

THE UNIVAC® 494 REAL-TIME SYSTEM







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OPERATION BIG TIME IN REAL-TIME

The UNIVAC 494 is a new, ultra-capacity, super-speed real-time computer system. It processes several real-time programs concurrently with multiple batch applications. The 494 is backed by executive software systems that automatically control concurrency and program mix for the utmost in compact, simultaneous and time-shared processing.

The UNIVAC 494 processor and peripheral speeds are exceedingly well-balanced for optimum performance. The 494 processor features memory cycle time of 750 nanoseconds, overlapped. This is under three quarters of a microsecond per 30 bit computer word. A number of random access storage units is available to provide a range of high-speed and high-capacity subsystems for processing unsequenced inquiries or incoming data on a real-time priority basis.

The UNIVAC 494 is highly modular, providing data-processing power proportional to user requirements. Core memory starts at 16,384 computer words and is expandable to 131,072 words. Twelve input-output channels are standard; with increments made at the computer site in segments of four up to a maximum of 24. This is power and capacity unequalled in its class for real-time, batch, and scientific applications.

For organizations that require remote computers operating on-line with a central system, the UNIVAC 494 serves as the master system, providing program compatibility with two other Modular 490 Systems—UNIVAC 491 and 492. These Modular 490 Systems offer expandable capabilities for concurrent real-time and batch operations. The software compatibility with the 494 means great savings in program preparations and costs. Any remote units that operate with common carrier communications lines function on-line with the UNIVAC 491, 492 and 494.

The need for real-time data processing is growing. Communications experts expect 50% of the common carrier communications lines in the country to be used for data transmission in the coming years. Let Univac real-time specialists help you attain split-second operational control via communications. Univac real-time is not an experiment. It is a proved-in-use mode of operation for the most advanced data systems currently in operation anywhere in the world. The company that gets the jump in its field will be ahead in real-time computer communications experience and techniques.

