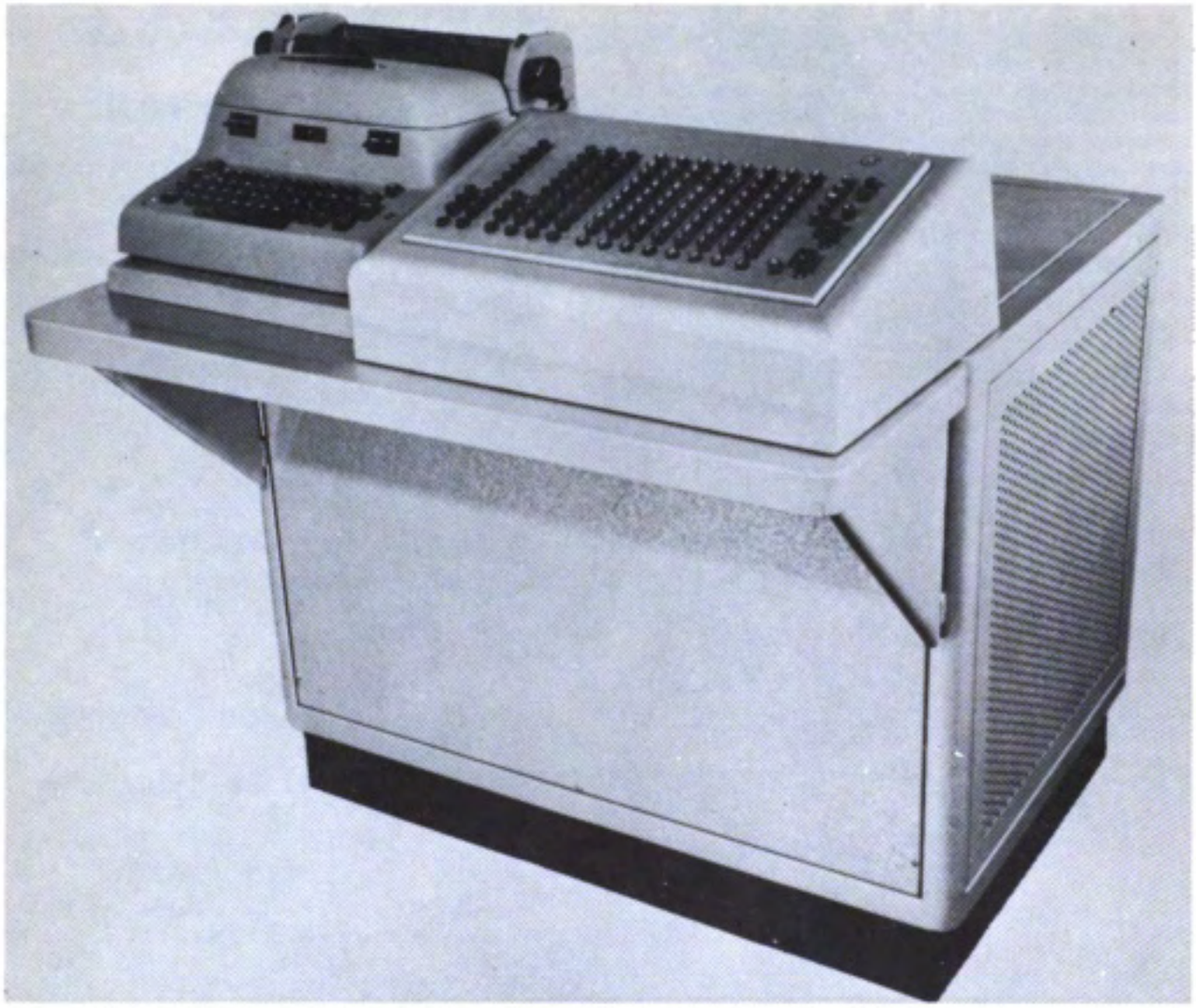
MAGNEFILE B

Magnefile Electronic Data Processing System B

MANUFACTURER

Electronics Corporation of America
Business Machines Division



Picture by Electronics Corporation of America

APPLICATIONS

Inventory control for retail sales department store

NUMERICAL SYSTEM

Internal number system	Decimal
Decimal digits per word	8
Instructions per word	Instructions wired in
Instructions used	7
Arithmetic system	Fixed point
Instruction type	One address

Three addresses are entered simultaneously.

