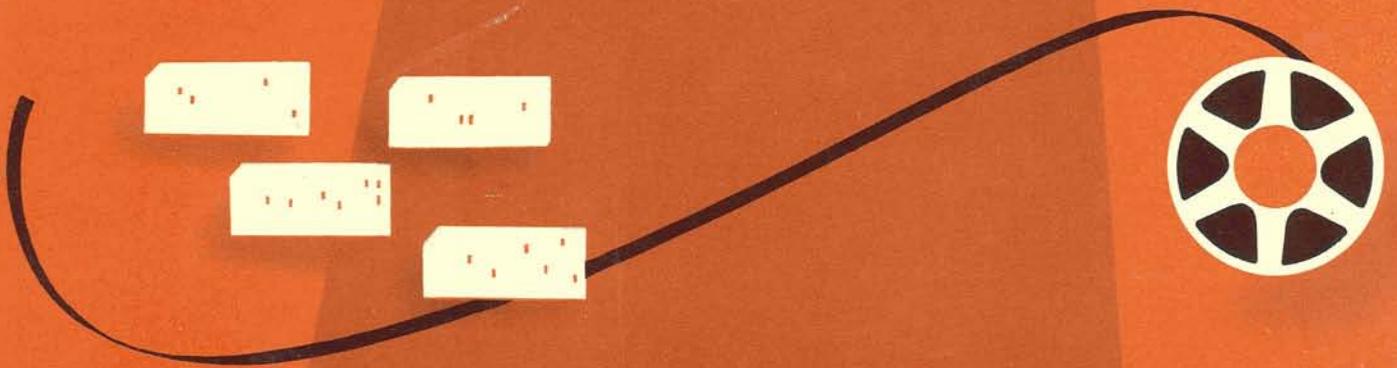
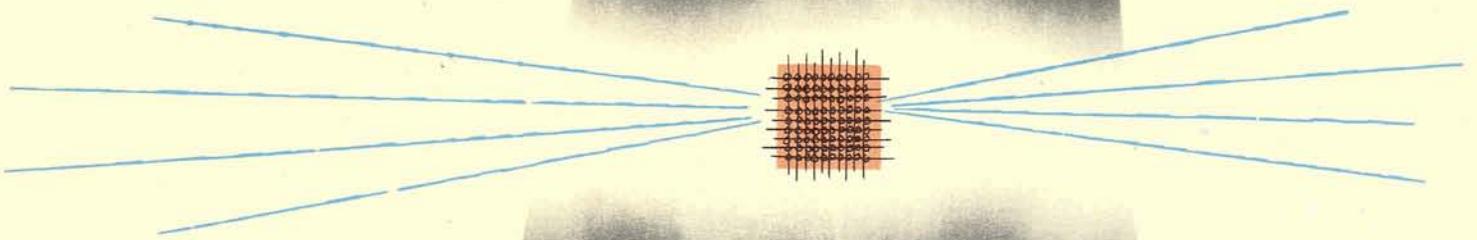


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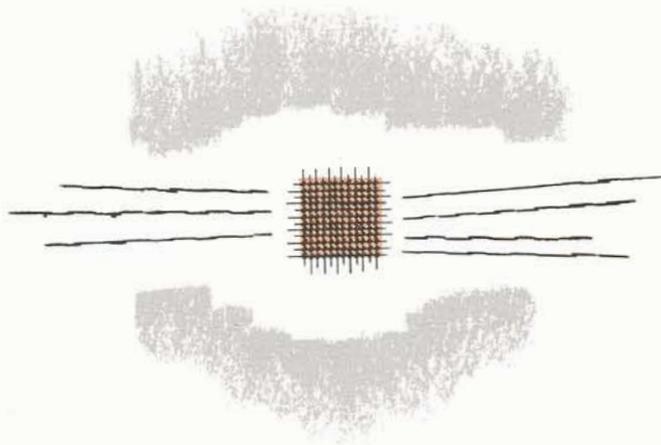
ELECTRONIC DATA PROCESSING MACHINE



IBM

705 • EDPM

ELECTRONIC DATA PROCESSING MACHINE



MANAGEMENT INSTRUMENT

ELECTRONIC

Factory automation, growing lustily, requires a corollary increase in office automation. IBM equipment has kept pace through the years with requirements for better and faster means of handling the records and the arithmetic of business.

HERE IS A PARTIAL LIST

The 604—an electronic calculator introduced in 1948. More than 2,000 of these machines are now in use, the vast majority on business and industrial applications.

The 650—magnetic drum—stored program—electronic data processing machine of intermediate capacity. The 650 makes data processing equipment available for wide commercial application.

The CPC—Card-programmed Electronic Calculator—workhorse in the fields of engineering and scientific computation. The CPC has also proved to be applicable to many business accounting procedures. Introduced in 1949, several hundred are now in use.

The 701—a large-scale electronic computing machine capable of performing 14,000 typical operations per second. Developed primarily as a scientific computer, the 701 has nonetheless proved to be exceedingly useful on a number of business problems.

The 607—larger version of the 604. Many of these machines have been put in service in a wide variety of businesses and industries.

The 702—an electronic data processing machine of vast capacity, designed for commercial applications.

The 704—a new scientific computing machine from 7 to 20 times more powerful than the 701 in handling typical scientific problems. It will also be useful in some commercial applications and is completely compatible with other IBM data processing systems.

DATA PROCESSING

Data Processing, an inclusive term for automatic record-keeping, has been advanced to new heights through electronic machines that IBM has developed from the experience of many years.

OF ACCOMPLISHMENTS:

*Significant as past attainments have been,
they are now overshadowed by the*

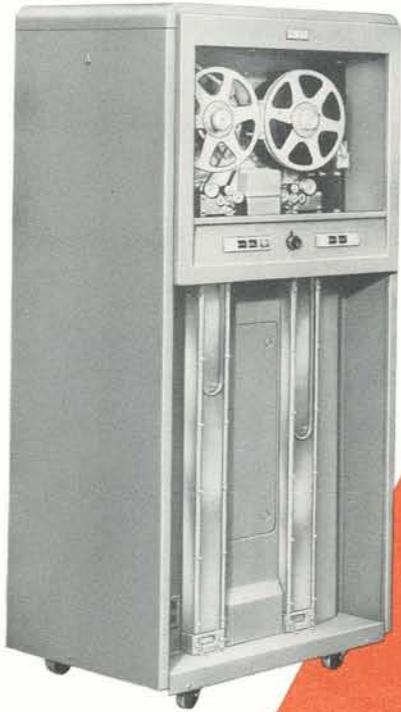
705 • EDPM

WITH MAGNETIC CORE MEMORY

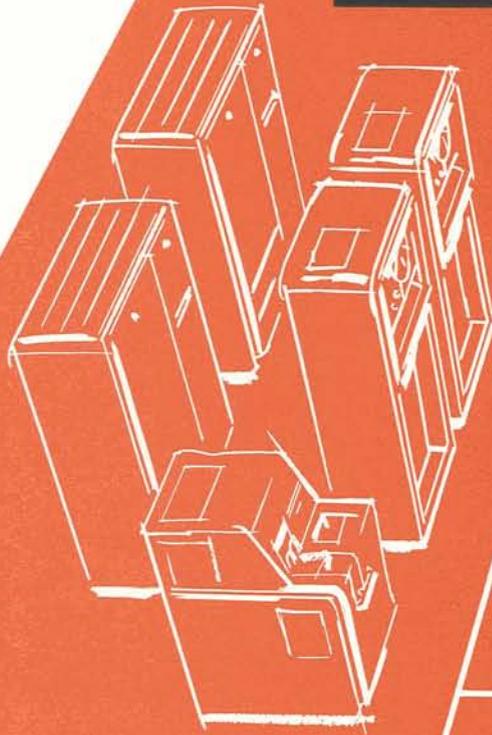
the 705 features the latest engineering developments in the design of its components and incorporates many new improvements that give it vast superiority in *speed, flexibility, capacity and ease of use.*