THE EVOLUTION OF REAL-TIME PROCESSING



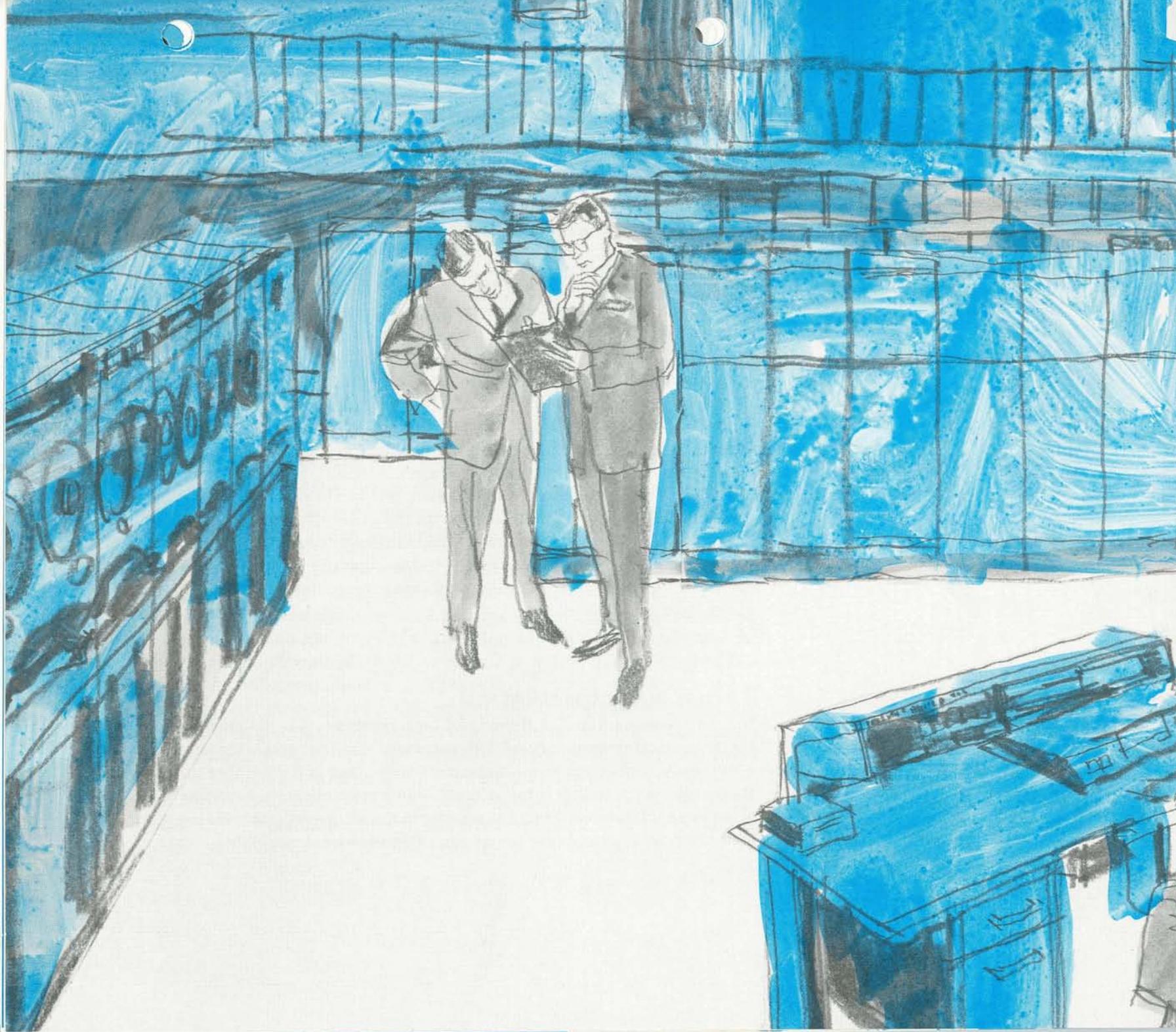
BATCH PROCESSING

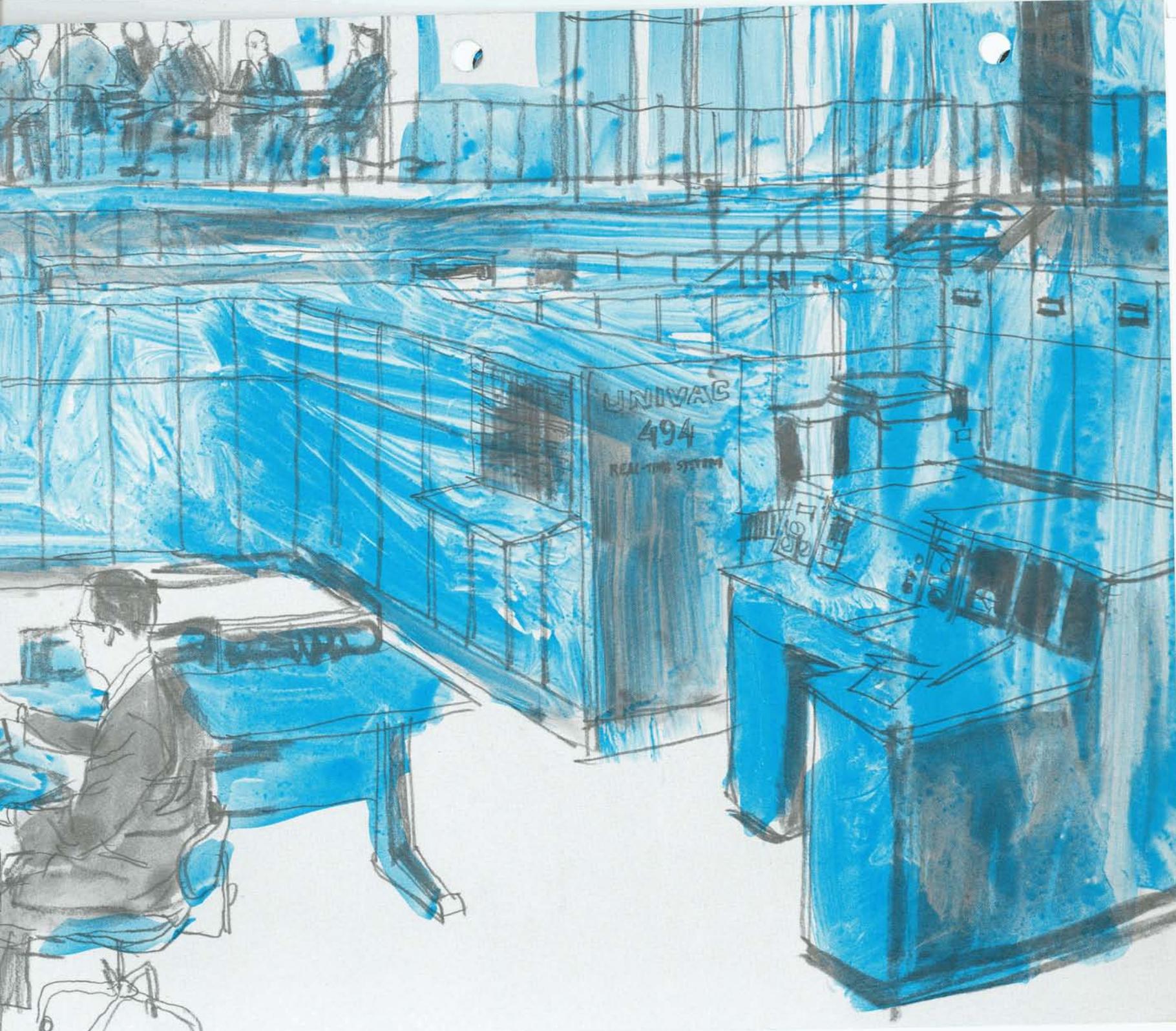
Prior to the development of direct communications to a central computer or on-line communications, the majority of computer operations were performed by bulk processing, or the grouping of data into batches of similar or associated information. The data was accumulated until sufficient volume was collected to justify the amount of computer time required for processing. Data was forwarded for processing in the form of original documents or copies, or punched into cards or paper tape. Once at the processing center, additional handling was necessary to convert the source data into cards or tape, as well as adding supplementary data to the cards received prepunched. Following this, further off-line handling was required to sort and sequence the file data in the required order for processing. The cut-off for processing usually reflected the accounting cycle under which the processing was controlled, such as weekly or monthly.

