

a new generation in external memory

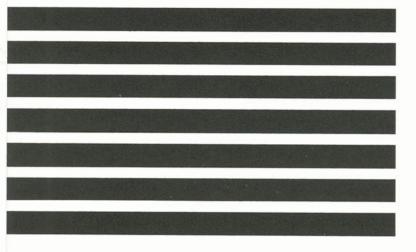


CRAM can be used like tapes, disks, or drums

Card Random Access Memory (CRAM) is more than just a new random access device. It is a major breakthrough in the external storage of data for high-speed electronic processing. It opens up new processing techniques which set new standards of economy and efficiency in magnetic file operations. Although CRAM represents a new generation in external memory devices, it retains certain features of the old that have proven to be successful. Since the introduction of electronics to business record-keeping, magnetic tapes, disks, and drums have been the most widely used forms of external memory. CRAM has been designed to incorporate all the advantages of these other types of memory and at the same time has eliminated many of their disadvantages. To help you evaluate CRAM, this brochure highlights its operation and the many advantages it brings to electronic record-keeping.

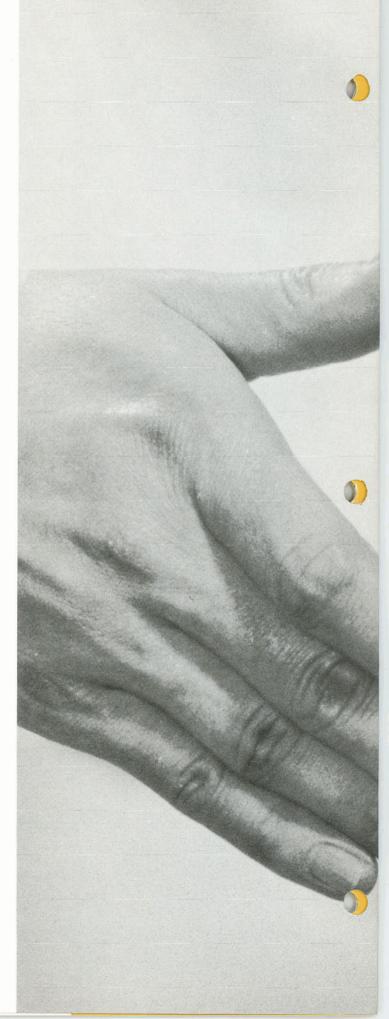
operating principles

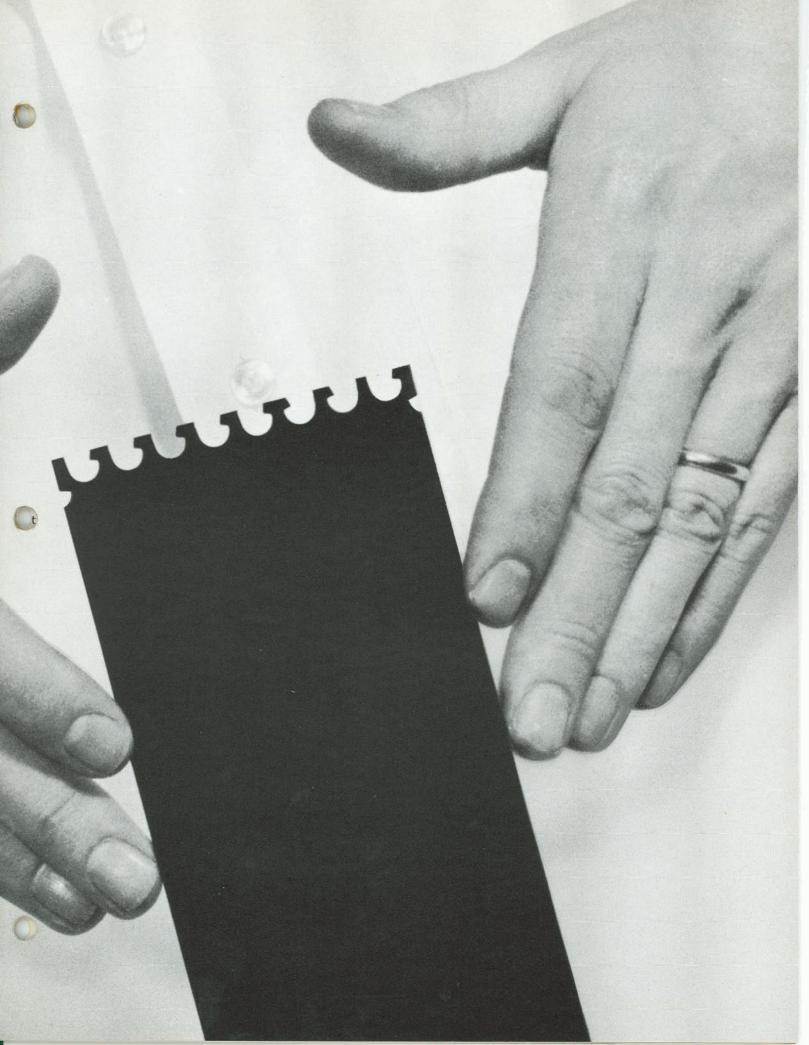
To completely appreciate the speed, power and flexibility provided by CRAM, it is first necessary to understand basically how this unique external memory device operates.

