UNIVAC PRODUCTS - ST. PAUL

A Handbook of Major Products Designed, Developed, and Manufactured at . . . . . .

Remington Rand Univac

ST. PAUL 16, MINNESOTA

1947 to 1959

I M P O R T A N T

The material included in this book is intended for reference only. Information on products still in the current line may be secured by request to Applications Engineering, Remington Rand Univac, Univac Park, St. Paul 16, Minnesota.

Foreword

In the 13 years from 1947 to 1959, the St. Paul Division of Remington Rand Univac produced over a hundred electronic and mechanical products ranging in size and complexity from large-scale data-processing systems to miniature computer components. Not only the quantity but also the quality of the products is a source of justifiable pride to St. Paul personnel. Many of the devices and computer components formed the basis for new technological advancements both in America and in foreign countries.

These products are described in the following pages. Early developments of Engineering Research Associates - which was later incorporated into Remington Rand Univac - are included, but current developments not yet marketed are omitted.

Products are divided into six sections:

Section I - Digital Data-Processing Systems
Section II - Recording and Data-Handling Apparatus
Section III - Communications Equipment
Section IV - Instruments and Controls
Section V - Component Apparatus and Production Devices
Section VI - Mechanical Developments

No attempt has been made to separate obsolete products from those which are currently available for sale or rental, as there is a natural overlapping of the marketing stages of a product from its initial announcement to its final obsolescence. Salesmen will have listings of the company's current product line in their management directives.

Not every product proposed and developed on paper during the 13 years covered by this compendium could be listed. The fertile minds of Remington Rand design engineers in St. Paul conceived many products that were judged infeasible for immediate development or were found to be similar to previous inventions.

Some of the unlisted products were small components built for a single customer or were forerunners of listed products and are therefore omitted as separate entities in themselves. Others were produced for military purposes, and their nature - even, in some instances, their names - may not be disclosed outside a classified ring of secrecy, for reasons of national security. The entire story of the design work carried on in Remington Rand Univac's design laboratories would form a considerable volume in itself; it would make interesting reading but cannot properly be a part of this factual listing of patented or widely recognized equipment.

Those who use this book for reference should bear in mind that the listed products do not, by any means, comprise the entire Remington Rand Univac product line. While St. Paul personnel were engaged in design, development, and manufacture, other branches of the parent company were also carrying on major work in the fields of computers, electronic control, storage, communications, and instrumentation. The contribution of the St. Paul Univac plants, therefore, has been only one part of the total achievement, but it has been a

notable and gratifying part because some of the products which started with simple designs grew to a series of complex devices that quite literally revolutionized an industry, technique, or art. Such effects of St. Paul's inventive genius have been especially apparent in the field of electronic computing, but are also evident in other fields, such as geophysical exploration.

Product Planning personnel who prepared this Handbook wish to express their appreciation of the generous assistance given them by engineers and various technologists who contributed information. Special mention must be made of the assistance given by men in the Applications Engineering, Special Products, and Systems Planning Departments, and to the Director of the Patent Department.

Manuals, prepared for use with the various computers and peripheral equipment, may be obtained from the New York or Buffalo offices. These manuals include engineering specifications, functional specifications, programming instructions, operating instructions, and maintenance instructions.

Full information on patent numbers and patent specifications on all the patented products may be secured by writing to Patent Department, Remington Rand Univac, St. Paul 16, Minnesota.

Product Planning Division
Remington Rand Univac
December 31, 1959

TABLE OF CONTENTS

SECTION I: Digital Data-Processing Systems

TABLE OF CONTENTS (Cont.)

SECTION II: Recording and Data-Handling Apparatus

TABLE OF CONTENTS (Cont.)

TABLE OF CONTENTS (Cont.)

SECTION III: Communications Equipment

SECTION IV: Instruments and Controls

TABLE OF CONTENTS (Cont.)

SECTION V: Component Apparatus and Production Devices

SECTION VI: Mechanical Developments

UNIVAC PRODUCTS - ST. PAUL

SECTION I

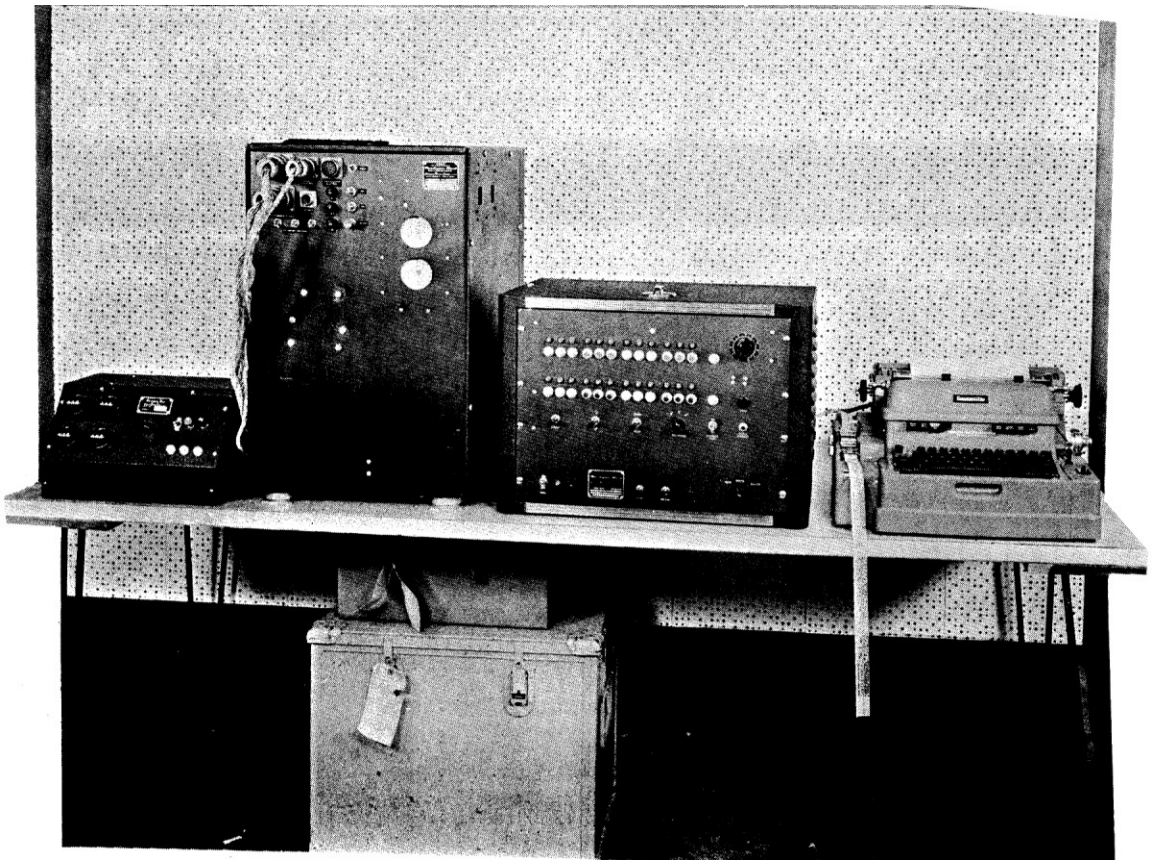
DIGITAL DATA-PROCESSING SYSTEMS

From 1947 when Goldberg I, the electronic data-processing system with the first magnetic drum, was invented, up to 1959 when the G-40 Command Computer was developed, the design of high-speed, digital, data-processing systems has been a continuing challenge to Remington Rand Univac, St. Paul, design engineers. New ideas, new materials, and new approaches have met the challenge, as the systems listed in the following section will attest.

More than fifty different computing and data-processing systems have been developed in St. Paul, but all are not included. Those omitted were developed for limited purposes, such as small drum storage systems that had few novel features.

Some of the computers are referred to as "special purpose," because they were intended for the solution of only a single type of problem over and over again. Others, designed for more diverse computations, are termed "general purpose," because they can be used for a wide variety of commercial, military, and scientific data processing.

One of St. Paul's more notable contributions to the electronic computer industry has been the development of reliable magnetic drum storage systems that give large-storage capacity with rapid access for interrogation and without an undue amount of electronic equipment. But other contributions of St. Paul engineers described in this section have also served to bring the listed systems into wide acceptance as a vital adjunct to commerce, industry, and governmental agencies.



Airborne Computer

AIRBORNE COMPUTER

DESCRIPTION

The Airborne Computer, developed under the name of *Scaling-Multiplier Incremental Computer,* is a special-purpose machine developed for the United States Air Force.

The Central Computer is based on a novel technique, developed by Remington Rand Univac St. Paul engineers. This invention relates to an incremental method of computation that is especially suited to control system applications where inputs vary in a continuous manner. By this method, the results of previous computations, or initial values, are stored in the memory, and the incremental changes are used to modify the previous results in order to arrive at a new solution. This logic makes possible a desired reduction in components compared with those necessary in conventional general-purpose systems.

An analog-to-digital and digital-to-analog converter is included in the machine, based on magnetic techniques. Fifteen channels are available for input-output; word length may be variable, although a 20-bit length is used for the majority of operations. The speed of the system in operation is high, with a sampling rate of 200 times per second; this is to say that all inputs will be sampled, new computations performed, and corrected output provided at the rate of 200 times per second.

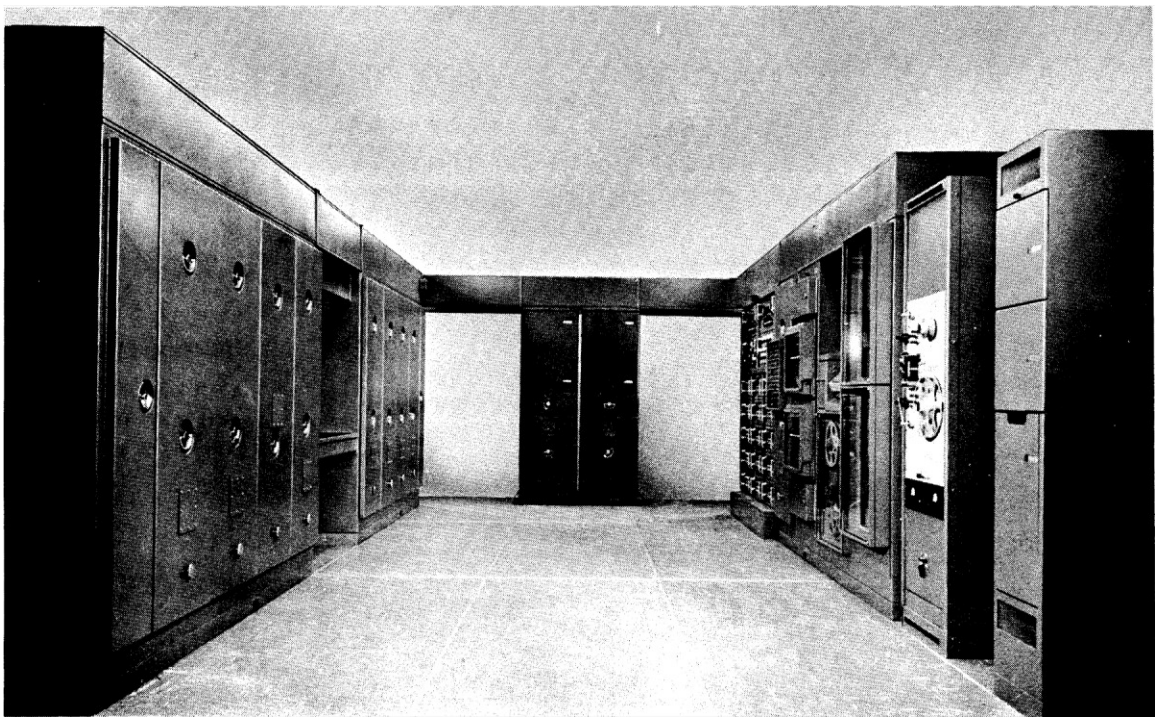
PURPOSE

A single unit, four cubic feet in size, contains the power supply, the Central Computer including magnetic drum and ferrite core storage, and the analog-to-digital and digital-to-analog converter equipment. The machine is well suited, therefore, to airplane control system applications in which the size of airborne equipment must be as small as possible.

A nonvolatile type of program storage is used so that power may be turned off at any time, and when turned on again, the operation starts without necessary reprogramming.

The heart of the analog-to-digital and digital-to-analog conversion equipment is a group of magnetic cores that use moly-permalloy material. This results in an accurate, speedy conversion, and extremely rugged hardware that is not affected either by the movements of the plane or by temperature changes.

Note: The picture shown for the Airborne Computer includes a tester, equipment for initial programming, and a Flexowriter; but only the single unit containing the computer and conversion equipment is necessary or is used after the initial program is read into the computer's memory.



Athena. Computer

ATHENA COMPUTER

DESCRIPTION

The Athena Guidance Computer is a special-purpose, binary, single-address, solid-state, digital computer. It performs 38 different arithmetic and logical operations. The computer operates in the parallel mode; that is, all digits (24 bits) of a word are operated upon simultaneously.

The internal memory consists of a magnetic drum containing 8,192 individually addressable 17-bit words with an average access time of 2.5 milliseconds. The magnetic drum stores the instructions and constants for the guidance problem and provides the timing pulses. After the program begins, no further writing operations take place on the drum. A magnetic core memory provides the computer with rapid-access storage for 256 24-bit words. The address locations of these words are specified by the instructions stored in the magnetic drum. It is in the magnetic core that the radar data are stored after passing through the Digital Data Converter.

PURPOSE

The Athena was developed for the United States Air Force. It is part of the ground-based system for the ICBM "Titan." The computer continually computes the speed, elevation, direction, azimuth, and position of the missile and compares this information with data stored in its magnetic memory.

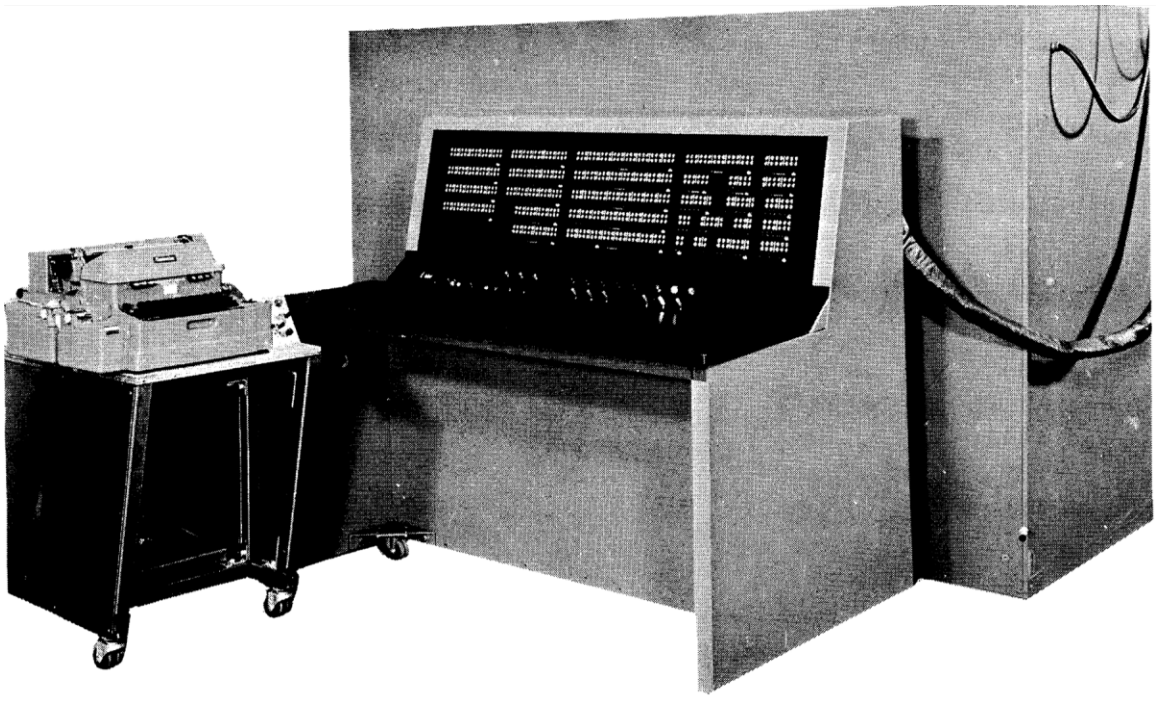
FEATURES

A monitor buffer section is provided to monitor data output to a magnetic tape recorder, Teletype® paper tape punch, and electric typewriter.

The monitor buffer section has its own core matrix of 64 24-bit words. This storage is not random access. The addresses are controlled by the buffer address counter. The core matrix is loaded from a photoelectric paper tape reader.

ATLAS I and II

The Atlas Computers were among the first developed. Two versions, Atlas I and Atlas II, were developed for the United States Navy. The application of these computers is classified. They were binary machines with magnetic drum storage and paper tape input and output. The design was the forerunner of the ERA 1101 Computer.



Bogart Computer

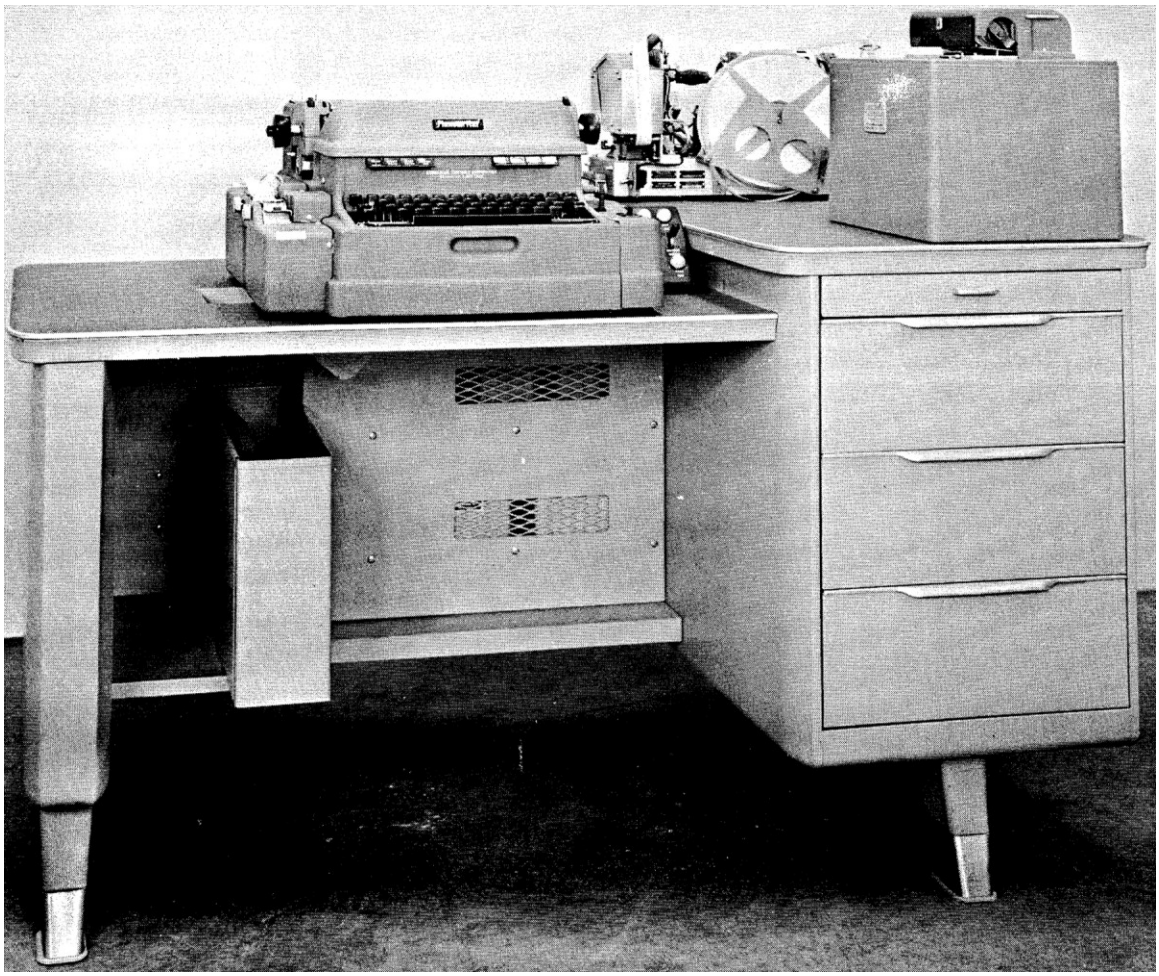
BOGART COMPUTER

Bogart is a high-speed, general-purpose binary, digital computer, capable of operating on small units of input data, handling large amounts of input data, and producing a large amount of output data. The machine can perform analytic, counting, and arithmetic operations which are controlled by 57 different instructions. The machine has 4,096 individually addressed, rapid-access, magnetic core registers. Each register can store a 24-bit word.

The internal binary arithmetic is handled by switching magnetic cores rather than by conventional vacuum tube flip-flop circuitry. The use of the magnetic cores and printed circuits results in a small, compact computer.

Bogart is a single-address machine which operates on all or part of a 24-bit computer word in the parallel mode. The minimum execution time is 20 microseconds. This machine has seven B-index or *B-box* registers of 15 bits.

Input Media	Output Media
Teletype Paper Tape Reader	Teletype Paper Tape Punch
Photoelectric Tape Reader	Flexowriter
Flexowriter	Input-Output Cable (a device manufactured by IBM)
Magnetic Tape	



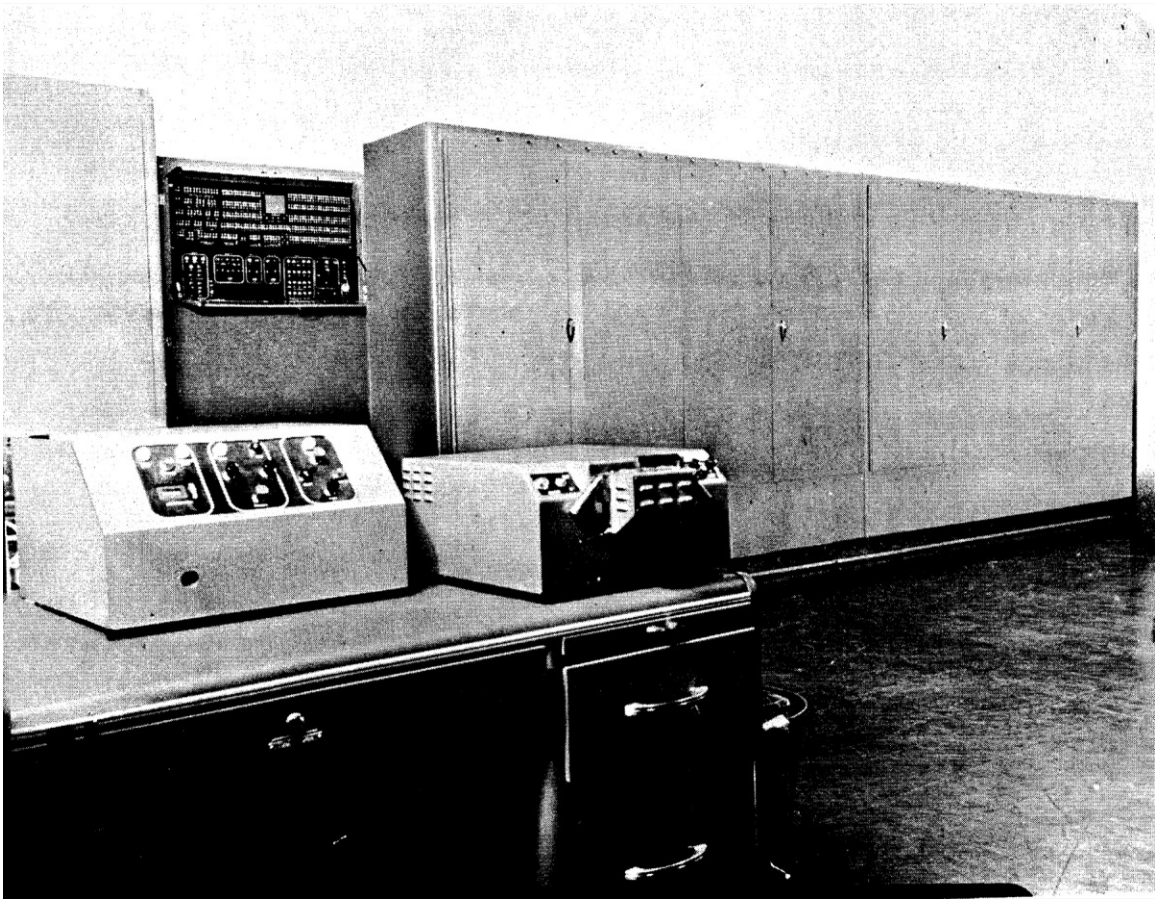
BuShips Computer - Input-Output Cabinet

BUSHIPS COMPUTER

The BuShips Computer is a special-purpose computer designed and developed for the United States Navy Bureau of Ships. All information concerning it is classified.

DEMON I, II, and III COMPUTERS

The Demon series of computers was developed for the United States Navy. Three types, designated Demon I, II, and III, were manufactured. Specific information regarding these computers remains classified.



ERA 1101 General-Purpose Computer

ERA 1101 GENERAL-PURPOSE COMPUTER

DESCRIPTION

The ERA 1101 General-Purpose Computer is a binary, vacuum-tube machine which operates in the parallel mode with a 24-bit word length, single address, and drum memory. The 1101 is an internal program machine with 38 different commands. The first unit was delivered in December, 1950.

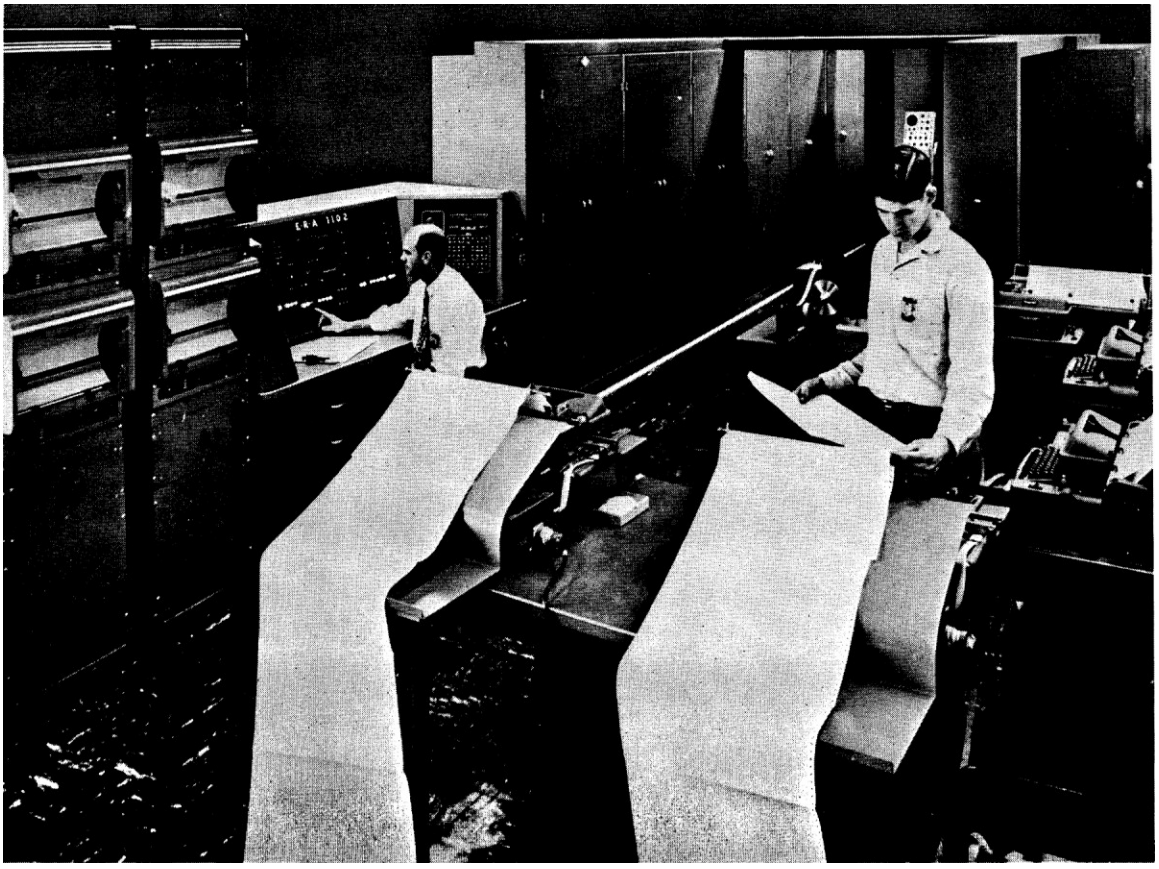
The drum memory consists of 16,384 words, each word 24 bits long. The drum operates at a speed of 3,500 rpm and has a diameter of 8½ inches. The basic clock pulse comes from the drum at a rate of 125 pulses per second. The pulse duration is 0.1 microsecond. The internal clock rate of the computer is 400 kc. The average access time for the drum is 8 milliseconds.

FEATURES

The basic input to the computer is by means of a photoelectric paper tape reader which has seven channels. The loading rate is 35 words per second.

The basic output from the computer is handled by an electric typewriter on a paper tape punch.

The 1101 was the first computer to use plug-in chassis of uniform size. It was also the first computer to use air-to-water cooling chambers, and a false floor or plenum. A total of 2700 vacuum tubes and 2385 crystal diodes are used in the 1101.



ERA 1102 Data Reduction System

ERA 1102 DATA REDUCTION COMPUTER

DESCRIPTION

The ERA 1102 Data Reduction Computer was especially designed for the Arnold Engineering Development Center. The first unit was delivered in July, 1954. This machine is internally programmed with 39 commands. It is a single-addressed machine and operates in the parallel mode. The main memory is a drum memory, which consists of 8,192 words, each word 24 bits long. The drum rotates at a speed of 7,200 rpm with an average access time of 4 milliseconds.

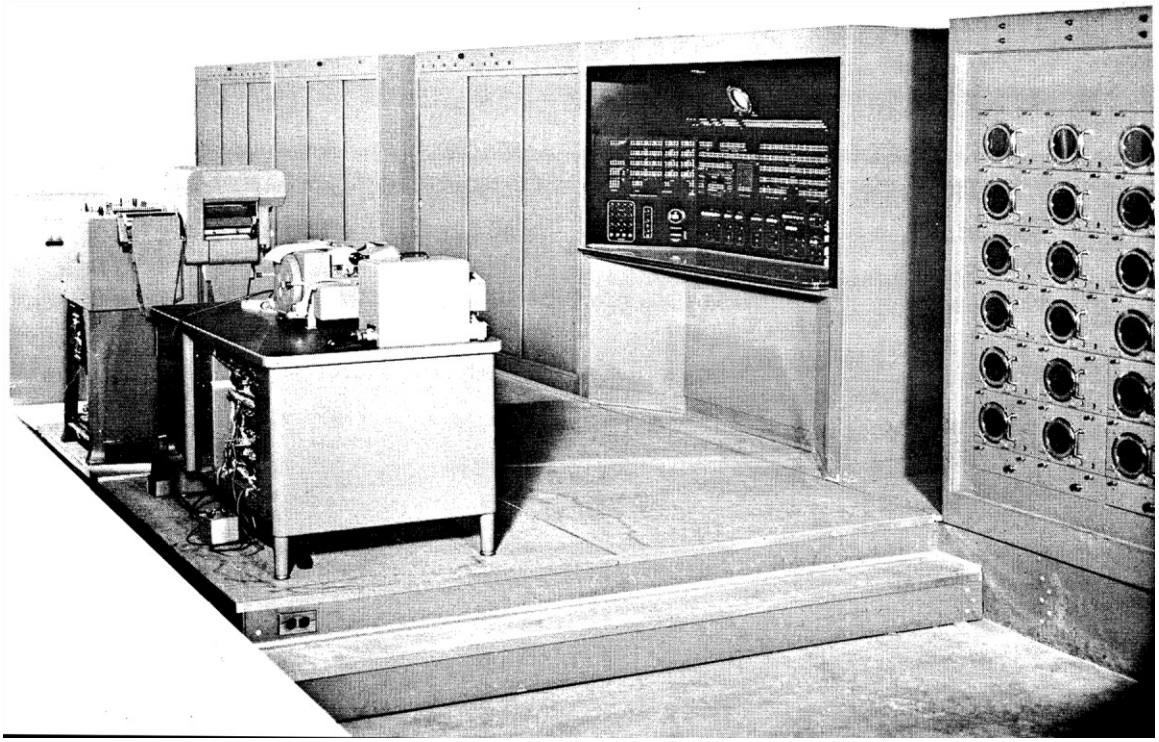
PURPOSE

The ERA 1102 was designed for on-line processing of data from wind tunnels and engine-test facilities.

FEATURES

The main input to the computer is through a scanner, which is attached to various kinds of transducers. A secondary input device is a photoelectric punched paper tape reader. Output results are presented in plotted and tabulated form.

Five electric typewriters are attached on-line for tabulated hard copy output. Four X-Y Plotters are also connected on-line for graphical display, and five paper tape Teletype punches are attached on-line, giving paper tape output. In all, there are ten input-output registers on the machine. It has an air-conditioning cabinet; power requirements are 30 kva. The computer has 2,700 tubes and 3,000 germanium diodes.



ERA 1103 General-Purpose Computer

ERA 1103 GENERAL-PURPOSE COMPUTER

DESCRIPTION

The 1103 General-Purpose Computer is a two-address, 36-bit word, binary computer, which operates in the parallel mode. It has rapid access, electrostatic or magnetic core storage, magnetic drum storage, and magnetic tape storage. The first prototype was delivered in September, 1953. In the early models, the rapid-access storage was electrostatic, on 5-inch cathode ray tubes; in later models it was on magnetic cores. The rapid-access storage accommodates 1,024 words in both models.

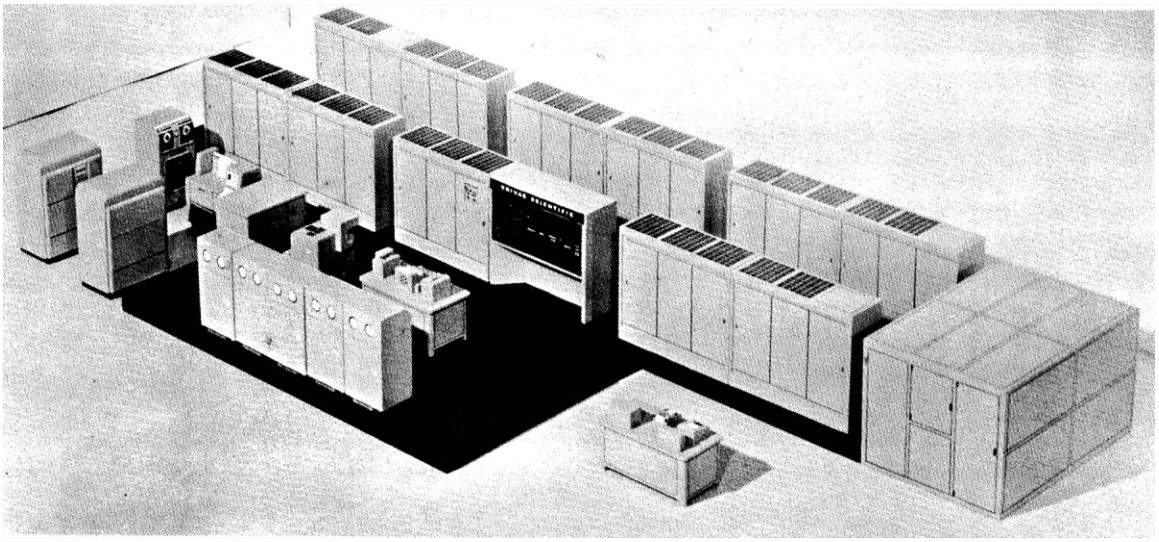
The 1103 has 16,384 words of magnetic drum storage; the drum operates at a speed of 1,750 rpm and has an average access time of 17 milliseconds. Each machine is equipped with four built-in magnetic tape units, which use plastic tape and are used for bulk storage only. There are 38 commands in the instruction repertoire.

PURPOSE

The 1103 was designed primarily for scientific work.

FEATURES

The machine is cooled by an air-to-water chamber; the air is pushed through a false floor and up through the cabinets. It requires 41½ kva power input. Approximately 3900 vacuum tubes and 5000 diodes are used in the 1103.
Data can be brought into the machine by means of paper tape or punched cards. The output of the machine can be handled by means of paper tape, punched cards, or the Flexowriter.



1103A, Univac Scientific

1103A, UNIVAC SCIENTIFIC

DESCRIPTION

The 1103A, Univac Scientific, is an outgrowth of the 1103 Computer. The first delivery was in September, 1956. This machine operates in the parallel mode with a 36-bit word length. It is a two-address machine and has 41 commands. The 1103A has a rapid access, magnetic core memory and a drum memory of 16,384 words with an average access time of 17 milliseconds. The main timing pulses are obtained from the drum at a clock rate of 125 kc. The main clock pulse for the computer is 500 kc with a pulse duration of one-fourth microsecond.

Input Media	Output Media
Punched cards (80 column)	Punched cards
Punched paper tape	Punched paper tape
Magnetic tape	Magnetic tape
	Electric typewriter
	High-Speed Printer

The magnetic core memory of the 1103A initially was 4,096 words, later increased to 8,192 words, and eventually to 12,288 words.

Up to ten Uniservos, Model I or Model II, are used for magnetic tape output. The magnetic tape format is Univac Excess 3 code. The Uniservos use only metallic magnetic tape and operate at a density of 128 lines per inch.

Variable block mode was included in the 1103A along with fixed block mode. Continuous mode was also available for the magnetic tape output.

Floating point arithmetic can be provided in the machine; this necessitates the addition of nine new commands.

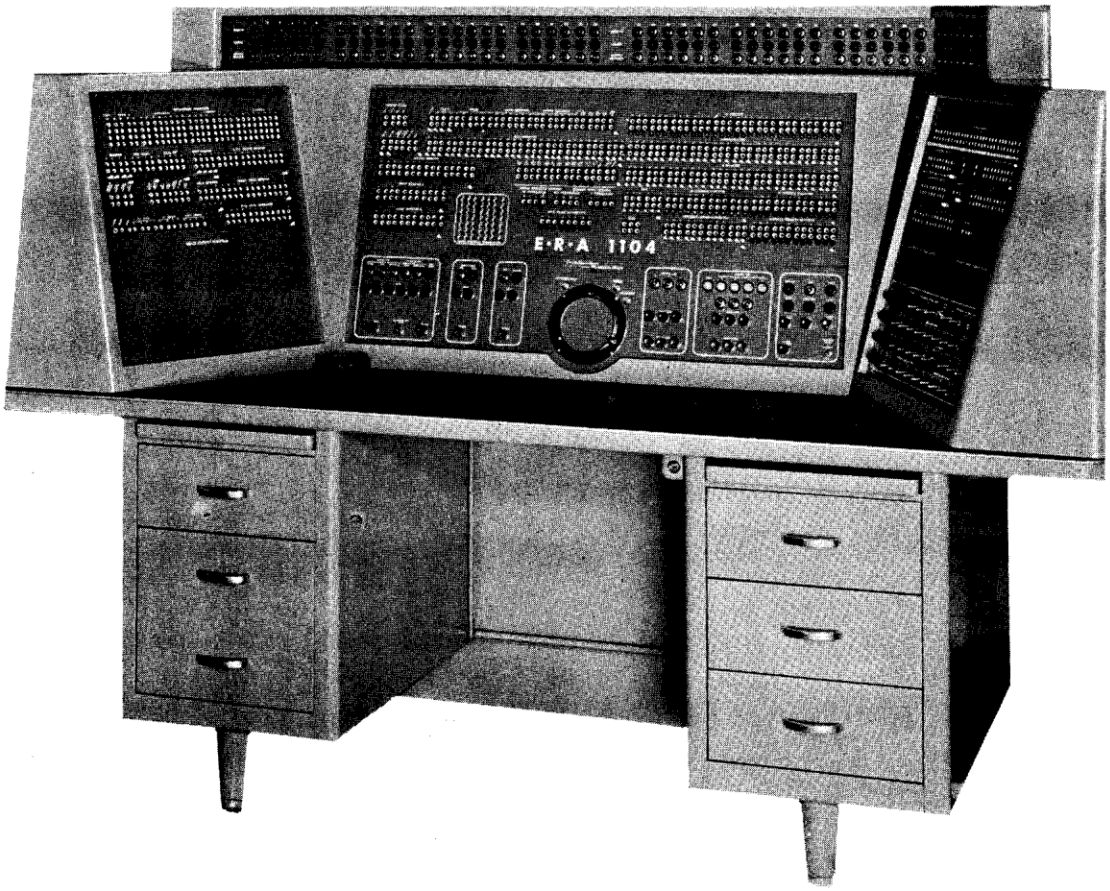
The Univac High-Speed Printer is available for on-line operation with the 1103A. A plotting feature was adapted for the High-Speed Printer to allow the computer to plot its output directly on paper.

PURPOSE

The machine was designed primarily for scientific data processing.

FEATURES

Air-to-water cooling chambers are provided with this machine. The power requirement is 100 kva. Approximately 5,346 vacuum tubes and 9,404 diodes are used in the maximum configuration.



1104 Command Computer - Control Console

1104 COMMAND COMPUTER

DESCRIPTION

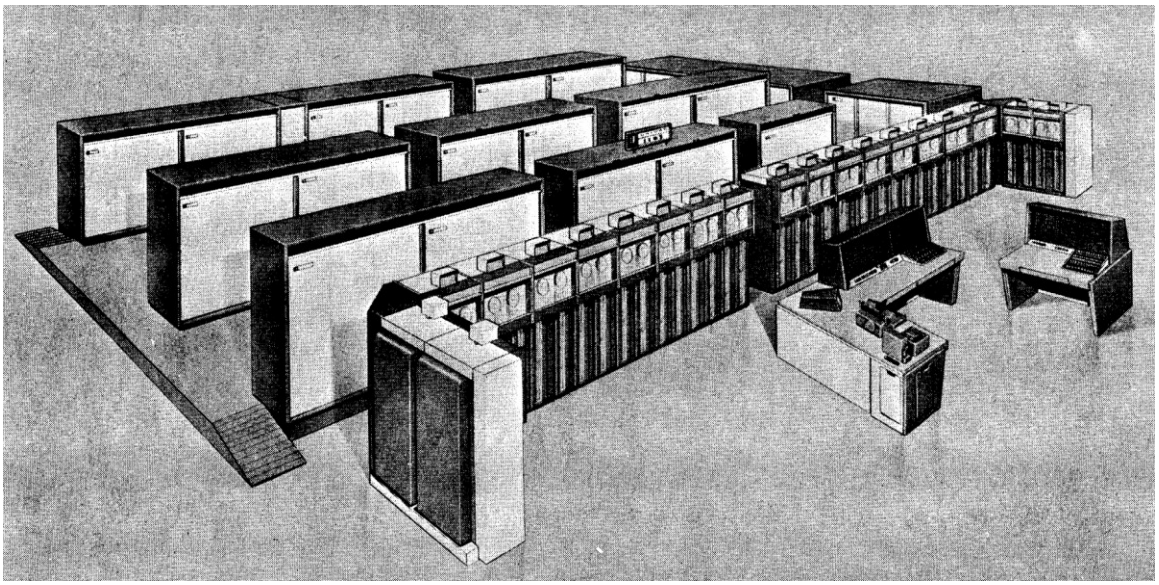
The 1104 Command Computer is a special development for use in missile guidance. This computer has specialized input scanning equipment, analog-to-digital conversion abilities, and special output equipment to feed directly into a data link transmitter.

PURPOSE

The 1104 Command Computer, designed under the name of the *Bomarc Guidance Computer,* was developed for control of the Bomarc Missile.

FEATURES

The computer circuits and logic are those of the 1103 Computer. It has a 30-bit word with magnetic drum storage and electrostatic storage for internal memories.



1105 Computer

1105 COMPUTER

DESCRIPTION

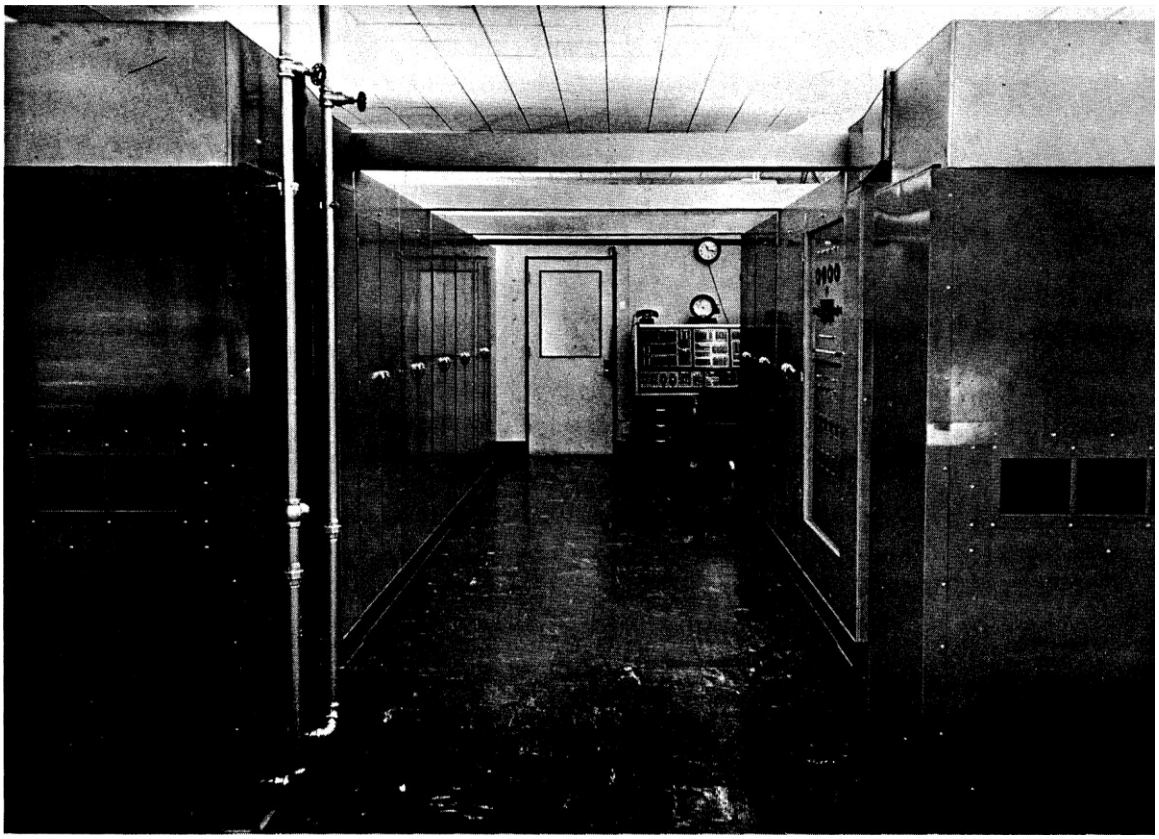
The Univac 1105 is a successor to the 1103A. The first delivery was made in February, 1959. It is a parallel mode operating machine with 36-bit word length and two-address structure. It has a repertoire of 41 commands plus nine floating point commands and additional buffer control commands.

Up to 24 Uniservo II's which can use plastic or metallic magnetic tape can be placed on the 1105. Two 120-word Buffers are included which allow efficient tape handling, since the computer can compute while the tapes are either being read or written upon. Two tape control units are supplied with the 1105, each unit handling 12 Uniservo II's**.** The pulse density is 128 or 208 lines per inch. No on-line feature for the High-Speed Printer is available for this machine. The capacity of the drum memory of the 1105 is 32,768 words. The magnetic tape output can operate in either variable block, fixed block, or continuous modes. Floating point arithmetic is a built-in feature of the machine but may be removed at the customer's option.

Input Media	Output Media
Punched cards (Optional)	Punched cards (Optional)
Punched paper tape	Punched paper tape
Magnetic tape	Magnetic tape
	Electric Typewriter

FEATURES

Air-to-water cooling chambers and a false floor are provided with the machine. The power requirement is 170 kva.



Flight Plan Storage System

FLIGHT PLAN STORAGE SYSTEM

DESCRIPTION

The Flight Plan Storage System was developed and built for the CAA Technical Development and Evaluation Center at Indianapolis. This equipment was a forerunner of the Univac File Computer. Input and output to memory are via 75 word per minute Teletype lines. The equipment was built with two input-output channels, expandable to ten. Messages received are limited to 230 characters, excluding blank spaces. They are stored on a magnetic drum and can be retrieved by the identification of select groups of the first 23 characters. Nine types of messages, each of fixed format, are accommodated by the system and stored on a completely random basis, without address.

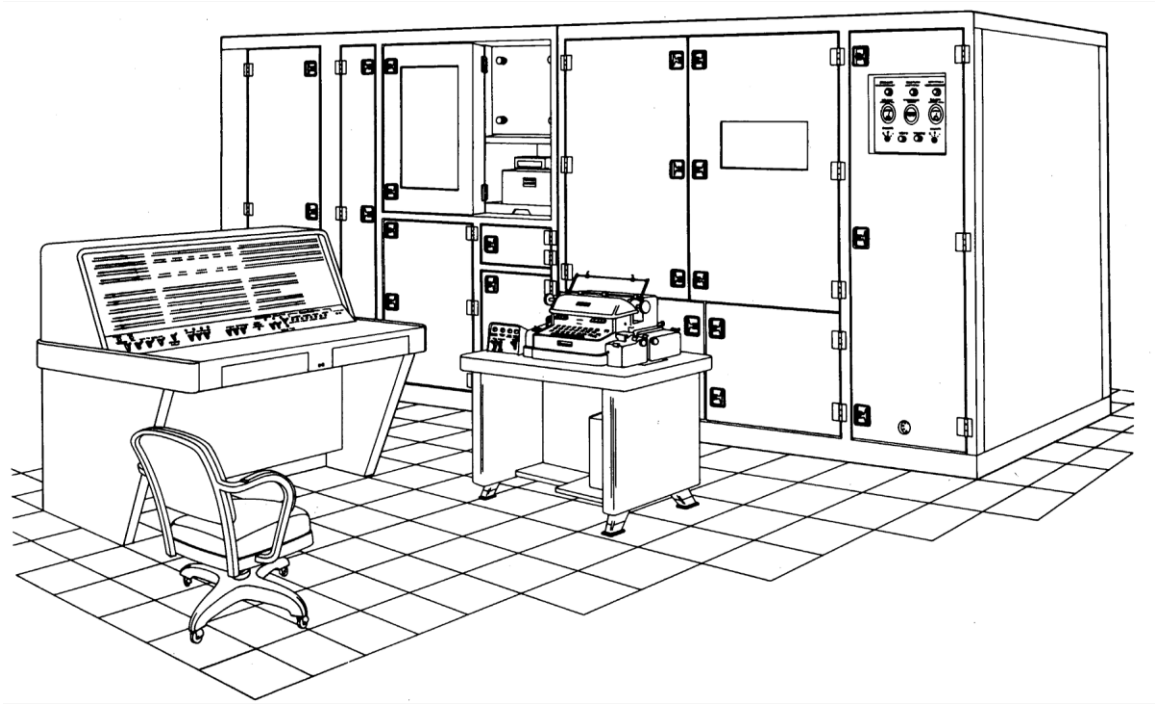
A single 22-inch storage drum, 30 inches long with a capacity of 316,250 characters, holds the filed messages. The total number of messages stored is limited to 2,000, of which 750 can be 230 characters or less and the remainder cannot be more than hall that length.

PURPOSE

Although designed for the special needs of one customer, this system is adaptable to any needs for storage of a few standard types of messages, retrievable according to their contents.

FEATURES

A high-speed readout, serial-by-character at 1050 words per minute, is provided for connection to locally situated displays. Readout over Teletype of all messages in storage which fall within a preselected time, registered as part of the message, is also provided for. Format checking and control are incorporated in the equipment. Internal states of the equipment, including the settings of all flip-flops, can be displayed on the maintenance console.



G-40 Command Computer

G-40 COMMAND COMPUTER

DESCRIPTION

The G-40 Command Computer is a general-purpose computer that offers a wide range of applications for data processing and the solution of real-time problems. The characteristics are basically the same as those of the M-460; the difference comes chiefly in the assemblage of components.

Internal operations are performed in a parallel binary mode with a 30-bit instruction word and a 15- or 30-bit data word. Instructions are of the one-address type with an average execution time of 20 microseconds.

The usable internal storage consists of 20,480 magnetic core storage locations, each with a 30-bit capacity. The control, arithmetic, and input-output sections have independent access to the magnetic core storage section. Digits of a given word are represented by the state of 30 cores, each in a certain matrix. Reading from a core storage address does not in any way alter the content of the location read.

Communication between the computer and associated external equipment normally is handled by block transmission of data, with the timing under control of the external device. Transmissions may be under direct program control or may employ independent access to memory. The latter are asynchronous to the main computer program.

PURPOSE

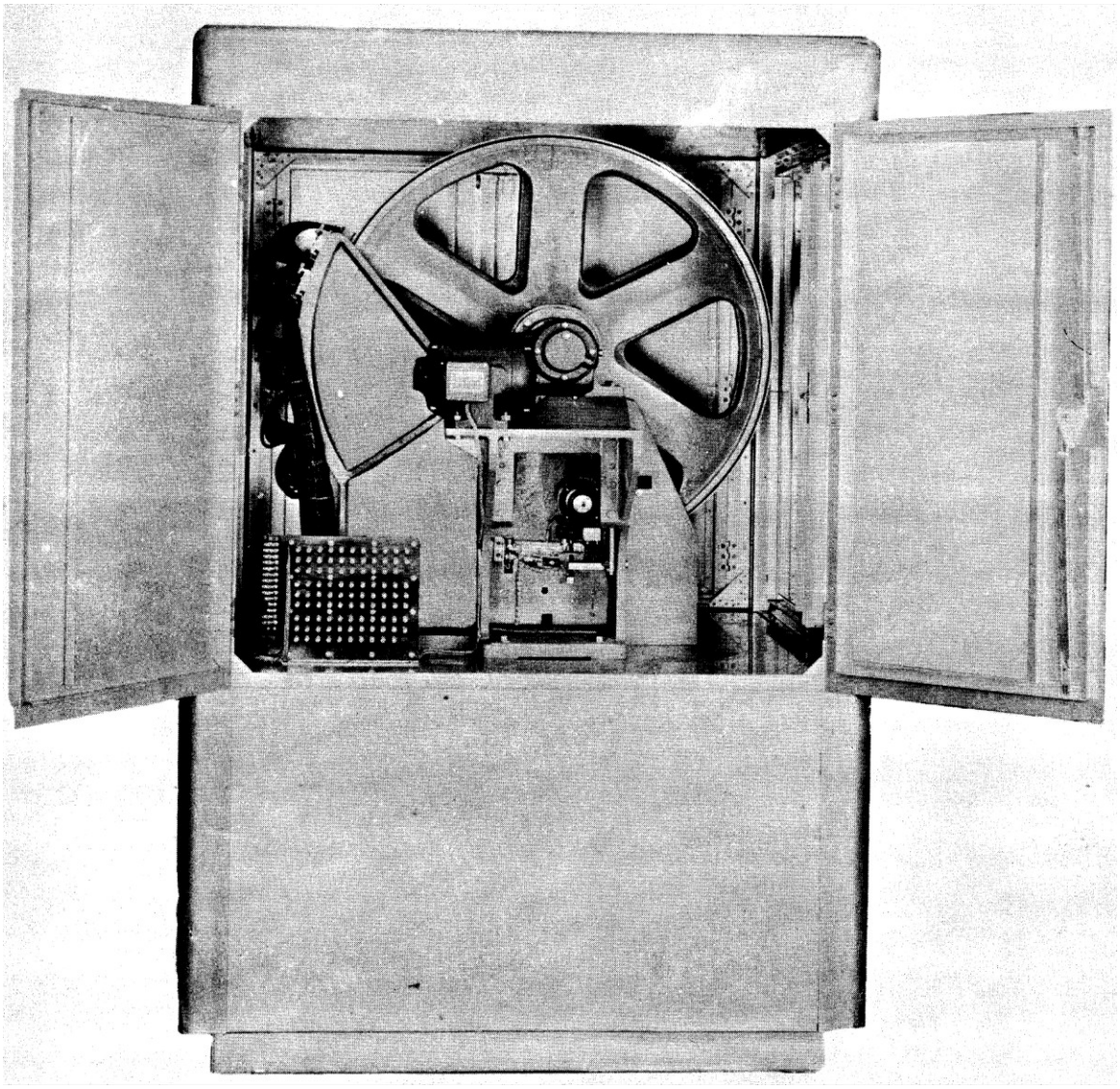
The G-40 Computer was especially designed as part of a system for guidance of the Bomarc Interceptor Missile (IM-99).

