

UNIVAC 9200 & 9300

MANAGEMENT SUMMARY

The 9200/9300 systems constitute UNIVAC's small-scale entry in the third-generation computer market. Designed primarily for business data processing, they offer most small-volume users a nicely balanced combination of processing power and economy. They are also being effectively employed as I/O processors and remote communication terminals in conjunction with larger computers.

The 9200 and 9300 systems were announced in June 1966, more than two years later than the IBM System/360. They were the first two members of the long-awaited UNIVAC 9000 Series, and UNIVAC salesmen assured their prospects that the series would soon be expanded into a System/360-like family of processors. But, to date, only the medium-scale UNIVAC 9400 has been added to the line. The lack of large-scale models in the 9000 Series will not represent a significant drawback for most users who start with a 9200 or 9300 system, since the 9400 should offer more than enough expansion potential to meet their future needs.

Two characteristics of the 9200/9300 systems aroused strong interest throughout the EDP world: they were the first commercial computers to employ plated-wire main

This family of small-scale data processing systems, introduced in 1966, features plated-wire main memories and System/360-style architecture. Originally quite limited in its peripheral and software facilities, the line has been greatly enhanced through subsequent additions. "Packaged" disc-oriented configurations are now available at attractive prices.

CHARACTERISTICS

MANUFACTURER: UNIVAC Division, Sperry Rand Corporation, P.O. Box 500, Blue Bell, Pa. 19422.

MODELS: UNIVAC 9200, 9200 II, 9300, and 9300 II.

DATA FORMATS

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 2 BCD digits, or 8 binary bits. Two consecutive bytes form a "halfword."

FIXED-POINT OPERANDS: 1 halfword (16 bits) in binary mode. In decimal mode, lengths can range from 1 to 16 bytes (1 to 31 digits plus sign) for arithmetic operations and from 1 to 256 bytes for move, edit, and logical operations.



This card-oriented UNIVAC 9300 system includes the dual-feed 1001 Card Controller (left) as well as the basic card reader and

punch (at right). The 600-lpm printer is an integral part of the processor cabinet (center).

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▷ memories, and they are largely compatible with the IBM System/360.

The plated-wire memories use a UNIVAC-developed, thin-film storage technique that results in demonstrably higher speeds and lower prices than most of the magnetic core memories in other current computers. By operating in a nondestructive-readout mode, the plated-wire memory eliminates the need for regeneration of the data after every read operation. Moreover, plated-wire memories can be manufactured and tested largely in continuous, automated processes, whereas core memories still tend to require painstaking manual assembly operations. Although UNIVAC's plated-wire memories have performed well, it has now become apparent that semiconductor technology, rather than plated wire, is destined to replace magnetic cores as the principal computer storage medium of the future.

UNIVAC was not the first major computer manufacturer to announce an IBM-compatible product line; that distinction went to RCA, which introduced the Spectra 70 line in December 1964. Even so, UNIVAC's decision to strive for data and program compatibility with the System/360 represented an important step toward industry standardization and improved communication.

Actually, UNIVAC has not gone as far down the road toward total System/360 compatibility as RCA. The 9200/9300 systems employ the same byte-oriented data structure, EBCDIC code, I/O media, and instruction formats as the System/360. But the UNIVAC processors have a repertoire of only 32 or 35 instructions, and not all of these have direct counterparts in the System/360's far larger instruction set. There is a higher degree of correspondence between the facilities of the 9200/9300 systems and the small-scale System/360 Model 20, but here again the compatibility is by no means complete.

The implications of the resulting compatibility picture can be summarized this way:

- Data can be freely interchanged between suitably equipped System/360 and 9200/9300 systems.
- Programmers who have System/360 experience can easily learn to program the 9200/9300 systems in the same language, and vice versa.
- System/360 source programs written in Assembler, COBOL, FORTRAN, or RPG will generally require changes ranging from very slight to quite extensive before they can be translated and executed on a 9200/9300 system, and vice versa.
- There is no object-program compatibility between the two lines; programs written for a System/360 must be reassembled or recompiled before execution on a 9200/9300 system, and vice versa.

▶ **FLOATING-POINT OPERANDS:** No hardware facilities; FORTRAN compiler and MATHPAC routines use 6 bytes per operand: 2 decimal digits for exponent and 11 digits plus sign for fraction.

INSTRUCTIONS: 4 or 6 bytes in length, specifying 1 or 2 memory addresses, respectively.

INTERNAL CODE: EBCDIC or USASCII, depending upon setting of a mode byte.

MAIN STORAGE

STORAGE TYPE: Plated-wire (a thin-film memory technique).

CAPACITY:

9200 Processor: 8,192, 12,288, or 16,348 bytes.

9200 II and 9300 Processors: 8,192, 12,288, 16,348, 24,576, or 32,768 bytes.

9300 II Processor: 16,348, 24,576, or 32,768 bytes.

CYCLE TIME: 1.2 microseconds per 1-byte access in 9200 and 9200 II; 0.6 microsecond per 1-byte access in 9300 and 9300 II.

CHECKING: Parity bit with each byte is generated during writing and checked during reading.

STORAGE PROTECTION: None.

RESERVED STORAGE: First 260 bytes of main storage are reserved for registers, buffer control words, and printer image area.

CENTRAL PROCESSORS

INDEX REGISTERS: The programmer has access to eight 16-bit general registers, used for indexing, base addressing, and as accumulators. (A second set of eight general registers is used in the I/O mode.)

INDIRECT ADDRESSING: None.

INSTRUCTION REPERTOIRE: 35 instructions, 3 of which (decimal multiply, divide, and edit) are offered as an extra-cost option in the 9200 and 9200 II Processors. Included are facilities for decimal arithmetic, binary addition and subtraction, comparison, code translation, logical AND and OR, packaging, and unpacking. Most of the instructions are identical with those of the IBM System/360 Model 20, but the input/output and control instructions are different.