*The most powerful tool yet available to
business management — for business problems*

BLUEPRINT



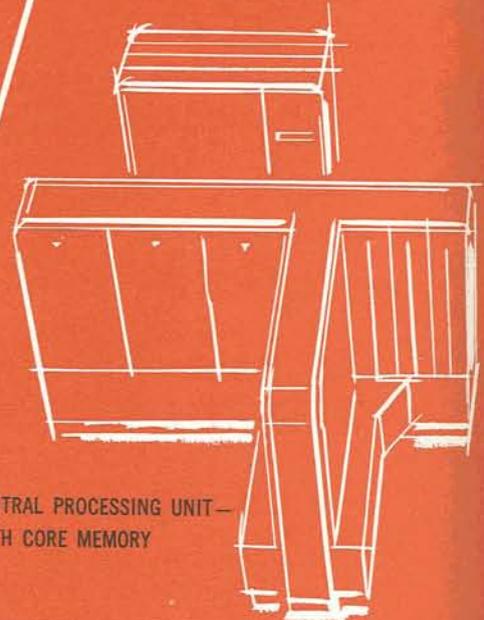
INPUT



MAGNETIC
TAPE
UNITS

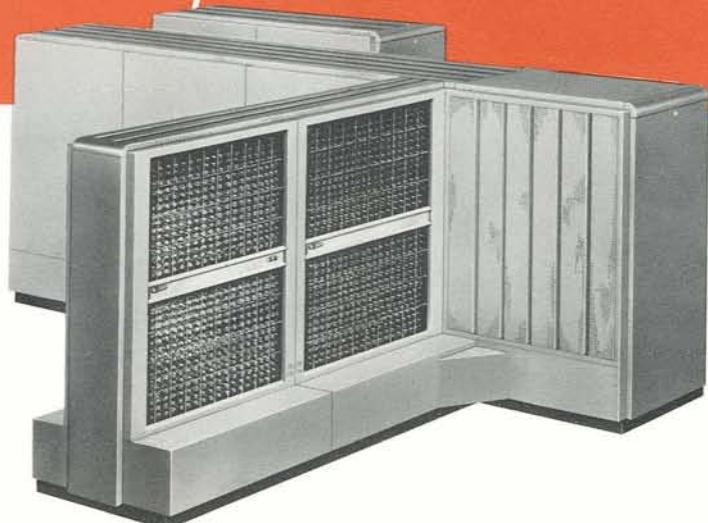
CARD
READER

PROCESSING



CENTRAL PROCESSING UNIT—
WITH CORE MEMORY

CONTROL



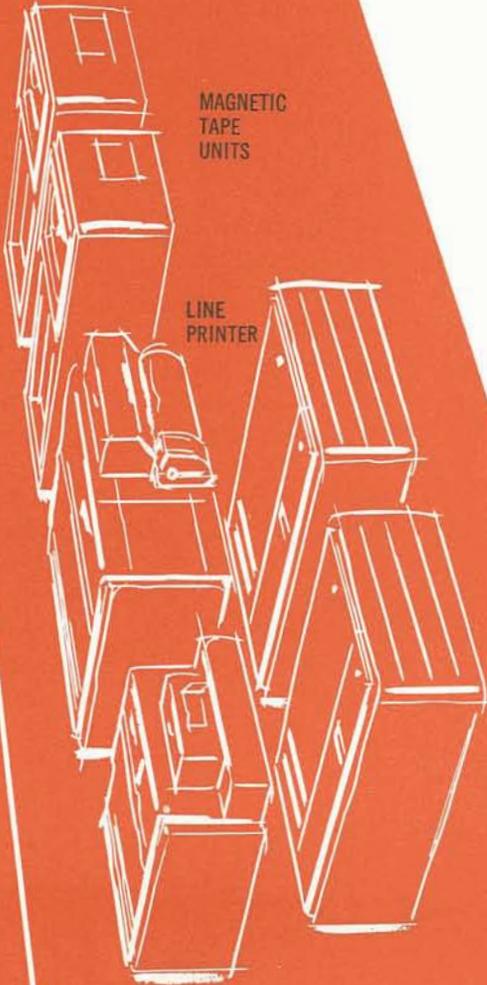
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FOR ACTION

OUTPUT

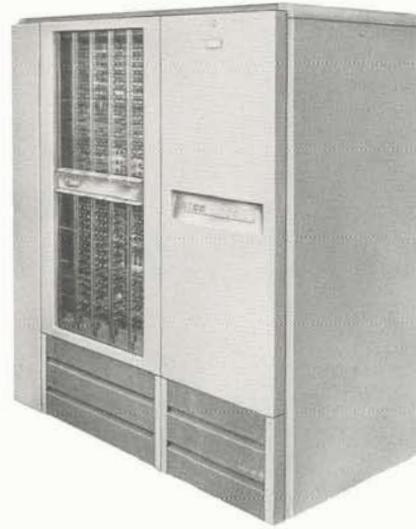


MAGNETIC DRUM UNIT



MAGNETIC
TAPE
UNITS

LINE
PRINTER



OPERATOR'S
CONTROL UNIT

CARD
PUNCH



705

Data processing needs are as diversified as American commercial enterprises, and change not only with the type of business and size of the organization, but with the particular application involved as well. Length of record, volume, ratio of input and output to processing, and the format of documents are examples of the variations encountered. These variable conditions are balanced in the 705, which consists of versatile units merged into a flexible, high-speed system.

The complete series of operations required for any data processing task can be performed through the facilities of fast input and output, large capacity magnetic core memory and automatic control. Magnetic tape input-output units permit masses of data to enter and leave the internal memory of the machine rapidly. Card reading and card punching units offer an additional means of input and output. Cards presently serving other areas of a business can thus be incorporated readily into 705 procedures.

Line printers are used for preparing final reports,

either coupled directly with the 705, or independently with tape units as tape-operated printers.

Individual requirements determine the number of card readers, tape units, card punches or printers. The building-block techniques thus provided offer a wide latitude of choice to meet every data processing need.

The 705 can accommodate any combination of numerical, alphabetical, and special characters with equal facility in all reading, writing, storage and processing functions.

The Stored Program is an important underlying principle of the 705. This means that instructions for a given procedure can be stored in the memory of the machine. These instructions are referred to, one at a time, in the proper sequence required for handling each problem. Each instruction not only specifies the functional operation to be performed, but also directs the results into appropriate channels. Provision is made in programming for alternative routines where the logical features of the machine choose between two separate courses of



EDPM

GENERAL DESCRIPTION

action. For example, in ascertaining that a calculated result is a minus figure, the 705 can select program steps appropriate only to the minus figures, ignoring these when plus results are obtained.

