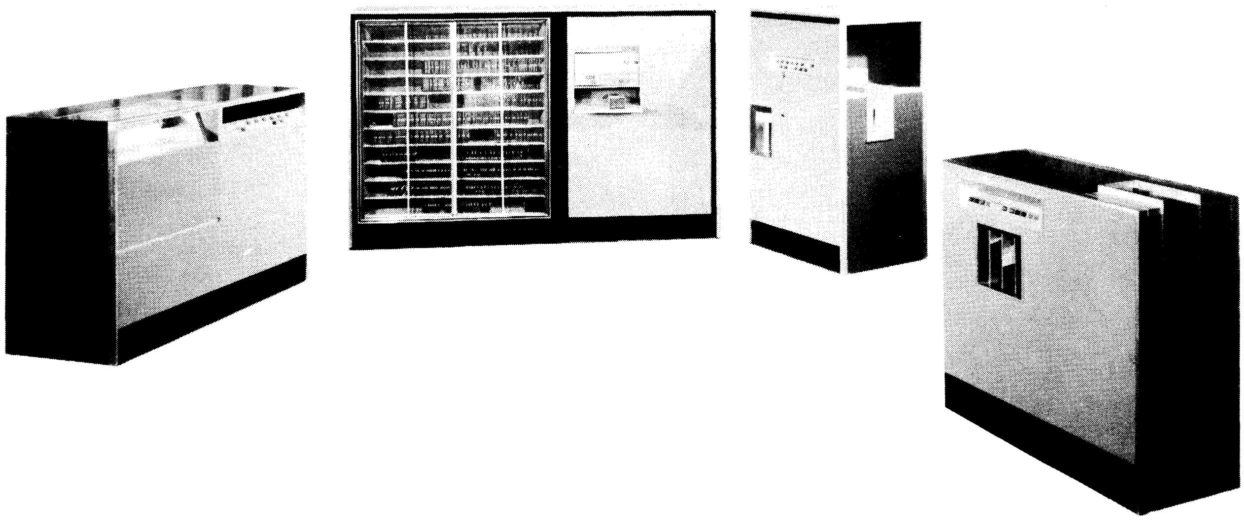
UNIVAC®
SOLID–STATE
90

General Description

Remington Rand Univac
DIVISION OF SPERRY RAND CORPORATION

Contents

UNIVAC SOLID-STATE Computer



The UNIVAC Solid-State Computer is a general-purpose, alpha-numeric, digital, punched-card computing system. It is composed of four individual units: a Central Processor, a High-Speed Reader, a Read-Punch Unit, and a High-Speed Printer. The units are connected to form a completely on-line, balanced data-processing system.

Operating as a system, these units perform the following basic functions:

INPUT	*The High-Speed Reader reads punched-card data into the system at speeds of up to 450 cards per minute.*
OUTPUT	*The High-Speed Printer produces printed reports at 600 lines per minute.*
INPUT-OUTPUT	*The Read-Punch Unit operates as an input / output unit at speeds of up to 150 cards per minute.*
PROCESSING	*The Central Processor performs arithmetic and logical processing operations at electronic speeds, houses the data storage, and provides centralized processing control. Word time is 17 microseconds.*

FEATURES

- 90-column punched-card input/output
- Fast arithmetic and logic circuits. Transfer rate is 707,000 characters per second.
- 5000 word Magnetic Drum Storage. Each word consists of ten digits plus sign for a total of 50,000 digits of information storage.

- Average access time 1.7 milliseconds in the normal area of the drum; 0.425 milliseconds in the High-Speed area of the drum.
- The UNIVAC Solid-State Computer is completely internally programmed.
- The input and output units are buffered to insure simultaneous read, print, punch and compute operations.
- All internal word transfers are parity checked.
- A bit by bit comparision check of all the input and output information can be programmed to insure complete accuracy of reading, punching and printing.
- 1 ½ address logic. Each instruction consists of 10 digits, the first two digits represent the instruction code, the next four digits represent the operand and the last four digits represent the address of the next instruction.
- Simple solid-state circuits, standardized for production and ease of maintenance -- the most reliable circuitry in existence.

The UNIVAC Solid-State Computer combines the advantages of large capacity storage, microsecond access and processing with input/output units working simultaneously on-line and in balance. The user is able to quickly reduce his costs, because:

1. The UNIVAC Solid-State Computer is less expensive to build and to maintain -- and these savings are passed on to the user.
2. The UNIVAC Solid-State Computer allows the user to update physical records while simultaneously creating management reports. It insures economies of operation by eliminating costly intermediate processing runs -- often a complete application can be accomplished in one run.
3. The UNIVAC Solid-State Computer is programmed by the easy Remington Rand method of programming in English statements. It eliminates the expensive, time consuming chore of manually coding machine instructions. Management gains increased control through a complete and comprehensible mode of communication between themselves and their computer personnel. English language programming also reduces the time required for training and program testing.

CONCEPT OF DESIGN

In 1948, Bell Laboratories, while conducting a series of experiments on crystal ionization,developed the transistor -- a device which they found would reduce the costs of producing and maintaining their carrier equipment. The advantages of this device were multifold. The transistor was small, inexpensive, required very little power, dissipated little heat, and was far more reliable than the vacuum tube could ever be. Instead of using an electron beam to transmit a pulse of information as in conventional tubes, this device employed a solid grid which would oscillate when pulsed.