INSTRUCTION TIMES: See table; the times shown are for 1-address binary addition of halfword (16-bit) fields and for 2-address decimal addition of signed 5-digit (3-byte) fields.

INPUT/OUTPUT CONTROL

I/O CHANNELS: One multiplexer channel is standard in the 9300 II and optionally available for the other three processors. One selector channel is standard in the 9300 II and optionally available for the 9200 II Processor only.

CONFIGURATION RULES: Controls for the integrated printer and the basic card reader and punch are built into each processor. The 8411 and 8414 Disc Drives require the selector channel, which is available only for the 9200 II and ▶

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CHARACTERISTICS OF THE 9200/9300 PROCESSORS

	9200	9200 II	9300	9300 II
MAIN STORAGE				
Cycle time, microseconds	1.2	1.2	0.6	0.6
Bytes fetched per cycle	1	1	1	1
Minimum capacity, bytes	8,192	8,192	8,192	16,384
Maximum capacity, bytes	16,384	32,768	32,768	32,768
PROCESSOR				
Multiply, Divide, & Edit	optional	optional	standard	standard
Add time, microseconds (16-bit binary fields)	40.8	40.8	20.4	20.4
Add time, microseconds (5-digit decimal fields)	103.2	103.2	51.6	51.6
CHANNELS				
No. of selector channels	none	0 or 1	none	1
Maximum selector channel data rate, bytes/sec.	—	350,000	—	350,000
No. of multiplexer channels	0 or 1	0 or 1	0 or 1	1
Maximum multiplexer channel data rate, bytes/sec.	85,000	85,000	85,000	85,000
PERIPHERALS				
Integrated printer speed, lpm	250/300	250/300	600	600
Basic card reader speed, cpm	400	400/600	600	600
Magnetic tape speed, bytes/sec.	none	68,320	34,160	68,320
8410 Disc Files	yes	yes	yes	yes
8411 Disc Drives	no	yes	no	yes
8414 Disc Drives	no	yes	no	yes

➤ As announced in 1966, the 9200/9300 product line included only two central processors and a curiously restricted complement of peripheral equipment and software. The 9200 was strictly a card-oriented processor, while the 9300 offered magnetic tape and card I/O but not much else. Mass storage and data communications facilities were conspicuously absent.

Since then, UNIVAC has busily expanded both the product line and the supporting software, thereby greatly increasing both its scope of applications and its overall attractiveness in the marketplace. The line now includes data communications controls, an optical document reader, paper tape I/O, line printers with speeds of up to 1600 lpm, and three types of disc files—including IBM 2311-compatible and 2314-compatible units. Magnetic tape speed, long limited to a maximum of 34,160 bytes per second, was doubled in April 1971 when UNIVAC announced the availability of the 1600-bpi Uniservo 12 tape unit with 9200/9300 systems. Other new peripheral units introduced during 1971 include a 1000-cpm card reader, an upper-and-lower-case printer, and a console/inquiry station.

➤ 9300 II Processors and can accommodate up to 6 disc control units. All other peripheral devices are connected via the multiplexer channel, which can accommodate up to 8 control units and 64 devices.

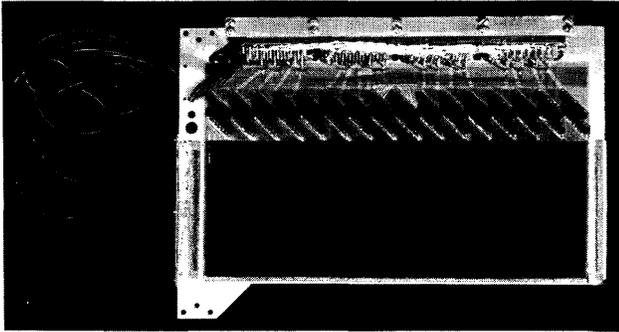
SIMULTANEOUS I/O OPERATIONS: Concurrently with computing, the processor can control card reading, punching, and printing on the three basic I/O units, plus multiple I/O operations with a combined data rate of up to 85,000 bytes per second on the multiplexer channel. The selector channel accommodates one I/O operation at a time with a data rate of up to 350,000 bytes per second, but in this case computation is suspended while data is being transferred.

I/O INTERFERENCE: Demands on the processor imposed by multiplexer channel operations range from less than 1 percent (for card reading and punching) to about 33 percent (for magnetic tape I/O). Computing is suspended during selector channel (disc) I/O operations, though multiplexer I/O operations can continue.

MASS STORAGE

8410 DISC FILE: Uses interchangeable single-disc cartridges to provide low-cost random-access storage. Each of the two disc surfaces in the 7.5-pound cartridge holds 1.6 million bytes of data, but only one of the surfaces on each

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UNIVAC's plated-wire memory is the most distinctive hardware feature of the 9000 Series computers.

➤ The software complement now includes adequate, if unimaginative, support for card, tape, and disc-oriented systems (including limited multiprogramming for 24K and 32K systems). After getting off to a very late start in the development of application programs, UNIVAC has recently introduced a number of well-conceived packages. And UNIVAC's still-bundled support policy can lead to important savings for users.

The biggest single event in the steady expansion of the 9200/9300 line occurred in February 1969, when the 9200 II and 9300 II Processors were introduced. These new models feature greatly increased I/O capabilities at very small increases in cost. A selector channel accommodates data transfer rates as high as 350,000 bytes per second and is used to control the 8411 and 8414 Disc Drives. The 9200 II Processor offers magnetic tape I/O and up to 32K bytes of storage, whereas the original 9200 is a card-only system with a maximum storage capacity of 16K bytes.

The distinguishing characteristics of all four of the current processors are summarized in the table. Internal speeds of the 9300 and 9300 II Processors are identical and exactly twice as fast as those of the 9200 and 9200 II. A 9200 Processor can be successively field-upgraded to a 9200 II, then to a 9300, and finally to a 9300 II.

