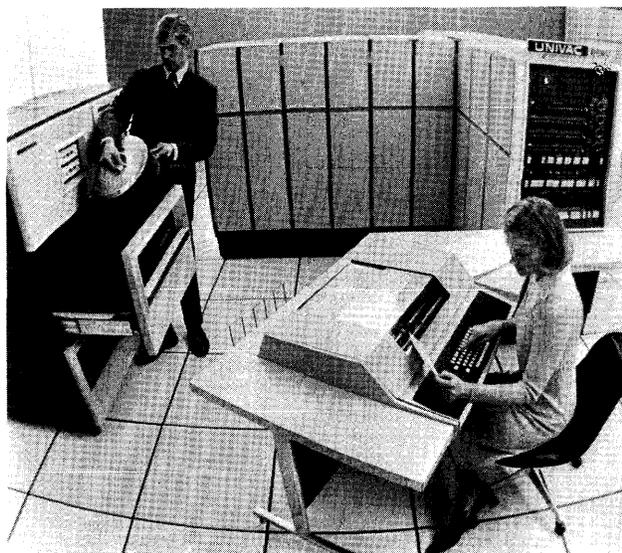


UNIVAC 9400 and 9480



MANAGEMENT SUMMARY

UNIVAC effectively replaced the UNIVAC 9400 on March 15, 1973, by announcing the immediately available, substantially less expensive Model 9480 as a direct replacement. The newer machine differs from the older 9400 only in that its main store utilizes MOS semiconductors rather than UNIVAC's familiar plated wire. The new processor, the peripheral subsystems available for it, and the software are all unchanged from the 9400 except for minimum memory capacity and a few restrictions affecting outdated peripherals. Many of those restrictions will not apply in converting a 9400 to a 9480.

The 9480 is considerably less expensive than the 9400; savings on the CPU and storage in purchased systems will range from 20% on a 65K CPU to 48% on a 262K CPU. Rental savings are in direct proportion.

In additional announcements in March 1973, UNIVAC made its 8424 (dual-density IBM 2314-type) Disc Storage available to both 9400 and 9480 users, and announced reductions in plated-wire memory prices for certain-size memory expansions on 9400 systems.

The medium-scale UNIVAC 9400 was introduced in January 1968 as the third member of UNIVAC's 9000 Series product line. It offers considerably higher performance than the small-scale 9200 and 9300 systems which were announced 19 months earlier. Nearly three years later, in November 1971, UNIVAC finally announced the long-anticipated top-end model in the 9000 series, the 9700. The 9700 is approximately three times as powerful as the 9400 or 9480. Customer deliveries of the 9400 began in May 1969, and over 500 systems have been installed to date.

Similar to the IBM System/360 in overall design, the medium-scale UNIVAC 9400 and the 9480, its replacement, offer processing power nearly equivalent to that of the IBM 370/135 at a substantially lower cost. The degree of compatibility with both the IBM systems and the smaller UNIVAC 9200/9300 computers, however, is somewhat limited.

CHARACTERISTICS

MANUFACTURER: UNIVAC Division, Sperry Rand Corporation, P.O. Box 500, Blue Bell, Pa. 19422. Telephone: (215) 646-9000.

MODELS: UNIVAC 9400 and UNIVAC 9480. (The 9400 can no longer be ordered.)

DATA FORMATS

BASIC UNIT: 8-bit byte. Each byte can represent 1 alphanumeric character, 2 decimal digits, or 8 binary bits. Two consecutive bytes form a 16-bit "halfword," while four consecutive bytes form a 32-bit "word."

FIXED-POINT OPERANDS: Can range from 1 to 16 bytes (1 to 31 digits plus sign) in decimal mode; 1 halfword (16 bits) or 1 word (32 bits) in binary mode.

FLOATING-POINT OPERANDS: No hardware facilities; FORTRAN compiler uses 5 or 10 bytes per operand: 8 bits for binary exponent and 7 or 17 decimal digits plus sign for fraction.