FEATURES

An outstanding feature is the Program Recovery Routine which allows instructions to be loaded into the computer and used for program recovery. The Program Recovery Routine may also be used in cases of malfunction.

A total of 18 input channels and 12 output channels is provided. These channels vary in size from 6 to 30 parallel lines per channel. The 30 channels are in three groups: Input, Output, and Function lines. Buffering registers and control circuits are provided to permit concurrent activation of seven channels. The maximum transfer rate over a given channel varies up to 50,000 transmissions per second.

A Line Printer and a Magnetic Tape Unit are included as an integral part of the computer system.



Goldberg Computer

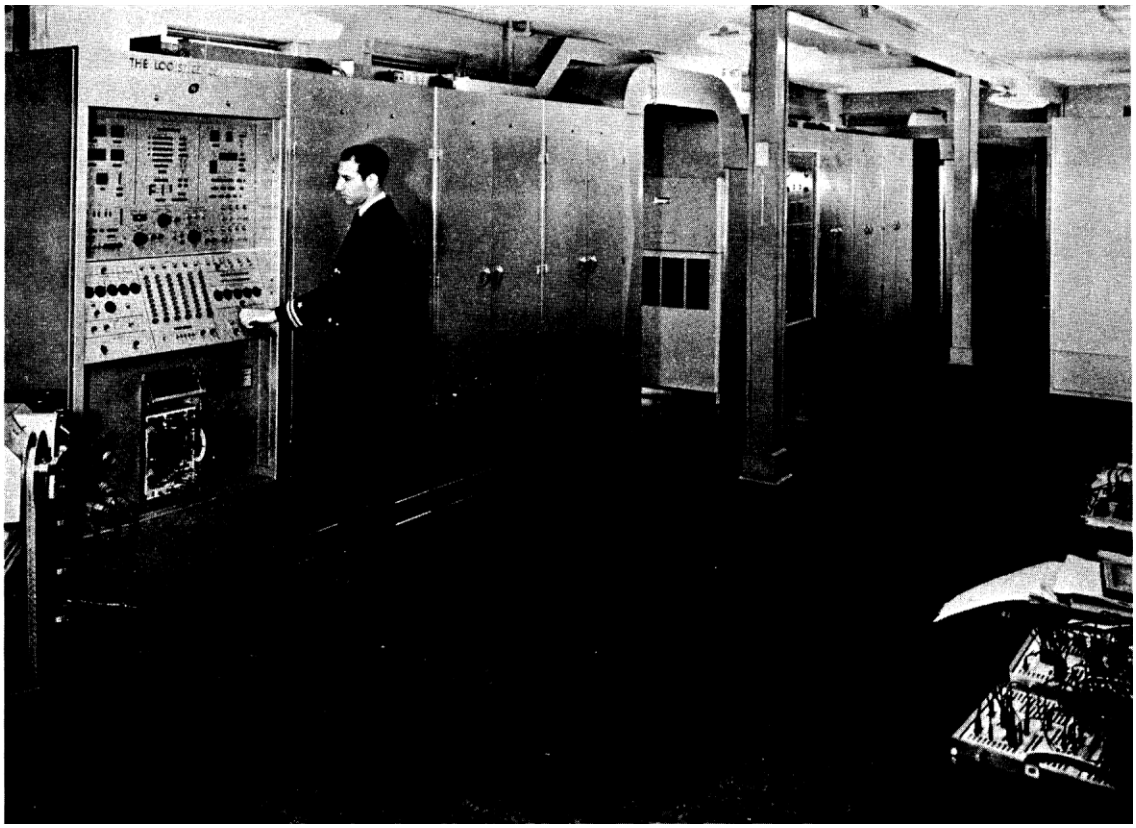
GOLDBERG COMPUTERS

The Goldberg Computers were developed for the Navy, for classified purposes. There were two types, Goldberg I and Goldberg II. They are of historical interest, since the first magnetic drum was built for use with Goldberg I.

The drum was 34 inches in diameter, with magnetic tape bonded to the drum surface to provide a recording surface. The drum was advanced slowly, one row at a time, for recording, and was run continuously at 50 rpm for reading.

HECATE I and II DATA PROCESSORS

The Hecate Data Processors, Hecate I and Hecate II, were designed and manufactured for the U. S. Navy. Their specifications are classified.



Logistics Computer

LOGISTICS COMPUTER

DESCRIPTION

The Logistics Computer is a special-purpose, numerical machine with plug board programming and magnetic drum storage. Input and output are provided by magnetic tape and paper tape.

Word lengths of from four to twelve decimal digits can be handled according to two fixed-sequence programs set up on the plug board. Forty steps are available for a program.

Input tapes can be run at either of two speeds, 150 or 300 characters per second. The tape unit can function as an external memory.

FEATURES

Drum storage for about 180,000 decimal digits is provided in the excess three code. Non-return-to-zero recording is at a 220-kilocycle pulse rate. In normal operations, input data are processed and the results are stored, or internally stored information is processed and the results are read to the output equipment or optionally are retained in the computer memory.

Peripheral units consist of the Magnetic Tape Input-Output Equipment, a photo-electric tape reader, tape perforator, and IBM electric typewriter. The typewriter operates from the tapes.

The tape input is at 150 or 300 characters per second, selectable to conform to the speed of internal processing. A magnetic core shift register is used as the input register.

Output data to magnetic tape are at the rate of 600 characters per second. Alternatively, it can be punched into paper tape at the rate of ten characters per second.

Fifty-eight instructions are provided including add, subtract, and multiply, jumps, counting, and functional controls. A maintenance console and a manual keyboard for factor insertion are integral parts of the computer. Internal operation is serial-by-character with bits parallel.

Operation is from 230-volt, three-phase power. Air conditioning is an integral part of the computer.

The Logistics Computer is described in Technical Report PX 29883, and a technical description of its design was published in the *Proceedings of the Institute of Radio Engineers ,* Volume 41, October, 1953.

Magtec II Computer

MAGTEC I and II COMPUTERS

DESCRIPTION

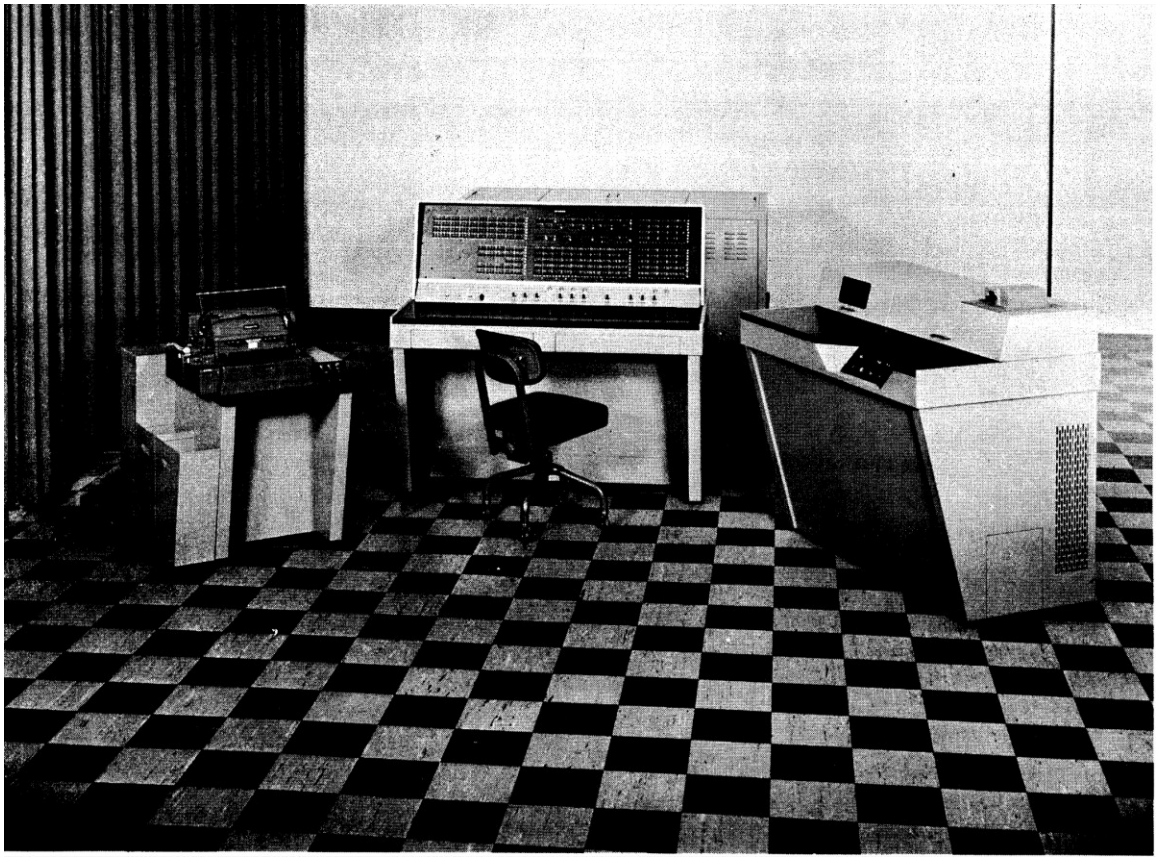
Two models of the Magtec (Magnetic Core General-Purpose) Computers were built; they were designated Magtec I and Magtec II. They were developed to investigate the capabilities of magnetic core circuitry, and in many aspects parallel the transistor circuitry of the Transtec Computers. Logical building blocks with magnetic core circuits were developed on plug-in cards less than 3 inches square, and these are mounted on racks which swing out for easy maintenance.

PURPOSE

The Magtec computers were developed solely for research purposes in the limited area described above.

FEATURES

The Flexowriter is used with the computer for both input and output.



M-460 Computer

M-460 COMPUTER

DESCRIPTION

The Univac M-460 is a stored-program computer that emphasizes high-speed, large internal memory with random access storage, and programming flexibility. The M-460 requires little floor space, dissipates little power, is light in weight, and requires no cooling. It communicates, in a time-shared manner, with a large variety of external units, including other computers, without intervening data-synchronizing machinery. A total of 18 input and 12 output channels is provided. The internal operations are performed in a parallel binary mode, with a 30-bit instruction word and either a 15-or 30-bit data word. Instructions are of the one-address type, with an average execution time of 20 microseconds.

Internal storage consists of a maximum of eight modular units, each unit comprised of 4,096 magnetic core storage locations with a 30-bit capacity per location. Each of the possible 32,768 storage locations may be interpreted as a single 30-bit word, or as two 15-bit words individually addressed. Information flows over parallel transmission paths between the storage unit and other units in the system.

The arithmetic and logical operations are performed in a parallel binary mode, with the result appearing generally in a 30-bit accumulator register. Computer operation is controlled by a stored program capable of self-modification. Each program instruction contains a function code of six bits, one storage address of fifteen bits, and three execution modifiers of three bits each. The execution modifiers provide for address incrementing, operand interpretation, and branch point designation. A storage address may be incremented by any one of seven index registers.

PURPOSE

Designed primarily as a tactical system for military applications, the M-460 can be used for complex scientific problems as well as for data processing. It is best adapted to real-time processing.

FEATURES

The basic M-460 features are as follows:

1. Internal high-speed storage having 8-microsecond cycle time and 32,768word capacity
2. 30-bit word length.
3. Optional operation with 15-bit half-words.

4. Average instruction-execution time of 20 microseconds.
5. Internally stored program.
6. Parallel, one s complement binary notation.
7. Single-address instructions with provisions for address modification.
8. Repertoire of 62 instructions, most of which provide for conditional pro-gram branches.
9. Internal real-time clock for dating of real-time inputs, program timing, etc.
10. Provisions for rapid data exchange with external equipment without main-program attention.

MOBILE COMPUTER

DESCRIPTION

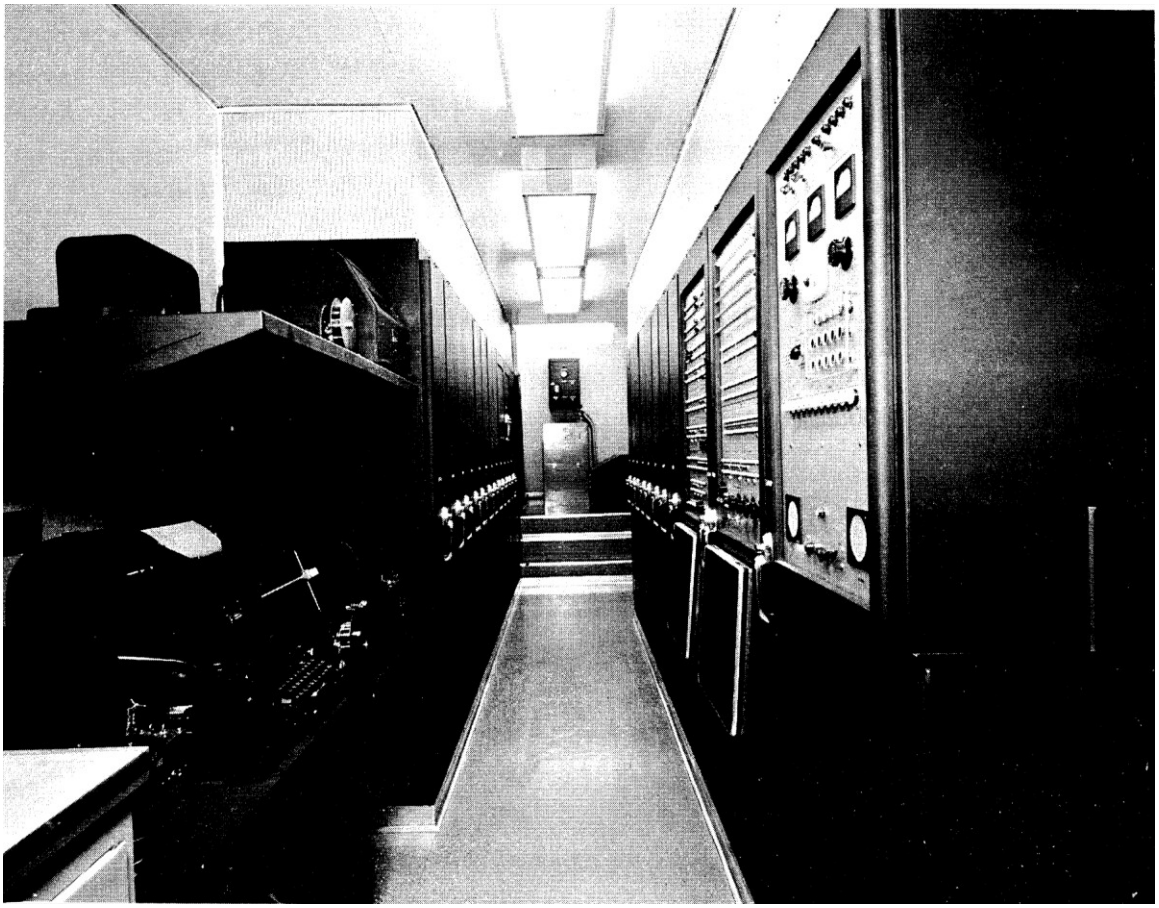
The Mobile Computer, designed under the name of *Mobile Electronic Countermeasures Equipment,* is a data-handling system that represents a type of packaging for military field use. It is designed for comparatively low-speed, tactical data handling. The system uses Teletype and similar input and output communications means, and includes a map display.

PURPOSE

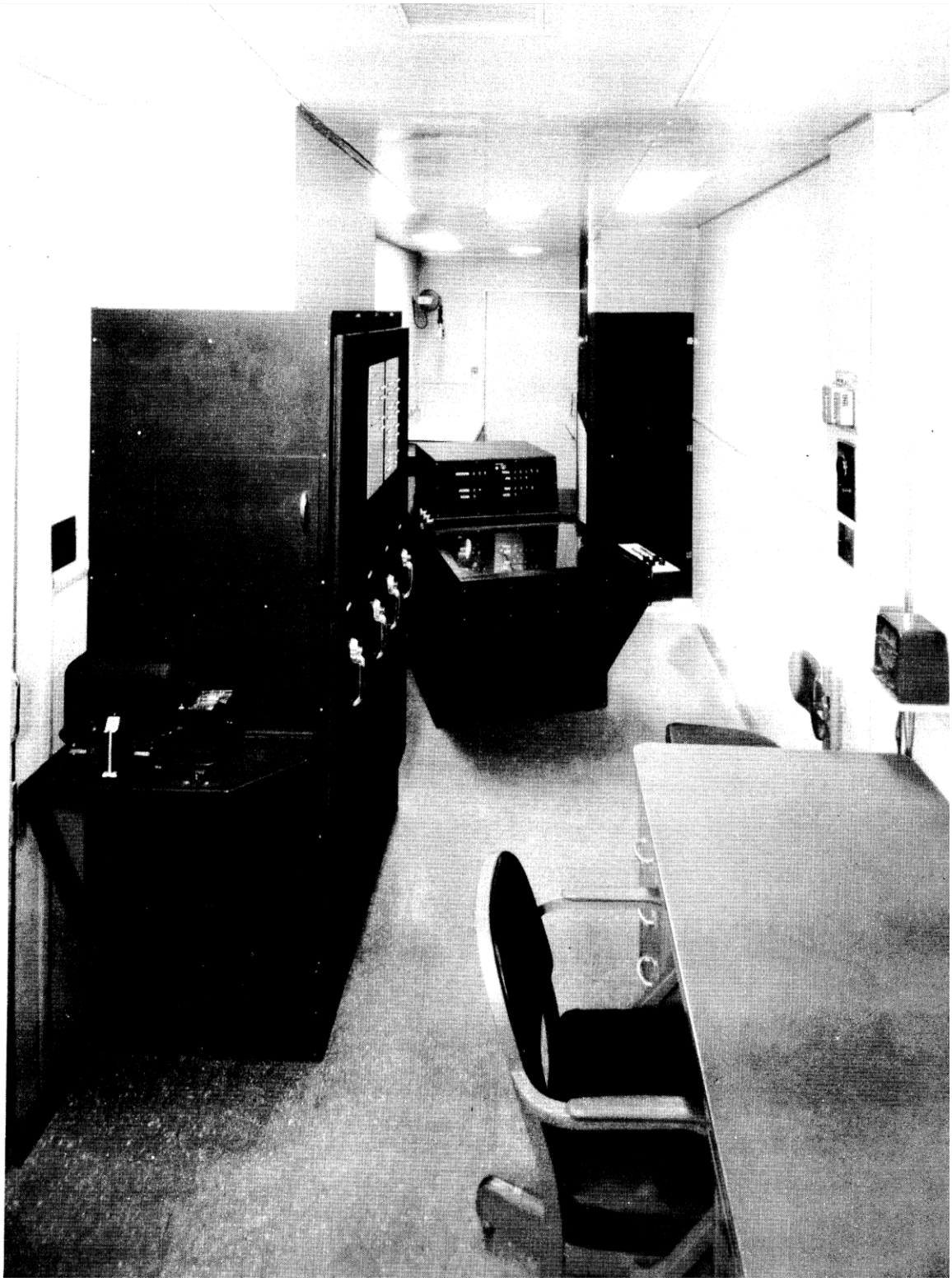
The Mobile Computer was designed for the Air Force as an advanced electronic countermeasures system.

FEATURES

The equipment includes features for direct communication, a high-speed magnetic drum file, and automatic map display features. The system is installed in two mobile, air-conditioned trailer vans.



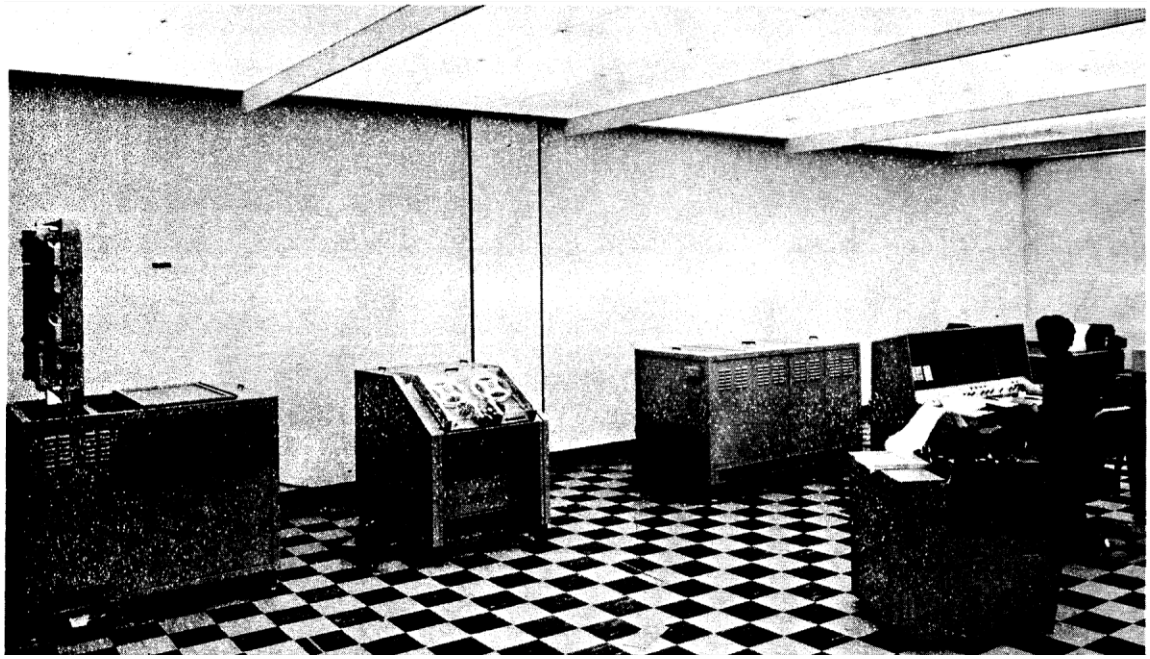
Mobile Electronic Countermeasures Equipment, Forward Part, Trailer 2



Mobile Electronic Countermeasures Equipment, Aft Part, Trailer 1

NAVAL TACTICAL DATA SYSTEM (NTDS)

The NTDS System uses the T46 Computer plus other equipment. The use of this equipment is classified. The T46 Computer has been commercialized as the M-460 Computer.



Naval Tactical Data System Computer

O'MALLEY COMPUTER

The O'Malley Computer is a special-purpose computing system that was designed and built for the U. S. Navy. Its specifications are classified.

Railroad Car Weighing System

RAILROAD CAR WEIGHING SYSTEM

DESCRIPTION

The Railroad Car Weighing System records and tabulates weights of railroad cars in motion and their contents. It was designed and built for use with iron ore cars.

PURPOSE

The system handles ore cars from a fixed complement with their tare weights stored in advance in the equipment. Weighing is at the rate of three cars per minute; this rate is limited by the relative lengths of car and scale.

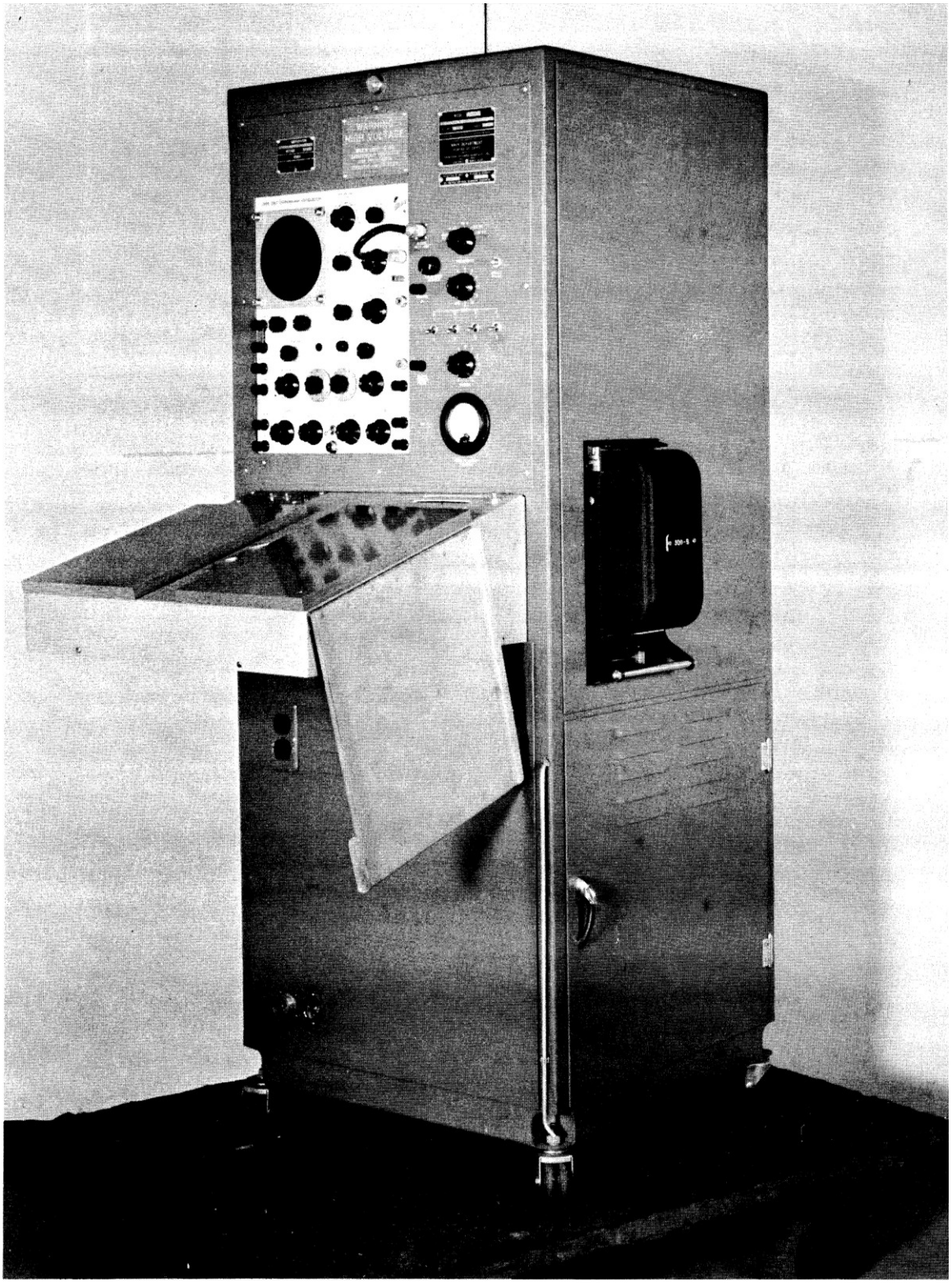
FEATURES

Car numbers are read from approaching cars and manually inserted into the console of the equipment. Numbers can be inserted two cars in advance of weighing, and auxiliary information for the tabulations can be inserted via the keyboard.

The car numbers contain a terminal check digit. The equipment computes this digit from the remainder of the car number and compares it with that digit in the inserted number as a check on the keyboard entry. Failure of the check allows the record to be completed with the inserted number, but prevents the weights from being added to accumulated totals. It also marks the tabulated record for that car.

The equipment takes from its memory the tare weight of the car and with this and the live weight from the scale computes the net weight of the contents.

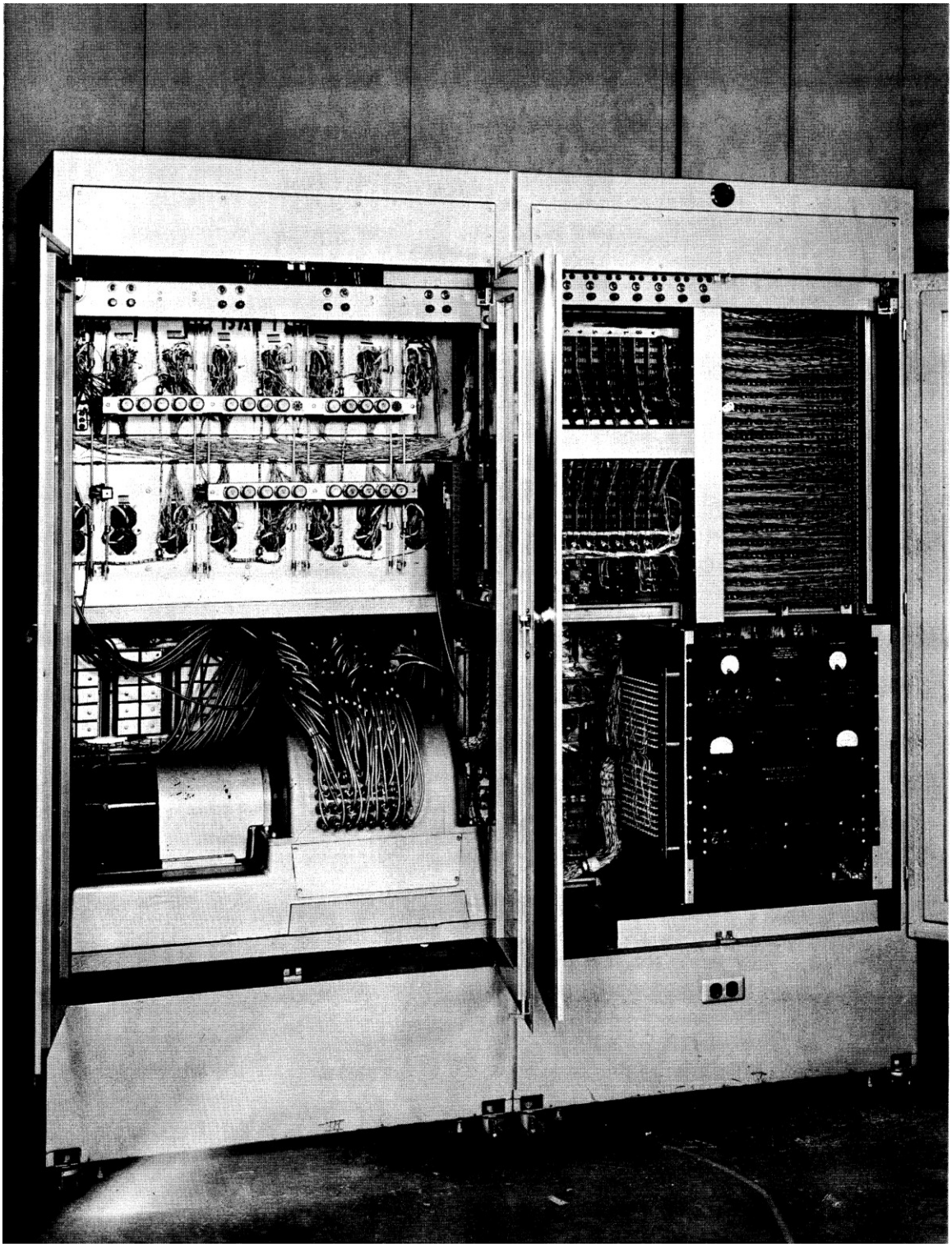
These figures are punched into tape and tabulated on hard copy, and totals for groups of cars are accumulated and encoded for Teletype transmission. The tare weight memory is a magnetic recording using cross-bar switching; arithmetic computation is by mechanical means electrically actuated.



One Unit of Robin II

ROBIN I and II COMPUTERS

Robin I and II are special-purpose, analytical computers designed for military purposes. All information is classified.



Speed Tally System - Memory Unit

SPEED TALLY SYSTEM

DESCRIPTION

The Remington Rand Speed Tally System applies high-speed electronic equipment and techniques to basic record-keeping operations. The system is made up of ten keyboard indicator desk sets, a tape punch and reader, a magnetic drum memory, and an output printer.

PURPOSE

The system instantaneously provides individual inventory or activity totals for any one of 39,000 stock keeping records, and produces complete printed tabulations at the rate of approximately 4,000 items totaled per hour. The Speed Tally provides totals up to 13,000 items in any of three categories - for example, orders, cancellations, and returns.

FEATURES

Keyboard Indicators. To give the system item numbers and quantities, ten operators work simultaneously at ten keyboards. For example, to enter five of item 45678 the operator punches 05, the quantity; then 45678, the item.

The instant the operator punches the fifth digit of the item number, the magnetic drum memory automatically takes over. In four-tenths of a second, the system seeks out the operator's keyboard, locates the drum area specified by the item number, reads the quantity previously recorded on the drum, transfers this number to the arithmetic register, adds or subtracts to produce the new total, re-records it at the same drum area from which the original was obtained, releases the keyboard for the next entry, and displays the new item total on the indicator panel of the entering keyboard.

The keyboard is the same fast, ten-key keyboard found on the Remington Rand Adding Machine. The keyboard indicator consists of a three decimal digit illuminated panel. These keyboard units may be located up to 300 feet from the Magnetic Drum Processing Unit.

The Memory and Processing Unit. The heart of the Speed Tally System is the Magnetic Drum Memory Unit which consists of a drum; associated reading, writing, and locating circuits; input keyboard scanner; and regulated power supplies. The Speed Tally Magnetic Drum is the same drum that is used on the ERA 1103 General Purpose Computer System. The drum travels at a peripheral velocity of 1,590 inches per second. It has 16 tracks per inch of length and 68 cells per inch of circumference. In general, the system's electronics are made up of easily replaceable plug-in chassis.

The Output Printer and Tape Recorder Reader Punch. The Speed Tally Output printer prints a list of desired inventory or tally totals as instructed by a perforated paper control tape. Tapes are readily prepared by simply punching in numbers on the tape unit ten-key keyboard to produce such reports as specific product activity, warehouse inventory, total or order volume. The speed of the output printer, which is a standard unit, is 75 lines of tally totals per minute.

The Tape Control Unit. Two functions are performed by this unit: it both prepares and reads a code-perforated tape which schedules the item numbers and category for which the tally totals are desired. Output from this unit is to the central control where tape coding is translated into electrical signals which give the item addresses on the magnetic drum.

TACTICAL AIR CONTROL SYSTEM (TACS)

DESCRIPTION

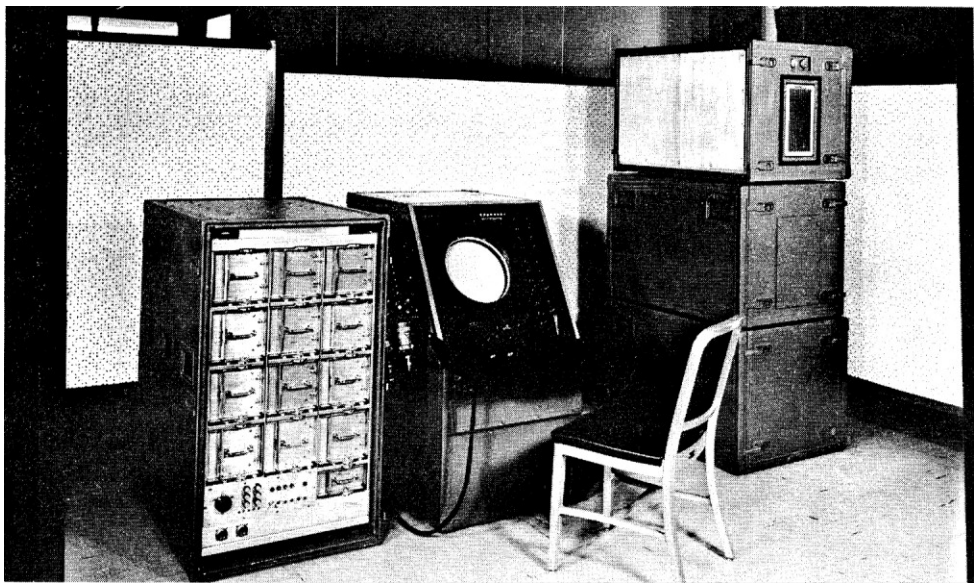
The Tactical Air Control System (TACS) is, in main part, a multiple-installation system of transportable, ground-based, electronic, data-processing equipment, interconnected by communication links.

PURPOSE

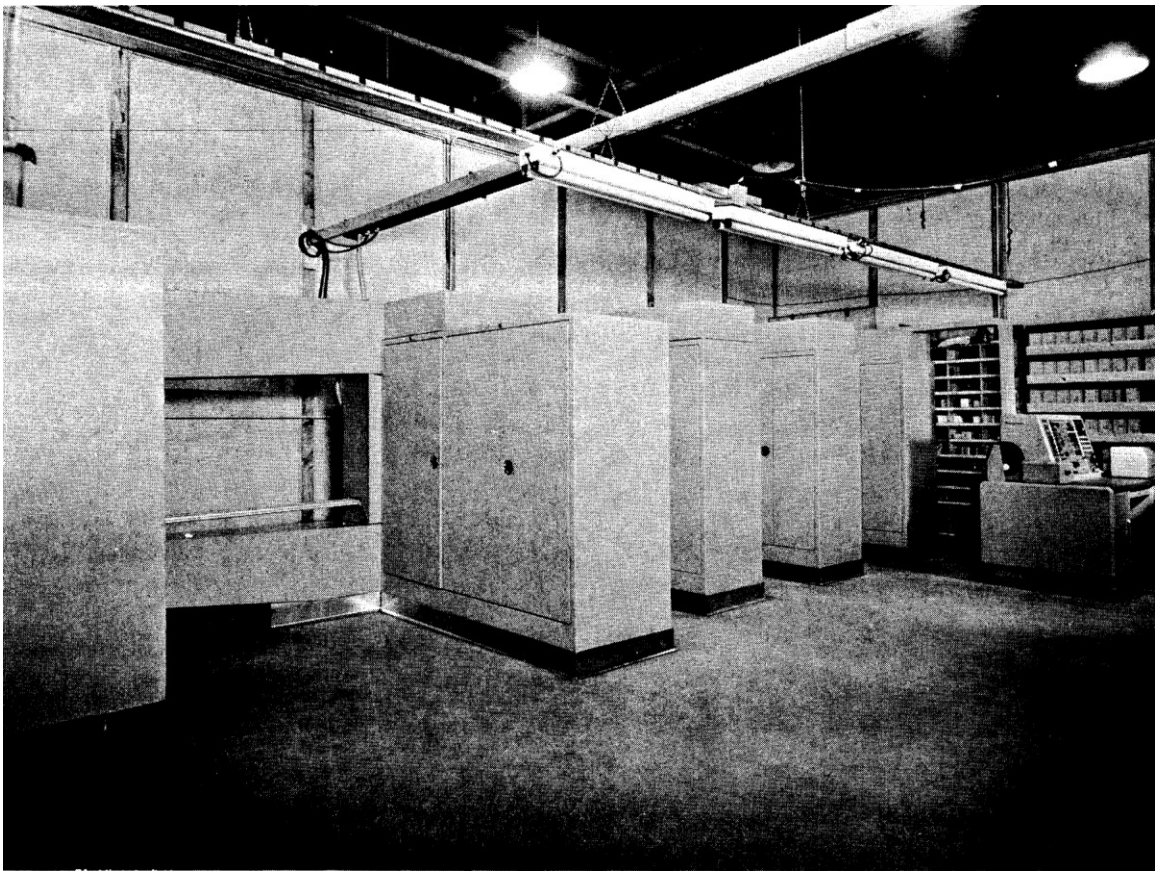
The system provides a Tactical Air Force with accurate information necessary to control its weapons during various missions. In providing this information, TACS performs four primary functions: (1) Acquisition of all data affecting both friendly and enemy operations; (2) Conversion of acquired data into a form compatible with the AN/TSQ-13 System (see below); (3) Distribution of acquired data for display and accurate evaluation to enable the formulation of tactical control and command decisions; (4) Development of most efficient use of available weapons to achieve a tactical objective.

FEATURES

The main feature of TACS is the Remington Rand Univac AN/TSQ-13. The AN/TSQ13 is an aircraft direction and reporting system. It aids the Tactical Air Command in directing air action and coordinating air and ground activity within the TAC area of responsibility. Track data on targets within this area are gathered by radar and auxiliary data-gathering equipment, transmitted through system communication links, processed by data-handling components, and presented in display form. Thus, a complete data presentation of the air activity within the TAC area is available at all times. From this data presentation, command decisions can be made to maintain air superiority and to order interdiction and close-support missions.



TACS Target Display



Transportable Computer

TRANSPORTABLE COMPUTER

DESCRIPTION

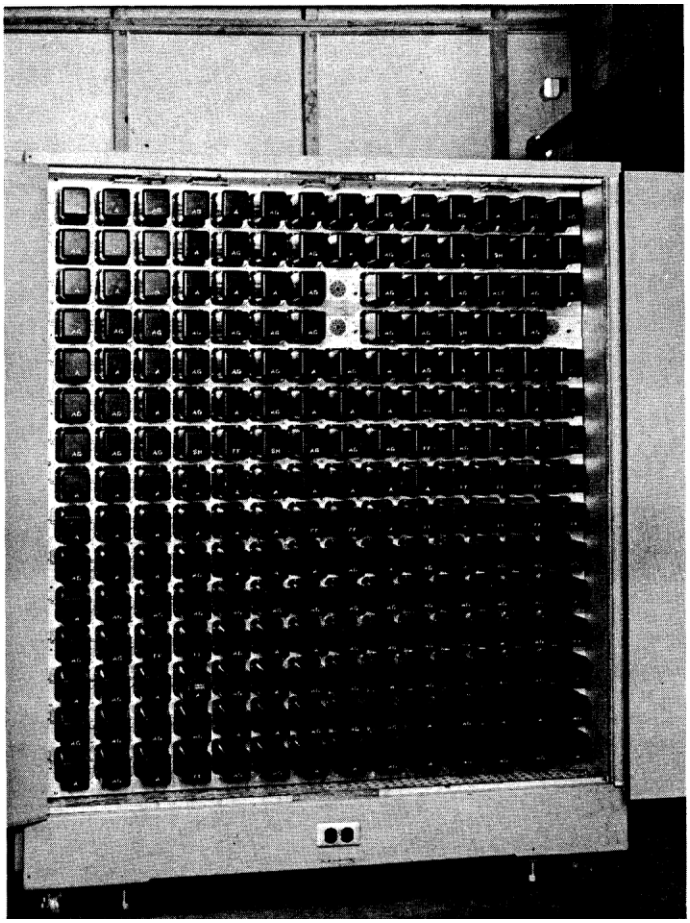
The Transportable Computer was developed for the United States Air Force. It consists of individually potted circuit elements of several types which plug into vacuum tube bases to permit ready replacement.

PURPOSE

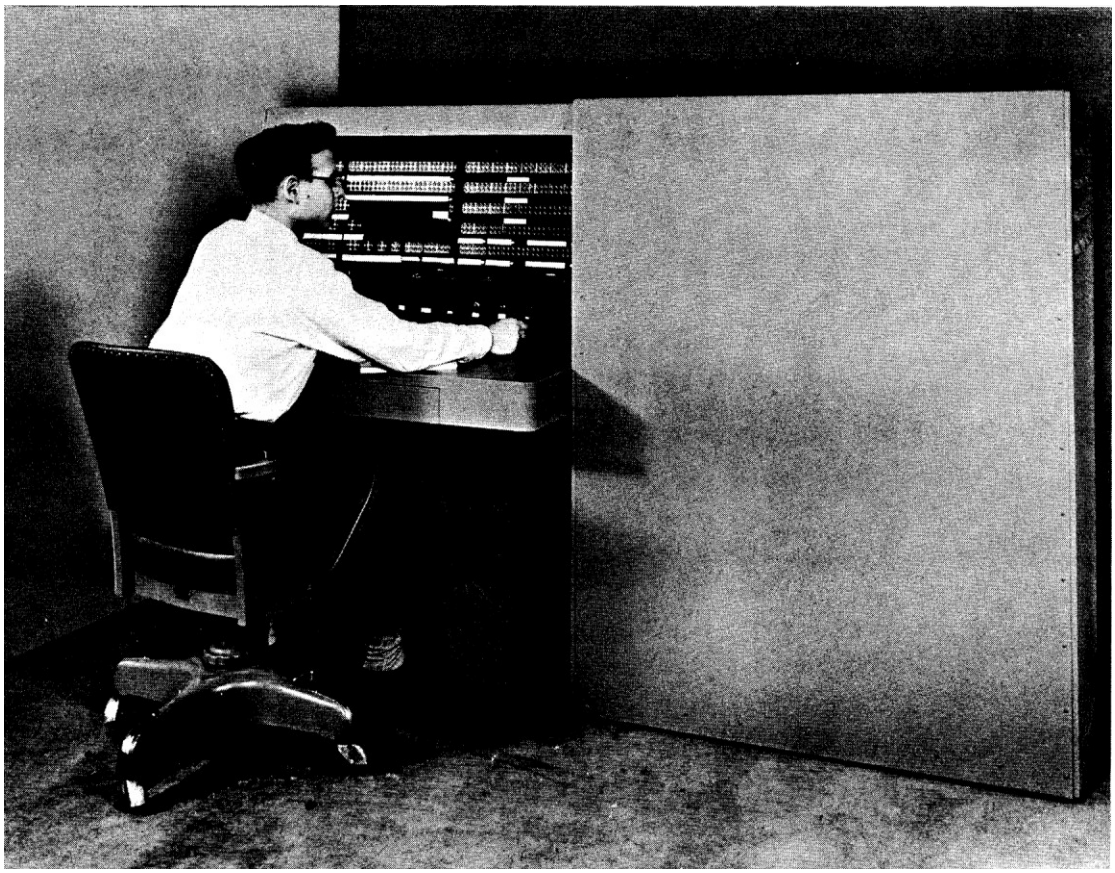
The Transportable Computer was designed for easy transportation from place to place, for simplicity of electronic connections, and for reliable operation.

FEATURES

A feature of the input-output system of this computer is the paper tape comparator. This equipment runs two paper tapes which record the same data and compares them, creating a third tape and stopping if disagreement between the two input tapes is detected.



Computer Showing Plug-In Chassis



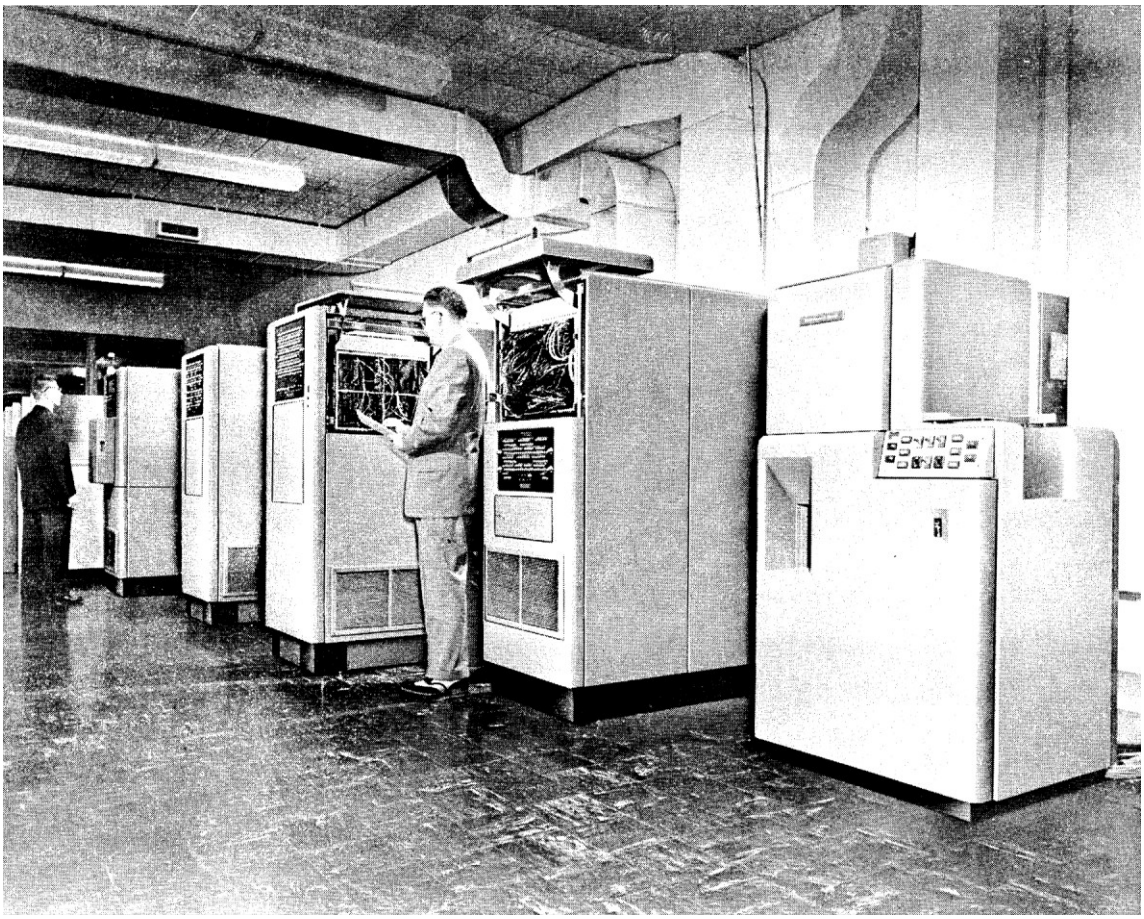
Transtec II Computer

TRANSTEC I and II COMPUTERS

The Transtec Computers, designated as Transtec I and Transtec II, were general purpose machines developed to investigate the use of transistors. They had limited, general-purpose capabilities.

Small logical building blocks were developed on panels less than 3 inches square which plugged into racks that could be swung out for easy access.

Transtec **II** had a 4,096-word core memory using 24-bit words. Input and output data were handled by a Flexowriter and Ferranti Tape Reader.



Univac File Computer, Model 0

UNIVAC FILE COMPUTER, MODEL 0

DESCRIPTION

The Univac File Computer, Model 0, is a medium-sized, electronic computing system that handles both alphabetic and numeric data and embodies self-checking features. It provides for the simultaneous operation of (1) a Central Computer; (2) a General Storage System that consists of large-capacity, random-access, magnetic drum memory; and (3) an integrated system of Input-Output units and other auxiliary devices.

Central Computer. The Central Computer, a general-purpose system, is composed of a Program Control Unit and an Arithmetic Unit. The Program Control Unit uses a plug board for control. The capacity of the program that may be wired on the plug board is 48 three-address program steps which may be expanded by the use of selectors, branching, and a Code Distributor. The Arithmetic Unit provides the necessary circuitry to perform the data-processing functions upon the stored information, including Comparison.

General Storage System. The General Storage System has two components: (1) A General Storage Control Unit (Type 4902) which includes one storage drum, and (2) from one to ten General Storage Extension Units (Type 4912 with one drum and Type 4922 with two drums). The maximum drum storage capacity is 1,800,000 characters. Each drum in the system has a storage capacity of 180,000 characters. The surface of a drum is divided into three major sections; each section is divided into 100 tracks or channels; each channel has a capacity of 600 characters. Associated with each charnel on the drum is a read-write head which provides for the reading of information from the channel or the writing of information onto the channel. Associated with each drum is a Revolver which provides the Central Computer with a means of rapid access to information stored on the drum.

The 600 characters of each channel on a drum are divided into specific *Unit Record Areas.* The unit record length is fixed for all drums included in any one Univac Model 0 File Computer System. Eleven Unit Record lengths are available:

12, 15, 20, 24, 30, 40, 50, 60, 75, 100, or 120 characters.

Input-Output. Up to eight UFC Input-Output units, in any combination, can be simultaneously controlled in Model 0 Systems.

PURPOSE

The UFC-0 system was developed for commercial data-processing that demand a large storage capacity and requires rapid access for interrogation.

FEATURES

1. A File Computer System possesses the capacity for storing internally thousands of Unit Records. The number of Unit Records and the length of each Unit Record are flexible and determined by individual application requirements.

2. A random-access storage feature permits the File Computer System to keep a current balance for a large number of items with high-volume activity. Specifically, it allows entry of input data into General Storage in the random sequence of its arrival and random access to any Unit Record stored in General Storage, either to obtain data from that Unit Record or to selectively alter data in that Unit Record.

3. A Search feature enables General Storage to look for a certain Unit Record in accordance with a key or identifier, even though that Unit Record's address is not known.

4. General Storage operates simultaneously with the Central Computer. Once given a time-sharing operation to perform, General Storage carries that operation out independently of the Central Computer.

UNIVAC FILE COMPUTER, MODEL 1

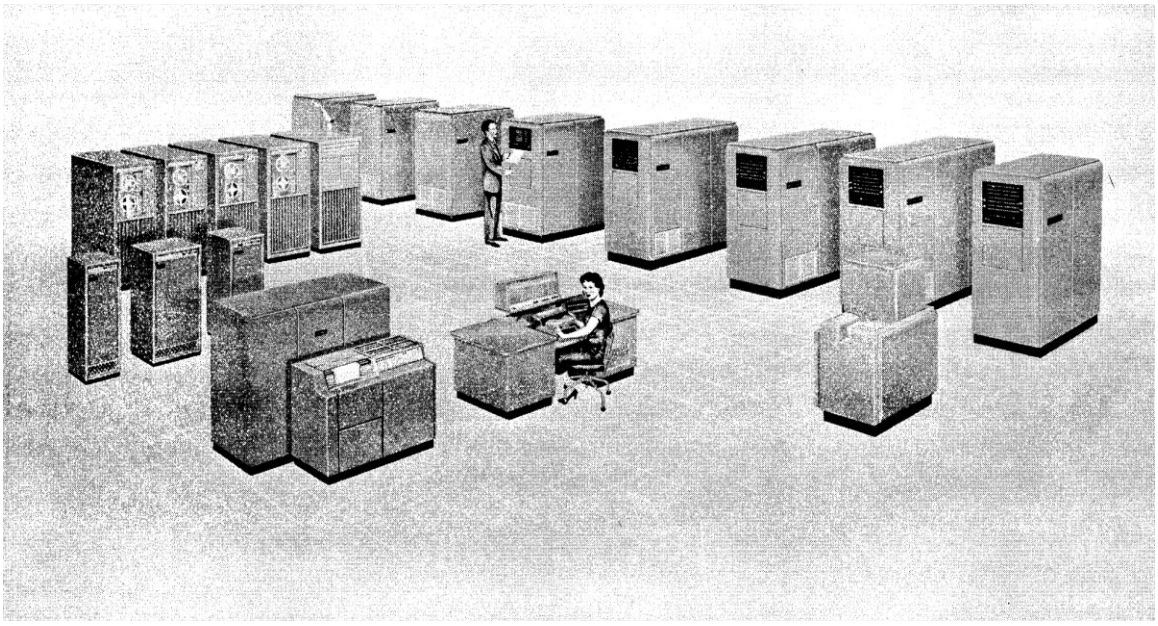
DESCRIPTION

The Univac File Computer, Model 1, although basically similar to the UFC, Model 0, differs from it in features of the Central Computer and General Storage, and in the number of Input-Output Channels.