The processors are compact, attractively-styled units that include integrated bar-type printers. Monolithic integrated circuits are used throughout. Customer deliveries began in June 1967, and the systems delivered to date have generally lived up to UNIVAC's reputation for reliable, well-engineered hardware. More than 3000 of the 9200/9300 systems are now in use throughout the world.

In an effort to boost the sales of the 9200/9300 systems, which were lagging as a result of the weak economy and the steadily improving product lines from competitive computer makers, UNIVAC made two significant recent moves.

➤ disc drive can be on-line (accessible for reading and writing) at a time. Each surface contains 100 logical data tracks, and each track is divided into 100 sectors of 160 bytes each. In addition, each surface has one "Fastband," a fast-access track that contains fifty 160-byte sectors and is particularly useful for storage of file directories.

Two read/write heads are mounted on a single access arm, which moves radially across the disc. Average head movement time is 117 milliseconds, and average rotational delay is 25 milliseconds. The single "Fastband" is served by a fixed read/write head and has an average access time of 25 milliseconds.

The minimum 8410 Subsystem consists of a Dual Disc Drive Master containing two disc drives, control unit, and 160-byte buffer. This configuration provides 3.2 million bytes of on-line storage. Additional Single or Dual Disc File units can be added, up to a maximum total of 8 drives (or 12.8 million bytes of on-line storage).

8411 DISC DRIVE: Provides interchangeable disc-pack storage of larger capacity than the 8410 Disc File. Each disc pack contains six 14-inch discs, weighs 10 pounds, holds up to 7.25 million bytes of data, and is compatible with the IBM 1316 Disk Pack used in IBM 2311 Disk Storage Drives. One read/write head serves each of the 10 recording surfaces. Up to 36,250 bytes (10 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 75 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 156,000 bytes per second. Record lengths are variable.

Up to eight 8411 Disc Drives (58 million bytes) can be connected to a Disc File Control, which in turn can be connected only to the selector channel of a 9200 II or 9300 II Processor. The following options are available: File Scan, which permits searching of data areas as well as record keys; Record Overflow, which permits records longer than one track (3625 bytes); and Dual Channel, which allows two different computers to access an 8411 subsystem.

8414 DISC DRIVE: Provides large-capacity random-access storage in interchangeable 11-disc packs which are compatible with the IBM 2316 Disk Packs used in the IBM 2314 Direct Access Storage Facility. Each pack stores up to 29.17 million bytes of data. Up to 145,880 bytes (20 tracks) can be read or written at each position of the comb-type access mechanism. Average head movement time is 60 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312,000 bytes/sec. Record lengths are variable.

From two to eight 8414 Disc Drives can be connected to a Disc Control, providing from 58.4 to 233.4 million bytes of on-line storage. The 8414 Disc Control, in turn, can be connected only to the selector channel of a 9200 II or 9300 II Processor. The File Scan and Record Overflow features are standard, and the Dual Channel capability is optional.

INPUT/OUTPUT UNITS

UNISERVO VI C MAGNETIC TAPE UNIT: Reads and records data on standard ½-inch tape in IBM-compatible formats. Available in both 9-track and 7-track versions. Tape speed is 42.7 inches per second, forward or backward, and data transfer rate is 34,160 bytes per second at 800 bpi. The 9-track version has a recording density of 800 bpi, while the 7-track version can operate at 200, 556, or 800 bpi. An optional feature enables the 9-track version to

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▷ In March 1971, the discounts on UNIVAC's extended-term leases were increased. Customers now receive a discount from the short-term monthly rental prices of 15% on a 3-year lease or 25% on a 5-year lease, compared with the previous discount of only 15% on a 5-year lease.

Then, in August 1971, UNIVAC introduced the 9311 and 9314 "D" Systems. These are "packaged" disc-oriented configurations consisting of a 9300 II Processor with 16K, 24K, or 32K bytes of main storage, a 600-lpm printer, 600-cpm card reader, 75-200-cpm punch, and two 8411 or 8414 disc drives. None of the hardware is new, but the pricing certainly is: the 9311 and 9314 systems are offered at purchase prices up to 24% and rental prices up to 11% below the list prices of their individual components.

The UNIVAC 9200/9300 systems provide impressive performance at attractive prices in the small-volume business data processing applications for which they were designed, while retaining a reasonable degree of compatibility with larger computers produced by UNIVAC, IBM, and RCA. Despite the advent of strong new competitors such as the IBM System/3 and the NCR Century Series, the 9200/9300 systems continue to deserve serious consideration by companies shopping for a small-scale data processing system. □

▶ handle 7-track tape as well. The Data Conversion feature, for 7-track drives, converts each group of four 6-bit characters from tape into three 8-bit bytes in main storage, and vice versa.

A Uniservo VI C Subsystem consists of a control unit and from two to eight tape drives. One or two tape subsystems can be connected to the multiplexer channel of a 9300 or 9300 II Processor, while a single tape subsystem can be used with the 9200 II. Read/write/compute simultaneity is possible in 9300 or 9300 II systems with two tape subsystems.

UNISERVO 12 MAGNETIC TAPE UNIT: A medium-speed tape drive that reads and records data on standard ½-inch tape in IBM-compatible formats. Available in both 9-track and 7-track versions. Tape speed is 42.7 inches per second, forward or backward. The standard 9-track version has a recording density of 1600 bpi (in phase-encoded mode) and a data rate of 68,320 bytes per second; the optional Dual Density feature permits operation at 800 bpi (in NRZI mode) at a data rate of 34,160 bytes per second—the same speed as the Uniservo VI C. The 7-track version can operate at 200, 556, or 800 bpi, with corresponding data rates of 8,540, 23,740, or 34,160 characters per second.