At the start of each procedure, the program of instructions is read into memory from tape or cards and is stored there for use with each record processed. This one entry of instructions suffices to set up all units, as all are controlled from the stored program. Changes from one procedure to another or within a program are readily accomplished.

Accounting controls are an integral part of any data processing system. Not only are established controls fully protected by the 705, but because of the logical ability of the system, inconsistencies in source information can be detected. Corrective routines to handle discrepancies automatically may be planned and incorporated into the stored program.

The flexibility of the 705 permits the programmer to elect the method of verification, and, if necessary, correction. When data is questioned by the 705, the machine need not be stopped, but can

automatically repeat the process, write the questionable data on the printer or typewriter or take other desired action.

Further safeguards are provided through automatic checking devices which keep data within the system under constant electronic scrutiny for 100% proof of processing accuracy.

To insure maximum utilization, the input-output devices have been designed so that they can be combined with one another independently of the 705 to provide a wide range of auxiliary equipment.

The following examples illustrate the versatility of these units: any tape unit can be combined with a card reader for converting cards to magnetic tape. Conversely, any tape unit can be connected to a card punch to create cards from tape. The printer can be used in connection with a tape unit as a tape operated printer. In this way, operations not requiring the arithmetical and logical ability of the 705 can be performed separately, reserving the main unit for other operations.

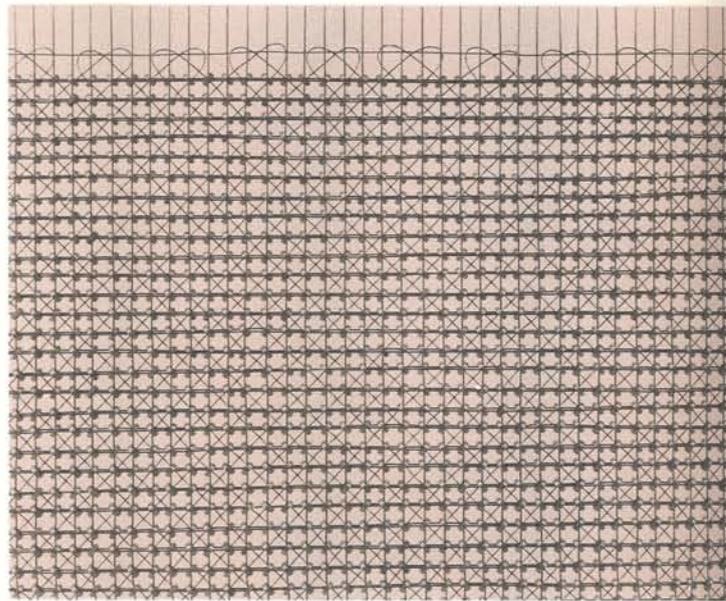


Magnetic Core Memory

Magnetic cores are tiny, doughnut-shaped objects that can “remember” information indefinitely, and recall it in a few millionths of a second. A network of ferrite magnetic cores is strung on screens of wire. When current is passed through a pair of wires it causes the core affected to store the data involved. Information is called out of memory by reversing the process and reading the stored data by means of a third wire.

Cores are extremely stable and will last indefinitely. Their small size permits large storage capacity to be housed in relatively little space. *The 705 has capacity for the storage of 20,000 characters*, any one of which can be located and transferred at the rate of seventeen millionths of a second.

A new principle of parallel reading is employed. This permits the five characters of an instruction to be read and interpreted in one cycle of 17 microseconds. Similarly, rearrangement of data in memory can be accomplished through direct transfer of data from one section to another in parallel fashion.



Accumulator and Auxiliary Storage Units

An accumulator is used for temporary storage of data during arithmetical and logical operations. The accumulator has a capacity of 256 positions. In addition, there are 256 positions of auxiliary storage, grouped in one unit of 32 positions, and fourteen of 16 positions each. These facilities provide great flexibility of use such as storing intermediate results of computation, modifying addresses, shifting decimal positions, rounding sums, and for control and program simplification.

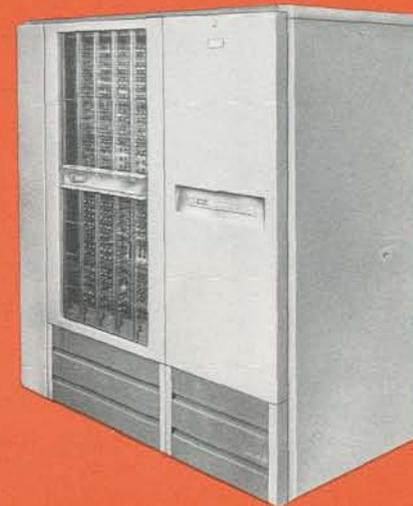
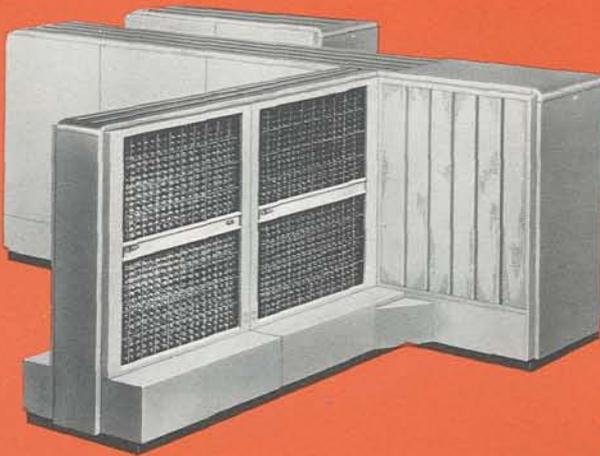
COMPONENTS

Central Processing Unit—With Core Memory

The Central Processing Unit (CPU) is capable of addition, subtraction, multiplication and division, in millionths of a second. Any desired combination of these functions can be performed. The "logical" ability to make decisions is centered here. By being able to distinguish between positive, negative and zero values and by the ability to make comparisons, the CPU determines which of several possible alternatives is appropriate.

Information is received from memory and processed according to the stored instructions. Results are routed to accumulator storage for further operations or to sections of memory, depending on the instruction.

The CPU is compatible with the variable field length features of magnetic tape recording. Less time is taken for handling smaller fields than for larger ones.



Magnetic Drums

The large storage capacity of magnetic core memory will suffice for the majority of applications. In those cases where the nature of the work requires additional storage capacity, magnetic drum units can be added to the 705. Data are recorded on the surface of a drum in the form of magnetized spots. Revolving at high speed, the drum surface can be scanned at the rate of 25,000 characters per second. The capacity of each drum is 60,000 characters. The drum may be used for storage of additional sub-routines, intermediate results, rate tables, or other information.

INPUT and OUTPUT UNITS

The number of each is optional!

Each may be used independently with other units!

Magnetic Tape



Oxide-coated cellulose acetate tape is used to record information in the form of magnetized spots. Tape units, interchangeable for either reading or writing, operate at a rate of 15,000 characters per second.

The density of recording is 200 characters per inch, permitting permanent files of data to be compressed onto a 10½" diameter reel holding 2,400 feet of tape. A single reel can contain over 50,000 grouped records of 100 characters each. Tapes may be reused a great many times, since old information is automatically erased during a new recording. Tape feeding can be program-controlled for back-spacing, as well as rewinding at high speed.

