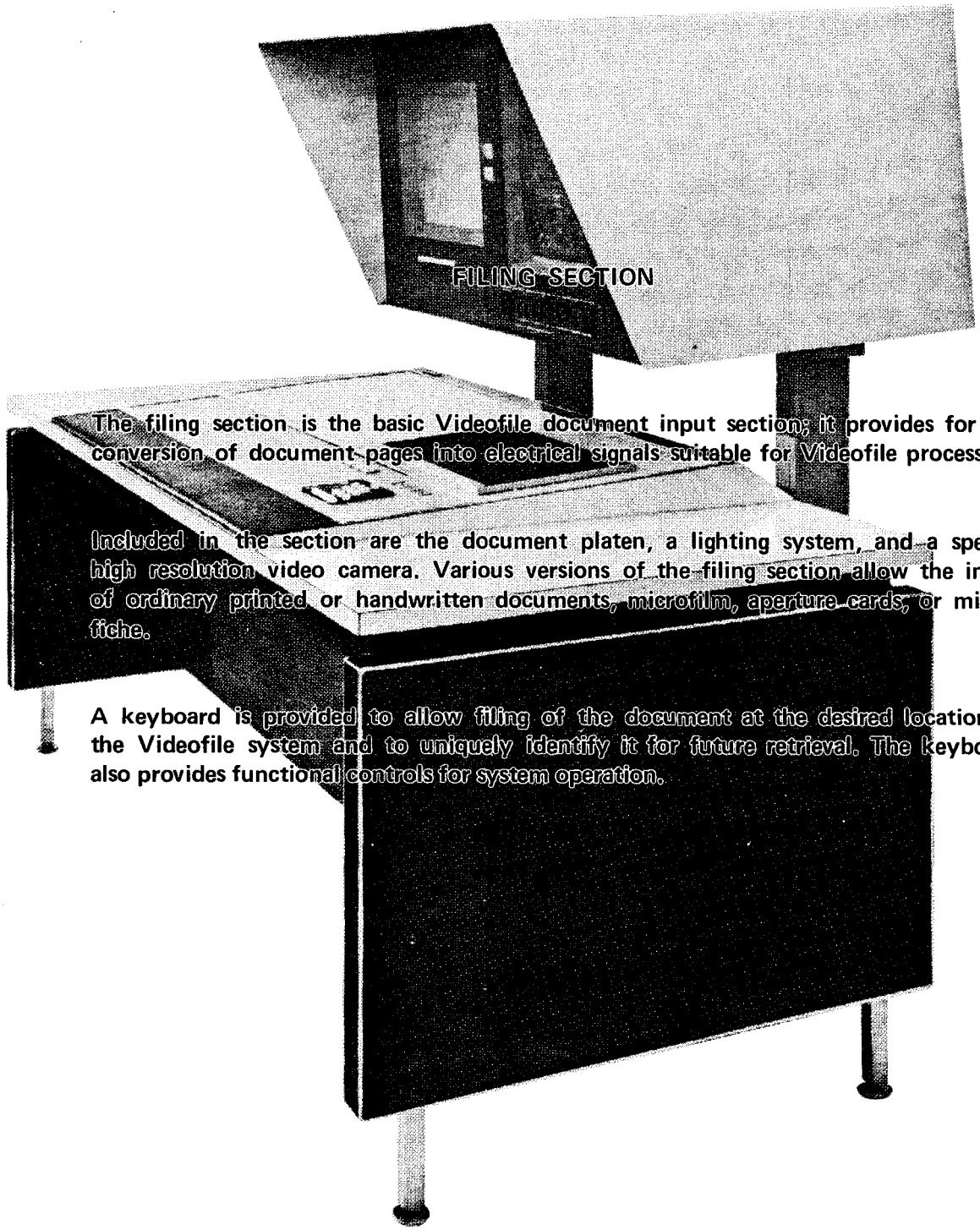
There is a substantial space saving when storing documents on a Videofile System. For example, a single 14" diameter reel of magnetic tape can store over ¼ Million documents, the equivalent to twenty (20) four-drawer file cabinets.

The ease of document processing and copying in a Videofile Information System allows great operational flexibility. Work tapes or "scratch pad" tapes can be generated for a variety of purposes. For example, when filing, documents can be recorded on a work tape so the operator does not have to wait for a time consuming search of the master file for each document. Later, perhaps on the evening

shift, the documents recorded on the work tape can be automatically filed in the proper location in the master file. The reverse of this is also possible; the files required for the next day's activities can be automatically recalled to a short work tape, thus placing them on line for quick access tomorrow.

A specific form of document processing is sorting. The Videofile System is capable of using address information to automatically rearrange a group of documents into a desired order.

The Action of a Videofile System in recalling a document is to initiate a copying process for the requester - the original is still in the file and can be copied again for another's use. There is never an out-of-file condition in a Videofile System.



FILING SECTION

The filing section is the basic Videofile document input section; it provides for the conversion of document pages into electrical signals suitable for Videofile processing.

Included in the section are the document platen, a lighting system, and a special high resolution video camera. Various versions of the filing section allow the input of ordinary printed or handwritten documents, microfilm, aperture cards, or microfiche.

A keyboard is provided to allow filing of the document at the desired location in the Videofile system and to uniquely identify it for future retrieval. The keyboard also provides functional controls for system operation.

VF 110 FILING SECTION

The VF 110 Filing Section serves as an input device for a Videofile Information System. Its function is to convert document pages into "electronic video images", somewhat similar to television images, for Videofile processing.

The Section provides a large work surface at desk height with a platen, illuminated from below, on which documents to be filed are placed. This platen has a hinged lid which is closed by the operator in preparation for filing the document. When the filing process is complete, the lid opens.

The platen can be either an 8½ x 11" unit or an 8½ x 14" unit. A combination of lens and mirrors are used to focus the document images on the camera.

The camera is a high resolution device employing a 2" Vidicon camera tube. The associated camera control unit is also housed in the Section.

Physically, the VF 110 Filing Section is a flat topped console 72" x 30" x 29" high. A portion of the top is slightly sloping toward the operator to aid the filing operator's work pattern. The Section has been "human engineered" for maximum operator efficiency. Work flow starts by selecting the top document from a stack placed immediately in front of the operator, then noting and entering on a keyboard the variable address information to be filed with the document, next placing the document face down on the platen against positioning stops, finally closing the lid and actuating the "file" key on the keyboard. In two seconds or less the lid automatically releases (unless a tape search is required) indicating that filing is complete. The operator can now slide the filed document off the platen into a recessed hopper on the left, select the next document, and repeat the operation.