INSTRUCTIONS: 2, 4, or 6 bytes in length, specifying 0, 1, or 2 main storage addresses, respectively.

INTERNAL CODE: EBCDIC or ASCII, depending upon setting of a mode bit.

MAIN STORAGE

STORAGE TYPE: Plated wire (a thin-film technique) in the 9400; MOS (metal-oxide semiconductor) in the 9480.

CAPACITY: 9400—from 24,576 to 262,144 bytes, in eight sizes: 24K, 32K, 49K, 65K, 98K, 131K, or 262K bytes; 9480—from 65,536 to 262,144 bytes in five sizes: 65K, 98K, 131K, 196K, or 262K bytes.

CYCLE TIME: 0.6 microsecond per 2-byte access in both the 9400 and 9480.

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

STORAGE PROTECTION: Optional Limits Register holds address limits of the program in operation. An interrupt is generated whenever a write operation is attempted in a storage location outside these limits. In up to 131K byte machines, storage is protected in 512-byte contiguous blocks; in larger machines, the protected contiguous block size is 1,024 bytes.

RESERVED STORAGE: The first 512 bytes of main storage are reserved to hold specific operating information.

CENTRAL PROCESSORS

INDEX REGISTERS: The programmer has access to sixteen 32-bit general registers, which are used for indexing.

UNIVAC 9400 and 9480

▷ Like the 9200/9300 systems, the 9400 makes use of monolithic integrated circuits and UNIVAC's plated-wire main memory. Also, like the 9200 and 9300, the 9400 has an overall design that is similar to that of the IBM System/360—except for a smaller instruction set that omits about one-fourth of the standard System/360 instructions and all of the floating-point instructions.

As a result of these technological innovations and the smaller instruction repertoire, UNIVAC can offer substantially more processing power per dollar than the System/360 line. Specifically, the 9400 provides higher internal processing speeds than the System/360 Model 40 while costing less than comparable configurations of the System/360 Model 30.

When compared with the newer IBM System/370 line, the UNIVAC 9400 still manages to hold its own. Specifically, the 9400 delivers processing power nearly equivalent to that of the System/370 Model 135, and at a substantially lower cost—particularly if the user purchases the equipment or takes advantage of a UNIVAC extended-term lease. What's more, the 9400 user gains additional savings as a result of UNIVAC's still-bundled support policy.

The 9480 is identical to its predecessor in all respects except for the type of storage used and the main memory sizes available. Its memory speed (600 nanoseconds per two bytes), instruction execution time (6 microseconds for a binary add), and instruction repertoire are the same. On the 9480, unlike the 9400, the basic CPU includes storage (65K) and one selector channel (333 KB/sec). Storage on a 9480 can be expanded to 98K, 131K, 196K, or 262K. A second selector channel is optional. Optional storage protection, as on the 9400, is write-only and protects 512-byte blocks of contiguous storage on 65-131K machines and 1,024-byte blocks on 196K or 262K machines. Also like the 9400, the 9480 has no floating-point arithmetic facilities.

The net effect of the 9480 announcement is to improve the price/performance of a 9400-type system by lowering prices while maintaining performance at the same level. It can be surmised that UNIVAC hopes to retain its installed 9400-type user base in the face of competition from the now virtual-memory IBM 370/135, as well as from systems such as the Burroughs B 1700 Series and Honeywell Series 2000 offerings. The 9400 series is more easily convertible to the IBM System/360 or 370 than to the Burroughs or Honeywell systems. Conversely, because of the larger IBM instruction repertoire, it can be relatively difficult to convert from a 360 or 370 to a 9400 or 9480, although the difficulty is eased to some extent by availability of a software simulator on the 9400 or 9480 for some System/360 hardware instructions. The 9400 was very competitive with IBM 360/30 and 360/40 systems, and ▷

▷ in addressing, and as accumulators. (A second full set of 16 registers is used by the operating system.)

INDIRECT ADDRESSING: None.