Individual tape records and data fields within each record may be variable in length. Only three quarters of an inch gap is required between records. The number of characters in any record is limited only by the 20,000 character capacity of the main memory.

Information is recorded in seven parallel channels or "tracks" along the length of the tape. Each character is represented by two or more magnetized spots or "bits." The coding system employed provides that there is always an even number of bits to represent each letter, number or symbol. The system also checks every record for an even number of bits in each of the seven channels. Both of these patterns are under constant inspection for validity.

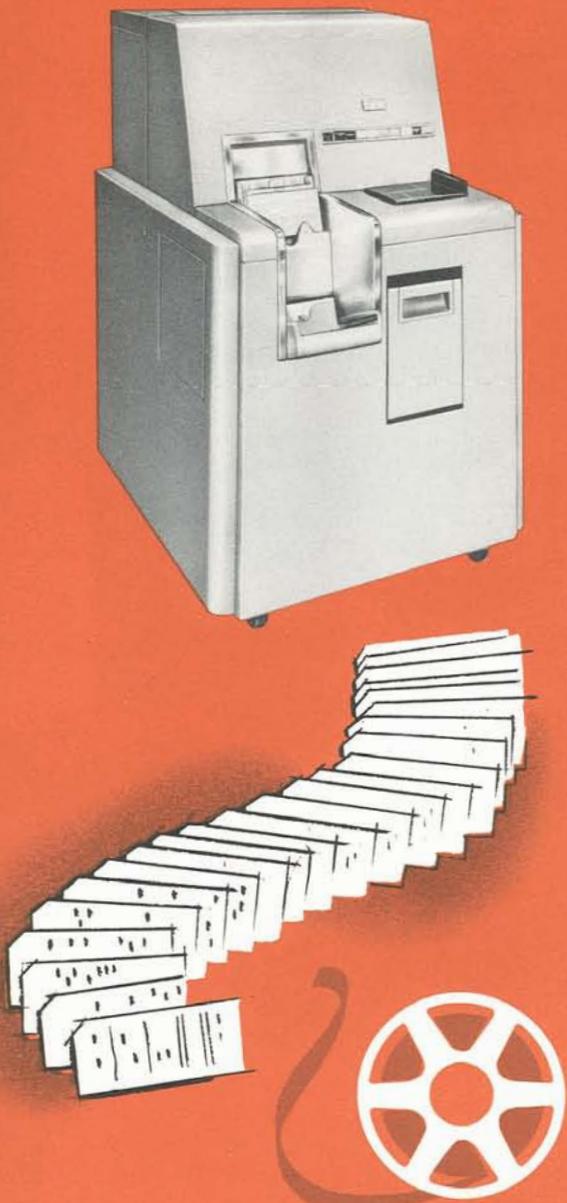
A simultaneous "read while writing" instruction permits recording during the same cycle that reading takes place. Under this arrangement, record "A" may be written on one tape unit while record "B" is being read from another tape unit for processing.

A tape unit may be attached to a card reader for transcribing the data contained in punched cards, independently of the 705. During this conversion from cards to tape, the information recorded on the tape is completely checked for accuracy of transcription.



	PART NO.	QTY.	NAME
	12 A-34	0016	BOLT
CHECK — C			
ZONE — B			
A			
8			
4			
NUMERICAL — 2			
1			





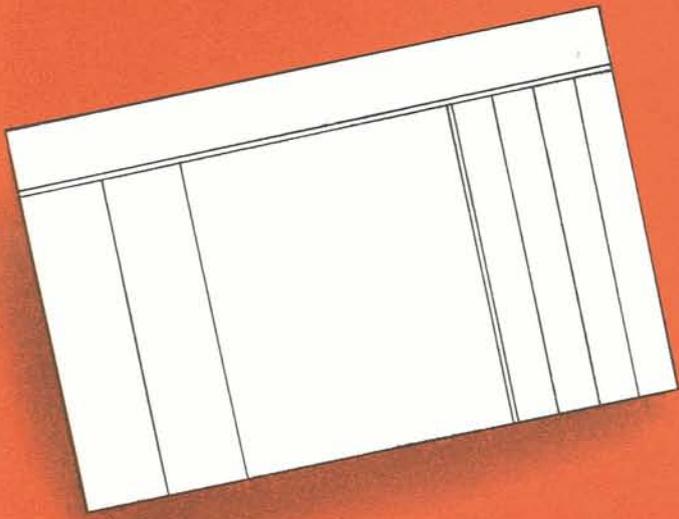
Card Readers

The versatility of the individual units of the 705 is illustrated by the use of card readers directly with the 705 or with tape units. In the latter case, the information on cards is converted to tapes independently of the 705.

Alphabetical, numerical or symbolic data can be read at a rate of 250 cards per minute. Equipped with a control panel, the card reader is able to select and rearrange information read into the 705 or onto tape. In addition, through the ability to emit constant information such as date, and to split multiple-punched columns, the 80 column card can be expanded to a larger tape record. During independent card to tape conversion, up to 46 columns of information from each of two cards can be recorded in one tape record.

Record Storage

Essentially complete overlapping of tape reading, data processing, and tape writing is accomplished through the intermediate storage of up to 1000 characters. Input data can be read and temporarily stored for electronic transmission to the main unit when the program cycle calls for it. Similarly, processed data can be stored temporarily in a record storage unit and subsequently written on tape independent of 705 processing. As many record storage units can be used as the job requires.



Printers

Results can be printed at the speed of 150 lines per minute per printer. The printers have 120 type wheels, each equipped with 47 alphabetical, numerical and special characters. Results to be printed directly from the CPU are transferred to temporary magnetic core storage at electronic speed so that the main unit can continue its processing while printing is taking place.

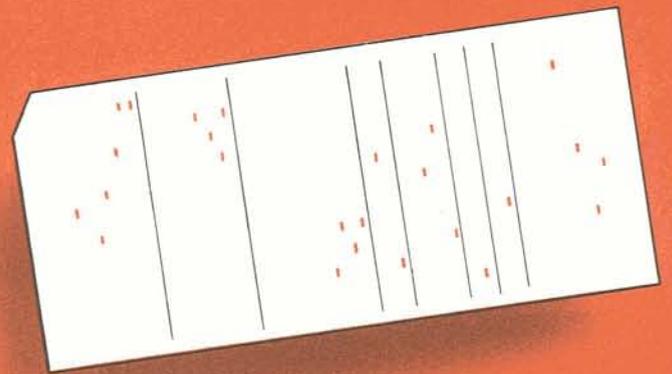
The checking system used so effectively for many years on IBM's 407 Accounting Machine supervises the accuracy of printed results.

Printers may be used independently of the main unit as tape-operated listing machines.

Card Punches

Alphabetical, numerical or symbolic data are punched at a speed of 100 cards per minute. Results to be punched directly from the CPU are transferred to temporary magnetic core storage at electronic speed so that the main unit can continue its processing while punching is taking place.

Punches may be used as direct output units or with tape units as independent tape-operated punches.