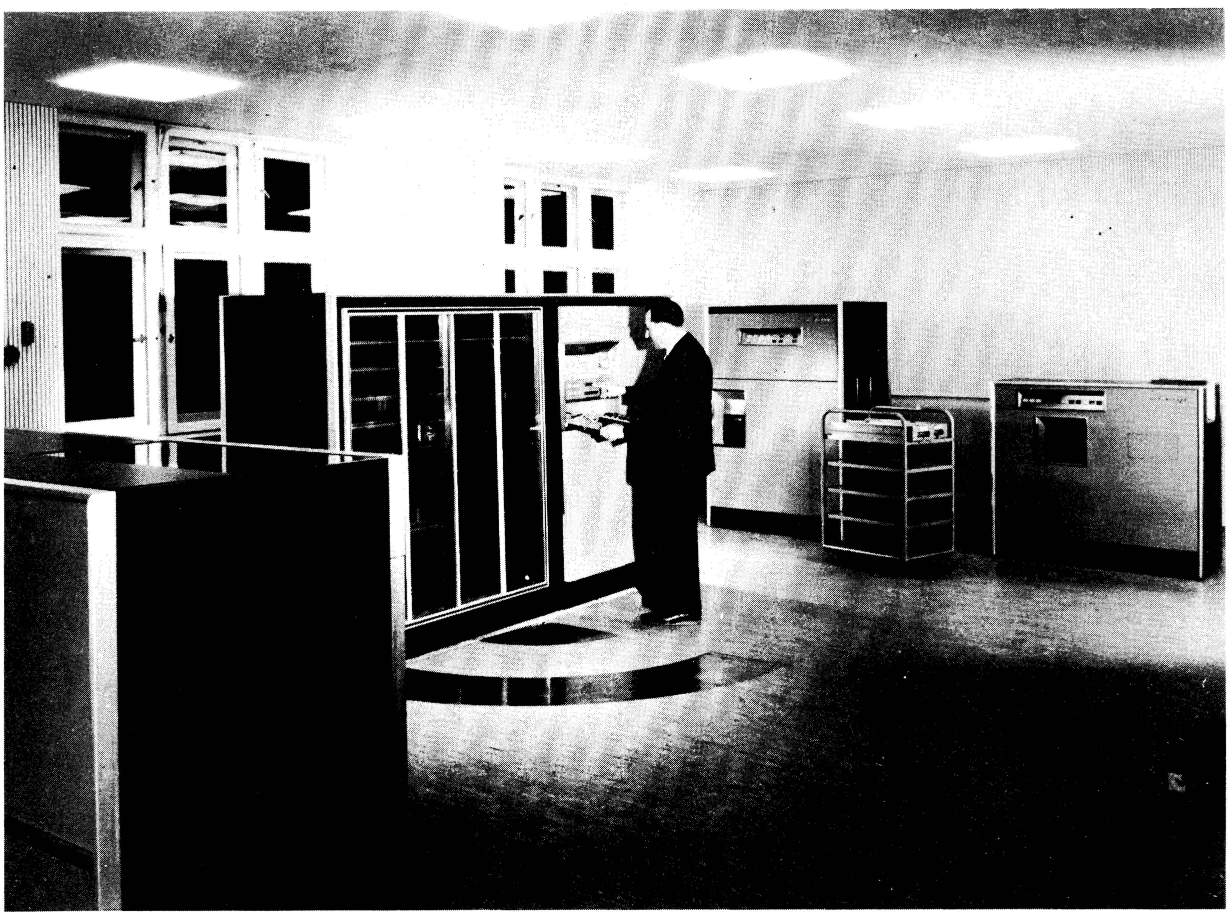
Remington Rand engineers realized early the potential of solid-state components. Why not, they reasoned, produce a computer which would combine the advantages of their systems with those of solid-state circuits. Furthermore, why not reduce costs by mounting those circuits on printed circuit cards whose utility had already been proved in radar and other military electronics gear. By doing so, they could produce a high-speed, reliable, large scale computing system at far less cost.

The result of this thinking was the prototype of the UNIVAC Computer -- the Cambridge Air Force Computer which Remington Rand installed for the armed services in 1956.

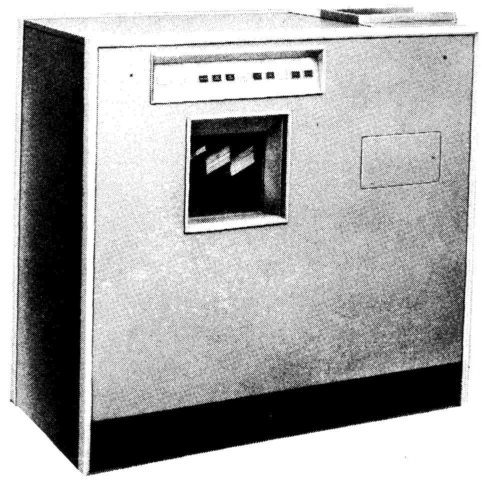
About the time that the basic specifications were being designed for the Cambridge Computer and its commerical counterpart, additional requirements beside low costs, microsecond operating speeds and reliability, also became critical if the UNIVAC Solid-State Computer was to become a commerical success. Paramount among these requirements was that of keeping the System as simple as possible for ease of production and maintenance; but more important, for the case of customer operation, programming and installation. Therefore, in the basic design specifications, all control circuits, not only for the computer, but also for the input/output units, were combined and built into the Central Processor. As the superior reliability of solid-state circuitry eliminated the need for expensive duplicate self-checking circuits, in a similar fashion, the cost of duplicating off-line control circuits in the input/output units was also eliminated by combining them -- that is, by making the same circuit do double or triple duty.

Another example of design simplicity was the use of a four level plus parity-bit machine code. In using this type of modified biquinary code, the design engineers insured the maximum utilization of memory area. Furthermore, this code and the arithmetic and control circuits of the system most easily lent themselves to bit manipulation. Bit manipulation enables the machine to accept any type of coding --- punched-card alpha-numerics, machine biquinary, or any other type of statistical code which the user may require.

In October of 1958 this computer was first installed in the Dresdner Bank of Hamburg, Germany. Since this time, approximately 16 other systems have been successfully installed in Europe. Now the UNIVAC Solid-State Computer is available to users in the United States. It has been fully field tested and proven under the most rigorous operating conditions. It is the first commercially available solid-state electronic computer on the market today.



INSTALLATION AT DRESDNER BANK, HAMBURG, GERMANY

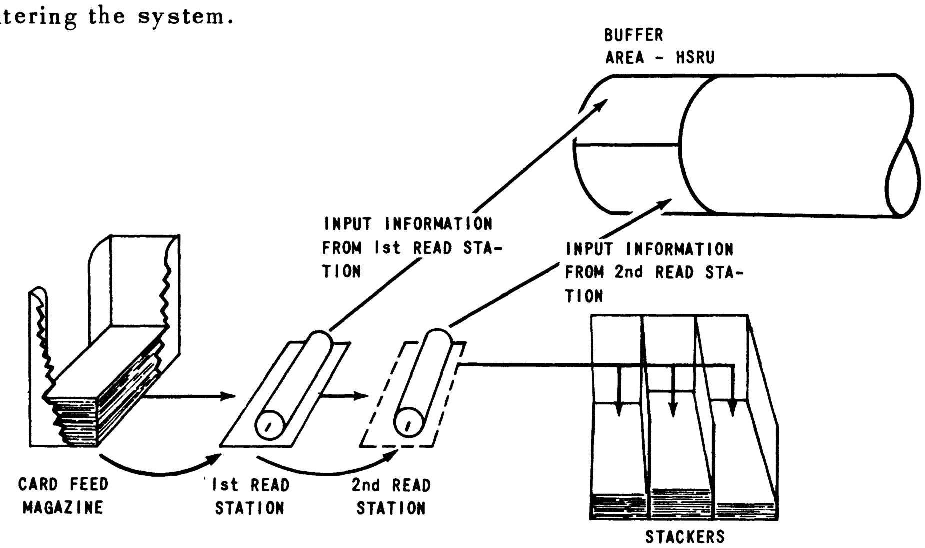


THE HIGH-SPEED READER

The functions of this Unit are:

1. To enter data in the system.
2. To collate data in the system. In this case, the Unit is used as a primary input station (analogous to a tape servo) for the collation of data in the Central Processor.
3. To segregate input cards. This operation is analogous to multi-servo dispersions on magnetic tape.