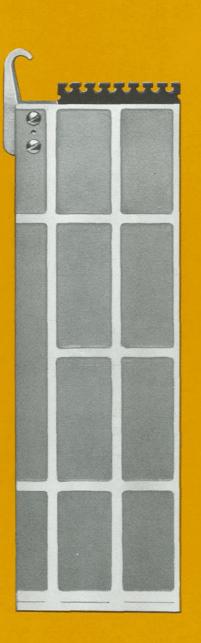


storage media

CRAM reads and records data on mylar magnetic cards 14 inches long and 3¼ inches wide. Each card has seven data recording tracks that can be individually addressed for reading or recording data. A single track has a storage capacity of 3,100 alphanumeric characters. Thus, each magnetic card has a total storage capacity of 21,700 alphanumeric characters.





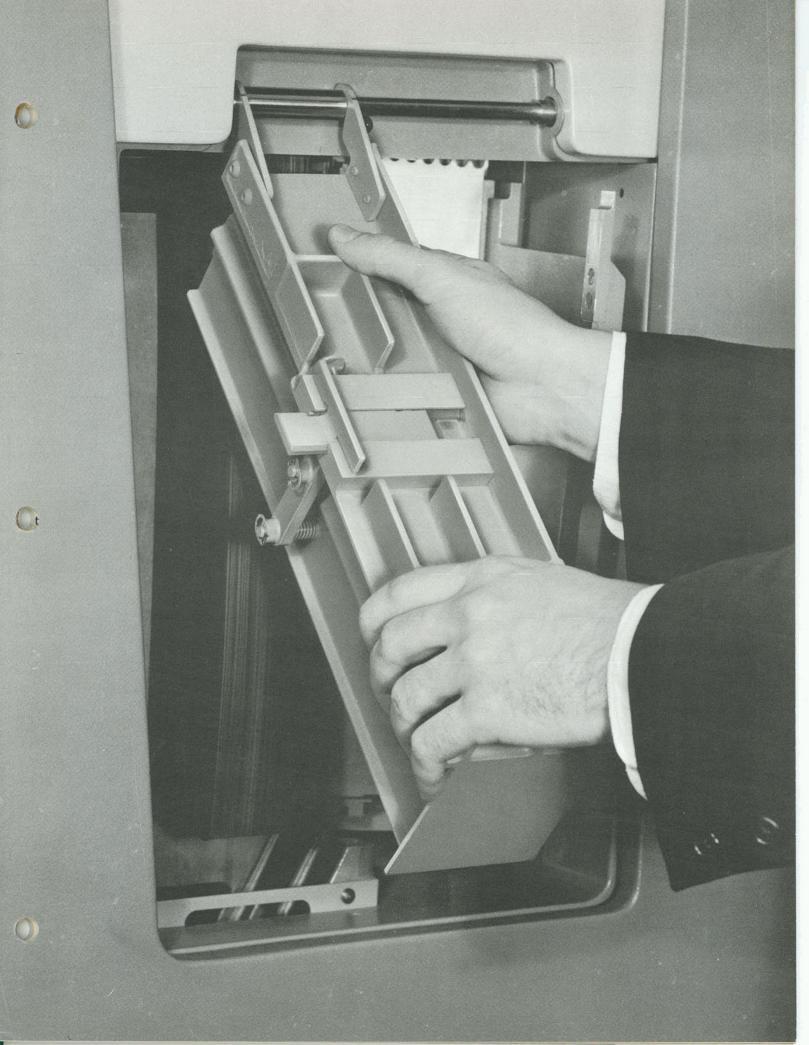


loading

Each CRAM file is designed to handle a deck of 256 magnetic cards with a storage capacity of over 5.5 million alphanumeric characters of information.

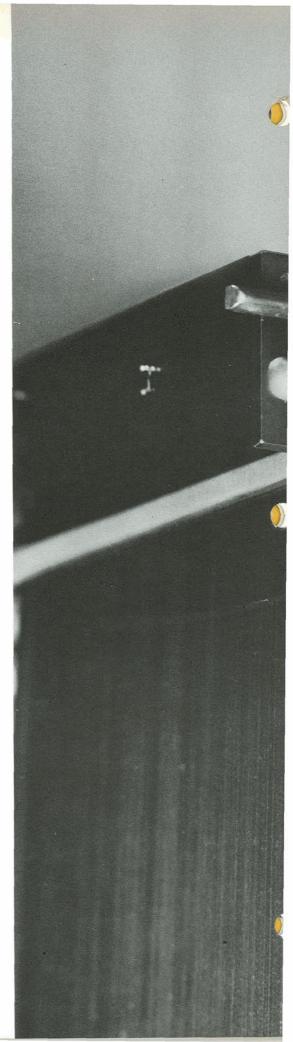
Like reels of magnetic tape, the decks of magnetic cards have been designed in such a way that they can be easily mounted and removed from the CRAM unit. For ease of mounting and convenience in storing, the decks are housed off-line in a cartridge.