The cumulative process associated with establishing each batch, combined with the fixed cut-off, resulted in peak load requirements, often resulting in around-the-clock operations to obtain the necessary results and special reports. These peak processing periods frequently led to the establishment of over-sized systems to absorb the peak-volume at costs far in excess of the overall productivity realized.

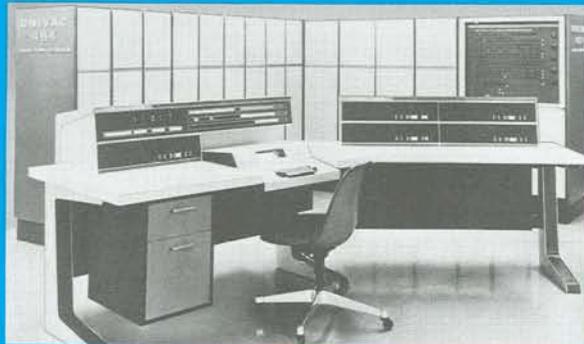
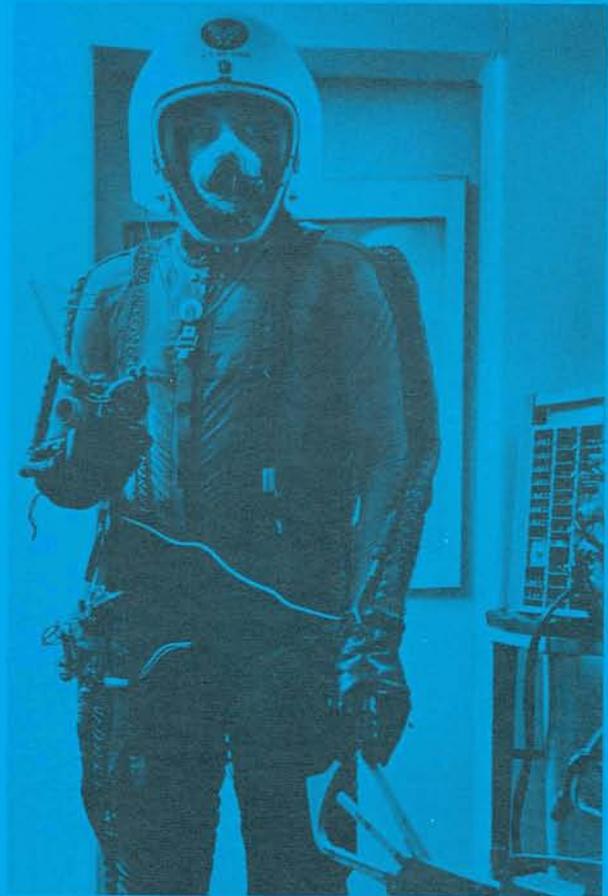
As the use of data processing was expanded for multi-plant or multi-office operations, data collection problems grew more complex. This led to the multi-system approach involving systems of different sizes located in the various departments, divisions, and offices. Data from these systems was then sent to the main site for organization-wide processing and analysis. This method worked in some instances, but serious problems of data collection persisted.