This unit consists of a card input magazine, two read stations and three output stackers. It also contains a motor to advance the cards and a monitoring control panel. Its operation is completely controlled by the program stored on the drum of the Central Processor. The presence of the two read stations permits the Processor to perform a complete verification and audit on all input information entering the system.



HIGH SPEED READER

OPERATION

This High-Speed Reader operates in the following manner:

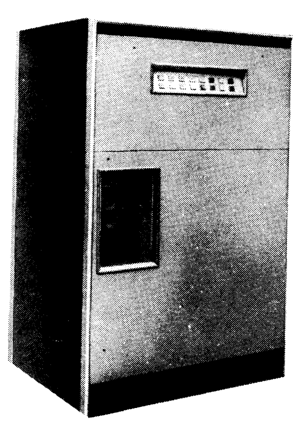
1. An instruction from the stored program prepares the High-Speed Reader to execute a card cycle. From this point on, the Unit is automatically actuated and monitored by its associated control circuits -- thereby leaving the Processor Unit free to perform other operations, such as computations or actuating the other peripheral units.
2. At the proper time in the cycle, a card is fed from the input magazine to the first read station. Here, the card is sensed and the information transferred to the buffer on the drum.
3. The card is next advanced to the second reading station. The information is transferred to second buffer area.
4. The Processor, then, by programmed instructions, compares the contents of the two buffer areas, punched hole by punched hole. Complete reliability of input information is assured by this checking operation.
5. The program then determines the stacker into which the card is to fall. Input error cards detected in step 4 can be sorted into any stacker reserved for this operation.
6. The program can then initiate the next card cycle before resuming its computing operation.
7. Meanwhile, the card advances to the designated output stacker and the next card cycle begins.

This entire cycle on the High-Speed Reader takes approximately 133 milliseconds to execute. However, because the Unit is buffered, the Processor is delayed only three word times(.051 milliseconds) . An additional three word times are required by the Processor to execute the stacker select instruction. With these buffers,therefore, it is possible to completely balance the system -- executing simultaneous read, write and compute operations while entering cards at the maximum rate of 450 per minute.

INPUT VERIFICATION AND AUDIT

Information sensed at Read Station 1, is compared with that sensed at Read Station 2. This comparison consists of a hole-by-hole (binary bit-by-bit) comparison within the Processor Unit. Where required, this subroutine can be expanded to perform various auditing functions such as a Modulus 11 Check Digit Verification, etc. Errors, therefore, can be detected at the time they occur and immediately outfiled into a designated stacker.

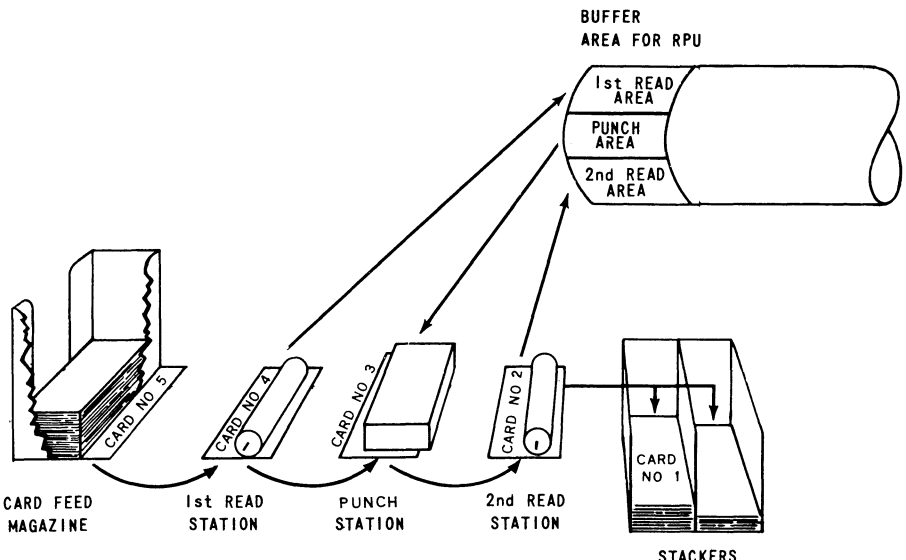
THE READ-PUNCH UNIT



The function of Read-Punch Unit is:

1. To enter and/or collate data into the system. When collating, the Unit functions as a secondary input station.
2. To punch computed results into cards.
3. To perform both input/output functions -- that is, to sense information from a card and then punch the computed result into the same card.
4. To segregate the output cards.
5. To perform the same input/output audit that was performed on the High-Speed Reader.

This unit consists of a card feed magazine, a first read station, a punch station, a second or post read station, and two card stackers. In addition, it also contains its own motor and a monitoring control panel.



READ-PUNCH UNIT

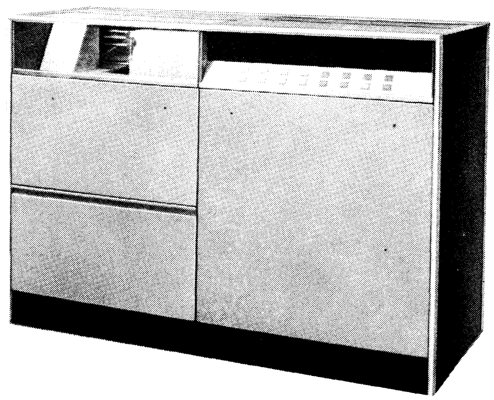
OPERATION

The Read-Punch Unit operates under automatic control in the following manner:

1. A programmed instruction transfers information from memory to the punch buffer. With the completion of this transfer, the Read-Punch Unit is automatically actuated by its control circuits. Thus, the computer at this point is free to operate on other instructions.
2. The information in the buffer is next transferred to the punch station and punched into a card.
3. The cards at both read stations are sensed and the corresponding data transferred to their associated buffer areas on the drum.
4. A new card is fed into the Unit and all cards are advanced one station.
5. The Unit then executes the programmed stacker selection.