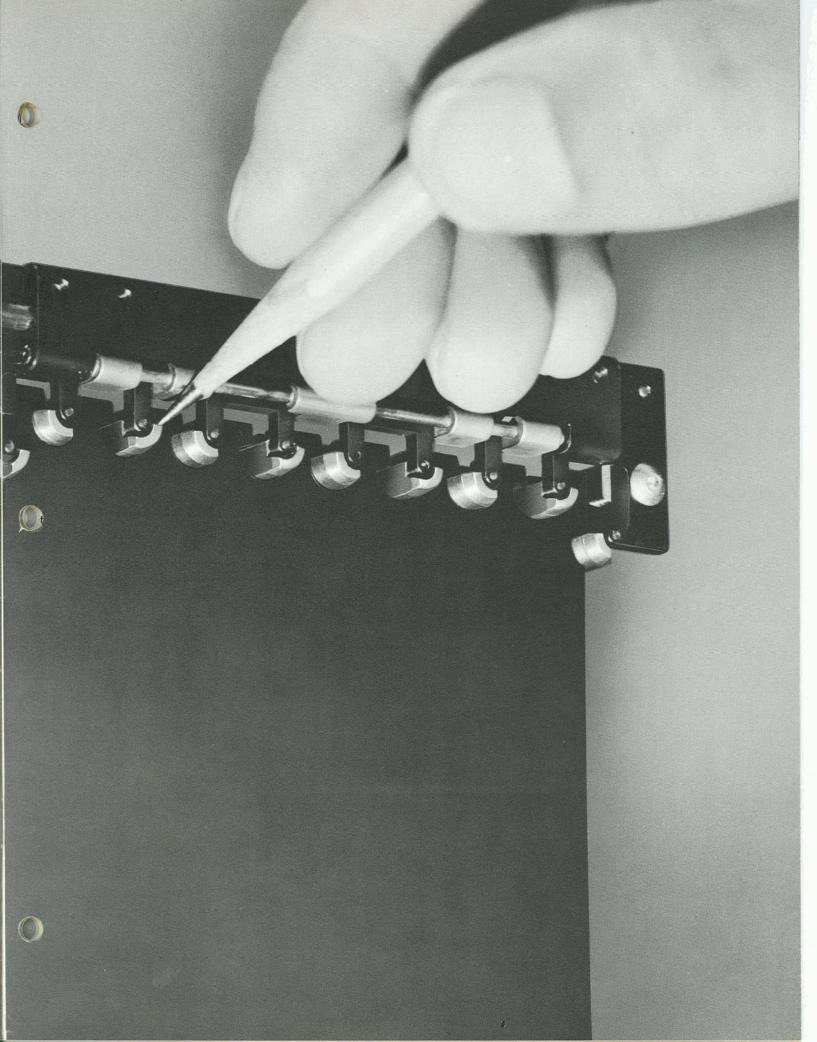
Any number of these cartridges of cards can be stored off-line; any one of which can be interchanged on the CRAM unit in approximately one minute when required for processing.

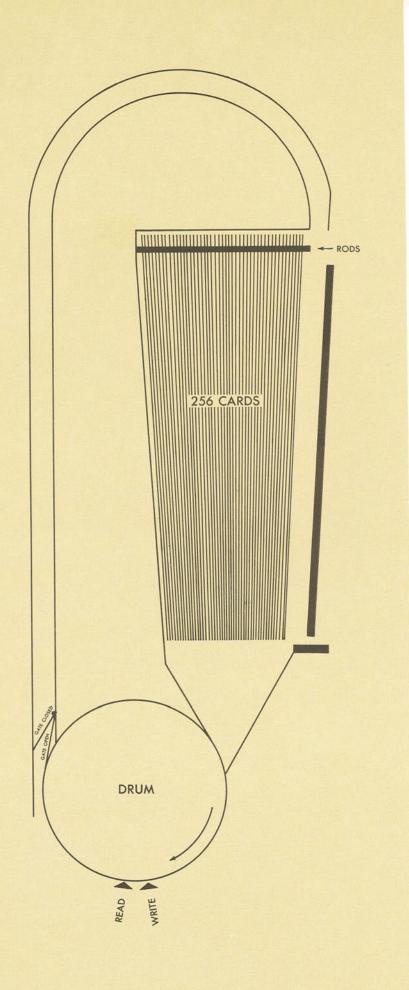


card selection

When mounted on the CRAM unit, the deck of magnetic cards is suspended from two gating rods. The cards are individually selected by eight electronically controlled two-position rods. Each of the 256 magnetic cards has a unique binary notching configuration that permits it to be released from the deck when selected. For example: if card number five is addressed by the computer, the eight two-position rods are automatically set to the binary value of five ... the gating rods are opened ... and the card with the notching configuration of five is released from the deck.