At this stage it was obvious that the physical transfer of data and documents by mail or similar means slowed down computer operations. Attention logically turned to public telephone and teletypewriter facilities.





UNIVAC
494
REAL-TIME SYSTEM





GENERAL DESCRIPTION

The UNIVAC 494 Real-Time System design is based on a unique combination of proven real-time experience, plus the most highly advanced circuitry available in the computer field today.

The split-second input-reply principle was pioneered by Univac for military real-time systems which were employed to aim, guide and track missiles in flight. The pioneering of the UNIVAC 490 Real-Time System for business soon followed as it became apparent that constant control, updating and reporting was needed in industries with time-sensitive operations. UNIVAC Real-Time Systems are now extending instant control over wide geographical areas via communications for an extensive variety of industries.

Experience with the original UNIVAC 490 Systems shows that real-time is a mode of operation needed by almost every large organization. Operations at geographically dispersed locations can be controlled from a central office by real-time processing with the UNIVAC 494... reducing time lag to the minimum...and integrating interrelated functions most efficiently.

GROWTH CAPABILITY

The UNIVAC 494 Real-Time System is highly expandable, providing substantial growth potential and the ability to set up real-time operations gradually at proportionally incremented costs. You pay for capacity you need, not for possible future requirements.



UNIVAC 494 REAL-TIME SYSTEM

The Processor

The processor in the UNIVAC 494 Real-Time System is an extremely fast stored program computer with expandable core memory. The system is program-compatible with UNIVAC 491 and UNIVAC 492 Real-Time Systems. The UNIVAC 494 is capable of handling vast quantities of converging data in real-time, batch processing and scientific applications—concurrently. Instant response and the ability to interrupt routine for priority data makes the UNIVAC 494 processor the center of extensive nation-wide data processing operations in real-time.

The UNIVAC 494 controls the performance of extremely high-capacity random-access storage subsystems, versatile communications subsystems plus a selection of card units, magnetic tape units, printers and other peripherals. It also controls on-line, a variety of remote communications devices.

The processor includes 12 input-output channels, with optional increments in groups of four, to a maximum of 24. Computer to computer hook-up can be attained with other 490 Modular Real-Time Systems through these channels.

Input-output data transfers are automatically controlled by signals issued by the processor or the subsystems. Each input-output device has a control unit which carries out the instructions while the processor issues other instructions and responds to converging signals.

The processor employs 99 instructions which can be combined with the contents of the instruction word to expand to a flexible repertoire of almost unlimited programming functions. It performs with a memory cycle time of three-quarters of a microsecond. Standard memory of 16,384 words is expandable to 131,072 words of storage.

A special memory lockout feature reserves 64-word memory segments for program debugging purposes. This eliminates the possibility of memory erasures through overlap of other programs.

The UNIVAC 494 System offers unmatched communications control through E.S.I. (Externally Specified Index.) E.S.I. provides a unique address for incoming data. E.S.I. addresses are generated by the UNIVAC Communications Terminal Module Controller which operates on-line through one computer channel. Each address reserves buffers in memory for the remote unit initiating a transfer of data, making program attention unnecessary. This permits other transactions to run uninterruptedly while communications data comes into and out of the system. When communications data involves memory outside the immediate buffer area, other data is interrupted only for microseconds because UNIVAC 494 circuitry maintains ensuing instructions in readiness at all times.