A Uniservo 12 Subsystem consists of a control unit and up to 16 tape units. Each "master" tape unit can control up to three "slave" tape units. A single Uniservo 12 subsystem can be connected to the selector channel of a 9200 II or 9300 II Processor only.

400-CPM CARD READER: Reads 80-column cards serially by column at 400 cpm. Can be equipped to read 51-or 66-column short cards or UNIVAC 90-column cards. Standard card input unit for the 9200; also usable with the 9200 II.

600-CPM CARD READER: Reads 80-column cards serially by column at 600 cpm. Otherwise, has same specifications as the 400-cpm reader. Standard card input unit for the 9300 and 9300 II; also usable with the 9200 II.

1000-CPM CARD READER: Reads 80-column cards serially by column at 1000 cpm. Can be equipped to read 51-or 66-column short cards. Has a 2400-card input hopper and two 2000-card stackers. Compressed code translation and image-mode reading are standard; translation to EBCDIC or ASCII is an extra-cost option. Connects to the multiplexer channel of a 9200, 9200 II, 9300, or 9300 II Processor. Deliveries are scheduled to begin in the fourth quarter of 1972.

1001 CARD CONTROLLER: Has two card feeds, each equipped with a photoelectric read station, and a total of seven stackers. Each feed can operate independently at up to 1000 cpm. Thus, the 1001 can read data from two separate files and perform on-line card merging and selection operations. Arithmetic facilities and a 256-character core memory enable the 1001 to perform collating, editing, sorting, and proving operations in an off-line mode. Usable with all four processors, the 1001 is connected to the multiplexer channel via a 1001 Control.

75-200-CPM CARD PUNCH: Punches 80-column cards in column-by-column fashion. Speed ranges from 75 cpm when all 80 columns are punched to 200 cpm when the last column punched is column 14 or lower. Can be equipped with a pre-punch read station and programmable stacker selection. Standard card output unit for all four processors.

200/250-CPM CARD PUNCHES: Punch 80-column cards in row-by-row fashion at either 200 or 250 cpm, depending upon the model selected. Two program-selectable 1000-card stackers are standard. Can be equipped with a pre-punch read station. Connects to the multiplexer channel of a 9200 II, 9300, or 9300 II Processor.

PAPER TAPE SUBSYSTEM: Consists of a 300-char/sec reader, 110-char/sec punch, and control unit in a single cabinet. Reads and punches 5-, 6-, 7-, or 8-level tape. Spoolers are optional for both the reader and punch. Connects to the multiplexer channel of all four processors.

250/300-LPM PRINTER: An integral part of each 9200 and 9200 II Processor. Uses an interchangeable, horizontally oscillating type bar. Basic model has 96 print positions and a speed of 250 lpm with the standard 63-character set. Optional features increase the speed to 300 lpm and the number of print positions to 120 or 132. The Variable-Speed Printing feature provides a special 48-character typebar that yields speeds of 500 or 600 lpm when using a 16-character numeric set and 250 or 300 lpm when the entire 48-character alphanumeric set is used. Skipping speed is 25 inches/sec.

600-LPM PRINTER: An integral part of each 9300 and 9300 II Processor. Uses an interchangeable, horizontally oscillating typebar. Has 120 print positions (expandable to 132) and a speed of 600 lpm with the standard 63-character set. The High-Speed Numeric Print feature provides a special 16-character typebar that permits printing at 1200 lpm. Skipping speed is 25 inches/sec.

900/1100-LPM PRINTER: Prints at 900 lpm when the full 63-character set is used and at 1100 lpm when using any 49 contiguous characters. Has 132 print positions. Connects to the multiplexer channel of a 9200 II, 9300, or 9300 II Processor. ▶

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► **1200/1600-LPM PRINTER:** Prints at 1200 lpm when the full 63-character set is used and at 1600 lpm when using any 43 contiguous characters. Has 132 print positions. Connects to the multiplexer channel of a 9200 II, 9300, or 9300 II Processor.

0768-02 PRINTER: Features full upper-and-lower-case alphabetic printing plus high-speed numeric printing. Each of the 132 print positions has 94 discrete characters, with the 10 numerics and 4 special characters duplicated on opposite sides of the drum. Peak printing speed is 2000 lpm for numerics (at single, double, or triple spacing), 1000 lpm for up to 87 contiguous characters, and 840 lpm when all 94 characters are used. A choice of three character sets is offered, all in the UNIVAC H-14 font which is readable by the 2703 Optical Document Reader. A Print Code Expansion feature allows logical expansion of the character set to 108 different characters. Skipping speed is 33 inches per second. Connects to the multiplexer channel of a 9200 II, 9300, or 9300 II Processor. Deliveries are scheduled to begin in the fourth quarter of 1972.

CONSOLE/INQUIRY UNIT: Consists of a typewriter-style data entry keyboard and a 30-character-per-second serial printer similar to the one used in the UNIVAC DCT 500 Data Communications Terminal. Serves as a system control center and/or a local inquiry station. Multiple units can be connected a system to provide additional inquiry stations, but only one can serve as an operator's console. Connects to the multiplexer channel of a 9200, 9200 II, 9300, or 9300 II Processor equipped with a disc or tape subsystem, and allows use of the new OS/500 operating system.

2703 OPTICAL DOCUMENT READER: Reads printed numeric data from individual documents ranging from 2.75 to 4.25 inches in height and 3.00 to 8.75 inches in length. Basic speed of 300 six-inch documents per minute can be increased to 600 dpm by an optional feature. Other options permit reading of vertical pencil marks and of standard 80-column punched cards. Character set consists of the digits 0-9 and four special symbols, in either UNIVAC H-14 or USASOOCR Size A font. Has a 2000-document feed hopper and three 1000-document stackers. Connects to the multiplexer channel of all four processors.