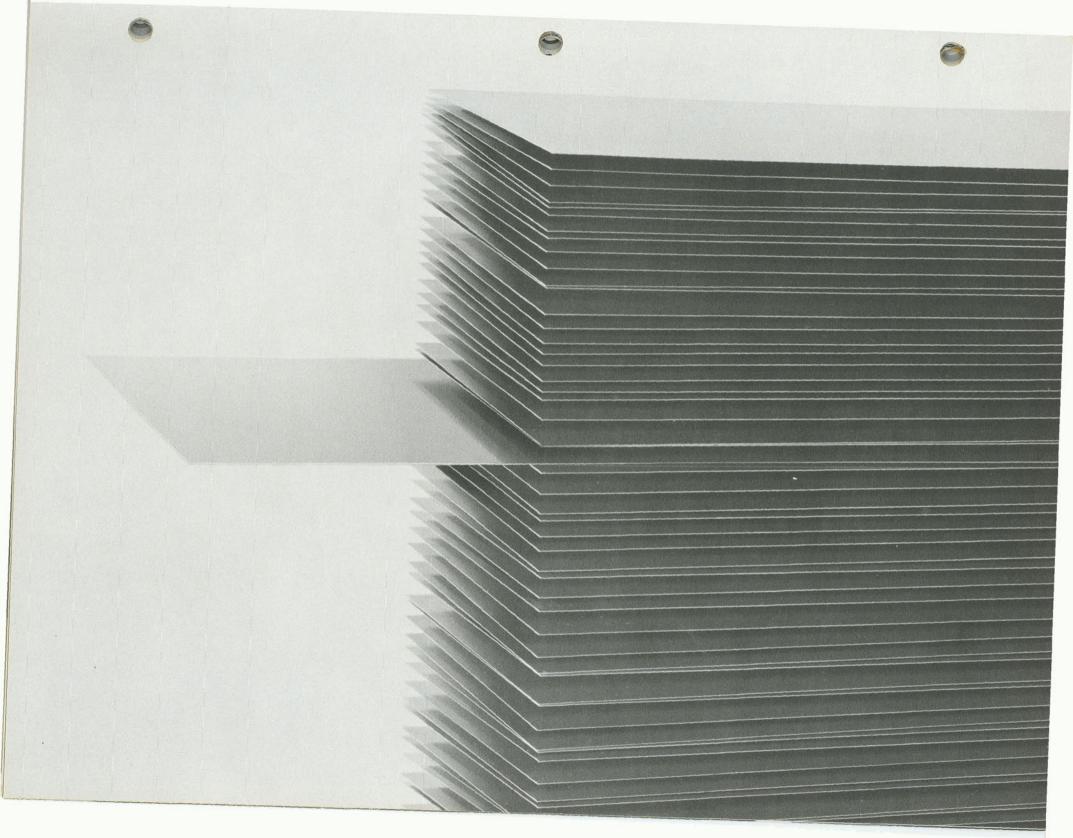


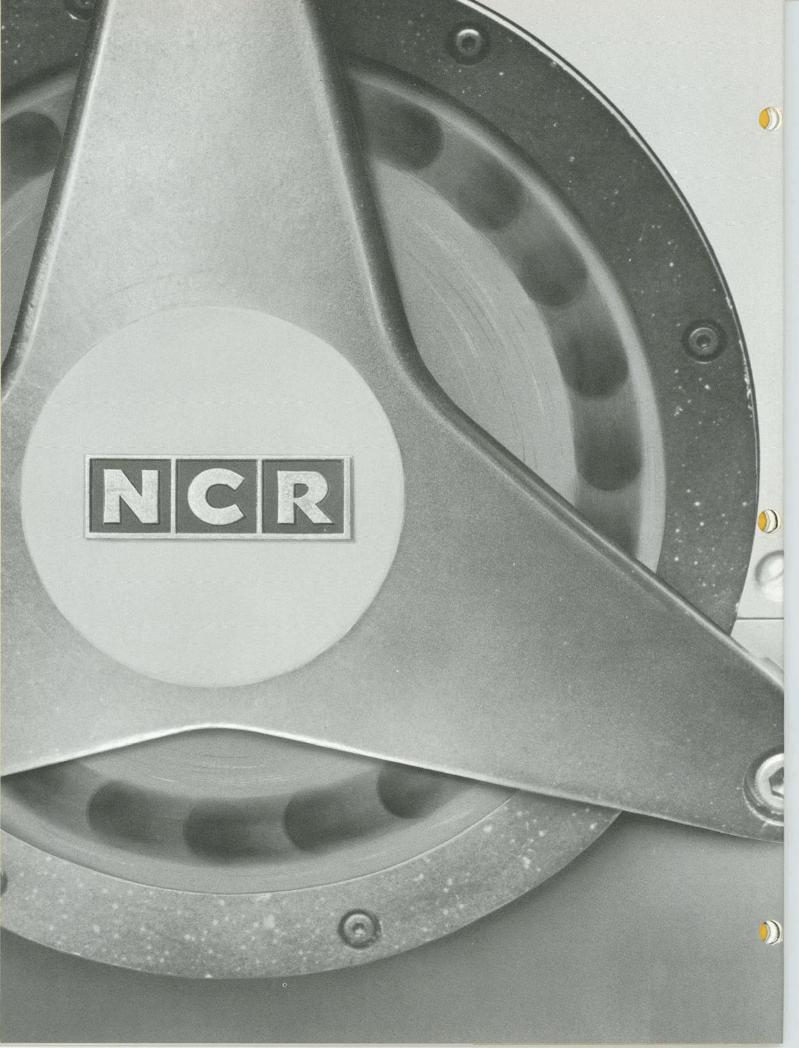
card drop

Once a card has been called for by the computer, and the rods in the CRAM unit have been properly set, the magnetic card is dropped from its hanging position on the rods. The cards are separated by 256 jets of air that permit the selected card to fall freely. After the card has been released, it will be pulled by means of a vacuum onto a rotating drum and quickly accelerated to a speed of 400 inches a second.

While the card is dropping to the drum, the computer is free to perform other processing steps including the issuing of instructions to a second CRAM unit.

Through a series of photoelectric cells, CRAM signals the computer that the card has reached the drum and is in position to transmit or receive data.





While on the drum, the magnetic card passes over seven write-read heads . . . one for each of the seven data recording tracks. The read-head automatically checks the accuracy of recording as well as its normal function of reading data stored on the cards. The cards travel at 400 inches per second and the data is recorded at 250 characters per inch. Thus, CRAM provides a tremendous transfer rate of 100,000 characters per second.

After reading or writing a track of data, the magnetic card may be recirculated to process data on the other tracks or it may be released. The magnetic card returns through a tunnel of



moving air, when released, back to the eight rods where it is suspended until selected again . . . completely eliminating the rewind time encountered in magnetic tape systems.

With a card on the drum, CRAM is similar to the drum type memory systems used with other computers. However, with CRAM the recording surface of the drum can be quickly changed by simply calling for another card...providing another 21,700 characters of memory.