Actual computer time required to load and unload the buffer areas of the magnetic drum and to set up the required circuits for the stacker selection is approximately 0.2% of the Unit's card cycle time. Thus, while operating at 150 cards per minute (or at a 400 millisecond card cycle rate) , the entire operation requires only 7.02 milliseconds of computer time. Therefore, there is ample time for:

1. Performing the hole-for-hole or pattern input/output audit.
2. Determining which stacker the card is to enter.
3. Computing.
4. Simultaneously operating the High-Speed Reader and the High-Speed Printer.
5. Sensing and punching at the continuous rate of 150 cards per minute.



THE HIGH-SPEED PRINTER

The High-Speed Printer is the same 600 lines per minute printer which has been used so successfully with the UNIVAC I and UNIVAC II Systems since 1952. The only difference between this and the previous models is that its control circuits are now inside the Processor Unit. The Printer is optional with the UNIVAC Solid-State Computer.

The function of this Unit is to print input information, intermediate results, distributed accumulations and balances, and final reports. As in the other two units, it is completely program controlled and buffered.

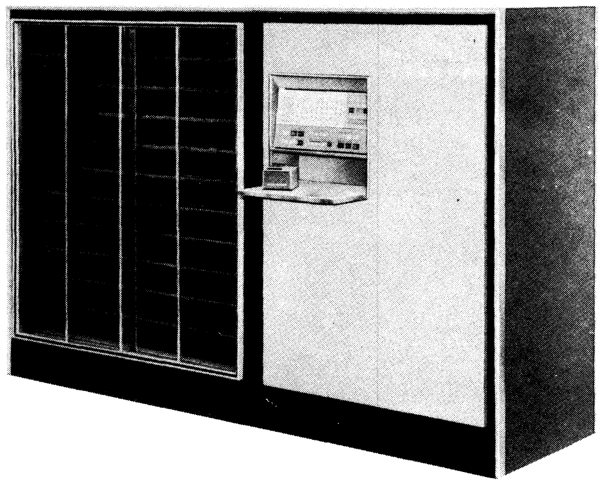
Basically, this device is built around 130 print wheels which revolve at high speeds. These wheels correspond to the horizontal printing positions across the page. Each print wheel contains 26 alphabetic, 10 numeric and 15 special characters such as period, dollar sign, ampersand, colon, and semicolon. Character spacing is ten to the inch across. Line spacing is six to the inch vertically with single, double, triple or variable spacing options available to the programmer. Report format, dual and multiline printing, zero suppressions, special characters, etc. are also program controlled. No plugboard is required. This device accommodates paper from 4 to 21 inches wide.

OPERATION

The High-Speed Printer operates as follows:

1. Information to be printed is transferred by programmed instruction to the buffer area on the magnetic drum. Once this is accomplished, the computer is available for other operations.
2. The High-Speed Printer then advances the paper to the required printing line, prints the information and performs all the required checks. These consist of parity checks, comparisons of data to be printed with data stored in the buffer area, and checks that all information has been printed.

Because this Unit is essentially a wheel printer, the type fount produces clearly printed copy similar to that printed by a typewriter or conventional punched-card tabulating equipment.



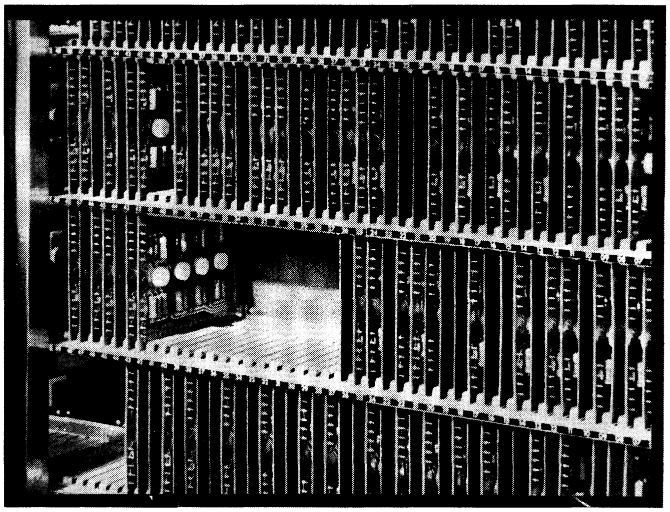
CENTRAL PROCESSOR

The Central Processor is the heart of the UNIVAC Solid-State System. It serves the dual purpose of controlling the operation of the entire system as well as housing the main memory.

As such, it consists of:

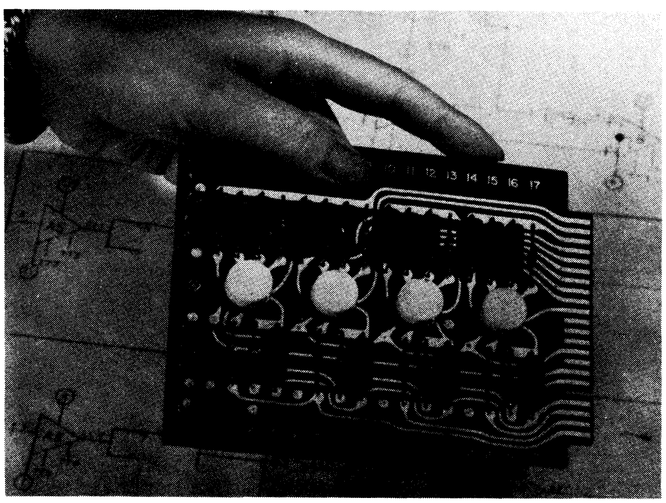
1. The control section -- the arithmetic, logic and control circuits.
2. The main memory or drum.
3. The supervisory control panel, which is used for monitoring the entire system.
4. An inquiry keyboard -- for entering information and interrogating various parts of the system.
5. The central power supply and voltage regulator.

As previously mentioned, this unit is extremely fast. It has a transfer rate of 707,000 characters per second. Thus, it is capable of performing 705,882 additions or subtractions per minute. These speeds are further augmented by the programming flexibility of the computer. The registers A, X, and L are directly addressable. Register C is also accessable. Finally, the presence of buffer test instructions eliminates time-consuming interlocks when the peripheral units are not immediately available for processing.



CONTROL SECTION

The control section consists of banks of printed solid-state circuit cards plugged into the front of the Processor. When called on by the program, some of these circuits execute the required arithmetic or logic operation, others perform a check on the information, while others coordinate and control the simultaneous operations of the three input/output units.