The UNIVAC 494 features the following additional advanced capabilities:

- 14 index registers
- Decimal arithmetic
- Double-precision floating point arithmetic
- Ability to lock out Delta Clock interrupt
- Ability to access Day Clock and get reading in seconds
- Ability to use repeat and not lockout interrupts
- Ability to retain address on E.S.I. output as well as input
- Memory parity

SPECIFICATIONS—UNIVAC 494

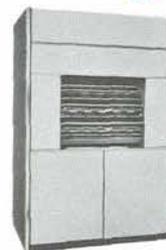
Storage Capacity	16,384 to 131,072 words
Word Length	30 bits
Input-Output Channels	12 to 24
Memory Cycle Time	750 nanoseconds

THE SUBSYSTEMS



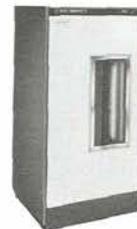
FH 432 Magnetic Drum Subsystem

262,144 30-bit words per drum, or 1,310,720 alphanumeric characters
786,432 words per three-drum minimal subsystem
Nine-drum subsystem on a single computer channel through 432 Drum Control Unit
4.25 millisecond average access time
1,200,000 characters/second transfer rate



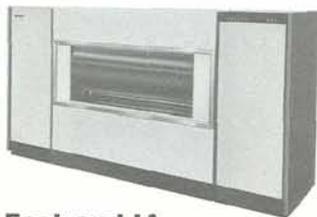
FH 880 Magnetic Drum Subsystem

786,432 30-bit computer words per unit, or 3,932,160 alphanumeric characters
Up to 8 units per computer channel
17 milliseconds average access time
518 bits per inch recording density
880 read-write heads



Modular Fastrand Mass Storage Subsystem

2,162,688 30-bit computer words per unit, or 10,813,440 alphanumeric characters
Up to 16 units per computer channel
67.5 milliseconds average access time
1,000 bits per inch recording density
16 read-write heads
Fastband option—16 fixed read-write heads, 84,480 characters, 17.5 milliseconds average access time



Fastrand IA Mass Storage Subsystem

12,976,128 30-bit computer words per unit, or
 64,880,640 alphanumeric characters
 Up to 8 units per computer channel
 92 milliseconds average access time
 1,000 bits per inch recording density
 64 read-write heads
 Fastband option—24 fixed read-write heads, 253,440 characters, 35 milliseconds average access time

Fastrand II Mass Storage Subsystem

25,952,256 30-bit computer words per unit, or
 129,761,280 alphanumeric characters
 Up to 8 units per computer channel
 92 milliseconds average access time
 1,000 bits per inch recording density
 64 read-write heads
 Fastband option—24 fixed read-write heads, 253,440 characters, 35 milliseconds average access time

Uniservo VI C Magnetic Tape Subsystem

8,500, 24,000 and 34,000 characters/second transfer rates
 200, 556 and 800 6-bit characters/inch recording densities
 42.7 inches/second tape speed
 2,400' tape length
 1.5 mils tape thickness
 7 channel tape—6 data, 1 parity
 Reading in forward and backward directions, writing in forward direction only
 Up to 16 UNISERVO VI C units per computer channel connected through a channel synchronizer
 Master UNISERVO VI C controls up to 3 UNISERVO VI C units
 Read/Read—Read/Write option available



Uniservo VIII C Magnetic Tape Subsystem

24,000, 66,700 and 96,000 characters/second transfer rates
 200, 556 and 800 6-bit characters/inch recording densities
 120 inches/second tape speed
 2,400' tape length
 .5 inch tape width
 1.5 mils tape thickness
 7 channel tape—6 data, 1 parity
 Reading in forward and backward directions, writing in forward direction only
 Up to 16 UNISERVO VIII C units per computer channel connected through a channel synchronizer
 Read/Read—Read/Write option available

600/900 CPM Reader

600 to 900 cards per minute reading
 Reliable photodiode code sensing
 2,500 card input hopper
 1 output stacker, 1 reject stacker
 Overlap of processing with card reading