The keyboard provides a standard 26-alpha, 10-numberic style keyboard for entering numeric address digits plus a maximum of nine function controls as follows:

Standard Controls	Optional Controls
File	Transfer
Address Hold Set Up	First Page Marker
Address Hold Clear	Last Page Marker
Correction	Folder Set Up
	Replace

In addition to the control functions above, other functions may be optionally controlled by keyboard character entry:

Optional Functions

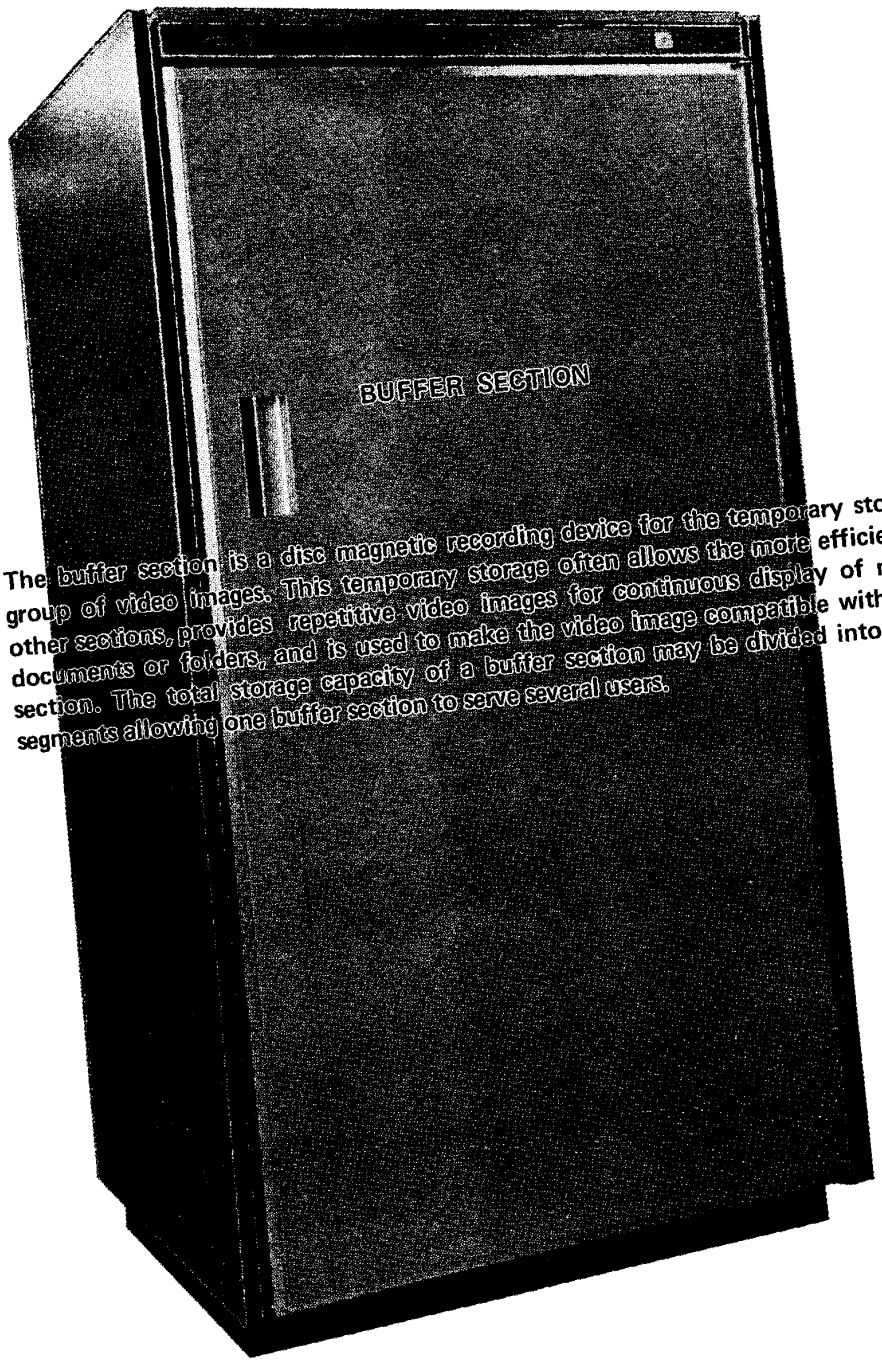
Tape Identification
Address Register Selector
Document Pages
Folder Pages

Status indicators are provided to report to the operator after the actuation of several controls:

Standard Indicators	Optional Indicators
Filing	Transfer
Error	Replace
Fault	

A companion VF 152/18 Display Section has been designed specifically for use with a Filing Section. This Section will allow the filing operator to see the document displayed just as the "system will see it".

The VF 175/10 Stack Card Reader can also be placed conveniently near a Filing Section operator so that a portion or all of the address may be entered via punched cards.



The buffer section is a disc magnetic recording device for the temporary storage of a group of video images. This temporary storage often allows the more efficient use of other sections, provides repetitive video images for continuous display of multi-page documents or folders, and is used to make the video image compatible with a printer section. The total storage capacity of a buffer section may be divided into fixed size segments allowing one buffer section to serve several users.

VF 120 BUFFER SECTION

The VF 120 Buffer Section serves as a temporary image storage device in a Videofile System. The function it is to perform during a particular system operating period will generally be one of the following:

> A number of pages from a Filing Section can be assembled in it, then recorded on tape in one segment. Thus, the Tape Section need make only one search in order to write the entire group of pages.
>
> Pages recalled from the file tapes can be assembled in it, then read out repeatedly, giving a continuous display on a monitor.
>
> Pages can be written in it in some random order, then read out in some other desired order in a sorting operation.

The recording medium in the Buffer is a 24" diameter aluminum disk, plated with a very smooth magnetic coating of nickel cobalt. This disk is driven by a servo controlled DC motor at 1800 revolutions per minute.

The video record/reproduce heads operate with 0.020" track width, the tracks spaced on 0.025" centers. The heads are indexed to the desired track location by a stepping motor, the time required for indexing to an adjacent track is 33 milliseconds. Each 1280/15 frame requires two tracks. Two heads are mounted on the Buffer, each head recording and reproducing 50 tracks. The first head records and reproduces the track for the top half of the frame; the second head provides for the bottom half. The single division Buffer is capable of storing fifty (50) video frames.

Where frames are recorded or reproduced sequentially, the heads are alternately indexed, one head indexing while the other is recording or reproducing which allows the input to, or output from, the Buffer to be continuous.

