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AUTOMATIC DATA PROCESSING

EQUIPMENT REPORTS

November 1, 1957 Release

Enclosed are reports on the following equipment:

Bull Machine Company Gamma 60

Philco Transac S-2000 Data Processing System

For filing instructions see other side.

FILING INSTRUCTIONS

File the enclosed pages into Volume 1 of Automatic Data Processing Equipment Reports as follows:

Remove **Equipment Reports—Pages v to x**; insert **Equipment Reports—Pages v to x**.

TURN TO DIVIDER "4E. LARGE COMPUTERS"

After **4E 115.1—Page 13** insert **4E 151.1—Pages 1 to 4**.

After **4E 380.4—Page 18** insert **4E 610.1—Pages 1 to 4**.

Discard blank sheet following.

**Automatic
Data
Processing**

EQUIPMENT REPORTS

By

**JOHN DIEBOLD
& ASSOCIATES, INC.**

Management Consultants

Cudahy Publishing Company

Chicago

Foreword

This volume is designed to provide a comprehensive critical description and analysis of available automatic data processing equipment. Each piece of machinery is classified to the function it is designed to perform and is then cross-referenced to other pieces of equipment which may be used in conjunction with it, thus giving for the first time a single source where one can secure the information necessary for analyzing an ADP installation or determining what changes or additions should be made in an existing installation to secure from it maximum benefits.

Basically the volume is divided into five major sections: Input, Communication, Conversion, Processing and Output. Each of these headings is in turn subdivided into logical groupings for purposes of easy reference. Page numbering is based on the divisional groupings mentioned above—coupled with a manufacturer's code number which has been arbitrarily assigned by the publisher to further aid in the use of this volume.

A few moments spent examining this material will quickly clarify any questions you might have about the manner in which it should be used.

All Equipment Reports that are not dated in the upper right-hand corner of page 3 were completed as of March-April, 1956.

All future Equipment Reports will be dated with the month and year in which the reports were completed. In this way, the reader will know the date on which the technical data, description, and costs listed were checked for accuracy. As changes in the equipment occur, the report will be up-dated.

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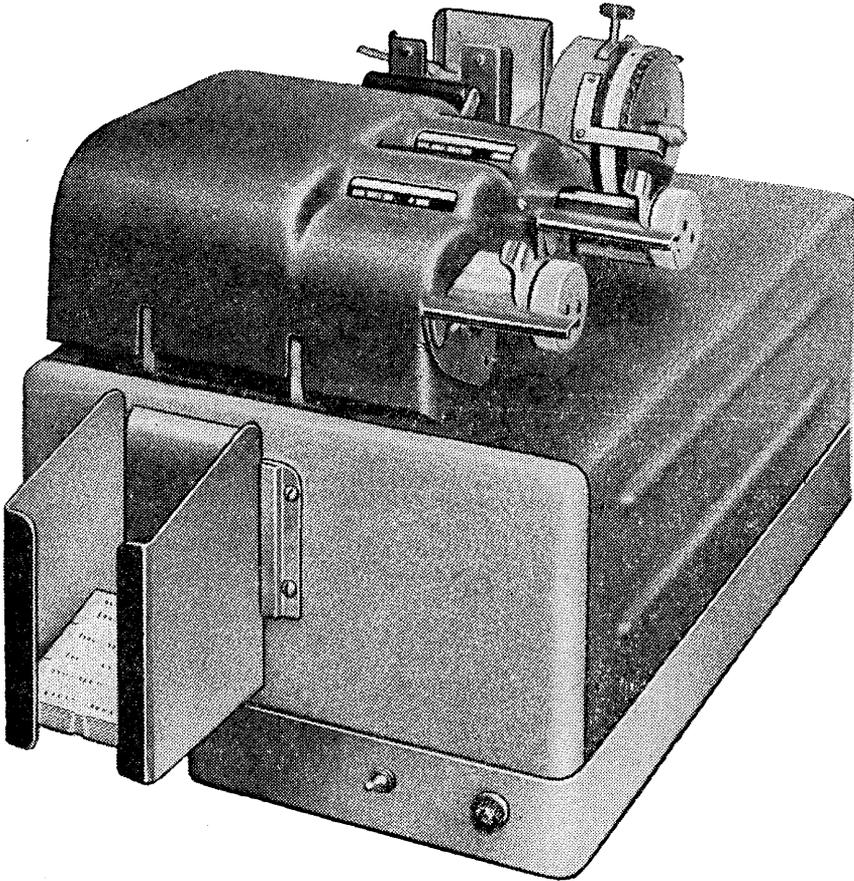
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**DENNISON
PRINT-PUNCH MARKING MACHINE**



May, 1957

DENNISON PRINT-PUNCH MARKING MACHINE

MANUFACTURER

Dennison Manufacturing Company

BRIEF DESCRIPTION

The Print-Punch Marking Machine will handle either cut tickets or those tickets in continuous fanfolded strips. The perforations in the merchandise tickets are 5-channel Dennison encoded. The printing capacity of the Print-Punch is 47 columns of which any 25 may be punched.

Punched tickets may be used in conjunction with point of sale recording devices to produce a punched paper tape record of merchandise transactions. This paper tape could be used as computer input for accounting, auditing and inventory purposes. Moreover, if desired, the information in these punched tickets could be converted into 80 or 90-column punched card form, or to paper tape.

APPROXIMATE COST

Print-Punch \$59 per month rent and up. Maintenance is included in rental charge.

PERFORMANCE

Simultaneously prints and punches at a maximum rate of 200 stubs per minute.

EQUIPMENT REPORT

PUNCHED TICKET CHARACTERISTICS

Code	Standard 5-hole (check, 7, 4, 2, 1)
Characters numeric special	0 to 9. Blank.
No. of Columns punched printed	25 columns: 1 column for control and 24 columns for sales information. 47 columns.
Punch Mode	Parallel by punch by digit, serial by cards. The information is set up in the circuits by the Dennison Dial-Set method. The entire card is punched and printed in one operation. One depression of the operating lever initiates punching and printing for an entire stack of cards.
Format printing	The upper print line of a ticket accommodates 25 digits of printing. The lower print line accommodates 22 digits.

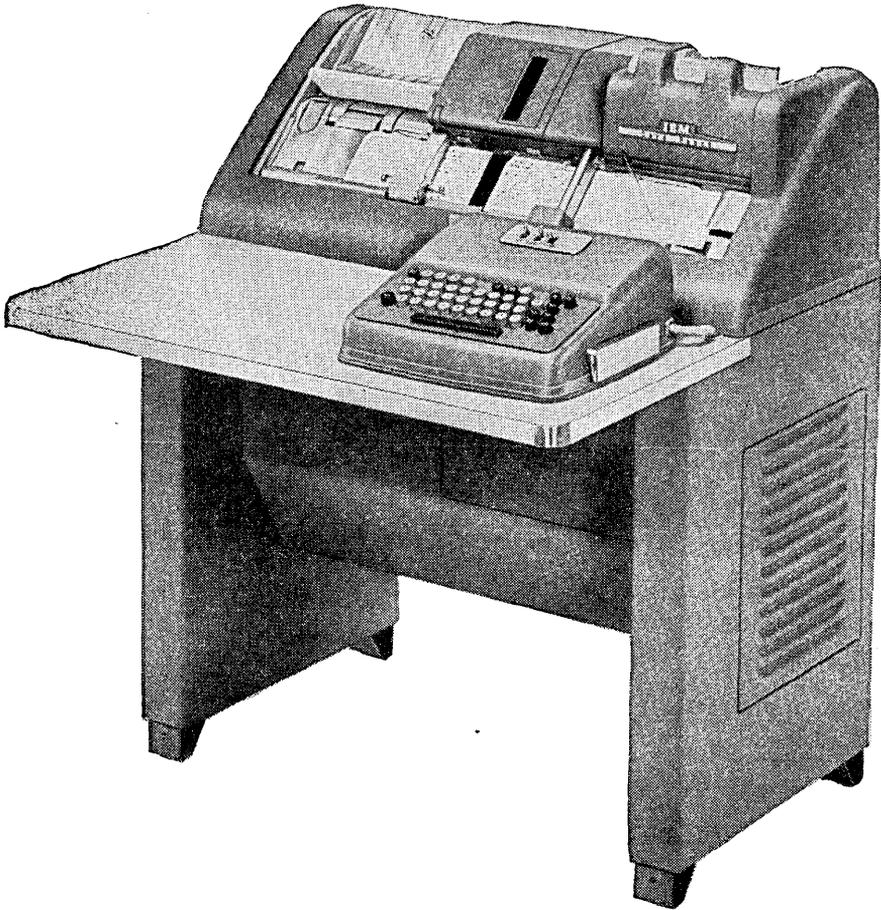
PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Print Punch	13 $\frac{3}{4}$ "	12"	19"	100 lbs.
Heat dissipation: Negligible.				
Power: 115 volts, 60 cps, 2 amps.				

ADDITIONAL INFORMATION

Write to: Machines Systems Division
Dennison Manufacturing Company
Framingham, Massachusetts

IBM 024 and 026
Card Punches



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June 29, 1956—2

April, 1956

IBM 024 and 026

Card Punches

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM 024 and 026 card punches are capable of preparing IBM punched cards with information from a manually operated keyboard with automatic skipping and duplicating operations possible. The 026 differs from the 024 in that the 026 has a printing mechanism that prints the characters on the top of the card as they are punched.

APPROXIMATE COST

	<i>Monthly Rental</i>
IBM 024	\$35.00
IBM 026	55.00
Auxiliary Duplication Device	5.00
Alternate Program Unit	2.50
Gang Punch Device	5.00
Card Insertion Device	5.00
Self-Checking Number Device	15.00

The above rentals are for one-shift operation; two-shift operation increases the rental charge by 50%; three-shift operation increases the rental charge by 100%. Maintenance is included in rental charge.

PERFORMANCE

	<i>Type 024</i>	<i>Type 026</i>
Card Feeding Speed (approximate)	60 cards/minute	60 cards/minute
Duplication Speed	20 columns/second	17 columns/second
Skipping Speed	80 columns/second	80 columns/second

EQUIPMENT REPORT

PUNCHED CARD CHARACTERISTICS

Code	IBM (Hollerith)
Characters alphabetic numerical special	A to Z (2 hole code). 0 to 9 (1 hole code). & / # @ , - % \$ * . □ (2 to 3 hole code).
No. of Columns	80 columns.
Punch Mode	Parallel by punch; serial by character by card. Key punching, skipping and duplicating are accomplished one column at a time.
Format: control	Controlled by the program unit. Automatic skipping, duplicating, and/or shifting from numerical to alphabetic punching for any number of columns are designated by codes in a program card. The program card is placed around a cylindrical metal drum in the program unit.
printing	Each character punched in a column can be printed above the column punched. Zero printing or suppression of printing in a particular column or field is controlled by the coding in the program card.

KEYBOARD CHARACTERISTICS

Class	Electromechanical
Characters alphabetic numerical special	A to Z (Keyboard Models 2 and 3). 0 to 9 (Keyboard Models 1, 2 and 3). Keyboard Model 1: - & Keyboard Model 2: - & / Keyboard Model 3: - & / # @ , % \$ * . □
Control Keys	Skip, feed, numerical shift, alphabetic shift, multiple punch, duplicate, release, card register and space bar. An auxiliary duplicate and an alternate program key are supplied with a machine with these optional features.

IBM 024 AND 026

The following functions can be performed by the control keys:

A card column can be left blank. Cards can be fed one at a time. Except for those card columns coded for duplication on the program card, cards can be released without any punching.

Skipping of a field can be accomplished by the depression of the skip key. The punching can be duplicated from the partial or complete reading of the previous card.

PHYSICAL DATA

<i>Type</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation BTU/hr.</i>
024	39"	31"	28"	220 lbs.	820 @ 115 volts AC
026	39"	31"	28"	222 lbs.	907 @ 115 volts AC

Power Requirements

024	115/230 volts, 60 cps, single-phase, 2.8/1.4 amps.
026	115/230 volts, 60 cps, single-phase, 3.0/1.5 amps.

COMMENTS

Original source information can be punched in code into IBM cards by means of the 024 or 026. One character in a card column is punched at a time. If an error in punching occurs, the card is released to the reading station; the previously punched correct information can be duplicated in a new card and with the rekeying of the card column in error the card punching can continue.

Three control switches accomplish the following functions: cards can be fed automatically; automatic duplication and skipping of card columns designated on the program card is effective by the use of one control switch; printing is made effective on the card punch 026. A backspace key enables the card to be backspaced one column at a time.

The codes in the program card define the card fields, the start of automatic skipping or duplication, and the automatic shifting into alphabetic punching. Additional codes for the 026 permit the suppression of printing of one or more card columns, or the automatic suppression of printing zeros to the left of the first significant digit in a numerical field.

The optional features of the card punches allow: duplication from an auxiliary drum master card rather than from the card

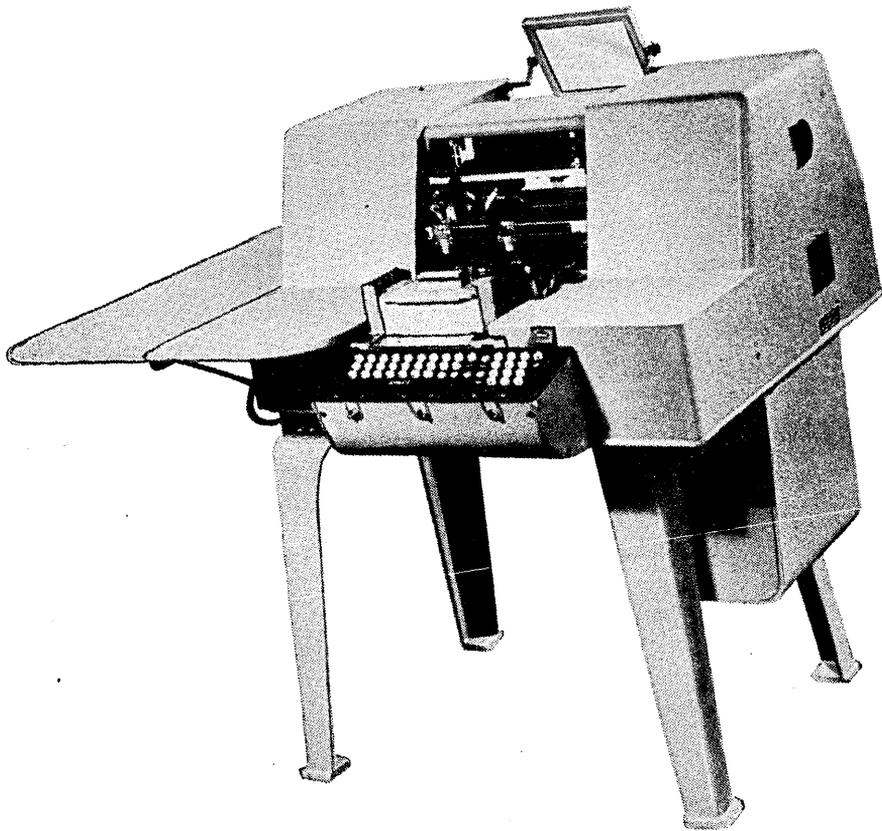
EQUIPMENT REPORT

at the reading station; different programs for different types of cards with the alternate program unit; interspersed duplicated cards with the gang punch device; and simpler insertion of a master card in front of detail cards by the card insertion device.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND TYPES 306-2 and 306-3
Alphabetic Punch and Alphabetic Numbering Punch



1A 660.1—Page 2

4-56-6

REMINGTON RAND TYPES 306-2 and 306-3

Alphabetic Punch and Alphabetic Numbering Punch

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

Types 306-2 and 306-3 are capable of producing Remington Rand punched cards from a manually operated keyboard and associated settings of margin stops, tabs and other control latches. Type 306-2 and Type 306-3 differ in the following respects: Type 306-2 incorporates the verifying attachment; Type 306-3 incorporates the numbering attachment permitting serial numbering of each card.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 306-2	\$2,430	\$35
Type 306-3	2,663	40

The monthly rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift costs by 50%; 120-hour week, three-shift operation increases the single-shift costs by 100%. Maintenance is included in the monthly rental. A maintenance contract is available to purchasers.

EQUIPMENT REPORT

PERFORMANCE

	<i>Card Feeding Speed</i>
Type 306-2	86 cards/minute
Type 306-3	125 cards/minute

PUNCHED CARD CHARACTERISTICS

Code	Alphabetic-numeric 3-hole code.
Characters	
alphabetic	A to Z (2 or 3 hole coded).
numeric	0 to 9 (1 or 2 hole coded).
special	One character of any design is available.
No. of Columns	90 columns.
Punch Mode	Parallel by punch by character, serial by cards. With the format set up, the information is set up in the machine by the keyboard. One depression of the trip key punches the entire card.
Format: control	Controlled by skip-stops (tab settings), marginal stops, and retract latches (set for repeat punching). A maximum of 7 columns at a time can be skipped by a skip-stop setting. A wider skip field requires more skip-stop settings. The marginal stops are for the left-hand margin and an intermediate margin. Retract latches permit retention of set-up where repeat information is to be punched in all cards. Some other controls are indicated under the control keys of the keyboard.
printing	8-digit serial numbering stamped in the left end of the card—a standard feature on Type 306-3.

REMINGTON RAND TYPES 306-2 AND 306-3

KEYBOARD CHARACTERISTICS

Class	Electromechanical.
Characters	
alphabetic	A to Z.
numeric	0 to 9.
special	One character of any design is available.
Control Keys	Skip, trip, backspace, erase, carriage return, card carriage return, cancel, trip intermediate, card keys and space bar. The following functions can be performed by the control keys: A card column can be left blank. The carriage can be back-spaced one card column, returned to the left margin or to the intermediate margin stop, or to the preceding skip-stop. For correcting information before the card is punched, the set bar in the position of the carriage can be cleared, all set bars back to the margin stops can be cleared. Cards can be completely duplicated by the repeated depression of the "card" key, or by means of the "repeat switch" at 86 cards/minute.

PHYSICAL DATA

Height, 39½"; width, 40"; depth, 36"; weight, 324 lbs.

Power, AC or DC.

Heat dissipation, 60 BTU/hr.

COMMENTS

Original source document information can be punched in code into Remington Rand cards by means of the Types 306-2 or 306-3. By means of the "Punch Die" principle, i. e., the information is set up in the punch mechanism by the keyboard without any holes being punched in the card, information incorrectly keyed can be corrected before the punch operation. One depression of the trip key punches the entire card.

The Type 306-2 incorporates the verifying attachment. This attachment permits a second operator to insert already punched cards into the magazine, to repunch the same information into identical cards so that columns with correctly coded information

EQUIPMENT REPORT

have elongated punched holes and columns with errors in them have perfectly round holes representing the two different items of information. The Automatic Verifying Machine, Type 313, will detect these round holes as cards incorrectly punched.

The Type 306-3 in addition to incorporating the numbering attachment has a 5-digit card counter to register the quantity of cards stamped. The card counter is a standard feature of this model.

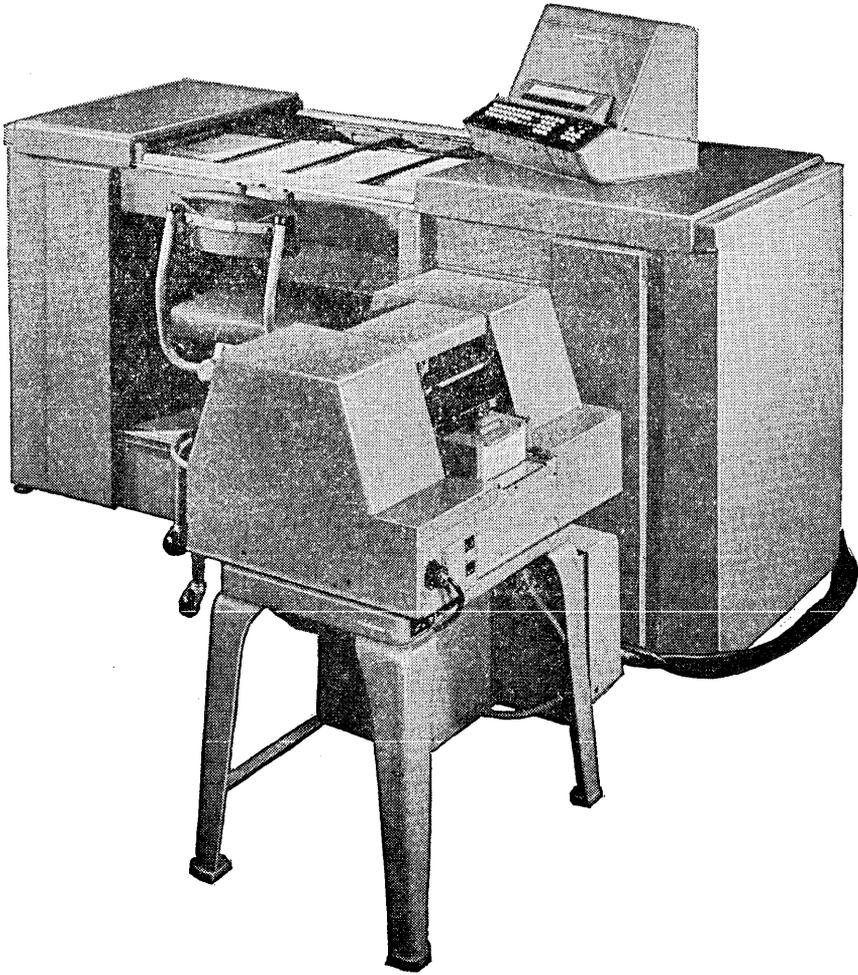
The card capacity of the card feeding magazine and the card receiver is 400 cards.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 308-6

Card-O-Matic Punch



August, 1956

REMINGTON RAND TYPE 308-6

Card-O-Matic Punch

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 308-6 consisting of two units, the sensing unit with keyboard and the automatic punch unit, is capable of reproducing in whole or in part, pre-punched Remington Rand cards. Variable information may be added to the cards by means of the keyboard. The units are connected by a 15-foot electrical cable.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 306-8	\$5,220	\$85

The above monthly rental is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases one-shift rental by 50%; 120-hour week, three-shift operation increases one-shift rental by 100%. Maintenance is included in rental. Maintenance contracts are available to purchasers.

PERFORMANCE

Duplicating Speed 86 cards/minute, maximum.

EQUIPMENT REPORT

PUNCHED CARD CHARACTERISTICS

Code	Alphabetic-numeric 3-hole code.
Characters alphabetic numerical special	A to Z (2 or 3 hole coded). 0 to 9 (1 or 2 hole coded). One character of any design is available.
No. of Columns	90 columns.
Punch Mode	Parallel by punch by character, serial by card. With the format set up and the information set up in the set bars by the keyboard, one depression of the trip punches the entire card.
Format control	Selection and rearrangement of information from a master card is controlled by a wiring panel. Up to six different fields from one master card may be selected for duplication on detail cards in a common field. The retract latches must be down for the columns where repeat information is to be punched in all cards.

SENSING UNIT CHARACTERISTICS

One master card is inserted into the sensing unit at a time and all positions punched are sensed simultaneously. Only those columns wired on the connection panel will duplicate. This duplication operation is on the basis of card column positions rather than punched codes.

With a starting key depressed, the duplicating operation will start at the first detail card column wired for duplicating. The individual master card columns are automatically read and set up the punching dies in the punch unit as the punch carriage spaces to the card column into which the information is to be punched. As information is duplicated into individual columns, the carriage moves to the next column. When a column is not wired for duplicating the carriage comes to rest so that variable information may be inserted.

REMINGTON RAND TYPE 308-6

KEYBOARD CHARACTERISTICS

Class	Electromechanical.
Characters alphabetic numerical special	A to Z. 0 to 9. One character of any design is available.
Control Keys	Skip, trip, backspace, erase, carriage return, card carriage return, cancel, trip intermediate, card key, field selector keys and space bar.

The following functions can be performed by the control keys:

A card column can be left blank. The carriage can be backspaced one card column, returned to the left margin or to the intermediate margin stop, or to the preceding skip-stop. For correcting information before the card is punched the set bar in the position of the carriage can be cleared; all set bars back to the margin stop can be cleared. Cards can be completely duplicated by the repeated depression of the 'card' key. Selector keys permit duplicating of any one of six fields. Skip-stops permit skipping of up to 7 columns at a time. A wider skip field requires more skip-stop settings. Marginal stops are provided for the left-hand margin and an intermediate margin.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Automatic Punch	39½"	40"	36"	436 lbs.
Sensing Unit	15"	19½"	14¾"	
Power	110 volts, 60 cps, 7.5 amps., AC.			
Heat Dissipation	negligible.			

COMMENTS

The Type 308-6 Card-O-Matic Punch has the same features of the Type 306 punches except:

1. The reading board, verifying attachment and visible card reading platform are not included.
2. A card sensing unit and connection panel have been added.

EQUIPMENT REPORT

3. The keyboard is combined with this sensing unit and has been removed from the punch. A set of field selector and control keys have been added to the keyboard-sensing unit combination.

These modifications make possible the selection, rearrangement and duplication of information contained in a master card into a detail card. At the same time variable information may be added to the detail card by use of the keyboard. The field selection keys and connection panel permit duplication of combinations of six fields of six columns each and six fields of two columns each. Selection of any one of these fields is accomplished by depressing one of six field selector keys which causes the sensing unit to read only the field selected. This selected information is punched in a common field of the duplicated card. The machine is controlled by the wiring panel. It is possible to punch columns 1 to 45 of the master card into any column 1 to 45 of the detail card and column 46 to 90 of the master card into any columns 46 to 90 of the detail card.

The card capacity of the card feeding magazine and the card receiver is 400 cards.

The Type 308-6 is also capable of performing many functions of the 306 model key punches. It can punch information from original source documents in Remington Rand punched cards. By means of the 'Punch Die' principle, i. e., the information is set up in the punch mechanism by the keyboard without any holes being punched in the card, information incorrectly keyed can be corrected before the punch operation. One depression of the trip key punches the entire card.

ADDITIONAL INFORMATION

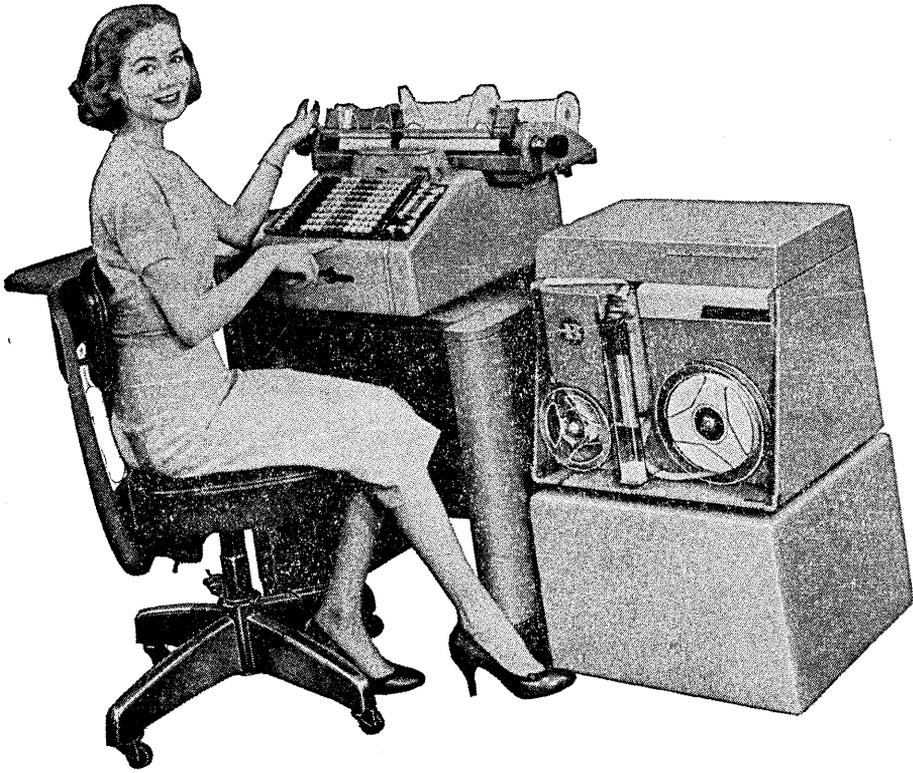
Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

BURROUGHS SENSIMATIC-TO-PUNCHED TAPE EQUIPMENT

1B 155.1—Page 1

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May 31, 1957—1



April, 1957

BURROUGHS SENSIMATIC-TO-PUNCHED TAPE EQUIPMENT

MANUFACTURER

Burroughs Corporation

BRIEF DESCRIPTION

The Sensimatic-to-Punched Tape equipment includes an accounting machine attached to a paper tape perforator. Some, all or none of the characters produced or emitted by the accounting machine may be punched into the paper tape. The resultant tape is chad punched and may be used for paper tape-to-punched card conversion, paper tape-to-magnetic tape conversion, transmission or computer input. 5, 6, 7 or 8-channel tape perforators are available.

APPROXIMATE COST

Sensimatic-to-Punched Tape Equipment \$3,613 and up.

PERFORMANCE

Prints and perforates at a maximum speed of 24 characters second.

EQUIPMENT REPORT

ACCOUNTING MACHINE CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type.
Characters numerical special	0 to 9. Up to 45 special transaction and date codes.
Control Keys	Skip, return carriage, selective program control (up to 4 different programs may be selected), add, minus, total, sub-total; and 9 printing format controls.
Format	8 characters/inch; 6 lines/inch, maxima. Writing line is 22" wide with standard 22" carriage.
Printing Medium paper ribbon	Up to 22" wide with standard 22" carriage. 1/2" wide; 13 yds. long. Red-black; two color.

The accounting machine may be disconnected from the tape perforator by means of a switch, or removed completely from the perforator.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5, 6, 7 or 8.
Format	Determined by punch format program selected.
Motion	Tape Feed Key, manually depressed, spaces between sections of work and feeds tape at the beginning and end of the reel. During automatic operation, depression of control keys or accounting machine causes tape motion.
Perforating Medium	1" wide paper tape. Reel holds 1000 ft. of tape.

BURROUGHS SENSIMATIC-TO-PUNCHED TAPE EQUIPMENT

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Burroughs Sensimatic Accounting Machine	12"	16"	20"	110 lbs.
Tape Perforator	16"	19½"	16½"	100 lbs.

ADDITIONAL INFORMATION

Write to: Burroughs Corporation
6071 Second Avenue
Detroit 32, Michigan



CLARY PRINT-PUNCH

1B 170.1—Page 1

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May 31, 1957 - 7

April, 1957

CLARY PRINT-PUNCH

MANUFACTURER

Clary Corporation

BRIEF DESCRIPTION

The Print-Punch consists of a paper tape punch connected to either an adding machine or a cash register. It is used to produce chad perforations in paper tape representing some or all of the numbers entered, processed or produced in the adding machine or cash register. The paper tape produced may be used for computer input, paper tape-to-punched card, paper tape-to-magnetic tape conversion or transmission. Either a 5, 6, 7 or 8-channel tape perforator can be provided.

APPROXIMATE COST

Paper tape Punch, Model 701	\$1,000
Adding Machine	\$500 to \$1,000
Cash Register	\$500 to \$1,000

PERFORMANCE

Prints and perforates at a maximum rate of 20 characters/second.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5, 6, 7 or 8.
Characters numerical special	0 to 9. - . ,
Format	Determined by end use (computer input, conversion or transmission).
Motion	Controlled by depression of Control Keys.
Perforating Medium	1" wide paper tape. Reel holds 500 or 1,000 feet of paper tape.

EQUIPMENT REPORT

ADDING MACHINE CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Characters numerical special	0 to 9. - , . T S etc.
Keyboard ten key full keyboard	8 or 10 digit capacity. 6 to 9 digit capacity, narrow. 10 to 12 digit capacity, wide.
Control Keys ten key full keyboard	Add, minus, sub-total, total, repeat add, repeat minus, non-add, correction and clear. Add (2), minus, sub-total, total (2), repeat add, repeat minus, non-add, clear.
Format	6 characters/inch; 6 lines/inch, maxima. Writing line is 1 $\frac{3}{4}$ " wide, using standard 2 $\frac{1}{2}$ " platen. Triple space after total and sub-total. One or two color printing; subtracted amounts print in red on deluxe and custom models; credit totals and sub-totals print in red on credit balance models.
Printing Medium paper ribbon	2 $\frac{1}{4}$ " wide; 220 ft. long. 1 $\frac{1}{2}$ " wide; 6 yds. long. Red-black, two-color; black, one color. Moves transversely to direction in which paper is fed.

CLARY PRINT-PUNCH

CASH REGISTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Characters numerical special	0 to 9. PO CH TX R/A NS \$. , etc.
Keyboard, full	8 digit capacity, listing. 9 digit capacity, totaling.
Control Keys	Total, sub-total, salesperson identification, department number, amount of sale, type of sale, tax, etc.
Format	6 characters/inch; 6 lines/inch, maxima. One color printing.
Printing Medium paper ribbon	2 $\frac{1}{4}$ " wide (receipts); 250 ft. long. 1 $\frac{1}{2}$ " wide; 18 ft. long. Moves transversely to direction in which paper is fed.
Special Features	Model 304.62 End of Day grand total; Validation of sales checks. Model 301.64 End of Day grand total; Itemizing and automatic customer total; Validation of sales checks; Printing receipts. Model 306.66 Cash and charge totals; Validation of sales checks; Printing receipts.

EQUIPMENT REPORT

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Adding Machine				
narrow	7"	9"	14"	20½ lbs.
wide	7"	11"	14"	23¾ lbs.
Cash Register,				
Model 301.64	10"	13"	19"	25 lbs.
Model 304.62	14"	13"	19"	25 lbs.
Model 306.66	14"	13"	19"	25 lbs.
Paper Tape Punch,				
Model 701	9"	12"	13"	30 lbs.

ADDITIONAL INFORMATION

Write to: Systems Division
Clary Corporation
San Gabriel, California

FRIDEN ADD-PUNCH

1B 180.1—Page 1

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May 31, 1957—13

April, 1957

FRIDEN ADD-PUNCH

MANUFACTURER

Friden Calculating Machine Co., Inc.

BRIEF DESCRIPTION

The Add-Punch is composed of an adding machine and an associated paper tape perforator. It is used to produce chad perforations in a 5, 6, 7, or 8-channel paper tape representing some or all of the numbers entered, processed or produced in the adding machine. The paper tape produced may be used for input to a computer, for punched card preparation via a tape-to-card converter, or for transmission.

APPROXIMATE COST

Add-Punch \$1,500 to \$2,500

PERFORMANCE

Prints and perforates at a maximum speed of 15 characters/second.

EQUIPMENT REPORT

ADDING MACHINE CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Keyboard, ten key	Up to 11 digit capacity.
Characters numerical special	0 to 9. Any 8 characters. The choice would be governed by end-use equipment.
Control keys	Total, sub-total, add, minus, clear keyboard, void (marks tape record).
Format	7 characters /inch (horizontal); 6 lines/inch, maximum. Writing line up to 15/8" wide using 29/32" wide adding machine tape; space after total and sub-total. Carriage: 2 1/2" wide. One or two color printing; subtracted items and negative totals appear in red.

PAPER TAPE CHARACTERISTICS

Recording Density	6 characters/inch.
No. of channels	5, 6, 7, or 8.
Control characters	Choice of 8, governed by end-use equipment.
Motion	Controlled by depression of control keys on the adding machine. Depression of a tape feed key will cause tape motion independent of the adding machine.
Perforating Medium	1 1/16, 7/8, 1" wide paper tape. Reel holds 1,000 feet of tape.

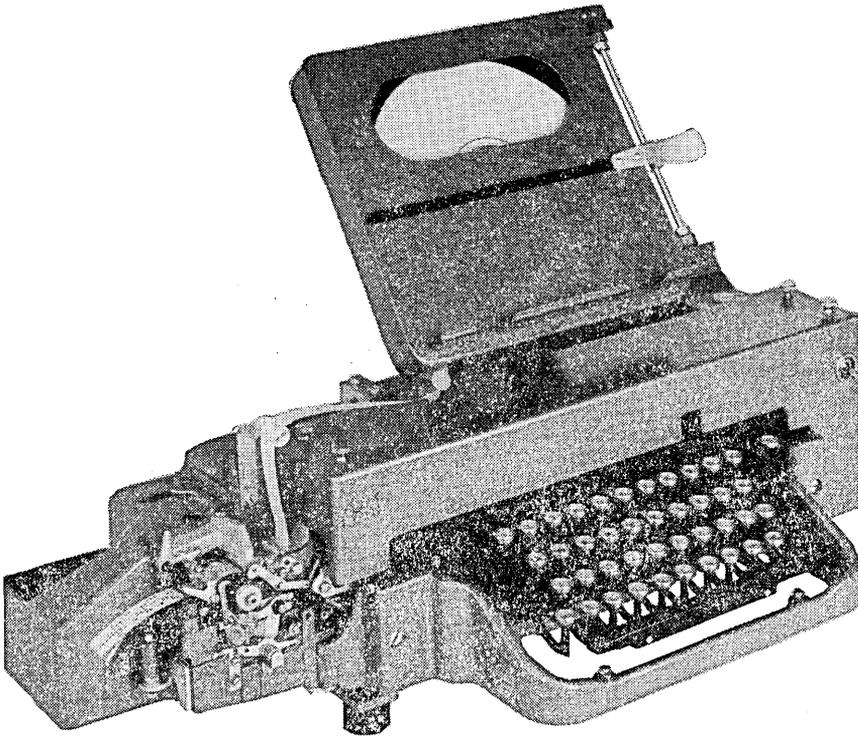
PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Add-Punch	10 1/2"	16"	20"	42 lbs.

ADDITIONAL INFORMATION

Write to: Friden Calculating Machine Co.
331 Madison Avenue
New York 17, N. Y.

CREED MODEL 7 P/N
Keyboard Perforator



1B 190.1—Page 2

October 5, 1956—8

July, 1956

CREED MODEL 7 P/N

Keyboard Perforator

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Model 7 P/N Perforator is capable of producing chad perforations in paper tape from manual keying operations. The information in the perforated tape is in the five-unit code.

APPROXIMATE COST

Model 7 P/N Keyboard Perforator, \$424.

PERFORMANCE

Perforates at a maximum speed of 14 characters/second.

KEYBOARD CHARACTERISTICS

Class	Mechanical
Characters	
alphabetic	A to Z
numerical	0 to 9
special	() , . - : ? / ' % @ + = Codes for telegraphic functions such as line feed, carriage return, letters-shift, etc. Special codings and keyboard layouts, as required, are available
Control Keys	Run-out, backspace, end-of-line indicator

EQUIPMENT REPORT

The control keys have the following functions:

The 'run-out' key provides for continuous punching of the last selected character. Each depression of the 'backspace' key moves the paper tape 1/10th of an inch backward so that the operator can correct a detected error.

In the preparation of perforated tape to be used for automatic transmission to a page printer receiver, the 'end-of-line' indicator lamp lights after fifty-five key depressions from the previous 'carriage return' key depression. This warning indicates to the operator to depress the 'carriage return' key.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Motion	Controlled by the depression of keys; moves $\frac{1}{10}$ th of an inch per character or code key depressed.
Perforating Medium	$\frac{1}{16}$ " wide paper tape. Reel holds 1,020 feet of tape.

PHYSICAL DATA

Height, 15 $\frac{1}{2}$ "; width, 22 $\frac{1}{4}$ "; depth, 13"; weight, 47 lbs.

ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation
22 Thames Street
New York 6, New York

- or -

Creed & Company Limited
Telegraph House
Croydon, England

CREED MODEL 80
Perforating Typewriter



July, 1956

CREED MODEL 80

Perforating Typewriter

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Perforating Typewriter is used to produce chad perforations in paper tape, and is capable of preparing typed copy at the same time. It consists of an Underwood typewriter fitted with a tape perforating attachment. The information in the perforated tape is in the five-unit code, but six-unit codings can be provided.

APPROXIMATE COST

Model 80 Perforating Typewriter, \$1,187.

PERFORMANCE

Prints and perforates at a maximum speed of 20 characters/second.

EQUIPMENT REPORT

TYPEWRITER CHARACTERISTICS

Class Printing Mode	Mechanical. Single Action Mechanical Decoding.
Characters alphabetic numerical special	A to Z 0 to 9; 1/2, 1/4, 3/4, 1/8, 3/8, 5/8, 7/8 Other fractions are available on special keyboard layouts. () % @ ? / ' , . - : \$ & # Telegraphic function codes. Special non-telegraphic codings can be provided.
Format	12 characters/inch; 6 lines/inch, maxima. Writing line is 10" wide with standard 11" carriage. Writing line is 14" with 15" carriage, at extra cost. Typed identical to the desired format on the paper tape.
Printing Medium paper ribbon	Up to 11 1/4" wide or 15 1/4" with 11" or 15" carriage respectively. Original and up to five carbon copies with pica or elite type style. Up to 11 copies with pica type only. <hr/> 1/2" wide; 10 yds. long. Red-black, two color. Moves transversely to direction in which paper is fed.

The typewriter may be disconnected from the tape perforating attachment by means of a switch, or removed completely from the perforating attachment. In either case, it can be used as a standard typewriter.

CREED MODEL 80

PAPER TAPE CHARACTERISTICS

Recording Density No. of Channels	10 characters/inch. 5 total, Baudot code.
Format	Letters and figures-shift codes precede alphabetic and numerical information respectively. A 'form bar in' key can put the perforator unit under control of a form bar that designates the pre-selected columns of printing that are to be perforated in the tape.
Motion	The feeding of the tape to be perforated simultaneously with the typing of copy, can be halted by a 'perforator out' key.
Perforating Medium	$1\frac{1}{16}$ " wide paper tape. Reel holds 1,020 feet of tape.

PHYSICAL DATA

Height, 12"; width, 22"; depth, 18"; weight, 88 lbs.

Power 100/125 or 200/250 volts, 50 or 60 cps, AC, 100 watts.

ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation

22 Thames Street

New York 6, New York

- or -

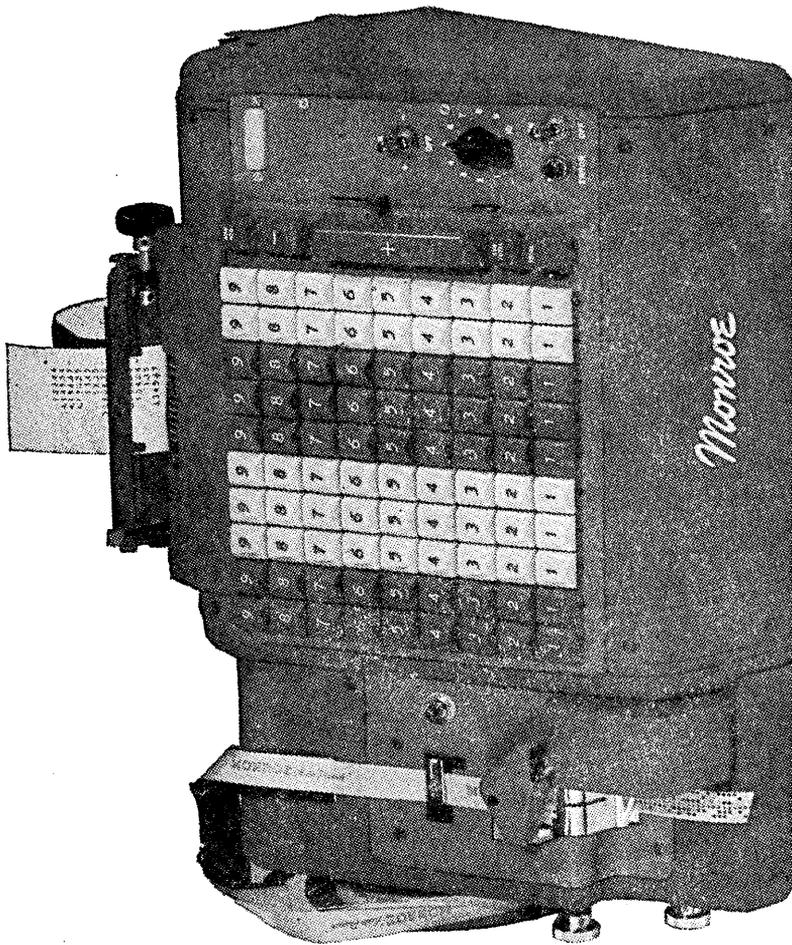
Creed & Company Limited

Telegraph House

Croydon, England

MONROE SYNCHRO-PUNCH

Adding Machine—Tape Punch



May, 1957

MONROE SYNCHRO-PUNCH

Adding Machine—Tape Punch

MANUFACTURER

Monroe Calculating Machine Company, Inc.

BRIEF DESCRIPTION

The Synchro-Punch consists of a paper tape perforator connected to an adding machine. The Punch produces chad perforations in paper tape representing some or all of the numbers which are entered, processed or produced in the adding machine. The punched paper tape may be used for computer input, paper tape-to-punched card conversions or transmissions. Either a 5, 6, 7 or 8-channel tape perforator can be provided.

APPROXIMATE COST

Synchro-Punch, adding machine with
tape perforator

\$1450

PERFORMANCE

Prints and perforates at a maximum speed of 20 characters/second.

EQUIPMENT REPORT

ADDING MACHINE CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type bars.
Keyboard, full	10 to 14 column capacity; Split keyboard optional.
Characters alphabetic numerical special	Optional. 0 to 9. \$ - . , T S etc.
Control Keys	Sub-total, total, add, minus, non-add, keyboard clear; automatic repeat from add, minus and non-add.
Format	8 characters/inch; 6 lines/inch, maxima. Writing line up to 1 $\frac{3}{4}$ " wide, using 4 $\frac{3}{4}$ " carriage (400 series); space after total and sub-total. One or two color printing (optional on 400 series); subtracted items and negative totals in red on the R models, other models have one color printing; two color printing standard on 200 series.
Printing Medium paper ribbon	Up to 12" wide, 13" platen. Up to 1 $\frac{1}{2}$ " wide, 10 yds. long. Red-black, two color; black, one color. Moves transversely in direction to which paper is fed.

The adding machine may be connected to a card punch for simultaneous operation.

MONROE SYNCHRO-PUNCH

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5, 6, 7 or 8.
Characters alphabetic numerical special	Optional. 0 to 9. \$ - . , T S etc.
Motion	Controlled by the depression of keys, moves $\frac{1}{10}$ " /key depressed.
Perforating Medium	1" wide paper tape. Reels hold 500 feet tape.
Variable Field Switch	May be manually set to select capacity of digits punching from operating bars.

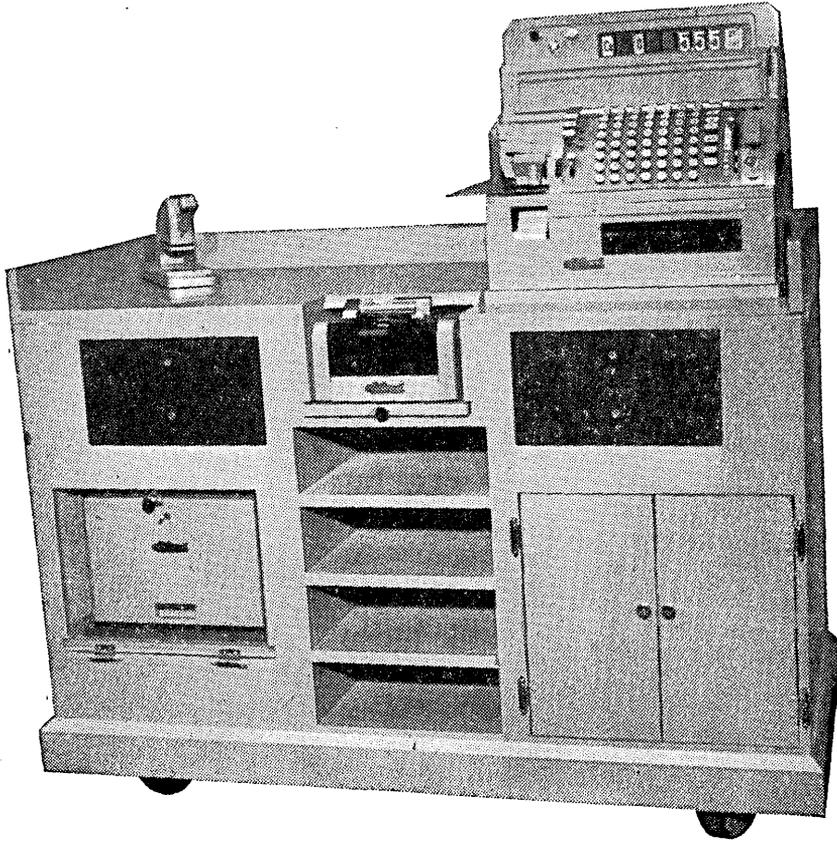
PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Synchro-Punch	8"	18"	11"	32 lbs.

ADDITIONAL INFORMATION

Write to: Monroe Calculating Machine Company, Inc.
555 Mitchel Street
Orange, New Jersey

NATIONAL SALES INPUT REGISTER
Point of Sale Recorder



April, 1957

NATIONAL SALES INPUT REGISTER

Point of Sale Recorder

MANUFACTURER

National Cash Register Company

BRIEF DESCRIPTION

The Sales Input Register consists of a cash register, a paper tape recorder and a media reader. The paper tape recorder produces chad perforations in paper tape representing some or all of the digits which are entered, processed or produced in both the cash register and the media reader. The media reader reads data from clerk tokens, customer tokens or merchandise tags. The cash register prints and validates the sales check.

The punched paper tape produced by the Sales Input Register may be used for computer input, paper tape-to-punched card conversion, paper tape-to-magnetic tape conversion or transmission. Either a 5, 6, 7 or 8-channel tape perforator can be provided.

APPROXIMATE COST

Paper Tape Recorder, Model 461-1	\$1,695
Media Reader, Model 421	1,495
Cash Register: Class 6000	not released
Class 21	not released
Wiring to correct components of system	1,110

PERFORMANCE

Prints, perforates and reads at maximum rate of 20 characters/second.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	11 characters/inch.
No. of channels	5, 6, 7 or 8.
Characters numerical special	0 to 9. End-of-frame, error correction, cash, charge, COD, etc.
Motion	Controlled by depression of control keys on the adding machine, cash register or ac- counting machine. Depression of tape control button causes tape motion independent of adding machine, cash register or accounting machine con- trol.
Perforating Medium	1" wide paper tape. Reel holds 500 ft. of tape.

MEDIA READER CHARACTERISTICS

Class	Electromechanical.
Code	Dennison; Kimball.
Characters alphabetic numerical special	Optional. 0 to 9. Optional: maximum of 5.
No. of Columns	31. Maximum of 30 columns for data; 1 column identifies the medium being read.
Media	Customer token, sales person token, 3 types of merchandise tags.
Reading Mode	Parallel by bit by character; serial by charac- ter by medium.

NATIONAL SALES INPUT REGISTER

CASH REGISTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Characters alphabetic numerical special	Optional. 0 to 9. \$ - . , etc.
Keyboard, full	4 to 13 digit capacity, listing. 4 to 14 digit capacity, totaling.
Control Keys	Total; sub-total; sales person identification; department number; amount of sale; type of sale, cash, charge, COD, cash send, etc. Depression of a type of sale key causes the automatic selection of a series of steps which the sales person must follow to effect the particular type of sale. These steps appear serially in the register.
Printing Medium paper	Up to 2½" wide for printed receipts.
Format	8 characters/inch; 6 lines/inch, maxima. Writing line up to 2" wide using 1½" wide copy. One color printing.
Special Features	Validates sales checks.

PHYSICAL DATA

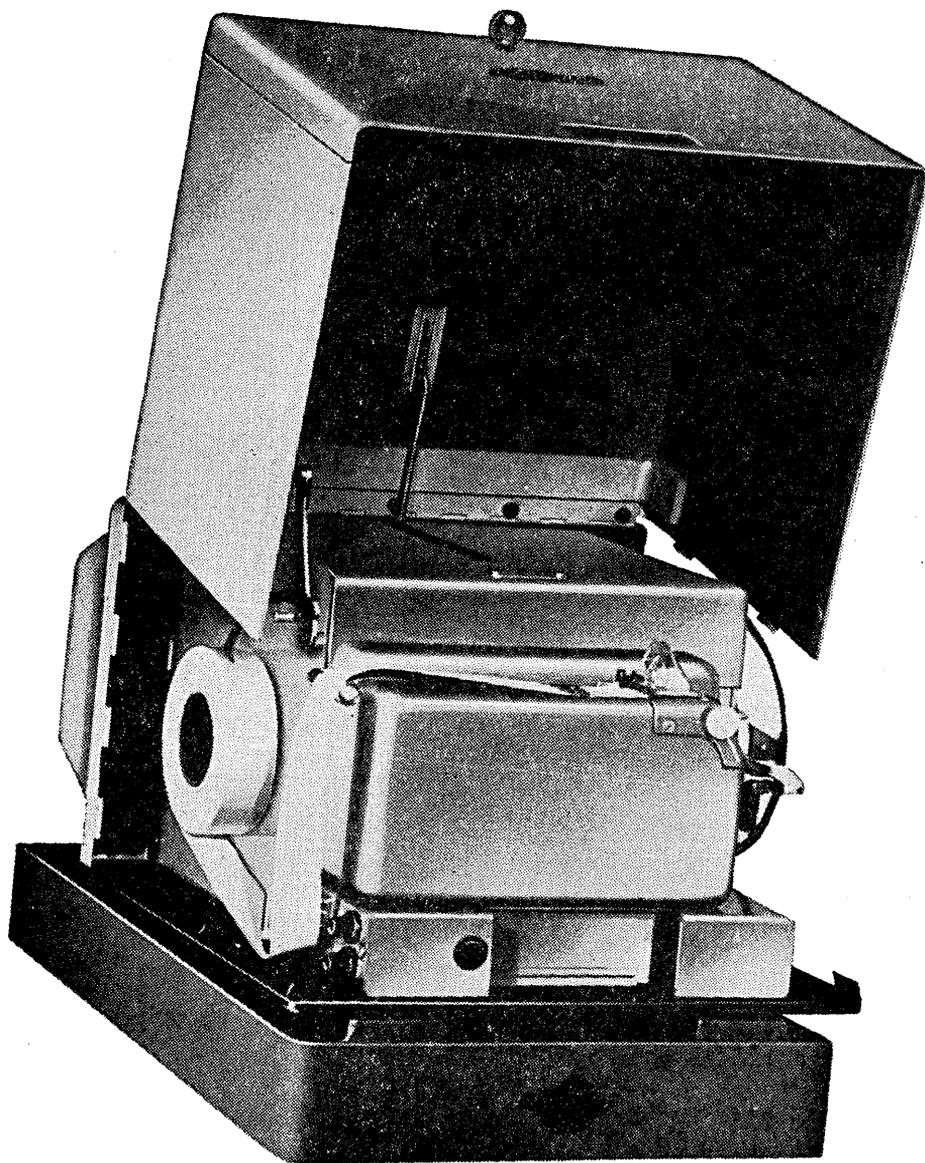
	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Paper Tape Recorder, Model 461	12"	12"	16"	35 lbs.
Media Reader, Model 421	8"	10"	15"	20 lbs.
Cash Register, *Class 6000	23⅛"	20⅜"	15⅞"	175 lbs.

* Single cash drawer.

ADDITIONAL INFORMATION

Write to: Manager, Department Store Division
National Cash Register Company
50 Rockefeller Plaza
New York 20, N. Y.

NATIONAL MODEL 461-2
Paper Tape Recorder



September 26, 1957—12

1B 540.2—Page 2

April, 1957

NATIONAL MODEL 461-2 Paper Tape Recorder

MANUFACTURER

National Cash Register Company

BRIEF DESCRIPTION

The Model 461-2 may be connected to an adding machine, cash register or accounting machine. This recorder produces chad perforations in paper tape representing some or all of the digits which are entered, processed or produced in the adding machine, cash register or accounting machine.

The punched paper tape may be used for computer input, paper tape-to-punched card conversion, paper tape-to-magnetic tape conversions or transmission. Either a 5, 6, 7 or 8-channel tape perforator can be provided.

APPROXIMATE COST

Model 461-2	\$1,695
Wiring to connect Model 461-2 to adding machine, cash register or accounting machine	395 to \$635

PERFORMANCE

Perforates at a maximum rate of 20 characters/second.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	11 characters/inch.
No. of Channels	5, 6, 7 or 8.
Characters numerical special	0 to 9. End-of-frame, error correction, cash, charge, COD, etc.
Motion	Controlled by depression of control keys on the adding machine, cash register or accounting machine. Depression of tape control button causes tape motion independent of adding machine, cash register or accounting machine control.
Perforating Medium	1" wide paper tape. Reel holds 500 ft. of tape.

ADDING MACHINE CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Keyboard, full	8 to 14 column capacity; split keyboard optional.
Characters alphabetic numerical special	Optional. 0 to 9. \$ - . , T S # & Date, etc.
Control Keys	Total (Simplex machine has one total key; duplex machine has two total keys), sub-total, add, minus, non-add, keyboard clear; automatic repeat from add, minus and non-add.
Printing Medium paper	Up to 12" wide; up to 15" platen.
Format	8 characters/inch, 6 lines/inch, maxima. Writing line up to 11" wide using 12" wide copy; space after total and sub-total. One or two color printing; subtracted items and negative totals in red.

NATIONAL MODEL 461-2

CASH REGISTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Line-at-a-time type wheels.
Characters alphabetic numeric special	Optional. 0 to 9. \$ - . , etc.
Keyboard, full	4 to 13 digit capacity, listing. 4 to 14 digit capacity, totaling.
Control Keys	Total, sub-total, sales person identification, department number, amount of sale, type of sale, cash, charge, COD, cash send, etc.
Printing Medium paper	Up to 2½" wide for printed receipts.
Format	8 characters/inch; 6 lines/inch, maxima. Writing line up to 2" wide using 2½" wide copy. One color printing.
Special Features	Validates sales checks.

PHYSICAL DATA

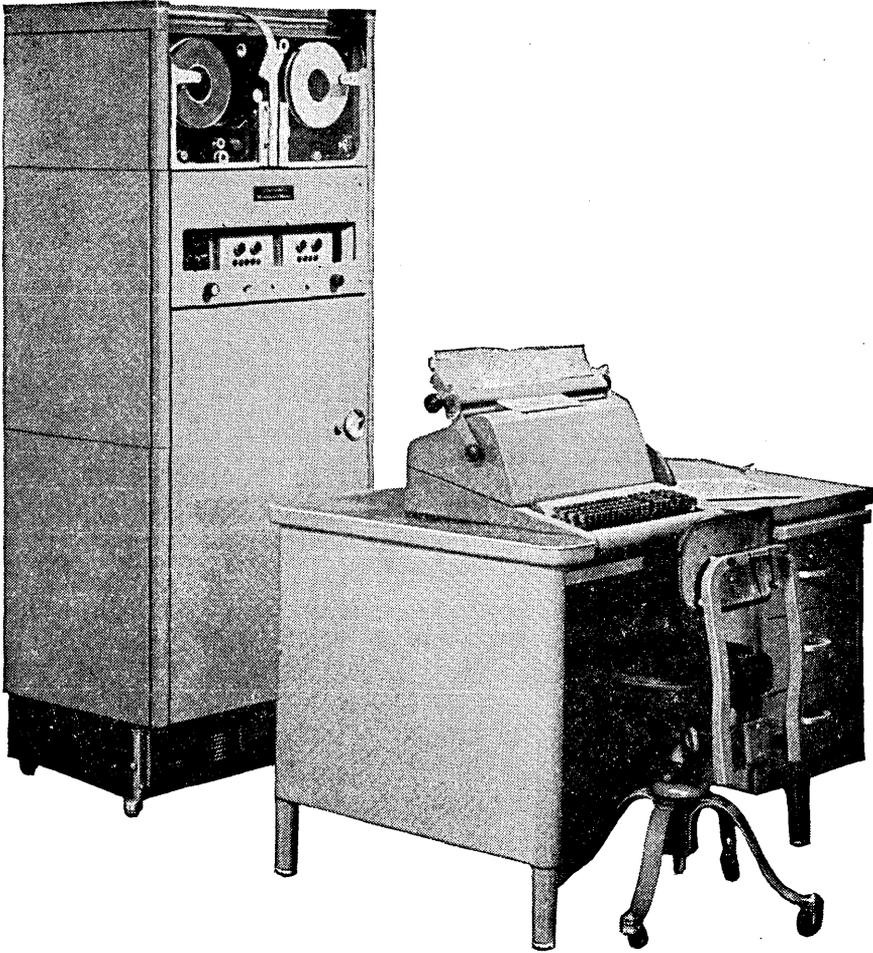
	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Model 461-2	12"	12"	16"	35 lbs.
Adding Machine	8"	16"	18"	25-40 lbs.
Cash Register*				

* There are several models of cash registers. Many of these have different dimensions.

ADDITIONAL INFORMATION

Write to: Manager, Accounting Machine Sales Division
National Cash Register Company
50 Rockefeller Plaza
New York 20, N. Y.

REMINGTON RAND UNITYPER I



1B 660.1—Page 2

June 1, 1956—2

April, 1956

UNITYPER I

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Unityper, composed of two units (the keyboard and tape recorder units), is capable of recording on magnetic tape the coded symbols for alphabetic, numerical and special characters used in the Univac system.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Unityper I with one loop control device	\$22,000	\$390
Additional loop control devices, each	1,500	30

The above rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental charge by 50%; 120-hour week, three-shift operation increases the single-shift rental charge by 100%. Monthly rentals for a Univac system include maintenance for the Unityper. A maintenance contract is available to purchasers of a Univac system.

PERFORMANCE

Records at a maximum speed of 15 characters/second.

EQUIPMENT REPORT

KEYBOARD CHARACTERISTICS

Class	Manually impulsed.
Encoding Mode	Electronic.
Characters	
alphabetic	A to Z.
numerical	0 to 9.
special	Not reported.

COMPONENTS OF THE UNITYPER I

<i>Designation</i>	<i>Function</i>
Keyboard Unit	Keys; converts manual keystroke to electrical pulse.
Tape Recorder	Converts electrical pulse to coded magnetic record. Tape characteristics: ADP Equip. Rpt. Ref. 4G 660.1, except for the following requirements: Recording density: 20 characters/inch. Format: 60 words/block at 12 characters/word; 2.4" gap between blocks of 720 characters.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Keyboard Unit	29"	45"	30"	200 lbs.
Tape Recorder	70½"	29"	21½"	650 lbs.
Power	110 volts, 60 cps, single-phase, 800 watts.			
Heat dissipation	2,500 BTU/hr.			

COMMENTS

The Unityper I is the basic means of recording information on tape for the Univac system. The Printing Unit of a Uni-printer may be used with the Unityper I to produce a typewritten copy of the information being recorded on magnetic tape. However, every keystroke, even a space or skip, will produce a typewritten character.

UNITYPER I

Control of the tape motion and of the Printing Unit is provided, through the use of five special keys: skip, backspace, erase, blanking and carriage return key.

Of special interest is the loop control device. One loop control device is supplied as standard equipment, and two more may be attached to each Unityper I. Through the use of punched paper loops it can:

1. Control recording of data in predetermined fields and permit only the correct number of characters to be entered in a field or item.
2. Fill in standard length item with arbitrary symbols when entries are of variable length.
3. Automatically record a combination of up to three symbols.

The three characters available for optional or fully automatic recording may be changed to any other three characters by re-wiring a plug-in unit.

ADDITIONAL INFORMATION

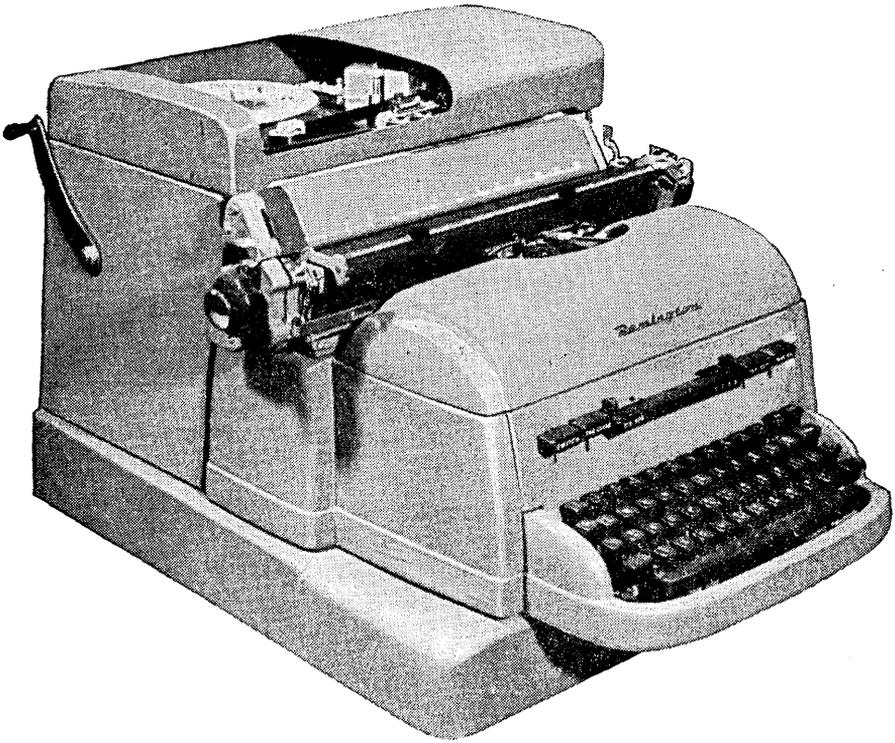
Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND UNITYPER II

1B 660.2—Page 1

Copyright, 1956, A.D.P. Co., Inc.

June 1, 1956—7



April, 1956

UNITYPER II

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Unityper II is composed of three units: a modified electric typewriter, tape unit and power supply which are assembled together. It is capable of recording on magnetic tape the coded symbols for alphabetic, numerical and special characters used in the Univac system and simultaneously producing a typewritten copy.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Unityper II	\$4,500	\$90

The above rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental charge by 50%; 120-hour week, three-shift operation increases the single-shift rental charge by 100%. Monthly rentals for a Univac system include maintenance for the Unityper. A maintenance contract is available to purchasers of a Univac system.

PERFORMANCE

Recording and printing at a maximum speed of 12 characters/second.

EQUIPMENT REPORT

TYPEWRITER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single action.
Characters	
alphabetic	A to Z.
numerical	0 to 9.
special	Not reported.
Format	12 characters/inch, 6 lines/ inch, 120 characters (one blockette)/line.
Printing Medium	
paper	Up to 11" wide.
ribbon	Moves transversely to the direction in which the paper is fed.

COMPONENTS OF THE UNITYPER II

<i>Designation</i>	<i>Function</i>
Remington Electric Typewriter	Produces pulse code and typewritten copy simultaneously from keyboard.
Tape Unit	Converts pulse code into magnetic recording. Tape characteristics: ADP Equip. Rpt. Ref. 4G 660.1, except for the following requirements: Length: 200 ft. Recording density: 50 characters/inch. Format: 10 words/blockette at 12 characters/word; 2.4" gap between groups of 120 characters.
Power Supply	Supplies voltages required for recording and erasing.

PHYSICAL DATA

Height, 14½"; width, 17"; depth, 24"; weight, 100 lbs.

Power 115 volts, 60 cps, single-phase, 75 watts.

Heat dissipation 250 BTU/hr.

UNITYPER II

COMMENTS

The Unityper II is the basic means of recording information on magnetic tape for the Univac system. It is a portable unit which requires the working space of a typewriter. Information is packed in blockettes of 120 characters. A block for the Univac system is usually made up of six blockettes.

The number of characters in the writing line is equal to the number of characters in the blockette. The recording head's position within a blockette can be ascertained by the position of the carriage.

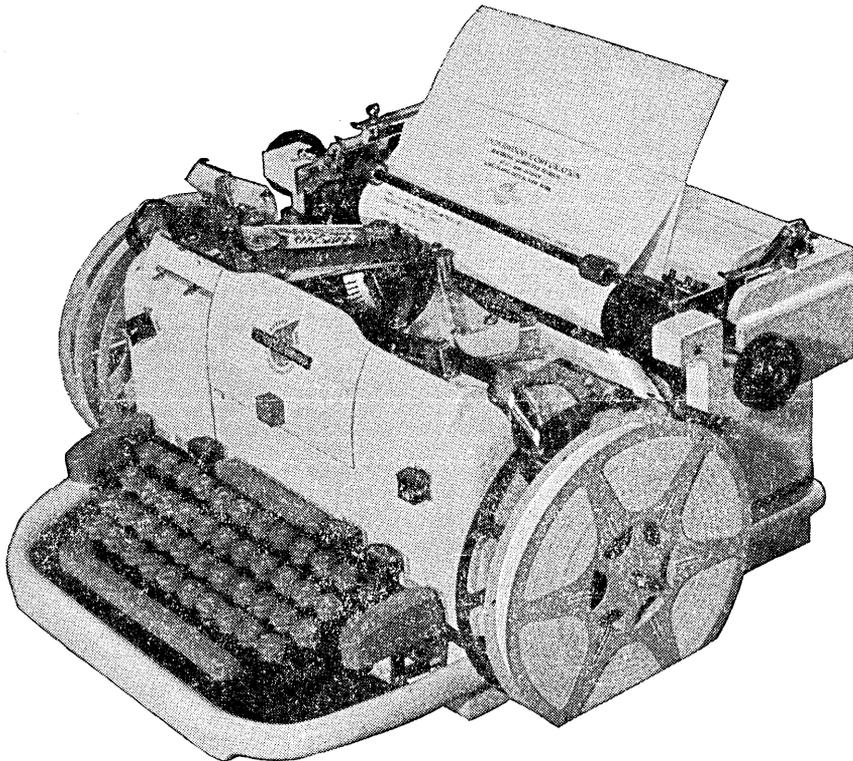
Control of typing and recording is obtained through:

1. The operating lever to load or rewind a reel of tape.
2. The fill selector switch to enter either zeroes or spaces to fill in the rest of a group of characters.
3. The backspace key and the erase key to return the carriage and to erase either one character or an entire line of characters respectively.
4. The fill key to tabulate the carriage and to advance and fill in tape for a corresponding distance with fill-in characters.
5. The trip key to advance the tape and carriage between blockettes and blocks.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

UNDERWOOD TAPETYPER



UNDERWOOD TAPETYPER

MANUFACTURER

Underwood Corporation

BRIEF DESCRIPTION

The Tapetyper is used to prepare a printed dot pattern on paper tape and is capable of typing hard copy at the same time.

APPROXIMATE COST

\$1,000 with standard carriage.

TYPEWRITER CHARACTERISTICS

Class	Mechanical.
Printing Mode	Single action; paper tape and hard copy printed by same type slug.
Characters alphabetic numeric special	A to Z. 0 to 9. . , and 4 optional characters.
Format	10 characters/inch; 6 lines/inch (max.); writing line 10" standard to 25" (max.); typed identical to the desired format on the paper tape.
Printing Medium paper ribbon	Up to 27 $\frac{1}{4}$ " wide (max.); original copy only. $\frac{3}{4}$ " wide; one-time carbon paper; moves transversely to the direction in which the paper is fed.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	20 characters/inch.
No. of Channels	6 total, 4 digit, 2 zone; other codes available at additional cost.
Format	Determined by computer input desired. There will be end-of-word characters. For visual checking, a miniature character is also printed above the dot pattern that represents this character.
Motion	Disengagement on carriage return and tabulation; tape backspaces with carriage (a backspace and a striking of an "erase" key permits correction of error in the last type-written character); moves transversely to the direction in which the paper is fed.
Reel Capacity	1200 ft. of tape.

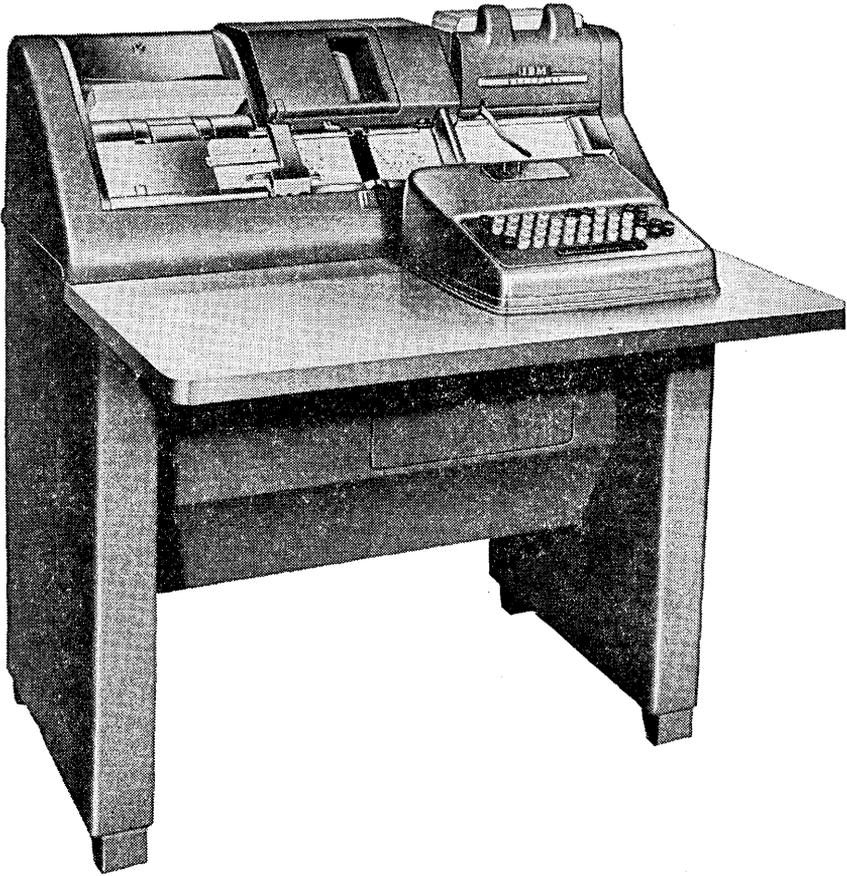
PHYSICAL DATA

Height, 10 $\frac{3}{8}$ "; width, 17 $\frac{3}{8}$ "; depth, 16 $\frac{1}{8}$ "; weight, 65 lbs.

ADDITIONAL INFORMATION

Write to: Electronic Computer Division
Underwood Corporation
35-10 36th Avenue
Long Island City 6, N. Y.

IBM 056
Card Verifier



May, 1956

IBM 056 Card Verifier

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The 056 Card Verifier is capable of checking the accuracy of the numerical, alphabetic or special character information punched in IBM cards. It is similar in design to the IBM 024 and 026 Card Punches with the punching mechanism replaced by sensing pins. The original data is manually rekeyed over the previously punched cards, and any discrepancy between the two key punching operations is detected. Error cards can be corrected at the point of detection, or in another operation. Automatic verification of duplicated card field information and automatic skipping of card columns are possible.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 056	
Numerical	\$35.00
Numerical and Alphabetic	45.00
Auxiliary Verification Device	5.00
Alternate Program Unit	2.50

Two-shift operation increases the single-shift monthly charge by 50%; three-shift operation increases the single-shift monthly charge by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

60 cards/minute, approximate feeding speed.
20 columns/second, verification speed of duplicated fields.
80 columns/second, skipping speed.

KEYBOARD CHARACTERISTICS

Class	Electromechanical
Characters	
alphabetic	A to Z (Alphabetic Keyboard).
numerical	0 to 9 (Alphabetic or Numerical Keyboard).
special	— & / # @ , % \$ * . □ (Alphabetic Keyboard).
Control Keys	Skip, feed, numerical shift, alphabetic shift, verify duplication, release, card register and space bar. The auxiliary verify and alternate program keys are supplied with a machine with these optional features.

The following functions can be performed by the control keys:

Cards can be fed one at a time. Except for those card columns programmed for verification on the program card, cards can be released without verification. Skipping of a field can be accomplished by the depression of the skip key. Any card field with the same information in consecutive cards can be verified by the verify duplication key.

FUNCTIONAL CHARACTERISTICS

The card hopper and card stacker each hold approximately 500 cards.

<i>Feature</i>	<i>Function</i>
Program Unit	Controls automatic skipping, automatic duplicate information verification, changing from numerical to alphabetic shift and vice versa.
Control Switches	Cards can be fed automatically. Another switch makes effective the punching in the program card for automatic skipping and verification.
Auxiliary Verification (optional)	A comparison is made with a master card rather than the card at the reading station. The master card is fastened around an auxiliary drum.
Alternate Program Unit (optional)	Cards can be verified under either of two programs. The transfer between the two programs is controlled by the depression of an alternate program key.

PHYSICAL DATA

Height, 39"; width, 28"; depth, 31"; weight, 222 lbs.

Power 115/230 volts, 60 cps, single-phase, 2.9/1.6 amps.

Heat Dissipation 950 BTU/hr.

COMMENTS

On the 056 Card Verifier, IBM punched cards are verified manually for some columns and automatically for the card fields with the same information in consecutive cards. When a card is verified as correct a notch is cut in the right end of the card.

At the time an error is detected, an error light turns on and the keyboard becomes inoperative. Three more attempts at the verification of the character is possible. If the character is verified in one of these attempts, card verification can continue in the next column. If it is incorrect, the column is error-notched. The card can be corrected at this time, or all the error cards can be corrected in another operation.

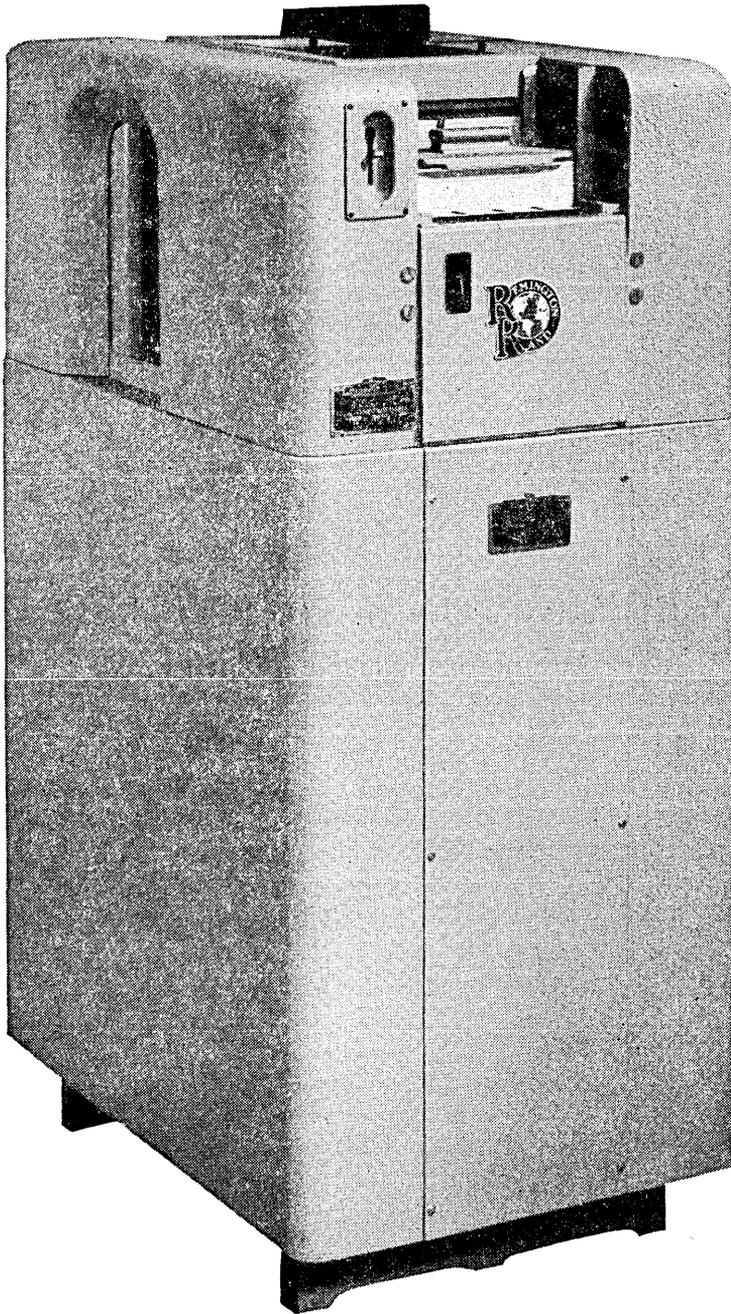
EQUIPMENT REPORT

The optional features of the verifier add flexibility to the operation. When common information is to be verified for some cards and not for others, the auxiliary verification feature is used. The common information is compared and verified with the information on a master card on the auxiliary drum. The alternate program unit feature is used when an occasional card requires a different verification program control. The card may be of a different design or may be a partially prepunched master.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND TYPE 313
Automatic Verifying Machine



REMINGTON RAND TYPE 313

Automatic Verifying Machine

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 313 Automatic Verifying Machine is used in conjunction with card punches having the verifying attachment. Cards which have been verify-punched are processed by the machine and an error-indicating card is automatically placed behind each card that is incorrectly punched. Circular punched holes in a card are incorrectly punched information; elongated punched holes are correctly punched information.

APPROXIMATE COST

	<i>Approximate Purchase Cost</i>	<i>Approximate Monthly Rental</i>
Automatic Verifying Machine	\$4,168	\$60

Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%. Maintenance is included in the rental charge. Maintenance contracts may be obtained with purchase orders.

EQUIPMENT REPORT

PERFORMANCE

Processes 200 90-column cards/minute.

FUNCTIONAL CHARACTERISTICS

There are two card feeding magazines, one for detail cards holding 600 cards and one for error indicating cards holding 400 cards. The card receiver holds 400 cards.

<i>Feature</i>	<i>Function</i>
Stopping	Automatic stop when either feeding magazine is empty, when receiver is full or when a card fails to feed.
Column Lock-Out Controls	Prevents sensing in any columns desired.

PHYSICAL DATA

Height, 42"; width, 17½"; depth, 24½"; weight, 264 lbs.

Power, 110 volts, 60 cps, 8 amperes.

Heat dissipation, 559 BTU/hr.

ADDITIONAL INFORMATION

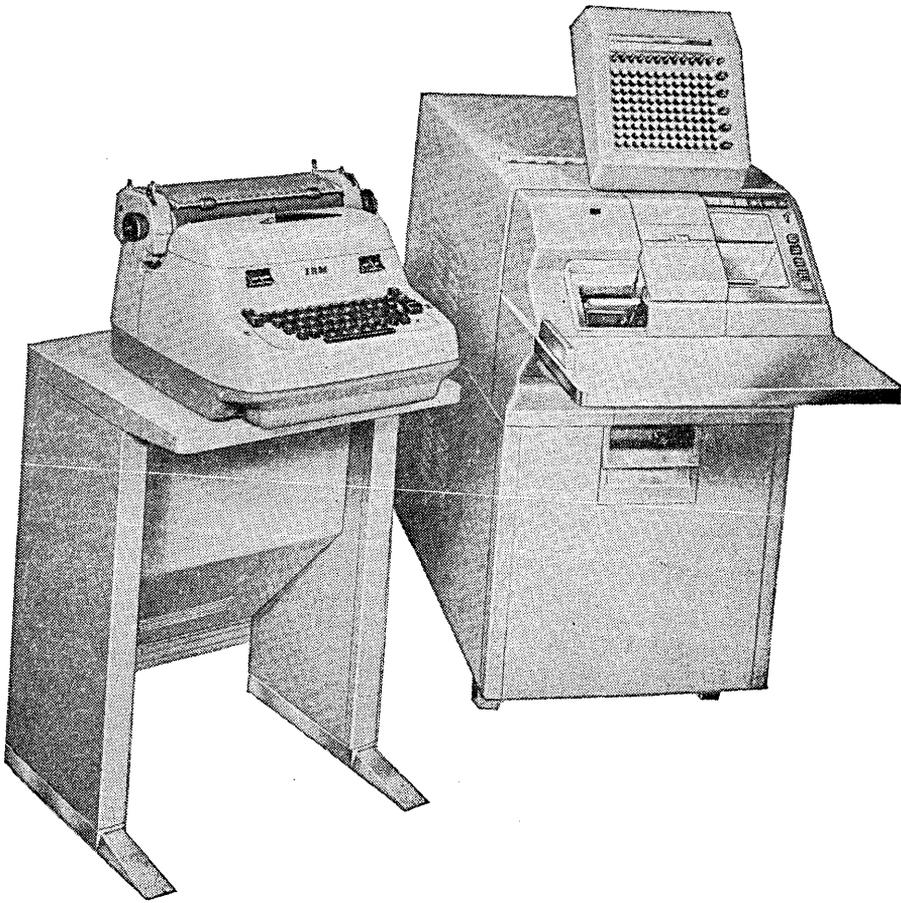
Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

IBM TYPE 858 CARDATYPE
Accounting Machine

ID 380.1—Page 1

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4-56-15



IBM TYPE 858 CARDATYPE

Accounting Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The basic Cardatype consists of three units: the control unit with the card reader, one typewriter, and an auxiliary 12-position keyboard. It is capable of preparing typewritten hard copy from the information on IBM punched cards, and from supplemented information by manual typing and/or keying operations.

When equipped with a full complement of optional features, the Cardatype consists of many units: the three units mentioned above, an arithmetic unit, an additional 12-position keyboard, three additional slave typewriters, and a 5 or 8-channel paper tape punch or a card punch. With all these added features, the Cardatype is capable of accumulating totals, subtraction, multiplication and crossfooting; is capable of simultaneously typing as many as four separate documents; is capable of preparing an IBM punched card or punched paper tape with selected information.

EQUIPMENT REPORT

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Basic Cardatype consisting of the control unit, including main operating controls, 120 program steps, and the card reader; one single-case typewriter and one 12-position auxiliary keyboard	\$250
120 additional program steps	15
Additional auxiliary keyboard, Type 972	20
Re-read feature for card reader	10
Automatic start feature for card reader	5
Transmitting feature for typewriter in basic 858 (transmitting typewriter is Type 868)	20
Additional slave typewriters, Type 866, each (3 additional, maximum)	35
Double-case type for non-transmitting typewriter, each	5
Two-color feature, any typewriter, each	5
*Card punch, non-printing, Type 534	55
*Card punch, printing, Type 536	75
*8-channel tape punch, Type 961	25
*5-channel tape punch, Type 962	50
Arithmetic unit, Type 863	
without multiplication	70
with multiplication	95

* A choice of a card punch or a tape punch is available as optional equipment. Neither one may be substituted for the other after installation.

In addition to the above features, additional selectors and distributors are available at extra cost.

The single-shift rental cost of a working Cardatype may range from \$250 per month for the basic machine to \$700 per month for a machine with all of the optional features. Two-shift operation increases single-shift costs by 50%; three-shift operation increases single-shift costs by 100%. Maintenance is provided by the manufacturer as part of the rental agreement.

IBM TYPE 858 CARDATYPE

PERFORMANCE

The Cardatype reads cards, typewrites and punches cards or paper tapes at a speed of 10 alphabetic, numerical or special characters per second.

The speeds of operation of the arithmetic unit are as follows: add, .4 to .6 seconds; multiply, 1.7 to 2.75 seconds; transfer, .4 to .6 seconds; compare, approximately .4 to .6 seconds.

CONTROL UNIT (WITH CARD READER) CHARACTERISTICS

Control Unit Panel	Wiring on the control panel controls each of the Cardatype units: its card reader, the typewriters, the paper tape punches, and the arithmetic unit. Its control features are mentioned under each of the units.
Card Reader	
Class	Electromechanical.
Reading Mode	Parallel by punch, serial by character by card.
Characters	
alphabetic	A to Z.
numeric	0 to 9.
special	\$ & . , - / * # @ % □
Format Controls	The control unit controls the card readings: all or part of the card; singly or up to 200 cards with automatic feeding. The optional re-read feature permits repetitive reading of all or part of a card, controlled by the control panel wiring. The optional automatic start feature is an electronic photocell device that will automatically feed a card placed in the card reader feed and position the card at the brush read station. The device makes feeding of single cards a more efficient operation by eliminating manual depression of the start key.

EQUIPMENT REPORT

TYPEWRITER CHARACTERISTICS

Class	Electromechanical.
Printing Mechanism	Single-action mechanical decoding.
Characters	
alphabetic	A to Z standard; a to z optional for non-transmitting typewriters, Type 866.
numeric	0 to 9.
special	\$ & . , - / * #
Format	10 characters/inch (standard), 6 lines/inch (any type-face for standard IBM typewriters is available). Format controlled by control unit panel wiring. All typewriters in the system are separately controlled by the control panel wiring and each may prepare documents differing in size and content.
Printing Medium	
paper	Maximum of 19" wide with a 20" carriage. 12" carriage standard; 16" and 20" are available. Original plus 9 carbon copies possible. Friction platen is standard; pin-feed platens are available.
ribbon	$\frac{9}{16}$ " wide, cloth; moves transversely to the direction of the paper's movement. Two color typing feature is optional.

The typewriters may not be disconnected from the system and used independently as standard electric typewriters.

IBM TYPE 858 CARDATYPE

CARD PUNCH CHARACTERISTICS

Class	Electromechanical.
Punching Mode	Parallel by punch; serial by character, by card.
Characters	
alphabetic	A to Z.
numeric	0 to 9.
special	\$ & . , - / * # @ % □
Format	An alternate program device permits selective punching of two different card forms for a given problem. The selective punching is controlled by the control unit panel wiring.

The Type 536 card punch can simultaneously punch a character in a card column and print that character at the top of the card.

TAPE PUNCH CHARACTERISTICS

Class	Electromechanical.															
Punching Mode	Parallel by punch; serial by character, by word.															
Characters																
alphabetic	A to Z.															
numeric	0 to 9.															
special	\$ & . , - / * # % □ Plus several function codes for control of converters and other equipment.															
Format	10 columns/inch; one character/column.															
	<table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th><i>Total</i></th> <th><i>Digit</i></th> <th><i>Zone</i></th> <th><i>Other</i></th> </tr> </thead> <tbody> <tr> <td>8-channel</td> <td style="text-align: center;">8</td> <td style="text-align: center;">4</td> <td style="text-align: center;">2</td> <td style="text-align: center;">2</td> </tr> <tr> <td>5-channel</td> <td style="text-align: center;">5</td> <td colspan="3" style="text-align: center;">teletype code</td> </tr> </tbody> </table>		<i>Total</i>	<i>Digit</i>	<i>Zone</i>	<i>Other</i>	8-channel	8	4	2	2	5-channel	5	teletype code		
	<i>Total</i>	<i>Digit</i>	<i>Zone</i>	<i>Other</i>												
8-channel	8	4	2	2												
5-channel	5	teletype code														
	Selective punching is controlled by the control unit panel wiring.															
Punching Medium	Paper tape, 1" wide, 1000' long on an 8"-diameter reel.															

EQUIPMENT REPORT

ARITHMETIC UNIT CHARACTERISTICS

Arithmetic Mode	Serial.
Notation	Decimal.
Negative Representation	Nine's complement.
Zero Representation	999...99.

Automatic conversion from complement to absolute value and negative sign on readout for punching or typing.

The arithmetic unit consists of one 6 or 10-position storage and from two to four 10-position net-balance counters. The counters may be used as storage or as accumulators under control of the control unit.

When multiplying, the multiplier must be taken from the basic auxiliary keyboard, the storage or a counter; the multiplicand must be in the storage unit or another counter; the product must be stored in a counter. The limitations on the size of the factors are: first, the multiplier must have from one to five digits; and second, the product can have no more than 10 positions.

Tests for positive or negative conditions of each counter, rounding, and shifts up to five positions in either direction may be used by wiring of the control panel. Multiplication can continue during card reading.

PHYSICAL DATA

<i>Designation</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Control Unit w/Card Reader	35"	19"	49"	422 lbs.
Typewriter w/Stand	37"	21"	19"	107 lbs.
Card Punch, Type 534	39"	28"	31"	206 lbs.
Card Punch, Type 536	39"	28"	31"	211 lbs.
Tape Punch, Type 961	9 ¹ / ₄ "	11"	14 ¹ / ₂ "	40 lbs.
Arithmetic Unit	22 ³ / ₄ "	17 ¹ / ₂ "	29 ¹ / ₂ "	204 lbs.
	<i>Power Supply</i>		<i>Heat Dissipation</i>	
*Cardatype	115 v, 60 cps, 10 amperes, AC required		1498 BTU/hr.	
Card Punch, 534	115 v, 60 cps, 2.5 amperes		582 BTU/hr.	
Card Punch, 536	115 v, 60 cps, 2.7 amperes		625 BTU/hr.	

* Includes one 863, four 866s or 868s, one 961, and two 972s.

IBM TYPE 858 CARDATYPE

COMMENTS

The Cardatype Accounting Machine's primary function is to reduce the number of manual operations in the preparation of documents. With repetitive data automatically typed from IBM punched cards and with only variable data manually typed and/or keyed in the auxiliary keyboard, the number of manual operations is reduced in the preparation of typed documents. With the addition of three slave typewriters, as many as four separate documents can be typed simultaneously or selectively; the information on the four documents need not be the same, and may be typed in upper and lower case letters and/or two colors.

The machine operates at a typing speed of 10 characters per second. However, the actual number of characters typed in a second depends on the number of operations such as tabulations, stops, skips and carriage returns that may be necessary. Also, the punched cards are read serially one column at a time at the rate of 10 characters per second. As is true with the typing speed, this does not necessarily mean 10 characters are read every second.

The Cardatype's secondary function is to record the information in such a way that re-transcriptions are eliminated. By the use of four typewriters, additional document transcription from the original data seems improbable. By further adding a card punch or tape punch unit, it is possible to put the original data in a form for further data processing. The card or tape need only to have selected information punched on it and need not be the same information as on any of the four typewritten documents. However, typing and punching can occur simultaneously in serial fashion at the rate of 10 characters per second.

The Cardatype with the arithmetic unit has the added ability to accumulate totals, subtract, multiply and crossfoot. The quantities obtained from these arithmetic operations may be typed on any or all of the typewritten documents, and/or punched in a summary card or paper tape. Thus, one person can prepare final documents and other media for further processing, with all entries—unit cost extensions, gross and net balances due.

All of these functional operations are directed from a control panel wired with all instructions for the Cardatype to

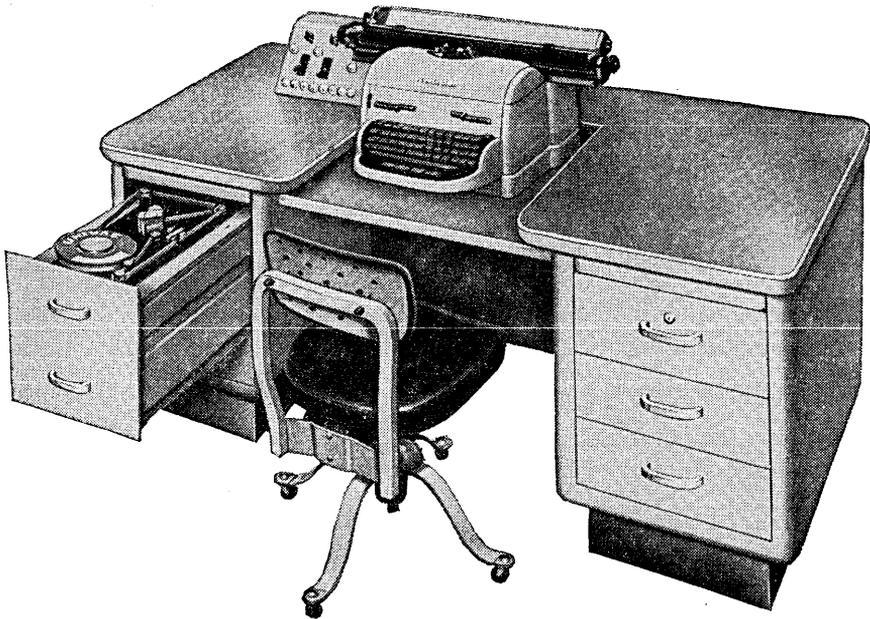
EQUIPMENT REPORT

follow. These panels are readily changed to meet the specific requirements of different applications.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

**REMINGTON RAND
UNIVAC TAPE VERIFIER**



April, 1956

UNIVAC TAPE VERIFIER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Univac Tape Verifier consisting of a typewriter unit with coding circuitry, a tape transfer unit, a power supply unit, and electronic circuitry, is completely housed in a desk. The Verifier is capable of recording information on magnetic tape from a manually operated keyboard; of preparing type-written copy from recorded information on magnetic tape; or of comparing the information on a magnetic tape with original source information typed on a keyboard, permitting the operator to correct detected errors. The information on the tape is recorded in a code, packed and in a fixed block length as used in the Univac computer system.

APPROXIMATE COST

Univac Tape Verifier

Approximate Cost
Purchase Mo. Rental

Cost figures not currently available

PERFORMANCE

Manual keying
Printing and verification
Skipping during verification

Characters/Second

12, maximum

10

80

EQUIPMENT REPORT

TYPEWRITER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single action, electronic decoding.
Characters	
alphabetic	A to Z.
numerical	0 to 9.
special	. ,
Format	10 characters/inch, 120 characters/line, 6 lines/inch (maxima). Determined by the application of equipment, i. e., recording, printing or verifying. Any format desired for hard copy printing may be obtained by appropriate coding on tape.
Printing Medium	
paper	Up to 11" wide; original and up to 4 carbon copies.
ribbon	1/2" wide; moves transversely to the direction in which paper is fed.

TAPE CHARACTERISTICS

Length	200 feet in reel of 6" in diameter.
Recording Density	50 characters/inch.
No. of Channels	8 (6 information, 1 redundancy check, 1 sprocket).
Record or Copy Mode	Serial by character by word, parallel by bit.
Tape Format	12 characters/word, 10 words/blockette, with 2.4" gap between groups of 120 characters and blocks of 720 characters.

UNIVAC TAPE VERIFIER

FUNCTIONAL CHARACTERISTICS

Preparation of Magnetic Tape from the Keyboard

This is called the record cycle when hard copy is produced at the same time that information is recorded on the tape.

	<i>Function</i>
Trip Key	After 120 characters have been entered on the keyboard, a depression of this key causes the typewriter carriage to return, and the tape to advance 2.4" for the space between blockettes.
Fill Key	With tab stops previously set, a depression of this key causes the typewriter carriage to move to the next tab stop, and fills the tape with as many zeros or spaces as the typewriter characters to the tab stop. A selector switch, manually set, determines what the fill-in symbols (space or zero) on the tape will be.
Backspace Key	Moves the tape and carriage back one space at a time to permit correction of information on the tape.
Carriage Return Key	Returns the carriage, advances the paper, moves the tape backward to the beginning of blockette and erases information recorded in that blockette.

Preparation of Typewritten Copy from Magnetic Tape

This is called the print cycle. There are two modes of printing: one, the format is determined by the instructions (tabulate, carriage return, etc.) on the tape; or two, the printing symbols for these special instructions are typed as well as the information on the tape, with an automatic carriage return at the right margin.

EQUIPMENT REPORT

Verification of Information Recorded on Magnetic Tape

This is called the verify cycle when source of information is keyed to compare with the information recorded on the magnetic tape, to permit the operator to correct detected errors. During this cycle, each blockette is checked for 120 characters.

	<i>Function</i>
Hard Copy Printing	Verified characters appear in red; characters not verified or corrected characters appear in black.
Fill Key	With the tab stops set, permits skipping past insignificant material without printing or verifying.
Backspace Key	Moves the tape and carriage back one space at a time to permit correction of information on the tape.
Carriage Return Key	Returns the carriage and tape to the beginning of the blockette, but does not erase the tape.
Trip Key	Returns the carriage and advances the tape.

PHYSICAL DATA

Height, width, depth and weight were not reported.

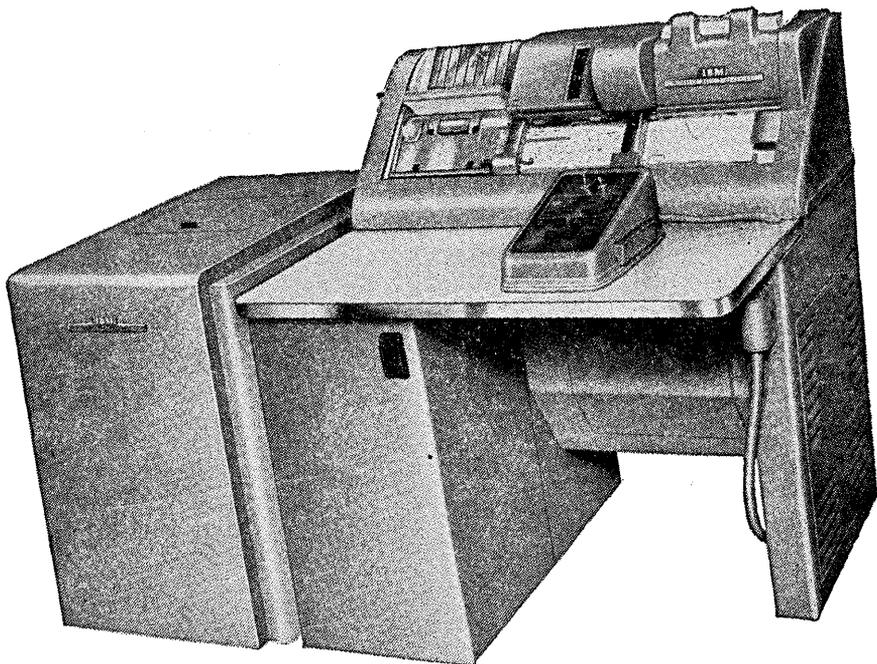
Power 115 volts, 60 cps, single-phase, 1 kva.

Heat dissipation, not reported.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

IBM DATA TRANSCEIVER



2A 380.1—Page 2

June 29, 1956—8

April, 1956

IBM DATA TRANSCIVER

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Data Transceiver consists of two units, the IBM 65 or 66 card punch unit and the 67 or 68 signal unit. It makes possible the transmission over wires and circuits of information read from an IBM punched card, and the preparation of another IBM punched card with this information.

Two Data Transceivers are necessary, one to read the card data to be transmitted and the other to punch the data into a card at the receiving point. Either machine is capable of transmitting or receiving. The IBM 66 card punch unit differs from the 65 in that it is capable of simultaneously printing the information that is being punched in the card.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 65, card unit	\$ 90
IBM 66, card unit	110
IBM 67 Telegraph signal unit	85
IBM 68 Telephone signal unit	85

Two-shift operation increases single-shift rental by 50%; three-shift operation increases single-shift rental by 100%. Maintenance is included in the rental charge. There is a single use charge of \$30 to alter the speed selector setting on the telegraph signal unit; and a single use charge of \$100 for the installation of a telephone channel selector.

In addition to the rentals listed, the total cost will include rentals for the telegraph and telephone lines or microwave and short-distance radio circuits leased for transmission.

EQUIPMENT REPORT

PERFORMANCE

IBM 67 Telegraph Signal Unit:

Only one transmission per telegraph line is possible at one time.

	<i>Words/Minute Transmitted</i>	<i>Approximate Cards/Minute</i>
IBM 65 or 66	60, 75, or 100	3, 4, or 5

Transmission of 60, 75 or 100 words/minute (assuming an average word is five characters and a space) can be obtained, by the use of the IBM 67, on microwave or long-distance radio circuits whose characteristics are at least equal to the land-leased telegraph circuits.

IBM 68 Telephone Signal Unit:

The following speeds are based on the use of two data transceivers. Actually, up to four independent transmissions are possible simultaneously over the same telephone line. With four pairs of transceivers and one telephone line, the number of cards punched would be four times as many.

<i>IBM 65</i>	<i>IBM 66</i>
16 card columns/second	14 card columns/second
11, 80-column fully punched cards/minute	10, 80-column fully punched cards/minute

Transmission at approximately ten or eleven cards per minute can be obtained by the use of the telephone signal unit on microwave and short-distance radio circuits whose characteristics are at least equal to land-leased telephone circuits.

IBM DATA TRANSCEIVER

COMPONENTS OF THE DATA TRANSCEIVER

<i>Component</i>	<i>Function</i>
Control Unit	A 7-key keyboard with lights and switches for control of: transmitting or receiving, printing, indicating the end of transmission, stopping transmission, indicating ready to receive, feeding cards, error lights.
Card Punch	Reads the information in the card if transmitting, punches the card if receiving information. In this unit is the cylindrical drum for the program card to control the operation of the machine for the corresponding columns of the card being read or punched. The punching in the program card can control the card field definition, skipping of card columns, duplication, or indicate variable card column punching to be transmitted.
Signal Unit	Contains electronic circuits to convert the card reading pulses to be transmitted over telegraph or telephone wires, and to convert the received pulses to the IBM punched card code.

PHYSICAL DATA

<i>Type</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
65	39"	31"	28½"	294 lbs.
66	39"	31"	28½"	296 lbs.
67	29½"	27"	18½"	177 lbs.
68	29½"	27"	18½"	177 lbs.

Power 115 volts, 60 cps, 7.3 amps.

Heat Dissipation 2,200 BTU/hr. for a card punch and signal unit.

COMMENTS

The Data Transceiver is used to transmit information read from a punched card for punching this information into another card. For a punched card machinery installation, data is transmitted to the directly usable medium without the intermediate step of converting data on perforated paper tape to punched cards.

Two program cards are prepared for each application. One card is used at the transmitter and one at the receiver. Since the program cards may be coded as to which card columns are

EQUIPMENT REPORT

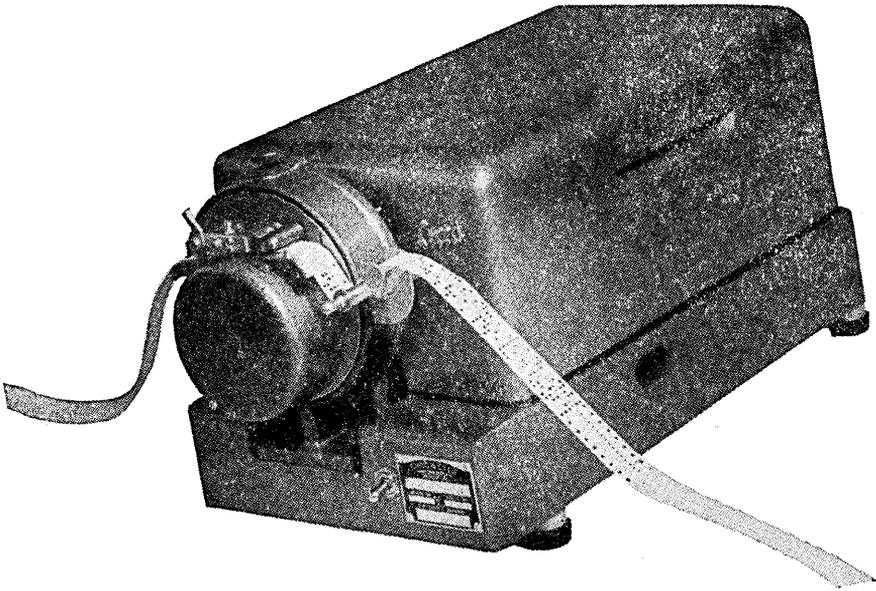
to be read and which card columns are to be punched, the information read at the transmitting end need not be in the same card columns as the information punched at the receiving end. A varying number of card columns from the same group of cards may also be transmitted by the appropriate codes in the program cards.

Checks for the reliability of the reading transmission, and punching of the information are included in this machine. At the receiver, a test is made that every character received is a legitimate four-out-of-eight code. The machines stop for any of the following reasons: failure to read a character at the transmitter, failure to punch or skip the proper number of card columns at the receiver, failure to punch a character at the receiver, failure to feed a card at the receiver, interruption or interference on the transmission medium, or if a signal is received while the receiver is duplicating or skipping.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

CREED MODEL 6S/5
Automatic Tape Transmitter



2B 190.1—Page 2

October 5, 1956—18

July, 1956

CREED MODEL 6S/5

Automatic Tape Transmitter

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Model 6S/5 Tape Transmitter is capable of reading and translating the five-unit code in perforated tape, chad or chadless, into electrical signals. Model 6S/5 can translate the reading for transmission on a single-wire and has a single-reading head.

APPROXIMATE COST

Model 6S/5 Tape Transmitter, \$319.

PERFORMANCE

7 or 7½ unit transmission.

72 or 66 words/minute. Each word is assumed five characters and a space.

PAPER TAPE CHARACTERISTICS

Material	1½" or 7/8" wide paper tape.
Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Copy Mode	Parallel by bit, serial by character by word.

EQUIPMENT REPORT

PHYSICAL DATA

Height, 8"; width, 15"; depth, 7½"; weight, 30 lbs.

Power Requirements: The Model 6S/5 Transmitter can be fitted with AC or DC motors wound for any single voltage between 100 to 250 volts in steps of 10 volts, at either 50 or 60 cycles per second. The power consumption is 50 watts.

Heat Dissipation is 170 BTU/hr.

COMMENTS

The Model 6S/5 is capable of transmitting the 5-unit tape perforations into single or double current signals. It can translate the tape code for single-wire transmission, and is therefore used mainly for telegraphic applications. For input to a digital computer, the 3-Gang Multiple Transmitters, ADP Equip. Rpt. Ref. 2B 190.2, equipped with a single head can translate the tape code into five separate impulses, multi-wire simultaneous transmission.

When the tape becomes taut or when the end of the tape has passed the reading head, a warning is given. The Model 6S/5 fitted with a magnetic clutch control enables the transmitter to be remotely controlled.

The Model 6S/5 combined with the Model 7P/N Keyboard Perforator operate together to form a perforator transmitter Model 67P/N. The Model 67P/N can transmit while tape is being perforated. The two functions can also take place independently.

ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation

22 Thames Street

New York 6, New York

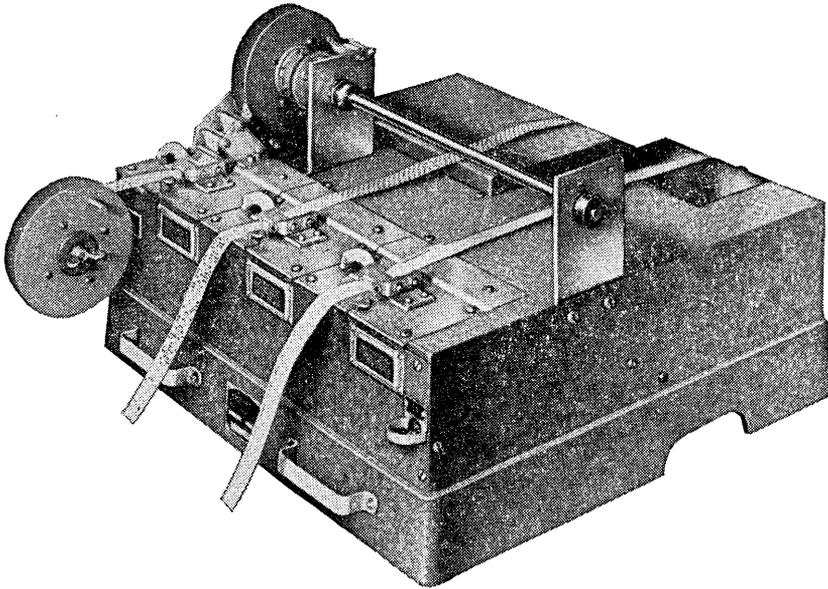
- or -

Creed & Company Limited

Telegraph House

Croydon, England

CREED 3-GANG MULTIPLE TRANSMITTER



September, 1956

CREED 3-GANG MULTIPLE TRANSMITTER

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Multiple Transmitters are capable of reading and translating the five-unit code in perforated tapes, chad or chadless, into electrical signals. Transmitters can translate the readings for transmission on a single-wire or five-wires. There are one to three reading heads on these transmitters. Model 74D is illustrated on page 2.

APPROXIMATE COST

	<i>Approximate Cost Purchase</i>
Single-Wire	
Model 71D, 2 message transmitting heads	\$723
Model 72D, 3 number transmitting heads	775
Model 74D, 3 (message and number) transmitting heads	740
Five-Wire, 3 message or number transmitting heads	
Normal speed	1,030
High speed	1,155

Transmitters with one or two heads cost less than the above. Control units for double current operation and/or flip-flop operation increase the cost.

EQUIPMENT REPORT

PERFORMANCE

	<i>Unit Transmission</i>	<i>Words/minute</i>
Single-wire Models	7.42	67
Five-wire Models	7.42	67 or 133

Each word is assumed to be five characters and a space.

PAPER TAPE CHARACTERISTICS

Material	$1\frac{1}{16}$ " or $\frac{7}{8}$ " wide paper tape.
Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code. Five-wire transmitters may read the 5 channels of two or three tapes into 10 or 15 unit codes, if desired.
Characters	Message heads—all characters. Number heads—numerical characters only.
Copy Mode	Parallel by bit, serial by character by word (for each reading head).

PHYSICAL DATA

Height, $6\frac{1}{4}$ "; width, 17"; depth, 17"; weight, 47 lbs. The three reels on the number transmitters add $4\frac{1}{4}$ " to the height, $3\frac{1}{2}$ " to the width, and 8 lbs./reel to the weight.

Power Requirements: The 3-Gang Transmitters can be fitted with AC or DC motors wound for any single voltage, between 100 to 250 volts in steps of 10 volts, at either 50 or 60 cycles per second. The power consumption is 100 watts.

Heat Dissipation is 350 BTU/hr.

COMMENTS

The 3-Gang Multiple Transmitters can be mounted with one, two or three heads. The models with three reading heads are capable of reading the information on three tapes simultaneously. These transmitters enable one operator to control three tape readings and result in a saving in space and components. A single-current output is produced, but this can be converted to double-current, if required.

CREED 3-GANG MULTIPLE TRANSMITTER

The three heads may be number or message transmitting heads, in any combination. The number transmitting heads differ from the message heads in the following respects: they are used for numerical information transmission; the letters-shift code is used to indicate the end of a transmission; they are externally equipped with two reels, one for the input tape and one for the take-up tape.

The Model 71D or 72D transmitter normally reads three tapes simultaneously for transmission over three separate circuits. The control unit for flip-flop operation provides transmission over one circuit. The Model 74D can be fitted with a control unit to provide flip-flop operation, with automatic numbering insertion over one circuit. These control units can also be specified for the five-wire transmitters.

When the end of a tape has passed a reading head, a warning is given.

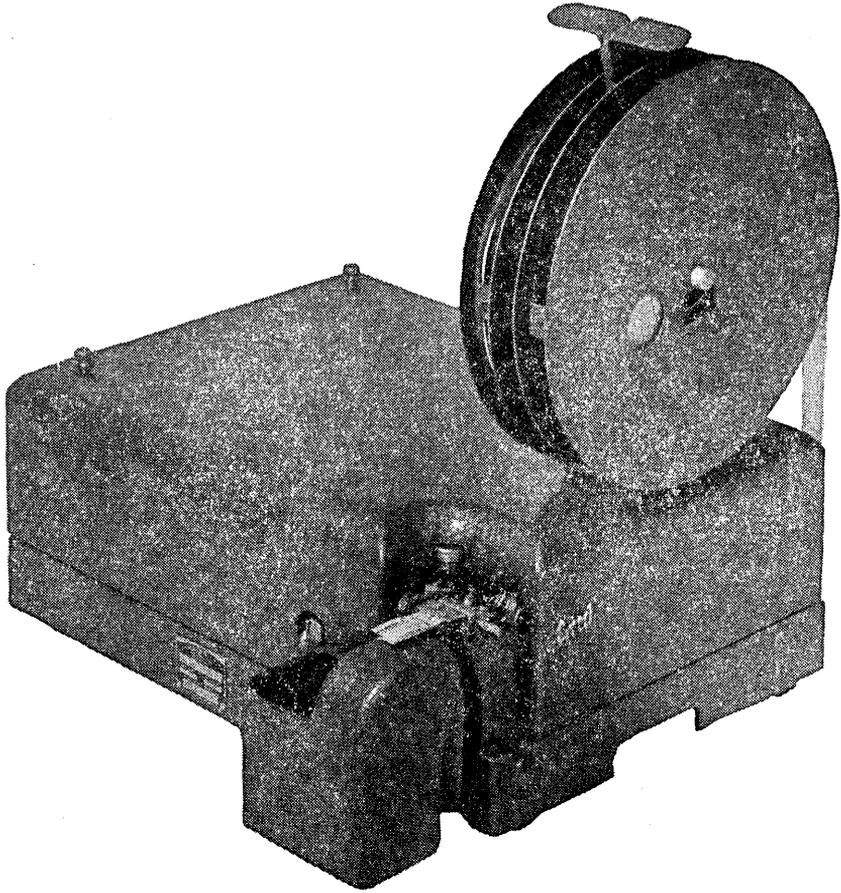
ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation
22 Thames Street
New York 6, New York

- or -

Creed & Company Limited
Telegraph House
Croydon, England

CREED MODEL 7TR/3
Non-Printing Reperforator



July, 1956

CREED MODEL 7TR/3 Non-Printing Reperforator

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Model 7TR/3 is capable of converting five-unit coded electrical signals to produce the five-unit coded chad perforations in paper tape. It is designed to perforate tape from single-wire input, and can accept single or double current input by adjustment.

APPROXIMATE COST

Model 7TR/3 Reperforator, \$355.

PERFORMANCE

7 or 7½ unit transmission.

72 or 66 words/minute. Each word is assumed five characters and a space.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Motion	Actuated by receiver. Moves ¼ ₁₀ " for each character perforated.
Perforating Medium	1¼ ₁₆ " wide paper tape. One or two rolls of tape can be perforated at a time. Each of the two reels of tape on one holder contains 1,020 feet of tape.

EQUIPMENT REPORT

PHYSICAL DATA

Height, 18"; width, 17"; depth, 16"; weight, 48 lbs.

Power Requirements: The Model 7TR/3 Reperforator can be fitted with AC or DC motors wound for any single voltage between 100 to 250 volts in steps of 10 volts, at either 50 or 60 cycles per second. The power consumption is 100 watts.

Heat Dissipation is 350 BTU/hr.

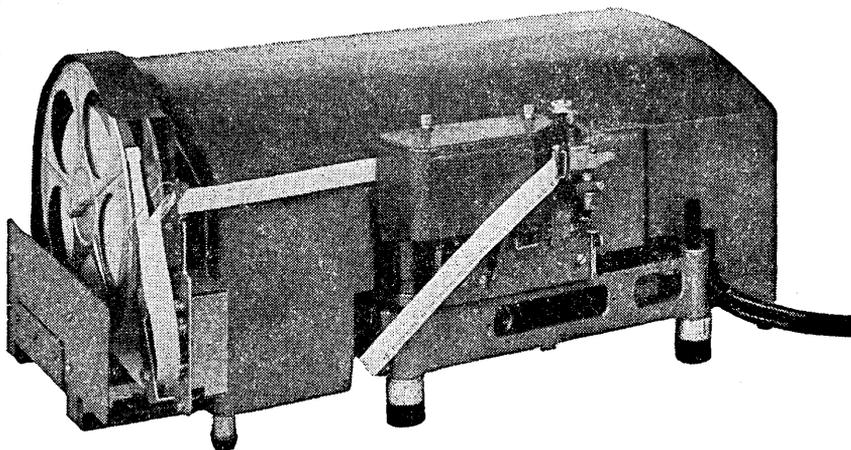
ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation
22 Thames Street
New York 6, New York

- or -

Creed & Company Limited
Telegraph House
Croydon, England

CREED MODELS 85 and 86
Printing Reperforators



October, 1956

CREED MODELS 85 and 86

Printing Reperforators

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

Models 85 and 86 Reperforators are capable of converting five-unit coded electrical signals into the paper tape five-unit (channel) code perforations, with a simultaneous printed record on the tape. Both models accept signals from a single-wire input. Model 85 produces a chadless perforated tape with the printing over the fourth and fifth code channel; Model 86 produces a chad perforated tape with the printing underneath the fifth code channel.

APPROXIMATE COST

	<i>Approximate Cost Purchase</i>
Model 85	\$966
Model 86	709

PERFORMANCE

7½ or 7 unit transmission.

66 or 72 words/minute. Each word is assumed five characters and a space.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Motion	Actuated by the receiver unit. Moves ¼" for each character perforated.
Perforating Medium	1½" wide paper tape for Model 85. ⅞" wide paper tape for Model 86. Reel holds 1,020 feet of tape.

EQUIPMENT REPORT

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Model 85	11"	24"	15½"	58 lbs.
Model 86	11"	24"	16"	58 lbs.

Power Requirements: The Models 85 and 86 Reperforators can be fitted with AC or DC motors wound for any single voltage between 100 to 250 volts in steps of 10 volts, at either 50 or 60 cycles per second. The power consumption is 100 watts.

Heat Dissipation is 350 BTU/hr.

COMMENTS

Models 85 and 86 Reperforators record incoming messages both as code combinations and printed characters on the tape. Telegraphic function codes have a printed symbol so that every code combination may have a printed equivalent. These reperforators accept either single or double current input.

Model 85 uses an 1¼" width tape, perforates tape of the chadless kind, and prints over the perforations. Model 86 uses a 7/8" width tape, perforates tape of the fully punched kind, and prints underneath the perforations. When the tape is exhausted, a visual or audible warning occurs.

Fitted with a keyboard, either model is capable of preparing its own peculiar kind of perforated tape, with a printed record on the tape, from manual keying operations.

ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation

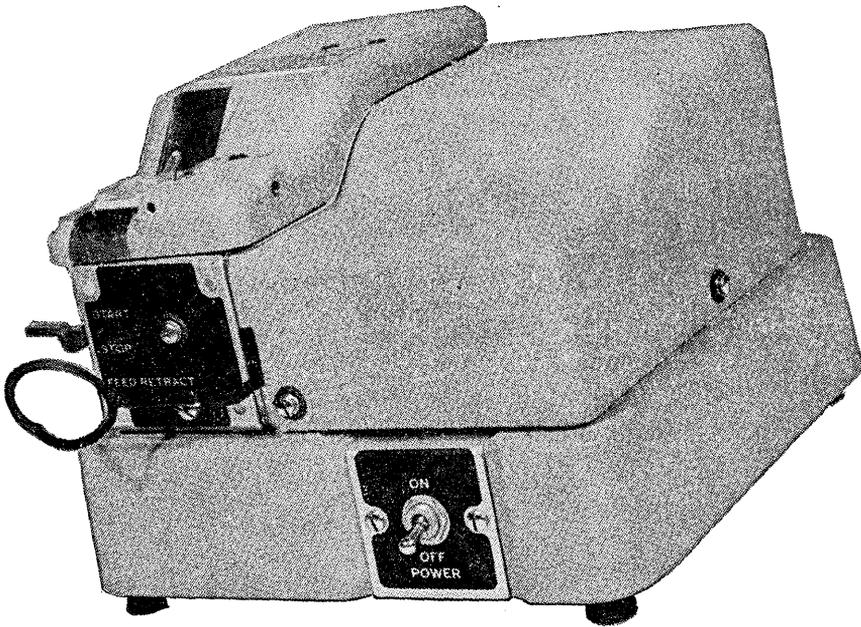
22 Thames Street
New York 6, New York

- or -

Creed & Company Limited
Telegraph House
Croydon, England

KLEINSCHMIDT MODEL 140

Tape Transmitter



2B 445.1—Page 2

September 7, 1956—12

July, 1956

KLEINSCHMIDT MODEL 140

Tape Transmitter

MANUFACTURER

Kleinschmidt, Incorporated

BRIEF DESCRIPTION

The Model 140 Tape Transmitter is capable of reading and translating the five-unit code in perforated tape (chad or chadless) into sequential electrical impulses for transmission over a pair of wires. It has a single reading head.

APPROXIMATE COST

Model 140 Tape Transmitter, \$300.

PERFORMANCE

7.42 unit transmission.

60, 66, 75 or 100 words/minute, preset depending upon the motor drive gear set used. Each word is five characters and the start-stop pulses.

PERFORATED TAPE CHARACTERISTICS

Material	$\frac{7}{8}$ " or $\frac{11}{16}$ " wide paper tape.
Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Copy Mode	Parallel by bit, serial by character by word.

PHYSICAL DATA

Height, $6\frac{3}{4}$ "; width, $8\frac{1}{4}$ "; depth, $8\frac{3}{4}$ "; weight, $13\frac{1}{2}$ lbs.

Power 115 volts, 60 cps, AC.

115 volts, 50-60 cps, AC or DC motor at additional cost.

Heat Dissipation not reported.

EQUIPMENT REPORT

COMMENTS

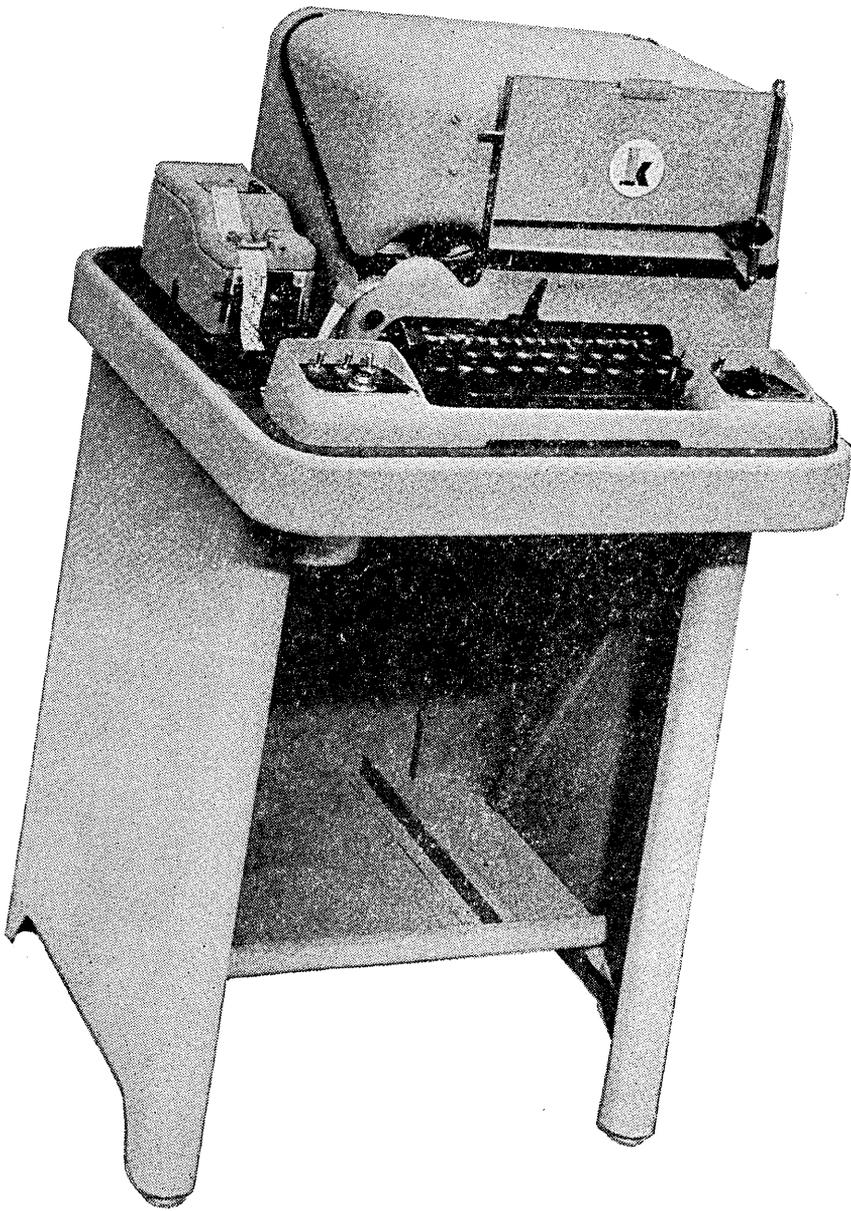
The Model 140 is designed to operate over metallic wire lines, radio or micro-wave relay networks. A tight-tape switch will stop the transmitter if the tape becomes taut or if the tape runs out.

Higher operating speeds for special applications and remote control of clutch mechanisms are additional features available.

ADDITIONAL INFORMATION

Write to: Kleinschmidt, Incorporated
County Line Road
Deerfield, Illinois

KLEINSCHMIDT MODEL 120
Typing Reperforator Tape Transmitter



July, 1956

KLEINSCHMIDT MODEL 120

Typing Reperforator Tape Transmitter

MANUFACTURER

Kleinschmidt, Incorporated

BRIEF DESCRIPTION

The Model 120 is capable of converting received sequential electrical impulses to produce chadless perforations in paper tape; of reading and translating the code in chad or chadless perforated tape into electrical impulses for transmission. A three-row keyboard may be used for manual line transmission or local tape preparation.

APPROXIMATE COST

Model 120, Typing Reperforator Tape Transmitter, \$1,400.

PERFORMANCE

7.42 unit transmission.

60, 66, 75, or 100 words/minute, depending upon the motor gear set used. Each word is five characters and the start-stop pulses.

PERFORATED TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Perforating Medium	$\frac{7}{8}$ " or $\frac{11}{16}$ " wide paper tape for transmission. $\frac{7}{8}$ " wide paper tape for perforation and printing. Tape reel has a capacity of approximately 1,200 ft. or 20,000 words.

EQUIPMENT REPORT

KEYBOARD CHARACTERISTICS

Class	Electromechanical.
Characters	
alphabetic	A to Z.
numerical	0 to 9.
special	- \$! & ' () " / : ; ? , .
Control Keys	Line feed, space, carriage return, repeat, bell, letters-shift, figures-shift, end-of-line indicator.

The control keys have the following functions:

The paper can be fed one line at a time; the carriage can be moved to the left-most margin of the paper; the carriage can be moved one space at a time.

A 'repeat' key allows repeated operation of a character or function without repeated operation of the key lever. The 'bell' key signals the operator at the receiving station.

Letters-shift designates the information sent as alphabetic; figures-shift designates the information sent as numerical.

PHYSICAL DATA

Height, 37½"; width, 22"; depth, 19"; weight, 72 lbs.

(dimensions include console table)

Power 115 volts, 60 cps, AC.

115 volts, 50-60 cps, AC governed motor available.

Heat Dissipation not reported.

COMMENTS

The Model 120 Typing Reperforator Tape Transmitter is designed for transmitting and receiving information in the form of sequential electrical impulses over metallic wire lines, radio or micro-wave relay networks. It has applications in communications, telemetering or data processing systems.

There is a tape-out alarm to signal when the tape supply is low on the reperforator.

ADDITIONAL INFORMATION

Write to: Kleinschmidt, Incorporated
County Line Road
Deerfield, Illinois

CREED MODEL 54
Page Teleprinter



2C 190.1—Page 2

October 5, 1956—26

July, 1956

CREED MODEL 54

Page Teleprinter

MANUFACTURER

Creed & Company Limited

BRIEF DESCRIPTION

The Model 54 Teleprinter consisting of two parts (a keyboard transmitter and receiver) is capable of coding electrical signals for transmission from manual keying operations, or of converting received coded signals into a printed page. When transmitting and receiving, it is possible to produce both a printed copy and a perforated tape on machines fitted with the reperforing attachment. The information received or transmitted can be numerical, alphabetic, special symbols, or machine functions.

The teleprinter can be used as an output component of computer systems to produce a printed page.

APPROXIMATE COST

Model 54 Page Teleprinter, \$1,143.

PERFORMANCE

7 or 7½ unit transmission.

72 or 66 words/minute. Each word is assumed five characters and a space.

EQUIPMENT REPORT

KEYBOARD CHARACTERISTICS

Class	Electromechanical.
Characters	
alphabetic	A to Z
numerical	0 to 9
special	() % @ ? / ' , . - : + = £ Other specialized characters can be fitted, if required
Control Keys	Line feed, carriage return, who-are-you, bell, space, letters-shift, figures-shift, run-out, here is

The control keys have the following functions:

The paper can be fed one line at a time; the carriage can be moved to the left-most margin of the paper; the carriage can be moved one space at a time.

By depressing the 'who-are-you' key at the receiver station, the transmitting station automatically sends back a code identifying the transmitter. The depression of the 'here is' key automatically sends an identification code to the receiver. The 'bell' key signals the operator at the receiving station. The depression of the 'run-out' key results in the last signal sent being repeatedly transmitted for as long as the key remains depressed.

The Reperforating Attachment is fitted with a manual back-space key.

Letters-shift designates the information sent as alphabetic; figures-shift identifies the information sent as numerical.

CREED MODEL 54

PRINTING UNIT CHARACTERISTICS

Class Printing Mode	Electromechanical. Single Action Mechanical Decoding.
Characters	Identical characters to keyboard characters.
Format	10 characters/inch; 3 or 6 lines/inch; 60 characters/line, maxima. Any format desired may be obtained by appropriate depression of the keys or appropriate coding of the paper tape being read at the transmitting station. Automatic single or double line spacing is possible.
Printing Medium paper	8½" wide; up to 300 ft. long in a continuous roll. 7" wide for sprocket-fed continuous preprinted forms. 4½" wide friction-fed paper for special applications. Original (up to 5 carbon copies for sprocket-fed forms).
ribbon	½" wide; 10 yds. long. Red-black, two color option. Moves transversely to the direction in which the paper is fed.

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Motion	Sprocket-fed. Disengagement on bell, who-are-you, or answer-back unit signals.
Perforating Medium	1½/16" wide paper tape. Reels hold 1,080 feet of tape.

PHYSICAL DATA

Height, 13"; width, 23½"; depth, 22½"; weight, 110 lbs. with keyboard or 100 lbs. for the Receiving-only model.

Power Requirements: Fitted with AC or DC motors wound for any single voltage between 100 to 250 volts in steps of 10 volts, 50 or 60 cps. The power consumption is 100 watts.

Heat Dissipation is 350 BTU/hr.

EQUIPMENT REPORT

COMMENTS

The Teleprinter is used to transmit information over distances in the five-unit telegraphic code, and/or to convert received coded signals into a printed page. When transmitting or receiving, it is possible to produce a printed copy and a perforated tape on machines fitted with reperfoming attachments. As a direct output component of a computer, the Model 54 consists of a Receiving-only Page Teleprinter, e. g., on the Elliott 405 computer system.

The 'line feed' and 'carriage return' keys have no function if the information received is perforated in tape.

The answer-back unit option is the device that automatically sends an identification code in answer when a 'who-are-you' signal is received. The operation counter option is an 'end-of-line' indicator to signal the transmitting operator that the receiving page printer is at the end of a line and he should depress the carriage return key. It counts up to fifty-five key depressions after each operation of the 'carriage return' key, and then signals the transmitting operator.

ADDITIONAL INFORMATION

Write to: International Standard Trading Corporation

22 Thames Street

New York 6, New York

- or -

Creed & Company Limited

Telegraph House

Croydon, England

KLEINSCHMIDT MODEL 150
Sending-Receiving Page Teleprinter



2C 445.1—Page 2

September 7, 1956—20

July, 1956

KLEINSCHMIDT MODEL 150

Sending-Receiving Page Teleprinter

MANUFACTURER

Kleinschmidt, Incorporated

BRIEF DESCRIPTION

The Model 150 Page Teleprinter is capable of coding electrical impulses from manual keying operations or of converting received coded impulses into a printed page.

The teleprinter can be used as an input-output component of computer systems.

APPROXIMATE COST

Model 150 Page Teleprinter, \$1,400.

PERFORMANCE

7.42 unit transmission.

60, 66, 75, or 100 words/minute, determined by motor gear set used. Each word is five characters and the start-stop pulses.

KEYBOARD CHARACTERISTICS

Class	Electromechanical.
Characters alphabetic numerical special	A to Z. 0 to 9. - \$! & ' () " / : ; ? , .
Control Keys	Line feed, carriage return, bell, space bar, stop, letters-shift, figures-shift, repeat.

The control keys have the following functions:

The paper can be fed one line at a time; the carriage can be moved to the left-most margin of the paper; the carriage can be moved one space at a time.

EQUIPMENT REPORT

A 'repeat' key allows repeated operations of a character or function without repeated operation of the key lever. The 'bell' key signals the operator at the receiving station. Motor mechanism stops on receipt of 'stop' signal. Letters-shift designates the information sent as alphabetic; figures-shift designates the information sent as numerical.

PAGE PRINTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single Action Mechanical Decoding.
Characters	Identical to keyboard characters.
Format	10 characters/inch; 6 lines/inch; 72 characters/line, maximum. Any format desired may be obtained by appropriate depression of the keys.
Printing Medium paper	8½" wide; roll paper, fanfold paper or sprocket-fed forms. Original and up to 10 carbon copies depending upon the weight of the paper. Friction or sprocket-fed, without modification.
ribbon	½" wide; 12 yds. long.

PHYSICAL DATA

Height, 11½"; width, 17½"; depth, 20¼"; weight, 55 lbs.

Power 115 volts, 60 cps, AC.

Heat Dissipation not reported.

COMMENTS

The Model 150 Page Teleprinter is designed to transmit and receive information in printed page form. Printing is in response to sequential electrical impulses transmitted over metallic wire lines, radio or micro-wave relay networks. The Model 150 may be used in communication, computer or telemetering systems. For special applications, it may be obtained to operate over five-wire (parallel) circuits.

The receiver is equipped with a manual carriage return and letters-shift mechanism. If a carriage return signal is not

KLEINSCHMIDT MODEL 150

received, the carriage return and line feed are automatic to prevent over-printing.

ADDITIONAL INFORMATION

Write to: Kleinschmidt, Incorporated
County Line Road
Deerfield, Illinois

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Chapter I. Introduction to the Study of the History of the United States

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Chapter III. The American Revolution

Chapter IV. The Early National Period

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Chapter VI. The Civil War

Chapter VII. Reconstruction

Chapter VIII. The Gilded Age

Chapter IX. The Progressive Era

Chapter X. World War I

Chapter XI. The Roaring Twenties

Chapter XII. The Great Depression

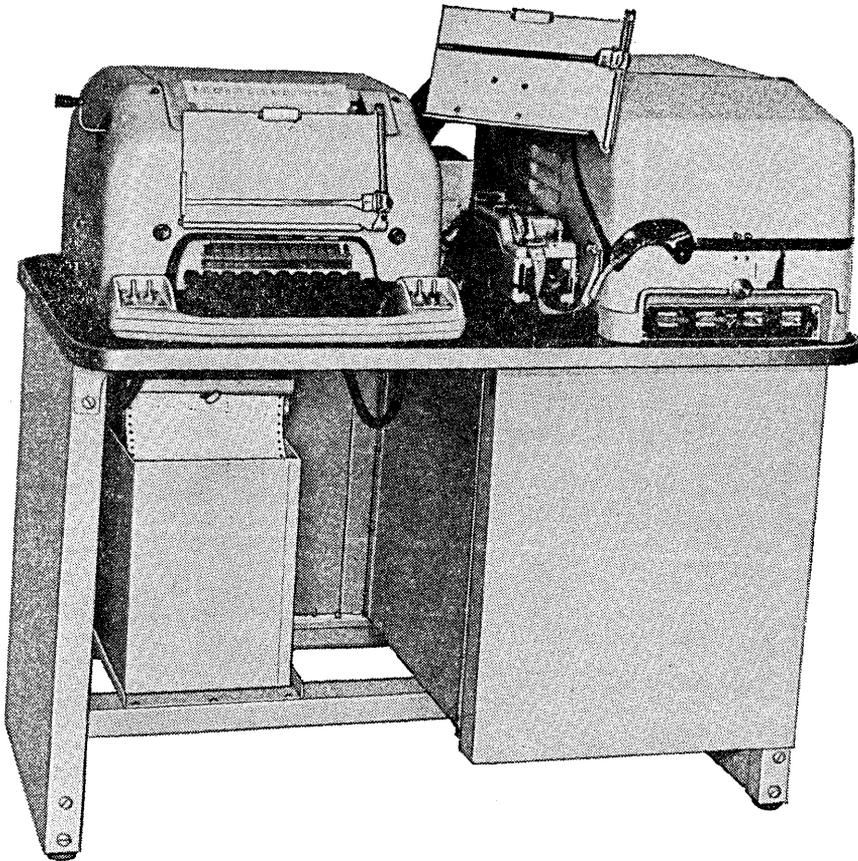
Chapter XIII. World War II

Chapter XIV. The Cold War

Chapter XV. The Modern Era

KLEINSCHMIDT MODEL 154

Complete Station Teleprinter



September 7, 1956-26

2C 445.2-Page 2

CONFIDENTIAL

July, 1956

KLEINSCHMIDT MODEL 154

Complete Station Teleprinter

MANUFACTURER

Kleinschmidt, Incorporated

BRIEF DESCRIPTION

The Model 154 Teleprinter has three functions: the receiving and converting of electrical signals into a printed page or into perforated and printed tape; for transmission, the coding of electrical signals from manual keying operations or from the reading of perforated tape; or the local preparation of perforated tape from manual keying operations. The Model 154 includes patching panels and switches so that various operating combinations of the components may be obtained.

The information received, transmitted or keyed can be the standard communication's characters and functions.

APPROXIMATE COST

Model 154, Complete Station Teleprinter, \$3,800.

PERFORMANCE

The operating speed is determined by the driving gears selected for each of two motors. The possible operating speeds for transmitting and receiving are:

60, 66, 75, or 100 words/minute; where each word is five characters and the start-stop pulses.

7.42 unit transmission.

The possible operating speed for the preparation of tape from the keyboard is:

140 words/minute, depending upon the ability of the operator.

EQUIPMENT REPORT

KEYBOARD TRANSMITTER CHARACTERISTICS

Class	Electromechanical.
Characters alphabetic numerical special	A to Z. 0 to 9. - \$! & ' () " / : ; ? , .
Control Keys	Line feed, space, carriage return, repeat, bell, letters-shift, figures-shift, end-of-line indicator.

The control keys have the following functions:

At the receiving station: the paper can be fed one line at a time; the carriage can be returned to the left-most margin of the paper; the carriage can be moved one space at a time.

The 'repeat' key allows repeated operation of a character or function, without repeated operation of the key lever. The 'bell' key signals the operator at the receiving station. Letters-shift designates the information sent as alphabetic; figures-shift identifies information sent as numerical.

In the preparation of perforated tape to be used for automatic transmission to a page printer receiver, the 'end-of-line' indicator signals after sixty-six key depressions from the previous 'carriage return' key depression. The signal indicates that the operator should depress the 'carriage return' key.

PAGE PRINTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single Action Mechanical Decoding.
Characters	Identical to keyboard characters.
Format	10 characters/inch; 6 lines/inch; 72 characters/line, maxima. Any format desired may be obtained by appropriate depression of the keys or appropriate coding of the paper tape being read at transmitting station.
Printing Medium paper	8½" wide; roll paper, fanfold forms or sprocket-fed forms. Original and up to 10 carbon copies, depending upon the weight of paper. Friction fed.
ribbon	½" wide; 12 yds. long.

KLEINSCHMIDT MODEL 154

PERFORATED TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, Baudot code.
Perforating Medium	$\frac{7}{8}$ " wide, for printing, on a reel with the capacity of approximately 1,200 feet of paper tape or 20,000 words.
Transmitting Medium	$\frac{7}{8}$ " or $1\frac{1}{16}$ " wide perforated paper tape.

PHYSICAL DATA

Height, 40"; width, 40"; depth, $23\frac{1}{4}$ "; weight, 190 lbs.

Power 115 volts, 60 cps, AC.

Heat Dissipation not reported.

COMMENTS

The Model 154 Complete Station Teleprinter provides complete printing communication facilities in a single set.

The keyboard is equipped for sequential transmitting, but may be operated on a parallel or 5-wire basis when perforating tape. This parallel setting of the keyboard allows tape preparation at speeds higher than normal operation. There is a back-space lever for error correction in the tape.

When the tape runs out or becomes too taut, there is an audible alarm on the reperforator or a stop on the tape transmitter. When receiving information in the form of a printed page, and a carriage return signal is not received at the right-most margin, carriage return and line feed function automatically to prevent over-printing.

ADDITIONAL INFORMATION

Write to: Kleinschmidt, Incorporated
County Line Road
Deerfield, Illinois

DATAMATIC 1200
Input Card-to-Magnetic Tape Converter

March, 1957

DATAMATIC 1200

Input Card-to-Magnetic Tape Converter

MANUFACTURER

DATAmatic Corporation

BRIEF DESCRIPTION

The Model 1200, card-to-magnetic tape off-line converter reads, edits and converts punched card information into binary-coded decimal notation and causes the recoded information to be written onto DATAmatic magnetic tape using the Model 1100, Magnetic File Unit.

APPROXIMATE COST

	<i>Purchase</i>	<i>Mo. Rental</i>
DATAmatic 1200, includes card reader	\$185,000	\$3,325

PERFORMANCE

Maximum Reading Speed

900 80-column cards/minute.

1,200 characters/second; any of which may be numerical, alphabetic or special characters.

EQUIPMENT REPORT

COMPONENTS OF THE CARD-TO-MAGNETIC TAPE CONVERSION OPERATION

<i>Component</i>	<i>Model</i>	<i>Function and Characteristics</i>
Card Read Unit		Reads Hollerith coded information from 80-column punched cards. This is a modified Burroughs G101 Electronic High Speed Card Reader, Printer and Punch; see ADP Equip. Rpt. Ref. 4G 155.1 for characteristics of the card reader.
Input Converter	1200	Edits information from 80-column punched cards by control panels, converts the Hollerith code into binary-coded decimal notation, writes encoded information onto magnetic tape; contains timing, coding and checking circuits; 100 positions of input core storage, 16 52-bit words of output core storage.
Magnetic File Unit	1100	Output: contains magnetic tape on which information is written by the converter; see ADP Equip. Rpt. Ref. 4G 205.1 for characteristics of the Magnetic File Unit.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
Input Converter	87"	255"	31"	6,500 lbs.	} 23,900 BTU/hr.
Card Reader	57"	74"	30"	1,500 lbs.	

Power: 11 kva.

COMMENTS

The DATAmatic card-to-magnetic tape conversion system utilizes a modified Burroughs 900 card per minute card reader, the Model 1200, Input Converter, and a Magnetic File Unit. Information from up to two cards is assigned one block on tape. Each of these blocks contains 62 words of alphanumeric information. A 2,700 foot reel of this magnetic tape may contain data from 10,800 punched cards.

The entire card must be read and its contents edited by the card reader's plugboards; hence, all transposition, duplication and discarding of card information is accomplished by means

DATAMATIC 1200

of the first plugboard. This information is stored in the input buffer of the converter and, under control of the Input Converter's plugboard, is conditioned for output. Each column of output information must contain either an alphanumeric, numerical or hexadecimal character (all three with blank columns not permitted); or an alphanumeric, numerical, hexadecimal or sign character (all four with blank columns permitted).

The properly positioned, converted information is stored onto magnetic tape on a Magnetic File Unit. A 4-bit 'weight count' for validity purposes is manufactured for each word during the conversion process and stored onto the tapes also.

The comparison check in the card reader is a column by column comparison between the card reading taken at the first reading station and that taken at the second reading station. A mismatch may stop the conversion process, at the user's option. If the conversion is not stopped, the error is signaled on magnetic tape.

ADDITIONAL INFORMATION

Write to: DATAmatic Corporation
151 Needham Street
Newton Highlands 61, Massachusetts

DATAMATIC 1300

**Output Magnetic Tape-to-Card Converter
Output Magnetic Tape-to-Printer Converter**

March, 1957

DATAMATIC 1300

Output Magnetic Tape-to-Card Converter
 Output Magnetic Tape-to-Printer Converter

MANUFACTURER

DATAmatic Corporation

BRIEF DESCRIPTION

The Model 1300, Output Converter, reads information from DATAmatic magnetic tape and both edits and revises this information for output. This encoded output information is then either punched via a card punch or printed via a line printer.

Either the card punch or the line printer may be connected on-line to the Model 1300, Output Converter.

The Output Converter is used off-line with the DATAmatic 1000 system.

APPROXIMATE COST

	<i>Purchase</i>	<i>Mo. Rental</i>
DATAmatic 1300, does not include either card punch or line printer which are modifications of standard units and must be ordered separately	\$100,000	\$1,800

EQUIPMENT REPORT

PERFORMANCE

Maximum Punching Speed

100 80-column cards/minute, maximum.

133 characters/second; any of which may be numerical, alphabetic or special characters.

Maximum Printing Speed

150 120-character lines/minute, maximum.

300 characters/second; any of which may be numerical, alphabetic or special characters.

COMPONENTS OF THE MAGNETIC TAPE-TO-CARD AND MAGNETIC TAPE-TO-PRINTER CONVERSION OPERATIONS

<i>Component</i>	<i>Model</i>	<i>Function and Characteristics</i>
Magnetic File Unit	1100	Input; contains magnetic tape from which information is read into the converter or other equipment via a switching network, see ADP Equip. Rpt. Ref. 4G 205.1 for characteristics of the Magnetic File Unit and the magnetic tape.
Output Converter	1300	Conditions binary-coded decimal and alphabetic information from magnetic tape for printing or punching; contains timing, coding and checking circuits; edits by control panel; 8 words of input core storage; 120 positions of output core storage.
Card Punch		Output; punches information from the Model 1300. This is a modified IBM 519, Reproducing Card Punch; see ADP Equip. Rpt. Ref. 3C 380.2 for characteristics of the punched cards and the card punch unit.
Line Printer		Output; prints information from the Model 1300. This is a modified IBM 407, Line Printer; see ADP Equip. Rpt. Ref. 4B 380.4 for characteristics of the line printer.

DATA-MATIC 1300

PHYSICAL DATA

	<i>Height</i>	<i>Length</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
DATAmatic 1300	87"	224"	31"	5,300 lbs.	29,000 BTU/hr.
Card Punch	49½"	53"	25"	1,180 lbs.	4,090 BTU/hr.
Line Printer	51"	31"	73"	3,286 lbs.	7,500 BTU/hr.
Power:	31.83 kva.				

COMMENTS

The DATAmatic magnetic tape-to-card or printer conversion system utilizes a Magnetic File Unit; an Output Converter, Model 1300 and either a modified IBM 519, card punch, or a modified IBM 407, line printer.

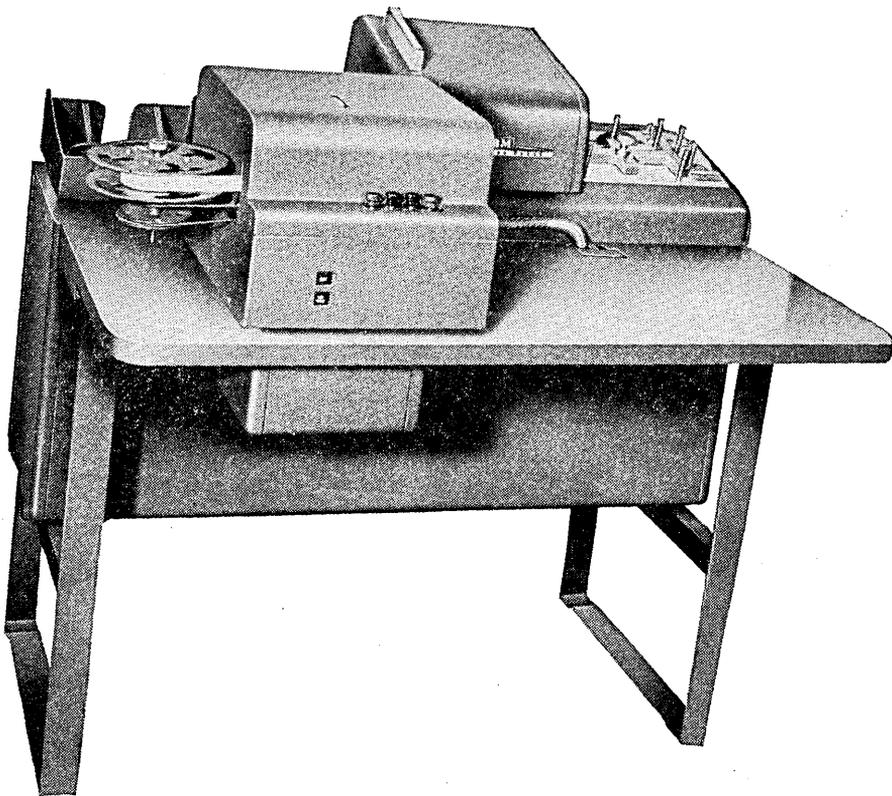
The information in 62 word blocks is read into the input buffer of the Output Converter, one block at a time at a rate of 100 inches per second. The converter's plugboards condition the magnetic tape information for output. The information in 8 word sections is read into the input storage of the Output Converter. The Converter's plugboards condition the magnetic tape information for output. These plugboards are wired so as to control each character of input information in accordance with its category classification; these categories include 4-bit numbers, 6-bit alphabetic, 4-bit sign, as well as 1-, 4-, and 6-bit rejection of information. The bit codes are converted into the Hollerith code and delivered to the output buffer of the converter for either 150 120-position line per minute printing or 100 80-column card per minute punching.

This Output Converter system is off-line with the DATA-matic 1000 system.

ADDITIONAL INFORMATION

Write to: DATAmatic Corporation
151 Needham Street
Newton Highlands 61, Massachusetts

IBM TYPE 63
Card-Controlled Tape Punch



IBM TYPE 63

Card-Controlled Tape Punch

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM Type 63, card-controlled tape punch, is capable of preparing 5-channel chad paper tape from information punched in IBM cards. By the control panel wiring and control punches in the card, it is possible to edit the information from the card to the tape. It is also possible to produce the telegraphic coded tape to be used for transmission either to a telegraphic page printer, or to a telegraphic tape reperforator, or to a tape-to-card punch.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Type 63	\$65
Additional 10 Distributors	5

Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift costs by 100%. Maintenance is included in the rental charge.

PERFORMANCE

Tape is perforated at 10 columns per second, approximately 10 characters per second.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, telegraphic code.
Characters alphabetic numeric special	A to Z. 0 to 9. & - / * . \$ @ % # , □ (optional characters furnished on special request).
Format	On which equipment the tape is to be used next, determines the format. There will be no blank spaces on the tape. Letters- and figures-shift precede alphabetic or numeric information respectively for telegraphic equipment use.
Motion	Continuous feeding and punching, except on skips of as many card columns desired.
Reel Capacity	1,000 feet of tape. A reel is provided for the rewinding of approximately 300 feet of tape.

CARD READING UNIT CHARACTERISTICS

The card capacity of the card hopper is 250 cards; of the card stacker is 300 cards. The reading unit is similar in principle to the reading unit of the Type 55 Alphabetic Verifier. One card column is read at a time.

There is an Adjustable Skip Bar in this unit. It controls the stopping of the skipping of any number of columns, directed by the control panel wiring. The skip-stop inserts are manually set anywhere in the bar except in adjacent columns.

The wiring of the control panel and the control punches in the cards, control the punching of the paper tape from the reading unit. The following operations can be performed by this flexible wiring:

Complete or partial reading of the card is possible.

Information on the card can be edited by punctuation marks, omissions, and insertions of information for tape perforation.

Master cards can be read completely, and detail cards only partially read.

The information on the card can be repeated in the punching of the tape—a gang punching operation.

IBM TYPE 63

PHYSICAL DATA

Height, 38"; width, 29"; depth, 39"; weight, 314 lbs.

Power, 115/230 volts, 3/1.5 amps., 60 cps, AC.

Heat dissipation, 940 BTU/hr.

COMMENTS

The Type 63 is used to prepare perforated telegraphic coded paper tape, from information on IBM cards. The information on the tape can then be transmitted telegraphically and/or used to prepare written documents on a teleprinter.

Each column of the card is read unless it is skipped by wiring. All alphabetic characters automatically punch their five-hole counterpart in tape. However, the control panel must be wired to punch digits, blank columns, or special code combinations on tape.

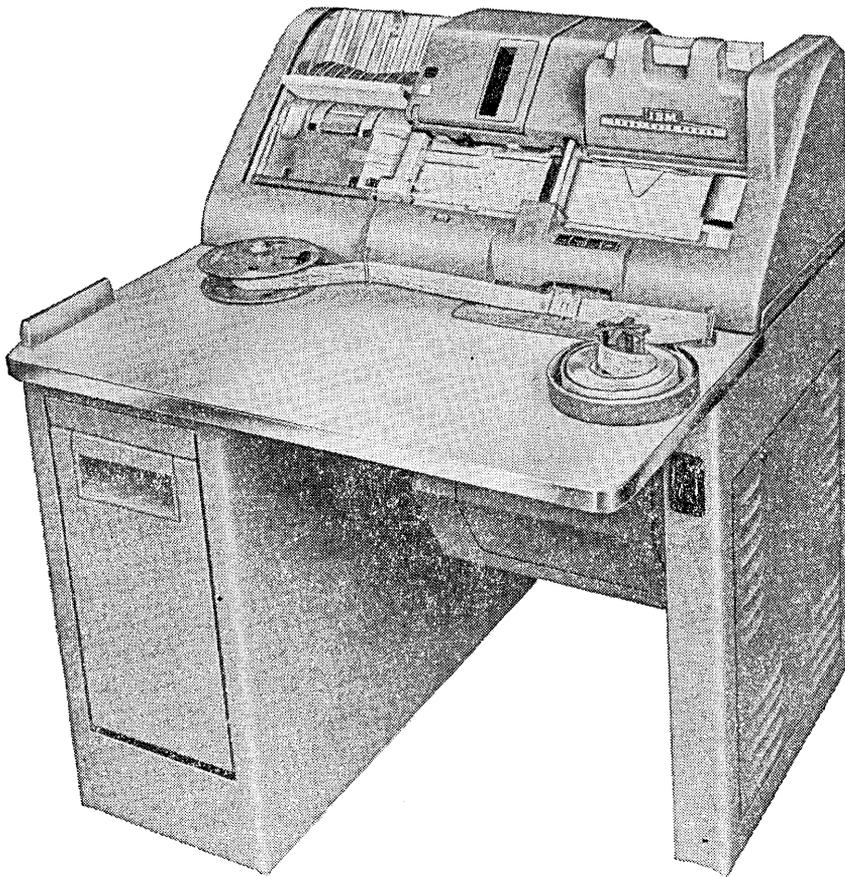
An automatic stop for tape punching occurs on the following conditions: the supply of tape or cards runs out; the card feeding is imperfect; the tape tension is too tight; or a code is not punched during a punching cycle.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.



IBM 46 and 47
Tape-to-Card Punch and Printing Punch



May, 1956

IBM 46 and 47

Tape-to-Card Punch and Printing Punch

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM 46 and 47, tape-to-card punches, are capable of preparing IBM punched cards from information on chad or chadless perforated paper tapes. Different models of the 46 and 47 read from either five-channel and/or eight-channel tape, that must contain instructions to direct the machine as well as codes that represent the information to be transferred to cards. The 47 is capable of printing along the top of the card the information punched in the card. The 46 has no print unit.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 46	
8-channel tape	\$135
5- and 8-channel tape	140
IBM 47	
8-channel tape	155
5- and 8-channel tape	160

Two-shift operation increases single-shift costs by 50%; three-shift operation increases single-shift costs by 100%. Maintenance is included in the rental charge.

PERFORMANCE

	<i>IBM 46</i>	<i>IBM 47</i>
Reads tape and punches cards	20 columns/sec.	18 columns/sec.
Skipping and releasing	80 columns/sec.	80 columns/sec.

EQUIPMENT REPORT

PUNCHED CARD CHARACTERISTICS

Code	IBM (Hollerith).
Characters	
alphabetic	A to Z (2 hole coded).
numerical	0 to 9 (1 hole coded).
special	., - & / \$ # @ * % □
No. of Columns	80 columns.
Punch Mode	Parallel by punch, serial by character by card.
Format	Controlled by the wiring in the control panel. As tape is processed, different types of cards with different card field definitions can be punched. Skipping and duplicating of card columns is also possible.

TAPE READING CHARACTERISTICS

The tape reader senses the 5-channel telegraphic or 8-channel codes in the paper tape. The tape supply reel capacity is 300 feet of tape.

By the control panel wiring, and punching in the program card on the metal cylinder drum:

All or part of the information on the tape may be punched into the cards. Reading of the tape may be stopped while information is being duplicated from a card or from an auxiliary duplicating drum unit to the card at the punch station.

An error code in the tape (erroneously perforated tape) will cause a 4 to be punched in column 82 of the card, so that the error cards can be needed or sorted out later.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
IBM 46	39"	31"	28"	305 lbs.
IBM 47	39"	31"	28"	307 lbs.
		<i>Power</i>		<i>Heat Dissipation</i>
IBM 46		115 volts, 60 cps, 3.3 amps, AC or DC		798 BTU/hr.
IBM 47		115 volts, 60 cps, 4.7 amps, AC or DC		814 BTU/hr.

IBM 46 AND 47

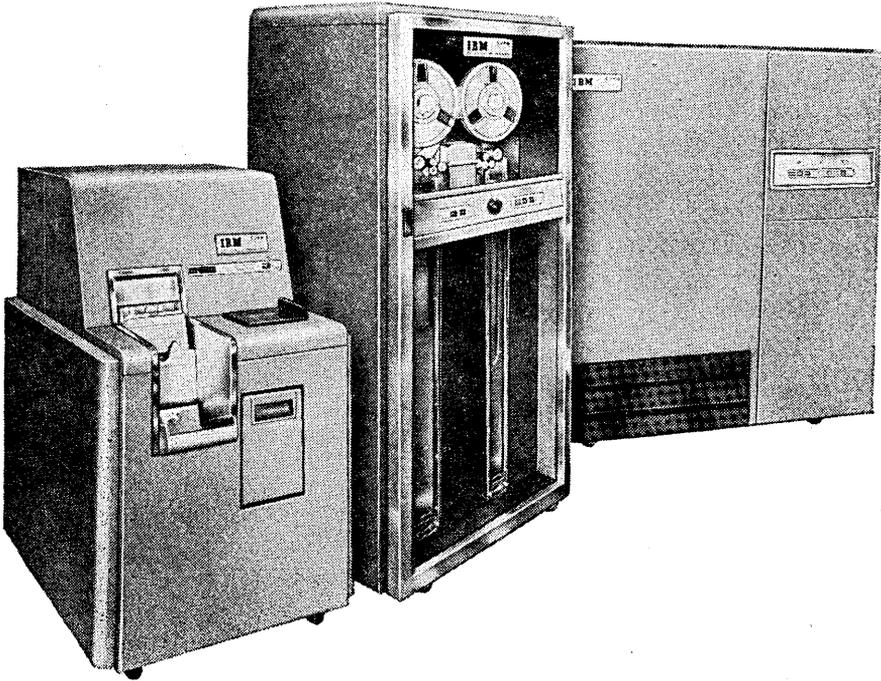
COMMENTS

An automatic stop for card punching occurs on the following conditions: the card feeding hopper (capacity of 500 cards) is empty; the tape reader runs out of tape; the tape reading mechanism for 8-channel tape reads an even number of punches in any column; the card stacker (capacity of 500 cards) is full.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

CARD-TO-TAPE CONVERSION
IBM 714 CARD READER, 759 CARD READER
CONTROL UNIT, AND 727 MAGNETIC
TAPE UNIT



CARD-TO-TAPE CONVERSION

IBM 714 CARD READER, 759 CARD READER CONTROL UNIT, AND 727 MAGNETIC TAPE UNIT

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The card-to-tape conversion operation, using the 714 Card Reader, the 759 Card Reader Control Unit, and the 727 Tape Unit, is capable of recording on magnetic tape information from IBM punched cards. The entire or partial reading of the card information is possible with any combination or arrangement of fields to produce the information in a coded and packed form on magnetic tape for use on the 704, and 705 computer systems.

The card reader with its control unit can also be used for direct input to the central unit of the IBM 705 computer system.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 727, magnetic tape unit	\$ 550
IBM 714, and 759, card reader and control unit	2,400

Two-shift operation increases single-shift rental by 50%; three-shift operation increases single-shift rental by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

Maximum Reading Speed

250, 80-column cards/minute.

20,000 characters/minute, any of which may be numerical, alphabetic or special characters.

COMPONENTS OF CARD-TO-TAPE CONVERSION OPERATION

<i>Component</i>	<i>Type</i>	<i>Function and Characteristics</i>
Card Reader	714	Input; sensing and reading of card information into the control unit storage. By the wiring of the control panel: the selection or arrangement of the card information that is read can be determined; emitting of characters is possible; a grouping feature may be used to convert two card records to a single tape or storage record.
Control Unit	759	Power supply; timing and coding circuits; 92 positions of magnetic core storage. During a card-to-tape operation, the sensing of the record storage mark will cause an inter-record gap on tape. During card to storage operation, the sensing of the mark stops the reading into computer storage.
Tape Unit	727	Tape recording mechanism; see ADP Equip. Rpt. Ref. 4G 380.3 for magnetic tape and the tape unit's characteristics.

PHYSICAL DATA

The following information is all tentative:

<i>Type</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
714	54"	33"	47"	1100 lbs.	9680 BTU/hr.
759	67"	32"	60"	2100 lbs.	8250 BTU/hr.
727	69"	29 $\frac{1}{4}$ "	31"	920 lbs.	4100 BTU/hr.

Power: 208 volts, 60 cps, 26.8 amp., three-phase, 10 kva.

CARD-TO-TAPE CONVERSION

COMMENTS

To record information on magnetic tapes from punched cards, the tape-to-card converter is used when there is no need to use the arithmetical and logical abilities of the 704 or 705 computer systems. The information on the punched cards may be data to be recorded onto magnetic tapes for later input to the computer; may be output information on cards from the computer to be recorded onto magnetic tapes for storing purposes; may be a master file to be recorded onto magnetic tapes for consultation during a later computer operation. If the logical abilities of the 704 or 705 are needed, the card information is read into the central unit of the computer systems by the card reader (711 for the 704; 714 for the 705) and its associated control unit.

All selection and arrangement of the card information to the magnetic tapes is accomplished by the wiring of the control panel. The entire card may be transcribed on tape or any arrangement or combination of fields may be selected. For the operation of converting two card records into one tape record, there are the following restrictions: the same card columns must be used from the two card records of not more than 46 characters each; the maximum tape record is 92 characters.

There are two checking features in the card-to-tape operation. Previous to the card being read into the control unit storage, the number of holes in each horizontal line of the card is determined to be odd or even. When the data is read out of the control unit storage, the same type of odd-even count is taken. These two counts should be identical. The second checking feature is a tape recording check. After a card record has been recorded on tape, the tape is backspaced and read for a redundancy check bit laterally for each character and longitudinally for the record.

ADDITIONAL INFORMATION

Write to: EDPM Department
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

PROBABILITY

Probability is a branch of mathematics that deals with the possibility of an event occurring. It is a measure of the likelihood of an event occurring, expressed as a number between 0 and 1. The probability of an event occurring is the ratio of the number of favorable outcomes to the total number of possible outcomes.

For example, if you have a bag containing 10 balls, 3 of which are red and 7 are blue, the probability of drawing a red ball is $\frac{3}{10}$ and the probability of drawing a blue ball is $\frac{7}{10}$.

Probability is used in many fields, including science, engineering, and finance. It is used to predict the outcome of an event, such as the weather, the stock market, or the results of an election.

There are two main types of probability: theoretical probability and experimental probability. Theoretical probability is based on the assumption that all outcomes are equally likely, while experimental probability is based on the results of an experiment.

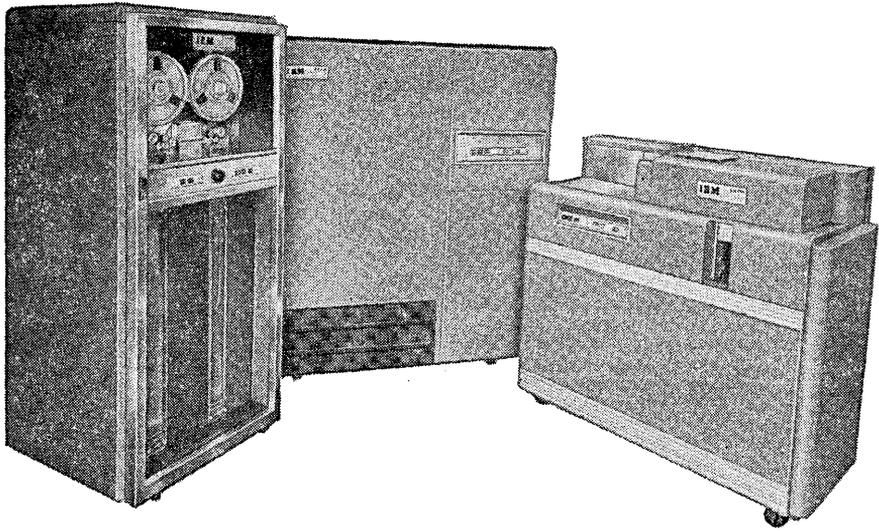
Theoretical probability is calculated by dividing the number of favorable outcomes by the total number of possible outcomes. For example, the theoretical probability of rolling a 6 on a six-sided die is $\frac{1}{6}$.

Experimental probability is calculated by dividing the number of times an event occurs by the total number of trials. For example, if you roll a six-sided die 100 times and get a 6 15 times, the experimental probability of rolling a 6 is $\frac{15}{100}$.

Probability is also used to calculate the expected value of a random variable. The expected value is the long-run average value of a random variable. It is calculated by multiplying each possible outcome by its probability and then summing the results.

For example, if you have a game where you can win \$10 with a probability of $\frac{1}{6}$ or lose \$5 with a probability of $\frac{5}{6}$, the expected value of the game is $\frac{1}{6} \times 10 + \frac{5}{6} \times (-5) = -\frac{5}{6}$.

TAPE-TO-CARD CONVERSION
IBM 722 CARD PUNCH, 758 CARD PUNCH
CONTROL UNIT, AND 727 MAGNETIC
TAPE UNIT



TAPE-TO-CARD CONVERSION

IBM 722 CARD PUNCH, 758 CARD PUNCH CONTROL UNIT, AND 727 MAGNETIC TAPE UNIT

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The magnetic tape-to-card conversion operation, using the 727 Magnetic Tape Unit, the 722 Card Punch Control Unit, and the 758 Card Punch, is capable of punching IBM punched cards with information from magnetic tapes. The information on the magnetic tapes must be coded and packed with accompanying end of record and group codes as output from the IBM 704 or 705 computer systems. In addition to this independent magnetic tape-to-card operation, the card punch with the card punch control unit may be used as an output component of the 705 computer system.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 727, magnetic tape unit	\$ 550
IBM 722 and 758, card punch and control unit	1,050

Two-shift operation increases the single-shift rental by 50%; three-shift operation increases single-shift rental by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

Maximum Punching Speed

100, 80-column cards/minute.

8,000 characters/minute, any of which may be numerical, alphabetic or special characters.

COMPONENTS OF THE TAPE-TO-CARD CONVERSION OPERATION

<i>Component</i>	<i>Type</i>	<i>Function and Characteristics</i>
Card Punch	722	Punching mechanism. Information is punched in the cards in the same order and arrangement that it is read from tape or that it is stored in the 705 storage.
Control Unit	758	Power supply; timing and coding circuits; 80 positions of magnetic core storage, storing the information from the tape to be transferred to the punch unit.
Tape Unit	727	Input; converts magnetic recording into electrical pulses; see ADP Equip. Rpt. Ref. 4G 380.3 for the magnetic tape and tape unit's characteristics.

PHYSICAL DATA

The following information is all tentative:

<i>Type</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
722	50"	26"	52"	1250 lbs.	6,830 BTU/hr.
758	67"	32"	60"	2150 lbs.	13,660 BTU/hr.
727	69"	29 $\frac{1}{4}$ "	31"	920 lbs.	4,100 BTU/hr.

Power: 208 volts, 60 cps, 33.5 amps., three-phase, 12.3 kva.

TAPE-TO-CARD CONVERSION

COMMENTS

To transcribe information into cards from magnetic tape, the tape-to-card converter is used when there is no need to use the logical abilities of the 704 or the 705 computer systems. This transcription is possible without using the valuable computing time of the computer's central unit. The information on magnetic tape may be desired on cards for several reasons: manual access to the file of cards is possible; the file can be easily separated.

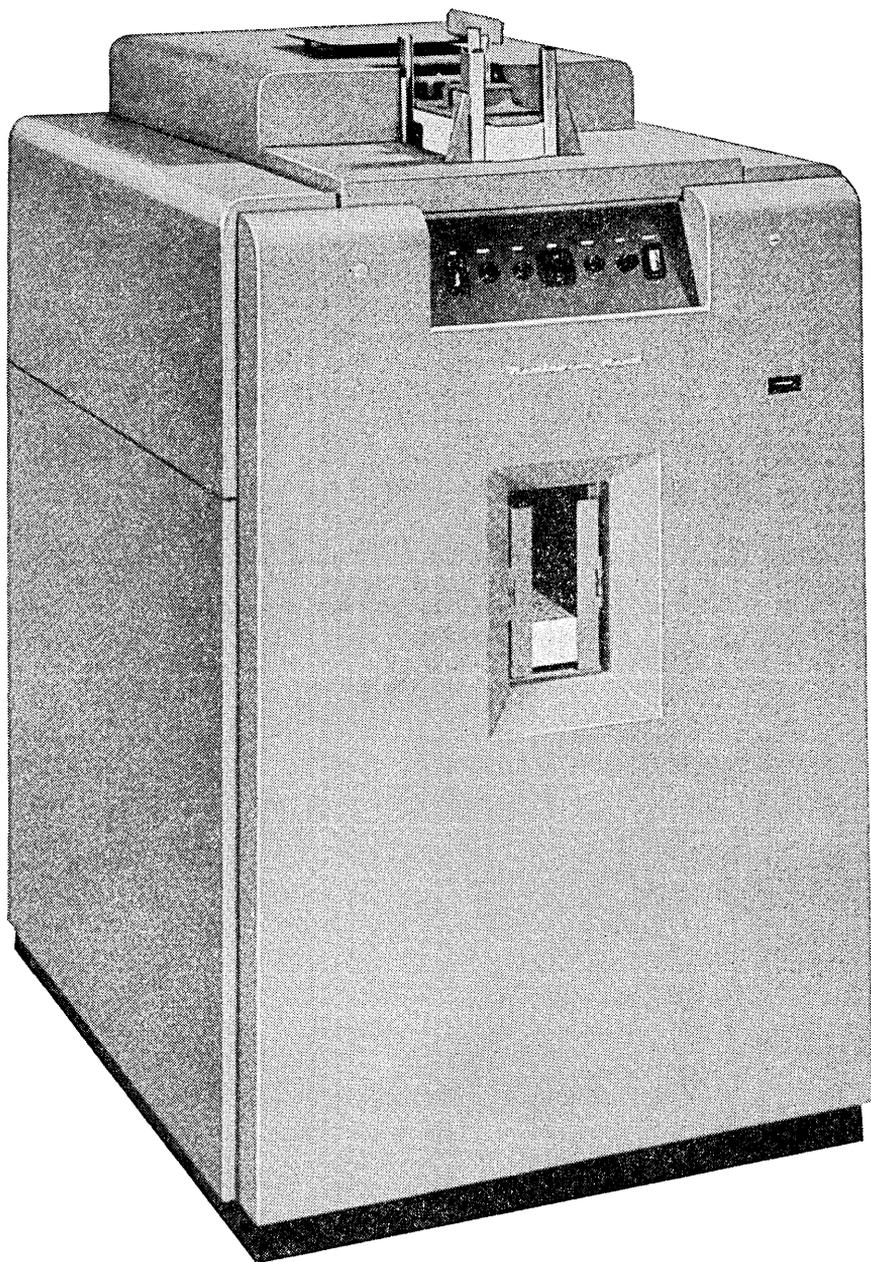
The information must be in sequence on tape for the tape-to-card operation or may be arranged in the computer's main storage to fit established fields before it is punched.

In the tape-to-card operation, information read from the tape is checked for a redundancy check bit laterally for each character and longitudinally for the record. Information transmitted to the card punch control unit's storage from main computer storage is given a character redundancy check. The second checking feature is an odd-even horizontal row count of the holes punched in the card. This count is matched against a similar row count that was taken on the data from the control unit's storage. These two counts should be identical.

ADDITIONAL INFORMATION

Write to: EDPM Department
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND TYPE 318
Card-to-Tape Converter



REMINGTON RAND TYPE 318

Card-to-Tape Converter

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 318, card-to-tape converter, is capable of preparing 5-channel chadless paper tape from information punched in Remington Rand cards. By the connection panel wiring and control punches in the card, it is possible to edit the information from the card to the tape. It is also possible to produce the telegraphic coded tape to be used for transmission either to a telegraphic page printer, or to a telegraphic tape reperforator, or to a tape-to-card converter.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 318	\$8,500	\$105

The monthly rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental costs by 50%; 120-hour week, three-shift operation increases the single-shift costs by 100%. Maintenance is included in the monthly rental. A maintenance contract is available to purchasers.

PERFORMANCE

Tape is perforated at the rate of 15 characters per second.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	10 characters/inch.
No. of Channels	5 total, telegraphic code.
Characters	
alphabetic	A to Z.
numeric	0 to 9 and the most common fractions.
special	Codes for limited standard communication characters such as \$ () " / are available.
Format	On which equipment the tape is to be used next, determines the format. There will be no blank spaces on the tape. Letters- and figures-shift precede alphabetic or numeric information respectively for telegraphic equipment use.
Motion	Continuous feeding and punching, except on skips of 5 to as many card columns as desired.
Reel Capacity	— feet of tape.

CARD READING UNIT CHARACTERISTICS

The card capacity of the card feeding magazine and the card receiver is 700 cards. Card columns 1 through 45 are sensed by the first set of brushes, a column at a time. After the sensing of column 45, the second set of brushes sense columns 46 through 90, one column at a time.

By the wiring of the connection panel and control punches in the card, the card information can be edited to tape as follows:

Complete or partial reading of the card is possible.

Punctuation of card information, and insertion of control codes, e. g., carriage return, line feed, into tape teletype codes is possible.

Master and detail cards can have different types of information in different fields and treated accordingly.

PHYSICAL DATA

Height, 45 $\frac{3}{4}$ "; width, 25"; depth, 45 $\frac{1}{4}$ "; weight, 470 lbs.

Power, 115 volts, 60 cps, 6.3 amps., AC.

Heat dissipation, 2100 BTU/hr.

REMINGTON RAND TYPE 318

COMMENTS

The Type 318 is used to prepare perforated telegraphic coded paper tape from information on Remington Rand cards. The information on the tape can then be transmitted telegraphically and/or used to prepare written documents on a teleprinter.

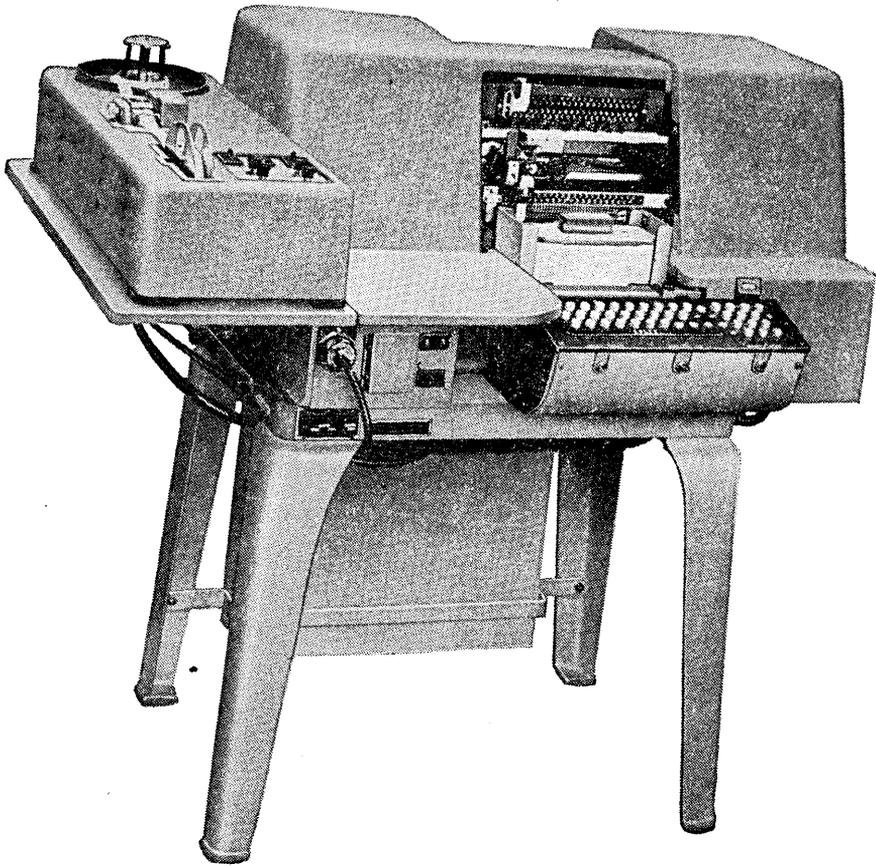
There is automatic conversion of the alphabetic and numeric data to the 5-position teletype codes. Special character conversion must be provided for by the wiring on the connection panel.

An automatic stop for tape punching occurs on the following conditions: the supply of cards is exhausted; a card fails to feed; the supply of tape is at a low point.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 308-5
Tape-to-Card Converter



REMINGTON RAND TYPE 308-5

Tape-to-Card Converter

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 308-5, tape-to-card converter, is capable of preparing Remington Rand punched cards from information perforated in 5-channel paper tape. The telegraphic coded information on the paper tape is: sensed; translated into 3-hole alphabetic and numeric codes with the subsequent punching of these codes into Remington Rand cards, or translated into operation signals to cause the functioning of the major features of a card punch.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 308-5	\$5,065	\$70

The monthly rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental costs by 50%; 120-hour week, three-shift operation increases the single-shift costs by 100%. Maintenance is included in the monthly rental. A maintenance contract is available to purchasers.

PERFORMANCE

Tape is read at the rate of 7 characters per second.

EQUIPMENT REPORT

PUNCHED CARD CHARACTERISTICS

Code	Alphabetic-numeric 3-hole code.
Characters	
alphabetic	A to Z (2 or 3 hole coded).
numeric	0 to 9 (1 or 2 hole coded).
special	One character of any design is available.
No. of Columns	90 columns.
Punch Mode	Parallel by punch by character, serial by card. With the format set up and the information from tape set up in the set bars, an impulse that depresses the trip key punches the entire card.
Format	Teletype operation and special character codes are translated into punch functions which make use of the format controls. . The format controls are the skip-stops (tab settings), and marginal stops. A maximum of 7 columns at a time can be skipped by a skip-stop setting. The marginal stops are for the left-hand margin and an intermediate margin.

TAPE CONTROL UNIT AND TRANSLATING UNIT CHARACTERISTICS

The tape control unit feeds and senses the 5-position teletype code in the paper tape.

By the translating unit's wiring, done by a representative of Remington Rand's mechanical service department, the teletype operations and special character codes are translated into punch functions. This wiring is changed by Mechanical Service replugging connection wires. The punch functions allow the tape information to be edited to the card as follows:

All or part of the information on the tape may be punched into the cards.

Incorrect information perforated in the tape, with corrected data following it, will not be punched in the cards.

Information is punched in the card in the same order as read from the tape.

REMINGTON RAND TYPE 308-5

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Tape Control Unit (on ledge of punch unit)	8½"	9"	25"	30 lbs.
Automatic Punch Unit	39½"	51"	36"	324 lbs.
Power	6¼ amps., AC or DC			
Heat Dissipation	1800 BTU/hr.			

COMMENTS

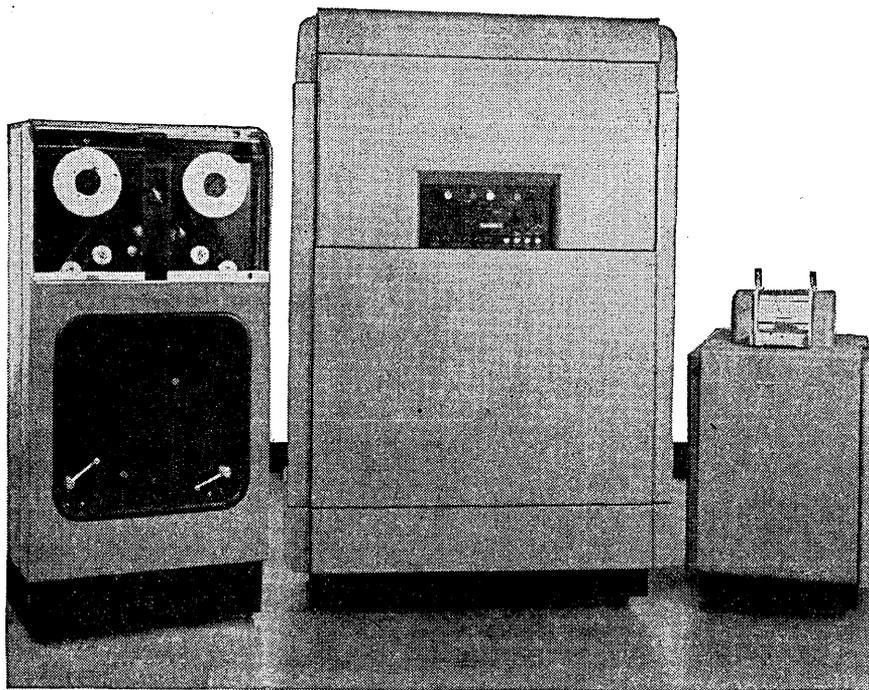
An automatic stop for card punching occurs on the following conditions: the card feed is empty; a card fails to feed; the end of the tape is sensed.

When the punch is performing an operation such as trip, cancel, etc., the tape continues feeding after the operation is completed.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

**REMINGTON RAND
CARD-TO-MAGNETIC TAPE CONVERTER**



April, 1956

CARD-TO-MAGNETIC TAPE CONVERTER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Card-to-Magnetic Tape Converter, consisting of three units (the card-feed unit, the electronic control unit and the tape unit), is capable of recording on magnetic tape information from punched cards. The Converter is available in two models: the 90-column card converter and the 80-column card converter. The entire or partial reading, and any rearrangement of the card information for recording is possible by the wiring of the plugboard.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
80 or 90-Column Card-to-Magnetic Tape Converter	\$142,100	\$2,520

The above rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental charge by 50%; 120-hour week, three-shift operation increases the single-shift rental charge by 100%. Monthly rentals for a Univac system include maintenance for the converter. A maintenance contract is available to purchasers of a Univac system.

EQUIPMENT REPORT

PERFORMANCE

Maximum Reading Speed

240, 80 or 90-column cards/minute.

24,960 or 27,360 characters/minute, any of which may be numerical, alphabetic or special characters read from the card with 24 split wirings possible.

COMPONENTS OF THE CARD-TO-MAGNETIC TAPE CONVERTER

<i>Component</i>	<i>Function and Characteristics</i>
Card-Feed Unit	Input; reading of card information into the control unit storage.
Control Unit	Power supply; timing, coding and checking circuits; temporary storage. Wiring of the plugboard provides for the selection of the information on the card to be read and the arrangement of the information on the tape.
Tape Unit	Tape recording mechanism; see ADP Equip. Rpt. Ref. 4G 660.1 for magnetic tape and the tape unit's characteristics.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
80-Column Card:					
Card-Feed Unit	36"	30"	30"	320 lbs.	} 31,400 BTU/hr.
Electronic Unit	76"	50"	32"	2,265 lbs.	
Tape Unit	60"	29"	23"	650 lbs.	
90-Column Card:					
Card-Feed Unit	36"	30"	30"	300 lbs.	} 38,040 BTU/hr.
Electronic Unit	66"	50"	32"	1,800 lbs.	
Tape Unit	60"	30"	24"	500 lbs.	
Power	208/230 volts, 60 cps, three-phase, approx. 10 kva.				

CARD-TO-MAGNETIC TAPE CONVERTER

COMMENTS

The card-to-magnetic tape converters are used to record information from 80-column or 90-column cards onto magnetic tapes, the input medium of the Univac computer system.

All editing of the card information to the magnetic tape is accomplished by the wiring of the plugboard. The information from each card is assigned 120 character positions (one blockette) on tape. The gap between blockettes is approximately 1.8 inches. Information from 5,200 cards may be recorded on one 1500 foot reel of tape.

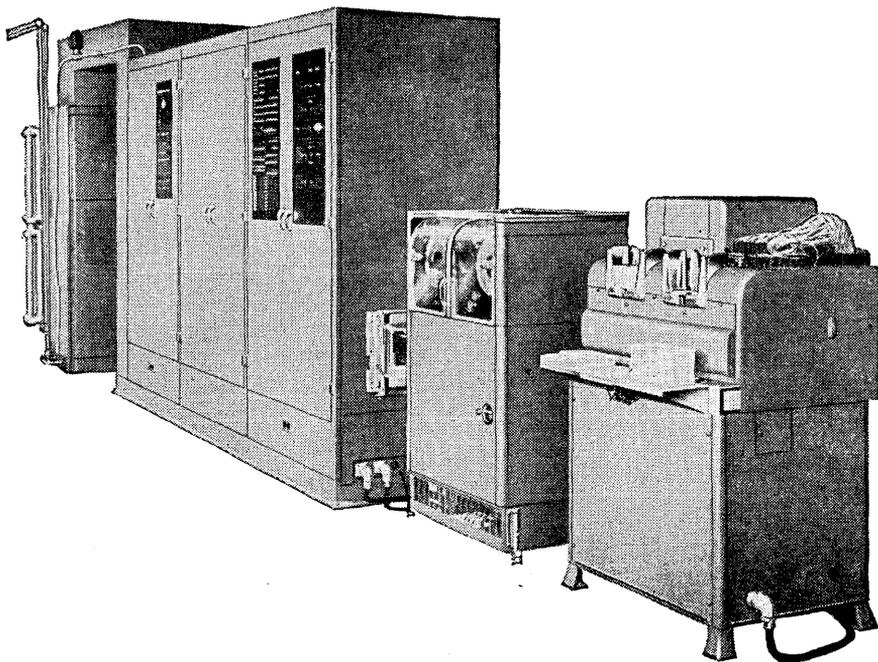
Some of the checking features of the card-to-tape operation are the mispunch detector, the odd-even check, the 120-digit check and the comparison check. The mispunch detector examines each card column during the first reading of the card to detect any illegitimate punch combinations. When such combinations are detected, the card is rejected and the converter stops.

The odd-even check stops the machine if any of 120 characters recorded on tape have an even number of recorded bits. The 120 digit check counts the digits. Each blockette must have 120 digits or the machine is stopped. The comparison check is a digit-by-digit comparison between the recording on tape and the information in the electronic unit's storage from a second reading of the card. A mismatch results in the rejection of the card and stopping of the converter.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

**REMINGTON RAND
MAGNETIC TAPE-TO-CARD CONVERTER**



April, 1956

MAGNETIC TAPE-TO-CARD CONVERTER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Magnetic Tape-to-Card Converter, consisting of three units (the tape reader, the electronic control unit, and the card punch), is capable of punching 80-column cards with information from magnetic tape. The information on the tapes must be coded, packed and in a block length as output from the Univac computer system.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Magnetic Tape-to-Card Converter	\$130,000	\$2,300

The above rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift rental charge by 50%; 120-hour week, three-shift operation increases the single-shift rental charge by 100%. Monthly rentals for a Univac system include maintenance for the converter. A maintenance contract is available to purchasers.

PERFORMANCE

Maximum Punching Speed

120, 80-column cards/minute.

9,600 characters/minute, any of which may be numerical, alphabetic or special characters.

EQUIPMENT REPORT

COMPONENTS OF THE MAGNETIC TAPE-TO-CARD CONVERTER

<i>Component</i>	<i>Function and Characteristics</i>
Card Punch	Punching mechanism; card feeding.
Electronic Unit	Timing, coding and check circuits; 120 positions of core storage, temporarily storing the information from the tape to be transferred to the punch unit. Wiring of the plugboard determines which characters from the tape will be punched into the selected card columns.
Tape Unit	Input; converts magnetic recording into electrical impulses; see ADP Equip. Rpt. Ref. 4G 660.1 for the magnetic tape and tape unit's characteristics.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Card Punch	48"	36"	38"	800 lbs.
Electronic Unit	90"	40"	190"	3,000 lbs.
Tape Unit	60"	24"	30"	400 lbs.
Motor Generator Set	20"	18"	56"	600 lbs.
Air Conditioning Unit *				
Refrigeration Type	69"	40"	22"	approx. 3,025 lbs. with elec- tronic cabinets

Power 115/220 volts, single or three-phase.

* A refrigeration type or chilled water type of air conditioning may be used. A refrigeration unit is furnished by the manufacturer. The water type is supplied by the customer.

MAGNETIC TAPE-TO-CARD CONVERTER

COMMENTS

The magnetic tape-to-card converter is used to transcribe information into 80-column cards from magnetic tapes, the output medium of the Univac computer system.

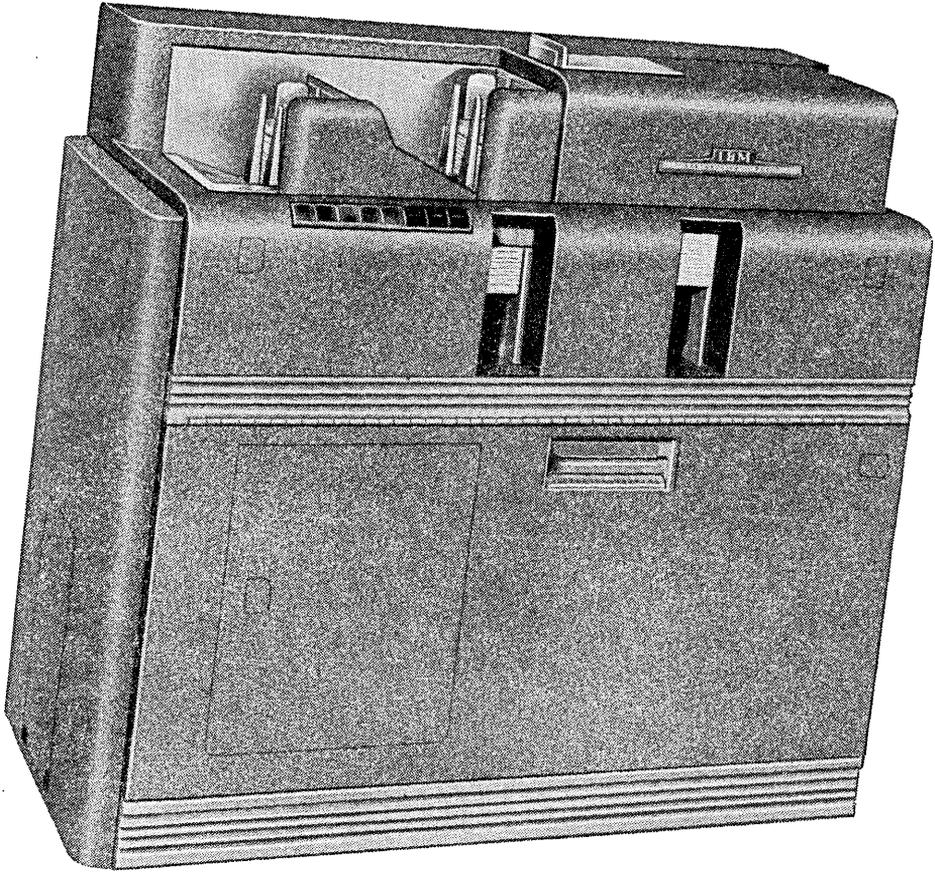
The information on the magnetic tapes is recorded at 128 characters/inch in blocks of 720 characters. Up to 1800 blocks may be recorded on a single 1500 foot reel of tape. Each block of 720 characters is subdivided into six blockettes of 120 characters. Spacing between blockettes is 0.1 inches. The resulting punched cards have up to 80 characters of information from each 120-character blockette. Characters are selected and assigned to card columns by the wiring of the plugboard.

Checking features that ensure conversion of information from tape to cards are included with the converter. Each tape character that is read, is given a redundancy check to ensure that the character read has an odd number of bits. Information transmitted to the electronic unit's storage for punching a card is checked against the information in the card after punching. Any character position of a blockette which is wired for punching in the card and which contains characters that do not have a punched card code equivalent will stop the converter.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

IBM TYPE 514
Reproducing Punch



IBM TYPE 514

Reproducing Punch

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Type 514 Reproducing Punch is capable of transferring or comparing information between two sets of IBM punched cards. In addition, information may be gang punched in the cards in the punch feed hopper. When equipped with the mark sensing unit, it is capable of transcribing mark-sensed data as punches; and in connection with an accounting machine (Types 402, 403, 405, 407, 416, and 419) will punch results into cards.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Model 5, reproducing only	\$40
Model 4, 45 column comparing	60
Model 3, 80 column comparing	75
Model 2, 45 column comparing	85
Model 1, 80 column comparing (Models 1 and 2 for use with the Accounting Machines Type 400 series.)	100
Mark Sensing Unit	\$15 to 50
Two 10-position selectors, each	5
Double punch blank column checks, each 10-positions (Maximum of 30 column positions; 10 columns are standard with machine equipped with mark sensing.)	5
Gang Punch Emitter	5

EQUIPMENT REPORT

Second-shift is an additional 50% of single-shift rental; third-shift is 100% additional. Maintenance is included in rental charge.

PERFORMANCE

Processes in up to	100 cards per minute 80 columns per card
Mark Senses up to	26 columns/card, read feed; 27 columns/card, punch feed
Totaling in up to	80 columns per card

FUNCTIONAL CHARACTERISTICS

There are two feed hoppers, one for reading and one for punching cards, each holds 800 cards. Cards accumulate in one or two stackers holding 1000 cards.

<i>Standard or Optional Feature</i>	<i>Function</i>
Feeding (standard)	The two feeds are either synchronized or independent.
Automatic Stop (standard)	Automatic on last card or when cards do not compare. Indicator shows which columns are in error.
Column Splits (8, standard)	"X" or 12 punches can be transferred or eliminated.
Mark Sensing Unit (optional)	Transcribes mark-sensed data into punches.
Selectors, 10-position (optional)	Selects data punching position on card, or selects whether or not data is to be punched, dependent upon pick-up of "X" punch.
DPBC (10 columns standard on machine with mark-sensing; otherwise optional)	Checks a maximum of 30 columns for double punches or blank columns.
Gang Punch Emitter (optional)	Emits pulses for punching without master card, on gang punch operation.

IBM TYPE 514

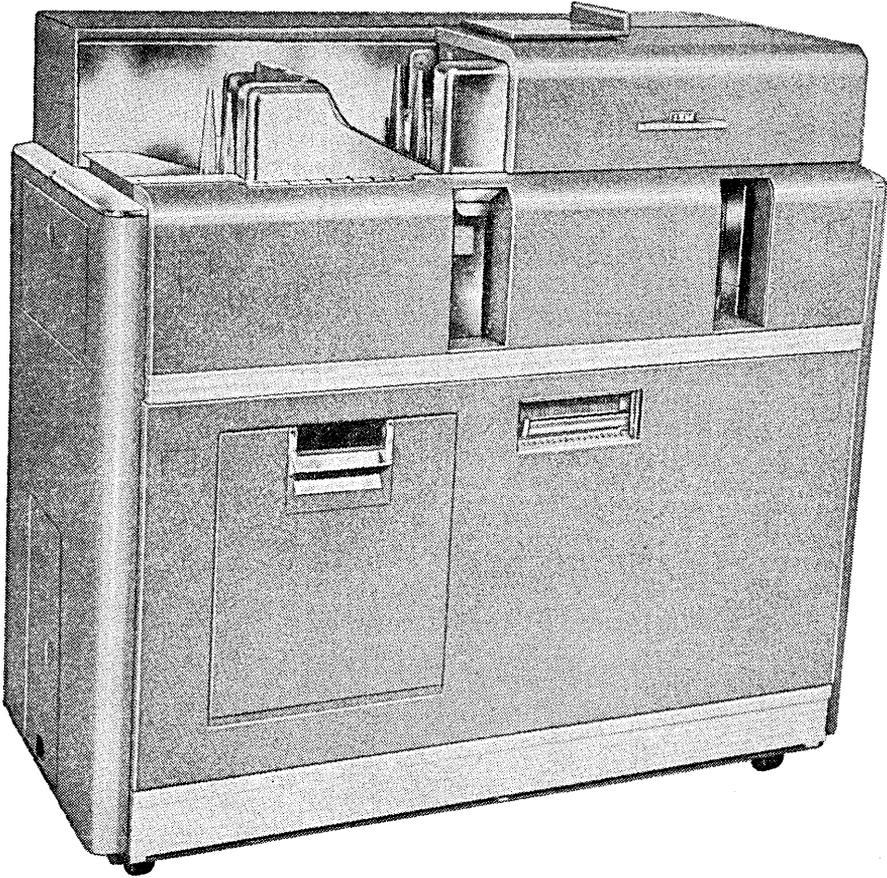
PHYSICAL DATA

Height, 51"; width, 53"; depth, 25½"; weight, 960 lbs.
Power, 115/230 volts, 12.2/6.1 amps., 60 cps, AC.
Heat dissipation, 3820 BTU/hr.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM TYPE 519
Electric Document-Originating Machine



IBM TYPE 519

Electric Document-Originating Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Type 519 Electric Document-Originating Machine transfers information between two sets of IBM punched cards and interprets or transcribes up to eight digits onto the end of a card. As special features, it may compare information, interpret mark sensing and in connection with an accounting machine (e. g., Types 405, 416), punches results into cards. The 519 can be used as an input component or in an independent tape-to-card operation in the 705 computer system.

EQUIPMENT REPORT

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Model 5, reproducing only	\$55
Model 4, 45 columns comparing	75
Model 3, 80 columns comparing	90
Model 2, 45 columns comparing	100
Model 1, 80 columns comparing (Models 1 and 2 for use with Accounting Machines Type 400 series)	115
Mark Sensing Unit	\$15 to 50
Double punch, blank column checks, each 10- position (Maximum of 30 column positions; 10 positions standard w/mark sensing unit)	5
Offsetting Stacker (Standard w/mark sensing unit)	5
Gang Punch Emitter	5

Second-shift is an additional 50% of single-shift rental; third-shift is 100% additional. Maintenance is included in rental charge.

PERFORMANCE

Processes in up to	100 cards per minute, 80 columns per card
Mark senses up to	26 columns/card, read feed; 27 columns/card, punch feed

Punches summaries or totals up to 80 columns per card. Prints up to 8 digits on end of card in either of two lines.

FUNCTIONAL CHARACTERISTICS

There are two feed hoppers, one for reading and for punching cards, each holds 800 cards. Cards accumulate in stackers holding — cards.

IBM TYPE 519

<i>Standard or Optional Feature</i>	<i>Function</i>
Feeding (standard)	Independent feed of cards in one hopper; or synchronized feeding of two hoppers.
Automatic Stop (standard)	On empty hopper, full stacker; on detection of an error in a compare operation.
End Printing, 8-digits (standard)	Interpretation and printing of 8-digits on card, or transcription and printing of 8-digits on another card.
Mark Sensing Unit (optional)	Transcribes mark-sensed data into punches.
Comparing Unit (optional)	80 or 45 card column positions compared on reproduce or gang punch operation.
Summary Punching (optional)	Punching a total of amounts that have been accumulated in the accounting machine counters.
Double Punch, Blank Column Detection (optional, or standard for machine w/mark sensing)	Maximum of 30 card column positions can be checked for double punches or no punches.
Column Splits, 12 (standard)	Elimination or transfer of X or 12 punch.
Offsetting Stackers (optional, or standard for machine w/mark sensing)	Offsets in stacker, cards with specified punches or cards with errors in punching.
Gang Punch Emitter (optional)	Permits gang punching or printing of common information without the use of master cards.

PHYSICAL DATA

Height, 49½"; width, 53"; depth, 25"; weight, 1180 lbs.

Power, 115/230 volts, 13/6.5 amps., 60 cps, AC.

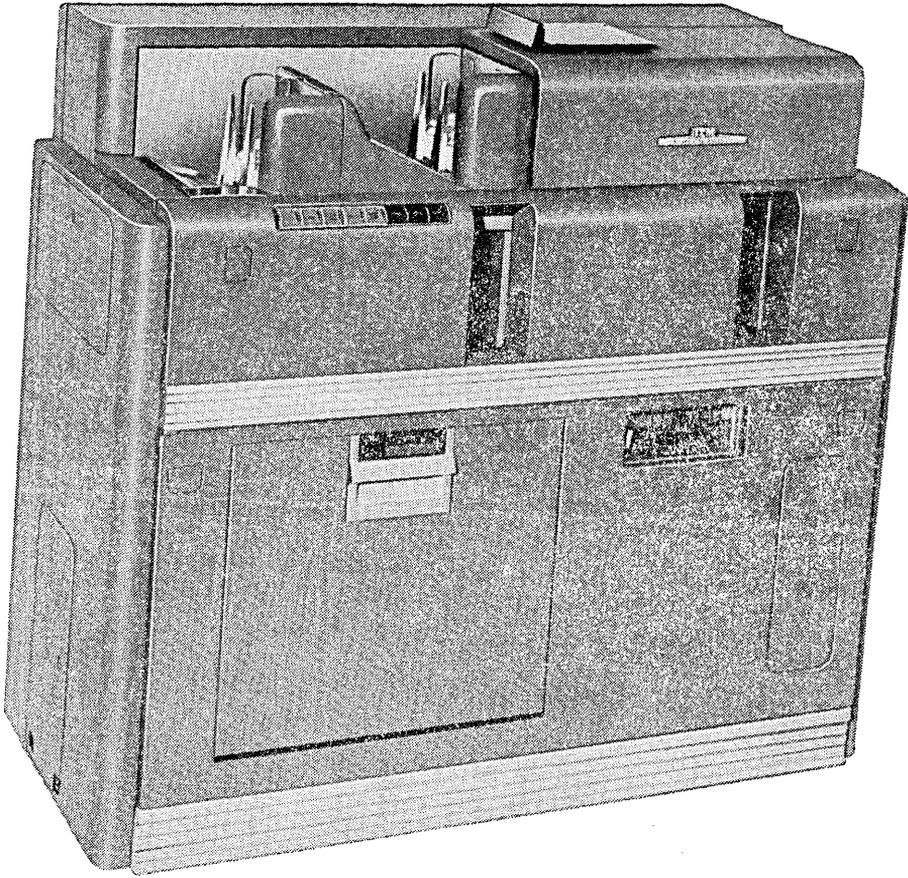
Heat dissipation, 4090 BTU/hr.

EQUIPMENT REPORT

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM TYPE 528
Accumulating Reproducer



IBM TYPE 528

Accumulating Reproducer

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Type 528 Accumulating Reproducer is capable of transferring or comparing information between two sets of IBM punched cards. It also performs totaling operations entering the results as punches on the cards from an accounting machine (Types 402, 403, 405, 407, 416 and 419).

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Type 528, non-summary punching with 45 columns compare	\$160
Additional 35 columns compare	15
Group control unit, compare control fields	20
Summary Punching	25
First 12 positions of Accumulators	70
Each additional 12 positions (a maximum of 48 positions)	55
Mark Sensing Unit	\$15 to \$50
Double punch, blank column check	5
Digit emitter and selector (both standard with machine w/mark sensing)	5

Second-shift operation increases single-shift rental by 50%; three-shift operation increases single-shift rental by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

Processes	100 cards per minute, during punching 200 cards per minute, when not punching
In up to	80 columns per card
Totals up to	12 groups of numbers
In up to	48 counter positions

FUNCTIONAL CHARACTERISTICS

<i>Standard or Optional Feature</i>	<i>Function</i>
Feeding (standard)	Two feed hoppers, one for reading, one for punching with synchronized or independent feed.
Stopping (standard)	Automatic on last card or non-compare.
Group Control Unit (optional)	Recognizes changes in control codes to control feeding, or for total punching.
Summary Punching (optional)	Permits punching of totals from an accounting machine.
Mark Sensing Unit (optional)	Reads mark data on a card in read and punch unit; punches this data into a card in punch unit.
Double Punch, blank column check (optional, standard with mark sensing unit)	Checks up to 30 columns for blank or double punched columns.
Digit Emitter & Selector (optional)	Selects specific digits in a card column or emits constant digits.

PHYSICAL DATA

Height, 49½"; width, 53"; depth, 25"; weight, 1430 lbs.

Power, 115/230 volts, 6.4/3 amps., 60 cps, AC.

Heat dissipation, 3166 BTU/hr.

ADDITIONAL INFORMATION

Write to: Department of Information

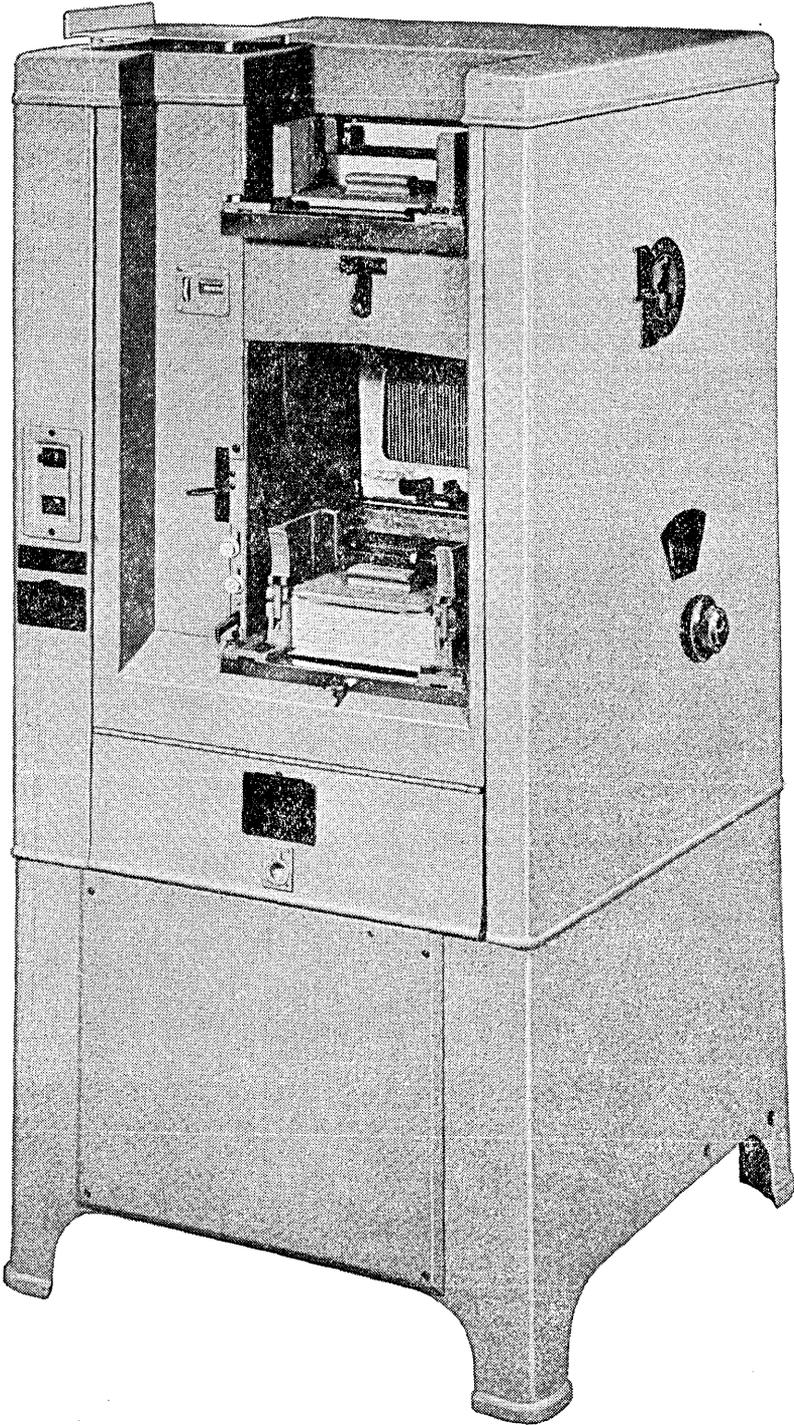
International Business Machines Corporation

590 Madison Avenue

New York 22, N. Y.

REMINGTON RAND TYPE 314

Reproducing Punch



June, 1956

REMINGTON RAND TYPE 314

Reproducing Punch

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 314 Reproducing Punch is capable of punching information previously punched in one Remington Rand card into another card or cards; in this punching operation certain card columns may be eliminated or transposed.

APPROXIMATE COST

<i>Reproducing Punch</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Type 314, 90 column	\$3,473	\$47
Type 314-2, Numbering, 90 column	3,820	50
Type 314-3, Short Card, 32 column	8,750	125
Type 314-4, Short Card, 40 column	8,750	125
Type 314-5, Short Card, 54 column	8,750	125
Type 314-6, Short Card, 66 column	8,750	125

The monthly rental figure is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases the one-shift cost by 50%; 120-hour week, three-shift operation increases the cost by 100%. Maintenance contracts are available to purchasers.

PERFORMANCE

Both feeding and punching at 125 cards/minute.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The capacity of the upper card feeding magazine is 360 cards; the lower card feeding magazine 600 cards, the upper card receiver 850 cards, and the lower card receiver 460 cards.

<i>Feature</i>	<i>Function</i>
Upper and Lower Card Feeding Magazines	Upper feeds card or cards from which information is to be duplicated or reproduced; lower feeds cards into which the information is to be punched.
Upper and Lower Card Receivers	Receives card fed by the upper or lower card feeding magazines respectively.
Column Lock-Out Controls	One for each card column. Allow when up, prevent when down, the setting up and punching of information from any card column or columns. These controls determine which card column or columns will be set up to punch.
Column Retract Controls	One for each card column. Allow when up, prevent when down, the clearing of punching dies of any card column or columns. These controls permit information to be locked into the dies for punching on every machine cycle.
Automatic Retract Control	Permits duplication into many cards the information in a single card by preventing the clearing of punching dies that are holding the single card information.
Manual Retract Lever	Permits manual clearing of the die setup, when clearing of the dies is prevented by the setting of the automatic retract control.
Wiring Unit	Transfers information from original card to card to be reproduced. Either column-for-column transfer or transposed-column transfer is available by use of different wiring units.
Automatic Stopping Device	Causes card feeding to stop immediately after the last card leaves either feeding magazine.
Duplication-Reproducing Control	When active permits continuous card feeding during a duplication operation even if there are no cards in the upper card feeding magazine.
Variable Automatic Stopping Control	Will permit the stopping of the machine after a predetermined number of cards have been punched.

REMINGTON RAND TYPE 314

PHYSICAL DATA

Height, 47"; width, 24"; depth, 24"; weight, 500 lbs.
Power 110 volts, 60 cps, 7.5 amps., AC or DC.
Heat Dissipation negligible.

COMMENTS

The purpose of the type 314 is to reproduce a new set or file of Remington Rand punched cards from an existing set. This reproduction may be an exact column-for-column reproduction, or certain card columns and card fields may be eliminated or transposed. The machine may also be used as a duplicating punch, punching from one card, any number of cards containing identical information.

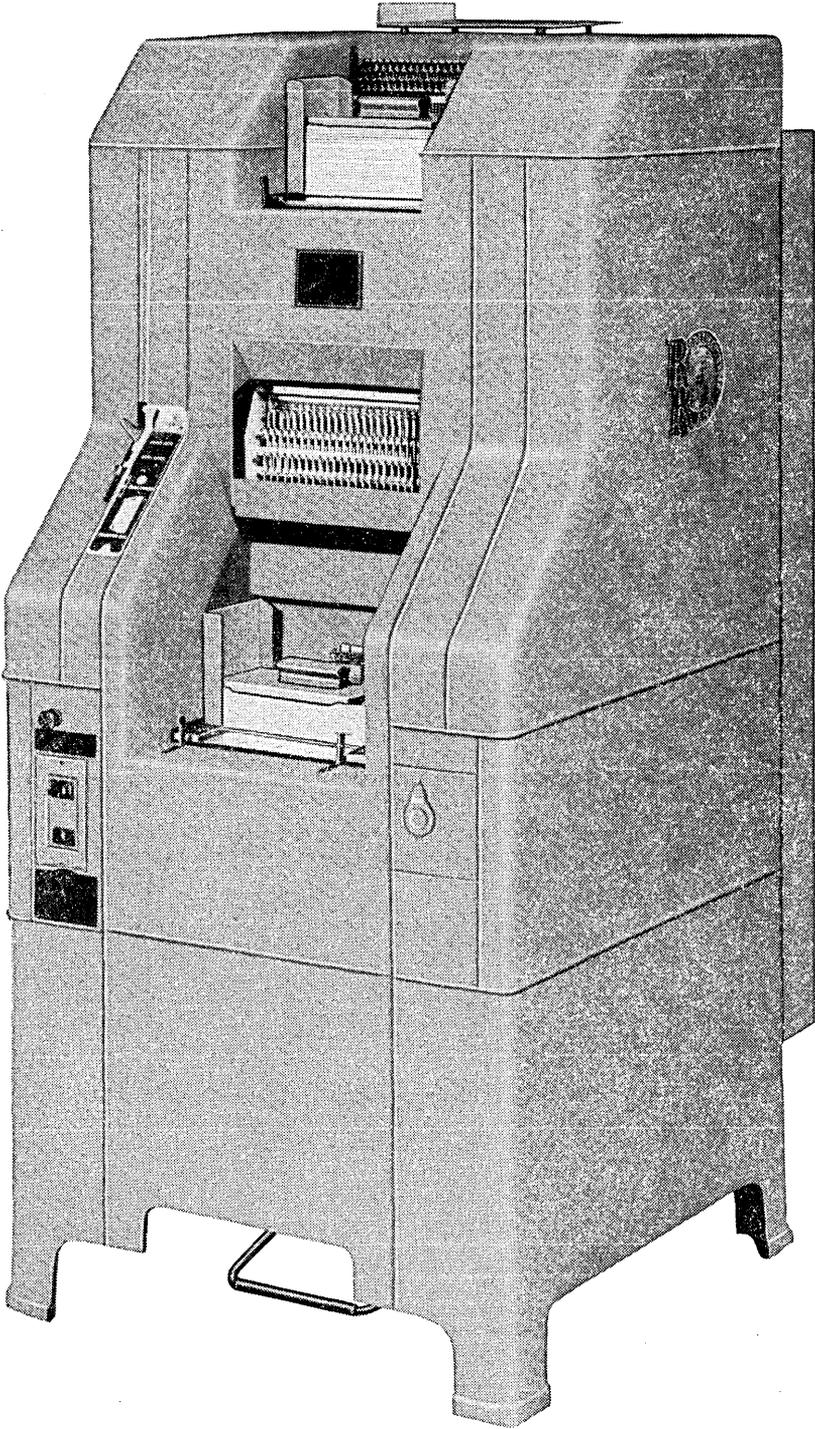
The Type 314-2 is equipped with additional devices which permit card counting and stamping. The numbering device stamps a constant or repeat number and a consecutive number on each card fed by the lower card feeding magazine. The card counter maintains a visible count of the number of cards being punched and stamped by the numbering device. This card counter has a 5-digit capacity. The numbering device and the card counter are made operative or inoperative by the setting of the numbering device control.

Reproducing punches for feeding 'short cards' (Types 314-3, 314-4, 314-5 and 314-6) are modifications of the standard Type 314 punch and have the same features. The reproducing punches reproduce 90 column cards from short cards of 16, 20, 27 or 33 column length. Each of the short cards has a capacity of 32, 40, 54 or 66 columns (characters) respectively.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 310
Multi-Control Reproducing Punch



November, 1956

REMINGTON RAND TYPE 310

Multi-Control Reproducing Punch

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 310 Multi-Control Reproducing Punch is capable of comparing two sets of Remington Rand punched cards, and on the basis of this comparison can punch cards fed by the lower magazine or segregate the cards in each of the two sets. The Type 310-1 Interfiling Reproducing Punch can interfile selected cards from both sets while segregating certain cards according to the comparison.

APPROXIMATE COST

<i>Reproducing Punch</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
310 Multi-Control, with 3 functions	\$7,640	\$ 85
310-1 Interfiling, with 3 functions	9,376	110
Additional functions,* each		5

* A maximum of eight functions.

The monthly rental figure is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases the one-shift cost by 50% ; 120-hour week, three-shift operation increases the cost by 100%. Maintenance contracts are available to purchasers.

PERFORMANCE

100 cards/minute, for each feeding magazine.

200 cards/minute, both feeding magazine feeding simultaneously.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The capacity of the upper and lower card feeding magazines is 600 cards each. The capacity of the 4 or 5* card receivers is 750 cards each.