Basically you have seen how CRAM operates. Up to 16 of these unique magnetic card handlers can be operated on-line in an NCR 315 Computer System. With its speed, power, and flexibility, this new external memory device opens a whole new approach to economical electronic processing.

read-write operation

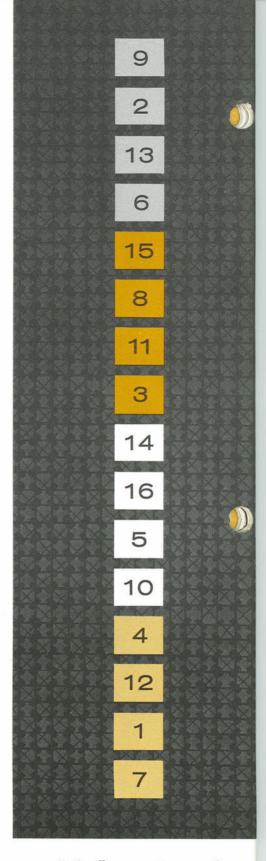
computer routines

With the operating principle of CRAM firmly in mind, let's take a look at two of the most common computer routines to see how these principles are applied to provide a faster, more economical approach to electronic data processing.

sorting:

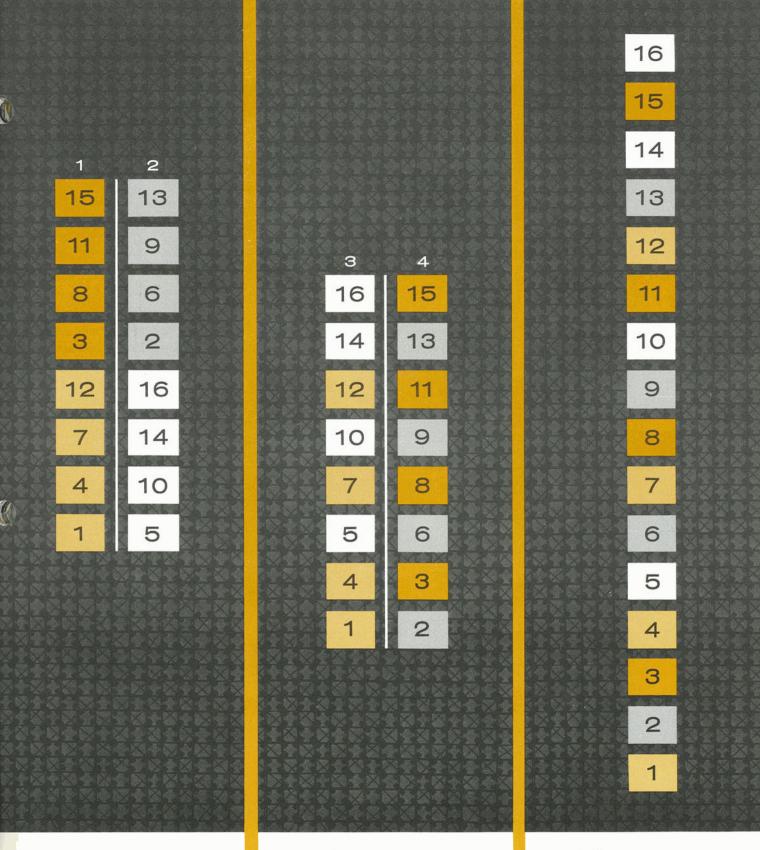
One of the major tasks found in almost every computer installation is sorting data into sequential order. Sorting the many transactions that occur daily in any business requires that a computer be capable of keeping track and rearranging a large amount of data. How fast and efficiently this job can be done is determined to a great extent by three factors: (1) The amount of available internal memory; (2) The number of independent external file areas; (3) The speed that data can be transferred between internal and external memory.

At the right is a simplified illustration of the manner in which computers rearrange data into sequential order.

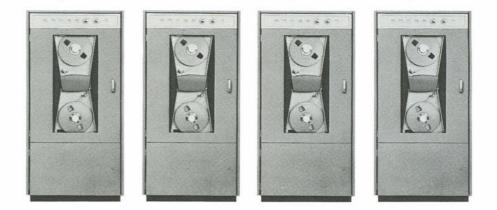


1. Small groups of unsorted items are read into the computer, sequenced, and written out alternately to two independent file areas. The size of the sorted group is dependent on the amount of available internal memory.

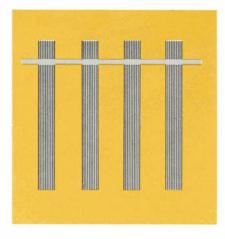




2. The sorted groups from file areas 1 and 2 are read back into memory, merged, and written alternately to independent file areas 3 and 4. 3. The sorted groups from file areas 3 and 4 are read back into memory, merged and written alternately to file areas 1 and 2. 4. The merging operation is repeated until a single group of sorted items is achieved. The number of merge passes is determined by the number of items to be sorted and the number of independent file areas available.



The sorting routine illustrated on the previous page is commonly referred to as a two-way merge. Accomplishing this type of sort, with magnetic tape as the external memory, it would require a minimum of four magnetic tape handlers to satisfy the need for four independent file areas. This same routine



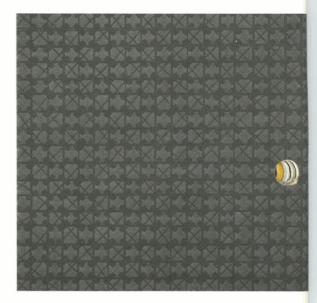
could be accomplished on the NCR 315 using a single CRAM unit for external memory. Because of the ability to select any one of the 256 cards, CRAM can provide any number of independent file areas within a single deck of magnetic cards. Combining this ability with its transfer rate of 100,000 characters per second, CRAM provides the NCR 315 with sorting capabilities unmatched by other systems using tapes, disks or drums for external memory.