The *Central Computer* is composed of two Program Control Units, Types 6900 and 6903, and an Arithmetic Unit, Type 6901. The two Program Control Units are necessitated by the amount of circuitry involved. In a typical application, the Central Computer, operating on a combined plug board and internal program, performs the following functions:

1. It controls the reading of information from 80- or 90-column punched cards, high-speed paper tape, magnetic tape, or any combination of these.

2. It obtains a corresponding item from a file stored as magnetic spots on a General Storage Drum.



Univac File Computer, Model 1

3. It performs all operations on the data as the instructions dictate.

4. It stores the updated item back on the General Storage Drum and writes developed results on magnetic tape, punched cards, paper tape, or line printers.

5. It checks all operations to insure that they are performed with complete accuracy.

Two types of computer instructions are interpreted, executed, and placed in sequence by Program Control's circuitry: (1) Instruction words, which are 120-character coded quantities stored internally in the computer, and (2) program steps, which are plugboard-defined instructions manually patch-wired on the Program Control Plugboard.

A computer program can consist of (1) instruction words only, in an internally stored program, (2) program steps only, in a plugboard-defined program, or (3) a combination of instruction words and program steps. Normally, the combination type of program is most efficient.

The Arithmetic Unit contains four registers, a serial adder-subtractor, a comparator, and the necessary counters and control circuitry required for the execution of each process involved in an instruction.

The *General Storage System* is a large-capacity, random-access memory composed of the following parts:

1. General Storage Control, Type 6902. This unit controls the several storage drums.

2. General Storage Drums. Type 6912, one drum; Type 6922, two drums. A UFC-1 system may include from 1 to 10 magnetic drums, each capable of storing 180,000 alphanumeric characters.

The foregoing General Storage Units include the following:

General Storage Address Register. A 7-digit register holds the address of the general storage location involved in a general storage reference.

General Storage Buffer. A 120-character, magnetic core buffer serves as an intermediate storage in data transmissions to and from the general storage drums, and holds the unit record identifier in channel search operations.

Circuitry. The controlling, locating, and synchronizing circuitry necessary for execution of general storage operations.

Once a General Storage operation is initiated, it is carried out in General Storage completely independent of the Central Computer.

The components of the UFC-1 *Input-Output System* include the demand stations, input-output tracks of the high-speed drum and their track switching circuitry, input-output control lines, and the various input-output devices up to ten in number, which may be included in any one system, in any desired combination. The UFC Input-Output devices include the following:

Console Panel
Inquiry Typewriter
80-Column Card System
90-Column Card System
High-Speed Printer
High-Speed Paper Tape System
Magnetic Tape Unit
Sorting-Collator System
Airlines Reservation System

PURPOSE

The UFC-1 was developed to include stored programs which can be altered during operation. It was designed primarily for commercial data processing.

FEATURES

The General Storage System provides random access to large-capacity files of information readily accessible for the interrogations necessary in a business transaction.

In addition to the basic Unit Record Area in storage, an *item* or *file entry* is handled in a group, identifiable as unique from all other major units in the file. Items or file entries of varying lengths may be stored (1) in different drums within the General-Storage System, (2) in different sections of a single drum, (3) in different channels of a section, or (4) in different character groups within a channel.

The demand station concept makes possible time-shared, independent operation of a large number of input-output devices.

Twenty-seven basic operations may be executed through both internal and external instructions. This repertoire is supplemented by an extensive group of subcommands and plug board features.

UNIVAC FILE COMPUTER, MODEL 1 MODIFICATION A

DESCRIPTION

A modified version of the Model I File Computer has been developed for on-line applications, such as Airline Reservations Systems and Air Traffic Control. The computer comprises the following units:

Program Control Unit No. 1 Type 6905

Program Control Unit No. 2 Type 6906

Arithmetic Unit Type 6907

General Storage Control Type 6908

Storage Extension Unit -- 1 Drum, Type 6910

Storage Extension Unit -- 2 Drums, Type 6909

PURPOSE

This modification operates in conjunction with traffic control and airlines reservations peripheral units and with modifications of File Computer peripheral units designed especially for on-line use. In general, this version of the File Computer is not compatible with the standard peripheral equipment for Model I, and its special peripheral equipment is not compatible with that of the unmodified version of the Model I File Computer.

FEATURES

The modified UFC I has isolated error alarms whereby an error can be localized. This allows the system to continue to operate after an error is detected and, in case of errors in a unit of peripheral equipment, may permit operation not involving that equipment to continue or cause a duplicate equipment to be operated instead. Certain circuit components in this version are designed for the more rugged and reliable operation required for on-line systems.

UNIVAC II Computer

UNIVAC II COMPUTER

DESCRIPTION

The Univac II System is a general-purpose, digital computer. The internal memory consists of a 2,000-word magnetic core storage system, a 10-word transfer register, and a 60-word transfer register. The external memory may consist of as many as 16 Uniservo II magnetic tape units. Each tape can store 4,000 blocks. Each block contains 60 words with a maximum pulse density of 250 per inch.

The sequence of operation of the Univac II System is determined by a program of internally stored instructions capable of self-modification. With a word length of 84 bits, the computer is a single-address, excess-three binary coded decimal machine, which operates in the serial mode. The basic computer has 64 arithmetic and logical operations.

PURPOSE

The UnivacII was a redesign of the Univac I. The purpose of the new development was to attach a magnetic core memory to the Univac I, to redesign completely the input-output equipment of the Univac I, and to provide flexibility of the instruction repertoire.

FEATURES

Storage: High-Speed Coincident-Current Magnetic Core Storage - 2000 words; memory cycle time is 20 microseconds per half word.

Magnetic Tape Storage - As many as 16 Uniservo II tape units, 250 pulses per inch (128 ppi and 50 ppi also used). Tape speed, 100 inches per second.

Word Size: 11 digits plus sign. Alphanumeric coding, excess-three binary coded decimal.

Representative Speeds: Addition - 240 μsec/word (includes instructions and acquisition time)

Subtraction - 240 μsec/word (includes instructions and acquisition time)

Multiplication - 1900 microseconds

Division - 3700 microseconds

Input-Output Devices: Magnetic Tape (Uniservo - Reads and records on magnetic tape at densities of 50, 128, and 250 ppi.

Supervisory Control Typewriter and Console - Provide manual keyboard input and programmed control output at a rate of 10 characters per second.

General: In the fully automatic Central Computer, the sequence of operation is determined by a program of internally stored instructions capable of self modification. The basic word size is 12 characters. A word may contain either an instruction pair, or a number composed of any 12-digit combination of the 63 characters.

WARLOCK I and II DATA PROCESSORS

The Warlock Data Processors were designed and built for the U. S. Navy. Two versions were manufactured, Warlock I and Warlock II. The specifications for both are classified.

SECTION II

RECORDING AND DATA-HANDLING APPARATUS

In correlation with the creation and development of computers and other digital data systems, the St. Paul Univac Division has produced a variety of equipment for inserting, recording, and displaying digital data. Other devices have included equipment for recording and reading analog data. The products listed in Section II range from a camera to large input-output systems, all designed as recording and data-handling apparatus; together, they show a wide diversity of engineering achievement.

Agent Set

AGENT SET

DESCRIPTION

The Agent Set is a keyboard entry device for entering inquiries and information and for displaying replies and status reports on airplane trip reservations. A set must work with a Programmer Scanner Model II or Model I, because some of the circuits essential for set operation are placed in the Programmer Scanner.

PURPOSE

The set is designed specifically for handling airline reservations with the type of its operations fixed in advanced. Additional facility to handle certain supervisory operations can be wired into a set.

FEATURES

The predominant feature of the Univac Agent Set is a photographic projection system in which a light beam is passed through a single frame of a conventional 35 mm slide, projecting the film image on a viewing screen on the upper panel of the set. This equipment is suitable in size for use on a counter or desk. It has banks of keys for entering transactions, and light panels for indicating replies. Any of 30 slides can be selected from a magazine and projected on a back panel.

The slides contain up to eight columns, each representing a flight, and ten rows, each corresponding to an airport. Columns and rows can be selected by corresponding keys. The selection of two rows defines the terminus of a flight and the selection of a column designates the flight. Other keys are depressed for the date, type of transaction, and number of seats if desired.

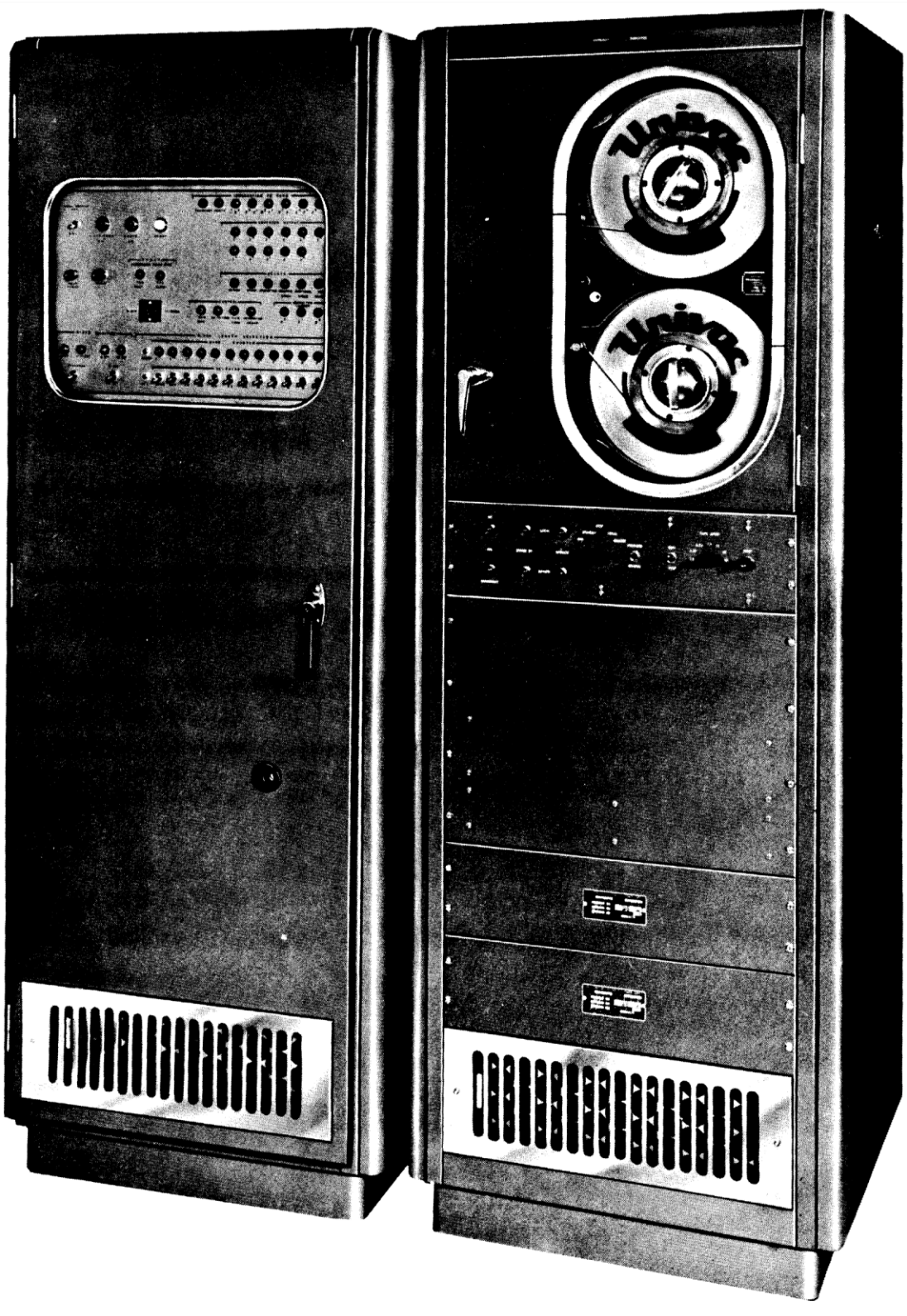
Normal transactions are inquiry for space availability; selling, canceling, or wait listing space; or asking for a report on expected departure or arrival time. In the case of inquiries for availability, a specific flight does not have to be selected and ail applicable flights on the slide will be reported. Errors or malfunction are indicated by appropriate lights.

Magazines of slides can be changed readily, giving the set a large capacity. The set encodes a transaction from the settings of the keys and from an optically sensed code in the margin of the slide. This information is decoded by the computer and a coded reply is formulated which lights the appropriate reply lights.

Agent Sets are not addressable, but remain connected to the computer until a reply is returned.

ANALOG SIGNAL STORAGE DRUM

The Analog Signal Storage Drum, Type 116M, was a single-channel drum used for boundary displacement recording of analog signals. Although it has been outmoded for many years, it still has historical interest since it was one of the earliest analog storage drums built by an American manufacturer. It had a stark simplicity of design, but in its day and for its purposes, it was uncommonly efficient; it became a basic pattern upon which later, more complex, devices were based.



Analog-to-Digital Magnetic Tape Converter

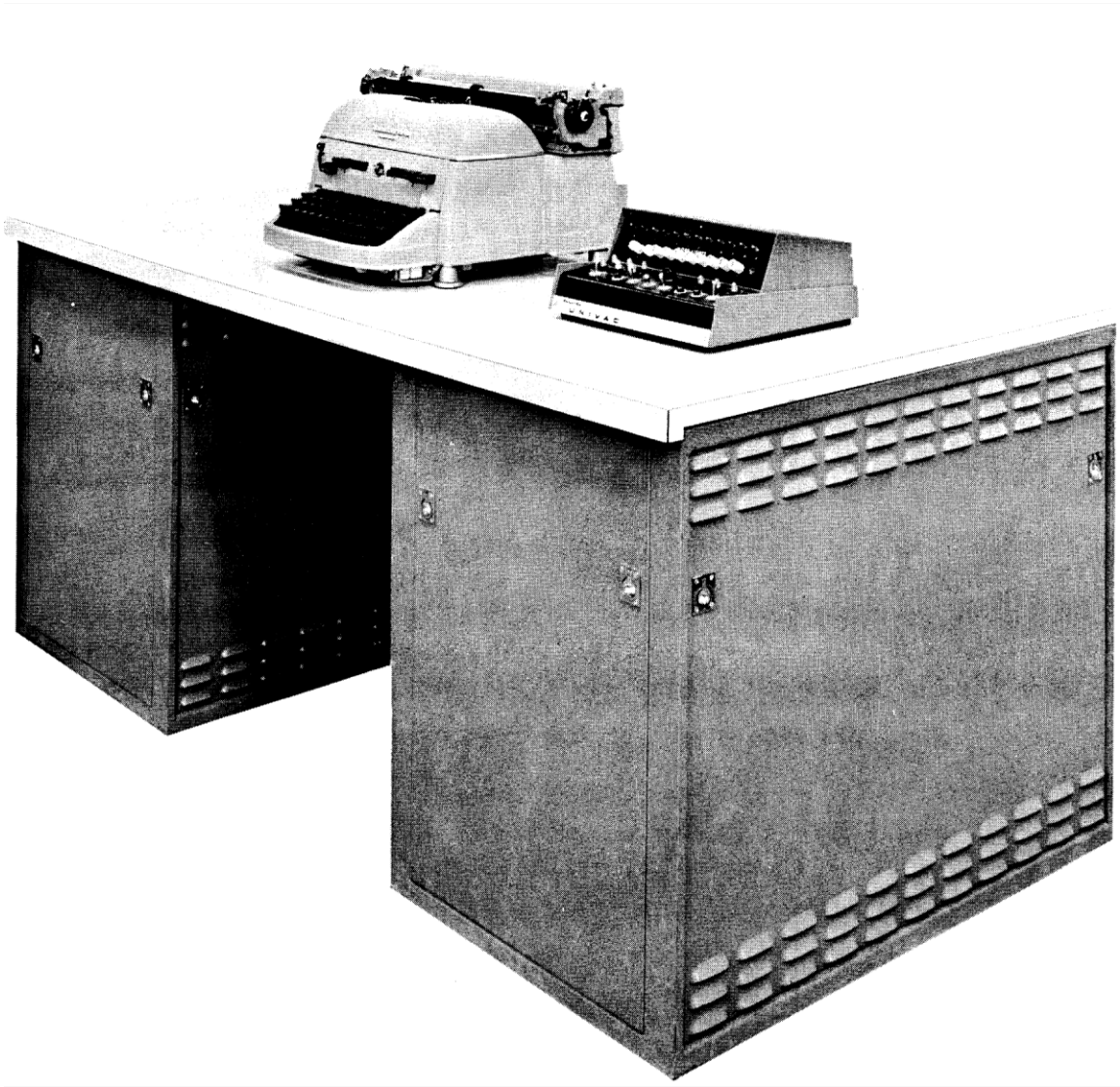
ANALOG-TO-DIGITAL
MAGNETIC TAPE CONVERTER

DESCRIPTION

The Analog-To-Digital Magnetic Tape Converter is a high-speed converter which gives a tape unit control functions for the proper format of inputs to the 1103 Computer.

PURPOSE

The units are used for conversion of aircraft tele-metering data into the 1103 Computer so that the data may be processed in desired format.



Automatic Typewriter

AUTOMATIC TYPEWRITER

DESCRIPTION

The Automatic Typewriter was designed as an alphanumeric keyboard input-output unit for the Univac File Computer, Model 0 and Model I. It consists of the following units:

Desk - Type 4860

Typewriter Unit - Type 4962

Control Keyboard Devices Pedestal - Type 4880

Automatic Read/Punch Pedestal - Type 4964

Translator - Type 4965

The Automatic Typewriter provides input and output for the File Computer via an alphanumeric keyboard and 4-, 5-, 6-, or 7-level paper tape. Printed copy can be produced along with keyboard or tape input and tape output. A plug board provides format control and permits various modes of operation.

PURPOSE

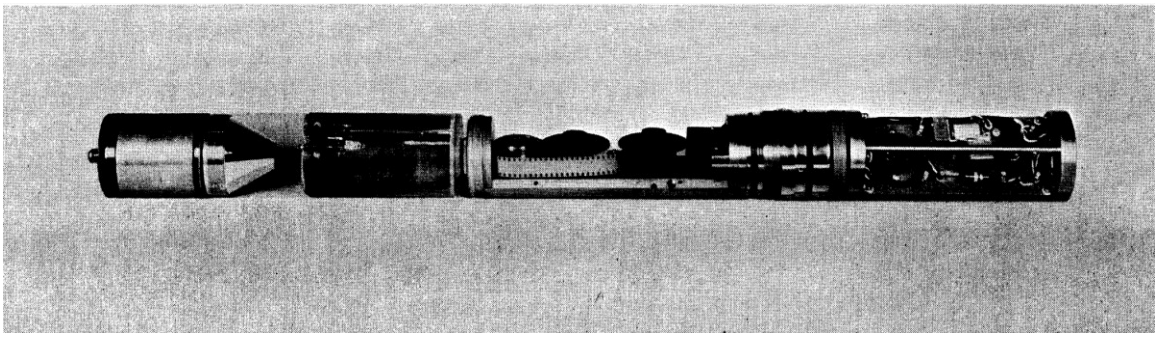
This typewriter was designed for handling input-output data in volume. On-line operations include on-line input and output with paper tape, on-line manual input, and on-line checking of tape input or keyboard input against a prepared tape.

FEATURES

The typewriter has a 44-key keyboard, and these characters together with carriage operations are transferred to and from the typewriter in Univac code. The other characters of the Univac code can be encoded from selected upper case characters of the typewriter.

The Read/Punch Pedestal Unit and the Translator are optional additions to this equipment. More than one Translator can be used with an Automatic Typewriter. The desk contains one Read/Punch Unit and the Pedestal provides a second one.

Preliminary Engineering Specifications EF 347 and EF 348 cover respectively the Automatic Typewriter and the Translator.



Bore-Hole Camera

BORE-HOLE CAMERA

DESCRIPTION

Developed under the supervision of the U.S. Corps of Engineers by the Engineering Research Associates, Inc., the Bore-Hole Camera produces a continuous 360-degree photograph of the side wall of a three-inch diameter bore hole, on either black and white or colored 16-millimeter moving picture film. The camera unit is encased in a tubular, stainless steel housing 2 3/4 inches in diameter and 31 3/8 inches long.

PURPOSE

The camera provides an improved exploratory technique for appraisal of characteristics of bedrock, interior concrete, and well or drained casings. It makes possible detailed inspections of interior surfaces. Lowered into a three-inch bore-hole, the camera provides a photographic record of the entire bore-hole sidewall surface.

FEATURES

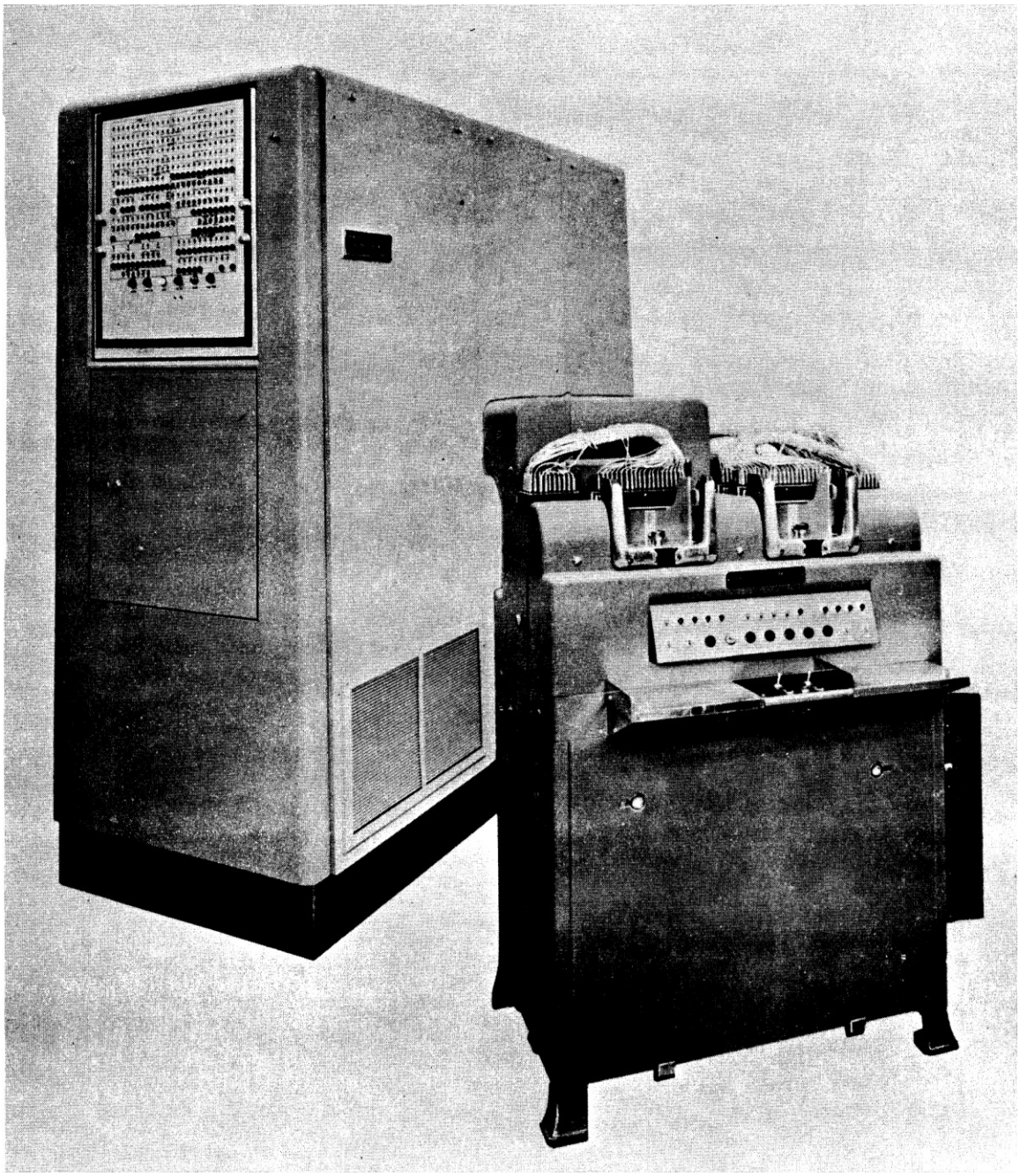
The Bore-Hole Camera equipment consists of five major elements:

1. Photographic unit - A 16-millimeter camera with a film drive, conical mirror, flash tube, and compass.

2. Dummy camera - A casing, similar to that which houses the photographic unit and which is used for preliminary exploration of the bore-hole.

3. Cable unit - A manually operated table reel used to lower and raise the photographic unit into the bore-hole.

4. Power Supply - An electronic chassis used to supply necessary direct current operating voltages for the photographic unit. The electrical power required to operate the camera is the conventional 115 volts a-c. For remote location operation, power may be derived from a standard, gasoline driven motor generator set.



Card System (80 Column)

CARD SYSTEM (80 COLUMN)

DESCRIPTION

The 80-Column Card System is a data-handling input-output device developed for on-line use with the Univac File Computer. The system is composed of two major units: (1) a Card Processor (Types - 4940, 80-Column Sensing-Punching Unit, 4941, 80-Column Dual Feed Sensing-Punching Unit); (2)a Card Control Unit (Types - 4940, 80-Column Bull 48 Character Translation, 4841, 80-Column Duel Feed, 4845, 80-Column Bull 64 Character Translation).

The system is controlled entirely by computer commands via the Computer-to-I/O control lines except during manual run-in and run-out. Conversely, the system may send program-altering signals to the computer by way of I/0-to-Computer control lines.

PURPOSE

The system uses standard 80-column card code and can operate simultaneously on two stacks of cards, punching output data into one stack and reading input data from either or both stacks at the rate of 150 cards per minute per stack. The units of the 80-Column Card System may be used: as a card input device; as a card output device; as a combined input-output system.

FEATURES

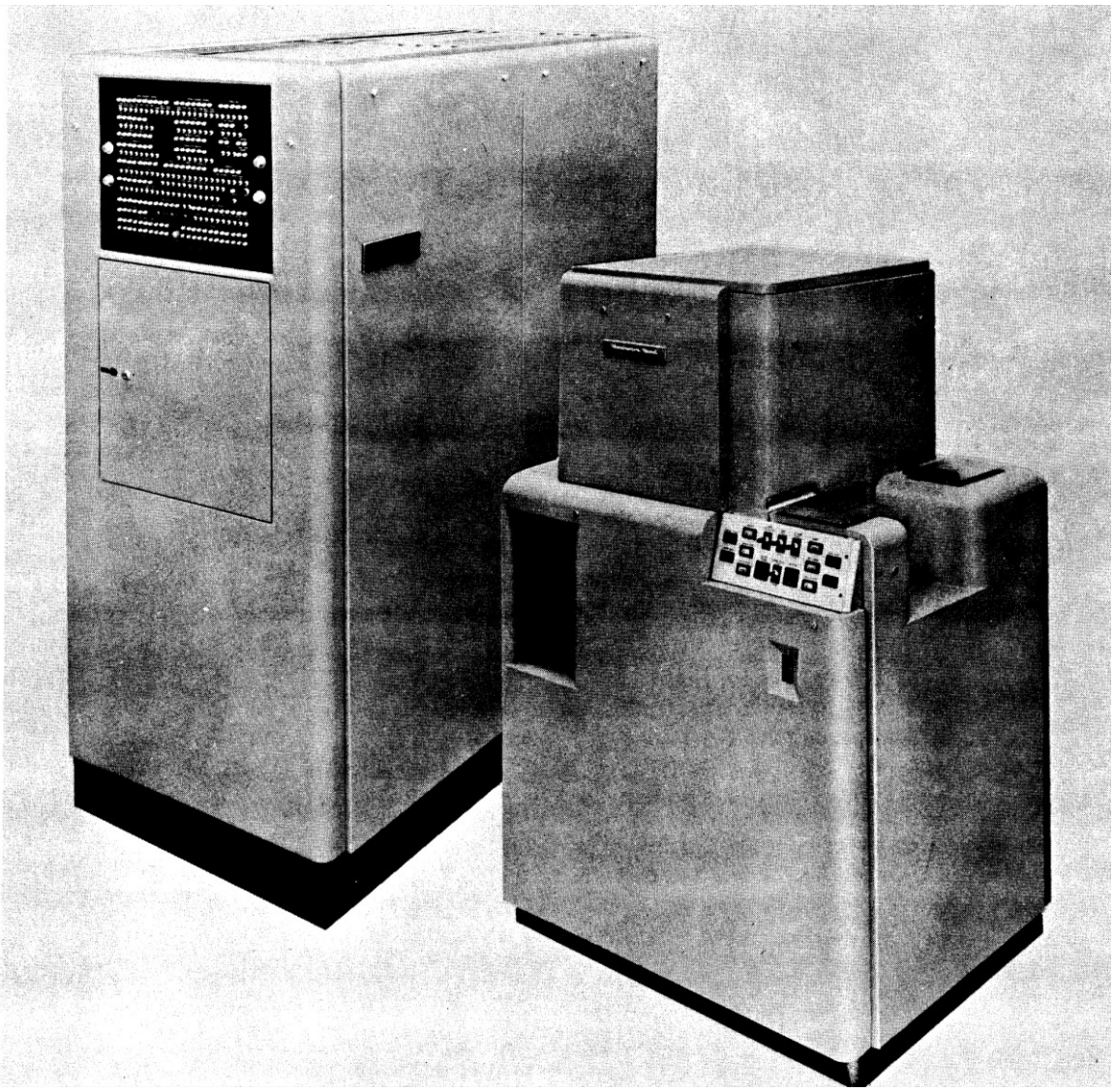
In general, the system has two modes of operation:

Mode I operation is any input-output operation in which all computer input data come from the read channel and ail output data are sent to the punch channel. The cards entered in the punch-feeding magazine may be either blank or pre-punched. The read operation in the punch channel is not used (except perhaps, for control signals). Mode I operation allows 400 milliseconds of computer time per card and 150 cards per minute with ("post-read") checking in both channels.

Mode **II** operation is any input-output operation in which input data are read from cards in the punch channel and the corresponding output data are subsequently punched on the same cards. The read channel may be (1) unused, (2) used simultaneously to enter unrelated data in the computer, or (3) used to provide computer input data augmenting that read in the punch channel. In the latter case, the reading is synchronized so that data from two corresponding cards - one in each channel - may enter the computer as two distinct input blocks or may be merged to form a single input block.

At 150 cards per minute with "post-read" checking in both channels, the computer time per card is 80 milliseconds in the punch channel and 320 milliseconds in the read channel.

In either operational mode, control via plug board wiring permits format control, editing, check control, and other miscellaneous logical operations.



Card System (90 Column) Control and Card Unit

CARD SYSTEM (90 COLUMN)

DESCRIPTION

The 90-Column Card System is a data-handling input-output device for on-line use with the Univac File Computer. The system reads information from cards and transmits it through a buffer to the computer. It is composed of two major units:

1. A Card Processor (Types - Non-Check, 4033 Partial Check)
2. A Card Control Unit (Types - 4830 Non-Check, 4833 Partial Check)

The system is controlled entirely by computer commands via the Computer-to-I/0 control lines except during manual run-in and run-out. Conversely, the system may send program-altering signals to the computer by way of I/0-to-Computer control lines.

The Card Processor reads, punches, and sorts cards in accord with signals from the Control Unit. In includes the feed magazine in which up to 600 cards may be entered and the two receivers ("normal" and "sort") into which they are finally deposited.

The Control Unit houses the connective circuitry (translators, registers, etc.), between the Card Processor and the Computer. It included a display panel provided with lights to indicate errors, contents of registers, etc. A concealed maintenance panel provides ready access to controls used in the maintenance operations. The Control Unit also contains the plug board.

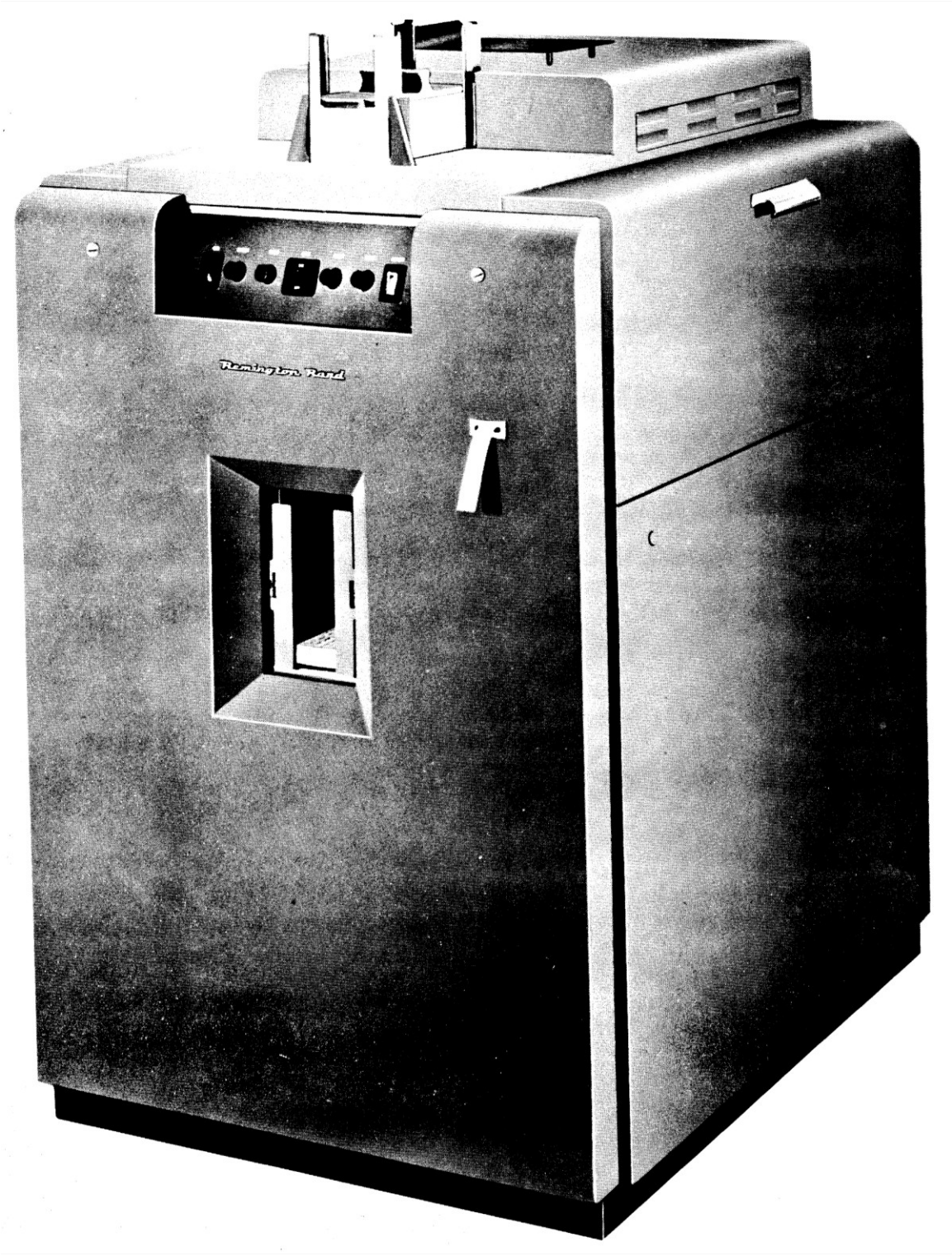
PURPOSE

The system uses Remington Rand 90-column card code. In the absence of prolonged computations (exceeding 235 milliseconds of computer time per card), it processes 150 cards per minute. The units of the 90-Column Card System may be used: as a card input device; as a card output device; as a combined input-output system.

FEATURES

The system contains a card feeding magazine that feeds cards through a card processing channel to a receiver. The channel picks the bottom card from the magazine, reads it, punches it, and deposits it in the receiver. Any of these processes may be without effect, depending on the program. In an input operation, for example, the card passes through the punch process unchanged.

The plug board included in the system permits format control, editing, and other miscellaneous control operations.



Card-to-Paper Tape Converter

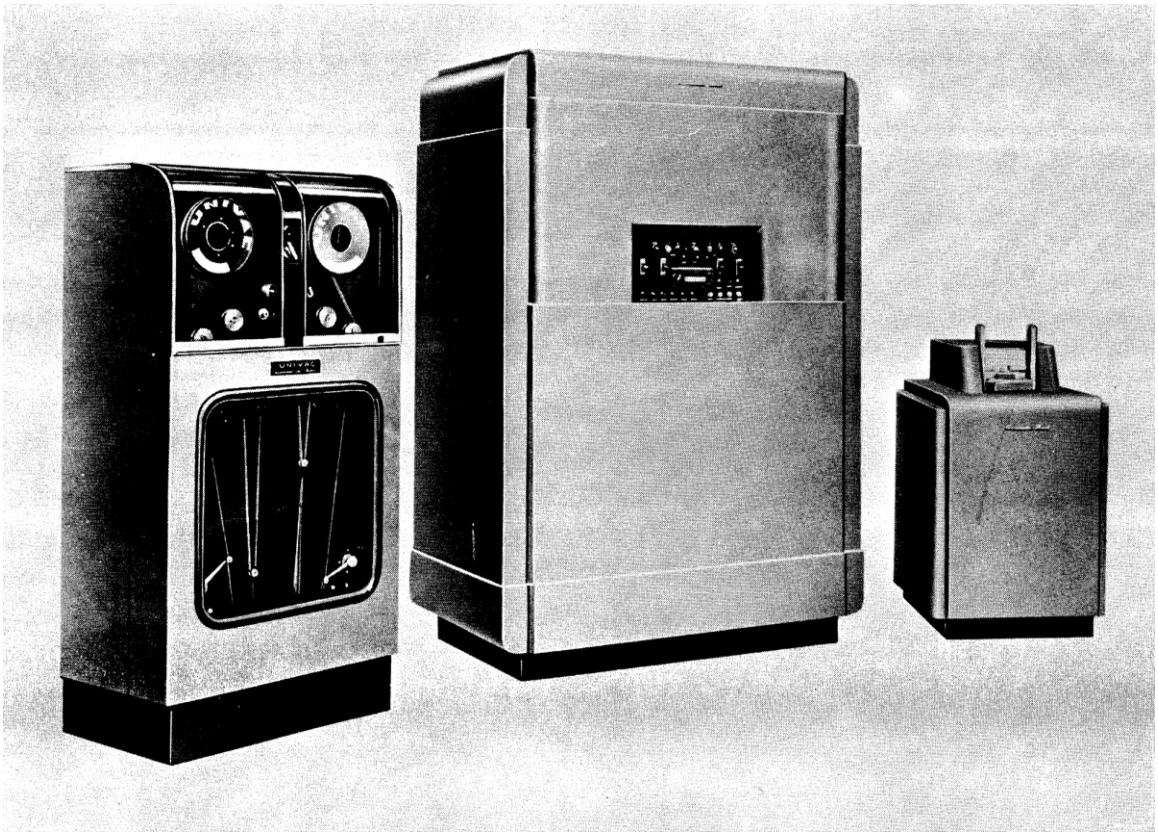
CARD-TO-PAPER TAPE CONVERTER

DESCRIPTION

The Card-to-Paper Tape Converter was developed for the United States Air Force. It converted data from 80-column punched cards to a coded 7-level perforated paper tape. Because of additional features, which included a magnetic tape converter, the Card-to-Paper Tape Converter was a device capable of many adaptations and applications. It contained a plug board for programming purposes with provision for obtaining a variety of formats.

PURPOSE

The Air Force processing device which the Card-to-Paper Tape Converter was designed to serve had a rigid format. The Converter made up for the lack of flexibility in the Processor and served to provide a widely diversified format.



Card-to-Tape Converter (80 Column)

CARD-TO-TAPE CONVERTER (80 COLUMN)

DESCRIPTION

The Card-to-Tape Converter is a data-processing system that transfers pre-punched 80-column card information from cards to Univac Magnetic Tape. The system is composed of three major units:

1. Card Feed Unit
2. Card Control Unit
3. Tape Unit

The Card Feed Unit consists of an input bin with a 1000 card capacity, a volume feed system, two brush-type card reading sets, a reject bin of 400-card capacity, and an output bin of 1,000-card capacity.

The Control Unit contains the necessary electronic circuitry for controlling the tape and card feed units in addition to the equipment necessary for reading, recording, and checking all operations.

The Magnetic Tape Unit is a clutch-operated modified Uniservo. The Tape Unit accepts the standard Univac Magnetic Tape reel holding 1,500 feet of tape on which may be recorded the information from 5,200 cards.

PURPOSE

The Card-to-Tape Converter processes at a maximum operating rate of 240 cards per minute, recording information on magnetic tape at a density of 128 characters per inch. The information from each card is assigned 120 character positions (1 blockette) on tape. A blank space of approximately 1 8/10 inches is passed between the blockettes.

In the basic mode of operation, the Card-to-Tape Converter:

1. Reads the card and stores the information in memory.

2. Transfers the information from memory to tape on a forward write.

3. Reads the tape backward.

4. Reads the tape forward. At the same time the card is given a second reading by a second set of brushes, the information is passed into circuitry, which is the same as used on the first card read (Step 1) but has been so shifted in relationship to the brushes that each punch position is handled by different memory elements.

FEATURES

1. Mispunch Detector. The Mispunch Detector rejects unacceptable cards and stops the machine.

2. Misfeed Detector. Each card, as it passes the first reading station, generates the feed signal for the next card. If a card fails to feed, the Converter, after one more attempt to feed a card, stops and will not start until the operator provides another start signal.

3. Odd-Even Check. If any of the 120 digits are found by the odd-even check to have an even number of recorded bits, the card is rejected, the tape is repositioned for recording over the same blockette, and the Converter stops.

4. The 120-Digit Check. If the 120-Digit check finds any number of digits other than 120, the card is rejected, the tape is repositioned, and the Converter stops.

5. Recording Level Check. Separate signal and noise checks are made on each recording by an automatic switch of the tape amplifier gain between the *Read tape backward* and *Read tape forward* operations.

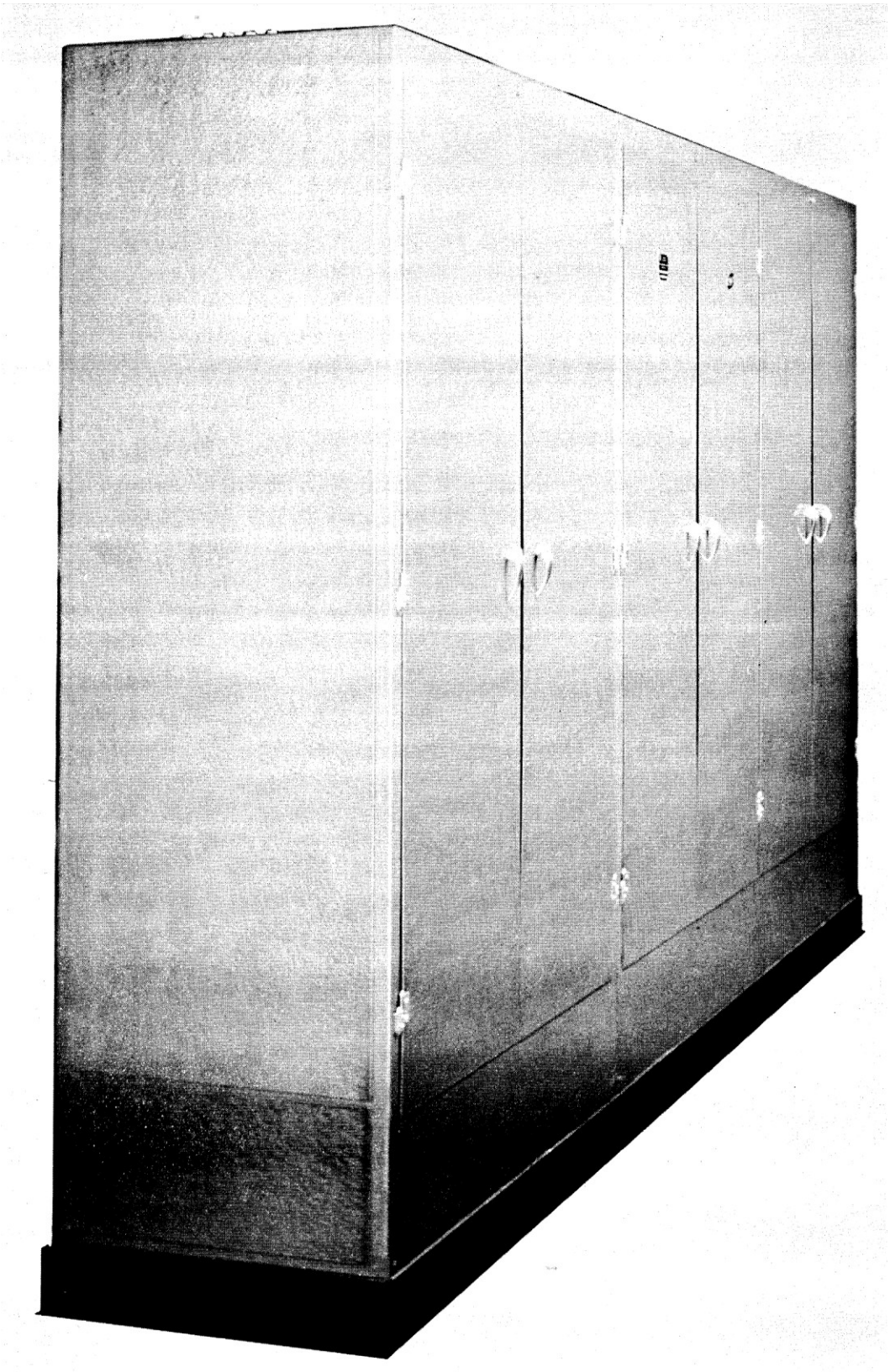
6. Digit-for-Digit Comparison. A digit-for-digit comparison is made between the information recorded on tape from the first *Read* card and the information in memory for the second *Read* card. If the comparison fails to give complete equality, the card is rejected, the Converter stops feeding cards, and the tape is repositioned for recording over the same area of tape.

7. Plugboard Check. Plugboard checks ensure that all plugs are making proper contact. If not, the Converter rejects the card it was processing at the time of the break in contact, repositions the tape, and stops.

8. Card Counter. The Card Counter is advanced each time all other checks applied to a card conversion have been met. If any check fails, the counter is not permitted to move, and the Converter stops. In addition, the counter itself is checked to ensure its operation.

9. Brush Pulser. The card-reading brushes are checked to ensure that they are yielding an output during the card readings. If all output ceases, the Converter stops, and the tape is repositioned.

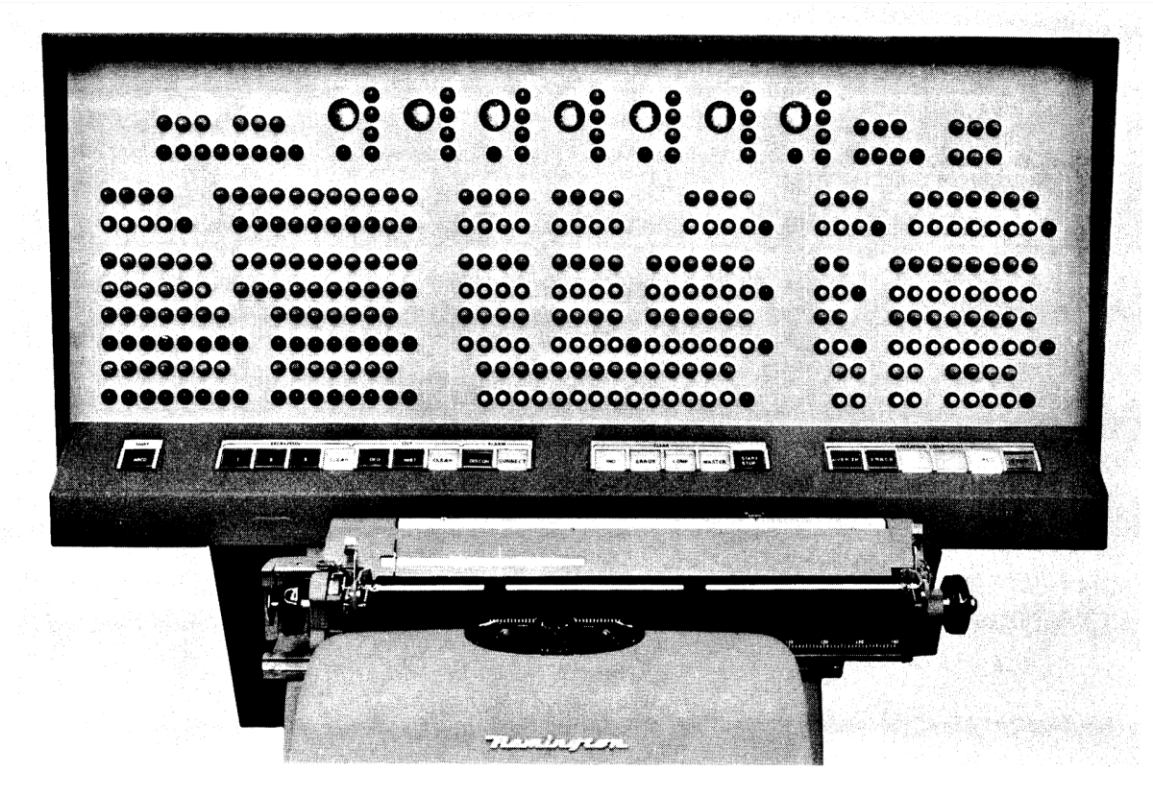
10. Error Insert. Under each error-indicating neon on the control panel is an *Error Insert* button. When any one of these buttons is pressed, the checking circuits sense the indicated error. The machine should then perform as if this error occurred. This provides a check on the checking circuits themselves.



Comparator Predictor

COMPARATOR PREDICTOR

The Comparator Predictor was developed for the United States Air Force. All information concerning it is classified.



Console Control Panel for UFC 1

CONSOLE CONTROL PANEL FOR UFC 1

DESCRIPTION

The Console Control Panel, Type 4963, is an optional auxiliary for the Model I File Computer. The panel attaches to the desk of the Inquiry Typewriter and is used with that unit.

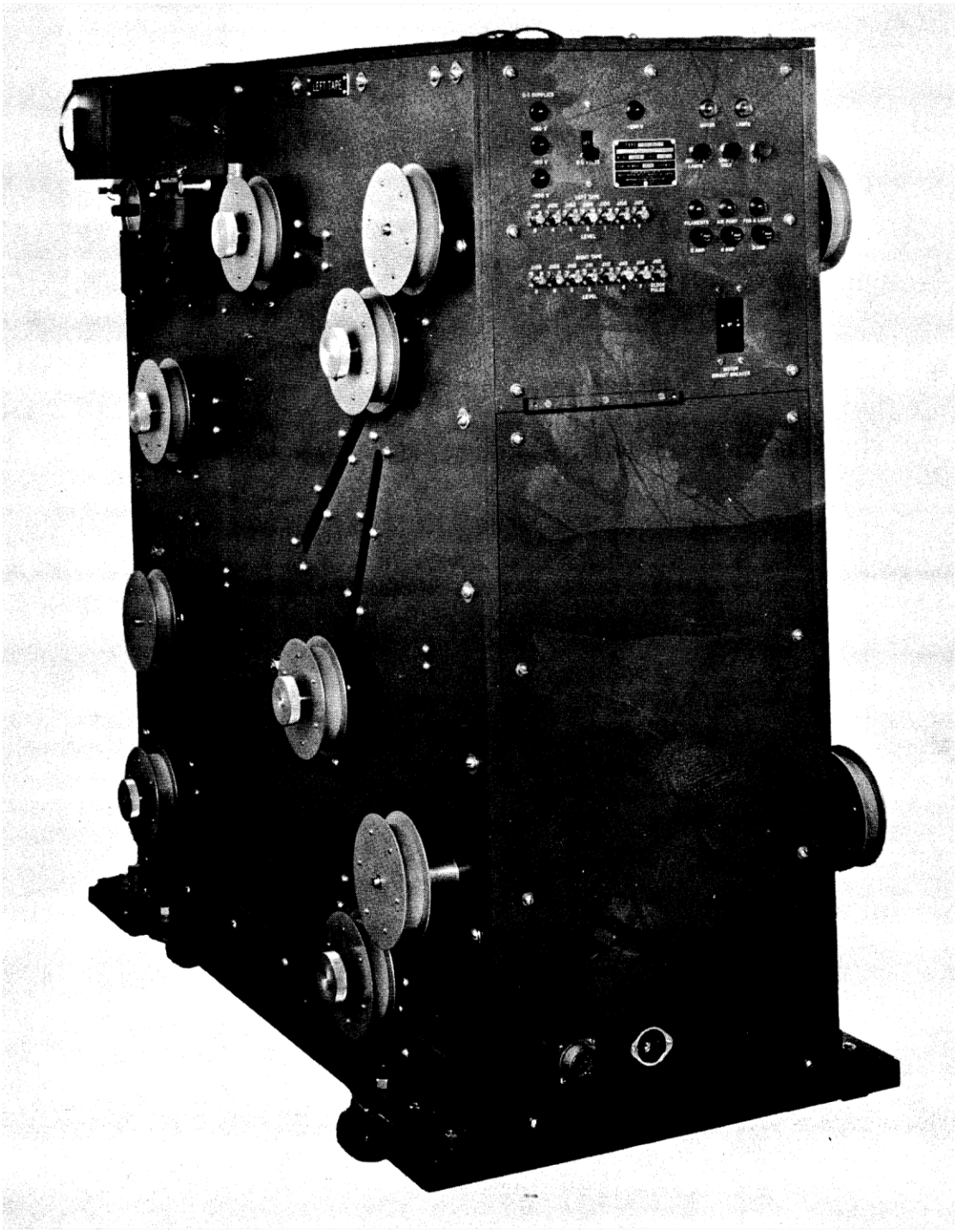
PURPOSE

The Console panel displays on lights the contents of various registers of the Univac File Computer and the states of the circuits, and it permits the operator to alter by means of push buttons the conditions displayed.

It is principally an auxiliary unit for programming and maintenance purposes. Its use is described in tentative specification EF 338.