<i>Feature</i>	<i>Function</i>
Upper and Lower Card Feeding Magazine	Upper feeds card or cards from which information is to be compared and punched; lower feeds cards from which information is to be compared and into which information is to be punched.
Upper and Lower Sensing Section	Senses information punched in cards fed by upper or lower feeding magazine respectively.
Upper Setup Section	Retains information sensed by upper sensing section.
Comparing Unit	Compares information in upper setup section with information in lower sensing section, to determine whether the information matches or not.
Punching Setup Station	Sets up and retains information transmitted through the punching wiring unit from the upper setup station to be punched into the card from the lower sensing station.
Upper and Lower Front Card Receivers	Receives segregated cards fed by the upper or lower card feeding magazines respectively.
Upper Rear and Lower Center* Card Receivers	Receives non-segregated cards fed by the upper or lower card feeding magazines respectively; and all cards fed by the upper or lower card feeding magazines respectively when segregation is not desired.
Interfiled Card Receiver	Receive cards fed by both upper and lower magazines for interfiling. (On 310-1 only.)
Card Feeding Magazine Stopping Control	One for each feeding magazine. When up, machine will stop immediately after the last card leaves magazine. When upper card feeding magazine stopping control is down, the machine will continue to operate in the absence of cards in the upper magazine. When lower card feeding magazine stopping control is down, the machine will stop when last card leaves lower sensing station. When up, it will stop when last card leaves the lower feeding magazine.

* On 310 lower center card receiver is lower rear card receiver.

REMINGTON RAND TYPE 310

FUNCTIONAL CHARACTERISTICS—Cont.

<i>Feature</i>	<i>Function</i>
Column Lock-Out Controls	One for each card column. Allow when up, prevent when down the sensing of information punched in card in upper sensing section.
Column Comparing Controls	One for each card column. When up comparison takes place, when down the comparing of information cannot take place.
Function Selector Dial	Selects card feeding operation; coordinates card segregation and card punching.
Segregation Control	Controls card reviewing operations; permits either segregation of cards fed by lower card feeding magazine only, by upper card feeding magazine only or both.
Selective Punching Control	Permits punching of matched cards only, non-matched cards only or all cards.
Interfiling Control	Permits interfiling of either matched cards; of non-matched cards; of all cards or of no cards. (On 310-1 only.)
Column Retract Controls	One for each card column. When up, normal retraction occurs on punching, when centered, information set up previous to starting operation is repeat-punched into all cards, when down, prevents information from the sensing unit to be punched.

PHYSICAL DATA

Height, 51"; Width, 22½"; Depth, 34"; Weight, 702 lbs.

Power, 110 volts, 60 cps, 7½ amps; AC or DC.

Heat Dissipation, negligible.

COMMENTS

One purpose of the Type 310 is to reproduce a new set or file of Remington Rand punched cards from an existing set. This reproduction may be an "exact" column for column reproduction, or certain card columns and card fields may be eliminated or transposed.

EQUIPMENT REPORT

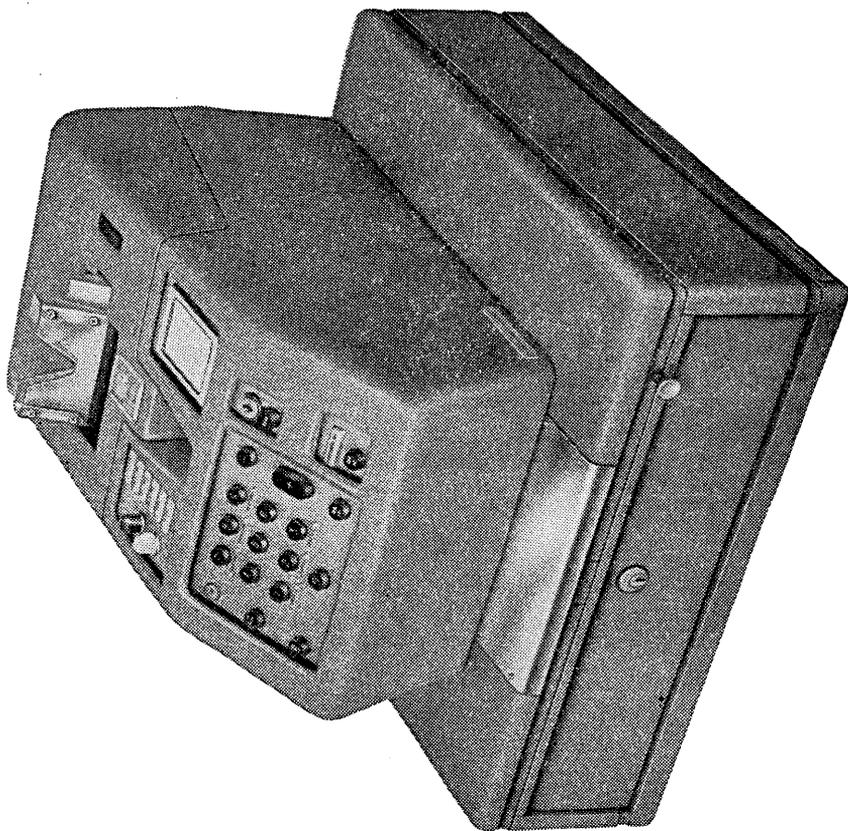
In addition the Type 310 feeds two sets of cards and compares the value in one set with those in the other set for the purpose of punching those which either match, do not match or all cards. At the same time it can segregate the cards that do not match from those that do in either or both files.

The Type 310-1 incorporates all the features of the 310 plus the ability to interfile selected cards as required.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, New York

**REMINGTON RAND
POINT O'SALE RECORDER**



May, 1957

REMINGTON RAND POINT O'SALE RECORDER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Point O'Sale Recorder consists of three units: cash register, tag reader and tape perforator. It records sales information on multi-copy sales checks and perforated 7-channel paper tape. This paper tape may be used for computer input, paper tape-to-card or paper tape-to-magnetic tape conversions.

APPROXIMATE COST

	<i>Purchase</i>	<i>Monthly Rental</i>
Point O'Sale Recorder	\$5,400.00	\$125.00

CASH REGISTER CHARACTERISTICS

Class	Electromechanical.
Keyboard	10-key.
Keys numerical control	0 to 9. add, subtract, total, subtotal, tax, markdown, void, customer number.
Control Lights	7 for sequencing purposes: tax or fee type, transaction type, sales number, drawer, de- partment, classification, amount. When one of the seven steps is completed, its light turns off and the light indicating the next step turns on. In-process light (when on, indicates that a trans- action has been started but is not yet com- pleted). Warning light (when on, indicates exhausted tape supply in the sales register).
Accumulators	2: transaction total accumulator and grand total accumulator.

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

Recording Density	10 digits per inch.
No. of Channels	7-channel, Univac code. (Standard)
Perforating Medium	1" wide paper tape.
Control Keys on Perforator	Feed key, push key to shut off power to the Point O'Sale Recorder.
Control Lights on Perforator	Tape supply light to indicate exhausted tape supply, power light.
Tape Format	Fixed length information blocks. Each block contains data relevant to an item in the transaction.

MEDIA READER CHARACTERISTICS

Class	Electromechanical.
Code	Kimball or Dennison.
Operation Modes	2: tags optional, tags always.
Tags	Merchandise tags containing 29 or 24 digits of information if Kimball coded, or 20 to 25 digits of information if Dennison coded; customer tokens; clerk tokens.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Sales Register	12"	10½"	21"	52 lbs.
Media Reader	8½"	10"	16"	36½ lbs.
Tape Perforator	12"	20"	15"	67 lbs.

Heat dissipation: Negligible.

Power: 115 volts, 60 cps, ½ amp.

POINT O'SALE RECORDER

COMMENTS

The Point O'Sale Recorder is a sales information recording device. It produces printed, itemized sales checks in multiple copies (if desired) and records the details of each transaction on perforated paper tape. This paper tape may be used as computer input for audit and inventory purposes or for tape-to-card conversion. The paper tape is ordinarily coded in the Univac System, but the Recorder can be modified to perforate other codes into the paper tape.

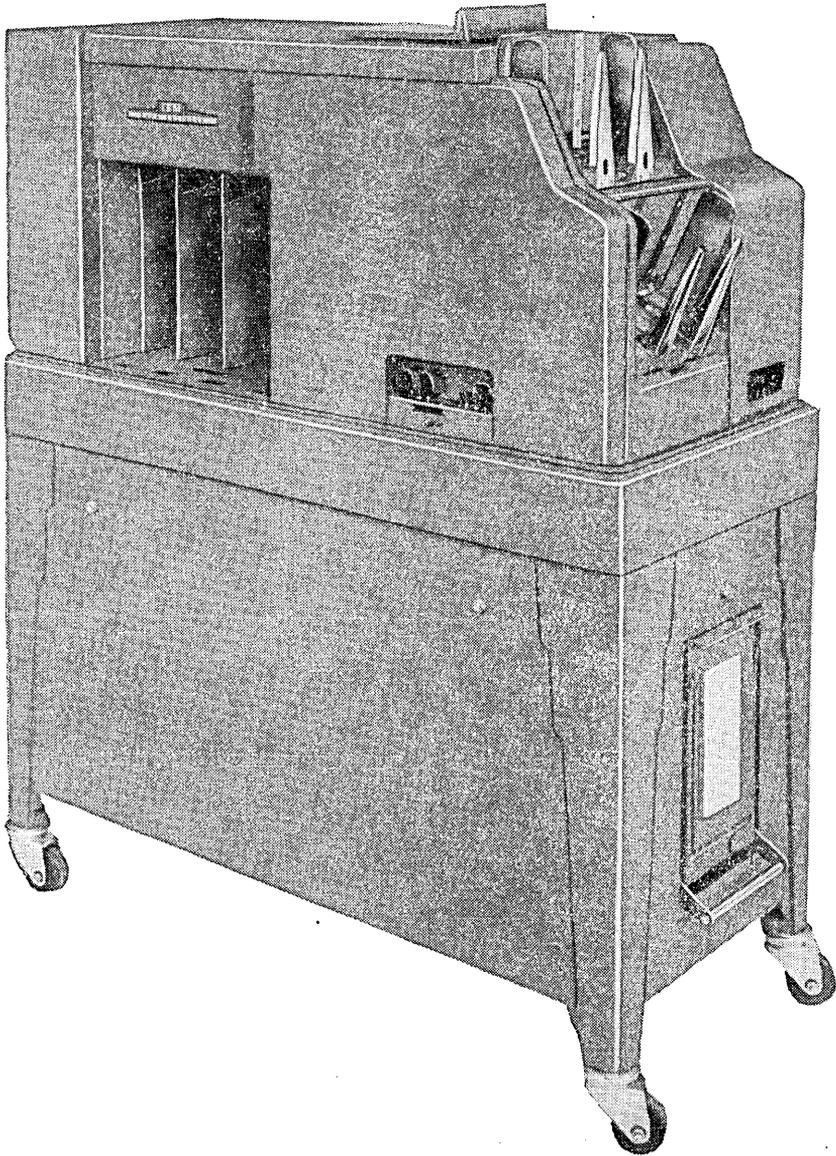
Operation of the units of the Point O'Sale Recorder depends on the program sequence chosen by the sales clerk prior to recording a transaction. Nine types of transactions are possible: C. O. D., Parcel Post, C. O. D. Deposit, Gift Wrap, Alteration, Federal Tax, No Tax, State Tax, and City Tax. A set of seven sequencing lights on the Sales Register indicates to the sales clerk which step must be performed next in the recording of a transaction.

The Media Reader unit accepts either Kimball or Dennison coding. Point O'Sale Recorders may be set such that tag reading is either optional or necessary to the transaction.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

IBM 077
Collator



May, 1956

IBM 077 Collator

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The 077 Collator is capable of selecting, sequence checking, and merging files of IBM punched cards. With the alphabetic device option, these operations can be performed on numerical and alphabetic card information. The cards from the two feed hoppers are read, compared and selected or merged into any of the four pockets under control of the control panel wiring. At the same time, cards in each file that do not match those in the other can be separated from the rest of the file.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 077	\$80.00
Counting Device	7.50
Alphabetic Device	20.00

Two-shift operation increases the single-shift monthly rental charge by 50%; three-shift operation increases the single-shift monthly rental charge by 100%. Maintenance is included in the rental.

PERFORMANCE

240 cards/minute, for each feed hopper.

480 cards/minute, with both feeds operating simultaneously.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The card capacity of each feed hopper is 800 cards; the capacity of each of the four pockets is approximately 1,000 cards.

<i>Feature</i>	<i>Function</i>
Automatic Stop	Stop after last card is fed from either hopper. Stop when any of the four pockets is full.
Selector Unit	32 storage comparing positions. 16 comparing positions for each feed. The cards from each of the two feeds can be compared for determining whether they are equal, or if unequal, which of the two is lower. These conditions can be recognized to cause feeding and selection of cards.
Primary Sequence Unit	16 comparing positions. Their main usage is sequence checking of the cards in the primary feed. If the primary sequence unit is coupled to the selector unit, 32 columns can be sequence checked and compared.
Control Panel	The wiring of this panel controls and connects all operations of the collator.
Alphabetic Device (optional)	8 characters maximum. Cards can be selected, sequence checked, merged or matched by alphabetic characters punched in them.
Counting Device, 2-digit (optional)	Each counter counts up to 9. Coupled together, the two-position counter can count up to 99.

PHYSICAL DATA

Height, 51½"; width, 50"; depth, 19½"; weight, 758 lbs.

Power 115/230 volts, 60 cps, single-phase, 13.7/6.9 amps.

Heat Dissipation 4,290 BTU/hr.

COMMENTS

The operations of the collator fall under five general classifications: card selection, sequence checking, merging, merging with selection, and matching. In a single file of cards, a particular type of card can be selected, and/or the sequence of this card file can be checked. Two files of cards, already in sequence, can be combined into a single sequenced file. At the same time of the merging operation, a selection operation is possible. Matching is the operation by which the collator compares two files of cards and can select unmatched cards. The sequence of the cards in the primary feed can be checked during a merging or matching operation.

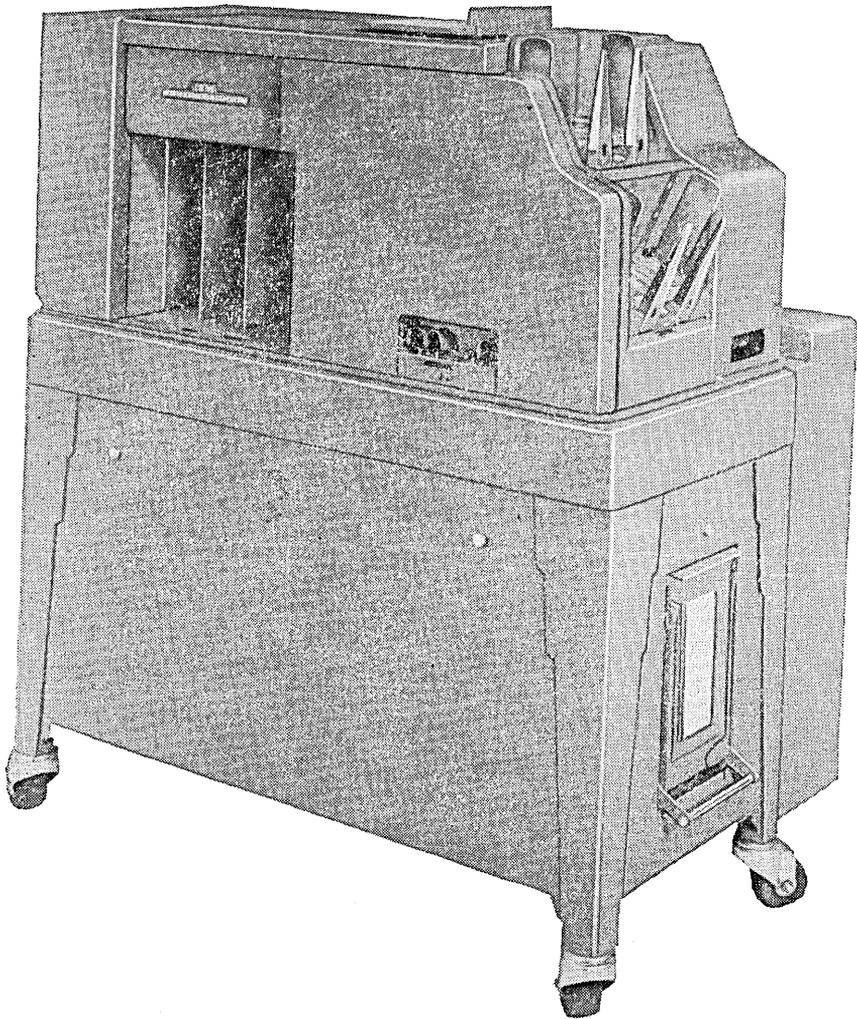
More specific operations that are possible are: the comparison of two fields of information in the same card; the selection of cards by a control number or either of two control numbers; the insertion of cards behind predetermined groups of cards; the selection of zero cards; the insertion of a predetermined number of cards ahead or behind a master card.

All operations are determined and controlled by the control panel wiring.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM 089
Alphabetic Collator



May, 1956

IBM 089 Alphabetic Collator

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The 089 Alphabetic Collator is capable of selecting, sequence checking, and merging files of IBM punched cards. These operations can be performed on numerical, alphabetic, and special character information in the cards. The cards from the two feed hoppers are read, compared and selected or merged into any of the four pockets under control of the control panel wiring. At the same time, cards in each file that do not match those in the other can be separated from the rest of the file.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 089	
with 16 position control units	\$190.00
with 19 position control units	220.00
Counting Device	7.50

Two-shift operation increases the single-shift rental charge by 50%; three-shift operation increases the single-shift rental charge by 100%. Maintenance is included in the rental charge.

PERFORMANCE

240 cards/minute, for each feed hopper.

480 cards/minute, with both feeds operating simultaneously.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The card capacity of each of the two feed hoppers is 800 cards; the capacity of each of the four pockets is approximately 1,000 cards.

<i>Feature</i>	<i>Function</i>
Automatic Stop	Stops after the last card if fed from either hopper. Stops when any of the four pockets is full.
Feed Control Unit	32 or 38 storage comparing positions. 16 or 19 comparing positions for each file. The cards from each of the two feeds can be compared for determining whether they are equal, or if unequal, which of the two is lower. These conditions can be recognized to cause feeding and selection of cards.
Sequence Control Unit	16 or 19 comparing positions. Their main usage is sequence checking of the cards in the primary feed. If the sequence control unit is coupled to the feed control unit, 32 or 38 columns can be sequence checked and compared.
Control Panel	The wiring of the control panel controls and connects all operations of the collator.
Counting Device, 2-digit (optional)	Each counter counts up to 9. Coupled together, the two-position counter can count up to 99.

PHYSICAL DATA

Height, 51½"; width, 49½"; depth, 26½"; weight, 1,027 lbs.

Power 115 volts, 60 cps, single-phase, 12.0 amps.

Heat Dissipation 3,760 BTU/hr.

COMMENTS

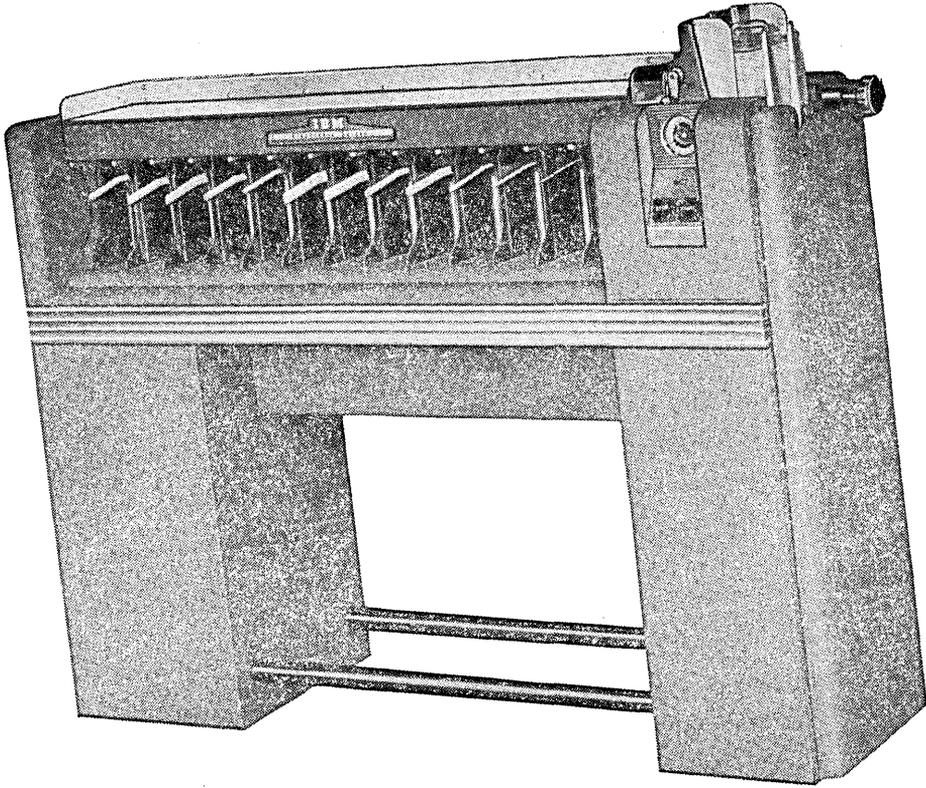
The 089 Collator is capable of all the 077 Collator operations, ADP Equip. Rpt. Ref. 4A 380.1. As a standard feature of the 089, these operations can be performed on numerical, alphabetic and eleven special character information in the cards. The information in the cards can be 16 or 19 characters. The 077 was limited to 16 positions of numerical information, and with a special device to 8 positions of alphabetic information.

IBM 089

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM TYPES 75, 80, 82 SORTERS



IBM TYPES 75, 80, 82 SORTERS

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM sorters are capable of grouping IBM punched cards into any sequence, usually a numerical, alphabetic or alphanumeric sequence. With special attached devices, it is possible to do additional operations: a count, matching, group selection, and/or multiple column selection of cards.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Type 75, model 1 (with counters)	\$50
Type 75, model 2 (with counters)	35
Type 80, model 1 (unavailable)	40
Type 80, model 2	25
Type 82	60
Special Features	
Group Sorting Device (available for Types 80, 82)	10
Multiple Column Selection Device (available for Types 75, 80 and for Type 82 that is not equipped with the group sorting device)	10

Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift rental by 100%. There is a \$60 single-use installation charge for the 5-digit card counter, and a \$25 single-use installation charge for the card-matching device. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

<i>Type</i>	<i>Cards/Minute for each punch in each column sorted</i>
75, model 1	400
75, model 2	250
80, model 1	450
80, model 2	250
82	650

Numerical sort: 1 pass through sorter.

Alphabetic sort: 2 passes through sorter.

IBM TYPES 75, 80, 82 SORTERS

FUNCTIONAL CHARACTERISTICS

The card capacity of the card feed hopper is approximately 800 cards for Types 75, 80, and 850 cards for Type 82. The card capacity of the 13 receiver pockets (1 reject pocket; 12 pockets for 0 to 12 punch positions on card) is approximately 550 cards for Types 75, 80, and 82.

<i>Standard or Optional Features</i>	<i>Available for Type</i>	<i>Function</i>
Automatic Stops (standard)	all	Stop after run-out and sorting of all cards in feed hopper. Stop on full pocket.
Selection Switch (standard)	all	Sorting of cards on column set by brushes with particular punch, 0 to 12. Selection and sorting of cards on column set by brushes, with 0, 11, 12 zone punches. All other cards fall in the reject pocket.
Counter, 5-digit (optional)	80, 82	Totals cards passing through machine.
Counters, 5-digit (standard)	75	15 counters: 1 for each pocket, 1 for subtotals, 1 for grand totals.
Card Matching Device (optional)	all	Corner cut or 12 punch determines selection of master cards which are not matched with detailed cards.
Sorting Suppression Device (optional)	all	All cards with a punch in column set by brushes are segregated into 12 pocket, except no punch or selected digit cards.
Group Sorting Device (optional)	80, 82	Corner cut determines master card. Master card with detail cards fall into the same pocket.
Multiple Column Selection Device (optional)	all	Cards with multiple column fields with identical information will be selected. Other cards fall into the reject pocket.

EQUIPMENT REPORT

PHYSICAL DATA

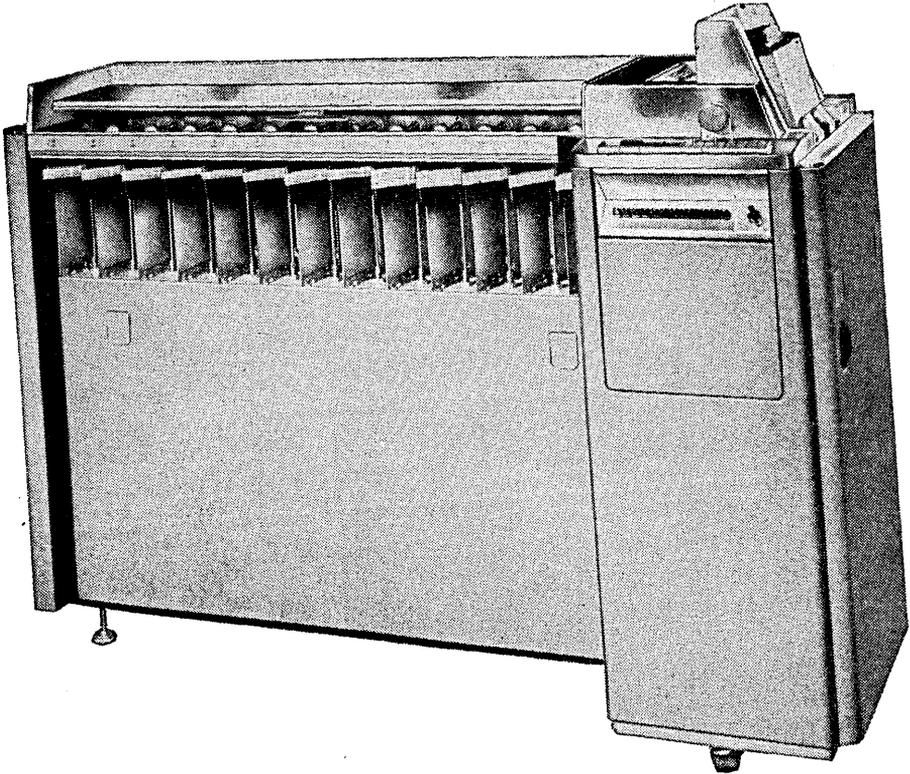
	<i>Height</i>	<i>Width</i>	<i>Length</i>	<i>Weight</i>	<i>Heat Dissipation</i>
Type 75	48"	22"	63"	546 lbs.	1875 BTU/hr.
Type 80	45"	16"	63"	425 lbs.	1565 BTU/hr.
Type 82	46"	16"	61"	492 lbs.	2030 BTU/hr.

Power: 115/230 v, 60 cps, single-phase.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM TYPE 83 SORTER



IBM TYPE 83 SORTER

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM Type 83 Sorter is capable of grouping IBM punched cards into any sequence, usually a numerical, alphabetic or alphanumeric sequence. It is possible to sort selectively or to suppress selected-digit sorting, and to check for double and multiple punches. With special additional devices, faster alphabetic sorting and/or a card count is possible.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Type 83 Sorter	\$115
Alphabetic Device	15
Auxiliary Card Counter	7

Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift costs by 100%. Maintenance is included in the rental charge.

PERFORMANCE

Sort speed: 1,000 cards/minute for each punch in each column sorted.

Numerical sort: 1 pass through sorter.

Alphabetic sort: 2 passes through sorter.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The card capacity of the card feed hopper is approximately 1,200 cards. The card capacity of the 13 receiver pockets (1 reject pocket, 12 pockets for 0 to 12 punch positions on card) is approximately 900 cards. Adjustable pocket capacities may be set so that each pocket will hold approximately 400, 565, 735 or 900 cards.

<i>Standard or Optional Features</i>	<i>Function</i>
Automatic Stop (standard)	Stop after run-out and sorting of all cards in feed hopper. Stop on one of four different pocket card capacities, set manually.
Digit Suppression Keys (standard)	When one of the 12 keys, representing the 12 possible punches, is depressed, the corresponding punch is not read and has no effect on sorting.
Sort Selection Switch (standard)	Sorting numerically or on zones with double punch error stop or rejection. Sorting on digits in combination with selected zone punch in identical column with multiple digit or zone punches error stop. Sorting numerically and on zones with more than one zone or one digit punch error stop.
Alphabetic Sorting Device (optional)	Changes the sorting patterns of the sort selection switch. Alphabetic sorting requires less sorting time. Ten letters are sorted in one pass with the second pass on only part of the cards.
Auxiliary Card Counter (optional)	Totals cards passing through the machine. Six position unit counter.

IBM TYPE 83 SORTER

PHYSICAL DATA

Height, 47"; width, 20"; length, 62½"; weight, 500 lbs.

Power: 115 v, 60 cps, single-phase.

Heat dissipation: 977 BTU/hr.

ADDITIONAL INFORMATION

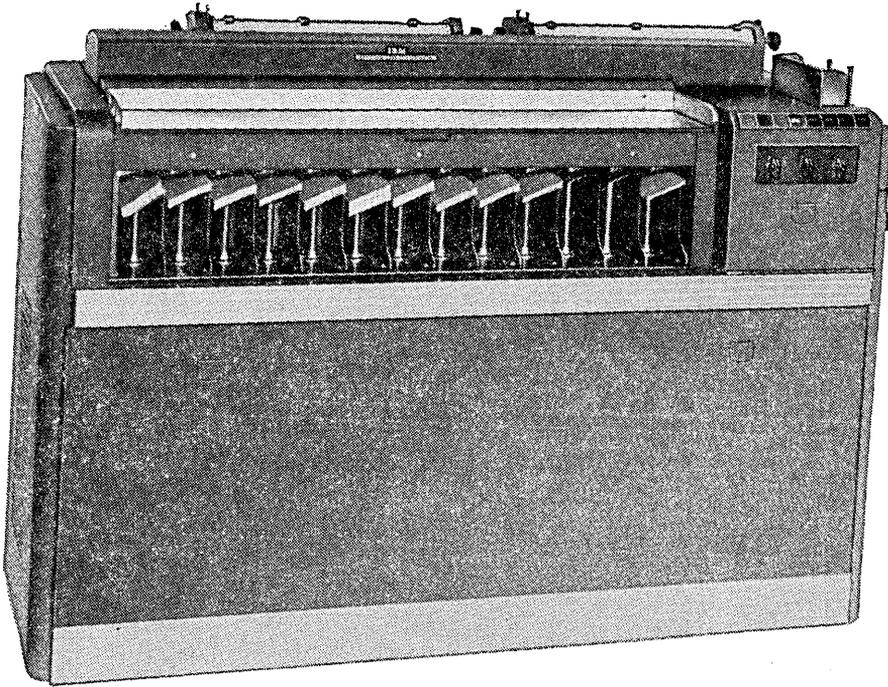
Write to: Department of Information

International Business Machines Corporation

590 Madison Avenue

New York 22, N. Y.

IBM TYPE 101
Electronic Statistical Machine



4A 380.5—Page 2

IBM TYPE 101

Electronic Statistical Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Type 101 Electronic Statistical Machine is capable of sorting, counting, accumulating, balancing, editing and printing summaries of data on IBM punched cards. Readings from the counters and accumulators may be punched on cards by a Type 524 summary punch.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
Model 1: two printers, 60 counters	\$450
Model 2: one printer, 15 counters	195
Equipped for Type 524 summary punch	40

Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%. Maintenance is included in the rental charge.

PERFORMANCE

Processing Speed	450 cards/minute
Numerical Sort	1 pass per column
Alphabetic Sort	2 passes per column

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The card capacity of the card feed hopper is approximately 800 cards; of the 13 receiver pockets (1 reject pocket, 12 pockets for 0 to 12 punch positions on card) is approximately 650 cards each.

<i>Feature</i>	<i>Function</i>
Automatic Stop	Stops on last card from hopper, when a pocket becomes full, or when certain conditions are present.
Column Selection	Selects up to 22 columns for sorting and senses control impulses.
Sort Selection	Controls type of sorting, printing and counting.
Counters, 4 digit	Counts cards in 60 categories (Model 1) or 15 categories (Model 2).
Accumulation	Two counters forming 8-digit totals from 5-digit amounts. Coupling counters together, forms a 12-digit total from 9-digit amounts (Model 1).
Printing Carriage	Prints a total, group indication, the counts from up to 30 counters, and a check symbol.

PHYSICAL DATA

Height, 48"; width, 26½"; depth, 66"; weight, 1505 lbs.

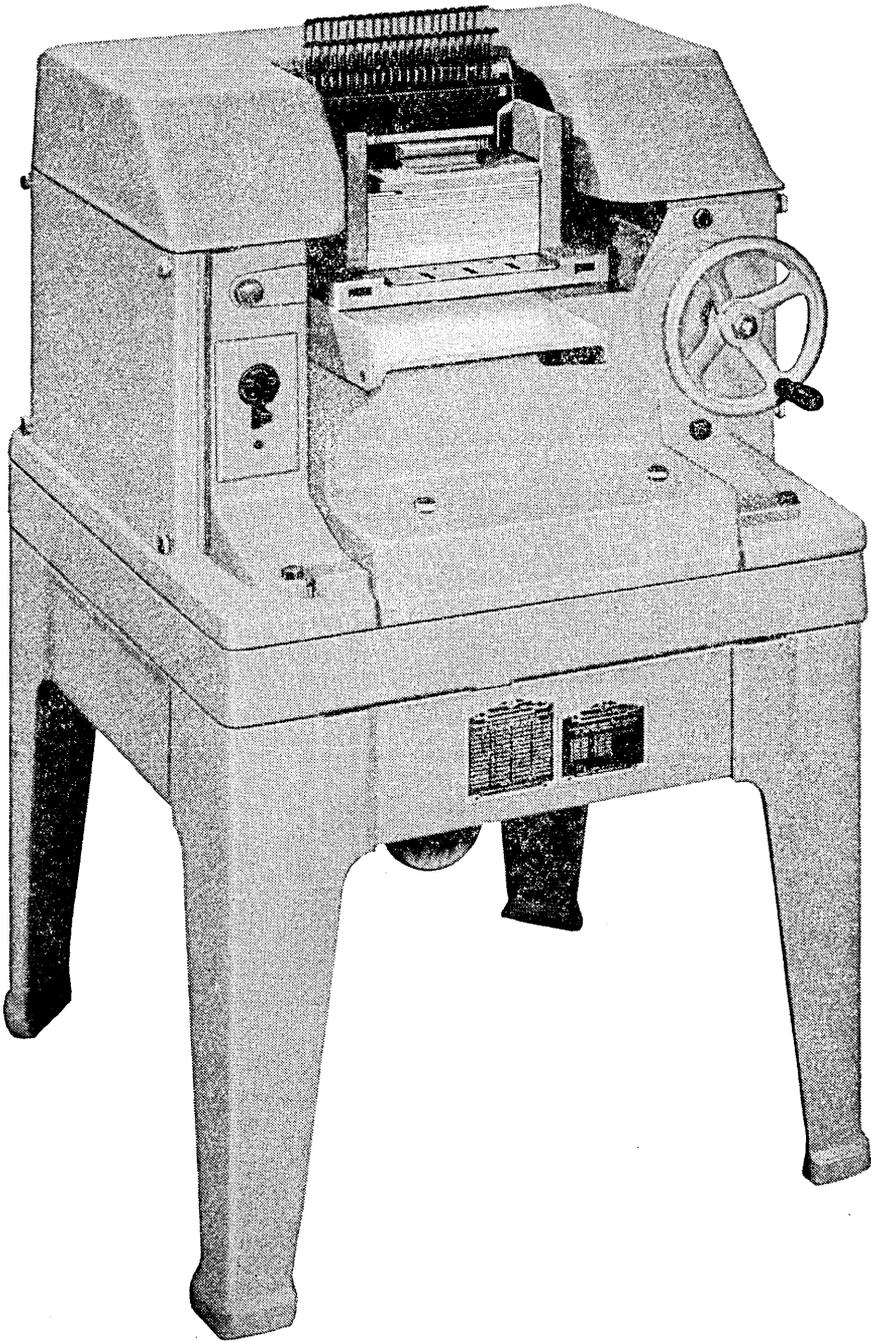
Power, 115/230 volts, 10.5/5 amps., 60 cps, AC.

Heat dissipation, 3,285 BTU/hr.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND TYPE 325
Duplicate Card Detector



4A 660.1—Page 2

May 18, 1956—18

REMINGTON RAND TYPE 325

Duplicate Card Detector

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 325 Duplicate Card Detector is capable of segregating (from a deck of Remington Rand cards) any card in which the information in selected card columns is dissimilar to the information in the same card columns of adjacent cards. At the same time as segregating any card without a duplicate adjacent to it, the first card of a group of cards with similar information in those particular card columns, may be segregated.

APPROXIMATE COST

	<i>Approximate Purchase Cost</i>	<i>Approximate Monthly Rental</i>
Duplicate Card Detector	\$2,778	\$40

Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%. Maintenance is included in the rental charge. Maintenance contracts may be obtained with purchase orders.

PERFORMANCE

130 90-column cards/minute.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The capacity of the feeding magazine is 625 cards. There are two card receivers, one for single cards and one for duplicates, each holding 600 cards.

<i>Feature</i>	<i>Function</i>
Stopping	Automatic stop when feeding magazine becomes empty.
Column Controls	Determines which of the 90 card columns are sensed.
Function Control Lever	Selects which operation is performed, i. e., whether the first card of a group of similar cards is placed with the single dissimilar cards or with its group.

PHYSICAL DATA

Height, 36"; width, 24"; depth, 24"; weight, 428 lbs.

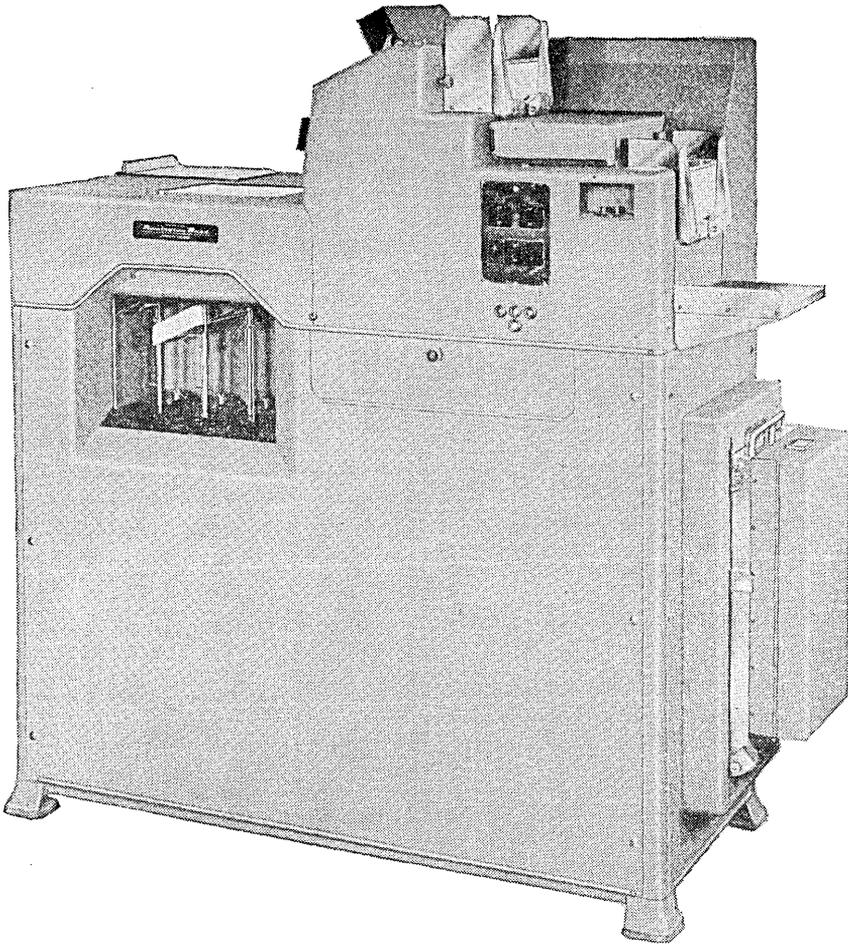
Power, 110 volts, 60 cps, 8 amperes.

Heat dissipation, 559 BTU/hr.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 319-2
Numerical Collator



April, 1956

REMINGTON RAND TYPE 319-2

Numerical Collator

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 319-2 Numerical Collator is capable of numerically selecting, sequencing, and merging Remington Rand punched card files. Cards from the two feeding magazines are read, compared and selected into the four receivers under control of the connection panel. It is also possible to compare the alphabetic information, and separate non-matching cards.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Type 319-2 Numerical Collator with two connection panels	\$9,900	\$100

Additional connection panels may be purchased for \$150 each, or rented for a \$100 single-use charge. The monthly rental figure is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases the one-shift costs by 50%; 120-hour week, three-shift operation increases the costs by 100%. Maintenance is included in the rental charge. Maintenance contracts are available to purchasers.

PERFORMANCE

240 cards/minute, for each feeding magazine.

480 cards/minute, both feeding magazines operating simultaneously.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS

The capacity of the primary and secondary card feeding magazines is 750 cards each. The capacity of the 4 card receivers is 700 cards each.

<i>Feature</i>	<i>Function</i>
Automatic Stop	Stops machine when last card leaves either feeding magazine, when any receiver is full, or when a card is misfed or damaged. Signal lights indicate the cause of the stoppage.
Column Selection	Collates cards on numerical information in any of up to 15 columns/card.
Storage	There are two storage registers of 15 columns each, one register for storage of information read from the primary magazine and one for information read from the secondary magazine.
Comparing Unit	60-column capacity. 30 columns from one source can be compared with 30 columns from another source.
Control Panel	Controls relationship between the primary and secondary card feeding operations; permits an optional variation in the wiring of connection panel without rewiring.
Connection Panel	Except for control panel, all machine operations are connected and controlled through this panel. This panel is removable and may be wired by collator operator.

PHYSICAL DATA

Height, 55"; width, 52"; depth, 20"; weight, 1,200 lbs.

Power 115 volts, 7 amperes, 60 cps, AC.

Heat Dissipation 1,980 BTU/hr. The power dissipation is 1 kva.

REMINGTON RAND TYPE 319-2

COMMENTS

The Type 319-2 Numerical Collator will feed two card files from two feeding magazines to interfile these cards in numerical sequence. It will also compare two card files and segregate the cards that do not match. Cards from one file may be substituted for selected cards in another file. In all the above operations the collator is capable of simultaneously sequence checking each file.

The collator compares information on two cards from the two feeding magazines to determine which card has the higher and which has the lower value, or whether the cards have identical values. This comparison may be from cards within a file, cards from two files or a combination of these operations. The information for the comparison can be sensed directly from a card or taken from machine storage. The results of these comparisons control and coordinate machine functions so as to send cards to any of the four receiving magazines. The collator can perform these operations: interfiling, matching, selecting, sequence checking, substituting, eliminating and searching.

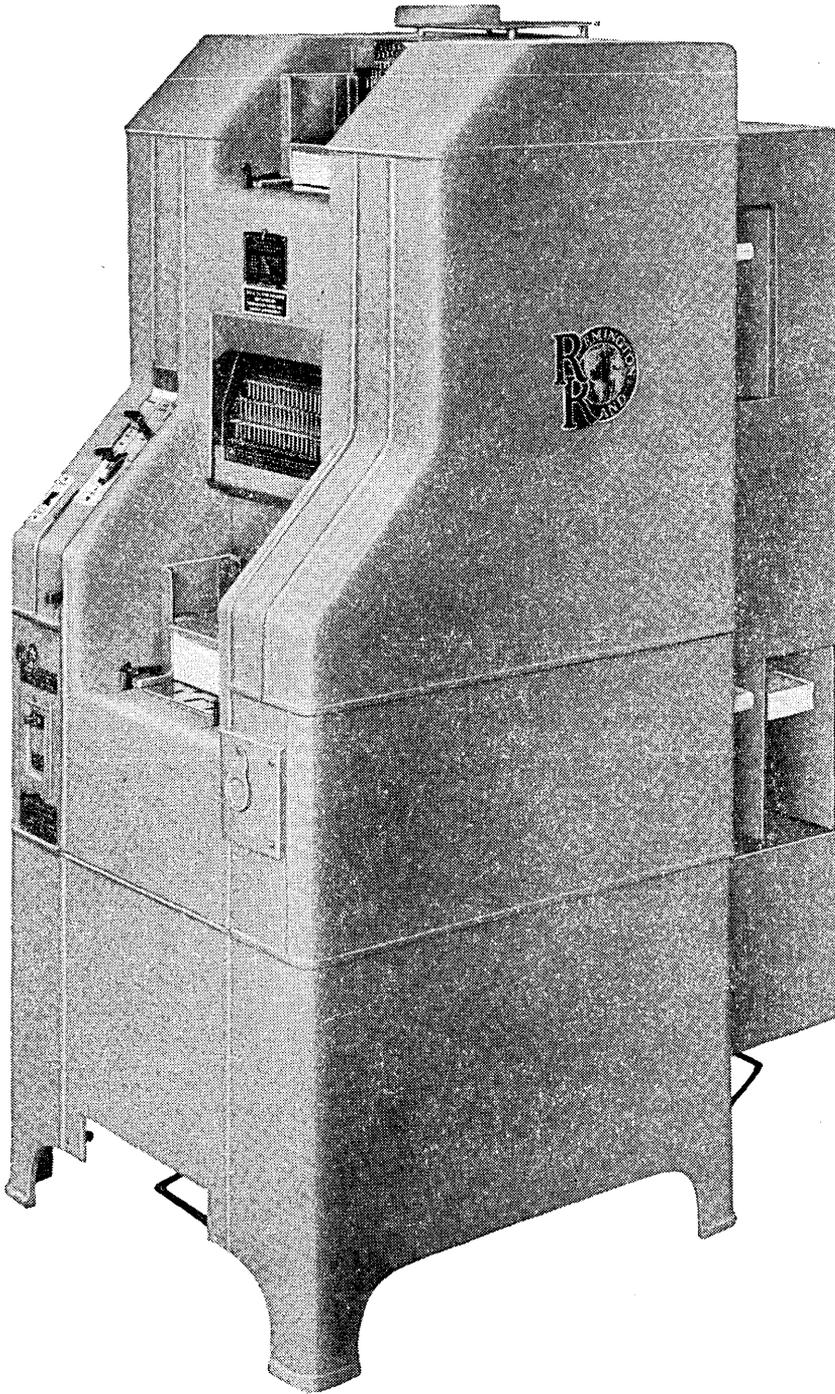
These operations may be performed individually or may be combined to meet specific application requirements. Control of these operations is provided through the use of a connection panel.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 315-1

Collating Reproducer



4A 660.3—Page 2

December 14, 1956—24

November, 1956

REMINGTON RAND TYPE 315-1

Collating Reproducer

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 315-1 Collating Reproducer mechanically feeds and senses Remington Rand punched cards from two magazines for the purpose of determining whether one card is greater than, equal to, or less than the other; and at the same time comparing the cards for the purpose of punching, merging and segregating them.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Type 315-1 Collating Reproducer *	\$12,000.	\$150.
Additional non-sequencing Card Feeding Operations (each)	341.	5.
Self-sequence Comparing Wiring Unit (each)	687.	10.

* With 4 sequencing control card feeding operations and 4 non-sequencing card feeding operations.

The monthly rental figures are for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases the one-shift cost by 50%; 120-hour week, three-shift operation increases the costs by 100%. Maintenance is included in the rental charge. Maintenance contracts are available to purchaser.

EQUIPMENT REPORT

PERFORMANCE

100 cards/minute, for each feeding magazine.

200 cards/minute, both feeding magazines operating simultaneously.

FUNCTIONAL CHARACTERISTICS

The capacity of the upper and lower card feeding magazines is 600 cards each. The capacity of the 5 card receivers is 750 cards each.

<i>Feature</i>	<i>Function</i>
Upper and Lower Card Feeding Magazine	Upper feeds cards, or cards from which information is to be compared and punched; lower feeds card from which information is to be compared and into which information is to be punched.
Upper and Lower Sensing Section	Senses information punched in cards fed by upper or lower feeding magazine respectively.
Upper Setup Section	Retains information sensed by upper sensing section.
Comparing Unit	Compares information in upper setup section with information in lower sensing section, to determine whether the information matches or not.
Punching Setup Station	Sets up and retains information transmitted through the punching wiring unit from the upper setup station to be punched into the card from the lower sensing station.
Sequence Control Unit	Compares up to 15 columns of information for sequence control of card feeding, punching or segregating.
Sequence Control Lock-Out	One for each column of sequence control unit. Allows when out, prevents when in the sensing of information in the sequence control unit.
Upper and Lower Front Card Receivers	Receives segregated cards fed by the upper or lower card feeding magazines respectively.
Upper Rear and Lower Center Card Receivers	Receive all non-segregated cards fed by the upper or lower card feeding magazines respectively when interfiling control is set inoperative; receive no cards when interfiling control is set in an operative position.

FUNCTIONAL CHARACTERISTICS—Cont.

<i>Feature</i>	<i>Function</i>
Interfiled Card Receiver	Receives cards from upper and lower magazines for interfiling.
Card Feeding Magazine Stopping Control	One for each feeding magazine. When either upper or lower card feeding magazine is up machine will stop immediately after the last card leaves magazine. When upper card feeding magazine stopping control is down, the machine will continue to operate in the absence of cards in the upper magazine. When lower card feeding magazine stopping control is down, the machine will stop when last card leaves lower sensing station. When up, it will stop when last card leaves the lower magazine.
Column Lock-Out Controls	One for each card column. Allow when up, prevent when down the sensing of information punched in card in upper sensing section.
Column Comparing Controls	One for each card column. When up comparison will take place, when down the comparing of information will not be made.
Punching and Segregating Dial	Provides the optional setting of the machine for various combinations of selective card punching and segregating, when machine is operating under sequence control, comparing control or both.
Sequence Control Card Feeding Operation	Permits feeding from either upper or lower or both feeding magazines on equal cards.
Selective Punching Control	Determine whether all, some or no cards fed by the lower card feeding magazine will be punched.
Interfiling Control	Permits interfiling of either matched cards; of non-matched cards; of all cards or of no cards.
Column Retract Controls	One for each card column. When up, normal retraction occurs on punching, when centered information set up previous to starting operation is repeated-punched into all cards, when down prevents information from the sensing unit to be punched.

EQUIPMENT REPORT

FUNCTIONAL CHARACTERISTICS—Cont.

<i>Feature</i>	<i>Function</i>
Sequence Feeding Control	Determines whether machine is to be used for one or two file operation.
Upper Card Holding Control	Determines whether a card in the upper sensing station is held or ejected at the end of a machine cycle. It may be set so that it will release a card only on a matched or non-matched, equal or unequal condition with respect to the card being fed by the upper magazine. Can also modify sequence control.
Wiring Units (2)	Transfers information from original card to card to be punched or compares information in two cards. Either column-for column—or transposed-column transfers or comparison is available by use of different wiring units.

PHYSICAL DATA

Height, 51"; Width, 22½"; Depth, 34"; Weight, 728 lbs.

Power, 110 volts, 60 cps, 7½ amps, AC or DC.

Heat Dissipation, negligible.

COMMENTS

The Collating Reproducer is essentially of the same basic design as the Interfiling Reproducing Punch (Equip. Rpt. 3C 660.2). The major difference is the addition of sequence control. By rendering sequence control inoperative, the machine may be used to perform the Interfiling Reproducing or Multi-Control Reproducing Punch functions.

The purpose of the Type 315-1 is to interfile two files of cards in numerical sequence. The feeding operation of the machine is governed by a comparison of card sequence, which may also govern the various operations of card punching and segregating. Comparing control may also govern card punching and segregating by comparing cards.

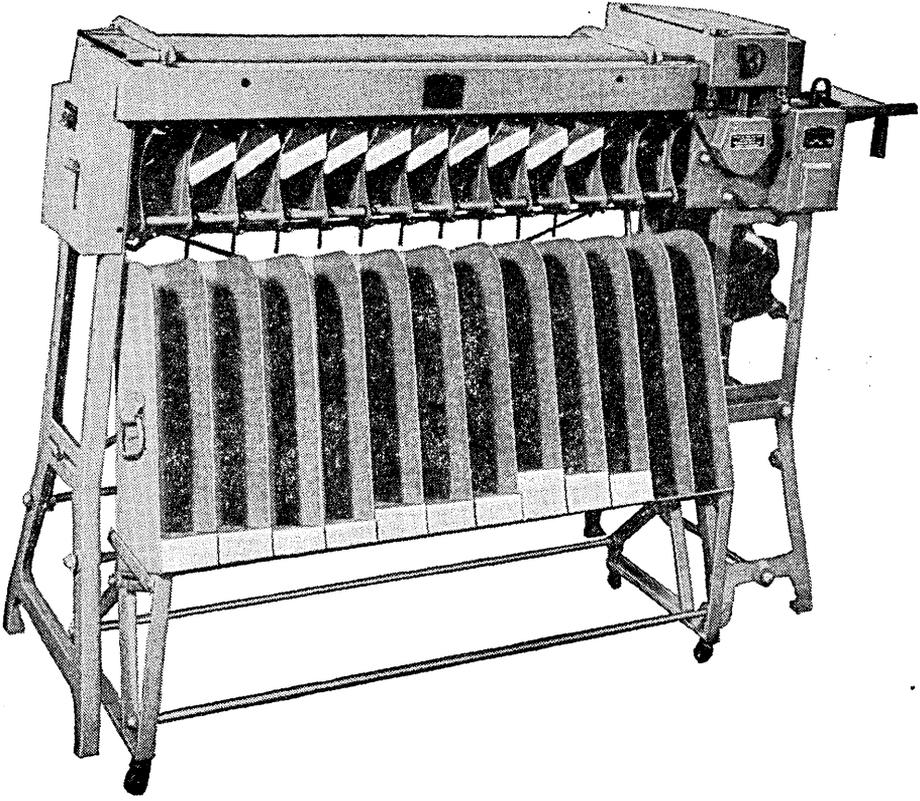
REMINGTON RAND TYPE 315-1

The Collating Reproducer may be used for operation with either one or two card files. A single file of cards may be fed for the purpose of determining whether the file is in sequence. If a card is out of sequence, the out of order card may be noted by a signal card or it may be segregated out of the file and replaced by a signal card. Two separate card files, each of which has been presequenced, may be interfiled in numerical sequence. Selective punching, segregating, and interfiling may be performed simultaneously.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, New York

REMINGTON RAND TYPES 320 and 321
Automatic Sorters



REMINGTON RAND TYPES 320 and 321

Automatic Sorters

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 320 Automatic Sorter is capable of arranging Remington Rand punched cards into any sequence, usually a numerical, alphabetic or alphanumerical sequence. In addition, Type 321 is equipped with 4-digit counters for counting the cards received in each receiver and 5-digit counters for the total and grand total of all cards sorted.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 320		
250 cards/minute	not sold	\$30
420 cards/minute	\$2,778	40
Type 321		
250 cards/minute	not sold	40
420 cards/minute	\$3,452	50

The above monthly rental is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases one-shift rental by 50%; 120-hour week, three-shift operation increases one-shift rental by 100%. Maintenance is included in rental. Maintenance contracts are available to purchasers.

EQUIPMENT REPORT

PERFORMANCE

Sorting Speed	250 or 420 cards/minute
Numerical Sort	1 pass per column
Alphabetic Sort	2 passes per column

FUNCTIONAL CHARACTERISTICS

The capacity of the card feeding magazine is 600 cards. The capacity of the 11 card receivers (1 for each of the 0 to 9 punch positions, and 1 reject) is approximately 400 cards.

<i>Feature</i>	<i>Function</i>
Automatic Stopping	Machine stops when damaged card is detected or receivers become full.
Column Selection	Release latch positions sensing mechanism to desired column.
Selector Pins	Controls which half of card and punches are sensed.
Conversion Lever	Selects either numerical or alphabetic sorting.
Selective Sorting Controls	Selects which characters are sorted individually.

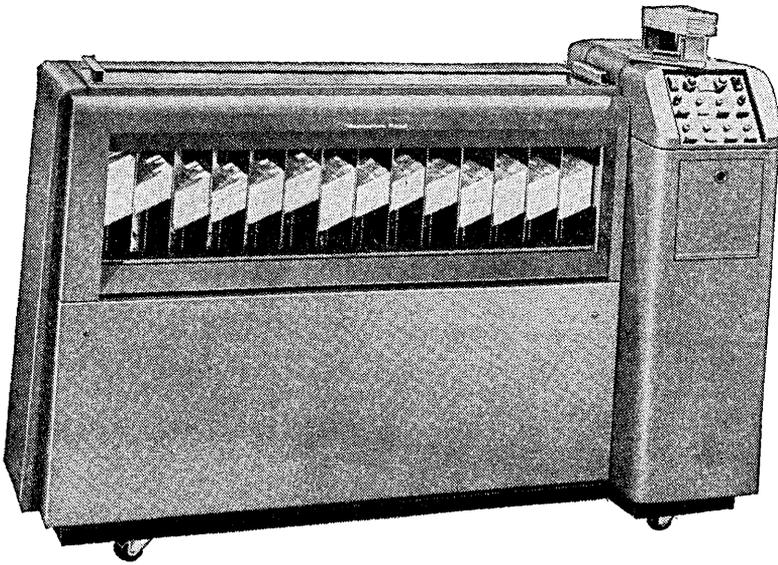
PHYSICAL DATA

Height, 39½"; depth, 24"; width, 64"; weight 590 lbs.
Power, 60 cps, 8 amps., single-phase, AC.
Heat dissipation, 780 BTU/hr.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPES 420 and 421
Electronic Sorters



REMINGTON RAND TYPES 420 and 421

Electronic Sorters

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Type 420 Electronic Sorter is capable of arranging Remington Rand punched cards into sequence, usually a numerical, alphabetical or alphanumeric sequence. In addition, the Type 421 is equipped with 6-digit counters for counting the cards received in each receiver and the total and grand total of all cards sorted. The wiring of the control panel controls the alphabetic and numerical codes or card columns to be sensed or selected; determines the card receivers into which the selected cards are sent; and may connect two or more numerical and/or alphabetic codes to be received in the same magazine.

APPROXIMATE COST

	<i>Approximate</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Type 420	\$5,600	\$80
Type 421	6,650	95

The monthly rental figure is for a 40-hour week, one-shift operation. 80-hour week, two-shift operation increases the one-shift costs by 50%; 120-hour week, three-shift operation increases the costs by 100%. Maintenance is included in the rental charge. Maintenance contracts are available to purchasers.

EQUIPMENT REPORT

PERFORMANCE

Sorting Speed	800 cards/minute
Numerical Sort	1 pass per column
Alphabetic Sort	2 passes per column

FUNCTIONAL CHARACTERISTICS

The capacity of the feeding magazine is 1200 cards. The card capacity of the 14 card receivers is 1,000 cards each.

<i>Feature</i>	<i>Function</i>
Automatic Stopping	Machine stops when damaged card is detected or receivers become full.
Column Selection	Hand wheel positions sensing mechanism to desired column, key selects which half of card is sensed.
Code Selection	Three keys select numerical, A-M, or N-Z sorting.
Connection Panel	Controls sensing of punches and routing of cards to receivers, characters may be grouped or sorted individually.

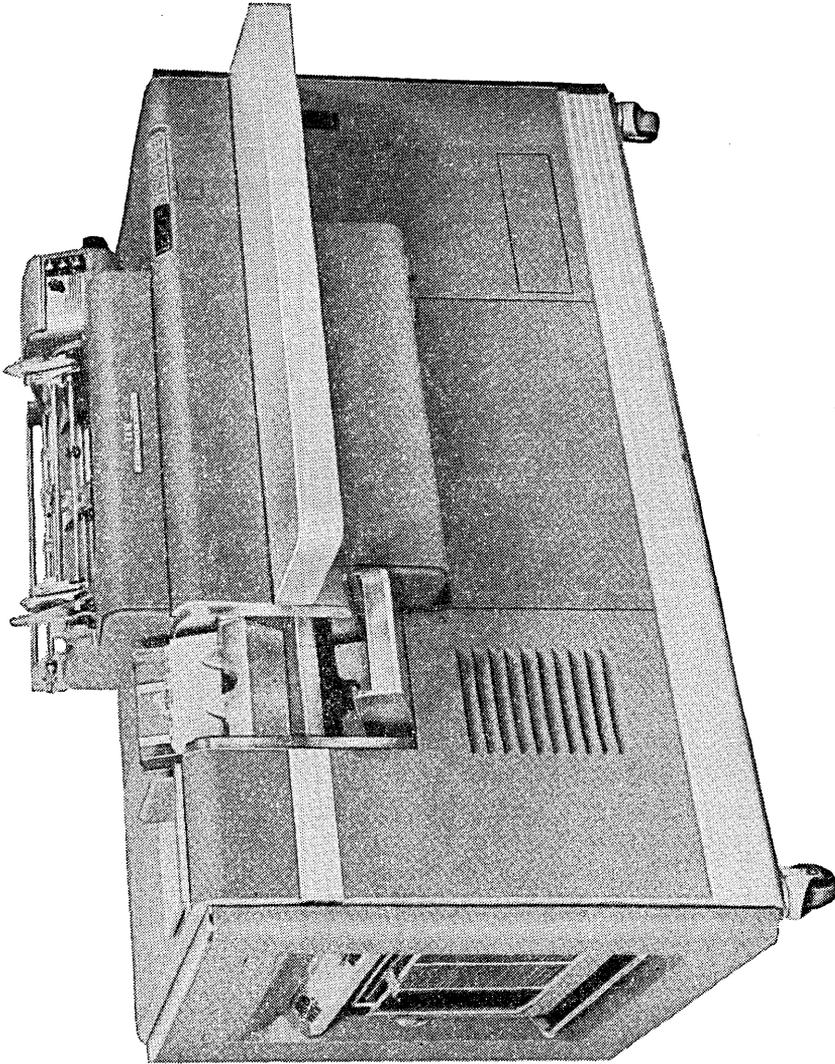
PHYSICAL DATA

Height, 45"; depth, 24½"; width, 65"; weight, 750 lbs.
Power, 115/230 volts, 50/60 cps, 8 amp., single-phase, A.C.
Heat dissipation, 1800 BTU/hr.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

IBM 402, 403 and 419
Accounting Machines



September, 1956

IBM 402, 403 and 419

Accounting Machines

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM 402, 403 and 419 are capable of preparing printed reports from IBM punched cards. The Accounting Machines can perform limited arithmetic operations on the numerical information punched in the cards. The 402 and 403 can store the numerical information but can read alphabetic as well as numerical information for printing; the 419 can store and print numerical information only. The 402 or the 419 usually prints only one line from a card, but the 403 can print three lines from a single card.

In combination with an IBM Summary Punch (513, 514, 517, 519 or 523) any information can also be punched in IBM cards. The 403 is illustrated on page 2.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
IBM 402	
80 lines/minute	\$205 to \$410 *
100 lines/minute	280 to 460 *
IBM 403	
80 lines/minute	\$275 to \$460 *
100 lines/minute	350 to 510 *
IBM 419	\$400 to \$460 *

* The rental charge increases to this maximum for the following options: machine speed (tabulating as well as listing); number of print positions; a net balance machine; from 32 to 44, 56 or 80 counter positions; additional selectors and comparing positions.

EQUIPMENT REPORT

Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%. Maintenance is included in the rental charge.

PERFORMANCE

<i>Type</i>	<i>Maximum Lines/Minute</i>	<i>Maximum Characters/Line</i>
402, 403	80 or 100	88
419	150	89

PRINTING UNIT CHARACTERISTICS

Class	Electromechanical
Printing Mode	Line-at-a-time Type Bars
Characters †	<i>Left most 43 bars</i> <i>Right most 45 bars</i>
alphabetic	A to Z
numerical	0 to 9
special	& * (odd-numbered bars) CR (even-numbered bars)
Format	6.3 characters/inch; 6 or 8 lines/inch maxima. Variable spacing, selection and any rearrangement of card information and calculations is possible by the wiring of the control panel. Automatic single, double or triple line spacing is possible. Other line spacing variation is controlled by a 12-channel paper tape loop.
Printing Medium	
paper	Up to 19½" wide; continuous forms up to 22" long. Pin, pressure, or tractor fed, controlled by a 12-channel paper tape loop.
ribbon	¾" wide; 18 yards long. Moves transversely to the direction in which the paper is fed.

† The 419 has the numerical, * and CR characters only.

IBM 402, 403 AND 419

FUNCTIONAL CHARACTERISTICS

<i>Feature</i>	<i>Function</i>
Accumulators and Storage	Up to 80 individual accumulators (counter positions), each of which can add up to 9. These counter positions are combined in up to 16 groupings called counters of 2, 4, 6 or 8 positions each. The counters can be coupled in any desired arrangement to form a counter of 6, 8, 10, 12, etc. counter positions in length.
Program Control	Distinguishes cards of one group classification from those of another. Three different types of totals printed from the same or different type bars are possible: minor, intermediate, and major.
Stopping	Automatic stopping is possible for a negative balance condition and for a particular card punch, with or without printing.
Hammersplit Levers	88 levers, one for each type bar (89 levers for IBM 419). Any raised lever will suppress the printing of zeros and special characters to the right of the lever, up to the next significant digit. The 45 numerical bars will automatically print up to ten zeros to the right of a significant digit, unless suppressed.
Multiple Line Printing	Permits the retention of a card for the printing of up to three lines of alphabetic or numerical information from the card.

PHYSICAL DATA

<i>Type</i>	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
402	47"	68"	43"	2,155 lbs.
403	47"	68"	43"	2,315 lbs.
419	47"	68"	43"	1,997 lbs.

Power Requirements

Heat Dissipation

402	115/230 volts, 60 cps, 12/7.5 amps., AC. 115/230 volts, 12/6 amps., DC.	4,692 BTU/hr. 4,800 BTU/hr.
403	115/230 volts, 60 cps, 13/8 amps., AC. 115/230 volts, 13/6.5 amps., DC.	5,000 BTU/hr. 5,080 BTU/hr.
419	115 volts, 60 cps, 12 amps., AC.	3,480 BTU/hr.

EQUIPMENT REPORT

COMMENTS

The 402, 403 or 419 Accounting Machine's primary usage is to prepare printed reports from information in punched cards, with or without arithmetic operations upon this information. These machines are capable of performing the operations of addition and subtraction. Any rearrangement of the information with variable spacing is possible by the wiring of the control panel. Within reasonable limitations one control panel may be used for several different reports by the use of the setup change switches on the side of the machine. Typical applications for these machines are the preparation of invoices, W-2 Withholding Statements and sales summary reports.

Summary cards can be punched during the preparation of detail reports by a summary punch machine connected to the accounting machine. Several totals accumulated for a group of detail cards and the group designating information are punched by the wiring of the control panels on the two machines. From these summary cards periodic reports can be prepared. The cards can be punched at a maximum rate of 1.2 seconds/card.

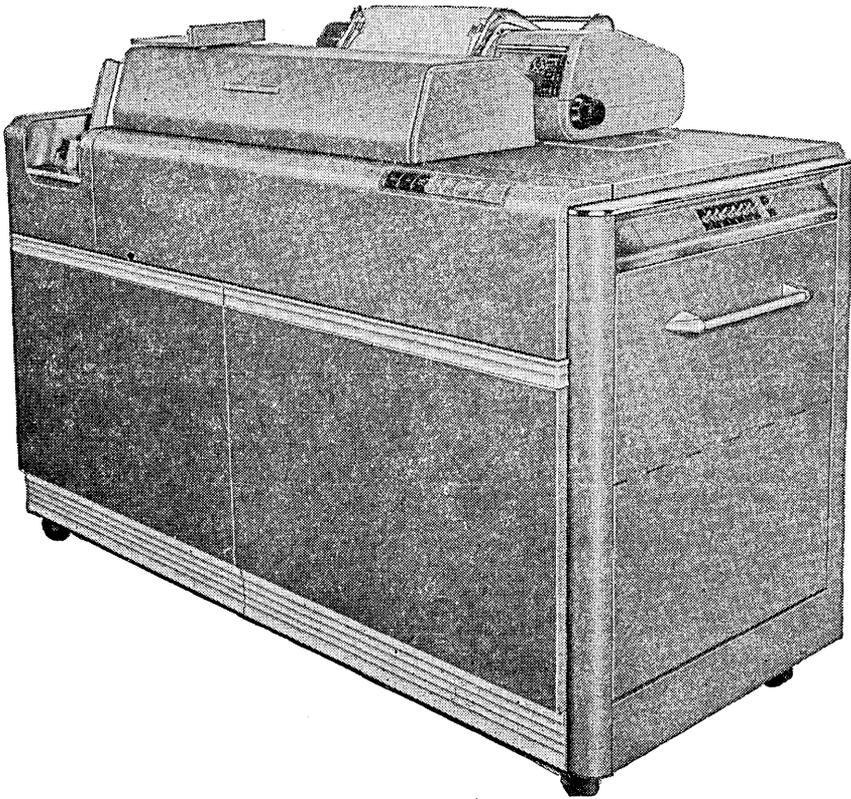
80-column cards are read at the rate of 80, 100 or 150 cards/minute for the 402 and 403, and at the rate of 150 cards/minute for the 419. The 402 and 403 operate at 80 or 100 cards/minute for detail printing; the 419 at 150 cards/minute. For crossfooting and the taking of special program cycles, the card feed speed rate of these machines is decreased. However, as many as three fields can be crossfooted either from each individual card or a group of cards. Crossfooting five or more fields can be done by using the special program features or the 'Multiple Line Printing' selector system on the 403.

The Tape-Controlled Carriage controls the feeding and spacing of forms. Spacing between lines of printing up to 3½ inches can be skipped without decreasing the card feed speed. Skipping can be controlled to eight different sections of the form. The number of sections can be increased by three as an optional feature, or in some instances by repeated use of the same holes in the paper tape loop.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

IBM 407
Accounting Machine



4B 380.4—Page 2

June 29, 1956—20

April, 1956

IBM 407

Accounting Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The 407 Accounting Machine is capable of preparing printed reports from IBM punched cards. It can perform limited arithmetic operations on the numerical data and can store the numerical or alphabetic data for printing. In combination with an IBM Summary Punch (514, 519 or 523) any information can also be punched in IBM cards.

APPROXIMATE COST

	<i>Single-Shift Monthly Rental</i>
407 Accounting Machine	
Model 1, with 112 counter positions	\$800
Model 2, with 126 counter positions and additional filters	835
Model 3, with 168 counter positions and additional filters and selectors	920

Two-shift operation increases the single-shift rental charge by 50%; three-shift operation increases the single-shift rental charge by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

150, 80-column cards/minute, for accumulating totals, for group printing, total printing, crossfooting or taking special program cycles for other operations.

120 characters/line, 18,000 characters/minute for printing, maximum.

PRINTING UNIT CHARACTERISTICS

Class Printing Mode	Electromechanical. Line-at-a-time Type Wheels.
Characters alphabetic numerical special	A to Z. 0 to 9. # \$ % . , / * @ & - □.
Format	10 characters/inch ; 6 or 8 lines/inch maximum. Variable spacing, deletion and any rearrangement of information from cards and calculations is possible by the wiring of the control panel. Automatic single or double line spacing is possible. Other line spacing variation is controlled by a 12-channel paper tape.
Printing Medium paper	4 $\frac{3}{4}$ " to 16 $\frac{3}{4}$ " wide; continuous forms up to 22" long. Original and up to 7 carbon copies, depending upon paper weight. Pin fed, controlled by 12-channel paper tape.
ribbon	$\frac{3}{4}$ " wide; 18 yards long. Moves transversely to the direction in which the paper is fed.

IBM 407

FUNCTIONAL CHARACTERISTICS

<i>Feature</i>	<i>Function</i>
Accumulators	Up to 168 individual accumulators (counter positions), each of which can add up to 9. These counter positions are combined into 28 different groupings called counters of 3, 4, 6 or 8 positions each. The counters may be coupled in any desired arrangement to form a counter of 7, 9, 10, 11, 12, 13, etc. counter positions in length.
Storage	Four 16-position units to store numerical, alphabetic or the special symbols - & / information from the card, emitter or counter for final printing or summary punching.
Program Control	Distinguishes cards of one group classification from those of another. Three types of totals printed from the same or different print wheels are possible, minor, intermediate, and major.
Stopping	Automatic stopping is possible for the three types of totals, for a negative or zero balance condition, and for a particular card punch, with or without printing.
Emitter	Digits, letters and special characters without being read from the punched card may be emitted for printing or punching in a summary punch operation.
Zero Print Control	The wiring of these hubs can determine the printing of zeros, commas, decimal points, dollar signs, ampersands, and dashes.

PHYSICAL DATA

Height, 51"; width, 31"; length, 73"; weight (maximum), 3,286 lbs.

Power 115/230 volts, 60 cps, single-phase, 22/11 amps.

Heat Dissipation 7,500 BTU/hr.

EQUIPMENT REPORT

COMMENTS

The 407 Accounting Machine's primary usage is to prepare printed reports from information in punched cards, with or without arithmetic operations upon this information. Any rearrangement of the information with variable spacing is possible by the wiring of the control panel. A typical application for the 407 is the preparation of shipping labels or invoices.

Summary cards are generally punched during the preparation of detail reports by a summary punch machine connected to the 407. Several totals accumulated for a group of detail cards and an identification for that group are punched with the information edited by the wiring on the 407 control panel. From this reduced card volume, a periodic report can then be prepared. The cards can be punched at a maximum rate of 1.2 seconds/card.

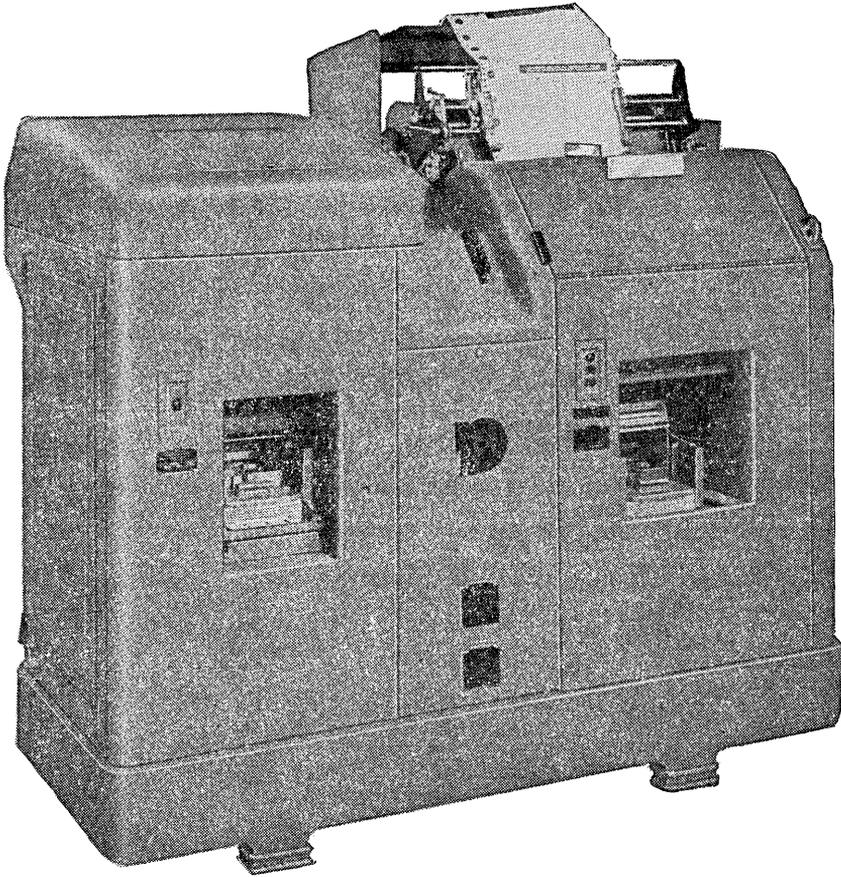
80-column cards are read and results are printed or punched at a rate of 150 cards/minute for accumulating totals, for group printing, total printing, crossfooting or taking special program cycles. In earlier models of the accounting machine, the card feed speed was decreased when taking special program cycles for the more complicated calculations on the punched card information. Spacing between lines of printing up to 2 inches can be skipped without decreasing the rate of 150 cards/minute. Longer skips will increase the processing time.

A card may be read more than once (multiple line reading). There is no limitation on the number of times a card can be read, and at each reading a line can be printed. In general, for more than three lines of printing, the rate of printing will be decreased.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND MODEL 3
Alphabetical Tabulator



April, 1956

REMINGTON RAND MODEL 3

Alphabetical Tabulator

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Model 3 Alphabetical Tabulator is capable of preparing printed reports from Remington Rand punched cards. It can perform limited arithmetic operations on numerical data and can store the numerical data for printing. In combination with a Remington Rand Summary Card Punch (Type 311) any information can also be punched in Remington Rand cards.

APPROXIMATE COST

<i>Model 3 Alphabetical Tabulator</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
3100 Models	Not for sale	\$235 to \$410
3200 Models with Universal Automatic Carriage, Optional Hammer Control and Automatic Stopping Device	\$19,900 to \$26,000	\$305 to \$455
3300 Models with Universal Automatic Carriage, Optional Hammer Control, Automatic Stopping Device, 3 Stage Multi-Stage Selector	\$22,600 to \$28,700	\$345 to \$495

Minimum costs include 60 printing sectors and 30 counters; maximum costs include 100 printing sectors and 80 counters. Two-shift operation increases the single-shift rental by 50%;

EQUIPMENT REPORT

three-shift operation increases the single-shift rental by 100%. Maintenance is included in the rental charge. Maintenance contracts may be obtained with purchase orders.

PERFORMANCE

100, 90-column cards/minute, for accumulating totals and grand totals, crossfooting and printing.

100 characters/line, 10,000 characters/minute for printing, maximum.

PRINTER UNIT CHARACTERISTICS

Class Printing Mode	Mechanical. Line-at-a-time Type Bars.
Characters alphabetic numerical special	A to Z. 0 to 9. One character of any design is available.
Format	6.3 characters/inch; 6 lines/inch maximum, 100 characters/line maximum. Variable spacing, deletion and any rearrangement of information from cards and calculations is possible by the wiring of the control panel. Automatic single, double and triple line spacing is possible. Other line spacing is controlled by the compensator cylinders of the Universal Automatic Carriage.
Printing Medium paper	19½" maximum width; up to 17" long. Original and up to 7 carbon copies depending upon paper weight. Pin fed, controlled by Universal Automatic Carriage.
ribbon	¾" wide; 15 yards long. Moves transversely to the direction in which the paper is fed.

REMINGTON RAND MODEL 3

FUNCTIONAL CHARACTERISTICS

<i>Feature</i>	<i>Function</i>
Accumulators and Storage	Up to 160 individual counters, each of which can add up to 9. These counters are grouped in units to form two types of accumulators, straight adding and direct subtraction. Straight adding and direct subtraction accumulators come in groups of 5, 6, 7, 8, 9, 10, 11 or 13 counters each. Straight adding accumulators are also available in groups of 20, 25, 30 or 40 counters each. Each accumulator is engaged or disengaged by the use of the accumulator control button. Subtraction may be initiated by a punched card with a hole in the credit position.
Automatic Stop Control	This control may be set to stop the machine before a total, after a total or before and after a total.
Cipher Control	Used to permit or restrict the automatic printing of ciphers to the right.
Automatic Universal Carriage*	Used to compensate line spacing.
Multi-Stage Selectors*	Permits the retention of a card for up to 3 machine cycles and the reading of up to 3 zones of the card. This selector also makes possible the printing of as many as 3 lines and the crossfooting of up to 3 different quantities from each card.

* These features are standard on 3300 and 3200 models. On 3100 models they are optional features.

PHYSICAL DATA

Height, 52"; width, 26½"; length, 27"; weight, 875 lbs.

Power 110 volts, 7 amperes, AC or DC.

Heat Dissipation negligible.

EQUIPMENT REPORT

COMMENTS

The Model 3 Alphabetical Tabulator's primary usage is to prepare printed reports from information in punched cards. The tabulator is capable of performing the operations of addition and subtraction. A number of different formats may be printed using the same wiring unit by varying the control settings on the machine proper. When there is a radical change from report to report, different wiring units must be used for each report. A typical application for the model 3 tabulator is the preparation of payroll and labor distribution reports.

A 13-digit capacity multiplying device is available for tabulators with a Multi-Stage Selector at additional cost. Multiplication is accomplished by repetitive addition under control of this device, with each addition requiring a complete machine cycle.

Summary cards may be punched during the preparation of detailed reports by connecting the 311 summary punch machine to the tabulator. The punch produces cards for either total groups or grand total groups or both, and designating data summarized from detailed cards by the tabulator. From these summary cards periodic reports may be prepared.

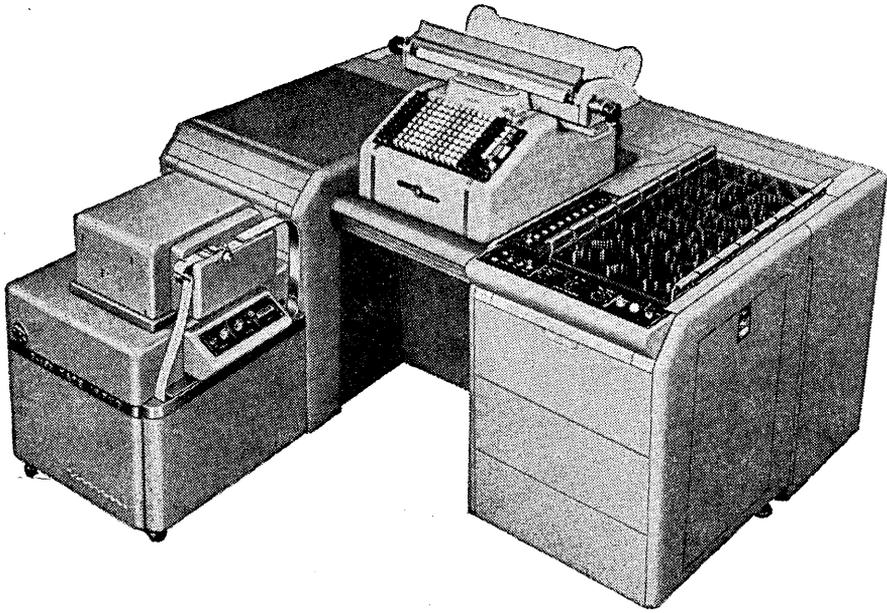
90-column cards are read and results are printed or punched at an unvarying rate of 100 cards/minute.

The Automatic Universal Carriage is used to compensate a form to four different terminal points within the form length. This compensation is initiated by cards or by the sensing of totals both before and after printing them or by sensing the last line on a form. The operating speed of the tabulator is not affected during compensation regardless of the length of the compensation or the manner originated.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

BURROUGHS E101
Electronic Digital Computer



BURROUGHS E101

Electronic Digital Computer

MANUFACTURER

Burroughs Corporation

BRIEF DESCRIPTION

The E101 is a small-size general purpose digital computer applicable to scientific and business problems. It uses a numerical decimal system.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	
Input	manual from keyboard	punched paper tape
Output	semi-ganged printer	punched paper tape
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$32,500	\$42,500
monthly rental	\$850	\$1,120
Storage Capacity	100 words	220 words
Machine Floor Area	65 sq. ft.	65 sq. ft.

The rental figures are based on single-shift operation, exclusive of auxiliary equipment. Minimum figures are for the basic E101. Maximum figures include the punched paper tape input and output options and additional drum capacity.

EQUIPMENT REPORT

APPLICATIONS

There are several installations of the E101. The following are a few of the applications:

Business

- Pension plan rate tables
- Accrual accounting in banks
- Train operating statistics
- Statistical trend analysis
- Correlation coefficients

Scientific

- Wind tunnel test data reduction
- Analysis of variance
- Optical ray tracing
- Turbine performance calculations
- Curve fitting

COMPONENTS OF THE E101 AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment. The rental figures are for single-shift operation. Two-shift operation increases single-shift costs by 50%; three-shift operation increases single-shift rental by 100%. An option-to-buy clause of the rental contract permits credit of 50% of all rentals paid up to a maximum of 50% of the purchase price at the time the option is exercised. The user's needs will determine which computer components he will require: the basic E101 (A) alone, or in combination with the additional storage (B) and/or the additional input and output units (C).

<i>Components</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
A. E101 computer (includes keyboard input, semi-ganged printer, 100-word magnetic drum, 2 sets of pinboards)	\$32,500	\$850
Pinboards (with pins), each	25	
B. Magnetic drum, additional 120-word capacity (supplement to basic)	3,000	80
C. Paper tape reader	3,500	95
Paper tape punch	3,500	95

The hardware cost of a workable installation, exclusive of auxiliary equipment, ranges from \$32,500 to \$42,500.

BURROUGHS E101

PERSONNEL

In some installations, the persons originating the problems will prepare the program and operate the computer. In other installations a programmer and/or operator will be responsible for processing problems through the computer. For a machine with paper tape input, an additional person may be required to prepare the tapes.

MAINTENANCE

One year's maintenance is provided by the manufacturer as part of the purchase agreement. After this first year a separate contract is arranged at a cost of \$2000 per year. When renting, maintenance is provided by the manufacturer as part of the rental agreement.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses are provided at no additional cost by the manufacturer for the training of programmers and operators. They are not fixed in length but usually average three or four days.

A Programmer's Manual #EDP-104 and an Operator's Manual are provided by the manufacturer. A detailed Manual of Sub-Routines for use with the E101 is also available from the manufacturer.

PHYSICAL DATA

These approximate figures are for the E101 exclusive of auxiliary equipment. No allowance is made for storage of boards, tape, etc.

Space, 65 sq. ft.; width, 60"; height, 30"; weight, 1800 lbs. Air temperature, relative humidity, heat dissipation: not reported to this service.

Air conditioning: Normal room air conditioning for operator's comfort only.

Power: For the E101, a 220-volt single-phase AC supply is required. The power dissipation is 3 kw. It is a three-wire system.

FIVE COMPONENTS OF THE E101

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Physical Description</i>
Input	Keyboard (manual)	E101	1	1	From 11-column keyboard.
	Paper Tape Reader		0		20 decimal digits/second; data or instructions; 5, 6, 7 or 8-channel tape.
Output	Printer	E101	1	1	Semi-ganged printer. Format control by pinboard and built-in carriage control. Prints up to one full word each half second.
	Paper Tape Perforator		0	1	Speed not reported; 5, 6, 7 or 8-channel tape.
Storage	Magnetic Drum	E101	1	1	Capacity: 100 fixed length words (12 decimal digits and sign), basic E101; 120 additional words available on expanded drum. Access time: 16.7 milliseconds/word, average. Size: 5" diameter, 6" long; 10 channels. Speed: 3600 rpm. Drum for storage of data only; split-word storage can be programmed.

Control		E101	1	1	<p>Built-in circuitry for control of the components. Built-in control of carriage; some format control from pinboard. Manual control by setting of switches.</p>
Arithmetic Unit	<p>Accumulator: 12 digits and sign. "B" Register: 12 digits and sign. Note: Multiply and divide are performed as follows: ("B" Register) \times (Memory), product to accumulator; (Accumulator)/("B" Register) quotient to memory, remainder left in accumulator. Instructions are not stored internally; the placing of pins in 8 pinboards allows the programmer 128 single address codes. Additional instructions can be read from punched paper tape. There are 8 arithmetic, 4 logical and 7 transfer operations.</p>			<p>Notation: decimal. Arithmetic mode: serial. Negative representation: absolute value and sign. Zero representation: + or — 00000000000. The speeds of the following operations are in milliseconds: add, 50; multiply, 250; divide, 250; transfer, 50; compare, 50 (operating speeds are independent of magnitude of numbers involved and include access to the drum).</p>	

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The basic E101 does not require auxiliary equipment. If the punched paper tape input option is included, some method of preparing the tape will be required. As the E101 paper tape reader can be provided to accept either 5, 6, 7 or 8-channel tape, any one of a large number of machines can be used as auxiliaries.

ADDITIONAL INFORMATION

Write to: Computer Section
Special Machines Department
Burroughs Corporation
1616 Walnut Street
Philadelphia 3, Penna.

APPRAISAL

The Burroughs E101 is a small computer, adaptable to both business and scientific problems. Although its operating speeds are slow when compared with the small computers of the punched card type, it has several advantages over these machines. It has a relatively large storage capacity for a small machine, much greater, in fact, than any of the small computers using electronic storage.

The pinboards, from which the machine is instructed, permit arrangement of the operating codes into programs involving up to 128 individual steps. Larger problems can be processed by entering instructions and/or data from the optional punched paper tape reader. The reader and the tape punch used as an output component are compatible with many information processing systems since 5, 6, 7, or 8-channel tape options may be obtained. An auxiliary converter would be required to incorporate the E101 into a punched card or magnetic tape system.

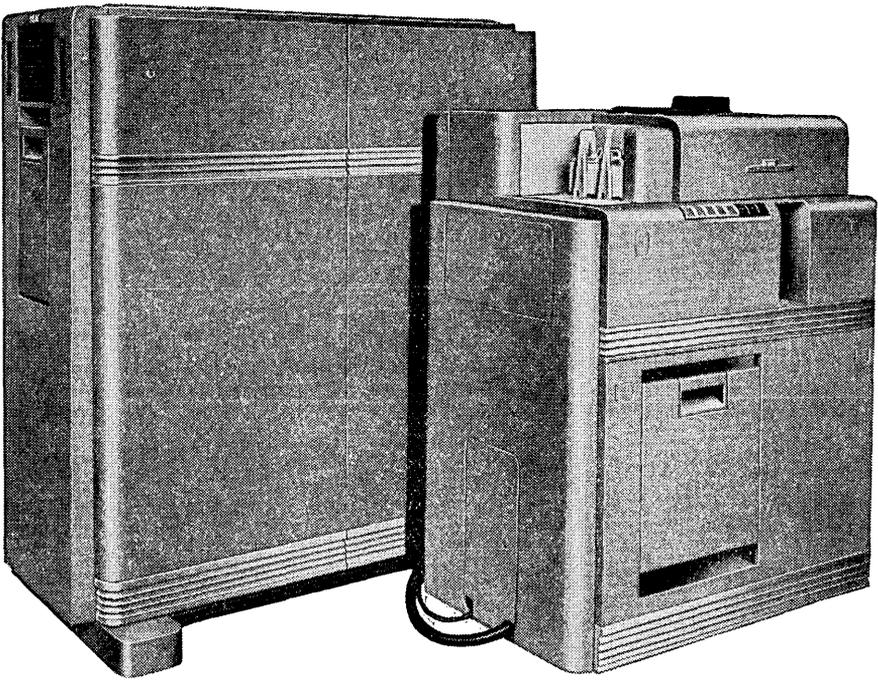
The coding system used for the machine is simple and flexible. Transforming a coded problem into machine language is accomplished by marking positions on a paper template corresponding to the holes in a pinboard. The template is then placed over the pinboard and the pins inserted. Programs are kept simply by placing the templates in an envelope. When reruns are required it is a simple and direct process to make up the pin-

BURROUGHS E101

boards. The simplicity of problem preparation is illustrated in the brief 3 to 4-day course required to train programmers.

Thus the E101 system lends itself to an installation in which the person originating the problem can program the problem and operate the machine himself, or to an installation in which a programmer and/or operator is responsible for the processing of the problems on the machine.

IBM TYPE 604
Electronic Calculating Punch



IBM TYPE 604

Electronic Calculating Punch

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The Type 604 is a small-size general purpose digital computer, applicable mainly to business problems of a repetitive nature. It uses a numerical decimal system.

KEY DATA

	<i>Type</i>
Storage	electronic flip-flop
Input	punched cards
Output	punched cards
Cost	monthly rental \$550.00
Storage Capacity	50 decimal digits
Machine Floor Area	70 sq. ft.

The 604 consists of two machines, the 604 Electronic Calculating Unit and the 521 Punch Unit. The cost given above is for the basic 604. Additional program steps and selectors are available at additional cost.

APPLICATIONS

There are about 2400 Type 604s in operation. They are used primarily for accounting purposes such as payroll, inventory, and billing.

EQUIPMENT REPORT

COMPONENTS OF THE TYPE 604 AND APPROXIMATE COST

The following rentals are for single-shift operation exclusive of the rentals of auxiliary machines. Two-shift operation increases single-shift costs by 50%; three-shift operation increases single-shift costs by 100%. The user's needs will determine the characteristics of the Type 604 applicable to his problems: the basic machine (A) alone, or with additional program steps (B).

<i>Components</i>	<i>Monthly Rental</i>
A. Basic Type 604, including 20 program steps	\$550
B. Additional program steps, for each 20 steps (A maximum of 40 additional steps is available.)	20

Hardware cost of a Type 604, exclusive of auxiliary machines, single-shift operation, ranges from \$550 to \$590 per month.

PERSONNEL

The Type 604 is frequently included in an accounting installation as one of a number of different type machines. The installation will require at least one methods person and several machine operators. Persons operating the Type 604 may operate several other machines at separate times. A minimum number of personnel required for the Type 604 is one operator, experienced in plugboard wiring.

Maintenance is provided by the manufacturer as part of the rental agreement.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two weeks of 1/2-day courses for training personnel in machine operation and control panel wiring at no additional cost are provided by the manufacturer.

A "Principles of Operation" manual, Form #22-5279, is available from the manufacturer.

IBM TYPE 604

PHYSICAL DATA

These figures are for the Type 604 alone. No allowance is made for auxiliary equipment, personnel, storage of cards, etc.

Space: 60 sq. ft. max.

Height: 58" max.

Width: 53" max.

Weight: 1950 lbs. max.

Air temperature: 90-100° F. max.

Relative humidity: not reported.

Heat dissipation: 19,000 BTU/hr.

Air conditioning: No special air conditioning required. A heat exhaust hood should be used.

Power: A 230-volt, 33-ampere, 60-cycle, single-phase AC supply is required. The Type 604 uses a three-wire machine-grounded system.

FIVE COMPONENTS OF THE TYPE 604

The Type 604 is composed of two units: the punch unit and the electronic calculating unit. The wiring of the 521 plugboard controls the input format by reading information from any card column into the desired location in storage; output format is controlled by wiring from the position in storage containing the desired information to any card column. The type, order, and number of steps to be followed in the computation are controlled by the wiring of the 604 plugboard.

EQUIPMENT REPORT

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Physical Characteristics</i>
Input	Punch Unit	521	3700 decimal digits/minute, maximum; 37 digits/card, 100 cards/minute.
Output	Punch Unit	521	2900 decimal digits/minute, maximum; 29 digits/card, 100 cards/minute.
Storage	Electronic Calculating Unit	604	50 decimal digits: counter, 13 digits and sign; MQ unit, 5 digits and sign; two sets of storage, each having two 3-digit and sign and two 5-digit and sign groups, which may be arranged to form 3, 5, 6 or 8-digit words.
Control	Punch Unit	521	Control of format, stop on error in punching, or unfinished program, controlled by plugboard wiring.
	Electronic Calculating Unit	604	Emits pulses to control punch unit. Alters calculation by recognition of condition of intermediate results.
Arithmetic Unit	<p>Notation: binary coded decimal. Arithmetic mode: parallel. Negative representation: absolute value and sign. Zero representation: plus or minus 000...00. Counter: accumulator, 13 positions and sign. MQ unit: multiplier-quotient unit, 3 positions and sign. Up to 60 program steps are available. Each step is effectively a two-address code. Although sequential in operation, steps may be made inoperative by suppression. All functions controlled by plugboard wiring. Average speeds of the following operations are: add, 480 microsec.; multiply, 14.40 millise.; divide, 17.28 millise.; transfer, 480 microsec. Tests for positive, negative and zero are available. Shifts of up to five positions may be made. 121 millise. are available for calculating between successive card feeds.</p>		

IBM TYPE 604

AUXILIARY MACHINES

The Type 604 is very frequently a part of an accounting installation. All standard IBM punched card auxiliaries should be represented in such an activity.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

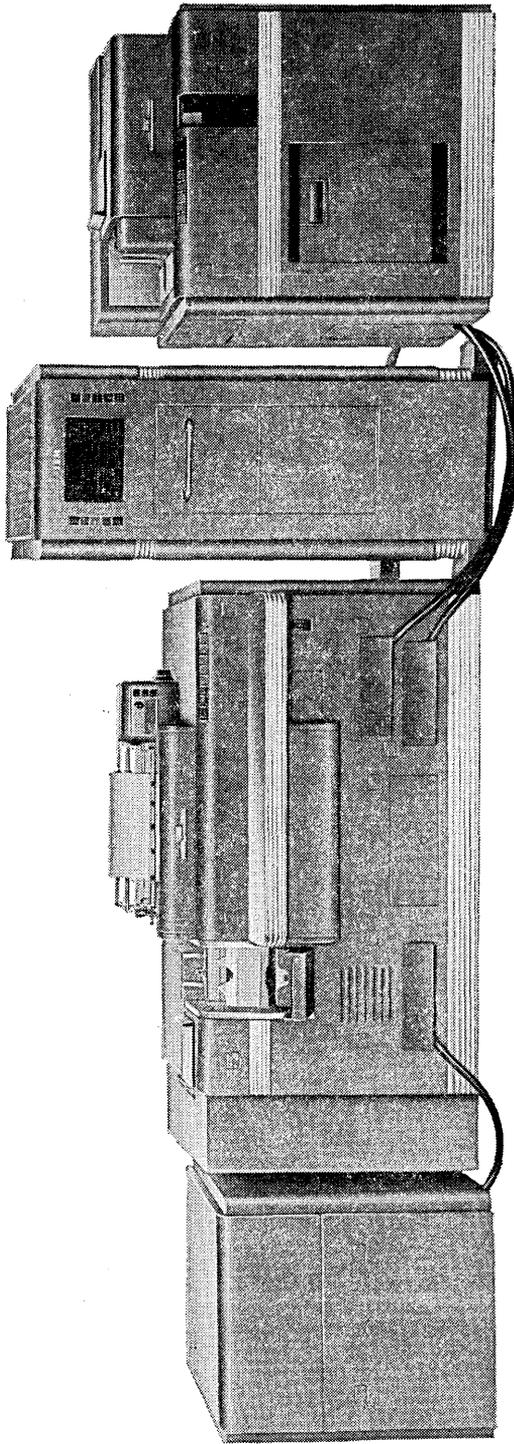
The Type 604 is a small-size computer that has been used primarily in accounting installations. Since IBM punched cards are the input-output media, it is compatible with all machines using this card. Flexibility is achieved by controlling the operation through the use of wired plugboards. The preparation of these boards is a relatively easy process to learn. A course approximately forty hours in length is provided to learn the operating principles of the machine. As some of these features are common to the other punched card machines, experience on such card auxiliary machinery facilitates learning this machine.

The 604 has several drawbacks. First, its storage capacity is limited to fifty decimal digits. Second, a limited number (60 maximum) of operation steps may be performed during calculate time. Third, the machine operates in a sequential mode and although a given step may be made inoperative in a given sweep, a certain amount of time must be allowed for the machine to skip that step. The latter two drawbacks are alleviated to some extent by the comparatively fast operating speeds of the computer but must still be considered in evaluating the usefulness of the 604 for a given application.

A final limitation of the 604 is the five-position MQ unit. This limited number of positions may not be a drawback for many business-type problems. In cases where double precision arithmetic is desired, a greater number of program steps and a longer calculate time are required to develop a longer product or quotient.

The 604 has proven to be an efficient, useful machine for those problems suited to its capabilities.

IBM CPC
Card-Programmed Calculator



IBM CPC

Card-Programmed Calculator

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

A small-size general purpose digital computer, applicable to scientific and some business problems. The CPC uses a numerical, decimal system.

KEY DATA

	<i>Type</i>	
Storage	electromechanical	
Input	punched cards	
Output	punched cards, line printer	
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: monthly rental	\$1,775	\$2,625
Total Personnel	3	7
Storage Capacity	240 decimal digits	880 decimal digits
Machine Floor Area	200 sq. ft.	300 sq. ft.

The above figures are based on one-shift operation, exclusive of auxiliary equipment. Minimum figures refer to a CPC using a 418 accounting machine and one 941 storage unit. Maximum figures are for a CPC using the 412 accounting machine and five 941 storage units.

EQUIPMENT REPORT

APPLICATIONS

There are about 175 installations of the CPC. The following are a few of the applications:

Business

- Calculation of loan amortization tables
- General accounting calculations
- Sales analysis
- Inventory control

Scientific

- Guided missile design
- Thermodynamic calculations
- Stress analysis
- Optical ray tracings

COMPONENTS OF THE CPC AND APPROXIMATE COST

The following rentals are for single-shift operation exclusive of the rentals of auxiliary equipment. Two-shift operation increases single-shift rental by 50%; three-shift operation increases single-shift rental by 100%. The user's needs will determine which computer components he will require: the basic CPC (A), or in combination with the additional storage (B) and/or the substitute input-output (C).

	<i>Components</i>	<i>Monthly Rental</i>
A.	Basic CPC consisting of:	
	412 Tabulator	\$760
	527 Summary Punch } 605 Arithmetic Unit }	865
	941 Storage Unit (one)	200
B.	Additional 941 storage units, each (Maximum of five in CPC system; internal circuitry allows for three, accounting machine requires modification for the fourth and fifth 941s)	200
C.	418 tabulator to replace 412 tabulator	710

Hardware cost of a workable installation, single-shift operation, exclusive of auxiliary equipment, ranges from \$1,775 to \$2,625 per month.

IBM CPC

PERSONNEL

Approximation of personnel required for a single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	} 1	} 2
Programmers		
Operators (CPC)	} 2	1
Operators (auxiliary)		1
Key Punch Operators		1

Maintenance provided by manufacturer; included in rental.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Three-week courses for programmers, two-week courses for operators, and one-week advanced programming courses are provided by the manufacturer at no additional cost.

The programming and operating manual, form #22-8686-3, is available to the user. Information on installation requirements is also supplied by the manufacturer.

PHYSICAL DATA

These approximate figures are for the CPC alone. No allowance is made for auxiliary equipment, personnel, storage of cards, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	200 sq. ft.	300 sq. ft.
Length		75"
Width		43"
Height		58"
Weight	5458 lbs.	7870 lbs.
Air Temperature		90-100° F.
Heat Dissipation	27,930 BTU/hr.	33,090 BTU/hr.

Air conditioning: No special air conditioning required for the machine. Exhaust fan and hood will be required.

Power: For the basic system: 230-volt, 60-cycle, single-phase, 44.5-ampere AC is required. The maximum system requires 52.5 amperes. A three-wire grounded system is used.

FIVE COMPONENTS OF CPC

	<i>Accounting Machine</i>		<i>Calculating Unit</i>	<i>Summary Punch</i>	<i>Storage Unit</i>
Type	412	or 418	605	527	941
Minimum	1	or 1	1	1	0
Maximum	1	or 1	1	1	3 standard, 5 special adapt.
Refer to	ADP Equip. Rpt. 4B 380.5	ADP Equip. Rpt. 4B 380.7	ADP Equip. Rpt. 4G 380.1	ADP Equip. Rpt. 4G 380.1	
<i>Component</i>					
Input	Reads 80 column cards: max. rate 150 cards/minute, no listing; 100 cards/minute, listing.	Reads 80 column cards: max. rate 150 cards/minute, with or without listing.			
	Reads both instructions and data. Format control and codes controlled by wiring of plugboards.				
Output	100 lines/minute 45 alphanumeric type bars 43 numeric type bars Alphabetic information may be listed from cards.	150 lines/minute 89 numeric type bars		Summary punches from Type 412 or 418 counters, a maximum of 80 columns; from the 605 a maximum of 29 columns. Speed, 100 cards/minute maximum.	
	Output format controlled by plugboard wiring.				

Storage	Contains 80 counter positions which may be used as storage by plugboard wiring. (Counter positions may be coupled by wiring to form counter groups 2, 4, 6, 8, 10, 12, etc., digits in length.) Negatives stored as complements. For floating decimal operation counters are used only as storage, with negative numbers stored as absolute value and sign.	Contains 32 positions of electronic storage (used as working storage), which can be grouped as 3, 5, 6 or 8-digit factors with sign. Multiplier-quotient: 5 digits and sign. Counter: accumulator, 13 digits and sign.		Each unit stores 16 fixed length words, 10 decimal digits and sign. Wiring of plugboards permits use of two units together for double precision arithmetic. Electromechanical.
Control	Interprets instructions, emits control impulses for other units of calculator. Will interrupt feeding while 605 is performing an iterative routine, or while 527 is punching.	Recognizes zero, non-zero, positive and negative values. Emits signals to control subsequent operations of accounting machine or 605.	Limited control of punching operation.	
Arithmetic Unit	Counter positions may be wired to act as algebraic accumulators for fixed-decimal operation. Contains comparing circuits. Wiring of plugboards permits use of multiple address systems other than usual three-address system. Internal circuitry permits shifting up to 6 positions. Wiring determines how basic operations are combined into an operating set of codes. Internally, basic operations of add, subtract, multiply, divide, test for zero, test for negative, $\frac{1}{2}$ adjust (for rounding), shift up to 5 positions are provided. When combined with program repeat, iterative procedures may be performed. Floating decimal arithmetic by wiring.	General: Notation: binary coded decimal. Arithmetic mode: parallel by digit. Negative number representation: absolute value and sign. Zero representation: plus or minus 00...0. Card read speed of accounting machine in general controls overall computing time. Calculations occur in interval between successive card feeds.		

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required		
1-Key Punch	026	1A 380.2
1-Sorter	083	4A 380.4
1-Reproducer	514 or 519	3D 380
Recommended		
1-Collator	077 or 089	4A 380
1-Verifier	056	1C 380.1

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

When the CPC was first introduced in 1949, it was the only mass produced computer in the moderate priced field. Although developed primarily for scientific applications, it has been successfully used for the solution of business problems.

The CPC is an extremely versatile and flexible machine. Versatility is achieved by imaginative design of the control panel wiring for the machine. Boards for fixed and floating point arithmetic, double precision arithmetic, matrix inversion and many others have been designed. One set of panels permits the machine to act as an internally programmed calculator for certain types of problems.

This versatility lends itself to the solution of many different types of problems both in scientific and business applications. Although the general purpose concept of board design is widely advocated, the special purpose concept has not been overlooked. Many companies have developed boards suited to a problem peculiar to their operation and in many cases have boards applicable to just one small phase of the operation.

Another example of the CPC's flexibility is the possibility of using the 605 and 527 units as a separate computer on repetitive problems requiring a limited amount of storage and relatively

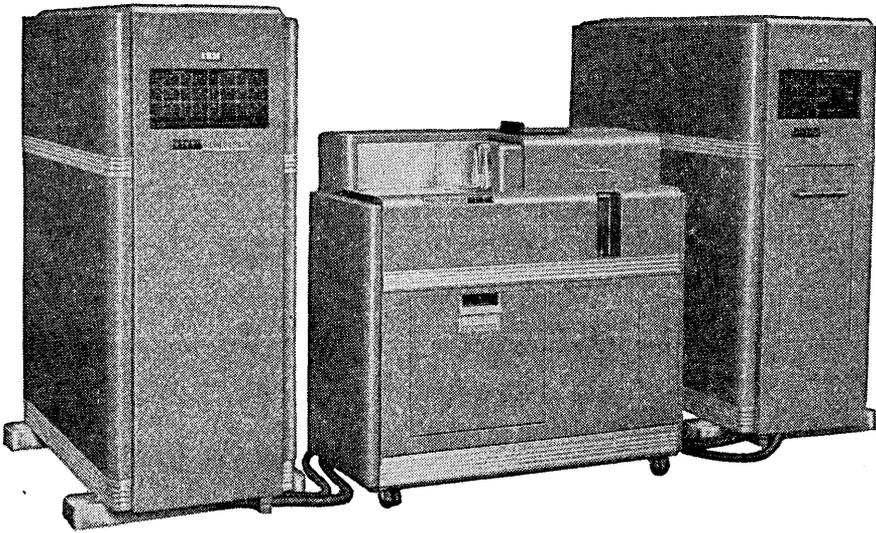
IBM CPC

simple operations. For this type of operation, the internal connection between the accounting machine and the 527 is broken and the 605-527 are used independently. While such an operation is in progress, the accounting machine can be operated simultaneously on problems suited to its characteristics. This operation effectively makes the CPC three machines—the CPC System using all the machines as an integrated whole, a small punched card calculator and an accounting machine.

The CPC has three basic disadvantages. First, it is limited in storage capacity. Using the usual criterion of a 10-decimal digit word length, a maximum of 88 words of storage capacity is available. Second, because the feeding of cards bearing instructions is at a fixed rate of speed the machine does not utilize the speed of operation as efficiently as a stored program machine. Third, it is not a stored program machine, resulting in rather inefficient operation, especially for a job requiring many branch or loop operations. This difficulty can, however, be alleviated to some extent by good board design.

In general, the basic characteristics and reliability of the CPC make it a satisfactory machine for a low budget installation. When a well designed board has been wired, much of the programming can often be left to relatively inexperienced personnel, leaving the more experienced personnel for the development of new applications and methods.

IBM TYPE 607
Electronic Calculator



IBM TYPE 607

Electronic Calculator

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

A small-size general purpose digital computer, applicable mainly to business problems of a repetitive nature. The Type 607 uses a numerical decimal system.

KEY DATA

	<i>Type</i>	
Storage	electronic flip-flop tubes	
Input	punched cards	
Output	punched cards	
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: monthly rental	\$800	\$1850
Storage Capacity	66 decimal digits	162 decimal digits
Machine Floor Area	80 sq. ft.	160 sq. ft.

The above figures are based on single-shift operation, exclusive of auxiliary equipment. Minimum figures are for the basic 607 consisting of the Type 607 Electronic Calculating Unit with 40 program steps and the Type 529 Punch Unit. Maximum figures include 40 additional program steps and a full capacity Type 942 Electronic Storage Unit.

EQUIPMENT REPORT

APPLICATIONS

There are about 200 Type 607s in operation. They are used primarily in general accounting installations for payroll, inventory and billing.

COMPONENTS OF THE TYPE 607 AND APPROXIMATE COST

The following rentals are for single-shift operation exclusive of the rentals of auxiliary machines. Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift costs by 100%. The user's needs will determine which computer components he will require: the basic 607 (A) alone, or with additional storage (B) and/or program steps (C).