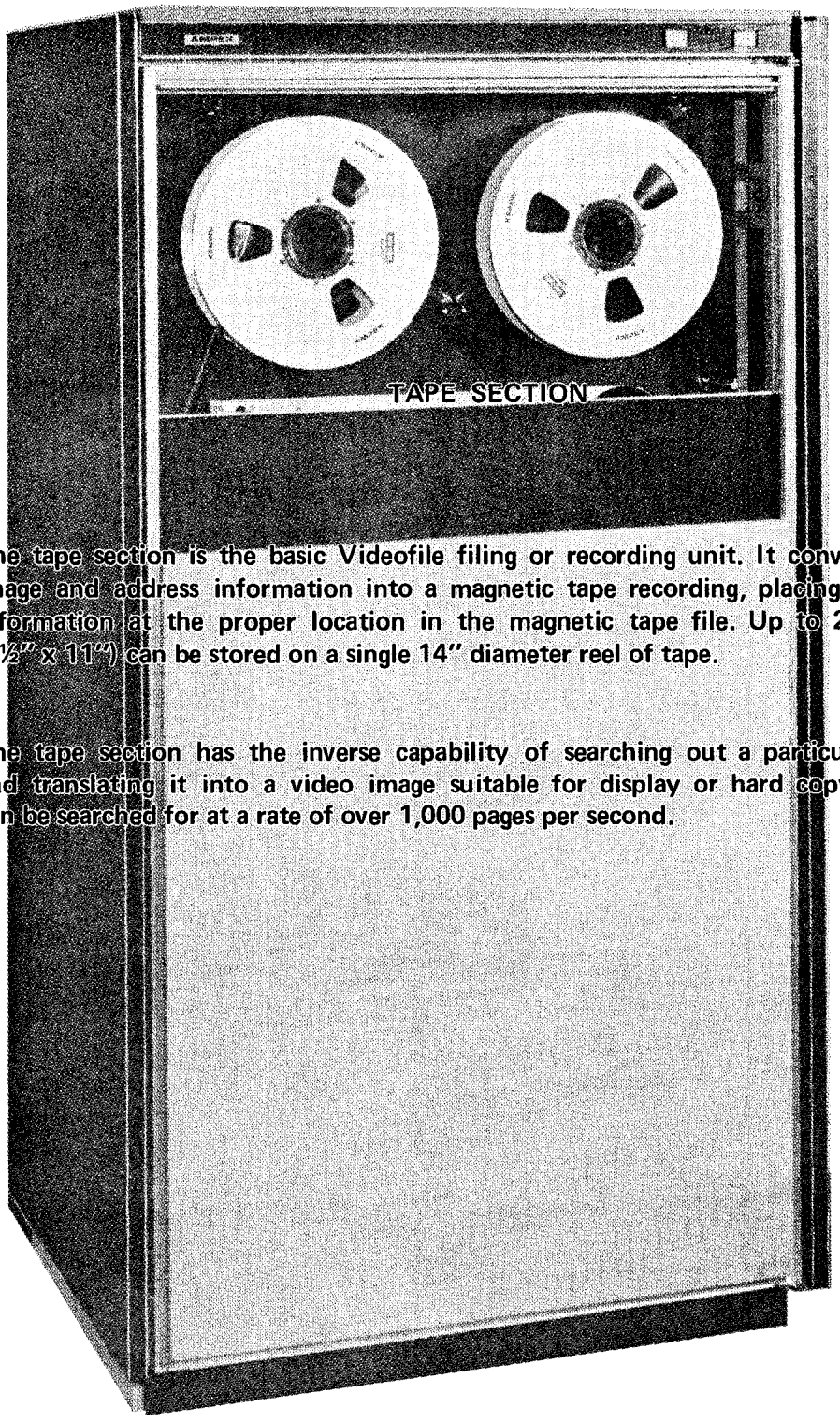
The Buffer Section stores video images only; when address information is required, as in filing, the address is stored in the Buffer Control Block of the System Controller. As the image is called out of the Buffer, the appropriate

address is called out of the Control Block in proper synchronism with the image.

When images stored on a Buffer are no longer needed, they must be erased as a separate operation; video may not be written over a previous video image. The erasure is done by a separate erase head covering the entire written area. Two complete revolutions of the disk are required for erasure. The total erase cycle, including returning the heads to the first track, is less than two seconds.

Physically, the Buffer Section is a cabinet 36" wide by 28" deep by 68-3/8" high. Its weight is approximately 750 pounds. It is intended to operate in the temperature controlled environment of the Videofile central area separated by no more than 100' from the System Control Section. All power, control and signal leads are brought into the Section through the floor. Cooling for the Section is provided by the room air. Air is drawn in through filters near the floor level and exhausted at the top of the Section.

The nominal operating power for the Buffer is 1 KW. However, when the Section is started, a surge power of 8 KW is required for approximately ten seconds. Delay circuits are incorporated in the Buffer Section to prevent the starting of all buffers at once on system start up.



The tape section is the basic Videofile filing or recording unit. It converts the video image and address information into a magnetic tape recording, placing the recorded information at the proper location in the magnetic tape file. Up to 250,000 pages (8½" x 11") can be stored on a single 14" diameter reel of tape.

The tape section has the inverse capability of searching out a particular document and translating it into a video image suitable for display or hard copy. Documents can be searched for at a rate of over 1,000 pages per second.

VF 130 TAPE SECTION

The VF 130 Tape Section is the basic Videofile Storage unit for Systems using the 1280/15 video standard. It converts the video image and its address into a magnetic tape recording and has the inverse capability of retrieving the recording.

The Tape Section contains the transport, mounted across the top of the Section, and the support equipment such as electronics, pumps, blowers, etc. mounted in the lower part.

The main transport top plate provides mounting for the vacuum hold-downs for the supply and take-up reels, the reel motors, the capstan for pulling tape, an air lubricated rotary video head, heads for writing and reading the addresses as well as erase and control track heads. Two vacuum chambers mounted below the top plate provide a means of storing tape during the starting and stopping operations providing a low inertial compliance system so that the stop and start times/distances are held to a minimum.

Tape can be transported at two speeds: 380" per second to search a tape for a particular address in either forward or reverse direction, and 5" per second for reading and writing video and addresses in the forward direction only.

A Servo Electronics Unit, located in the Servo Electronics Section, operates with the video head of a Tape Section, synchronizing it with the timing of the rest of the Videofile System. This servo unit is used only when the video head is writing and can often be shared with other tape sections, particularly when the Section spends the major portion of its operating time searching the tape rather than reading or writing.