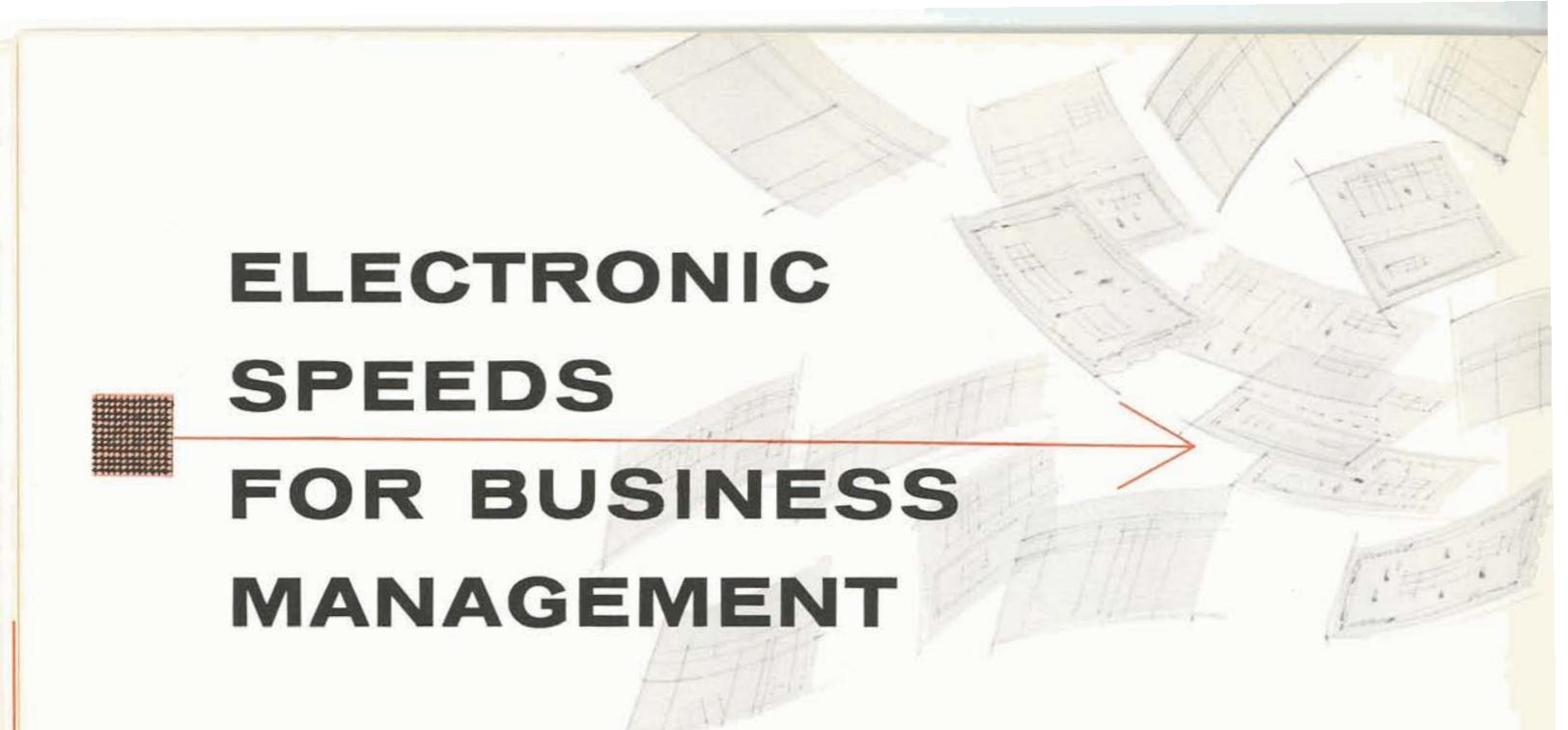
Operator's Control Center

In electronic recordkeeping of the scope provided by the 705, direct communication between operator and machine is of great advantage. This is especially true in getting new programs correctly established. The operator's console supplies an ideal means of supervising all functions of the system. Here the operator can determine the exact step being performed at any time and can inspect the contents of the arithmetical unit, control counters, character registers, and similar features.

Program testing and the establishment of original programs is facilitated through the operator's ability to call out the entire contents of memory. Starting at a specified address, everything in memory can be recorded on any selected output unit.

Instructions and data can be entered into the 705 from a keyboard on the console to supplement or alter the usual automatic programming from cards or tape.

A further aid to the operator is a typewriter which can print any portion of memory one character at a time at a rate of 600 characters per minute. Through programming, the 705 may type special notations or instructions to the operator.



ELECTRONIC SPEEDS FOR BUSINESS MANAGEMENT

INPUT

From Tape

15,000 characters per second

From Cards

20,000 characters per minute—each card reader

PROCESSING

Rate per Second

8,400 additions or subtractions (5 digits)
1,250 multiplications (5 digits x 5 digits)
550 divisions (6 digit dividend ÷ 4 digit divisor)
29,400 logical decisions

Capacity

MAGNETIC CORE MEMORY 20,000 characters—alphabetical, numerical or symbolic—available at the rate of 58,800 characters per second.

MAGNETIC DRUM 60,000 characters per drum—available at the speed of 25,000 characters per second.

OUTPUT

To Tape

15,000 characters—per second, each unit

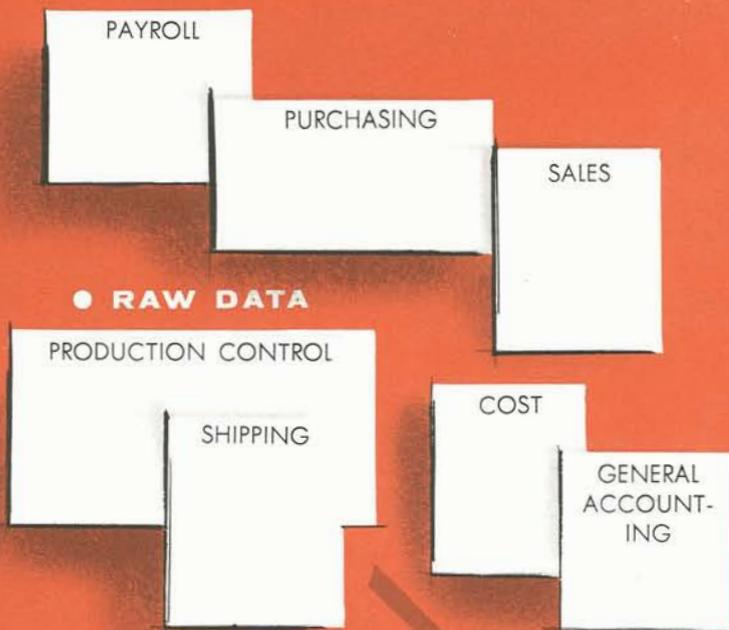
To Printer

150 lines per minute—each machine

To Cards

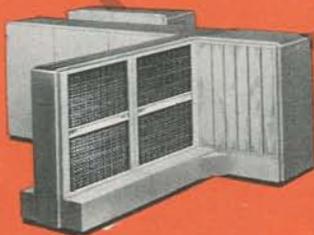
100 cards per minute—each machine

APPLICATIONS ON THE 705



● RAW DATA

● ELECTRONIC DATA PROCESSING



● ORGANIZED MANAGEMENT FACTS

A simple line drawing of a data table with three columns and two rows. A thick, dark arrow points from the computer cabinet above to the top-left corner of the table.