ARITHMETIC UNIT

	Microsec
Add time (exclud. stor. access)	150,000
Construction	Vacuum tubes
Basic pulse repetition rate	30 Kc/sec
Arithmetic mode	Serial
Timing	Asynchronous
Operation	Sequential

STORAGE

Media	Words	Microsec Access
Magnetic Drum	4,040	300,000

8 decimal digits per word.

INPUT

Media	Speed
Full Keyboard	4 char/sec

OUTPUT

Media	Speed
Electric Typewriter	7 char/sec

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	130
Tube types	6
Crystal diodes	40
Different plug-in units	10
Separate cabinets	1

CHECKING FEATURES

Continuous checking total

POWER, SPACE AND WEIGHT

Power, computer	0.6 KW
Space, computer	3.5 ft x 2.5 ft
Weight, computer	400 lbs

COST, PRICE AND RENTAL RATE

Approximate cost of basic system $20,000

PERSONNEL REQUIREMENTS

One operator required during operation.

A service technician is called when needed. No engineer is required in attendance.

RELIABILITY AND OPERATING EXPERIENCE

Acceptance test 15 February 1954

INSTALLATIONS

B. Altman and Company
Fifth Avenue
New York, New York

ADDITIONAL FEATURES AND REMARKS

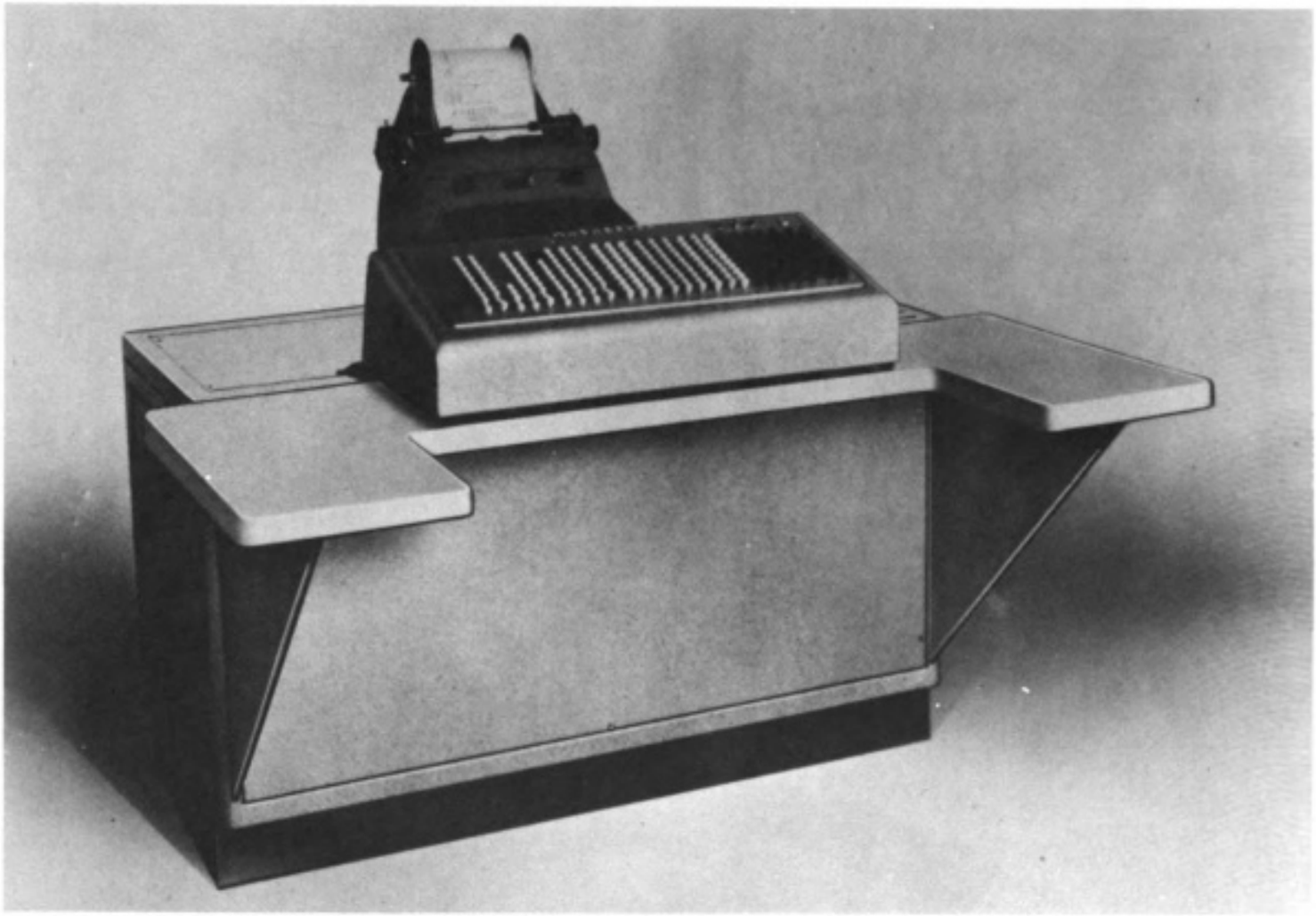
Magnefile systems are special purpose digital systems utilizing drum storage and wired in programming.