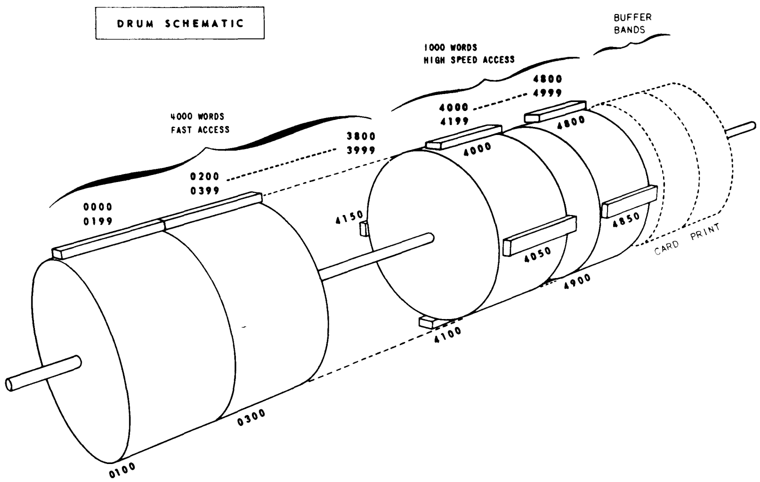


The above picture shows a typical printed circuit card. Although there are approximately one thousand printed circuits in the system, over 90% of them are mounted on only eight types of solid-state cards. Thus, production is standardized and maintenance is reduced to a relatively simple operation. Malfunctioning circuits are easily located, removed from the Processor, and a new circuit card slipped into place. In addition to ease of production and maintenance, these solid-state circuits impart a high degree of operating reliability to the computer while reducing the power, cooling and space requirements of the System.

MEMORY

The system's memory is a 5,000 word magnetic drum. It is used for storing programs, input/output information and intermediate results. The drum revolves at 17,667 revolutions per minute. This speed is attained by enclosing the drum in a helium atmosphere. The helium atmosphere acts not only as coolant, but also as a lubricant.

Data is stored in 25 bands around the horizontal axis of the drum. Each band consists of 200 ten digit words and sign -- for a total of 5,000 words of information. As shown in the following illustration, the memory is divided into three separate areas.



The Fast Access Area -- consists of 20 bands of information for a total of 4,000 words. Average access time to information in this area is 1.7 milliseconds. Programs and tables are normally stored in this area.

The High-Speed Access Area -- consists of five bands for a total of 1,000 words. Each band in this area has four read-write heads, thereby decreasing average access time to 0.425 milliseconds. Normally, input/output data and intermediate computed results are stored in this area of the drum.

The Buffer Area -- contains the individual buffers for each station in the peripheral units. The function of this buffer area is to increase the transfer speed of information between the input/output units and the computer. Once these data transfers have been effected, the control circuits can take over the job of independently reading, punching, moving the cards and printing the results. During these latter operations the Processor is free to continue simultaneous computing.

PROGRAMMED BUFFER TESTS

In order to increase the efficiency of coded programs, buffer test instructions have been built into the system. If the input/output data buffers are available, the contents of register C (the control register) are transferred to Register A (the arithmetic register) , thereby executing an automatic change of control in the program. If, on the other hand, the unit's buffers are not available, control will pass to the address of the operand.

MINIMUM LATENCY CODING

Minimum latency coding is easily achieved because of the simple 1½ address instruction logic of the UNIVAC Solid-State Computer. By coding in minimum latency, access time is reduced to one word time, or 17 microseconds.

Recognizing the need to reduce programming costs, Remington Rand has developed a new approach to programming and coding. This method is known as FLOW-MATIC. By using the FLOW-MATIC program statements, the programmer can express an operation in simple English language. The computer then translates the FLOW-MATIC statements into a running machine program.

10. HAS MAN ALREADY CONTRIBUTED LEGAL LIMIT? IF SO, ELIMINATE FICA DEDUCTING, GO TO INSTRUCTION 17.
11. MULTIPLY HIS GROSS EARNINGS BY CURRENT FICA RATE. THE PRODUCT IS THE FICA DEDUCTION.
12. ADD THE COMPUTED FICA DEDUCTION TO HIS ACCUMULATED DEDUCTIONS FOR THIS YEAR. THE RESULT IS A TEST ACCUMULATED FICA DEDUCTIONS SUM.
13. ARE THE TEST ACCUMULATED FICA DEDUCTIONS GREATER THAN THE LEGAL LIMIT? IF SO, GO TO INSTRUCTION 15.
14. ENTER THE TEST ACCUMULATED FICA DEDUCTIONS AS THE NEW ACCUMULATED FICA DEDUCTIONS, AND GO TO OPERATION 17 TO CONTINUE PROCESSING.
15. SUBTRACT THE ACCUMULATED FICA DEDUCTIONS FROM THE LEGAL LIMIT. THE RESULT IS FICA DEDUCTIONS FOR THE CURRENT PAY PERIOD.
16. ENTER THE LEGAL LIMIT AS THE NEW ACCUMULATED FICA DEDUCTIONS.
17. (CONTINUE OTHER COMPUTATION OF WAGES).

The above is an illustration of a typical employee FICA calculation as expressed in management terminology. Under the old system of manually coding the operation, this routine was translated into alpha-numeric machine instructions by a highly skilled specialist. Depending upon his years of experience and the type of computer, this routine would require from several hours to several days to program. In addition, the programmer had to allocate various areas of the computer's memory to hold the data and computed results -- that is, he had to determine which of the remaining memory locations were available and which of these were the most efficient to use. Finally, once coded, the routine had to be "debugged" on the computer to detect any clerical or analytical errors.