The Tape Section also contains many of the 1280/15 electronics required for the operation of the Section, including video head drivers, preamplifiers, head equalizers, head channel switch and digital address read and write electronics.

The video information written on, and read from tape is in the form of a frequency modulated signal. The Video Electronics Unit performs the modulation and demodulation function, converting the video signal from a camera into FM form for use in the Videofile System and converting it back to a video form for output from the System. These electronics units are contained in a Video Electronics Section rather than in the Tape Section itself.

The tape used in a Tape Section is recorded with three distinct but related recordings:

1. video image;
2. digital address;
3. control track.

The video image occupies the center of 1½" wide tape. The video head velocity is approximately 1,500" per second, perpendicular to the length of the tape. Since the longitudinal tape motion is 5 ips, the video track is almost perpendicular to the tape. The video track width is 0.0035" with center-to-center spacing of 0.005".

The video head rotates at a speed of 14,000 rpm or 240 rps, each of the four heads writing or reading each revolution. Thus, the number of tracks written per second is 4 x 240 = 960. In a 1280/15 frame, 64 tracks are written per frame, or one track for each 20 video lines.

The video image is written in the form of a frequency modulated signal. The center carrier frequency, corresponding to "gray" is 9.7 MHz and is deviated 2.5 MHz downward to 7.2 MHz for white, and up to 12.2 MHz for black. With a signal bandwidth of 7.2 MHz (3db point) a recording bandwidth is required from essentially 0 to 20 MHz.

The digital address writing is done in a track occupying ¼" on one edge of the tape. A burst of 112 bits is written for each 1280/15 frame in an NRZ MARK format, with a packing density of 620 bpi. Thus, the address for each 1280/15 frame occupies something over one-half the length of the frame. At writing and reading speeds the bit rate is 3,100 per second; at a search speed of 380 ips, the reading is 236,000 bits per second.

The control track is written in a ¼" track on the opposite edge of the tape from the address track. It consists of a series of short (a few microseconds) pulses written at a rate of 240 pulses per second at 5 ips; therefore, there is a one-to-one relation between head drum revolutions and control track pulses. The beginning of each frame is signaled by the insertion of an additional pulse between the regular control pulses.

The control track is used to accurately synchronize the passage of the tape with system timing and to align the video tracks with the passage of the video heads, this accurate alignment being necessary since the tracks and heads are only 0.0035" wide. Due to the accuracy required in video track alignment, all video reading and writing operations are done against a prerecorded control track with the synchronization being done by the

control track read head. The control track is always written on the tape before it is used for writing video.

A leader section is written on approximately the first and last 75' of a reel of tape. This leader is physically a part of the tape and is used to provide blank tape for threading, and to write the reel identification in the address track (this may be either an arbitrary number or the first and last address on the tape). Other bits written in the address track indicate tape location to the Videofile System. Beginning and ending of the tape (BOT and EOT) are sensed by interruption of a light beam by the tape pack.

Physically, the Tape Section is a cabinet 36" wide by 28" deep by 68-3/8" high, weighing approximately 1,200 pounds. It is intended to operate in the temperature controlled environment of the Videofile central area separated by no more than 100' from the System Control Section. All power, control and signal leads are brought into the Section through the floor as is the pneumatic line from the Air Section (VF 171/4, VF 171/5 or VF 171/6). Cooling for the section is provided by the room air. Air is drawn in through filters near the floor level and exhausted at the top of the Section.

Cabinet construction, finishes, and colors are similar to other Videofile Sections, lending a unified appearance to the whole system. Doors on the front and rear of the cabinet allow access for maintenance of the Section; a transparent sliding window covers the tape reel and head area.

The tape reels used on the Tape Section are different from standard 2" video reels. The main differences are:

1. The hub width is slightly larger to prevent any possibility of curling the edge of the tape;

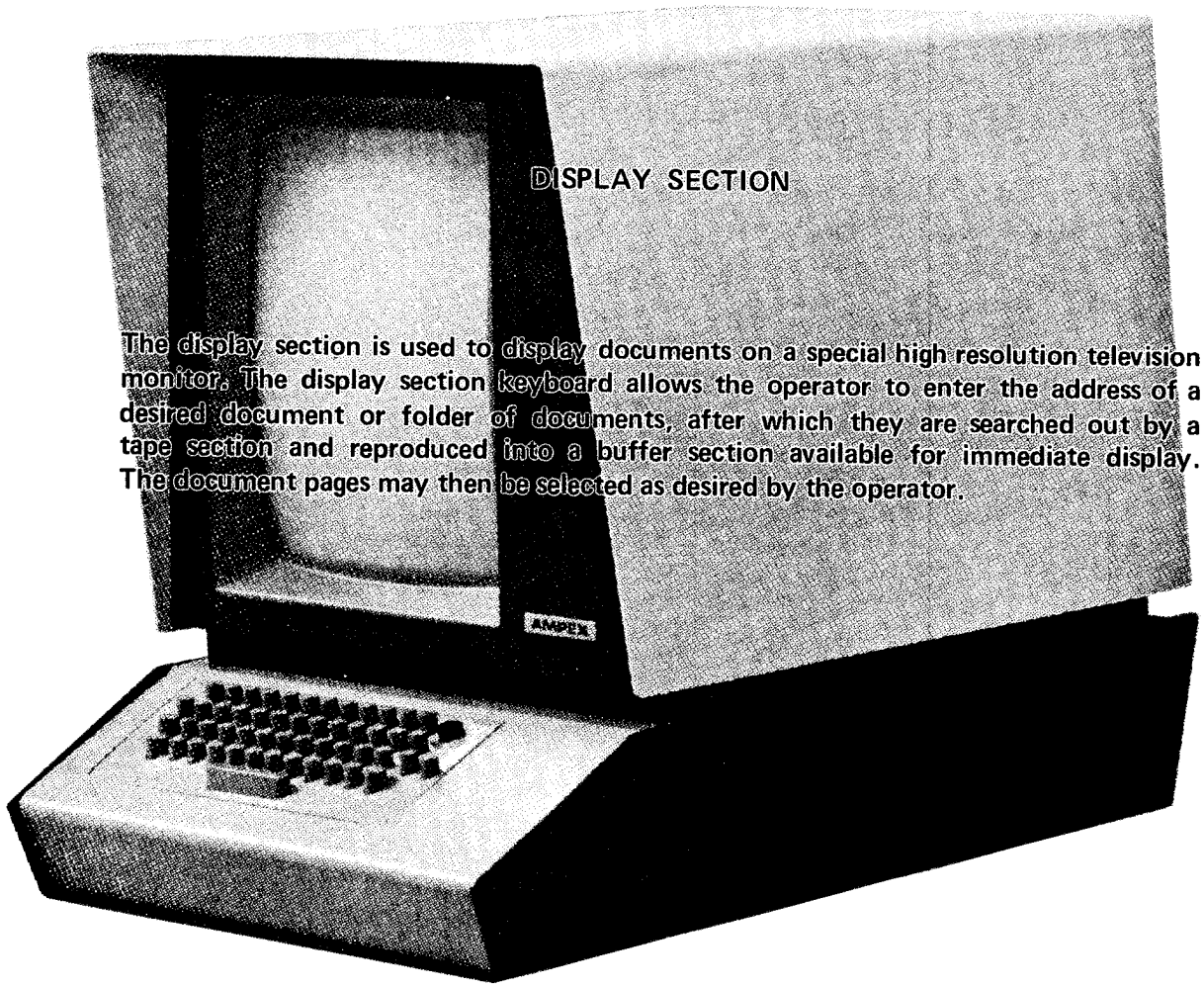
2. A cap is permanently installed on one side of the hub for operation with the vacuum hold-down system;