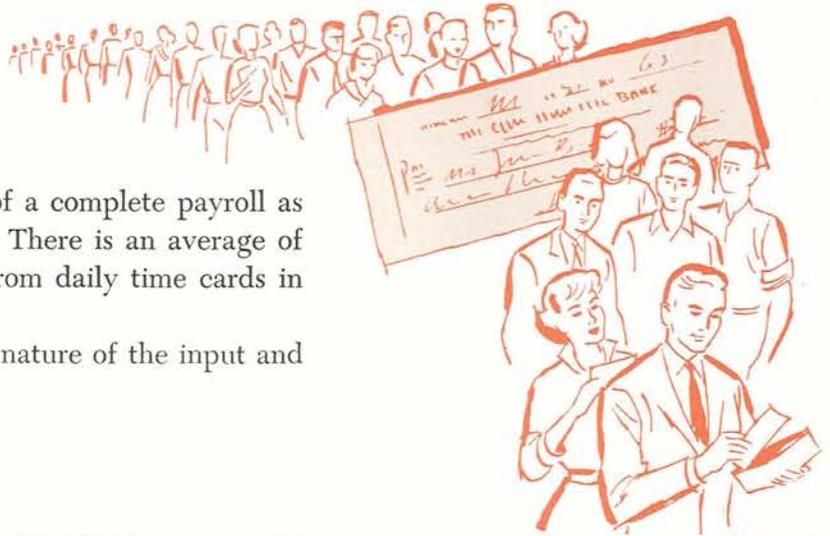
The 705 was developed after intensive study of the requirements of IBM's commercial customers. Each step in its design was carefully planned not only from an engineering and production point of view, but from the standpoint of the ultimate user as well.

The result is a system of equipment which has been explored for a variety of applications. Many business organizations have made invaluable contributions. Millions of man hours were devoted to specifying equipment that has the inherent ability to process a wide variety of information.

This thoroughly reasoned approach has established the fact that the 705 can be applied to present accounting functions, and in addition, many new areas of office operation can be mechanized.

TYPICAL APPLICATION

Payroll and Labor Costs



This hourly payroll involves the preparation of a complete payroll as well as the distribution of labor costs to jobs. There is an average of two jobs per day per man. These are rated from daily time cards in the form of prepunched IBM cards.

Full advantage is taken of the independent nature of the input and output devices.

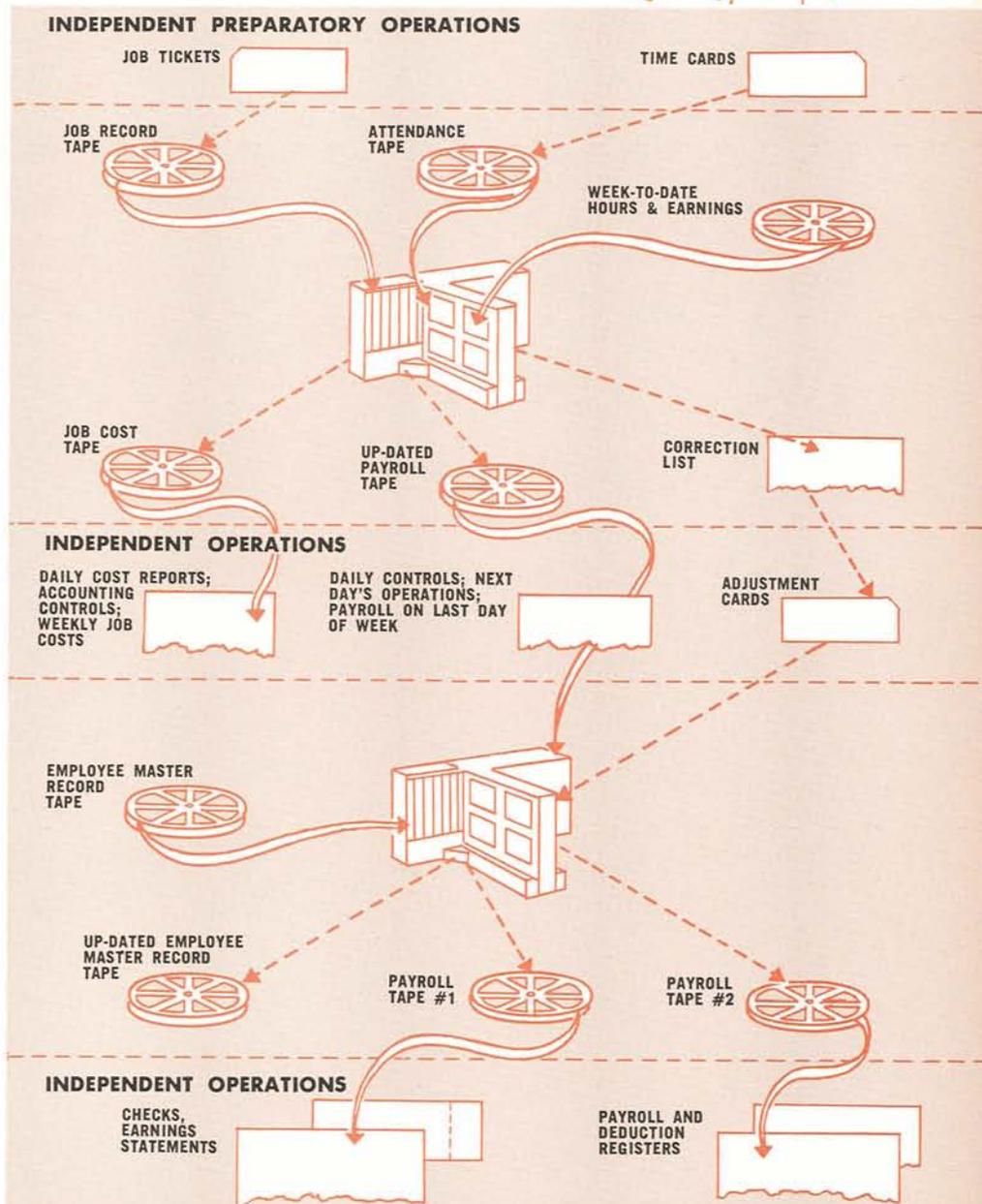
DAILY PROCEDURE

Daily transactions, converted to tapes in auxiliary operations, are combined with a tape carrying cumulative hours and earnings for the week to date.

Hourly rates are prepunched in the attendance cards and are carried into the tape for rating and extending job time hours as well as regular and overtime attendance hours.

WEEKLY PROCEDURE

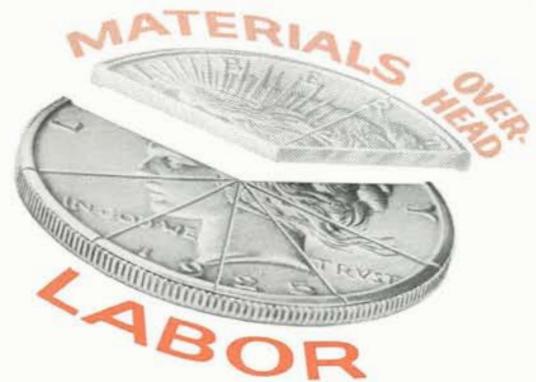
The employee master tape record contains year-to-date figures for tax computation and complete control and identification information. Elective deductions and their frequency schedules are also on the tape. By combining this with the tape for the last day of the week, all data for payroll records is calculated in the 705 for preparation of the tapes that write the final payroll record as subsequent operations.