The following illustration is the same problem coded in FLOW-MATIC statements.

```
010 COMPARE ACCUMULATED-FICA 01 WITH LEGAL-LIMIT C IF GREATER GO TO OPERATION 017
    OTHERWISE GO TO OPERATION 011

011 MULTIPLY AND ROUND GROSS-EARNINGS 02 BY FICA-RATE C PLACE THE RESULT IN FICA-
    DEDUCTION 02

012 ADD FICA-DEDUCTION 02 TO ACCUMULATED-FICA 01 PLACE THE RESULT IN TEST-AC-
    CUMULATION W

013 COMPARE TEST-ACCUMULATION W WITH LEGAL-LIMIT C IF GREATER GO TO OPERATION 015
    OTHERWISE GO TO OPERATION 014

014 MOVE TEST-ACCUMULATION W TO ACCUMULATED-FICA 01 AND GO TO OPERATION 017

015 SUBTRACT ACCUMULATED-FICA 01 FROM LEGAL-LIMIT C PLACE THE RESULT IN FICA-
    DEDUCTION 02

016 MOVE LEGAL-LIMIT C TO ACCUMULATED FICA 01

017 (CONTINUE COMPUTATION OF WAGES)
```

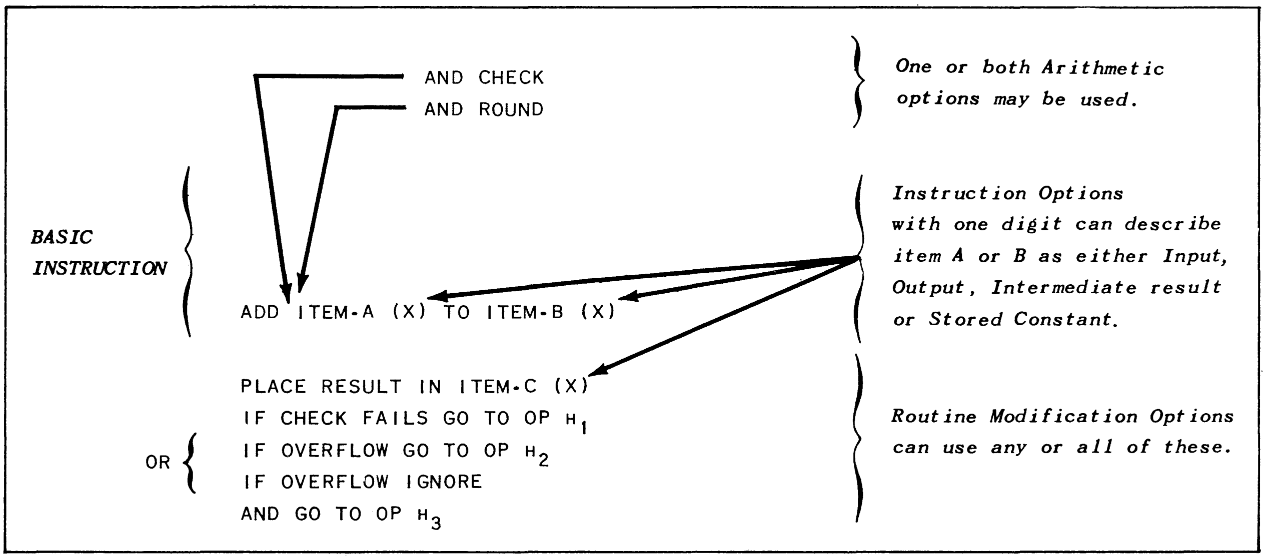
For the FLOW-MATIC programmer, the job is almost finished as soon as it is stated. He simply determines which activity cards have the basic information (card-type 01 in this illustration) , which information or constants are common to the entire operation (shown as "C") , which data is an intermediate computed result (referred to as "W" in working storage) , and what results are printed or punched (again referred to by types) . There is no problem of memory allocation.

THE FLOW-MATIC METHOD OF PROGRAMMING

The FLOW-MATIC method of programming employs a series of simple English language statements. Five of these statements cover all the input/output operations and their associated housekeeping routines (item advances, buffer tests, coordinating input to output, editing, decimal allignment, memory drums, initial starts, memory clears, stopping the system for given types of errors, etc.) In other words, these statements cover almost all operations from the time data is read into an input unit until it is ready to be fully processed, and from the time data is processed until it is printed and/or punched.

The remaining 16 statements (and associated options) are used to describe the basic processing operations such as add, subtract, compare, transfer, etc.

The FLOW-MATIC instructions are efficient, powerful, and flexible. As shown below, for example, there are up to seven basic options which the programmer can utilize with the Add instruction.



Another good example is the power and flexibility of the Compare instruction. In this case, with one FLOW-MATIC statement, the programmer can code up to 25 equality-magnitude comparisons by merely using the conditional transfer options.