3. Radial holes in the hub apply the hold-down vacuum to the tape leader when it is first wound on, aiding the threading of the tape.

Operation of the Tape Section is very simple in normal operation. The single operating control is an emergency "power off" push button mounted in the upper right corner of the cabinet. This control is used only in case it is desired to shut down the Section at the Section itself.

Normally, the Section is started and shut down by System Control and requires no operator attention. An indicator light next to the power "off" button shows whether the Section is on-line or off-line.

When tape reels must be changed, the transparent window is slid down, the old reel is removed (it has been wound off on command of System Control Section) the new reel is placed on the hub and the tape is threaded through the tape path. Closing of the window signals the System Control Section that the tape is ready and the tape is wound on without further operator attention. It is impossible to reverse a tape on the Tape Section since each reel hub is blocked on one side, preventing reversal of the reel.



DISPLAY SECTION

The display section is used to display documents on a special high resolution television monitor. The display section keyboard allows the operator to enter the address of a desired document or folder of documents, after which they are searched out by a tape section and reproduced into a buffer section available for immediate display. The document pages may then be selected as desired by the operator.

VF 150 DISPLAY SECTION

The VF 150 Display Section serves as an output device for a Videofile Information System. Its function is to convert "electronic video images" into document images on a monitor in a manner similar to the function of a television receiver.

The monitor is a high resolution unit using a 17" CRT. Document viewing area may be masked to 8½" x 11" (for 8½" x 11" documents) or masked to 7" x 11½" (for 8½" x 14" documents). Document displays are oriented so that the long dimension is vertical.

Physically, the VF 151 Display Section is a cabinet 32" long by 19" wide by 23" high. It has been designed for use on a desk top with operator viewing distances approximating normal document reading conditions.

The face of the Display Section incorporates a light filter/anti-glare material to allow use in office areas with normal illumination levels. More specifically, satisfactory document image contrast can be obtained with light levels from overhead ranging up to 90 footcandles.

A standard "10-key" or Alpha Numeric style keyboard is included in the Section to provide a means of entering address data. The keyboard also provides a maximum of eleven function controls as follows:

Standard Controls	Optional Controls
Display	
Release	
Browse Forward	Large Folders
Browse Reverse	
Print	Requestor's Identification
Address Hold Set Up	
Address Hold Clear	
Correction	
Ignore	

In addition to the control functions above, other functions may be optionally controlled by keyboard character entry:

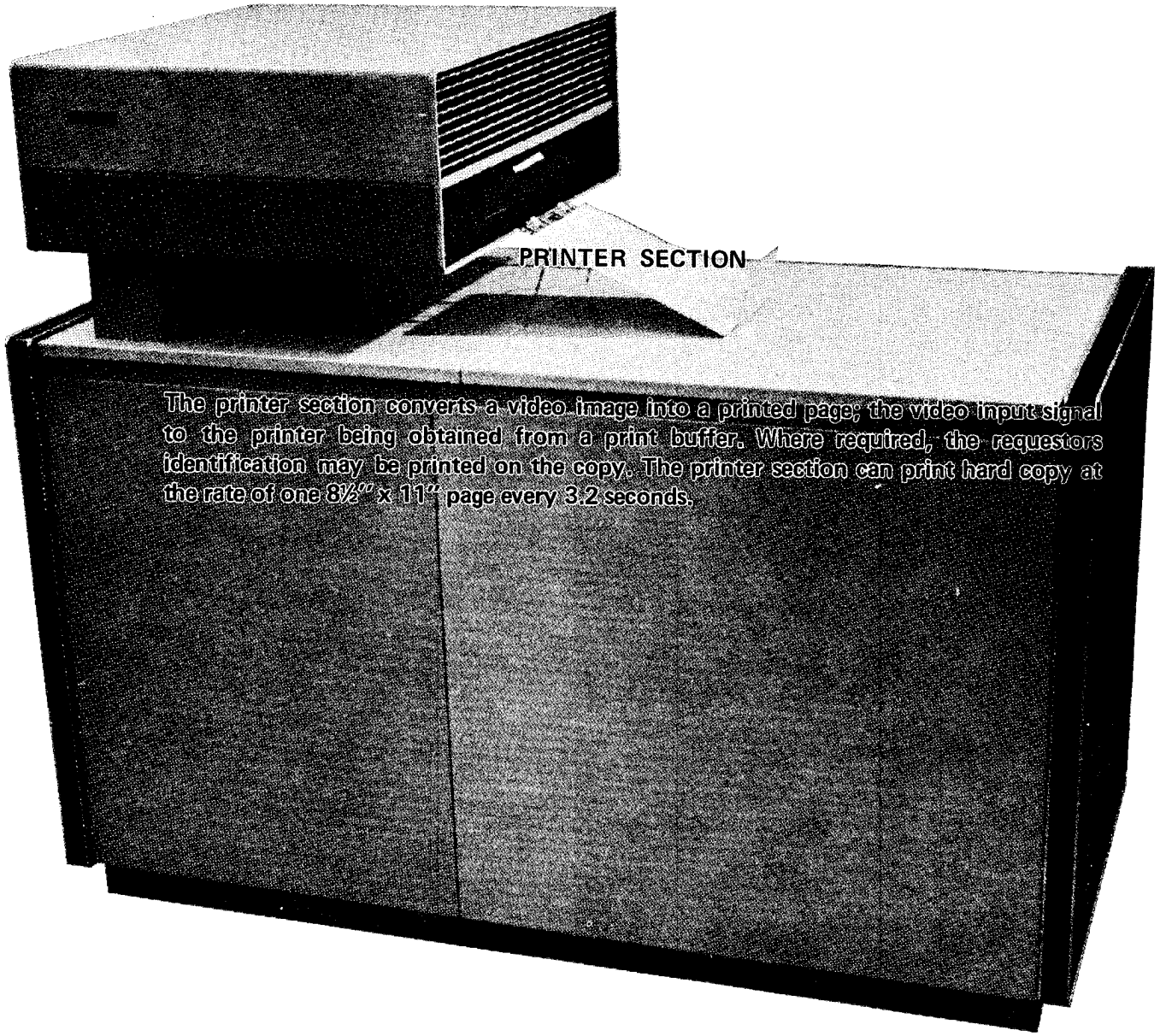
Optional Functions
Address Register Selector
Tape Identification