FEATURES

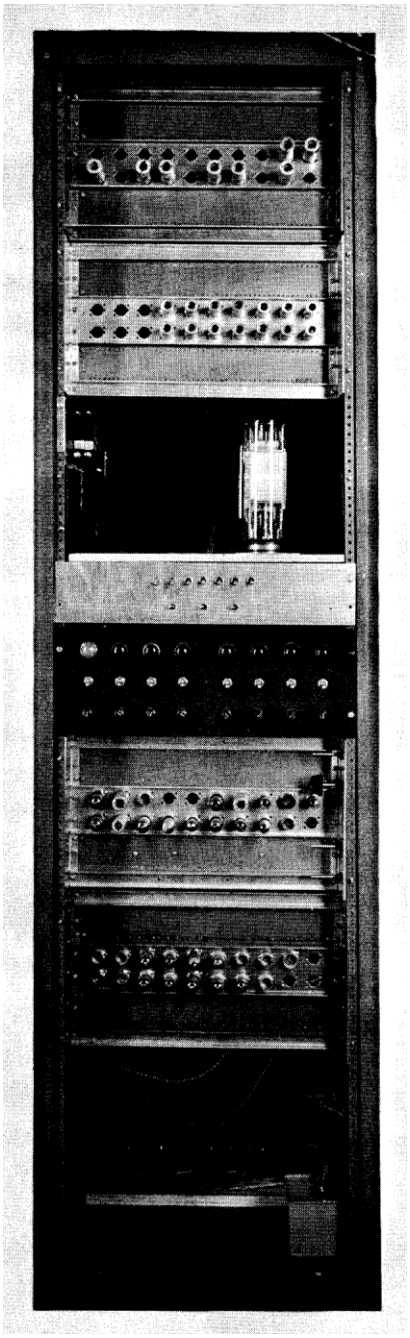
The contents of each register and counter are displayed in a bank of lights. Associated with each light is a push button for changing the bit it represents, and each bank of lights has a push button for entering the changes into the register. By this means, existing internal states of the computer can be displayed, and changes to them made manually on the console can be introduced into the computer. Contents of storage can be displayed and changed similarly.



Dual Tape Reader

DUAL TAPE READER

The Dual Tape Reader was developed as a unit of peripheral equipment for use with the Robin Computers. Two sets of tapes were mounted on the unit, one on each side, and could be read through the Reader's sensing mechanisms. Applications are classified.



Electrostatic Storage Equipment

ELECTROSTATIC STORAGE EQUIPMENT

Electrostatic Storage Equipment, utilizing the Selectron tube, was developed at St. Paul for the Bureau of Ships, U.S. Navy. The Selectron, a special-purpose tube developed by RCA, contained a 16 x 16 matrix whereby storage of a 256-position pattern was made possible. The ERA equipment used one Selectron tube and could store and read out the 256 bits of information. The Selectron tubes were experimental, and when their manufacture was discontinued the electrostatic storage equipment using them was abandoned.

Flying Head Drum — FH400

FLYING HEAD DRUM - FH400

DESCRIPTION

The FH400 magnetic drum storage system is a self-contained unit designed as a replacement for the Model 1 File Computer Double Drum Extension Unit, Type 6922. The FH400 consists of a standard 1123 magnetic drum equipped with 18 flying heads, held away from contact with the drum-surface by pneumatic action. Together with other electronic and mechanical apparatus, it is housed in a cabinet 40 inches wide x 30 inches deep x 48 inches high.

PURPOSE

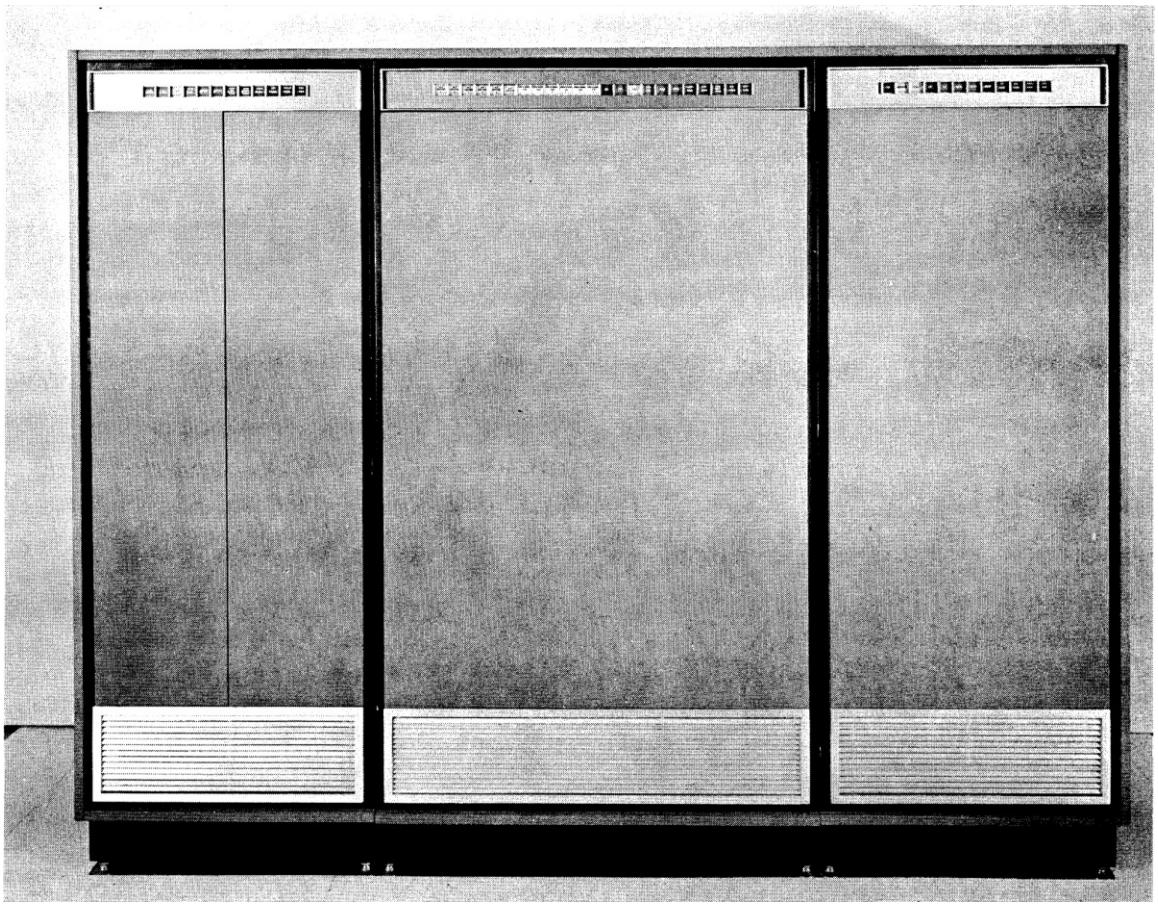
The FH400 operates with the File Computer after certain modifications to the General Storage Control cabinet of the basic computer.

FEATURES

Eighteen flying heads are stationed about the periphery of the drum, which rotates at a nominal speed of 1750 rpm. Each head is capable of writing into, or reading from, 22 individual tracks. The spacing between adjacent channels is 0.120 inch, but interlacing the flying heads in groups of three results in a nominal spacing of 0.040 inch between logically adjacent channels. The FH400 contains 396 channels.

In the FH400, the combination of two factors - decreased head altitude from that of the type 6922 drum and constant head altitude - results in an increase in signal resolution of 20 per cent. Resolution of the FH400 is in the order of 90 per cent. Collectively, the features inherent in flying heads result in a storage system capable of handling successfully the bits that would exist if the recording density of the type 6922 drum were at least doubled. The recording density during the majority of evaluation tests conducted by the Product Design Division was 160 bits per inch. The feasibility of operating at twice this density was established by recording 320 bits per inch.

A comparison of the FH400 with the type 6922 drum unit reveals that one drum (FH400) is capable of storing as much information as the two drums in the 6922.



High-Speed Paper Tape System I

HIGH-SPEED PAPER TAPE SYSTEM I
(Single Channel)

DESCRIPTION

The Univac High-Speed Paper Tape System is a data-handling device developed primarily for use with the Univac File Computer. The standard system is composed of three major units:

1. Paper Tape Read-Punch Unit, Type 4970
2. Translator and Format Control Unit, Type 4870
3. Input and Output Control Unit, Type 4871

The three module units are joined to form a single cabinet 81 inches wide x 27 inches deep x 60 inches high. The system reads information at 240 characters per second and punches data at the rate of 60 characters per second.

PURPOSE

The units may be used in two ways:

1. The complete system may be used with the Univac File Computer System:

   as a punched paper tape output device;
   as a punched paper tape input device;
   as a combined Input-Output System;
   as an off-line paper tape-to-paper tape converter.

2. The Translator and Format Control Unit and the Read-Punch Unit may also be used as an integral part of the Bidirectional Paper-to-Magnetic Tape Converter.

FEATURES

In general, the system possesses:

1. The ability to read input data recorded on 5-, 6-, 7-, or 8-level "Chad" punched paper tape, to translate the paper tape code into Univac 7-level code or any other 5-, 6-, or 7-level code, and to record the data in any desired format in the computer memory.

2. The ability to accept data in Univac 7-level code from the computer, and to translate and punch the data in any desired format on 5-, 6-, or 7-level punched paper tape.

3. The ability to read data recorded on 5-, 6-, 7-, or 8-level punched paper tape, to translate the paper tape code into 5-, 6-, or 7-level code, to arrange the incoming information in any desired format in the 120-character buffer, and to punch the translated information on 5-, 6-, or 7-level paper tape. These off-line operations may be performed independent of central computer operations and control.

Seven special features insure accuracy and facility of data transmission and control of program path.

1. Dual-read tape checking, by which the tape is read twice for comparison purposes.

2. Detecting control punches to facilitate control and selection of format and program path.

3. A unique "position-stepping" feature which performs control and selection of format and program path in the absence of function codes.

4. The deletion of information not required for further processing.

5. The insertion of additional information, such as characters desirable for format control in further processing of information, either for input or output.

6. Checking at various stages of processing.

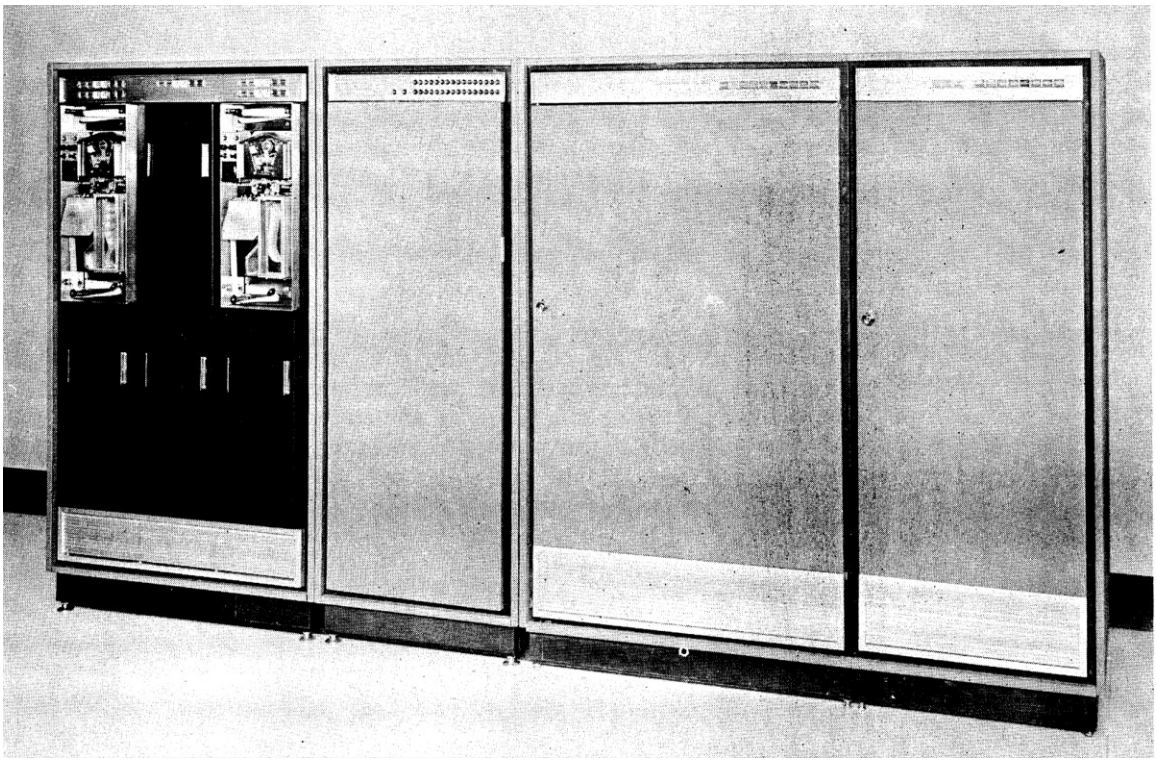
7. Correction features that instruct the system to ignore erroneous input information, such as may occur during tape preparation.

HIGH-SPEED PAPER TAPE SYSTEM II
(Multiple Channel)

DESCRIPTION

The High-Speed Paper Tape System II provides for Teletype input and output between the Univac File Computer Model 1 and several Teletype channels. The system is made up of combinations of the following modular units:

Translator and Format Control - Type 6973
Input-Output Unit - Type 6974
Output Distributor - Type 6965
Input Scanner - Type 6964
Input Control Unit - Type 6971
Output Control Unit - Type 6972
Read-Punch Substation - Type 6966
Cabinet and Power Supply - Type 6967



High-Speed Paper Tape System

As many as 16 substations can be handled by one Input Scanner or one Output Distributor.

By a combination of some of these units, either an input system or an output system can be created. Each type of system connects to a demand station of the File Computer.

For an input system, Read-Punch Substations, each with an associated Input Control Unit, are connected to an Input Scanner. The scanner connects to a Translator and Format Control Unit and thence to the computer through an input-output unit.

For an output system, the computer connects through an input-output unit to an Output Distributor. This distributor is in turn connected to a number of Read-Punch Substations, each associated with an Output Control Unit.

Translation between the Teletype code and the computer code is set up on a plug board, which is in the Translator and Format Control Unit. This unit also provides format and a parity checking of characters. Other codes can be translated by appropriate plug board connections.

Each cabinet and power supply will hold and serve five substations, each with an associated control unit, and by choice of control units, these can all be output units or ail input units, or a mixture of the two.

PUR POSE

This system is designed specifically to operate with the on-line modification of the Model 1 File Computer, and is not to be confused with High-Speed Paper Tape System I which operates with the off-line version.

FEATURES

The Read-Punch Substations are all of one design, with high-speed punches and readers. They provide a tape-loop buffer between the computer and the line. On the Teletype line side, they operate at the Teletype speeds of 60, 75, or 100 wpm, and on the control side; the punch operates at 60 characters per second and the reader at 240 characters per second. Thus, the relatively slow speeds of a number of Teletype lines are effectively matched to the higher speed of handling in the File Computer and its peripheral system.

The outgoing message is punched immediately into paper tape in the Substation as soon as it is established. It is read out from the Substation to the line when the line is ready to receive it, but only after it has been completely punched into the Substation tape. Incoming messages from the Teletype line are immediately punched into the paper tape at the Read-Punch Substation for a line. They are read out to the computer after connection with it is established, but only after the message is completely punched into the paper tape. End-of-message characters are used to control these operations.

The Scanner and Distributor sequentially scan their connected substation controls until transfer of a pending message is completed.

The units of this system are packaged with the Translator and Format Control and Input-Output Units in a common cabinet. The Scanners and the Distributors have their own individual cabinets, and the Substations and Control Units are housed with a common power supply in the Cabinet Unit in combinations of five or fewer. Equipment for this system is described in Engineering Specification PX 1107.

HIGH-SPEED PRINTER AND CONTROL UNIT

DESCRIPTION

The High-Speed Printer is a device that converts information magnetically recorded on tape, in the Univac binary XS-3 code, into a visible printed record. It is composed of four separate units properly interconnected by means of cables.

Tape Reader. The Tape Reader is a modified clutch-operated Uniservo, whose function is to convert information recorded as magnetic spots on magnetic tape into a corresponding pattern of electrical pulses. It reads information recorded on tape in blockette form (120 digit groupings) at a density of from 50 characters per inch (as produced by Unityper H) to128 characters per inch (as produced by the Card-to-Magnetic Tape Converter and the Central Computer). The standard 1,500-foot Univac reel may be used.

Printing Unit. The Printing Unit contains the operator's control panel, the electromechanical printing mechanism, and the paper feeding mechanism.

Memory Unit. The Memory Unit contains a cold cathode gas tube memory having a 120-digit (one blockette) capacity. This unit also contains a removable plug board.

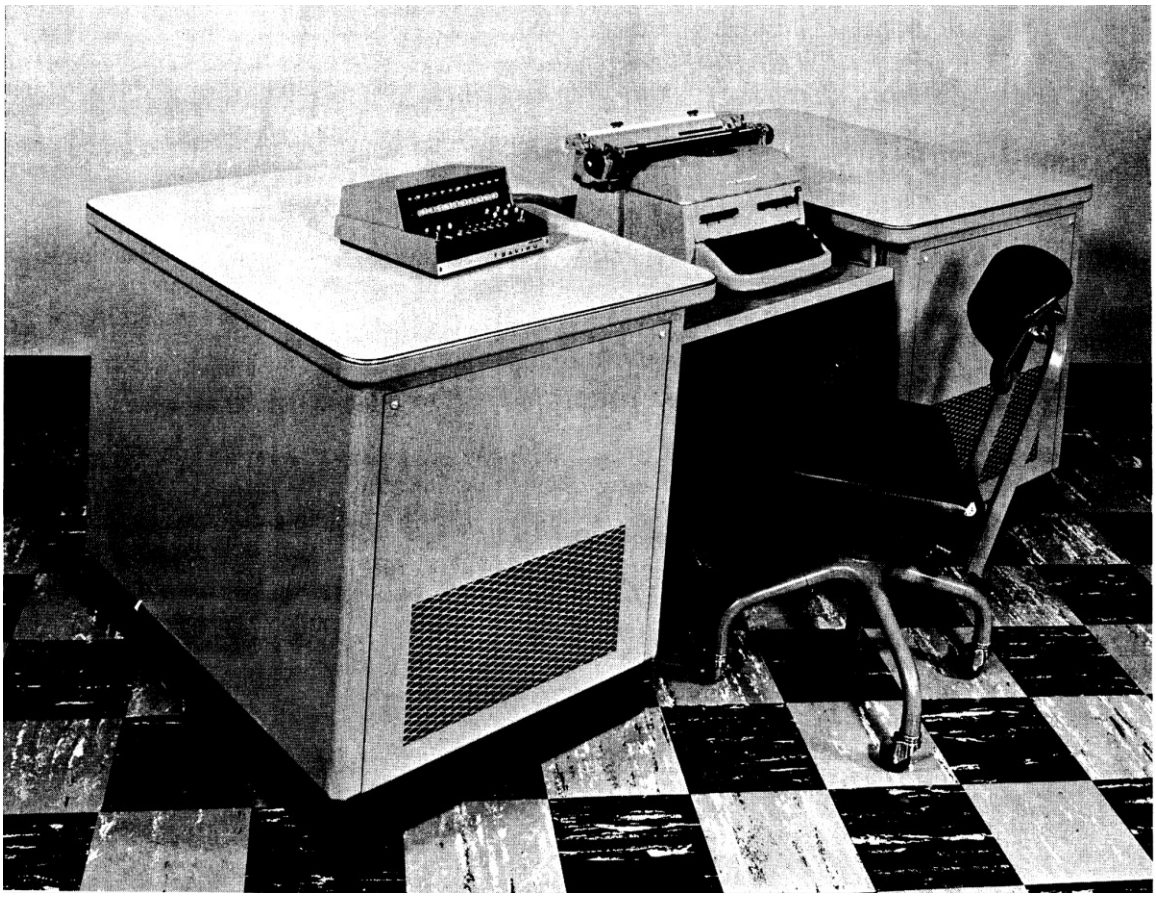
Control Unit. The Control Unit contains the main power supply, and directs the over-all sequence and mode of the printer's operation. It also contains many of the printer's checking circuits.

PURPOSE

By use of the Control Unit, the High-Speed Printer may currently be adapted to online use with the Univac Solid-State Computer, to off-line use with the Univac I, Univac II, and Univac Scientific, and to both on-line and off-line use with the Univac File Computer.

FEATURES

Characters printed per line:	130
Lines printed per minute, optional at:	200, 400, or 600
Horizontal character spacing:	10 per inch
Vertical character spacing:	6 per inch
Number of different printable characters:	51
Printing format control:	Plug board, punched paper loop, and special editing symbols on magnetic tape.



Inquiry Typewriter

INQUIRY TYPEWRITER

DESCRIPTION

The Inquiry Typewriter is an alphanumeric keyboard input-output device for use with the Model 0 and Model I File Computers. It has two components:

Desk - Type 4862

Typewriter Unit - Type 4962

The typewriter can decode 44 characters plus carriage controls from the computer and can encode these and other characters of the Univac code for input to the computer.

PURPOSE

The Inquiry Typewriter is essentially a device for manual entry into and extraction of information from the File Computer and is best adapted to use as an access de-vice for programmers and maintenance personnel.

FEATURES

On input or output, the typewriter will handle up to 10 words of 12 characters each, to or from addresses manually selected one at a time by means of a control panel. The words are read via a one-character translator to and from tracks on the High-Speed Drum.

For normal input the words are read onto the drum for use by the computer. A console input mode can be selected by means of a switch on the console to allow the input words to be used as instructions.

Two output modes are likewise selectable. One allows words to be typed out one at a time as called for by a signal from the appropriate address button on the console. The other mode provides automatic typing of words from a selected address as rapidly as words are supplied to that address by the computer.

The Inquiry Typewriter is described in Final Specifications EF 335.

A more elaborate console, the Supervisory Console, Type 4963, is available as an auxiliary for the Inquiry Typewriter.

INQUIRY TYPEWRITER, MODIFICATION A

DESCRIPTION

The Civil Aeronautic Authority Modification of the Inquiry Typewriter, designated as Modification A, was designed specifically for operation in the Air Traffic Control System using the on-line version of the Model I File Computer. This typewriter consists of the following units:

Desk - Type 6862
Typewriter Unit - Type 4966
Control Keyboard Device Pedestal - Type 4880
Programmer for Inquiry Typewriter Pedestal
Modification A - Type 4967

PURPOSE

This modified inquiry typewriter was designed for a special application: the automatic printing of flight progress trips as they are processed in the computer, with a manual keyboard to allow additions, deletions, and changes.

FEATURES

The typewriter has a 42-character keyboard with special type and characters. The keyboard includes weather symbols. Both upper and lower shifts are used to give two different character sizes for the letters, which are a11 capitals. The platen has a sprocket feed for handling special forms.

A two-color ribbon may be shifted between colors. The carriage shifts and color shifts are coded into output messages for automatic operation of these features. Automatic Read-Out of ten words is provided for.

This unit is described by Preliminary Specifications EF 346.

INQUIRY TYPEWRITER
AIRLINES RESERVATIONS SYSTEM MODIFICATION

DESCRIPTION

The Inquiry Typewriter, Modification B, was developed specifically for use with the Airlines Reservation System. It comprises:

Desk – Type 6862

Typewriter Unit – Type 6962

PURPOSE

Modification B consists of changed circuitry in the desk unit which allows the typewriter to be used with the on-line version of the Model I File Computer in conjunction with the Airlines Reservation System.

FEATURES

The Typewriter features are the same as those included in Type 4962.

INQUIRY TYPEWRITER WITH PAPER TAPE INPUT-OUTPUT

DESCRIPTION

A specially modified Inquiry Typewriter, sometimes referred to as the Ft. Meade version, consists of the following units plus some modification apparatus:

Desk - Type 4862 M
Typewriter Unit - Type 4962
Control Pedestal - Type 4880

The typewriter operates with the Univac File Computer, Model 1. Computer intervention between words entered into the computer is necessary, and control of format is not provided.

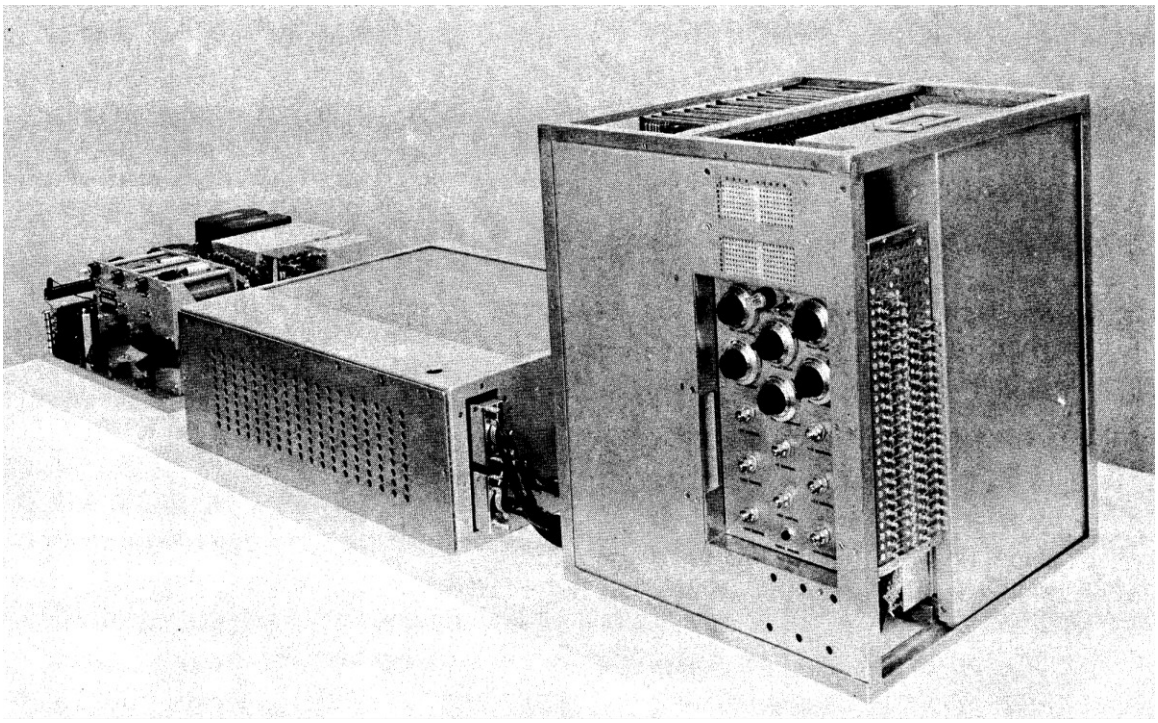
PURPOSE

This typewriter modification was designed as an interim measure to meet a specific application requiring the ability to read and punch 7-level paper tape.

FEATURES

The distinguishing feature of this unit is the 7-level paper tape reader and punch. Information from a paper tape can be read into the computer through a single word address, 12 characters at a time. Output from the computer can be punched into 7-level paper tape.

A compute signal can be given to the computer at the end of an input word. Other programming capabilities are the same as for the Inquiry Typewriter, with manual switch settings for control. The keyboard is the same as that for the standard Inquiry Typewriter.



Magnetic Core Memory System

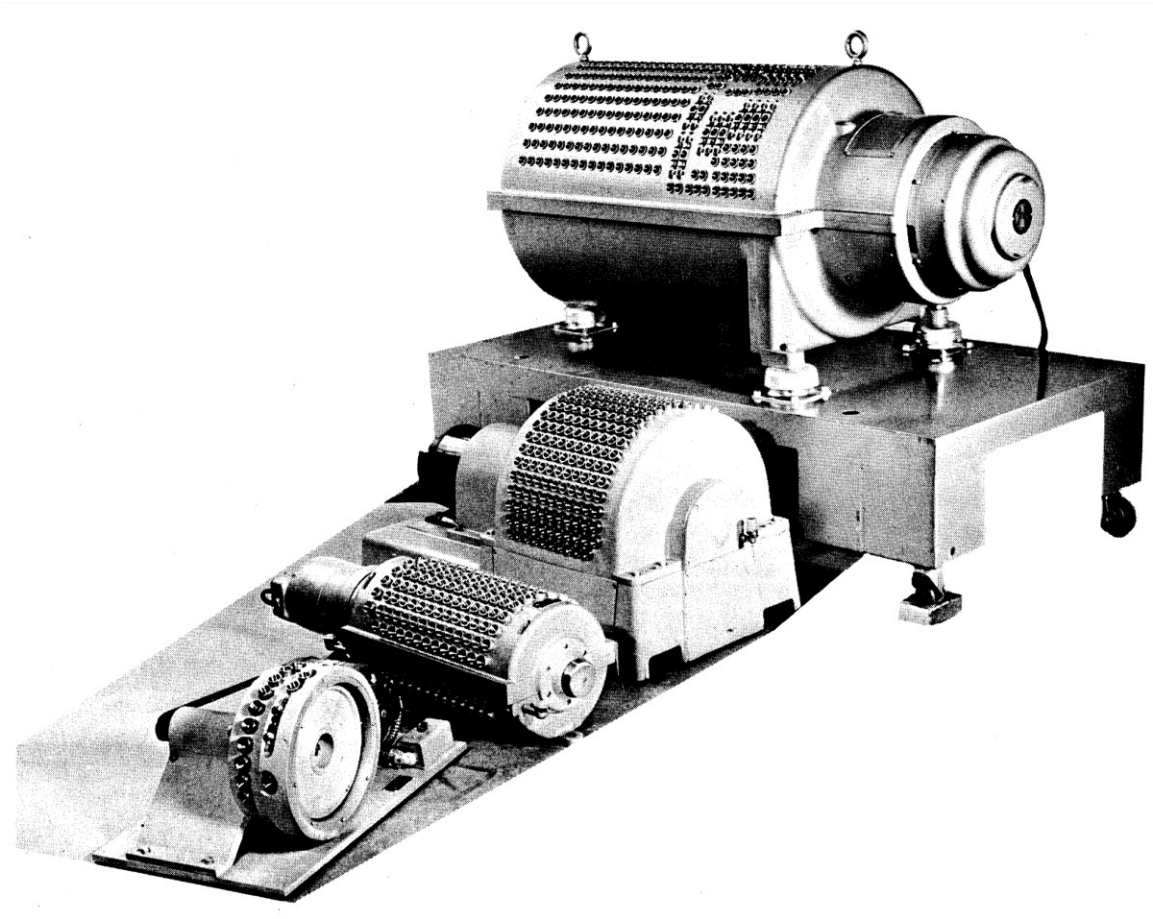
MAGNETIC CORE MEMORY SYSTEM

DESCRIPTION

The Magnetic Core Memory System, developed in I955, was a 64 x 64 array of 36-bit word length complete with input-output circuitry including buffer registers and power supply.

PUR POSE

The Magnetic Core Memory System was developed according to specifications outlined by Philco Corporation for their Transac S-1000 Computer.



Magnetic Drums

MAGNETIC DRUMS

DESCRIPTION

Many types of magnetic, revolving drums have been developed and marketed by ERA and Remington Rand Univac. Specifications for eight major drum developments are listed on the following page, including models numbered 1I00 through 1125. All were of the return-to-zero magnetic recording.

PURPOSE

The 1I23 drum was used in the later production units of Univac Scientific 1103A and the 1105. It was also used with the Univac File Computer as the general storage media. The 1100 drum was used with the ERA 1101 and ERA 1104 computers and later with the prototype ERA 1103 computer. The 1120 drum was used with ERA 1102 computers. The 1107 series of drums was used with the ERA 1103 and the first several units of the 1103A.

READ-WRITE HEADS

Special Read-Write Heads were developed for use with the eight drums numbered 1100 through 1125. Type 206 Magnetic Read-Write Head was used with the ERA Magnetic Recording Drums, Models 11I9, 1123, 1124, and 1125. Two types of heads were developed for Models 1100, 1107, 1110, and 1120. Type 202 Head was used on Model 1100, 1107, and 1110. Type 205 Miniature Head was used on Model 1120. Specifications for Read-Write Heads, according to type, are given following drum specifications.

MAGNETIC DRUM SPECIFICATIONS

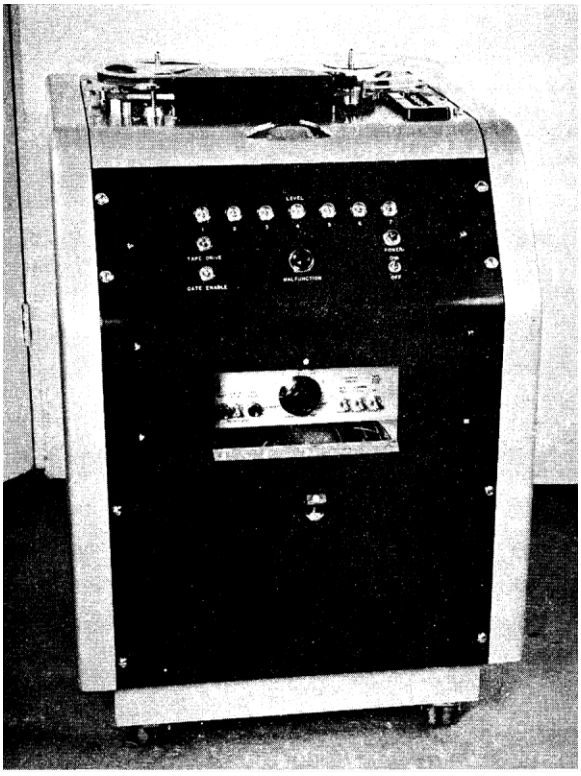
Model	1100	I107	1110	1119	1120	1123	1124	1125
Maximum bit capacity	470,400	733,250	2,552,000	196,000	256,800	1,740,000	297,000	775,000
Number of tracks	224	175	464	180	240	410	270	363
Bits per track (approx.)	2I00	4190	5500	II00	1070	4250	1100	2I25
Maximum access time, millisec.	17	34	5I	5	Variable 11.3-4.5	34	5	17
Tracks per inch (axial)	16	16	I6	25	16	25	25	25
Normal bits per inch (peripheral)	80	80	80	80	80	80	80	80
Drum diameter inches	8.5	17	22	4 3/8	4.375	17	4 3/8	8 I/2
Nominal RPM	3,5I0	1,750	1,190	12,000	Variable 4800-12,000	1,740	12,000	3,525
Motor Horsepower	1/3	3/4	1 1/2	1/5	Variable 1/5 at 7200 rpm	3/4	1/5	1/3
Weight (lbs. approx.)	I25	270	500	55	70	360	70	165
Dimensions by inches	35x10½x11"	36¾x25½x24"	56½x24½x26½"	18½x6½x7"	26½x6½x7"	20x20x31"	7x7x22"	11x12x34"

READ-WRITE HEAD SPECIFICATIONS

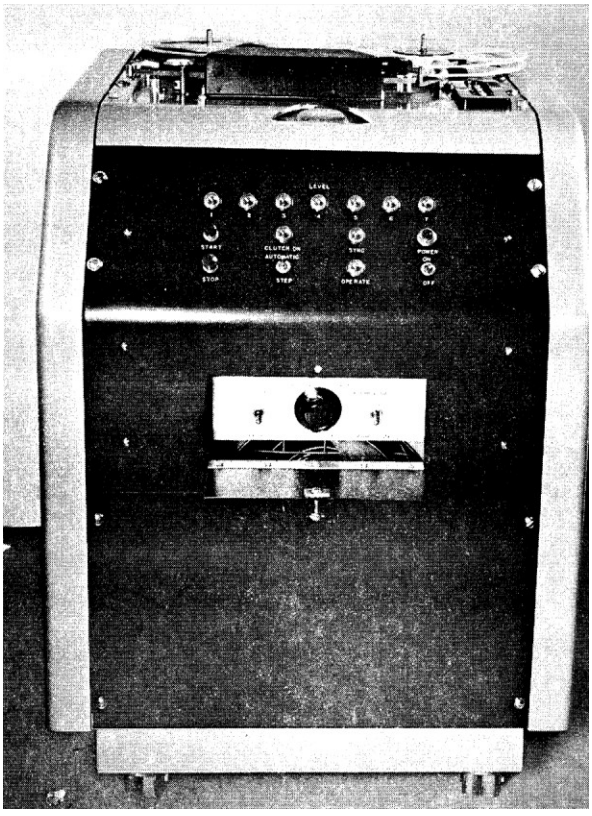
	Type 206	Type 202 and 205
Core Material	Ferrite	Ferrite
Nominal Pulse Density	80	80
Nominal Track Density	25	16
Number of Windings	1	1
Number of Turns (no center top)	60	30
Inductance (approximate)	37 microhenries	10 microhenries
Nominal Writing Currents	225 milliamperes	500 milliamperes
Nominal Writing Voltage	20 volts	15 volts
Nominal Recording Pulse Width	1.0 microsecond	1.5 microseconds
Nominal Head — Drum Spacing	0.002 inch	0.002 inch
*Read Back Signal (Peak to Peak Minimum)	375 millivolts	250 millivolts
Breakdown Voltage (Coil to Case)	70 volts	70 volts

*For Type 206 Read from 20:1 step up transformer terminated in 68k resistance when recorded on an ERA drum with a 1.0 microsecond 13.5 ampere turn pulse and a drum surface speed of 1600 inches per second.

*For Types 202 and 205 Read from 30:1 step up transformer when recorded on ERA drum with 1.5 microsecond I5 ampere turn pulse and a drum speed of 1600 inches per second.



Magnetic Tape Output Recorder



Magnetic Tape Input Reader

MAGNETIC TAPE INPUT
AND OUTPUT EQUIPMENT

DESCRIPTION

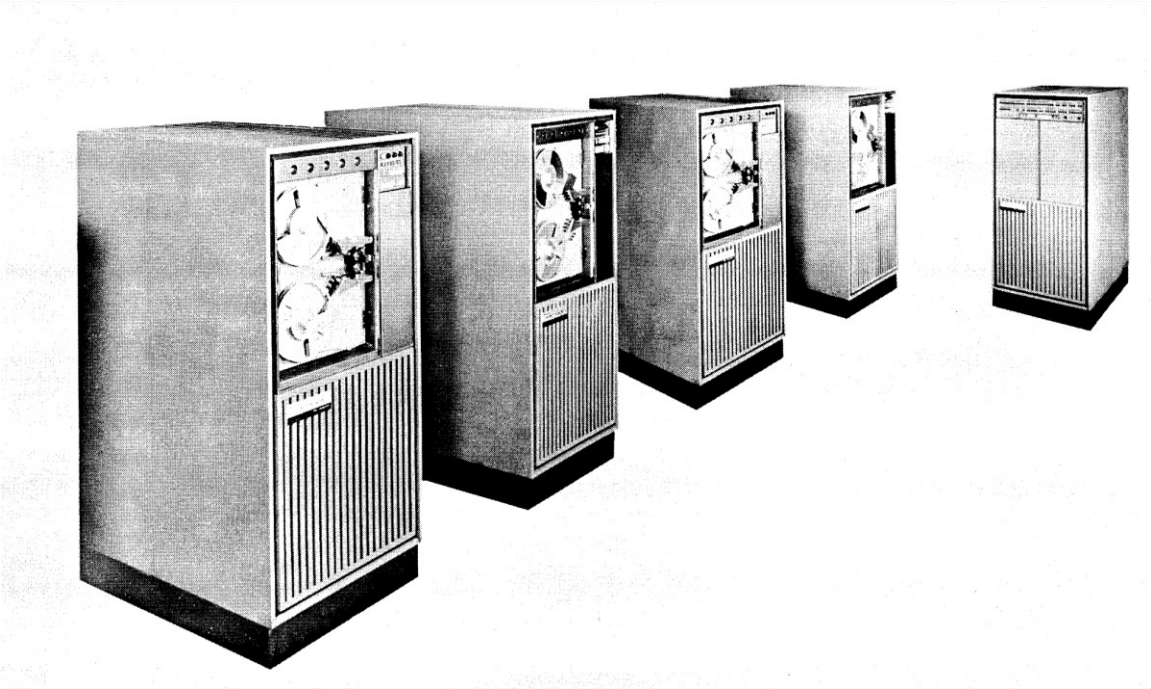
The Magnetic Tape Input and Output Equipment was developed primarily as an adjunct to the Logistics Computer. It consists of two types of units:

Magnetic Tape Output Recorder

Magnetic Tape Input Reader.

PURPOSE

The Magnetic Tape Output Recorder stores characters at the rate of 600 per second. Seven levels can be used including control and parity check pulses. The Magnetic Tape Input Reader plays recorded numerical data from magnetic tape at either 150 or 300 characters per second for entry into the computer. The Reader also will play back the information to a typewriter at eight characters per second or to paper tape equipment at speeds compatible with the handling of paper tape.



Magnetic Tape Sorting Collator

MAGNETIC TAPE SORTING COLLATOR

DESCRIPTION

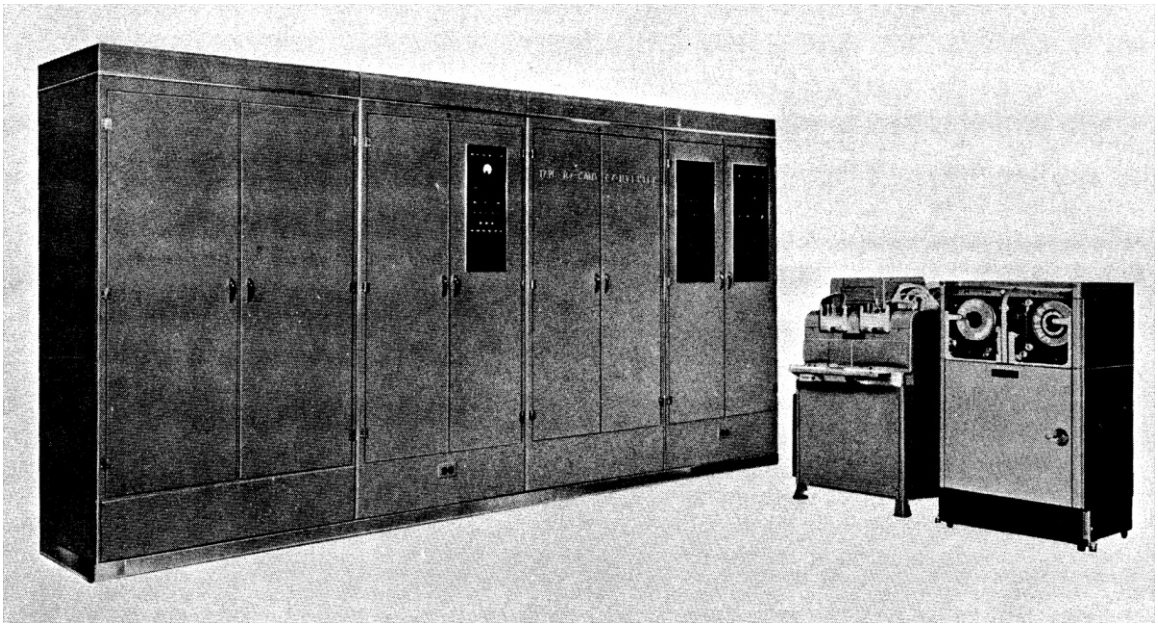
The Magnetic Tape Sorting Collator is a special-purpose tape processing system developed for use with the Univac File Computer. It is a five-cabinet assembly consisting of four Magnetic Tape Handlers and one Sort-Collate Unit. The tape units function both as the input-output and the memory elements of the system. Each is identical, and therefore interchangeable, with the magnetic tape units used as input-output equipment for the File Computer. The Control Unit governs the operation of the tape units, causing them to read, write, rewind, or perform other operations in accordance with the program being executed. The Control Unit also acts as a connective link between the tape unit buffers so that buffer-to-buffer transmissions can occur between the tape units. Although the Sorting Collator does not compute, the Control Unit can perform comparisons and make decisions, based on the results of each comparison, regarding the transfer of data between tape units.

PURPOSE

The UFC Sorting Collator can perform a wide variety of checking, sorting, merging, extracting, and collating operations. It can perform independently of any central computer, handling all required off-line magnetic tape data processing that does not involve calculations. When connected to the File Computer, however, it can perform not only its off-line functions of checking, sorting, merging, extracting, and collating, but it can also interrupt its own activity to perform plug board-defined operations of merging, extracting, and file reproduction, and can communicate with the central computer in a pseudo on-line mode of operation.

FEATURES

Each of the four tape units has an input, output, intermediate storage or not-used function in each program executed by the system. Each tape unit also performs, via its buffer, a temporary memory function related to the data it supplies as input or receives as output. This memory function permits comparisons to be made between successive units of input data and the unit of data last processed by the system.



Magnetic Tape-to-Card Converter

MAGNETIC TAPE-TO-CARD CONVERTER
(80 COLUMN)

DESCRIPTION

The Tape-to-Card Converter is a data-processing *sy*stem that transfers information from Univac magnetic tape to 80-column punched cards. The system is composed of three major units:

1. Tape Reader Unit
2. Control Unit
3. Card Punch Unit

Tape-recorded information is supplied to the Converter on standard Univac magnetic tape, recorded in blocks of 720 characters subdivided into blockettes of I20 characters. Spacing between blockettes is 1/10 inch, and recorded pulse density is 128 characters/inch.

PURPOSE

The system is capable of producing punched cards at a rate of 120 cards per minute. The resulting punched cards store up to 80 characters from each 120-character blockette. Characters are selected and assigned to card columns by plug board wiring. Each character is stored as a one-hole or two-hole punched code in a card column.

FEATURES

1. Tape Reader - The tape reader reads consecutive characters from the tape and transmits the characters to the input section.

2. 120 Distributor - Each time a character is read, a counting circuit in the 120-distributor is advanced; thus, the 120-distributor maintains a count of the number of characters read from each tape blockette. The 120 outputs of this section, each representing the reading of one of the 120 characters of a blockette, are available at 120 hubs on the left side of the plug board.

3. Blank Column Drive - Any two unused 120-distributor outputs may be wired to the blank column drive hubs to provide special blank column characters for the input section. Eighty outputs are available at the right side of the plug board, each representing one blank card column.

4. Input - Each time a tape character is read, the input section checks the character, using the Univac redundant-check system. The input section also receives the "blank" characters from the blank column drive section.

5. Coincidence Detector - Each time a tape blockette is read, the coincidence detector receives 80 consecutive signals via plugboard wiring. Some of these corne from the 120-distributor and the remainder from the blank column drive section. Each of these signals operates the coincidence detector so that one character, either a tape character or a blank column character, is transmitted from the input section to storage.

6. Storage - The storage section receives the tape and blank column characters and stores these temporarily. Information for punching six cards may be present in storage at one time.

7. Translator - The translator section receives information from storage and distributes this information for card punching and checking. The information for each card passes through this section twice; once to the card punch for card punching and once to the checking section for checking the card after it is punched.

8. Card Punch - The card punch processes cards in successive card cycles, each lasting about half a second. During each cycle, one new card is punched with information obtained from the translator, and one previously punched card is read and the information is transmitted to the checking section.

9. Checking - The checking section compares the information read from each card with the corresponding information received from storage via the translator section. If errors are detected, the equipment rejects the incorrect cards, stops, and indicates an error stop. The tape is then backed up so that additional attempts to produce correct cards can be made.

MAGNETIC TAPE UNIT - TYPE 815B1

DESCRIPTION

The Magnetic Tape Unit, Type 815B1, is an input-output device developed primarily for use as an integral part of the Bidirectional Paper-to-Magnetic Tape Converter (BPTM-7) or MTM Transrecorder. It is a single unit 35 inches wide x 26 inches deep x 60 inches high that reads or records at the rate of 66 inches or approximately 8,000 characters per second.

PURPOSE

In general the Magnetic Tape Unit possesses:

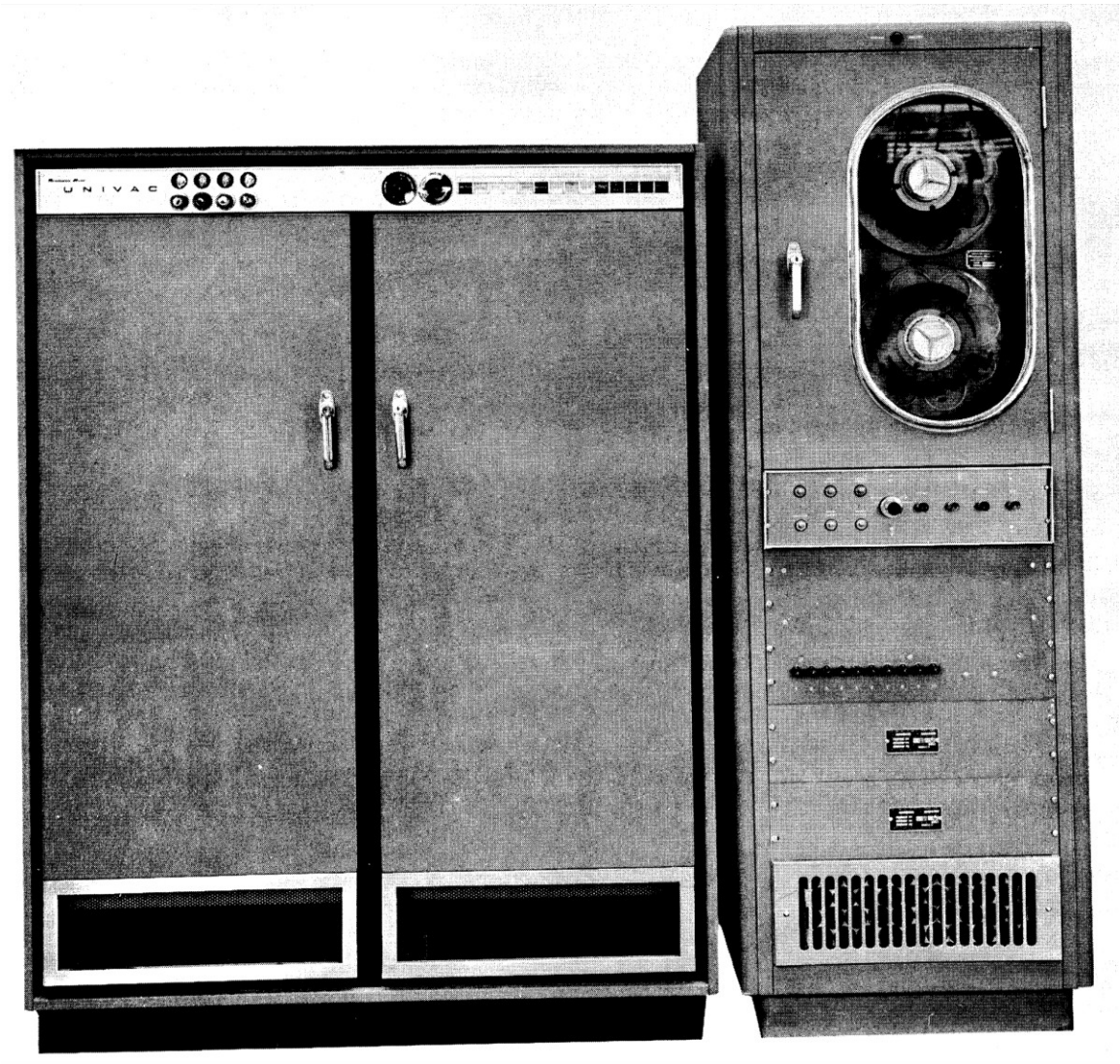
1. The facility to read binary information recorded on metallic or plastic magnetic tape and provide an output representing the interpreted information.

2. The equipment to accept binary information and record this information on metallic or plastic magnetic tape.

In either of the above operations, the Magnetic Tape Unit is controlled by the de-vice that provides the input information to the Magnetic Tape Unit and/or accepts the output information of the Magnetic Tape Unit.

FEATURES

The most unique features of the MTU are its instantaneous reversing speed for checking purposes and its timing (tape density), which is controlled by the external control unit.



Magnetic-to-Paper Tape Converter (MTP-5)

MAGNETIC-TO-PAPER TAPE CONVERTER (MTP-5)

DESCRIPTION

The Magnetic-to-Paper Tape (MTP-5) Converter is a system for reading magnetic tape and punching information in paper tape by use of a 5-channel code. The system provides a code translation, limited character insertion for format control, and limited deletion facilities so that the resulting perforated tape can be used on a Teletype transmitter-receiver hookup to produce perforated tape in a distant location, or a printed page, or both.

PURPOSE

The converter is used primarily as a means of producing communications-coded perforated tape for transmission over Teletype equipment when magnetic tape output from the Univac I or Univac II is available. However, it may also be used to convert magnetic tape outputs from a Univac File Computer equipped with compatible tape units or from the Univac Scientific to communications-coded perforated tape.

FEATURES

Conversion Control Unit

Core Buffer
Input Register Translator
Decoder
Encoder
Punch Register

Special Converter Function-Code Detectors and Activators Counters

SPECIFICATIONS

Power Requirements	30 amp. 115 volt a-c
Physical Characteristics	Conversion Control Unit: 46" w x 27" d x 60" h Wt. 1225 lbs. MTU: 34" w x 24" d x 60" h Wt. 775 lbs.