COMMUNICATION CONTROL

DATA COMMUNICATIONS SUBSYSTEMS—DCS-1 & DCS-4: The DCS-1 connects one communications line to a 9000 Series computer, while the DCS-4 connects up to four lines. A maximum of eight full-duplex lines can be connected to the multiplexer channel of a 9200, 9200 II, 9300, or 9300 II Processor through a combination of DCS-1 and/or DCS-4 subsystems.

Each DCS consists of a single Line Terminal Controller, plus Line Terminal and a Communications Interface for each connected line. Numerous models of line terminals and interfaces permit asynchronous and/or synchronous transmission over a wide variety of communications services at speeds of 75 to 230,400 bits per second.

The DCS-1C, announced in December 1969, is a Binary Synchronous Data Communications Subsystem that enables a 9000 Series computer to communicate with an IBM System/360 computer equipped with a 2701 Data Adapter Unit. Transmission can be in either EBCDIC or USASCII code and in either Transparent or Nontransparent mode. UNIVAC will provide a macro library that will enable the 9000 Series computer to serve as a remote terminal to a

System/360 using BTAM or QTAM. DCS-1C deliveries will begin in the fourth quarter of 1970.

SOFTWARE

SUPPORT LEVELS: The software support available to a 9200 or 9300 user depends upon the types of peripheral devices and the amount of main memory available. There are four basic categories of support:

CARD-ORIENTED SYSTEMS: The principal software facilities for systems without magnetic tape or disc units are an Assembler, Report Program Generator, Input/Output Control System, Gangpunch/Reproduce Program, and MATHPAC routines. All are operable on a system with as little as 8K bytes of main memory.

TAPE-ORIENTED SYSTEMS: 8K tape systems can use all the card-oriented software plus the Minimum Operating System (MOS) and a Tape Input/Output Control System and sort routines; 12K tape systems can use the MOS Report Program Generator; 16K systems can use the Non-Concurrent Operating System (NCOS), as well as a Tape Assembler, NCOS Report Program Generator, and COBOL and FORTRAN compilers; 14K and larger tape systems can operate under the Concurrent Operating System (COS).

8410 DISC SYSTEMS: 12K systems equipped with 8410 Disc Files can use all the card-oriented software plus the Minimum Operating System, Disc Sort, Input/Output Control System, and the MOS Report Program Generator; 16K systems can also use a Disc Assembler and the "control stream" operating mode. "Concurrency" is possible with 24K or 32K bytes.

8411-8414 DISC SYSTEMS: 16K systems equipped with at least one 8411 or two 8414 Disc Drives can operate under either MOS or NCOS and use a Disc Sort and Input/Output Control System. At least 24K is required for use of the Concurrent Operating System, Disc Assembler, Report Program Generator, and COBOL compiler.

OPERATING SYSTEMS: Four different operating systems are available for tape and/or disc-oriented 9200/9300 systems:

MINIMUM OPERATING SYSTEM: MOS is designed for configurations with 8K to 16K bytes of main storage, a card reader, card punch, and either disc storage or two or three magnetic tape drives. It consists of a Supervisor and a Job Control Program, which are stored on cards and loaded via the card reader. All programs must be stored on cards, though tape units and disc files can be used for data input and output. Thus, MOS cannot handle stacked-job processing. The system's principal functions are interrupt servicing, I/O control, operator communication, and interfacing with data communications I/O routines.

NON-CONCURRENT OPERATING SYSTEM: NCOS is designed for configurations with 16K to 32K bytes of main storage, a card reader, and either two or more disc drives or four or more magnetic tape drives. The principal NCOS control programs are an Initial Program Loader, Supervisor, and Job Control Program. NCOS locates and loads programs and overlays from tape or disc, initiates and terminates program execution, handles interrupts, controls I/O operations, coordinates operator

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► communication, provides program restart capabilities, and interfaces with data communications I/O routines. NCOS handles sequential stacked-job processing of one program at a time, as directed by a "control stream" entered via the card reader.

CONCURRENT OPERATING SYSTEM: COS is essentially the same as NCOS except for the addition of a limited multiprogramming capability, which UNIVAC calls "concurrency." A single main program can operate concurrently with up to five data transcription routines, called "symbionts." Each symbiont transfers data between a tape or disc drive and a slower I/O device or communications line. COS requires at least 24K bytes of main storage, and the tape version requires at least five tape drives.

OS 500 OPERATING SYSTEM: OS 500, introduced in mid-1971, is an operating system designed to provide users of tape or disc-oriented 9200/9300 systems with console control and both local and remote inquiry capabilities. Most of OS 500's functions and operations are similar to those of COS and NCOS; but unlike the other two, OS 500 is designed to keep the system in continuous operation instead of halting when various abnormal conditions arise.

OS 500 requires a 9200 II, 9300, or 9300 II Processor with at least 24K bytes of main memory, a card reader, a Console/Inquiry Unit, and either an 8410, 8411, or 8414 disc subsystem or a magnetic tape subsystem. OS 500 can also support additional local Console/Inquiry Units (for inquiry use only), DCT 500 remote inquiry units, and various data communications interfaces. A single main program can operate concurrently with one or more "symbiont" data transcription routines. When an inquiry is received, OS 500 can suspend execution of the main program, roll it out to disc storage, and load and execute the appropriate inquiry program. Upon completion of inquiry processing, the main program is restored and resumed.

COBOL: Compilers for the Minimum USA Standard COBOL language are available for 16K tape systems and 24K disc systems.

FORTRAN: A FORTRAN compiler is offered for 16K tape-oriented systems. The language is a subset of full USA Standard FORTRAN and includes some extensions beyond USASI Basic FORTRAN.

ASSEMBLERS: The 9200/9300 Assemblers permit programs to be coded in a symbolic assembly language that is similar to, though not fully compatible with, the IBM System/360 Model 20 Assembler language. Assemblers are offered for 8K card systems, 16K tape systems, 16K systems with 8410 Disc Files, and 24K systems with 8411 or 8414 Disc Drives. All versions have macro-instruction facilities, though the Card Assembler requires a separate pre-assembly macro pass.