<i>Components</i>	<i>Monthly Rental</i>
A. Type 607 w/40 program steps and storage for 66 decimal digits	\$800
B. Additional storage:	
1. First 16 decimal digits	300
2. Next 32 decimal digits	300
3. Next 32 decimal digits	300
4. Next 16 decimal digits	150
C. Additional program steps, for each 20 steps (40 additional, maximum on 66 digit and 162 digit models; 100 additional, maximum on 82, 114 and 146 digit models.)	20

Hardware cost of a Type 607, single-shift operation, exclusive of auxiliary equipment, ranges from \$800 to \$1850 monthly rental.

PERSONNEL

The Type 607 is very frequently included in an accounting installation as one of a number of different machines. The installation will require at least one methods person and several machine operators. Persons operating the Type 607 may operate several other machines at separate times. A minimum number of personnel required for the Type 607 is one operator, experienced in plugboard wiring.

Maintenance is provided by the manufacturer as part of the rental agreement.

IBM TYPE 607

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses—two weeks of half days—are available at no additional cost from the manufacturer for the training of personnel in machine operation and control panel wiring.

A "Principles of Operation" manual, form #22-6064, is available from the manufacturer.

PHYSICAL DATA

These approximate figures are for the 607 alone. No allowance is made for auxiliary equipment, personnel, storage of cards, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	80 sq. ft.	160 sq. ft.
Width		61¼"
Height		67½"
Weight	2780 lbs.	4330 lbs.
Air Temperature		90°-100° F
Heat Dissipation	28,100 BTU/hr.	39,000 BTU/hr.

Air conditioning: No special air conditioning required. A heat exhaust hood should be used.

Power: For the basic system, 230-volt, 60-cycle, single-phase, 43-ampere AC is required. The maximum system requires 62 amperes. A three-wire grounded system is used.

FIVE COMPONENTS OF THE TYPE 607

The Type 607 is composed of three units: the punch unit, the electronic calculating unit and the electronic storage unit. The wiring of the 529 plugboard controls the input format by reading information from any card column into the desired location in storage. Output format is controlled by wiring from the position in storage containing the desired information to any card column. The type, order and number of steps to be followed in the computation are controlled by the wiring of the 607 plugboard.

	<i>Punch Unit</i>	<i>Electronic Calculating Unit</i>	<i>Electronic Storage</i>
Type	529	607	942
Minimum	1	1	0
Maximum	1	1	1
<i>Component</i>			
Input	8000 decimal digits per minute, maximum (100 80-column cards /minute).		
Output	8000 decimal digits per minute, maximum (100 80-column cards /minute).		
Storage		For the machine with 80 program steps or less, 66 decimal digits; with 80-140 program steps, 50 decimal digits.	Up to 96 decimal digits, in increments of 32. If 66-digit 607 is used, the entire 96 digits must be incorporated.
		With exception of the counter holding 13 digits and sign, and the MQ unit, holding 5 digits and sign, storage is made up of sets each having two 3-digit and sign and two 5-digit and sign groups which may be arranged to form 3, 5, 6, or 8-digit words.	

Control	Control of format, error in punching, by plugboard wiring. Also the machine stop will occur when program is incomplete.	Emits pulses to control punch unit. Alters calculation procedure by recognition of condition of intermediate results.
Arithmetic Unit	<p>Notation: binary coded decimal. Arithmetic mode: parallel. Negative representation: absolute value and sign. Zero representation: plus or minus 00...0.</p> <p>Counter: accumulator, 13 positions and sign. MQ unit: multiplier-quotient unit, 5 positions and sign.</p> <p>Up to 140 program steps are available. Each step is effectively a two-address code. Although sequential in nature, steps may be skipped or made inoperative by suppression. A program repeat feature is included to permit iterative procedures to be followed. All functions controlled by plugboard wiring.</p>	<p>Average speeds of the following operations are: add, 520 microsec.; multiply, 13.86 millisecc.; divide, 16.62 millisecc.; transfer, 520 microsec.; skip or suppress after compare, 80 microsec./ prog. step.</p> <p>Skip and/or suppress may be result of zero test or balance test operations. A shift of up to five places in either direction may be made.</p> <p>115 milliseconds are available for calculation between successive card feeds unless delay is wired. If delay is wired, 85 milliseconds of calculating time is available before causing the card feed to latch and provide more calculate time.</p>

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment used with the Type 607 usually is that of an accounting installation. The number and types of machines depend on the installation. Any IBM equipment used in card preparation may be used with the Type 607.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

The Type 607 is a small-size digital computer, used primarily for brief, repetitive problems in accounting installations. Essentially, it is an outgrowth of the Type 604 Electronic Calculating Punch, with greater capacity and flexibility, and several additional features. The Type 607 uses the IBM punched card for input and output and thus is compatible with all other equipment using this card. The 607 is a relatively easy machine to learn; courses in operations and plugboard wiring require about 40 hours. Experience on other punched card equipment, particularly the 604, speeds proficiency in the use of the 607.

The 607 has up to approximately three times the storage capacity and from 20 to 80 more program steps than the maximum 604 depending on the optional features desired. Flexibility has been increased by incorporating a delay circuit that permits effectively unlimited calculating time. Program steps can be made inoperative by either a program skip feature or by suppression. The program repeat, the delay, and the ability to make steps inoperative make possible the incorporation of iterative techniques in the solution of a problem.

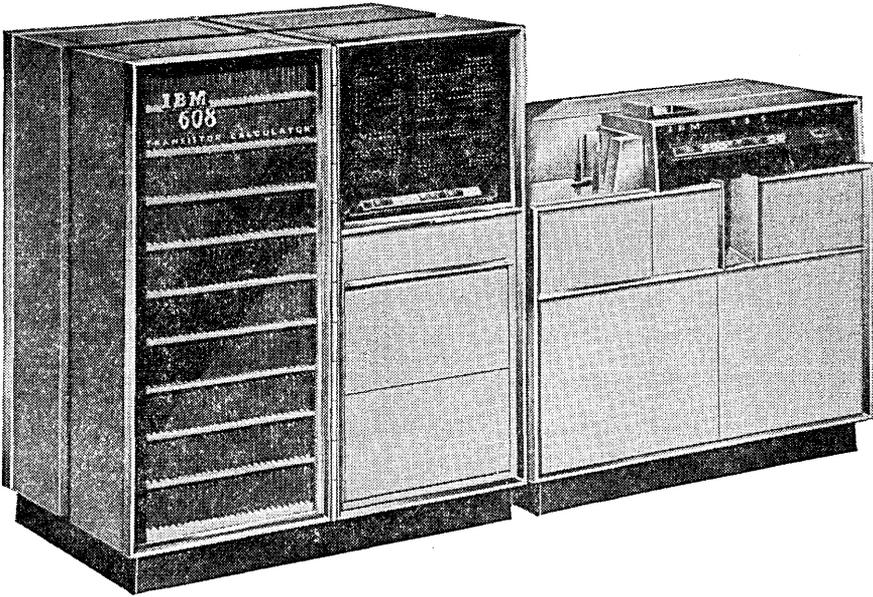
Although the 607 is more flexible and has greater capacity than the 604, it has much the same limitations. The storage capacity is small. A relatively limited number of discrete steps are available for a given problem. The MQ unit is only five places and thus more program steps and operating time are required for the processing of information requiring more

IBM TYPE 607

places. The operating speeds of the 607 are approximately the same as those of the 604.

The 607, however, is useful and efficient on those problems suited to its characteristics.

IBM TYPE 608
Transistor Calculator



IBM TYPE 608

Transistor Calculator

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

A small-size general purpose digital computer, applicable mainly to business problems of a repetitive nature. The Type 608 uses a numerical decimal system.

KEY DATA

	<i>Type</i>
Storage	magnetic core
Input	punched cards
Output	punched cards
	<i>Approximate Figures</i>
Cost: monthly rental	\$2250
Storage Capacity	40 words
Machine Floor Area	70 sq. ft.

The above figures are based on one-shift operation, exclusive of auxiliary equipment. Rental figures are for the basic 608 consisting of the Type 608 Calculating Unit and the Type 535 Punch Unit with the minimum complement of program steps. Additional program steps and greater quantities of several functional features are available at extra cost.

APPLICATIONS

Some possible applications of the Type 608 are payroll, inventory and billing.

EQUIPMENT REPORT

COMPONENTS OF THE TYPE 608 AND APPROXIMATE COST

The following rentals are for single-shift operation, exclusive of the rentals of auxiliary machines. Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift costs by 100%. The user's needs will determine whether he will require the basic 608 (A) alone, or with additional program steps (B), and/or with greater numbers of several functional features such as selectors, program exit expanders, etc.

<i>Components</i>	<i>Monthly Rental</i>
A. Basic Type 608 w/80 program steps and minimum complement of functional features	\$2250
B. Additional program steps, for each 20 steps (80 additional, maximum)	30

The minimum hardware cost for single-shift operation, exclusive of auxiliary equipment, is a monthly rental of \$2250; the maximum cost, with a full complement of presently announced devices, is a monthly rental of \$2677.50.

PERSONNEL

The Type 608 is intended, primarily, for use in an accounting installation as one of a group of different machines. The installation will require at least one methods person and several machine operators. Persons operating the Type 608 may operate several other machines at separate times. A minimum number of personnel required for the Type 608 is one operator, experienced in control panel wiring. Maintenance is provided by the manufacturer as part of the rental agreement.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Operator training is not yet available.

A brief manual, form #29-9151-0, is available from the manufacturer.

IBM TYPE 608

PHYSICAL DATA

These approximate figures are for the 608 alone. No allowance is made for auxiliary equipment, personnel, storage of cards, etc.

	<i>Approximate Maximum</i>
Space	70 sq. ft.
Width	61 $\frac{5}{8}$ "
Height	64 $\frac{1}{16}$ "
Weight	2400 lbs.
Heat Dissipation	7459 BTU/hr.

Air conditioning: No special air conditioning required. A heat exhaust hood should be used.

Power: 115-volt, 60-cycle, single-phase, 19 ampere AC supply is required. A three-wire grounded system is used.

FIVE COMPONENTS OF THE TYPE 608

The Type 608 consists of two units: the calculating unit and the punch unit. The wiring of the 535 control panel controls the input format by reading information from any card column into the desired location in storage. Output format is controlled by wiring from the position in storage containing the desired information to any card column. The type, order and number of steps to be followed in the computation are controlled by the wiring of the 608 control panel.

EQUIPMENT REPORT

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Physical Characteristics</i>
Input	Punch Unit	535	12,400 decimal digits/minute, maximum; 155 80-column cards/minute.
Output	Punch Unit	535	12,400 decimal digits/minute, maximum; 155 80-column cards/minute.
Storage	Calculating Unit	608	40 words, each consisting of 9 decimal digits, that may be split into a 3-digit and a 6-digit word with associated signs. Word split assignment may be changed during calculation.
Control	Punch Unit	535	Control of format, error in punching by plugboard wiring. Machine stop occurs when program is incomplete.
	Calculating Unit	608	Emits pulses to control punch unit. Alters calculation procedure by recognition of condition of intermediate results.
Arithmetic Unit	<p>Notation: binary coded decimal. Arithmetic mode: parallel. Negative representation: absolute value and sign. Zero representation: plus or minus 00000000. Counter: accumulator, 18 positions and sign. Up to 160 program steps are available. Each step is effectively a two-address code. The program steps are non-sequential in nature, allowing direct repetition of a group of program steps in iterative procedures. All functions are controlled by plugboard wiring. Average speed of the following operations are: add, 220 microsec.; multiply, 11.88 millisecc.; divide, 14.52 millisecc.; transfer, 220 microsec.; compare, 220 microsec. Alternation of program sequence may be result of zero, non-zero, positive, negative, overflow conditions of the accumulator or a quotient which will exceed 9 digits. Shifts up to 9 positions in either direction may be made. 117 milliseconds are available for calculation between successive card feeds unless delay is wired. If delay is wired, 85 milliseconds of calculating time is available before causing the feed to latch and provide additional calculate time.</p>		

IBM TYPE 608

AUXILIARY EQUIPMENT

The auxiliary equipment used with the Type 608 will usually be that of an accounting installation. The number and types of machines will depend on the installation. Any IBM equipment used in card preparation may be used with the Type 608.

ADDITIONAL INFORMATION

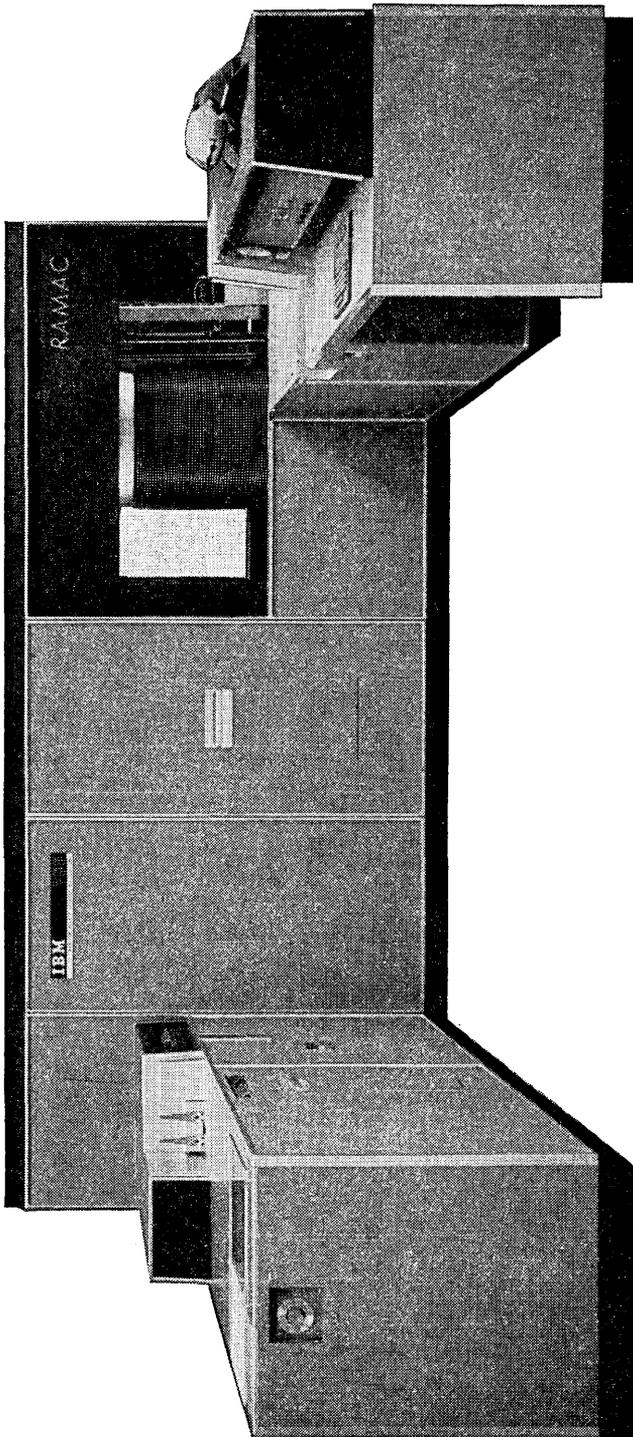
Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

DIFFERENCES FROM THE IBM TYPE 607

The Type 608 differs from the Type 607 in many ways. The following are only the major differences:

1. Germanium transistors have replaced all tubes.
2. Magnetic core storage has replaced the electronic flip-flop circuits.
3. Instructions are non-sequential in nature, resulting in more efficient use of calculating time; no time lost for skipping unused program steps.
4. Operating speed is substantially higher.
5. Storage capacity is more than double that of the 607.
6. Zero test occurs automatically on any accumulator read-out cycle and is non-destructive; i. e., testing the accumulator for a zero or non-zero condition does not alter the contents of the accumulator.
7. Automatic accumulator balance test on each cycle.
8. Electronic selectors allow alteration of programming during calculate time as the result of logical decisions.

305 RAMAC
Random Access Memory Accounting System



December, 1956

305 RAMAC

Random Access Memory Accounting System

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The 305 Ramac is a small-scale, electronic digital computer designed specifically for in-line data processing of business applications. It uses a numerical decimal system. The 305 Ramac can store alphabetic and special characters, and process numeric information.

KEY DATA

Storage	magnetic drum, magnetic disks
Input	punched cards, manual
Output	punched cards, typewriter, alphabetic printer
Cost: monthly rental	\$3,200
Total personnel	3 to 8
Storage capacity	5,000,000 characters

The rental figure above, based on single-shift operation exclusive of auxiliary equipment, includes a 305 processing unit with console, inquiry keyboard, typewriter and card reading device; a magnetic disk storage unit, a card punching unit and a power unit.

EQUIPMENT REPORT

APPLICATIONS

There are 4 installations of the 305 Ramac. Some applications are:

Business

- Budget and appropriation accounting
- Production control
- Billing, inventory, sales analysis and updating accounts receivable
- Payroll and labor distribution

COMPONENTS OF 305 RAMAC AND APPROXIMATE COST

The following rental costs are for a single-shift operation exclusive of auxiliary equipment:

<i>Components</i>	<i>Mo. Rental</i>
305 Ramac processing unit	\$1,250
340 Power supply unit	375
380 Operator's console; including inquiry keyboard, typewriter and card reader	400
323 Card punch unit	225
350 Magnetic disk unit	650
370 Alphabetic printer	300

PERSONNEL

The approximate number of personnel required for single-shift operation of the 305 Ramac system alone would be:

	<i>Minimum</i>	<i>Maximum</i>
Methods	0	1
Programmers	1	1
Operators (experienced in plug-board wiring)	1	2
Key punch operators	1	3
Maintenance	1	1

Maintenance is provided by the manufacturer as part of the rental agreement. Maintenance contracts with the manufacturer are available to purchasers of 305 Ramac.

305 RAMAC

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

A two-week course for programmers (includes control panel wiring) is provided by the manufacturer at no additional cost.

A programming and operating manual is available to the user. Information on installation requirements is also provided by the manufacturer.

PHYSICAL DATA

These figures do not allow for auxiliary equipment, record storage space, personnel, etc.

Space	400 sq. ft.
Length	62"
Width	32"
Height	72"
Machine floor loading	270 lbs./sq. ft., maximum
Air temperature	50°F to 90°F
Heat dissipation	58,000 BTU/hr.
Relative humidity	0% to 80%

Air conditioning: Generally required for the 305 Ramac system.

Power: For the 305 Ramac a 208 or 230 volt, three-phase, 60 cps, 56 to 61 amp. AC power supply is required.

FIVE COMPONENTS OF THE 305 RAMAC

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>ADP Eqpt. Rpt. Ref.</i>	<i>Physical Description</i>												
Input	Keyboard, manual } Card Reader } Console	380	1	1	1A 380.1	Keyboard characteristics of IBM 24.												
						125, 80-column cards/minute; maximum of 166 characters/second.												
Output	Card Punch	323	1	1		100, 80-column cards/minute; maximum of 133 characters/second.												
	Printer *	370	1	1		30 lines/minute; 80 printing positions/line.												
	Typewriter	380	1	1		10 characters/second.												
Storage	Magnetic Disk Unit	350	1	1		<table border="0"> <tr> <td>No. of disks: 50.</td> <td>Average access time to a record: 825 milliseconds.</td> </tr> <tr> <td>No. of disk faces: 100.</td> <td>Average access time to a disk: 600 milliseconds.</td> </tr> <tr> <td>No. of tracks/face: 100.</td> <td>Average access time when the access arm is at the disk, to a track on the disk: 225 milliseconds.</td> </tr> <tr> <td>No. of records/tracks: 5.</td> <td>Size of disk: 24" diameter.</td> </tr> <tr> <td>No. of characters/record: 100.</td> <td>Speed: 1,200 rpm.</td> </tr> <tr> <td>Total characters of storage/disk unit: 5,000,000.</td> <td></td> </tr> </table>	No. of disks: 50.	Average access time to a record: 825 milliseconds.	No. of disk faces: 100.	Average access time to a disk: 600 milliseconds.	No. of tracks/face: 100.	Average access time when the access arm is at the disk, to a track on the disk: 225 milliseconds.	No. of records/tracks: 5.	Size of disk: 24" diameter.	No. of characters/record: 100.	Speed: 1,200 rpm.	Total characters of storage/disk unit: 5,000,000.	
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No. of records/tracks: 5.	Size of disk: 24" diameter.																	
No. of characters/record: 100.	Speed: 1,200 rpm.																	
Total characters of storage/disk unit: 5,000,000.																		
Magnetic Drum	305	1	1		Capacity: 3,200 characters; 100 characters/track. Average access time: 5 milliseconds. Size: ***" diameter; ***" long; 32 tracks. Speed: 6,000 rpm.													

Control	Arithmetic Unit Control Panel	305	1	1	Built in circuitry to control components. Logical operations are wired.
	Operator's Console	380	1	1	
Arithmetic Unit	Accumulator: 1 track on drum contains 10 separate accumulators; 10 characters/accumulator; no positive or negative signs in the accumulator. Logical operations in the instruction sequence are control panel wired. Magnetic core storage: 100 characters of core storage serve as intermediate storage for each internal transfer of data. Address register: contains the 5-position disk address of the unit record being handled.			Notation: binary coded decimal. Arithmetic mode: serial. Negative number representation: ten's complement in accumulator; absolute value with minus sign over units position elsewhere. Zero representation: -00...00 or 00...00. Word length: variable. Average speeds * of the following operations are given in milliseconds: add, 0.30; multiply, 0.60 plus 0.10 milliseconds per digit in the multiplier; division by subroutine; transfer, 0.30; compare, 0.30. * If the arithmetic operation is followed by a logical operation, the operating speed of an instruction increases by 0.20 milliseconds. Logical operations are governed by control panel wiring.	

* The 370 Printer may be omitted, and an "off-line" printer used instead.

** Not available.

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment used with the 305 Ramac is that of an accounting installation. The number and types of machines depend on the installation. Any IBM equipment may be used with the 305 Ramac.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

PRELIMINARY REPORT ON THE 305 RAMAC SYSTEM

The 305 Ramac is a small-scale general purpose digital computer designed for 'in-line' commercial data processing. It differs from other small-scale data processors in that it utilizes magnetic disks for secondary storage. Its primary storage media is magnetic drum storage. The prototype of the disk storage unit was announced in May, 1955. This storage unit has a capacity of 5,000,000 characters. Any of its 100-character records can be located without scanning through intervening records.

'In-line' data processing implies the immediate processing of individual transactions as soon as the data describing them is received at the data processing center. This is not a new concept to the data processing field. To date, its applications have been mainly: airline and railroad space reservations, inventory control and bank accounting. Previously, these applications have utilized systems whose large-capacity storage media are large-capacity magnetic drums instead of magnetic disks. In general, these magnetic drum systems provide faster random access than magnetic disk systems. The great advantage of the disks is the relatively large storage capacity available at comparative prices.

In most of the present general purpose digital computer installations, magnetic tape serves as the mass data storage media. Although magnetic tape has large storage capacity (up to 5,000,000 or more digits per reel, using standard ½ inch

width tape), it is essentially a serial type of storage. To read any record which is stored on tape, it is necessary to search all the records between the point where the tape units' read heads are positioned when the search command is given and the point where the desired record is stored. The random search time for the operation usually ranges from one to two minutes. Using the disk type storage which is parallel-serial in nature, a record may be located in less than a second regardless of where the previously read record is stored. Thus, the amount of time necessary to locate filed information is substantially reduced to a point where it becomes practical to process records without first sorting them.

This does not mean that magnetic tape has become obsolete. The cost per digit of storing information on disks as opposed to tape is substantially higher. The use of disks must be justified economically on the basis of actual dollar savings accrued either directly, by increased business, or indirectly, by better customer service. Magnetic tape will continue to be the main mass data storage until the costs of the newer types of mass data storage are substantially reduced.

The 305 system is composed of four units: the 350 disk storage unit, the 305 processing unit with magnetic drum and core buffer, the 380 console unit with punched card reader and inquiry keyboard, and a 323 card punch. A 370 printer unit may be connected to the system as an optional component.

The magnetic disk unit consists of 50 metal disks arranged in a vertical stack. Both sides of the disk are used for recording data; thus, there are 100 faces available for storage. There are 100 tracks on each disk face, and each track will hold five 100-character records. Access to these records is accomplished via an arm which mechanically moves both vertically and horizontally under electronic control. Information is transferred to and from storage in units of 100-characters.

Average access time to any record in disk storage depends on the vertical and/or horizontal motion of the arm. If the arm is at the disk required and only horizontal motion is necessary, the random access time is about 225 milliseconds. However, if both vertical and horizontal motions are necessary to locate a record, the access time is approximately 875 milliseconds. Hence, processing time may be greatly reduced if all records on a given

EQUIPMENT REPORT

disk are processed first, and records on an adjacent disk are processed next.

The 305 processing unit contains a magnetic drum for working storage, a magnetic core buffer through which information is transferred, and the control circuits for data handling and arithmetic. The drum stores program instructions and furnishes temporary working storage to rearrange the information in records. It also contains sections used for accumulating, multiplying, and inquiry output. Division, when needed, must be programmed. Logical operations must be control panel wired. A maximum of 200 instructions and 1200 characters of working storage can be stored on the drum. The magnetic core buffer holds a maximum of 100 characters for the transfer of information from the magnetic drum or from a track of disk memory.

The 380 console unit permits the operator to control the operations and to obtain a specific record from storage through use of the inquiry keyboard and typewriter combination. Input to the system is accomplished through a punched-card reader which is incorporated in this console unit.

The standard output device is a 323 card punch, which has a maximum punching rate of 100 cards per minute. Information to be punched must be on the output track of the magnetic drum prior to punching.

Optional output is provided by a specially designed printer which has a 30 line per minute speed. This 370 printer is a departure from the previous IBM printer units. It prints a character-at-a-time instead of a line-at-a-time. There is only one type bar which travels across the 80-character printing line.

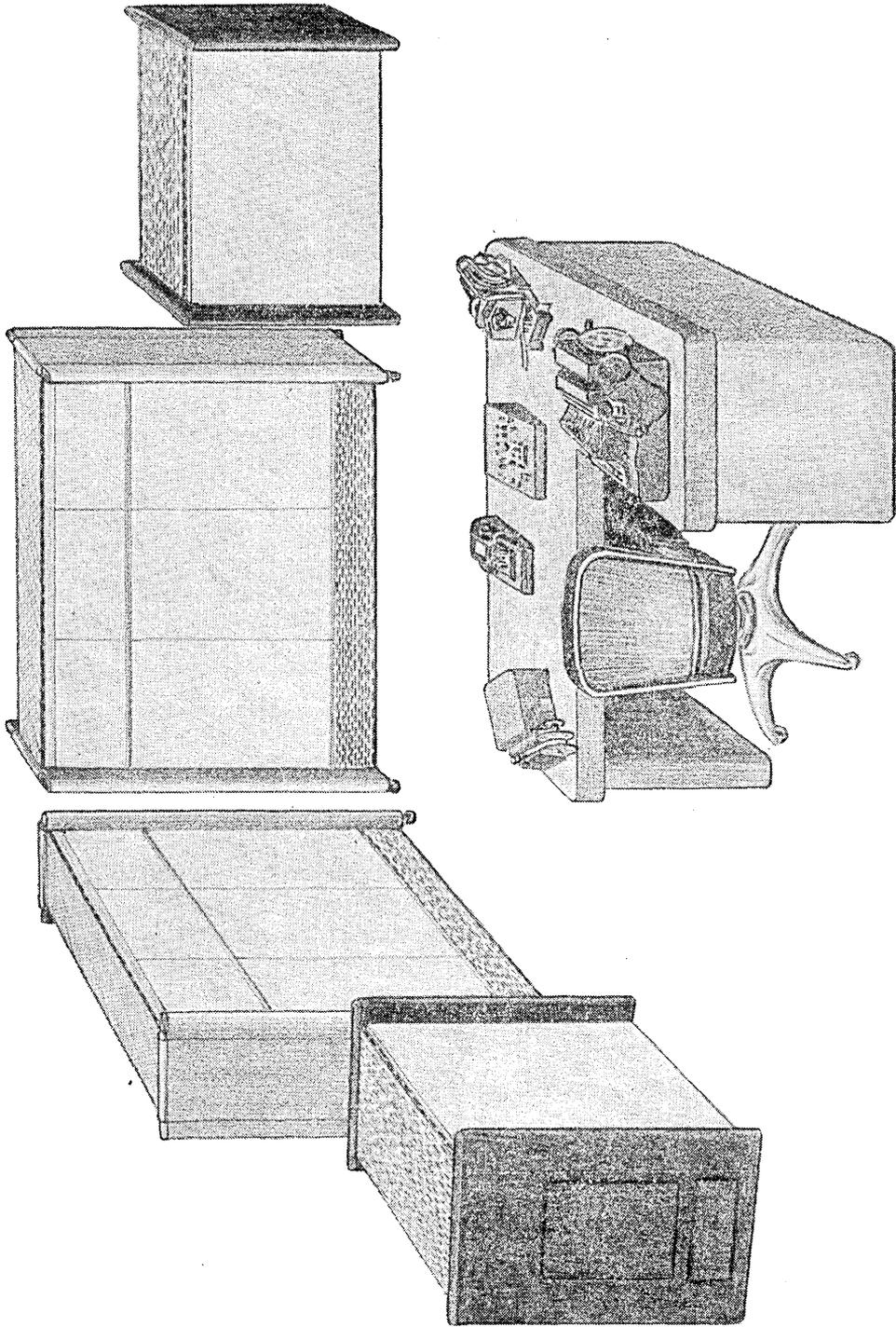
At the present time, it appears that the major portion of applications for the 305 Rmac system will be in those data processing areas in which a large volume of records must both be kept up-to-date and constantly referred to on short notice. The machine's design is geared to commercial problem solving. This requires only the basic arithmetic operations. For the accounting type problem, the logical structure of the machine is satisfactory. It is not intended for scientific or engineering work and would be of extremely limited use in these areas.

At present, only one disk storage unit may be used in conjunction with a 305 system. It is hoped that in the future more than one Rmac unit may be included, even as more than one

305 RAMAC

Ramac unit may be included in the 650 Ramac system. This would not only increase the storage capacity, but it would also effectively decrease the time required to locate a record since more than one Ramac could be searching for a record at a given time.

TIM II
Electronic Data Processing System



May, 1956.

TIM II

Electronic Data Processing System

MANUFACTURER

Laboratory for Electronics, Inc.

BRIEF DESCRIPTION

A small-size general purpose digital computer designed to handle small and medium-sized problems in account posting. The TIM II uses a numerical decimal system.

KEY DATA

Storage	magnetic core, magnetic drum
Input	manual, punched paper tape
Output	punched paper tape, adding machine printer
	<i>Approximate Minimum</i>
Cost: purchase	\$60,000
Total Personnel	2
Storage Capacity	720,000 decimal digits
Machine Floor Area	70 sq. ft.

The above figures are exclusive of auxiliary equipment. The minimum figures are for the basic workable TIM II consisting of a basic TIM with 116 digits of magnetic core shift-registers, 1 numerical keyboard, 1 adding machine printer, 1 low-speed paper tape reader, 1 low-speed paper tape punch, and 1 drum with a storage capacity of 720,000 decimal digits.

EQUIPMENT REPORT

APPLICATIONS

The following are a few of the applications planned for TIM II:

Business

- Check handling
- Mail order house inventory
- Department store inventory
- Savings Banks: Mortgage and accounts
- Balance keeping

COMPONENTS OF TIM II AND APPROXIMATE COST

The following cost is exclusive of auxiliary machines costs. The manufacturer has not yet announced a detailed price schedule. Further cost information would have to be obtained from the manufacturer.

The user's needs will determine which computer components he will require: the basic TIM II (A) alone, or in combination with the additional storage (B) and/or the additional input-output (C).

<i>Components</i>	<i>Approximate Cost Purchase</i>
A. TIM II with 116 digits of magnetic core storage, 720,000 digit drum, manual input keyboard, and adding machine printer, low-speed paper punch and reader	\$60,000
B. Additional 720,000 digit drums	} Costs not announced as yet
C. High-speed paper tape reader	
High-speed paper tape punch	
Additional manual keyboards	
Additional adding machine printers	

The minimum cost of a workable installation, exclusive of auxiliary equipment is \$60,000.

TIM II

PERSONNEL

Approximation of the personnel required for single-shift operation.

<i>Position</i>	<i>Minimum</i>	<i>Maximum</i>
Methods	0	1
Programmers	1	1
Operators (TIM II)	1	1
Tape Preparers or Key Punch Operators	1	3
Maintenance	one man may service several TIMs	

Maintenance contracts from the manufacturer are available to purchasers of the TIM II.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming and specification manuals are available from the manufacturer. The manufacturer intends to set up programming courses later in 1956.

PHYSICAL DATA

These approximate figures are based on the TIM II alone. No allowance is made for auxiliary equipment, personnel, storage of tapes, cards, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	70 sq. ft.	not reported
Height		78"
Width		32"
Weight	3,000 lbs.	not reported
Air Temperature	65° F.	85° F.
Relative Humidity	0%	100%
Heat Dissipation	15,700 BTU/hr.	not reported

Air conditioning: Recommended, but not required.

Power: For the TIM II, a 115/220 volt, single-phase, 60 cps, 40/20 amps, 4 kva, AC supply is required. It is a two- or three-wire system.

FIVE COMPONENTS OF THE TIM II SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Manual Keyboard	TIM II	1	1*		Ten key, numerical keyboard. Several keyboards, at remote locations, can be provided for random queries.
	Paper Tape Reader, low-speed	Flexowriter	0	1	4G 180.1	14 digits/second.
	Paper Tape Reader, high-speed	Teletype	0	1	4G 745.1	60 digits/second. Input is not printed when high-speed reader is used.
Output	Adding Machine Printer	TIM II	1	1*		14 digits/second plus 0.33 seconds/line of printing.
	Paper Tape Punch, low-speed	Flexowriter	0	1	4G 180.1	14 digits/second.
	Paper Tape Punch, high-speed	Teletype	0	1	4G 745.1	60 digits/second.
Storage	Magnetic Core	TIM II				116 digits, minimum; 204 digits, maximum.
	Magnetic Drum	TIM II	1	1		Capacity: up to 720,000 decimal digits/drum. Each drum can have up to 300 tracks of 2,400 digits each. Random access time to any account: 1/2 second average (includes search of whole drum), 5/6 second, maximum. 1/6 second average (if account number reflects track number), 1/3 second, maximum. Size: 14" diameter, 14" long. Speed: 180 rpm.

Control	ALU and Keyboard	TIM II	1	1	Console: manual control by keys on adding machine keyboard and by characters punched in paper tape. ALU: built-in circuitry for control of components.
Arithmetic Unit	<p>Accumulator: A register, 11 digits and sign. C register, 11 digits and sign; multiplier, quotient. B register: 11 digits and sign; input and output pass through. I register: exactly as long as any account on drum; 32 to 120 digits. R register (program register): 36 digits; 18 instructions currently being performed. These instructions are executed sequentially with the first following the eighteenth. A new sequence of 18 instructions may be transferred from the drum to the R register either by manual control by the operator or by the sequence containing an instruction which directs the computer to do so automatically. There are 5 arithmetic, 10 logical, 8 transfer, and 5 input-output instruction codes.</p>			<p>Notation: excess three, binary coded decimal. Arithmetic mode: serial by bit. Negative number representation: stored as 9's complement but printed or punched out as absolute value and sign. Word length: variable, from one digit and sign to eleven digits and sign. Zero representation: — 9, . . . , — 999 999 999 99. Average speeds of following operations in milliseconds: Add or Subtract 2 Multiply or Divide (done by subroutine) 50/digit in multiplier or quotient.</p>	

* Only one input and one output device can be connected to the computer at the same time; but several may be used, nevertheless, by means of a multiplex plugging system.

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The basic TIM II requires a tape perforator to prepare the input paper tape, since there will be a large quantity of data being entered into the computer. Punched card input-output is being planned for the TIM II. Equipment used for card preparation and assembling will be needed in an installation with punched card input-output.

ADDITIONAL INFORMATION

Write to: Laboratory for Electronics, Inc.
75 Pitts Street
Boston 14, Massachusetts

APPRAISAL

The TIM II is a small-size computer designed to handle a broad variety of accounting problems for a small or medium-sized firm. TIM II has quick random access to large files of information stored on magnetic drums. It is a stored program computer with the program contained on the drum in a special track. As many as 60 program sequences of 18 instructions each may be stored thereon. The sequence being operated on is stored in a magnetic core shift register. The computer can get from one sequence to any other either manually by the operator typing a new sequence number or automatically by means of the instructions in the sequences. New sequences may be entered very easily. If a spot in the sequence track is set aside for rarely used sequences and these sequences kept on punched paper tape, then the number of programs available is unlimited.

Input data is entered on perforated tape; output can be on paper tape or by an adding machine printing. The manufacturer plans punched card input-output, and a line printer output.

Compared to other small-size computers on the market, the TIM II has a large storage capacity. Up to 720,000 decimal digits may be stored on one drum, and additional drums are available as required. Word size is variable with 11 digits and sign being the maximum size. Ten words make up a record, the length of which may be any multiple of 4 from 32 to 120 digits. For a given machine, the record length is fixed, but within the

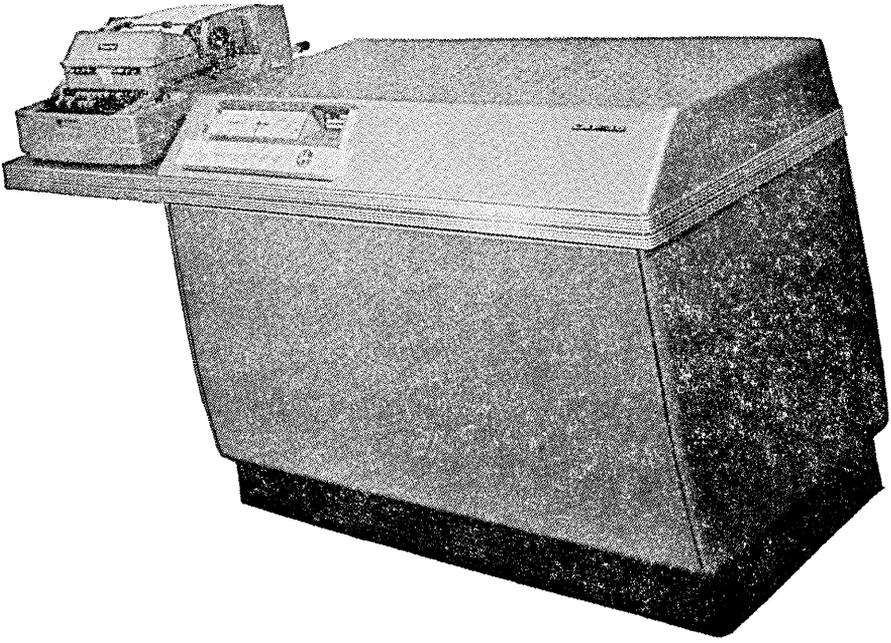
TIM II

record, the words are variable in length. Records may be posted in *any* order; no presorting of sales slips, checks, etc. need be done. Maximum random access to any account is 5/6ths of a second. Only one drum may be connected at any one time to the computer. The manual setting of a switch determines which drum is in the system. (Automatic drum selection is planned by the manufacturer.)

Although its operating speeds are slow when compared with small punched card computers, it has several advantages over these machines. It has a very large storage capacity, flexible programming facilities and is very simple to operate. The standard machine can handle only numerical information, although the manufacturer offers to supply optional equipment to handle alphabetic information. Both multiplication and division are programmed.

LGP-30

General Purpose Computer



40 475.1—Page 2

June 29, 1956—32

June, 1956

LGP-30

General Purpose Computer

MANUFACTURER

Manufactured by Librascope, Incorporated
Marketed and serviced by Royal McBee Corp.

BRIEF DESCRIPTION

A small-size digital general purpose computer, primarily applicable to scientific problems. It uses a numerical binary system. Decimal input-output is possible by programming.

KEY DATA

Storage	magnetic drum
Input	manual, punched paper tape
Output	typewriter punched paper tape,
	<i>Approximate Minimum</i>
Cost	\$39,600
Storage Capacity	4,096 words
Total Personnel	1
Machine Working Area	35 sq. ft.

EQUIPMENT REPORT

APPLICATIONS

It is expected that there will be 12 installations of the LGP-30 by the end of 1956. First production deliveries will be made in the summer of 1956. The following are possible applications of the LGP-30:

Scientific

- Parameter studies
- Simultaneous equation solutions
- Differential equation solutions
- Curve fitting
- Data reduction

COMPONENTS OF THE LGP-30 AND APPROXIMATE COST

A single price is given for the LGP-30 as no optional components are yet available. Details on rental agreements are available from the marketer.

	<i>Approximate Cost Purchase</i>
LGP-30, including the Flexowriter with tape input-output	\$39,600
Spare Flexowriter	3,500

PERSONNEL

In some installations, the persons originating the problems will prepare the program and operate the computer. In other installations a programmer and/or operator will be responsible for processing problems through the computer. If the quantity of input data and computer instructions is large enough, an additional person may be required to prepare the paper tapes.

A maintenance contract or maintenance "on-call" is provided to purchasers of the LGP-30.

LGP-30

AVAILABILITY OF TECHNICAL LITERATURE AND TRAINING

At no additional cost, the training of operators and programmers is available from the manufacturer. Programming assistance and a library of sub-routines are also provided.

A general description of the LGP-30, its panel, its commands and specifications is available. More detailed manuals are expected to be available soon.

PHYSICAL DATA

These figures are for the LGP-30 alone. No allowance is made for the storage of paper tapes.

Space, 35 sq. ft.; height, 33"; depth, 26"; width, 44"; weight, 700 lbs.

Air Temperature: 95° F. maximum.

Relative Humidity: minimum, 25%; maximum, 95%.

Heat Dissipation: 5,120 BTU/hr.

Air Conditioning: An internal forced air blower is included in the LGP-30. No external air conditioning is required.

Power 115 volts, 60 cps, single-phase, 13 amps., 1500 watts, AC power is required.

FIVE COMPONENTS OF THE LGP-30

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Keyboard (Manual) and Paper Tape Reader	Flexowriter	4G 180.1	10 decimal digits/second; programmed conversion decimal to binary; 6 channel paper tape.
Output	Punched Paper Tape and Typewriter	Flexowriter	4G 180.1	10 decimal digits/second; programmed conversion binary to decimal; 6 channel paper tape.
Storage	Magnetic Drum	LGP-30		Capacity: 4,096 fixed length words (30 binary digits and sign); 64 tracks; 64 words/track. Average access time: 8.5 milliseconds/word. Size: 6.5" diameter; 7" long. Speed: 3,600 rpm. Data and instructions are stored on the drum.
Control	Manual Arithmetic Unit			Manual control by use of the panel buttons. Built-in circuitry for control of components.
Arithmetic Unit	Accumulator: 30 binary digits and sign; operand; results of calculation. Counter register: 12 binary digits; storage location of next instruction to be executed. Instruction register: 31 binary digits; instruction just executed. Single-address system in which the accumulator holds one operand and the result of all arithmetic operations. There are 6 arithmetic, 2 logical, and 5 transfer operations. There is 1 input, 1 output and a stop operation.			Notation: binary. Arithmetic mode: serial. Negative No. Representation: minus 2's complement. Zero Representation: plus 00...0. Average speeds for the following operations are in milliseconds: add, 2.26; multiply, 19; divide, 19; transfer, 2.5; compare, 1. The operating speeds are independent of the magnitude of the numbers involved and include access to the drum. However, the above timings, as reported for other computers, do not include: the address of the instruction reading in; the locating of the instruction on the drum; the instruction reading into its register.

LGP-30

AUXILIARY EQUIPMENT

The LGP-30 does not require auxiliary equipment. If the volume of input data is large or if the computer with its Flexowriter is operating on other applications, punched tape may be prepared on a spare Flexowriter.

ADDITIONAL INFORMATION

Write to: Royal McBee Corporation
Westchester Avenue
Port Chester, New York

APPRAISAL

The LGP-30 is a small-size computer designed for engineering and scientific applications. At this time no machines, other than the manufacturer's, have been installed.

Although its operating speeds are slower than small computers of the punched card type, its storage capacity of 4,096 words far surpasses the punched card machines' capacity of less than 90 words. It is an internally stored program computer with the program, as well as data, stored on the drum.

The LGP-30 uses a Flexowriter with a tape reader and tape punch for input-output; punched card input-output is being developed. The tape reading and punching speeds are equal or slower than other tape machines. However, for scientific applications, the quantity of input and output data is small, and the number of calculations on the data is large.

For printed output, the print order types just one symbol at a time. The symbol to be printed is indicated in the address portion of the print instruction; and any of the characters of the typewriter keyboard can be printed at the maximum rate of 10 characters per second. To print the results of a calculation, each digit and any editing characters will have to be programmed into a series of print orders. A master printing program can be developed for reuse, but this program will take up additional drum storage.

The operations available to the programmer are versatile. The "extract" order and the ability to modify addresses are usually available only in larger computers. Subroutines are

EQUIPMENT REPORT

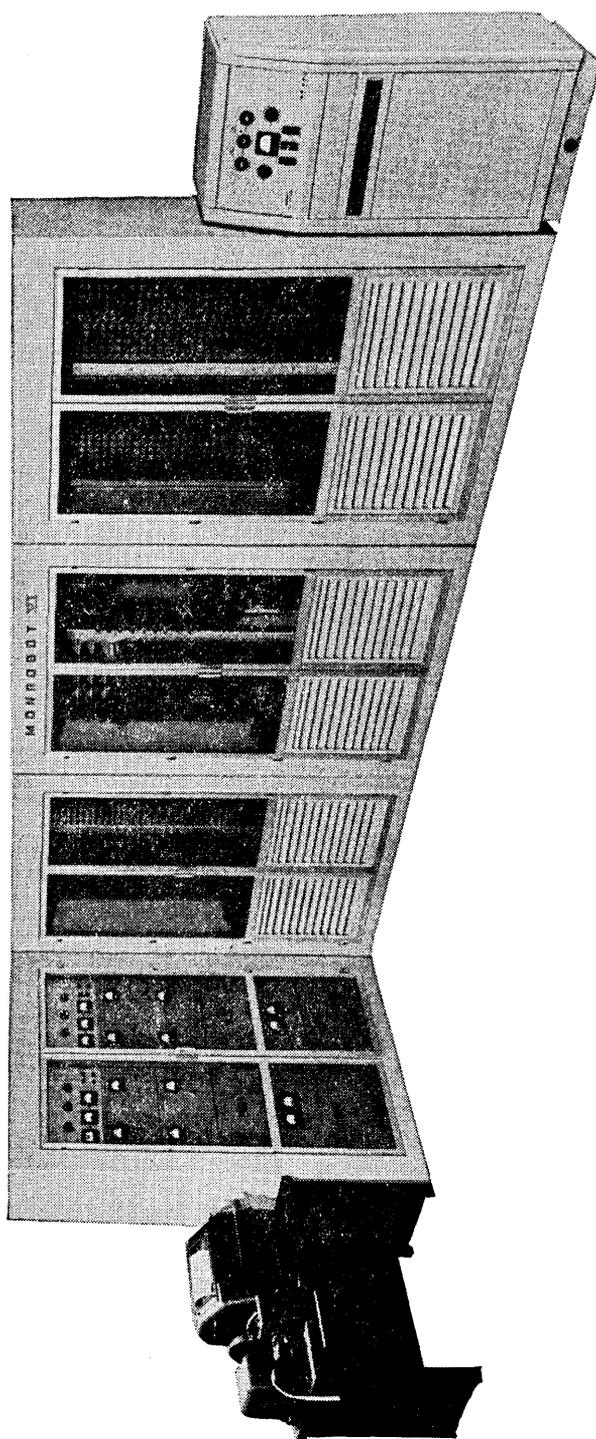
available to a program by the computer's ability to modify addresses. The "control transfer" orders permit the branching into one path or another depending upon the result of a calculation. A "zero test" order is not available in the LGP-30.

For the checking of programs, a switch is available that permits one operation to be performed at a time. An oscilloscope displays the contents of the accumulator, the instruction just executed, and the address of the next instruction. For loop routines, a breakpoint order that tests the on-off condition of five switches enables the programmer to see the results of his program at different intervals of calculation.

Since the LGP-30 uses the binary number system and will be used for scientific applications, the programming will require skilled personnel. In some installations, the persons originating the problems will prepare the program and operate the computer. However, since decimal input-output is possible by a library conversion routine, and the LGP-30 is simple to operate, highly trained operators are not needed. In those installations the operator would be responsible for processing the problems through the computer with the programming done by individuals or by one person.

MONROBOT VI

Electronic Calculator



MONROBOT VI

Electronic Calculator

MANUFACTURER

Monroe Calculating Machine Company

BRIEF DESCRIPTION

A small-size general purpose digital computer primarily for scientific calculations. It uses a numerical decimal system.

KEY DATA

Storage	magnetic drum
Input	manual from keyboard, punched paper tape
Output	punched paper tape, teleprinter
	<i>Approximate Minimum</i>
Cost	\$75,000
Storage Capacity	4,000 decimal digits
Machine Floor Area	120 sq. ft.

The above figures are for the (dual) Monrobot VI including the MAID unit. They do not include the costs of input-output equipment or auxiliary equipment.

APPLICATIONS

The following are a few of the applications of the Monrobot VI:

Scientific

Photogrammetry calculations
Geodetic survey position calculations
Least squares adjustment of triangulation data
(Mapping) Coordinate transformations

EQUIPMENT REPORT

COMPONENTS OF THE MONROBOT VI AND APPROXIMATE COST

A single price is given for the Monrobot VI as no optional components have as yet been announced. The price is for the (dual) Monrobot VI with the MAID (Monrobot Automatic Internal Diagnosis) System but does not include input-output devices. At present the equipment is being made for use with the standard Teletype Reader and Teleprinter. Other input-output devices may be adapted to the system on special order only, as some minor internal modifications must be made. The user's needs will determine the requirements for input-output equipment.

Cost: Monrobot VI (including dual circuitry, and MAID, equipped for use with, but not including, Teletype Reader and Teleprinter) : \$75,000.

PERSONNEL

In some installations, the persons originating the problems will prepare the programs and operate the computer. In other installations a programmer and/or an operator will be responsible for processing problems through the computer. An additional person may be required to prepare punched paper tape for the machine.

The ability of the MAID System to locate the area in which a failure is occurring simplifies the problems of routine maintenance and permits the operator to perform routine maintenance.

Service contracts are available on a contract basis from the manufacturer.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

A course, approximately one week in length, is provided by the manufacturer for the training of programmers and operators at no additional cost. An operating and programming manual is being prepared.

MONROBOT VI

PHYSICAL DATA

These approximate figures are based on the Monrobot VI alone. No allowance is made for auxiliary equipment, personnel, storage of paper tape, etc.

Space: 120 sq. ft., maximum.

Width: 205", maximum.

Height: 74 $\frac{3}{8}$ ", maximum.

Weight: 3600 lbs., maximum.

Air temperature: minimum, 32° F.; maximum, 125° F.

Relative humidity: not reported.

Heat dissipation: 50,000 BTU/hr.

Air conditioning: not required, may be desirable for operator comfort.

Power: for the Monrobot VI 115-volt, single-phase, 60-cycle, AC power is required. A three-phase power source is optional. The power dissipation is 18 kva. A three-wire system is used.

FIVE COMPONENTS OF THE MONROBOT VI

<i>Component</i>	<i>Designation</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Physical Characteristics</i>
Input	Teletype Tape Reader	1	1	6½ to 10 decimal digits/second; 5-channel paper tape.
	Keyboard (Manual)	1	1	Instructions and/or data.
Output	Teletype Tape Punch	1	1	6½ to 10 decimal digits/second; 5-channel paper tape.
	Teleprinter	1	1	6½ to 10 decimal digits/second.
Storage	Magnetic Drum	1	1	Capacity: 4,000 decimal digits; divisible into fixed length data words (20 decimal digits and sign) and fixed length instruction words (10 decimal digits with sign, for each pair of instruction words) in any combination. Average access time: 16.7 millisecc./word. Size: 6" diameter, 20" long. Speed: 3,600 rpm. Number of channels: 25 (two sets). In the dual Monrobot VI all information is processed twice in parallel by separate arithmetic units. The drum contains all information in two locations and thus both reading and writing are performed twice in parallel. Each channel contains 4 interlaced records per channel. Each record consists of two data words or one data plus two instruction words or four instruction words.

Control	Keyboard (Manual)	1	1	Manual control by the depression of keys.
	Arithmetic Unit	2	2	Built-in circuitry for control of components.
	MAID System	1	1	On an unlike condition between the two parallel operations MAID causes a recomputation of steps on which error occurred. Assumes control in order to locate source of error automatically.
Arithmetic Unit	<p>The working registers (accumulator, multiply and divide registers) are non-addressable. Magnitude of the results of a computation are limited by the size of the data word (20 decimal digits with centrally located decimal point).</p> <p>Instruction codes consist of two operand addresses, an address in which to store the result, the address of the next instruction and the operation code. Instructions may be stored on the drum or read and followed directly from keyboard or punched paper tape inputs. Computation can continue during printing. There are 4 arithmetic and 5 logical operations.</p>		<p>Notation: binary coded decimal.</p> <p>Arithmetic mode: serial.</p> <p>Negative representation: absolute value and sign.</p> <p>Zero representation: + 000000000.000000000.</p> <p>The speeds of the following operations are in milliseconds: add, 135; multiply, 600; divide, 600; compare, 135; transfer (performed by an "add" operation), 135. Operating speeds are independent of magnitude of numbers involved and include access to the drum.</p>	

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

When the Teletype input-output system is used, the machine is completely self-contained. An overprinting tape punch may be required to help prepare punched paper tape.

ADDITIONAL INFORMATION

Write to: Monrobot Laboratory
Monroe Calculating Machine Co.
Morris Plains, N. J.

APPRAISAL

The Monrobot VI is a small-size computer primarily for scientific applications but usable for certain types of business problems. The most important feature of this computer is the MAID System. The MAID (Monrobot Automatic Internal Diagnosis) device is an error location device. By comparing values processed by each half of the dual system at each step of the process the MAID detects an error when a discrepancy occurs. Under control of the MAID, the calculator then repeats the step until identical values are obtained by each half of the computer or until the MAID has approximately located the component causing the failure. As the computer repeats a step on which an error occurs, the two values will either compare or will not compare. Each failure to compare permits the internal circuits of the MAID to advance towards the points of most probable error.

The Monrobot VI uses a word, 20 decimal digits in length with a centrally located decimal point. With this system the computer operates exclusively in a fixed decimal mode. The word length is sufficient to process a majority of problems without danger of error by dropping high order significant digits but this may easily happen with some problems. In a like manner some accuracy may be lost when operating on extremely small decimal numbers. The addition of a "shift" instruction would help alleviate these two problems. However, it should be noted that information in a register may be shifted in either direction by the programmed multiplication or division by an appropriate power of ten; and the word size used internally will eliminate these problems in a majority of cases. Simul-

MONROBOT VI

taneously, location of decimal point is maintained by the machine.

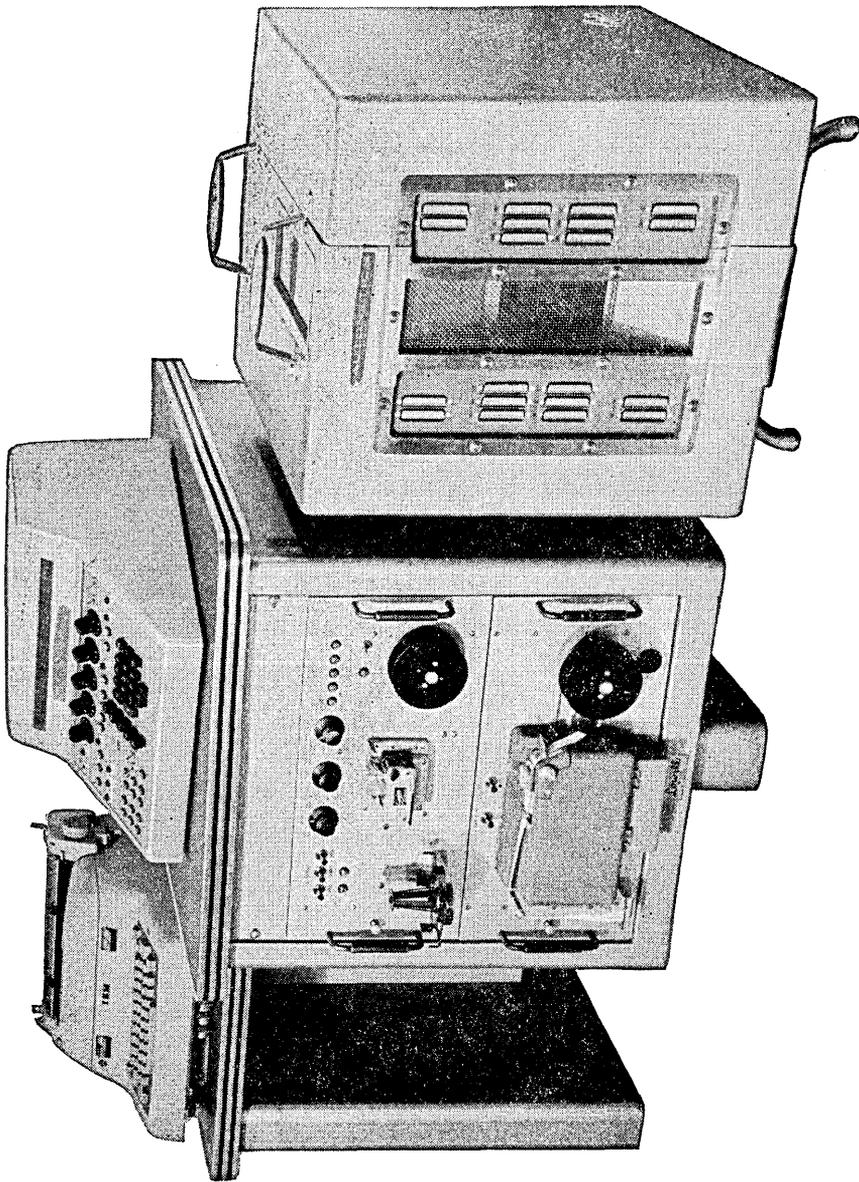
The greatest drawback of the Monrobot VI is its extremely slow operating speed. The use of an already limited drum storage to hold instructions rather than hold them in some other type of internal storage may be a limitation for several applications. The size of the computer is large when compared with the other small computers. Finally, the price of the computer is much higher than the other comparable computers because of its dual nature and the inclusion of the MAID System. However, the Monrobot VI (dual unit) is essentially two computers. An extra set of input-output units and some field modifications on the MAID unit would yield two machines.

The Monrobot VI should find use on problems suited to its capacity especially in those cases where qualified maintenance personnel are difficult to obtain. In these cases the MAID System will assume much of the maintenance load.

RECOMP

ADVANCE REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.



March, 1957

RECOMP

MANUFACTURER

Autonetics Division
North American Aviation, Inc.

KEY DATA

Storage	magnetic disk,
Input	paper tape, typewriter, keyboard
Output	paper tape, typewriter

BRIEF DESCRIPTION

The Recomp is a portable, small-scale, digital computer designed for business and scientific applications. Its six cubic foot size and two hundred pound weight permit the easy transporting of Recomp from one location to another.

Recomp functions internally in the binary number system and utilizes a fixed word length of 40 binary digits including sign. Instructions are of the single-address type and two of them may be stored in one computer word. Eighteen fixed or floating-point arithmetic instructions, seventeen logical and transfer instructions and nine input-output instructions are available to the programmer.

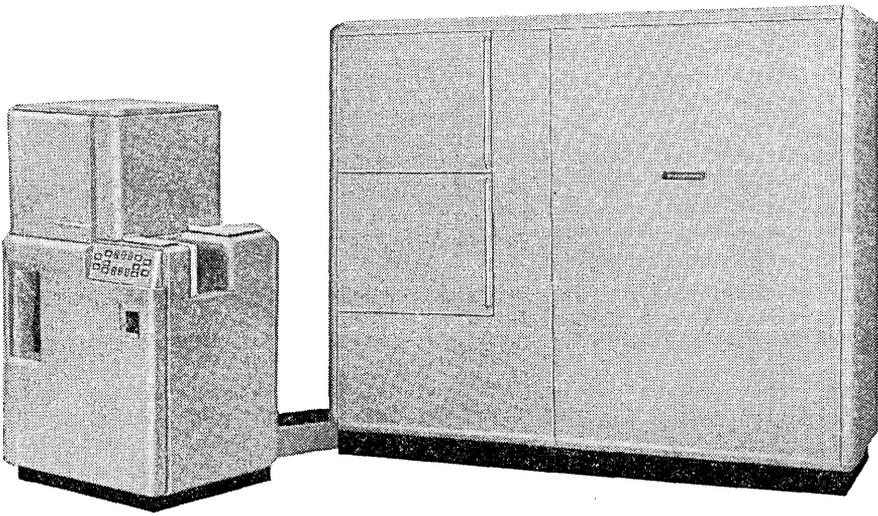
A magnetic disk capable of storing 4,080 40-bit words affords Recomp a storage capacity which is many times the size of other small-scale computers. High-speed recirculating storage may contain a maximum of 16 words and affords rapid access to data. Average access to magnetic disk storage is approximately

EQUIPMENT REPORT

17.42 milliseconds per word as opposed to 1.82 milliseconds per word for high-speed storage.

Recomp's input and output facilities include a paper tape reader and punch unit, a console keyboard for manual input, a console register to display 15 decimal digits plus sign and a typewriter.

UNIVAC 60 and 120
Punched Card Electronic Computers



UNIVAC 60 and 120

Punched Card Electronic Computers

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Univac 60 and 120 are small-size general purpose digital computers, applicable to business and some scientific problems. The 60 and 120 use a numerical decimal system, and are capable of reproducing alphabetic information. The difference between the Univac 60 and the Univac 120 machines is the storage capacities (60 digit capacities, 120 digit capacities, respectively).

KEY DATA

Storage	electronic flip-flop tubes	
Input	punched cards	
Output	punched cards	
	<i>Univac 120</i>	<i>Univac 60</i>
Approximate Cost		
purchase	\$97,500	\$75,000
minimum monthly rental	1,000	690
maximum monthly rental	1,275	965
Storage Capacity	120 decimal dig.	60 decimal dig.
Machine Floor Area	170 sq. ft.	170 sq. ft.

EQUIPMENT REPORT

The above figures are for single-shift operation, exclusive of auxiliary equipment. The minimum rental figures are for the basic Univac 60 and 120, both consisting of two units, the Card Sensing-Punching Unit and the Electronic Computing Unit. The purchase and the maximum rental figures are for the Univac 60 and 120 with full complement of program steps, elements, selectors, and constant digits.

APPLICATIONS

There are more than a hundred Univac 60s and 120s in operation. They are used for such applications as payroll, billing, costing, and material control.

COMPONENTS OF THE UNIVAC 60 AND 120 AND APPROXIMATE COST

The following rental costs are for a 40-hour week, single-shift operation, exclusive of auxiliary equipment. 80-hour week, two-shift operation and 120-hour week, three-shift operation increase single-shift rentals by 50% and 100% respectively. The user's needs will determine which Univac he will require, the basic 60 or 120 (A), and with what additional program steps, elements, selectors, and constant digits (B). When purchased, the Univac 60 and 120 have all the features under (A) and (B) and have a reading speed of 150 cards/minute. The purchase costs are exclusive of auxiliary equipment.

	<i>Approximate Purchase Cost</i>
Univac 60	\$75,000
Univac 120	97,500

UNIVAC 60 AND 120

<i>Component</i>	<i>Approximate Monthly Rental</i>
A. Univac 60, basic: 125 cards/minute	\$ 690
150 cards/minute	740
Univac 120, basic: 125 cards/minute	1,000
150 cards/minute	1,050
with 60 or 120 digits possible from input on cards and 27 possible constant digits which can be split up into 12 elements or factors from 1 to 10 digits; 20 program steps; 18 (10, 4-column; 8, 1-column) selectors.	
B. Additional 8 program steps	30
or 12 program steps (maximum of 20 additional steps possible)	45
Each additional 12 elements or factors (maximum of 24 additional elements possible)	20
Each additional group of 5, 4-column and 4, 1-column selectors (maximum of 10, 4-column and 8, 1-column additional selectors possible)	25
Each additional 27 constant digits possible (maximum of 81 additional constant digits possible)	20

The hardware rental cost of the Univac 60, exclusive of auxiliary equipment, single-shift operation ranges from \$690 to \$965. The hardware rental cost of the Univac 120, exclusive of auxiliary equipment, single-shift operation, ranges from \$1,000 to \$1,275.

EQUIPMENT REPORT

PERSONNEL

The Univac 60 or 120 is frequently included in accounting installations as one of a number of different machines. The installation will require at least one methods person and several machine operators. Persons operating the Univac 60 or 120 may operate several other machines at separate times. A minimum number of personnel required for the Univac 60 or 120 is one operator, experienced in plugboard wiring.

Maintenance is provided by the manufacturer in the rental agreement. Upon purchase of the equipment, a maintenance contract can be arranged.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two-week courses are available at no additional cost from the manufacturer for the training of personnel in machine operation and control panel wiring.

An Operating Instructions Manual on the Univac 60 and 120 is available to the user.

UNIVAC 60 AND 120

PHYSICAL DATA

The following figures are for the card sensing-punching unit and the electronic computing unit alone. No allowance is made for personnel, auxiliary equipment, storage of cards, etc.

Maxima: space, 170 sq. ft.; length, 86"; height, 69"; weight, 3230 lbs.

Maxima: air temperature, 130° F.; heat dissipation, 24,000 BTU/hr.

Air Conditioning: four fans are located in the electronic unit. No other special air conditioning is required.

Power: For single phase operation of the computer, 208/220 volt, 60 cycle, 3-phase, 4 or 3 wire, 40 amp., AC is required.

For three phase operation of the computer, 120/220 volt, 60 cycle, 3-phase, 4 or 3 wire, 30 amp., AC is required.

FIVE COMPONENTS OF THE UNIVAC 120

<i>Component</i>	<i>Card Sensing-Punching Unit</i>	<i>Electronic Computing Unit</i>
Input	Maximum of 120* decimal digits divided into a maximum of 36 elements or factors of from 1 to 10 digits. These 120* digits may be read as input values from the punched card or be constant values wired on the panel that are manually set.	
	Maximum of 120* decimal digits. 150, 90-column cards/minute.	Maximum of 108 constant decimal digits.
Output	Maximum of 120* decimal digits divided into a maximum of 12 elements or factors of from 1 to 10 digits each. 150, 90-column cards/minute.	
Storage		240* decimal digits: 120* digits in up to 12 accumulator input storage units. 12* intermediate output storage units (10 digits and sign).
Control	Automatic stop on no card feed and error on computation. Control of general machine operation.	Emits impulses to control Card Unit. Alters calculation by recognition of condition of intermediate results. Automatic checking of each arithmetic step.
Arithmetic Unit	Notation: modified decimal. Arithmetic Mode: parallel. Negative Representation: absolute value and sign. Zero Representation: plus 00...00. Accumulator: 22 counters with result of 10 significant decimal digits and sign. Up to 40 program steps are available. Each step is in effect a three address code. Steps may be programmed in any sequence with any number of steps reused in the same program by plugboard wiring. Average speeds of the following operations are in milliseconds: add, 10; multiply, 50; divide, 50; transfer, 10; compare, 10. Tests for positive and negative, division by zero are available. A clear operation will set selected storage units to zero. 325 or 375 milliseconds are available for calculating between successive card feeds at the feeding rate of 150 cards/minute or 125 cards/minute respectively.	

UNIVAC 60 AND 120

- * The Five Components of the Univac 60 differ only in the following:
- Input and Output—maximum of 60 decimal digits
 - Storage— 120 decimal digits:
 - 60 digits in up to 6 accumulator input storage units.
 - 6 intermediate output storage units.

AUXILIARY EQUIPMENT

The Univac 60 and 120 are frequently included as a part of an accounting installation. The punched card input and output can be handled by all standard Remington Rand punch card auxiliaries (punch, sorter, collator).

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

APPRAISAL

The Univac 60 and 120 are small-size general purpose digital computers, used for some scientific applications and primarily for accounting applications. Both these computers' input-output medium, storage capacity and speed make them suitable for applications of a repetitive nature and some complexity, but do not make them suitable for large-scale business and scientific problems. Since Remington Rand punched cards are the input-output medium, all equipment that can use these cards is compatible with this computer system.

The internal storage capacity of these computers is small, 60 or 120 digits. However, additional storage is available in two ways:

1. The 60 or 120 digits in the accumulator input storage units are always accessible throughout the program—although the storage units cannot be used for intermediate results.
2. By the use of the operation "set" during a program, it is possible to expand the storage still further. To "set" a value for output punching from an intermediate internal storage unit, places the value in the output punching unit for the time that punching is to be done; and the intermediate storage unit is available for use for the remainder of the program steps until the next card is punched.

EQUIPMENT REPORT

The access time to the information in storage is fast as compared to machines with magnetic drum type storage. However, the storage is volatile; if the power is turned off, the stored information is lost.

Both the 60 and 120 have the advantage of flexible programming. Any of the available operations may be used in any of the available 40 program steps and any or many of the program steps can be reused during one program. A "branching" operation (the sign of a result of one step, instructs the machine of the next action to be taken) is possible on each of the forty program steps.

It should be pointed out that an expansion of a program for more than 40 steps may lengthen processing time, but with an automatic slower cards per minute speed to match the longer calculation time.

Each arithmetic step is automatically checked, so that programmed checking or duplicate processing is unnecessary.

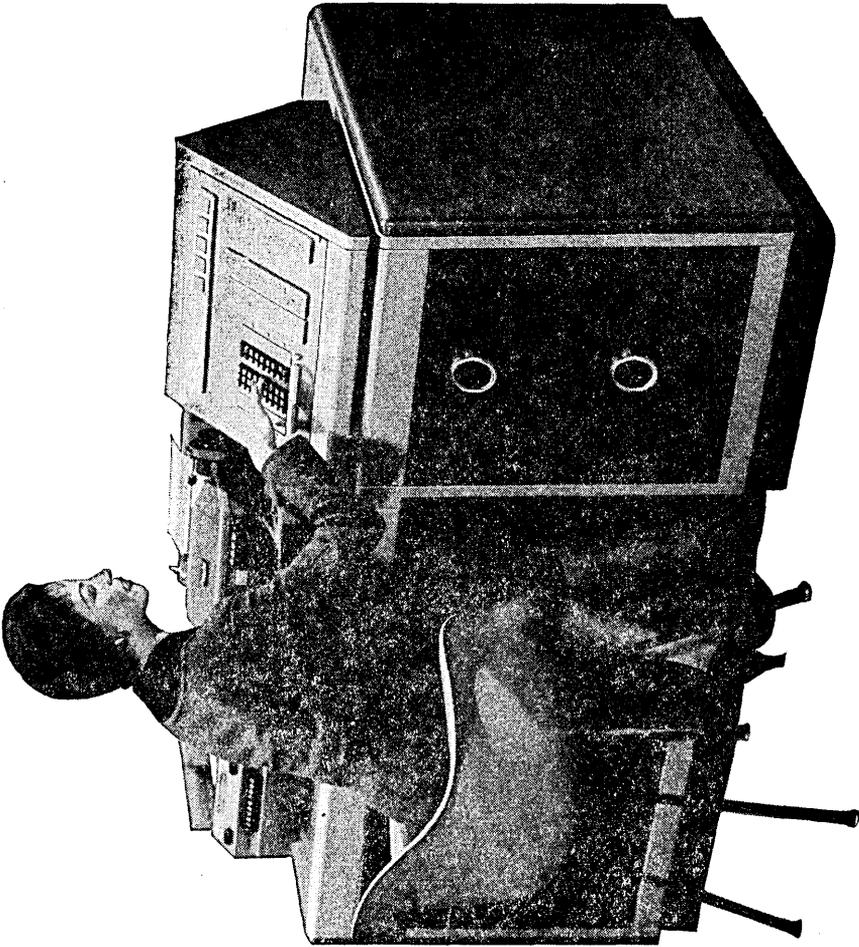
The Card Sensing-Punching Unit has two card receivers. Usually, cards will be fed into one receiver; but by use of a "sort" operation, cards can be selected to be fed into the other card receiver by a control punch in a card or by the result of a calculation. In a particular application, the sort operation can save sorting of the cards before or after calculations.

STEWART-WARNER

Electronic Data Processing Unit

ADVANCED REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.



April, 1957

STEWART-WARNER

Electronic Data Processing Unit

MANUFACTURER

Stewart-Warner Electronics

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	
Input	manual (console), magnetic cards	edge punched cards, paper tape
Output	typewriter (Flexowriter), magnetic cards	paper tape punch

BRIEF DESCRIPTION

The Stewart-Warner Electronic Data Processing Unit is a desk size digital computer. It was designed especially for business applications such as inventory and mail order control. This unit can process numerical decimal information and make logical decisions. The results may then be distributed in any arbitrary fashion to any combination of six output devices.

The internal storage component of the Stewart-Warner machine is a 512 character magnetic drum divided functionally and physically into four 128 character tracks.

- (1) Information track
- (2) Arithmetic control track
- (3) Sequence track
- (4) Distribution track

The information track receives the information read into the machine from the magnetic card reader or other input devices. The information track is divided into two sections. Section I

EQUIPMENT REPORT

receives the 64 characters read from the magnetic card. Section II is used for storing commonly used characters (spaces, decimal points, numerical constants, zero suppression symbols, etc.), for storing the results of calculations, and for storing numbers that must be carried over from one processing run to the next.

The arithmetic control track is used to store the arithmetic program. There are 128 address locations available on this track. Some of the machine commands require two addresses, while others require only one. Therefore, the capacity of the arithmetic control track is between 64 and 128 complete commands. The machine is capable of going into certain types of iterative loops so that its program capacity is effectively increased.

The sequence track determines the order in which the contents of the information track are taken for distribution to the various output devices. There are 128 addresses on this track. Each address on the sequence track corresponds to a particular address on the information track. If a particular address on the information track contains a character that is to be the first character read out, a "1" is put into the corresponding address on the sequence track. If a particular address in the information track contains a character that is to be the third character read out, a "3" is put into the corresponding address on the sequence track. Thus the contents of the information track may be read out in any order.

The distribution track determines to which of the six possible output devices any character is distributed. This track also has 128 addresses, each of which corresponds to a particular address on the information track. When a particular character in the information track is called for by the sequence track, the machine checks the corresponding address in the distribution track to determine what output devices are to receive that particular character. Each address in the distribution track has provision for seven bits. The first bit determines whether or not output #1 is to be used; the second bit determines whether or not output #2 is to be used, etc.

Input to the computer is primarily via the magnetic card reader and the console. The magnetic cards are 5" x 8 $\frac{1}{8}$ ". Each card has recorded on it 10 fields of 64 characters per field. One

STEWART-WARNER

field is read into the computer by the card reader. (Reading is accomplished in approximately one second.) The desired field is manually selected. The console contains 15 banks of numerical keys, each of which is addressable. The program can call for, and use, keyboard information at any time.

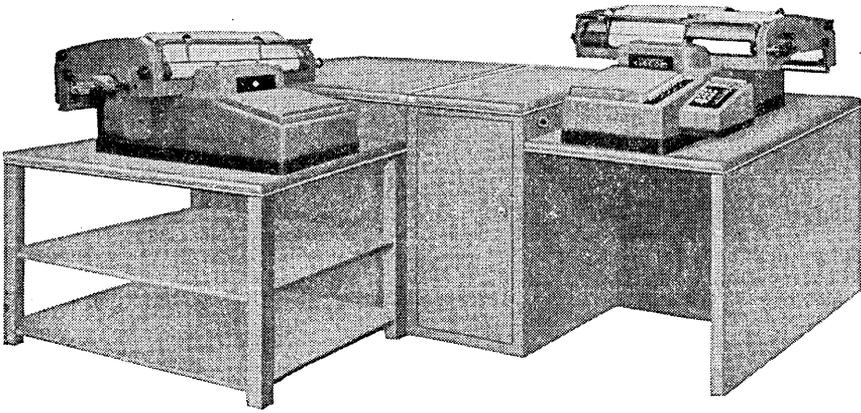
Entering the program into the machine consists of storing the appropriate characters in the arithmetic control track, the sequence track, the distribution track, and the second section of the information track. Data for each processing run is read from one field of the magnetic card reader into first section of the information track. Variable data is entered via the console keyboard.

A typical processing run would consist of selecting and reading one field of a magnetic card, entering whatever keyboard information is necessary, and initiating the machine operation. The computer will then perform whatever calculations are required and distribute the contents of the entire information track as desired. Thus invoices, checks, etc., may be typed while a record in machine language is also produced. Seven bits of the standard eight bit code is used within the machine.

Possible output components of the Stewart-Warner Computer consist of a magnetic card recorder, a ten character per second flexowriter or a paper tape punch. Up to six output components may be attached on-line to this data processing machine.

The only power source needed by this machine is an ordinary wall outlet. No air conditioning or special ventilation is required.

ELECOM 50
Electronic Digital Computer Accounting Machine



ELECOM 50

Electronic Digital Computer Accounting Machine

MANUFACTURER

Underwood Corporation

BRIEF DESCRIPTION

A small-size general purpose digital computer, applicable to business and some scientific problems. The Elecom 50 uses a numerical, decimal system.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum, program tape	
Input	manual	punched paper tape, edge punched card
Output	two gang printers	punched paper tape, edge punched card
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$18,000	\$22,500
mo. rental		\$650
Total Personnel	1	1
Storage Capacity:		
data	100 words (10 decimal digits and sign)	
program	2400 steps	
Machine Floor Area	80 sq. ft.	

The above figures are based on single-shift operation, exclusive of auxiliary equipment. The minimum cost refers to the

EQUIPMENT REPORT

basic Elecom 50 which has two outputs, a main carriage (24") and an auxiliary carriage (18") Sundstrand accounting machines. The maximum cost includes this basic Elecom plus paper tape input and output.

APPLICATIONS

The following are possible applications on the Elecom 50.

Business

- Payroll calculation and posting with simultaneous check writing and labor cost analysis
- Tax and public utility billing
- Mortgage loan accounting
- Accounts payable with expense distribution
- Department store sales audit
- Sales accounting including non-descriptive billing, accounts receivable, salesman's commissions, and sales analysis

Scientific

- Wind tunnel data reduction

COMPONENTS OF THE ELECOM 50 AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment. The user's needs will determine which computer components he will require: the basic Elecom 50 (A) alone, or in combination with the additional input-output and storage provided by paper tape (B).

<i>Components</i>	<i>Approximate Cost Purchase</i>
A. Elecom 50 (includes 10-key keyboard input, and two Sundstrand accounting machines for output)	\$18,000
B. Paper tape reader and punch (both)	4,500
Additional paper tape readers, each	2,000
Additional paper tape punches, each	2,000

The hardware cost for a workable installation ranges from \$18,000 to \$22,500.

ELECOM 50

PERSONNEL

Since the programs are usually prepared by the manufacturer there is only one operator required for the Elecom 50.

Maintenance is provided by the manufacturer at a cost of \$1,100 per year.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses are provided at no additional cost by the manufacturer for the training of operators. The formal training requires less than an hour.

The Elecom 50 literature folder contains a description of the system and its operations.

PHYSICAL DATA

These approximate figures are for the Elecom 50 exclusive of auxiliary equipment. No allowance is made for storage of paper and program tapes, etc.

Space: 80 sq. ft.

Length: 7 ft.

Width: 5 ft.

Height: 3 ft.

Weight: 700 lbs.

Air temperature: not reported.

Relative humidity: 25 to 95%.

Heat dissipation: 7,800 BTU/hr.

Air conditioning: normal room air conditioning for operator's comfort only.

Power: for the basic system, a 117-volt, 60-cps, single-phase, 3-wire system is required. The maximum surge current is 20 amperes, and power dissipation is 2 kva.

FIVE COMPONENTS OF ELECOM 50

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics and Description</i>
Input	Keyboard (Manual)		1	1		10-key keyboard: 4 digits/second (maximum).
	Motorized Paper Tape Reader	Commercial Controls	0	1	4G 180.2	20 digits/second.
Output	Accounting Machine (Main)	Sundstrand	1	1	4G 733.1	24-inch platen, 10 digits/second plus date; gang printer.
	Accounting Machine (Auxiliary)	Sundstrand	1	1	4G 733.1	18-inch platen, 10 digits/second plus date; gang printer. Simultaneous printing may be performed independently on both carriages.
	Motorized Paper Tape Punch	Commercial Controls	0		4G 180.2	20 digits/second.
Storage	Magnetic Drum		1	1		Capacity: 100 fixed length words (registers: 10 decimal digits and sign). Access time: 16 milliseconds/word. Size: 11" diameter, 1/2" thickness. Speed: 1800 rpm.
	Program Control Tape		1			2,400 steps, maximum of 31 programs per reel.

Control	Program Control Tape		1			2,400 program steps, up to 31 addressable programs on one reel.
	Manual		1	1		Built-in control of carriage through motor bars, and selection of program through 5 buttons.
	ALU Control					Built-in circuitry for control of components.
Arithmetic Unit	<p>Accumulator: 10 digits and sign; 2 working registers, 10 digits and sign. Timing register: instructions are stored on magnetic tape. Up to 31 programs may be placed on one reel. There are 16 arithmetic, 4 logical, 9 transfer and 13 special control operations. Computing is possible during the output cycle. The time for the program depends mainly upon the time required for printing.</p>					<p>Notation: binary coded decimal. Arithmetic mode: serial. Negative number representation: absolute value and sign. Zero representation: + or — 000000000. The speeds of the following operations are in seconds: add, 1/15; multiply, 1/15; transfer, 1/15; compare, 1/15; program skip 1/30. Division is performed by programming. (Operating speeds are independent of magnitude of number involved and include access to the drum.)</p>

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The Elecom 50 does not require auxiliary equipment. Punched tape may be prepared by a variety of means, although new data is usually entered manually.

ADDITIONAL INFORMATION

Write to: Electronic Computer Division
Underwood Corporation
35-10 36th Avenue
Long Island City 6, N. Y.

APPRAISAL

The Elecom 50 is a small computer especially suited to the solution of business problems. The operation is extremely simple. The accounting machine carriages are controlled by four motor bars, express forward, correction, backspace and the entry motor bar. The addressable programs are selected by depressing a combination of one to five program select buttons. Data may be inserted either manually with the 10-key keyboard or by use of perforated paper tape or edge-punched cards. When the calculation is completed the program tape automatically returns to the beginning of the just calculated program unless a new program is selected.

A reel of program tape, on which up to 31 programs may be written is easily stored and may be rapidly changed. The skill needed to operate this machine is minimized since the programming is done at the factory. The preparation of a new program or modification of an existing one will take at least one week to be completed by the manufacturer. This drawback may be overcome by the addition of hardware and a programmer for on-the-premises preparation of programs. A single word may be added to or subtracted from one to fifty registers in a single-program step.

A feature of special interest is the completely independent control of the main and auxiliary carriage movements. Either carriage can execute forward or reverse vertical feed, and forward or backward horizontal movement independently of each other.

Although its operating speeds are slow when compared with the small computers of the punched card type, it has several

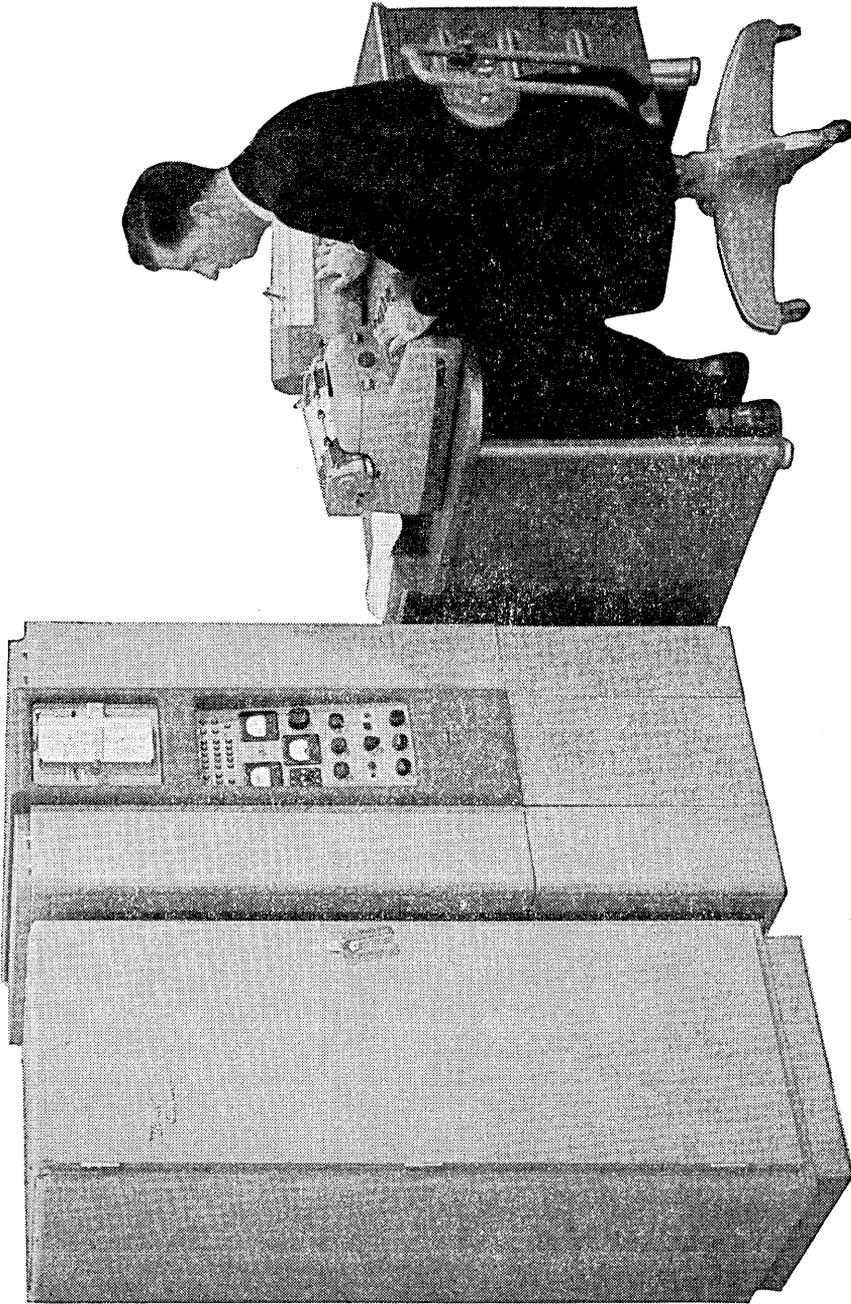
ELECOM 50

advantages over these machines. It has a relatively large storage capacity for a small machine, much greater, in fact, than in any of the small computers using electronic storage.

The Elecom 50 system can use either five-channel punched tape or edge-punched cards as input-output or as additional external storage. The edge-punched cards, which are handled on the motorized paper tape reader and motorized paper tape punch through an attachment that is supplied with them, provide a means of handling unit record cards. Compatibility with other perforated tape media can be obtained only through the use of auxiliary converters. Information on punched cards or magnetic tape must be translated to perforated paper media to be used in this system.

BENDIX G-15

General Purpose Computer



January, 1957

BENDIX G-15

General Purpose Computer

MANUFACTURER

Bendix Computer Division
Bendix Aviation Corporation

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to engineering and scientific problems. The Bendix G-15 uses a numerical binary system internally. Decimal input-output is available through use of a conversion routine. A digital differential analyzer may be added to the system.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	punched paper tape, and typewriter	magnetic tapes, punched cards
Output	punched paper tape, and typewriter	magnetic tapes, punched cards
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$44,800	\$101,830 + \$110 mo. rental
rental	1,350	3,685
Total Personnel	2	11
Storage Capacity	2,176 words	1,200,000 words
Machine Floor Area	45 sq. ft.	400 sq. ft.

The above figures are based on one-shift operation, exclusive of auxiliary equipment. The minimum figures are values for

EQUIPMENT REPORT

the basic Bendix computer which is composed of: computer (including 2176 word drum); high-speed photoelectric paper tape reader and paper tape punch. The maximum figures include four magnetic tape units, high-speed paper tape punch, digital differential analyzer, provision for simultaneous IBM input and output and plotter/follower.

APPLICATIONS

There are 30 installations of the Bendix G-15 computer. The following are possible applications:

Scientific

- Electrical transmission and pipe lines
- Petroleum exploration and refining
- Real-time data processing
- Missile performance and trajectories
- Correlation of hydroelectric factors
- Numerical machine tool control
- Construction engineering

BENDIX G-15

COMPONENTS OF THE BENDIX G-15 COMPUTER AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment costs. The user's needs will determine which components he will require—the basic Bendix G-15 alone or in combination with the Digital Differential Analyzer (A), or in combination with the additional storage (B), and/or the additional input-output (C).

<i>Components</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
A. Bendix G-15A, basic computer with electric type-writer, high-speed photoelectric paper tape reader and paper tape punch	\$44,800	\$1,350
Bendix G-15D, with same components as G-15A, and provision for use of DA-1 Digital Differential Analyzer	49,500	1,485
Digital Differential Analyzer	13,700	500
B. Magnetic tape units (maximum 4 of each)	6,800	270
C. High-Speed Paper Tape Output Punch	3,240	130
Alphanumeric Paper Tape Input and Output Accessory	6,900	280
Punched Card Coupling Unit (One may be used for either input or output, two required for input and output)	1,245	50
Punched Card Input IBM 026	\$55 mo. rental	
Punched Card Output IBM 026	\$55 mo. rental	
Graph Plotter	1,800	75
Graph Plotter/Follower	5,700	230

EQUIPMENT REPORT

PERSONNEL

Approximation of the personnel required for single-shift operation.

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods } Programmers } Operators } Tape Preparer or } Key Punch Operator } Maintenance	1 1 1 1 1	2 3 1 3 1

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two courses, three weeks each, are provided by the manufacturer, at no additional cost, for the training of programmers and operators and maintenance personnel.

Interpreter and compiler routines are available. Programming, operating and maintenance manuals are available to the user.

PHYSICAL DATA

These approximate figures are based on the Bendix G-15 Computer system alone. No allowance is made for auxiliary equipment, personnel, storage of tapes, card, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	45 sq. ft.	400 sq. ft.
Width		60"
Height		61"
Floor Loading Factor		142 lbs./sq. ft.
Air Temperature		90° F.
Relative Humidity		80%
Heat Dissipation		11,932 BTU/hr.

Air Conditioning: Internal blower.

Power: For basic Bendix G-15, 110-120 volts, single-phase. The power dissipation is 3.8 kva and power factor is 92%.

BENDIX G-15

AUXILIARY EQUIPMENT

The auxiliary equipment, required or recommended, for more efficient system utilization, has been divided into groups A and B, depending on the input-output equipment used with the Bendix G-15.

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required			
A.	1 Paper tape preparer	Flexowriter	4G 180.1
	1 Paper tape interpreter	Flexowriter	4G 180.1
B.	1 Key Punch	IBM 024 or 026	1A 380.1
	1 Sorter	IBM 083	4A 380.4
	1 Reproducer	IBM 500's	3D 380
	1 Accounting Machine	IBM 400's	4B 380
Recommended			
B.	1 Collator	IBM 089	4G 380.2
	1 Verifier	IBM 056	1C 380.1
	1 Key Punch	IBM 026	1A 380.1

FIVE COMPONENTS OF THE BENDIX G-15

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>ADP Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Typewriter Control		1	1		8 characters/second, maximum.
	Photoelectric Paper Tape Reader		0	1		200 characters/second.
	Key Punch Unit	IBM 024 or 026	0	1		12 80-column cards/minute, maximum of 17 characters/second.
	Magnetic Tape Unit	MTA-2	0	4		450 sexadecimal digits/second.
	Graph Plotter/Follower*	PFA-2	0	1*		17 increments/second; 100 increments/inch.
Output	Typewriter Control		0	1		8 characters/second.
	Paper Tape Punch					17 characters/second.
	Paper Tape Output Punch	PTP-5, 7				60 characters/second.
	Key Punch Unit	IBM 024 or 026	0	1		10 80-column cards/minute, maximum of 11 characters/second.
	Magnetic Tape Unit	MTA-2	0	4		450 sexadecimal digits/second.
	Graph Plotter*	PA-2	0	1*		17 increments/second.
	Graph Plotter/Follower*	PFA-2	0	1*		17 increments/second.

Storage	Magnetic Drum		1	1	Capacity: 2,176 fixed length words (28 bits and sign). Average access time: 14.5 milliseconds/word, 2,160 words main storage; 0.54 milliseconds/word, 16 word rapid access storage. Size: 12" diameter; 4" long. No. of channels: 20 channels, 108 words/channel; 4 channels, 4 words/channel. Speed: 1,800 rpm.
	Magnetic Tape Unit	MTA-2	0	4	Capacity: 300,000 words/tape.
Control	Arithmetic Unit		1	1	Built-in circuitry for control of components.
	Console		1	1	Manual control by setting of switches and by use of typewriter keys.
	Punched Card Coupling Unit	CA-1	0	2	Used to control two IBM 024 or 026 Key Punches for input and/or output.
Arithmetic Unit	AR register: 29 binary digits; accumulator PN register: 58 binary digits; accumulator, product, dividend MQ register: 58 binary digits; multiplier, quotient ID register: 58 binary digits; multiplicand, divisor Modified three address instruction; with provision for micro-programming. The instruction word is 29 binary digits (bits) long. The first bit indicates whether the command is immediate or deferred, the next 7 bits refer to the address, time or duration of execution. The next bit indicates the presence or absence of a breakpoint stop and the following seven give the location of the next command. The characteristic of the operation to be performed requires two bits. Five bits are used			to specify the address of the source and five more to specify the address of the destination. The last bit indicates single or double precision operation. Notation: binary. Arithmetic mode: serial. Negative number representation: absolute value and sign. Zero representation: 000...00 (positive binary zero). Average speeds of the following operations in milliseconds: Add, 0.54; Multiply, 16.7; Divide, 16.7; Transfer, 0.54; Compare, 0.54. (Optimum coding using rapid access storage.)	

* May be used in conjunction with G-15D and Digital Differential Analyzer only.

EQUIPMENT REPORT

ADDITIONAL INFORMATION

Write to: Marketing Department
Bendix Computer Division
5630 Arbor Vitae Street
Los Angeles 45, California

APPRAISAL

The Bendix G-15 is a medium-scale, general purpose digital computer, specifically designed for engineering and scientific data processing. Information throughout the system is represented in pure binary notation. Input and output to the system may be provided by punched paper tape, punched cards and a plotter or plotter-follower. Magnetic tape can be used for back-up store. A portion of the magnetic drum is reserved for input and output storage, thus permitting computation to be carried on in parallel with input-output operations.

The main storage facility provides 2,160 words of 29 bits each. Average access time to any of these words is 14.5 milliseconds. An additional 16 words of rapid access store, 0.54 milliseconds per word, is obtained by use of recirculation techniques on the drum.

These internal storage facilities are augmented by magnetic tape. Up to four tape units may be connected to the computer. These units can search a tape at the rate of 45 inches (8,600 bits) per inch. Information may be transferred to or from the system at 1,720 bits per second. This transfer rate is slow when compared with other medium-scale computer systems. However, this may not be a severe restriction in many applications. A small quantity of data to be transferred or a large number of operations to be performed on each item of data may not require a high rate of data transfer.

The main input and output media of the system is perforated paper tape. A photoelectric reader is attached to the computer. It can read paper tape at 200 frames per second. A low-speed paper tape punch is the standard output provided with the system. Provision is made for the use of a high-speed punch capable of operating at 60 frames per second. Punch cards may also be used for input-output. A standard IBM 24 or 26 Key Punch is connected via a punched card coupling unit.

BENDIX G-15

The G-15D Model differs from the G-15A mainly in its ability to include a digital differential analyzer for on-line solution of differential equations. A plotter or a plotter-follower may be connected to this differential analyzer.

The plotter or plotter-follower may be used to draw a graph showing the relationship between any two variables generated by the computer in one-hundredth inch increments. The plotter-follower, when used as a curve reader, has one axis driven in one-hundredth increments corresponding to any variable generated by the computer. It then enters into the computer increments corresponding to the functional value represented by a graph on the follower. The follower is a photoelectric device, capable of following dark pencil or ink lines on light paper.

The logical design of the G-15 offers an unusual opportunity for micro-programming or micro-coding. This technique gives the programmer freedom to synthesize his own commands or instructions. Most commercially produced data processors have a fixed number of commands in their repertoire. From this limited set of instructions, the programmer must find one which best suits the particular operation he desires to be performed. With micro-coding available, the programmer can construct the exact command he requires. However, to use such a method effectively much native ingenuity and experience is required on the part of the coder. Operating experience has indicated that a longer training period in coding is necessary to produce personnel capable of making effective use of this computer than is ordinarily required in other machines.

In order to simplify coding, an interpretive method called INTERCOM has been developed. This interpretive routine permits a program written in pseudo-code to be carried out by the computer. These techniques facilitate programming at the expense of much computer time and are only economical when used to perform non-routine tasks.

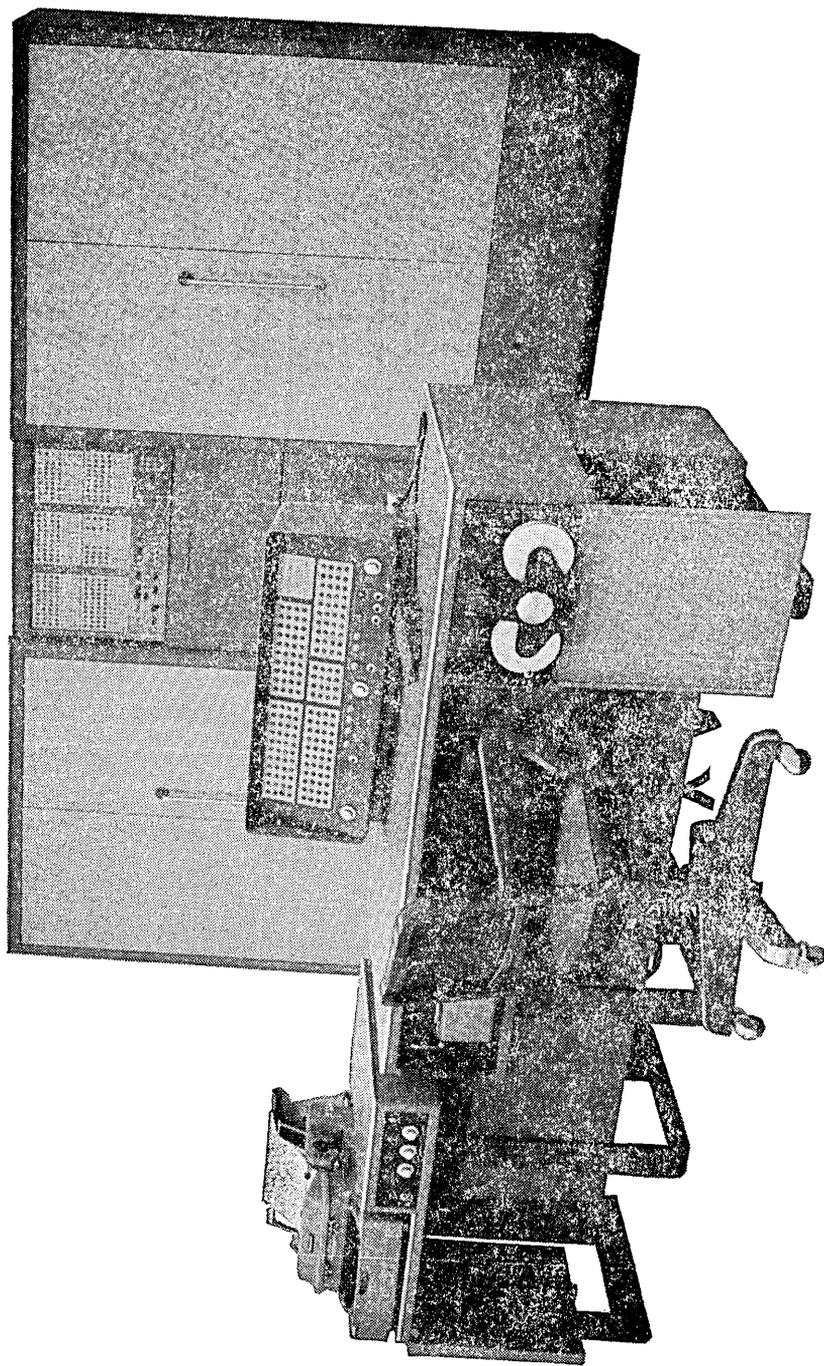
The G-15 lacks the built-in circuitry for automatically performing floating point operations. To perform these operations, floating point sub-routines must be stored on the drum. This effectively decreases the amount of internal storage available to the programmer. Circuitry for automatic address modification is lacking and sub-routines are required to perform auto-

EQUIPMENT REPORT

matic address modification. The above mentioned INTERCOM system provides both the floating point and address modification features. This system makes the G-15, a three address machine, effectively a one address machine.

A modified version, the G-15C, is used in conjunction with the Bendix tape controlled machine tool systems. In this application the computer reduces the engineering specifications to coded instructions indicating machine tool motions. Output from the computer is in the form of punched paper tape. This tape is then mounted on the machine tool control and the coded instructions direct both the movement of the piece in as many as three coordinate directions, and the speed and motion of the cutting tools.

DATATRON
Electronic Data Processing Machine



August, 1956

DATATRON

Electronic Data Processing Machine

MANUFACTURER

ElectroData Division
Burroughs Corporation

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to scientific or business problems. The Datatron uses a numerical, decimal system and can process alphabetic information by programmed sub-routines.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	manual, punched paper tape	magnetic tapes, punched cards
Output	punched paper tape and typewriter	magnetic tapes, punched cards, line printer
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$150,000	\$481,000 + \$2,510 rental
monthly rental	\$4,362	\$16,630
Total Personnel	7	12
Storage Capacity	4,080 words	20,000,000 words
Machine Floor Area	530 sq. ft.	920 sq. ft.

EQUIPMENT REPORT

The above figures are based on single-shift operation, exclusive of auxiliary equipment. The minimum figures are for the basic workable Datatron, consisting of: the computer (including 4080-word drum and magnetic electronic power supply); the basic console; and the typewriter input-output option. The maximum figures include the use of eight magnetic tape units, two DataFiles and the Cardatron unit with two input stations and two output stations.

APPLICATIONS

There are approximately 41 installations of the Datatron. The following are a few of the applications:

Business

- Maintenance of automobile insurance policy records
- Billing and inventory control
- Oil royalty accounting
- Accounts receivable and payable

Scientific

- Reduction of wind tunnel data
- Missile data reduction
- Petroleum process control
- Engineering design
- Flight test data reduction
- Oil refinery piping design
- Thermodynamic and aerodynamic calculation
- Geological data reduction

COMPONENTS OF THE DATATRON AND APPROXIMATE COST

The following costs are exclusive of the costs of auxiliary machines. The monthly rental is for single-shift operation. Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%. An option-to-buy clause in the rental contract permits credit of 40% of all rentals paid, up to a maximum of 60% of the purchase price at the time the option is exercised. The user's needs will determine which computer components he will require: the basic Datatron (A) alone, or in combination with the additional storages (B) and/or the various optional input-output (C).

DATATRON

<i>Components</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
A. Basic Datatron digital computer <i>plus</i>	\$135,000	\$3,900
Basic Console (for any input-output) <i>or</i>	7,050	230
Consolette (exclusively for punched cards)	1,980	70
Plus one of the optional input-output systems	(See (C) below)	
Floating decimal arithmetic unit	21,100	725
B. Magnetic tape unit	each 12,000	375
Multiple magnetic tape bin unit	(max. of 10) each 25,000	825
Magnetic tape control unit (only 1 required)	25,000	750
C. Typewriter Control unit <i>plus</i>	4,560	137
Flexowriter	3,135	95
Photoelectric reader (punched paper tape)	2,960	95
Paper Tape Perforator	2,040	61
Paper Tape Perforator, high speed	2,980	89
Punched Card Converter unit	18,625	567
<i>or</i>		
Cardatron: Control Unit and power supply	31,000	770
Input Station	22,500	560
Output Station		
80 characters	26,300	660
120 characters	27,550	690
IBM 500 Series summary punch, input (1 maximum w/Punched Card Converter)		\$60 to 455
IBM 089 Collator, input		190 to 220
{ IBM 500 Series summary punch, output		60 to 455
{ IBM 400 Series tabulator, output (1 maximum w/Punched Card Converter)		205 to 800

The minimum hardware cost of a workable installation exclusive of auxiliary equipment is \$150,000; the maximum, \$481,000 plus the IBM single-shift monthly rental of \$2,510.

EQUIPMENT REPORT

PERSONNEL

Approximation of personnel required for single-shift operation.

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	1	1
Programmers	1	3
Operators (Datatron)	1	1
Operators (Auxiliary)	1	3
Tape preparers or card punch operators	2	3
Maintenance	1	1

Maintenance is included in rental. When purchased, maintenance contracts are available.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two-week courses are provided at no additional cost for customers and prospective customers for the training of programmers and operators. Advanced programming courses are available for users of the Datatron. A ten-week course in machine maintenance is also available. Installation, operation, and programming manuals are provided by the manufacturer.

PHYSICAL DATA

These are approximate figures based on the Datatron System alone. No allowance is made for auxiliary equipment, personnel, storage of tapes, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	530 sq. ft.	920 sq. ft.
Width		144"
Height		78"
Weight	3400 lbs.	24,500 lbs.
Air Temperature	60° F	80° F
Relative Humidity	40%	60%
Heat Dissipation	72,080 BTU/hr.	188,700 BTU/hr.

DATATRON

Air conditioning: Generally necessary and dependent on climatic conditions. 6 to 15 tons required, depending on size of installation.

Power: For the Datatron system, either 208-volt, three-phase, 60 cps, four-wire system; or a 230-volt, three-phase, 60 cps, three-wire and a 115/230-volt single-phase, 60 cps, three wire systems are required. The basic Datatron requires 21.2 kva and the maximum system requires 55.5 kva.

FIVE COMPONENTS OF THE DATATRON SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Paper Tape Reader	458 Flexowriter	0	1	4G 180.1	10 decimal digits/second.
	Photoelectric Paper Tape Reader	406 or 409 Console	0	1	4G 155.2	540 decimal digits/second; 6-hole tape.
	Punched Cards Summary Punch	IBM 500's	0	2	4G 380	100 to 200 80-column cards/minute; maximum of 266 characters/second.
	Collator	IBM 089	0	2	4A 380.2	240 80-column cards/minute; maximum of 320 characters/second. Maxima of punched card equipment are for system with Cardatron unit.
	Note: At least one of the above options must be used in a working Datatron installation.					
	Magnetic Tape Unit	544	0	10*	4G 155.1	6,000 decimal digits/second; 3,000 characters/second.
	Manual	403, 5, 6, 9 Consoles	1	1		Switches and a decimal keyboard; 405 Console used only with punch card system.
Output	Punched Paper Tape and Typewriter	458 Flexowriter	0	1	4G 180.1	10 decimal digits/second.
	(Paper) Tape Perforator	406 Console	0	1	4G 155.2	60 decimal digits/second.

	Punched Cards Summary Punch	IBM 500's	0	4	4G 380	100 80-column cards/minute; maximum of 133 characters/second.
	Line Printer	IBM 400's	0	4	4B 380	150 lines/minute; maximum of 300 characters/second. Maxima of punch card equipment are for system with Cardatron unit.
	Note: At least one of the above options must be used in a working Datatron installation.					
	Magnetic Tape Unit	544	0	10*	4G 155.1	6,000 decimal digits/second; 3,000 characters/second.
Storage	Magnetic Drum	205	1	1		Capacity: 4,080 fixed length words, 10 decimal digits and sign. Average access time: 8.5 milliseconds/word (main storage); 0.85 milliseconds/word (80 word high-speed storage). Size: 12" diameter; 15" long; 20 channels in main storage. Speed: 3600 rpm.
	Magnetic Tape Unit	544	0	10*	4G 155.1	400,000 words/tape.
	Multiple Magnetic Tape Unit	560	0	10*	4G 155.3	40,000 words/tape; 50 tapes/unit; 2,000,000 words/unit.

* A maximum of 10 tape units can be used with a Datatron. These units may be either Type 544 or Type 560.

Continued on Next Page

FIVE COMPONENTS OF THE DATATRON SYSTEM—Continued

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Control	Arithmetic Unit	205	1	1		Built-in circuitry.
	Manual	403, 5, 6, 9 Con.	1	1		Manual by switch setting.
	Tape Control Unit	543	0	1	4G 155.1	Controls up to ten tape units. Required only if at least one tape unit is in system.
	Typewriter Control Unit	446	0	1		Used for Flexowriter format control.
	Punched Card Converter	500	0	1		Used to control one IBM summary punch for input and one IBM summary punch or tabulator for output.
	Cardatron	506	0	1		Advanced version of Punched Card Converter. Permits use of a combination of up to seven IBM input or output devices. These devices are summary punches, collators, and/or tabulators. Permits computation during input and output operations.
Note: Either the Cardatron or the Punched Card Converter must be used to adapt punched card equipment to the Datatron.						

Arithmetic
Unit

Notation: binary coded decimal.

Arithmetic mode: serial.

Negative notation: absolute value and sign.

Zero representation: plus or minus 0000000000.

Five electronic flip-flop registers:

“A” register: 10 digits and sign; accumulator.

“R” register: 10-digit extension of “A” register;
takes sign of “A” register.

“D” register: 10 digits and sign; distributor, mul-
tiplicand, divisor.

“C” register: instruction register, 2-digit operation,
and two 4-digit addresses.

“B” register: special 4-digit register; used for
address modification and automatic
tallying.

There are 15 arithmetic, 19 logical and 17 transfer oper-
ations, plus additional codes for use with special de-
vices. Computation does not normally continue dur-
ing input-output operations. The Cardatron unit will,
however, permit computation to continue during input
from punch cards and/or output to punch cards or a
line printer.