MAGNEFILE D

Magnefile Electronic Data Processing System Model D

MANUFACTURER

Electronics Corporation of America
Business Machines Division



Picture by Electronics Corporation of America

APPLICATIONS

Inventory control

NUMERICAL SYSTEM

Internal number system	Decimal
Decimal digits per word	42
Instructions per word	All instructions are wired in
Instructions used	77
Arithmetic system	Fixed point
Instruction type	One address

Three one-address commands are entered simultaneously.

ARITHMETIC UNIT

	Microsec
Add time (exclud. stor. access)	100,000
Construction	Vacuum tubes
Basic pulse repetition rate	40 Kc/sec
Arithmetic mode	Serial
Timing	Asynchronous
Operation	Sequential

STORAGE

Media	Words	Microsec Access
Magnetic Drum	8,000	50,000
Magnetic Drum	500	50,000

The larger drum stores 8,000 21 dec dig words.
The smaller drum stores 500 42 dec dig words.

INPUT

Media	Speed
Full Keyboard	Manual (4 char/sec)

Remote keyboards may be added.

OUTPUT

Media	Speed
Electric Typewriter	10 char/sec

CIRCUIT ELEMENTS ENTIRE SYSTEM

Tubes	140
Tube types	4
Crystal diodes	240
Different plug-in units	12
Separate cabinets	1

POWER, SPACE AND WEIGHT

Power, computer	1 KW
Space, computer	5 ft by 3 ft
Weight	700 lbs

PRODUCTION RECORD

Number produced	1
Number in current operation	1
Delivery time	7 Months

COST, PRICE AND RENTAL RATE

Approximate cost of basic system $50,000

PERSONNEL REQUIREMENTS

Daily Operation	No. of Tech
One 8-hour shift	1

No engineers are used. A service technician is on call when needed.