Status indicators are provided to report to the operator after the actuation of several controls:

Standard Indicators	Optional Indicators
On Line	More Pages
Clear	
Printing	
Error	
Fault	

The VF 175/10 Stack Card Reader may also be placed conveniently near the Display Section operator so that a portion or all of the address may be entered via punched cards.

The Display Section is usually located remotely from the central system area.



PRINTER SECTION

The printer section converts a video image into a printed page; the video input signal to the printer being obtained from a print buffer. Where required, the requestors identification may be printed on the copy. The printer section can print hard copy at the rate of one 8½" x 11" page every 3.2 seconds.

VF 140 PRINTER SECTION

The VF 140 Printer Section is an electrostatic printer designed to produce 8½" x 11" copies of images stored in a Videofile Information System. In operation, images for printing are stored in a VF 121/10 or VF 121/20 Buffer which has been set up as the Print Buffer. Documents for printout are collected in this Buffer until either the Buffer is full, or a designated interval of time has elapsed since last writing an image in the Buffer. When these conditions occur, the operating speed of the Buffer is slowed down by a factor of 48:1 and printout commences.

To print, paper is drawn from an 8½" wide roll stored in the Printer and an 11" length is cut off and starts through the Printer. It is charged by high voltage electrodes as it passes toward the printing cathode ray tube (CRT) - a special tube with a fiber optic face. As the paper passes over the tube, the electron beam is deflected across the faceplate, creating one horizontal line of picture information of that video image in the Print Buffer being reproduced. The fiber optics convey this one line of the image to the paper causing the paper's electrostatic charge to be dissipated in proportion to the light intensity levels of the image line. Paper motion is synchronized with the Buffer Scan so that each line of the video image is reproduced as the paper passes the CRT.

A fine toner power is next applied which adheres to the surface of the paper in accordance with the remaining charge pattern. This "develops" the image and it only remains to "fix" it by the application of heat to melt the particles of toner onto the surface of the paper.

After initial warm up, taking about 15 minutes, the Printer will produce a print in less than 25 seconds. This is the time required from the cutting of the sheet of paper until it is delivered to the output tray. The throughput rate is 3.2 seconds per page, or 18-3/4 pages per minute. Thus, a fifty page Print Buffer can be fed into the Printer in 2-2/3 minutes.

It may be desired to identify each print made in the Printer so that it can be delivered to the requester. The requester's identification (RID) is printed on the sheet as a result of having mixed identifying video characters with the document image video at the time it was stored in the Print Buffer. This identification appears as a part of the video image, normally in the upper right hand corner of the page. The RID is produced by a Character

Generator Unit (CGU) and Character Select Unit (CSU) external to the Printer.

The Printer measures 53" wide by 27" deep and 48" high to the top of the delivery unit. The weight of the unit is approximately 900 pounds.

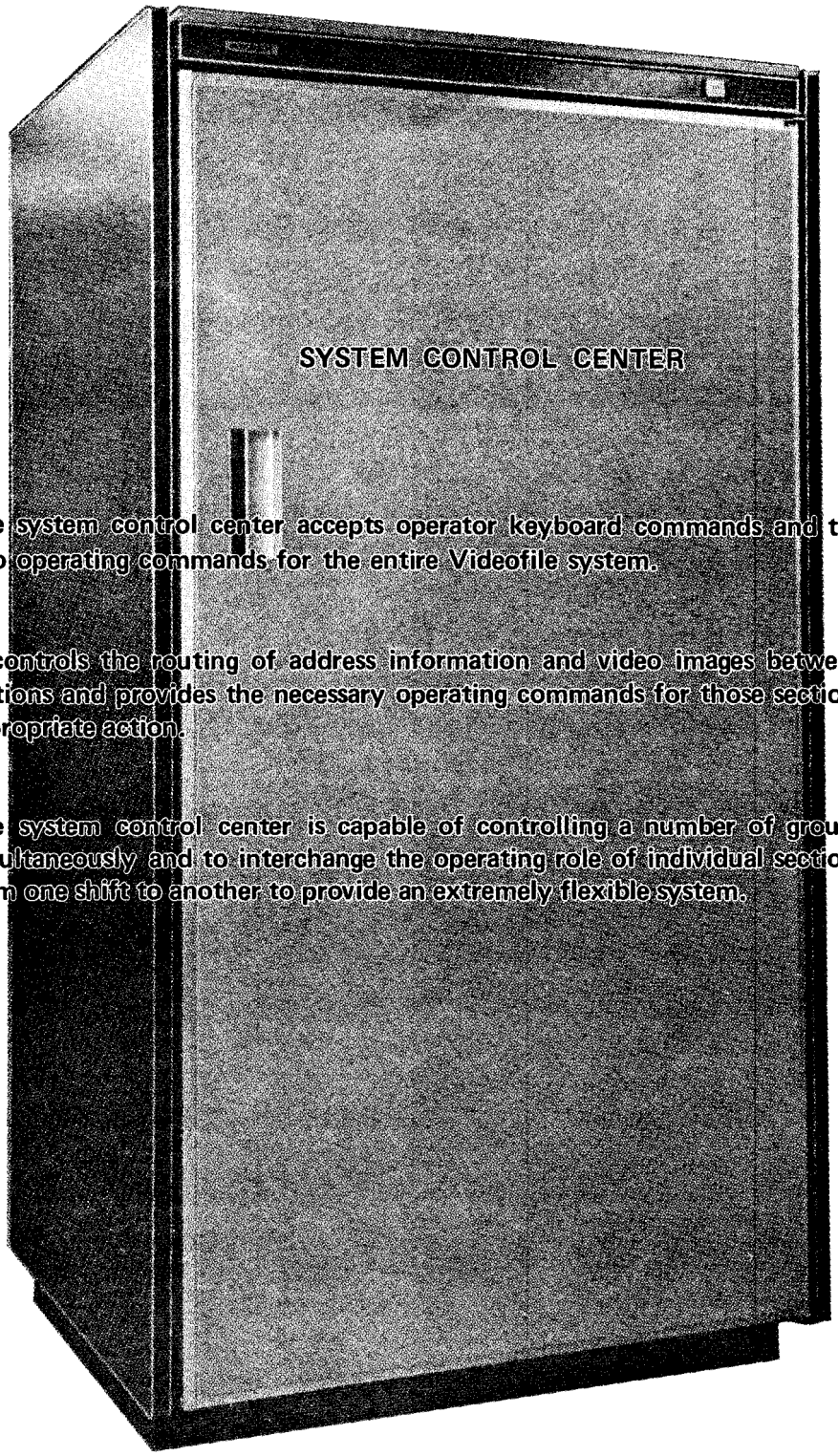
During start up, the Printer requires approximately 5 KW for 15 minutes or less. After warm up, the power requirement is 4 KW. AC power requirements are 208 and 117 volts, single phase. The power frequency must be 60 Hz $\pm$ 0.5 Hz.