INSTRUCTION REPERTOIRE: 70 instructions, including facilities for decimal arithmetic, binary addition and subtraction (but not binary multiplication or division), comparison, code translation, logical operations, packing, unpacking, editing, shifting, testing, branching, I/O, and supervisory control. Seven I/O and control instructions are "privileged" and usable only by the operating system. Nearly all of the other instructions are the same as instructions in the much larger repertoire of IBM System/360 Models 25 and above.

INSTRUCTION TIMES: For 1-address binary addition of 32-bit fields: 6.0 microseconds.

For 2-address decimal addition of signed 5-digit (3-byte) fields: 22.2 microseconds

Most instructions that use fixed-length operands are executed in 6 microseconds or less; those that use variable-length operands require substantially more time, as indicated in the above comparison of add times.

INPUT/OUTPUT CONTROL

I/O CHANNELS: One multiplexer channel, which can accommodate a number of simultaneous low-speed I/O operations, is standard. Up to two selector channels, each of which can handle one high-speed operation at a time, can exist on the system. On the 9480 the first selector channel is standard; on the 9400, both are optional.

CONFIGURATION RULES: High-speed peripheral devices, such as Uniservo 12 and 16 Magnetic Tape Units or disc drives, must be connected to a selector channel. Up to eight control units can be connected to each selector channel.

MASS STORAGE

8411 DISC DRIVE: Provides interchangeable disc-pack storage of moderate capacity. 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, and up to eight controls can in turn be connected to each UNIVAC 9400 selector channel. 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 selector channels on the same or different computers to access an 8411 subsystem. File Scan and Record Overflow, however, are not software-supported.

The 8411 is unavailable on newly-ordered 9480 systems, but upon upgrade from a 9200, 9300, or 9400 system, 8411 drives can be retained and even increased in number.

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 ▷

JUNE 1973

UNIVAC 9400 and 9480

▷ the 9480 is even more so—although this statement might not apply to used 360/30's and 40's that are obtained at third-party rates, equipped with memory expansion, and, perhaps, even fitted with CPU accelerators.

In comparison with the IBM System/370, the 9480 offers twice the real main memory capacity of the 370/125 and slightly more than the 370/135. Its CPU performance is likewise competitive, and its I/O channels are higher-powered than those of the 370/125. However, the 9480, while about one-third less expensive than a 125, has no virtual storage capability and no disc pack drive equal in capacity to that of the IBM 3330 or 3340. In terms of total on-line disc storage permitted on the system, and of the number of bytes of disc storage per dollar, however, the 9480 is superior to the 370/125.

The restrictions on peripherals that can be used on 9400's but not 9480's are minor: (1) 7-track Uniservo VI C equipment and related features are not available on new 9480 orders, but this equipment can be retained (though not increased in number) when converting from a 9200, 9300, or 9400 system; (2) the 9-track Uniservo VI C Type 0858-99 is only available to new 9480 systems in a maximum 2-drive configuration; (3) the 8411 Disc Subsystem is unavailable on new 9480 orders, but can be carried over and even increased in number (subject to availability); and (4) rental or leased Series "D" systems cannot be used as 9480 I/O subsystems. None of the foregoing restrictions apply to peripherals for on-order 9400 systems that are converted to 9480's; the ordered peripherals will be shipped with the 9480, if required. These were announcement-time restrictions that are subject to change, according to UNIVAC.

The 9400 or 9480 is best suited for business data processing, and its instruction set has clearly been chosen to maximize its performance in typical commercial applications. Complete arithmetic facilities for variable-length decimal operands are provided, whereas the binary multiply and divide instructions have been left out. The nonavailability of floating-point arithmetic hardware makes the 9400 or 9480 a doubtful choice for most scientific applications, even though a FORTRAN compiler with unusually powerful language facilities is offered.