RELIABILITY AND OPERATING EXPERIENCE

Acceptance test 5 August 1953

INSTALLATIONS

B. Altman and Company
Fifth Avenue
New York, New York

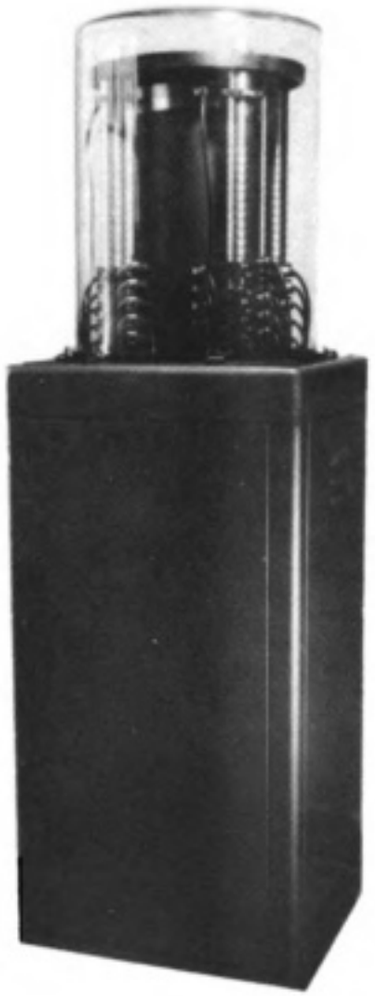
ADDITIONAL FEATURES AND REMARKS

Large magnetic drum storage
Wired (fixed) programming
Special purpose machine

MAGNETRONIC BID ASKED

Magnetronic Bid-Asked Stock Quotation System

The Teleregister Corporation
Subsidiary of the Ogden Corporation



Picture by the Toronto Stock Exchange

APPLICATIONS

Data processing associated with stock exchange bid-asked price quotations

NUMERICAL SYSTEM

Binary digits per word 24

ARITHMETIC UNIT

Timing Synchronous
Operation Sequential

Five seconds of additional time are required for a transaction when input/output data are transmitted over teletype lines.

STORAGE

A single magnetic drum storage unit is utilized.

The drum capacity is 100,000 binary digits.

The system is designed to handle a maximum of 8 million average transactions/hour.

Relays are used for temporary storage of information.

INPUT / OUTPUT

There are 200 special input/output devices located in Toronto, Canada. These are located near the printing mechanism.

For remote locations, special transceivers are utilized to serialize and check data.

CHECKING FEATURES

Visual verification of input/output data (response) is possible at the originating input point.

Input error or data rejection is immediately signalled to the originating input device.

Automatic checking and data verification controls are built into the system.

PRODUCTION RECORD

Produced	1
Operating	1

COST, PRICE AND RENTAL RATE

Cost dependent upon customer requirements.

System was installed but is not being maintained by the manufacturer.

RELIABILITY AND OPERATING EXPERIENCE

Operating ratio (Good/Attempted to run) 0.999

The system is operated on line 7 hours/day, 5 days/week.

INSTALLATIONS

Toronto Stock Exchange
Toronto, Canada

ADDITIONAL FEATURES AND REMARKS

Special purpose system

System is operated "on-line" with current updating features.

Status reporting feature included.

Control is possible from all input transactions recording locations.

System incorporates remote control of the data processor from input/output stations.

The following is a technical, operational and historical description of the system:

The electronic equipment at the Toronto Stock Exchange, now in service for more than three years, represents the first use of electronic digital computer techniques for the storage and dissemination of stock quotations.

In 1937 The Teleregister Corporation installed for the Toronto Exchange an automatic, electro-mechanical system for displaying, storing and disseminating bid-asked prices on the more actively traded stocks. Bid-asked prices, generated at the trading posts on the floor of the Exchange from orders placed on the outside, were transmitted by reporters over an interphone system to keyset operators in the basement of the Exchange building. These keyset operators entered the bid-asked prices into the automatic system. The prices were displayed on electro-mechanical indicator units located at the posts on the floor for the information of the traders at that location. Simultaneously, the same prices were posted on indicators in a "check-board" located in front of the keyset operators.

The system also included a Canadian National Telegraphs network from the common equipment at the Exchange to brokers' offices in the Toronto area, who were provided with dial-ticker units. A broker desiring the current bid-asked prices for a particular stock, looked up the three digit code number for the stock in a code-assignment register. When he was ready to dial, he pressed a request button on his dial set. The operation of this button connected his dialing circuit and ticker line, through the line connecting equipment, to one of 24 transmitters which may be idle at the time. When the connection to the transmitter was completed, a ready lamp lighted on the broker's dial set, telling him that the equipment was ready to receive his dialing. The operation thus far is similar to that of a telephone exchange when the subscriber picks up the hand set and receives a dial tone. The dialed code numbers were stored in the transmitter, which was conditioned to extract the requested bid-asked price from the system's memory.

Up until three years ago the display indicators in the check board served a dual purpose in that they were also used as storage devices or memory units. These indicators were pulse actuated mechanisms which display the digits 1 through 0 and blank, on a 11-position rotatable drum. An indicator was set to display the desired digit by transmitting counted pulses to its winding after it has first been pulsed to its blank display position. In order to respond to a broker's dialed request, the indicators displaying the selected stock prices were actuated by exactly 11 pulses. This would leave the indicators in the same display position as before, but since it was possible to determine the number of pulses required to move each unit from its display position to its blank position, a coded read-out of the stored prices was accomplished. These prices were then automatically sent by one of the 24 transmitters to a ticker at the calling broker's office.