300 CPM Punch

300 cards per minute punching
 1,000 card input hopper
 Post read station
 Simple jam clear device
 Overlap of card punching with processing

700/922 LPM Printer

700 to 922 lines per minute printing
 132 characters per line
 6 or 8 lines per inch vertical
 10 lines per inch horizontal
 63 printable characters
 Takes paper stock, sprocket fed, 4 to 27 inches wide, up to card stock thickness
 Clearly prints an original and up to 5 carbons on 12 pound paper stock

Paper Tape Subsystem

Reads forward and backwards, 400 characters/second
 Punches 110 characters/second
 Accepts tape widths of 11/16 inch, 7/8 inch or 1 inch
 Handles 5, 6, 7 or 8-channel tape



Communications Terminal Module Controller

Contains Communications Terminal Modules (CTM's)
 Functions as link between processor and CTM's
 Includes up to 64 CTM positions
 CTM's transmit and receive data bit-serially
 CTM's available in these transfer rate capabilities:
 1) Low Speed: Up to 300 B.P.S.
 2) Medium Speed: 300 B.P.S. to 1,600 B.P.S.
 3) High Speed: 1,600 B.P.S. to 4,800 B.P.S.

Data Communications Terminal

Complements the Communications Terminal Module Controller
Provides single line high-speed communications capabilities at low cost
Includes high-speed operations with multiple stations, one at a time
Connects broadband stations by leased Telpak line
5, 6, 7, or 8 data bits per character
Accepts and generates all necessary control functions
Dial circuit at 2,000 bits/second
Leased voice circuit at 2,400 bits/second
Leased broadband circuit at 40,800 bits/second or higher
One to six CTS modules in Data Communications Terminal cabinet



UNIVAC 1004 Processor

A versatile data processing unit which reads 80- or 90-column punched cards and prints hard copy. It can be used on-line with the UNIVAC 494. At remote locations, the UNIVAC 1004 communicates with the UNIVAC 494 or another UNIVAC 1004 through an optional Data Line Terminal. Data transmission rates are 2,000 bits per second, Dial, and 2,400 bits per second Private Lines. The UNIVAC 1004 also functions off-line as a satellite, providing extensive computing under plugboard control and communications through its own capabilities.

The UNIVAC 1004 includes these features:

- Up to 62 re-usable program steps
- 961 characters of core storage, expandable to 1,922 character positions
- 6.5 or 8 microsecond memory cycle time
- 615 or 400 card per minute reading speed
- 600 or 400 line per minute printing rate
- 132 alphanumeric characters per line

The following UNIVAC 1004 options add these capabilities to any location, at low cost:

Card Punch

200 cards per minute punching
Punching fully overlapped with reading, processing and printing
Two 1,000 card stackers

Card Read-Punch

Reading and punching fully overlapped with standard unit reading, printing and processing
Two 1,000 card stackers

Auxiliary Card Reader

400 cards per minute reading
Reading, punching and printing may occur simultaneously
1,000 card input capacity
Three 1,000-card stackers

Magnetic Tape Unit

Compatible tape mode
200, 556, 800 ppi tape densities
Mylar* tape in reels of 2,400 feet
Tape reading or writing and card or paper tape punching may occur at the same time.

Paper Tape Reader

400 characters/second reading
5, 6, 7 and 8-level codes
Tape reading, punching and printing may occur simultaneously

Paper Tape Punch

110 characters/second punching
5, 6, 7 and 8-level codes
Tape punching overlaps reading, printing and processing

Remote Devices

Equipment that is compatible with communications common carrier facilities operates on-line with the UNIVAC 494 Real-Time System.

*Trademark of E. I. duPont de Nemours and Company, Inc.





THE SOFTWARE IS ALL THERE

The power of the UNIVAC 494 is delivered in full through a flexible, control-oriented software package. The package includes an executive system that enables several real-time programs plus batch processing applications to run concurrently. The package also includes a family of powerful problem solving languages; an easy-to-use sort-merge; and an extensive support library which provides input and output routines, program test aids and program maintenance capability.