Checking Features	Parity Check, Blockette Count
Number and Type of Registers	One 1-character input register One 1-character punch register
Buffer	One 120-character core buffer
Program Controls Available	Operators' panel and pin board Operators' dial
Pin board or Plug board	Pin board internally wired
Tape	Plastic or metal tape
Method of Recording	A character on the magnetic tape must have been recorded in the staggered 8-bit standard positioning.
Pulse Densities	40-150 characters/inch
Operation Rates	60 inches/second
Bad Spot Detection	Photoelectric mechanism for detecting holes punched in tapes
Tape Lengths	1500 feet metal 2400 feet plastic
Levels (Channels)	8 level
Type Reader and/or Punch	Teletype Model BRPE-2
Operating Rates	60 frames/second
Paper Tape Characteristics	Standard or parchment 5 channel tape 11/16 inch wide
Program Controls	Delete, stop conversion, start conversion, end of data, illegal code, format character insertion

Checking Features	Parity Check, Blockette Count

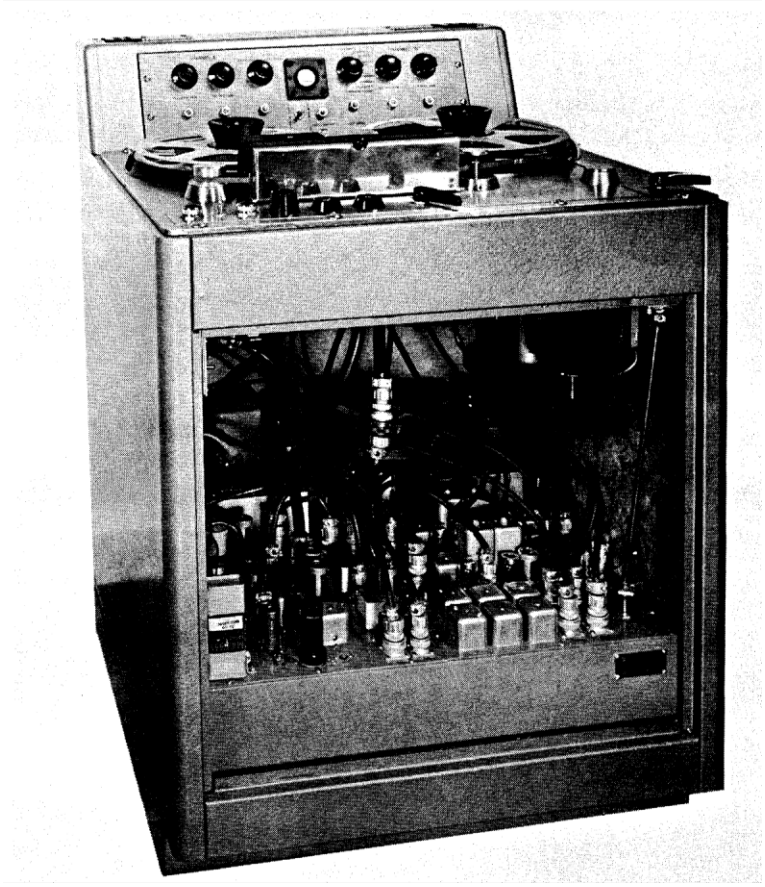
MAGNETOSTATIC READING EQUIPMENT

DESCRIPTION

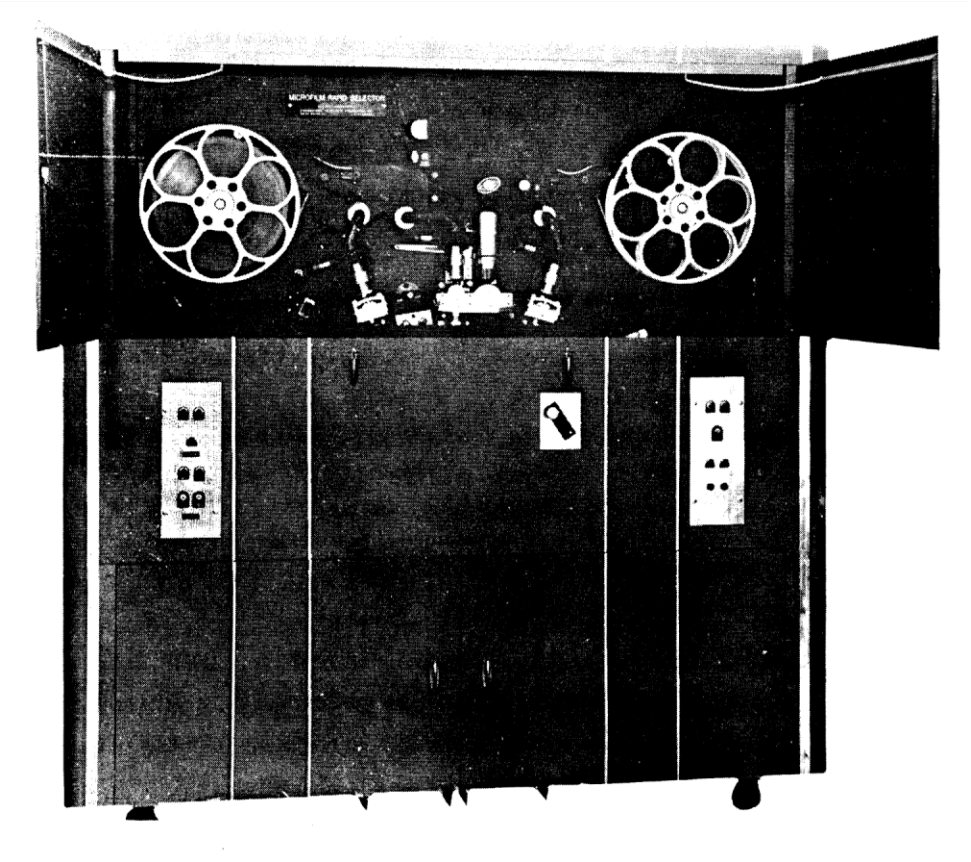
The Magnetostatic Reading Equipment, developed in 1950, was designed for reading data recorded on magnetic tape when there is little or no motion between the tape and the reading element. By means of a static reading head, the device scans magnetic tape at slow speed, or it reads an element of a stationary tape. It operates on the flux-gate or saturable reactor principle to detect the direction and degree of magnetization of the element of tape under the head, thereby enabling recognition of a recorded bit of information.

PURPOSE

The device is useful for such purposes as low-speed reading of data which has been recorded previously at high speed. It may also be used to read low frequency analog data at a reasonable speed.



Magnetostatic Reading Equipment



Microfilm Rapid Selector

MICROFILM RAPID SELECTOR

DESCRIPTION

The Microfilm Rapid Selector copies selected frames from a reel of film onto another of unexposed film for later development. Selection is by means of codes recorded on each frame of the film record. The negative, when developed, provides a means for projecting and examining only the selected portions of the film record.

The equipment comprises the Microfilm Selector itself, a Card Punch for coding interrogation cards to dente the selections desired, and a Master Camera to prepare the film record with appropriate coding for subsequent selection of frames.

The film record is on 35 millimeter film. One half of each frame contains a reduced photograph of an abstract; the other half contains, in binary coding, six numbers of seven digits each by means of which the abstract is classified in as many as six categories.

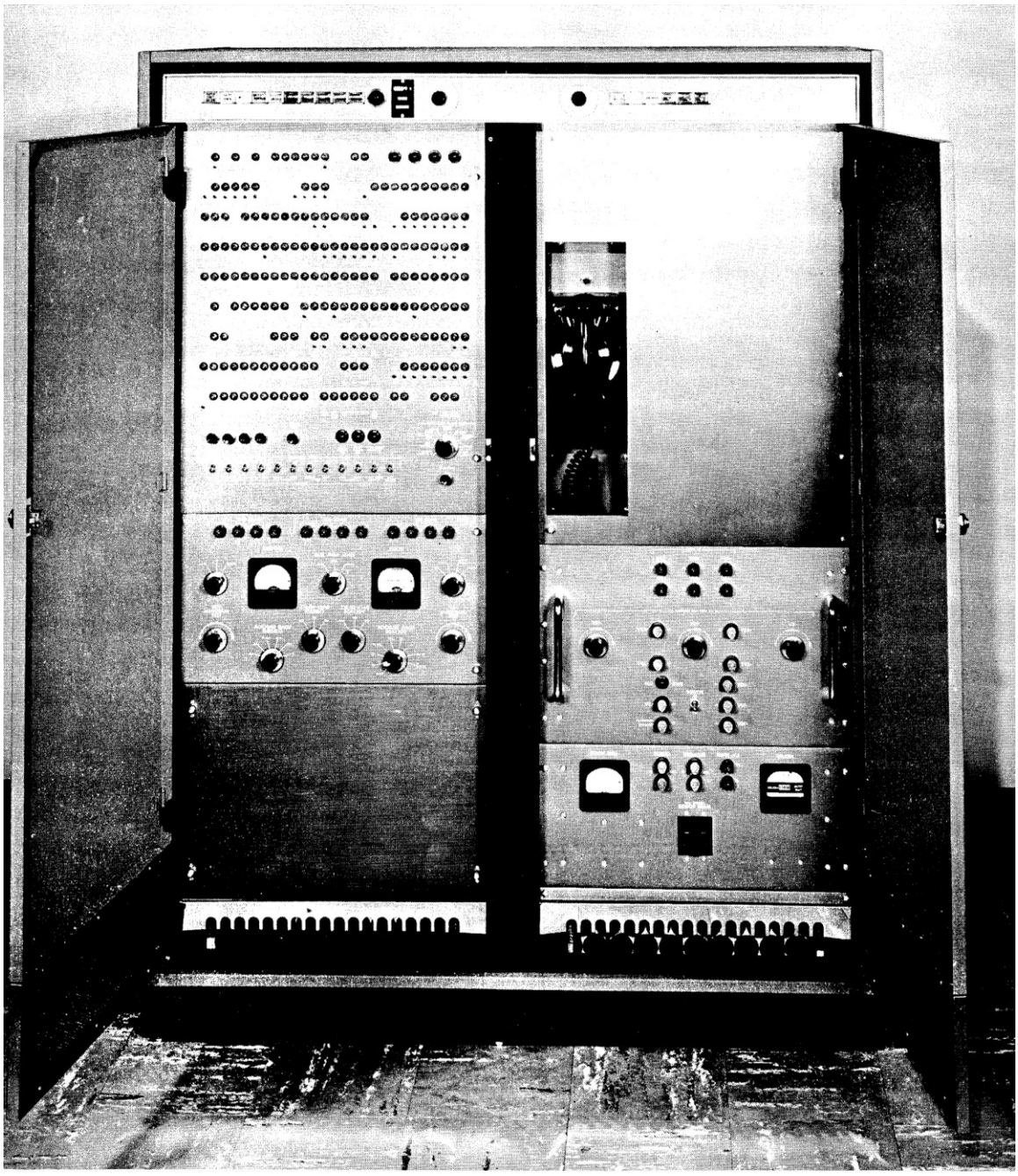
The machine accommodates 2,000-foot reels, which can be changed to allow access to an unlimited file of abstracts or other items.

PURPOSE

The original. intent of this design was to provide a means of selecting abstracts on a subject from a large file.

FEATURES

The equipment scans the film record at 180 frames per second during search. When a frame is encountered which is classified under the category being sought, as indicated by the interrogation card, the film speed is slowed to 30 frames per second, and the selected frame is exposed to a negative film at the proper instant. The negative film is advanced one frame alter each such exposure, and in the end pro-vides a sequence of frames of the selected material. One full reel of record can be searched in 6 2/3 minutes minimum; this time is lengthened in proportion to the number of frames copied.



MTM Transrecorder

MTM TRANSRECORDER

DESCRIPTION

The MTM Transrecorder is a digital, magnetic recording and reproducing device for reading from magnetic tape and recording onto other magnetic tape. Two Transrecorders connected by a communications facility comprise a system for the accurate remote reproduction of digital data on magnetic tape as derived from a Univac magnetic tape source.

PURPOSE

The communication of data by a pair of Transrecorders is a programmed process designed to minimize manual operations. Except for loading and unloading reels of data tape, the operator is required only to turn the equipment on and off, establish communication with the remote station, and correct any malfunction of the equipment which is beyond the error-correction capabilities of the Transrecorder's logical functions.

FEATURES

Power Requirements	Control Unit: 250 watts, without modem 400 watts, with internal modem Magnetic Tape Unit: 2.75 KW
Physical Characteristics	Control Unit: 45½"w x 10 5/8"h x 25½"d; Magnetic Tape Unit: 34¾ "w x 60 5/8"h x 25¾"d; 800 lbs. wt. Modem Unit is contained in Control Unit, or may be furnished separately by public communication facility.
Operational Mode	Transfer between tape and buffer is bit parallel, character serial; transfer over the communication line is bit serial.
Checking Features	Parity check by character when read from or written on tape and when data enters or leaves buffer. Parity check on each into level of a blockette. Character count by blockette

Buffer Register	One 120-character buffer register in both transmitting and receiving units; 30 ms transfer rate for each 120 characters.	
Program Controls	Operator can program to handle block groups of 1,2,4,8, or 16 blocks long.	
Operation Mode	Block and blockette mode (regular High-Speed Printer format).	
Tape	Plastic and metal.	
Tape Characteristics	½" wide. Either 1½ or 1 mil.	
Start/Stop and Reversal Time	5 to 8 ms without air lubricated guides 3½ to 5 ms with air lubricated guides.	
Pulse Densities	120 ppi ± 20%	
Spacing	Block Spacing	Blockette Spacing
Input tape	2.4 (± 0.36) in.	1 inch min.
Output tape	2.4 (± 0.24) in.	1 inch (+0.5-0).
End of Tape Detection	5 lineal feet of blank tape.	
Tape	1500' metallic, 2400' plastic.	
Operating Rates	66 inches/second with no pattern sensitivity. 100 inches/second with possibility of pattern sensitivity.	
Compatibility	Compatible with any equipment using Univac High-Speed Printer format.	

MULTIPLE ADAPTER POWER SUPPLY

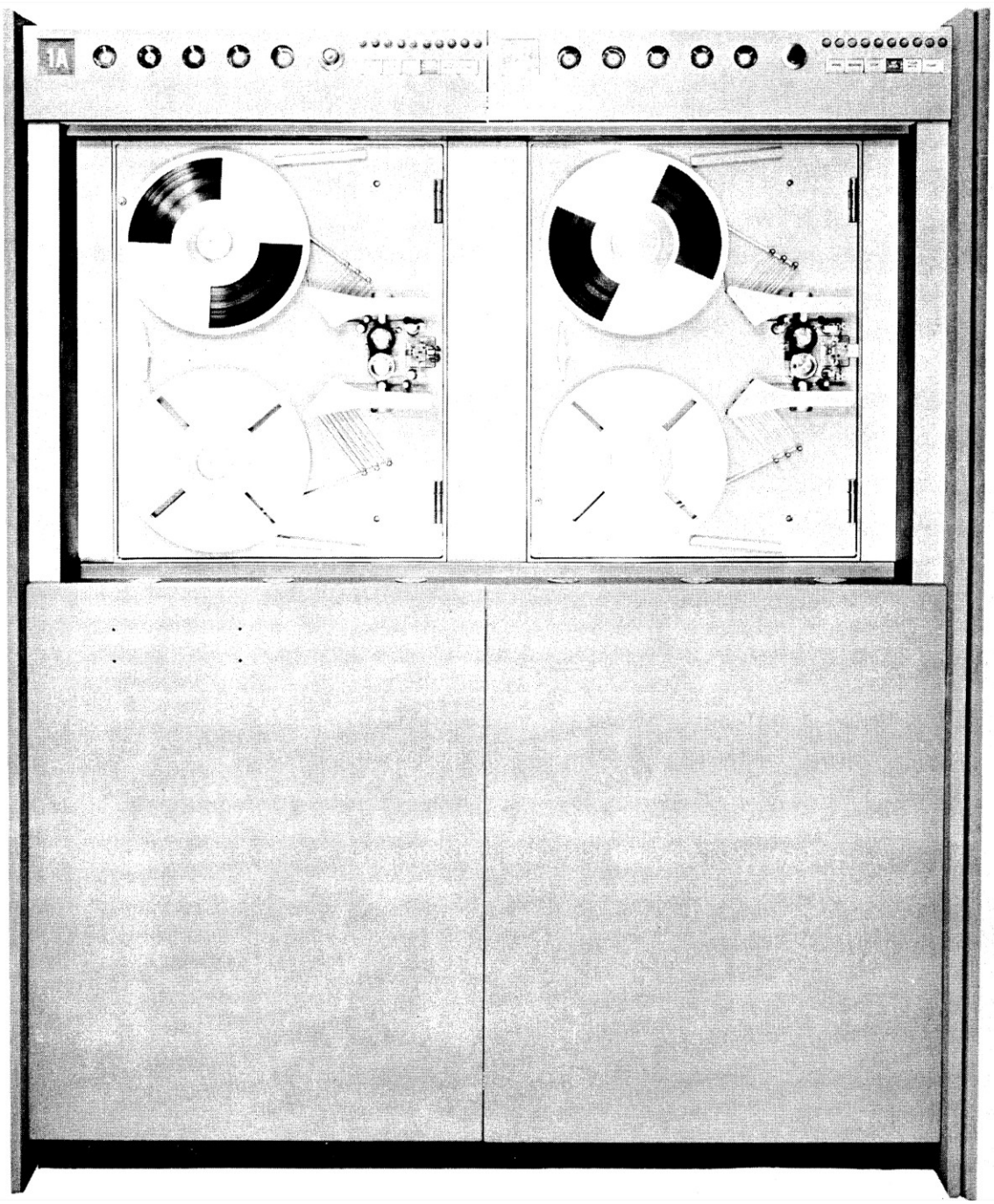
DESCRIPTION

The Multiple Adapter Power Supply, Type 4834, supplies power for keyboard devices in the File Computer peripheral equipment when more than two such devices are used in a single system. The power for one or two can be derived from the File Computer itself.

In addition to the original design, two modifications of this unit have been produced, designated as Type 4834M.

FEATURES

One of the modified types is a power supply for a magnetic tape testing device, and the other modified type is a power supply for the File Computer Chassis Tester.



Multiple Tape Handler and Control Unit

MULTIPLE TAPE HANDLER AND CONTROL UNIT

DESCRIPTION

The Multiple Tape Handler and Control Unit was developed as a controller for Potter tape units. The Multiple Tape Handler Control Unit, Type 4883, is to be used with the Multiple Tape Handler, Type 4983.

PURPOSE

The Tape Controller controls from one to four Potter Tape Handlers. A later model was planned for control of one to four Uniservo II's, but this model was never fully developed. The system can operate under the control of three external devices: (1) Univac File Computer, (2) UFC Sort-Collate Unit, or (3) a UFC High-Speed Printer.

FEATURES

Demand Station. Permits off-line execution of all instructions so that the multi-handler system may be time-shared with other UFC input-output systems.

Buffer. A one-blockette buffer is incorporated in the unit.

Sequence Control Section. This section responds to each input instruction by generating a corresponding series of instructions for the desired operation.

Comparator. This section is used in search operations for comparing tape blockettes with the buffer-stored identifier blockette, producing outputs indicating whether the tape blockette is equal to, greater than, or less than the identifier.

Instructions. Eighteen programmable instructions are available together with bad-spot rejection, terminal condition processing, and error detection.

Error Detection:

1. Character count on every blockette entering or leaving the buffer.
2. Parity check on every character entering or leaving the buffer.

3. Character count and parity checks on every blockette passing the read/ write head during any rewind operating with or without interlock.

Power Requirements.	9 kw 208-240 vac, 1 phase
Plastic Tape Only.	0.5 inch wide, 1.5 mil thick, 2400 feet long, up to 10½ inch reel
Recording Method.	Magnetic return to zero.
Pulse Density.	139 characters per inch
Tape Speed.	75 inches/second
Character Transfer Rate.	10.4 kc_
Interblockette Spacing.	½ inch 1 inch
Interblock Spacing	½ inch 2¼ inch
End of Tape Sensing.	Optical through clear leader
Bad Spot Detection.	Photoelectric

NUMEROSCOPE PRINTER

DESCRIPTION

The Numeroscope Printer, developed in 1949 and now obsolete, was a magnetic output device for high-speed computing machines. It provided a method for selecting a desired character from character-forming signals magnetically recorded on the periphery of a rapidly rotating drum. An electronic circuit was designed to provide a tie-in between the output translator of a computer and the input to the printer.

PURPOSE

The printer was designed to provide an output method that would not impose limitations on the speed of a computer's operation.

FEATURES

Printing rate – 30 lines a second with provision for increase to 100 lines per second

Characters per line – 50 with provision for increase to 100

Characters available – 40, to be readily capable of change.

OSCILLOSCOPE PRINTER PLOTTER

DESCRIPTION

The Model 3061 Oscilloscope Printer Plotter, an adaptation of the Numeroscope Printer, was a portable unit to present the results of digital computations as graphs, animated drawings, words and numbers. The display dot may be positioned in up to 65,536 different locations on a 5-inch cathode ray tube screen. The display dot location is on a 256 x 256 position roster. A choice of four different locations for the origin of the x and y coordinates is controlled by a Display Mode Switch.

PURPOSE

This Plotter was intended for use with the 1103A Univac Scientific Computer as an output device.

FEATURES

The Printer-Plotter was available with a 35 millimeter automatic camera or a manually operated Polaroid-Land camera for permanent, reproducible record. When not in use, the camera was easily removable. The maximum recording speed was 40,000 spots per second.

PAPER-TO-MAGNETIC TAPE CONVERTER, BIDIRECTIONAL (BPTM-7)

DESCRIPTION

The BPTM-7 is a data-handling device composed of four major units:

1. Read-Punch Unit
2. Translation and Format Control Unit
3. Magnetic Tape Control Unit
4. Magnetic Tape Unit

The three module cabinets for units 1, 2, and 3 listed above are joined to form a single unit 81 inches wide x 27 inches deep x 60 inches high. The Magnetic Tape Unit is a separate unit 35" wide x 26" deep x 60" high. The Converter reads information from paper tape at the rate of 240 characters per second and punches data into paper tape at 60 characters per second. Units of the BPTM-7 may be used in two ways:

1. The complete converter system may be used:

   as a punched paper tape-to-magnetic tape converter;
   as a magnetic tape-to-punched paper tape converter;
   as a paper tape-to-paper tape converter.

2. The Translator and Format Control Unit and the Read-Punch Unit may also be used as an integral part of the High-Speed Paper Tape System.

PUR POSE

The BPTM-7 was developed for use with Univac I and II, Univac Scientific, or Univac File Computer.

FEATURES

In general, the Converter possesses:

1. The equipment to read data recorded on 5-, 6-, 7-, or 8-level "chad" punched paper tape, to translate the paper tape code into Univac 7-level code or any other 5-, 6-, or 7-level code, and to record the data in any desired format on either metallic or plastic magnetic tape.

2. The facility to read data recorded on 5-, 6-, or 7-level metallic or plastic magnetic tape and to translate and punch this data in any desired format on 5-, 6-, or 7-level punched paper tape.

3. The mechanism to read data recorded on 5-, 6-, 7-, or 8-level punched paper, to translate the paper tape code in 5-, 6-, or 7-level code, to arrange the incoming information in any desired format in the 120-character buffer, and to punch the translated information onto 5-, 6-, or 7-level paper tape.

Seven special features ensure accuracy and efficiency of data transmission and control of program path.

1. Dual-read tape checking by which the paper tape is read twice for comparison purposes.

2. Detecting control codes to facilitate control and selection of format and program path.

3. Performing control and selection of format and program path in the absence of function codes by a unique "position-stepping" feature.

4. Deleting information not required for further processing.

5. Inserting additional information, such as characters desirable for format control in further processing of information.

6. Checking at various stages of processing.

7. Correction features that instruct the converter to ignore erroneous input information, such as may occur during tape preparation.

PERFORATED-TO-MAGNETIC TAPE CONVERTER (PTM-5)

DESCRIPTION

The Perforated-to-Magnetic Tape (PTM-5) Converter is a device for reading perforated five-channel communications-coded paper tape and for recording the information on either plastic or metallic magnetic tape. The PTM-5 Converter pro-vides code translation, limited format control, and limited editing performance so that the resulting magnetic tape can be used in the various Univac Systems.

The PTM-5 Converter consists of the following basic components:

Tape Reader. Ferranti Mark H which reads five-channel "chad" perforated tape.

Translator. A two-part component: (1) a Decoder, which examines the input from the tape reader and produces an output on one of 64 output lines, and (2) an encoder, which has 63 input lines corresponding to the 63 permissible Univac codes.

Function Code Detectors. Specialized devices which sample the Decoder outputs, looking for specific outputs or sequences of outputs. When they find what they are looking for, a Special Converter Function is initiated.

Special Converter Function Controls. The means for providing limited format control and limited editing of the input messages.

Holding Registers. Regulation devices which permit the use of multiple character function codes.

Core Buffer. 120-character core buffer, which receives and holds information to be recorded.

Magnetic Tape Unit. The recording unit that transcribes blockettes of 120 characters on magnetic tape.

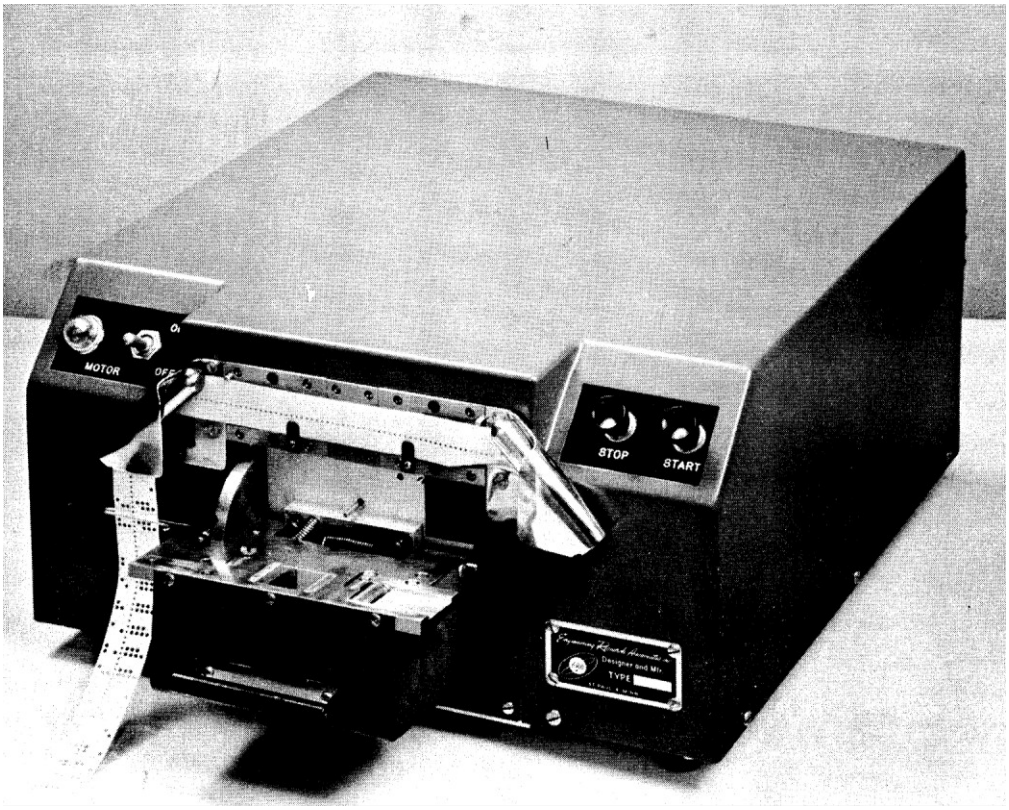
FEATURES

Power Requirements	30 amp. 115 volts a-c.
Physical Characteristics	Control unit - 46" w x 27" d x 60" h -- 1225 lbs. MTU -- 34" w x 24" d x 60" h -- 775 lbs. 8' x 8' floor area.

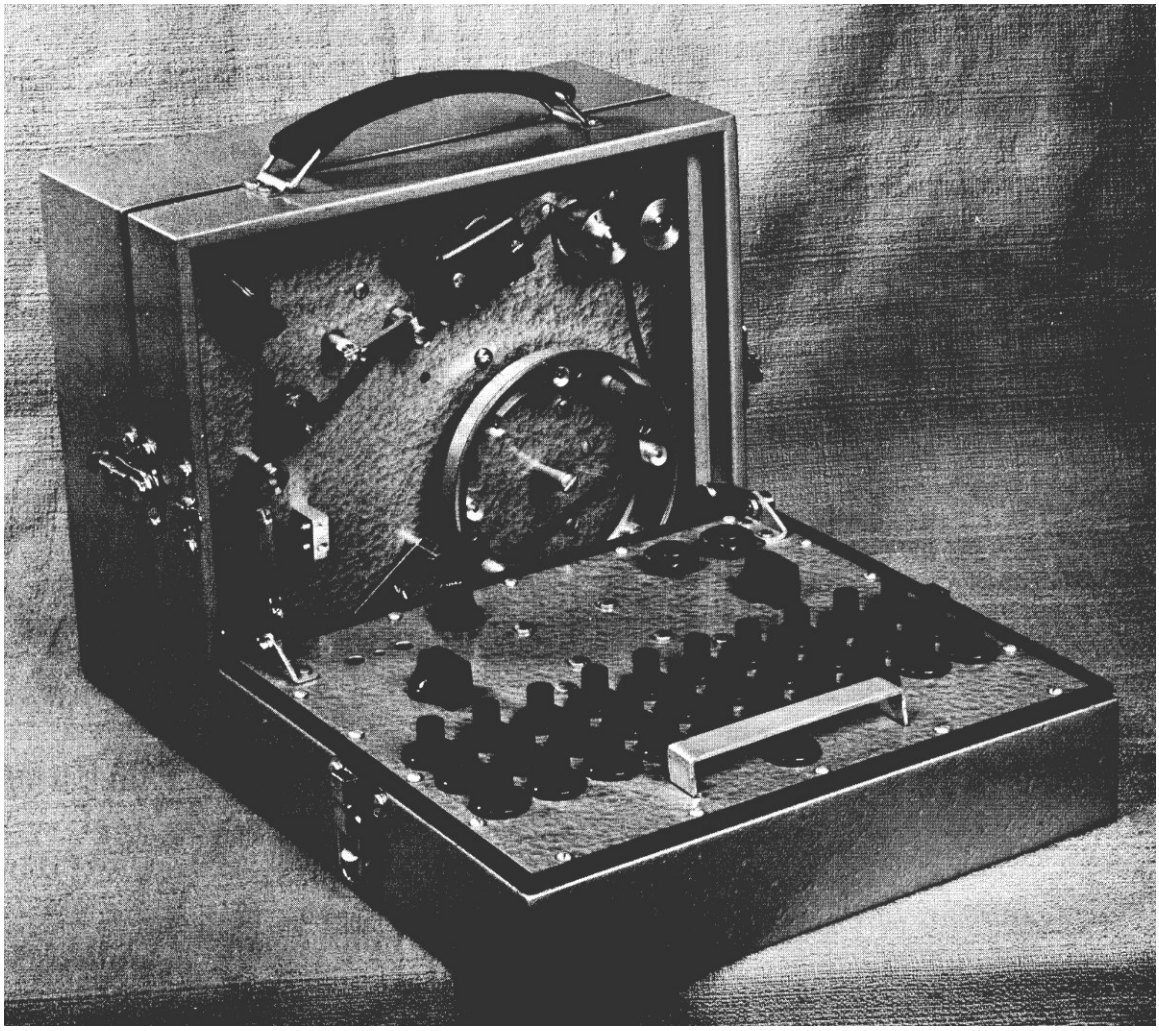
Checking features	Dual read-parity check - character count in 120 character buffer.
Number and type of registers	One 1-character decoder input register.
Buffer	One 120-character core buffer.
Program controls available	Operator's dial and plug board, start-stop record, word error, word fill C or UC, Blockette fill C or UC, stop tape reader, delete character.
Plug board or pin board	Plug board - Modes HV internally wired, patch wires.
Operational mode used	Blockette
Tape	Plastic or metal
Start/stop and reversal time	8 ms from start to operating speed and operating speed to stop.
Method of recording	Staggered 8-bit standard positioning.
Reading/Writing pulse densities	128 characters/inch.
Operational rates	60 inches per second
Spacing	1" inter-blockette, 2.4" inter-block.
Type paper tape reader	Ferranti, Mark II
Operating rates	Tape reader 200 frames/second nominal, 240 frames/second when running.
Paper tape characteristics	5-channel perforated tape 11/16" wide.

PHOTOELECTRIC TAPE READER

Photoelectric Tape Readers were developed in St. Paul for input devices for Atlas and other early computers. Their principal purpose was to permit punched paper tape to be read into a system more rapidly than was possible with existing electromechanical equipment and to provide stop-start features not found in existing readers. Readers for five- and seven-level tapes were developed, capable of speeds up to 20 characters per second.



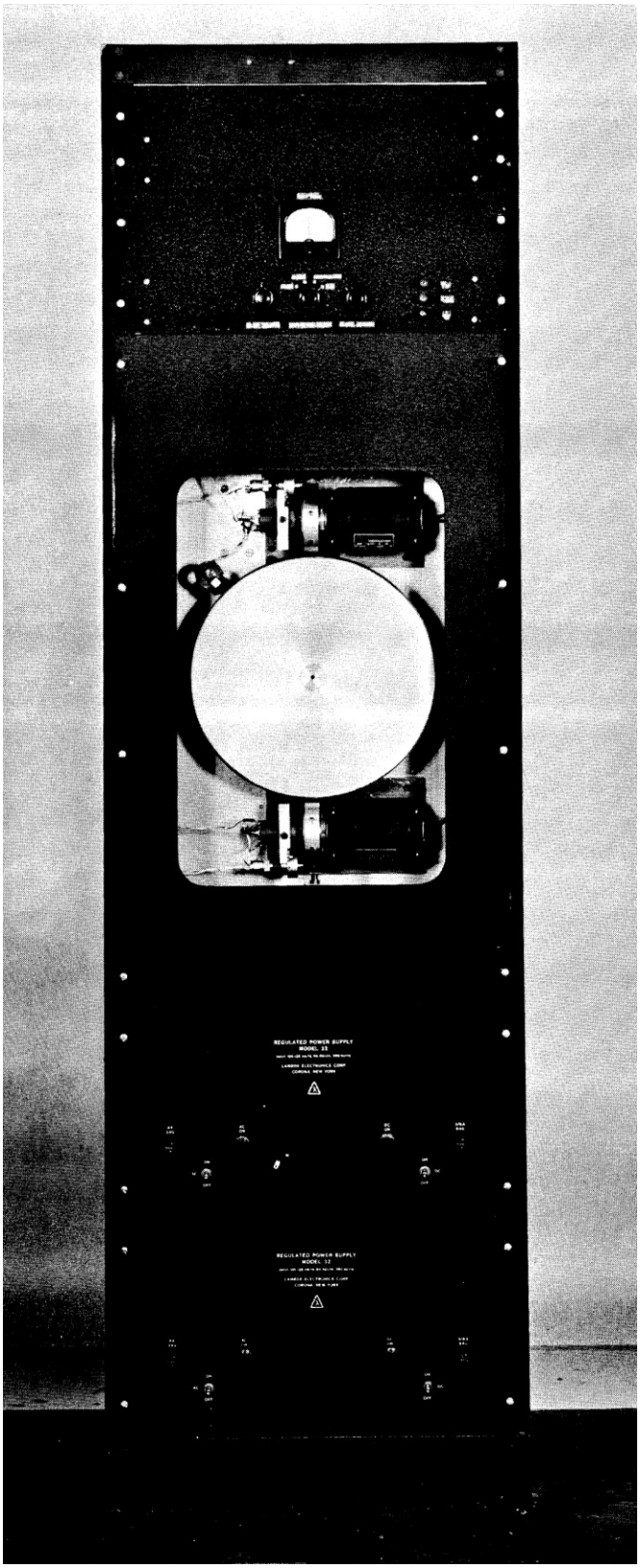
Photoelectric Tape Reader



Portable Magnetic Tape Recorder

PORTABLE MAGNETIC TAPE RECORDER

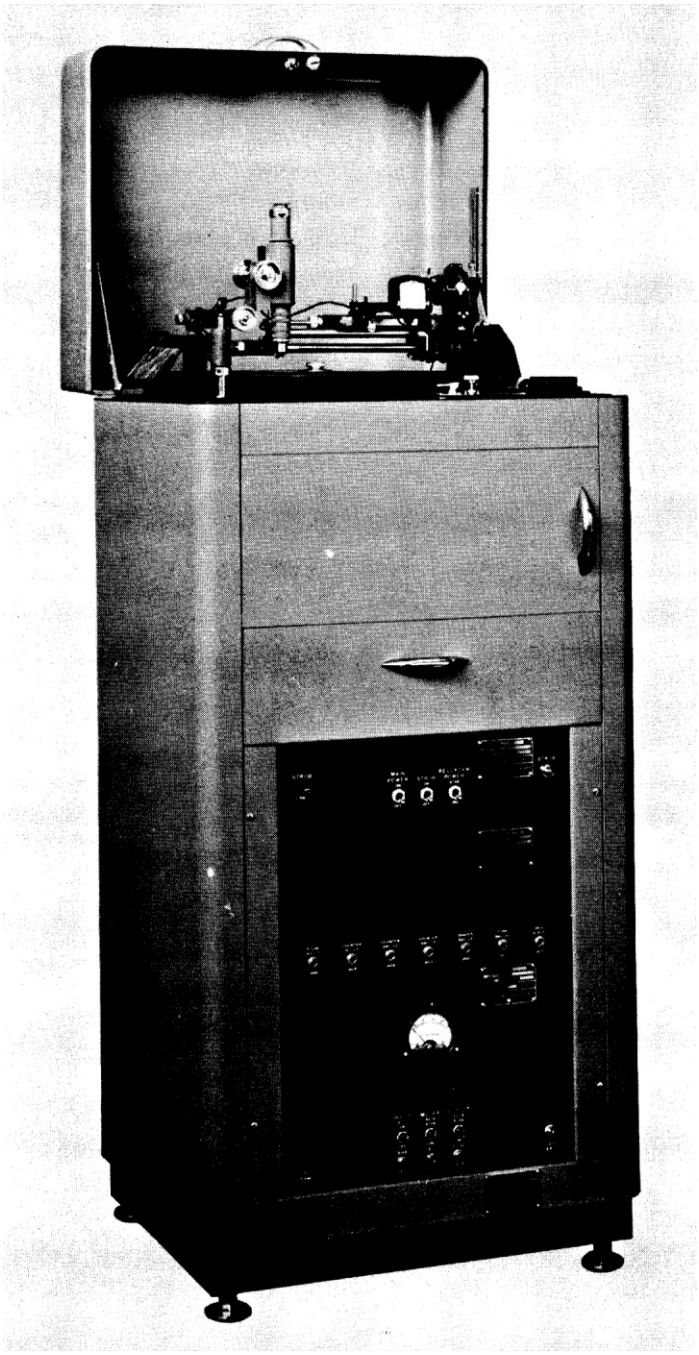
The Portable Magnetic Tape Recorder features the mechanical storage of tape on a free-running basis instead of on conventional spool-type reels. Detailed description, purpose, and special features of this Recorder are classified.



Precision Analog Recorder

PRECISION ANALOG RECORDER

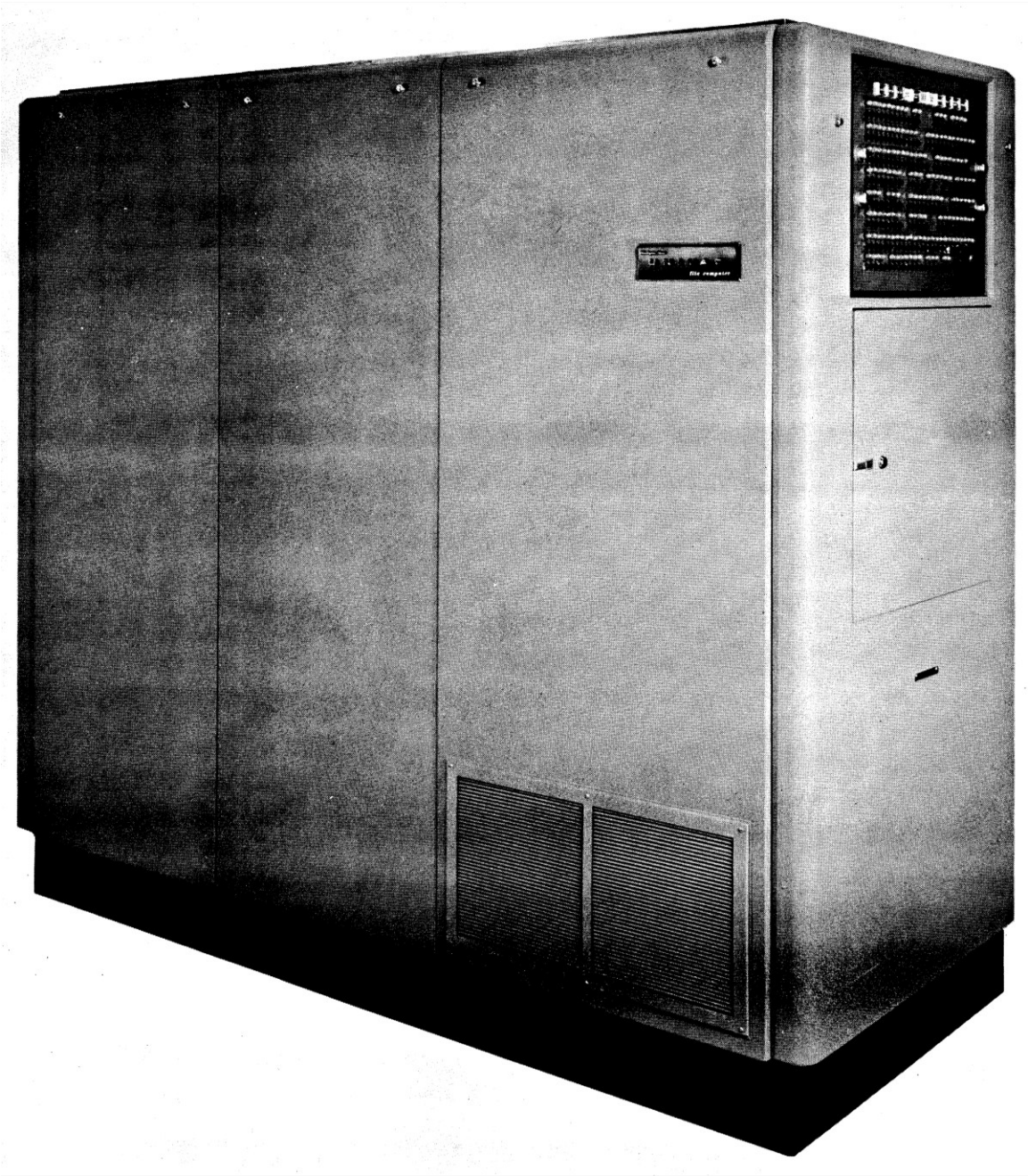
The Precision Analog Recorder was a high-precision device that could record analog signals from direct currents up to approximately 100 kilocycles. It included a recording drum with a concave surface upon which recording heads were spaced, and contained its own power supply and read-write circuitry. A meter gave electrical stability of precision recording. The Precision Analog Recorder was a forerunner of the Ampex Television Tape Recorder.



Precision Disc Recorder

PRECISION DISC RECORDER

The Precision Disc Recorder was designed for cutting records of received radio signals with absolute accuracy. It was developed and manufactured for the U. S. Navy under a classified contract.



UFC Control Unit

RANDEX CONTROL UNIT

DESCRIPTION

The Randex is an input-output system providing mass storage for the Univac File Computer. It consists of a Randex Control Unit, Type 4875, and a variable number of Randex Drum Units, Type 4975. When connected to a demand station of a Model 1 File Computer, the Randex Control Unit may have between one and ten drum units; when connected to a Model 0 File Computer, it may have between one and eight drum units. Each drum unit contains a pair of drums.

PURPOSE

Randex is a mass storage system offering by variable capacity, random access, time-shared operation, and full checking of data transfers. The Control Unit was developed to permit its operation in conjunction with the Univac File Computers.

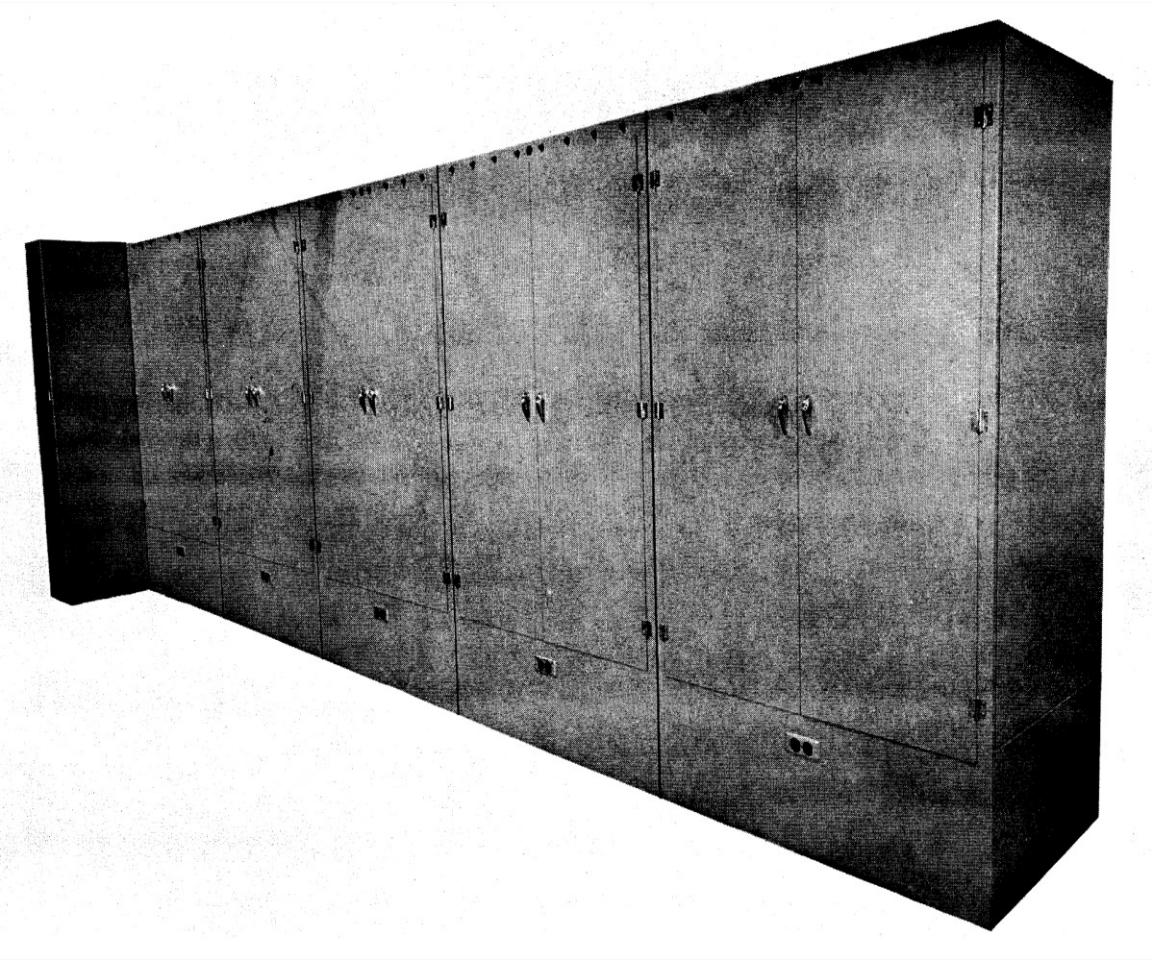
FEATURES

Each sector of each drum can store 120 seven-bit characters as storage of the basic unit of information handled by the Randex Control Unit: the 120-character blockette. The addressing structure of the system permits the direct selection of any sector. The time required to gain access to a given sector is a function of the head-positioning time and of the drum period.

The Randex Control Unit executes instructions off-line, permitting time-shared operation with the computer and with other UFC input-output systems.

During every transfer of data, whether between the computer and Randex or within Randex, a check is made to ensure that the data are parity-correct.

The Control Unit requires 6.6 kva electrical service; this is additional to the 3.9 kva required for each drum unit.



Recognition Unit

RECOGNITION UNIT

The Recognition Unit was developed for the Bureau of Ships to provide for recognizing radio signals. Further information is classified.

Remote Electric Totalizer

REMOTE ELECTRIC TOTALIZER

DESCRIPTION

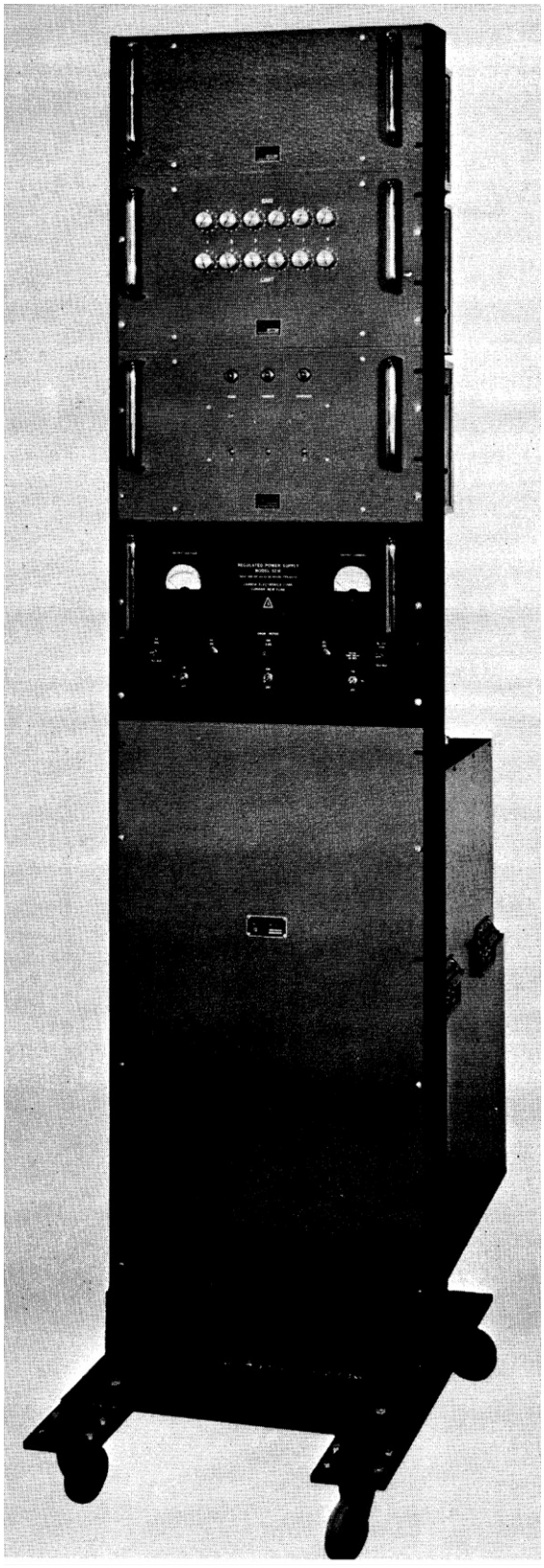
The Remote Electric Totalizer, Model ERA 503, was released by Engineering Research Associates, Inc. in 1955. It is a Remington Rand adding machine modified to receive information electrically as well as manually and to provide parallel decimal readout.

PUR POSE

This adding machine can take input at 10 to 25 milliseconds per digit. It can print out at 60 lines per minute. Digital output is up to eight decimal digits in parallel with contact closures for each digital value.

FEATURES

The unit is similar to the Remington Rand Model 93 Adding Machine, modified for its special purpose as given above.



Six-Channel Analog Recorder

SIX-CHANNEL ANALOG RECORDER

The Six-Channel Analog Recorder was a unit of special equipment designed and developed in 1954 for military purposes. The Recorder is housed in a single unit which contains a recording amplifier, a reproduce amplifier, and a trigger and servo amplifier, with their power supply, together with other components which are classified *SECRET*.

No additional information regarding this recorder has as yet been declassified.

Ten-Key Inquiry Keyboard

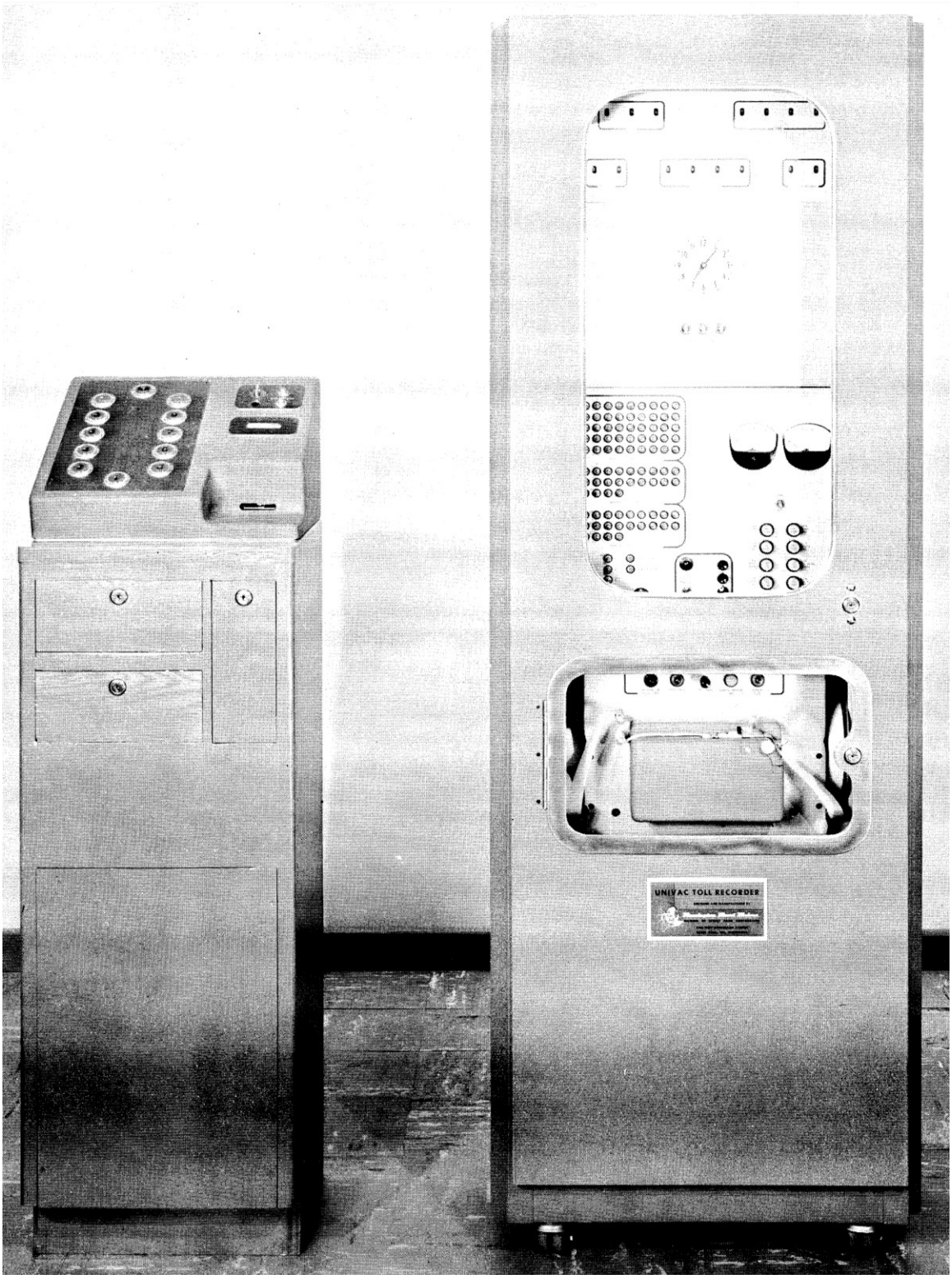
TEN-KEY INQUIRY KEYBOARD

DESCRIPTION

The Ten-Key Inquiry Keyboard was a numerically keyed device for generating inputs to the Univac File Computer. It included a 10-column numerical printer. This keyboard was a forerunner of the Inquiry Typewriter and became obsolete alter further developments that resulted in four later types of Inquiry Typewriters that perform alphanumeric functions.

PURPOSE

The Ten-Key Inquiry Keyboard was designed solely for use with the Univac File Computer and was never adapted to other systems.



Toll Ticket Reader and Recorder

TOLL TICKET READER AND RECORDER

DESCRIPTION

The Univac Toll Ticket Reader and Recorder provides a detailed record on punched tape of cash and toll ticket transactions at a toll gate.

The Ticket Reader equipment comprises the following units: Classified Push Button Panel, Key Identifier Unit, Ticket Reader Assembly.

The Classification Push Button Panel has keys numbered one through nine for designating classes, with a tenth key for special classifications. This keyboard creates the classification entry into the recorder.

The Ticket Reader Assembly senses information from small punched toll tickets, and transmits this information to the recorder.

The Key Identifier Unit provides means for unlocking the equipment to render it operable, simultaneously entering into it the identifying number of the key used, and retaining the key until the equipment is turned off.

The Toll Punching Recorder was developed initially for use by the Triborough Bridge Authority in New York. It operates in conjunction with the Classification Push Button Panel and Key Identifier Unit. One Recorder is used for each pair of vehicle lanes.