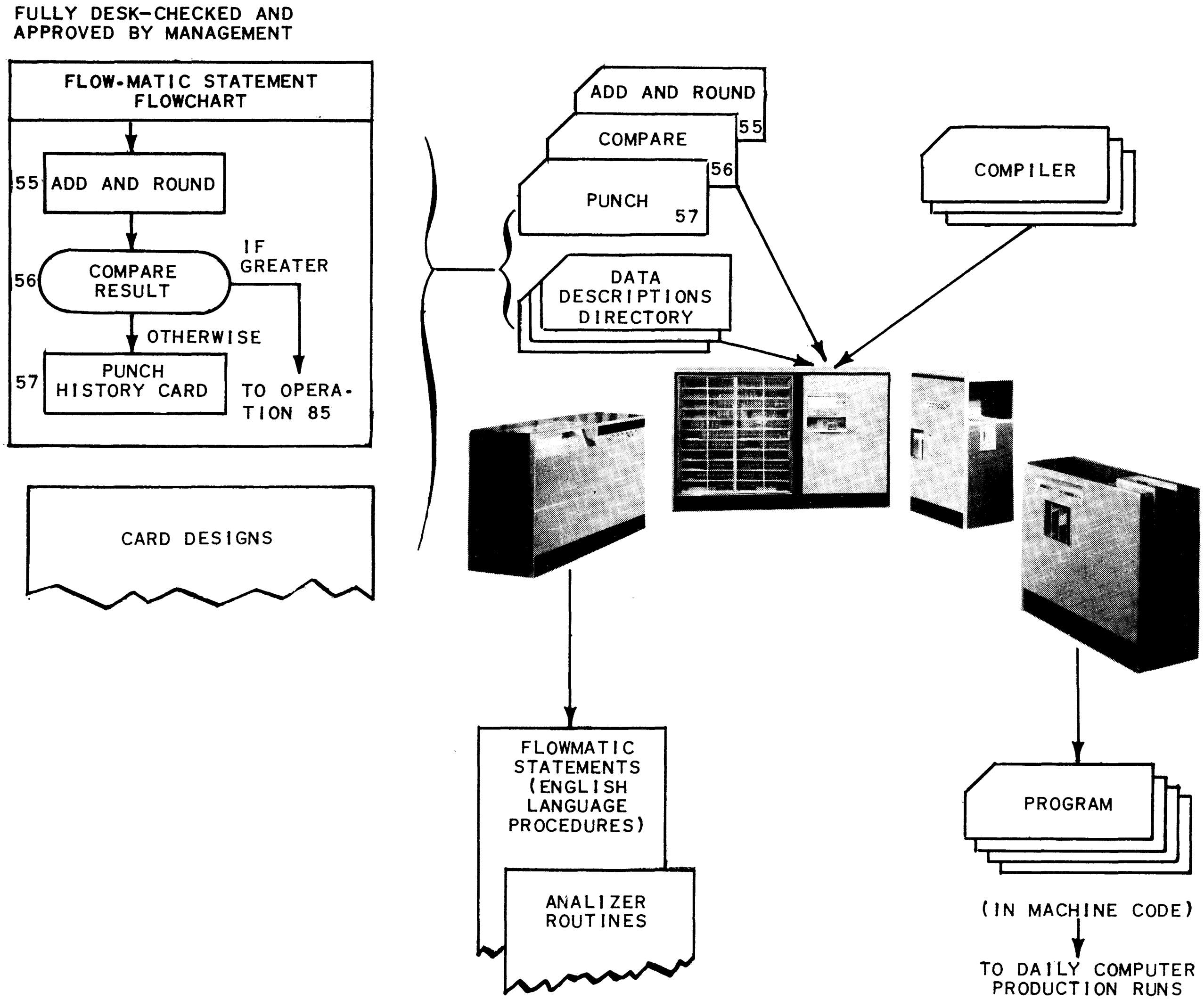
APPLICATION

With the UNIVAC Solid-State Computer, the operating conversion period breaks down into two phases. In the first or one-time phase, the problem is analyzed and flow-charted in the English language FLOW-MATIC statements. Since English is used, Management can completely understand and therefore ontrol what is to be done in their operations. Punched-cards and reports are also designed during this stage and presented to Management for approval.

The flow-charts are then checked and transcribed in FLOW-MATIC form to punched-cards. In the same fashion, the input/output cards and report formats are also transcribed to cards. All checking and "debugging" is finished by the programmer at his desk, not on the computer where "debugging" can be expensive.

The punched-cards containing the FLOW-MATIC statements, are then translated into a finished machine coded program.

The second phase is merely the production, or daily operating cycle. For daily operations, these machine program cards are entered into the system on the High-Speed Reader. Then, in less than two minutes, the program is stored on the drum of the computer and processing begins.



MINIMUM LATENCY

The running programs operate at peak efficiency -- that is,at the best possible minimum latency time.

TRAINING

Programmers can be trained in only two weeks. They can achieve peak programming efficiency within several more weeks. Management,on the other hand, can be given a full understanding of the equipment and of the FLOW-MATIC procedures within several days.

AUDITING

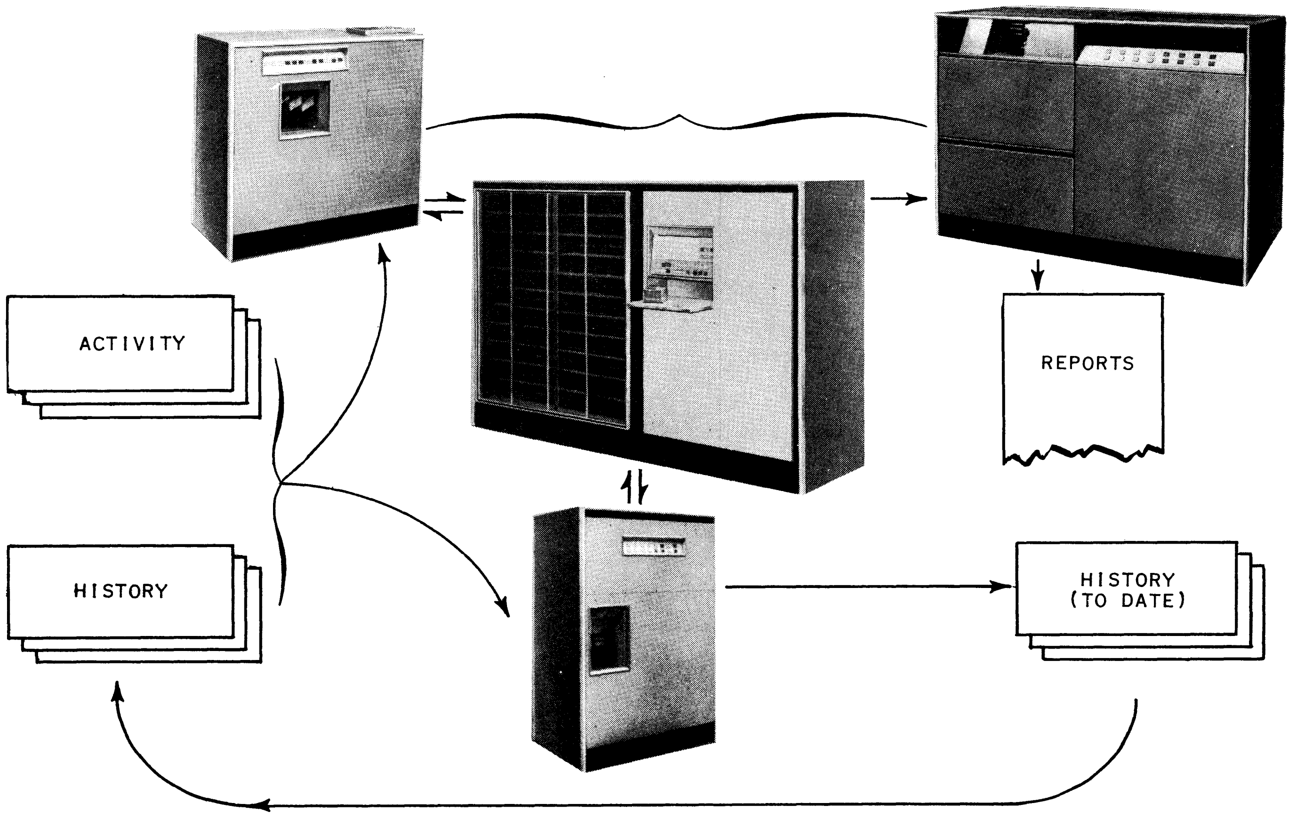
Because the machine programs are defined in English, they are fully comprehensible to auditors. This means that auditors can exercise the required amount of control over the system.

STANDARIZATION OF FLOW-CHARTING AND CODING

While each programmer can develop his own short-hand and short cuts, the program still remains in basic English language statements -- and is fully comprehensible to all.

APPLICATION OF THE UNIVAC SOLID-STATE COMPUTER

In any type of data-processing operation, whether it be processing by pencil, punched-cards or high-speed electronics gear, new information or Activity is processed against previous information or History. The result of this processing, as shown below, is up-dated History as well as printed material to document the transaction.