The maximum storage capacity of 262,144 bytes on a 9400 or 9480 system (originally 131,072 bytes on the 9400, but increased in April 1971) greatly enhances these systems' potential for multiprogrammed operation and helps to keep them competitive with the IBM 370/125 and 135. Interestingly, both the UNIVAC and IBM machines (the latter running under DOS/VS) can run five multiprogrammed partitions with a disc operating system. The 9400 and 9480 also compete well with the UNIVAC Series 70 Models 2 and 3. It must be ▷

▶ 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. Up to eight Disc Controls, in turn, can be connected to each UNIVAC 9400 selector channel. The File Scan and Record Overflow features are standard, and the Dual Channel capability is optional. The 8414 is the UNIVAC counterpart to the IBM 2314. Its standard File Scan and Record Overflow features are not supported by software.

8424 DISC DRIVE: Provides twice the storage per disc pack of the 8414. This double-density version of the 8414 has two drives per unit, each drive holding a 58-million byte disc pack. A disc pack has 406 (instead of 203) tracks on each of the 20 surfaces used for data recording. The access mechanism is faster than the 8414's (30 versus 60 milliseconds average), but the latency timing and data transfer rates are the same. A 5024-99 Controller is used on a 9400 or 9480 system to control up to four dual drives, for an on-line capacity of 466 million bytes.

Options for the 8424 include Dual Access (which is used on each drive when two controllers are employed and read/write simultaneity is required) and Dual Channel (two channel connections for the same controller; access controlled by an operator's switch). The 8424's standard file scan and record overflow features are not software-supported.

INPUT/OUTPUT UNITS

UNISERVO VI C MAGNETIC TAPE UNIT: A low-cost 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, 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 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 2 to 8 tape drives. The subsystem must be connected to a shared multiplexer subchannel of the 9400 or 9480 Processor.

The 7-track Uniservo VI C is not available to newly-ordered 9480 systems, but this equipment can be carried over (but not increased in quantity) when converting to a 9480 from a 9200 or 9300 system. Further, 9-track Uniservo VI C's (0858-99) are only available to new 9480 systems in 2-drive configurations.

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.

From 1 to 16 Uniservo 12 and/or Uniservo 16 Tape Units can be connected to a tape control, and up to 8 controls can in turn be connected to each selector channel. Optional features enable the tape control to be connected to two selector channels, permitting simultaneous read/read, read/write, or write/write tape operations. ▶

UNIVAC 9400 and 9480

▷ remembered, however, that UNIVAC doesn't sell the Series 70 to new customers, but uses the line exclusively to serve former RCA Spectra users. The Spectra and Series 70 computers, being virtual copies of the System/360, can be converted to the 9400 or 9480 only with the same degree of difficulty as could a System/360. Even at that, the conversion would be a parallel one rather than an upgrade. These users will probably look instead toward the UNIVAC 9700 as an upgrade into the 9000 series. The 9700 also has an instruction repertoire more akin to that of the former RCA machines; it is also a superset of the 9400/9480 instruction set.

Like most current UNIVAC computers, the 9400 and 9480 display a strong emphasis on data communications. The 9400/9480 processor can control up to 64 duplex lines, and the hardware communications facilities are well supported by the standard UNIVAC software.

The 9400 and 9480 offer an adequate complement of peripheral devices, though not an outstandingly broad one by present-day standards. Three IBM-compatible tape units provide data rates ranging from 34,160 to 192,000 bytes per second. An upper and lower case line printer, announced in April 1971, complements the previously available 900/1100-lpm and 1200/1600-lpm printers. Also, a 1000-cpm card reader was announced in April 1971, and an improved version of the earlier 600-cpm card reader model was announced in August 1972. The two present card reader models now offer the same features and differ only in speed.

The scope of practical applications for the 9400 was substantially broadened by the September 1969 announcement of the 2703 Optical Document Reader and the 8414 Disc Drive. The 2703 reads printed numeric data and/or vertical pencil marks from turn-around documents. The 8414 is an IBM 2314-compatible unit that provides large-capacity on-line storage of the disc pack type, complementing the 2311-compatible 8411 Disc Drive that was introduced along with the 9400. In August 1971, UNIVAC announced major reductions in the prices of the 8414 Disc Drives to counter IBM's price cuts on its 2314/2319 equipment.