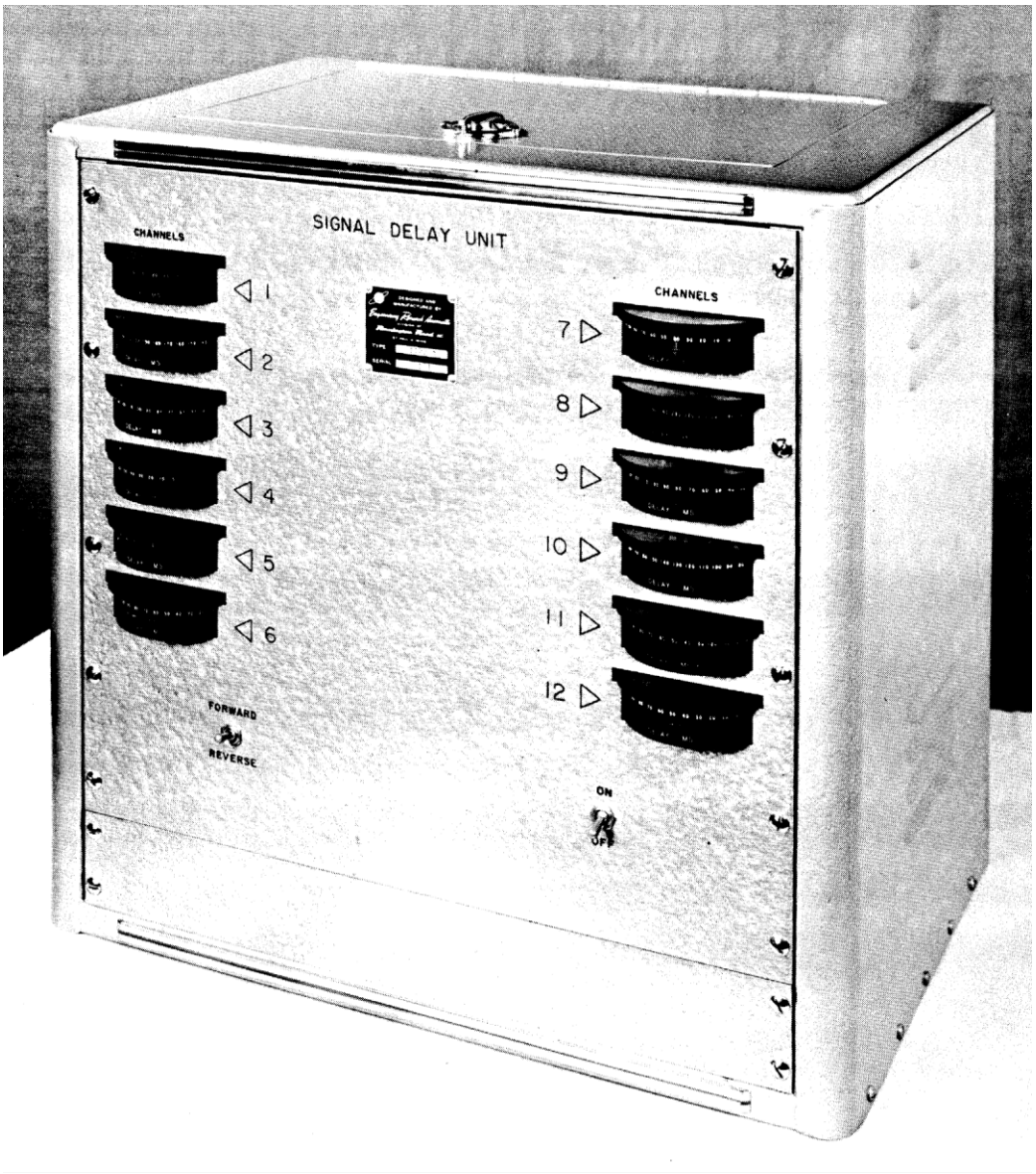
Portions of the Toll Ticket Reader and Recorder are manufactured by Electronic Signal Co. under license to Remington Rand Univac.

PURPOSE

The equipment was designed primarily as part of a Toll Accounting system and can be used to record classification data on a maximum of 10 different classes of vehicles, and data from toll tickets received in lieu of cash.

In five-hole punched paper tape, the equipment records data from the Ticket Reader Unit and axle counts from a treadle in the roadway. It also records the identification number of the lane and of the collector whose key is inserted in the Identifier Unit. A classification is punched for each vehicle transaction, with an initial record punched when the collector turns the equipment on and a terminal record when he turns it off. These initial and terminal transactions cause a record of the time and the number of axles in each direction as then recorded on the axle counters to be punched in the tape, along with the lane and collector numbers. They also reset the counters. A display of the recorded information on light banks is provided for maintenance purposes.

The Recorder accumulates and displays on electromechanical counters the number of vehicles in each of 10 classes and the number of treadle actuations in each direction. It also displays treadle actuations in each direction which occur when the lane is closed. A printed paper tape record of the information is produced by the equipment, and a punched tape record is made from the counters whenever a lane is closed.



Variable Delay Recorder

VARIABLE DELAY RECORDER

DESCRIPTION

The Variable Delay Recorder is the most sophisticated of a series of delay recorders developed in St. Paul for geophysical exploration. (See "Magnetic Delay Unit," Section IV, for the first piece of equipment produced in this series.) The Variable Delay Recorder is a 12-channel device that compensates for phase difference between signals received from a series of seismographic pick-up elements variously spaced from a pressure wave source. The relative time delays can be read directly from adjusting dials. This system uses six drums as recording surfaces, ail mounted on a single shaft.

PURPOSE

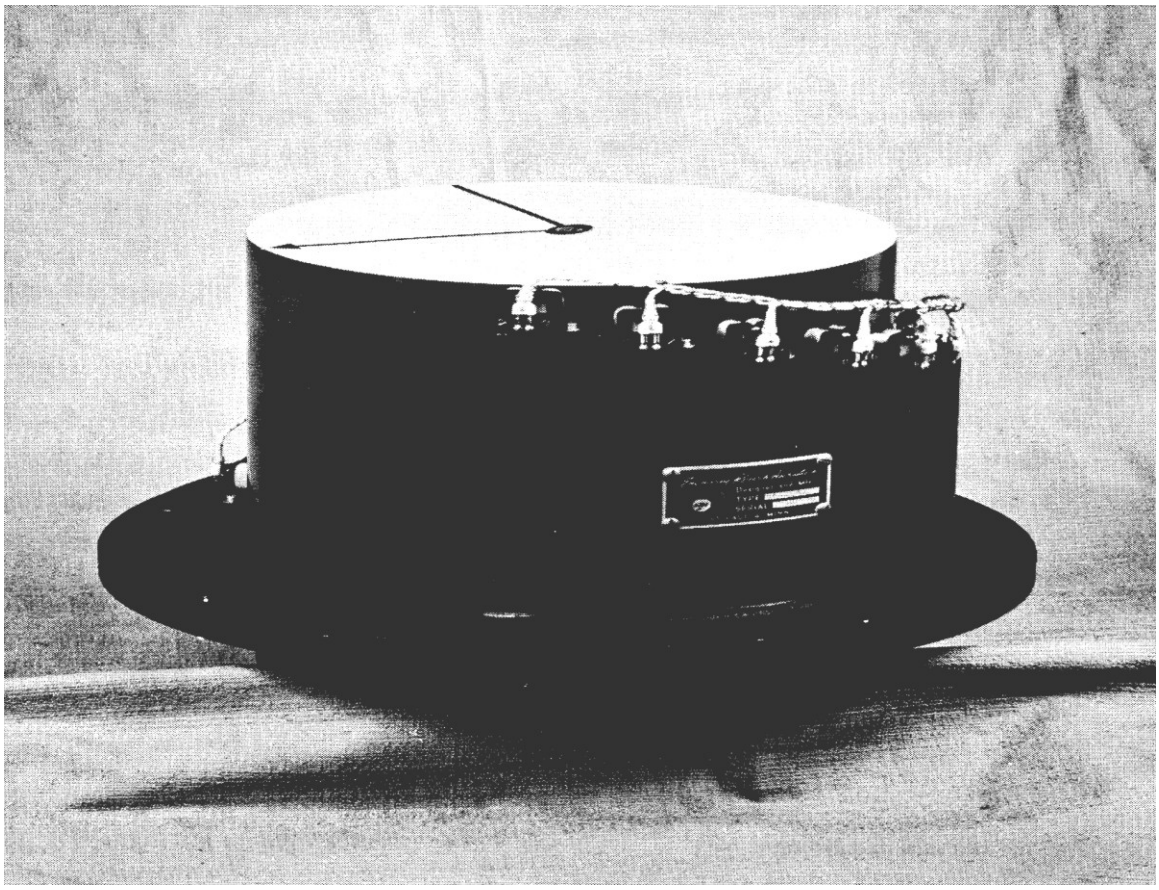
The Variable Delay Recorder is an effective tool in data reduction. Its primary use is to record disturbances produced by an underground explosion set off for geophysical prospecting. Microphones, placed at predetermined increments of distance from each other, are connected to heads in the Recorder, and the intervals between reverberations and echo produced by the explosion are recorded on the delay line.

FEATURES

The Variable Delay Recorder possesses components that make possible an attachment to an electronic computer. By such a connection, and by proper programming, data received by the Recorder may be processed immediately, thus greatly expediting the reception of exact data regarding oil deposits.

SPECIFICATIONS

Channels:	12
Frequency Range:	6-180 cps
Signal Delay:	250-500 microseconds per channel
Delay Adjustment:	Direct reading, continuous external control
Accuracy of Adjustment:	± 0.5 microsecond
Mounting:	19 inch rack, floor cabinet
Drum Diameter:	9.165 inches
Peripheral Velocity:	12 inches per second
Drum Drive:	Spur gear, 18:1 ratio
Motor:	450 rpm, 117 volts, 60 cps synchronous
Recording Amplifiers:	ERA 417C1 Plug-in B+ 250 vdc at 0.5 ma 6.3 filament voltage at 0.6 amp
Output Level:	Full Recording - 8 volts, rms
Delay Flutter:	2 electrical degrees at 60 cps (0.1 ms)
	Average Change in Output at 180 cps in Changing Delay from 0 to 250 microseconds
Scale Reading:	1.2 decibels
Record Head Signal Coil:	5000 turns
Record Head Bias Coil:	3000 turns
Playback Head:	5000 turns
Erase Head:	1500 turns
Signal Coil Current:	8 ma rms (40 ampere turns) (full record level)
Bias Coil Current:	50 ma
Erase Coil Current:	60 ma



Voice Recorder

VOICE RECORDER

DESCRIPTION

The Univac Voice Recorder is a 16-channel drum for special use in oil storage operations. One spoken word may be recorded on each channel, such as a number representing inches or feet. When the number of the storage tank is dialed remotely, the correct tracks are electrically selected in sequence and a verbal statement of the level of the fluid in the selected tank is transmitted back to the operator.

PURPOSE

This Recorder was developed to provide a verbal statement for telephonic transmission, as to the level of oil in any number of remote storage tanks.

SECTION III

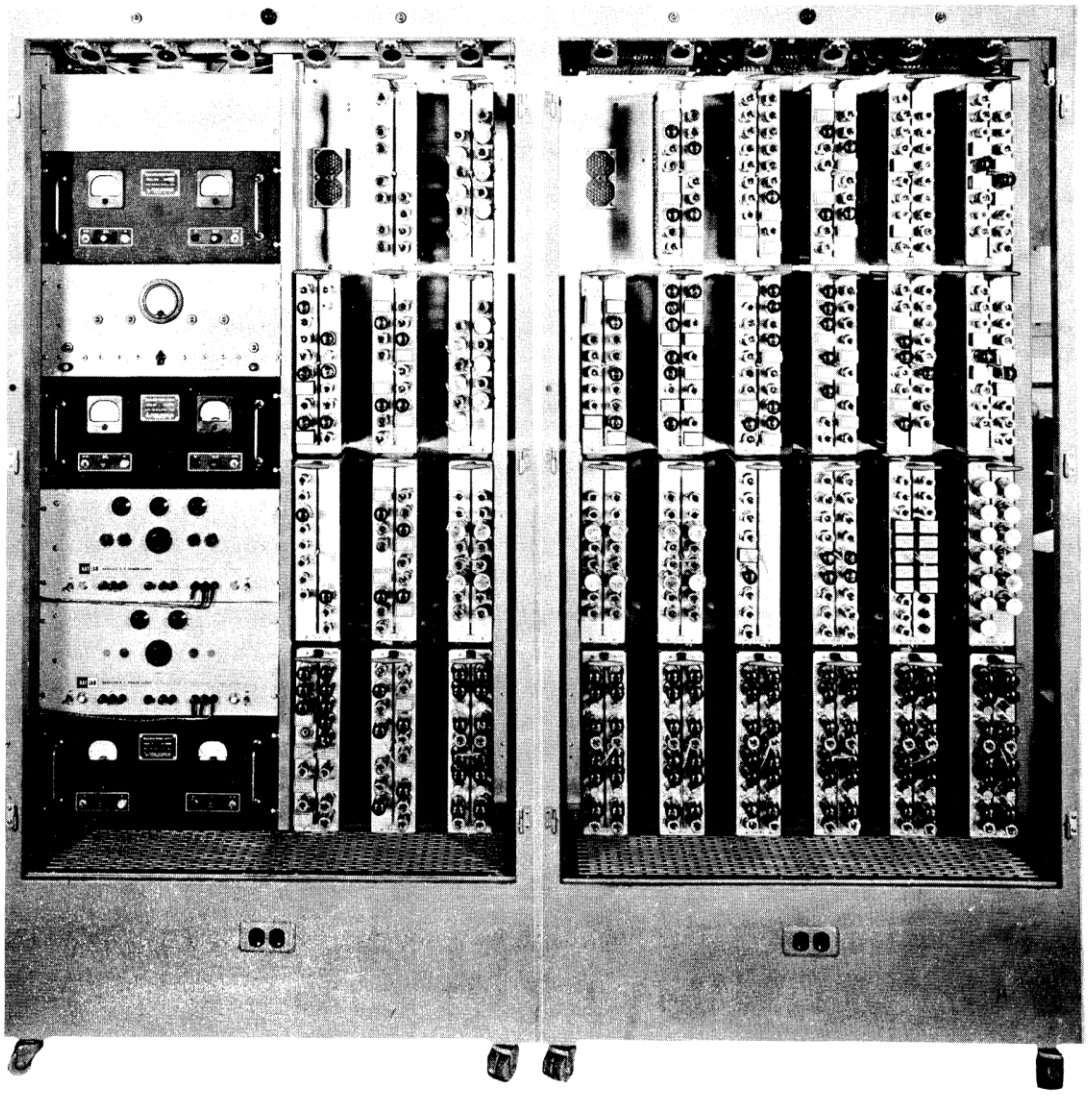
COMMUNICATIONS EQUIPMENT

From the beginning of its existence, the St. Paul Division of 'Remington Rand Univac has developed and built special communications equipment. Many of these products are used in conjunction with commercial communications facilities to link an electronic computer system to remote input and output devices; the remainder comprises units of special communications apparatus that need not be linked to computers.

Univac communications equipment has many applications, both commercial and military. Among its current and planned commercial applications are Airlines Reservations, Air Traffic Control, on-fine inventory control, vehicular traffic control, and labor time control. Military applications include the mechanization of military bases, sea surveillance, satellite and missile tracking, telemetry, and tactical logistics.

Currently, a study is being made to provide further tie-in of existing equipment with Univac computers, to draft specifications for components of future equipment, and to formulate recommendations on a unified communications line.

The communications units and systems designed and developed in St. Paul up to December, 1959, are listed in the following section.

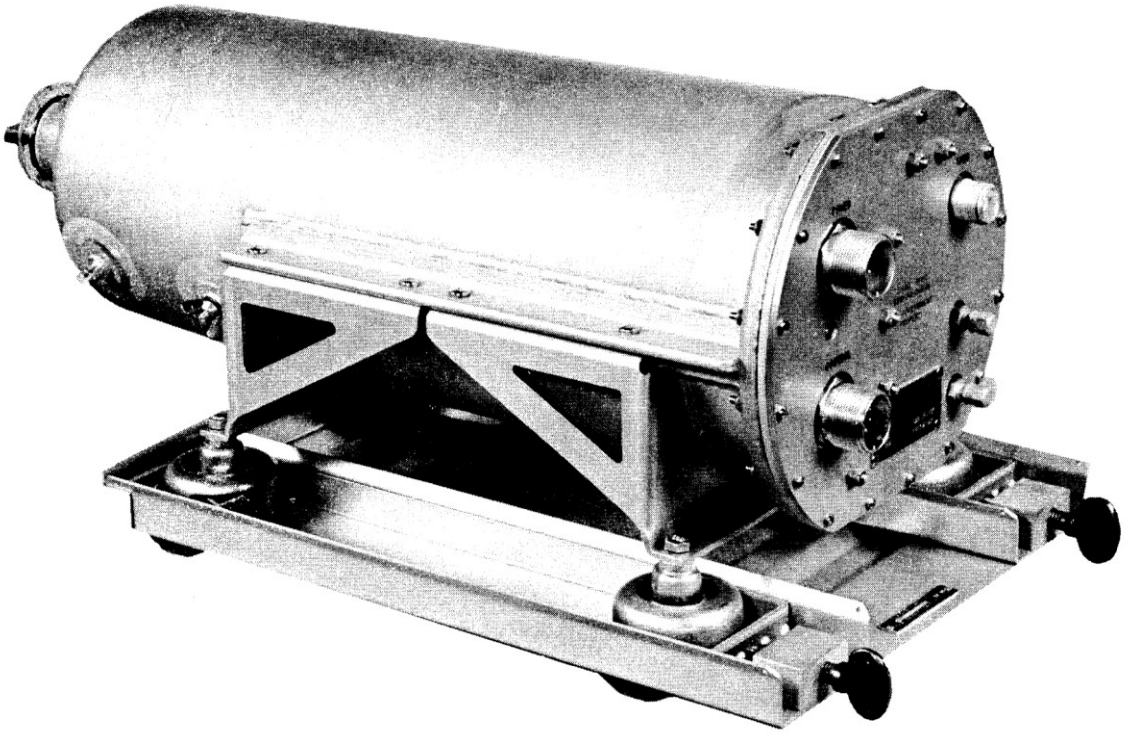


Analog-to-Digital Conversion Equipment

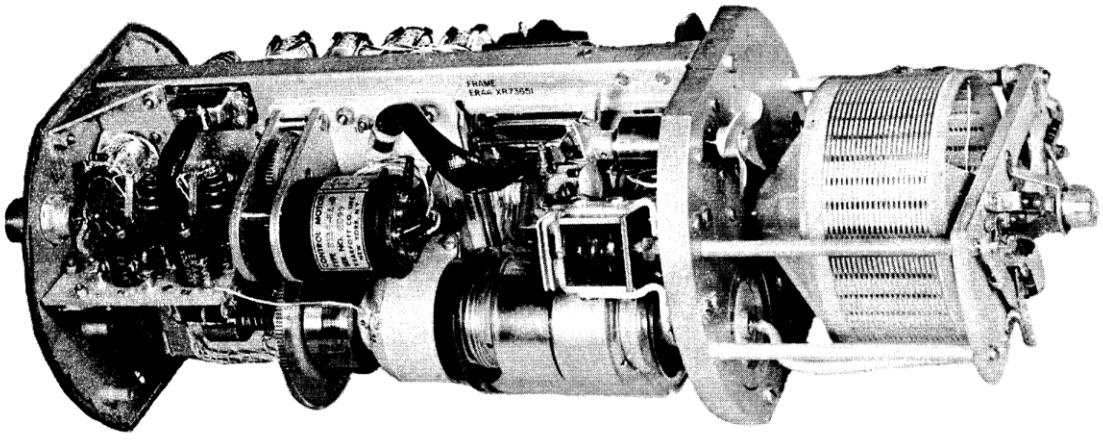
ANALOG-TO-DIGITAL CONVERSION EQUIPMENT

The Analog-To-Digital Conversion Equipment is an electronic device that transforms analog voltages to binary equivalents for input to digital computers. It was developed for use with the 1103 and 1104 computers. The equipment scans in sequence 28 sets of analog input information until one is found with an active signal on it. The scanner then remains at that setting and converts the analog voltages on each of the 11 lines into digital outputs to the computer.

The equipment includes an Analog Voltage Simulator and a high-speed relay type of converter which generates successive binary steps of standard voltages for comparison with the analog input, transmitting those for which equivalents are found. Inasmuch as it converts the voltages on all 11 lines within 200 milliseconds, it thus can make one complete conversion each drum revolution.



Automatic Antenna Coupler



Automatic Antenna Coupler, Out of Container

ANTENNA COUPLER
(Impedance Matching Unit)

DESCRIPTION

The Antenna Coupler is essentially an automatic tuning network with variable capacitance and variable inductance. The tuning elements are driven by servo-motors which are controlled by phase and resistance discriminators. Several models of the Automatic Antenna Coupler have been produced to match automatically the impedances of aircraft radio antennas and their transmission lines. Basically, each coupler consists of two functional units: a control unit and a tuning unit. In some models both units are contained in a single case while other models consist of two separate cases. Later models include a self-testing unit for preflight checking of the equipment as an integral part of the Antenna Coupler package.

PURPOSE

When there is an impedance mismatch between an antenna and its connecting r-f line, the standing wave ratio on the r-f line is increased; a loss of power results, and the increased voltage stress may break down the line. The problem of continually matching changing impedances is solved automatically by an Automatic Antenna Coupler inserted in the line between antenna and transmitter. The couplers are used in aircraft, ships, or wherever environmental changes vary the impedance presented by an antenna.

FEATURES

The following are some of the more outstanding performance features of the later models of the Automatic Antenna Coupler:

Average tuning time:	3 seconds
Continuous frequency range:	2-36 megacycles
Power handling capacity:	up to 1,350 watts

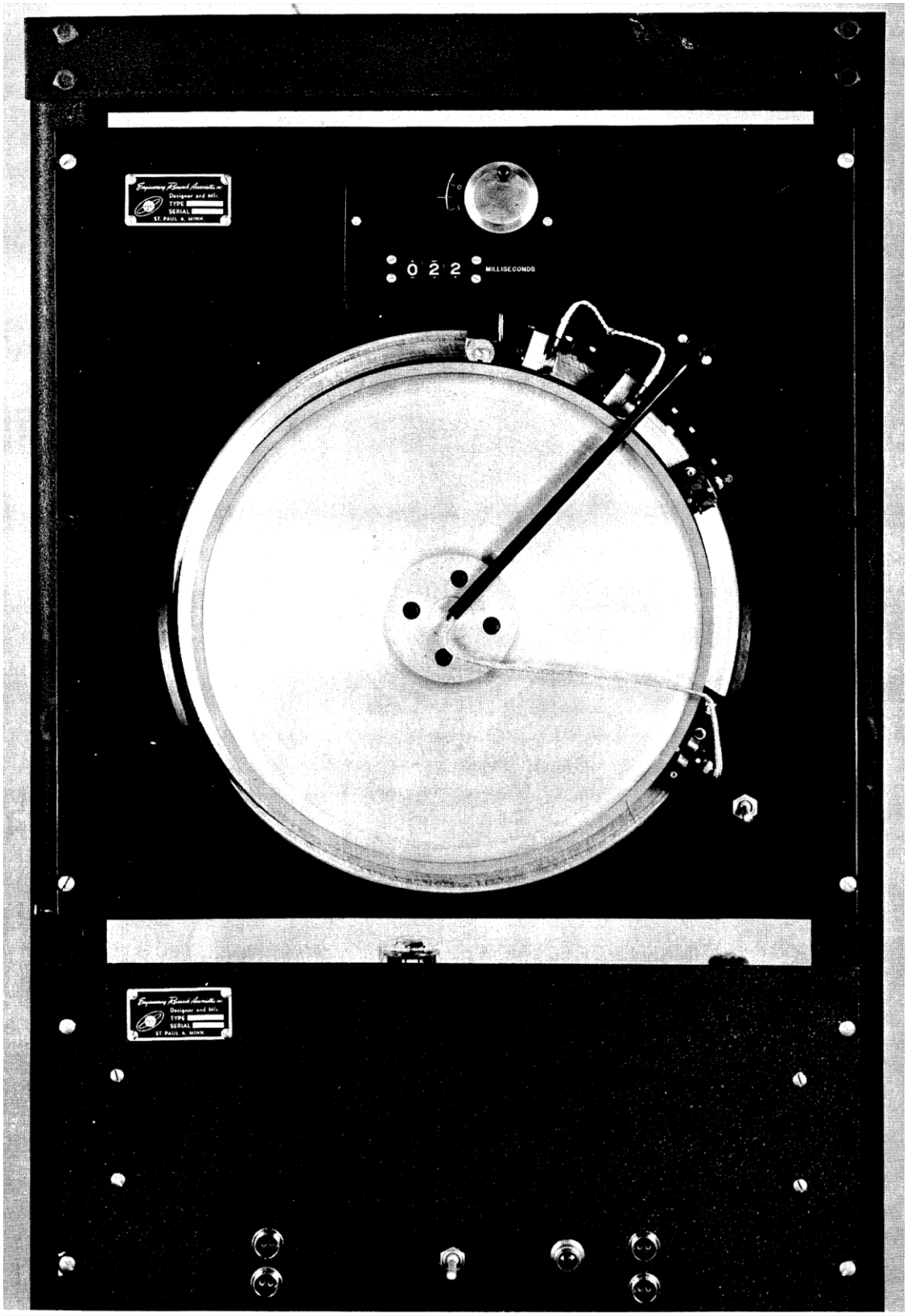
Full power operation to 75,000 feet altitude

VSWR tuning accuracy: less than 1.5:1

Continuously variable and completely automatic coverage over entire range.

Protection by special safety devices against overheating and corona arc-over in the event of a loss of pressure in the tuner container.

Shock proof up to 30 G



Boundary Displacement Delay Line

BOUNDARY DISPLACEMENT DELAY LINE

DESCRIPTION

The Boundary Displacement Delay Line, developed in 1953, is a magnetic, variable, two-channel delay unit that includes one two-channel recording amplifier, two Type 416C2 playback amplifiers, and one power supply, in addition to the boundary displacement recorder. Its design was based on magnetic storage and plug-in circuit principles defined by Engineering Research Associates.

PURPOSE

The unit provides delay of signals in increments that are continuously variable. The delay may be set within one-tenth of a millisecond.

DUAL-CHANNEL DEMULTIPLEXER

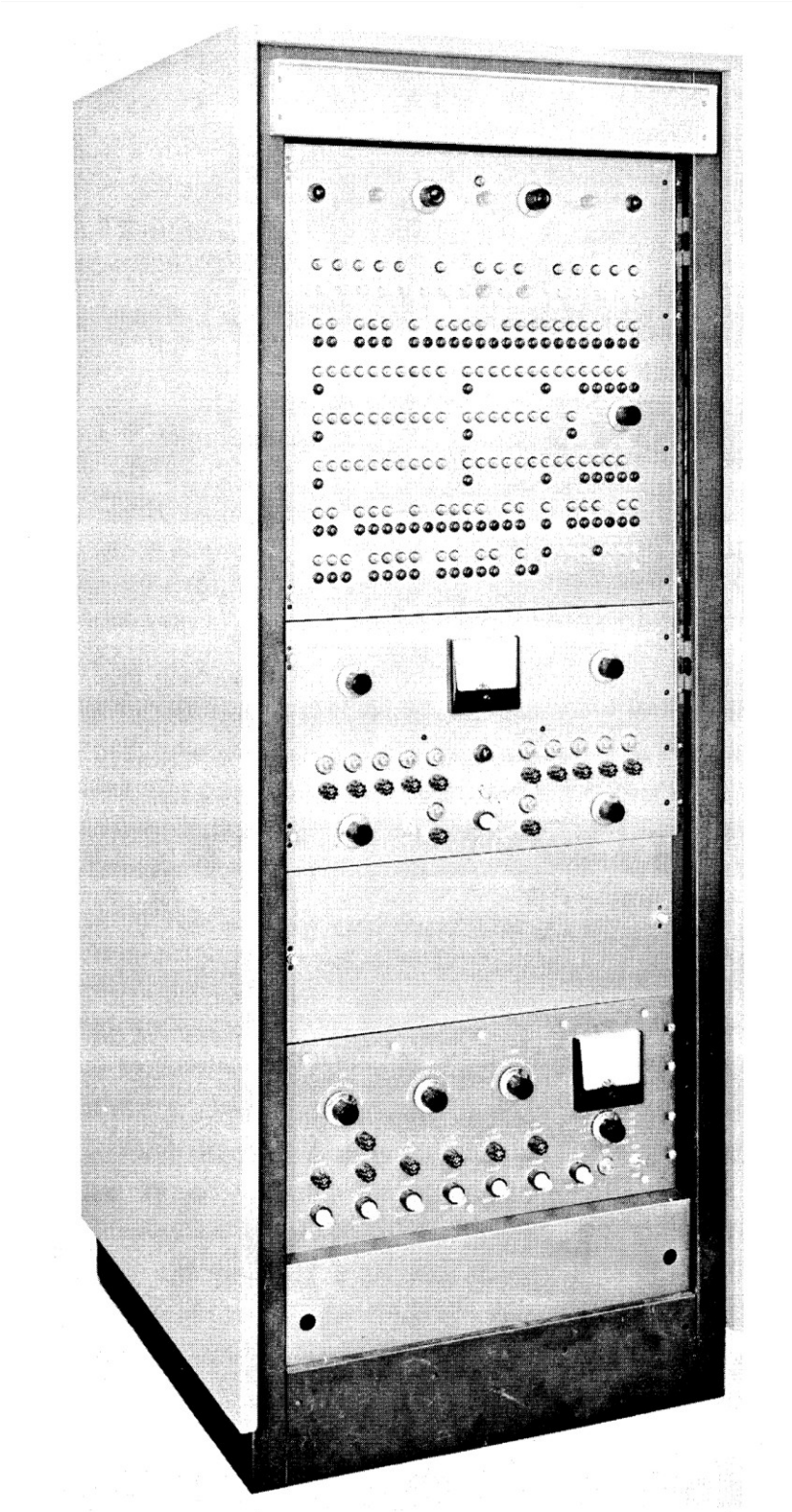
The Dual-Channel Demultiplexer is an electromechanical device built for the U.S. Navy. Its specifications are classified.

ELECTRONIC DEMULTIPLEXER

The Electronic Demultiplexer demultiplexes telegraph signals by electronic means. It was designed and built for the United States Navy; information concerning it is classified.

FREQUENCY SHIFT DISCRIMINATOR

The Frequency Shift Discriminator is a radio receiving unit, built for the United States Navy. Its specifications are classified.



Input-Output Unit

INPUT-OUTPUT UNIT, MODEL C
INPUT-OUTPUT UNIT, MODEL E

DESCRIPTION

The Input-Output Unit, Model C, Type 4993, connects the Univac File Computer to two Programmer-Scanners, Models L or M. Input-Output Unit, Model E, Type 4994, connects the File Computer to two Programmer-Scanners, one Model H and one Model L or M, via separate channels. Both units have two channels.

In the Model C unit, both channels connect to Programmer-Scanners, Model L or M. In the Model E unit, one channel connects to Programmer-Scanner, Model L or M, and the other channel connects to one or more Programmer-Scanners, Model H.

PURPOSE

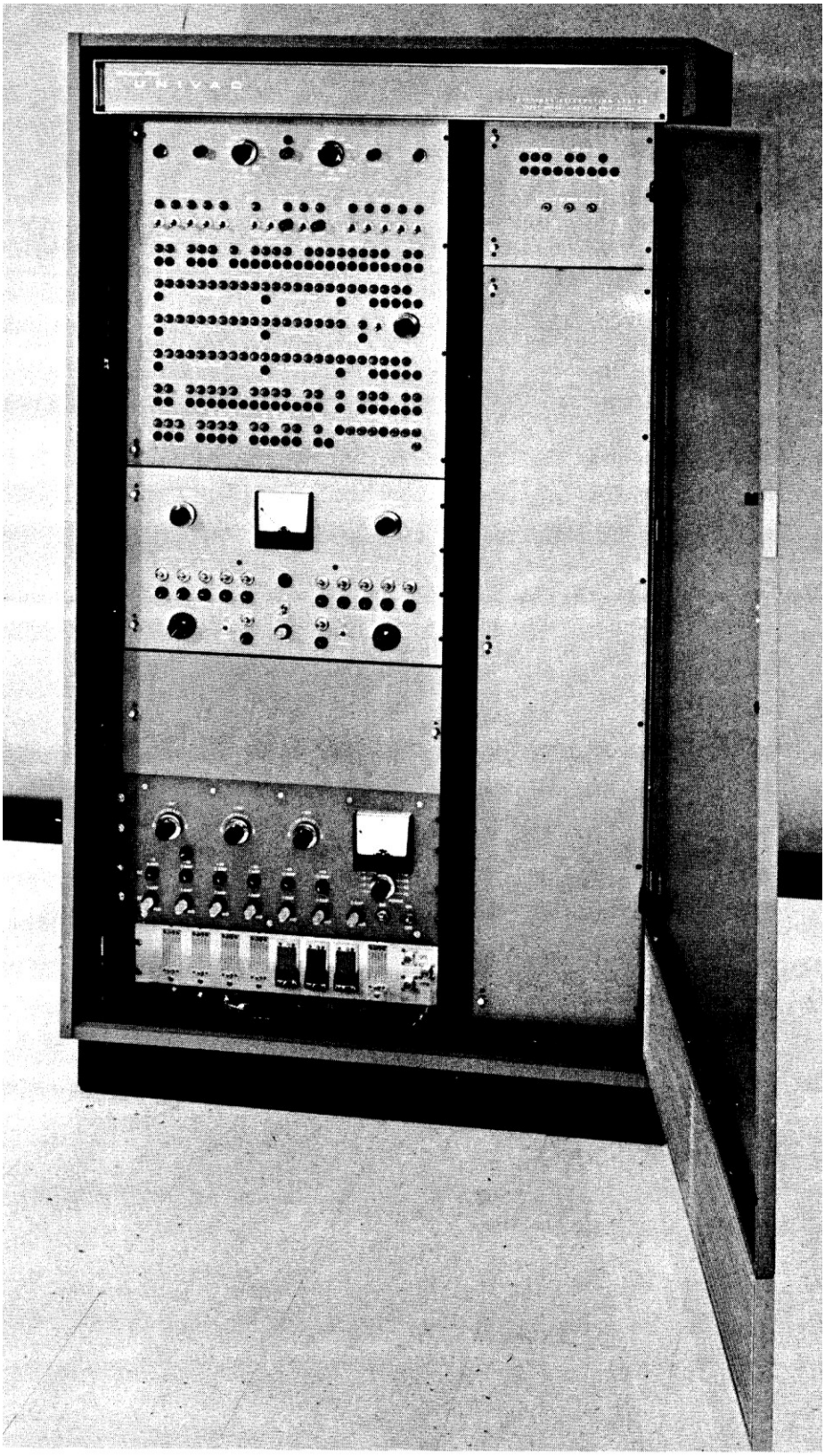
The function of both units, Model C and Model E, is to translate the characters from the five-level code of the Programmer-Scanner to the seven-level code of the computer, to arrange the format, and to check parity.

FEATURES

In the case of the Programmer-Scanner Model L, connection to the File Computer is via a Teletype channel. Connection for a Programmer-Scanner Model M is via either a Teletype or other telegraphic channel. Each channel of an Input-Output Unit is connected to a demand station of the File Computer. Information is transferred between the unit and the File Computer at a bit rate of 168 kc.

Between the unit and a Model L or Model M Programmer-Scanner, the information exchange rate is variable from 6 to 20 characters per second, depending upon the telegraphic rate; for 100 wpm telegraph circuits this rate is 10 characters per second. The high-speed channel transfers the information to and from the Model H Programmer-Scanners at approximately 200 characters per second. Up to four Programmer-Scanners Model H can be accommodated on the high-speed channel of the Model E Unit.

Cabinets are 24 by 26 inches and 62 inches high. The units can be bolted together into a multi-bay assembly.



Input-Output Control Unit, Model G

INPUT-OUTPUT CONTROL UNIT, MODEL G

DESCRIPTION

The Input-Output Unit, Model G, Type 6969, connects a Programmer-Scanner, Model G, to a demand station of the on-line version of the Model 1 File Computer.

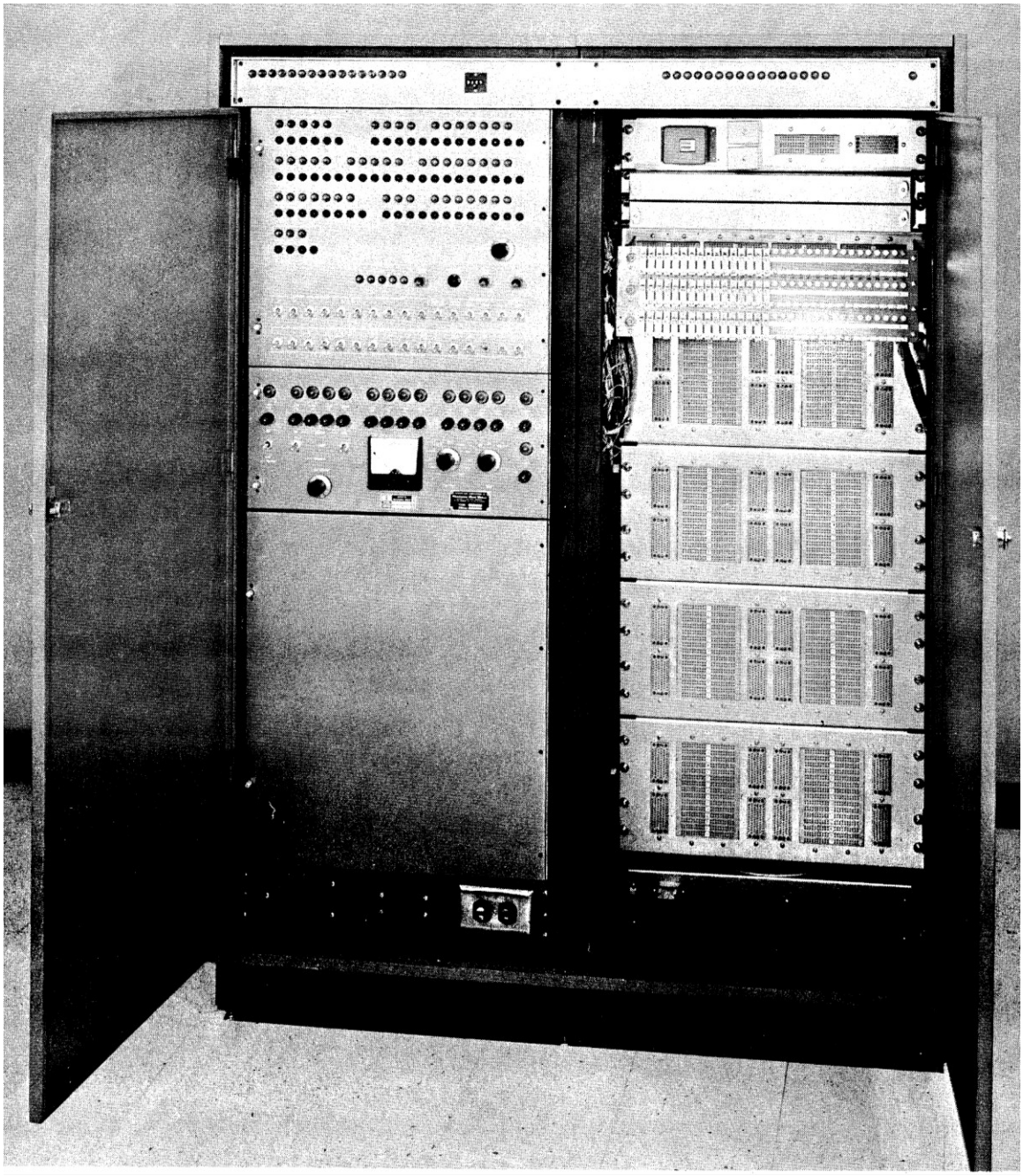
PURPOSE

The Model G Input-Output Unit is limited to use with the special-purpose Model G, Programmer-Scanner.

The Input-Output Unit, Model G, can handle an 18-character input message and a 16- character reply message. The Input-Output Unit, Model G, must be located within 500 feet of its associated Programmer-Scanner.

MULTICHANNEL DEMULTIPLEXER

The Multichannel Demultiplexer is an electromechanical device used for the separation of multiplexed telegraph messages. It was built for the United States Navy; its specifications are classified.



Programmer-Scanner Model G

PROGRAMMER-SCANNER MODEL G

DESCRIPTION

The Programmer-Scanner Model G, Type 6970, is an electronic multiplexing device which connects the Univac File Computer to the Controller's Keyboard (devices built for the Federal Aviation Agency by another company).

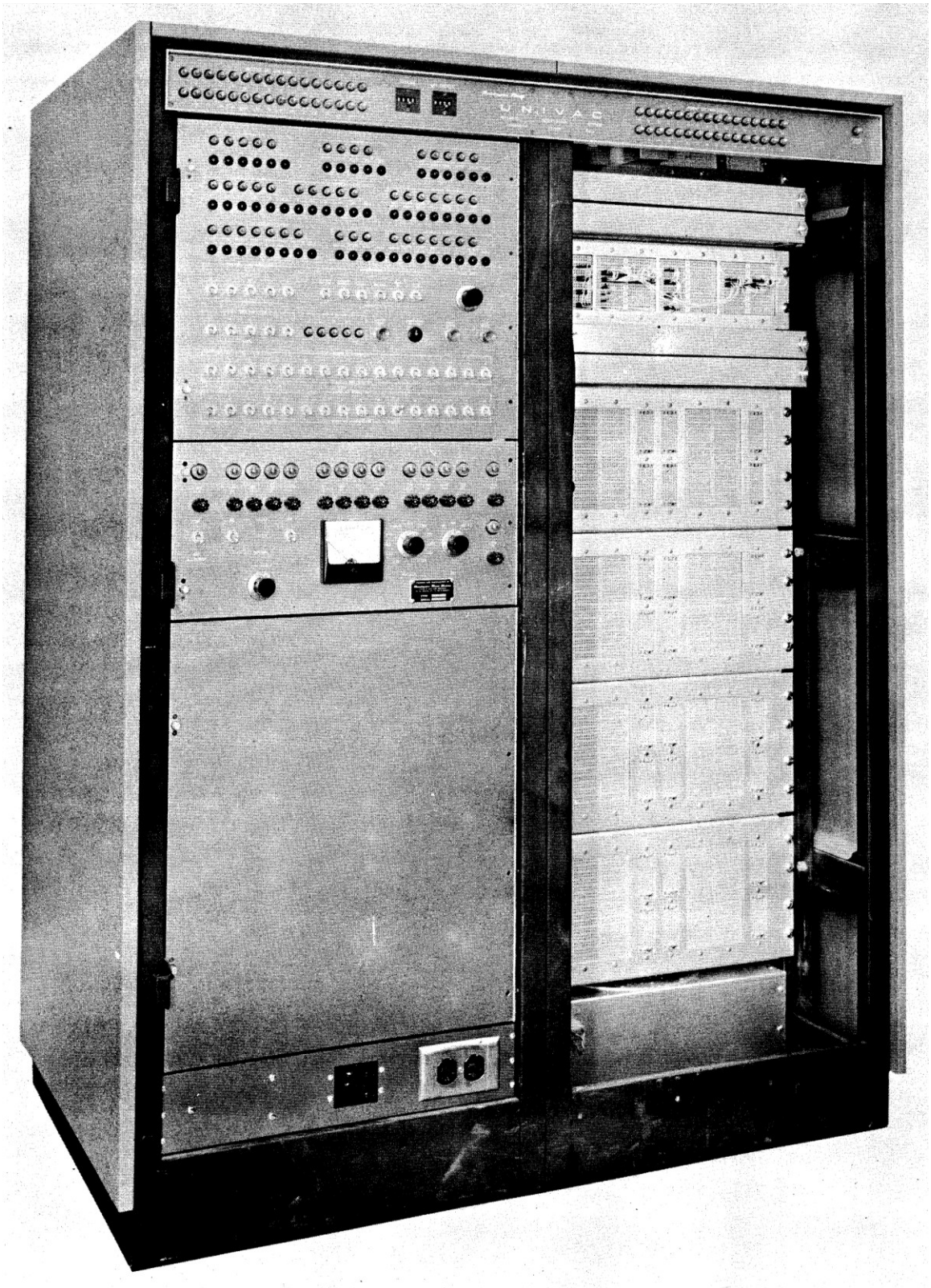
PURPOSE

The Model G Scanner is used with the on-line modification of the Model 1 File Computer.

FEATURES

The scanner can handle an 18-character input message and a 16-character reply message. Provision is made for checking parity format, and for character count.

The scanner and associated keyboards are located together and connected to the computer by a cable. The scanner scans the connected keyboards in turn until one ready for service is found, whereupon it encodes the keyboard setting and transmits it to the computer, maintaining connection until a reply is received. By means of signals from the Input-Output Unit, Model G, the Programmer-Scanner can notify one of 16 connected keyboard units that a message is waiting for it in the computer.



Programmer-Scanner Model H

PROGRAMMER-SCANNER MODEL H

DESCRIPTION

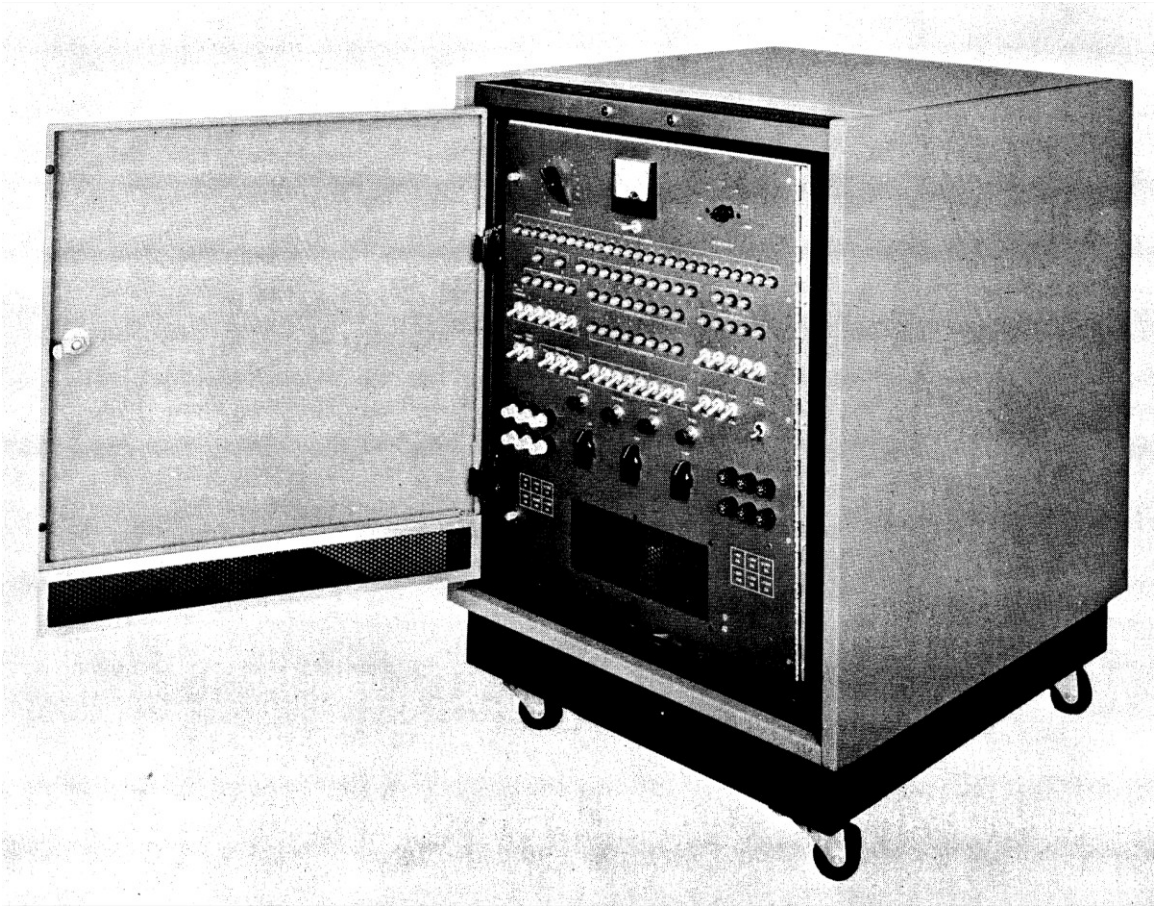
The Programmer-Scanner Model H, Type 4986, is a multiplexing unit which connects the Univac File Computer to a maximum of 32 locally situated Agent Sets. It scans the connected sets sequentially until it finds one ready for service; it then connects this waiting set to the File Computer and maintains the connection until a reply has been received. The scanning rate is 25 kc. The total number of characters in a message and reply is limited to 23. The high-speed channel of an Input-Output Unit, Model E, must be interposed between this Programmer-Scanner and the File Computer.

PURPOSE

The Model H Programmer-Scanner is used with the on-line modification of the File Computer, Model 1. It codes the transaction from the Agent Set into an input suitable in form and sequence for the File Computer and decodes the reply into appropriate light combinations for the Agent Set. It maintains a light combination on an Agent Set until that set is cleared.

FEATURES

This scanner is fully transistorized ànd scans electronically. Four different message formats can be handled, and these are alterable to some extent by means of a pin board. Provision is made for parity check of characters and character count checking. Monitoring lights are provided on the front panel. The equipment is contained in a two-bay cabinet 48 inches by 26 inches by 62 inches in height.



Programmer-Scanner Model L

PROGRAMMER-SCANNER MODEL L

DESCRIPTION

The Programmer-Scanner Model L, Type 4985, is a multiplexing unit which connects the Univac File Computer to Airlines Agent Sets, which can be located at a site remote from the computer and connected via a telegraph channel. The Model L operates into 100 wpm telegraph lines.

Up to eight Agent Sets can be handled by the Model L Scanner, but all must be situated close to the scanner. The connected Agent Sets are scanned sequentially by electromechanical means until one ready for service is found; thereupon connection with the computer is established and maintained until a reply is received. Four different message formats can be handled at one time and these can be altered by a change of connections on a pin board. The total number of characters in a message and its reply is limited to 23. A low-speed channel of an Input-Output Unit Model E or Model C must be interposed between this Programmer-Scanner and the File Computer. This combination works with the on-line modification of the Model 1 File Computer.

PURPOSE

The scanner converts the input from an Airlines Agent Set into a code suitable for Teletype transmission and entry to the File Computer and decodes the reply into light combinations for the Agent Set. It holds the lights on the Agent Set lighted in the reply code until they are cleared. In scanning, the unit gives collective precedence to earlier demands for service.

FEATURES

Parity check of characters and character count checking are provided by this unit. Monitoring lights are provided on the front panel. The Programmer-Scanner, Model L, is about 24 x 26 inches and 30 inches high.

PROGRAMMER-SCANNER MODEL M

DESCRIPTION

The Programmer-Scanner, Model M, Type 6976, like the Programmer-Scanner, Model L, which it supersedes, is a multiplexing unit which connects the Univac File Computer to Agent Sets of the Airlines Reservations equipment. The Scanner can be located at a site remote from the computer and connected to it via a communications channel. The Model M can operate into either 100 wpm or 200 wpm telegraph lines, the speed determined by internal connections which can be made in the field.

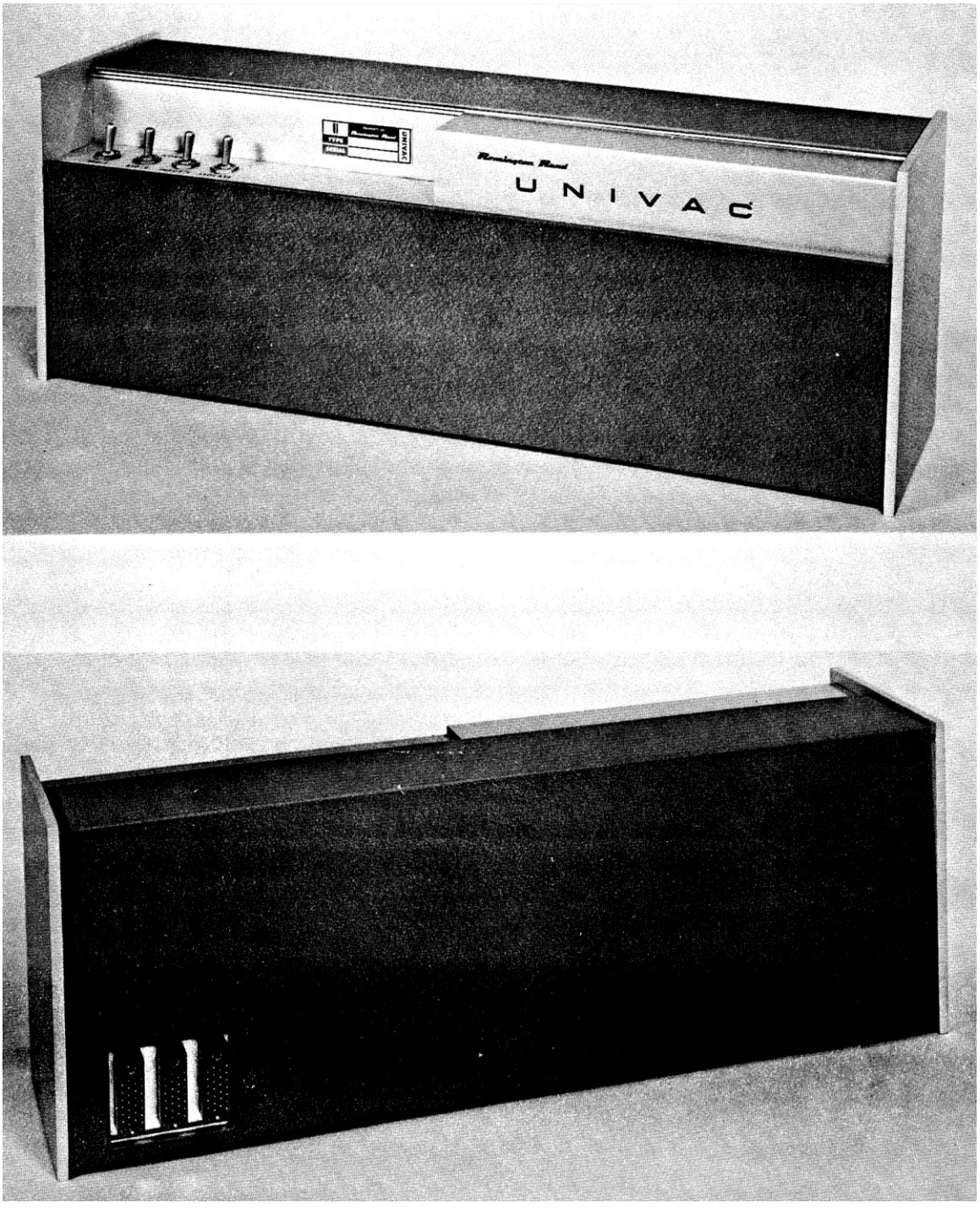
Up to eight Agent Sets can be handled by the Model M Scanner, but all must be situated close to the Scanner. The connected Agent Sets are scanned sequentially by electromechanical means until one ready for service is found; thereupon connection with the computer is established and maintained until a reply is received. Four different message formats can be handled at one time, and these can be altered by a change of connections on a pin board. The total number of characters in a message and its reply is limited to 23. A low-speed channel of an Input-Output Unit Model E or Model C must be interposed between this Programmer-Scanner and the File Computer. This combination works with the on-line modification of the Model 1 File Computer.