PLANS

Cost Accounting

The effect of all labor costs is carried forward so that control figures are obtained daily. Work-in-process costs are obtained weekly or at any other time. Cost statements for finished jobs are produced directly on the printer for immediate review.



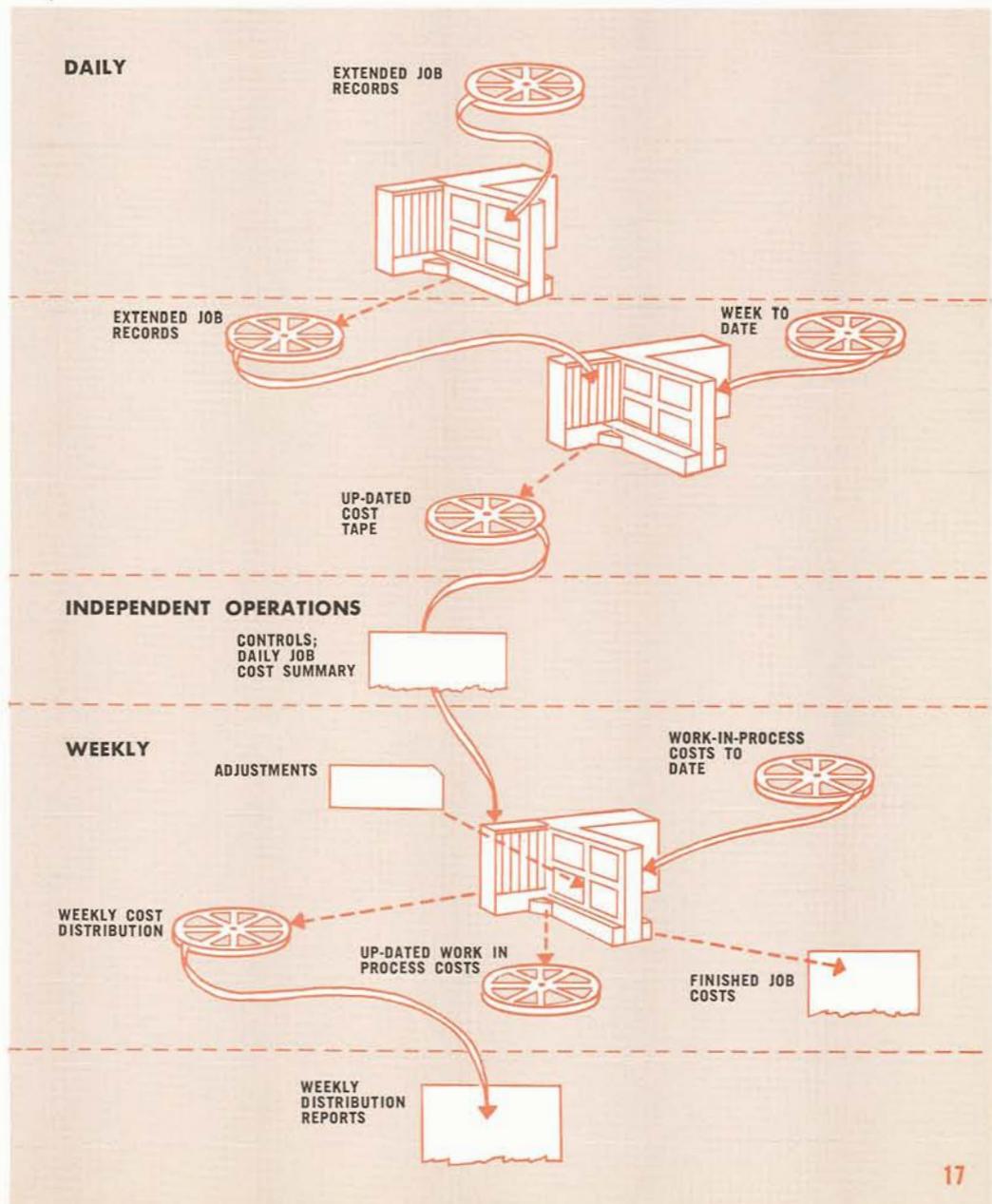
DAILY PROCEDURE

Extended job record tapes, in employee sequence, obtained during the daily balancing and extending procedure for payroll, are sorted in the 705 to rearrange the data to job sequence.

The new tape is associated with one carrying the cumulative totals for the week. New week-to-date figures are developed to bring forward cost totals.

WEEKLY PROCEDURE

After processing the tapes for the last day of the week, the final up-dated tape is combined with one carrying the work in process totals for all open jobs. Two tapes are produced. One carries the current period costs, control and budget figures for weekly closing reports. The other is a complete file of cumulative work in process costs. Jobs finished during the current week are separately recorded on the printer for direct production of Finished Cost Statements.



File Maintenance

A problem common to most businesses is to incorporate the effect of current transactions with historical records and also to copy from historical records the information needed for proper handling of current transactions. This vast amount of file searching, matching, copying, and data processing can be automated to the optimum degree by storing files of information on magnetic tape and introducing all changes and transactions from another tape. By using this common language of data processing, the 705 can do a complete recordkeeping and file maintenance job. The procedure illustrated was developed for a life insurance application, but the principles established are pertinent to all file maintenance problems.