With the announcement of the 9480, UNIVAC made its 8424 Disc Subsystem available for both the 9400 and 9480. The 8424 is a "double-density" version of the 8414. The 8424 unit provides two independent disc drives, each with a capacity of 58 million bytes. Average head movement time is 30 milliseconds, average rotational delay is 12.5 milliseconds, and data transfer rate is 312,000 bytes per second. On a 9480 or 9400, the subsystem's 5024-99 controller can handle up to four dual-drive 8424-00 disc units for a total on-line capacity of 466 million bytes.

Software support for the 9400 or 9480 is just about what a prospective buyer might reasonably expect it to ▷

▶ **UNISERVO 16 MAGNETIC TAPE UNIT:** A high-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 120 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 192,000 bytes per second; the optional Dual Density feature permits operation at 800 bpi (in NRZI mode) at a data rate of 96,000 bytes per second.

The 7-track version operates at 200, 556, or 800 bpi, with corresponding data rates of 24,000, 66,720, or 96,000 characters per second.

From 1 to 16 Uniservo 12 and/or Uniservo 16 Tape Units can be connected to a tape control, and up to 8 tape controls can in turn be connected to each selector channel. Optional features enable the tape control to be connected to two selector channels, permitting simultaneous read/read, read/write, or write/write tape operations.

600-CPM CARD READER: Reads 80-column cards serially by column at 600 cpm. Can be equipped to read 51- or 66-column short cards or UNIVAC 90-column cards. Reads in either EBCDIC or card-image mode; ASCII translate is optional. Has a 2400-card feed hopper and two 2000-card stackers. Connected via a shared multiplexer subchannel. Multi-read error checking is a standard feature.

1000-CPM CARD READER: Identical to the 600-cpm unit above except for its greater speed.

250-CPM CARD PUNCH: Punches 80-column cards in row-by-row fashion at 250 cpm, in either EBCDIC or card-image mode. Has a 1000-card feed hopper and two 1000-card stackers. Can be equipped with a pre-punch read station, giving the unit read/punch capabilities. Connected via the multiplexer channel.

PAPER TAPE SUBSYSTEM: Consists of 300-char/sec reader, 100-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. Connected via the multiplexer channel.

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. Uses a conventional rotating-drum print mechanism. Has 132 print positions. Skipping speed is 33 inches per second at the normal vertical spacing of 6 lines per inch. Connected via a shared multiplexer subchannel.

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. Uses a conventional rotating-drum print mechanism. Has 132 print positions. Skipping speed is 33 inches per second at the normal vertical spacing of 6 lines per inch. Connected via a shared multiplexer subchannel.

0768-02 PRINTER: Features 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. Connected via a shared multiplexer subchannel.

2703 OPTICAL DOCUMENT READER: Reads printed numeric data from individual documents ranging from ▶

UNIVAC 9400 and 9480

➤ be. Like most of its competitors, the system offers a choice of four programming languages: Assembler, COBOL, FORTRAN, and RPG. A comprehensive operating system is available in versions for both disc and tape-oriented systems. Multiprogramming of up to five independent programs is possible in disc-oriented systems, while tape-oriented systems are limited to running up to five data transcription routines concurrently with a single main program.

A definite plus on the software ledger is the availability on both the 9400 and 9480 of IMS 4, a simple inquiry/response system with basic data base capabilities (somewhat like those of IBM's DOS-Standard CICS). It boasts extreme ease of use; a user can receive operating instructions from the system after entering the command OPEN LEARN. User-supplied passwords protect each user's files. The data base facility eliminates redundancies and yields program data independence, while the communications facilities enable the user to obtain transaction processing (file inquiry/update, etc.) from a variety of remote terminals.