PURPOSE

The Scanner converts the input from an Airlines Agent Set into a code suitable for telegraph transmission and entry to the File Computer and decodes the reply into light combinations for the Agent Set. It holds the lights on the Agent Set lighted in the reply code until they are cleared. In scanning, the unit gives collective precedence to earlier demands for service.

FEATURES

Parity check of characters and character count checking is provided by this unit. Monitoring lights are provided on the front panel. The Programmer-Scanner, Model M, is about 24 by 26 inches and 30 inches high.



PS-L Duplexer

PS-L DUPLEXER

DESCRIPTION

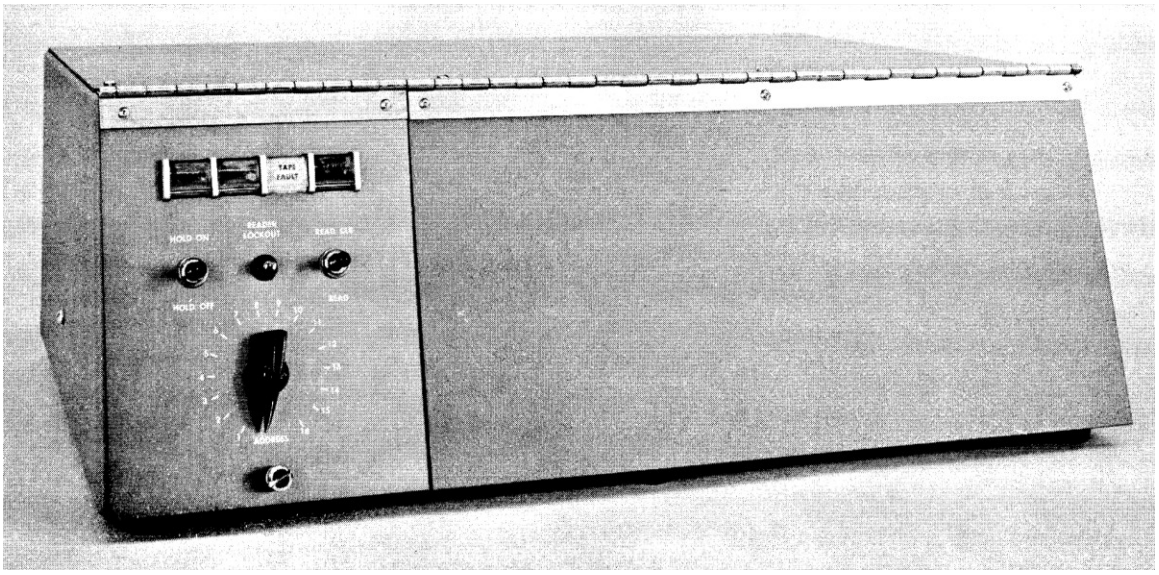
The PS-L Duplexer, Type 6963, is a switching unit that permits the connection of two Model L or Model M Programmer-Scanners in place of one.

PURPOSE

The Duplexer is devised primarily to permit two Programmer-Scanners and their associated Agent Sets to be connected over one telegraph channel, thus saving communication facilities. It is also possible to connect a Duplexer to another one in place of one Agent Set; by this means two Duplexers will allow three Scanners to connect to one telegraph channel. More elaborate tandem arrangements are possible.

FEATURES

The Duplexer is a relay device which obtains its power from one of the Programmer Scanners connected to it. It is a portable unit 20 inches wide, 6 inches deep, and 7 inches high and is used in the vicinity of the connected Programmer Scanner.



Synchro-Tape Substation

SYNCHRO-TAPE SUBSTATIONS

The Synchro-Tape Substation is a piece of conversionary equipment developed for the Federal Aviation Agency. It is used to convert data from the Synchro-Tape Typewriter to Univac File Computer codes. It is packaged in two versions: an Input Substation and an Output Substation. The former includes a Punch Control unit for converting input data; the latter includes a Reader Control unit for converting output data. It has been a popular device and still continues in production with good demand.

TELEGRAPHIC BUFFER AND CONTROL UNIT

DESCRIPTION

The Telegraphic Buffer and Control Unit, Type 6977, was designed to operate with the 100-word per minute Bell 83B1 Selective Calling System as modified for the Airlines Reservations System, but will operate with any telegraphic system having an operating rate of 200 words per minute or less, if equivalent interconnections are provided. Although the ALRS Telegraphic System utilizes a five-level code, the Telegraphic Buffer and Control Unit can accommodate as many as eight levels.

The pulse communications portion of the unit operates with the character-by-character "request, transfer and clear" system used between all peripheral units of ALRS. The nominal transfer rate is 200 characters per second. Again, as many as eight levels can be accommodated.

The unit utilizes a core matrix memory for temporary message storage, permitting independent (but not simultaneous) operation of the pulse and telegraphic channels. The capacity of the core storage is 120 characters of eight bits each. If the messages are significantly shorter than this, circuits pertaining to the unused portions can be removed or these areas can be used to store predetermined control messages. The latter can be transmitted under control of the error-processing circuitry incorporated in the unit.

Access to the core matrix is provided through a one-character register which is connected either to the telegraphic or the pulse channel. The Telegraphic Buffer and Control Unit thus employs four types of message transfer:

1. Telegraphic channel to storage
2. Storage to pulse channel
3. Pulse channel to storage
4. Storage to telegraphic channel.

PURPOSE

The Telegraphic Buffer and Control Unit provides for the interchange of messages between telegraphic and pulse communication channels.

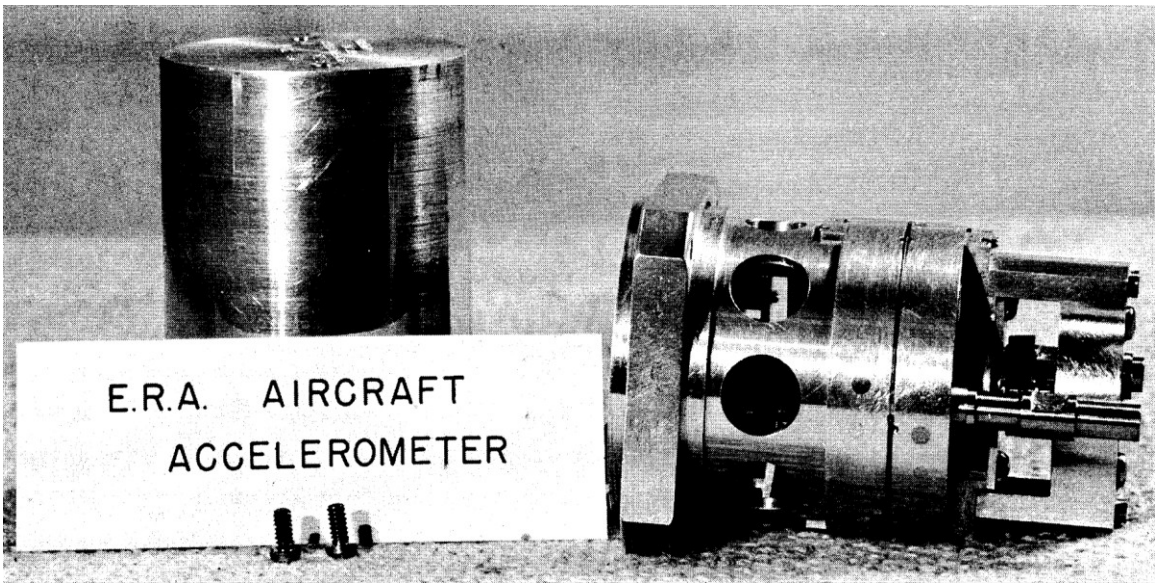
FEATURES

A removable pin board provides versatility and permits one unit to be employed as a spare with several systems, even if they use different formats and operating logic, simply by use of the appropriate board. Two units are mounted together in a common package.

SECTION IV

INSTRUMENTS AND CONTROLS

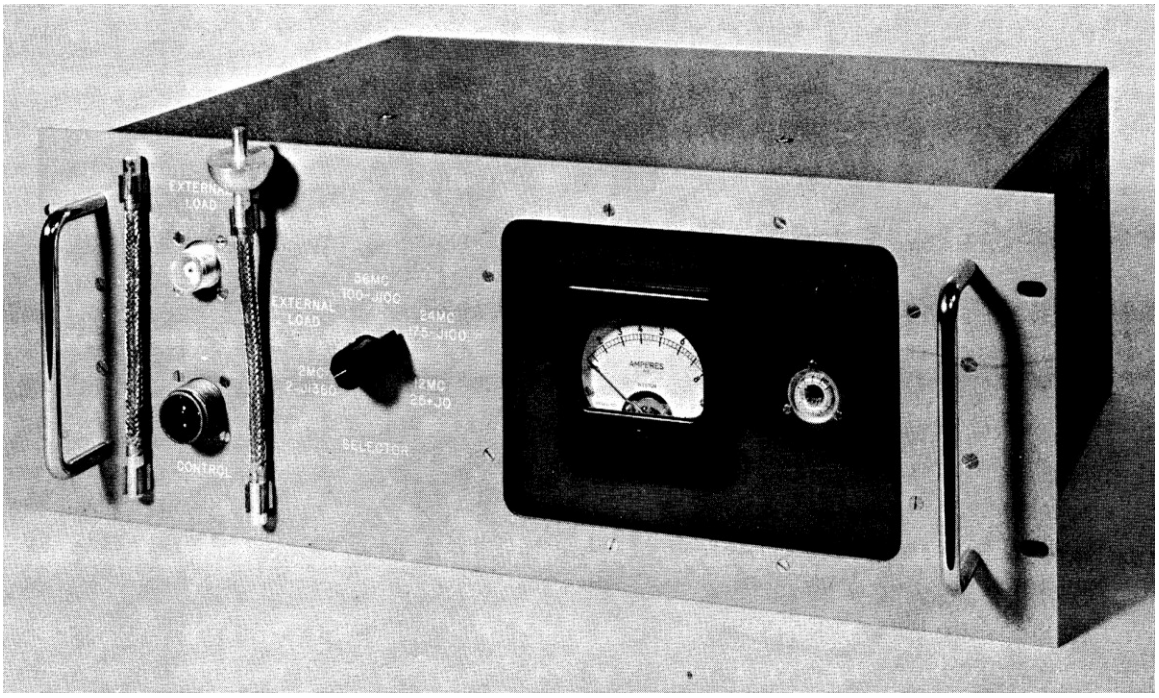
In the field of instruments and controls for measurement and evaluation, the activities of the St. Paul Division have been applied principally toward the creation of instruments not otherwise available. Computers, peripheral equipment, and communications equipment have received the major emphasis in Univac's St. Paul Division; the designing of small instruments has been the province of other Divisions or other Companies. Certain instruments or controls, however, have been designed or modified for use with other Univac products, or have been developed for certain specific uses. These are listed in the following section.



Aircraft Accelerometer

AIRCRAFT ACCELEROMETER

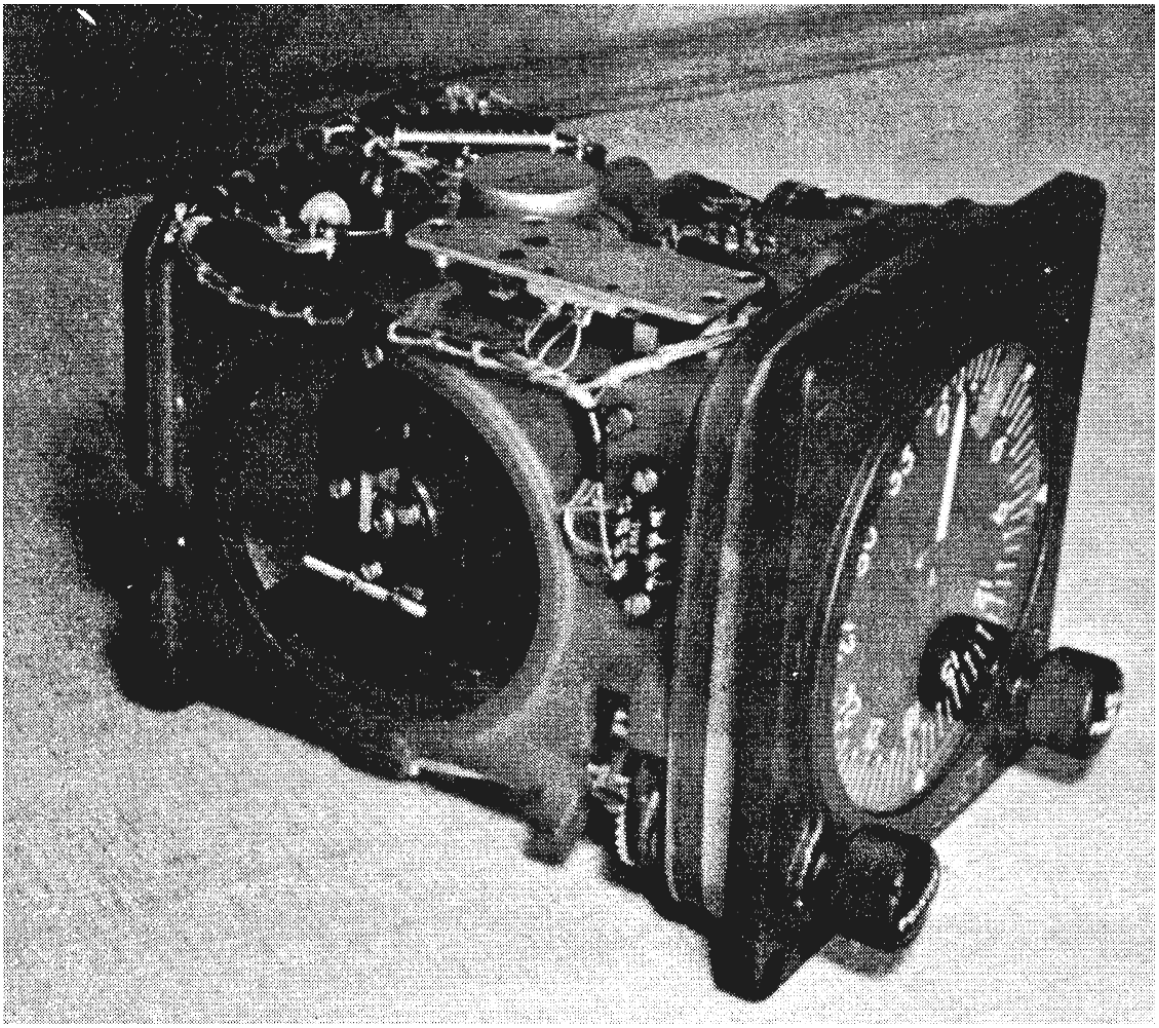
The Aircraft Accelerometer was designed for the measurement of G-forces in air-planes or missiles. It was an early development of Engineering Research Associates, and although it may still be in use, it is no longer manufactured.



Artificial Antenna

ARTIFICIAL ANTENNA

The Artificial Antenna is a piece of special apparatus developed for loading antenna couplers for testing purposes. It is a variable device, capable of simulating a number of different types of antennas. Included in the single unit are cables for connecting the antenna to the coupler, and a plug-in facility physically placed on the front panel alongside a current meter that measures the r-f input current.



Directional Gyro Indicator

DIRECTIONAL GYRO INDICATOR
TYPE 16800

DESCRIPTION

The Directional Gyro Indicator, Type 16800, is an aircraft instrument which contains a non-tumbling free gyro. The Indicator provides continuous relative directional indication regardless of aircraft maneuvers.

PURPOSE

The Gyro Indicator may be used for all types of aircraft maneuvering. During pre-take-off check, a pilot merely sets the desired course heading on the dial and the runway heading on the pointer; thereafter, the action of the indicator is fully automatic.

FEATURES

The gyro wheel operates in a hermetically sealed helium atmosphere at a speed of 23,000 rpm. The instrument is capable of continuous accurate operation under extremely adverse conditions of temperature, altitude, and exposure.

DOPPLER FIRING ERROR INDICATOR

The Doppler Firing Error Indicator was a special piece of equipment designed and developed for the United States Air Force and delivered in 1952. It is used in combat airplanes to measure any distance that a fired projectile may miss a target, thereby enabling corrections to accomplish accurate target hits. Further details are classified.

DOPPLER WINDRIFT INDICATOR

The Doppler Windrift Indicator was developed for the Signal Corps. The equipment was in two parts: one was missile-borne, the other airborne in a mother aircraft. The end-result of the data-reduction process accomplished by the Indicator was an indication of wind velocity and direction for 2,000-foot levels. Further details of this equipment are classified.

STEVE CANYON . . .

DYNAMIC WEIGHER

DESCRIPTION

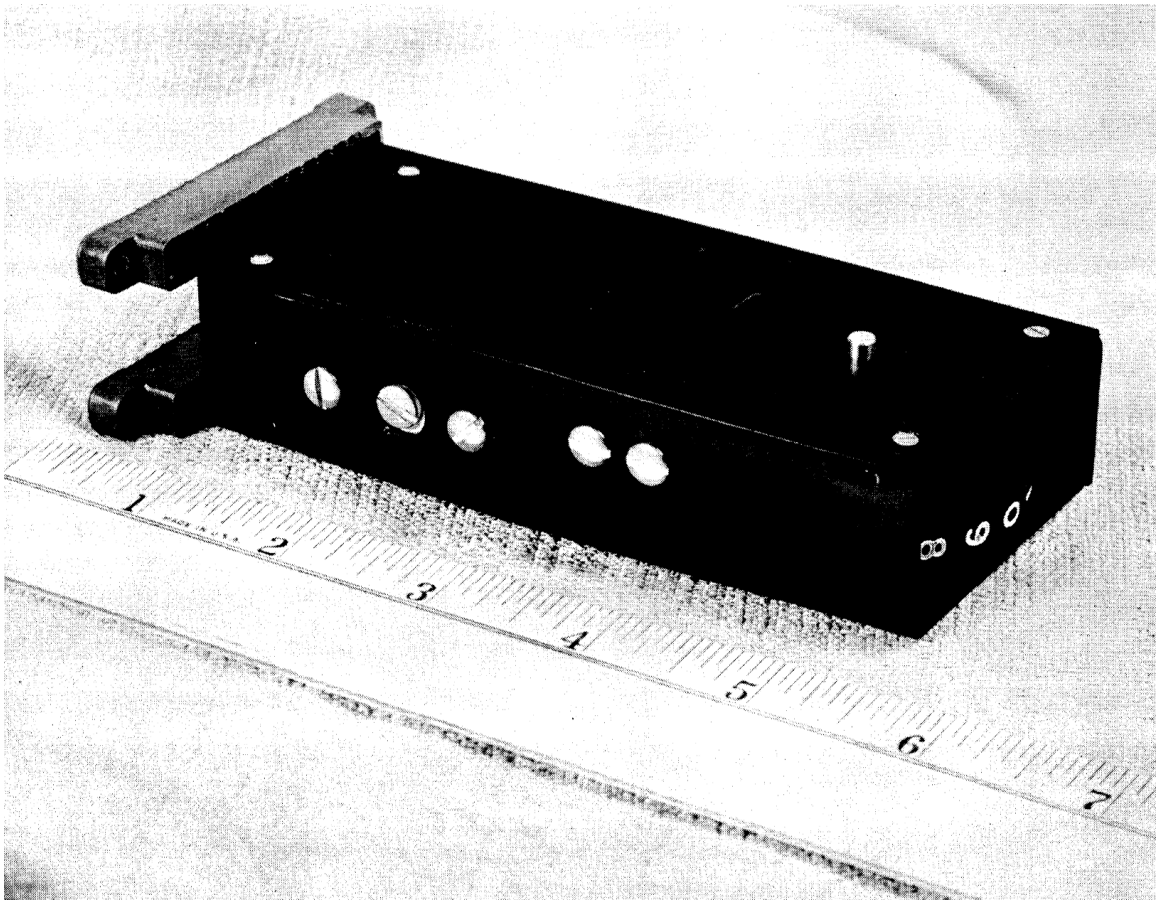
The Dynamic Weigher uses a magnetic balance to obtain a fast and accurate weighing of small packages within predetermined tolerance limits. The instrument comprises a precision current-force transducer arranged to counteract the gravitational force on the weight, and its supporting table, together with automatic means for establishing the current at such value as to achieve balance. The current supplied to the transducer at equilibrium is then a precise measure of weight.

PURPOSE

This weigher was designed for rapidly checking weights of packaged goods on production line conveyers to permit removal of overweight and underweight packages.

FEATURES

The main feature of the weigher is the precision current-force transducer that balances the unknown weight when used in conjunction with the self-balancing mechanism. An automatic rejection circuit was also developed for the Dynamic Weigher.



ERA 1200 Counter

ERA 1200 COUNTER

DESCRIPTION

The ERA 1200 Counter is an electromechanical counter that can be stacked to six digits and can provide reliable carry-over at an operating speed of 1,200 counts per minute. The counter reads rightward with big white numbers 7/16 of an inch high on a black background. It can be reset to zero electrically in one-half a second, can be read out electrically, and the subtotaling circuit can be used to transmit the count to a printer or other device. Alter read-out, resumption of the pulsing results in a continued count from the subtotal.

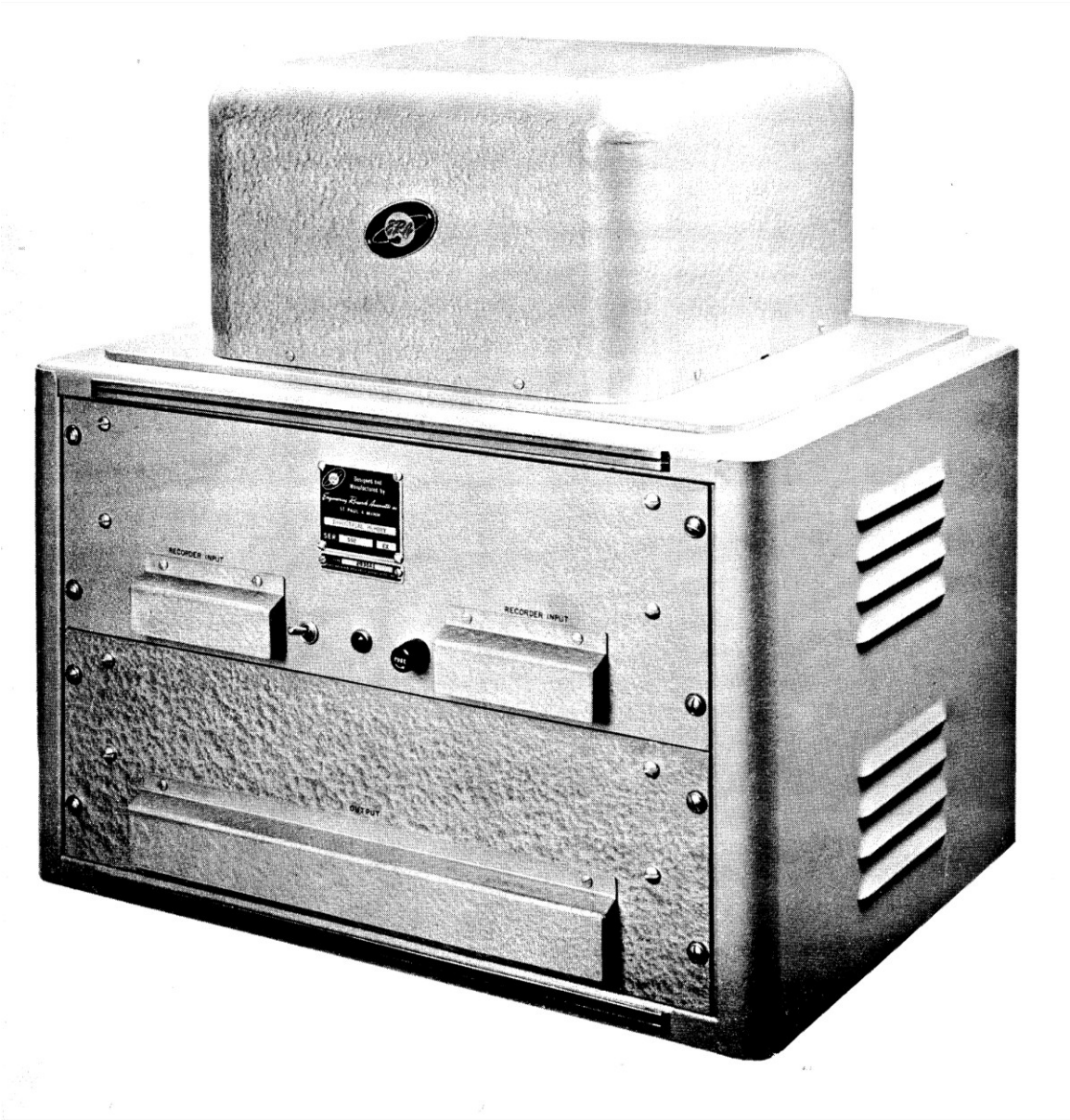
PURPOSE

The ERA 1200 Counter was developed to serve as a high-visibility indicator of numerical integers. When electrically connected to any machine or device, it displays an accurate count of any desired sequence, adding by single-cell input and providing remote control counting.

FEATURES

The individual cells may count up to a maximum rate of 35 counts per second or be entirely reliable at a rate of 20 counts per second, when approaching the capacity of the six-cell counter. At the end of the count, an alarm rings just before the reading and all become zero, or the alarm can be set and the counter continues to count without losing the counting pulses. The counter operates on low power (90 milli-amperes at 115 volts d-c operates each cell). A telephone dial will pulse the supply satisfactorily to operate the counter. Thirty milliseconds is the normal square-away pulse duration required. The total power required is 11 watts per cell.

Easy maintenance is facilitated by two alarm lamps, one on the panel front and the other near the input jack at the rear tray; handy plug-in cells make replacement easy.



Industrial Memory

INDUSTRIAL MEMORY

DESCRIPTION

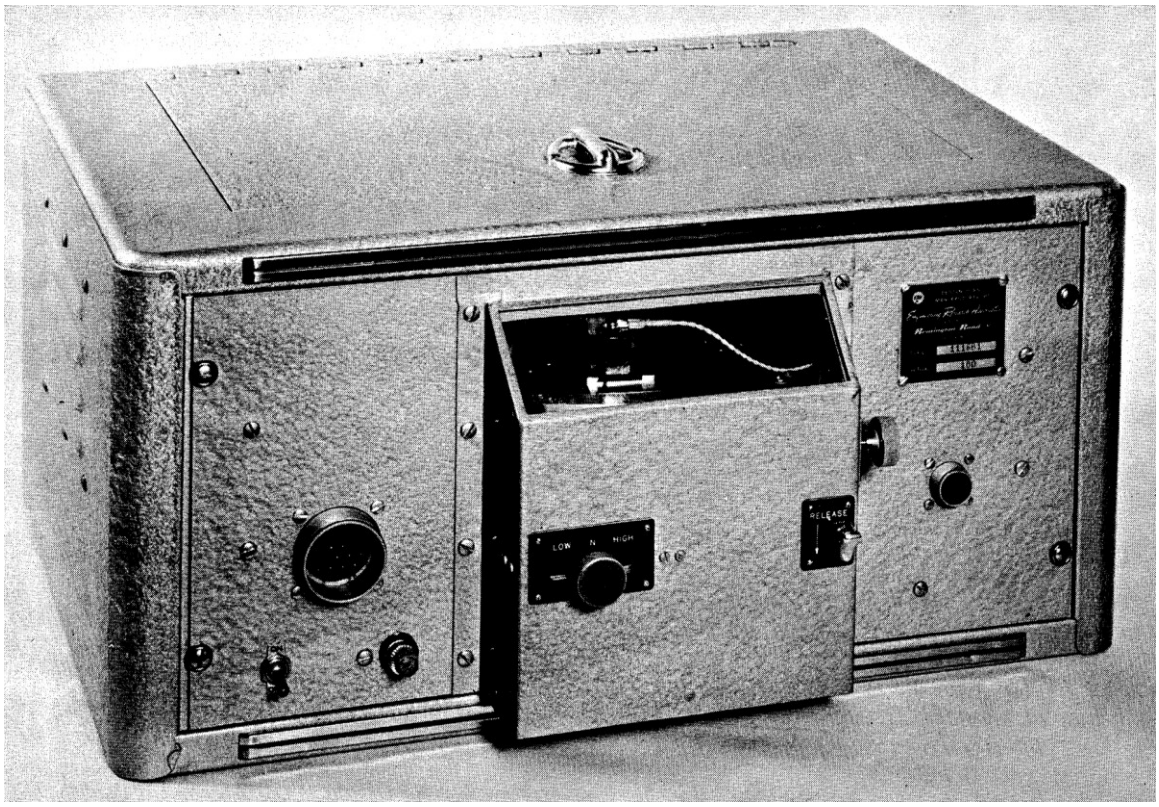
The Industrial Memory, Model 2030, is equipment used as part of a control system for checking industrial products for weight, size, electrical characteristics, opacity, or some other property before being delivered for shipment. Such a system includes three units of control equipment: 1) a sensing device that initiates a signal for each of three possible package categories; 2) the memory unit which records, stores, and plays back the scale signals in a particular time relationship; and 3) actuating devices, controlled by the memory unit, which shift the package from the main incoming conveyer to one of three outgoing conveyers or bins.

PURPOSE

The Industrial Memory was designed to fit present-day manufacturing requirements for grading or sorting operations on parts, assemblies, or finished products as these items are transported between processing stations on a conveyer line.

FE ATUR ES

The transfer actuators make it possible to separate packaged products into three categories based on the nature of the particular sensing device employed.



Magnetic Delay Unit

MAGNETIC DELAY UNIT

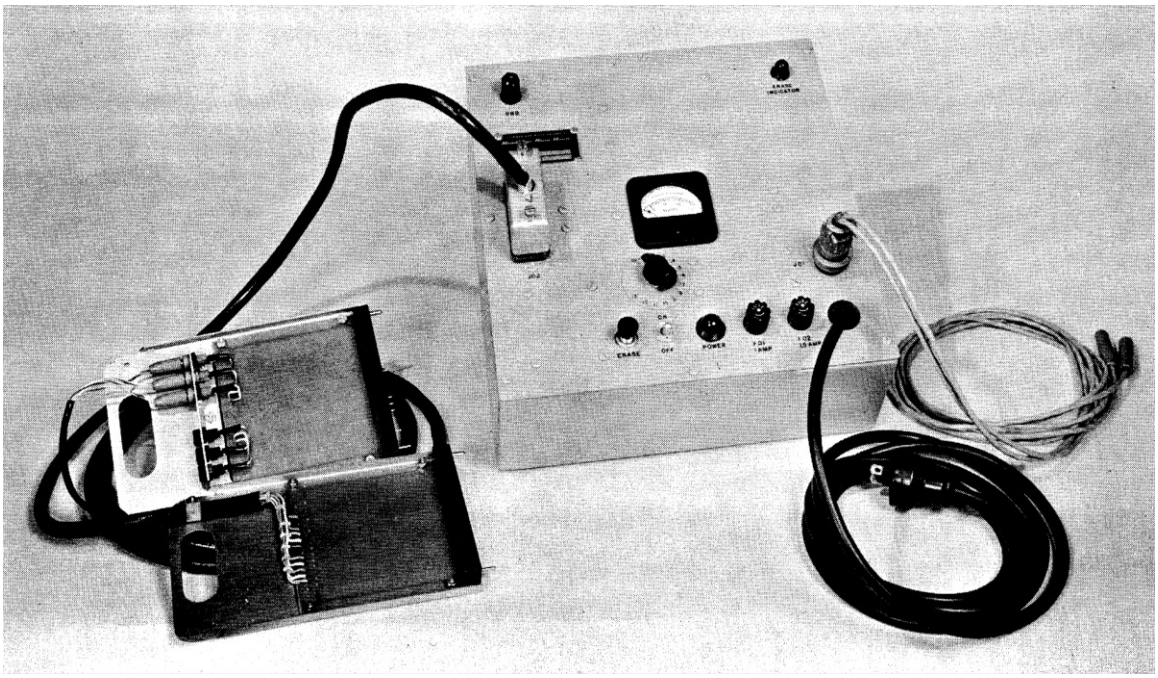
DESCRIPTION

The Magnetic Delay Unit, now obsolete in production although quite possibly in use in industry, was a unique invention, designed and built in 1953 for the petroleum industry. The single unit included a recording amplifier, a reproducing amplifier Type 416D2, and a reproducing head. By the boundary displacement method, the device recorded signals received by microphones from underground explosions and played them back, introducing the requisite delay. Each microphone was connected to a separate head in order that the interval between reverberation and echo might be recorded and stored.

The Magnetic Delay Unit was an early forerunner of more sophisticated geophysical equipment produced by Remington Rand Univac, St. Paul.

PURPOSE

By recording the intervals that it takes for reverberation and echoes to bounce off underground formations, whether of rock, sand, earth, water, or oil, a Magnetic Delay Unit is an aid to the indication of the presence or absence of oil in an area.



Magnetic Drum Erase Unit

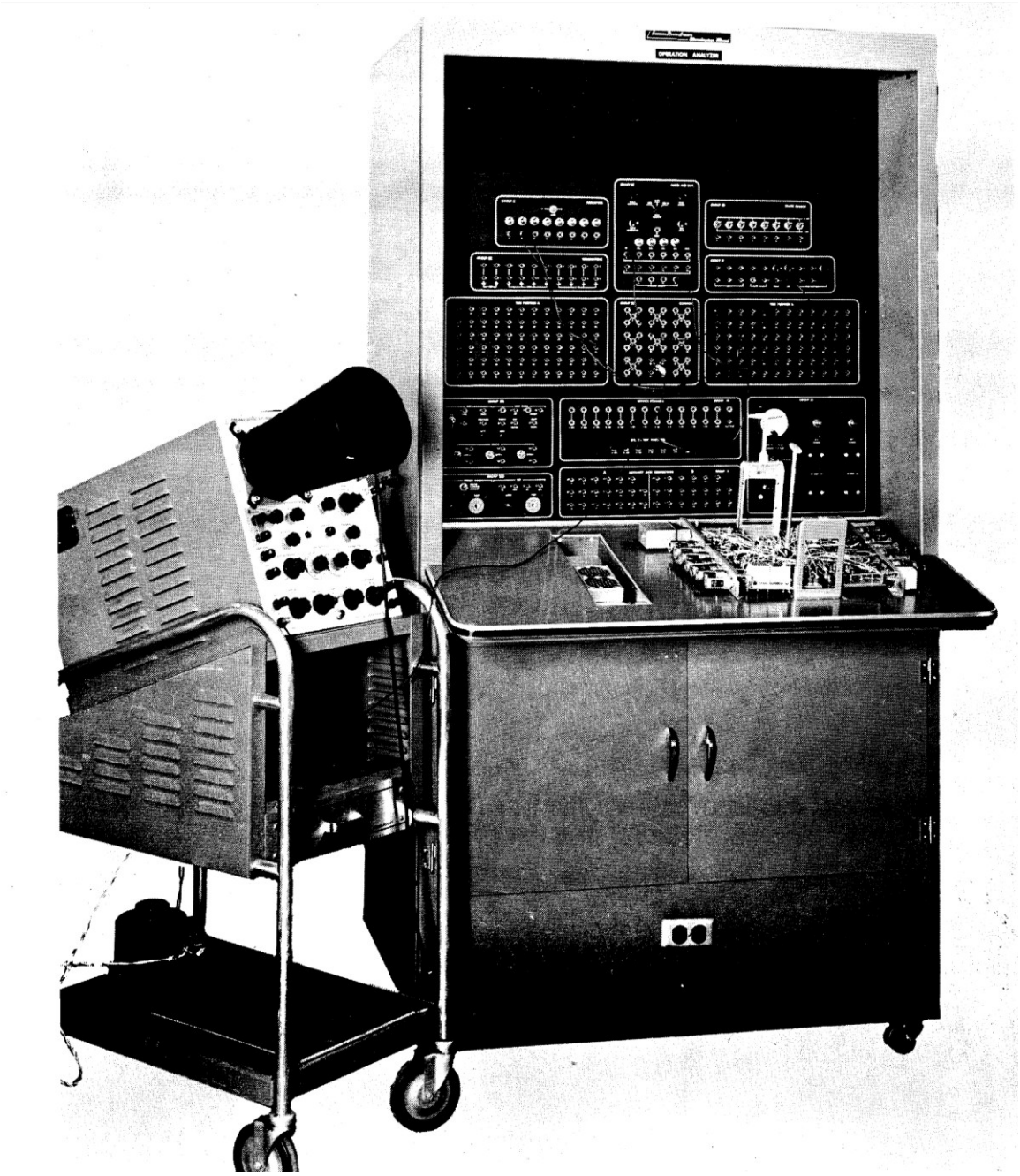
MAGNETIC DRUM ERASE UNIT

DESCRIPTION

The Magnetic Drum Erase Unit, which operates with a plug-in erase chassis as its output device, was developed in 1953-1954 to clear information from selected portions of magnetic storage drums. It is included in this compendium as an example of many pieces of plug-in gear designed in St. Paul during the development of the 1100 Series of computers.

PURPOSE

The Magnetic Drum Erase Unit was used with the 1102 Computer.



Operation Analyzer

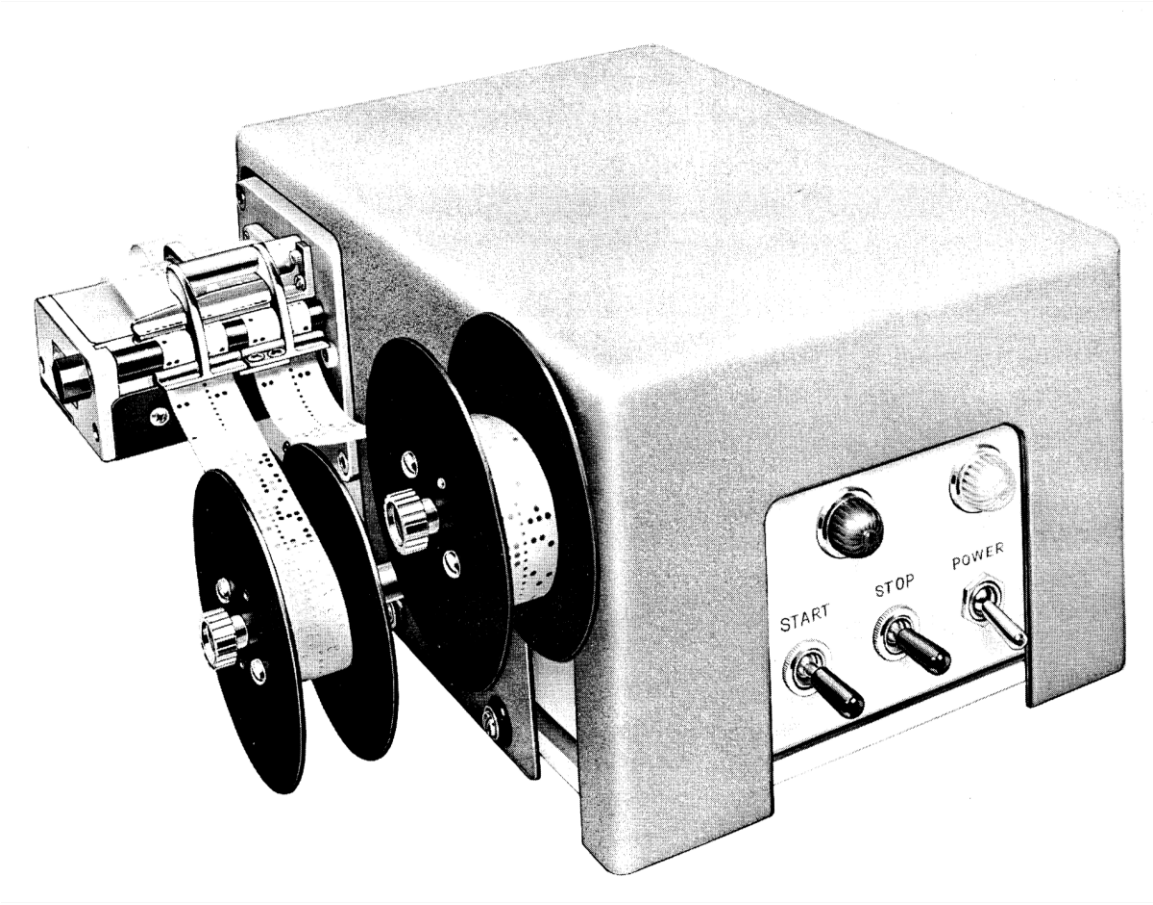
OPERATION ANALYZER

DESCRIPTION

The Operation Analyzer was developed in 1953-1954 for testing computer chassis. Although the significance of the Operation Analyzer is not great, it is included here to typify the many pieces of testing apparatus that were designed at St. Paul during the construction of the 1100 Series of computers.

PURPOSE

The Operation Analyzer was been used by maintenance personnel on computer sites or by in-plant production personnel as a piece of testing gear for the 1102, 1103, 1103A and 1105 Computers.



Perforated Tape Comparator

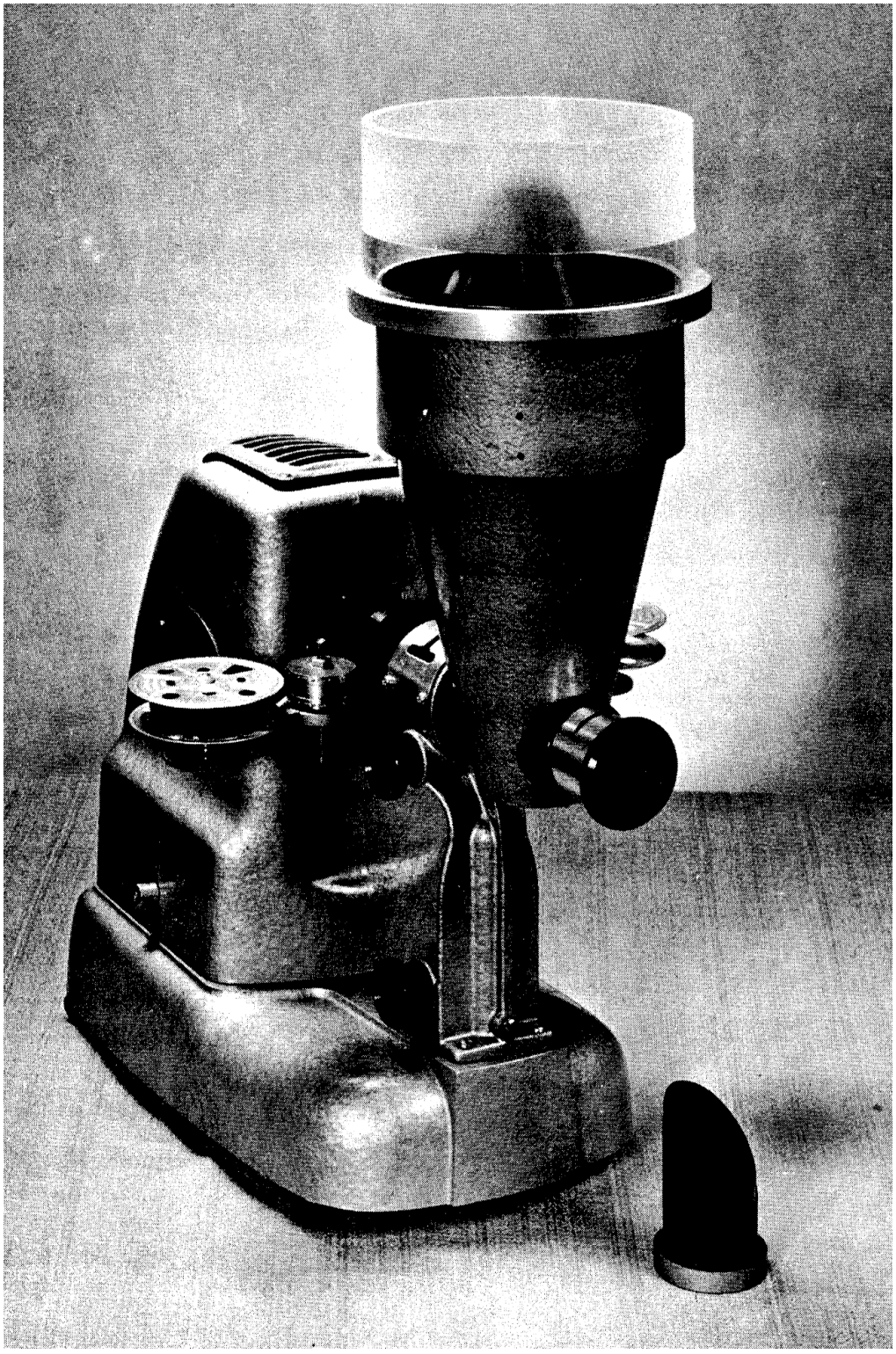
PERFORATED TAPE COMPARATOR

DESCRIPTION

The Perforated Tape Comparator provides a mechanical means of checking duplicate perforated paper tapes against each other. Although not a Remington Rand product in its original form, it was modified for and adapted to Univac equipment by St. Paul Univac engineers.

PURPOSE

This single-unit device was developed for use with the Univac File Computer.



Projector for Bore-Hole Camera Film

PROJECTOR FOR BORE-HOLE CAMERA FILM

DESCRIPTION

The Bore-Hole Projector is a 16-millimeter projector with a conical mirror and a cylindrical viewing screen on which are viewed film images from the Bore-Hole camera. The two-dimensional photo images are brought back into three-dimensional form when projected on the tubular screen. Features revealed in the small diameter bore-hole are thus made to pass before the observer's eyes as if he were descending into the hole.

PURPOSE

The projector makes possible accurate interpretation of the sequential photographs recorded by the Bore-Hole Camera.

REMOTE-SHAFT
POSITION-TO-DIGITAL CONVERTER

DESCRIPTION

The Remote-Shaft Position-To-Digital Converter, Model 502, originally called *Digiverter,* was designed by Engineering Research Associates. Conversion is accomplished by two brush and commutator assemblies which are controlled by a Servo System. Input to the Servo System is a voltage derived from the control synchro, and output consists of contact closures representing five parallel decimal digits.

One set of brushes is connected directly to the Servo Motor, and the other set directly to a shaft coupled to the motor through a reduction gearing. During the time that the brushes are in motion, they are out of contact with the commutator, thus minimizing wear. On an externally programmed command to read-out, after the Servo System has achieved balance, the brushes are brought into contact with the commutator. An exclusive Univac Division digit-justifying mechanism prevents ambiguity.

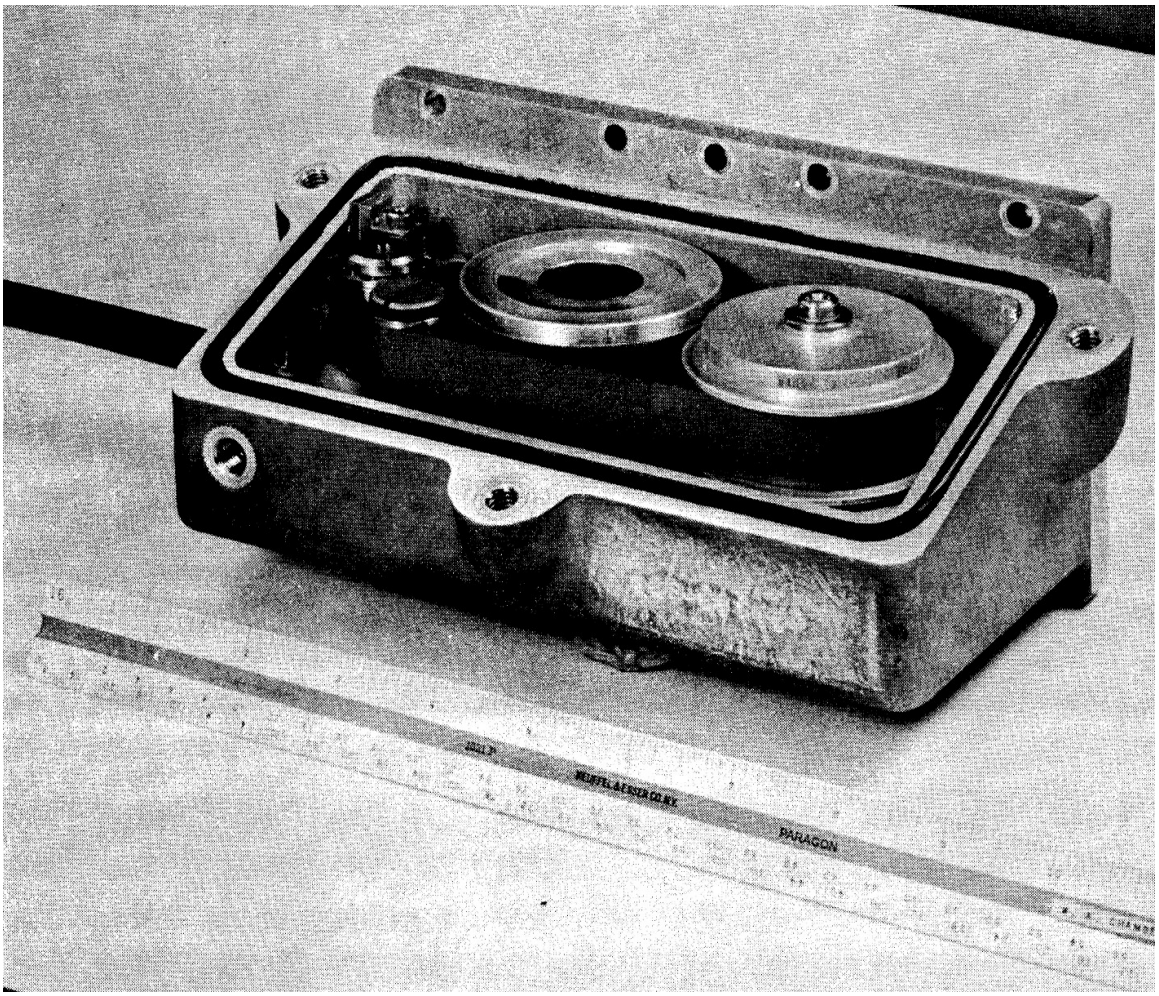
A highly stable Servo amplifier is included with the converter. The speed of response is excellent due to the specially designed rate-controlled damping circuit.

PURPOSE

The Converter was designed for use in a wide variety of applications, including use in systems which require digital read-out from scales, pressure and temperature transducers, dials and gauges, and other instruments.

FEATURES

Output:	Contact closures representing five decimal digits.
Resolution:	One part in 6,250
Gearing:	Anti-backlash precision.
Response Time:	One second (to balance).



Self-Recording Accelerometer with Top Removed

FEATURES

Magnetic Recording Accelerometer Type E-62

Maximum recording time	7 seconds
Constant speed (plus 10%) Recording Time	4 seconds
Weight	8 pounds
Operating Temperature	50°F to 120°F
Starting Mechanism	Electric fuse wire
Dimensions	4 x 4 x 8 inches (approx.)

Carrier Recording and Playback Unit Type E-57

Consists of motor driven drum, oscilloscope display unit, and power supply.

Sweep duration	Adjustable from 0.010 second to 8 seconds
Carrier frequency	1270 cycles per second

SELF-RECORDING ACCELEROMETER

DESCRIPTION

The Self-Recording Accelerometer, developed by Engineering Research Associates, is a device for measuring and recording complex acceleration patterns of any duration from a few milliseconds to several seconds. The transducer and recording elements are in one unit. No telemetering equipment, electronic amplifiers, or power supplies are required; the only external connections are to an electrical or mechanical starting line.

The acceleration of the instrument is recorded on magnetic tape driven by a spring motor. A tiny permanent magnet mounted on the seismic mass constitutes the recording element. Several different seismic spring recording elements are available in the many ranges of acceleration and resonant frequencies.

The tape is initially prepared by magnetically prerecording a high frequency carrier upon it. During the recording of acceleration, the prerecorded tape is driven past the seismic recording element. The recorded acceleration is measured by comparing the record produced before the transient with that produced during the transient; thus the calibration is independent of the sensitivity of the playback.

In a playback unit provided to play back the transient, the tape is simply wrapped around a drum which is rotated past a conventional magnetic reading head; thus, the signal is played back repetitively. It may be used to display a trace on a cathode ray tube, observed within a few minutes after the transient occurs, or a photograph may be taken for permanent record. The electrical signal from the magnetic recording is available for analysis with an electrical analyzer or for introduction into a simulator.

PURPOSE

The Accelerometers are useful wherever exploratory tests must be made to determine acceleration and frequency ranges, or as secondary instrumentation with which to check primary remote recording instruments.,

The ERA Magnetic Recording Accelerometers were first developed for use as secondary or check instrumentation in a large underground explosion test program. One model was developed to be used in a rocket, and was designed to withstand large forces while the motion of the rocket is being arrested. Another instrument built on this principle, but designed for a longer recording time, is suited to packaging research and for operational tests of automobiles, trains, and airplanes to determine their ride characteristics.

Sequence Controls for TNT Process

SEQUENCE CONTROLS FOR TNT PROCESS

DESCRIPTION

The Sequence Control System consists of the Controller itself, valves and other controls in chemical lines, and sensing instruments for pressure, temperature, and similar variables in the lines, together with the necessary hydraulic and electrical coupling means to connect the system.