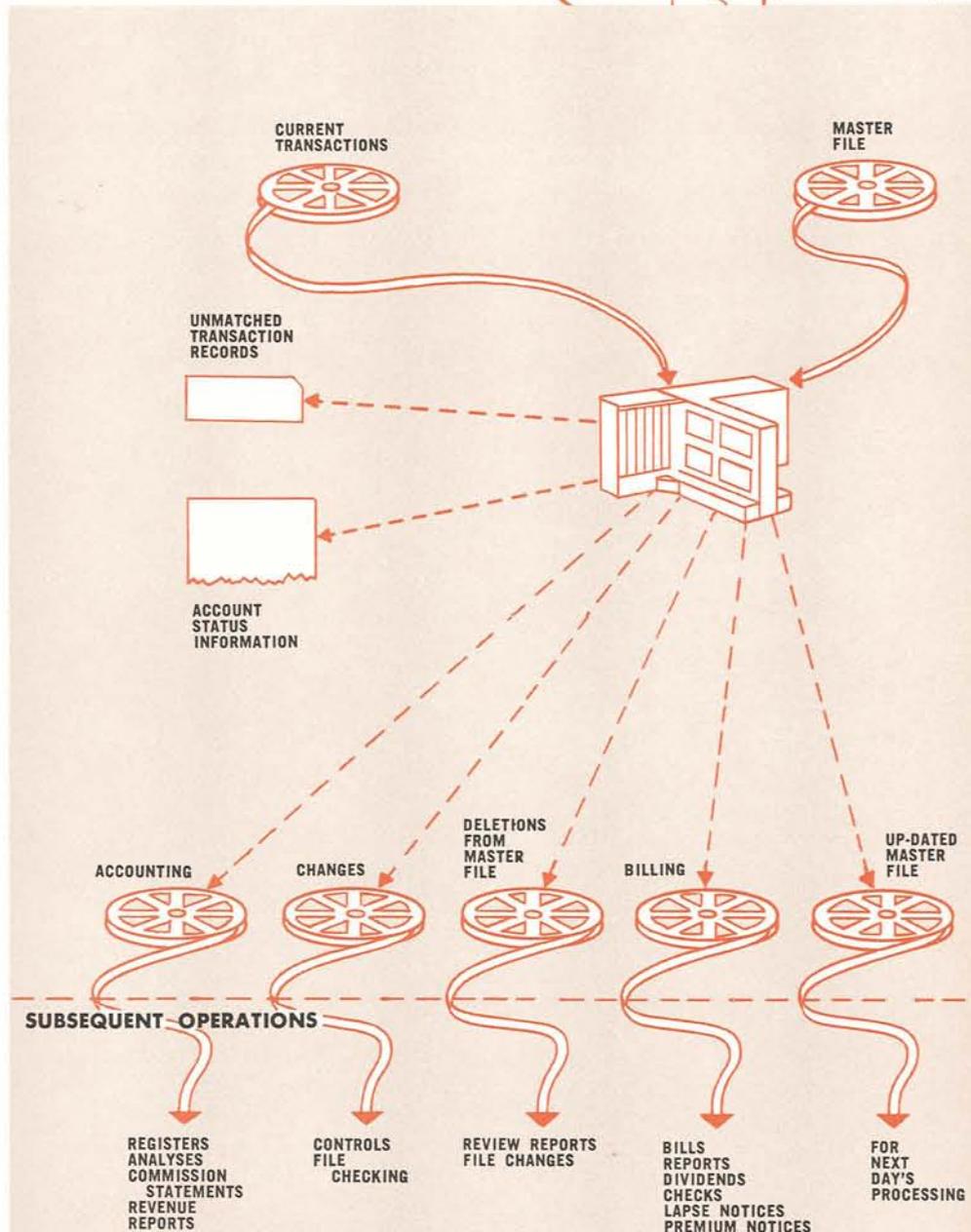
Data to effect changes in master files and for current action is written onto magnetic tape during previous independent card to tape operations and prior 705 processing. Such transactions as new business, collections, lapses, changes to master files, adjustments, and requests for information are consolidated in policy number order in the action tape.

All details as to name, address, identification, control dates, classification and rates for each policyholder are contained in the master tapes.

The logical, arithmetical and comparative abilities of the 705 are called into play to feed the tapes alternately, determined by sequence. New information and changes are copied into an up-dated master file to bring it up to date, while details from the master file are added to the data in the action tape to document new transactions. Anniversary dates in the master tape generate transactions when appropriate.

Information from both master and action tapes is selected and combined in different ways in separate output forms. Tapes are created for accounting, changes, policy master file, billing and deletions.

Direct printer listings are made for requests for account status. When transactions have been reported for accounts not in the master file, punched cards are created directly for investigation of discrepancies. The several output tapes prepared are used in later procedures for the necessary billing, accounting, statistical and control procedures.



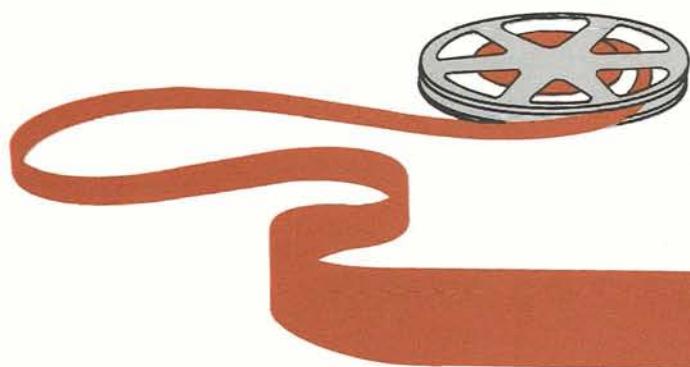
Control and Analysis of Inventories; Forecasting Requirements

The vast amount of data that can be collected, processed at high speed and finalized in report form to prompt important decisions is dramatically displayed in the tape record shown on the right. Here the data from diverse sources are reflected in an inventory position tape carrying 248 characters for each part. Source data originates in 15 different transaction classes such as assembly inventory, requisitions, ordered material, transfers and adjustments, shipments, planning requirements, and all other work centers where papers relating to inventory uses and needs are initiated. Each transaction is recorded on a punched card, which is automatically converted to tape. The effect of the individual transactions against stocked items is shown daily and the inventory position is tape recorded for all items.

The tape shows daily changes, inventory rotation, available quantities, authorizations, requirements, and similar control data.

The following records are produced:

- | | | |
|----------------|---|---|
| <i>daily</i> | } | Raw Material Requirements |
| | | Order Authorization |
| | | Inventory Position all items |
| | | Inventory Movements – Facsimile Posting
medium for items that have moved |
| <i>monthly</i> | } | Field Maintenance Report |
| | | Laboratory Report |
| | | Inventory Valuation |



TAPE RECORD	
FIELD	NUMBER OF CHARACTERS
Date	6
Scrap	1
Rotating Inventory	1
Value Code	2
Part Name	10
Zone	2
Characteristic	1
Part Number	7
Source	1
Type	1
Status	1
Drawing Size	1
Factory Number	1
Cost Control	1
Transaction Code	1
Control	12
Obsolescence Code	1
Inventory Year-to-Date Adjustment	2
Gross Requirement	8
On Order	8
In Process	8
In Stock	8
Total in Assembly	8
Available for Planning	8
Receipts Year-to-Date	8
Withdrawals Year-to-Date	8
Shipments Year-to-Date	8
Transfers and Adjustments Year-to-Date.....	8
Unfilled Final Assembly Requisitions.....	8
Parts in Final Assembly	8
Field Maintenance Requirement	8
Monthly Maintenance Withdrawals	8
Year-to-Date Maintenance Withdrawals	8
Laboratory Requirement	8
Laboratory Monthly Withdrawals	8
Laboratory Year-to-Date Withdrawals	8
Raw Material Code	10
Unit Code	2
Raw Material Weight	8
Operation Hours	8
Setup Hours	5
Transfer or Lead Days	5
Storage Space	7
Unit Cost	7
Total.....	248 CHARACTERS

IBM SERVICE IN THE DATA PROCESSING FIELD

The determination of electronic data processing requirements and applications begins with IBM's regular field forces who coordinate customer activity through the various stages of investigation.

Amplifying the branch office services, the following assistance is available:

Special Representatives—Skilled in data processing applications, this group offers over-all consulting service in connection with the study of possible uses.

Educational Program—One-week classes conducted for executives at IBM educational departments in Endicott and Poughkeepsie, New York. Comparable classes are available in several major cities across the country. These courses are designed to acquaint executives with the organization, operating characteristics, capacities, and applications of the 705. Customers who complete this course are better able to evaluate the advantages, economies and wide business applications of the 705.

In addition to the executive class, courses are available to qualified methods personnel. These classes are of longer duration and provide complete knowledge of programming and necessary operating details.

Programming Service—Qualified personnel is available for consultation with field representatives and customers. A library of programs common to many problems is available for adoption as sub-routines by customer.

The **IBM**
705 • EDPM

*opens the door TODAY for the
management techniques of TOMORROW*