Normally, data-processing requires many interim operations before the daily activity finally appears in management report form. These operations usually involve collating and sorting, performing the basic calculations, and then summarizing the results. This cycle may have to be repeated many times before the final information is available for printing the final reports. After each individual or group of operations is performed, control listings must be prepared and balanced, errors detected and corrected, and the balanced results (control totals) posted to control ledgers. In punched-card accounting, this involves considerable expense in the areas of machine processing and clerical intervention.

With the advent of small and medium scale punched-card computers, the number of interim processing operations and interventions was not materially reduced, although the processing speeds were increased and some savings realized. With larger scale or tape fed computers, many of these operations were combined to achieve tremendous operating efficiencies. However, the initial cost of large memories or tape input devices proved to be too costly for most potential users.

Now, with the UNIVAC Solid-State Computer, it is possible to achieve a new degree of processing efficiency at the most economical cost levels. Because of this system's large memory capacity, high speeds, and low operating costs, it is now possible to apply large-scale tape-fed techniques to a punched-card computer. In many cases, a single application can now be done in one operation because of the ability to enter activity and history data into the memory, process it at high speeds, and simultaneously produce printed reports and punched-card output.

As shown in the previous illustration, the application approach to data-processing on the UNIVAC Solid-State Computer has been completely changed. The system utilizes standard 90-column punched-cards as input. However, the system's overall microsecond speeds, large-scale capacity and solid-state reliability can now be used to apply large-scale techniques.

- **MEMORY CAPACITY.** The system's 5,000 word memory capacity enables the user to combine many different programs (and consequently applications) into one run. In addition, it is possible to summarize and store intermediate results for further processing within the computer. This, in turn, eliminates intermediate summarization runs, collating and sorting which normally have had to be done off-line.
- **SPEED.** Microsecond calculating abilities permit the user to build additional operations such as distributions, table look-ups, etc. into a program without decreasing its overall efficiency. Again, because of these speeds, the capacity of the cards can be figuratively stretched in cases where there is not enough room in the card for required information. It is economical in many instances to recalculate the entire transaction in subsequent runs rather than punch the initial results into the card. This, in turn, will leave room in the output punched-card for more important information.
- **FLEXIBILITY.** Because the system is basically a bit machine, it can be programmed to perform many types of special manipulations. This ability permits the programmer to utilize exceedingly sophisticated programming. Bit manipulation means that the system is not restricted to any given type of input/output code.
- **RELIABILITY.** The system's ability to perform programmed audits on all input-output information, and thus guarantee the accuracy of this information, eliminates costly off-line control listing runs.
- **IN-LINE SIMULTANEOUS OPERATIONS.** The Read-Punch and High-Speed Reader Units can be utilized in a fashion analogous to tape units. The system can perform internal collations by working these two units in conjunction with one another. This, in turn, eliminates additional off-line collating.

  Printed reports can be run concurrent with processing. This type of operation eliminates lengthy off-line report listings on conventional punched-card equipment as well as clerical control balancing.

THE FULLY BALANCED SYSTEM

Because of the unique abilities of the UNIVAC Solid-State Computer, the user can have fully balanced data processing abilities -- and have them at low operating costs. Not only is the system able to economically process large volume "bread and butter" operations, but also those applications previously avoided because of the excessive costs and time requirements. Now, in addition to the normal work-load requirements, the user can also economically examine business problems by using such tools as linear programming, Monte-Carlo techniques or game theory to conduct inquiries into the entire field of Management and Operations Research.

SPACE The UNIVAC Solid-State Computer requires only 530 square feet of floor space.

AIR CONDITIONING The UNIVAC Solid-State Computer is primarily an air cooled system. Fans or blowers built into the equipment take care of what little heat is dissipated by the motors and solid-state circuits. A small air conditioning system is built into the Processor to cool the drum. Therefore, the user requires only enough air conditioning for the operator's comfort.

POWER REQUIREMENTS Power requirements can be met in most cases by the existing electrical outlets found in most office buildings. The system operates on conventional 220 volt single phase lines. Power rating is 14.4 KVA. Where the user does not require the in-line High-Speed Printer, the power requirements will drop to 10 KVA's.

CONSTRUCTION The entire system weighs slightly over 6,000 lbs. In most cases, architectural or structural changes (primarily shoring up the floor under the computer) are not required.

PERFORMANCE Tests consisting of a series of diagnostic routines are conducted at the plant prior to shipment by the manufacturer. The system is shipped to the user only after the results of these tests meet with his approval.
At the installation site, the equipment is checked out with a series of rigorous systems and services tests by Remington Rand engineers. Final customer acceptance is predicated upon the successful completion of these tests.

SPECIALIZED APPLICATIONS

Low operating costs, speed, memory capacity, and programming simplicity, make the UNIVAC Solid-State Computer an ideal solution to problems which heretofore were too expensive for many computer users.

ONE TIME JOBS Because of the programming, debugging, and computer expenses involved in conventional types of computers, management was often reluctant to request special reports. With the UNIVAC Solid-State Computer and the power of the FLOW-MATIC statements, costs can be reduced to point where the production of these reports are now economically feasible.

SMALL VOLUME JOBS For the same reasons as stated above, this was another processing area which previously proved to be exceedingly expensive. Today, however, the low operating costs of the system permits these jobs to be done at realistic cost levels. In many cases, due to the system's tremendous memory capacity, many of these jobs can be combined with other applications and processed at practically no expense.

TABLE LOOK-UP OPERATIONS One of the more costly types of computer operations is the Table Look-up. It is used within a given computer run primarily to distribute various types of information such as schedules, rate computations or sales analysis distributions. In conventional computers, tables require tremendous amounts of memory and consume large chunks of expensive computer time. With the 50,000 digit memory and fast access time of the UNIVAC Solid-State Computer, this type of operation is now relatively inexpensive.

STATISTICAL JOBS The bit-manipulation feature of the UNIVAC Solid-State Computer makes it an ideal solution for statistical jobs. For these operations, the card capacity can be increased by using specialized rather than machine codes. For example, each punching position in a card can be a yes or no answer to a specific question.

ENGINEERING, SCIENTIFIC APPLICATIONS This is another good application area for the UNIVAC Solid-State Computer. Heretofore, these applications were limited by storage capacity and arithmetic speed or the tremendous costs for coding the programs.

UNIVAC® — The FIRST Name in Electronic Computing Systems

U 1741.1 REV. 1 PRINTED IN U.S.A.