Average speeds for the following operations are in milli-
seconds: add, 1.76; multiply, 10.18; divide, 13.46;
transfer, 1.76; compare, 1.76 (optimum coding using
high-speed storage).

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment required and recommended has been divided into groups A and B, depending on the input-output equipment used with the Datatron.

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required			
A.	1-Tape perforator and Verifier	ElectroData 454	1B 155.1
B.	1-Key Punch	IBM 024, 026	1A 380
	1-Sorter	IBM 083	4A 380.4
	1-Reproducing Punch	IBM 514, 519	3D 380
	1-Tabulator (if none are included in system)	IBM 400 series	4B 380
Recommended			
A.	1-Spare Flexowriter		4G 180.1
B.	1-Collator	IBM 089	4A 380.2
	1-Verifier	IBM 056	1C 380.1

ADDITIONAL INFORMATION

Write to: Technical Services Department
ElectroData Division
Burroughs Corporation
460 Sierra Madre Villa
Pasadena, Calif.

APPRAISAL

The ElectroData Datatron is a medium-size computer for business, scientific or combined business-scientific data processing. Since information throughout the system is decimal in form, no conversion is required for input-output. The system has great flexibility in its many input-output options. The Cardatron unit is of particular interest. It provides a means of using IBM tabulating equipment with the Datatron. Any combination of up to seven input or output units may be used. This permits a high rate of punched card input and at the same time allows printing and/or punching of different card forms and documents. The buffer drum units of the Cardatron permit computation to continue during input and output.

The design of the Datatron tape unit permits storing 400,000 words on each reel of tape. Twelve channels are recorded

DATATRON

across the width of the tape, but only six of these are read or recorded at one time. Each of these six channels is called a lane. The six channels of one lane are interlaced with those of the other lane thus permitting the storage of two words in the space normally used for one word. Each twenty word block of information on the tapes is completely addressable by a four-digit address. As compared to the reel type unit, the multiple bin DataFile provides a relatively rapid access to a file of 2,000,000 words. It contains fifty separate 250 foot lengths of magnetic tape. Two read-write heads, one of each tape lane, is capable of transversing the entire file of 50 tapes in 2 seconds. The average random access time to any block is 16.3 seconds. The tape control unit, serving in the system as a control for any combination of up to ten tape units or DataFiles, can also be used to inspect tapes for flaws and while inspecting subdivide the tape into zones one block in length and simultaneously apply the block identification number.

The automatic tally feature of the "B" register combined with the use of the register for address modification result in a versatile and efficient coding system. The B register may be used to alter the address portion of whole groups of commands without changing the command in storage by adding the contents of the "B" register to the address portion of each command just prior to execution of the command. The automatic tally feature is a simple and fast method of controlling repetitive or loop routines.

The Floating Point Arithmetic Unit is an extremely important addition to the Datatron, especially for scientific applications. The unit eliminates the need for storing floating point sub-routines on the drum and thus effectively increases the amount of storage on the drum available to the programmer. Because this device is used in conjunction with the regular arithmetic unit, both fixed and floating point routines may be used in the same problem, at no loss in computing speed.

The Datatron has two characteristics that may detract from the advantages cited above:

First, it shares the basic limitation of all computers of the drum type. It has a relatively slow operating speed and a high access time when compared to machines having electrostatic or core internal storage. Although tape opera-

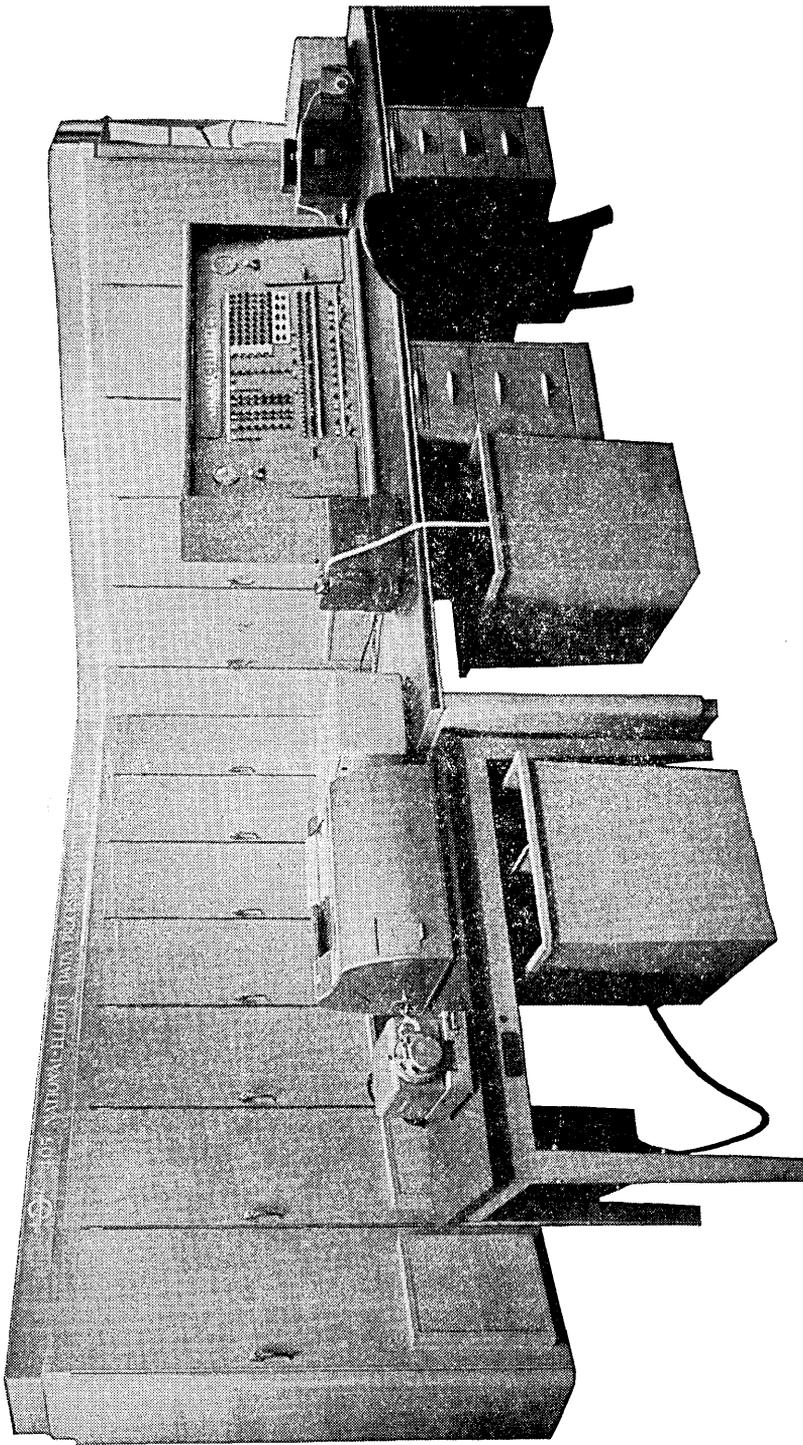
EQUIPMENT REPORT

tion for most computers is inherently slow, this is not true with Datatron. The Model 560 DataFile Multiple Bin Tape Unit has a relatively short access time to a file of 2,000,000 words. Also, through individually addressed blocks of information the tape unit has the ability to interpret the coded address, permitting the tape to be searched for a particular address while computation continues.

Second, computation must stop during input-output operations. However, the Cardatron will permit computation to continue during input from punched cards and output to punched cards or line printers.

In general, however, the sound design and flexibility of the Datatron make it an efficient data processing machine for a wide variety of problems.

ELLIOTT 405
Unit-Construction Business Computing System



August, 1956

ELLIOTT 405

Unit-Construction Business Computing System

MANUFACTURER

Elliott Brothers (London) Limited

BRIEF DESCRIPTION

A medium-size, general purpose computer of the building block type, applicable primarily to business but also to scientific problems. The 405 uses a numerical binary system with automatic conversion between binary and decimal notation available. It can process numerical and alphabetic information.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	nickel delay line	magnetic drum, magnetic disc, magnetic film
Input	manual	punched paper tape, punched cards, magnetic film, analogue-to-digital converters
Output	typewriter	punched paper tape, line printer, magnetic film, digital-to-analogue converters
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$45,400	\$343,000
Total Personnel	3	10
Storage Capacity	128 words	1,817,000 words
Machine Floor Area	100 sq. ft.	450 sq. ft.

EQUIPMENT REPORT

The above costs do not include import or export duties, or export packing expenses. No auxiliary equipment has been included in the above figures. The minimum figures are for the basic workable Elliott 405 consisting of a System Center with 128 words of storage, a Control Console, an input-output cabinet, an electric typewriter output unit, and a slave power cabinet. The maximum figures include the basic system, an additional 256-word store, a 32,768-word magnetic disc, a magnetic film master unit, 4 magnetic film slave units, 4 magnetic film output units, a block input-output control, a compiler cabinet, 2 paper tape readers, 2 punched card readers, 1 perforator, 2 line printers and 4 additional slave power cabinets.

APPLICATIONS

There are several installations in England and more proposed in both England and the Continent. These include the following:

Business

- Payroll and analysis
- Inventory and stock record—automobile mfg.
- Group life insurance and pension plan accounting
- Central accounting and analysis
- Production control
- Sales statistics and forecasting

Scientific

- National Agricultural Census
- Analysis of wind tunnel results
- Market research

COMPONENTS OF THE ELLIOTT 405 AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment costs. Import or export duties, or export packing expenses have not been included in these costs.

The user's needs determine which components of the system he requires. Further components may be plugged into (or detached from) the system at any time. The various input-output and store devices have their associated high-speed nickel delay storages that are used as buffers and as part of the high-speed storage system. In this manner the high-speed store may

ELLIOTT 405

be extended to 512 locations. The basic system (A) may be used alone, or in combination with any of the store devices (B), and/or with any of the input-output equipment (C).

<i>Components</i>	<i>No. of Cabinets</i>	<i>Approximate Cost Purchase</i>
A. System Center with power cabinet and 128 words high-speed store	3	\$28,000
Control Console		4,200
Input-output cabinet	1	9,800
Electric Typewriter		1,960
Slave power cabinet (1 needed for every 4 to 5 other cabinets)		6,200 (or less)
B. 4,096-word Drum, and 128 words high-speed store	2	28,000
16,384-word Disc, and 128 words high-speed store	3	42,000
32,768-word Disc, and 128 words high-speed store	4	56,000
Magnetic Film Master unit, and 64 words high-speed store	3	31,000
Magnetic Film Slave unit	1	9,000
Additional 256-word high-speed store		10,400
C. Compiler Cabinet	1	9,800
Block input and output Control	1	9,300
Magnetic Film output unit	1	9,800
Fast paper tape reader input unit, Ferranti		1,400
Paper tape perforator output unit, Creed Model 25		1,120
Punched-Card Reader input unit		2,800
Line Printer output with print unit and 16 words high-speed store	2	33,600

The minimum hardware cost of a workable installation exclusive of auxiliary machines is \$45,400; the maximum, that includes the component equipment listed under Key Data, is \$343,000. Duties and transportation costs have not been included in these costs.

EQUIPMENT REPORT

PERSONNEL

Approximation of the personnel required for single-shift operation:

<i>Position</i>	<i>Minimum</i>	<i>Maximum</i>
Methods		3
Programmers or Coders	1	4
Operators (405)	1	3
Operators (auxiliary)		6
Tape Preparers or Key Punch Operators	1	20
Maintenance	1	2

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming and maintenance courses are provided by the manufacturer at the plant in Borehamwood, England. Programming manuals are available.

PHYSICAL DATA

These approximate figures are based on the Elliott 405 computer system alone. No allowance is made for auxiliary equipment, personnel, tape and card storage, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space (including clearances)	100 sq. ft.	450 sq. ft.
Width	96"	
Height	78"	78"
Machine Floor Loading	84 lbs./sq. ft.	84 lbs./sq. ft.
Air Temperature		100° F.
Relative Humidity		90%
Heat Dissipation	14,000 BTU/hr. for basic system.	
Power	A three-phase supply is required to run a motor generator used as a buffer between supply mains and computer.	

FIVE COMPONENTS OF THE ELLIOTT 405 SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Fast Paper Tape Reader	Ferranti	0	8 *	4G 270.1	150 to 180 characters/second; 5-channel tape. 600, 80-column cards/minute; maximum of 800 characters/second. 2,250 characters/second or 3,375 digits/second. If high-speed is unnecessary, the operation to read one character at a time between computations is used.
	Punched Card Reader	Elliott	0	8 *	4G 248.1	
	Magnetic Film Unit	Elliott Multi-channel	0	8 *	4G 248.2	
	Console (Manual)	Elliott	1	1		
Output	Electric Typewriter	Compuprinter	0	8 *		20 characters/second; 170 characters/line maximum.
	Paper Tape Perforator	Creed Model 25	0	8 *	4G 190.1	25 characters/second.
	Line Printer	Bull	0	8 *		150 lines/minute; 92 characters/line, maximum.
	Magnetic Film Output Unit	Elliott	0	8 *	4G 248.2	300 characters/second.
Storage	Nickel Delay Line	Elliott 405	1	16 *		128 to 512 words in blocks of 16 words. Average Access Time: 0.76 milliseconds. The various input-output and store devices have their associated nickel delay storages that are used as buffers and as part of the high-speed storage system.
	Magnetic Drum	Elliott 405	0	1 †		Capacity: 4,096 words (32 bits each). 32 tracks of 128 words each. 64 blocks of 64 words each. Average Access Time: 26 milliseconds for 64 words. Speed: 4,600 rpm. Size: 9" diameter; 2" long.

Continued on Next Page

FIVE COMPONENTS OF THE ELLIOTT 405 SYSTEM (Continued)

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Storage (Cont.)	Magnetic Disc	Elliott 405	0	1 †		Capacity: 16,384 words (32 bits each). 64 tracks of 256 words each. 256 blocks of 64 words each. or 32,768 words (32 bits each). 128 tracks of 256 words each. 512 blocks of 64 words each. Average Access Time: 33 milliseconds for 64 words in both cases. Speed: 2,300 rpm. Size: 19" diameter; 1/2" thick. 300,000 (9 digit or 6 letter) words/1,000 ft. reel; 35mm.
	Magnetic Film Unit	Elliott Multi-channel	0	16 *	4G 248.2	
Control	ALU and Console	Elliott 405	1	1		Console: Manual control by setting of switches. ALU: built-in circuitry for control of components. Controls up to 16 film slave units. (64 words of high-speed store).
	Magnetic Film Master Unit	Elliott	0	8 *	4G 248.2	

Arithmetic
Unit

Arithmetic Register: 32 bits; accumulator.
B Register: 13 bits (2 registers).
Control Register: 13 bits.

There are two instructions per word. Each instruction consists of an operation code, an address, and an order modification.

There are 8 arithmetic, 3 logical and 5 transfer operation codes. In addition, many input-output codes are available. Computing is possible during input-output operations.

Notation: binary.
Arithmetic Mode: serial.
Negative Number Representation: 2's complement.
Zero Representation: not reported.

Average speeds of the following operations are in milliseconds: add, 0.153; multiply by 0, 2, 4, 8, 10 or 12, 0.153; other multiplications, 3.366; divide, 3.366; transfer, 1.505; compare, 0.153.

* The number of input devices is limited to 8; the number of output devices is limited to 8.
The number of film mechanisms (master or slave) is limited to 16.

† An installation can have either a drum or a disc.

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The following auxiliary equipment is either required or recommended depending on the units in the particular installation.

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Magnetic film to electric typewriter converter	Elliott	
Electric Typewriter	Compuprinter	
Magnetic film paper tape converter	Elliott	
Creed Paper Tape Punch	Model 25	4G 190.1
Magnetic film line printer converter	Elliott	
Paper tape to page teleprinter converter comprising Creed Tape Transmitter	Model 6S/5	2B 190.1
and Creed Teleprinter	Model 54	2C 190.1
Creed Keyboard Perforator	Model 7 P/N	1B 190.1
Card Punch	IBM 024, 026	1A 380.1

ADDITIONAL INFORMATION

Write to: Elliott Brothers (London) Limited
Elstree Way
Borehamwood
Hertfordshire
England

APPRAISAL

The Elliott 405 Unit-Construction Business Computing System is a relatively fast, medium-size computer. This system is a versatile computer due to the fact that so many different kinds of components are available.

The 405 has three types of internal storage available: 128 to 512 words of nickel delay line, and a 4,096-word magnetic drum or a 16,384 word or 32,768 word magnetic disc. In addition, sixteen magnetic film units are available as secondary storage. Paper tape and punched cards can be used for input; paper tape, magnetic film and line printing can be used for output. The converter units for magnetic film-to-printer, and magnetic film-to-paper tape are available. For engineering and scientific applications various types of analogue input-output devices can be connected to the system. All of the components are pluggable and can easily be connected and disconnected.

ELLIOTT 405

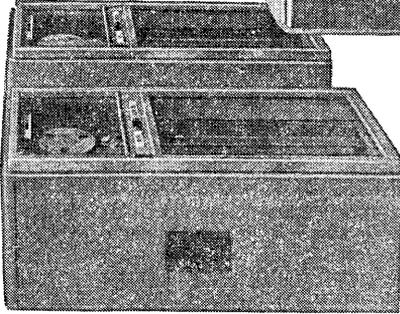
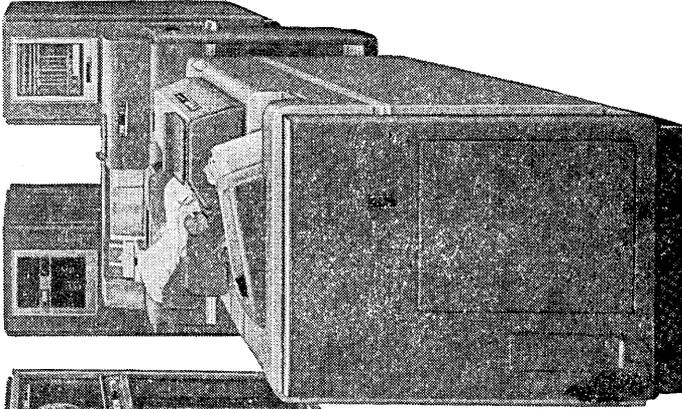
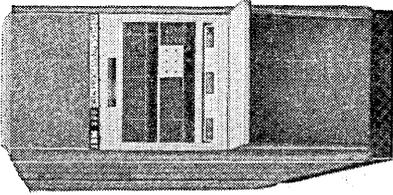
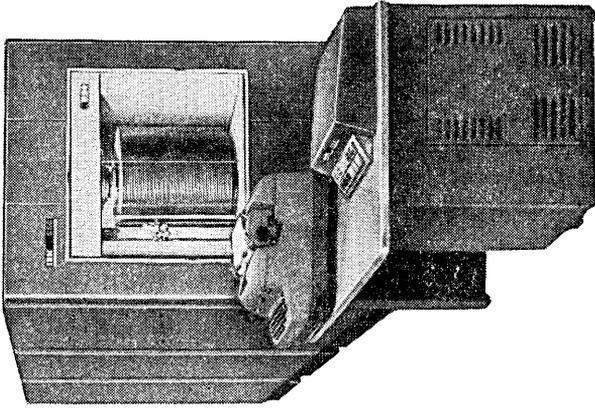
Two features of the Elliott 405 contribute to the speed of the processing of information. The various input-output and store devices are separately buffered so that any or all of these devices may work simultaneously with computation. Computation is possible while searching for any block of information on film. The sorting of original data, an important operation in business applications, is relatively rapid.

The Elliott 405 has a fixed word length and fixed block length. This is not as adaptable to business records as is variable block and word lengths. However, the majority of medium-size computers also have fixed block and word lengths, and it is an advantage to have fixed lengths in scientific applications. Information is usually transferred in blocks between high-speed storage and the drum or disc. One word transfer requires the same time execution as a block transfer. There is no built-in floating decimal attachment available in the 405. But, floating decimal is not used in business applications, and would be available by programmed subroutines for scientific applications.

In addition to having a multiplicity of store and input-output units, the Elliott 405 has an excellent set of orders that make it an easy machine for which to program. There are, for example, commands to exchange the contents of the arithmetic register with the contents of any high-speed storage location, to subtract the contents of the arithmetic register from the contents of any high-speed storage location or to subtract the contents of the location from that of the arithmetic register, to transfer 16 word blocks within the high-speed store, to multiply by 0, 2, 4, 8, 10, or 12 in the time it takes for an addition. There are two commands per word; hence, a jump command in the second half allows coding for minimum time as in a one plus one address system. There are B registers for automatic modification of commands. The control register is addressable. The paper tape and card readers can independently search for a given character. These and the other commands in the Elliott 405 make for easy and efficient programming.

The Elliott 405 is pure binary internally that lends for faster arithmetic operations and for economy in equipment and storage. However, those who prefer to use decimal need not be concerned that the computer is binary internally. There is a converter unit available known as a Compiler that automatically converts input-output data.

IBM 650 AND 650 RAMAC
Magnetic Drum Data Processing Machine



4D 380.1—Page 2

March 22, 1957—2

ALL INFORMATION CONTAINED

February, 1957

IBM 650 AND 650 RAMAC

Magnetic Drum Data Processing Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to scientific or business problems. The 650 uses a numerical, decimal system and can process alphabetic characters through the use of additional devices. A 650 Ramac system contains at least one magnetic disk unit.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes, magnetic core, magnetic disk
Input	manual, punched cards	magnetic tapes, typewriter
Output	punched cards	magnetic tapes, printer, typewriter
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: monthly rental	\$3,750	\$20,000
purchase price	\$205,900	\$1,117,000
Total Personnel	3	8
Storage Capacity	2,000 words	5,140,000 words
Machine Floor Area	210 sq. ft.	1,600 sq. ft.

The above monthly rental figures are based on one-shift operation, exclusive of auxiliary equipment. The minimum figures pertain to the basic 650 system which is composed of: the console

EQUIPMENT REPORT

unit containing the calculating unit, control console, and magnetic drum; the power supply unit; the punched-card input-output unit. Maximum figures include the use of six tape units and four Ramac units.

APPLICATIONS

There are about 439 installations of the 650 of which 2 are Tape 650's. No 650 Ramac's have been installed yet. The following are a few of the applications:

Business

- Calculation of insurance salesmen's commissions
- Market research analyses
- Payroll processing
- Customer billing for a utility
- Actuarial computations
- Centralized branch store accounting
- Inventory control
- Production control
- Personnel records

Scientific

- Guided missile design
- Oil refinery design and engineering calculations
- Analyses of flight tests made by supersonic aircraft

IBM 650 AND 650 RAMAC

COMPONENTS OF THE 650 AND 650 RAMAC AND APPROXIMATE COST

The following rentals are for single-shift operation exclusive of the rentals of the auxiliary machines. Two-shift operation increases the single-shift costs by 40%; three-shift operation increases the single-shift costs by 80%. The user's needs will determine which computer components he will require: the basic 650 (A) alone, or in combination with the additional storages (B) and/or additional input-output equipment (C).

	<i>Components</i>	<i>Monthly Rental</i>	<i>Purchase Price</i>
A.	650 Model II with 2,000-word magnetic drum	\$3,750	\$205,900
	Alphabetic device for basic system	325	15,525
	Special character device for basic system	100	6,600
B.	Magnetic Tape units	550	29,800
	Magnetic Tape control unit	1,950	111,200
	High-Speed Core	2,425	138,200
	Magnetic disk Ramac unit	975	72,200
C.	407, Line Printer	1,035	67,250
	Alphabetic device for Type 407 printer	250	15,525
	Special character device for Type 407 printer	100	6,600
	Card Read-Punch unit, 537	700	46,200
	Card Read-Punch unit, 533	550	36,300
	Inquiry Station, 838	175	10,000

Rental of a workable installation, exclusive of auxiliary machines, for a single-shift operation, ranges from \$3,750/month to \$20,000/month. Purchase price ranges from \$205,900 to \$1,117,000.

EQUIPMENT REPORT

PERSONNEL

Approximation of the personnel required for single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	1	3
Programmers	1	4
Operators (650)	1	1
Operators (auxiliary)	1	3
Key Punch Operators	1	4

Maintenance included in rental. When purchased, maintenance contracts are available.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two-week courses are provided by the manufacturer at no additional cost, for the training of programmers and operators. One-week executive courses are also available.

The programming and operating manual form #22-6060-1 is available to the user. An installation manual is also supplied by the manufacturer.

IBM 650 AND 650 RAMAC

PHYSICAL DATA

These approximate figures are based on the 650 and 650 Ramac system alone. No allowance is made for auxiliary equipment, personnel, storage of cards, tapes, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	210 sq. ft.	1,600 sq. ft.
Width		76.5"
Height		71"
Floor Loading Factor		290 lbs./sq. ft.
Air Temperature	50° F	90° F
Relative Humidity	0%	80%
Heat Dissipation	48,300 BTU/hr. for the basic system	

Air conditioning: Generally necessary and dependent upon climatic conditions for the basic 650. Necessary for maximum 650 system.

Power: For the basic system, 208 or 230-volt, single-phase, 60-cycle, 100-ampere AC supply is required (some machines are three-phase). The power dissipation is 16.8 kva, with an operating power factor of 86%. It is a two-wire machine grounded system.

FIVE COMPONENTS OF THE 650 AND 650 RAMAC SYSTEMS

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Card Read-Punch	533	0	3 *	4G 380.2	200 80-column cards/minute; maximum 266 characters/second.
		537	0	3 *	4G 380.7	155 80-column cards/minute; maximum 206 characters/second.
	Accounting Machine	407	0	3 *	4B 380.4	150 80-column cards/minute; maximum 200 characters/second.
	Magnetic Tape Unit	727	0	6	4G 380.3	15,000 decimal digits/second; 7,500 characters/second.
	Inquiry Station	838	0	10	4G 380.8	10 characters/second, maximum.
	Console (manual)	650	1	1		
Output	Card Read-Punch	533	0	3 *	4G 380.2	100 80-column cards/minute; 133 characters/second, maximum.
		537	0	3 *	4G 380.7	155 80-column cards/minute; maximum 206 characters/second.
	Accounting Machine	407	0	3 *	4B 380.4	150 lines/minute; 120 printing positions/line.
	Magnetic Tape Unit	727	0	6	4G 380.3	15,000 decimal digits/second; 7,500 characters/second.
	Inquiry Station	838	0	10	4G 380.8	10 characters/second, maximum.
Storage	Magnetic Drum	650	1	1		Capacity: 2,000 fixed length words (10 digits and sign). Average access time: 2.4 milliseconds/word. Size: 4" diameter, 16" long; 20 or 40 channels. Speed: 12,500 rpm.
	Magnetic Tape Unit	727	0	6	4G 380.3	456,000 words/tape.

	High-Speed Core	653	0	1		Capacity: 60 words (10 digits and sign). Average access time: none.												
	Ramac Unit	355	0	4	4G 380.9	<table border="0"> <tr> <td>No. of disks: 50.</td> <td>Average access time, when the access arm is at the disk: 225 milliseconds.</td> </tr> <tr> <td>No. of disk faces: 100.</td> <td></td> </tr> <tr> <td>No. of tracks/face: 100.</td> <td>Average access time, when the access arm is not at the disk: 600 milliseconds.</td> </tr> <tr> <td>No. of digits/track: 600.</td> <td></td> </tr> <tr> <td>Total digits/disk unit: 6,000,000.</td> <td>Size of disk: 24" diameter.</td> </tr> <tr> <td></td> <td>Speed: 1,200 rpm.</td> </tr> </table>	No. of disks: 50.	Average access time, when the access arm is at the disk: 225 milliseconds.	No. of disk faces: 100.		No. of tracks/face: 100.	Average access time, when the access arm is not at the disk: 600 milliseconds.	No. of digits/track: 600.		Total digits/disk unit: 6,000,000.	Size of disk: 24" diameter.		Speed: 1,200 rpm.
No. of disks: 50.	Average access time, when the access arm is at the disk: 225 milliseconds.																	
No. of disk faces: 100.																		
No. of tracks/face: 100.	Average access time, when the access arm is not at the disk: 600 milliseconds.																	
No. of digits/track: 600.																		
Total digits/disk unit: 6,000,000.	Size of disk: 24" diameter.																	
	Speed: 1,200 rpm.																	
Control	ALU and Console	650	1	1		Console: manual control by the setting of switches. ALU: built-in circuitry for control of the components.												
	Tape, Ramac and Inquiry Station Control	652	0	1		Controls the tape units, Ramac units and inquiry station. Required if at least one tape unit or one Ramac unit is included in system. A 652 will control up to 6 tape units, 4 Ramac units and 10 Inquiry Stations.												
Arithmetic Unit	<p>Accumulator: 20 digits and sign, divided into upper and lower accumulators of 10 digits each which may be used independently.</p> <p>Distributor: 10 digits and sign.</p> <p>Program register: 10 digits (2-digit operation code and two 4-digit address codes).</p> <p>Indexing Registers: 4 digits and sign. Maximum of 3 such registers.</p> <p>Floating-decimal arithmetic may be included in the system.</p> <p>There are 19 arithmetic, 14 logical and 8 transfer operation codes. There are in addition several others including those used with tape, disks and inquiry stations.</p>				<p>Computing is possible during input-output operations.</p> <p>Notation: bi-quinary coded decimal.</p> <p>Arithmetic mode: serial.</p> <p>Negative number representation: absolute value and sign.</p> <p>Zero representation: plus or minus 0000000000.</p> <p>Average speeds of the following operations are in milliseconds: add, 0.72; multiply, 12.14; divide, 15.98; transfer, 0.72; compare, 0.43 (optimum coding using core storage).</p>													

* Any combination of 533's, 407's or 537's up to a maximum of three units can be connected to the system.

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rep. Ref.</i>
Required			
1	Key Punch	24 or 26	1A 380.1
1	Sorter	83	4A 380.4
1	Reproducer	514 or 519	3D 380
1	Accounting Machine (if 407 not in system)	400 series	4B 380
Recommended			
1	Collator	77 or 89	4A 380
1	Verifier	56	1C 380.1

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

The 650 is a medium-scale computer system designed to process business and scientific data. While its internal circuitry processes only numerical information, alphabetic and/or special characters may be handled by optional devices, which encode these characters as two digit numbers.

Input-output facilities of the basic 650 include the console and a card read-punch unit, 533 or 537. Both units read and punch up to 80 columns of information, 30 of which may be alphabetic and/or special characters. The 533 reads information from one card and punches information into another card, while the 537 reads from and punches into the same card. When operating at maximum speed, the 537 can read and punch 155 cards per minute, while the 533 can punch 100 cards per minute.

The 407, Line Printer, may be used on-line or off-line with the 650 system. When operating on-line, it is either an input and/or output component of the system. The 407's counters, storage areas and selectors may be under the 650's control when acting in an on-line mode. Its maximum card read rate is 150 cards per minute whether on- or off-line; however, on-line performance rate depends on the complexity of the operations performed.

IBM 650 AND 650 RAMAC

The 407 prints at a maximum rate of 150 120-position lines per minute.

Magnetic tape provides the 650 system with a faster transfer medium than punched cards. A 60-word block of data on tape transferred to core storage is immediately accessible for processing. There is no method of simultaneously reading and writing on tapes in the 650 system. However, this is not a serious disadvantage since the computer's processing rate is much slower than the tapes read-write rate. Alpha-numeric and special characters may be read from or written onto these tapes. Up to 6 tape units may be included in the system.

The 838, Inquiry Station is designed to permit direct inquiry to the system and to type the replies. The speed of these operations is limited by the typewriter's print rate of 10 characters per second. A maximum of ten inquiry stations may be included in the system.

As yet, no allowance has been made for the incorporation of paper tape input-output devices into the 650 system. Prior to using data stored on these tapes, a conversion to punched cards or magnetic tapes is necessary. This a definite shortcoming in several applications.

A maximum of four 355 magnetic disk storage units may be included in the 650 system. Each of these units has a maximum storage capacity of 6,000,000 decimal digits in 10 digit-plus-sign words. Alphabetic and/or special characters must be encoded as 2-digit numbers prior to storing these characters on magnetic disks.

Magnetic tapes may also be used as secondary storage. One reel of tape can store 23,000 100-character records. The 650 system can include up to six magnetic tape units. An intermediate high-speed magnetic core buffer unit is a necessary component of both the 650 Tape and the 650 Ramac system. This buffer stores 60 10-digit-plus-sign words which may be referred to by the program singly or in block form. Core storage may be included in a 650 system without the tape or disk components.

Primary storage in the 650 is a 2,000 10 decimal digit-plus-sign word magnetic drum. Both program steps and data are stored on this drum. Certain portions of this drum have special functions besides the ability to be used for general storage. These functions relate to input-output and table-look-up operations.

EQUIPMENT REPORT

Read-punch units, inquiry stations and line printers communicate with the magnetic drum via buffers called synchronizers. These synchronizers are located within two 'unaddressable' bands on the drum's circumferential surface. One such synchronizer is standard equipment. A maximum of three may be included in the system.

The number and type of operations allowed the programmer permit efficient and relatively simple coding of even the most complex problems. One such operation which minimizes the time spent searching for data is the automatic table-look-up operation. Addition of a Ramac unit is accompanied by the 'seek' instruction which permits the seeking of a record by the access arms in the disk unit while processing continues in the computer.

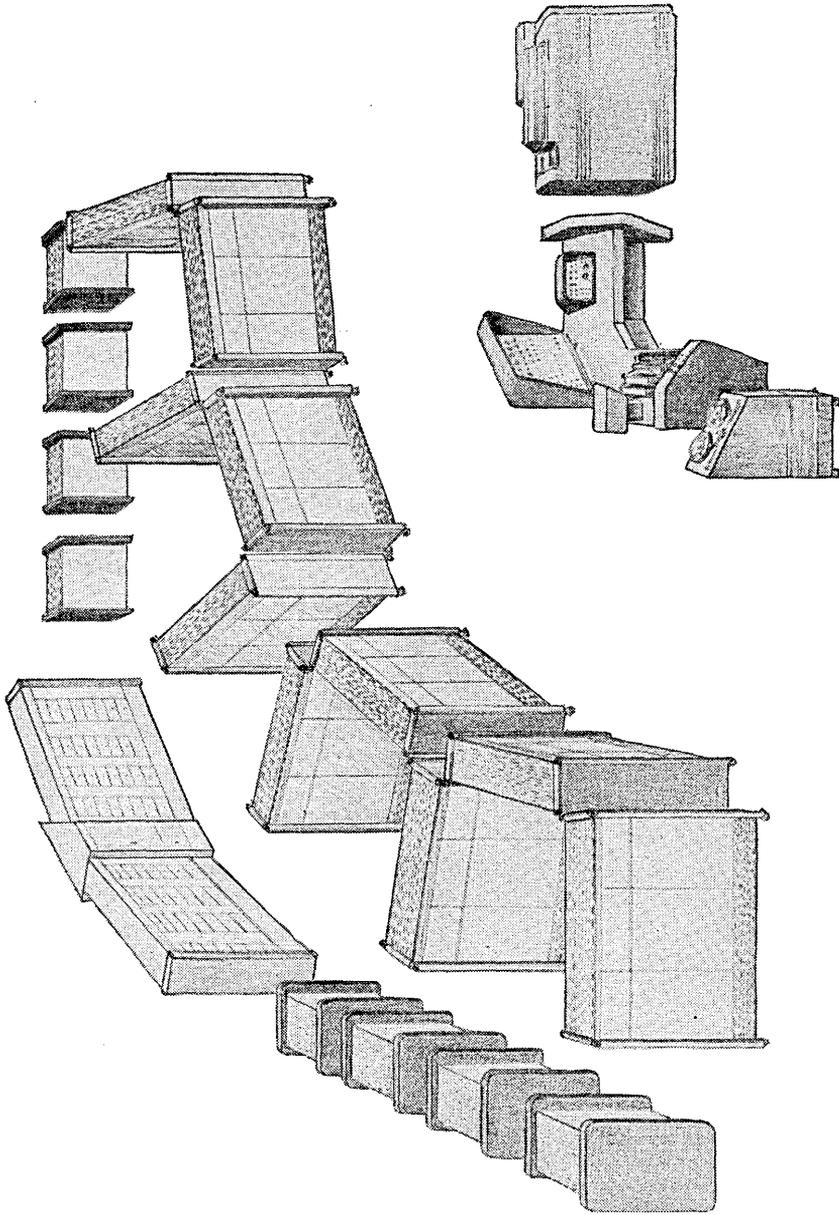
Up to three indexing registers containing 4 digits plus sign may be included in the 650 system. These registers were designed primarily to minimize both the time and the storage area required to program the modification of an address. Additional functions for these registers are accumulating totals, holding group multipliers and general high-speed storage. Each indexing register is addressable by the 650 program.

Modification of the 650's circuitry is necessary if the floating-decimal arithmetic feature is incorporated into the basic system. This feature facilitates the programming of lengthy, complex scientific and engineering calculations that otherwise would require extensive analysis to determine the size and range of intermediate and final results. The time required to execute floating-decimal operations is approximately the same as for fixed-point operation.

Programs may be debugged by means of a 'trace' routine. This is a more rapid and accurate method than console tracing. Results of the trace program can either be punched into cards and then listed, or typed directly using an 838, Inquiry Station. In the latter instance, when an error is detected by the programmer, tracing can either be stopped; or stopped, modified and continued at the discretion of the programmer.

Several compiler, automatic coding, and trace routines have been written and are available from the manufacturer.

DIANA
Electronic Data Processing System



June, 1956

DIANA

Electronic Data Processing System

MANUFACTURER

Laboratory for Electronics, Inc.

BRIEF DESCRIPTION

A medium-size general purpose digital computer designed for accounting applications. The Diana uses an alphanumeric, decimal and duodecimal system and can process alphabetic and numerical data.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic core, magnetic drums, magnetic tape	
Input	manual, punched paper tape	punched cards
Output	typewriter, punched paper tape	punched cards, line printer, cathode ray tube viewer
	<i>Approximate Minimum</i>	<i>Typical Larger Installation</i>
Cost: purchase	\$375,000	\$685,000
Total Personnel	4	9
Storage Capacity	10.9 million characters	38.7 million characters
Working Area	800 sq. ft.	1,500 sq. ft.

The above figures are exclusive of auxiliary equipment. The minimum and maximum figures are values for the Diana installations, as detailed in the section "Components of the Diana and Approximate Cost," under A and B respectively.

EQUIPMENT REPORT

APPLICATIONS

There are two Dianas to be installed in 1957. Some applications are:

Business

- Payroll accounting
- Insurance
- Savings bank accounts
- Checking accounts
- Inventory control
- Cost and expense distribution
- Production control

COMPONENTS OF THE DIANA AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment costs. The monthly rental charges are not as yet available and will have to be obtained from the manufacturer. The user's needs will determine which computer components he will require: the Diana with components as listed under A, or in combination with the additional equipment listed in B that might be required in a larger installation.

<i>Components</i>	<i>Approximate Cost Purchase</i>
A. Diana with 500 character core storage, 52,500 character high-speed magnetic drum, 1,875,000 character low-speed magnetic drum, a paper tape reader and tape punch, a magnetic tape unit, and dual arithmetic unit	\$375,000
B. Typical additional equipment for a larger installation: ten 1,875,000 character low-speed Magnetic Drums one Magnetic Tape Unit one 80-column Punched Card Reader, BTM one 80-column Punched Card Punch, BTM one Line Printer, BTM two Typewriters, Flexowriters two Cathode-ray tube viewing scopes 500 characters of core storage	
Additional	\$310,000

DIANA

The minimum hardware cost of a workable installation exclusive of auxiliary equipment is \$375,000; for a larger installation, \$685,000.

PERSONNEL

Approximation of the personnel required for single-shift operation:

<i>Position</i>	<i>Minimum</i>	<i>Maximum</i>
Methods	1	2
Programmers	1	3
Operators (Diana)	1	2
Tape Preparers or Key Punch Operators	2	5
Maintenance	1	2

Maintenance contracts are available to purchasers of the Diana.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming manuals are available from the manufacturer. Programming and maintenance courses are to begin in the fall of 1956.

Automatic coding, compiling, and input-output sub-routines are being developed.

PHYSICAL DATA

These approximate figures are based on the Diana system alone. No allowance is made for auxiliary equipment, personnel, storage of tapes, cards, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	800 sq. ft.	1,500 sq. ft.
Width		29"
Height		75"
Machine Floor Loading		200 lbs./sq. ft.
Air Temperature	no restriction	80° F.
Relative Humidity	0	70%
Heat Dissipation	not reported	15,500 BTU/hr.

Power: 208 volts, 60 cps, three-phase, 4-wire or 230 volts, 60 cps, single-phase, 3-wire power supply is required. The power dissipation is 52 kva, with a power factor of 92%.

FIVE COMPONENTS OF THE DIANA SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Typewriter Keyboard (1)*	Flexowriter	1	1 to 60*	4G 180.1	10 characters/second, depends on operator.
	Paper Tape Reader (3)*	Ferranti	1	1 to 20*	4G 270.1	200 characters/second.
	Punched Card Reader (3)*	BTM	0	1 to 20*		100, 80-column cards/minute; maximum of 133 characters/second.
Output	Paper Tape Punch (1)*	Teletype	1	1 to 60*	4G 745.1	60 characters/second.
	80-Column Card Punch (3)*	BTM	0	1 to 20*		100, 80-column cards/minute; maximum of 133 characters/second.
	Line Printer (6)*	BTM	0	1 to 10*		150 lines/minute; 120 characters/line.
	Typewriter (1)*	Flexowriter	1	1 to 60*	4G 180.1	10 characters/second.
	Cathode-ray Tube Viewer (1)*	Diana	0	1 to 60*		200 characters/frame.

Storage	Magnetic Core Storage	Diana	1	1	4G 465.1	<p>Up to 10,000 characters. Average access time to any character : 44 microseconds. Capacity: 52,500 characters. 1,500 characters/band ; 35 bands/drum. Average access time: 10 milliseconds. Speed: 6,000 rpm. Size: 7" diameter ; 9" long. Capacity: 1,875,000 alphanumeric characters or 2,500,000 digits/ drum. 6,250 characters/track ; 300 tracks/drum ; maximum of 10,000 tracks/drum unit. Speed: 180 rpm. Size: 15" diameter ; 15" long. Contains up to 33 File Drums as above. 9,000,000 characters/2,400 ft. reel. The magnetic tape can only read into or out of the drum units.</p>
	High-speed Magnetic Drum	Diana	1	1		
	File (low-speed mag- netic) Drum	Diana	1	33/ drum unit		
	File Drum Unit Magnetic Tape Unit	Diana Diana	1 } 1 }	10**		

* Input and output units require the number of drum buffer sectors as indicated in the parenthesis after each unit. 60 such sectors are available so that the combination of input and output units must be such as not to require more than the 60 available buffer sectors.

** The total number of drum and tape units may not exceed 10.

Continued on Next Page

FIVE COMPONENTS OF THE DIANA SYSTEM—Cont.

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Control	ALU and Console	Diana	1	1		ALU: Built-in circuitry for control of the components. Console: Manual control by switches and keyboard.
Arithmetic Unit	<p>Arithmetic Unit contains 3, 13-digit (core) registers: P register, 12 digits and sign, product, addend, remainder. N register, 12 digits and sign, multiplicand, addend, dividend. M register, 12 digits and sign, multiplier, addend, divisor.</p> <p>Static control register: 10 characters; holds current instruction. There are 7 arithmetic, 5 transfer, and 7 logical operation codes plus input-output codes. Computation is possible during input-output operations.</p>					<p>Notation: 7-bit binary coded alphanumerical (includes a check bit). Arithmetic Mode: serial. Negative No. Representation: absolute value and sign. Zero Representation: 0+, 00+, . . . , 000000000000+. Word Length: variable; maximum length of numerical words to be operated upon by arithmetic unit is 12 digits and sign.</p> <p>Average speeds of following operations in milliseconds: add, 0.275; multiply, 0.200 plus 0.400 times the number of digits in multiplier; divide, 0.400 plus 0.800 times the number of fives in quotient; transfer, 0.275; compare, 0.275. For 12-digit words and the multiplier and quotient consisting of all fives, the multiply and divide operations would require 5.00 and 10.0 milliseconds respectively.</p>

DIANA

AUXILIARY EQUIPMENT

The auxiliary equipment that is recommended has been divided into two groups, A and B, dependent upon the input-output equipment used with the Diana.

	<i>Designation</i>	<i>Type</i>
A.	Spare Typewriter Adding Machine with Paper Tape Punches	Flexowriter
B.	Key Punch Sorter Reproducer Collator Line Printer (if none included in system)	} BTM or IBM

ADDITIONAL INFORMATION

Write to: Laboratory for Electronics
75 Pitts Street
Boston 14, Massachusetts

APPRAISAL

The Diana is a medium-size general purpose computer that was designed for accounting applications. No units have been installed, although the prototype is under construction.

The Diana has fast operating speeds and low access time together with a very large internal storage. It uses many low-speed drums in place of magnetic tapes. The access time for the information on the drums is much lower than for tapes. However, magnetic tape units generally cost less than drums for the same amount of storage.

The choice of input-output equipment is varied. Equipment using paper tape, punched cards as input media can be tied into the Diana; equipment using paper tape, punched cards or the printed page can be used for output. The number of input-output units that can be tied into the computer depends upon the number of buffer sectors each individual unit requires, and the limit of 60 such sectors that are available. For illustrative purposes (not describing any installation) the input-output units could be: 9 random access station typewriters, 9 cathode-

EQUIPMENT REPORT

ray tube viewers, 3 line printers, 2 card readers, 2 card punches, 3 paper tape readers, and 3 paper tape punches.

Since information throughout the system is decimal in form, no conversion is required for input-output. The editing of information for printed readable output is helped by a financial editing operation code.

Diana has the largest storage available, both high and low speed, of all computers in the medium-size range. There are three different kinds of storage: (a) magnetic core, zero access storage which provides for a maximum of 10,000 alphanumeric characters; (b) high-speed drum, revolving at 6,000 rpm, providing rapid access storage for 52,500 alphanumeric characters; (c) low-speed file drum units that provide storage for 61.8 million alphanumeric characters per unit. There will be available magnetic tape units of which the purpose will be to store the contents of the file drum units for safekeeping or to load a totally different program into its own large file drum storage through the computer. Up to ten units, that may be either low-speed file drum units or magnetic tape units, can be used.

The File Drum Units are used for the same purpose as magnetic tapes on other computers. The average random access time to any record on a file drum unit is 186 milliseconds whereas the average random access time to information stored on magnetic tape is of the order of several minutes. This means that the usual accounting input information (checks, bills, accounts to be posted, etc.) need not be sorted before being introduced into the computer.

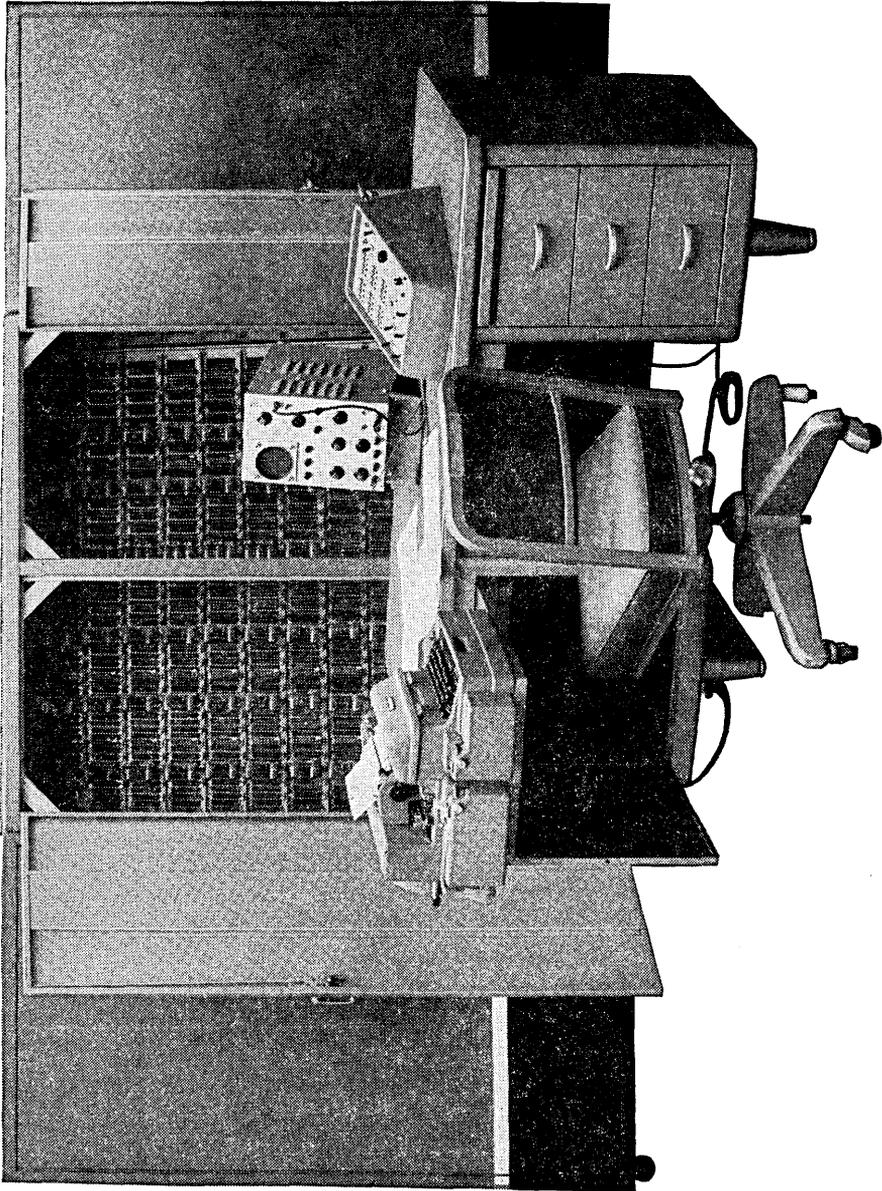
For a sorting operation, each track on a drum might be searched on a particular item for the lowest (actually it can be any arbitrary sequence) of the items on this track. This organizing time for 300 tracks on the drum would take two minutes. To print this information without an undue amount of editing and at the same time organizing the next items, the operation would proceed at the rate of 150 lines/minute (the speed of the printer) until all items had been organized and printed.

The reason capacities were given in characters, not words, is that the Diana has a variable word, block, and record length. It was designed specifically for business applications. The only limit placed on the word length applies to those numerical words that pass through the arithmetic unit; the maximum size for

DIANA

these words is 12 digits and algebraic sign. The only limit on the block and record length is that a block has 100 words, and a record has 10 blocks. The use of a variable length word saves storage space and eliminates the packing and unpacking of information. However, the use of a variable length word makes two features of fixed length word computers unavailable. These two features are the automatic floating decimal feature and index registers. However, the nature of the majority of business applications does not require floating point operation. Index registers would be used for automatic counting and address modification.

ALWAC III AND IIIE
Digital Computer Systems



ALWAC III AND IIIE

Digital Computer Systems

MANUFACTURER

Logistics Research, Inc.

BRIEF DESCRIPTION

A medium-size general purpose digital computer applicable to scientific and business problems. The Alwac III and IIIE use a numerical binary system with conversion between binary and decimal notation by programming or special devices. Alphabetic information may be processed by programming.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	punched paper tape, manual	punched cards, magnetic tapes
Output	punched paper tape, and typewriter	punched cards, magnetic tapes
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$60,000	
monthly rental	\$1,850	
Total Personnel	2	13
Storage Capacity	4224 words	5,128,000 words
Machine Floor Area	160 sq. ft.	

The above figures are exclusive of auxiliary equipment. Rental figures are based on single-shift operation. The minimum figures are for the basic Alwac III with the 4096-word drum storage and Flexowriter input-output. Maximum figures are for the Alwac IIIE (similar to the Alwac III but with an automatic address modification feature) with the 8192-word drum, 10 Flexowriter input-output stations, the punched card input-output option and a full complement of 16 magnetic tape units.

EQUIPMENT REPORT

APPLICATIONS

There are two installations of the Alwac III. The following are some of the applications:

Business

Statistical calculations
Accounting calculations

Scientific

Wind tunnel data reduction
Mass spectrometer computation
Thermodynamic calculations

COMPONENTS OF THE ALWAC III AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment. Rentals are for single-shift operation. Two-shift operation increases the single-shift costs by 50%; three-shift operation increases the single-shift costs by 100%. An option-to-buy clause of the rental contract permits application of 50% of paid rental to the purchase of installed equipment. The user's needs will determine which computer components he will require: the basic Alwac III (A) alone, or in combination with the additional storages (B) and/or additional input-output options (C).

<i>Component</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
A. Alwac III with 4096-word drum	\$60,000*	\$1,850*
Alwac IIIE (same as III but with automatic address modification)	68,000*	2,100*
B. Additional 4096 words of drum storage (must be included in original order)	7,000	250
Magnetic Tape Units (max. of 16), each	cost undetermined	
Tape Buffer Unit (only 1 required)	cost undetermined	
C. Punched card converter unit	24,000	750
Punched card input, IBM 523		60
Punched card output, IBM 523		60
Additional Flexowriter stations (max. of 10), each	cost undetermined	
Scanning unit for use with additional Flexowriters	cost undetermined	

*The cost of the basic Alwac includes the Flexowriter, control panel, diode tester and plug-in tester.

The hardware cost of a workable installation, exclusive of auxiliary equipment, ranges from \$60,000 to ——— plus \$120 monthly rental for the IBM equipment.

ALWAC III AND IIIE

PERSONNEL

Approximation of personnel required for single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>		
Methods	}	}		
Programmers			1	2
Operators (Alwac III)	}	}		
Operators (auxiliary)			1	1
Tape or card preparers			2	3
Maintenance		1		

The user's personnel may be trained to perform routine maintenance. A maintenance contract may be arranged with the manufacturer. Maintenance costs are in addition to either rental or purchase cost under such a contract.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses for training in operation, programming and maintenance are provided by the manufacturer.

Operation, programming, and maintenance manuals are provided.

PHYSICAL DATA

These approximate figures are based on the basic Alwac alone. No allowance is made for auxiliary equipment, personnel, storage of cards, tapes, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	160 sq. ft.	
Width		260"
Height		67"
Weight	2300 lbs.	
Air Temperature	50° F	80° F
Relative Humidity		80%
Heat Dissipation		

Air conditioning: not essential with minimum system. May be required for operator comfort.

Power: A 110 or 220-volt, 60-cycle, single-phase AC supply is required. The power dissipation of the minimum Alwac is 6 kva.

FIVE COMPONENTS OF THE ALWAC III SYSTEM

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<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Paper Tape Reader	Flexowriter	1	10	4G 180.1	9 decimal digits/second, programmed conversion, decimal to binary.
	Punched Card, Summary Punch	IBM 523	0	1	3D 380.4	100 80-column cards/minute; maximum of 133 decimal digits/second, automatic conversion, decimal to binary.
	Magnetic Tape Unit		0	16		10,000 decimal digits/second; 5,000 characters/second.
	Manual	Flexowriter	1	10		Flexowriter keyboard.
Output	Punched Paper Tape and Typewriter	Flexowriter	1	10	4G 180.1	9 decimal digits/second, programmed conversion, binary to decimal.
	Punched Card, Summary Punch	IBM 523	0	1	3D 380.4	100 80-column cards/minute; maximum of 133 decimal digits/second, automatic conversion, binary to decimal.
	Magnetic Tape Unit		0	16		10,000 decimal digits/second; 5,000 characters/second.
Storage	Magnetic Drum		1	1		Capacity: 4096 or 8192 fixed length words (32 binary digits and sign), plus 160 words of high-speed storage. Average access time: .5 milliseconds from high-speed storage. Information must be transferred in blocks from main to high-speed storage to be made available for processing. Size: 7½" diameter, — inches long. 32 or 64 channels. Speed: 3500 rpm.
	Magnetic Tape Unit		0	16		320,000 words/tape.

Control	Arithmetic Unit		1	1		Built-in circuitry.
	Manual					Manual, by switch setting on control panel.
	Tape Buffer		0	1		Controls up to 16 tapes. Required only if at least one tape unit is in system.
	Punched Card Converter		0	1		Controls one IBM summary punch for input and one IBM summary punch for output; contains circuits to convert information between binary and decimal number systems.
Arithmetic Unit	<p>Four high-speed recirculating registers on drum:</p> <p>A register: 32 binary digits and sign; accumulator.</p> <p>B register: 32 binary digits; extension of A register. (A and B combine to hold product when multiplying or dividing for division.)</p> <p>D register: 32 binary digits and sign; multiplier or divisor.</p> <p>E register: 32 binary digits and sign; multiplicand or quotient.</p> <p>Alwac IIIIE contains indexing (automatic address modification) register to increase flexibility of programming.</p> <p>Single address system; instruction word is half length word containing operation code and address.</p>					<p>There are 26 arithmetic, 44 transfer and 9 logical operation codes plus several additional for use with tape and the index register.</p> <p>Notation: binary.</p> <p>Arithmetic mode: serial.</p> <p>Negative notation: absolute value and sign.</p> <p>Zero representation: + or — 000....000.</p> <p>Average speeds for the following operations are in milliseconds: add, 1; multiply, 17; divide, 17; transfer, 1; compare, 1. (Optimum coding using high-speed storage. Execution times of multiplication and division are independent of magnitude of numbers involved.)</p>

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment required and recommended has been divided into groups A and B, depending on the input-output equipment used with the Alwac.

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required			
B.	1 Key Punch	IBM 024, 026	1A 380.1
	1 Sorter	IBM 083	4A 380.4
	1 Reproducing Punch	IBM 514, 519	3D 380
	1 Tabulator	IBM 400 series	4B 380
Recommended			
A.	1 Spare Flexowriter		4G 180.1
B.	1 Collator	IBM 089	4A 380.2
	1 Verifier	IBM 056	1C 380.1

ADDITIONAL INFORMATION

Write to: Public Relations Department
Logistics Research, Inc.
P. O. Box 431
141 S. Pacific Avenue
Redondo Beach, Calif.

APPRAISAL

The Alwac III (and IIIE) is a medium-size general purpose digital computer primarily for scientific applications but with some applicability to business problems. The use of up to nine additional Flexowriter input-output stations at relatively remote locations will permit efficient use of computer time in many installations. At points where long computations may be conveniently interrupted the machine through an intermediate scanning device may process shorter problems that may have been set up on one of the additional Flexowriters. This process would eliminate the delays often found when extensive problems are being processed and would eliminate the physical transportation of information to the computing center and the delivery of printed copy to the problem originator.

The storage capacity of the Alwac drum is good. Addition of magnetic tape units to the system increases its versatility and

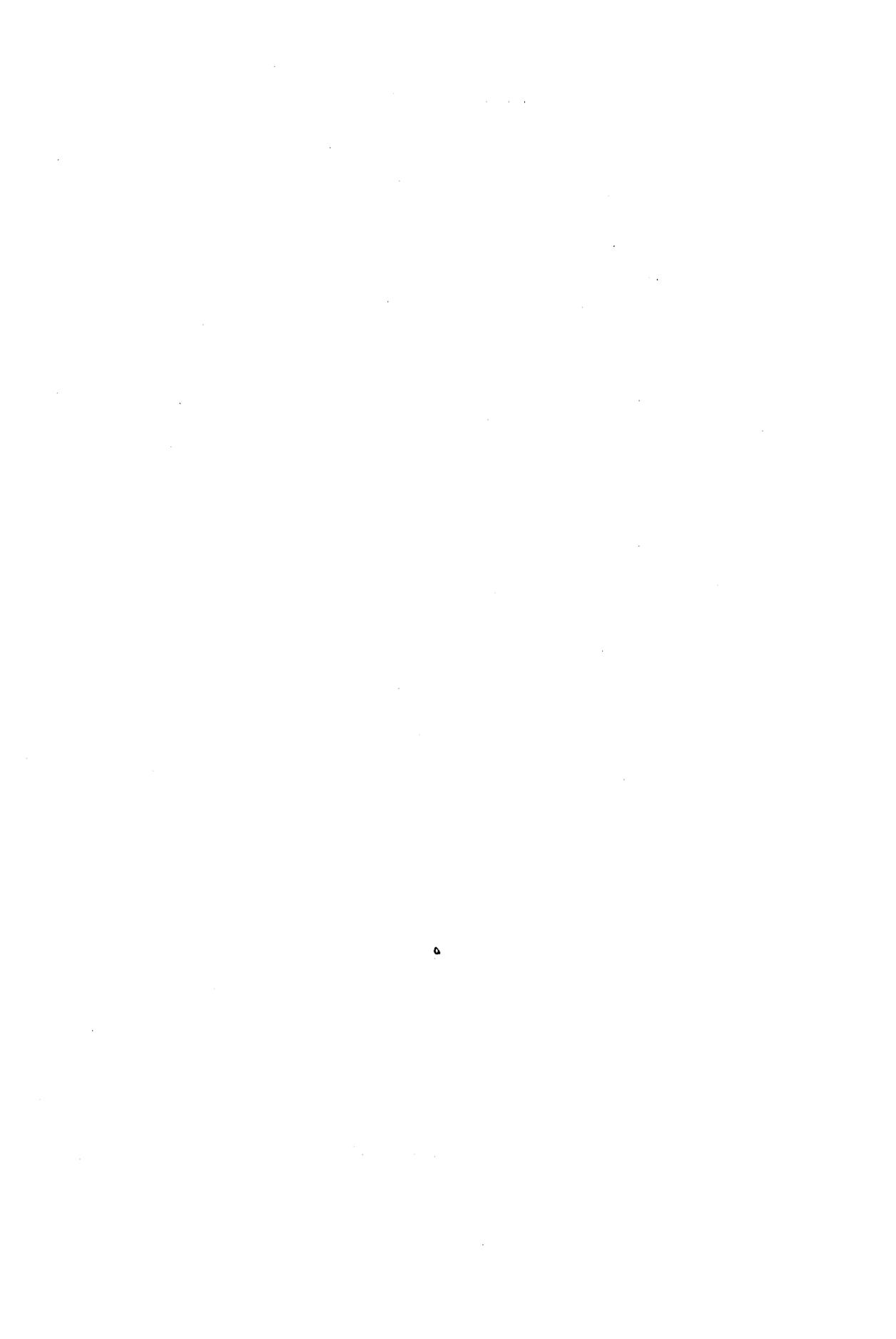
ALWAC III AND IIIE

capacity. Routine maintenance is relatively simple and can be performed by the user.

The Alwac IIIE with an index register extends the system's versatility and will probably be more widely used than the Alwac III. The Alwac III and IIIE share the limitation of all computers of the drum type—they are significantly slower in operation than the machines using electrostatic or core internal storage. Also, since magnetic tape operation is inherently slow, search of tapes for a particular item of information is inefficient despite the facts that the Alwac tape units contain addressable information and operate at high speeds independent of the computer. Although the rate of input and output via punched cards is comparable to other medium-sized computers, the Alwac has no high-speed paper tape devices or a high-speed line printer. Both of these points detract from the machine's usefulness in business applications.

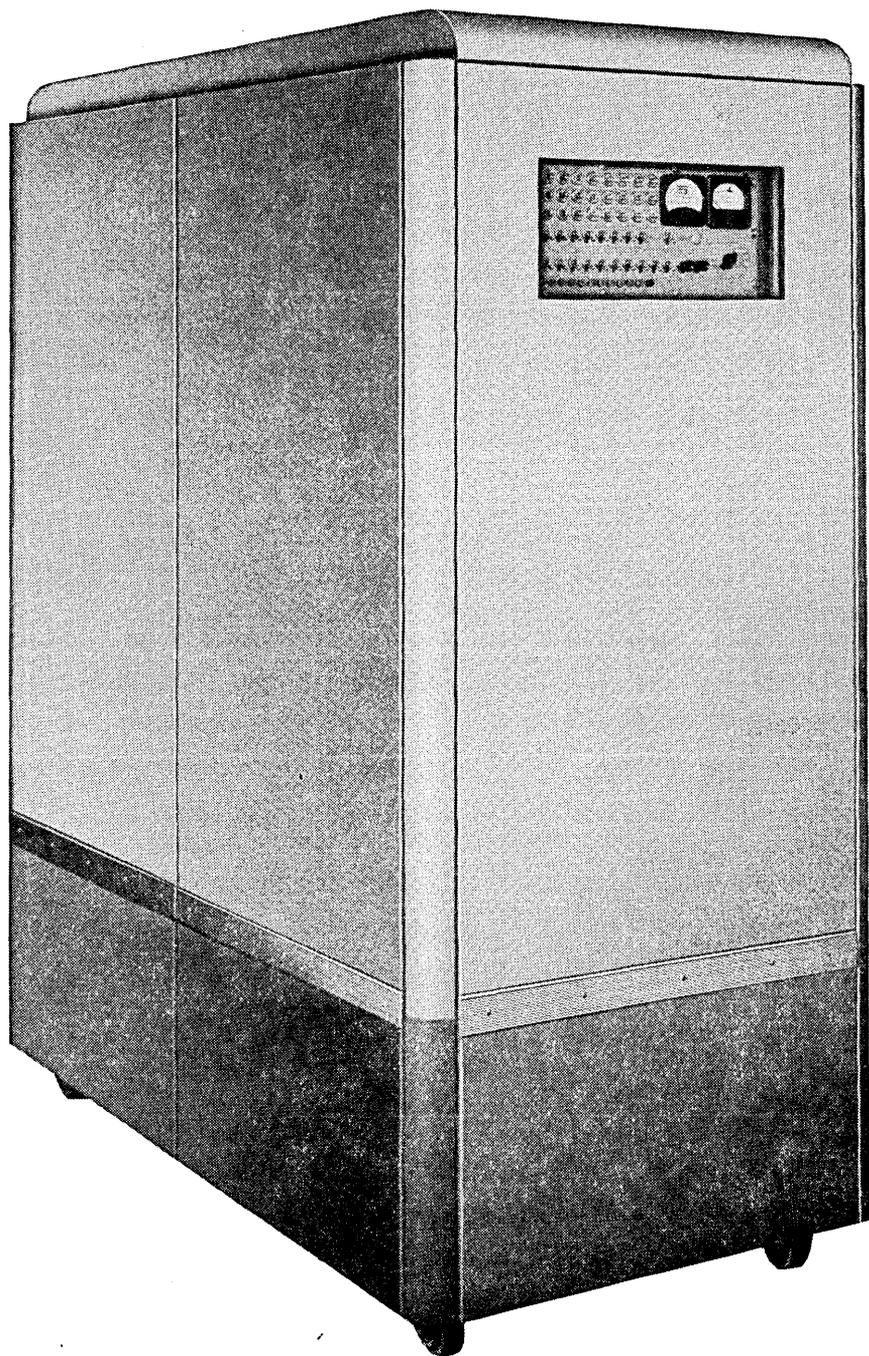
The punched card and magnetic tape options help alleviate these drawbacks. The conversion between the binary notation used internally by the machine and the common decimal system is performed automatically by the punched card converter but must be programmed when the paper tape input-output devices are used. Programmed conversion for independent magnetic tape to card or printer operation will be required.

Finally, the high-speed storage of the Alwac is used as an input-output buffer. At the same time, since communication between the working registers and the main drum storage is prohibited, the high-speed storage must contain all instructions and data to be processed. This dual use of the high-speed storage increases processing times, particularly for those applications requiring many input-output operations.



NATIONAL 102-D

Computing System



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NATIONAL 102-D

Computing System

MANUFACTURER

The National Cash Register Company

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to business or scientific problems. The National 102-D uses a decimal system, and can process numerical and alphabetic data for input-output.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	punched paper tape, manual	magnetic tapes, punched cards
Output	punched paper tape and typewriter	magnetic tapes, punched cards
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$99,500	\$256,300 + \$130 mo. rental
Total Personnel	2	information not released
Storage Capacity	1032 words	806,032 words
Machine Floor Area	80 sq. ft.	240 sq. ft.

EQUIPMENT REPORT

The above figures are based on one-shift operation, exclusive of auxiliary equipment. The minimum figures are values for the basic National 102-D which is composed of: the computer unit containing the magnetic drum, the calculating and power units; the control console with the typewriter for input-output and for additional control. Maximum storage figures include the use of seven tape units.

APPLICATIONS

There are two installations of the National 102-D. The following are a few of the possible applications:

Business

- Payroll processing
- Labor distribution
- Material and inventory control
- Department store sales and inventories
- Cost accounting

Scientific

- Missile evaluation
- Flight test and wind tunnel data reduction
- Geophysical data reduction

NATIONAL 102-D

COMPONENTS OF THE NATIONAL 102-D SYSTEM AND APPROXIMATE COST

The following purchase costs do not include maintenance, service, installation or auxiliary equipment costs. The installation charge is a maximum of \$3330, dependent upon the location and size of the installation. Maintenance is included in rental costs, and supplied to purchasers of equipment by contract. Rental prices are available from the manufacturer only. The user's needs determine which computer components he will require: the basic 102-D (A) alone, or in combination with the additional storage (B) and/or additional input-output (C).

<i>Components</i>	<i>Purchase</i>	<i>Mo. Rental</i>	
A. National 102-D with 1032-word drum, console, and Flexowriter	\$99,500	} available from mfr. only	
B. Magnetic tape units (maximum of 7), each	19,500		
C. 2 additional paper tape readers, and punch and typewriter, Flexowriter, each	2,900		
Paper tape reader (high-speed)	9,500		
Paper tape punch (high-speed)	5,000		
Punched card reader, IBM 523			\$60 to \$65
Punched card output, IBM 523			\$60 to \$65

The minimum hardware cost of a workable installation, exclusive of auxiliary equipment is \$99,500; and the maximum is \$256,300 plus the IBM single-shift monthly rental of \$130.

EQUIPMENT REPORT

PERSONNEL

Approximation of personnel required for single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	} 1	} Information not yet released by National to this service
Programmers		
Operators (102-D)	} 1	
Operators (auxiliary)		
Tape Preparers or Key Punch Operators	1	
Maintenance	1	

Maintenance included in rental. When purchased, maintenance contracts are available.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming courses are provided by the manufacturer for purchasers of equipment.

The programming and operating manual is available to the user.

NATIONAL 102-D

PHYSICAL DATA

These approximate figures are based on the National 102-D system alone. No allowance is made for auxiliary equipment, personnel, storage of cards, tapes, etc.

Space: minimum, 80 sq. ft.; maximum, 240 sq. ft.

Width: 59", maximum.

Height: 73", maximum.

Weight: minimum, 1975 lbs.; maximum, 6430 lbs.

Air temperature: minimum, 32° F.; maximum, 90° F.

Relative humidity: not reported to this service.

Heat dissipation: 23,500 BTU/hr. for the basic system.

Air conditioning: adequate ventilation and/or air conditioning necessary if air temperature will be greater than 90° F.

Power: for the basic 102-D, 230 plus or minus 5% volts, single-phase, 57-63 cycles/second, 59 amperes, is required. The power dissipation is 7.7 kva, with an operating power factor of 71%.

FIVE COMPONENTS OF THE NATIONAL 102-D SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Punched Tape Reader	Flexowriter	1	1	4G 180.1	10 decimal digits/second.
		National 160	0	1		200 characters/second (no further information available from National at this time).
	Punched Card Reader Summary Punch	IBM 523	0	1	4G 380.4	Maximum of 100 40-column cards/minute; maximum of 66 characters/second.
	Magnetic Tape Unit	National 126	0	7	4G 540.1	600 decimal digits/second or 360 characters/second.
	Console (manual)	National 102-D	1	1		
Output	Punched Tape and Typewriter	Flexowriter	1	3	4G 180.1	10 decimal digits/second.
	Punched Tape	National 170	0	1		60 characters/second (no further information available from National at this time).
	Punched Card Summary Punch	IBM 523	0	1	4G 380.4	Maximum of 100 40-column cards/minute; maximum of 66 characters/second.
	Magnetic Tape Unit	National 126	0	7	4G 540.1	600 decimal digits/second, or 360 alphabetic characters/second.

Storage	Magnetic Drum	National 102-D	1	1		Capacity: 1,032 fixed length words (9 decimal digits and sign). Average access time: 8.3 milliseconds/word (main storage); 1.5 milliseconds/word (8 word, high-speed storage). Size: 12" diameter, 6" long; 17 channels in main storage. Speed: 2,400 rpm.
	Magnetic Tape Unit	National 126	0	7	4G 540.1	115,000 words/1,200 ft. reel.
Control	ALU and Console	National 102-D	1	1		ALU: built-in circuitry for control of the components. Console: manual control by the setting of switches.
Arithmetic Unit	<p>4 one-word, recirculating registers. E, F, G, and H for arithmetic and control functions; only register G is addressable. An instruction is one word containing the operation code and three addresses (14 octal digits). There are 8 arithmetic and transfer, 8 logical and transfer, and 2 transfer operation codes. There are in addition a stop code and input-output codes for optional equipment. Computation is possible during tape searching but not during input-output operations.</p>				<p>Notation: binary coded decimal. Arithmetic mode: serial. Negative number representation: not reported to this service. Zero representation: not reported to this service. Average speeds for the following operations are in milliseconds: add, 8.2; multiply round, 46.4; divide round, 49.2; compare, 7.8; transfer, 10.6.</p>	

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required		
Spare Flexowriter		4G 180.1
National Accounting Machines	National Class 2000	
If punched card input-output is used		
1 Key Punch	IBM 024	1A 380.1
1 Sorter	IBM 083	4A 380.4
1 Reproducer	IBM 500's	3D 380
1 Accounting Machine	IBM 400's	4B 380
Recommended		
1 Collator	IBM 077 or 089	4A 380
1 Verifier		1C 380.1
	IBM 056	

ADDITIONAL INFORMATION

Write to: Accounting & Electronic Machine Sales
National Cash Register Company
Dayton 9, Ohio

APPRAISAL

The National 102-D is a medium-size computer system for business, scientific or combined business-scientific data processing. As with all computers of the drum type, it has a comparatively slow operating speed and high access time as compared with machines having delay line or core internal storage. However, the access time for a block of data on magnetic tape is relatively fast on this machine, since each block of data in two sections of eight words each has an individual address and tape searching can be performed independently of other computer operations.

The magnetic drum storage locations on this machine were well placed for minimal latency coding. Since the storage locations on the drum are alternately numbered, i. e., each successive storage location is one-half a drum revolution apart, it is possi-

NATIONAL 102-D

ble to execute an instruction within one-half a drum revolution so that the least amount of time elapses between operations.

However, several drawbacks may be found in the programming of applications for this computer. First, since an instruction consists of 14 octal digits, any modification of these instructions must be programmed in the octal number system. Input-output data is in decimal form; but any internal programmed editing of this data, such as shifting or extracting for readable printed output, must be done in the binary and octal number systems. Since the programmer must make use of the three number systems, the program is more liable to errors and program preparation will be slower in the actual coding of the problem and in the debugging of the program. Second, printed output must be readable and many times suitable to be printed onto forms. However, any data to be printed in a readable form must be edited by an editing program that may be a library routine, but in some cases will be peculiar to applications. The time spent in programming the problem and in processing it on the computer consequently is longer.

The input-output speeds of this computer do not compare well with the speeds of other medium-sized computers. While the National 102-D's magnetic tape word capacity is equal to or less than the magnetic tape word capacity of other medium-sized computers, the read-write speed of this medium in decimal digits per second is $\frac{1}{3}$ to $\frac{1}{25}$ slower than those speeds of other medium-sized computers. The rate of reading and punching IBM cards of 40 columns or less is equal to that of other computers of comparable size, while the rate of greater than 40 columns is one-half.

The choice of input-output equipment makes this computer system compatible with already established data-handling systems using paper tape and/or punched cards.

NATIONAL 303

General Purpose Computer

NOT AVAILABLE

This machine is not available, only an experimental model was designed. It was never produced for sale.

NATIONAL 304
Electronic Data Processing System

August, 1956

NATIONAL 304

Electronic Data Processing System

MANUFACTURER

The National Cash Register Company

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to business problems. The National 304 uses an alphanumeric system.

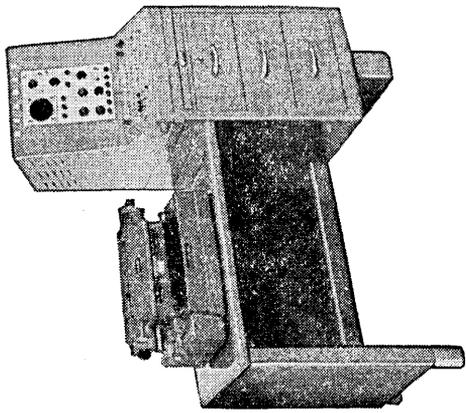
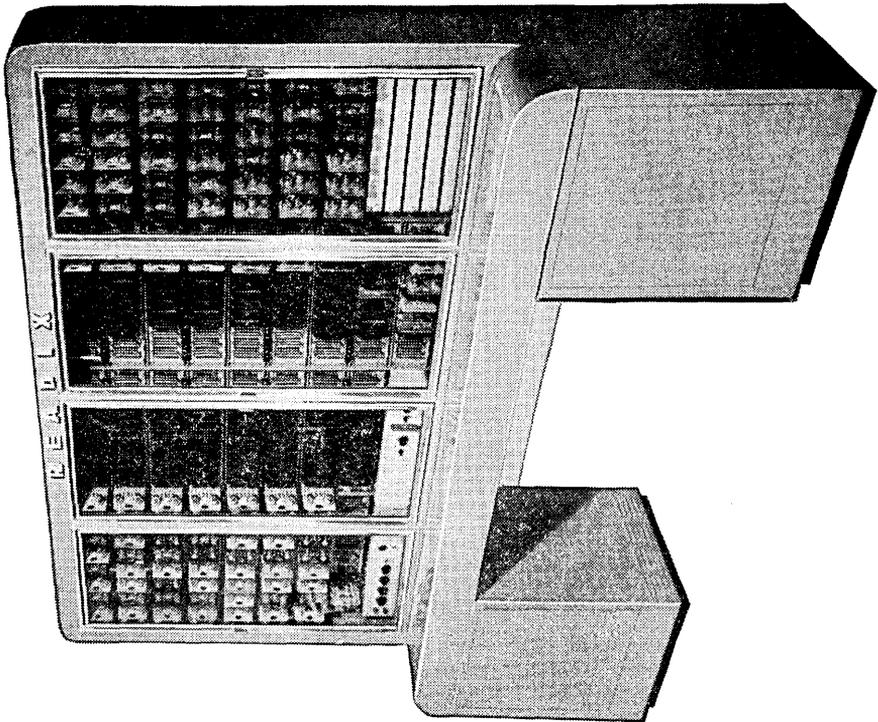
This computer is under development and is not yet available.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	2,000 words magnetic core	4,000 words magnetic core
Input	punched paper tape	punched cards, magnetic tape
Output	punched paper tape, typewriter	punched cards, magnetic tape, line printer

READIX

General Purpose Computer



READIX

General Purpose Computer

MANUFACTURER

J. B. Rea Company

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to scientific or business problems. The Readix uses a numerical, decimal system and can process alphabetic information. The Readix has built-in automatic floating point operation as well as fixed point.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	punched paper tape, manual	magnetic tapes, punched cards
Output	punched paper tape and typewriter	magnetic tapes, punched cards, plotter
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$79,000	\$208,400 + \$920 mo. rental
rental (mo.)	\$2,875	\$8,528
Total Personnel	3	12
Storage Capacity	4160 words	504,100 words
Machine Floor Area	100 sq. ft.	230 sq. ft.

EQUIPMENT REPORT

The above figures are based on one-shift operation, exclusive of auxiliary equipment. The minimum figures are values for the basic Readix machine which is composed of: the console unit containing the Flexowriter input-output and oscilloscope; the computer unit; and the power supply unit. The maximum figures include the use of 10 tape units, a digital point plotter, and provision for simultaneous IBM input and output.

APPLICATIONS

There are about two installations of the Readix. The following are a few of the applications:

Business

- Payroll
- Utility billing
- Production and inventory control
- Linear programming

Scientific

- Aircraft performance calculations
- Flight test data processing
- Missile trajectory
- Cine-theodolite data reduction
- Optical ray tracing
- Hyper and supersonic nozzle design

READIX

COMPONENTS OF THE READIX AND APPROXIMATE COST

The following prices and rentals are for single-shift operation exclusive of the cost of the auxiliary machines. Maintenance is included in rental and by contract to purchasers. The user's need will determine which computer components he will require: the basic Readix (A) alone, or in combination with magnetic tape units (B) and/or the additional output (C).

<i>Components</i>	<i>Purchase</i>	<i>Monthly Rental</i>
A. Readix and Flexowriter and fixed and floating point operation	\$79,000	\$2,875
B. Magnetic Tape Unit (maximum of 10), each	10,300	377
C. Paper Tape Reader, high-speed Ferranti	Prices not yet established	
Digital Point Plotter	4,800	175
Punched-Card Converter Unit (one may be used for either input or output, two required for simultaneous input and output)	10,800	394
Punched Card Input IBM 523		60
Punched Card Output IBM 523		60
Line Printer IBM 407		800

The minimum cost of a workable installation, exclusive of auxiliary equipment, for single-shift operation is \$79,000; the maximum is \$208,400 plus IBM monthly rental of \$920. The maximum figures include the use of 10 magnetic tape units, 2 IBM 523s, a digital point plotter and an IBM 407 line printer.

EQUIPMENT REPORT

PERSONNEL

Approximation of the personnel required for single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods		2
Programmers	1	3
Operators (Readix)	1	1
Operators (auxiliary)		2
Tape Preparers or Key Punch Operators	1	3
Maintenance	1	1

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming, operating, and maintenance manuals are available for purchasers of the Readix system. Training and maintenance courses are included in the cost of the equipment.

READIX

PHYSICAL DATA

These approximate figures are based on the Readix system alone. No allowance is made for auxiliary equipment, personnel, storage of cards, tapes, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	100 sq. ft.	230 sq. ft.
Width		86.5"
Height		85"
Weight	1400 lbs.	3450 lbs.
Air Temperature	40° F.	95° F.
Relative Humidity		95%
Heat Dissipation		15,000 BTU/hr.

Internal blower with filtered input. No external air conditioning under normal ambient conditions.

Power: For basic Readix, 110 volt, single-phase, 60 ampere, 60 cycle, AC supply is required. The power dissipation is 5.68 kw and the power factor is 90%.

FIVE COMPONENTS OF THE READIX SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Punched Tape Reader	Flexowriter	1	1	4G 180.1	10 characters/second.
		Ferranti	0	1	4G 270.1	Photo-electric paper tape reader.
	Read-Punch Unit	IBM 523	0	1	4G 380.4	100 80-column cards/minute; maximum of 133 characters/second.
	Magnetic Tape Unit	Potter	0	10	4G 655.1	500 characters/second.
Output	Punched Tape and Typewriter	Flexowriter	1	1	4G 180.1	10 characters/second.
	Read-Punch Unit	IBM 523	0	1	4G 380.4	100 80-column cards/minute; maximum of 133 characters/second.
	Digital Point Plotter	Librascope	0	1	5C 475.1	1 plot/second.
	Line Printer	IBM 400's	0	1	4B 380	150 lines/minute; 120 characters/line using IBM 407.
	Magnetic Tape Unit	Potter	0	10	4G 655.1	500 characters/second.
Storage	Magnetic Drum	Readix	1	1		Capacity: 4160 fixed-length words (10 digits and sign). Average access time: in main memory 9 millise./word, in high-speed 4.5 millise./word. Size: 7" diameter, 11" long. Speed: 3,450 rpm.

	Magnetic Tape Unit	Potter	0	10	4G 655.1	Capacity: 1,000,000 decimal digits/ 1200 ft. reel.
Control	ALU and Console	Readix	1	1		Console: manual control by setting of switches and by use of Flexo- writer keys. ALU: built-in circuitry for control of the components.
Arithmetic Unit	Accumulator: S register (10 digits and sign). S-T register (20 digits and sign). T register: 10 digits and sign; multiplier. U register: 10 digits and sign; multiplier, divisor. V register: 10 digits and sign; address modifier. Control register. There are 14 arithmetic, 18 transfer, and 10 logical operation codes. In addition there are some special attachment codes. The Readix can continue to com- pute during the output cycle only.			Notation: binary coded decimal. Arithmetic mode: serial. Negative number representation: absolute value and sign. Zero representation: plus or minus 0000000000. Average speeds (excluding memory access) of the fol- lowing operations in milliseconds: add, 1; multiply, 16; divide, 24; transfer, 4.5; compare, 1.		

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment, required or recommended, has been divided into groups A, B, dependent upon the input-output equipment used with the Readix.

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required			
A.	Flexowriter		4G 180.1
B.	1 Key Punch	IBM 024	1A 380.1
	1 Sorter	IBM 083	4A 380.4
	1 Reproducer	IBM 500's	3D 380
	1 Accounting Machine	IBM 400's	4B 380
Recommended			
B.	1 Collator	IBM 089	4A 380.2
	1 Verifier	IBM 056	1C 380.1

ADDITIONAL INFORMATION

Write to: Customer Relations
J. B. Rea Company
1723 Cloverfield Blvd.
Santa Monica, Calif.

PRELIMINARY REPORT ON THE READIX

With the information currently available the following features and characteristics of the Readix are noted:

The Readix is a medium-size computer for scientific, business or combined scientific-business use. Since information throughout the system is in decimal form, no conversion is required for input or output. Many choices of low and high-speed, input and output equipment permit integration of this computer with a scientific or business installation that already has some automatic data handling equipment and processes. Of special interest is the Rea analogue to digital converter which will convert voltages, say from recording instruments, into coded impulses on magnetic tape that may be used with the Readix. The addressable magnetic tape provides relatively rapid random access to secondary storage.

READIX

The Automatic Floating Point operation is an extremely important addition to the Readix system, especially for scientific applications. This addition eliminates the need for storage of floating point sub-routines on the drum and thus effectively increases the amount of storage on the drum available to the programmer. Because this device is used in conjunction with the regular arithmetic unit, both fixed and floating point operations may be used in the same program.

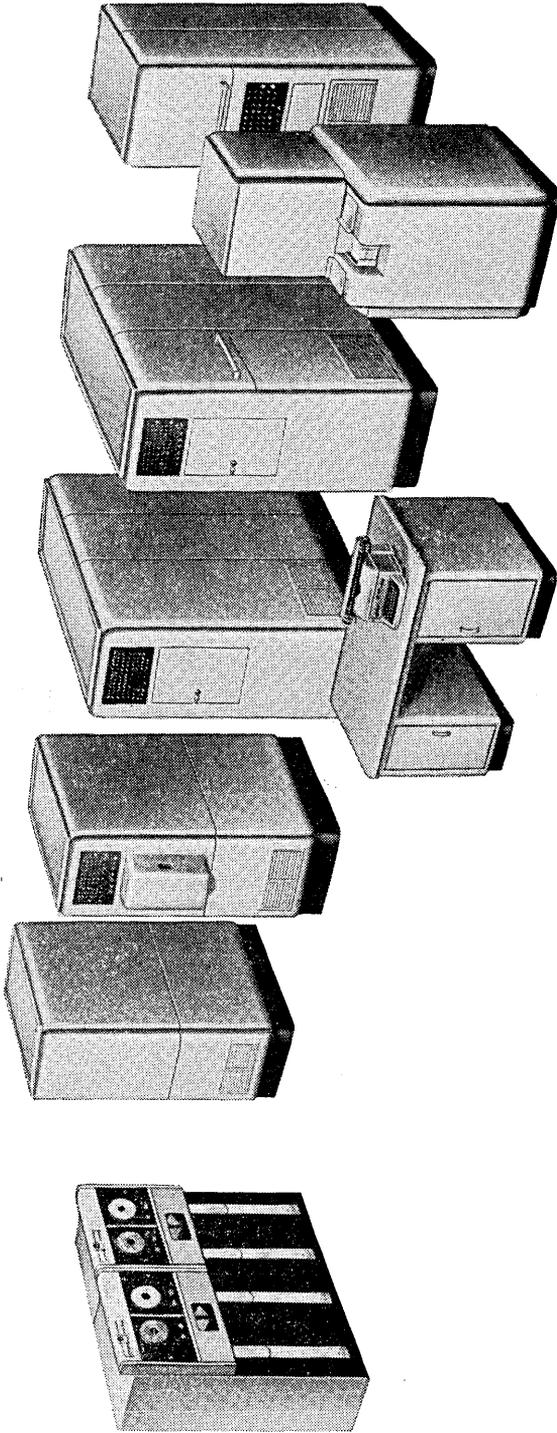
The magnetic drum on the Readix, 4000 words of main memory and 160 words of rapid access, is well designed for minimal latency coding. This is accomplished by the internal counter that determines the address of the next instruction by skipping every other word.

However, there are several features which detract from the above advantages. First, as with all computers of the drum type, it has slow operating speeds and relatively high access time as compared with machines having electrostatic or core internal storage. The rapid access time, 4.5 milliseconds, of the Readix is slow when compared with the rapid access time of most other medium size computers. Second, Flexowriter output, that must be readable and many times suitable to be printed on forms, requires an editing program which takes extra programming and computer time. Third, the addressable magnetic tape may make inefficient use of the tape space.

For the purposes for which it has been designed (mainly scientific and combined scientific-business problems) the Readix may provide an adequate solution at relatively low cost.

UNIVAC FILE COMPUTER

Model O



October, 1956

UNIVAC FILE COMPUTER

Model O

MANUFACTURER

Remington Rand Univac Division

BRIEF DESCRIPTION

A medium-scale general purpose digital computer, designed for business problems. The Univac File Computer can process numerical decimal information, alphabetic characters and any typewriter keyboard characters.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	manual, punched cards	punched paper tape, magnetic tapes
Output	typewriter, punched cards	punched paper tape, magnetic tapes, adding machine, line printer
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$222,000	\$536,590
monthly rental	3,700	8,950
Total Personnel	5	13
Storage Capacity	180,600 characters	7,800,600 characters
Machine Floor Area	600 sq. ft.	900 sq. ft.

The above figures are based on single-shift operation, exclusive of auxiliary equipment. The minimum figures are for the

EQUIPMENT REPORT

basic workable Model O File Computer consisting of: the computer with 50 words of storage, multiplex control and 48 steps; a large capacity file drum and a typewriter input-output unit with paper tape reader and perforator; the maximum figures include: The Model O File Computer, 4 magnetic tape units, 5 magnetic drums, a typewriter and a card sensing and punching unit.

APPLICATIONS

There are 5 installations of the Model O File Computer. The following are a few of the applications:

Business

- Inventory and production control
- Public utility billing
- Payroll and labor accounting
- Statistical analysis
- Production control
- Checking accounts
- Brokerage accounting
- Freight manifesting

COMPONENTS OF THE UNIVAC FILE COMPUTER AND APPROXIMATE COST

The following costs are exclusive of the costs of auxiliary machines. The monthly rentals are for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases single-shift rental by 50%; 120-hour week, three-shift operation increases single-shift rental by 100%. The user's needs will determine which computer components he will require: the basic File Computer (A) alone, or in combination with the additional storages (B) and/or the various optional input-output (C).

UNIVAC FILE COMPUTER

<i>Components</i>	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
A. Basic File Computer Model O with 50 word high-speed magnetic drum and multiplex control	\$147,000	\$2,450
B. First additional magnetic drum and control circuitry (180,000 characters)	51,000	850
Additional magnetic drums ordered singularly (each)	30,000	500
Additional magnetic drums ordered in pairs (two)	54,000	900
C. 90-column card sensing and punching unit	62,590	1,050
80-column card sensing and punching unit	62,590	1,050
Magnetic tape unit	36,000	600
Typewriter Input-Output with Paper Tape Reader (20 characters/second)	24,000	400
Paper Tape Punch (20 characters/second)		
10-key Inquiry Keyboard Input-Output with Paper Tape Punch (20 digits/second)	24,000	400
Line Printer	120,000	2,000
Paper Tape Reader (20 characters/second)	•	•
Paper Tape Reader (200 characters/second)	•	•
Paper Tape Punch (20 characters/second)	•	•
Paper Tape Punch (60 characters/second)	•	•
90-column Key Punch	•	•

* Prices not available

The minimum hardware cost of a workable installation exclusive of auxiliary equipment is \$222,000. The maximum cost is \$536,590 and includes the Model O File Computer, 4 magnetic tape units, 5 magnetic drums, a typewriter and a card sensing and punching unit.

EQUIPMENT REPORT

PERSONNEL

Approximation of personnel required for single-shift operation.

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	1	1
Programmers	1	2
Operators (File Computer)	1	1
Operators (Auxiliary)	1	3
Tape preparers or card punch operators	1	4
Maintenance	1	2

Maintenance is included in the rental. Maintenance contracts are available to purchasers.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

A 5-week programming and operating course is provided by the manufacturer at no additional cost.

Programming, operating and maintenance manuals are available to the user.

PHYSICAL DATA

These approximate figures are based on the Model O File Computer system alone. No allowance is made for auxiliary equipment, personnel, storage of cards, tapes, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	600 sq. ft.	900 sq. ft.
Width		79"
Height		71"
Floor Loading Factor		165 lbs/sq. ft.
Air Temperature		90° F
Relative Humidity *		40% to 60%
Heat Dissipation	54,540 BTU/hr,	for basic system

* Using mylar tape.

Air conditioning: Generally necessary for the basic system.

Power: For the basic system, 208, 220, 240 volt, three phase, four-wire 60 cps, or 208, 220, 240, single-phase, three-wire, 60 cps, AC power supply is required. The power dissipation is 17.2 kva, with an operating power factor of 90%.

FIVE COMPONENTS OF THE MODEL O FILE COMPUTER SYSTEM

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Paper Tape Reader		0	8 *		20 characters/second; codes available: 5 channel Teletype, 6 channel Flexowriter, or 7 channel Univac.
			0	8 *		200 characters/second; codes available: 5 channel Teletype, 6 channel Flexowriter, or 7 channel Univac.
	Punched Card Input-Output Unit	Card Sensing and Punching Unit—90 column	0	8 *		150 90-column cards/minute; maximum 225 characters/second; 120 characters of magnetic core buffer storage.
		Card Sensing and Punching Unit—80 column	0	8 *		150 80-column cards/minute; 200 characters/second, using one feed for reading and another for punching; 100 80-column cards/minute; 133 characters/second, using same feed for reading and punching; 120 characters of magnetic core buffer storage.
	Magnetic Tape Unit		0	8 *		7,680 characters/second for metallic tape; 9,600 characters/second for plastic tape; 120 characters of magnetic core buffer storage.
	Adding Machine	10-Key Keyboard Printer	0	8 *		11 digits and sign.
Typewriter		0	8 *			

* The total number of input-output units may not exceed 8.

Continued on Next Page

FIVE COMPONENTS OF THE MODEL O FILE COMPUTER SYSTEM—Cont.

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Mini- mum</i>	<i>Maxi- mum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Output	Paper Tape Punch		0	8 *		20 characters/second; codes available: 5 channel Teletype, 6 channel Flexowriter or 7 channel Univac.
			0	8 *		60 characters/second; codes available: 5 channel Teletype, 6 channel Flexowriter or 7 channel Univac.
	Magnetic Tape Unit		0	8 *		7,680 characters/second for metallic tape; 9,600 characters/second for plastic tape; 120 characters of magnetic core buffer storage.
	Adding Machine		0	8 *		180 lines/minute; 11 digits and sign/line; maximum of 33 digits and 3 signs/second; 12 characters of magnetic core buffer storage.
	Typewriter		0	8 *		10 characters/second.
Line Printer	High Speed Printer		0	8 *		300 lines/minute; 130 characters/line; maximum of 650 characters/second; 120 characters of magnetic core buffer storage.

Storage	Magnetic Drum	High Speed Drum	1	1	Capacity: 50 words; 12 characters/word, the least significant position is used for sign. Average access time: 2.5 milliseconds. Size: 4 $\frac{3}{8}$ " diameter, 15" long. Speed: 12,000 rpm.
		High Capacity Drum	0	10	
	Magnetic Tape Unit	0	8 *	1,200,000 characters/1,500 ft. of metallic tape.	
			0	8 *	2,640,000 characters/3,600 ft. of plastic tape.
Control	Arithmetic Unit Manual Multiplex	File Computer	1	1	Built-in circuitry. Manual by switch setting. Connects up to 8 input or output devices, one at a time to the computer.
		Control Unit	1	1	
		File Computer	1	1	

* The total number of input-output units may not exceed 8.

Continued on Next Page

FIVE COMPONENTS OF THE MODEL O FILE COMPUTER SYSTEM—Cont.

<p>Arithmetic Unit</p>	<p>Arithmetic Unit contains 4, 12-digit (including sign) registers:</p> <p>A register: addend, subtrahend, multiplicand, dividend. B register: augend, minuend, multiplier, divisor. C register: product, remainder. D register: sum, difference, product, quotient.</p> <p>Computation is possible during input-output operations. A maximum of 48 3-address instruction steps is available to the programmer. This figure does not include the inter-step functions possible via control-panel wiring. The 48 instructions represent some sequence of the following 14 operation codes: add, subtract, multiply, divide, transfer, compare, channel search equal, channel search unequal, left zero elimination, right shift, left shift, read, write and masking transfer.</p> <p>Inter-step functions include branch, input-output control and selector operations.</p>	<p>Notation: excess three binary coded decimal. Arithmetic mode: serial. Negative number representation: absolute value and sign. Zero representation: $\pm 000\ 0000\ 0000$. Word length: maximum length of numerical words to be operated upon by arithmetic unit is 11 digits and sign.</p> <p>Average speeds for the following operations are in milliseconds: add, 4.894; multiply, 36.944; divide, 53.484; transfer, 0.504; compare, 0.67.</p>
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UNIVAC FILE COMPUTER

AUXILIARY OPERATION

Equipment for the independent off-line operations of card-to-magnetic tape and magnetic tape-to-card conversion, direct magnetic tape preparation and printing is listed under the Functional Units of the Univac I (Equip. Rpt. Ref. 4E 660.1). This auxiliary equipment is completely compatible with the Univac Scientific Model 1103 Computer. The need for this equipment will depend on the applications of the particular installation. For further information on this equipment see Remington Rand punched card and punched paper tape equipment such as card punches, paper tape-to-punched card converters, tape perforators, etc.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
1902 West Minnehaha Avenue
St. Paul W4, Minnesota

APPRAISAL

The Model O File Computer is a medium-scale general purpose digital computer designed for commercial data processing. It is modular in design and uses the seven level Univac code throughout. The first Model O was on display in mid-October at the National Business Show, and there are currently five installations.

The modular design and the mass data storage make it the first in a series of medium-sized computers which open a new era in data processing.

The variety of optional components available gives the modular design its flexibility. The mass storage facilities are composed of up to ten high capacity and relatively high access storage drums, each of which has a capacity of 180,000 alphanumeric characters, with an average access time of seventeen milliseconds. This compares quite favorably with the quantity and access times of the main storage of most other currently available medium-scale American computers.

Each drum channel is divisible into words of 12-characters each or unit records composed of multiples of 12-characters up to a maximum of 120-characters. Each word or unit record is

EQUIPMENT REPORT

further divisible into a maximum of 20 fields. A recirculating channel called a revolver is provided with the first high capacity storage drum. At any time during a program, a unit record from a high capacity drum is available to the arithmetic and control unit from this revolver. Access time to the unit record on the revolver depends on the length of the unit record. Average times vary from 0.343 milliseconds for a 12-character unit record to 3.429 milliseconds for a 120-character unit record.

In addition to these high capacity drums there are two types of magnetic tape units which may be used with the computer.

The first type is the Uniservo which can store 1,200,000 characters on a fifteen hundred foot reel of metallic tape. This tape has the same format and packing density as that used with the Univac I, II, and Scientific Computers. This means that all the off-line peripheral equipment employing magnetic tape used in the above systems is compatible with the File Computer. The Univac High-Speed Printer, Magnetic Tape-to-Punch Card converters, Punch Card to Magnetic Tape converters, Perforated Tape-to-Magnetic Tape converters, Magnetic Tape-to-Perforated Tape converters, Uniprinter I, and Unityper I and II are included in this associated peripheral equipment.

The second type utilizes a new plastic magnetic tape which has a capacity of 2,640,000 alphanumeric characters per 3,600 foot reel of mylar tape. This is the first non-metallic tape to be used in a Univac system. It cannot be used with the other standard Univac equipment. For this reason it is sometimes called non-compatible tape. Four tape units, using either metallic or plastic tape, connected to a specially designed unit may be used in an off-line data sorting operation.

A large variety of input and output media may be accommodated by: the 80-column and 90-column sensing-punching units; low and high-speed paper tape reading and perforating units which may be associated with the ten-key adding machine or typewriter input-output facilities; and the 300 line per minute printer. The magnetic tape units may also be counted in this array of input-output components.

The 80-column and 90-column card sensing-punching units contain 120 characters of magnetic core buffer storage. Cards are read and punched at a maximum rate of 150 cards per minute. These units permit use of either IBM or Remington Rand punched cards with the computer. The choice of on-line paper

UNIVAC FILE COMPUTER

tape equipment makes this computer compatible with some already established data handling systems. Either Teletype, Flexowriter or Univac coded paper tape can be used directly for input-output without programmed conversion. Chad (fully perforated) tape must be used. This may prove a limitation when used in conjunction with presently installed chadless telegraphic tape handling equipment. These paper tapes may be used in conjunction with the adding machine or typewriter units. In addition to these low-speed (20 characters/second) units, there are facilities for high-speed handling of paper tape. A photoelectric reader provides an input rate of 200 characters per second while a high-speed punch can perforate tape at the rate of 60 characters per second.

A high-speed line printer prints at a maximum rate of 300 130-character lines per minute. It may be used either in an on-line mode (directly connected to the computer) or in an off-line mode using magnetic tape.

In addition to these modular components, there is also a standard high-speed drum. This high-speed drum has three functions: (1) input-output storage, (2) intermediate storage, and (3) high-speed storage. Average access time to any of these storages is 2.5 milliseconds. Input-output storage is used mainly as a means of delivering information to and receiving information from the various input-output devices. It is also used to store intermediate results. Eight input-output tracks are on this section of the drum; each is associated with a particular input and/or output device and is addressable. Intermediate storage consists of 5 tracks of 12-character units addressable through programming. These tracks hold the intermediate results of calculations and the constants used in these calculations.

On Model O up to 8 input-output units can be connected to the computer by means of Multiplex control. All of these input-output units contain sufficient buffer storage to permit parallel operation with the computer, i. e., computation may proceed simultaneously with input-output operations. The input-output unit will store information in its buffer and deliver this information to the computer when it is ready. This Multiplex control can operate in two modes: scan or demand. When operating in the scan mode, the computer, through the multiplexing device, will successively examine the input-output devices to determine

EQUIPMENT REPORT

which unit is ready to deliver information to the computer. While in the demand mode the input-output device is directly accessible to the computer through programming.

Programming is accomplished externally via a 48-instruction step control panel. These steps are of the three address type. Inter-step functions are also available. Aside from the arithmetic operations of addition, subtraction, multiplication and division; control can be transferred and data can be compared and located. The inter-step functions occur between steps of a program. They include branching, reading or writing unit records, channel-search branching, step clear and program select.

The 'channel-search' equal or unequal operation permits a record to be located in high capacity storage without the complete address of this record. When the drum section and channel number are known, the designating data of the unit record from input or intermediate storage are compared with the designating data from each successive unit record stored on the high capacity drum. If the instruction is channel-search equal and an equal condition exists, the entire record from high capacity storage, of which the designating data was one field, is written on the revolver. If the instruction is channel-search unequal and an unequal condition exists, the entire record from high capacity storage is written on the revolver.

The File Computer makes use of 48 selectors. They have one, two or four poles. Energizing any of the single or multi-pole selectors causes one or more alterations in the program or data.

The code distributor is a unique type of selector. When a two digit code is placed in the code distributor's register, it remains there until replaced by a new value. It may then be distributed as one or more of the three addresses of any instruction. This function saves time and steps when a particular code must be frequently referred to during processing. A one digit code placed in the code distributor's register may be used to select the next instruction.

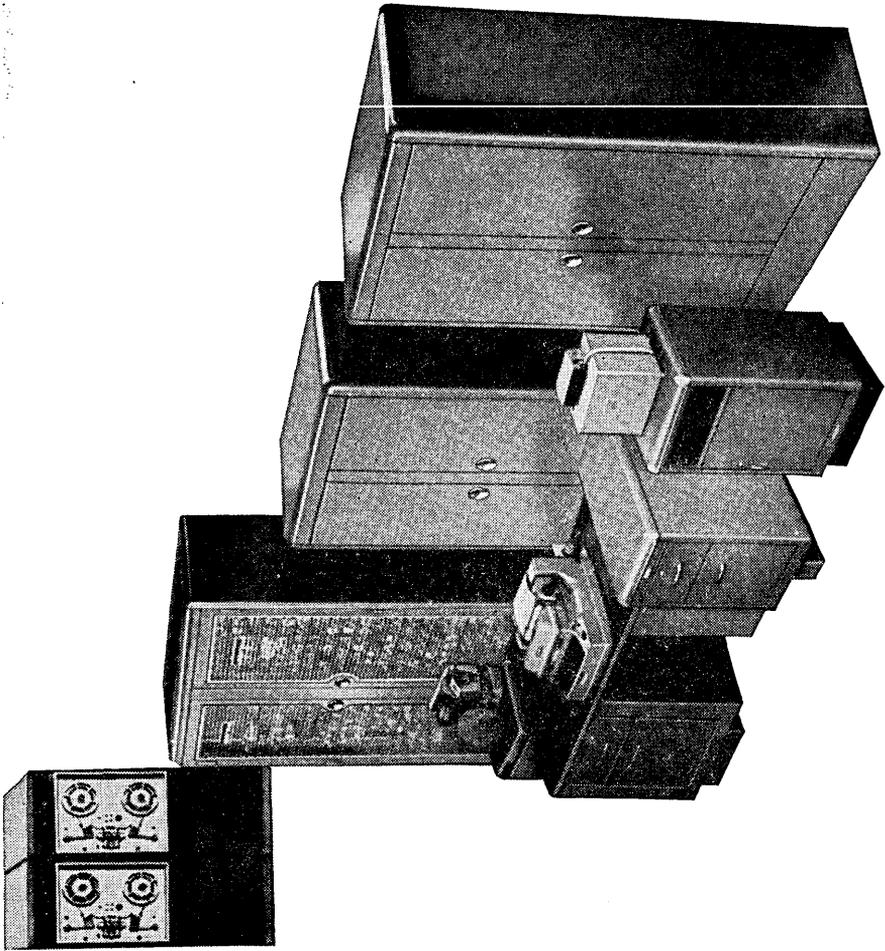
Detection of an invalid address, a parity error, an arithmetic error or an overflow resulting from either addition, subtraction or division will cause the program to stop. The program will not continue until the 'step clear' instruction is given. By means of 'program select' the result of a particular logical operation may be retained for future use.

July, 1956

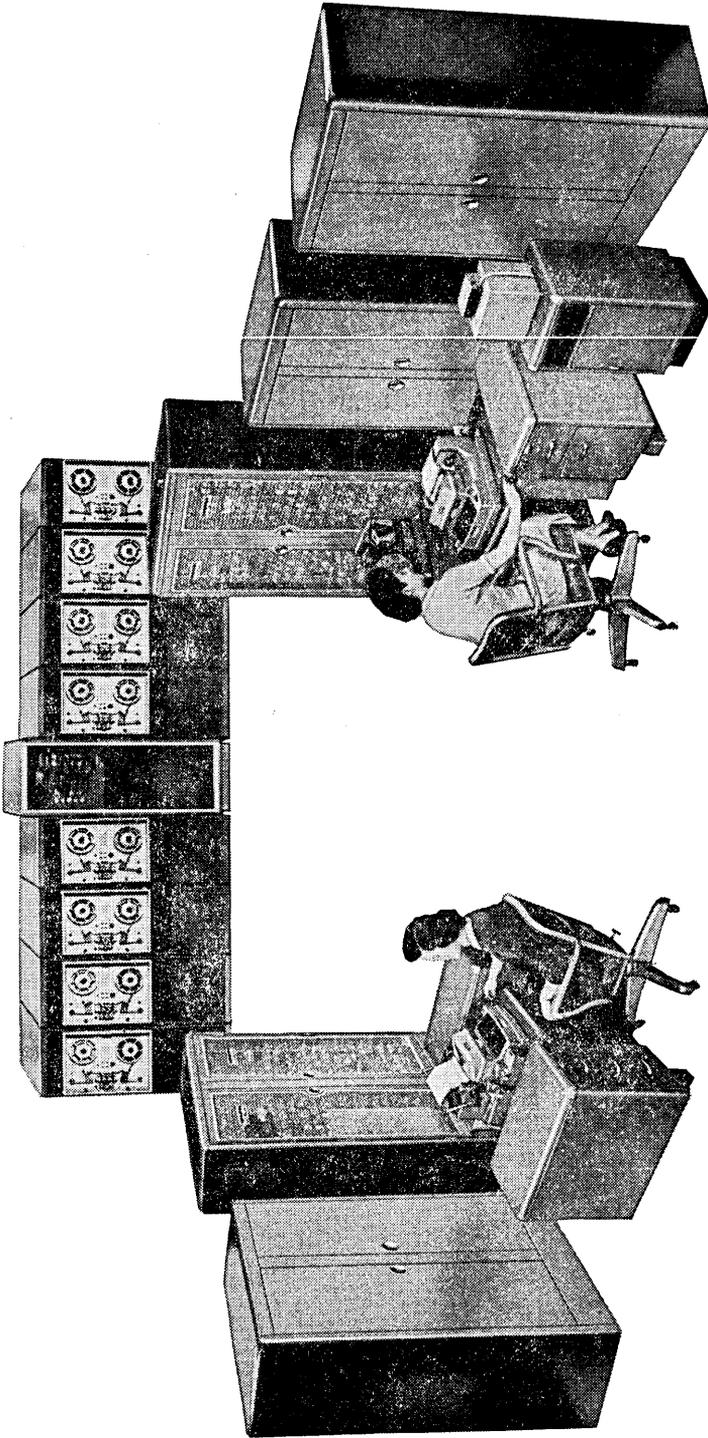
ELECOM 120A
Electronic Scientific System

DISCONTINUED

The Underwood Corporation has discontinued the manufacture of the Elecom 120A. It is no longer available.