After careful engineering analysis of the problem, it was decided to use electronic techniques and a non-volatile magnetic drum storage to process the 50,000 daily requests which were being received from brokers' offices. Since the existing display posting system represented a major capital investment, it was necessary to integrate much of the old electro-mechanical system with the new electronic data processing equipment. This integration presented the major engineering problem, since the electronic components had already been developed and proven in service in an American Airlines reservations system, (see Magnetronic Reservisor) which processes an inventory of airlines seats in place of stock bid-asked prices. It was also decided to use the old price storage circuitry as a fall-back, so that a manual switch-over system had to be provided.

The magnetic drum storage equipment is time shared between the 24 transmitters and the 6 operators positions by the seeker equipment. The purpose of the operators' positions is to keep the prices displayed at the Exchange and stored on the magnetic drum up to date with the trading. The seeker is a relay switching device which connects the next transmitter or operator's position awaiting access to the drum storage, which is time-shared to all positions. When a transmitter gets access to the storage, the 3-digit code number, dialed by a subscriber and stored in the transmitter, is translated by the selector into the energization of one of 600 single-wire selection leads which were previously used to connect the transmitters to a specific section of the check-board display when that unit was used as the system's memory. In the new system these 600 leads are coded by use of a diode matrix with the position code of the same information on the magnetic drum storage. The output of the diode matrix is connected through drum selection coding relays to the drum connecting relays which, in turn, select one of 40 channels on the drum. If one of the six operators' positions has been given access to the storage drum, the electronic equipment is used to write the new price information stored on the operators' keyset in the section of the drum selected by one of 100 keys on the operators' keyset.

The magnetic storage unit consists of a solid aluminum billet, eight inches in diameter and fifteen inches high, coated with an iron oxide film about 0.003 inches thick. The drum has capacity for storing approximately two thousand sets of prices,

six hundred being the initial usage. Prices are stored in permutation code on the drum coating as positively or negatively magnetized spots, the coding being changed as the prices alter. The drum is divided into circumferential tracks, or channels, each channel providing price storage for twenty-five stocks. The packing factor for this application is approximately 40 bits (or code elements) per inch along the track. A read-record head is mounted over each channel with a clearance of .001 inch from the drum surface. In recording, these heads polarize the magnetic coating as the drum rotates at a speed of 1,450 RPM beneath them, under control of electronic writing and gating circuits which are triggered off as the operators send in new prices. In a reading operation resulting from a broker's dialed request, the selected magnetized spots passing under the read-record head induce positive and negative pulses which are amplified and shaped into usable dynamic pulses.

The electronic equipment is under control of a program unit which is basically divided into seven circuits; starting, function determination, counting, 1 of 25 stock selection, 1 of 6 stock digit selection, read gating and write gating. Counting is in binary code and under control of three permanently magnetized tracks on the drum which are called synchronizing or "clock" tracks. These tracks deliver 1,256 and 600 pulses, respectively, for each revolution of the drum. The clock pulses to the electronic counters of the program unit open electronic gates at the precise instant that the desired storage area on the drum is passing beneath the selected read-record head. There is a reference pulse from the drum which assures that the electronic counting will always start in synchronism with the drum rotation. There are pulses which are used to select one or a combination of the six digits representing a bid-asked price. Since each price digit has a 4 element permutation code, there are 25 x 6 x 4, or a total of 600 storage bits in use on each drum track. The function of the shift registers is to read the amplified serial bid-asked price pulses from the drum and send the price in parallel to the transmitters, 24 elements at a time. In the case of a write operation, the shift registers control serial writing into the drum from parallel price code inputs from the operators' keysets. The electronic equipment contains approximately 400 tube envelopes, of which about half are Western Electric 396-A twin triodes and the remainder Western Electric 415-A pentodes. A few 6Y6 tubes are used in the drum record circuits. All electronic components are mounted on functional plug-in sub-assemblies, using printed wiring techniques. An open construction is employed for better heat dissipation and lower operating temperature.