The programmer may use the SPURT assembly language, COBOL or FORTRAN to state his problem solutions. The choice of the language is determined by the nature of the problem. The programmer may define portions of his problem in different languages and the executive system will construct the running program in the computer system from the elements written in SPURT, COBOL, or FORTRAN. Through the executive system, all activities both internal and external to the processor are properly correlated, assigned storage, and carried out in the most expedient sequence.

This is a new software package, designed to harness the speeds and unique multiple real-time and batch program capabilities of the 494. These new software tools are backed by the experience Univac has gained during many years of installing successful real-time computer operations.

SOFTWARE DESCRIPTION

The Spurt Assembly Language

a mnemonic problem-solving language

The SPURT Language Processor

processes source language and provides a print-out of the assembled program

Real-Time Executive System

maintains and controls the real-time multi-sequential program environment

The COBOL English Language Compiler

provides a widely used business language common to many computer systems

FORTRAN IV Mathematic Compiler

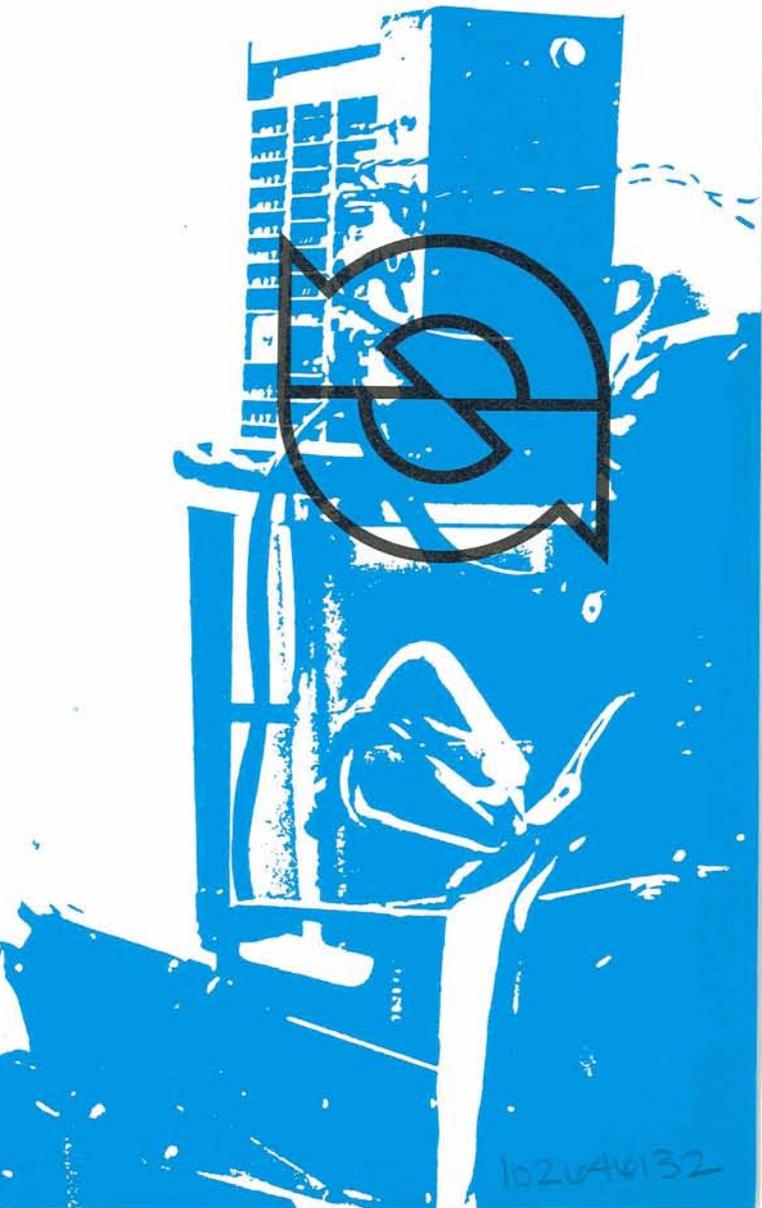
provides a powerful version of the widely used FORTRAN language

The Sort-Merge Packages

easy-to-use parameter-defined programs

Utility Routines

a complete set of routines for converting data from one medium to another



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