ELECOM 125
Electronic Business & Scientific System



July, 1956

ELECOM 125

Electronic Business & Scientific System

MANUFACTURER

Underwood Corporation

BRIEF DESCRIPTION

A medium-size general purpose digital computer, applicable to business or scientific problems. A tape file processor can be used in combination with the computer. The Elecom 125 is a decimal machine, and can process numerical and alphabetic data.

KEY DATA

	<i>Minimum</i>	<i>Optional</i>
Storage	magnetic drum	magnetic tapes
Input	punched paper tape, manual	magnetic tapes, punched cards, printed tape
Output	punched paper tape and typewriter	magnetic tapes, line printer, punched cards
	<i>Approximate Minimum</i>	<i>Approximate Maximum</i>
Cost: purchase	\$135,000	\$388,500+\$1,060
mo. rental	\$3,645	mo. rental \$11,550
Total Personnel	3	9
Storage Capacity	4,050 words	2,884,050 words
Machine Floor Area	600 sq. ft.	1,000 sq. ft.

EQUIPMENT REPORT

The above figures are based on one-shift operation, exclusive of auxiliary equipment. The minimum figures are values for the basic Elecom computer which is composed of: the control console with typewriter; the computer cabinet containing the calculating unit; the power supply and magnetic drum unit. The maximum figures include the file processor and fifteen tape units.

APPLICATIONS

There will be three installations of the Elecom 125 system by the end of 1956. The following are possible applications:

Business

- Cyclic billing
- Insurance policy writing, claims records
- Production and inventory control
- Payroll processing
- Subscription fulfillment
- General ledger bookkeeping and auditing

Scientific

- Guided missile design
- Boiler design
- Air frame flutter analysis
- Gear design

COMPONENTS OF THE ELECOM 125 SYSTEM AND APPROXIMATE COST

The following costs are exclusive of auxiliary equipment costs. The monthly rental for a two-year lease is dependent upon the purchase price of the equipment, approximately 2.7% of the purchase price. An option-to-buy clause in the rental contract permits credit of 60% of all rentals paid against the purchase price of the equipment when the lease agreement is concluded. Extra shift operation incurs no extra rental charge. The user's needs will determine which computer components he will require: the basic Elecom 125 (A) alone, or in combination with the file processor (B), and/or the additional storage (C), and/or the additional input-output (D). Only one punched card reader and one punch or line printer input-output media can be connected to the system at prices quoted.

ELECOM 125

<i>Components</i>	<i>Approximate Purchase Price</i>
A. 125 basic computer system with 4,050 word drum and two base registers.	\$135,000
Additional rapid access 50 words	10,000
Automatic floating decimal operation	12,500
B. 125 file processor	85,000
C. Magnetic tape units (maximum of 15), each	8,000
D. Additional Flexowriters, for use as spares with computer or file processor, each	3,500
Paper tape reader, high-speed, Ferranti	4,000
Paper tape punch, high-speed, Teletype	3,500
Printed tape reader, input unit	5,000
Facilities for connection of one IBM card reader and one IBM card punch or line printer	15,000
	<i>IBM</i>
	<i>Monthly Rental</i>
Punch card input, IBM 523 or IBM 528	\$ 60 200
Punch card output, IBM 523	60
Line Printer IBM 407	800

The minimum hardware cost of a workable installation exclusive of auxiliary equipment is \$135,000; the maximum, \$396,500 plus the IBM single-shift monthly rental of \$1,060.

EQUIPMENT REPORT

PERSONNEL

Approximation of the personnel required for single-shift operation:

<i>Position</i>	<i>Minimum No.</i>	<i>Maximum No.</i>
Methods	{ 1	{ 2
Programmers	{ 1	{ 3
Operators (125)	1	2
Operators (auxiliary)	1	2
Tape Preparers or Key Punch Operators	1	4
Maintenance	1	2

Maintenance is included in separate agreement under rental or supplied to purchasers of equipment by contract. Cost for full-time maintenance including parts depends upon the purchase price of the system. The following table gives these monthly costs for one-shift, 40-hour maintenance.

<i>Purchase Price</i>	<i>Maintenance Cost</i>	<i>Purchase Price</i>	<i>Maintenance Cost</i>
\$125,000	\$1,210	\$250,000	\$1,425
150,000	1,250	300,000	1,500
175,000	1,295	350,000	1,585
200,000	1,335	400,000	1,665

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses are provided by the manufacturer at no additional cost for the programmers, operators and maintenance men. Short executive courses are also available. The length of the programming and maintenance courses is one month, the operator course is two weeks.

Automatic code and integrated service routines are available. Programming and operating manuals are available to the user.

ELECOM 125

PHYSICAL DATA

These approximate figures are based on the Elecom 125 system alone, no allowance is made for auxiliary equipment, personnel, storage of tapes, cards, etc.

	<i>Minimum</i>	<i>Maximum</i>
Space	600 sq. ft.	1,000 sq. ft.
Width		72"
Height		72"
Weight	3,640 lbs.	12,400 lbs
Air Temperature		90°F
Relative Humidity	30%	80%
Heat Dissipation	42,060 BTU/hr.	
Air conditioning:	Room air conditioning recommended	

Power: For the basic system, 120/208-volt, three-phase, 4-wire, 60-cycle, AC supply is required. The power dissipation is approximately 15 kva, with an operating power factor of 90%.

FIVE COMPONENTS OF THE ELECOM 125 SYSTEM

4D 780.2-Page 8

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Input	Punched Tape Reader	Flexowriter	1	1	4G 180.1	8 characters/second.
		Ferranti	0	1	4G 270.1	200 or 400 characters/second.
	Punched-Cards Summary Punch	IBM 523	0	1	4G 380.4	100, 80-column cards/minute; maximum of 133 characters/sec- ond.
		IBM 528	0	1	3C 380.3	200, 80-column cards/minute; maximum of 266 characters/sec- ond.
	Printed Tape Reader	Underwood	0	1	4G 780.3	500 characters/second.
	Magnetic Tape Unit	Elecom	0	15 *	4G 780.2	File processor, 6000 decimal dig- its/second; computer, 2000 deci- mal digits/second.
	Console (manual)	125	1	1		

Output	Punched Tape and Typewriter	Flexowriter	1	1	4G 180.1	8 characters/second.
	Punched Tape	Teletype	0	1	4G 745.1	60 characters/second.
	Punched-Cards Summary Punch	IBM 523	0	1	4G 380.4	100, 80-column cards/minute; maximum of 133 characters/second.
	Line Printer	IBM 407	0	1	4B 380.4	150 lines/minute; 120 characters/line.
	Magnetic Tape Unit	Elecom	0	15 *	4G 780.2	Computer, 2000 decimal digits/second; file processor, 6000 decimal digits/second; parallel with input.

* Maximum of 15 includes 5 on file processor and 10 on computer.

Continued on Next Page

FIVE COMPONENTS OF THE ELECOM 125 SYSTEM—Cont.

AD 780.2—Page 10

<i>Component</i>	<i>Designation</i>	<i>Type</i>	<i>Minimum</i>	<i>Maximum</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Physical Characteristics</i>
Storage	Magnetic Drum	125	1	1		Capacity: main memory 4,000 to 10,000 fixed length words (10 digits and sign); rapid access 50 or 100 fixed length words (10 digits and sign). Average access time: 8.3 millise./word; rapid, 1.7 millise./word. Speed: 3,600 rpm.
	Magnetic Tape Unit	Elecom	0	15 *	4G 780.2	Capacity: 1,920,000 decimal digits/2400-ft. reel.
Control	ALU and Console	125	1	1		Console: manual control by setting of switches and by keys of Flexowriter. ALU: built-in circuitry for control of the components.
	Tape Control	125	1	1		Built-in circuitry and interconnecting panel to control the tape units.

Arithmetic
Unit

Accumulator: A register, 10 digits and sign.
Decimal Adder, 11 digits.

L register: 10 digits and sign; addend; multiplicand; divisor, etc.

X register: 10 digits and sign; multiplier; quotient, etc.

Control register: 10 digits and sign; holds instruction to be performed (2-digit operation code and two 4-digit address codes).

There are 7 arithmetic, 14 transfer, 10 arithmetic and transfer, and 3 logical operation codes. There are in addition some input-output and special attachment codes. Computing is possible during card punching and line printing.

Notation: excess three, binary coded decimal.

Arithmetic mode: serial.

Negative number representation: absolute value and sign.

Zero representation: + 00 0000 0000.

Average speeds of the following operations are in milliseconds: add, 3.5; multiply, 22; divide, 22; transfer, 2; compare, 2.

EQUIPMENT REPORT

AUXILIARY EQUIPMENT

The auxiliary equipment, required or recommended, for more efficient system utilization, has been divided into groups A, B, C and D dependent upon the input-output equipment used with the Elecom 125.

	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required			
A.	1 Spare Flexowriter		4G 180.1
B.	1 Key Punch	IBM 024	1A 380.1
	1 Sorter	IBM 083	4A 380.4
	1 Reproducer	IBM 500s	3D 380
	1 Tabulator (if not included in system)	IBM 400s	4B 380
C.	1 Line Printer	Underwood	5A 780.1
D.	1 Printed Tape Preparer	Tapetyper	1B 780.1
Recommended			
C.	1 Magnetic Tape Unit	Elecom	4G 780.2

ADDITIONAL INFORMATION

Write to: Underwood Corporation
Electronic Computer Division
35-10 36th Avenue
Long Island City 6, New York

APPRAISAL

The Elecom 125 is a medium-size computer for business, scientific, or combined business-scientific data processing. The File Processor is an individual unit of a data-processing system that sequences, collates, separates, selects and simultaneously collates and selects data on magnetic tape files. It has the advantage of rapid assembly of the day's business data and reinsertion of updated master files at approximately 6000 decimal digits per second parallel with input. Programming time is saved since the coding for the assembly of data for various applications is quite simple. With the Elecom's present built-in

circuitry, the probability of an undetected error is one in six hundred billion operations.

Many choices of input and output, low and high-speed, equipment make this computer easily compatible with a business that already has some automatic data-handling equipment and processes. A high-speed printed tape reader is available on special request. This input reads printed tape at 500 characters per second and that in combination with the tapetyper is a relatively inexpensive paper tape input and output system.

The provision for variable block length on magnetic tape, used both with the computer and the File Processor, greatly facilitates operation by eliminating packing and unpacking of information within a block. Various block lengths can be mixed freely in the file.

The many possible choices of programming operations aid the programmer to shorten the time and to enlarge the number of applications for automatic data processing. The attachment for automatic floating decimal and the base registers shorten the programming and processing time for certain operations.

The use of base registers for address modification results in versatile and efficient manual and automatic coding. The base registers are used to modify the address portion of pre-selected groups of instructions without altering the stored instruction by adding the contents of the base registers to the address part of the instruction just prior to the execution of the instruction. This feature is a simple method of controlling repetitive or loop routines especially useful when integrating sub-routines.

The Automatic Floating Decimal Operation is an extremely important addition to the Elecom system, especially for scientific applications. This addition eliminates the need for storing floating point sub-routines on the drum and thus effectively increases the amount of storage on the drum that is available to the programmer. Because this device is used in conjunction with the regular arithmetic unit, both the fixed and floating point routines may be used in the same problem.

There are several time consuming features that detract from the above advantages. First, Flexowriter output, that must be readable and many times suitable to be printed on forms, requires an editing program which takes extra programming and central computer time. A financial editing operation code

EQUIPMENT REPORT

in this computer is of some help here, and a library editing routine when applicable will shorten the programming time. For the high-speed line printer, this editing may be done through use of a plugboard. Second, the magnetic tape start-stop time with the computer is sixty milliseconds which is high when compared to most other medium-size computers. Third, computation cannot continue during the magnetic or paper tape input-output cycle. However, it is possible to compute during card punching and line printing.

The Elecom 125 has slow operating speeds and high access time as compared to machines with electrostatic or delay line internal storage. However, depending upon the application, these need not be considered as disadvantages, and the File Processor can materially speed up tape operations by the use of its sorting, collating and sequencing features.

ALWAC 800
General Purpose Digital Computer

ADVANCE REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.

ALWAC 800

General Purpose Digital Computer

MANUFACTURER

Alwac Corporation

BRIEF DESCRIPTION

The Alwac 800 is a large-scale digital computer designed for the solution of commercial problems and is suitable for scientific and technical applications. Internally, the computer operates in a parallel mode using binary coded decimal notation. It processes only numerical information, alphabetic information must be coded through programming. All arithmetic and logical operations are performed by the central processing unit which utilizes twelve digit-plus-sign words.

Input and output are effected in the Alwac 800 primarily via punched cards, although punched paper tape, high speed or low speed, and magnetic tape are other such media. The typewriter and line printer may also be included among possible output facilities.

EQUIPMENT REPORT

KEY DATA

Storage	internal working	magnetic core
	secondary	magnetic drum, magnetic tape
Input		punched cards, magnetic tape, typewriter, punched paper tape
Output		punched cards, magnetic tape, punched paper tape, line printer, typewriter

APPLICATIONS

There are presently no installations of the Alwac 800. The first installation will be made in September, 1957 at the Federal Reserve Board in Washington, D. C.

FUNCTIONAL UNITS OF THE ALWAC 800 SYSTEM AND APPROXIMATE COST

The following rental costs are for single-shift operation, exclusive of auxiliary equipment. Two-shift operation increases rental costs by 50%; three-shift operation increases rental by 100%.

The maxima given are based on the number of units that can be utilized as computer components. For independent card-to-magnetic tape, magnetic tape-to-card, magnetic tape-to-printer, etc. operations any number of card readers, card punches, line printers and magnetic tape units with their respective control units are available. Input-output equipment in most cases is the same type equipment as used in independent operations.

The user's particular application will determine the precise number and type of functional units that are necessary for his installation.

<i>Functional Unit</i>	<i>Type</i>	<i>Cost/Unit</i>		<i>Max. No. Units</i>
		<i>Purchase Price</i>	<i>Monthly Rental</i>	
Central Processing Unit; including console, power unit and 1000 words of core storage	801	\$325,000	\$8,350	1
Additional Internal Magnetic Core Storage Unit; 1000 words	881	75,000	2,550	1000
External Magnetic Core Storage Unit; 500 words	883	65,000	2,200	1000
Address Modification Register	882	6,500	220	5
Floating Point Control Unit	885	23,000	740	1
Magnetic Drum Buffer, 40 words	810	28,000	950	10
Magnetic Drum Storage Unit	815	34,000	1,150	500
Magnetic Tape Buffer; 40 words	840	25,000	850	10
Magnetic Tape Unit	845	18,000	610	100
Punched Card Buffer; 20 words	820	53,000	1,530	
Paper Tape and Keyboard Buffer	860	15,000	510	
Line Printer Buffer: 20 words 120 columns		cost undetermined		
High-speed Paper Tape Reader	866	2,500	85	10
High-speed Paper Tape Punch	867	1,500	40	10
Electric Keyboard	865	5,000	170	
Card Read-Punch Unit	IBM 528	26,400	440	
Line Printer	IBM 407	59,850	920	
Flexowriter		5,000	170	

EQUIPMENT REPORT

For Independent Operation

The Magnetic Tape Unit, Type 845, can be used with all of the equipment listed below:

<i>Operation</i>	<i>Input or Output Unit</i>
Card-to-Magnetic Tape	Card Read-Punch Unit, IBM 528
Magnetic Tape-to-Card	Card Read-Punch Unit, IBM 528
Magnetic Tape-to-Printer	High Speed Line Printer or IBM 407

The following figures illustrate the range in the number of personnel required by most installations for single-shift operations. Exceptions to these figures may be found.

<i>Position</i>	<i>Range</i>
Methods	2 to 10
Programmers	2 to 8
Alvac 800 Operation and Scheduling	5 to 20
Auxiliary Machine Operation	
Data Preparation	2 to 30
Maintenance *	1 to 3

* Maintenance is included in the rental cost. Maintenance contracts are available to purchasers.

The size of the staff required to operate a data processing center depends on the nature of the applications. Any increase in the number or complexity of new problems will result in a corresponding increase in the methods and programming personnel. After an installation is well established, the requirements for people in these capacities may be reduced.

Increased quantities of input information, non-standardized data formats and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and data preparation categories.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Two types of training courses are offered by the manufacturer at no extra cost: a two-week basic programming course, and a three-week machine operation course.

Aside from programming, operating and maintenance manuals, a detailed installation manual is supplied by the manufacturer preliminary to the delivery of the equipment. Library routines are also available from the manufacturer.

ALWAC 800

PHYSICAL CHARACTERISTICS

Space

In addition to equipment space, adequate work space for methods and programming personnel should be provided in an area adjacent to the equipment room.

A separate room, near the computing room, should be provided as working and storage space for maintenance personnel and equipment.

Area = 400 sq. ft.

Storage space is required for master cards, magnetic tapes and for supplies (cards, tapes, forms, etc.) used in processing a problem.

The actual size of the equipment room (or rooms if key punches and other auxiliary equipment are in a room separate from the computer) depends on the size of the installation. From 2½ feet to 5 feet clearance between machines is required for maintenance. Adequate work space should be provided for the operators and schedules actually responsible for the operation of the computer. The manufacturer will give technical assistance and detailed drawings of efficient machine locations in the allocated area.

Atmospheric Conditions and Air Conditioning

To ensure proper operation, the Alwac 800 must function under the following conditions:

Temperature Range 50°F to 55°F.

Relative Humidity 40% to 60%.

The individual units of the computer are equipped with internal blowers to provide adequate circulation of air. The equipment room must be air conditioned to maintain the above atmospheric conditions. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer system will determine the heat dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning required. A desirable feature of the equipment room should be some form of dust precipitator to ensure positive operation of magnetic tapes and drums.

Wiring

A 4-wire, 230 volt, 3-phase, 60 cycle AC power supply is used by Alwac 800. The amperage and consequently the power drawn by the system depend on the type and number of units included. The supply voltage should not vary more than + 10% to ensure errorless operation of the system.

PHYSICAL DATA

<i>Functional Unit</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight Pounds</i>	<i>Heat Dissipation BTU/hr.</i>	<i>Operating Current Amperes</i>
Central Processing Unit Power Unit Console	800					120,000	
Internal Magnetic Core Storage Unit	881						
External Magnetic Core Storage Unit	883						
Magnetic Drum Buffer Unit	810						
Magnetic Tape Buffer Unit	840						
Punched Card Buffer Unit	820						
Paper Tape and Keyboard Buffer Unit	860						
Line Printer Buffer Unit							
20 words 20 columns							
20 words 40 columns							
20 words 120 columns							
Magnetic Drum Storage Unit	815						
Magnetic Drum Control Unit							
Magnetic Drum Power Unit							
Magnetic Tape Unit	845						
Magnetic Tape Control Unit							
Magnetic Tape Power Unit							
High-Speed Paper Tape Recorder	866						
Tape Reader Control Unit							
Electric Keyboard	865						
Card Read-Punch Unit	IBM 528						
Flexowriter							
High-Speed Paper Tape Punch	867						
Tape Punch Control Unit							
Line Printer	IBM 407						
Line Printer Control Unit							

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FUNCTIONAL COMPONENTS OF THE ALWAC 800 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input*	Punched Cards	Card Reader	IBM 528		200 80-column cards/minute; maximum of 266 characters/second.
	Magnetic Tape	Magnetic Tape Unit	845		Maximum of 15,000 digits/second; alphabetic and binary coded decimal notation.
	Paper Tape	High-speed Paper Tape Reader	866		Maximum of 400 characters/second; 6-channel, chad tape.
		Flexowriter Tape Reader			Maximum of 10 characters/second; 6-channel, chad tape.
	Electric Keyboard	Flexowriter			Maximum of 10 characters/second.
Output*	Punched Cards	Card Punch	IBM 528		100 80-column cards/minute; maximum of 133 characters/second.
	Magnetic Tape	Magnetic Tape Unit	845		Maximum of 15,000 digits/second; alphabetic and binary coded decimal notation.
	Paper Tape	High-speed Paper Tape Punch	867		Maximum of 60 characters/second; 6-channel, chad tape.
		Flexowriter Tape Perforator			Maximum of 10 characters/second; 6-channel, chad tape.
	Printed Copy	High-speed Line Printer			Maximum of 900 lines/minute; 120 printing positions/line.
		Line Printer	IBM 407	4B 380.4	Maximum of 150 lines/minute; 120 printing positions/line
		Flexowriter			Maximum of 10 characters/second.

* Any combination of up to 10 input-output components is possible.

Continued on Next Page

FUNCTIONAL COMPONENTS OF THE ALWAC 800 SYSTEM—Cont.

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Storage	Magnetic Core	Central Processing Unit	801		1000 12-digit-plus-sign words. Access time: 40 microseconds/word.
		Internal Magnetic Core Storage Unit	881		1000 12-digit-plus-sign words. Access time: 40 microseconds/word.
		External Magnetic Core Storage Unit	883		500 12-digit-plus-sign words. Access time: 40 microseconds/word.
		Magnetic Drum Buffer	810		40 12-digit-plus-sign words. Access time: 40 microseconds/word.
		Punched Card Buffer	820		20 12-digit-plus-sign words. Access time: 450 microseconds/word.
		Magnetic Tape Buffer	840		1 block (40) 12-digit-plus-sign words. Access time: 40 microseconds/word.
		Paper Tape and Keyboard Buffer	860		1 12-digit-plus-sign words. Access time: 40 microseconds/word.
		Line Printer Buffer 120 columns			20 12-digit-plus-sign words. Access time: 40 microseconds/word.
	Magnetic Drum	Magnetic Drum Storage Unit	815		Capacity: 20,000 12-digit-plus-sign words. Average access time: 12 milliseconds/40 word block. Size: " diameter, " long. Speed: 7,200 rpm. No. of channels: 500. No. of words/channel: 40.
	Magnetic Tape	Magnetic Tape Unit	845		200,000 digits/2,500 ft. tape; 200 digits/inch.

Control	Central Processing Unit	800	Built-in circuitry.
	Operator's Console		Manual by switch-setting. Used to interrogate the program and to manually run the program.
	Floating Point Control Unit	885	Regulates arithmetic functions according to floating point methods.
	Magnetic Drum Control Unit		
	Magnetic Tape Control Unit		
	High-Speed Paper Tape Reader Control Unit		
	High-Speed Paper Tape Punch Control Unit		
	Line Printer Control Unit		

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FUNCTIONAL COMPONENTS OF THE ALWAC 800 SYSTEM—Cont.

July 12, 1957--18

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<p>Arithmetic Unit</p>	<p>Unit Designation: Alwac 800</p> <p>The Alwac 800 operates with two types of words. Data words are twelve digits plus sign in composition. There are six decimal digits to an instruction and hence two instructions are stored per computer word. An instruction contains a two digit operation code and a 4-digit address which designates the address of data, the address of some component of the system or the number of shifts to be taken.</p> <p>The Alwac 800 has two accumulators each with a 12-digit-plus-sign capacity: A register, B register. The A register contains an overflow digit and hence actually is composed of 13 digits plus sign. These accumulators or registers serve as temporary storage for information from magnetic core storage to be acted on either logically or arithmetically.</p> <p>The Alwac 800 can perform 59 different operations including reading, writing, comparing, arithmetic operation and certain logical manipulations.</p>	<p>Notation: binary coded decimal. Arithmetic Mode: parallel. Numerical Representation: absolute value with plus or minus sign over the unit's position. Zero Representation: $\pm 00...00$.</p> <p>In the following table, operating speeds are given in milliseconds:</p> <table border="1"> <thead> <tr> <th></th> <th><i>Fixed Decimal</i></th> <th><i>Floating Decimal</i></th> </tr> </thead> <tbody> <tr> <td>Add</td> <td>.096</td> <td>.120</td> </tr> <tr> <td>Multiply ¹</td> <td>.496</td> <td>.496</td> </tr> <tr> <td>Divide ²</td> <td>.616</td> <td>.616</td> </tr> <tr> <td>Compare</td> <td>.048</td> <td>.048</td> </tr> <tr> <td>Transfer data from working to internal storage</td> <td>.088</td> <td>.088</td> </tr> </tbody> </table> <p>¹ Full word multiplicand times 555 555 555 555 to give double length product. ² Double length dividend by divisor to give a quotient of 555 555 555 555.</p>		<i>Fixed Decimal</i>	<i>Floating Decimal</i>	Add	.096	.120	Multiply ¹	.496	.496	Divide ²	.616	.616	Compare	.048	.048	Transfer data from working to internal storage	.088	.088
	<i>Fixed Decimal</i>	<i>Floating Decimal</i>																		
Add	.096	.120																		
Multiply ¹	.496	.496																		
Divide ²	.616	.616																		
Compare	.048	.048																		
Transfer data from working to internal storage	.088	.088																		

ALWAC 800

AUXILIARY OPERATION

Equipment for the independent operations of card-to-tape, tape-to-card or tape-to-printer is listed under the Functional Units of the Alwac 800. The need for this equipment depends on the application. However, certain standard IBM punched card machines will be required or are recommended for the operation of the computer system.

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Card Punches	24, 26	1A 380.1
Reproducing Punch	514, 519, 528	3C 380
Sorter	82	4A 380.3
Verifier	56	1C 380.1
Collator	77	4A 380.1
Line Printer	407	4B 380.4

ADDITIONAL INFORMATION

Write to: Alwac Corporation
13041 South Cerise Avenue
Hawthorne, California

BULL MACHINE COMPANY GAMMA 60

ADVANCE REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.

November, 1957

GAMMA 60

MANUFACTURER

Bull Machine Company

KEY DATA

Storage	primary	magnetic core
	secondary	magnetic drum, magnetic tape,
Input		punched cards, paper tape, magnetic tape
Output		punched cards, paper tape, magnetic tape, printed copy

BRIEF DESCRIPTION

The Gamma 60 is a large-scale, general purpose, digital computer designed for management, scientific, military logistics and operations research problems. Approximately four hundred of these computer systems are installed throughout France.

This system functions internally in the binary system and utilizes a variable word length. Both fixed and floating point arithmetic are possible. Numeric, alphabetic and special characters may be processed.

Primary storage is effected via from 1 to 8 magnetic core units each having a capacity of 98,304 binary digits (24,576 digits or 16,384 characters). Access time to each character is 11 microseconds. Additional storage is provided by magnetic drums and magnetic tapes. The drums can store up to 48,152 digits or 32,768 characters. Access time to a drum character ranges from 11 to 22 microseconds.

EQUIPMENT REPORT

Input-output devices to the Gamma 60 include: punched cards, paper tape, magnetic tape and printed copy. The card unit both reads and punches 300 cards per minute. Magnetic tape functions at 200 characters per second and paper tape at 25 characters per second. The 300 line per minute printer in this system may be internally controlled by the program.

PHILCO
TRANSAC S-2000
Data Processing System

ADVANCE REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.

November, 1957

PHILCO TRANSAC S-2000

Data Processing System

MANUFACTURER

Government and Industrial Division
Philco Corporation

KEY DATA

Storage	primary	magnetic core
	secondary	magnetic drum, magnetic tape
Input		punched cards, magnetic tape, teletype, typewriter, paper tape
Output		punched cards, magnetic tape, teletype, typewriter, paper tape

BRIEF DESCRIPTION

Philco's Transac S-2000 is a large scale, digital computer designed for business management, industrial control as well as scientific research. This binary computer operates internally with a fixed word length of 48 binary digits. Numeric, alphabetical and special characters may be processed. Instructions are of the single-address type. The transistorized circuitry of the Transac S-2000 requires little power relative to similar computer systems and requires no air conditioning.

Internal storage ranges from 4,096 words to 65,536 words of magnetic core storage. Increased storage capacity may be had by addition of magnetic drums and magnetic tapes to the system. A drum consists of 400 4,096-bit channels or more, if a larger drum is requested.

EQUIPMENT REPORT

Instructions are composed of 24 bits: 8 bits for the operation code and 16 bits for the data-address. Therefore, two instructions are contained in one Transac word. The operations may be typed as: transfer, shift, jump, miscellaneous and arithmetic. When an instruction word is read from storage, the left instruction is executed first unless a transfer instruction specifies the right half.

Fifteen index registers are provided in the S-2000 to facilitate programming and save numerous instruction steps.

Several input-output devices are available with this computer system. They include the flexowriter and its several attachments, a photo-electric paper reader for 7-channel tape, card readers, magnetic tape units, card punchers and teletype paper tape punches. The paper tape readers operate at a rate of 200 or 400 characters per second. When on-line with the computer, the card unit reads at a rate of 200 cards per minute and punches at a rate of 100 cards per minute. However, if the card unit is involved in card-to-drum operations it both reads and punches 100 cards per minute. Magnetic tapes have a tape speed of 75 inches per second.

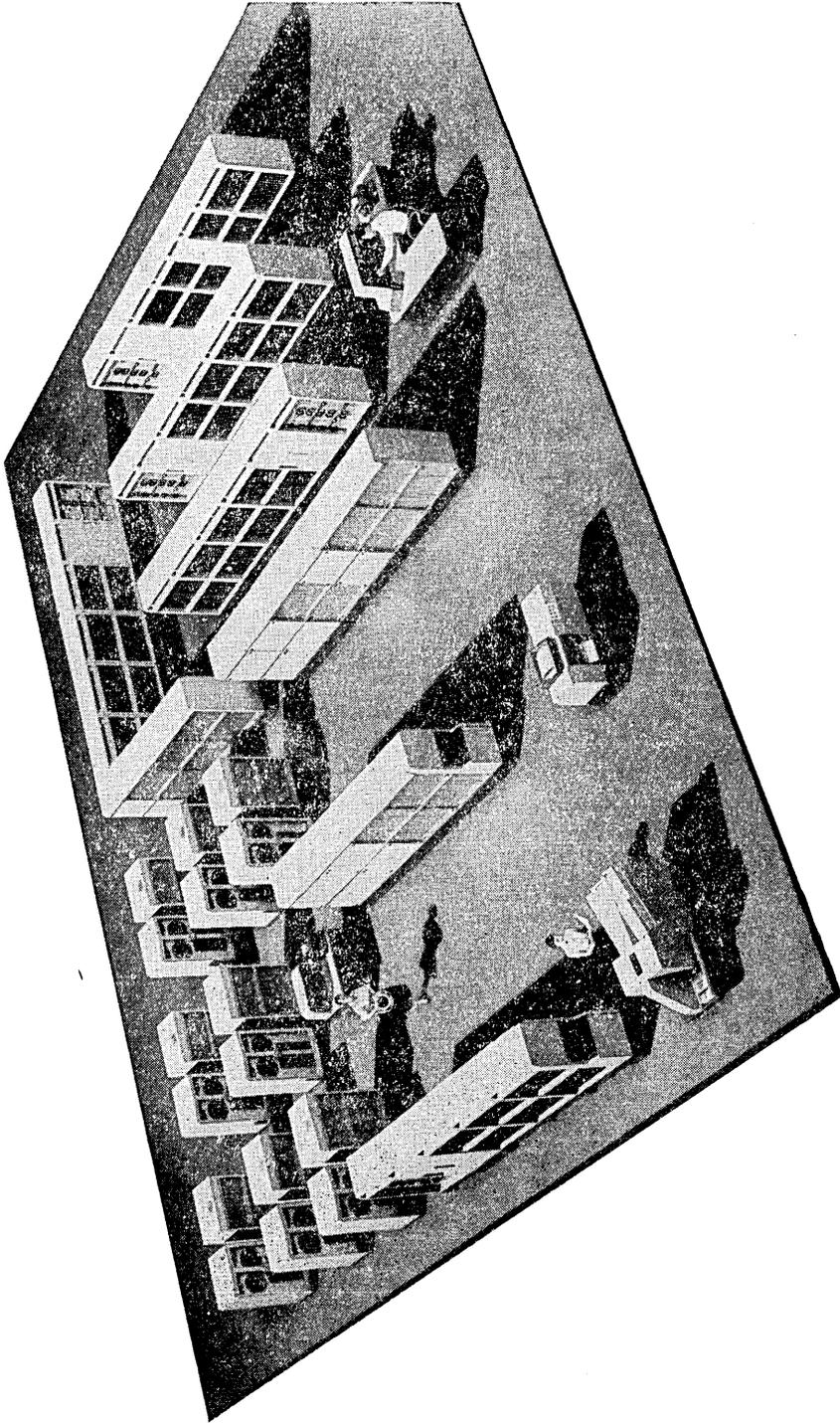
This large-scale computer requires little power and floor-space compared to computers of its size. The space required for a Transac S-2000 system composed of a flexowriter console, central computer, magnetic drum unit, 8 magnetic tape units and the necessary input-output controls is approximately 70 square feet.

RECEIVED

NOV 19 1957

AUDIT & SYSTEMS

DATAMATIC 1000
Electronic Data Processing System



March, 1957

DATAMATIC 1000

Electronic Data Processing System

MANUFACTURER

DATAmatic Corporation

BRIEF DESCRIPTION

The DATAmatic 1000 is a large-scale digital computer designed primarily for business data processing. The computer functions internally in the binary-coded decimal notation and utilizes a fixed word length of 52 binary digits. It can process numerical, alphabetic and special characters. All arithmetic, logical, input and output operations are performed under programmed control.

Large scale input to the DATAmatic 1000 system is provided by magnetic tape via the Model 1100, Magnetic File Unit. Punched paper tape input may be effected via the console's Flexowriter. Before it can be used by the Central Processor, punched card information is converted to magnetic tape information in an off-line conversion process utilizing the Model 1200, Input Converter. A paper tape-to-magnetic tape input converter is currently in the design stage.

The primary output medium of the DATAmatic 1000 system is magnetic tape. The information on these tapes is converted to punched cards or printed copy by means of off-line output converters: Model 1300 or Model 1400. Both card punching and regular speed printing may be obtained by the Model 1300. The Model 1400 was designed specifically for magnetic tape-to-high speed printer conversions. Additional output may be via paper tape or printed copy from the console's Flexowriter. Another output converter is being developed to convert information from magnetic tape-to-paper tape.

EQUIPMENT REPORT

KEY DATA

Storage	internal working	magnetic core
	secondary	magnetic tape
Input		magnetic tape, punched paper tape, typewriter
Output		magnetic tape, punched paper tape, typewriter

APPLICATIONS

There are, at present, no customer installations of the DATAmatic 1000 system. Five of these computer systems have been ordered. The following are some of its applications:

Business

- Inventory control
- Production control
- Railroad freight car accounting
- Hospital service subscriber record keeping
- Manufacturing and assembly scheduling
- Labor cost distribution
- Real estate loan accounting
- Corporate trust and deposit accounting
- Actuarial studies
- Investment accounting
- Commissions
- Payroll accounting

Scientific

Applications would include all general scientific computations.

FUNCTIONAL UNITS OF THE DATAMATIC 1000 SYSTEM AND APPROXIMATE COST

The monthly rentals are for single-shift operation. Two-shift operation increases DATAmatic single-shift rental by 50%. Three-shift operation increases DATAmatic single-shift rental by 100%.

DATAMATIC 1000

The maxima given are based on the number of units that can be utilized as computer components. For independent card-to-tape, tape-to-card and tape-to-printer operations, any number of card readers, card punches, printers and tape units with their respective control units are available. Input-output equipment, in most cases, is the same equipment as used in independent operations.

The user's application will determine the precise number and type of units that best suit his requirements.

<i>Functional Unit</i>	<i>Model</i>	<i>Cost/Unit Purchase</i>	<i>Cost/Unit Mo. Rental</i>
Central Processing Unit; includes Model 1090 Console, and power unit; controls up to 8 tape units	1000	\$985,000	\$21,500
Auxiliary Central Processor: Controls up to 2 additional tape units	1052	100,000	2,200
Controls up to 4 additional tape units	1054	175,000	3,900
Controls up to 6 additional tape units	1056	250,000	5,500
Controls up to 8 additional tape units	1058	295,000	6,600
Magnetic File Unit **	1100	60,000	1,350 (each)
File Reference Unit; includes typewriter	1150	50,000	1,075 (each)
File Switching Unit	1170	9,600	190 (each)
<i>Independent Units</i>			
Input Converter, card-to-magnetic tape, includes card reader	1200	185,000	3,325
Output Converter, magnetic tape-to-cards or printer	1300	100,000 (without printer)	1,800
Output Converter, magnetic tape-to-high speed printer, includes line printer	1400	215,000	4,300

** A minimum of 4 Magnetic File Units is recommended for a DATAMatic 1000 system.

EQUIPMENT REPORT

A typical installation consisting of a Central Processor, 8 Magnetic File Units, 1 Input Converter, 1 Output Converter (Model 1300), 1 File Switching Unit and 1 File Reference Unit rents for \$38,690 per month and costs \$1,809,600.

PERSONNEL

The following figures represent the range in number of personnel which most installations will require. Exceptions to these figures may be found. These approximate figures are for single-shift operation.

<i>Position</i>	<i>Range</i>
Methods	1 to 3
Programming	1 to 3
Coding	0 to 12
DATAmatic 1000 operation and scheduling	1 to 2
Auxiliary machine operation	0 to 3
Key punch operation	6 to no limit
Maintenance*	1 to 12

The size of the staff required to operate a data processing center depends on the nature of the applications. Any increase in the number and complexity of the problems results in a corresponding increase in methods, programming and coding personnel. After an installation is well established, the requirement for people in these capacities may be reduced by using assembly and compiling routines and an "automatic coding" technique, all of which will be available to customers in July of 1957.

Increased quantities of input data (particularly in forms not usable as direct input media), non-standardized formats and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and key punch operation categories. Computer operators and schedulers are grouped into a single classification also affected by these problems, but to a lesser degree than the other classifications.

Maintenance is performed by employees of the manufacturer either as part of the rental charge or under terms of a separate contract with the purchaser. Purchasers may also use their own maintenance personnel. The size of this staff depends on the hours of usage and total size of the installation—computer and all peripheral or auxiliary equipment.

* Included in rental cost or supplied to purchaser under contract.

DATAMATIC 1000

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Three types of training courses are given by the manufacturer at no extra cost: a 2-week general introductory course, a 6-week detailed programming course and a 4-week operating course which includes control panel wiring. These courses are given in Boston and, in some instances, at customer sites.

Operating and programming manuals are supplied by the manufacturer.

A detailed installation manual on physical layout, power requirements, etc., is supplied by the manufacturer when the order for the system is placed.

PHYSICAL CHARACTERISTICS

Space

In addition to equipment space, adequate work space for methods, programming and coding personnel should be provided in an area adjacent to the equipment room.

A separate room, adjacent to the computing room, should be provided as working and storage space for maintenance personnel and equipment.

Area = 700 sq. ft.

Storage space is required for master cards and magnetic tapes, and for supplies (cards, tapes, forms, etc.) used in processing a problem.

The actual size of the equipment room (or rooms if key punches and other auxiliary equipment are in a room separate from the computer) depends on the size of the installation. From 3 feet to 5 feet clearance between machines is required for maintenance. Adequate work space should be provided for the operators and schedulers actually responsible for the operation of the computer. The manufacturer will give technical assistance and detailed drawings of efficient machine locations in the allocated area.

Atmospheric Conditions and Air Conditioning

Atmospheric conditions and Air Conditioning the DATAmatic 1000 (Central Processor and Input and Output Converters are equipped with integral air conditioning units which provide optimum cooling for the equipment. In addition, there is sufficient capacity to maintain the average surrounding room enclosure at a comfortable level).

Peripheral equipment units are equipped with blowers to provide cooling by air circulation. The amount of auxiliary air conditioning required will depend on the number of Magnetic File Units in

EQUIPMENT REPORT

the system and the number of people working in the room.

Humidity in the Magnetic File area must be controlled between the limits of 90% to 60%.

Wiring

A 4-wire, 208 volt, 3-phase, 60 cycle AC power supply is used by the DATAmatic 1000. The amperage and consequently power drawn by the system depend on the type and number of units included. The system will operate satisfactorily with a prime supply voltage fluctuation of as much as 8% to 10%. A false or sub floor conceals inter-connecting cables and provides safety and appearance.

Preventive Maintenance

Adequate time should be allowed for preventive maintenance. Such time can be allotted outside of the standard shift worked by the user.

PHYSICAL DATA

<i>Functional Unit</i>	<i>Model</i>	<i>Height * Inches</i>	<i>Width Inches</i>	<i>Depth Inches</i>	<i>Weight Pounds</i>	<i>Heat Dissipation BTU/hr.</i>	<i>Operating Current Amperes</i>
Central Processing Unit	1000	78 *	284	31	6,800	27,300	105.0
Core Storage	10001						
Arithmetic and Control Unit I and II	10002						
Buffer Storage	10003						
Read-Write	10004						
Central Console	1090	30	134	78	2,100	5,123	4.9
Magnetic File Unit	1100	78	58	33	1,500	8,550	8.17
Amplifier Unit		78	43	30	900	5,130	4.9
File Reference Unit		30	74	30	1,500	6,830	5.55
File Switching Unit		42	42	30½	800	negligible	negligible
Input Converter	1200	78 *	255	31	5,500	23,900	22.9
card reader		57	74	30	1,500		
Output Converter	1300	78 *	224	31	5,200	29,000	27.8
card punch		49-½	53	25	1,180	4,090	6.5
line printer		51	31	73	2,815	7,500	11.0
Output Converter		78 *	224	31	5,200	19,800	19.0
high-speed line printer	52	52	33	750			

A floor loading factor of 125 lbs./sq. ft. should be allowed in the installation.

* These heights do not include 9 inches which will extend below the sub-flooring.

FUNCTIONAL COMPONENTS OF THE DATAMATIC 1000 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Model</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Magnetic Tape	Magnetic File Unit	1100	4G 205.1	40,000 alphanumeric characters/second; 60,000 decimal digits/second.
	Punched Paper Tape	Console, paper tape reader	1090	4G 180.1 (Flexowriter)	10 characters/second; 8 channel Flexowriter tape.
	Keyboard	Console	1090		10 characters/second.
	Keyboard	File Reference Unit	1150		10 characters/second.
Output	Magnetic Tape	Magnetic File Unit	1100	4G 205.1	40,000 alphanumeric characters/second; 60,000 decimal digits/second.
	Punched Paper Tape	Console, paper tape punch	1090	4G 180.1 (Flexowriter)	10 characters/second; 8 channel Flexowriter tape.
	Typewriter	Console, Flexowriter	1090	4G 180.1 (Flexowriter)	10 characters/second.
	Typewriter	File Reference Unit	1150	4G 180.1 (Flexowriter)	10 characters/second.
Storage	Magnetic Core	Central Processor	1000		Capacity: 2,000 52-bit words. Numerical words consist of 11 decimal digits and sign or 12 decimal digits. Alphanumeric words consist of 8 alphanumeric characters. Access time: 10 microseconds/word.

	Magnetic Core Input Buffer	Central Processor	1000		Capacity: 2 62-word blocks. Access time: 28 microseconds/word.
	Magnetic Core Output Buffer	Central Processor	1000		Capacity: 2 62-word blocks. Access time: 28 microseconds/word.
	Magnetic Tape	Magnetic File Unit	1100	4G 205.1	Capacity: 37,200,000 decimal digits/2,700 foot tape.
Control		Central Processor	1000		Built in circuitry for control of the components of the Datamatic 1000 system; controls up to 8 Magnetic File Units.
		Auxiliary Processor	1052		Contains circuitry to control up to 2 Magnetic File Units.
		Auxiliary Processor	1054		Contains circuitry to control up to 4 Magnetic File Units.
		Auxiliary Processor	1056		Contains circuitry to control up to 6 Magnetic File Units.
		Auxiliary Processor	1058		Contains circuitry to control up to 8 Magnetic File Units.
		Central Console	1090		Manual by keyboard and switch settings; monitors the read-write status of input-output components; locates malfunctioning electronic components of the Central Processor; locates validity and clocking errors.
		File Switching Unit	1170		Contains circuitry to interchange control of Magnetic File Units among Input and Output Converters and the Central Processor.

Continued on Next Page

FUNCTIONAL COMPONENTS OF THE DATAMATIC 1000 SYSTEM—Cont.

<p>Arithmetic Unit</p>	<p>Unit Designation: Central Processor, DATAmatic 1000. The DATAmatic 1000 processes alphanumeric data in 52-bit word lengths. Numerical data consists of 11 decimal digits and sign or 12 decimal digits. Alphanumeric words contain 8 alphanumeric characters. The instruction word is hexadecimal and contains an 8-bit operation code, three 13-bit addresses, sign bit and 4 check bits. The DATAmatic 1000 contains 10 special-purpose, program-addressable, 52-bit circulating storage registers. Control Register: Contains instruction under execution. Extractor Register: Contains the extraction constant necessary for the Transfer and Select orders. Sentinel Register: Usually contains either a sentinel word or a Pass Order; contains 7 times the multiplicand after a multiplication operation. Remainder Register: Contains the remainder from the division operation; contains the low-order 11 digits of a product from the multiplication operation. Current Order Register: Contains address of order under execution or contains order previously executed. Selection Register: Contains Transfer and Select orders after their execution; contains 4 times the multiplicand after a multiplication operation. Output Buffer Register: Contains the first word transferred to tape from the Output Buffer. 2 non-addressable Registers: Control purposes. The operations possible are: arithmetic calculations; shifting; 32-word block transfers; transmittal of data; tape reading forwards and backwards, writing, sorting, searching on as many as 10 tapes simultaneously and rewinding; typing; special purpose control, transfer and select orders; extracting of characters from words and logical operations.</p>	<p>Notation: binary-coded decimal or hexadecimal. Arithmetic mode: serial. Numerical representation: absolute value; sign, if required is in high order position. Zero representation: 000...000 (12 digits) or \pm 000...000 (11 digits and sign). In the following table, operating speeds are given in milliseconds: Add 0.23 Multiply* 1.00 Divide** 3.78 Compare .20 Transfer of control to 0.17 * Double length product and multiplicand, \pm555 5555 5555. ** Double length dividend yields quotient, \pm555 5555 5555.</p>
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DATAMATIC 1000

AUXILIARY OPERATION

Equipment for independent card-to-magnetic tape, magnetic tape-to-card and magnetic tape-to-printer operations is listed under Functional Units of the DATAmatic 1000. Certain standard IBM punched card machines are required for the operation of the system. The need for this equipment depends on the applications of the particular installation. Such equipment might include: Key Punches, for original data, and Reproducing Punches and Tabulators for use with the Model 1300 Output Converter.

ADDITIONAL INFORMATION

Write to: DATAmatic Corporation
151 Needham Street
Newton Highlands 61, Mass.

PRELIMINARY APPRAISAL

The DATAmatic 1000 is a large-scale digital computer designed specifically for business applications. However, it may be utilized satisfactorily in combined business-scientific installations. The operating speed of the DATAmatic 1000 is substantially lower than that of a computer which operates internally in the binary mode. This limitation is more than offset for business problems by: the ability of the DATAmatic 1000 to process large volumes of alphanumeric information, the sophisticated operation codes available to the programmer, and the special sorting capabilities of this machine.

Business data processing requires large quantities of input-output data, and the designers of the DATAmatic 1000 have recognized this fact. Direct input to the computer is available through magnetic tape, and up to 100 magnetic tape transport units may be incorporated into the system. Data may also be read into the system via the paper tape input reader and the keyboard of the central console. Direct output from the computer is provided primarily through magnetic tape although other output facilities include the central console's paper tape punch unit and typewriter.

Punched card-to-magnetic tape (Model 1200) and magnetic tape-to-punched card or printed copy (Model 1300 or 1400)

EQUIPMENT REPORT

conversions occur off-line with the DATAmatic 1000 system and, hence, do not limit the central computer's processing speed. A paper tape-to-magnetic tape converter and a magnetic tape-to-paper tape converter are currently in the design prototype stages. The Model 1200, Input Converter, reads, edits and converts information from 80-column punched cards for storage onto magnetic tape at a rate of 900 cards per minute. There are two Output Converters. The Model 1300 converts information from tape for either punching at the maximum rate of 100 80-column cards per minute or printing at the maximum rate of 150 lines per minute with each line 120 characters wide. High-speed printing, 900 lines per minute, is accomplished by a printer attached to the Model 1400, Output Converter.

The DATAmatic 1000 functions internally in the binary-coded decimal and alphabetic notation and utilizes a fixed word length of fifty-two binary digits of which 48 bits represent alphanumeric information or an instruction, and 4 bits represent check bits. Numerical words consist of either 12 4-bit decimal digits or 11 of these decimal digits and a 4-bit sign indication. Normally, these decimal digits are valued from 0 to 9; however, the hexadecimal notation of the DATAmatic 1000 permits a 4-bit coding for the numbers 10 through 15. Alphabetic words consist of 8 6-bit characters, and it is possible to pack alphabetic and numerical characters into the same word. Instruction words are of the three-address type containing, in general, a 2-character operation code (special 8-bit code), three 4-digit core storage addresses (special 13-bit code for each address) and a 1-bit sign code.

The DATAmatic 1000 contains seventeen special registers. Seven are reserved for control purposes and may be selected, under program control, as order sources under certain circumstances. The remaining ten registers located in the Arithmetic and Control Units contain such data as: the instruction under operation, the low order digits of a product, an extraction constant, multiples of the multiplicand, etc.

The primary operating storage of the DATAmatic 1000 consists of a magnetic core unit of 2,000 words; access to each word is at the rate of 10 microseconds per word. In addition, there are two 62-word input buffers and two 62-word output buffers which permit simultaneous reading from tape, writing onto

DATAMATIC 1000

tape and central computer processing. Words enter and leave these buffers at the rate of 28 microseconds each.

The DATAmatic magnetic tape system contains many desirable logical and mechanical features. The system of recording produces the extremely high bit packing density of approximately 800 alphabetic characters or 1200 decimal digits per inch. Data is recorded onto these tapes serially by bit by character in the 31 information channels. This results in fixed length blocks of 62 words each. One 2,700 foot tape contains a minimum of 50,000 blocks of information. As the result of a card-to-tape conversion, each information block may contain up to two 80-column punched cards worth of information. Editing is performed during conversion. One block of tape output from the computer may contain the equivalent of nine fully punched cards of information. Since inter-record or inter-block gaps are not required on the DATAmatic magnetic tape, a tape speed of 100 inches per second permits the DATAmatic 1000 system to achieve an actual data transfer rate of 40,000 characters or 60,000 decimal digits per second.

The DATAmatic scheme of fixed length data blocks does have the disadvantage of not always obtaining optimum utilization of the tape capacity. However, one of the great advantages of this system is the ability to modify information in the middle of a record without rewriting the entire tape that holds the particular record. Thus, in order to update one portion of a file that is kept on magnetic tape, that record must be read into the computer, the desired item modified and the altered record written on the same tape area from which it was extracted. Another considerable advantage of the DATAmatic tape system is its ability to read from or write onto the magnetic tape while it is travelling 'backwards'. It is, in fact, this ability which permits information to be stored in what might otherwise be called inter-block gaps. The ability to read 'backwards' greatly benefits many sorting procedures.

For the purposes of sorting and rapid identification of each tape record, the thirty-one tape information channels have been divided into two groups: the key channel and the satellite channels. Unique operation codes exist which place both key and satellite channels either in the read or the write status, or which place the key channel in the read status and the satellite chan-

EQUIPMENT REPORT

nels in the write status. Coupled with these operation codes, the tape search procedure interrogates only the key channel of each tape block; and hence, the time savings effected from not having to read entire 62-word blocks merely to check one word of indicative data is substantial.

The circuitry of the DATAmatic 1000 coupled with the Double Transfer and Select orders permit simultaneous transfer of data from the input buffer to core storage and from core storage to the output buffer. The Transfer and Select orders will perform either of these two operations singly. Transmission of data within the core storage unit is also possible. The remaining orders include the algebraic operations of addition, subtraction, multiplication and division as well as typewriting and shifting.

Manual interrogation of any Magnetic File Unit by the File Reference Unit is independent of the central processor and, in fact, occurs in parallel with the Central Processor's functioning. The key channel word is typed by the operator or read from paper tape via the Flexowriter keyboard of the File Reference Unit, Model 1150. The switches of this unit's console are set to identify the tape to be searched. A comparison between the typed word and the key channel words from the tape proceeds until an equal is found. The program to select the information to be printed is read from Flexowriter tape, an auxiliary paper tape reader, or is inserted by hand. The desired information is automatically printed under this program control.

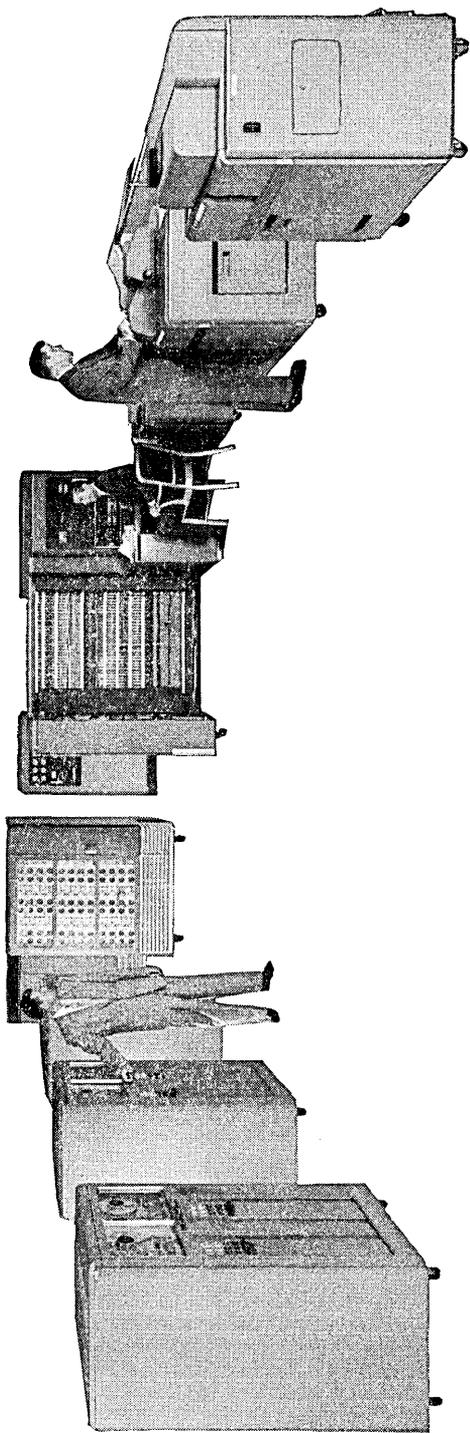
Additional control circuitry for DATAmatic systems which comprise more than eight Magnetic File Units is provided either by Auxiliary Processors or File Switching Units. The Auxiliary Processors, Models 1052, 1054, 1056 and 1058 control up to 2, 4, 6 and 8 magnetic tapes, respectively and provide the circuitry for tape units under control of the central computer. On the other hand, the File Switching Unit contains circuitry to interchange control of the Magnetic File Units among the following: input converter, output converter and central processor.

The DATAmatic Corporation offers a varied assortment of free customer training programs. These include courses in programming, operating and executive utilization of the DATAmatic system. These programs are provided on a scheduled

DATAMATIC 1000

basis at the DATAmatic plant in the Boston area. Automatic coding techniques, assembly routines, compiling routines and standard utility and service routines are in the process of preparation and will be available by the Fall of 1957. These will greatly facilitate preparation of problems for the DATAmatic 1000 system.

IBM 701
Electronic Data Processing Machine



IBM 701

Electronic Data Processing Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM 701 Electronic Data Processing Machine is a large-scale general purpose digital computer designed for the solution of commercial and scientific problems. The computer works internally in the binary-number system and has a fixed word length of 36 binary digits. It can process numerical decimal information, alphabetic and any eleven special characters by programming.

Punched cards may be used as direct input to the computer. An independent card-to-magnetic tape conversion permits the use of magnetic tape as another medium of direct input. Similarly, direct output facilities are provided by a card punch, a line printer or by magnetic tape recording.

The IBM 701 has been superseded by the IBM 704. Although the 701 is no longer in production, existing models are still available for rental.

KEY DATA

Storage	internal working	electrostatic
	secondary	magnetic drum, magnetic tape
Input		punched cards, magnetic tape
Output		line printer, cathode ray tube, punched cards, magnetic tape

EQUIPMENT REPORT

APPLICATIONS

There are presently 19 installations of the 701. The following are a few of the applications:

Scientific

- Wind tunnel data reduction
- Nuclear power plant design
- Airframe analysis
- Structural and flight dynamics
- Weather forecasting
- Design analysis of turbines
- Aerodynamic performance and stability design
- Flight simulation testing of aircraft-engine combinations

Business

- Base schedule projection
- Shop order writing
- Labor forecasting
- Payroll and labor distribution

FUNCTIONAL UNITS OF THE 701 SYSTEM AND APPROXIMATE COST

The following rental costs are for single-shift operation, exclusive of auxiliary equipment. Two-shift operation increases rental costs by 50%; three-shift operation increases rental by 100%.

The maxima given are based on the number of units that can be utilized as computer components. For independent card-to-tape, tape-to-card or tape-to-printer operations, any number of card readers, card punches, printers and tape units with their respective control units are available. Input-output equipment in most cases is the same equipment as used in independent operations.

The user's particular application will determine the precise number and type of functional units that are necessary for his installation.

IBM 701

<i>Functioning Unit</i>	<i>Type</i>	<i>Cost/Unit Mo. Rental</i>	<i>Maximum No. of Units</i>
Central Processing Unit; including console and power unit	701		1
Electrostatic Storage Unit	706		2
Magnetic Drum Storage Unit including power unit	731		1
Magnetic Tape Unit	726		4
Magnetic Tape Unit	727		5
Tape Control Unit for 727	753		1
Card Reader, model I	711	\$200	1
Line Printer	716		1
Card Puncher	721	\$200	1
Cathode Ray Tube	740		1

(The maximum number of units specified above are considered to be practicable limits. The 711, 721, 716, 726, 731 are under control of the computer at all times. The 753 Tape Control Unit can control up to a maximum of 10 727 magnetic tape units.)

For Independent Operation

The 727 Magnetic Tape Unit can be used with the following:

<i>Operation</i>	<i>Input or Output Unit</i>	<i>Control Unit</i>
Card-to-Tape	Card Reader, 714	759
Tape-to-Card	Card Punch, 722	758
Tape-to-Printer	Printer, 717	757

PERSONNEL

The following figures illustrate the range of the number of personnel which most installations will require for single-shift operation. Exceptions to these figures may be found.

EQUIPMENT REPORT

<i>Position</i>	<i>Range</i>
Methods Programming } Coding }	10 to 30
701 Operation and Scheduling	3
Auxiliary Machine Operation	4
Data Preparation	5 to 10
Maintenance *	3 to 5

* Maintenance is provided by the manufacturer and is included in the rental cost.

The size of the staff required to operate a data processing center depends on the nature of the applications. Any increase in the nature or complexity of new problems will result in a corresponding increase in the methods, programming and coding personnel. After an installation is well established, the requirements for people in these capacities may be reduced.

Increased quantities of input information, non-standardized data formats and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and data preparation categories. Under present rental policies all maintenance is provided by the manufacturer and is included in the rental charge.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

At no additional cost a three-week course in detailed programming is available from the manufacturer by special arrangement.

An operating and programming manual Form 24-6042-2 is supplied by the manufacturer. Methods of numerical techniques and programs are available in IBM's Computation Seminar Proceedings and Technical Newsletters.

A detailed installation manual on physical layout, power requirements, etc. is supplied by the manufacturer when the order for the machine is placed.

IBM 701

PHYSICAL CHARACTERISTICS

Space In addition to equipment space, adequate work space for methods, programming and coding personnel should be provided in an area adjacent to the equipment room.

A separate room, adjacent to the computing room, should be provided for working and storage space for maintenance personnel and their equipment.

$$\text{Area} = 400 \text{ sq.}^{\circ} \text{ ft.}$$

Storage space is required for master cards and magnetic tape files, as well as for the supplies used in processing a problem.

The actual size of the equipment room will depend on the size of the installation. Adequate clearance must be maintained between machines for the maintenance personnel. Working space must also be provided for the personnel responsible for the scheduling and operation of the computer and the associated peripheral equipment. The manufacturer will provide technical assistance and detailed drawings of efficient machine locations in the allocated area.

**Atmospheric
Conditions
and Air
Conditioning**

To ensure proper operation, the 701 must be operated under atmospheric conditions having the following limits:

Temperature	65°F to 80°F
Relative Humidity	40% to 60%

The individual units of the computer are equipped with internal blowers to provide adequate circulation of air. The equipment room must be air conditioned to maintain the above atmospheric conditions. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer system will determine the amount of heat that is dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning required.

A desirable feature of the equipment room would be some form of dust precipitator to avoid the possibility of dirt accumulation on the surface of the magnetic tapes or magnetic drums.

EQUIPMENT REPORT

Wiring

A four-wire, 208 volt, three-phase, 60 cycle AC power supply is necessary for the 701. The actual power drawn by the system will depend on the units included. The supply voltage should not vary more than 8 per cent to ensure free operation of the system.

The equipment room should have a false or sub-floor. Cables connecting the units should run under this floor for the sake of both safety and appearance.

Preventive Maintenance

Adequate time should be allotted for preventive maintenance. Such time can be allotted outside of the standard shift worked by the user.

PHYSICAL DATA OF THE FUNCTIONAL UNITS

<i>Functional Unit</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight Pounds</i>	<i>Heat Dissipation</i>	<i>Operating Current Amperes</i>
Central Processing Unit	701	72	37	66	3,440	95,500	97.5
Power Frame No. 1	736	61	34	65	2,770	14,700	15.0
Power Frame No. 2	741	61	34	65	3,610	14,700	15.0
Power Distribution Unit	746	41	34	65	1,070	3,000	3.1
Electrostatic Storage Unit	706	56	33	73	3,070	30,000	30.6
Magnetic Drum Storage Unit	731	55	31	67	1,930	25,200	25.7
Magnetic Tape Unit	726	39	32	63	1,370	11,400	23.6
Magnetic Tape Unit	727	29	31	69	920	4,100	6.6
Magnetic Tape Control Unit	753	60	32	67	2,240	9,200	16.7
Card Reader	711	32	30	32	560	1,700	1.7
Card Puncher	721	40	26	50	670	9,000	9.0
Alphabetic Printer	716	59	30	47	1,910	7,850	8.0
Cathode Ray Tube Output Recorder	740	37	28	52	752	6,140	6.7
Cathode Ray Display Unit	780	24	28	22	253		

FUNCTIONAL COMPONENTS OF THE 701 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Punched Cards	Card Reader	711	4G 380.5	150, 80-column cards/minute; maximum of 72 columns can be read; maximum of 180 characters/second.
	Magnetic Tape	Magnetic Tape Unit	726		7,500 characters/second; maximum.
		Magnetic Tape Unit	727	4G 380.3	15,000 characters/second; maximum.
Output	Punched Cards	Card Punch	721	4G 380.6	100, 80-column cards/minute; maximum of 72 columns can be punched; maximum of 120 characters/second.
	Magnetic Tape	Magnetic Tape Unit	726		7,500 characters/second; maximum.
		Magnetic Tape Unit	727	4G 380.3	15,000 characters/second; maximum.
	Printed Copy	Alphabetic Printer	716		150 lines/minute, maximum of 72 printing positions/line; 75 lines/minute, maximum of 120 printing positions/line. The 716 is a modified 407.
	Cathode Ray Tube	Cathode Ray Tube Output Recorder	740		200 alphabetic and numeric characters/second in the form of intensified spots on the tubes. 7,000 data points/second in the form of graphical display. This unit consists of a 21" cathode ray tube for visual display and a 7" cathode ray tube for photographic recording. Both tubes' output (display) are identical.
Storage	Electrostatic	Electrostatic Storage Unit	706		2,048 words of 36 bits each. 4,096 half-words of 18 bits each. Access time: 12 microseconds/word of data.

	Magnetic Drum	Magnetic Drum Storage Unit	731		Capacity: 8,192 full words of 36 bits each drum unit; 2 drums/drum unit. Average Access Time: 40 milliseconds/word; read-write speed 1.2 milliseconds/word. Size: 13" diameter, 5" long. Speed: 2,929 rpm. No. of Channels/drum: 72; No. of Sectors/Channel: 16; No. of Words/Sector: 256.
	Magnetic Tape	Magnetic Tape Unit	726		1,680,000 characters/tape maximum, depending upon length of records of information.
		Magnetic Tape Unit	727	4G 380.3	2,000,000 characters/tape.
Control		Central Processing Unit	701		Built-in circuitry.
		Operator's Panel	701		Manual by switch setting. It is also used to interrogate a program.
Arithmetic Unit	<p>Unit Designation: Central Processing Unit Type 701. Accumulator: 37 bits and sign (of which 2 bits are reserved for overflow). Multiplier-Quotient Register: 35 bits and sign; multiplier; quotient; buffer between electrostatic storage and other storage media or input-output devices. Instruction Location Counter: 12 bits; address of instruction being executed. Instruction Register: 18 bits; instruction being executed. The instruction word is 18 bits modified one address type: 5 bit operation code, 12 bit address and sign. There are 18 arithmetic, 7 logical, 7 input-output and 1 sense operation codes available.</p>				<p>Notation: binary. Arithmetic mode: parallel. Negative no. representation: binary digit 1 in the sign position. Zero representation: $\pm 00\dots00$ (35 zeros). The following operating speeds are in milliseconds: Add ¹ .060 Multiply .456 Divide .456 Transfer .048 ¹ .024 milliseconds less if a multiplication or a division has been performed in the preceding 12 program steps.</p>

EQUIPMENT REPORT

AUXILIARY OPERATION

Equipment for the independent operations of card-to-tape, tape-to-card or tape-to-printer is listed under Functional Units of the 701. The need for this equipment depends upon the application.

Certain standard IBM punched card machines will, however, be required for the operation of the system.

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required		
2-Key Punches	024, 026	1A 380.1
1-Reproducing Punch	514, 519, 528	3C 380
1-Sorter	082	4A 380.3
2-Verifiers	056	1C 380.1
Recommended		
1-Collator	077	4A 380.1

ADDITIONAL INFORMATION

Write to: Applied Science Division
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

The IBM 701 is a large-scale digital computer designed for scientific and engineering calculations. The 701 was developed under a crash program, during the Korean conflict, as an engineering and research tool for the large aircraft companies. By present standards, the 701 has a number of obvious limitations and is almost totally unsuited for business applications. However, the various 701 computers that are still in operation continue to perform valuable service in a number of engineering centers. Although the 701 has been officially superseded by the 704, a potential user may still have an opportunity to obtain an occasional "secondhand" 701.

IBM 701

The 701 operates internally in the binary system and has a fixed word length of thirty-six binary digits including a sign bit. Numbers and other data occupy a "full word" length of thirty-six bits, while machine instructions are eighteen bits long and are "packed" two to a machine word.

The high speed working storage of the 701 consists of a 2,048 word cathode ray tube storage unit. A maximum of two such units may be included in the system. A 737 magnetic core storage unit is available as an optional replacement for the cathode ray tube units. This core unit has a capacity of 4,096 words. Both the electrostatic and core storage units have random access cycles of twelve microseconds.

A drum storage unit may be included in the system. The drum storage unit contains two physical drums, each of which is further subdivided into two "logical drums." Each logical drum has a storage capacity of 2,048 words with an average access time of 40 milliseconds.

A maximum of four 726 magnetic tape units may be utilized as intermediate storage in the 701 system. The 726 tape unit operates under direct control of the central computer and is not compatible with any of the available peripheral data handling equipments that IBM has produced. These tape units have a packing density of 100 frames per linear inch. Each recorded frame contains six bits of information and one parity check bit. The maximum rate of information transfer is 7,500 such frames per second. The 701 computer can read tape backwards as well as forwards when it uses the 726 unit. One 'read backwards' instruction will read backwards only one unit record. This operation was designed for backspacing and to aid in sorting records; however, it is not precise and does not always give accurate results.

Under normal conditions, the only available input unit for the 701 is the 150 card per minute card reader unit. Both the 150 line per minute tabulator and a 150 card per minute card punch may be utilized as output units.

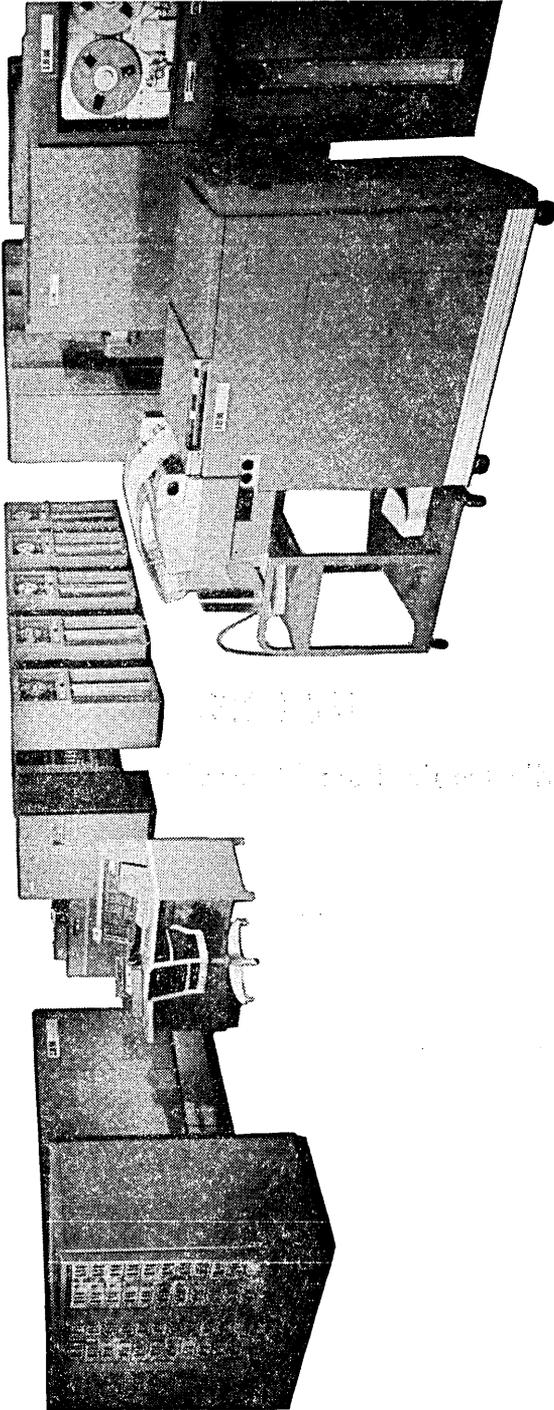
EQUIPMENT REPORT

Type 727 magnetic tape units are now available for use with the 701. Tape used in conjunction with these units has a packing density of 200 frames per inch and data is read or written at 15,000 frames per second. One 753 control unit is required for use with these tape units. A maximum number of 5 of these tape units may be utilized. The 727 tape units are compatible with all of the various IBM peripheral data handling equipments.

The 740 Cathode Ray Tube Output Recorder is also available for use with the 701. The 740 permits the display of output information in the form of points on the faces of two cathode ray tubes. A camera is attached to the smaller of the two tubes, so that a permanent film recording may be prepared of whatever appears on the face of that cathode ray tube. The larger cathode ray tube is used for immediate visual observation.

Some of the major data handling limitations of the original 701 system have been eliminated by addition of the magnetic core and 727 magnetic tape units. However, the limited size of the internal memory system will still present difficulties in the handling of large scale problems. The major drawback of the 701 is presented by its limited array of instructions. There are only 32 machine language orders available and these do not afford the necessary degree of flexibility. An interpretive routine, called SPEEDCODE was developed through a joint effort of IBM and the computation group at the United Aircraft Corporation. Although the use of this routine decreased the effective rate of machine operation to about 5 SPEEDCODE instructions per second, SPEEDCODE nevertheless gained wide acceptance because of its flexibility and versatility. Many of the better advantages that were offered by the SPEEDCODE Routine such as floating point arithmetic, Index Registers, and improved logical capability, have been included in the basic design of the newer 704.

IBM 702
Electronic Data Processing Machine



November, 1956

IBM 702

Electronic Data Processing Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM 702 Electronic Data Processing Machine is a large-size digital computer designed primarily for the solution of commercial data processing problems. The 702 can also be utilized for scientific and engineering calculations. The computer can process numerical decimal information, alphabetic characters, and any of eleven special characters. All arithmetic and logical functions are performed by the central processing unit which operates with a completely variable length data field.

Punched cards may be used as direct input to the computer. The use of an independent card-to-magnetic tape converter allows for the usage of magnetic tape as another medium of direct input. Similarly, direct output facilities are provided by a card punch, a line printer, or by magnetic tape recording. Information recorded on magnetic tape may be printed on an independent magnetic tape controlled line printer or punched into cards.

The IBM 702 has been superseded by the IBM 705. Although the 702 is no longer in production, existing models are still available for rental.

EQUIPMENT REPORT

KEY DATA

Storage	internal working	magnetic core
	secondary	magnetic drum, magnetic tape
Input		punched cards, magnetic tape
Output		punched cards, line printer, magnetic tape

APPLICATIONS

There are presently 14 installations of the IBM 702. The following are a few of the applications:

Business

- Life insurance commission calculation
- Payroll preparation
- Inventory accounting
- Utility billing
- Maintenance of accounts receivable and payable
- Industrial production scheduling

Scientific

- Operations research analysis
- Simulation of aircraft flight trajectories
- Atomic energy calculations

FUNCTIONAL UNITS OF THE 702 SYSTEM AND APPROXIMATE COST

The following rental costs are for single-shift operation, exclusive of auxiliary equipment. Two-shift operation increases rental costs by 50%; three-shift operation increases rental by 100%.

The maxima given are based on the number of units that can be utilized as computer components. For independent card-to-tape, tape-to-card, or tape-to-printer operations, any number of card readers, card punches, printers and tape units with their respective control units are available. Input-output equipment in most cases is the same type equipment as used in independent operations.

IBM 702

The user's particular application will determine the precise number and type of functional units that are necessary for his installation.

<i>Functional Unit</i>	<i>Type</i>	<i>Cost/Unit Mo. Rental</i>	<i>Maximum No. of Units</i>
Central Processing Unit; including console, power unit, and 10,000 positions of storage	702	8,650	1
Additional 10,000 positions of core storage	702	1,500	1
Magnetic Drum Storage Unit; including power unit	732	2,800	1
Magnetic Tape Unit	727	550	10
Tape Control Unit	752	550	1
Card Reader; including card reader control unit	712-756	1,050	1
Card Punch; including card punch control unit	722-758	1,050	1
Line Printer; including printer control unit	717-757	1,800	1

The maximum number of units specified above are considered to be the practicable limits. The 702 can handle up to ten 752 control units and 100 of each 756, 757 and 758. Likewise, each 752 control unit can control up to ten 727's and one functional unit only is handled by each of the 756, 757 and 758 control units.

For Independent Operation

The Magnetic Tape Unit Type 727 can be used with all of the equipment listed below

<i>Operation</i>	<i>Input or Output Unit</i>	<i>Control Unit</i>
Card-to-Tape	Card Reader 714	759
	Card Reader 712	756
Tape-to-Card	Card Punch 722	758
Tape-to-Printer	Printer 717	757
	Printer 719, 720, 730	760

EQUIPMENT REPORT

The following figures illustrate the range of the number of personnel which most installations will require. Exceptions to these figures may be found. These approximate figures are for single-shift operation.

<i>Position</i>	<i>Range</i>
Methods Programming } Coding }	10 to 30
702 Operation and Scheduling	3
Auxiliary Machine Operation	4
Data Preparation	5 to 10
Maintenance *	3 to 5

* Maintenance is provided by the manufacturer and is included in the rental cost.

The size of the staff required to operate a data processing center depends on the nature of the applications. Any increase in the number or complexity of new problems will result in a corresponding increase in the methods, programming, and coding personnel. After an installation is well established, the requirements for people in these capacities may be reduced.

Increased quantities of input information, non-standardized data formats, and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and data preparation categories. Under present rental policies, all maintenance is performed by the manufacturer and is included in the rental charge.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Three types of training courses are offered by the manufacturer at no extra cost: a general introductory course of one-week duration, a two-week course in methods and procedures, and a detailed four-week course in programming techniques.

A detailed installation manual is supplied by the manufacturer preliminary to the delivery of the equipment.

PHYSICAL CHARACTERISTICS**Space**

In addition to equipment space, adequate work space for methods, programming and coding personnel should be provided in an area adjacent to the equipment room.

A separate room, adjacent to the computing room, should be provided for working and storage space for maintenance personnel and their equipment.

Area = 400 sq. ft.

Storage space is required for master cards and magnetic tape files, as well as for the supplies used in processing a problem.

The actual size of the equipment room will depend on the size of the installation. Adequate clearance must be maintained between machines for the maintenance personnel. Working space must also be provided for the personnel responsible for the scheduling and operation of the computer and the associated peripheral equipment. The manufacturer will provide technical assistance.

Atmospheric Conditions and Air Conditioning

To ensure proper operation, the 702 must be operated under atmospheric conditions having the following limits:

Temperature 65° F. to 80° F.

Relative Humidity 40% to 60%

The individual units of the computer are equipped with internal blowers to provide adequate circulation of air. The equipment room must be air conditioned to maintain the above atmospheric conditions. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer system will determine the amount of heat that is dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning required. A necessary feature of the equipment room is some form of dust precipitator to avoid the possibility of dirt accumulation on the surface of the magnetic tapes or magnetic drums.

EQUIPMENT REPORT

Wiring

A four-wire, 208 volt, three-phase, 60 cycle AC power supply is necessary for the 702. The actual power drawn by the system will depend on the units included. The supply voltage should not vary more than ± 8 per cent to ensure error free operation of the system.

The equipment room should have a false or subfloor. Cables connecting the units should run under this floor for the sake of both safety and appearance.

Preventive Maintenance

Adequate time should be allotted for preventive maintenance. Such time can be allotted outside of the standard shift worked by the user.

PHYSICAL DATA

<i>Functional Unit</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight Pounds</i>	<i>Heat Dissipation BTU/hr.</i>	<i>Operating Current Amperes</i>
Central Processing Unit	702	152 †	150	65	5600	72,390	81.8
Power Unit	743	65	32	68	3510		
Console	781	71	28	44	555		
Magnetic Drum Storage Unit	732	65	32	67	1790	22,860	34.3
Magnetic Drum Power Unit	742	44	32	67	1720		
Magnetic Tape Unit	727	29	31	69	950		
Tape Control Unit	752	60	32	67	2240	9,200	16.7
Card Reader	712	47	33	54	1080	17,070	25.5
Card Reader Control Unit	756	60	32	67	2100		
Card Punch	722	52	26	50	1240		
Card Punch Control Unit	758	60	32	67	2140	20,490	33.5
Printer	717	71	33	49	2240	27,700	38.5
Printer Control Unit	757	60	32	67	2130		

A floor loading factor of 200 lbs./sq. ft. should be allowed in the installation.

† With core storage, this is 172 inches.

FUNCTIONAL COMPONENTS OF THE 702 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Punched Cards	Card Reader	712	4G 380.3	250, 80-column cards/minute. Maximum of 15,000 characters/second; alphabetic and binary coded decimal notation.
	Magnetic Tape	Magnetic Tape Unit	727		
Output	Punched Cards	Card Punch	722	3A 380.4	100, 80-column cards/minute; maximum of 133 characters/second.
	Printed Copy	Alphabetic Printer	717		150 lines/minute; 120 printing positions/line.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	Maximum of 15,000 characters/second; alphabetic and binary coded decimal notation.
Storage	Magnetic Core	Central Processing Unit	702		10,000 characters per unit; variable length field and record. Access time: .023 milliseconds per character of data.
	Magnetic Drum	Magnetic Drum Storage Unit	732		Capacity: 60,000 characters. Average Access Time: 8.0 milliseconds; read-write speed .04 milliseconds/character. Size: 10.7" diameter, 12.5" long. Speed: 3,750 rpm. No. of Channels: 30. No. of sectional channels: 10. No. of characters/section: 200.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	2,000,000 characters/tape.

Control	<table border="1"> <tr> <td>Central Processing Unit</td> <td>702</td> </tr> <tr> <td>Operator's Console</td> <td>781</td> </tr> <tr> <td>Tape Control Unit</td> <td>752</td> </tr> <tr> <td>Card Reader Control Unit</td> <td>756</td> </tr> <tr> <td>Card Punch Control Unit</td> <td>758</td> </tr> <tr> <td>Printer Control Unit</td> <td>757</td> </tr> </table>	Central Processing Unit	702	Operator's Console	781	Tape Control Unit	752	Card Reader Control Unit	756	Card Punch Control Unit	758	Printer Control Unit	757	<table border="1"> <tr> <td>3A 380.4</td> <td>Built-in circuitry. Manual by switch setting. It is also used to interrogate the program. Controls up to 10 tape units. Controls one 712 card reader unit. Controls one 722 card punch unit. Controls one 717 line printer.</td> </tr> </table>	3A 380.4	Built-in circuitry. Manual by switch setting. It is also used to interrogate the program. Controls up to 10 tape units. Controls one 712 card reader unit. Controls one 722 card punch unit. Controls one 717 line printer.							
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Arithmetic Unit	<p>Unit Designation: Central Processing Unit 702. The 702 operates with two types of words. The data words are variable in length; the instruction is a five character word. Both of which may contain mixed alphabetic and numerical information. The instruction word consists of a one character instruction code and a four character number indicating the address of a factor, designating some particular input-output unit, a secondary storage unit, or some additional information necessary for the execution of the instruction.</p> <p>The 702 has two accumulator storage units, each with a capacity of 512 character positions. An accumulator storage unit serves as temporary storage for information from magnetic core storage to be acted upon either logically or arithmetically.</p> <p>The 702 can perform 32 separate operations, including reading, writing, comparing, arithmetic operations, and certain logical manipulations.</p> <table border="1"> <thead> <tr> <th></th> <th><i>5 Binary Coded Decimal Digit Factors</i></th> <th><i>12 Binary Coded Decimal Digit Factors</i></th> </tr> </thead> <tbody> <tr> <td>Add ¹</td> <td>.276</td> <td>.437</td> </tr> <tr> <td>Multiply</td> <td>1.173</td> <td>4.554</td> </tr> <tr> <td>Divide ²</td> <td>6.625</td> <td>29.877</td> </tr> <tr> <td>Compare</td> <td>.253</td> <td>.414</td> </tr> <tr> <td>Transfer ³</td> <td>.138</td> <td>.138</td> </tr> <tr> <td>Store</td> <td>.253</td> <td>.414</td> </tr> </tbody> </table> <p>Notation: binary coded decimal. Arithmetic Mode: serial. Numerical Representation: absolute value, with plus or minus sign over units position. Zero Representation: ± 00...00. In the following table, operating speeds are given in milliseconds:</p> <p>¹ This figure is based on a 6 digit sum resulting from the addition of two 5 digit numbers. ² The dividend is a double length factor, divisor and quotient are as given. ³ Transfer of control to alternate instructions from the result of a test.</p>			<i>5 Binary Coded Decimal Digit Factors</i>	<i>12 Binary Coded Decimal Digit Factors</i>	Add ¹	.276	.437	Multiply	1.173	4.554	Divide ²	6.625	29.877	Compare	.253	.414	Transfer ³	.138	.138	Store	.253	.414
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EQUIPMENT REPORT

AUXILIARY OPERATION

As shown in the table of Functional Components, many of the units of the 702 may be used independently of the central processing unit to prepare input tapes and to produce punched cards or printed copy from the output tapes. Certain standard IBM punched card machines will, however, be required for the operation of the system. The number of each type required will depend on the number and types of applications. Any standard IBM punched card equipment may be used in a data processing system centering about the 702.

ADDITIONAL INFORMATION

Write to: Sales Department
International Business Machines Corporation
590 Madison Avenue
New York 22, New York

APPRAISAL

The IBM 702 is a large-size general purpose digital computer designed primarily for business applications. However, it may be utilized satisfactorily for combined business-scientific installations.

The operating speed of the 702 is substantially lower than that of a computer using an internal binary mode of operation. This limitation is offset in certain cases by the nature of the business data and by the ability of the 702 to process alphanumeric data without preliminary conversion. The variable length data field used by the 702 is convenient for many commercial applications. Such variable length data fields are most efficiently processed in a serial arithmetic fashion.

When a variable length data field is used, the problem of waste storage space and information packing are eliminated but certain other difficulties do arise. The transfer of data between locations may no longer be done by simply specifying certain word locations. Instead, this transfer must be done character by character. With the 702 the transmission begins at the address indicated and continues until a prearranged symbol is recognized. Such transfer procedures require few instructions, but are performed at a rate that is limited by the slowest

IBM 702

component involved. One advantage is that the computer is required to operate only on the actual figures involved. That is, when a computation has effectively been completed the machine does not have to wait for the finish of an artificial timing cycle.

Two features often considered necessary in a general purpose computer are prohibited by the nature of the variable field logic. No built-in floating point feature can be included in the machine facilities. This limitation will not be severe in the case of business calculations, but does limit the applicability of the 702 to scientific problems. Further, there are no Index Registers in the 702. Such Registers are extremely useful both in automatic counting and address modification for mass data handling.

The 702 has 10,000 characters of magnetic core storage. An additional 10,000 characters of core storage may be added. If this storage capacity proves to be less than adequate, a secondary storage capacity can be increased by the addition of magnetic drums each having a capacity of 60,000 characters. In addition, a theoretical limit of 100, and a practical limit of 10 magnetic tape units may be added to the system.

The present IBM magnetic tape system contains many desirable logical and mechanical features. The current system of recording produces a bit packing density of two hundred characters per inch, which is twice that of the previous system. Accordingly, the maximum of eighty characters which can be contained on one IBM punched card will now occupy two-fifths of a linear inch of magnetic tape. Allowing for the usual three-quarter inch inter-record gap between the data from each card, one can record the information from approximately twenty-five thousand punched cards in one reel of magnetic tape. With a tape speed of seventy-five inches per second, the IBM system is able to achieve a maximum data transfer rate of fifteen thousand characters per second.

The standard IBM scheme for variable length information blocks has also been retained in the new magnetic tape system. This permits an "optimum" utilization of the tape capacity in that one avoids the waste which occurs when the actual quantity of information does not fit into a predetermined "fixed" block length. The concurrent disadvantage of this system is that one cannot modify information in the middle of a record without rewriting the entire tape that holds the particular record. Thus,

EQUIPMENT REPORT

in order to update one portion of a file that is kept on magnetic tape, one must pass the entire file through the central computer and rewrite it, with the one modified item, on a new tape.

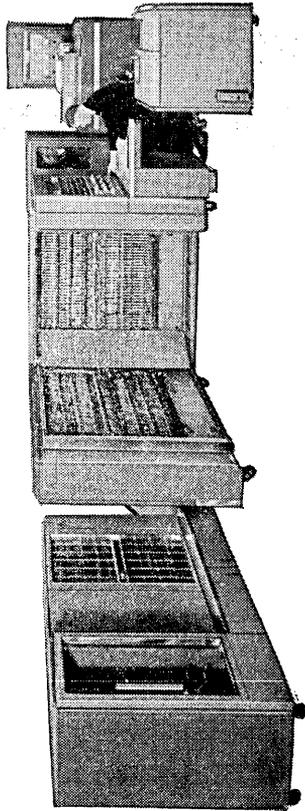
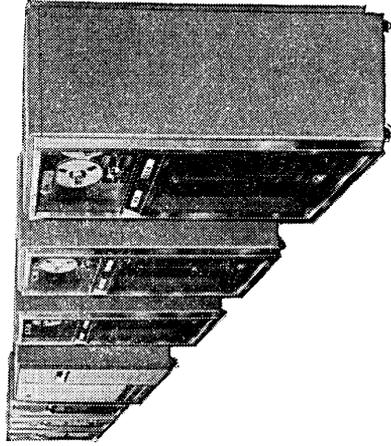
One definite disadvantage of the IBM magnetic tape system is the lack of the facility to write or read the tape while it is travelling "backwards." Although there is a high speed rewind function in the tape transport, almost all sorting procedures would greatly benefit from a two way operation with the files.

The addition of a tape buffer would also serve to materially increase the speed of the 702 operation. In particular, the Type 777 Tape Record Coordinator, which is now available for the 705 would be a welcome addition to the facilities of the 702. In addition, the 702's inability to handle paper tape as direct input is a definite shortcoming. One must currently resort to a time consuming paper tape-to-punched card conversion process.

The primary input to the 702 is from punched cards or magnetic tape. The 702 can process both numerical and alphabetic information directly, thus eliminating the need for preliminary conversion of data. For many applications the user may find it more expedient to perform an independent card-to-magnetic tape conversion. With such techniques, a rapid rate of data input to the 702 may be accomplished. A system of built-in check circuitry ensures the proper transcription of data during either independent or computer controlled operations. Output from the 702 is available through punched cards, a program controlled line printer, and by magnetic tape.

IBM offers a varied assortment of free customer training programs. These include courses in programming for the 702, executive utilization of large scale digital computers, and the study of applications for the 702. These programs are normally provided on a scheduled basis at various central locations, although certain courses are generally held only in New York City, Poughkeepsie, or Endicott, New York. The basic programming techniques for the 702 are not too difficult to learn. However, as with all large scale versatile digital computers, considerable practice is necessary to become an efficient programmer. IBM and many users of the 702 have developed a considerable library of sub-routines, assembly programs, and compiling routines. This library of programs will be of considerable assistance to any 702 installation.

IBM TYPE 704
Electronic Data Processing Machine



August, 1956

IBM TYPE 704

Electronic Data Processing Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM Type 704 is a large-size general purpose digital computer. Although the computer is designed primarily for engineering and scientific calculations, it is suitable for application to general data processing problems. The 704 operates internally in a parallel binary mode with a fixed word length of thirty-six binary digits. Decimal and alphabetic characters are converted to their prospective proper binary codings by a suitable internal program.

Direct input to the 704 is provided by a card reader and, with a suitable preliminary card-to-magnetic tape conversion, by direct reading of magnetic tape. Similarly, direct output is provided by card punching, line printing under program control, or by direct magnetic tape writing for later transfer to an independent magnetic tape controlled line printer. An oscilloscope for visual display is also available as optional equipment.

KEY DATA

Storage	internal working	magnetic core
	secondary	magnetic drum, magnetic tape
Input		punched cards, magnetic tape
Output		punched cards, magnetic tape, line printer, cathode ray tube

EQUIPMENT REPORT

APPLICATIONS

There are presently twenty-two installations of the Type 704. The following are a few of the applications:

Business

- Merchandising and operating results for department stores
- Life insurance rate calculations
- Postal pay rates
- Production packaging analysis
- Overhead cost allocation
- Stock inventory
- Production scheduling, price and analysis
- Evaluation of oil fields, with regard to reserves, production, prices and costs

Scientific

- Linear programming—transportation
- Multiple regression correlation
- Heat transfer and exchange problems
- Electron optics calculations
- Two phase reservoir flow problems
- Russian language translation
- Critical speeds in turbo-machines
- Weather forecasting
- Oil reservoir studies
- Gas network analysis
- Harmonic and spectrum analysis

FUNCTIONAL UNITS OF THE TYPE 704 AND APPROXIMATE COST

The following rental charges are for single-shift operation, exclusive of auxiliary equipment. Two-shift operation increases single-shift rental by 50%; three-shift operation increases single-shift rental by 100%.

The maxima given are based on the number of units that can be tied into the computers as components. For the independent operation equipment, any number of units are available.

The user's application will determine the number and type of units that best suit his requirements.

IBM TYPE 704

<i>Functional Unit</i>	<i>Type</i>	<i>Cost/Unit Mo. Rental</i>	<i>Maximum No. of Units</i>
Central Processing Unit; including operator's panel, and power units	704	\$13,000	1
Magnetic Core Storage (4096 words)	737 Model I	6,100	1
Magnetic Core Storage (4096 words—Can be used only in conjunction with Type 737-I)	737 Model II	5,000	1
Magnetic Core Storage (32,768 words—Cannot be used in addition to Type 737)	738	15,000	1
Magnetic Drum Storage (8192 words)	733	3,500	2
Magnetic Tape Unit	727	550	10
Magnetic Tape Control Unit	753	2,500	1
Card Reader (150 cards/min.)	711 Model I	200	1
Card Reader (250 cards/min.)	711 Model II	400	1
Card Recorder	721	200	1
Alphabetic Printer	716	800	1
Cathode Ray Tube Output Recorder	740	2,700	1
Display Unit (Used with Type 740)	780	150	1

For Independent Operation

The Magnetic Tape Unit Type 727 is used with all the equipment listed below:

<i>Operation</i>	<i>Control Unit</i>
Card-to-Tape	Card Reader, Type 714 Type 759
Tape-to-Card	Card Punch, Type 722 Type 758
Tape-to-Line Printer	Alphabetic Printer, Type 717 Type 757

EQUIPMENT REPORT

PERSONNEL

The following figures illustrate the range of the number of personnel which most installations will require. Exceptions to these figures may be found. These approximate figures are for single-shift operation.

<i>Position</i>	<i>Range</i>
Methods Programming } Coding }	15-60
704 operation and scheduling	2
Auxiliary machine operation	1-3
Key punch operation	1-10
Maintenance *	3-8

* Provided by the manufacturer, included in rental cost.

The size of the staff required to operate a data processing center depends on the nature of the application. Any increase in the number or complexity of new problems results in a corresponding increase in methods, programming and coding personnel. The base requirement for people in these capacities may be reduced by using established assembly and compiling routine and "formula translation" techniques.

Increased quantities of input data (particularly in forms not usable as direct input media), non-standardized formats and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and key punch operation categories. Computer operators and schedulers are grouped into a single classification also affected by the number of problems, but to a lesser degree than the other classifications.

All maintenance is performed by employees of the manufacturer as part of the rental cost. The size of this staff is determined by the manufacturer and is based on the total size of the installation—computer and all peripheral or auxiliary equipment.

IBM TYPE 704

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

At no additional cost, a three-week course in detailed programming is available from the manufacturer. A one-week course for personnel who already know the 701 is also offered.

An operating and programming manual, Form No. 24-6661-0 is supplied by the manufacturer. Methods of numerical techniques and programs are available in IBM's Computation Seminar Proceedings and Technical Newsletters. A preliminary installation manual is also supplied to the user.

PHYSICAL CONSIDERATIONS

Space

Adequate work space for methods, programming and coding personnel in an area adjacent to but not in the room holding the machines.

A separate room, adjacent to the computing room, must be provided for working and storage space for maintenance personnel and equipment.

Area = 400 to 1,000 sq. ft.

Storage space must be provided for master cards and magnetic tapes, and for supplies (cards, tapes, forms, etc.) used by the computer in processing a problem.

The equipment room (or rooms if key punches and other auxiliary equipment are in a room separate from the computer) must be planned carefully. The actual size depends on the size of the installation. Clearance between machines is required for maintenance. Adequate work space must be provided for the operators and schedulers actually responsible for the operation of the computer. The manufacturer will provide technical assistance and detailed drawings of efficient machine locations in the allocated area.

Approx. Working Area = 1,500 to 8,000 sq. ft.

A floor loading factor of 200 lbs./sq. ft. should be allowed in the installation.

EQUIPMENT REPORT

Atmospheric Conditions and Air Conditioning To assure proper operation the Type 704 must be operated under atmospheric conditions having the following limits:

Temperature 65° to 80° F.

Rel. Humidity 40 to 60%

The individual units of the computer are equipped with internal blowers to assure adequate circulation of air. The equipment room must be air conditioned to assure that the above mentioned atmospheric conditions are maintained. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer will determine the heat dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning required.

A desirable feature of the equipment room would be some form of dust precipitator, to assure positive operation of magnetic tapes and drums. Dust on the surface of the tape or drum may cause erroneous reading of the record.

Wiring A four-wire, 208 volt, three-phase, 60 cycle AC power supply is required by the Type 704. The amperage and consequently power drawn by the system depends on the type and number of units included in the installation. The supply voltage should be $208\text{ V} \pm 8\%$ to assure errorless operation of the system.

The equipment room should be provided with a false or subfloor. Cables connecting the units should run under this floor for safety and appearance.

Preventive Maintenance Adequate time should be allotted for preventive maintenance. Such time can be allotted outside of the standard shift worked by the user.

PHYSICAL DATA OF THE FUNCTIONAL UNITS

<i>Functional Unit</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight lbs.</i>	<i>Heat Dis- sipation Per Unit BTU/hr.</i>	<i>Operating Current Per Unit Amperes</i>
Central Processing Unit	704	72½	36¾	65¾	2,850	109,800	112.0
Power Frame No. 1	736	61	33½	65¼	2,810	14,700	15.0
Power Frame No. 2	741	61	33½	65¼	2,750	14,700	15.0
Power Distribution Unit	746	40½	33½	65¼	1,230	3,000	3.1
Magnetic Core Storage	737	105	31	64	2,445	16,400	17.8
Magnetic Drum Storage Unit	733	54¾	31¼	61½	1,480	25,200	25.7
Magnetic Tape Unit	727	29¼	28½	69	920	4,100	2.2
Magnetic Tape Control Unit	753	60	32¼	67	1,636	9,200	16.7
Card Reader	711	31¾	29½	31¾	530	1,700	1.7
Card Recorder	721	39½	25½	49¾	720	9,000	9.0
Alphabetic Printer	716	58¾	29¾	47	2,795	7,850	8.0
Cathode Ray Tube Output Recorder	740	25½	37	52	752	6,140	6.7
Cathode Ray Display Unit	780	24	28	21¾	253		

FUNCTIONAL COMPONENTS OF THE TYPE 704 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Punched Cards	Card Reader	711	4G 380.5	150 or 250, 80-column cards/minute; maximum of 200 or 333 characters/second.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	15,000 characters/second: alphabetic and binary coded decimal notation. 25,000 decimal equivalent digits/second: binary notation.
Output	Punched Cards	Card Recorder	721	4G 380.6	100, 80-column cards/minute; maximum of 133 characters/second.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	15,000 characters/second; alphabetic and binary coded decimal notation. 25,000 decimal equivalent digits/second: binary notation.
	Printed Copy	Alphabetic Printer	716		150 lines/minute; 120 printing positions/line. The Type 716 is a modified Type 407 Accounting Machine.
	Cathode Ray Tube	Cathode Ray Tube Output Recorder	740		200 alphabetic and numeric characters/second in the form of intensified spots on the tubes. 7,000 data points/second in the form of a graphical display. This unit consists of a 21" CRT for visual display, and a 7" CRT for photographic recording. Both tubes' output (displays) are identical.

Storage	Magnetic Core	Magnetic Core Storage Unit	737 738		4,096, 8,192, or 32,768 words. (One word refers to 36 binary digits or 10 decimal equivalent digits and sign.) Access Time: 12 microseconds.
	Magnetic Drum	Magnetic Drum Reader and Recorder Unit	733		8,192 words/drum unit. (One word refers to 36 binary digits or 10 decimal equivalent digits and sign.) 2 drums/drum unit. Average access time: 12.29 milliseconds; read-write speed: .096 milliseconds/word. Size: 13" diameter, 5½" long. Speed: 2,500 rpm. No. of Channels: 16/drum; No. of Sectors/Channel: 32; No. of Words/Sector: 128.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	900,000 words/tape maximum, depending upon length of records of information.
Control		Central Processing Unit	704		Built-in circuitry
		Operator's Panel	704		Manual by switch setting. It is also used to interrogate a program.
		Tape Control Unit	753		Controls up to 10 tape units.

Continued on next page.

FUNCTIONAL COMPONENTS OF THE TYPE 704 SYSTEM—Cont.

Arithmetic Unit	<p>Unit Designation: Central Processing Unit Type 704.</p> <p>Accumulator: 37 bits and sign (of which 2 bits are used for overflow).</p> <p>Multiplier-Quotient Register: 35 bits and sign; multiplier; quotient; buffer between core storage and other storage media or input-output devices.</p> <p>Instruction Location Counter: 12 or 13 bits; holds the address of the next instruction to be performed.</p> <p>Instruction Register: 18 bits; holds portions of the instruction word for interpretation and execution.</p> <p>Index Registers (3): 12 or 13 bits; counting and address modification.</p> <p>The instruction word is 36 bits and modified one address type.</p> <p>There are 26 arithmetic, 23 logical, 27 single-word copy, 7 input-output and 4 other instruction operation codes available.</p>	<p>Notation: binary</p> <p>Arithmetic Mode: parallel</p> <p>Negative No. Representation: minus absolute value</p> <p>Zero Representation: plus or minus 00...00 (35 zeros)</p>																		
		The following operating speeds are in milliseconds:																		
		<table> <thead> <tr> <th></th> <th style="text-align: center;"><i>Fixed Decimal</i></th> <th style="text-align: center;"><i>Floating Decimal</i></th> </tr> </thead> <tbody> <tr> <td>Add (addition of 2 positive full words)</td> <td style="text-align: center;">.024</td> <td style="text-align: center;">.084</td> </tr> <tr> <td>Multiply ¹</td> <td style="text-align: center;">.240</td> <td style="text-align: center;">.204</td> </tr> <tr> <td>Divide ²</td> <td style="text-align: center;">.240</td> <td style="text-align: center;">.216</td> </tr> <tr> <td>Compare</td> <td style="text-align: center;">.024</td> <td></td> </tr> <tr> <td>Copy (transfer word from working to internal storage)</td> <td></td> <td style="text-align: center;">.024</td> </tr> </tbody> </table>		<i>Fixed Decimal</i>	<i>Floating Decimal</i>	Add (addition of 2 positive full words)	.024	.084	Multiply ¹	.240	.204	Divide ²	.240	.216	Compare	.024		Copy (transfer word from working to internal storage)		.024
	<i>Fixed Decimal</i>	<i>Floating Decimal</i>																		
Add (addition of 2 positive full words)	.024	.084																		
Multiply ¹	.240	.204																		
Divide ²	.240	.216																		
Compare	.024																			
Copy (transfer word from working to internal storage)		.024																		
		¹ Full word multiplicand times 555 555 5555 multiplier to give double length product.																		
		² Double length dividend by divisor to give a quotient of 555 555 5555.																		

IBM TYPE 704

AUXILIARY OPERATION

Equipment for the independent operations of card-to-tape, tape-to-card or tape-to-printer is listed under the Functional Units of the Type 704. The need for this equipment depends upon the application. However, certain standard IBM punched card machines will be required or are recommended for the operation of the computer system.

<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
Required		
2-Card Punches	024, 026	1A 380.1
1-Reproducing Punch	514, 519, 528	3C 380
1-Sorter	082	4A 380.3
2-Verifiers	056	1C 380.1
Recommended		
1-Collator	077	4A 380.1
1-Line Printer	407	4B 380.4

ADDITIONAL INFORMATION

Write to: Applied Science Division
International Business Machines
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

The IBM 704 is a large-scale digital computer designed primarily for scientific and engineering applications. The high speed of operation and the array of input-output equipment in this machine, however, permits the 704 to be readily adapted to generalized data processing problems. The computer operates internally in the binary system and has a fixed word length of thirty-six binary digits including a sign bit. The instructions may be classified as the modified one-address type. The machine contains three Index or B-Registers as standard equipment and does have built-in floating point arithmetic circuitry. The primary high speed storage consists of a magnetic core unit of four thousand and ninety-six words. In addition, there are available a number of magnetic drums and magnetic tape units. The operation speed and capacity of the 704 qualify it as one of the

EQUIPMENT REPORT

most powerful general purpose digital computers presently available for large-scale data processing applications.

Scientific calculations frequently require large quantities of input-output data and the designers of the 704 have recognized this fact. The computer has been built with facilities that are capable of accommodating a wide variety of component and peripheral data handling devices. Direct input to the computer is available through a two hundred and fifty card per minute card reader. In addition, one may utilize the magnetic tape units for the direct input of information. Direct output is available by summary punching, by line printer under program control, or by magnetic tape writing.

The 704 utilizes two different "modes" of recording on magnetic tape. The primary mode is straight binary and presents a true reproduction of the thirty-six bit computer word. The secondary mode involves a "Binary-Coded-Decimal" recording which differs only slightly from the coding used on the 702, 705 and 650. In the latter mode each group of six bits in the machine word is considered to represent one alphameric character. Accordingly, this form of recording defines six such characters in each thirty-six bit 704 word.

The programmer indicates which of the two modes is to be utilized in writing, or which mode is to be used for translation in reading, by the manner of addressing the selected magnetic tape unit. One generally utilizes the binary mode of recording when the tape file is being used as a form of internal machine storage. Use of the Binary-Coded-Decimal mode permits the 704 to be utilized in conjunction with a variety of peripheral card-to-magnetic tape and magnetic tape-to-line printer equipment. Theoretically, this mode of recording will permit a tape which has been written on the 705 to be processed by the 704, and in general will permit an intercommunication between all of the IBM magnetic tape computers. Although this is of questionable practical value it does offer a situation which has a good deal of aesthetic merit. The true value of the dual recording system does lie in the fact that all of the available IBM peripheral data handling and data preparation equipment may now be readily utilized in conjunction with the 704 computer.

The present IBM magnetic tape system contains many desirable logical and mechanical features. The current system of

IBM TYPE 704

recording produces a bit packing density of two hundred characters per inch, which is twice that of the previous system. Accordingly, the maximum of eighty characters which can be contained in one IBM punched card will now occupy two-fifths of a linear inch of magnetic tape. Allowing for the usual three-quarter inch inter-record gap between the data from each card, one can thus record the information from over twenty thousand punched cards in one reel of magnetic tape. With a tape speed of seventy-five inches per second the IBM system is able to achieve a maximum data transfer rate of fifteen thousand characters per second.

The standard IBM scheme for variable length information blocks has also been retained in the new magnetic tape system. This permits an "optimum" utilization of the tape capacity in that one avoids the waste which occurs when the actual quantity of information does not fit into a predetermined "fixed" block length. The concurrent disadvantage of this system is that one cannot modify information in the middle of a record without rewriting the entire tape that holds the particular record. Thus, in order to update one portion of a file that is kept on magnetic tape, one must pass the entire file through the central computer and rewrite it, with the one modified item, on a new tape.

One definite disadvantage of the IBM magnetic tape system is the lack of the facility to write or read the tape while it is travelling "backwards." Although there is a high speed rewind function in the tape transport, almost all sorting procedures would benefit greatly from a two-way operation with files.

The addition of a tape buffer would also serve to materially increase the speed of 704 operation. In particular, the Type 777 Tape Record Coordinator, which is now available for the 705, would be a welcome addition to the facilities of the 704.

The 704's present inability to handle paper tape as direct input is a definite shortcoming. One must now resort to a time consuming paper tape-to-punched card conversion process. IBM's apparent inability to develop a satisfactory paper tape-to-magnetic tape converter serves only to highlight the need for some type of direct paper tape handling mechanism to be attached to the 704.

The memory complex that is available with the 704 is imposing. The basic high speed memory is a unit of four thousand

EQUIPMENT REPORT

and ninety-six words of magnetic core storage. The high speed store may be increased to an optional maximum size of thirty-two thousand words. This core unit has a random access memory cycle of twelve microseconds, thus allowing the machine to operate with an addition time of just twenty-four microseconds. In addition to the magnetic core memory one may select two magnetic drums, each of which has a capacity of eight thousand one hundred and ninety-two words, and up to ten magnetic tape units.

The 704 operates internally in a parallel binary mode. It has a single length accumulator with two overflow bits and a separate sign bit. For certain logical and shift instructions the sign and overflow bits may be considered as extensions of the accumulator itself. Alphabetic information may be read directly into the machine from the magnetic tapes and then operated upon internally while still in the Binary-Coded-Decimal Mode. In general, decimal and alphabetic information may also be handled by a preliminary programmed conversion. The 704 possesses a sufficient number of useful logical instructions so that this type of individual character processing of alphabetic data is quite feasible.

In general, numerical operations are performed in binary arithmetic with a fixed word length. The 704 does have a floating point arithmetic feature. With this additional equipment one gains the important advantage of being able to perform the four floating point arithmetic operations without the necessity for time and space consuming programming.

One of the most important features of the 704 is the three Index or B-Registers which are provided as standard equipment. The Index Register concept first arose several years ago on the EDSAC computer which was designed and built in the University Mathematical Laboratory of Cambridge University. There are several medium-scale serial drum computers which currently present this feature on a commercial basis. But, the 704 is the first large-scale parallel machine to be put into production with an Index Register incorporated in its operating design. The two main advantages of Index-Registers lie in their ability to automatically modify effective instruction addresses, without altering their actual condition in the memory, and in

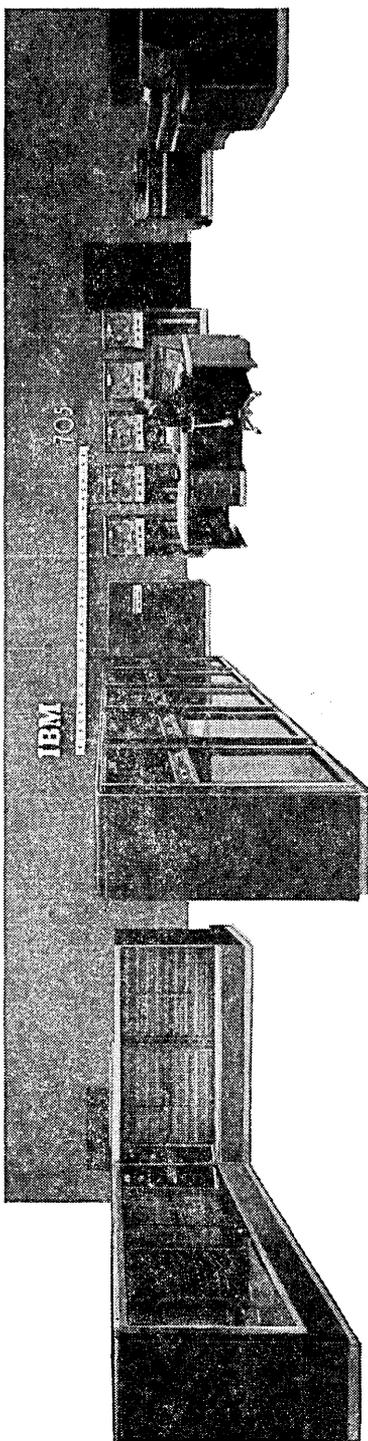
IBM TYPE 704

their usefulness for keeping an automatic tally of the number of repetitions which have occurred in an iteration loop.