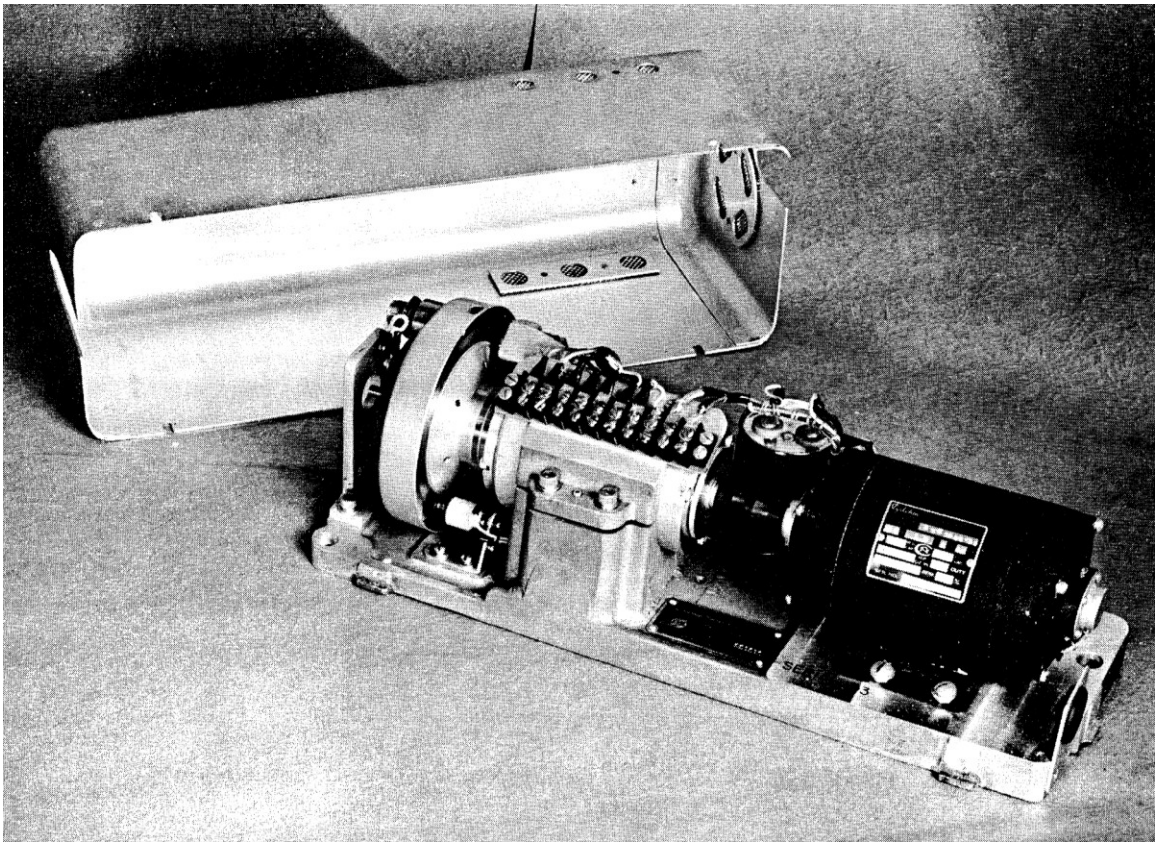
PURPOSE

The Sequence Control System was developed for automatic control of chemical processes and was specifically designed for a TNT production line. It provides a step-by-step sequence of controls on about 200 variables, each successive step being initiated in response to sensing instruments. The Sequence Controller can be manually set to determine which controls are actuated from each step.

FEATURES

The system is adjusted to the process it controls in order to initiate the sequence of steps as rapidly as the process is ready for them, and to correct pressure, temperatures, and flows automatically.

The process controlled is stopped by the Controller at the next stable stage whenever the stopping mechanism is actuated either by a push button or automatically by the instrumentation. Automatic stopping is initiated when the sensing instruments indicate that process variables are beyond the limits set and cannot be restored automatically.



Shaft Monitor

SHAFT MONITOR

DESCRIPTION

The ERA Shaft Monitor consists of two major components – an electromechanical locator and an electronic converter. The locator incorporates a rotor plate on which a magnetic writing head is mounted, and a magnetically coded disc which is driven at a relatively constant speed by an electric motor. A magnetic reading head and an erase solenoid are mounted near the periphery of the disc; a permanent index track containing 500 index marks is affixed to the disc and rotates with it. A separate magnetic reading head is mounted adjacent to the index track. The electronic converter is constructed on a single chassis and incorporates amplifying, frequency multiplying, shaping, delay, and control circuits necessary to the operation of the system. The components associated with each stage of the converter are contained in a plug-in can, which virtually eliminates circuit tracing problems.

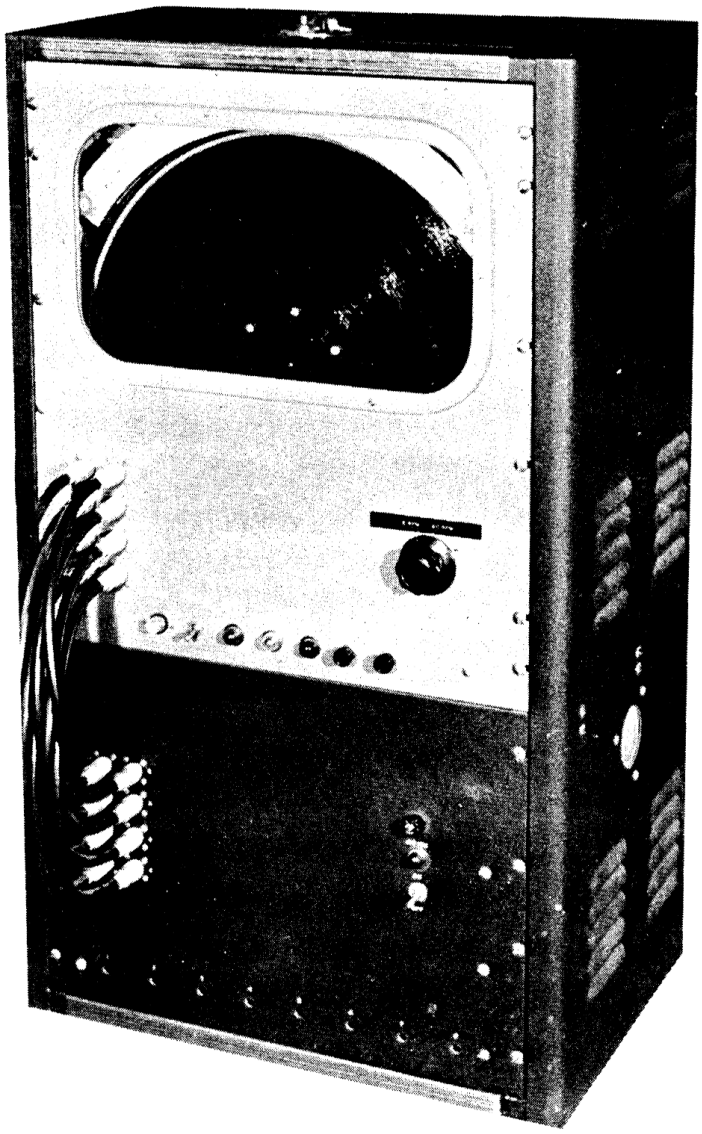
PURPOSE

The ERA Shaft Monitor, also known as the Shaft Position Indicator, rapidly and accurately detects the angular position of a rotating shaft and converts the result to a digital representation. This unit utilizes a magnetic recording to detect the position of a shaft. By counting recorded pulses from a reference position, it converts the analog shaft position to digital form. Accuracies of better than one-tenth of one degree are achieved. The first units made by ERA were under subcontract to the Austin Company, Special Devices Division, for use in mobile equipment for United States Army Ordnance.

FEATURES

In operation, the input shaft of the locator is mechanically coupled to the reference shaft for which measurements are required; consequently, the position of the writing head at any time corresponds to the position of the reference shaft. When determination of the reference shaft position is desired, the writing head writes a magnetic mark on the magnetic disc. The read-out of the train of pulses generated by the index track reading head is initiated by the write pulse.

The index pulses appear at the output of the shaft monitor until the reference mark written at the start of the cycle passes the reading head. The number of pulses in the pulse train obtained represents the shaft position at the time that the read signal was initiated. This serial pulse train is then fed to a data accumulation and coding unit, where the pulses are accumulated and coded in binary or decimal digit form before being routed to associated recording, processing or read-out equipment. These measurements, when routed to a convenient remote location, may be displayed as a visual indication in digital form, transferred to magnetic tape, punched tape, or punched cards for future analysis, or used to perform desired control functions.



Transient Monitor

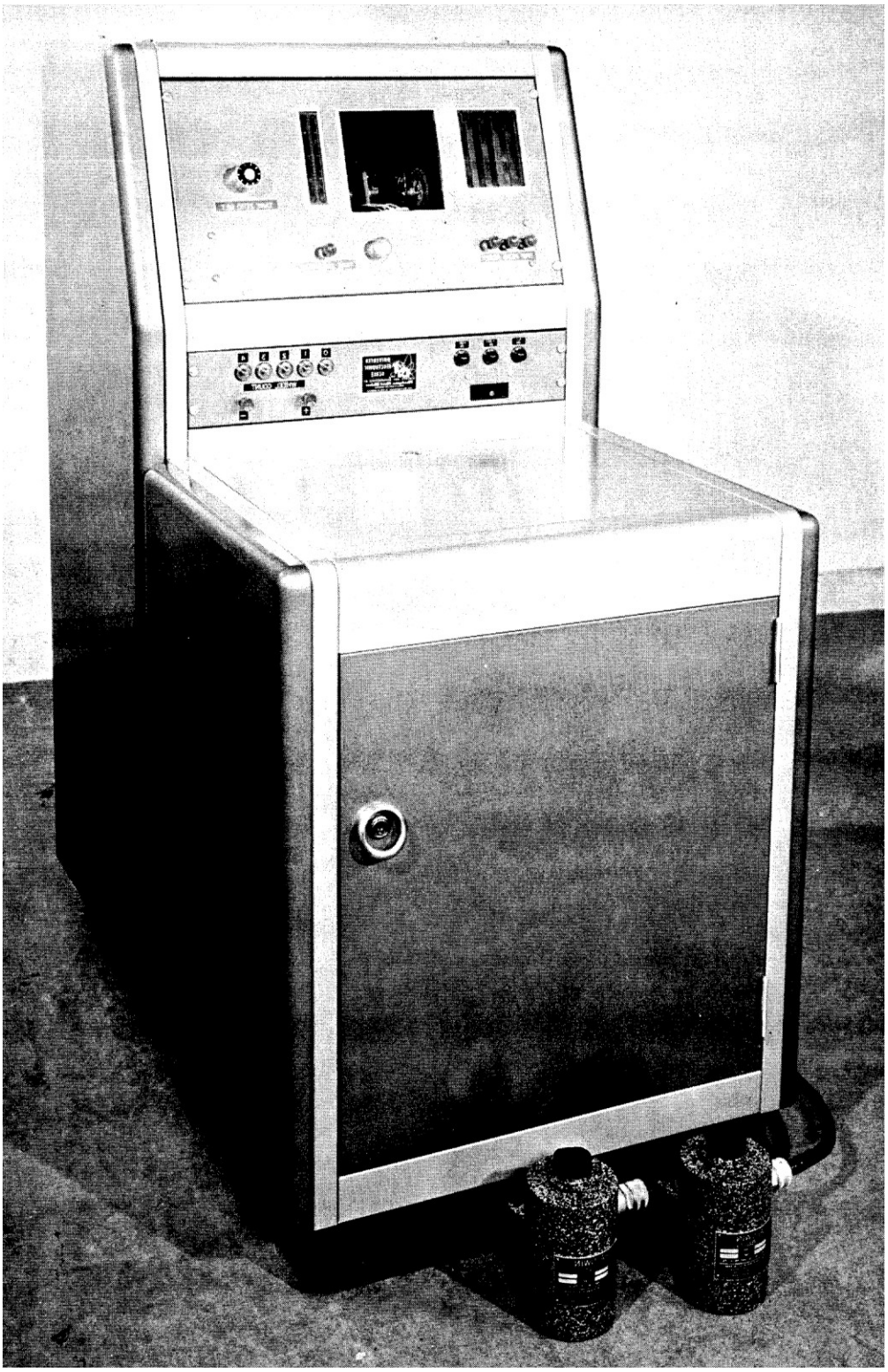
TRANSIENT MONITOR

DESCRIPTION

The Transient Monitor is an 8-channel transient monitoring system that continually records and erases signals representing power line currents and voltages. When a fault occurs on a line, the erase heads are disconnected, leaving voltage and current recordings for two seconds before and eight seconds following the initial disturbance.

PURPOSE

The first Transient Monitor was developed for a power company. Another was designed for the investigation of transient phenomena with frequency components from 200 cycles to 100 kilocycles.



Univac Electronic Scale

UNIVAC ELECTRONIC SCALE

The Univac Electronic Scale was developed as a part of the Railroad Car Weighing System to supplant a unit originally included in that system (a unit manufactured by another company). The scale weighs ore cars while they are in motion, providing a digital output corresponding to the weight of the car. It includes electronic strain gauge load cells, an analog-to-digital converter, an axle counter, and its own power supply. The axle counter keeps an automatic count of the number of car axles when an ore car passes onto the weigh bridge, and totals them to four in order to determine when the car is completely on the bridge.

SECTION V

COMPONENT APPARATUS AND PRODUCTION DEVICES

Because of the complex nature of much of the equipment built by the St. Paul Univac Division, it has been necessary in many cases to design apparatus and devices for the production of components or units. These products, which include testing apparatus, are listed in the following section.

AUTOMATIC FERRITE CORE TESTER

FEATURES

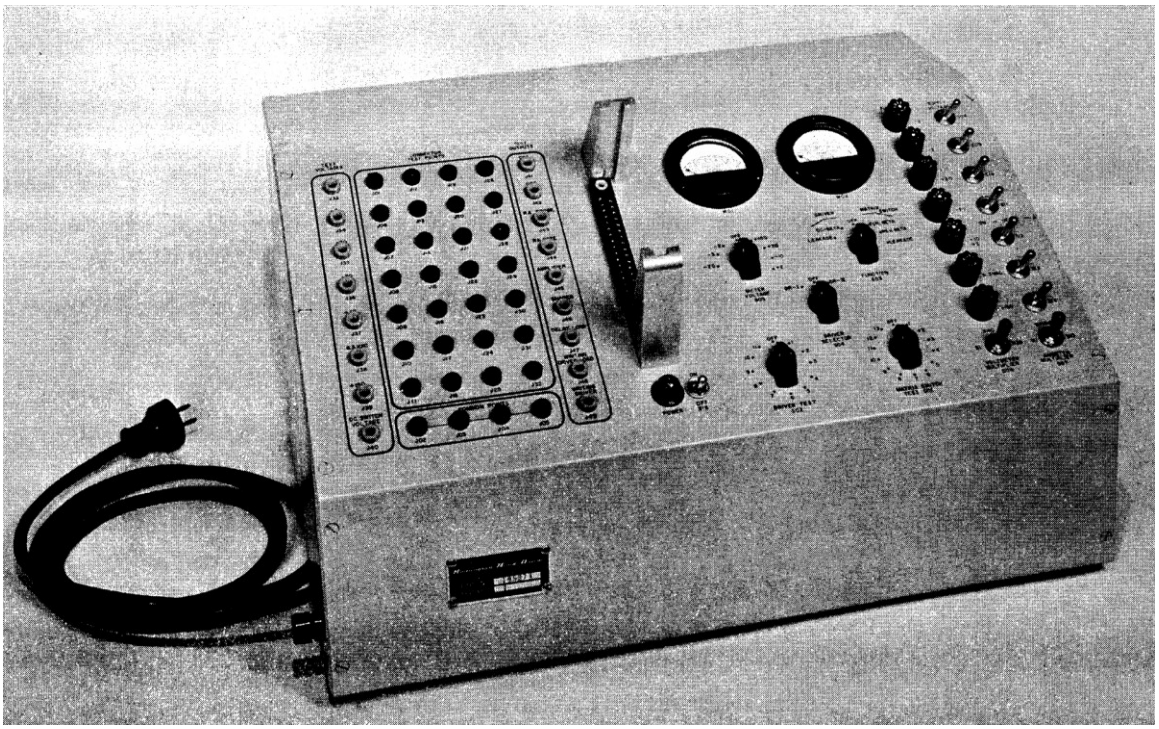
The Automatic Ferrite Core Tester, developed in 1957, and originally called the "Pneumatically Operated Core Transport Device," provides a method of testing magnetic cores. Cores to be tested for their magnetic properties are fed one at a time to a track, by gravity, from a syntron vibration type of elevator. As a result of the test, one of five selector valves is opened and the tested core is drawn by vacuum into one of five tracks and thence to one of five bottles. Air pressure is then removed from a vertical moving piston, allowing the horizontal moving piston assembly to rise into its original position.

PURPOSE

The purpose of this invention was to provide a magnetic core transport system utilizing pneumatic techniques for an electronic core-testing device.

FEATURES

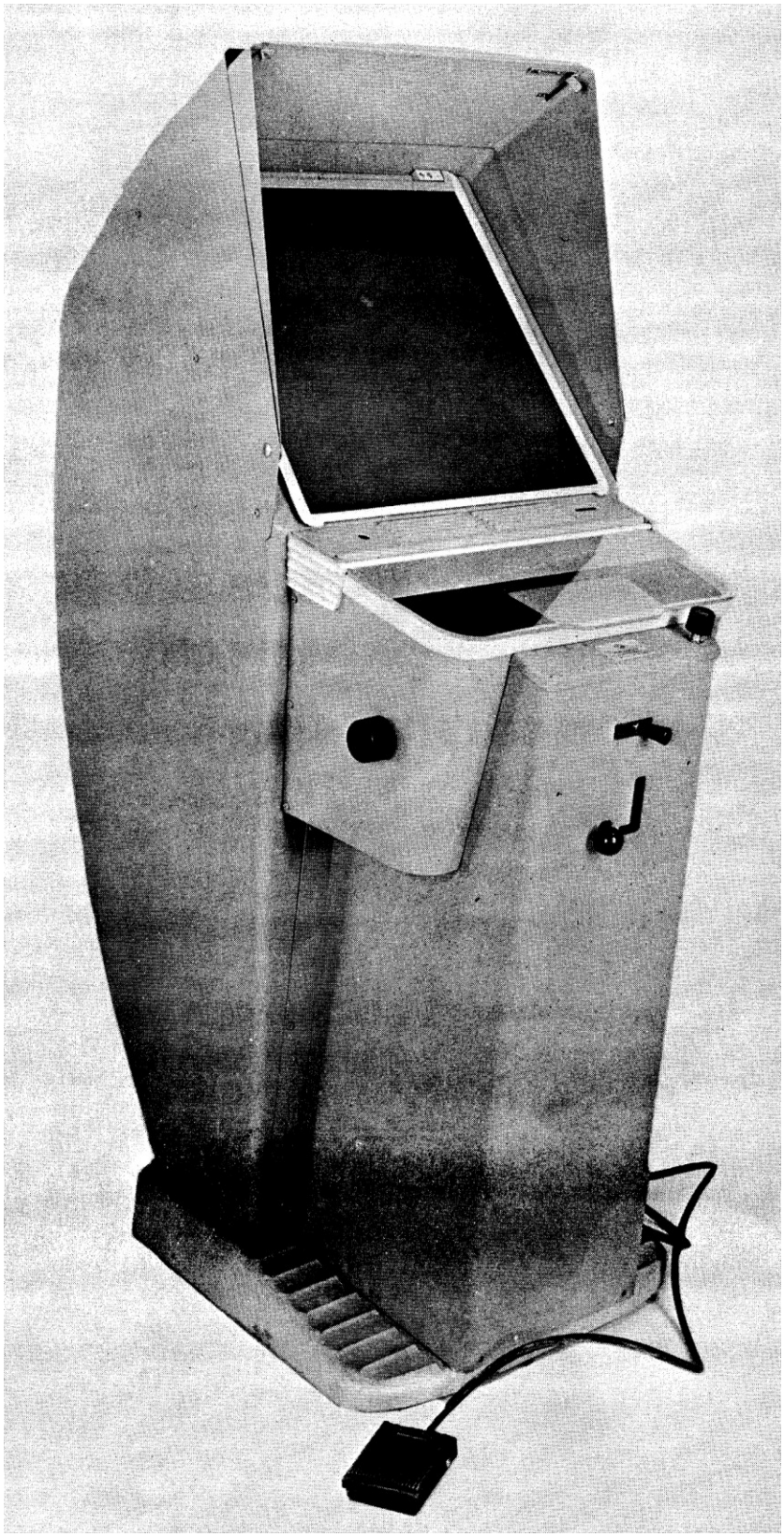
The Automatic Ferrite Core Tester tests cores at a rate of from 17 to 20 cores per second without chipping or otherwise damaging fragile cores. In prior core handlers of the magnetic selection type, the maximum rate was approximately three to six cores per second.



Chassis Tester

CHASSIS TESTER

The Chassis Tester, one of several devices called by this name, was a unit of special equipment designed for testing the chassis of the NAVDAC Magnetic Storage System. It contained an outlet on its top side for a plug-in connection with the NAVDAC chassis.



Film Cutter

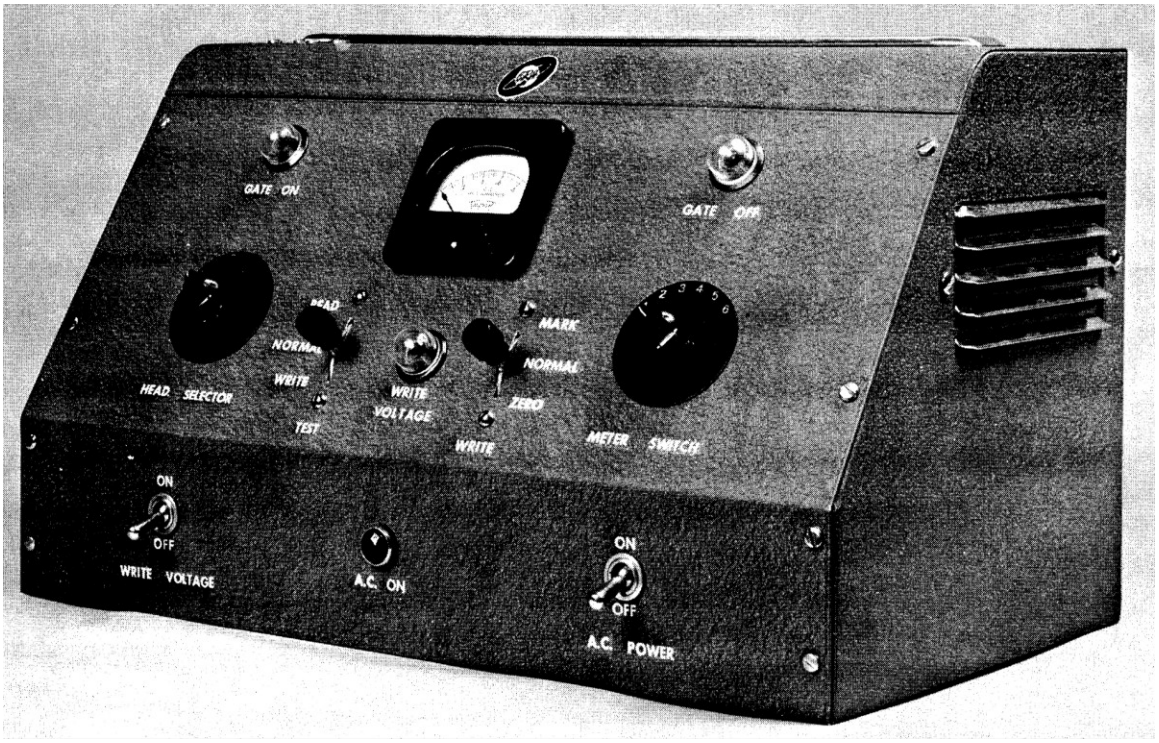
FILM CUTTER

DESCRIPTION

The Film Cutter was developed in 1957 for use with the Airlines Reservations System. It was part of the Slide Preparation Equipment that also included a camera and copying stand. (See Slide Preparation Camera.)

PURPOSE

The Film Cutter is used to produce slides for Agent Sets.



Magnetic Head Selector

MAGNETIC HEAD SELECTOR

DESCRIPTION

The Magnetic Head Selector is a special piece of test apparatus for engineering purposes. It was designed in 1951 primarily to provide a convenient means for determining the proper setting of the spacing between a magnetic recording head and the surface of a magnetic storage drum. The equipment consists of a gated amplifier circuit, a writing circuit, and a signal amplifier circuit, and contains its own power supply.

PURPOSE

The Magnetic Head Selector not only determines proper setting of head-to-drum spacing, but it also checks the operation of the head. It operates with four different types of magnetic heads: types 200A1, 200B1, 200D1, and 200E1. Originally, it also checked the operation of type 200C1, but this type was discontinued. By obtaining proper head-to-drum spacing, the Magnetic Head Selector achieves three advantages: it avoids damage to the magnetic coating of the drum; it protects the head from wear; and it ensures that the signal induced in the head will have the proper amplitude.

FEATURES

The Gated Amplifier produces a triggering pulse for the wiring circuit upon receiving a pulse read from the magnetic drum. The Writing Circuit produces a writing current through the head selected by the Test Switch. The Signal Amplifier increases the signal, from the head being set, to an amplitude sufficient for display on an oscilloscope.

MINN-A-MATIC

DESCRIPTION

The Minn-A-Matic is an automatic assembly machine used to drill holes, insert components, and clinch leads on printed-circuit boards. It is a single-head insertion machine for axial-lead components in which boards are run vertically through the machine. Minnesota Engineering Company designed the basic model and Engineering Research Associates perfected the design and built the machine in its present form.

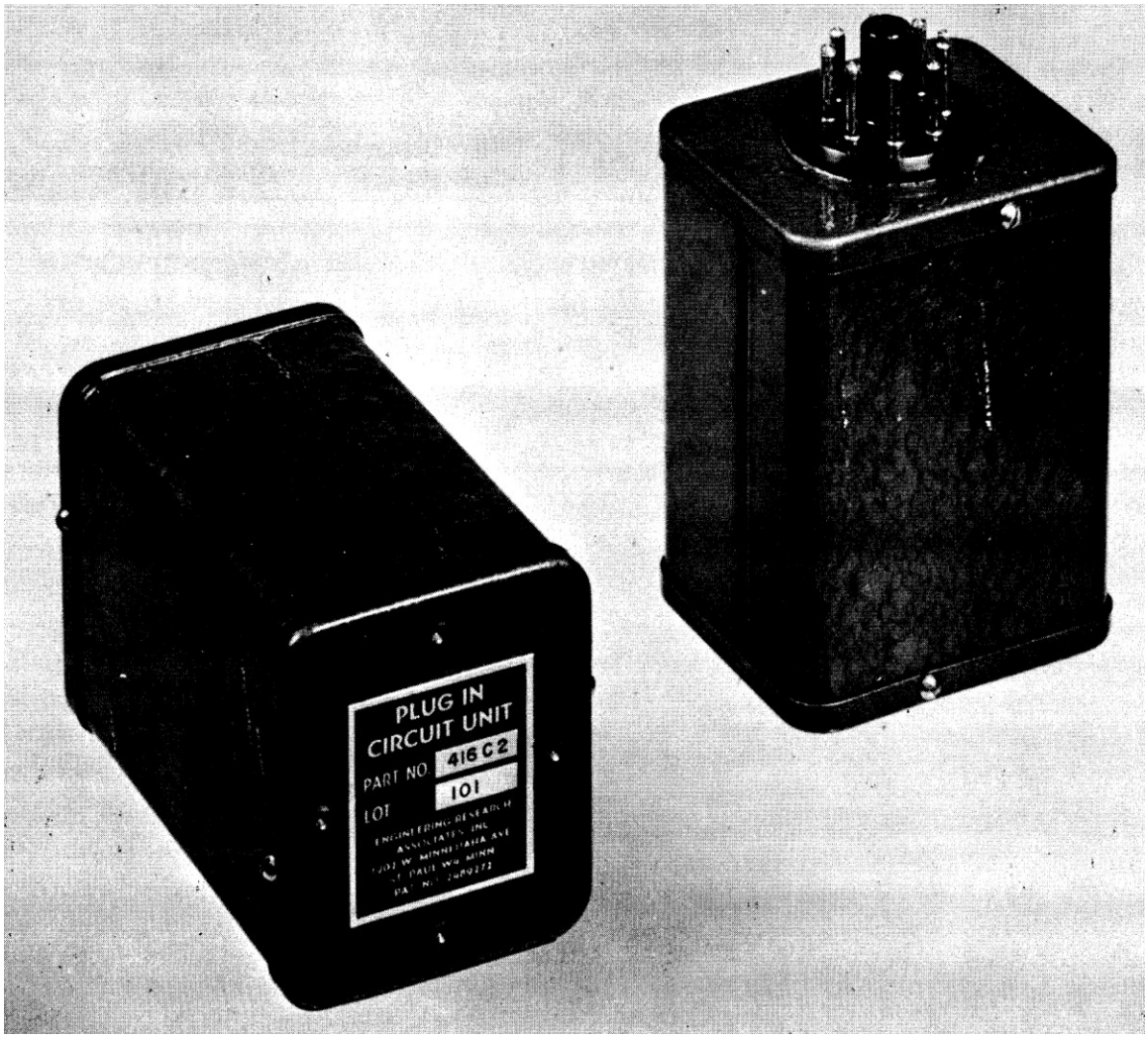
PURPOSE

The Minn-A-Matic will handle a variety of components, such as miniature diodes, resistors, capacitors to one microfarad, and round, cylindrical, and square shapes. A variety of wirings: stamped, pressed powder, plated, painted, or etched, may be used with the Minn-A-Matic.

FEATURES

Capacity:	Printed-wire boards from U' x 1" to 12" x 17" up to 1/4" thickness.
Components Handled:	Diodes to one mfd. capacitors.
Drills Used:	0.020 inch to 0.060 inch. Spacing between adjustable drills from 7/8 inch to 3 3/8 inches.
Adjustments are provided for:	1. Symmetrical or nonsymmetrical lead bend. 2. Varying length of the clinched tab.

Following insertion of the printed-wire boards, holes are drilled from the left hand side, as the axial-lead component is formed to the right of the board. As the drills are retracted, the component is inserted, and the leads are clinched flat against the pattern. The total cycle time from start of drilling to end of clinch is one second. The angle of wire clinch, with respect to the component is adjustable in 20-degree increments through 360 degrees; this assures a wipe back against a portion of the pattern.



Plug-In Circuit Units

PLUG-IN CIRCUIT UNITS

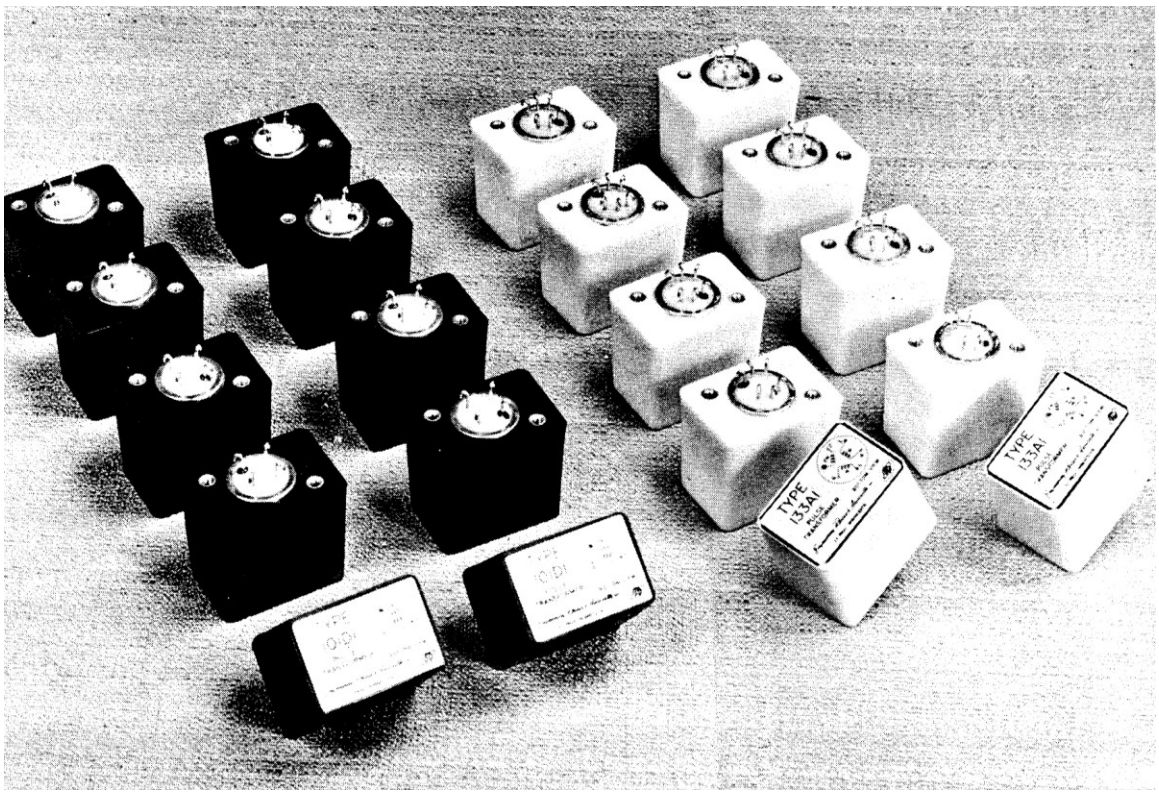
DESCRIPTION

Several types of plug-in circuit units were developed at St. Paul and were either marketed or were used as components of our equipment. These included amplifiers, oscillators, and similar electronic circuits.

The most important of these units was a Plug-In High-Gain Amplifier developed for low- signal -level, low-frequency applications. It was characterized by exceptionally high gain and relative independence of power-supply voltage fluctuation. One type of compact unit, which measured approximately 1 7/8 inches x 2 1/4 inches x 3 inches, was potted in a steel case, thus reducing micro phonics. Specific characteristics included a maximum gain of 9000 and a flat frequency response from 2 to 1000 cps. Power supply requirements consisted of 600 milli-amperes, 6.3-volt filament supply and a 0.5-milliampere, 250-volt plate supply. Maximum output voltage was 20 volts. It was designed for wide-range integrating circuits in which integration was achieved by a stabilizing negative feedback circuit. Because of its single-stage characteristics, the amplifier could accept an extraordinary amount of negative feedback without instability.

FEATURES

All of the plug-in circuit units were designed to fit standard vacuum tube sockets.



Pulse Transformers

PULSE TRANSFORMERS

DESCRIPTION

Various models of Pulse Transformers have been designed and produced in St. Paul. In general, each consists of several miniature transformer windings encapsulated in a highly stable Epoxy casting resin within a plastic insulating case.

PUR POSE

These Pulse Transformers are designed for use: 1) in inter-stage coupling circuits of pulse amplifiers; 2) as blocking oscillator transformers; 3) as impedance-matching transformers between tubes or generators and transmission lines or low impedance loads; 4) for driving magnetic core devices in triggering and counting circuits, and 5) for d-c isolation, inversion, or pulse-shaping.

FEATURES

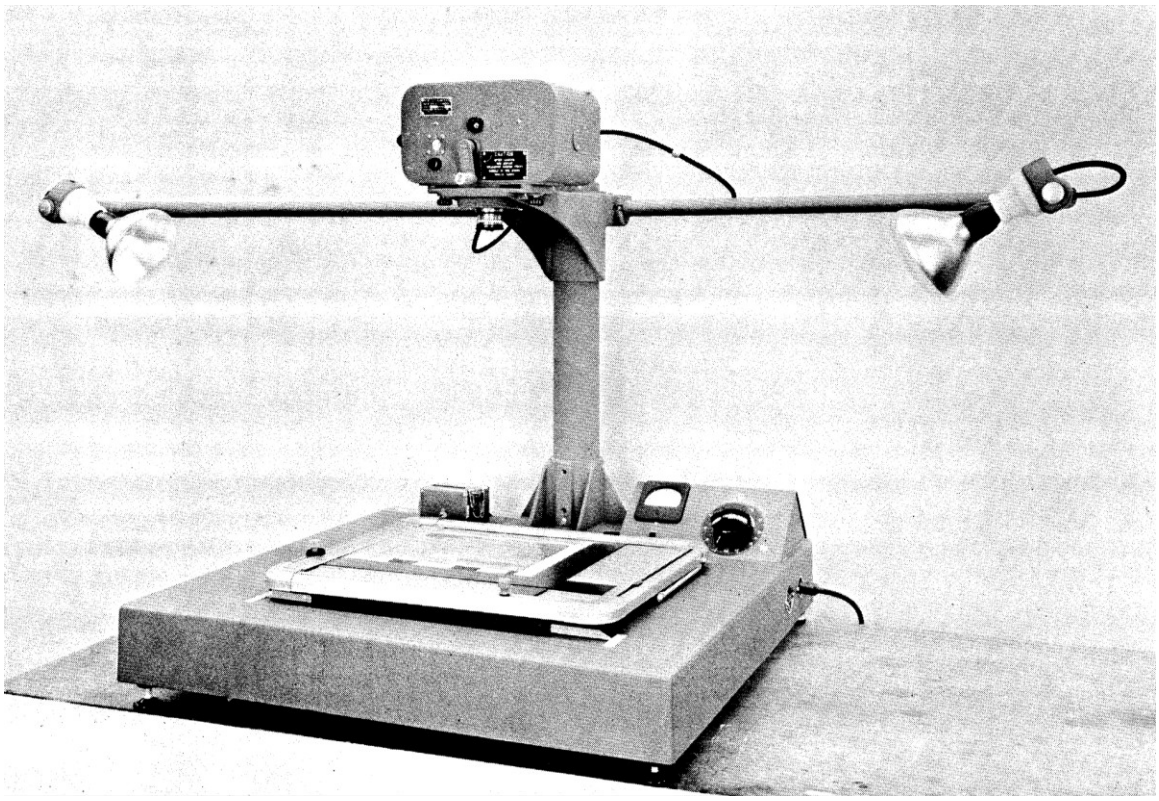
1. Plastic insulating case permits mounting in close proximity to other components and terminals without danger of short circuits.

2. Terminal design permits through-panel mounting utilizing same mounting hole pattern as in a conventional nine-pin miniature tube socket.

3. Rugged construction permits transformer to withstand severe temperature, shock, and humidity.

4. Compact transformer design permits mounting in approximately the same space required for standard miniature tubes.

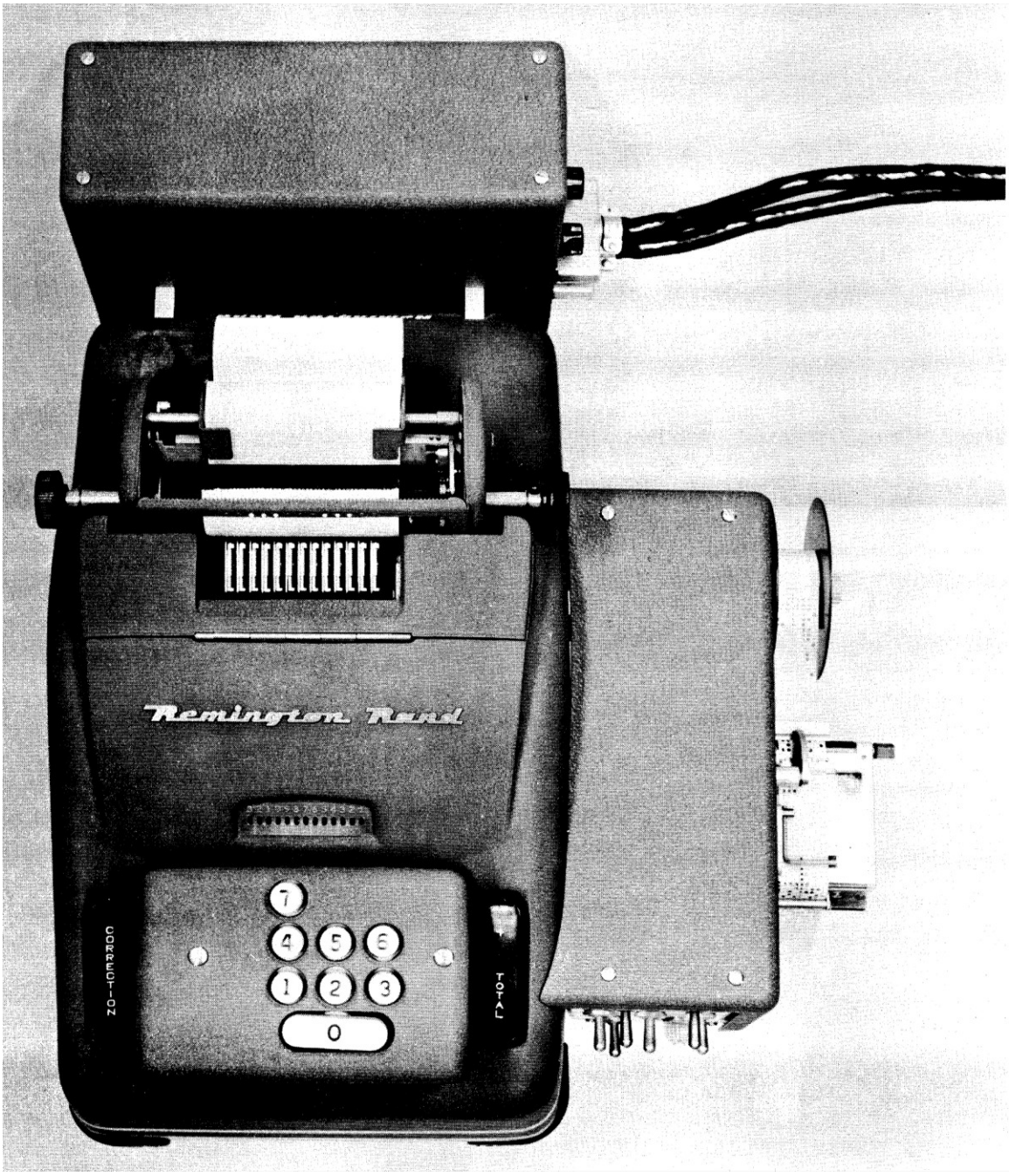
5. Superior electrical characteristics provide short rise time and small droop to minimize critical circuit design problems.



Slide Preparation Camera

SLIDE PREPARATION CAMERA

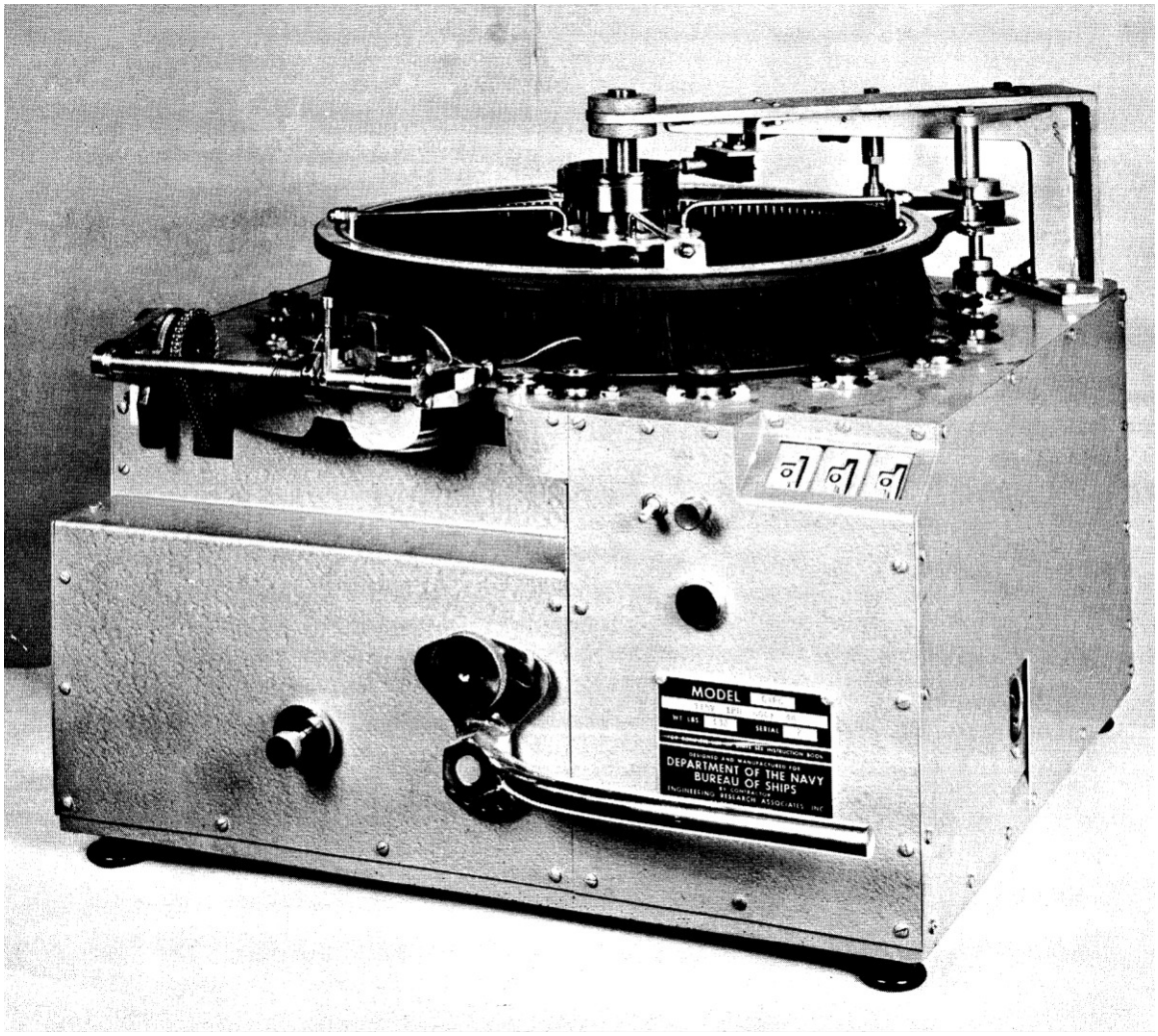
The Slide Preparation Camera was designed in conjunction with the Airline Reservation System. It consists of a camera assembly that includes mounting, frame, and light controls. The photographic unit is a Griscombe Microfilm Camera. The Slide Preparation Camera creates the 35-millimeter slide films for use in Agent Sets.



Tape Preparation Unit

TAPE PREPARATION UNIT

The Tape Preparation Unit is an octal device for preparing perforated paper tape, numerically coded, for the 1103 computer.



Toroidal Coil Winder

TOROIDAL COIL WINDER

DESCRIPTION

The Toroidal Coil Winder, invented by Univac engineers and patented in 1958, is an ingenious device for winding wire onto the toroidal cores used in computer circuits. It can also be used for other winding operations. By use of a circular brush, it substantially eliminates sudden tensions on the wires so that finer wire can be wound than would otherwise be possible.

The Coil Winder consists of a needle-like split ring shuttle supported for rotation by a number of drive rollers. The toroidal core to be wound is held in a position so that it may be interlinked with an annular shuttle. The core holder is in turn held by a support bar which is connected, through a shaft and chain drive, to a motor which oscillates the core about its axis. A rotating circular brush is mounted from a hollow shaft, and a flexible belt in the bristle of the brush imparts angular rotation of the same velocity as the shuttle.

Three straight brushes are rigidly mounted on an extending portion of the hollow shaft. Both the circular and stationary brushes are mounted so that their bristles just touch the top plate except in a clearance area underlying the core.

Alter the toroidal core is mounted and linked by the shuttle, one end of a piece of wire having a length equal to about 1 1/4 times the circumference of the circular brush is tied to the shuttle at the slot formed by separable joint. The wire is then laid around the circumference of the brush and the other end is tied at the core. The power may then be switched on to rotate both the brush and the shuttle and cause the wire to be wound around the core.

PURPOSE

The Coil Winder was developed to wind cores of far smaller inside diameter than those which could previously be wound automatically, and to provide means for laying each turn substantially parallel to the other turns on the core, and immediately alongside the previous turn.

FEATURES

A novel feature of this device is the sweeping brush that restrains movement of the entire length of wire to prevent it from tangling during the rotation of the shuttle.

SECTION VI
MECHANICAL DEVELOPMENTS

A few mechanical products that do not contain electronic components were developed by the St. Paul Univac Division. These are older products, now listed as obsolete for manufacture. They are a wide departure from the regular Univac product line, and no attempt is currently being made to continue similar developments. Three of these mechanical products are listed in the following section.

AIRPLANE GASOLINE SERVICE TRUCK

DESCRIPTION

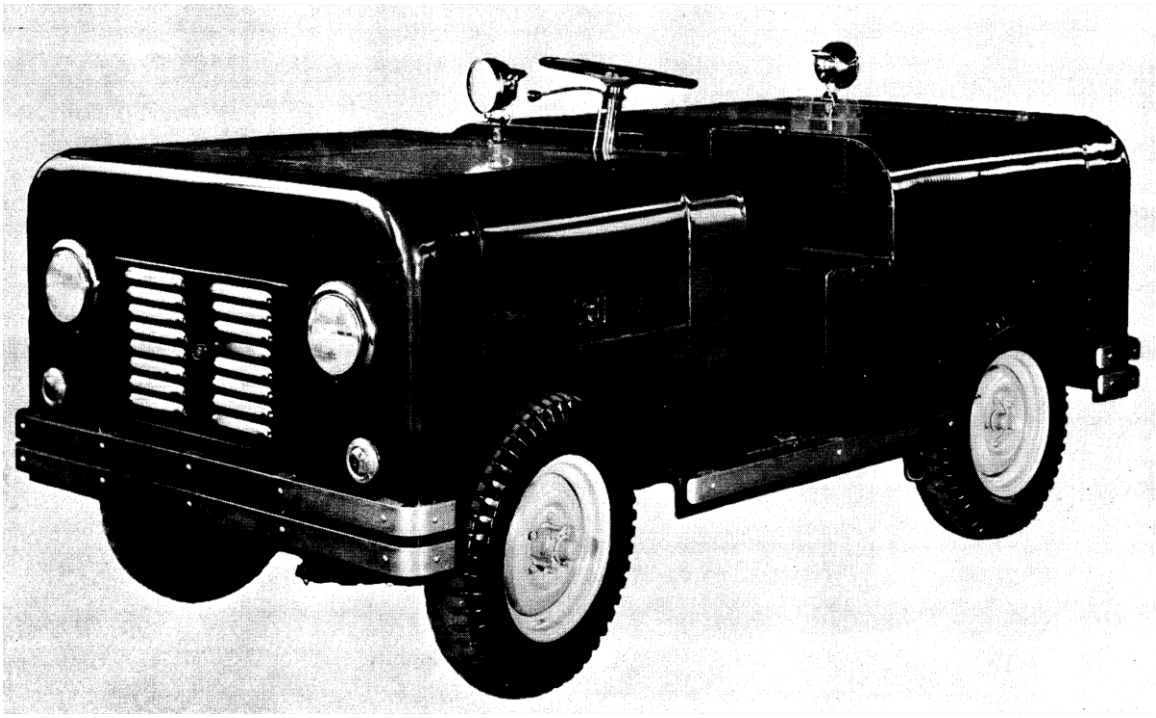
The Airplane Gasoline Service Truck, commonly known as the "Airport Gasporter", was one of the early developments of Engineering Research Associates. It provided mobile fuel service for light and medium aircraft. It was small and compact, designed for one-man operation, and was built on a Crosley truck chassis. The fuel was stored in a tank that formed a part of the truck and was siphoned directly into the airplane without need for a service crew or bulky equipment.

PURPOSE

As stated in the advertisements, the Airplane Gasoline Service Truck provided a "new, economical, and speedy method of fueling aircraft parked anywhere on the airport."

FEATURES

The truck had: 1) 200-gallon capacity; 2) it possessed dispensing equipment operated by power take-off from the engine; 3) it had a three-way valve - for plane defueling, for tank replenishing, and for fuel transfers; 4) height was 45 inches, width 48 inches, length 30 inches, fueling speed 25 gallons per minute.



Lavatory Service Porter

LAVATORY SERVICE PORTER

DESCRIPTION

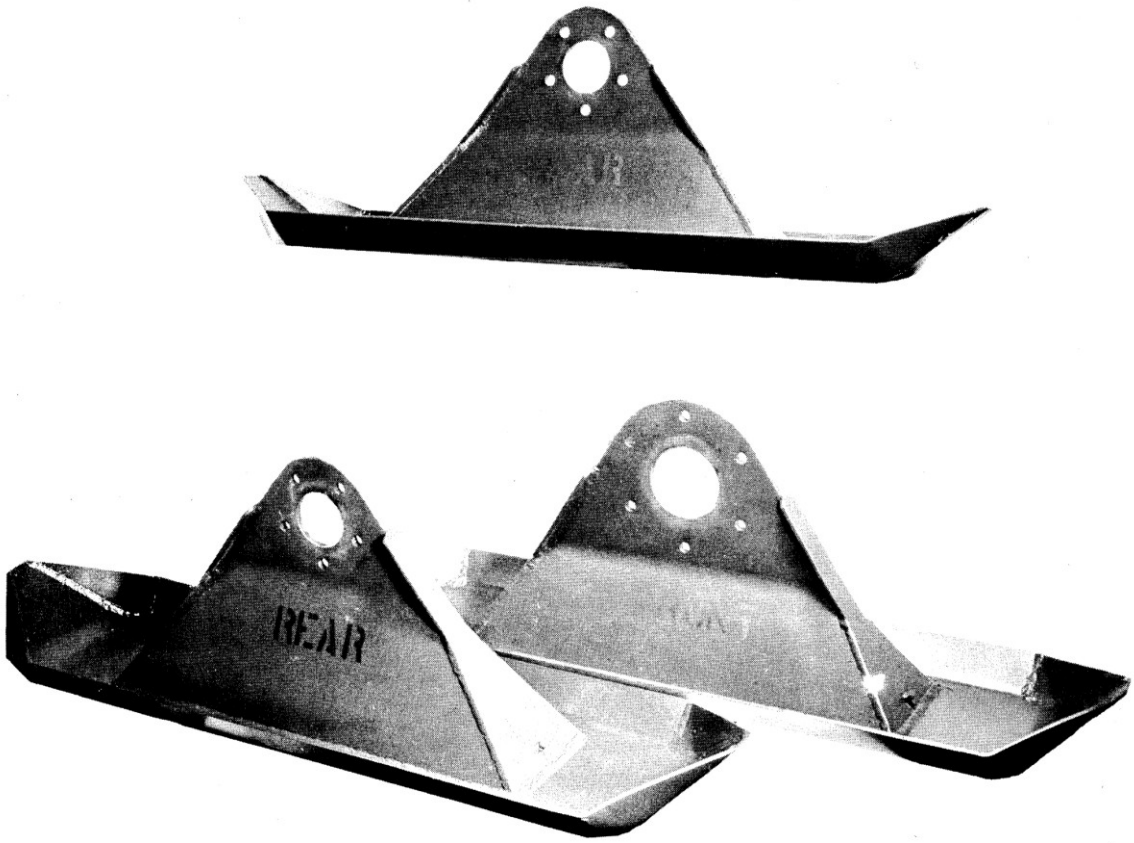
The Lavatory Service Porter, developed by Engineering Research Associates in 1948 and now obsolete, was a small, compact truck with front and rear housing assembly and rubber insulation. Built on a Willys Jeep chassis, it somewhat resembled the Airplane Gasoline Service Truck in appearance. It could go anywhere an airplane could land and could be operated easily and efficiently by one man.

PURPOSE

The Lavatory Service Porter was designed and produced to siphon out the septic tanks of passenger airplanes.

FEATURES

The main features of the truck were a squarely built, compact body, swivel-mounted spotlights, and ample capacity for the transportation of the complete contents of an airplane's septic tank.



Maintenance Dock Skis

MAINTENANCE DOCK SKIS

DESCRIPTION

Maintenance Dock Skis, developed by Engineering Research Associates in 1948, are a means of movable support for aircraft maintenance docks used under Arctic conditions. Three skis comprise one set for a maintenance dock; two skis for the rear and one for the front. All three are identical in physical size and shape. The rear skis are mounted rigidly to the docks whereas the front ski mounts on a rotating pivot to permit steering.

PURPOSE

The skis were designed for use with B-29 and C97 airplanes.

FEATURES

1. The facility for multidirectional motion.
2. Tapered front and upswept sides to permit deflection in any direction.
3. Space for loading down when in fixed position.
4. Pedestal construction for additional strength.