The printer is intended to operate at an ambient temperature selected from the range +55°F to +90°F and controlled to $\pm$ 3°F. Relative humidity must be controlled from 40% to 60%, non-condensing.

It is possible to locate the Printer Section up to 1,000 feet remotely from the central system area.

One Printer Interface Unit is also included as a part of this Section, but is physically located at the central system area in either a VF 172/44 or a VF 172/45 Interface Section.

Paper for the Printer is supplied in 2,000' rolls and will provide approximately 2,200, 8½ x 11" pages from the Printer.



SYSTEM CONTROL CENTER

The system control center accepts operator keyboard commands and translates them into operating commands for the entire Videofile system.

It controls the routing of address information and video images between the various sections and provides the necessary operating commands for those sections to take the appropriate action.

The system control center is capable of controlling a number of groups of sections simultaneously and to interchange the operating role of individual sections as required from one shift to another to provide an extremely flexible system.

VF 180 SYSTEM CONTROL SECTION

The Controller in a VF 180 System Control Section is a small, limited, but still a general purpose computer, making use of a stored program. It is supported by some special purpose hardware which allows interaction between the computer and its program and the Videofile peripherals. Each peripheral unit may be addressed and caused to accept a command or to report on its status. Some, such as the Tape Sections and keyboards, can interrupt the program running in the computer when they require attention. Other interrupts are derived from the System Synchronizing Generator and provide timing information to the program.

All action in the computer is initiated by interrupts. When the System is idle the computer runs in a loop which results in no action at all except when interrupted by the repetitive sync generator interrupts and the only action taken then is to increment memory locations which record the passage of time.

Generally, modes of operation are initiated by interrupts from keyboards. Once initiated, and provided with the correct data, such as a Videofile Address, a mode program will run automatically to its conclusion making use of sequences and subroutines provided by the system program. Provision is made for mode programs to relinquish control to the supervisor at regular intervals in order that several modes may run concurrently.

As the majority of subroutines and sequences are common to more than one mode, many of these elements are written as re-entrant code. A library of these program elements has been established from which standard operating modes can be assembled. The existence of this library will minimize the custom programming required to tailor the Controller operation for the requirements of each application.

To efficiently utilize this re-entrant programming technique, each peripheral (including keyboards) is allocated a control block or data storage area in memory in which temporary results, status, return addresses, and other information pertinent to the peripheral and its present mode of operation are stored.

There is no swapping of data and programs into and out of core as most modes involve reading addresses off tape at high speed which results in interrupts at the rate of over 1,000 per second from each Tape Section in operation.

OPERATING DESCRIPTION

There are thirteen (13) operating patterns or standard modes for a Videofile System. Each of these general modes has many possible variants. A specific mode incorporates one particular set of variants and provides one system operating pattern.

MODE DEFINITIONS		Mode Code
PREWRITE	PREWRITE is a mode, initiated by central TTY, in which a tape is prepared for subsequent filing operations. No video is written.	P
FILE	Initiated at the FILE Station, the video image and address of a document are written in blank spaces on a file tape, either directly or through a Buffer Section.	F
SELECTIVE COPY	The central TTY initiates the SELECTIVE COPY mode in which video and addresses from a "source" tape are selectively copied into blank spaces on a "copy" tape, through a Buffer Section.	U
REPLACE	REPLACE is initiated by the replace control at the Filing Station. Video images and addresses are transferred to tape and replace specific existing video and address information. Transfer may be either directly to tape or through a Buffer Section.	R
SELECTIVE REPLACE	Initiated at the central TTY in which video and addresses from a "source" tape are transferred	S

SELECTIVE REPLACE (Continued)	to a "copy" tape through a Buffer and replace specific existing video and address information.	S
COMPLETE REPLACE	A mode initiated by the central TTY, in which video and addresses from a source tape are transferred directly, without a Buffer, onto a copy tape.	C
DISPLAY	During the DISPLAY mode operation the tape is searched for the requested address. The document or group of documents are transferred to a Buffer and the first page is displayed on a Display Section Monitor.	D
BROWSE	The BROWSE mode enables the viewer at a Display Station to call or recall a specific image from those called into the Display Buffer. The operator can "leaf" through the images either forward or backward.	B
PRINT	When the "PRINT" Button is pressed on a Display Station the video image being displayed is copied into the Print Buffer.	A
RELEASE	RELEASE is a mode initiated by the "RELEASE" Button on the Display Station in which the screen is blank, awaiting another request.	E
HARDCOPY	Generally initiated by a punched card, in which a tape is searched for a specific document or collection of documents and these documents are transferred to the Print Buffer.	H