REPORT PROGRAM GENERATORS: RPG is probably the most widely used programming language in small 9200/9300 installations. Using five types of preprinted coding forms, the programmer prepares a set of specifications describing the input data, calculations, and desired output. The RPG then generates a program to perform the required functions. The coding forms and source language are essentially the same as those of IBM System/360 RPG.

UNIVAC offers RPG's for 8K card systems, 12K tape systems, 12K systems with 8410 Disc Files, and 24K systems with 8411 or 8414 Disc Drives. Programs generated for disc systems can process either sequential or indexed sequential files.

INPUT/OUTPUT CONTROL SYSTEMS (IOCS): These are sets of macro-instructions that facilitate the coding and control of input/output operations. Separate versions are available for card, tape, and disc systems. The Disc IOCS can handle sequential, indexed sequential, and random file organizations. Special input/output routines are also available for controlling data communications, the 2703 Optical Document Reader, high-speed printers, paper tape I/O, etc.

UTILITY ROUTINES: Tape and disc sort routines are available. The tape sort requires at least 12K bytes and three magnetic tape drives. The 8410 and 8411/8414 disc sorts require 12K and 16K bytes, respectively. All are generalized routines that can accommodate either fixed or variable-length records and the user's own coding.

The Gangpunch-Reproduce program accepts problem-oriented specifications and generates programs which enable a card-oriented 9200/9300 system to perform a variety of gangpunching, reproducing, and sequence-checking functions.

MATHPAC is a library of more than 30 closed subroutines which perform floating-point arithmetic and evaluate commonly-used mathematical functions (square root, sine, log, etc.).

SWITCH is a series of three programs designed to convert IBM 360/20 Card or Tape RPG source programs into UNIVAC 9200/9300 RPG source programs. The ACTS-1 Translator facilitates the conversion of IBM 1401/1440/1460 Autocoder or SPS source programs into UNIVAC 9200/9300 Assembly-language source programs.

Other utility routines are available to handle diagnostic, data transcription, file maintenance, and other commonly-required functions.

APPLICATION PROGRAMS: The limited number of application packages currently available from UNIVAC includes:

- Accounts Receivable Processing
- Bill of Materials Processor
- Critical Path Method Scheduling
- Dairy Route Accounting
- Fixed Assets Accounting
- General Ledger Processing
- LINCO III Automatic Typesetting System
- Mortgage Accounts Processing
- Savings Accounts Processing
- Universal Student Academic Scheduling
- Wholesale Ice Cream Accounting

PRICING

EQUIPMENT: The following systems are representative of the types of 9200 and 9300 systems that are being widely installed and are supported by standard UNIVAC software. All necessary control units and adapters are included in the indicated prices, and the quoted rental prices include equipment maintenance.

On August 5, 1971, UNIVAC announced a 7% increase in the monthly maintenance charges for nearly all of the ►

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► 9200/9300 equipment and a 5% increase in the purchase and rental prices for most of the peripheral and communications equipment used with the 9200/9300 mainframes. But as a result of the 90-day price freeze, these increased prices will not go into effect before November 15, 1971—if at all. Therefore, all of the following prices are the ones which were in effect prior to August 5 and are still in effect at this writing.

MINIMUM 9200 CARD SYSTEM: Consists of 8K 9200 Processor, 250-lpm Printer with 96 print positions, 400-cpm Card Reader, and 75-200-cpm Card Punch. Monthly rental and purchase prices are approximately \$1,202 and \$42,570, respectively.

9311-A SERIES D DISC SYSTEM: Consists of 16K 9300 II Processor with Multiplexer Channel and Selector Channel, 600-lpm Printer with 132 print positions, 600-cpm Card Reader, 75-200-cpm Card Punch, and two 8411 Disc Drives with control. Monthly rental and purchase prices for this “packaged” configuration are \$3,451 and \$111,040, respectively.

9314-C SERIES D DISC SYSTEM: Consists of 32K 9300 II Processor with Multiplexer Channel and Selector Channel, 600-lpm Printer with 132 print positions, 600-cpm Card Reader, 75-200-cpm Card Punch, and two 8414 Disc Drives with control. Monthly rental and purchase prices for this “packaged” configuration are \$4,469 and \$150,120, respectively.

9300 TAPE SYSTEM: Consists of 16K 9300 Processor, Multiplexer Channel, 600-lpm Printer with 120 print positions, 600-cpm Card Reader, 75-200-cpm Card Punch, and four Uniservo VI C Tape Units with control. Monthly rental and purchase prices are approximately \$4,036 and \$142,270.

9300 II TAPE/DISC SYSTEM: Consists of 32K 9300 II Processor with Multiplexer Channel and Selector Channel, 600-lpm Printer with 132 print positions, 600-cpm Card Reader, 250-cpm Card Punch, six Uniservo VI C Tape Units with control, and two 8414 Disc Drives with control. Monthly rental and purchase prices are approximately \$7,515 and \$274,580, respectively.

SOFTWARE AND SUPPORT: UNIVAC has not “un-bundled” to date, so the equipment prices listed above include all of the UNIVAC software described in this report and all normal educational courses and professional assistance.

CONTRACT TERMS: The standard UNIVAC use and service agreements allow unlimited use of the equipment (exclusive of the time required for remedial and preventive maintenance). There are no extra-use charges. The basic maintenance charge (included in all rental prices quoted above) covers maintenance of the equipment for nine consecutive hours a day, Monday through Friday. Extended periods of maintenance are available at extra cost.