IBM offers a varied assortment of free customer training programs. These include courses in programming for the 704, executive utilization of large scale digital computers, and in the study of applications suitable for 704 solution. These programs are normally provided on a scheduled basis at various central locations, although certain courses are generally held only in New York City, Poughkeepsie or Endicott, New York. The programming techniques of the 704 are relatively easy to learn. Programmers who have had experience with the SPEEDCO interpretive system that was developed for the 701 will recognize that a number of the desirable features of that system have been built into the 704.

During the past few years a pseudo-official organization has grown up under the name of "SHARE." The members of this group are representatives of various installations which already have a 704 installed or do have a 704 on order. The purpose of SHARE is to provide a common pool of knowledge and ability which may be shared by the participating units. Their activities so far have been concentrated on the development of scientific subroutine libraries, the design of an assembly program, the standardization of 704 utilization techniques, and on the study of desirable logical features which might be incorporated into existing equipment. IBM does belong to SHARE, but solely on an equal footing with the other member organizations. Although SHARE is specifically intended not to be an additional IBM sales tool, the benefits that membership in SHARE provides to 704 installations are considerable.

IBM 705
Electronic Data Processing Machine



4E 380.4—Page 2

May 18, 1956—22

IBM 705

Electronic Data Processing Machine

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

A large-size general purpose digital computer, primarily for business problems, suitable for scientific and combined business-scientific applications. The 705 can process numerical decimal information, alphabetic characters or any of eleven special characters. All arithmetic and logical operations are performed by the central computer unit. Input can be from punched cards, directly to the central computer unit or indirectly by using an independent card-to-magnetic tape operation so that the magnetic tape will be the direct input medium. Similarly, output, in the form of punched cards or a printed report may be performed by a card punch or line printer directly under the control of the central computer or in an independent magnetic tape-to-card punch (or line printer) operation. A variable length field (data word) is used.

KEY DATA

Storage	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">internal working</td> </tr> <tr> <td style="text-align: center;">secondary</td> </tr> </table>	internal working	secondary	magnetic core
internal working				
secondary				
Input		magnetic drum, magnetic tape		
Output		punched cards, line printer, magnetic tape		

EQUIPMENT REPORT

APPLICATIONS

There are 14 installations of the 705. The following are a few of the applications:

Business

- Life insurance commission calculation
- Utility billing
- Petroleum accounts payable
- Steel industry production scheduling
- Inventory control

Scientific

- Simulation of aircraft flight trajectories
- Aerodynamic heating and parameter studies
- Operations research and traffic studies

FUNCTIONAL UNITS OF THE 705 SYSTEM AND APPROXIMATE COST

The following rental costs are for single-shift operation, exclusive of auxiliary equipment. Two-shift operation increases rental costs by 50%; three-shift operation increases rental costs by 100%.

The maxima given are based on the number of units that can be tied into the computer unit as components. These maxima are determined by the logical organization of the address system of the equipment. For independent card-to-tape, tape-to-card or tape-to-printer operations any number of card readers, card punches, printers and tape units with their respective control units are available. Input-output equipment in most cases is the same equipment as used in independent operations.

The user's application will determine the number and type of units that best suit his requirements.

IBM 705

<i>Functional Unit</i>	<i>Type</i>	<i>Cost/Unit Mo. Rental</i>	<i>Maximum No. of Units</i>
Central Processing Unit; including console with typewriter and power unit			
with 20,000 positions of core storage	705 Model I	\$14,000	1
with 40,000 positions of core storage	705 Model II	16,500	
Magnetic Drum Storage Unit, including power unit	734	2,800	30
Magnetic Tape Unit	727	550	100
Tape Control Unit	754	2,000	*
Tape Record Coordinator	777	3,000	*
Card Reader, including card reader control unit	714 } 759 }	2,400	100
Card Punch, including card punch control unit	722 } 758 }	1,050	100
Document-Originating Machine (used in combination with the 774 and 747)	519	150	10
Tape Data Selector selector control unit	774 } 747 }	2,200	*
Accounting Machine (used in combination with the 774 and 747)	407	875	10
Printer, including printer control unit	717 } 757 }	1,800	100
Printer	719	1,400	10
Printer	720	2,100	
Printer	730	2,100	
Control and Storage Unit (for 719, 720 or 730)	760	1,850	*

* Unless otherwise specified by the lessee, provision is made for a maximum of ten 760, 754, 777 and 774 control units in any combination to be controlled by the 705 central processing unit. Each 760 can control one Printer (719, 720 or 730) and two 727 Tape Units. The 754 can control up to ten 727 Tape Units. The 777 can control up to eight 727 Tape Units. The 774 Tape Data Selector with the 747 permits one 519 or one 407 to be tied into the computer.

EQUIPMENT REPORT

For Independent Operation

The Magnetic Tape Unit 727 can be used with all the equipment listed below.

<i>Operation</i>	<i>Input or Output Unit</i>	<i>Control Unit</i>
Card-to-Tape	Card Reader 714	759
Tape-to-Card	Card Punch 722	758
	Document-Originating 519	774 & 747
Tape-to-Printer	Printer 717	757
	Printer 719, 720, 730	760
	Printer 407	774 & 747

PERSONNEL

The following figures illustrate the range of the number of personnel which most installations will require. Exceptions to these figures may be found. These approximate figures are for single-shift operation.

<i>Position</i>	<i>Range</i>
Methods	2 to 12
Programming	2 to 20
Coding	2 to 30
705 operation and scheduling	1 to 3
Auxiliary machine operation	1 to 6
Key punch operation	2 to 10
Maintenance *	4 to 8

* Provided by the manufacturer, included in rental cost.

The size of the staff required to operate a data processing center depends on the nature of the applications. Any increase in the number or complexity of new problems results in a corresponding increase in methods, programming and coding personnel. After an installation is well established, the requirement for people in these capacities may be reduced by using the assembly and compiling routines and an "automatic coding" technique, presently under development.

Increased quantities of input data (particularly in forms not usable as direct input media), non-standardized formats and physically disorganized information will affect the total number of personnel in the auxiliary machine operation and key punch operation categories. Computer operators and schedulers are grouped into a single classification also affected by the number of problems, but to a lesser degree than the other classifications.

Under present rental policies, maintenance is performed by employees of the manufacturer as part of the rental cost. The size of this staff is determined by the manufacturer and is based on the hours of usage and the total size of the installation—computer and all peripheral or auxiliary equipment.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Three types of training courses are given by the manufacturer at no extra cost: a general introductory course one week in length, a course in methods and procedures two weeks in length, and a detailed course in programming four weeks in length.

An operating manual, Form No. 22-6627 is supplied by the manufacturer.

A detailed installation manual on physical layout, power requirements, etc. is supplied by the manufacturer when the order for the machine is placed.

PHYSICAL CONSIDERATIONS

Space In addition to equipment space, adequate work space for methods, programming and coding personnel should be provided in an area adjacent to the equipment room.

A separate room, adjacent to the computing room, should be provided for working and storage space for maintenance personnel and equipment.

Area = 400 sq. ft.

Storage space is required for master cards and magnetic tapes, and for supplies (cards, tapes, forms, etc.) used in processing a problem.

EQUIPMENT REPORT

- Space—cont.** The actual size of the equipment room (or rooms if key punches and other auxiliary equipment are in a room separate from the computer) depends on the size of the installation. From 2½ feet to 5 feet clearance between machines is required for maintenance. Adequate work space should be provided for the operators and schedulers actually responsible for the operation of the computer. The manufacturer will give technical assistance and detailed drawings of efficient machine locations in the allocated area.
- Atmospheric Conditions and Air Conditioning** To ensure proper operation, the 705 must be operated under atmospheric conditions having the following limits:
- | | |
|-------------------|------------------|
| Temperature | 65° F. to 80° F. |
| Relative Humidity | 40% to 60% |
- The individual units of the computer are equipped with internal blowers to provide adequate circulation of air. The equipment room must be air conditioned to maintain the above atmospheric conditions. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer system will determine the heat dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning required. A desirable feature of the equipment room would be some form of dust precipitator, to ensure positive operation of magnetic tapes and drums.
- Wiring** A four-wire, 208 volt, three-phase, 60 cycle AC power supply is used by the 705. The amperage and consequently power drawn by the system depend on the type and number of units included. The supply voltage should not vary more than $\pm 8\%$ to ensure errorless operation of the system. The equipment room should have a false or sub-floor. Cables connecting the units should run under this floor for safety and appearance.
- Preventive Maintenance** Adequate time should be allotted for preventive maintenance. Such time can be allotted outside of the standard shift worked by the user.

PHYSICAL DATA

<i>Functional Unit</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight Pounds</i>	<i>Heat Dissipa- tion BTU/hr.</i>	<i>Operating Current Amperes</i>
Central Processing Unit } Power Unit } Console }	705M1	152 $\frac{1}{4}$ 64 $\frac{1}{2}$ 71	149 $\frac{1}{2}$ 32 $\frac{1}{4}$ 28 $\frac{1}{4}$	64 $\frac{3}{4}$ 67 45	5291 } 2961 } 508 }	76,020	86.1
	705M2	Same as M1				110,000	120.0
Magnetic Drum Storage Unit } Magnetic Drum Power Unit }	734	65 44	32 $\frac{1}{4}$ 32 $\frac{1}{4}$	67 67	1775 } 1646 }	22,860	34.3
Magnetic Tape Unit	727	29 $\frac{1}{4}$	31	69	920	4,100	6.0
Tape Control Unit	754	60	32	67	1636	9,660	17.6
Tape Record Coordinator	777	63	32	67	1900	34,000	32.0
Card Reader	714	47	33	54	1100 }	17,924	26.8
Card Reader Control Unit	759	60	32	67	2100 }		
Card Punch	722	52	26	50	1250 }	20,490	33.5
Card Punch Control Unit	758	60	32	67	2150 }		
Document-Originating Machine	519	53	25	49 $\frac{1}{2}$	1180	4,090	13.0
Tape Data Selector	774	63	32	67	2200 }	28,900	52.0
Tape Selector Control Unit	747	44	32	67	2000 }		
Accounting Machine	407	75	31	51	2815	5,630	17.5
Printer	717	70 $\frac{1}{2}$	32 $\frac{1}{2}$	51	2244 }	27,700	38.5
Printer Control Unit	757	60	32 $\frac{1}{4}$	67	1866 }		
Printer	719	75	30	53	1500	10,000	7.0
Printer	720	75	30	53	1500	10,000	7.0
Printer	730	95	30	53	2000	20,000	14.0
Control and Storage Unit	760	63	32	67	1900	24,000	17.6

A floor loading factor of 200 lbs./sq. ft. should be allowed in the installation.

FUNCTIONAL COMPONENTS OF THE 705 SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Punched Cards	Card Reader	714	3A 380.3	250 80-column cards/minute; maximum of 333 characters/second.
	Magnetic Tape (Punched Cards)	Magnetic Tape Unit	727	4G 380.3	15,000 characters/second. Information on tape from the following: <ol style="list-style-type: none"> 705 Central Processing Unit; results of an earlier processing operation. Card-to-tape operation, independent of Central Processing Unit, using only the 714 Card Reader with its 759 Control Unit and 727 Tape Unit. Independent operation is limited to the speed of card reader, 333 characters/second.
Output	Punched Cards	Card Punch	722	3A 380.4	100 80-column cards/minute; maximum of 133 characters/second.
		Document-Origina- ting Machine	519	3C 380.2	100 80-column cards/minute; maximum of 133 characters/second.
	Printed Copy	Printer	717		150 lines/minute; 120 printing positions/line; contains 120 positions of magnetic core buffer storage.
		Printer	719	5A 380.1	1000 lines/minute; 60 printing positions/line.
		Printer	720	5A 380.1	500 lines/minute; 120 printing positions/line.
		Printer	730	5A 380.1	1000 lines/minute; 120 printing positions/line.
	Accounting Machine	407	4B 380.4	150 lines/minute; 120 printing positions/line.	
Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	15,000 characters/second. Information on tape may be used for: <ol style="list-style-type: none"> Input to Central Processing Unit 705; source of information for subsequent processing operation. 	

	(Punched Cards)				<ol style="list-style-type: none"> 2. Tape-to-card operation, independent of Central Processing Unit, using only the 722 Card Punch with its 758 Control Unit, or the 519 Document-Originating Machine with the 774 and 747 Control Unit, and the 727 Tape Unit. Independent operation is limited to the speed of card punch, 133 characters/second. 3. Tape to printer operation, independent of Central Processing Unit. Uses only the 727 Tape Unit and any of the following printer-control combinations: <ol style="list-style-type: none"> a) 717 Printer; 757 Control—150 lines/minute, maximum. b) 720 Printer; 760 Control—500 lines/minute, maximum. c) 719, 730 Printer; 760 Control—1000 lines/minute, maximum. d) 407 Accounting Machine; 774 Tape Selector with the 747 Control—150 lines/minute, maximum.
	(Printed Copy)				
	Printed Copy	Console	705		Typewriter output—10 characters/second; used mainly for interrogation and checking purposes.
Storage	Magnetic Core	Central Processing Unit	705		20,000 or 40,000 characters; variable length field and record. Access time: 17 microseconds/character of data.
	Magnetic Tape	Magnetic Tape Unit	727	4G 380.3	5,760,000 characters/tape.
	Magnetic Drum	Magnetic Drum Storage Unit	734		Capacity: 60,000 characters. Average access time: 8.0 milliseconds; read-write speed, .04 millisecc./character. Size: 10.7" diameter, 12.5" long. Speed: 3750 rpm. No. of Channels: 30. No. of Sections/Channel: 10. No. of Characters/Section: 200.

FUNCTIONAL COMPONENTS OF THE 705 SYSTEM (Continued)

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Control		Central Processing Unit	705		Built-in circuitry for control of the components.
		Console	705		Manual, by switch settings.
		Card Reader Control Unit	759	3A 380.3	Controls one 714 Card Reader during direct input to the 705 or during an independent card-to-tape operation. Contains 92 positions of magnetic core buffer storage.
		Card Punch Control Unit	758	3A 380.4	Controls one 722 Card Punch during direct output from the 705 or during an independent tape-to-card operation. Contains 80 positions of magnetic core buffer storage.
		Printer Control Unit	757		Controls one 717 Printer during direct output from the 705.
		Control and Storage Unit	760	5A 380.1	Controls one 719, 720, or 730 Printer and one or two 727 Tape Units simultaneously. Used to control printer for direct output from Central Processing Unit or for independent tape to printer operations. Contains 1000 positions of magnetic core buffer storage.
		Tape Control Unit	754		Controls up to ten 727 Tape Units.
		Tape Record Coordinator	777		Controls up to eight 727 Tape Units. Contains 1024 positions of magnetic core buffer storage. Allows overlapping of tape input-output operations with simultaneous computation by Central Processing Unit.
	Tape Data Selector Control Unit	747		Controls one 774 Tape Data Selector for rearrangement of magnetic tape information for one 407 Accounting Machine's printing; or for one 519 Document-Originating Machine's punched card output. Permits rearrangement of data directly from the Central Processing Unit or during independent tape to printer or card operation.	

Arithmetic Unit

Unit Designation: Central Processing Unit 705.

The 705 operates with two types of information. The data is completely variable in length; the instruction is a five character word. Both types of information may contain mixed alphabetic and numerical information. The instruction consists of a one character instruction code and a four character number indicating the address of a factor, designating some input, output or secondary storage unit, or information required by the computer to execute the instruction. A single address system, all arithmetic operations are effectively made two address codes by placing a combination of zone pulses over the hundreds and tens positions of the address to indicate the accumulator or auxiliary storage to be used in the execution of the command.

The accumulator and auxiliary storage units are used to store, temporarily, factors to be used in a given operation. The accumulator can accommodate 256 characters. There are fourteen 16-character auxiliary storages and one 32-character auxiliary storage. These fifteen auxiliary storages can be coupled to form units up to 256 characters in length. One position of the accumulator and each group of auxiliary storages must be reserved for a special "storage mark" used to define the left hand limit of the field.

The auxiliary storages may be used for addition and subtraction. For multiplication, the multiplier is contained in the accumulator, the multiplicand in internal storage and the product appears in the accumulator. For division, the dividend is in the accumulator, the divisor is in internal storage and the quotient appears in the accumulator.

There are 8 arithmetic, 16 logical, 3 transfer and 15 input-output operations.

Notation: binary coded decimal.

Arithmetic Mode: serial by digit.

Numerical Representation: absolute value with plus or minus sign over units position.

Zero Representation: $\pm 00\dots00$.

In the following table, operating speeds are given in milliseconds:

	<i>5 Decimal Digit Factors</i>	<i>12 Decimal Digit Factors</i>
Add	.119	.238
Multiply	.799	3.298
Divide ¹	4.820	22.015
Compare	.119	.238
Transfer ²	.034	.034
Transmit ³	.035	.250

All times given include the time required to read and interpret the instruction code, .017 milliseconds.

¹ The dividend is a double length factor, divisor and quotient are as given.

² Transfer of control to alternate instructions from the result of a test.

³ Transmission from one portion of internal storage to some working storage. Transmission as a group of five characters in one case, as 12 single characters in the second case.

EQUIPMENT REPORT

AUXILIARY OPERATION

As shown in the table of Functional Components, many of the units of the 705 may be used independently of the central processing unit to prepare input tapes and to produce punched cards and/or printed copy from output tapes. Certain standard IBM punched card machines will, however, be required for the operation of the system.

<i>Range of Number of Units Required</i>	<i>Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>
2 to 12	Key Punch	024, 026	1A 380.1
1 to 3	Reproducing Punch	514, 519, 528	3C 380
1 to 3	Sorter	082, 083	4A 380
1 to 3	Collator	077, 089	4A 380
0 to 6	Verifier	056	1C 380.1

The number of each type required will depend on the number and types of applications. Other specialized equipment in particular, the Typewriter Punch, Cardatype, Tape Controlled Card Punch, Transceiver, etc., may be used to prepare input cards to the system. Any standard IBM punched card equipment may be used in a data processing system centering around the 705.

ADDITIONAL INFORMATION

Write to: EDPM Department
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

APPRAISAL

The IBM 705 is a large-size general purpose digital computer designed primarily for business use. Its versatility and storage capacity, however, make it satisfactory for combined business-scientific applications.

In general the logical design of the machine is sound. A user may start with a relatively small system, adding additional features and components as his understanding of the machine and size and number of applications grow. The full capacity

IBM 705

705 is sufficiently large for the great majority of applications existing today.

The operating speed of the 705 is substantially lower than that of a computer using the binary number system internally. This limitation is offset for many business applications, by the nature of business problems and the ability of the 705 to process alphanumeric data without conversion. The variable length data word (field) used by the 705 is convenient for many business applications. The variable length word is most efficiently processed in a serial (by character) arithmetic mode, and thus, it is desirable to limit the size of the word by careful programming. Because the machine is primarily a business machine, and is based on the variable length word, no automatic floating point feature is available. The variable length word makes the index register impracticable. However, for business use the efficiency of the variable length word and record makes up for the lack of these features.

The basis of the logical design and organization of the 705 is that information or data in business operations is defined by groups of characters that may vary widely in length, but that a majority of fields are six characters in length. Imposing a fixed word length (a definitive number of characters for each field) on a system sometimes results in uneconomical utilization of storage or packing and unpacking problems. That is, if the fixed word length in the computer is ten digits and the data is always less than ten digits, any storage location that is used either always has blank characters or has two pieces of data stored that usually must be separated (unpacked) to be computed upon and then (packed) regrouped for sending to storage. In many fixed word length computers, each word usually has to be transferred by a set of instructions or a block of words are transferred as a unit. This block is usually fixed in length and again may result in uneconomical use of storage capacity.

When the variable length field is used, the wasting of storage space and packing problems are eliminated but other problems replace them. The transfer of data from location to location (done in a fixed word length machine *word by word*) must, in general, be performed *character by character* in a variable word length machine. In the 705, the transmission of data is character by character, and the machine will begin transmission at the

EQUIPMENT REPORT

address (storage location) indicated and continue until a special symbol or condition is recognized. Such a transfer requires but a few instructions, but is performed at a rate limited by the slowest component involved. Serial transmission implies an arithmetic mode serial in character and an operation time that is directly a function of the size of factors involved.

However, the computer is required to operate only on the actual integers involved, i. e., when a computation is complete the machine can continue to the next step rather than wait until a fixed operation time has passed.

Two features often considered necessary in a computer are prohibited by the nature of a variable field length computer. First, no built-in floating point feature can be included. However, the nature of the majority of business problems does not require floating point operation. Second, there are no index registers. Index registers would be used for automatic counting and effective address modification.

In many business problems, the information to be processed is large in quantity and contains both alphabetic and numerical characters. If a computer using the binary notation is used, all alphabetic input must first be recoded into a combination of numerical characters, and the resultant decimal number converted to the binary notation. The reverse of this process must be followed on output. The ability of the 705 to process directly both alphabetic and numerical information eliminates the necessity for the above transformations. Although each character is processed at a slower rate of speed than the corresponding combination of binary digits would be processed, the total number of program steps involved from basic data to final report is reduced.

The storage capacity, both internal and secondary, of the 705 is large. Internal storage of up to 40,000 characters is magnetic core. The accumulator and auxiliary storages are also magnetic core with a total capacity of 312 positions. This large capacity working storage permits use of extremely flexible programming techniques. The direct transfer of data between positions of internal storage may be performed either one character at a time or in groups of five characters. The secondary storage consists of magnetic tapes and magnetic drums. Up to 100 tapes,

IBM 705

each with a capacity of approximately 5½ million characters can be included in the system at one time.

In addition to the large tape capacity, a large amount of data may be stored on magnetic drums. Up to thirty drums, each with a capacity of 60,000 characters may be used in the system. The only limitation of record size on the tape or drum is the capacity of internal storage: 40,000 characters. The access time of the drums and tapes is high compared to the access time of internal storage. This limitation is inherent in the media themselves. A system of redundancy checks provides insurance that data has been copied and transmitted free from error.

Input to the 705 is from punched cards or magnetic tape. As the 705 can process both alphabetic and numerical data, no conversion is required. For many applications the user may find it more expedient to perform an independent card-to-tape operation preparing input information while the 705 is processing a different problem. The design of the card reader and tape units permit this type of operation. A system of built-in check circuits insures proper transcription of data during either independent or computer controlled operation.

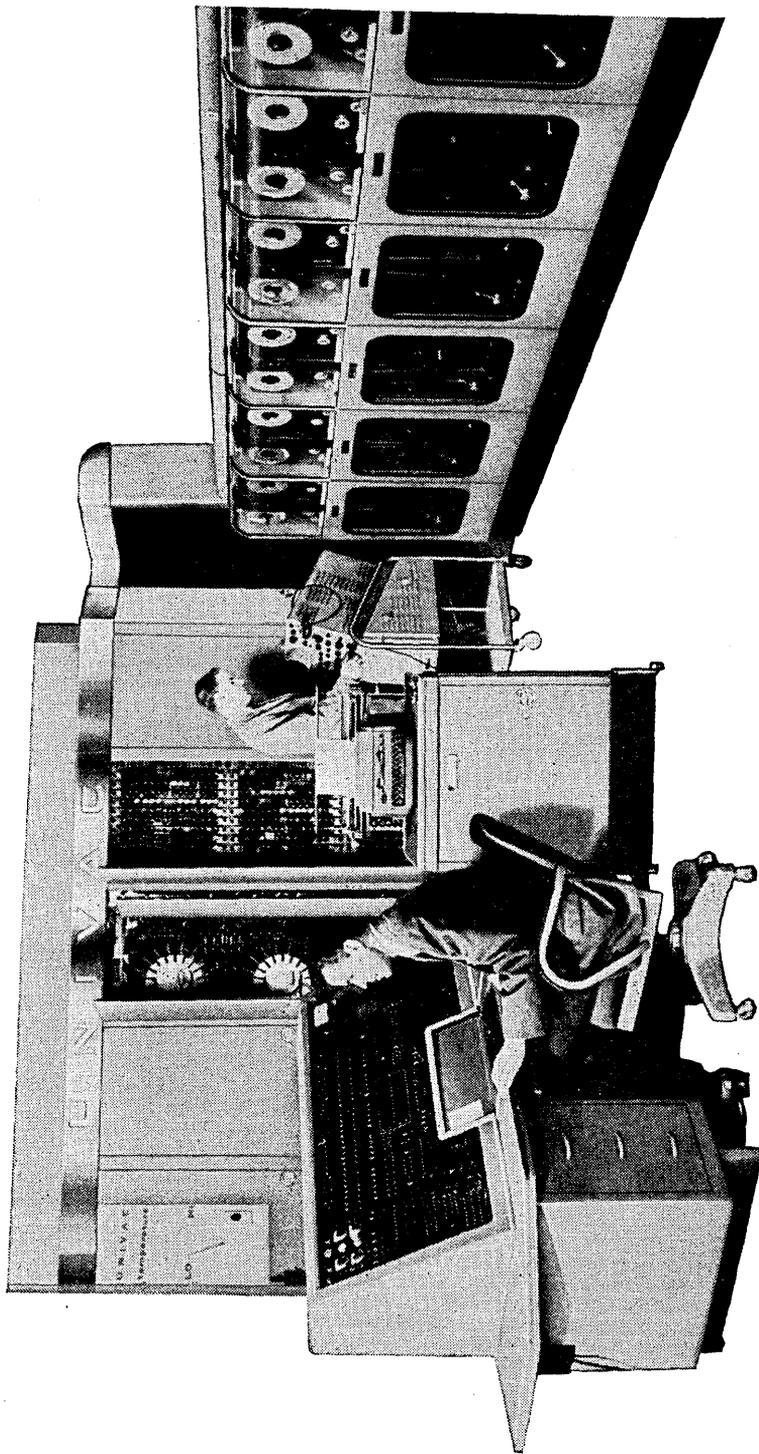
Output from the 705 is punched cards, magnetic tape and printed copy. Again, no conversion is required. The punched card and printed copy output may be performed under computer control or as an independent tape-to-card or printer operation. The large variety of printers available for use with the machine will facilitate many operations. The newly announced 774 Tape Data Selector eliminates the need for using computation time for the editing of data and preparation of forms by performing these operations independently of the central computer. With this device, many different reports can be prepared from a single master tape, ignoring unwanted information wherever required, extracting only the desired data from a tape record.

The auxiliary equipment used with this machine includes all standard IBM punched card equipment. The use of an auxiliary (punched paper) tape-to-card punch makes the 705 compatible with the several types of common language communications systems in use. The high speed printers used with the 705 system either as functional components or in independent tape to printer operations permit the preparation of voluminous data rapidly and efficiently.

EQUIPMENT REPORT

Training courses for programmers are provided by the manufacturer. Basically, the programming techniques for the 705 are easy to learn, but as with all large-size computers, considerable practice is required to become an efficient programmer. The instructions available for the programmer are versatile and adequate. The addition of "Transfer Low" and "Transfer Minus" codes would increase this versatility. Manufacturers and potential users are developing libraries of sub-routines, assembly programs, and compiling routines. An automatic coding technique is being developed and will greatly facilitate preparation of problems for the machine.

UNIVAC I
Universal Automatic Computer



April, 1956

UNIVAC I

Universal Automatic Computer

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

A large-size general purpose digital computer, primarily for business problems, suitable for scientific and combined business-scientific applications. The Univac I can process numerical decimal information, alphabetic characters and any typewriter keyboard characters. All arithmetic and logical operations are performed by the central computer. Input is accomplished directly by reading from magnetic tape to the central computer or indirectly by using an independent card-to-magnetic tape conversion. Similarly output is accomplished directly from the central computer to magnetic tape or indirectly by magnetic tape-to-card conversion. The information on the magnetic tape is printed by either a line printer or a typewriter in an independent operation. A fixed length word is used.

KEY DATA

Storage: internal working secondary	mercury delay line magnetic tape
Input	magnetic tape
Output	magnetic tape, typewriter

EQUIPMENT REPORT

APPLICATIONS

There have been 30 or more installations of the Univac I System since the original one in 1951. The following are a few of the applications for which they are used:

Business

- Accounts payable
- Inventory control
- Payroll preparation
- Cost and distribution analysis
- Market research and sales analysis
- Material utilization analysis
- Stock dividend calculation
- Life insurance policy analysis
- Freight car accounting

Scientific

- Trajectory and matrix calculation
- Stress and strain analysis
- Astronomical calculation
- Linear programming
- Regression and correlation analysis
- Traffic studies
- Trunk line estimates

UNIVAC I

FUNCTIONAL UNITS OF THE UNIVAC I AND APPROXIMATE COST

The following cost and rentals are exclusive of auxiliary equipment costs. Rentals are for 40-hour, single-shift operation. 80-hour, two-shift operation increases single-shift rental by 50%; 120-hour, three-shift operation increases single-shift rental by 100%.

The maxima given are based on the number of units that can be tied into the computer as components. For the independent operation unit equipment, any number of units may be used.

The user's application will determine the number and type of units that best suit his requirements.

<i>Components</i>	<i>Designation</i>	<i>Cost/Unit Purchase</i>	<i>Cost/Unit Mo. Rental</i>
Central Computer, including Supervisory Control and Printer Unit, Power Supply and 1,000 word mercury delay line storage	Univac I	\$750,000	\$13,390
Magnetic Tape Units (maximum of 10 Tape Units)	Uniservo I	18,000	320
<i>Independent Units</i>			
Magnetic Tape Preparer	Unityper I, with one Loop Control Device	22,000	390
	Additional Loop Control Devices, each	1,500	30
	Unityper II	4,500	90
Printer	Uniprinter	22,000	390
Tape Verifier	Univac Tape Verifier	Not established	
Line Printer	High Speed Printer	185,000	3,300
Card-to-Tape Converter (with 47 character code)	Card-to-Magnetic Tape Converter	142,100	2,520
Tape-to-Card Converter	Magnetic Tape-to-Card Converter	130,000	2,300

EQUIPMENT REPORT

PERSONNEL

The following figures illustrate the range of the number of personnel which most installations will require. Exceptions to these figures may be found. These approximate figures are for single-shift operation.

<i>Position</i>	<i>Range</i>
Methods } Programmers } Coders }	7 to 22
Operators (Central Computer Group)	2
Operators (Auxiliary)	1 to 3
Tape Preparers (Unitypists)	1 to 3
Maintenance Engineers	1
Maintenance Technicians	2 to 3

Maintenance is included in rental or will be supplied to purchaser under contract.

The size of the staff required to operate a Univac I computer system depends on the schedule of operations and the number and type of equipment units. The base requirements for programmers may be reduced by using established routines for coding, compiling, testing, sequencing, sorting and other operations.

Maintenance is performed by the employees of the manufacturer either as part of the rental charge or under terms of a separate contract with the purchaser. Purchasers may also use their own maintenance personnel. The size of the maintenance staff is based on the complement of installation—computer and all peripheral or auxiliary equipment.

UNIVAC I

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Programming and operating manuals may be purchased from the manufacturer. A specifications manual is available to customers.

The following courses in programming, operation and maintenance of the Univac I system are available.

<i>Title</i>	<i>Level</i>	<i>Duration</i>	<i>Cost</i>
Seminar	Executive	2 days	None
Introduction to Computers	General	2 weeks	\$ 125
Programming I	Programming	6 weeks	400
Programming II	Programming	6 weeks	500
Logical Operation	{ Operation, Maintenance	6 weeks	500

Courses in the maintenance of the Univac system units are available.

EQUIPMENT REPORT

PHYSICAL CONSIDERATIONS

- Space**
- Adequate work space should be provided for methods programming and coding personnel in an area adjacent to the machine room.
 - A separate office and maintenance area of 400 sq. ft. adjacent to the computing room must be provided. Storage space for spare parts (approximately 160 sq. ft.) and an area for a magnetic tape library are also required.
 - Adequate work space must be provided for the operators and auxiliary operators.
 - A maximum floor loading factor of 295 lbs./sq. ft. must be allowed for the power supply.
- Atmospheric Conditions and Air Conditioning**
- To ensure proper operation of the Univac I certain units are provided with blowers and heat exchangers to transfer the heat developed by these units to a chilled water refrigeration system. The customers must provide the piping and refrigeration system. Below are listed the requirements for each of the units needing a chilled water system.

<i>Units</i>	<i>Heat to Water Tons Refrigeration</i>
Central Computer	24.5
Power Supply	6.8
Card-to-Magnetic Tape Converter	3.1
High Speed Printer	4.9
Magnetic Tape-to-Card Converter	4.0

In addition to the above requirements, air conditioning may be required for the comfort of the machine room personnel, since there is a small quantity of heat transferred from the water cooled units to the room and heat generated by other units. Below is a table of the amount of heat transferred to the room or generated by non-water cooled units.

UNIVAC I

<i>Units</i>	<i>Heat to Room Tons Refrigeration</i>
Central Computer	1.00
Power Supply	0.33
Uniservo	0.22
Card-to-Magnetic Tape Converter	0.10
High Speed Printer	0.20
Magnetic Tape-to-Card Converter	0.25
Unityper I	0.21
Unityper II	0.21
Uniprinter	0.21

Wiring

The central computer, power supply and tape units require single or two-phase power at 230 volts between phases and 115 volts from each phase to ground. The power source for these units should be capable of handling 450 amperes per line. The card-to-tape converter, high speed printer, and the tape-to-card converter require single-phase power. The machine's power factor is approximately 90%. The amperage and consequently power drawn by the system depends on the type and number of units included. The regulation required for reliable operation of the central computer, power supply and tape units is $\pm 5\%$. Stabilizing units and switch gear must be provided by the customer.

Preventive Maintenance

For a one-shift operation 15 hours per week should be allotted to preventive maintenance. Such time may be allotted outside the standard shift worked by the user.

PHYSICAL DATA

<i>Components</i>	<i>Type</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight lbs.</i>	<i>Heat Dissi- pation BTU/hr.</i>	<i>Power kva</i>
Central Computer	Univac I	171	95	103	16,686	306,000	90
Console	Supervisory Control	82	33	51	515		
Typewriter	Printer Unit	29	21	44	270		
Power Supply	Univac I	70	52	104	5,892		
Magnetic Tape Unit	Uniservo I	29	22	61	650	91,800	27
						2,560	0.75
<i>Independent Units</i>							
Magnetic Tape Preparer	Unityper I:						
	Electronic Unit	29	21	70	665	2,500	0.75
	Keyboard	45	30	29	235		
	Unityper II	18	25	14	100	250	0.75
Typewriter	Uniprinter:						
	Tape Unit	29	21	48	468	2,500	0.75
	Printer Unit	29	21	44	270		
Line Printer	Univac High Speed Printer:						
	Printer Unit	47	32	48	800 *	54,630	18
	Power Supply	51	32	68	2,000		
	Memory Unit	51	32	68	1,200		
	Tape Unit	30	24	60	650		

Tape-to-Card Converter	Magnetic Tape-to-Card Converter:						
	Card Punch	36	38	50	800	} 52,360	15.4
	Tape Unit	30	22	47	468		
	Electronic Unit	185	40	90	3,750		
Motor Generator Set	56	18	20	600			
Card-to-Tape Converter	Card-to-Magnetic Tape Converter:						
80-column	Card Unit	30	30	36	320	} 31,400	9.2
	Tape Unit	29	23	60	650		
	Electronic Unit	50	32	76	2,265		
90-column	Card Unit	30	30	36	300	} 38,040	10.7
	Tape Unit	30	24	60	500		
	Electronic Unit	50	32	66	1,800		

* approximate

FUNCTIONAL UNITS OF THE UNIVAC I SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Magnetic Tape	Magnetic Tape Unit	Uniservo I	4G 660.1	12,850 characters/second. Information on tape from the following: 1. Central Computer, results of earlier processing operation. 2. Direct recording of information by means of a Unityper I, Unityper II or a Univac Tape Verifier, ADP Equip. Rpt. Ref. 1B 660.1, 1B 660.2 and 1D 660.1 respectively. 3. Independent card-to-tape conversion using the Card-to-Magnetic Tape Converter. Speed of card reader up to 240 cards/minute, 416 or 446 characters/second, for 80 or 90 column Card-to-Tape Converter.
	(Punched Card)			3A 660.1	
Output	Magnetic Tape	Magnetic Tape Unit	Uniservo I	4G 660.1	12,850 characters/second. Information may be used for: 1. Input to Central Computer, source of information for subsequent processing operation. 2. Independent tape-to-card conversion using Magnetic Tape-to-Card Converter. Conversion rate—120 cards/minute, 160 characters/second. 3. Independent tape to printer operation. This may be performed by: Uniprinter at 10 characters/second maximum. Univac High Speed Printer at 10 lines/second at 130 characters/line.
	(Punched Card)			3A 660.2	
	(Printed Copy)			5B 660.1	
				5A 660.1	
	Printed Copy	Console	Printer Unit	5B 660.1	10 characters/second; used mainly for interrogation and check purposes.

Storage	Mercury Delay Line	Central Computer	Univac I	4G 660.1	1000 fixed length words; 12 characters/word, the first character position of each word may be used for sign. No. of Channels: 100 channels, 10 words/channel. Average access time: 202 microseconds.									
	Magnetic Tape	Magnetic Tape Unit	Uniservo I		1,440,000 characters/1,500 ft. of tape.									
Control		Central Computer	Univac I		Built-in circuitry for control of components.									
		Console	Supervisory Control		Manual control by switch setting for stopping, starting or interruption of operations; keyboard insertion or correction of data or instructions. Indication of instruction being executed and machine condition by lights.									
Arithmetic Unit	<p>A register: 12 characters; accumulator. X register: 12 characters; addend, subtrahend, multiplier. L register: 12 characters; multiplicand, divisor, comparison. F register: 12 characters; mask, stores one word prior to transfer. V register: 24 characters; stores two words prior to transfer. Y register: 120 characters; stores ten words prior to transfer. Two instructions per word. One address system. There are 5 arithmetic, 13 transfer, 6 arithmetic and transfer, 5 logical, 12 tape handling and input-output, and 4 special instructions. Simultaneous computation, reading, writing, and rewinding are possible.</p>			<p>Notation: excess three; binary coded decimal. Arithmetic Mode: serial. Negative No. Representation: absolute value and sign. Zero Representation: 000 000 000 000.</p> <p>The following average operating speeds are in milliseconds:</p> <table border="0"> <tr> <td>Add</td> <td>0.525*</td> </tr> <tr> <td>Multiply</td> <td>2.150*</td> </tr> <tr> <td>Divide</td> <td>3.890*</td> </tr> <tr> <td>Transfer</td> <td>0.445/word</td> </tr> <tr> <td>Compare</td> <td>0.365</td> </tr> </table>	Add	0.525*	Multiply	2.150*	Divide	3.890*	Transfer	0.445/word	Compare	0.365
Add	0.525*													
Multiply	2.150*													
Divide	3.890*													
Transfer	0.445/word													
Compare	0.365													
					* Time includes reading and executing instruction, result in accumulator.									

EQUIPMENT REPORT

AUXILIARY OPERATION

Equipment for the independent operations of tape-to-card and card-to-tape conversion, magnetic tape preparation and printing, is listed under the Functional Units of the Univac I. The need for this equipment depends upon the application. However, certain punched card or punched paper tape machines may be used in conjunction with the Univac I computer system. For further information on this equipment see Remington Rand punched card and punched paper tape equipment such as card punches, paper tape-to-punched card converters, punched card-to-paper tape converters, tape transmitters, etc.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

APPRAISAL

The Univac I is a large-size general purpose digital computer capable of handling both business and scientific problems.

In general the logical design of the machine is sound. The full capacity of the Univac I is sufficiently large to handle the great majority of applications existing today.

The operating speed of the Univac I is substantially lower than that of a computer using the binary number system internally. This limitation is offset for many business applications, by the nature of business problems and the ability of the Univac I to process alphanumeric data without conversion. In most business problems, the information to be processed contains both alphabetic and numerical characters. In a computer using internal binary notation, all alphabetic input must be encoded into a combination of numerical characters, and the resultant decimal numbers converted to the binary notation. The computer then processes these binary numbers. The results of these operations then must be decoded on output. The ability of the Univac I to process directly both alphabetic and numerical information eliminates the necessity for this translation. Although each character is processed at a slower rate of speed

UNIVAC I

than the corresponding combination of bits would be processed, the reduction in the total number of program steps involved from basic data to final report is substantially reduced.

The basis of the logical design and organization of the Univac I system is that information or data is packed in fixed length words both inside the computer and on tape, and fixed length block and blockettes on tape. A block is composed of 60 words and a blockette of 10 words.

Imposing a fixed word and block length on a system sometimes results in uneconomical utilization of storage or packing and unpacking problems. In the Univac I the word length is fixed at 12 characters. If only a small quantity of data were exactly 12 characters in length, then many storage words would have blank characters or more than one unit of data stored in a word or one unit of data in several words. When one unit of data is not stored in one location, or one location has more than one unit of data, the data must be separated (unpacked) to be computed upon and then regrouped (packed) for sending to storage. Transfer of data between tape and storage may be performed in blocks, blockettes or single words. This again may result in uneconomical use of storage capacity.

Several features often considered necessary in a computer are not present in the Univac I. First, there is no built-in floating point operation. However, most business problems do not need the wide range of values that such an operation provides. Floating point routines may be provided by programming. Second, there are no index registers.

The storage capacity, both internal and secondary, of the Univac I is sufficient for most business and scientific applications. The main internal storage is 12,000 characters, divided into 1000 fixed length words. Auxiliary registers have a capacity of about 200 characters. All these storages except for the static register use mercury delay lines as their medium. Up to ten magnetic tape units with a capacity of approximately one and a half million characters each, can be included in the system at one time. The access time of tapes is high when compared to that of the internal storage, but this limitation is inherent in the media themselves. A character count check provides assurance that data has been copied and transmitted free from error.

EQUIPMENT REPORT

Input to the Univac I is chiefly from magnetic tapes. Since the Univac I can process both alphabetic, numerical and other typewriter keyboard characters, no conversion is required. Instructions and original data may be entered on tape in several ways, either directly or indirectly. The direct method consists in typing information directly on magnetic tape through use of a Unityper or Tape Verifier. The indirect methods involve translation of data from another coded medium to tape. Punched cards and punched paper tape may be translated through use of appropriate converters.

Output from the Univac I is chiefly to magnetic tapes. Again, no conversion is required. The information on the tapes may be printed directly by a typewriter at 10 characters a second or by a line printer at 1,300 characters a second. They also can be used to produce punched cards or a punched paper tape through appropriate converters. The information on paper tape may be sent by communication lines to other installations by standard communication equipment.

The use of computation time for the editing of data for preparation of forms is eliminated by performing these operations independently of the central computer. With the appropriate wiring of the plugboards on the line printer or the tape-to-card converters, many different reports can be prepared from a single tape, deleting unwanted information wherever required, extracting only the desired data from the tape record. These operations permit the preparation of voluminous data rapidly and efficiently.

Two built-in buffer storage units, one for input and the other for output permit three operations to be performed simultaneously: reading from tape (either forward or backward), writing on tape, and computing. The tapes may also be rewound during these operations. An automatic re-read operation is also provided. The Univac I has extensive self-checking circuits. They comprise about thirty per cent of the total circuitry. These circuits provide:

1. Parity, odd-even redundancy, checks on all digits and characters.
2. Duplicate arithmetic and logical operations.
3. Storage and arithmetic operation checks every four seconds.

UNIVAC I

4. An odd-even pulse count.
5. A count of the number of digits in each block.
6. A function table check to ensure that only one instruction is being executed at a given time.

Although these checking circuits increase the original hardware cost they substantially reduce the amount of time consumed by use of diagnostic routines for error tracing.

Training courses for programmers are provided by the manufacturer at additional cost. Basically the programming techniques for the Univac are easy to learn, but as with all large size computers, considerable practice is required to become an efficient programmer. An attempt was made in the design of the machine to simplify the work of planning the instruction code by making it mnemonic in nature. The instructions available for the programmer are versatile and adequate. Both the manufacturer and actual users have developed libraries of sub-routines, assembly programs and five compiling routines. Automatic coding techniques have been and are still being developed which facilitate preparation of problems for the machine.

UNIVAC II

July, 1956

UNIVAC II

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

A large-size general purpose digital computer, primarily for business problems, suitable for scientific and combined business-scientific applications. The Univac II can process numerical decimal information, alphabetic characters and any typewriter keyboard characters. Both arithmetic and logical operations are performed by the central computer.

Input is accomplished directly by reading from magnetic tape, to the central computer or indirectly from punched cards by using an independent card-to-magnetic tape operation. Similarly, output is accomplished directly from the central computer to magnetic tape or indirectly in the form of punched cards through a magnetic tape-to-punched card conversion.

The information on magnetic tape is printed by either a high speed printer or a Uniprinter in an independent operation. A fixed word length is used. A compatibility switch permits Univac I programs to be run on Univac II. The checking features of Univac I have been retained except for the storage and arithmetic operation checks every four seconds. Other differences between Univac I and Univac II are listed on an accompanying table, "Univac II Characteristics Differing from Univac I."

KEY DATA

Storage: internal working secondary	magnetic core magnetic tape
Input	magnetic tape
Output	magnetic tape, typewriter

EQUIPMENT REPORT

FUNCTIONAL UNITS OF THE UNIVAC II AND APPROXIMATE COST

The following prices and rentals are exclusive of auxiliary equipment costs. Rentals are for single-shift operation. Two-shift operation increases single-shift rental by 50%. Three-shift operation increases single-shift rental by 100%.

The maximum given is based on the number of units that can be tied into the computer as components. For the peripheral equipments independently operated, the number of units may be increased as required.

The user's application will determine the number and type of units that best suit his requirements.

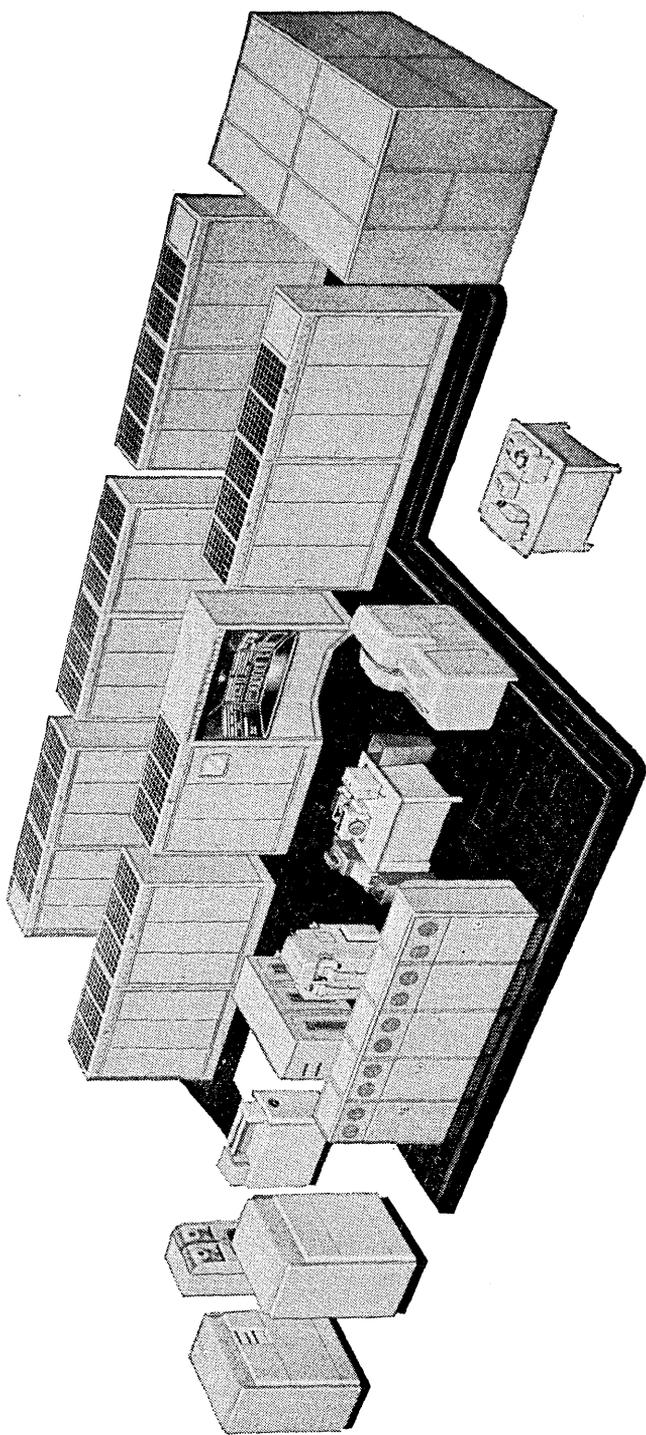
<i>Components</i>	<i>Designation</i>	<i>Approximate Cost</i>	
		<i>Cost/Unit Purchase</i>	<i>Cost/Unit Mo. Rental</i>
Univac II Central Computer with Power Supply, Supervisory Control and 2,000 word magnetic core storage *	Univac II	\$970,000	\$18,540
Magnetic Tape Units (tape units up to 16 maximum)	Uniservo II	20,000	450
<i>Independent Units</i>			
Magnetic Tape Preparer	Unityper I, with one loop control device	22,000	390
	Additional loop control devices, each	1,500	30
	Unityper II	4,500	90
Printer	Uniprinter	22,000	390
Tape Verifier	Univac Tape Verifier	Not Available	
Line Printer	High Speed Printer	185,000	3,300
Card-to-Tape Converter (with 47 character code)	Card-to-Magnetic	142,000	2,520
	Tape Converter		
Tape-to-Card Converter	Magnetic Tape-to-Card Converter	130,000	2,300

* 10,000 word magnetic core storage available at additional rental or purchase price.

UNIVAC II CHARACTERISTICS DIFFERING FROM UNIVAC I

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>Type</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>												
Input	Magnetic Tape	Magnetic Tape Unit	Uniservo II	4G 660.1	20,000 characters/second, 12,400 characters/second, 5,000 characters/second; using same tape unit.												
Output	Magnetic Tape	Magnetic Tape Unit	Uniservo II	4G 660.1	20,000 characters/second, 12,400 characters/second, 5,000 characters/second; using same tape unit.												
Storage	Magnetic Core	Central Computer	Univac II		2,000 or 10,000 fixed length words; 12 characters/word, the first character position of each word may be used for sign.												
Arithmetic Unit	<p>Instructions:</p> <p>Field selector permits use of variable word lengths internally as all instructions which refer to internal storage operate under control of extract pattern.</p> <p>“Add-to-memory” permits adding and retaining the results in storage.</p> <p>1 to 9 word transfer order.</p> <p>10 to 60 word transfer orders, in increments of 10.</p>				<p>The following average operating speeds are in milliseconds:</p> <table border="0"> <tr> <td>Add</td> <td>0.200 *</td> <td>Transfer</td> <td>0.120/word</td> </tr> <tr> <td>Multiply</td> <td>1.900 *</td> <td>Compare</td> <td>0.200</td> </tr> <tr> <td>Divide</td> <td>3.700 *</td> <td></td> <td></td> </tr> </table> <p>* Time includes reading and executing instruction, result in accumulator.</p> <p>All instructions are performed at minimum latency access times.</p>	Add	0.200 *	Transfer	0.120/word	Multiply	1.900 *	Compare	0.200	Divide	3.700 *		
Add	0.200 *	Transfer	0.120/word														
Multiply	1.900 *	Compare	0.200														
Divide	3.700 *																

UNIVAC SCIENTIFIC
Model 1103 A



UNIVAC SCIENTIFIC

Model 1103A

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Univac Scientific is a large scale general purpose digital computer designed primarily for engineering and scientific computation. The 1103 A operates internally in a parallel binary mode with a fixed word length of thirty-six binary digits. Decimal and alphabetic characters are converted to their respective binary codings by a suitable internal program.

The primary mode of entering information into the computer is through a photoelectric paper tape reader. The primary output facility is a high speed paper tape punch. Additional input-output facilities are available through an eighty column punched card input-output unit, a line printer, and through direct magnetic tape transfer of data. The magnetic tape system that is available with the 1103 A is compatible with the system utilized on the Univac I.

KEY DATA

Storage	internal working	magnetic core, magnetic drum
	secondary	magnetic tape
Input		paper tape, punched cards, magnetic tape
Output		paper tape, punched cards, line printer, magnetic tape

EQUIPMENT REPORT

APPLICATIONS

Seventeen Univac Scientific Computing systems are presently installed. These are all model 1103 computers. Twenty Model 1103 A systems are scheduled for delivery within the next eighteen months. The applications of the Univac Scientific have been predominantly in the scientific field and include the following:

Solution of differential equations

Matrix inversion

Monte Carlo methods

Atomic energy calculations

Guided missile research

Logistics calculations

Flight simulation

Mass data sorting

Operations research

FUNCTIONAL UNITS OF THE UNIVAC SCIENTIFIC AND APPROXIMATE COST

The following costs and rentals are exclusive of auxiliary equipment costs. Rentals are for forty hour, single-shift operation. Eighty hour, two-shift operation increases single-shift rental by 50%; one hundred and twenty hour, three-shift operation increases single-shift rental by 100%.

The maxima given are based on the number of units that can be tied into the computer as on-line components. For the independent operation equipment, any number of units are available.

The particular application of the computer will determine the specific number and type of units that are best suited for an individual installation.

UNIVAC SCIENTIFIC

<i>Functional Unit</i>	<i>Cost/Unit Purchase</i>	<i>Cost/Unit Mo. Rental</i>	<i>Max. No. of Units</i>
Univac Scientific Computer Model 1103A, including 4,096 word magnetic core storage; 16,384 word magnetic drum storage: Input/Output Desk containing one each Monitoring Flexowriter, High Speed Paper Tape Punch, and Photo- electric Punched Paper Tape Reader; Magnetic Tape Control Section	\$895,000	\$20,980	
Univac Scientific Computer Model 1103A, same as above except does not include magnetic drum storage	760,000	17,980	
Additional banks of 4,096 word magnetic core storage, each	195,000	4,500	2
Floating Point Feature	224,000	3,950	1
Uniservo Magnetic Tape Unit	18,000	320	10
Variable Block Length Feature for Mag- netic Tape Recording	17,000	290	1
Punched Card Input/Output unit (80- column)	44,500	890	1
Output Printer (150 lines per minute)	51,800	1,100	1
High Speed Printer (600 lines per minute)	185,000	3,300	
On-Line Operation for High Speed Printer	20,660	515	1
Plotting Feature for High Speed Printer	35,400	590	1
<i>Off-Line Auxiliary Equipment</i>			
Punched Paper Tape Preparation Unit- Model II	\$ 8,045	225	
Punched Paper Tape Comparator Unit	2,350	75	
Unityper II	4,500	90	
Uniprinter	22,000	390	
Punched Card-to-Magnetic Tape Converter	142,100	2,520	
Magnetic Tape-to-Punched Card Converter	130,000	2,300	
High Speed Printer (600 lines per minute)	185,000	3,300	

PERSONNEL

The following figures illustrate the range in the number of personnel which most installations will require. The approximate figures are based on single-shift operation.

	<i>Position</i>	<i>Range</i>
Analysis Programming Coding	}	4 to 30
1103A Operation and Scheduling		1 to 3
Auxiliary Machine Operation		1
Data Preparation		3 to 10
Maintenance		1 to 4

EQUIPMENT REPORT

Maintenance and replacement parts are included in the rental charge or will be supplied to purchaser under a separate contract.

The size of the staff required to operate a scientific computing center will depend greatly on the internal organization of the computer group. If an "open shop" is maintained, wherein all problems are prepared by originator then the necessary programming staff will not have to be too large. If a "closed shop" is maintained wherein all problem preparation is performed by the staff of the computation center, the personnel requirements will be increased correspondingly. The use of autocoding, compiling, and interpretive techniques serves to reduce the programming staff by a considerable extent.

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

Courses in programming and maintenance of the Univac Scientific Computer are available. These courses are normally given at St. Paul. Detailed and comprehensive operating, programming, and maintenance manuals are also provided. Many numerical methods and applications of advanced programming techniques for the 1103 have been prepared and published by those installations which have Univac Scientific Computers.

PHYSICAL CONSIDERATIONS

Space

Adequate work space for analysts and programmers should be provided in an area adjacent to the machine room.

Maintenance personnel should also be provided with an office and work area adjacent to the computer room.

Area = 400 to 1,000 sq. ft.

Adequate storage space must also be provided for card and magnetic tape storage.

The layout of the machine room should be planned carefully. The actual size will depend on the particular installation. Clearance is required between machines for the use of the maintenance personnel. Additional space is required for the use of the machine operators and schedulers. Technical drawings and detailed layouts are developed for the customer at no extra charge.

Approximate Area = 2,000 to 8,000 sq. ft.

A maximum floor loading factor of approximately 250 lbs./sq. ft. is required for the computer.

UNIVAC SCIENTIFIC

Atmospheric Conditions and Air Conditioning

To ensure proper operation the Univac Scientific must be operated under atmospheric conditions having the following limits:

Temperature 65°F. to 80°F.

Relative Humidity 40% to 60%.

The individual units of the computer are equipped with internal blowers to provide adequate circulation of air. The equipment room must be air conditioned so as to maintain the above atmospheric conditions. The amount of air conditioning depends on the heat dissipated by the equipment, the number of people working in the equipment room, etc. The type and number of units comprising the computer system will determine the heat dissipated. The manufacturer provides technical assistance and information on the amount of air conditioning that will be required. A desirable feature of the equipment room would be some form of dust precipitator, to assure positive operation of the magnetic tape and drum units.

Wiring

The Univac Scientific system is operated from a 208 volt or 416 volt, three-phase, four-wire, 60 cps power supply. (If a 416 volt supply is used, then 208 volt must be supplied to operate the drum and blower motors.) The maintenance area must be supplied with 115 volt, 15 ampere, single-phase outlets at each work bench, and three-phase, 208 volt, 15 ampere four-wire, 60 cps service for the operational test equipment. Two 115 volt, 15 ampere, single-phase, 60 cps circuits (three wires), fused or protected externally, must be brought into the computer to provide service for the convenience outlets within the computer.

The equipment room should have a false or sub-floor. Cables connecting the units should run under this floor for safety and appearance. However, the 1103A does include a platform plenum which contains properly designed channels and ducts for cables and air distribution. This plenum may be placed directly on the existing floor.

Preventive Maintenance

Adequate time should be allotted for preventive maintenance. Such time can be allotted outside the standard shift worked by the user.

EQUIPMENT REPORT

PHYSICAL DATA OF THE FUNCTIONAL UNITS

<i>Functional Unit</i>	<i>Length Inches</i>	<i>Width Inches</i>	<i>Height Inches</i>	<i>Weight lbs.</i>	<i>Heat Dissipation BTU/hr.</i>	<i>Amperes Operating Current</i>
Central Computer (Control & Arithmetic Sections)	456	28 $\frac{3}{4}$	74	5,260 or 9,930	<i>Information not supplied by manufacturer</i>	
Console (Supervisory Control Panel)	162 $\frac{3}{4}$	28 $\frac{3}{4}$	74	1,115		
Magnetic Drum	162 $\frac{1}{4}$	28 $\frac{3}{4}$	74	2,860		
Magnetic Core Unit	81 $\frac{3}{8}$	28 $\frac{3}{4}$	74	1,300		
Magnetic Tape Unit	30	24	60 $\frac{3}{4}$	650		
Punched Card Input- Output Unit Line Printer (150 lpm)	<i>Information not supplied by manufacturer</i>					
High Speed Printer (600 lpm)						
Printer Unit	47	32	48	800 *	<i>54,630</i>	
Power Supply	51	32	68	2,000		
Memory Unit	51	32	68	1,200		
Tape Unit	30	24	60	650		
Perforated Tape- Reader	11 $\frac{1}{4}$	11 $\frac{1}{2}$	9	37		
Perforated Tape- Punch	14 $\frac{1}{2}$	6 $\frac{3}{4}$	10	25		

* approximate

FUNCTIONAL COMPONENTS OF THE UNIVAC SCIENTIFIC SYSTEM

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>
Input	Punched Cards	Punched Card Input- Output Unit		Maximum of 120, 80-column cards/minute.
	Perforated Paper Tape	Paper Tape Reader	4G 270.1	7-channel paper tape with 6 information channels and 1 control channel; tape reading is under program control and may attain a maximum speed of 200 frames/second.
	Magnetic Tape	Magnetic Tape Unit	4G 660.1	Up to 12,850 characters/second. Each character consists of 6 information bits and one parity check bit.
Output	Punched Cards	Punched Card Input- Output Unit		Maximum of 120, 80-column cards/minute.
	Perforated Paper Tape	Tape Punch	4G 745.1	Punches on 6 or 7 channel tape at maximum rate of 60 characters/second.
	Magnetic Tape	Magnetic Tape Unit	4G 660.1	Up to 12,850 characters/second. Each character consists of 6 information bits and one parity check bit.
	Printed Copy Printed Copy	Line Printer (150 lpm) Line Printer (600 lpm)	5A 660.1	Up to 92 characters/line; up to 150 lines/minute. Up to 130 characters/line; up to 600 lines/minute.
Storage	Magnetic Core	Central Computer		4,096, 8,192, or 12,288 words of 36 binary digits (equivalent to 10 decimal digits plus sign). Access Time: 6 microseconds.
	Magnetic Drum	Central Computer		16,384 words of 36 binary digits. Average Access Time: 17 milliseconds. Size: 17" diameter, 12" long. Speed: 1,800 rpm.
	Magnetic Tape	Magnetic Tape Unit	4G 660.1	Maximum of 1,500,000 characters/tape.

Continued on Next Page

FUNCTIONAL COMPONENTS OF THE UNIVAC SCIENTIFIC SYSTEM—Continued

<i>Component</i>	<i>Medium</i>	<i>Unit Designation</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Operating Characteristics</i>								
Control		Central Processing Unit Operation Console Interrupt Control		Built-in circuits for central arithmetic and logical units. Manual control over computer settings and operation. Automatic control for on-line operation of data input equipment.								
Arithmetic Unit		<p>Unit Designation: Central Computer Model 1103A.</p> <p>X-Register: 36 bits. Serves as the central exchange register in the computer.</p> <p>Q-Register: Aids in the performance of numerous arithmetic and logical instructions. Is directly addressable by the program.</p> <p>Accumulator: A "double length" or 72 bit register which serves as the primary arithmetic register.</p> <p>Instruction words are 36 bits in length and are two-address type. There is a "Repeat" order which provides an automatic control for certain repetitive operations. There are a total of 41 input-output, arithmetic, and logical instructions.</p> <p>Input-output equipment is controlled by an "External Functions" instruction.</p>		<p>Notation: binary.</p> <p>Arithmetic Mode: parallel.</p> <p>Negative No. Representation: one's complement.</p> <p>The following operating speeds are in milliseconds:</p> <table> <tr> <td>Add and Transmit ¹</td> <td>.021</td> </tr> <tr> <td>Multiply ²</td> <td>.058</td> </tr> <tr> <td>Divide ³</td> <td>.240</td> </tr> <tr> <td>Compare</td> <td>.027</td> </tr> </table> <p>The speed of performance of two-address instructions should not be compared directly with the speed of one-address instructions.</p> <p>¹ Adds one number from memory to the contents of the Accumulator and stores the results in memory.</p> <p>² Forms the product of two numbers from the memory, leaves the double-length result in the Accumulator.</p> <p>³ Divides the double-length contents of Accumulator by a number taken from memory, quotient is formed in the Q-Register and stored in memory.</p>	Add and Transmit ¹	.021	Multiply ²	.058	Divide ³	.240	Compare	.027
Add and Transmit ¹	.021											
Multiply ²	.058											
Divide ³	.240											
Compare	.027											

UNIVAC SCIENTIFIC

AUXILIARY OPERATION

Equipment for the independent off-line operations of card-to-magnetic tape and magnetic-tape-to-card conversion, direct magnetic tape preparation and printing is listed under the Functional Units of the Univac I (Equipment Report Reference: 4E 660.1) This auxiliary equipment is completely compatible with the Univac Scientific Model 1103A Computer. The need for this equipment will depend on the applications of the particular installation. For further information on this equipment see Remington Rand punched card and punched paper tape equipment such as card punches, paper tape-to-punched card converters, etc.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
1902 West Minnehaha Avenue
St. Paul W4, Minnesota

APPRAISAL OF THE 1103A

The Univac Scientific Model 1103A is a large scale digital computer designed primarily for scientific and engineering applications. The predecessor of the current machine, the Model 1103, has been used almost exclusively on such types of work. However, the vastly increased input-output facilities of the 1103A, coupled with its high speed of operation, should enable this machine to capably perform in a number of generalized data processing fields.

The computer operates internally in the binary system and has a fixed word length of thirty-six binary digits including a sign bit. Standard two-address instructions are utilized and built-in floating point arithmetic is available as optional equipment. A unique logical feature of the 1103A allows the program to specifically address the Accumulator and the Q-Register. The primary operating storage consists of a magnetic core unit of 4,096 words with a maximum of two more such units being optionally available. Additional storage capacity is available in a 16,384 word magnetic drum and in the Uniservo magnetic tape units that may be added to the basic computer.

EQUIPMENT REPORT

The performance and capacity of the 1103 have always been of a very high calibre. The addition of a reliable magnetic tape system together with the sizable array of input-output equipment should suffice to qualify the 1103A as an extremely powerful general purpose digital computer.

For many years it has been contended that binary computers are not suitable for commercial data processing. This thesis has recently come under a searching reexamination. The extremely high operation speeds that have been attained with the large scale binary computers, together with their extensive logical and decision making capabilities, have led many designers to consider the feasibility of applying commercial problems to such equipments.

Although business data will always have to enter and leave the computing system in the familiar decimal and alphabetic format, there would seem to be few logically necessary prohibitions on internal conversion of the information into binary code. Once this initial transformation has been performed, all subsequent operations can proceed at a substantially higher speed than if the original character code had been retained. However, if each record of information is to be subjected to only a minor amount of actual processing in the computer, the time involved in this initial and final conversion may well amount to too great a portion of the total handling time. Accordingly, we may find that certain definite types of commercial applications are best suited to binary processing and, that other problems will still demand an internally decimal computer.

The basic input unit for the 1103A is a Ferranti photoelectric punched paper tape reader. This reader operates at a maximum rate of 200 frames per second where one frame contains six binary digits. This reader is under program control and individual characters can be read and processed by the computer. The primary output unit for the computer is a high speed teletype paper tape punch. This equipment output unit can operate at a maximum rate of 60 frames per second and is also under program control.

The 1103A has a punched card input-output unit that will process 80 column cards at a maximum rate of 120 cards per minute. Additional direct output is available through a line printer which has a capacity of 150 lines per minute with a

UNIVAC SCIENTIFIC

maximum of 92 characters per line. A high speed, 600 lines per minute printer, is also available for either on-line or off-line operation.

The automatic program interruption feature, Interrupt Control, permits external equipment to interrupt a program automatically when it is ready to communicate with the computer. After the information has been transferred and the interrupting routine has been completed, the computer automatically returns to the main program.

The basic magnetic core storage unit consists of 4,096 words. One or two additional core units may be added. A maximum total core storage capacity of 12,288 words is available. The core storage unit has a random access cycle of six microseconds which allows for the performance of one two-address addition in 21 microseconds. A magnetic drum with a capacity of 16,384 words is available and up to ten magnetic tape units may be used with the 1103A. Optional additional circuitry may be added to the system so as to allow for a variable block length mode of magnetic tape recording.

The Uniservo equipment possesses the desirable feature of being able to read the tape 'backward'. This allows for greater economy in tape movement during sorting operations. If a parity check error is detected during tape reading operation, the computer produces a signal which may be detected by the program. Under program control, the tape may then be reread with a variation in the bias level of the tape reading circuitry. This is a novel and ingenious feature which is intended to enable the programmer to 'pick up' information in situations that normally call for the attention of a maintenance engineer. It may well prove to be a significant improvement in magnetic tape processing of lengthy problems.

All information that is transmitted in and out of the central computer is routed via one of several buffer registers. The two principal buffer registers are the six bit 'IOA Register' and the thirty-six bit 'IOB Register'. These registers serve as data transfer points between the computer and the data handling devices. Information that is to be transferred to external equipment is selected by a programmed instruction and is stored in one of the IO registers. The appropriate output device is notified and then proceeds to process the information stored in the

EQUIPMENT REPORT

buffer. During this external processing the central computer is able to proceed with a separate mode of computation. Input data is handled in a similar fashion. The particular operation of these registers, the manner of transmission of the selected information, and the activities of the input-output equipments are controlled by one 'External Functions' instruction.

The standard Univac metallic magnetic tape system is available with the 1103A. This presents a twofold improvement. The previous magnetic tape systems that were available on the 1103 were less universally useful since they did not allow for use as input-output devices. The present magnetic tape system is completely compatible with all of the standard Univac peripheral equipment. As such, there is a sizeable selection of card-to-tape and tape-to-line printer equipment available.

The logical operation of the present magnetic tape system follows very closely that of the Univac itself. A standard block length of 720 frames, or 120 computer words, is utilized. Each block of information is divided into six blockettes; each blockette contains twenty computer words. The maximum rate of information transfer between magnetic tape and internal computer is 1,810 words per second. Allowing for a normal packing density and interblock spacing, the information contained in over 20,000 punched cards can be stored in one 1,500 ft. reel of magnetic tape.

The 1103A operates internally in the parallel binary mode. It has a double length accumulator with the left most bit designated as the sign bit. Both the Accumulator and the Q-Register are directly addressable by the program instructions. This fact, coupled with the variety and flexibility of the instruction repertoire, makes the 1103A an exceedingly capable machine for logical manipulation of large quantities of data.

In general, all numerical operations are performed in binary arithmetic with a fixed word length. The 1103A does have an optional floating point arithmetic feature. With this additional equipment one gains the important advantage of being able to perform the four floating point arithmetic operations without time and space consuming programming.

The designers of the 1103A have not included any B-Boxes or Index-Registers in the machine circuitry. However, there is a 'Repeat' instruction which provides an amount of flexibility

UNIVAC SCIENTIFIC

and versatility in the construction of repetitive loops. This 'Repeat' order is especially valuable when two streams of data are subjected to simple repetitive calculations. However, the logic of the instruction requires that the internal 'spacing' of the data be uniform throughout. In certain situations, the 'Repeat' order may possess specific advantages over a B-Box. But, in general, the 'Repeat' instruction does not allow the numerous advantages of a B-Box in controlling extended logical sequences and providing control flexibility. The lack of such B-Boxes is a definite weakness in the system.

Programming for a two-address machine such as the 1103A can be very challenging. Although the machine is simple in its basic logic and most problems can be coded quite directly, a competent and versatile programmer can obtain an extremely efficient performance from the computer.

Remington Rand Univac Division offers a varied assortment of free customer training programs. These include courses in programming for the Univac Scientific and courses in executive orientations to large scale digital computers. These courses are generally held in New York on a regularly scheduled basis, but special sessions are arranged periodically throughout the country.

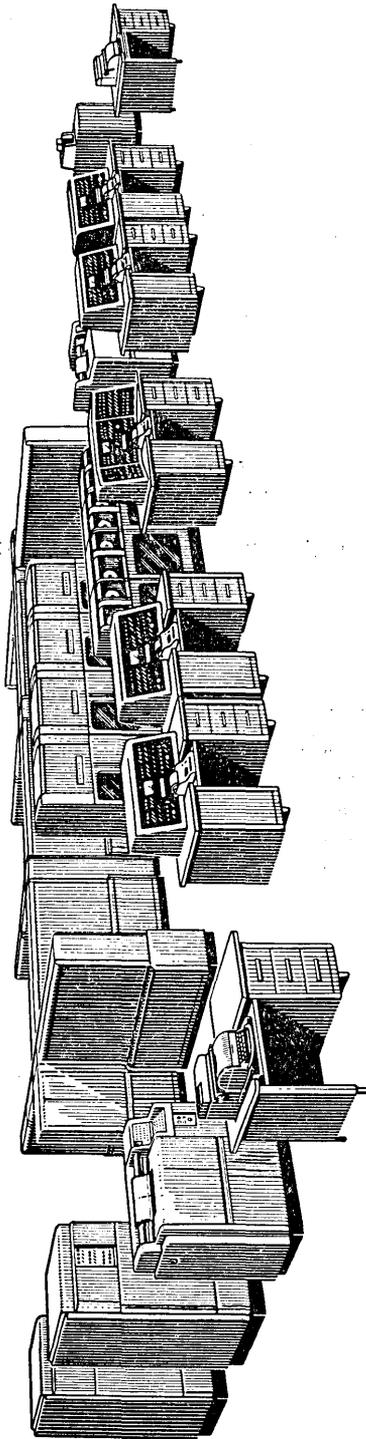
There exists a fairly active cooperative group of Univac Scientific users. This organization is composed of 1103 installations and is centrally coordinated at St. Paul. The activities of this group have so far been concentrated mainly on the development of a diversified assortment of scientific subroutines, and in the areas of standardization and automatic programming.

LARC

Livermore Atomic Research Computer

ADVANCE REPORT

Complete information on this equipment is not presently available. A comprehensive report will be issued as soon as the necessary information is released and our staff is able to complete their evaluation.



January, 1957

LARC

Livermore Atomic Research Computer

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

KEY DATA

<i>Component</i>	<i>Medium</i>	<i>Maximum</i>
Storage	magnetic core,	39 units; 2,500 words per unit.
	magnetic drum	24 units; 2,500,000 words per unit.
Input	punched cards,	600 cards per minute.
	magnetic tape,	20,000 characters per second.
	keyboard	
Output	punched cards,	600 cards per minute.
	magnetic tape,	20,000 characters per second.
	line printer,	600 lines per minute; 130 characters.
	typewriter	

DISCUSSION

The Larc is a large-scale, digital computer system which is modular in design. It may incorporate several input and output units, several internal storage units and two computers. All of these units are under direct control of the computer program.

Input equipment for Larc may include several punched card readers and magnetic tape units as well as a console keyboard. Among the output equipment may be included: card punch units, typewriters, magnetic tape units, high-speed printers, and

EQUIPMENT REPORT

character display and photographic recorder units. Also available for use in the Larc system are off-line tape-to-card, tape-to-printer, card-to-tape and magnetic tape-to-punched paper tape converters.

A maximum of 39 2,500-word magnetic core units may be included in high-speed storage; hence, magnetic core storage capacity is 97,500 12-digit words. Large capacity storage is effected through magnetic drums of which up to 24 250,000-word drums may be included in the system.

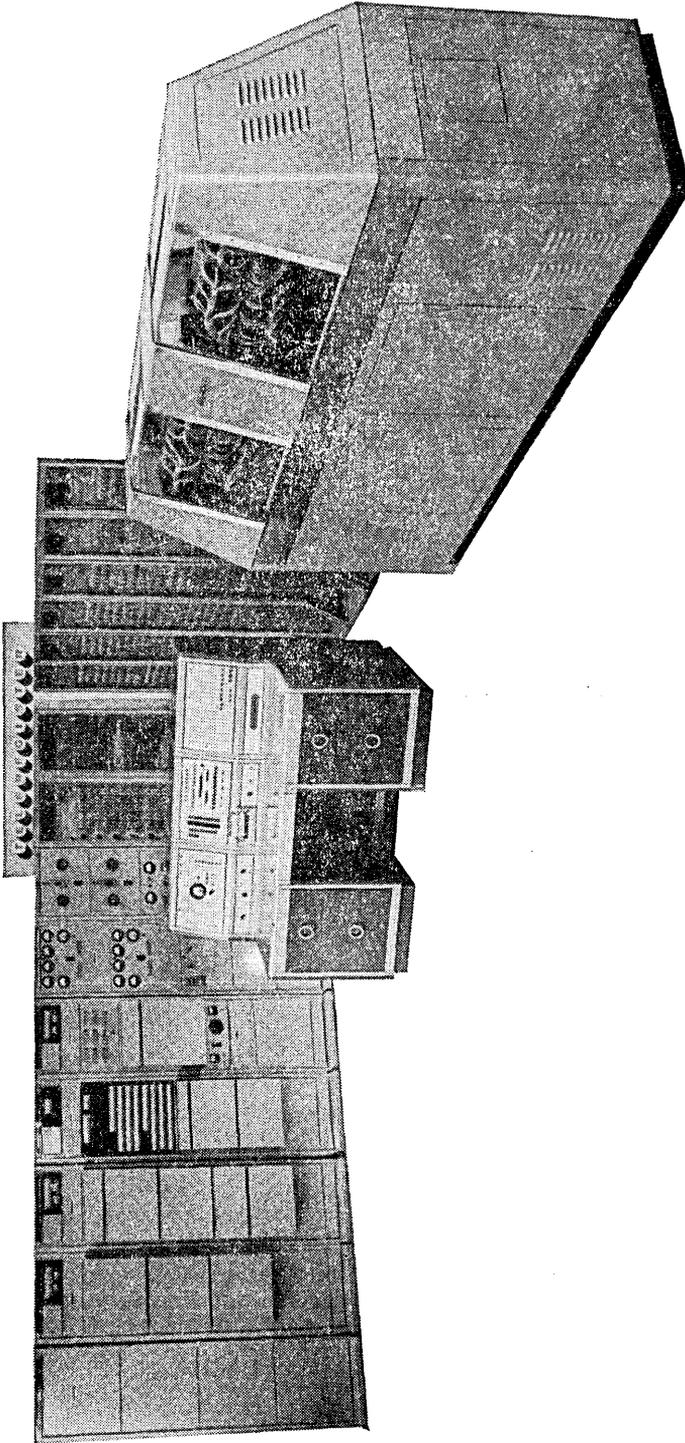
The arithmetic operations of the Larc are performed in parallel. Information is represented in binary-coded decimal notation. Data processing is performed by one or two computer units. Circuitry and instructions provide for both fixed-and floating-point arithmetic operations. Flexible programming and real-time overlapping of instructions may be accomplished by means of the high-speed index registers, high-speed arithmetic registers, control registers and instruction registers. With overlapping execution of instructions, typical speeds are: floating point add, 4 microseconds; multiply, 8 microseconds; divide, 28-32 microseconds.

The Larc was designed for scientific applications and the first system will be delivered to the University of California's Radiation Laboratory.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

MAGNETRONIC RESERVISOR SYSTEM



June, 1956

MAGNETRONIC RESERVISOR SYSTEM

MANUFACTURER

The Teleregister Corporation

BRIEF DESCRIPTION

The Magnetronic Reservisor System is a special purpose digital data processor designed to meet specific customer requirements through the application of magnetic drum storage and electronic data processing techniques using the binary code. The system uses multiple local and remote input-output devices.

KEY DATA

Storage	magnetic drum
Input	manual
Output	teletype printer, visual

APPLICATIONS

There are two installations of the Magnetronic Reservisor System. The basic system of this special purpose computer can be used to solve a variety of problems of the inventory control nature. The following are actual and planned applications:

Actual

- Airline space reservation
- Railroad space reservation

Planned

- Inventory control
- Savings bank accounting

EQUIPMENT REPORT

COMPONENTS OF THE MAGNETRONIC RESERVISOR SYSTEM

Magnetronic Reservisor Systems are designed and built to meet specific needs of the customer. The user's requirements will determine the type, number and capacity of components he will require. A basic system is usually made up of the following components.

<i>Components</i>	<i>Function</i>
Magnetic Drum	Storage
Multiple local and remote Agent and Master Agent Keysets, Teletype Perforators, Teletype Page Printers	Input Output
Master Seeker and Master Control Panel	Control
Electronic Data Processor	Arithmetic
Leased wire circuits and Transceivers	Transmission

PERSONNEL

The personnel required to operate a Magnetronic Reservisor System form two classes, ticket sales agents and supervisors. One or more ticket sales agents may operate one agent keyset, the exact number of agents per office is dependent only upon the sales volume. The supervisor is responsible for the operation of the master agent keyset. The number of supervisors required for single-shift operation is equal to the number of master agent keysets in the system.

Maintenance for the system is provided by the manufacturer under terms of the rental agreement.

MAGNETRONIC RESERVISOR SYSTEM

AVAILABILITY OF TECHNICAL TRAINING AND LITERATURE

The skills required to operate a Reservisor system are of a low order. The manufacturer works with and indoctrinates a small initial group of customer operating personnel during the installation of the system. These personnel are provided with training equipment and act as instructors. Ticket sales agents can learn to operate agent keysets in about an hour, supervisors usually require additional time to learn the operation of master agent keysets. A descriptive brochure is available from the manufacturer.

PHYSICAL CONSIDERATIONS

The magnetic drum, data processor, and control equipment are centrally located. The data below are for this central area in a typical installation.

	<i>Minimum</i>	<i>Maximum</i>
Space	500 sq. ft.	850 sq. ft.
Floor Loading Factor		60 lbs./sq. ft.
Air Temperature	65° F.	95° F.
Relative Humidity		100%
Heat Dissipation	34,130 BTU/hr.	68,260 BTU/hr.

Air Conditioning: recommended for the comfort of operating personnel.

Power: 220 volts, 3-phase, 4-wire, 60 cycle, AC supply is required. The power dissipation ranges from 10 to 20 kva, with an operating power factor of .95%.

FIVE COMPONENTS OF THE MAGNETRONIC RESERVISOR SYSTEM

<i>Component</i>	<i>Designation and Type</i>	<i>Mini- mum</i>	<i>Maxi- mum *</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Characteristics</i>
Input	Master Agent Keypad	1	4	4G 740.1	Manual input for large quantities of data, change of address.
	Agent Keypad	1	200	4G 740.1	Manual input at point of sale. Average elapsed time between placement of call by agent and receipt of reply, 1/3 to 5 seconds, depending on proximity of agent set to data processor.
Output	Master Agent Keypad	1	4	4G 740.1	Visual display of total availability of space on any flight, flight leg, pullman car, etc. at central location.
	Agent Keypad	1	200	4G 740.1	Visual display of availability of space on any flight, flight segment, flight leg, or pullman car at the point of sale.
	Teletype Page Printer	1	50	2C 745	Printed copy of date and time when a flight is sold out, at central office when a pullman car reaches a cushion condition, manifest of all space sold at train departure time or status of any accommodation by car or by type of accommodation.
	Teletype Tape Perforator	1	1	2B 745	When availability reaches zero or a predetermined cushion condition, tape may be generated for transmission of a teletype message.

Storage	Magnetic Drum	1	8	Capacity: stores up to 2600 flights, or pullman accommodations for six months. Size: varies from 8" diameter, 20" long to 20" diameter, 36" long. Speed: varies from 1350 to 3600 rpm.
Control	Master Seeker	1	6	Connects one keyset or teletype line at a time with processor and drum. Manual by switch setting.
	Master Control Panel	1	3	
Arithmetic Unit	Data Processor	1	3	Built-in programming. Excess three binary coded decimal. Dual circuitry.

* Maximum values are for a typical system.

EQUIPMENT REPORT

COMMENTS

The Magnetronic Reservoir System keeps a current inventory of airline and railroad space reservations on a magnetic drum. Access of seat availability information is provided by means of keysets. There are two types of keysets, agent and master agent. The latter can read out the exact seat count on a flight leg, or cause to be printed out all Pullman accommodations in a given car, or in a specified status (sold, reserved, or available) or of a specified type (lower, upper, roomette, drawing room, etc.). The new day's inventory is automatically entered by instruction of the Master Agent Set from a standard inventory stored on the drum.

As many as 200 Agent Sets may be included in a typical Reservoir System. By the use of teletype transceivers, an Agent Set may read information or change the inventory on a drum located thousands of miles away, using conventional telegraph facilities. Selection of the specific flight or train accommodation is made by use of a Destination Plate. Each plate lists 64 different flight segments or train accommodations, information on eight of which may be obtained simultaneously, thus making it easy to sell alternate space if the specific flight or accommodation desired is sold out.

Control equipment and the data processor select one keyset at a time, find the storage location on the drum, make the appropriate calculations, and enter the new data in the proper storage location. The entire process takes less than one second.

ADDITIONAL INFORMATION

Write to: Industrial Sales Department
The Teleregister Corporation
445 Fairfield Avenue
Stamford, Connecticut

MAGNETRONIC RESERVISOR SYSTEM

APPRAISAL

Due to the perishable nature of the value of airplane space American Airlines desired to replace their manual system of space inventory control with high-speed data processing machines. Such machines have to provide rapid quotations on the number of reservations which are for sale at a central control point. The airline and the Teleregister Corporation designed a special purpose computer to solve this problem. This computer, the first Magnetronic Reservisor, was installed in 1952. It was originally designed to keep an inventory of up to 1,000 flight legs per day for a ten day period, working twenty-four hours a day. In 1955, "FLIFLO," Flight Information Feature, was added. This feature permits furnishing of current information on airplane arrival and departure times. A ticket sales agent can learn the use of the keyset within one hour. The Destination Plate greatly simplifies the operation of obtaining space availability information. Maintenance of the system is easily accomplished through the use of functional plug-in sub-assemblies. In the four years following its installation it has operated 99.8 per cent of the time, processing as many as 20,000 reservations per day. This record of fulfilling the requirements justifies the conservative design of components and system.

Does the problem of inventory control of transportation space really require the use of a special purpose computer, or could a general purpose computer solve the problem just as efficiently? The nature of the problem dictates the use of a special purpose computer. A few of the reasons for this are stated below.

1. The repetitive nature of the calculation does not require the variety of circuitry available in a general purpose computer. The program needed is simple and not subject to change. Thus it is easily built into the basic circuitry of a special purpose computer. Building the program into the computer saves the cost of providing the circuitry needed to process programs of a variable nature.

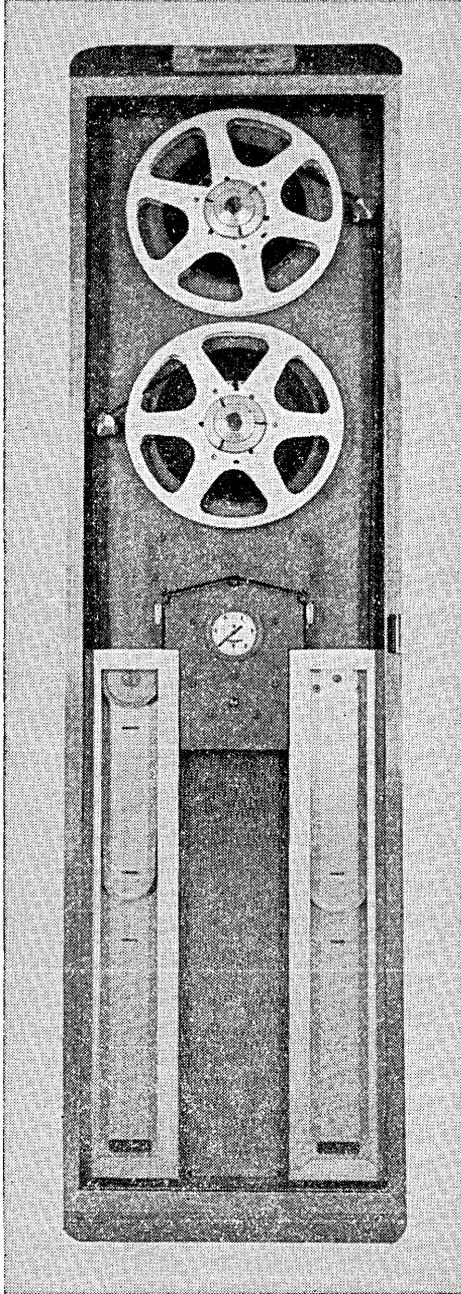
EQUIPMENT REPORT

2. The input to the system must be accomplished simply by non-technical personnel at many scattered and remote locations. The design of the agent keyset has taken this factor into consideration. Most general purpose computers have only a limited number of inputs and these are usually located near the central computer. These inputs require highly skilled personnel to operate them.

Magnetronic Reservisors are particularly adaptable to airline and railroad space reservation problems. Two such systems have been installed and five more are on order. Similar systems can be used to solve a variety of problems related to inventory control. Teleregister is presently designing and building systems for use in inventory control and in savings bank accounting.

Although the machine's main function is to provide rapid availability information on space, much of this same data is used in sales accounting. At present this data is recorded manually after a sale or cancellation has been made. A modification of the reservisor system could produce an original sales record on the magnetic drum at the point of sale without a manual duplication of information. This record would then be the original source document for accounting by means of automatic data processing equipment. Since in many cases up to half the cost of data processing is attributable to transcribing the original data into computer language the addition of the above feature could result in considerable reduction of clerical costs.

Another area of potential application is the control of retail store credit accounts. Information concerning a customer's credit rating would be coded on his credit card, while the amount of credit extended to him be kept on a magnetic drum in the central credit agency office. When the customer requests credit at any retail store, information regarding his credit rating would be read from his credit card by a keyset and compared with his account. Availability of credit would then be indicated on the keyset. Upon completion of the sale the sales clerk would enter the amount of the purchase into the customer's account and his account would be automatically updated. From this central file kept on each account monthly statements could be sent to the customer.



EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approximate Cost*</i>
Tape base	mylar plastic	2500 ft. long	\$32.63
coating	oxide	3/4" wide	
Reels, two		10 1/2" outside dia.	4.41
Recording Density	100 decimal digits/inch; 1/2" gap between records.		
No. of Channels	2 sets of 6, parallel interlaced; 8 information, 2 check, 2 block identification.		
Copy Mode	Serial by character by word, parallel by bit.		

*Tape and reels purchased through authorized representatives and distributors of Minnesota Mining & Manufacturing Company.

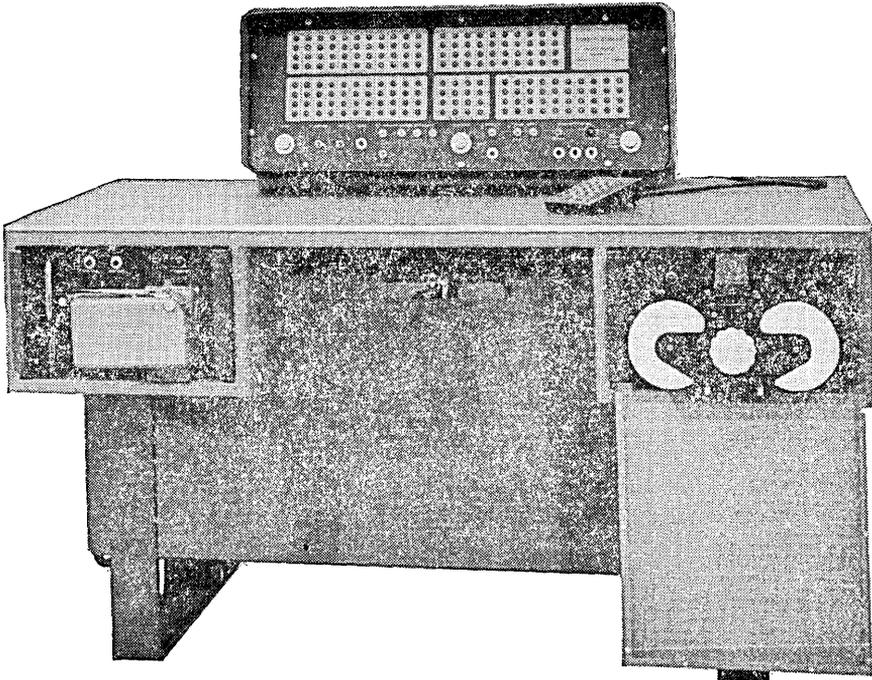
PHYSICAL CHARACTERISTICS

	<i>Tape Unit</i>	<i>Control Unit</i>
Height	61 3/4"	78"
Width	16"	38"
Depth	16"	28"
Weight	350 lbs.	600 lbs.
Power	105-125 v, 60 cps, 750 watts	approx. 1000 watts
Heat Dissipation	approx. 3,410 BTU/hr.	approx. 3,410 BTU/hr.

COMMENTS

The Tape Control Unit of the Datatron can be used as a tape editor. The unit will check tape for flaws in the magnetic coating by magnetizing all possible locations while advancing the tape. When the tape has been fully wound, the unit automatically goes into a rewind cycle. As the tape is rewound all bits are checked. Each length of the tape found free from flaws and capable of holding one block of information is automatically given a sequential block identification number. The final result is a tape with individually addressable blocks for information storage, with each block free from flaws.

ELECTRODATA MODELS 406 and 409 CONSOLES



August, 1956

ELECTRODATA MODELS 406 and 409 CONSOLES

MANUFACTURER

ElectroData Division
Burroughs Corporation

BRIEF DESCRIPTION

The Model 406 console consists of a desk with keyboard and controls for remote operation of the computer, display unit for all registers, the paper tape photoelectric reader, and the paper tape perforator unit. The Model 409 console is identical to Model 406 console except the tape perforator is not included, although there is room for it.

APPLICATION AND APPROXIMATE COST

Application: Datatron computer system, ADP Equip. Rpt. Ref. 4D 155.1.

<i>Consoles</i>	<i>Approximate</i>	
	<i>Purchase</i>	<i>Single-Shift Mo. Rental</i>
Model 406	\$14,211	\$451
Model 409	11,231	362

The monthly rental is for single-shift operation. Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%.

EQUIPMENT REPORT

PAPER TAPE READER AND PERFORATOR CHARACTERISTICS

	<i>Reader</i>	<i>Perforator</i>
Tape Speed	540 decimal digits/sec.	12 decimal digits/sec. <i>or</i> 60 decimal digits/sec.
No. of Channels	6 (4 information, 1 digit indicator, 1 end-of-word)	
Copy Mode	parallel by bit, serial by character by word	

KEYBOARD AND CONTROL

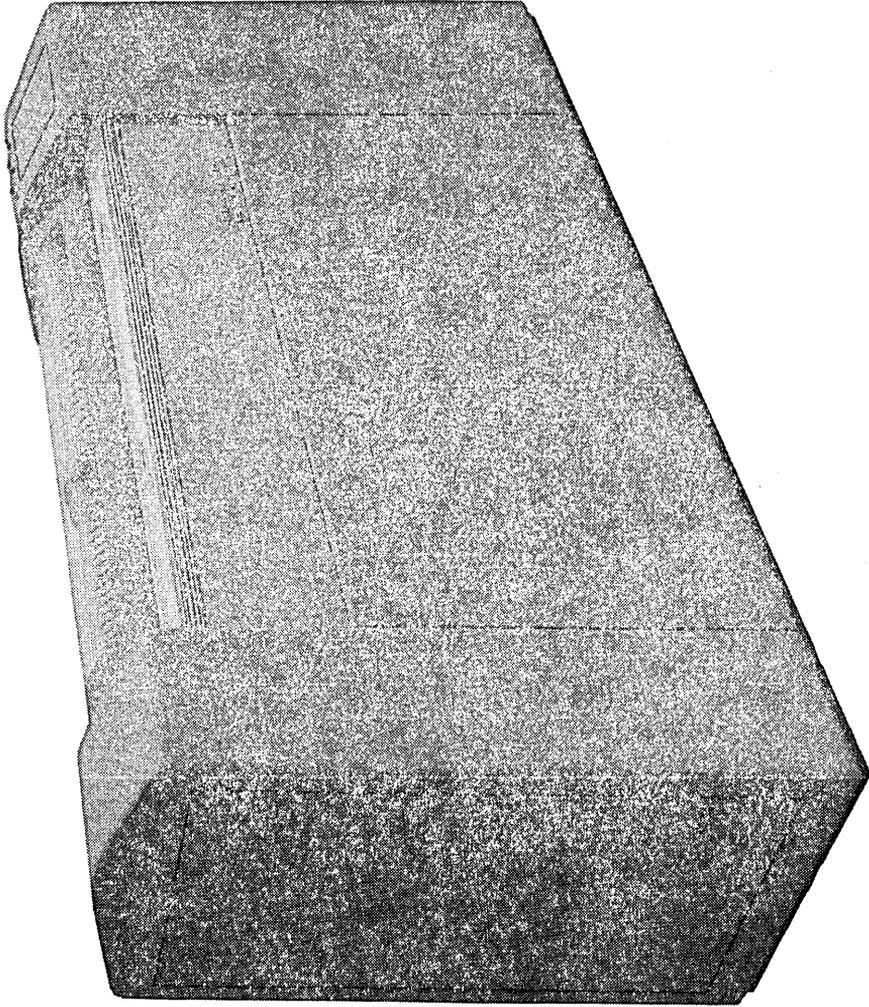
It is possible by the 13-key keyboard to prepare paper tape or to insert any number into any register of the computer.

PHYSICAL DATA

	<i>Width</i>	<i>Depth</i>	<i>Height</i>	<i>Weight</i>
Paper Tape Reader	16"	13"	9"	35 lbs.
Paper Tape Perforator (included on console desk)	16"	15"	9"	42 lbs.
Separate high-speed unit in mobile cabinet	15"	20"	36"	
406 Console complete	60"	31"	44"	450 lbs.

Model 406 console complete with Flexowriter and format control: power, 2.1 kw; heat dissipation, 7,170 BTU/hr.

ELECTRODATA DATAFILE
Model 560



September, 1956

ELECTRODATA DATAFILE

Model 560

MANUFACTURER

ElectroData Division
Burroughs Corporation

APPLICATION AND APPROXIMATE COST

Application: Datatron computer system, ADP Equip. Rpt.
Ref. 4D 155.1.

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Single-Shift Monthly Rental</i>
DataFile Multiple bin tape unit	\$25,000	\$825
Tape Control unit Controls up to ten DataReaders or DataFiles	25,000	750

The monthly rental is for single-shift operation. Two-shift operation increases the single-shift rental by 50%; three-shift operation increases the single-shift rental by 100%.

PERFORMANCE

Tape Speed: 60 inches/second; reading or writing.

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>
Tape base	mylar plastic	250 ft. long
coating	oxide	3/4" wide 50 tapes/DataFile
Recording Density	100 decimal digits/inch; 1/2" gap between records	
No. of Channels	2 sets of 6; parallel interlaced; 8 information, 2 check, 2 block identification.	
Copy Mode	Serial by character by word, parallel by bit	

EQUIPMENT REPORT

PHYSICAL DATA

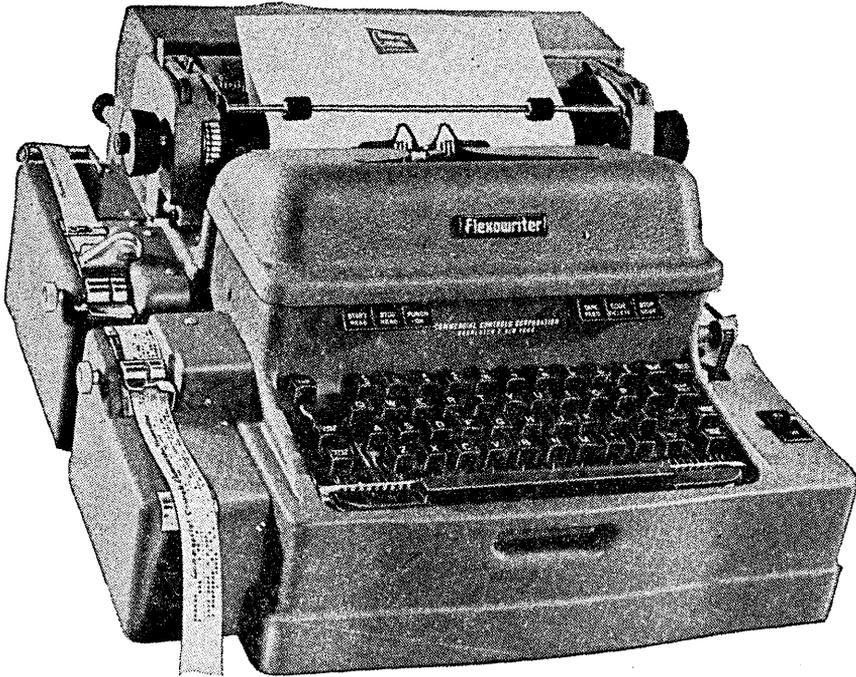
Height, 51"; width, 77½"; depth, 31½"; weight, 650 lbs.
Power 115 volts, 60 cps. 1.0 kva.
Heat Dissipation 3,400 BTU/hr.

COMMENTS

The Model 560 DataFile is a storage device providing relatively short access time to a file of 2,000,000 words. It contains fifty separate 250 foot lengths of magnetic tape each of which hangs free. A pair of magnetic heads, one for each lane on the tape moves transversely to the tapes, is capable of selecting any particular tape. The read-write head traverses the entire file of 50 tapes in two seconds. There are 2,000 blocks of 200 characters each per tape and thus 100,000 blocks per DataFile. The average random access time to any block is 16.3 seconds. By arranging the storage of information it is possible, in some instances, to reduce this access time to 4.1 seconds per block.

Up to ten DataFile units may be associated with a Datatron at one time, or any combination of DataFiles and DataReaders up to a total of ten. DataFile and DataReaders are controlled by the same model 543 Tape Control Unit.

FLEXOWRITER
Typewriter with Tape Punch and Reader



4-56-248

4G 180.1—Page 2

FLEXOWRITER

Typewriter with Tape Punch and Reader

MANUFACTURER

Commercial Controls Corporation; manufactured for and modified by computer manufacturers for their systems.

APPLICATION AND APPROXIMATE COST

<i>Computer Application</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Flexowriter</i>	
		<i>Purchase*</i>	<i>Mo. Rental*</i>
Alwac III	4D 485.1	not reported	
National 102-D	4D 540.1	\$2,900	**
Datatron	4D 245.1		
Modified Flexowriter		3,135	\$95
Flexo Control, Model 446 (includes stand and external format control equipment)		4,560	137
Elecom 120A	4D 780.1	3,500	**
Elecom 125	4D 780.2	3,500	**
Readix	4D 655.1	not reported	

*The cost of the basic computer includes the cost of one Flexowriter. Rental costs are for single-shift operation.

**Rental costs available from manufacturer only.

BRIEF DESCRIPTION

The Flexowriter typewriter with the tape punch and tape reader attached is used as a component for many computers. The typewriter can be used as a control for the computer and/or printed hard-copy output; the tape reader can be used for paper tape input; the tape punch, for paper tape output.

EQUIPMENT REPORT

PERFORMANCE

As a component of the above computers:

Printing, Tape Read or Tape Punch: maximum of 10 decimal digits or 5 to 10 alphabetic characters/second depending upon the particular computer.

TYPEWRITER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single action mechanical decoding.
Characters	
alphabetic	A to Z; a to z or A to z.
numeric	0 to 9.
special	16 to 25 special characters depending on the application.
Format	12 characters/inch, 6 lines/inch (maximum). Any format desired may be obtained by editing with an appropriate programming routine. If a quantity of printed output in a fixed line format is desired, the setting of tab stops for variable spacing of information on a line makes possible an editing of line format without programmed editing. The Datatron control unit has additional switches for the setting of numbers of columns, numbers of single-space lines, and end-of-page stop.
Printing Medium	
paper	Up to 14" wide; original plus 6 carbon copies; pin fed.
ribbon	$\frac{9}{16}$ " wide; 18 yds. long; moves transversely to the direction in which the paper is fed.

FLEXOWRITER

PAPER TAPE CHARACTERISTICS

	<i>Recording Density</i>	<i>Copy Mode</i>	<i>No. of Channels</i>		
			<i>Total</i>	<i>Digit</i>	<i>Zone Other</i>
Alvac III	10 columns of punched holes per inch	parallel by bit, serial by character by word	not reported		
National 102-D			6	5	1
Datatron			6	4	1 1
Elecom 120A			6	4	2
Elecom 125			6	4	2
Readix			6	not reported	

<i>Computer Application</i>	<i>Tape Format</i>			
	<i>Maximum Dec. Digits Per Word Per Inch</i>	<i>Maximum Alphas Per Inch</i>	<i>Input Editing</i>	<i>Output Editing</i>
Alvac III	9	5	necessary	necessary
National 102-D	9	6	necessary	necessary
Datatron	10	5	end-of-word	necessary
Elecom 120A	10	10	necessary	necessary
Elecom 125	10	10	end-of-word	necessary
Readix	10	10	necessary	necessary

PHYSICAL DATA

Height: 10".

Depth: 20".

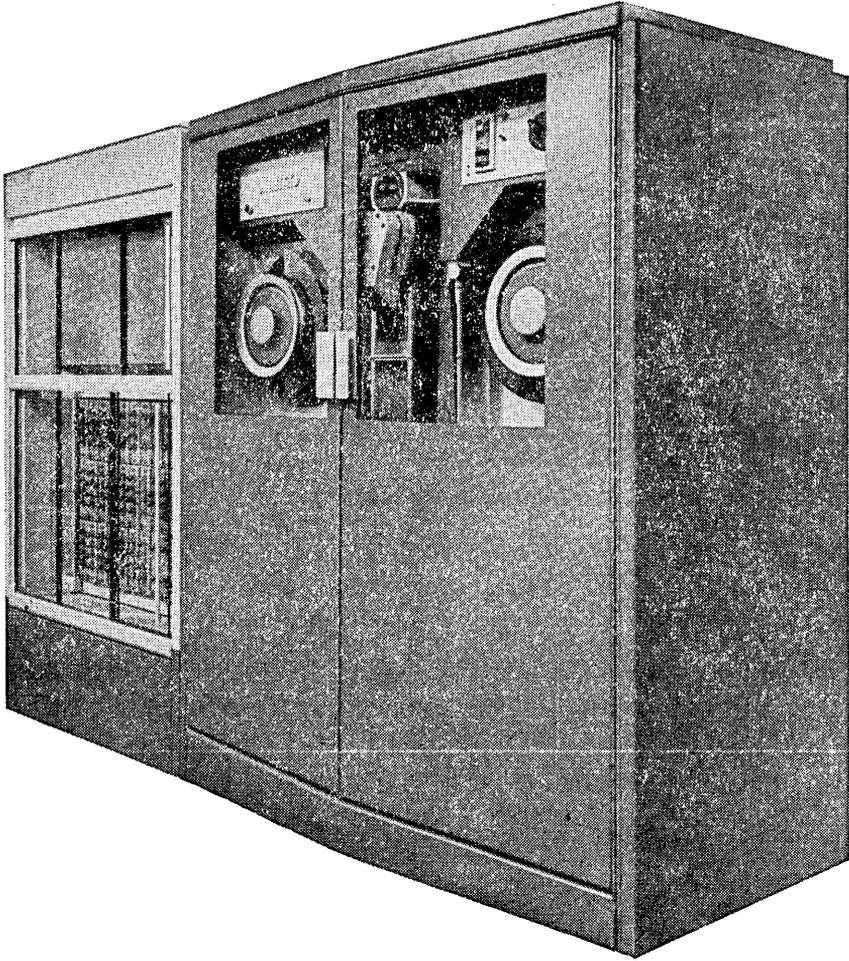
Width: 17½".

Weight: 85 lbs.

Power: 115 volts, 60 cps, 150 watts.

DATAMATIC 1100

Magnetic File Unit



4G 205.1—Page 2

May 3, 1957—40

March, 1957

DATAMATIC 1100

Magnetic File Unit

MANUFACTURER

DATAmatic Corporation

APPLICATION AND APPROXIMATE COST

Application: DATAmatic 1000 system, ADP Equip. Rpt.
Ref. 4E 205.1.

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Single-Shift Mo. Rental</i>
DATAmatic 1100	\$60,000	\$1,350

PERFORMANCE

Tape speed: 100 inches/second; reading and writing.

Start-stop time: 6 milliseconds to start; less than 4 milliseconds to stop.

Rewind time: Variable with actual problem.

EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approximate Cost</i>
Tape base	mylar plastic, envelops the magnetic coating	675; 1,350; 2,700 ft. long 3" wide	675' = \$230 1,350' = \$400 2,700' = \$775
coating	ferric oxide		
Reels, two		14" outside dia.	Furnished with tape at no extra cost.
Recording Density	1200 decimal digits/linear inch; no inter record gap.		
No. of Channels	800 characters/linear inch.		
Copy Mode	36; 31 information, 5 control.		
	Serial by bit by word, parallel by channel.		

PHYSICAL CHARACTERISTICS

Height: 78"
 Width: 58"
 Depth: 33"
 Weight: 1,500 lbs.
 Power: 4.5 kva.
 Heat Dissipation: 8,550 BTU/hr.

COMMENTS

The Model 1100, Magnetic File Unit, is the primary input-output and secondary storage component of the DATAmatic 1000 computer system. It is also necessary for the DATAmatic card-to-magnetic tape, magnetic tape-to-card and magnetic tape-to-printer conversion operations.

The magnetic tape utilized by the DATAmatic 1100 is 3 inches wide and contains 36 channels. Five of these channels are for control purposes. The remaining 31 channels contain data or instructions in blocks of 62 52-bit words. Thus, each block contains two words per channel.

Information is read from or written onto this magnetic tape in alternate blocks as the tape moves in one direction, until its physical end is reached. Then, the tape moves backwards, and

DATAMATIC 1100

information is read from or written onto those inter-block areas left vacant during the forward recording process.

A minimum of 4 Magnetic File Units is necessary with the DATAmatic 1000 system, up to 100 may be directly connected.

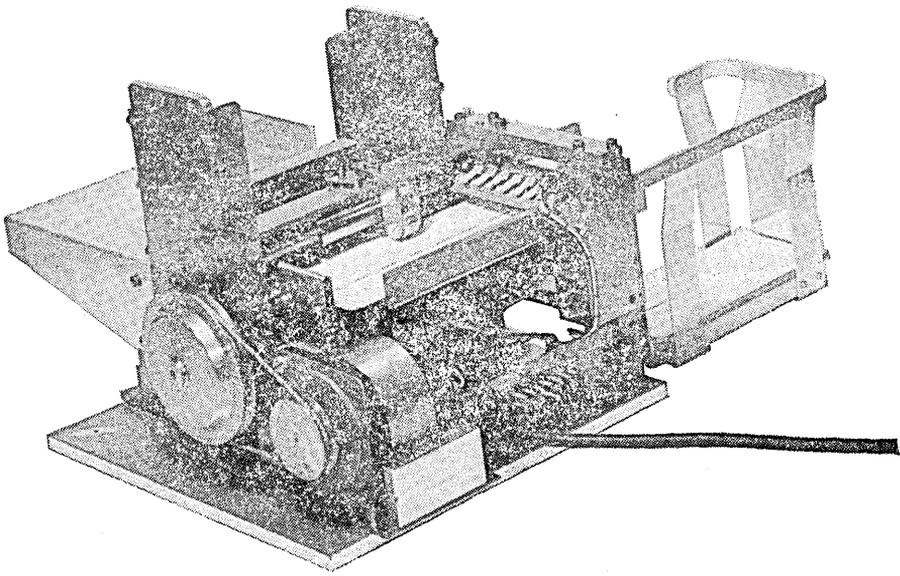
A File Reference Unit, DATAmatic 1150, acts as an inquiry station with respect to the magnetic tapes. Its keyboard permits inquiries to be directed to the file units, and its typewriter prints the answers.