A diode matrix array is used to integrate the drum selection coding with the output circuits from the previously installed operators' tables and stock selector. These diode matrices provide translation equivalent to that of 362 relays at less initial cost and maintenance expense. The choice of diodes was based on the relay currents involved, the operating voltage, and the ratio of forward to backward resistance of the diodes to give safe operation. For this application, commercial selenium rectifiers were used, mounted on 24 unit assemblies.

The electronic system has been designed to incorporate many input and output error detection circuits which check for impossible coding, absence of input selection codes, and the like. After each write operation into the drum, an automatic read-out of the just-written data is performed and automatic error detection circuits are used to check the accuracy of the data stored on the drum against the original input data. Marginal checking operations which are made after the market is closed bring to light most of the incipient tube failures long before the tube causes trouble during actual service. After more than two years' service, most of the original tubes are still in use. The system is currently handling about 60,000 calls per day.

There were but three instances during the first year of operation where it was necessary to switch to fall-back service and use the check-board indicators as the system memory. Since the first year, there have been no major service interruptions. It is interesting to note that the three failures during the first year were actually not caused by electronic components, but rather were due to input relay troubles. The system is currently operated for 8 hours per day for 6 days per week.

MAGNETRONIC INVENTORY CONTROL

Magnetronic Inventory Control System

The Teleregister Corporation
Subsidiary of the Ogden Corporation

APPLICATIONS

Manufacturer
Industrial inventory control (current up dating)

B. F. Goodrich Company, Footwear and Flooring Division
Finished goods inventory control

NUMERICAL SYSTEM

Binary digits per word 37

ARITHMETIC UNIT

Construction	Vacuum tubes
Arithmetic mode	Serial
Timing	Synchronous
Operating	Sequential

The time required for the completion of an average transaction from the completion of the input to the answer is 600 milliseconds. The system has a designed maximum capability of handling 6,000,000 average transactions per hour.

The operator has one master control panel for his use. A sub-supervisory control position is located at the data processor.

STORAGE

A single 1,500,000 binary digit capacity magnetic drum is utilized. The number of bits per standard item stored is 37 (comparable to a "word" in general purpose systems). Random access to the drum is possible.

The temporary storage medium is relays.

INPUT

One input/output device is located at the data processor.

One input/output device is located at the printing mechanism.

Paper tape is utilized as an input/output medium.

Electric office machines are controlled and driven by the system.

Punched cards are utilized.

B. F. Goodrich Company, Footwear and Flooring Division
Tape reader speed is 10 char/sec and tape punch speed is 20 char/sec. A digital display unit is utilized.

OUTPUT

Visual verication of input/output data (response) is possible at the supervisory station.

Input error data rejection is signalled immediately at the supervisory station.

Automatic checking and data verification controls are built into the system.

PRODUCTION RECORD

Produced	1
Operating	1

COST, PRICE AND RENTAL RATE

Prices of this special purpose system are based on customer requirements and are established by negotiation.

System is installed and is maintained by the manufacturer on a service contract basis.

B. F. Goodrich Company, Footwear and Flooring Division
Approximate cost of basic system was $300,000

PERSONNEL REQUIREMENTS

B. F. Goodrich Company, Footwear and Flooring Division

Daily Operation	Engineers	Tech and Operators
1-8 Hour shift	1	3

RELIABILITY AND OPERATING EXPERIENCE

System is installed, operating, and in use. It is operated for 8 hours/day on line and 2 hours/day off line, on a 5 day/week basis. The system has been in operation several months.

FUTURE PLANS

B. F. Goodrich Company, Footwear and Flooring Division
The future expansion of this system depends largely upon its current performance on the job for which it was built. Integration of our branch warehouse will be the next possible application.

INSTALLATIONS

B. F. Goodrich Footwear and Flooring Company
Division of the B. F. Goodrich Company
Watertown 72, Massachusetts

ADDITIONAL FEATURES AND REMARKS

Special purpose system

System is operated partially on an on-line basis.

System has combined on-line and off-line operating features.

The supervisory station permits stock status reports to be obtained, utilizing "tailored" functional input/output devices for completing transactions.

B. F. Goodrich Company, Footwear and Flooring Division
This piece of equipment is of a special purpose nature designed specifically in answer to our finished goods footwear problem. Its outstanding feature is random access to any one of many thousands of separate items of either inventory or sales. An additional feature is the display of inventory or orders on a digital display console, one item at a time.