In summary, it is difficult to find any one aspect of the 9400 or 9480 that warrants strong praise or criticism. For business data processing users who are considering the installation of a medium-scale System/370, the 9480's lower prices make it an attractive alternative. Each prospective user must decide for himself whether or not the 9480's price advantage and bundled support are outweighed by other factors such as its smaller instruction repertoire, its less extensive array of peripheral equipment, its smaller complement of supporting software, and its limited compatibility.

USER REACTIONS

Datapro 70 contacted several UNIVAC 9400 users and found them to be quite satisfied with their systems. User experience ranged from one and a half to four years with the 9400.

The smallest system encountered was a 32K 9400 with four tape drives and no discs. It, however, can utilize the user's 4K UNIVAC 1005 as an on-line I/O subsystem and is being used for up to two concurrent jobs.

A typical larger system is exemplified by a 131K 9400 (originally 98K) that has three 8414 disc drives and two Uniservo VI C 9-track tape drives. It presently runs on-line teleprocessing in a foreground partition under the Disc Operating System along with three background jobs. With the original 98K, two background jobs could be run concurrently with the foreground program.

All of the users expressed satisfaction with UNIVAC software support and service, but several believed that the software should have been stabilized during the time span that has elapsed since initial 9400 installations. □

➤ 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 USASCOCR Size A font. Has a 2000-document feed hopper and three 1000-document stackers. Connected via the multiplexer channel.

CHANNEL ADAPTERS: Permit any of the following small-scale UNIVAC data processing systems to be connected to the multiplexer channel: 1004, 1005, 9200, 9200 II, 9300, or 9300 II. The smaller processor can function in either an on-line or off-line mode. When on-line, it performs card reading, punching, and/or printing functions under control of the 9400 or 9480 Processor.

COMMUNICATION CONTROLS

DATA COMMUNICATIONS SUBSYSTEMS: Remote communications devices are connected to a UNIVAC 9400 or 9480 system by means of a Communications Adapter and from one to four Data Communications Subsystems. The DCS-1, DCS-4, and DCS-16 subsystems can accommodate 1, 4, and 16 half-duplex or full-duplex lines, respectively. Each DCS is connected to one of the eight shared multiplexer sub-channels. The Communications Adapter, at the interface between the DCS and the Processor, provides special-character recognition, parity recognition and generation, data chaining, and interrupt classification capabilities.

Each DCS consists of a single Line Terminal Controller, plus a 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 range of communications services at speeds of 75 to 250,000 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, using either EBCDIC or USASCII code and either Transparent or Nontransparent mode. It is not supported at present by UNIVAC software.

SOFTWARE

OPERATING SYSTEM: Software support for the UNIVAC 9400 and 9480 is structured around an operating system that is available in both tape and disc-oriented versions. The tape-oriented version requires at least four magnetic tape units, while the disc-oriented version requires at least two disc drives. Both versions also require a card reader and printer (or a smaller UNIVAC computer connected as an I/O subsystem).

The system control facilities of the operating system are divided into four main categories: Supervisor, Job Control, Data Management, and Message Control.

The Supervisor resides in main storage and schedules and coordinates all activities within the system. Its functions include interrupt handling, I/O scheduling and initiation, job time allocation, operator communication, job accounting, and control of multiprogrammed operations. In disc-oriented systems, up to five independent programs can be executed concurrently if sufficient memory and peripherals are available. In tape-oriented systems, multiprogramming is limited to the concurrent execution of a single main program and up to five "symbiont" (data transcription) routines. (No multiprogramming is possible in 24K tape systems.) The Supervisor provides five different priority levels, three of which are available for users' programs.

The Job Control routine controls transitions between job steps, suspension or cancellation of jobs, restarting of jobs, and termination of jobs. It receives its instructions from ➤

UNIVAC 9400 and 9480

► control cards which constitute a "job stream." In disc systems, job streams can be stored in disc files for subsequent selection and execution. In tape systems, the job streams are processed as they are read in via the card reader.