4 independent file areas within a



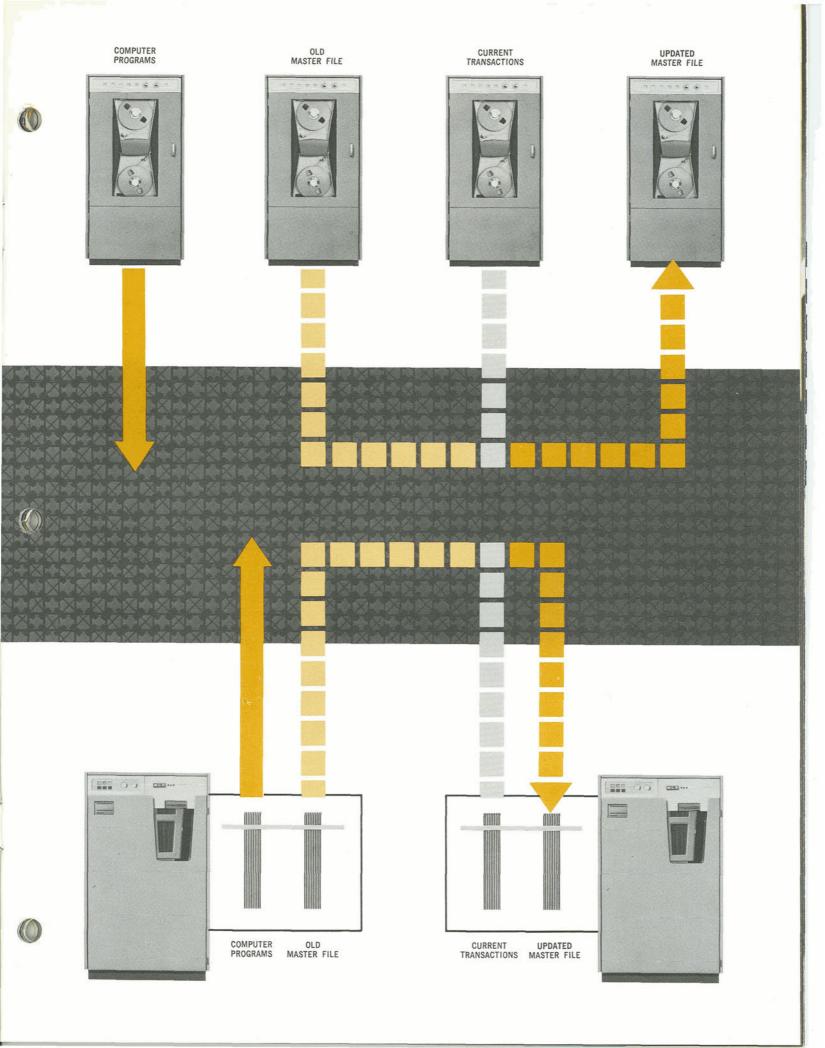
file updating

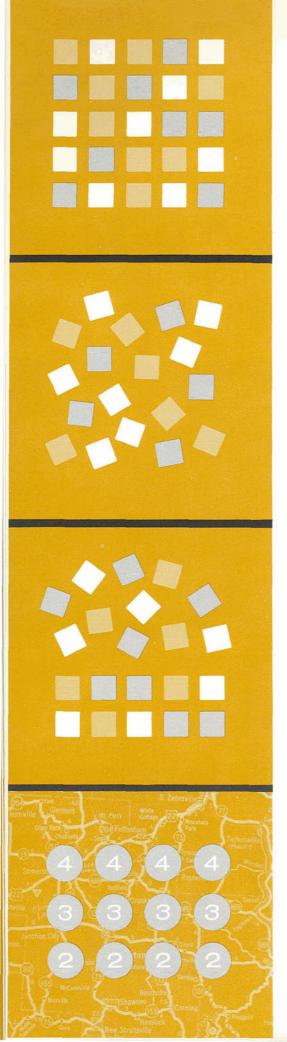
Another major operation in almost every computer system is the task of maintaining and processing records stored in some type of external memory file. The object of file updating is simply to get current changes and transactions reflected in the master files. Because computer systems utilizing magnetic tapes cannot efficiently access data in a random method, they are virtually limited to a sequential approach in updating files. The most common magnetic tape approach to master file updating is the "father-son" technique. Basically, this "father-son" technique involves reading blocks of sequenced transactions and master file records from two magnetic tape handlers. Those master records with transactions affecting them are updated and the updated version is written out to a third magnetic tape handler. In effect, the entire master file is read, updated and completely rewritten each time file updating is performed. To perform this type



of updating, a magnetic tape system requires a minimum of 4 tape handlers. Separate handlers are required to store the current transactions, the old master file, the updated master file and the computer programs.