LONG-TERM LEASES: In addition to the basic 1-year agreement, UNIVAC offers extended-term leases for the 9200/9300 systems at significantly lower monthly rates. Under a 3-year “level-payment” agreement, the monthly equipment charge is 85% of the 1-year rental rate shown in the accompanying price list. Under a 5-year “level-payment” agreement, the monthly charge is 75% of the 1-year rental rate. Under a 5-year “reducing-payment” agreement, the monthly charge is 85% of the 1-year rental rate during the first year, 80% the second year, 75% the third year, 70% the fourth year, and 65% the fifth year. ■

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Equipment Prices

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
SERIES "D" SYSTEMS				
9311-A	Includes Processor with 16,384 bytes of storage, Selector Channel, Multiplexer Channel, 600-lpm Printer, 600-cpm Card Reader, 75-200-cpm Card Punch, two 8411 Disc Drives and Control.	111,040	675	2,776
9311-B	As above, with 24,576 bytes of storage	119,240	709	2,981
9311-C	As above, with 32,768 bytes of storage	130,120	726	3,253
9314-A	Includes Processor with 16,384 bytes of storage, Selector Channel, Multiplexer Channel, 600-lpm Printer, 600-cpm Card Reader, 75-200-cpm Card Punch, two 8414 Disc Drives and Control.	131,040	665	3,276
9314-B	As above, with 24,576 bytes of storage	139,240	699	3,481
9314-C	As above, with 32,768 bytes of storage	150,120	716	3,753
F1652-99	Card Punch Upgrade; provides a 200-cpm Row Punch in any Series "D" System	3,454	19	82
PROCESSORS AND MAIN STORAGE				
3030-00	9200 Processor (includes 250-lpm Bar Printer with 96 print positions)	13,485	82	310
3030-94	9200 II Processor (includes Multiplexer Channel and 250-lpm Bar Printer with 96 print positions)	15,834	89	365
7007-93	Storage; 8,192 bytes; for 9200 & 9200 II	17,485	35	402
7007-92	Storage; 12,288 bytes; for 9200 & 9200 II	29,275	52	673
7007-91	Storage; 16,384 bytes; for 9200 & 9200 II	34,755	69	799
7007-87	Storage; 24,576 bytes; for 9200 II only	52,505	104	1,207
7007-85	Storage; 32,768 bytes; for 9200 II only	69,295	138	1,593
3030-02	9300 Processor (includes 600-lpm Bar Printer with 120 print positions, and the Multiply, Divide, Edit feature)	27,825	192	635
3030-96	9300 II Processor (includes Multiplexer Channel, Selector Channel, 600-lpm Bar Printer with 120 print positions, and the Multiply, Divide, Edit feature)	34,535	208	782
7007-08	Storage; 8,192 bytes; for 9300 only	24,390	52	555
7007-10	Storage; 12,288 bytes; for 9300 only	38,155	69	870
7007-12	Storage; 16,384 bytes; for 9300 & 9300 II	44,675	87	1,024
7007-18	Storage; 24,576 bytes; for 9300 & 9300 II	63,720	121	1,464
7007-14	Storage; 32,768 bytes; for 9300 & 9300 II	81,145	138	1,853
PROCESSOR FEATURES AND CHANNELS				
F0882-00	Multiply, Divide, Edit Feature (for 9200 & 9200 II)	3,380	5	79
F0869-98	Multiplexer Channel (for 9200)	2,175	5	53
F1104-99	Selector Channel (for 9200 II)	3,330	10	68
F0963-00	300-lpm Print Speed (for 9200 & 9200 II)	2,175	—	53
F0866-00	120 Print Positions (for 9200 & 9200 II)	5,070	15	116
F0868-01	132 Print Positions (for 9200 & 9200 II)	7,730	21	68
F0865-00	Variable Speed Printing (for 9200 & 9200 II)	2,900	15	68
F0969-00	8 Lines/Inch Print Spacing (for 9200 & 9200 II)	220	—	5
F1130-00	Form Alignment (for 9200 & 9200 II)	410	—	10
F0869-01	Multiplexer Channel (for 9300)	3,380	5	79
F0864-00	132 Print Positions (for 9300 & 9300 II)	3,140	10	74
F0867-00	High-Speed Numeric Printer (for 9300 & 9300 II)	1,690	15	42
F0969-00	8 Lines/Inch Print Spacing (for 9300 & 9300 II)	220	—	5
MASS STORAGE				
F1023-01	Disc File Control (for up to eight 8410 drives)	8,910	37	205
8410-00	Dual Disc File, Master; 3.2 million bytes	13,475	157	310
8410-92	Dual Disc File, Slave; 3.2 million bytes	13,475	131	310
8410-02	Single Disc File, Slave; 1.6 million bytes	8,220	84	189
F1015-00	Buffer/Fastband Search (mandatory feature for 8410)	7,080	30	163
F1016-00	Disc Drive (expands 8410-02 to Dual Disc File, Slave)	5,255	47	121
F1102-00	Disc Cartridge (for 8410 drives)	380	NA	12
5024-00	Disc File Control (for up to eight 8411 drives)	20,010	80	460
8411-00	8411 Disc Drive; 7.25 million bytes	19,920	75	415
F1043-00	Dual Channel Feature (for 5024-00)	3,700	15	85
F1098-00	Record Overflow Feature (for 5024-00)	435	—	10
F1099-00	File Scan Feature (for 5024-00)	1,525	—	36
F1211-00	Disc Pack (for 8411 drives)	490	NA	15
5024-02	Disc Control (for up to eight 8414 drives)	26,400	90	550
8414-92	Two 8414 Disc Drives; 58 million bytes	33,000	130	820
8414-94	Four 8414 Disc Drives; 116 million bytes	66,000	260	1,540
8414-96	Six 8414 Disc Drives; 174 million bytes	99,000	390	2,160
8414-98	Eight 8414 Disc Drives; 232 million bytes	132,000	520	2,680
8414-85	Single 8414 Disc Drive (for configuration expansion); 29 million bytes	16,500	65	410

* Rental prices do not include equipment maintenance.