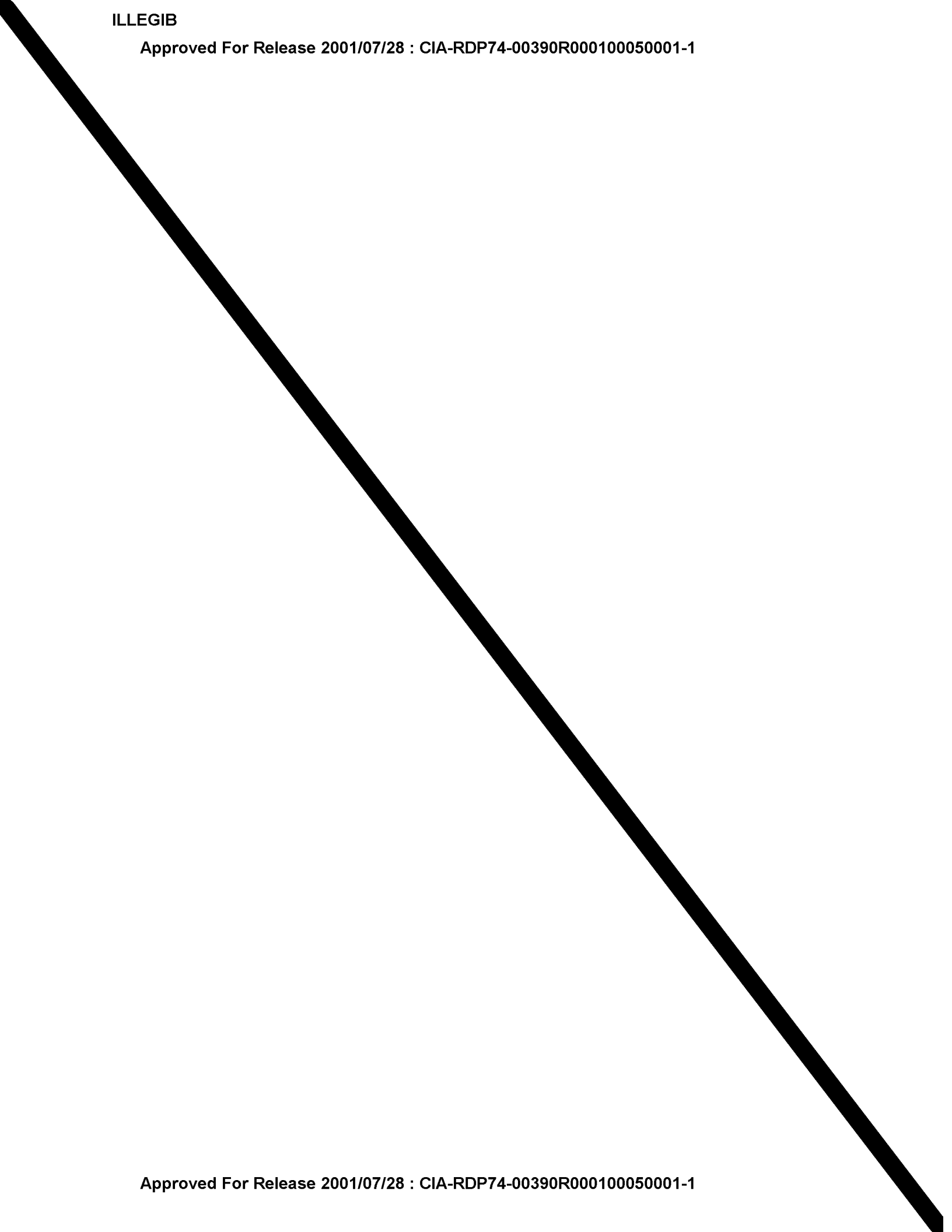
PRINTOUT	A follow-on mode to PRINT and HARDCOPY in which the video images on a Print Buffer are reproduced as printed pages on a Printer.	Q
SORT	The random ordered documents on a tape are transferred to a Buffer in ascending address order and rewritten onto a tape in an ordered fashion.	G

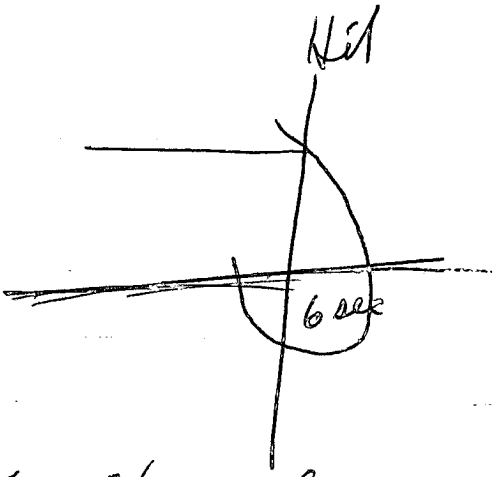
PHYSICAL DESCRIPTION

The VF 182 System Control Section is similar in appearance to other Sections in the Videofile central area. The Section measures 24" wide by 28" deep by 68-3/8" high. It weighs approximately 900 pounds. AC power requirements are similar to several other central sections: three wire, 117 volt, single phase, 60-cycle.

All power, control and signal leads are brought into the Section through the floor. Cooling is provided by room air, which is drawn in through filters near the floor, then exhausted at the top of the Section.

The same temperature controlled environment is required for this Section as is required by other Sections in the central area.





Tape life (active) X 500 read write on a selective track
300 read off analog

Storage life: indefinite

Southern Railroad

Add a line to a document.

15 month delivery time

$330,000 basic price.

Microfilm and microfiche can be accepted without resolution loss.

Input 9 digit address - 15 seconds per page.
3 seconds for a page in large documents.

Documents can be coded and optical scanned.

SECRET
(When Filled In)

SPEED LETTER	REPLY REQUESTED	DATE 25 September 1968
	YES ☐ NO ☐	LETTER NO.

TO : ALL HANDS, RAB

ATTN: THRU: Chief, RAB

FROM: [redacted] 25X1A

1. There has been occasion recently for us to be confronted with the problem of retiring video-tape to the Center. So, we have another records media with which to cope. Faced with this realization, the Chief, RAB, has assigned the task of conducting video-tape file research to me.

2. It is anticipated that visits to video-tape installations will be arranged as appropriate and possible. Anyone interested in such tours should let me know for planning purposes.

3. Also, I would appreciate your cooperation in bringing to my attention anything you may encounter in the way of publications, seminars, conventions, equipment displays, etc. which would be a source of information on video-tape. I think it would also be helpful if you would be alert for applications to the use of video-tape in Agency programs, as you find these during surveys, records officer visits, etc. Any other ideas you have will be greatly appreciated and welcomed.

[signature]

SIGNATURE

REPLY	DATE

SIGNATURE

ORIGINATOR'S SUSPENSE

FORM 5-61 1831

SECRET

Next 2 Page(s) In Document Exempt