A File Switching Unit, DATAmatic 1170, provides the circuitry to interchange tape control among Input and Output Converters and the Central Processor.

ADDITIONAL INFORMATION

Write to: DATAmatic Corporation
151 Needham Street
Newton Highlands 61, Massachusetts.

ELLIOTT PUNCHED CARD READER



August, 1956

ELLIOTT PUNCHED CARD READER

MANUFACTURER

Elliott Brothers (London) Limited

APPLICATION AND APPROXIMATE COST

Application: Elliott 405 computer system, ADP Equip. Rpt. Ref. 4D 248.1.

Approximate cost: \$2,800; this cost does not include import or export duties or packing expenses.

BRIEF DESCRIPTION

The Elliott Punched Card Reader reads cards photoelectrically one column at a time. The reader can accept any information coding on the card, since the Elliott 405 can be programmed to convert any code into its own internal code. However, the conventional codes of IBM and Samas are expected to be used most generally.

The production manufacture of the reader is to commence in the autumn of 1956. The prototype model is illustrated on Page 2. The production version of the card reader has an amplifier unit associated with it.

PERFORMANCE

600 cards/minute; 800 columns/second in the case of 80 column cards.

EQUIPMENT REPORT

PUNCHED CARD

Code	Any code; the Elliott 405 will convert it. Generally: IBM (Hollerith) code or the Samas code.
Copy Mode	Serial by card column and character.
Format	The information on the card must be in an identical order and format that is desired with the reading of one column at a time from column one to the last column of the card. Any rearrangement or editing of the information on the card would have to be done internally in the computer.

PHYSICAL DATA

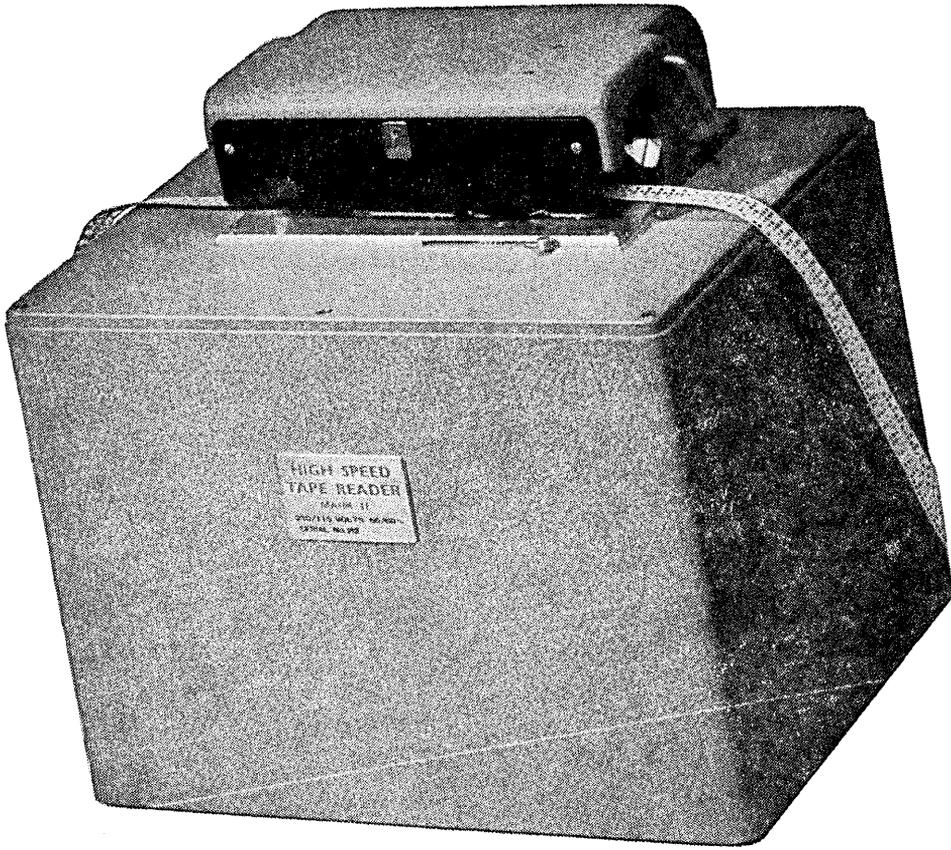
	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Card Reader	12"	24"	24"	50 lbs.
Amplifier Unit	12"	24"	12"	20 lbs.

Power: The power consumed by the card reader and amplifier unit is approximately 0.5 kva.

ADDITIONAL INFORMATION

Write to: Elliott Brothers (London) Limited
Elstree Way
Borehamwood
Hertfordshire
England

FERRANTI HIGH-SPEED TAPE READER



4G 270.1—Page 2

4-56-262

FERRANTI HIGH-SPEED TAPE READER

MANUFACTURER

Ferranti Electric Inc.

APPLICATION AND APPROXIMATE COST

<i>Application</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Approximate Tape Reader Cost*</i>
Pegasus computer	4D 270.2	\$1500
Mercury computer	4D 270.1	1500
Elecom 120A computer	4D 780.1	4000
Elecom 125 computer	4D 780.2	4000
National 303 computer	4D 540.2	cost not released as yet
Readix computer	4D 655.1	not established as yet

*Costs in excess of \$1500 are for the tape reader with recoding circuitry.

BRIEF DESCRIPTION

The Ferranti Tape Reader reads perforated paper tape photoelectrically, and is used as an input component of several computers. As an input component, the tape reader reads the paper tape as coded for these computers. However, the reader is capable of reading five, six or seven channel tape.

PERFORMANCE

<i>Computer System</i>	<i>Read Speed</i>
Pegasus	200 characters/second
Mercury	200 characters/second
Elecom 120A	200 or 400 characters/second
Elecom 125	200 or 400 characters/second
National 303	160 characters/second
Readix	Information not yet released by mfr. to this service

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

	<i>Recording Density</i>	<i>Copy Mode</i>	<i>No. of Channels</i>			
			<i>Total</i>	<i>Digit</i>	<i>Zone</i>	<i>Other</i>
Pegasus			5	teletype code		
Mercury			5	teletype code		
Elecom 120A	10 columns of punched holes per inch	parallel by bit, serial by character by word	6	4	2	
Elecom 125			6	4	2	
National 303			not reported			
Readix			6			

PHYSICAL DATA

Height: 9".

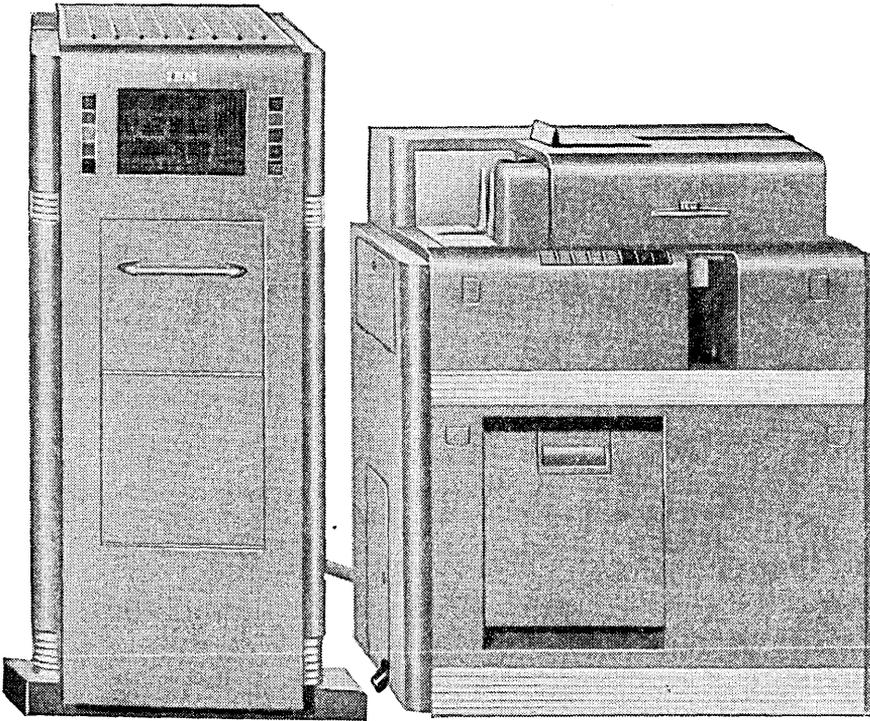
Depth: 11½".

Width: 11¼".

Weight: 37 lbs.

Power: 110 or 230 volts, 50/60 cps.

IBM TYPE 605
Electronic Calculating Unit with the
IBM Type 527 Punch Unit



IBM TYPE 605

Electronic Calculating Unit with the IBM Type 527 Punch Unit

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM CPC, ADP Equip. Rpt. Ref. 4C 480.4.

IBM Type 605: single shift monthly rental, \$865. (Includes rental of Type 527 Punch Unit. The 605-527 combination can be obtained only as a component of the CPC.)

BRIEF DESCRIPTION

The Type 605 is the arithmetic unit of the CPC. It performs all of the major portion of calculations for the CPC depending on board wiring. The 605 uses a numerical decimal system. The unit can be obtained only as a component of the CPC, but can be used with the 527 summary punch as a small independent computer for short repetitive calculations. The 605-527 combination cannot process alphabetic or special characters.

PHYSICAL DATA

	<i>Type 605</i>	<i>Type 527</i>
Weight	1535 lbs.	785 lbs.
Width	33"	40"
Depth	53"	26"
Height	58"	50"

Power: 230-volt, 33.5-ampere, 60-cycle, single-phase AC supply is required. 605-527 uses the CPC power supply by breaking the internal functional connection between the 527 and the tabulator, but leaving the electrical connections intact.

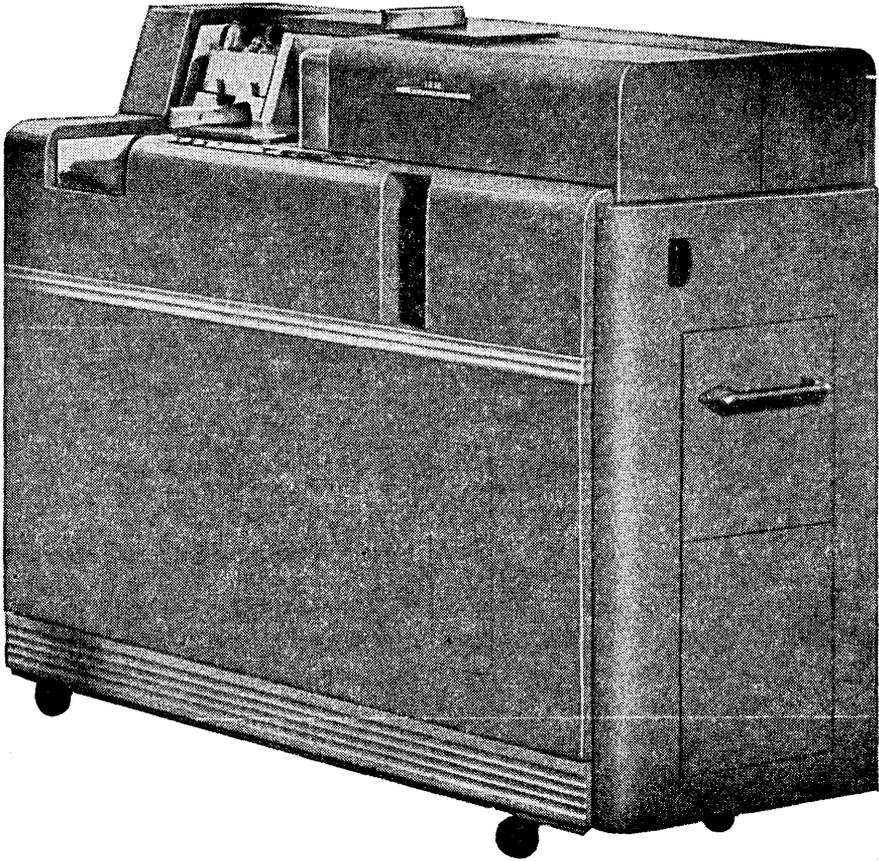
Heat dissipation: 21,640 BTU/hr.

FUNCTIONAL CHARACTERISTICS

The Types 605-527 units used as an independent and small-size computer have the following functions:

<i>Function</i>	<i>Designation</i>	<i>Type</i>	<i>Physical Characteristics</i>
Input	Summary Punch	527	3700 decimal digits/minute, maximum; 37 digits/card, 100 cards/minute.
Output	Summary Punch	527	2900 decimal digits/minute, maximum; 29 digits/card, 100 cards/minute.
Storage	Calculating Unit	605	50 decimal digits: counter, 13 digits and sign; MQ unit, 5 digits and sign; two sets of storage, each having two 3-digits and sign and two 5-digits and sign groups which may be arranged to form 3, 5, 6 or 8-digit words.
Control	Summary Punch	527	Control of format, stop on error in punching, or unfinished program, controlled by plugboard wiring.
	Calculating Unit	605	Emits pulses to control punch unit. Alters calculation by recognition of condition of intermediate results.
Arithmetic Unit	<p>Notation: binary coded decimal. Arithmetic Mode: parallel. Negative number representation: absolute value and sign. Zero representation: plus or minus 0000...00. Counter: 13 digits and sign; accumulator. MQ unit: 5 digits and sign; multiplier; quotient. 180 program steps, arranged in three groups of 60 each, called levels, are available. Each step is in effect a two-address code. A given step or group of steps may be made inoperative by either failing to activate the step or by suppressing the step. All functions are controlled by plugboard wiring. Average speeds of the following operations are: add, 760 microsec.; multiply, 14.12 millisecc.; divide, 16.42 millisecc.; transfer, 760 microsec. Each inoperative step in sweep of 60 steps takes 760 microsec. Tests for positive, negative, zero and non-zero are possible. A program repeat feature permits iterative procedures to be followed. Shifts up to 5 positions in either direction may be made. 115 milliseconds are available for computation between successive card feeds unless the delay feature is impulsed.</p>		

IBM TYPE 533
Read-Punch Unit



IBM TYPE 533

Read-Punch Unit

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM Type 650, ADP Equip. Rpt. Ref. 4D 380.1.

	<i>Single-Shift Monthly Rental</i>
IBM Type 533	\$550
Alphabetic device	325
Special character device (all eleven characters)	100
Special character device (11 and 12 punches only)	25

Additional selectors and punch error detection devices are available at additional cost.

BRIEF DESCRIPTION

The Type 533 Read-Punch unit is the basic input-output component of the IBM 650 computer system. The Type 533 contains two independent card feeds: a read station for input to the system and a punch feed for output. Information from the read feed must be transferred to the drum before it can be punched. The basic Type 533 will process numerical information only, but with special attachments will process alphabetic and special characters. These special devices recode punched card codes to and from the two decimal digit code used internally and represent non-numerical information.

EQUIPMENT REPORT

PERFORMANCE

<i>Maximums</i>	<i>Input</i>	<i>Output</i>
Cards/minute	200, 80-column cards	100, 80-column cards
Decimal digits per minute	16,000	8,000
Alpha or special characters per minute	6,000	3,000
Combined :		
digits	12,000 and	6,000 and
alphas and specials	4,000	2,000
	<i>or</i>	<i>or</i>
digits	8,000 and	4,000 and
alphas and specials	6,000	3,000

IBM TYPE 533

PUNCHED CARD

Code	IBM (Hollerith) code.
Characters	
alphabetic	A to Z (2 hole coded).
numeric	0 to 9 (1 hole coded).
special	. & \$ * - / , % # @ □ (1 to 3 hole coded).
Number of Columns	80.
Copy or Punch Mode	Serial by punch, parallel by character, serial by card.
Format	<p>Controlled by plugboard wiring. Since 10 positions of read and 10 positions of punch buffer storage are provided on the 650 drum, input and output are limited to 10 words unless unpacking and packing sub-routines are used. Six of these positions will accept alphabetic or special character inputs when the special devices are included in the machine. Since each alpha character is recoded into a two-digit representation, a maximum of 30 characters of information may be contained on any card. Any positions in the buffer storage may be wired to any position on the card (with the exception that alphabetic information must be handled by one of the first six positions).</p> <p>Information on the card may be data or instructions. The punching operation of the 533 may be checked for undesired double punches and/or blank columns by using the appropriate hubs on the control panel. Twenty of these devices are standard. Up to 60 additional positions can be obtained at a rate of \$5 for each 10 positions.</p>

PHYSICAL DATA

Height: 49.1".

Width: 59.5".

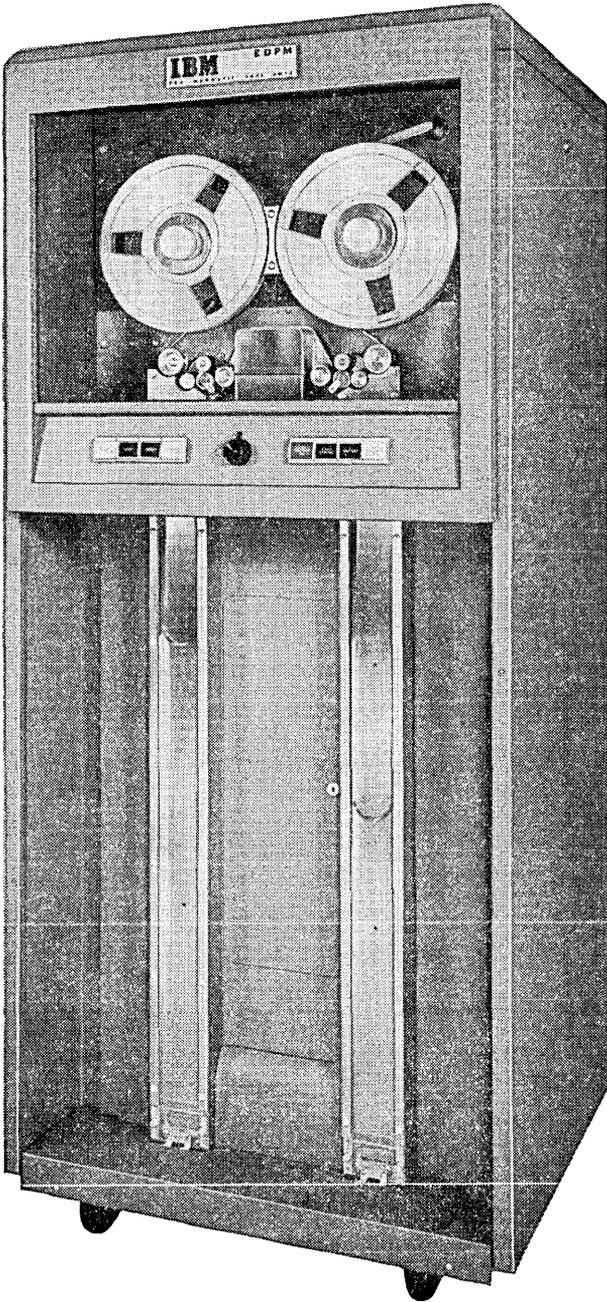
Depth: 25.4".

Weight: 1295 lbs.

Power: the Power Unit, Type 655, of the Type 650 system provides the power for this unit.

Heat dissipation: 1500 BTU/hr.

IBM TYPE 727 TAPE UNIT



4G 380.3—Page 2

IBM TYPE 727 TAPE UNIT

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

<i>Application</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Single-Shift Monthly Rental</i>
IBM Type 650	4D 380.1	
IBM Type 702	4E 380.2	
IBM Type 704	4E 380.3	
IBM Type 705	4E 380.4	
each tape unit		\$550

PERFORMANCE

Tape speed: 75 inches/second; reading or writing.

Start-stop time: 10 milliseconds.

Rewind time: 1.2 minutes (effectively constant for high-speed rewind of 450 to 2400 feet of tape).

EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approximate Cost</i>
Tape base coating	plastic oxide	2400 ft. long 1/2" wide	\$64 (includes reel and container)
Reels, two	plastic	10 1/2" outside dia.	\$5
Container	plastic	11 5/8" dia., 1 1/2" thick	\$4
Recording Density	200 decimal digits/inch; .75" gap between records		
No. of Channels	7 (6 information, 1 redundancy check)		
EDPM	650, 702, 704, 705		704
Notation	Binary Coded Decimal		Binary
Copy Mode	Parallel by bit, serial by character by word		Serioparallel, serial by word

PHYSICAL DATA

Height: 69".

Width: 29.3".

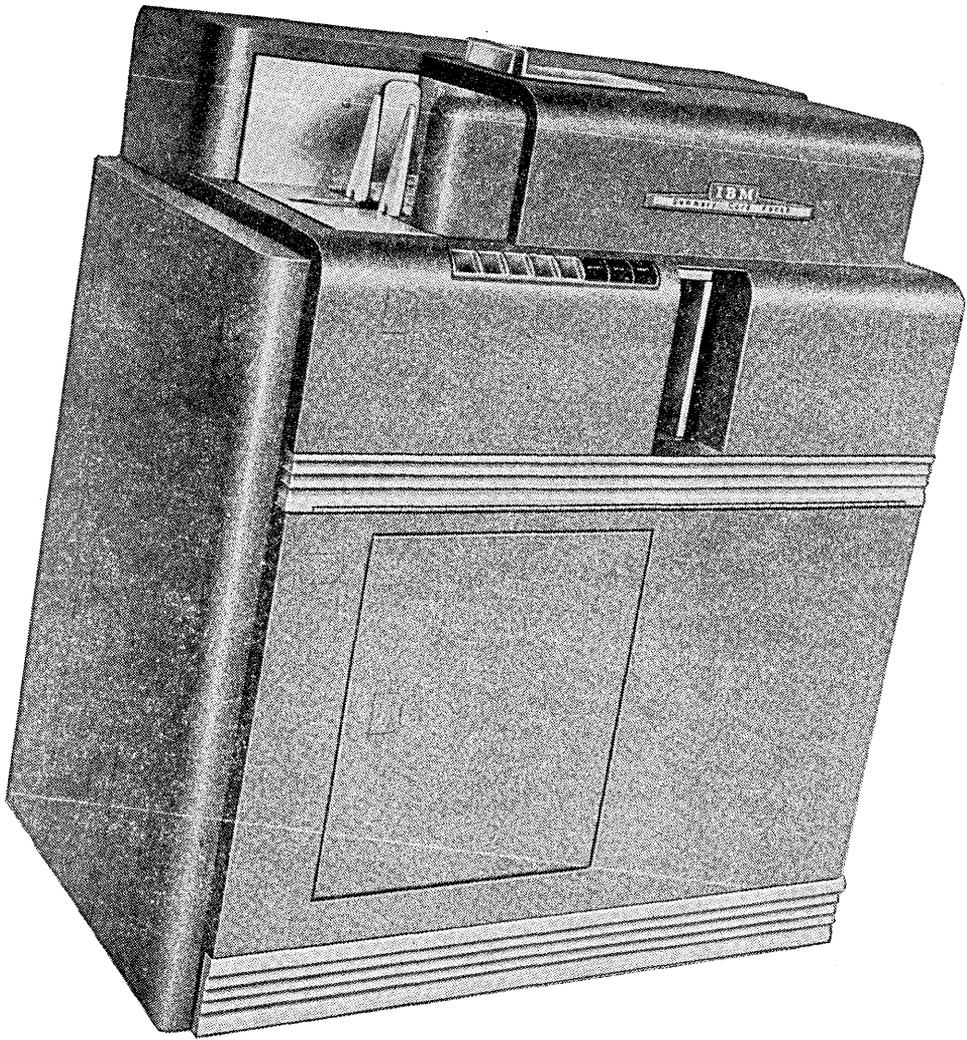
Depth: 31".

Weight: 920 lbs.

Power: 1200 watts.

Heat dissipation: mainly from tape control units.

IBM TYPE 523
Summary Gang Punch



IBM TYPE 523

Summary Gang Punch

MANUFACTURER

International Business Machines Corporation; modified by computer manufacturers for their systems.

APPLICATION AND APPROXIMATE COST

<i>Applications</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Approximate Mo. Rental*</i>
Alvac III Computer	4D 485.1	IBM Type 523:
National 102-D Computer	4D 540.1	Summary Punch \$60
Datatron Computer	4D 245.1	Summary Gang Punch 65
Elecom 120A Computer	4D 780.1	
Elecom 125 Computer	4D 780.2	
Readix Computer	4D 655.1	

*Single-shift operation.

BRIEF DESCRIPTION

Two Type 523 summary punches can be used as components of the above computers, one for input data on punched cards, the other for output data on punched cards. These 523 units are under the control of the computer at all times.

EQUIPMENT REPORT

PERFORMANCE

<i>Application</i>	<i>Cards/Minute</i>		<i>No. of Columns</i>	
	<i>Read</i>	<i>Punch</i>	<i>Read</i>	<i>Punch</i>
Alwac III	100	100	80	80
National 102-D	100	100	40	40
Datatron	100	100	80	80
Elecom 120A	100	100	80	80
Elecom 125	100	100	80	80
Readix	100	100	80	80

PUNCHED CARD

Code	IBM (Hollerith) code 2-hole coded alphabetics, A to Z. 1-hole coded numerics, 0 to 9.
No. of Columns	80.
Copy Mode	Serial by punch, parallel by character.
Format	Plugboard wiring permits flexible reading and punching of cards. Gang punching is possible for output. 8 column split features are included; i. e. an "x" punch can be transferred or eliminated. Detection of double punched or blank columns during reading and punching operations is possible. The monthly rental cost is \$5 for every 10 positions to be detected.

PHYSICAL DATA

Height: 51".

Width: 26".

Depth: 40".

Weight: 705 lbs.

Power: 115 to 230 volts, 60 cps, single-phase, 3-wire grounded.

Heat dissipation: 2375 BTU/hr. with 115 volts.

IBM 711 CARD READER

4G 380.5—Page 1

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September 7, 1956—49



September 7, 1956-50.

4G 389.5--Page 2

July, 1956

IBM 711 CARD READER

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM 701, ADP Equip. Rpt. Ref. 4E 380.1;
IBM 704, ADP Equip. Rpt. Ref. 4E 380.3

	<i>Single-Shift Monthly Rental</i>
IBM 711, model 1 (used with IBM 701 or 704)	\$200
IBM 711, model 2 (used with IBM 704)	400

BRIEF DESCRIPTION

The IBM 711 Card Reader is a basic input component of the IBM 701 and 704 computer systems. The reader senses and sends the card information to the core storage of the central processing unit; the reader is under control of the computer at all times.

PERFORMANCE

<i>Maxima</i>	<i>IBM 711, model 1</i>	<i>IBM 711, model 2</i>
Cards/minute	150, 72-columns/ card	250, 72-columns/ card
Decimal Information * characters/second	180	300
Binary Coded Information decimal digits/second	600	1,000
alphabetic characters/sec- ond	300	500

* Any of which may be numerical, alphabetic or special characters.

EQUIPMENT REPORT

PUNCHED CARD CHARACTERISTICS

Code	IBM (Hollerith) or binary code
Characters alphabetic numerical special	A to Z 0 to 9 & . - \$ / , % # @ * □
Number of Columns	80-column card, of which any 72 columns can be read.
Copy Mode	Serial by card row, parallel by character, serial by card.
Format	Decimal coded information: By the wiring of the control panel, the arrangement of the card fields of any 72 columns may be determined. Binary coded information: Each of the 12 rows of the card is split into two parts: each part consisting of 36 columns. Each half row can be treated as a 36-bit word to make a possible total of 24 words per card. The exact position of a word that each column represents is determined by control panel wiring.

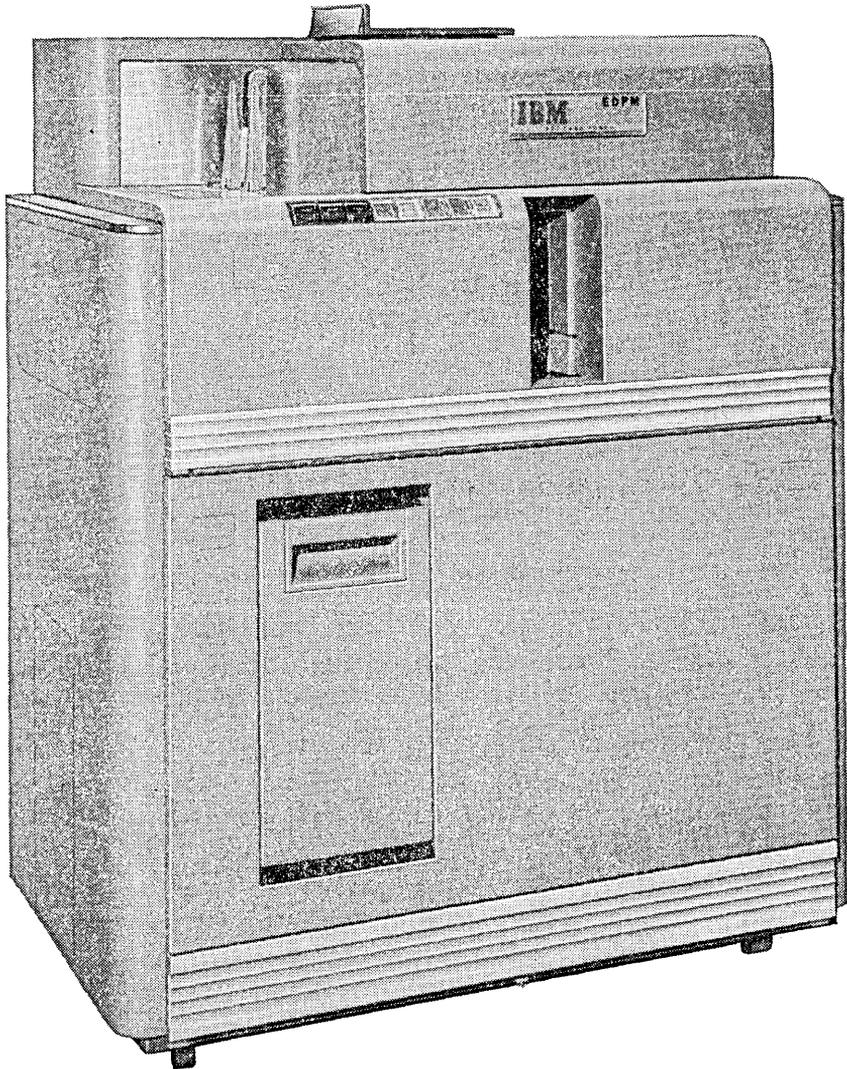
PHYSICAL DATA

Height, 32"; width, 32"; depth, 30"; weight, 560 lbs.

Power .7 kva, 60 cps, 500 watts.

Heat Dissipation 1,700 BTU/hr.

IBM 721 CARD PUNCH



July, 1956

IBM 721 CARD PUNCH

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM 701, ADP Equip. Rpt. Ref. 4E 380.1;
IBM 704, ADP Equip. Rpt. Ref. 4E 380.3

IBM 721

*Single-Shift
Monthly Rental*

\$200

BRIEF DESCRIPTION

The IBM 721 Card Punch is a basic output component of the IBM 701 and 704 computer systems. The punch (recorder) is under control of the computer's control unit.

PERFORMANCE

	<i>Decimal Information</i>	<i>Binary Information</i>
Cards/minute	100, 80-column cards	
Decimal digits/second	120	400
Alphabetic characters/second	120	200

EQUIPMENT REPORT

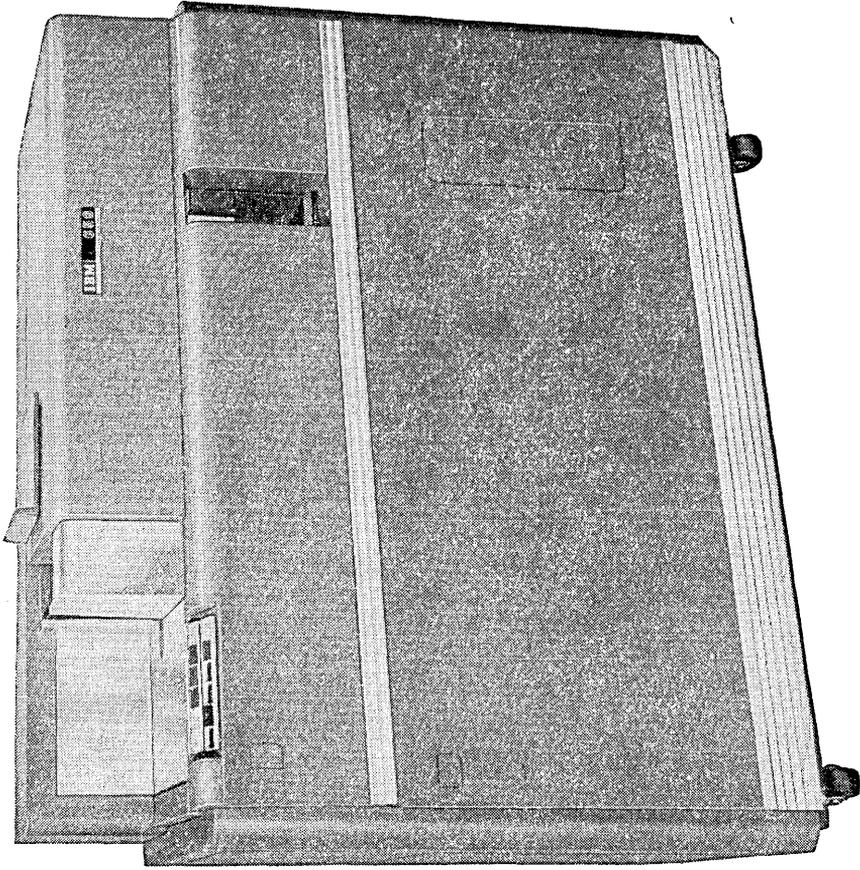
PUNCHED CARD CHARACTERISTICS

Code	IBM (Hollerith) or binary code
Characters alphabetic numerical special	A to Z 0 to 9 & . - \$ * / , % # @ □
Number of Columns	80-column card, of which only 72 columns may be punched from core storage (unless split-column wiring is used).
Punch Mode	Serial by card row, parallel by character, serial by card.
Format	<p>Decimal coded information: By the wiring of the control panel, the arrangement of the card fields of any 72 columns may be determined. Double punched or blank columns can be checked.</p> <p>Binary coded information: Each of the 12 rows of the card is split into two parts, each part consisting of 36 columns. Each half row can be treated as a 36-bit word to make a possible total of 24 words/card. The exact position of a word that each column represents is determined by control panel wiring.</p> <p>Gang punching is possible.</p>

PHYSICAL DATA

Height, 49 $\frac{3}{4}$ "; width, 39 $\frac{1}{2}$ "; depth, 25 $\frac{1}{2}$ "; weight, 670 lbs.
 Power 3.5 kva, 60 cps, 2,600 watts.
 Heat Dissipation 9,000 BTU/hr.

IBM 537
Card Read-Punch



February, 1957

IBM 537

Card Read-Punch

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM 650 and 650 Ramac, ADP Equip. Rpt. Ref. 4D 380.1.

	<i>Single-Shift Monthly Rental</i>	<i>Purchase Cost</i>
IBM 537	\$700	\$46,200
Alphabetical device	175	11,550
Special character device (all eleven characters)	100	6,600
Special character device (11 and 12 punches only)	25	1,650

BRIEF DESCRIPTION

The IBM 537, an input-output component of the IBM 650 system, punches calculated results into the same IBM cards from which the original source data were read. Numerical information, only, is processed by the basic read-punch unit; however, special devices added to this unit permit the processing of alphabetical and special characters by recoding the information to and from numerical form.

The component parts of this read-punch unit are: a card feed hopper; 1st and 2nd read stations; a processing station; a punch station; a punch reading station; and a punch stacker.

EQUIPMENT REPORT

PERFORMANCE

<i>Maximums</i>	<i>Input-Output</i>
Cards/minute	155, 80-column cards
Decimal digits/minute	12,400
Alpha or special characters/minute	4,650
Combined:	
digits	6,200
alphas and specials	4,650

PUNCHED CARD CHARACTERISTICS

Code	Hollerith Code.
Characters alphabetical numerical special	A to Z (2 hole coded). 0 to 9 (1 hole coded). . & \$ * - / , % # @ □ (1 to 3 hole coded).
Number of Columns	80.
Copy or Punch Mode	Serial by punch, parallel by character, serial by card.
Format	Controlled by plugboard wiring. For reading and punching, data must be packed into ten words since the input-output synchronizers of the IBM 650's drum have a maximum capacity of ten words. Non-numerical data will usually be handled in the first six of these ten words providing that the necessary alphabetical and/or special character devices have been incorporated into the IBM 650 system. Since each character is represented as a 2-digit number, a maximum of 30 such characters may usually be contained on one card. The punching operation of the 537 is checked for undesirable double punches and/or blank columns through appropriate control panel hubs. Twenty hubs are standard; the remaining sixty hubs are optional and are available at a rental of \$5 for each ten positions (one word).

IBM 537

PHYSICAL DATA

Height: 51"

Width: 26"

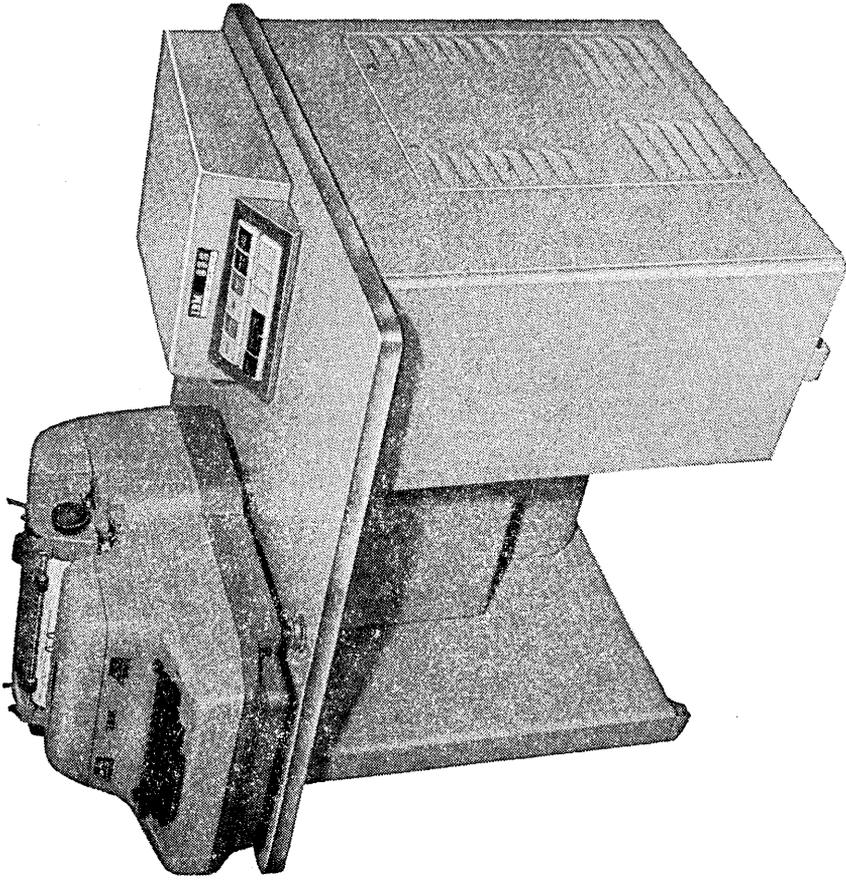
Depth: 60"

Weight: 1,230 lbs.

Power: The IBM 655, Power Unit, of the IBM 650 and 650 Ramac system provides the power for this unit.

Heat dissipation: 2,500 BTU/hr.

IBM 838
Inquiry Station



February, 1957

IBM 838

Inquiry Station

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM 650 Ramac, ADP Equip. Rpt. Ref. 4D 380.1.

	<i>Single-Shift Monthly Rental</i>	<i>Purchase Cost</i>
IBM 838	\$175	\$10,000

BRIEF DESCRIPTION

The IBM 838, Inquiry Station, an input-output component of the IBM 650 Ramac, directs operator-typed requests to the 650 and under control of the 650 program develops the replies and causes them to be typed.

A maximum of ten inquiry stations, divided into two groups may be included in one 650 Ramac system. Each group communicates via its own synchronizer with the 650's drum.

Those inquiry stations under the control of one synchronizer may be programmed to operate in parallel with those stations under the control of the other.

EQUIPMENT REPORT

TYPEWRITER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single action.
Characters alphabetic numerical special	A to Z 0 to 9 8 characters possible.
Format	10 characters/inch; 4 or 6 lines/inch; 104 characters/line.
Printing Medium paper ribbon	Up to 11" wide. 2-color ribbon device.

IBM 838

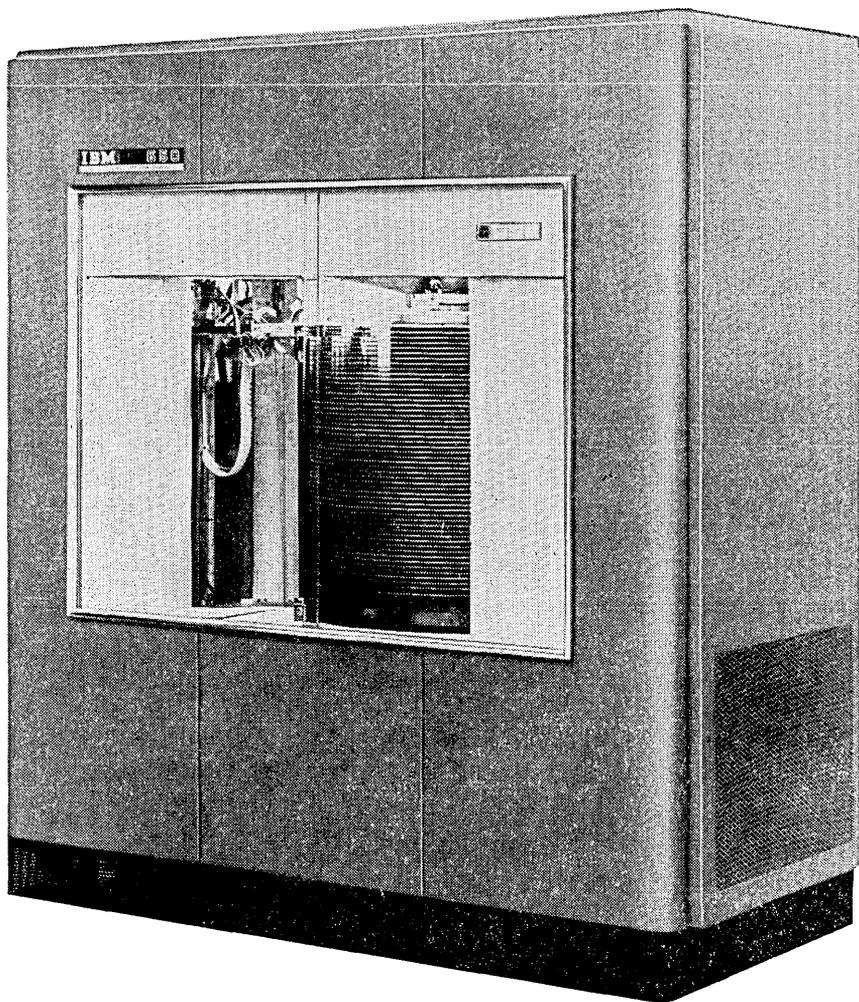
FUNCTIONAL CHARACTERISTICS

Typewriter	Transmits data to the 650 and types data from the 650.
Control Keys and Lights Request Key	Positions the format control tape and asks whether the 650 is ready for an inquiry.
Request Light	Turns on when the request key is depressed and turns off when the proceed light goes on.
Proceed Light	Turns on when the 650 system is ready to accept the message.
Input Light	Turns on when the control tape is at the beginning of the input format.
Release Key	When the output light is on, signals the 650 that the entire message has been sent, otherwise, signals an error.
Output Light	Turns on when the control tape is at the beginning of the output format.
Checking Light	Turns on when an error in transmission is recognized.
Cancel Key	Turns off the checking light; takes typewriter out of the proceed status.
Ready Light	Indicates that the Inquiry Station is ready for normal operation.
Program Tape	A 16-channel perforated plastic tape from 1 foot to 4 feet long provides: forms control through carriage tabulations and line spacing, entry and exit arrangements for data transmission, control and identification of data for IBM 650 processing, and zero suppression.

PHYSICAL DATA

Height: 37".
 Width: 37½".
 Depth: 29".
 Weight: 240 lbs.
 Power: 115 volts, 60 cps, .23 kva.
 Heat dissipation: 650 BTU/hr.

IBM 355
Random Access Memory



February, 1957

IBM 355

Random Access Memory

MANUFACTURER

International Business Machines Corporation

APPLICATION AND APPROXIMATE COST

Application: IBM 650 Ramac, ADP Equip. Rpt. Ref. 4D 380.1.

	<i>Single-Shift Monthly Rental</i>	<i>Purchase Cost</i>
IBM 355	\$975	\$72,200

Two-shift operation increases the single-shift rental by 40%;
three-shift operation increases the single-shift rental by 80%.

PERFORMANCE

The following figures are for one access arm operation only:

Average access time

To a record	: 600 milliseconds.
To a track on a disk, when the access arm is already straddling the disk	: 225 milliseconds.

EQUIPMENT REPORT

DISK UNIT CHARACTERISTICS

<i>Components</i>	<i>Characteristics</i>
Disks	Diameter: 24". Speed of rotation: 1,200 rpm. Material base: aluminum. coating: magnetic oxide. No. of disks/unit: 50. No. of disk faces/unit: 100. No. of tracks/face: 100. No. of records/track: 1. No. of digits/record: 600 (plus 60 sign indications. These digits and signs are arranged as 60 10-digit-plus-sign words). Alphabetical and special character representation: a 2-digit numerical code.
Access arms	No. of arms: 3. No. of read-write heads/arm: 2.

PHYSICAL DATA

Height: 71"
Width: 63"
Depth: 30"
Weight: 2,090 lbs.
Power: 208 volts, 60 cps, 4.6 kva.
Heat dissipation: 9,800 BTU/hr.

IBM 355

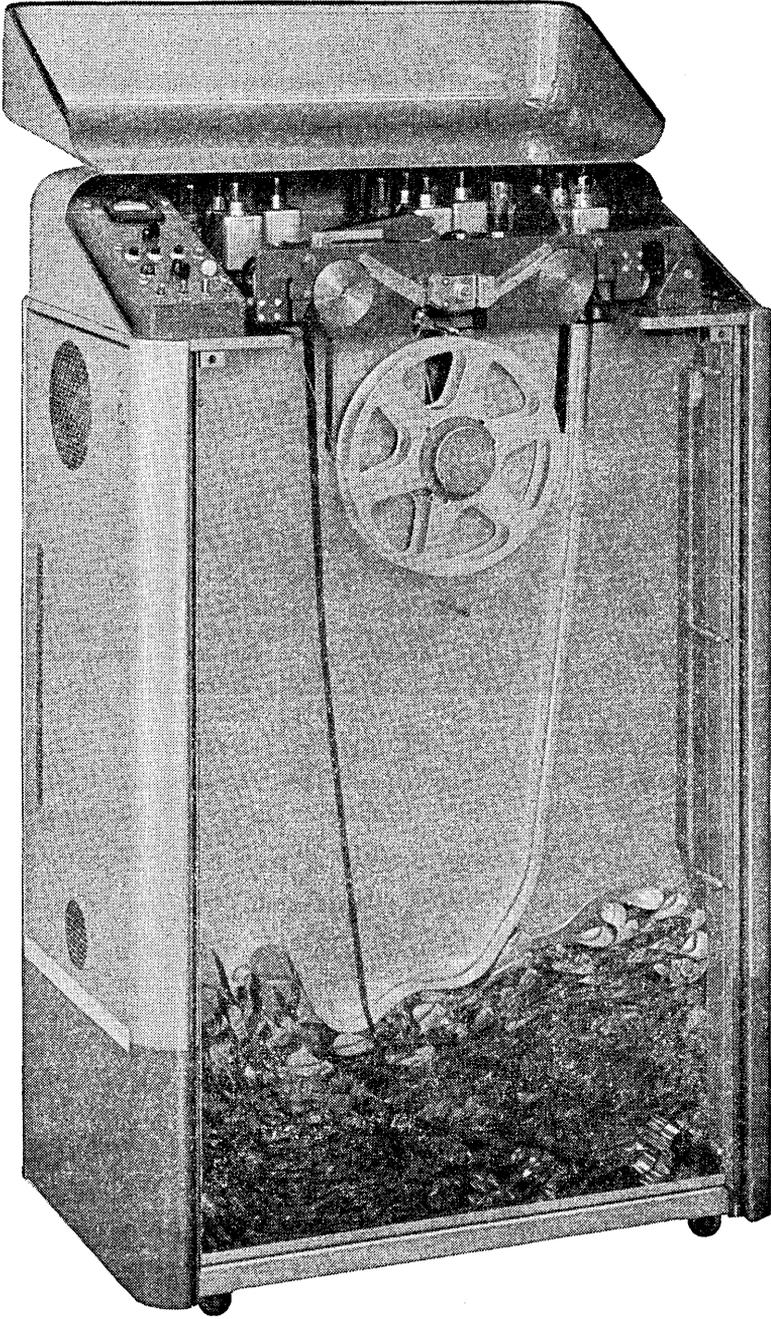
COMMENTS

The 355, Ramac Unit is an optional storage device for the IBM 650. It provides relatively rapid access, to a file of up to 6,000,000; packed into 600,000 10-digit-plus-sign words; bi-quinary digits. Alphabetical and special characters must be recorded into 2-digit numerical representation.

Reading and writing are accomplished by read-write heads mounted on the upper and lower branches of the 3, Y-shaped, access arms. These arms move vertically and/or horizontally to the desired data under the direct control of the 650 program.

Up to 4 Ramac Units may be connected with a 650 Ramac system. Both the 652, Control Unit and the 653, Storage Unit necessary for a tape 650 system are needed with a 650 Ramac system.

NATIONAL 126 TAPE UNIT



NATIONAL 126 TAPE UNIT

MANUFACTURER

The National Cash Register Company

APPLICATION AND APPROXIMATE COST

Application: National 102-D computer system, ADP Equip. Rpt. Ref. 4D 540.1.

Approximate cost, each tape unit: \$19,500 (rentals available from manufacturer only).

PERFORMANCE

Tape speed (inches/second): 15, read-write; 90, search.

Start-stop time: 3 milliseconds.

Rewind time: 2 minutes.

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approximate Cost</i>
Tape base	cellulose acetate	1200 ft. long	10½" reel with 1200 ft. tape:
coating	magnetic oxide, one side; aluminum on other side	1" wide	unclocked: \$30 clocked: \$60
Reel, one		10½" O.D.	
Recording Density	40 decimal digits/inch		
No. of Channels	10		
Copy Mode	Serial-parallel by bit, serial by word		

EQUIPMENT REPORT

PHYSICAL DATA

Height: 48".

Width: 30".

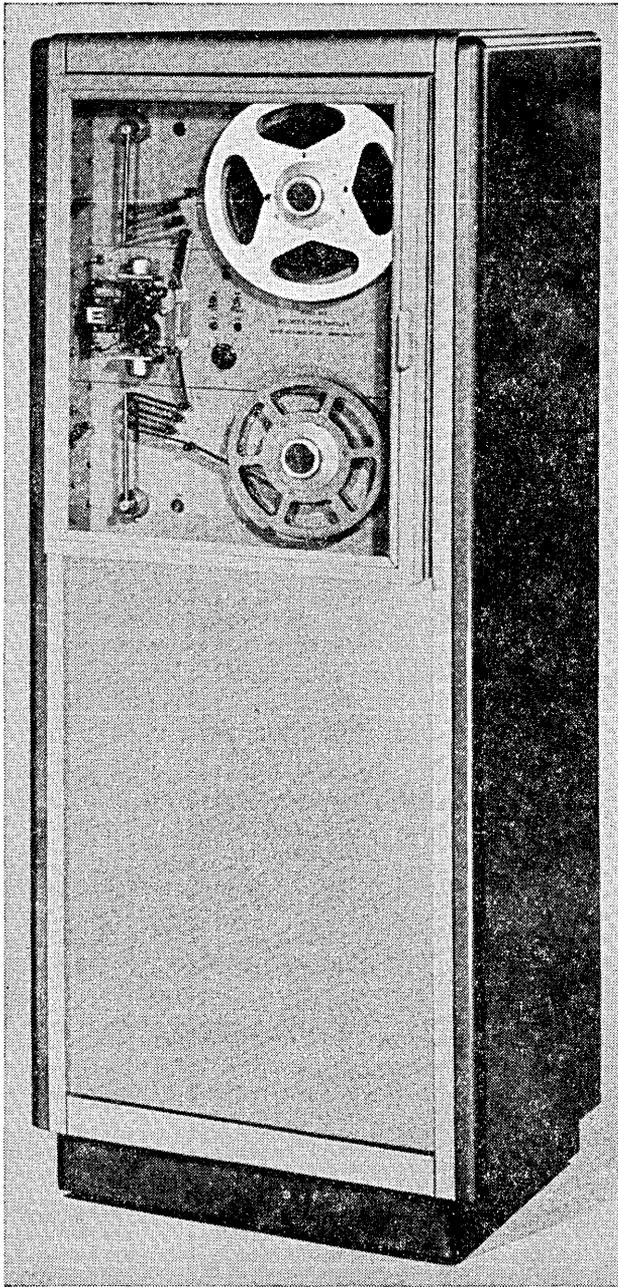
Depth: 18".

Weight: 911 lbs.

Power: 115 volts, 60 cps, 1100 watts.

Heat dissipation: 3500 BTU/hr.

READIX TAPE UNIT



READIX TAPE UNIT

MANUFACTURER

Potter Instrument Company, Inc.; modified by J. B. Rea Company.

APPLICATION AND APPROXIMATE COST

Application: Readix computer system, ADP Equip. Rpt. Ref. 4D 655.1.

Approximate cost, each tape unit: purchase, \$10,300; monthly rental, \$377 (single shift operation; maintenance included for one year on purchase or during rental period).

PERFORMANCE

Tape speed: 15 inches/second.

Start-stop time: 5 milliseconds.

Rewind time: 4 minutes.

EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approximate Cost</i>
Tape base coating	mylar plastic oxide	1200 ft. long 5/8" wide 10.5" O.D.	not established as yet
Reels, two			
Recording Density	70 dec. digits/inch ; 35 alpha characters/inch		
No. of Channels	8		
Copy Mode	parallel by bit, serial by character by word		

PHYSICAL DATA

Height: 67".

Width: 22".

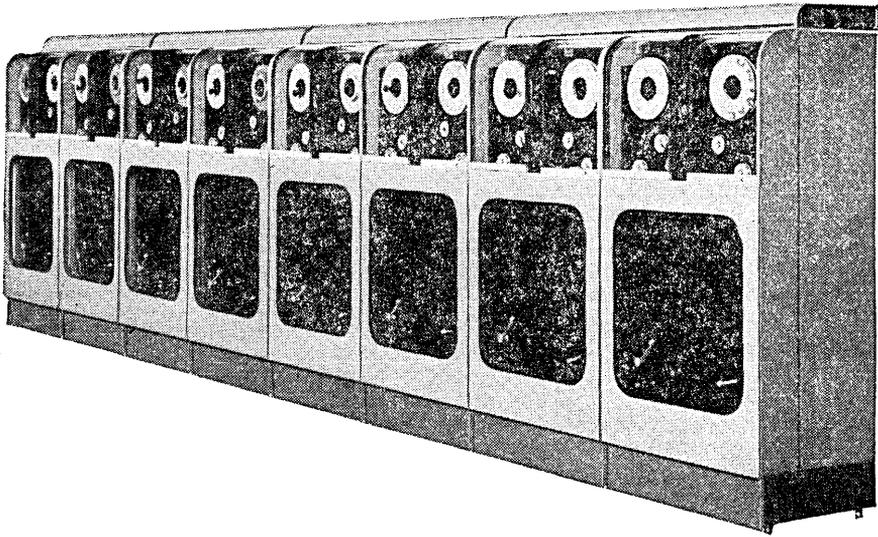
Depth: 18".

Weight: 150 lbs.

Power: 110 volts, 60 cps, 400 watts.

Heat dissipation: 1300 BTU/hr.

REMINGTON RAND UNISERVO



REMINGTON RAND UNISERVO

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

APPLICATION AND APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
		<i>One-Shift</i>
		<i>40-Hr. Week</i>
Uniservo I used with Univac I, each	\$18,000	\$320
Uniservo II used with Univac II, each	20,000	450

Monthly rental of a Univac system includes maintenance. A maintenance contract is also available to purchasers.

PERFORMANCE

	<i>Univac I</i>	<i>Univac II</i>
Tape Speed (inches/second)	100	100
Start-Stop Time (milliseconds)	44	15
Rewind Time (minutes)	3½	**

**Any number of Uniservos may be wound simultaneously.

EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Univac I</i>	<i>Univac II</i>
Approximate Cost	\$51/1500 ft. reel and container	Same cost. Current 1500 ft. reels contain more than the 1535 ft. required
Material base coating	phosphor-bronze oxide	phosphor-bronze oxide
Length	1500 ft.	1535 ft.
Width	½"	½"
Recording Density	128 characters/inch	200 characters/inch
Gap Between Blocks	2.4"	1.0"
Number of Channels	8 (6 information, 1 redundancy check, 1 sprocket)	8 (6 information, 1 redundancy check, 1 sprocket)
Copy Mode	Serial by character by word, parallel by bit	Serial by character by word, parallel by bit

PHYSICAL DATA

Height: 61".

Width: 30".

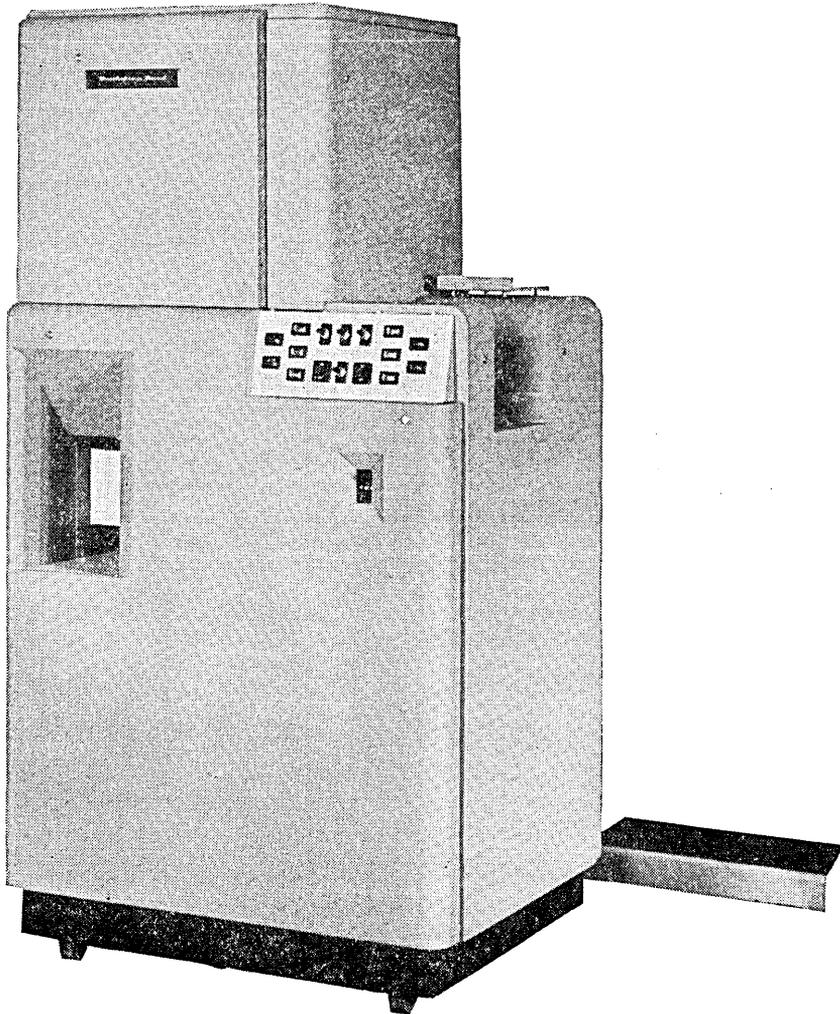
Depth: 21¾".

Weight: 650 lbs.

Power: 750 watts.

Heat dissipation: 2,560 BTU/hr.

UNIVAC FILE COMPUTER
90-Column Card Sensing and Punching Unit



December, 1956

UNIVAC FILE COMPUTER

90-Column Card Sensing and Punching Unit

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

APPLICATION AND APPROXIMATE COST

Application: Univac File Computer, ADP Equip. Rpt. Ref.
4D 660.1

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
90-column Card Sensing and Punching Unit	\$62,590	\$1,050

BRIEF DESCRIPTION

The 90-column Card Sensing and Punching Unit is one of the punched card input-output components of the Univac File Computer. The same card feeding magazine is used for feeding cards to the sensing and punching station. Cards may be segregated into either the segregate or normal card receivers under control of the computer. This sensing and punching unit is capable of processing both alphabetic and numerical information. Reproduction of alphabetic or numerical information may be accomplished without utilizing any of the storage capacity of the File Computer proper.

PERFORMANCE

<i>Maximum</i>	<i>Input-Output</i>
cards/minute	75
characters/second	225

EQUIPMENT REPORT

PUNCHED CARD

Code	Univac code
Characters	
alphabetic	A to Z
numeric	0 to 9
special	(one code)
Number of Columns	90
Copy or Punch Mode	Parallel by punch, parallel by character.
Format	Controlled by plugboard wiring, independent of the File Computer's plugboard, for the purpose of feeding, sensing, punching and receiving cards. This sensing and punching unit incorporates 120 positions of input-output magnetic core buffer storage.

PHYSICAL DATA

Height: 65"

Width: 30"

Depth: 33"

Weight: 1,020 lbs.

Power: 1.0 kva

Voltage: 230/220/208 volts single phase, 60 cps

Heat Dissipation: 3,420 BTU/hr.

TELETYPE TAPE PUNCH

TELETYPE TAPE PUNCH

MANUFACTURER

Teletype Corporation

APPLICATION AND APPROXIMATE COST

<i>Used With</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Approximate Tape Punch Cost</i>
Elecom 120A computer	4D 780.2	\$3,500
Elecom 125 computer	4D 780.3	3,500
National 303 computer	4D 540.2	cost not released as yet
Readix computer	4D 655.1	not established as yet

BRIEF DESCRIPTION

The Teletype Tape Punch perforates paper tape and is used as an output component of several computer systems.

PERFORMANCE

<i>Computer Application</i>	<i>Maximum Punch Speed</i>
Elecom 120A	60 characters/second
Elecom 125	60 characters/second
National 303	60 characters/second
Readix	60 characters/second

EQUIPMENT REPORT

PAPER TAPE CHARACTERISTICS

	<i>Recording Density</i>	<i>Copy Mode</i>	<i>No. of Channels</i>			
			<i>total</i>	<i>digit</i>	<i>zone</i>	<i>other</i>
Elecom 120A	10 columns of punched holes per inch	parallel by bit, serial by character by word	6	4	2	
Elecom 125			6	4	2	
National 303			6			
Readix			6			

PHYSICAL DATA

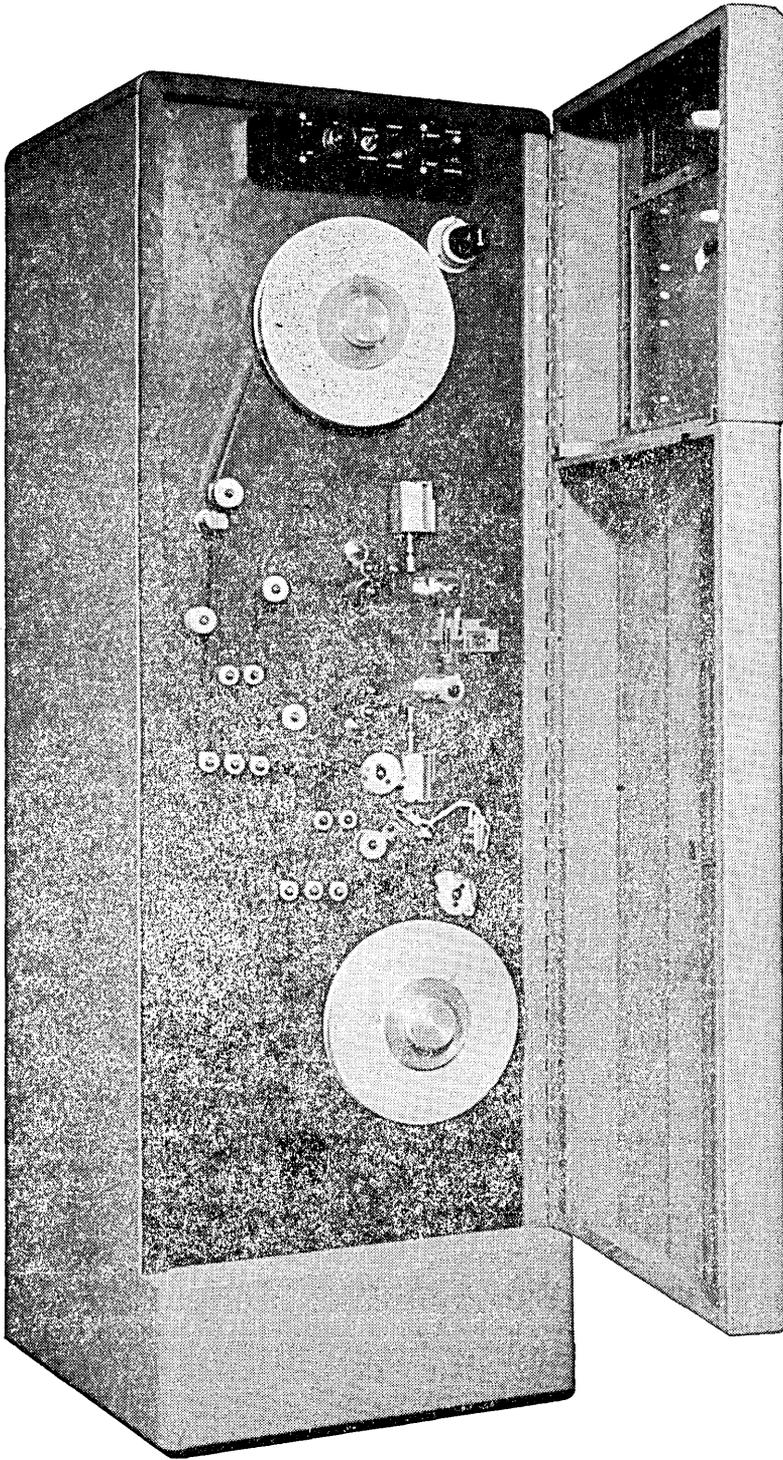
Height, 10"; width, 14½"; depth, 6¾"; weight, 25 lbs.
Power, 110/120 volts, 60 cps.

July, 1956

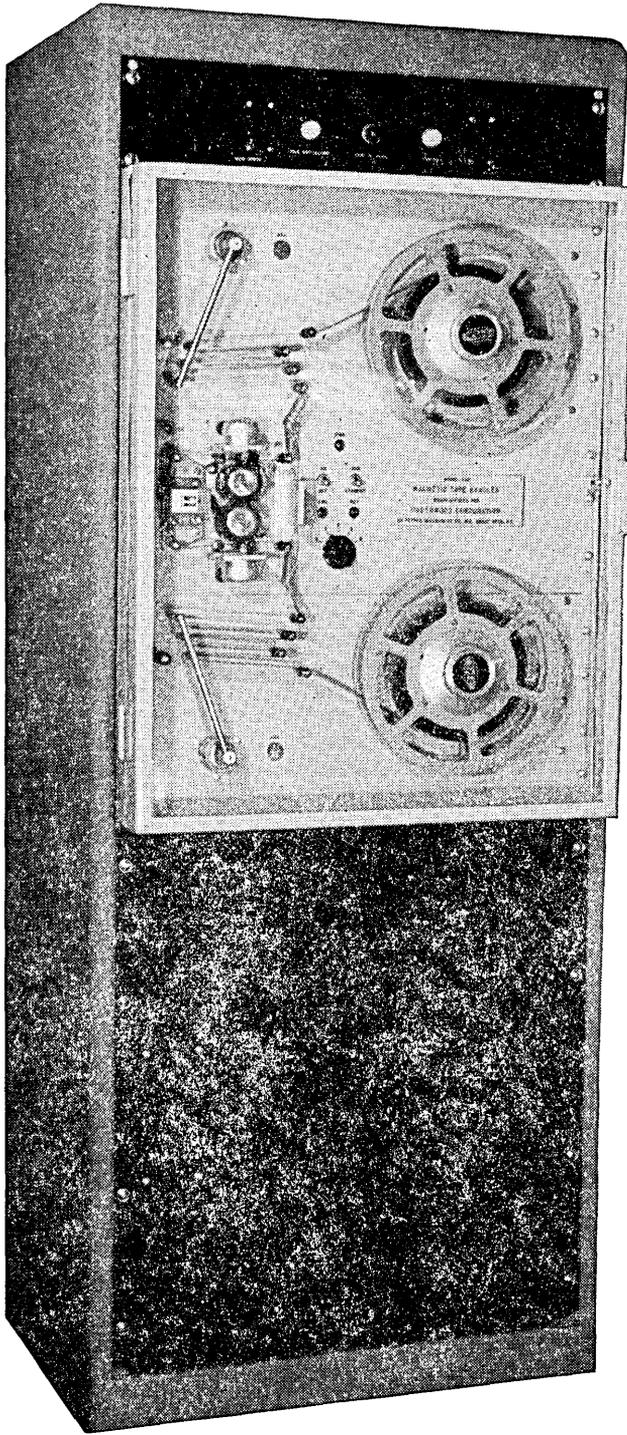
UNDERWOOD TAPE UNIT

DISCONTINUED

The Underwood Corporation has discontinued the manufacture of the Underwood Tape Unit. It is no longer available.



ELECOM TAPE UNIT



July, 1956

ELECOM TAPE UNIT

MANUFACTURER

Underwood Corporation

APPLICATION AND APPROXIMATE COST

<i>Application</i>	<i>ADP Equip. Rpt. Ref.</i>	<i>Approximate Cost</i>	
		<i>Purchase</i>	<i>Mo. Rental</i>
Elecom 125 computer system each tape unit	4D 780.2	\$8,000	\$216

PERFORMANCE

Tape speed: 20 inches/second, computer;
60 inches/second, file processor.

Start-stop time: 60 milliseconds, computer; 10 milliseconds,
file processor.

Rewind time: 4 minutes/1200 ft. reel; 8 minutes/2400 ft. reel.

EQUIPMENT REPORT

TAPE CHARACTERISTICS

	<i>Material</i>	<i>Dimensions</i>	<i>Approx. Cost</i>
Tape base coating Reels, two	plastic oxide	1200 ft. or 2400 ft. long $\frac{1}{2}$ " wide 8" O.D., 1200 ft. tape; 10 $\frac{1}{2}$ " O.D., 2400 ft. tape	\$40/1,200 ft. reel; \$55/2,400 ft. reel above costs include reel and container.
Recording Density	100 decimal digits/inch; $\frac{1}{2}$ " gap between records		
No. of Channels	6 (4 information, 1 sprocket, 1 good tape indicator)		
Copy Mode	parallel by bit, serial by character by word		

PHYSICAL DATA

Height: 54".

Width: 22".

Depth: 15".

Weight: 200 lbs.

Power: 208/120 volts, 60 cps, 400 watts.

Heat dissipation: 1350 BTU/hr.

UNDERWOOD PRINTED TAPE READER

UNDERWOOD PRINTED TAPE READER

MANUFACTURER

Underwood Corporation

APPLICATION AND APPROXIMATE COST

Application: Elecom 125 computer component, ADP Equip.
Rpt. Ref. 4D 780.2.

Approximate cost, each reader: \$5,000.

BRIEF DESCRIPTION

The Printed Tape Reader reads ink printed paper tape photoelectrically, and is used as an input component of the Elecom 125 computer.

PERFORMANCE

Read speed: 500 characters/second.

PAPER TAPE CHARACTERISTICS

Recording Density	20 characters/inch
Copy Mode	parallel by bit, serial by character by word
No. of Channels	6 total, 4 digit, 2 zone

PHYSICAL DATA

Weight:	} not yet released.
Power:	
Height:	
Depth:	
Width:	

DATAMATIC 1400

Output Magnetic Tape-to-High-Speed Printer Converter

March, 1957

DATAMATIC 1400

Output Magnetic Tape-to-High-Speed Printer Converter

MANUFACTURER

DATAmatic Corporation

BRIEF DESCRIPTION

The Model 1400, Output Converter, reads coded information from DATAmatic magnetic tape and both edits and revises this information for output. This encoded information is then printed by means of a high-speed line printer.

This Output Converter is used off-line with the DATAmatic 1000 system.

APPROXIMATE COST

	<i>Purchase</i>	<i>Mo. Rental</i>
DATAmatic 1400, includes high-speed line printer	\$215,000	\$4,300

PERFORMANCE

900 lines/minute, maximum.

120 characters/line, maximum.

108,000 characters/minute, maximum.

EQUIPMENT REPORT

PRINTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Rotating type-cylinder.
Characters alphabetic numeric special	A to Z 0 to 9 ' # @ + - = \$. * ¢ & ; / , % ½ () CR
Format	10 characters/inch; 6 lines/inch, maximum. Variable spacing, deletion and rearrangement of information from tapes controlled by control panels in converter.
Printing Medium paper	22" wide, maximum; continuous forms approximately 2 feet long. Up to card stock in weight. Original and up to 3 carbon copies, depending on a paper weight. Sprocket fed; controlled either by program or control panel and 8 channel paper loop.
ribbon	Wide, nylon ribbon operating vertically; reversible and reusable.

COMPONENTS OF THE HIGH-SPEED PRINTER—CONVERTER

<i>Designation</i>	<i>Function</i>
Printer Unit	Printer mechanism; operator control panel.
Magnetic File Unit	Input; contains binary-coded decimal information which the Model 1400 will convert into electrical impulses. Tape characteristics: ADP Equip. Rpt. Ref. 4G 205.1, Recording density: 1200 decimal digits/inch; 800 alphabetic characters/inch. Format: 62 words/block at 12 decimal digits (11 decimal digits and sign) or 8 alphanumeric characters/word; no inter block gaps.
Output Converter	Conditions binary-coded information from magnetic tape for printing or punching; contains timing, coding, and checking circuits; edits by control panel; 16 words of input core storage; 120 positions of output core storage.

DATAMATIC 1400

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
DATAmatic 1400 High-Speed Line	87"	224"	31"	5,300 lbs.}	19,800 BTU/hr.
Printer	52"	52"	33"	750 lbs.}	

COMMENTS

The DATAmatic 1400, Output Converter, converts information from magnetic tape for printing. The high-speed printer in this conversion system prints quantities of information from magnetic tapes without utilizing the valuable computing time of the central computer. Its main use is in business data processing applications since a large amount of printing in good form is needed in much larger quantities for business than for scientific applications.

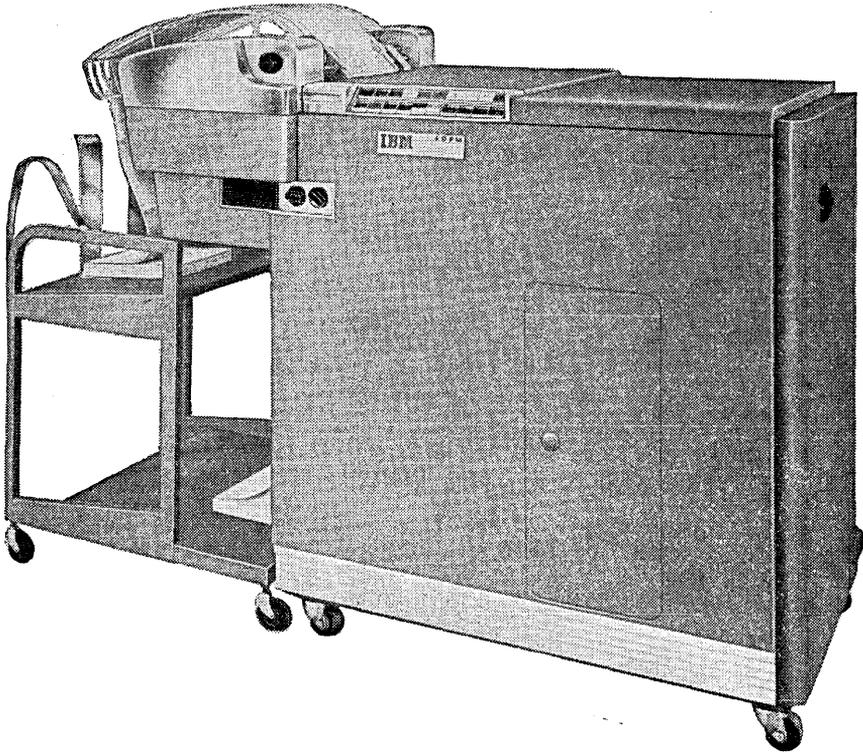
The information on magnetic tapes is converted and edited by plugboards in the Output Converter. The information in each 62-word block may result in the printing of a fraction of a line, a full line, or several lines of intermingled alphabetic and/or numeric information.

Any one of the 64 numeric, alphabetic or special characters can be printed by print-hammer contact in each column position. There are 160 typing positions per line of which 120 can be used. The paper feed is controlled by a 8-channel paper tape loop.

ADDITIONAL INFORMATION

Write to: DATAmatic Corporation
151 Needham Street
Newton Highlands 61, Massachusetts

IBM TYPES 719, 720, 730 PRINTERS



IBM TYPES 719, 720, 730 PRINTERS

MANUFACTURER

International Business Machines Corporation

BRIEF DESCRIPTION

The IBM Type 719, 720, or 730 high-speed printer used with its control storage unit and tape unit, is capable of independent preparation of printed documents from information on magnetic tapes. The information on the magnetic tapes must be coded, packed and in fixed single or group record lengths as output from the IBM computer systems. Any of the printers with its control and storage unit can also be used for direct output from the central unit of the IBM Types 702 and 705 computers.

APPROXIMATE COST

	<i>Monthly Rental</i>
Printer, Type 719 or 720	\$1,400
Printer, Type 730	2,100
Control and Storage Unit, Type 760	1,850
Tape Unit, Type 727	550

The above rental costs are for single-shift operation. Two-shift operation increases the single-shift cost by 50%; three-shift operation increases the single-shift costs by 100%. Maintenance is included in the rental charge.

EQUIPMENT REPORT

PERFORMANCE

	<i>Maximums</i>		
	<i>Lines/minute</i>	<i>Characters/line</i>	<i>Characters/minute</i>
Type 719	1,000	60	60,000
Type 720	500	120	60,000
Type 730	1,000	120	120,000

PRINTER CHARACTERISTICS

Class	Electromechanical.
Printing mode	Wire matrix.
Characters	<p>alphabetic A to Z.</p> <p>numeric 0 to 9.</p> <p>special & - / # . \$, @ ♦ * %.</p>
Format	<p>10 characters/inch; 6 lines/inch (maximum).</p> <p>Independent printing from tapes: Data is printed in the same sequence and format as read from the magnetic tapes, although suppression of groups of the 60 to 120 printing positions for every printed line is possible by the manual setting of levers. Automatic single and double line spacing is possible by the manual setting of a switch. Other line-spacing variation is controlled by a 5 channel paper loop.</p> <p>Direct output of central computer: Editing of data and line spacing is under control of the computer program.</p>
Printing Medium	<p>paper 16$\frac{3}{4}$" max. width; continuous forms, up to 22" in length. Original and up to 7 carbon copies. Pin fed controlled by 5 channel paper loop.</p> <p>ribbon ½" wide; 36 yards long. Moves at right angles to the direction in which the paper is fed.</p>

IBM TYPES 719, 720, 730 PRINTERS

COMPONENTS OF THE HIGH-SPEED PRINTERS

<i>Designation</i>	<i>Type</i>	<i>Function and Characteristics</i>
Printer	719, 720, 730	Printer mechanism; controls for operator.
Tape Unit	727	<p>Input; converts magnetic recording into electrical impulses.</p> <p>Tape format: Standard IBM Tape, ADP Equip. Rpt. Ref. 4G 380.3.</p> <p>All information must be in sequence and edited for direct printing.</p> <p>For the 719 printer, a single record or a group of 10 records of 60 characters or less is the required tape format.</p> <p>For the 720 or 730 printers, a single record or a group of 5 records of 120 characters or less, or a group of 10 records of 97 characters or less is the required tape format.</p>
Control and Storage Unit	760	Power supply; control and checking circuits; 1,000 positions of temporary storage, split into 10 records of 97 printable characters (automatic with the 719 as direct output from computer) or 5 records of 120 printable characters by a manual switch.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>	<i>Heat Dissipation</i>
Type 719	53"	30"	75"	1560 lbs.	10,000 BTU/hr.
Type 720	53"	30"	75"	1560 lbs.	10,000 BTU/hr.
Type 730	53"	30"	95"*	2000 lbs.*	20,000 BTU/hr.
Type 760	67"	32"	63"	1900 lbs.	24,000 BTU/hr.
Type 727	69"	29 ¹ / ₄ "	31"	920 lbs.	13,660 BTU/hr.

*Approximate.

Power: 208 volts, 60 cps, 3-phase, AC.

EQUIPMENT REPORT

COMMENTS

The IBM high-speed printers are used independently or for direct output in the 702 and 705 computer systems. Under independent operation, they are capable of printing quantities of information from magnetic tapes without using the valuable computing time of the central computer. Their main usage will be for business data-processing applications since the amount of printing is needed in much larger quantities for business than scientific operations.

The operating speeds of the line printers may be less than the maximum possible speeds of 500 to 1000 lines per minute. The length of the skips and the number of characters in a grouped record can increase operating time. Any skip over $3\frac{3}{8}$ inches increases operating time. If the skip is less than $3\frac{3}{8}$ inches, maximum speed is maintained if 0 to 120 characters per group are read from tape or 0 to 600 characters per group are read from the central computer. If either of these respective quantities is exceeded, the operating speeds are decreased to an extent dependent upon the number of characters in a group and the number of records per group.

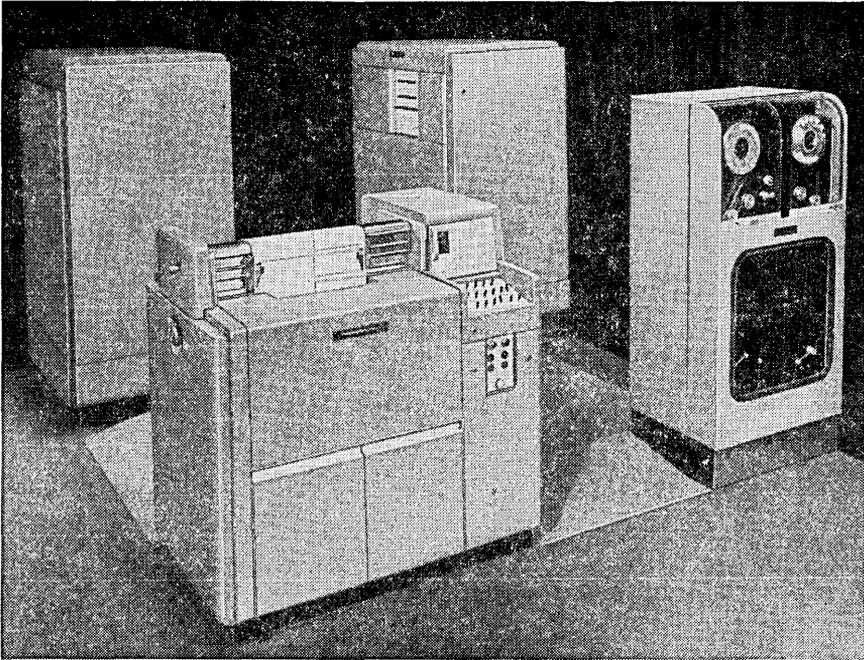
Any of the 47 numerical, alphabetic, and special characters can be printed by a 35-wire matrix in any of the printing positions. On the 719, thirty 35-wire matrices, printing heads, print once in the odd-numbered printing positions and once in the even-numbered printing positions for one line of printing. On the 730, the operation is the same except that there are 60 printing positions. On the 720, thirty printing heads shift in one direction four times for one line of printing, to the left or right depending upon where the print unit last stopped.

There are two checking features in the Type 760 control unit. The information read from the tape is checked by a tape redundancy check as each record or group of records is read in to the control unit. The information read from the control unit and the information that is received from this reading by the printing unit is compared. An error in either check will stop the printer.

ADDITIONAL INFORMATION

Write to: Department of Information
International Business Machines Corporation
590 Madison Avenue
New York 22, N. Y.

REMINGTON RAND HIGH-SPEED PRINTER



REMINGTON RAND HIGH-SPEED PRINTER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Univac high-speed printer, composed of four units (the printer unit, tape unit, memory unit, and the control unit), is capable of preparing printed documents from information on magnetic tapes. The information on the magnetic tapes must be coded, packed and in a fixed block length as output from the Univac computer system.

APPROXIMATE COST

High-Speed Printer: purchase, \$185,000; monthly rental, \$3,300.

The above rental cost is for a 40-hour week, single-shift operation; 80-hour week, two-shift operation increases single-shift rental costs by 50%; 120-hour week, three-shift operation increases single-shift rental costs by 100%. Monthly rental includes maintenance. A maintenance contract is available to purchasers.

PERFORMANCE

200, 400 or 600 lines/minute.

130 characters/line (maximum).

78,000 characters/minute (maximum).

EQUIPMENT REPORT

PRINTER CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Rotating-type wheel shaft.
Characters	
alphabetic	A to Z.
numeric	0 to 9.
special	# \$ % . , ' - * : ; () & / +.
Format	10 characters/inch; 6 lines/inch (maximum). Variable spacing, deletion and rearrangement of information from tapes controlled by plugboard in control unit.
Printing Medium	
paper	4" to 27" wide; continuous forms up to 22" in length. Up to card stock in weight. Original and up to 4 carbon copies, depending upon paper weight. Sprocket fed, controlled by 7 channel paper loop.
ribbon	Carbon: 6" diameter, up to 13½" in width. Nylex: approximately 6" in diameter. Ribbon moves in the same direction as the paper.

COMPONENTS OF THE HIGH-SPEED PRINTER

<i>Designation</i>	<i>Function</i>
Printer Unit	Printer mechanism; operator control panel.
Tape Unit	Input; converts magnetic recording into electrical impulses. Tape characteristics: ADP Equip. Rpt. Ref. 4G 660.1, except for the following requirements: Recording density: 50, 120, or 128 characters/inch. Format: 10 words/blockette at 12 characters/word; 1" space between blockettes; 2.4" space between blocks of 720 characters.
Memory Unit	Temporary storage; plugboard for format control.
Control Unit	Power supply; control and checking circuits; sequences printer.

REMINGTON RAND HIGH-SPEED PRINTER

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Printer Unit	48"	47.5"	32"	800 lbs.*
Tape Unit	60"	30"	24"	650 lbs.
Memory Unit	66.5"	50.9"	32"	1200 lbs.*
Control Unit	66.5"	50.9"	32"	2000 lbs.*

*Approximate.

Power: 16.2 kva plus 1 kva at wall outlet; 60 cycles, AC required.

Heat dissipation: 54,630 BTU/hr. total.

COMMENTS

The Univac High-Speed Printer is used as auxiliary equipment in the Univac computer installation. It prints quantities of information from magnetic tapes without using the valuable computing time of the central computer. Its main usage is in business data-processing applications since a large amount of printing in good form is needed in much larger quantities for business than for scientific applications.

The information on magnetic tapes is coded and packed as output from the Univac computer system and needs to be edited only by a space (end of block space) after 120 characters and a gap of 2.4 inches after every 720 characters. All other editing is done within the printer by a plugboard in the control unit. The information in each block of 120 characters may be edited for a maximum of 6 lines of printing.

Any one of the 51 numerical, alphabetic and special characters can be printed by the typewheel in each column position. There are 130 typewheels per line; the 120 characters contained in a blockette can be printed and 10 of these can be duplicated as additional characters on the line by means of the plugboard.

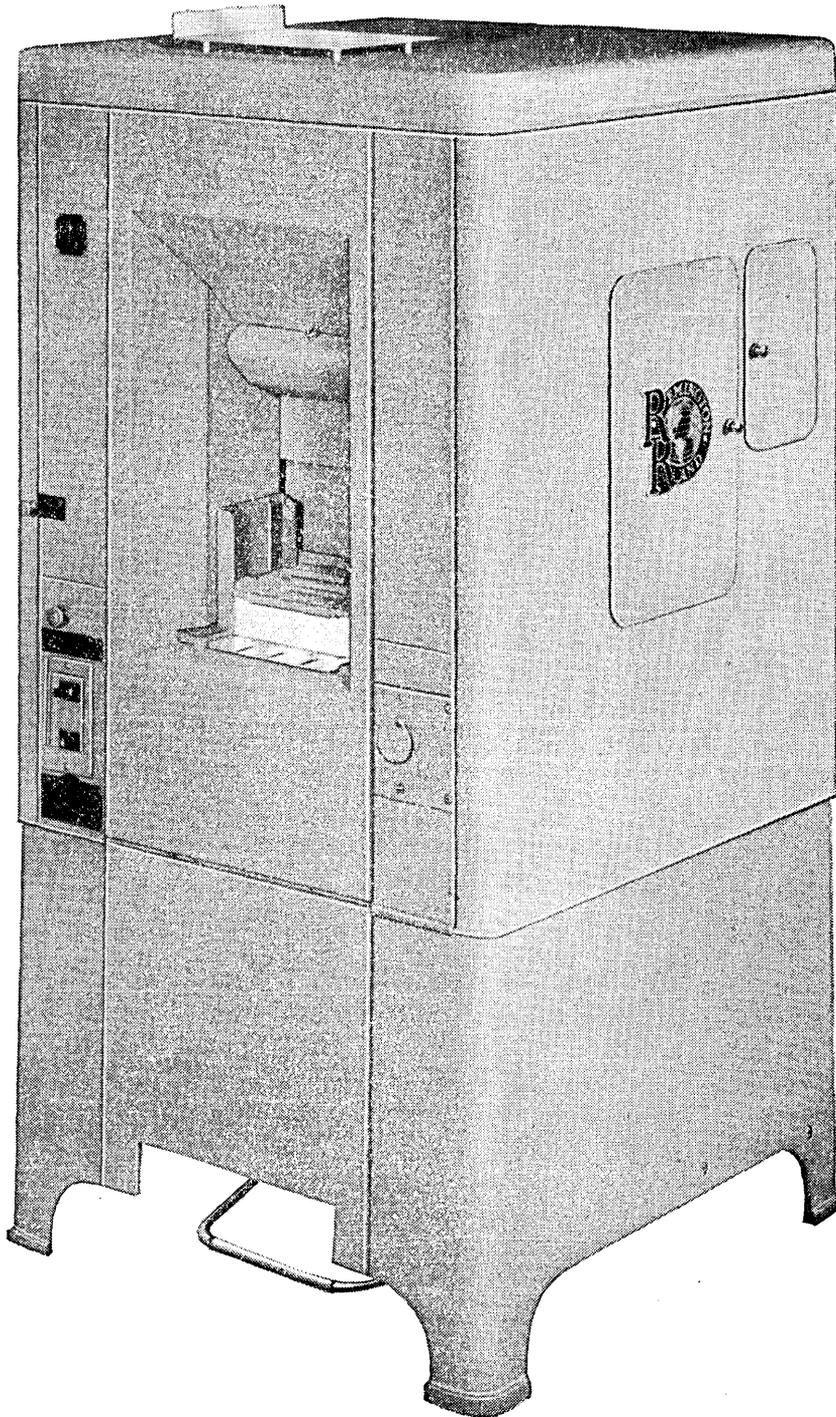
The paper feed is controlled by a 7-channel paper loop. When no printing is required on an area of a page, feeding of the paper at a speed of 20 inches per second can be effected in approximately 5 milliseconds.

EQUIPMENT REPORT

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND TYPE 312
Punched Card Interpreter



June, 1956

REMINGTON RAND TYPE 312

Punched Card Interpreter

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

Type 312 is capable of reading alphabetic and numerical information punched in Remington Rand punched cards and printing this information in any one of seven horizontal printing positions in the lower half or in any one of seven horizontal printing positions in the upper half of the same punched card. Printing of any character can occur either in the same column or in a different column from which it was read.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Mo. Rental</i>
Type 312 Interpreter	\$ 5,904	\$ 85
Type 312-1 Interpreter with Repeat Interpretation Device	6,945	100
Type 312-2 Check Writing Interpreter	6,600	95
Type 312-3 Check Writing Interpreter with Repeat Interpretation Device	7,640	110
Type 312-4 Posting Interpreter	10,420	150

The monthly rental is for a 40-hour week, single-shift operation. 80-hour week, two-shift operation increases the single-shift costs by 50%; 120-hour week, three-shift operation increases the single-shift costs by 100%. Maintenance is included in the monthly rental. A maintenance contract is available to purchasers.

EQUIPMENT REPORT

PERFORMANCE

90 cards/minute, 45 columns/card, maximum.

CARD PRINTING UNIT CHARACTERISTICS

Class Printing Mode	Mechanical Print Wheel
Characters alphabetic numerical special	A to Z 0 to 9 None
Format	45 characters/line, maximum; a line may be printed in any one of seven horizontal positions. Control switches are provided for, the suppression of printing in any card column, and the printing of unpunched zero in any column.
Printing Medium	
card	3.250" wide, 7.375" long and 0.0067" thick.
ribbon	1/2" wide; moves transversely to the direction in which the paper is fed.

CARD READING UNIT CHARACTERISTICS

The card capacity of the card feeding magazine is 650 cards and the card receiver 800 cards. The machine reads only 45 columns of information during one run of the cards. This information may be read from either the upper or lower half of the card or from both. Information may be printed in columns other than those from which the information is read, through use of the wiring unit. Different wiring unit designs must be used for different transpositions.

PHYSICAL DATA

Height, 47"; width, 24"; depth, 24"; weight, 650 lbs.

Power 110 volts, 60 cps, 7.5 amperes, AC or DC.

Heat Dissipation is negligible.

REMINGTON RAND TYPE 312

COMMENTS

The Type 312 is used to read alphabetic and numerical information that is punched in a Remington Rand punched card and to print this information on the face of the card. Modified versions of the 312 are used to produce checks and file cards for ledger accounting.

The Check-Writing Interpreter interprets the holes punched in a punched card and prints the interpretation on the face of the card or check. This machine is furnished with eight printing positions of bulletin style type in addition to the standard forty-five printing positions of boldface type. Six of the seven horizontal printing positions are available for the printing of the bulletin type, any two of which may be used.

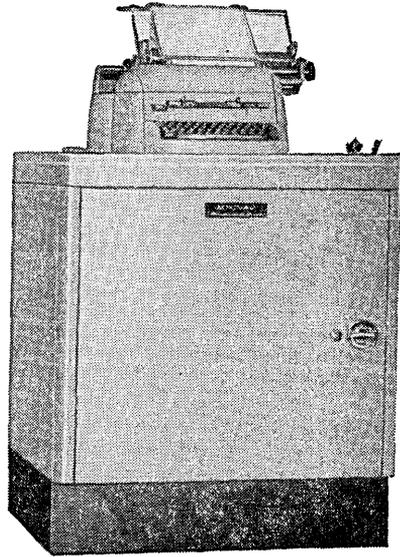
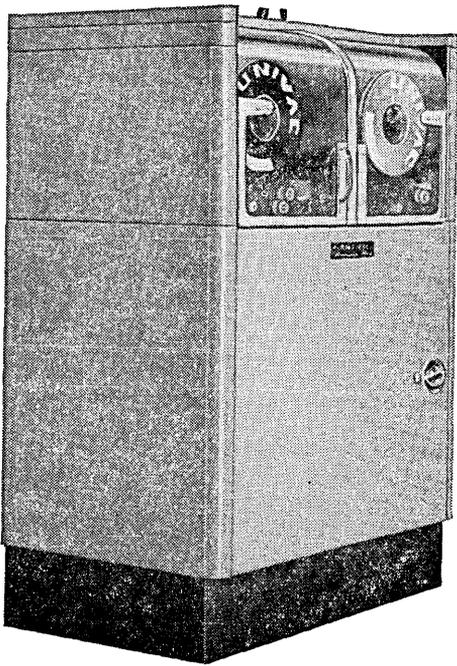
Type 312-4 in combination with a Type 315-1 Collator make possible automatic posting of alphabetic or numerical data on Remington Rand punched cards. Punched cards with the data to be posted are merged with the corresponding ledger cards on the collator. The set of cards is then placed in the Posting Interpreter. The Interpreter reads the punched information, selects the next unposted line and makes the posting. Ledger cards may provide for 13 lines of 45 digits or 26 lines of 22 digits.

The repeat interpretation device permits the printing on a punched card or cards the interpretation from a preceding punched card. The information sensed from and printed on the first punched card is retained and prints again on the punched card or cards which follow.

ADDITIONAL INFORMATION

Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

REMINGTON RAND UNIPRINTER



REMINGTON RAND UNIPRINTER

MANUFACTURER

Remington Rand Univac Division
Sperry Rand Corporation

BRIEF DESCRIPTION

The Uniprinter, composed of two units (the tape reader and the printing unit), is capable of preparing typewritten copy from recorded information on magnetic tapes. The information must be coded and packed as output from the Univac computer.

APPROXIMATE COST

	<i>Approximate Cost</i>	
	<i>Purchase</i>	<i>Monthly Rental</i>
Uniprinter (Tape Reader and Printing Unit)	\$22,000	\$390.00
Extra Printing Units, each	7,000	122.50

The above rental cost is for a 40-hour week, single-shift operation; 80-hour week, two-shift operation increases the single-shift costs by 50%; 120-hour week, three-shift operation increases the single-shift costs by 100%. Monthly rental includes maintenance. A maintenance contract is available to purchasers.

PERFORMANCE

10 characters/second.

EQUIPMENT REPORT

PRINTING UNIT CHARACTERISTICS

Class	Electromechanical.
Printing Mode	Single action electronic decoding.
Characters alphabetic numeric special	A to Z; a to z. 0 to 9. # \$ % . , ' - * : ; () & ''.
Format	10 characters/inch, 6 lines/inch (maximum); any format desired may be obtained by appropriate coding on tape.
Printing Medium paper	From 8½" to 17 ²⁵ / ₃₂ " wide, 11" long; original and up to 4 carbon copies.
ribbon	½" wide; moves transversely to the direction in which the paper is fed.

COMPONENTS OF THE UNIPRINTER

<i>Designation</i>	<i>Function</i>
Tape Reader	Converts magnetic recording to electrical pulse code. Tape characteristics; ADP Equip. Rpt. Ref. 4G 660.1, with the requirement that the recording density be 20 characters/inch.
Printing Unit	Converts electrical pulse code into typewritten copy.

PHYSICAL DATA

	<i>Height</i>	<i>Width</i>	<i>Depth</i>	<i>Weight</i>
Tape Reader	47½"	29"	21½"	410 lbs.
Printing Unit	44½"	29"	21½"	244 lbs.

Power: 110 volts, 60 cycle, 750 watts, 9 amperes.

Heat dissipation: 2,520 BTU/hr., heat to room.

REMINGTON RAND UNIPRINTER

COMMENTS

The printing unit of the Uniprinter is used with the supervisory control to monitor the Univac computer operation. It is used to print intermediate results, to monitor a Univac program while it is running and to keep the operator advised. The printing unit may also be used with the Unityper I to produce typewritten recordings of the keystrokes used in preparing a magnetic tape.

The principal use of the Uniprinter is as an auxiliary to the Univac computer producing small volume typed output. It is well suited to scientific problems and to the preparation of interim reports to management.

ADDITIONAL INFORMATION

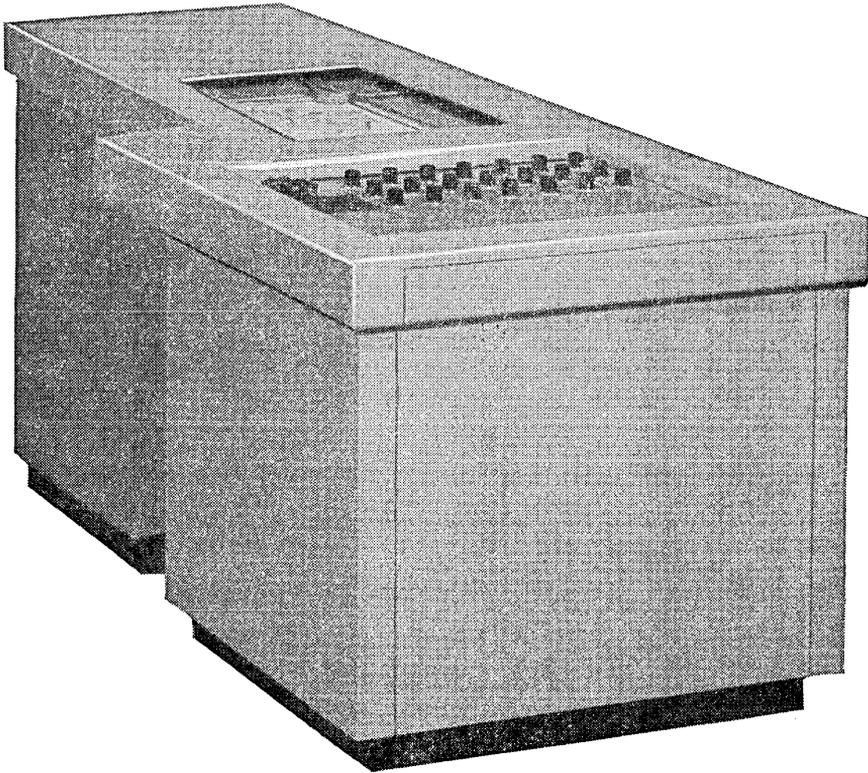
Write to: Remington Rand Univac Division
Sperry Rand Corporation
315 Fourth Avenue
New York 10, N. Y.

BENSON-LEHNER ELECTROPLOTTER

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4-56-329



BENSON-LEHNER ELECTROPLOTTER

MANUFACTURER

Benson-Lehner Corporation

BRIEF DESCRIPTION

The Benson-Lehner Electroplotter converts analog or digital input into a graph of discrete printed symbols. It may receive input from a Benson-Lehner OSCAR or BOSCAR (analog data-processing machines), punched card machines (IBM Type 517 or 523 summary punch), punched tape readers (reads paper tape codes of the Alwac, ElectroData, ERA, Elecom and National computers) or directly from a manually operated keyboard.

APPROXIMATE COST

	<i>Approximate Purchase Cost</i>
Electroplotter, with keyboard and analog input	\$11,500
Plus IBM punched card input	13,400*
Plus punched tape reader, input	14,700
Additional sets of zero and scale controls, first set	700
Second to fifth sets, each	300

*Plus the additional charge for the IBM Type 517 or 523 summary punch.

EQUIPMENT REPORT

PERFORMANCE

Speed	35 points/minute, keyboard operation. 50 points/ minute, IBM summary punch operation.
Accuracy	Plus or minus 0.015" or plus or minus 0.2% of full scale whichever is larger.
Response	Locates next point in 1 second, maximum.

PLOTTING BOARD CHARACTERISTICS

Class	Electromechanical.
Mode	Solenoid operated typebar strikes type. Inked automatically by rotating inked pad.
Paper	11" x 17" standard graph.
Area	Rectilinear plane 10" x 15".
Positioning	Vacuum table, manually adjusted guides.
Actuation	Abscissa and ordinate independently activated by servomotors.
Controls	Scale selection and zero-positioning.
Incremental Advance	Automatic movement of the pen in pre-selected steps along the X-axis when desired.

PHYSICAL DATA

Height: 29½".

Depth: 56".

Width: 32".

Weight: 400 lbs.

Heat dissipation: 3080 BTU/hr.

Power: 117 volts, 8.5 amps., 1 kva, 60 cps, 2-wire grounded, AC.

BENSON-LEHNER ELECTROPLOTTER

COMMENTS

The Electroplotter converts analog or digital input into a graph form. Three different models are available that differ by the types of input—manual (available on all three models), analog, punched cards, and paper tape. As part of an integrated data processing system, it presents results in a usable visual form from other machines supplying the input.

The additional sets of zero and scale controls, allow up to six superimposed plots, each with its own identifying symbol, on one sheet of paper. From these, correlations of data can be readily attained. The plotter does not plot in special scales, such as logarithms, so that the input must be adjusted accordingly if such a plot is desired.

The Electroplotter employs one operator, part or full time dependent upon the application and quantity of data to be plotted. The operator's training consists of one day's formal instructions provided by the manufacturer. In addition, operation and maintenance manuals are available to the purchaser. Maintenance is not provided, in general, but service contracts may be written.

ADDITIONAL INFORMATION

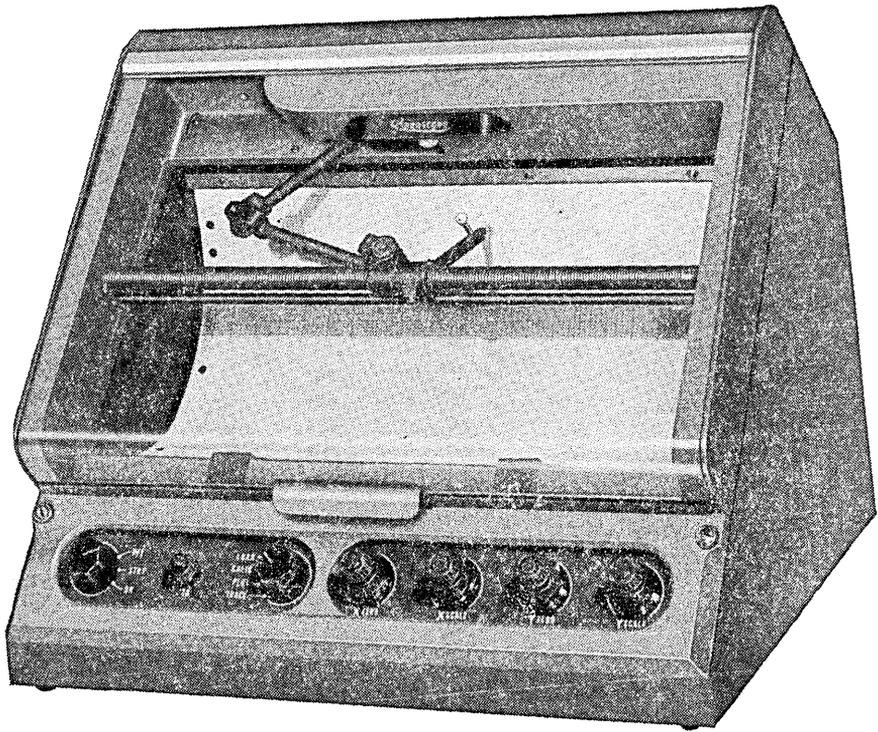
Write to: Benson-Lehner Corporation
11930 West Olympic Boulevard
West Los Angeles 64, California

LIBRASCOPE X-Y PLOTTER AND RECORDER

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4-56-335



LIBRASCOPE X-Y PLOTTER AND RECORDER

MANUFACTURER

Librascope, Incorporated

BRIEF DESCRIPTION

The X-Y Plotter consists of three distinct sections; mechanical, power supply and preamplifier and is capable of plotting discrete decimal point or continuous graphs. It accepts either analog or digital input. The plotter has the following accessories for supplying input: punch card converter, punch tape converter, binary converter and decimal keyboard.

APPROXIMATE COST

	<i>Approximate Purchase Cost</i>
Model 200A	\$2,500
Model 200B	2,800
Keyboard, Model 225 (for use with Model 200A)	600
Keyboard, Model 228 (for use with the punch card converter to provide supplemental manual data)	not reported
Keyboard, Model 226 (for use with Model 200B)	650
Punch Card Converter, Model 251	not reported
Punch Tape Converter	not reported
Binary Converter, Model 252	675
Plotter Preamplifier, Model 215A (used to convert a Model 200B to a Model 200A)	550
Plotter Preamplifier, Model 215B (used to convert a Model 200A to a Model 200B)	850

EQUIPMENT REPORT

PERFORMANCE

Speed: 40 points/minute, maximum.

Accuracy: Static, within .1% of full scale—Dynamic, within .5% full scale.

Response: Full scale in 1 second, maximum.

PLOTTING BOARD CHARACTERISTICS

Class	Electromechanical.
Mode	Servo operated, capillary pen having an integral ink reservoir.
Platen	120 degrees of a concave cylinder, will accommodate standard chart sizes of 8½" x 11" or 11" x 16½".
Paper	Librascope No. 1010A, vellum with horizontal grid of 10 lines/inch, vertical grid of 10 lines/1½".
Ink	Quick drying red, will reproduce on Ozalid.
Positioning	Manually adjusted guides.
Actuation	Ordinate and abscissa independently activated.
Controls	Scale selection and zero positioning.

PHYSICAL DATA

The plotter is furnished in a case for desk mounting. Mounting hardware can be supplied for installing on a standard RCA or RMA rack.

	<i>Height</i>	<i>Depth</i>	<i>Width</i>	<i>Weight</i>
Desk Mounting	16"	16¼"	19"	70 lbs.
RCA or RMA Rack Mounting	19¼"	14"	19"	70 lbs.

Heat dissipation: ——— BTU/hr.

Power: 115 volts, 28 amps., .29 kva, 60 cps, 2-wire, AC.

LIBRASCOPE X-Y PLOTTER AND RECORDER

COMMENTS

The X-Y Plotter and Recorder is capable of converting analog or digital input into a continuous or discrete graph form. Two models are available that differ only with respect to the type of inputs they can accommodate. As part of an integrated data processing system (e. g., an output component of the Readix computer system), it presents results in a usable visual form.

The plotter in addition to standard plotting may be used for polar coordinate data, time shared X versus Y plots and other special inputs by changing the preamplifier circuitry. Changing ink color can be employed for distinguishing between graphs made on the same chart.

One operator who handles the operation of the plotter and the operation of the input accessories, is required. Manuals are provided to assist the operator in gaining familiarity with the operating procedure. Maintenance is supplied by the purchaser.

ADDITIONAL INFORMATION

Write to: Sales Department
Librascope, Incorporated
808 Western Avenue
Glendale 1, California