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Equipment Prices

		<u>Purchase Price</u>	<u>Monthly Maint.</u>	<u>Rental (1-year lease)*</u>
INPUT/OUTPUT UNITS				
F1043-00	Dual Channel Feature (for 5024-02)	3,700	15	85
F1214-00	Disc Pack (for 8414 drives)	650	NA	20
0858-99	Uniservo VI C Subsystem; includes 9-track Control, Master and 1 Slave Tape Unit	32,190	215	735
0858-98	Uniservo VI C Subsystem; includes 7-track Control, Master and 1 Slave Tape Unit	32,190	215	735
F0828-00	7-Track Feature (for 0858-99)	2,130	5	53
F0827-00	Data Conversion (for 0858-98)	2,130	5	53
F1021-99	7-to-9-Track Conversion (for 0858-98)	200**	—	—
0858-14	Uniservo VI C Slave Tape Unit; 9-track	10,470	70	240
0858-10	Uniservo VI C Master Tape Unit; 9-track	17,350	115	400
0858-01	Uniservo VI C Slave Tape Unit; 7-track	10,470	70	240
0858-00	Uniservo VI C Master Tape Unit; 7-track	17,350	115	400
F1021-00	7-to-9-Track Conversion (for 0858-00 or 0858-01)	100**	—	—
5017-99	Uniservo 12 Magnetic Tape Control (for up to 16 9-track, 1600-bpi, nonsimultaneous Uniservo 12 Tape Units)	22,185	90	510
F0823-99	7-Track Feature (for 5017-99)	4,785	15	110
F0826-00	9-Track NRZl Feature (for 5017-99)	4,785	15	110
0861-00	Uniservo 12 Master Tape Unit; 9-Track	20,015	100	460
0861-01	Uniservo 12 Slave Tape Unit; 9-track	11,745	70	270
0861-04	Uniservo 12 Master Tape Unit; 7-track	18,055	100	415
0861-05	Uniservo 12 Slave Tape Unit; 7-track	10,440	70	240
F0935-00	Dual Density Feature (for 0861-00)	2,175	10	50
0711-00	Card Reader; 400 cpm	4,970	37	116
0711-02	Card Reader; 600 cpm	6,630	68	152
F0872-00	Short Card Feature; 51 Columns (for 0711-00 or 0711-02)	1,425	10	37
F0872-01	Short Card Feature; 66 Columns (for 0711-00 or 0711-02)	1,425	10	37
F1054-01	90-Column Read Feature (for 0711-00 or 0711-02)	430	—	21
F1097-00	Multi-Strobe Read Feature (for 0711-00 or 0711-02)	1,145	5	26
0716-97	Card Reader and Control; 1000 cpm	13,680	90	285
F1487-00	Short Card Feature; 51 columns (for 0716-97)	1,425	10	37
F1487-01	Short Card Feature; 66 columns (for 0716-97)	1,425	10	37
F1488-00	Validity Check Feature (for 0716-97)	720	—	15
F1498-00	Alternate Stacker Fill Feature (for 0716-97)	480	—	10
F1530-00	Dual Translate; either EBCDIC or ASCII (for 0716-97)	960	5	20
0603-04	Card Punch; 75-200 cpm	6,630	72	152
F0870-00	Read/Punch Feature (for 0603-04)	2,840	15	68
F0871-00	Selective Stacker Feature (for 0603-04)	410	—	10
0604-00	Card Punch; 200 cpm	9,920	90	230
0604-99	Card Punch; 250 cpm	15,660	90	360
F0875-00	Read/Punch Feature (for 0604-00 or 0604-99)	4,970	47	116
F0945-00	250-cpm Rate (for 0604-00)	5,740	—	130
0920-02	Paper Tape Control (for F1033-02 & F1032-02)	7,540	26	173
F1033-02	Paper Tape Reader; 300 char/sec	1,600	15	37
F1034-00	Reader Spooler (for F1033-02)	1,600	5	37
F1032-02	Paper Tape Punch; 110 char/sec	5,480	21	126
F1035-00	Punch Takeup Spooler (for F1032-02)	655	5	15
0768-00	Printer and Control; 900/1100 lpm	40,675	315	935
0768-99	Printer and Control; 1200/1600 lpm	50,465	390	1,160
F1071-00	1600/1200-lpm Rate (converts 0768-00 to 0768-99)	9,790	75	225
0768-02	Printer and Control; 840/1000/2000 lpm	46,545	355	1,070
F1522-00	Print Code Expansion Feature (for 0768-02)	240	—	5
8541-95	Console/Inquiry Station	6,960	30	145
2703-00	Optical Document Reader; 300 dpm	42,000	175	875
F1108-00	600-dpm Speed Upgrade (for 2703-00)	10,560	30	220
F1163-00	Modulus 10 Check Digit (for 2703-00)	960	5	20
F1106-00	Mark Read—EBCDIC (for 2703-00)	7,920	35	165
F1106-01	Mark Read—ASCII (for 2703-00)	7,920	35	165
F1149-00	Punch Card Read Feature (for 2703-00)	2,640	10	55
F1154-00	Validity Check Feature (for 2703-00)	480	—	10
F0943-99	Channel Adapter; permits connection of a UNIVAC 1004 or 1005 Processor	3,885	15	89
F0822-98	1001 Control; permits connection of a UNIVAC 1001 Card Controller	4,355	10	101
DATA COMMUNICATION SUBSYSTEMS				
F1000-00	Line Terminal Control 1 (for DCS-1)	4,750	15	105
8575-00	Line Terminal Control 4 (for DCS-4)	10,500	42	242
F1357-00	Line Terminal Control 1C (for DCS-1C)	6,000	25	125
8577-00	Line Terminal Control 1C, Free-Standing	8,640	30	180

Note: Numerous line terminals, communications interfaces, and optional features enable the above controls to accommodate a wide range of communications facilities and equipment.

* Rental prices do not include equipment maintenance.
** One-time charge; applies to rented or purchased equipment.