CRAM permits the NCR 315 to perform this same "father-son" type of updating. However, since CRAM can address magnetic cards individually, multiple types of data can be made available from a single deck of magnetic cards. For example, one CRAM can store the computer programs and the old master file while a second handler stores the current transactions and the updated master file. This capability eliminates the need for a separate handler for each type of data that must be on-line for the computer to perform this updating routine.





file updating flexibility

The "father-son" technique of updating is remarkably efficient for those applications that by nature have a high percentage of active accounts. But, since the entire master file must be read and then completely rewritten each time the file is updated, this approach becomes very inefficient for applications having a small percentage of active accounts. While magnetic tape systems are virtually limited to this approach, the NCR 315 with CRAM provides a more flexible approach to file updating. In addition to the "father-son" technique of updating, CRAM permits transaction data to be posted directly to the master file, at random without regard to sequence. This ability completely eliminates the need to sort transactions into sequential order.

CRAM permits transactions to be sorted into sequential order and then posted directly to active accounts... completely bypassing inactive records. This serial-selective recording method of updating is highly efficient for many applications since it takes advantage of both batch-sequential and random file techniques.

CRAM permits transactions to be posted directly to the master file as they actually occur at some remote location. NCR's On-Line accounting machines, in direct communication with CRAM, can process transactions as they occur... even from hundreds of miles away. For those applications that require master files to reflect up-to-the-minute facts, this on-line concept is the ultimate in file updating.



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NCR 353







real-time processing

CRAM as an external memory device makes the NCR 315 more than just another back-office electronic accounting machine. With CRAM's ability to store vast amounts of data that can be accessed at random, the 315 is capable of receiving and processing transactions on-line as they occur.

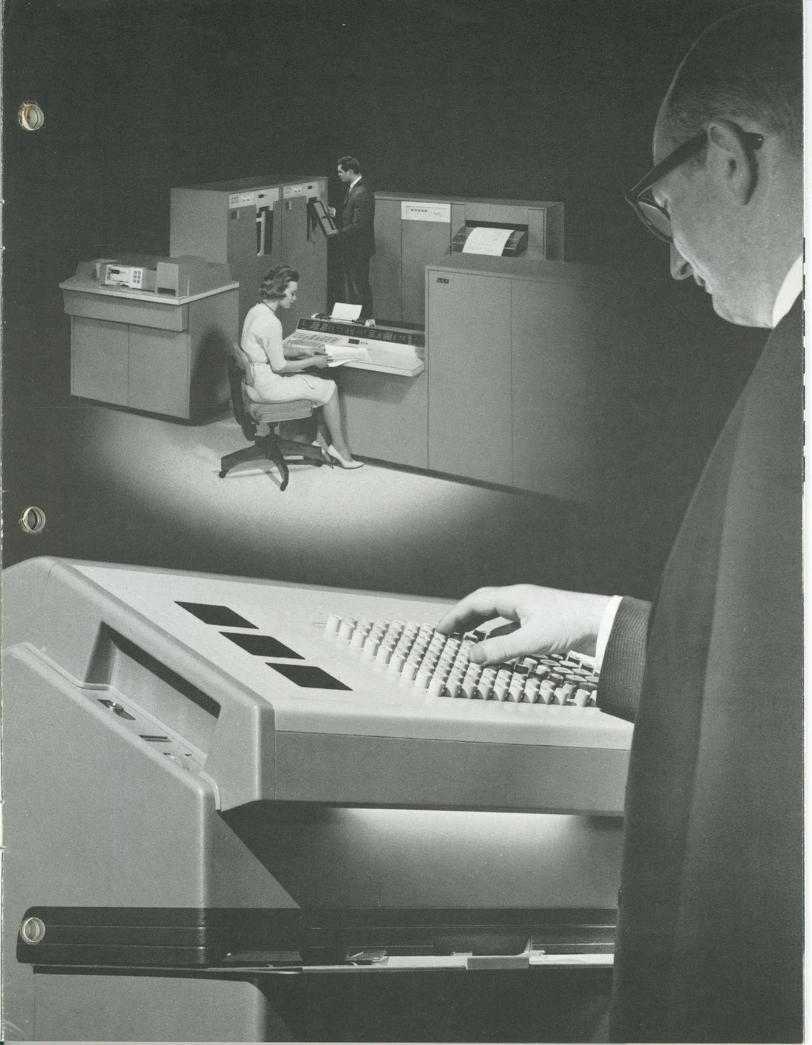
For example: In savings institutions, Class 42 Window Posting Machines can be operated on-line with an NCR 315 CRAM System to provide real-time processing of savings transactions. With the On-Line Savings System, the bank's savings accounts will be stored on CRAM cards. As a transaction occurs on the banking floor, the bank's record and the customer's passbook will be updated simultaneously under computer control. In effect, this system places the 315 CRAM Computer at the finger tips of every teller.

In industry, Class 473 TRANSACTER Input Stations can be linked with an NCR CRAM System to provide real-time processing of manufacturing data. Input Stations located at widely scattered points throughout the factory, can feed fixed and variable manufacturing data directly to the 315. The data can be processed immediately to provide management with up-to-the-minute information concerning all phases of operation within the plant.

The ability to have data fed into the computer as the transaction occurs, enables vital facts to be generated in time to be used most effectively by all levels of industrial management.

The ability of CRAM to take the shortest possible route to stored data, provides a degree of processing efficiency other computers are unable to match.

The ability to link input units to the computer... even from widely scattered remote locations...provides a realistic data entry system ... provides a direct route from the original entry to final management reports.



remote inquiry

Computers today work at tremendous speeds...but, they store data in a language of their own that cannot be read by human beings. Because of this, most computer systems must perform special print routines to generate reports for human use. However, with CRAM and the 315, Remote Inquiry Stations can be operated on-line...permitting humans to interrogate the computer files and receive immediate answers to inquiries.

For example: In a bank, Inquiry Units, placed in the various departments, enable authorized personnel to communicate with the computer files at will...to promptly answer requests for balances...to quickly obtain valuable credit information...to obtain current, up-to-the-minute reports on investments, loans and a host of other essential data.

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In industry, Inquiry Units can be located at dozens of remote locations ... in the office ... in the factory ... at the warehouse ... or at branch locations that are hundreds of miles away. The 315 with CRAM and Remote Inquiry permits all levels of industrial management to obtain immediate answers to questions about inventories ... work-in-process ... sales ... and many other facts people must have to manage effectively ... and act while the "iron is hot."

The ability to interrogate the computer files from remote locations enables management to keep a current finger on the pulse of business.

The ability of management to interrogate the data stored in CRAM files eliminates the need for many specialized computer reports.



Teletype Model 28 Send-Receive Set

REQUEST CREDIT HISTORY ACCOUNT NUMBER 8,326

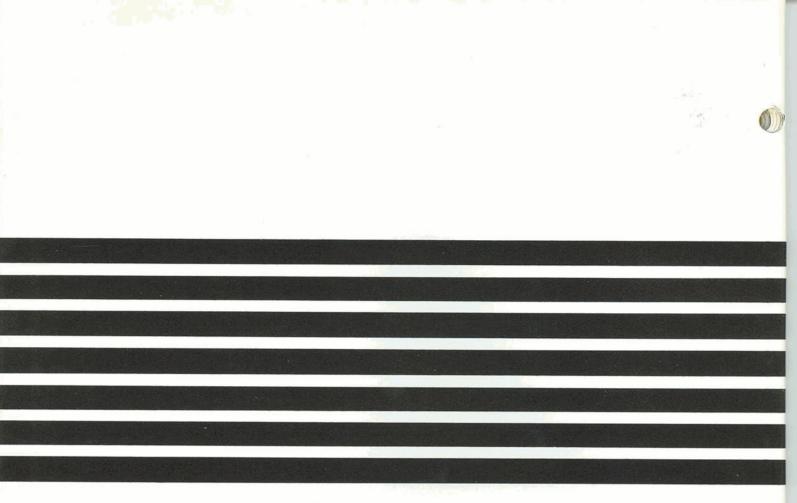
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COMM LN	3,281	830.00	PAID CURRENT	
MTG LN	28,645	12,345.25	PAID CURRENT	
SAVINGS	8,450	1,500.00	AVERAGE BALANCE	1,000.00
CHECKING 2	552 944	964.10	AVERAGE BALANCE	840.50



advantages specifications CRAM means that now you can have a computer system with complete magnetic file capabilities at less equipment cost. CRAM's ability to control multiple types of on-line data with a single handler permits one unit to perform many routines that normally require multiple magnetic tape handlers.

CRAM means that now you can approach each application solely on the basis of the requirements of the job . . . without being restricted by equipment limitation. CRAM's transfer rate, storage capacity, and random access speed combine to give this unique magnetic file system unmatched random-sequential processing capabilities.

CRAM means that people can interrogate the data stored on the magnetic cards and receive immediate answers to inquiries. Up to 128 inquiry stations can be located at strategic points, even hundreds of miles away, to permit management to keep a finger on the pulse of their business.

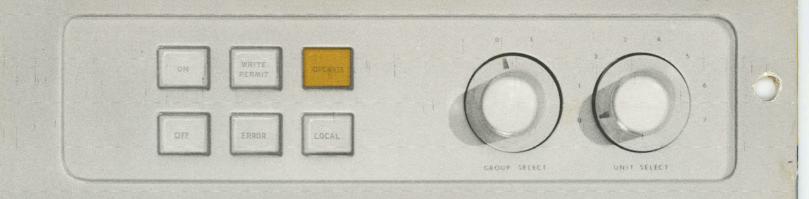


CRAM means that data can be processed on-line as the original transaction takes place. Through the use of an almost unlimited number of on-line input stations and accounting machines, records stored in CRAM files can be updated immediately by transactions as they occur. These transactions can be taking place in the same building with the computer or hundreds of miles away at some branch location.

CRAM means most of all speed ... power ... and flexibility. The speed to provide management with accurate and timely facts about their business. The power to store and keep track of vast amounts of information ... to update multiple files in a single computer run ... to combine several reports into one ... and the power to perform many tasks with fewer handlers. And, the flexibility that permits you to process each application in the most efficient manner and make changes as the needs of the time indicate ... changes that are impractical and many times impossible with other types of lernal memory devices.

CRAM SPECIFICATIONS

- Type of recording media: Mylar magnetic cards-14" long and 3[']/₄" wide
- Recording capacity per magnetic card: 21,700 alphanumeric characters
- Number of recording tracks per card: 7
- Recording capacity per track: 3,100 alphanumeric characters
- Number of cards on-line in a single unit: A deck of 256 cards
- Recording capacity of 256 magnetic cards: 5,555,200 alphanumeric characters
- Time required to change decks of magnetic cards: Approximately one minute
- Number of off-line decks per CRAM: Unlimited
- Number of CRAM units on-line in a single system: Up to 16
- Data transfer rate: 100,000 alphanumeric characters per second





NCR PROVIDES TOTAL SYSTEMS - FROM ORIGINAL ENTRY TO FINAL REPORT -THROUGH ACCOUNTING MACHINES, CASH REGISTERS OR ADDING MACHINES, AND DATA PROCESSING The National Cash Register Co.+1,133 offices in 120 countries +79 years of helping business save money



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