Data Management provides comprehensive input/output control facilities, including record blocking and unblocking, I/O buffering, data validation, and label processing. These facilities are provided by subprograms which are generated as part of the operating system and referenced by macro-instructions in users' programs. Nonsequential files in disc storage can be accessed by either the Direct (random Access Method, in which the user must specify the address of the desired disc record, or the Indexed Sequential Access Method, in which the user need only specify the key of the desired record. In a multiprogramming environment, the Data Management routines can be shared by all programs, thereby reducing main storage requirements.

The Message Control Program provides macro-instructions that enable the user to generate custom-tailored message control and message processing routines to handle communications input/output. Messages of fixed or variable length can be queued in main and/or disc storage, and the generated routines can perform functions such as code translation, message sequencing, time stamping, and error checking. Use of the full Message Control Program services requires a system with 65K bytes of main storage, though more limited communications I/O facilities are available for 49K systems.

COBOL: UNIVAC offers two COBOL compilers for the 9400 and 9480. Basic COBOL requires a system with 32K bytes of main storage and includes the minimum ANS COBOL language facilities. Extended COBOL requires a 65K-byte system and two disc drives; it includes the following facilities of ANS COBOL: Level 2 of the Nucleus, Sequential Access, Random Access, and Sort Modules and Level 3 of Table Handling. Extensions include Indexed Sequential Access and C-mode, which accepts programs coded in the older IBM DOS Level D COBOL.

FORTRAN: A FORTRAN compiler is available for operation on disc or tape systems with at least 32K bytes of main storage. It includes all the language facilities of full American National Standard FORTRAN. In addition, there are more than 20 useful language extensions, such as direct-access I/O statements and the ability to handle arrays of up to 7 dimensions.

ASSEMBLER: The 9400/9480 Assembler permits programs to be coded in a symbolic assembly language that is very similar to, though not totally compatible with, the Assembler languages for the UNIVAC 9200/9300 systems and the IBM System/360. Disc and tape versions are available for operation on systems with the minimum 24K bytes of main storage. The Assembler produces relocatable object modules which can be written on either disc or tape. These object modules can be linked to other modules prior to being loaded and executed. A macro-instruction facility simplifies the inclusion of precoded subprograms.

REPORT PROGRAM GENERATOR: The 9400/9480 RPG is designed to accept UNIVAC 9200/9300 RPG source programs for generation and execution on a 9400 or 9480. It is available for both tape and disc systems with the minimum 24K bytes of main storage. The generated RPG object programs can be recorded on tape, disc, or punched cards to eliminate the need for re-generation of the program before subsequent report runs. The object programs are relocatable modules that can be linked to other programs and stored in disc or tape libraries.

UTILITY ROUTINES: A Sort/Merge program capable of using disc and/or tape drives is available. It can sort fixed or variable-length records into either ascending or descending sequence, and includes provisions for the user's own coding. The program's operation can be controlled by parameters entered either when the sort is generated or at run time.

A Linkage Editor combines object modules produced by the language translators into "load modules" which are suitable for loading and execution under operating system control.

Library Service routines facilitate the creation and maintenance of various types of libraries on tape and disc.

Other available utility programs include data transcription routines, file maintenance routines, a dynamic (snapshot) dump, and a terminal (postmortem) dump.

To facilitate conversions from other computers to the 9400 or 9480, UNIVAC offers simulators for the UNIVAC 1050 and Solid-State computers and translators for IBM 1400 Series Autocoder and SPS and for IBM System/360 BAL.

APPLICATION PROGRAMS: Programs announced to date include IMPACT (inventory management), IMS-4 (information retrieval, display, and update), Message Switching, LINCO (typesetting), WIMS (Wholesale Inventory Management System), and UNIS (UNIVAC Industrial System), which includes a bill of material explosion, planning and scheduling, and inventory control.

IMS 4 is UNIVAC's data base system for the 9480. It also has a communications capability to allow inquiries from terminals. It can process terminal transactions. The data base files must be stored on 8414 or 8424 disc drives. IMS 4 is easy to learn, and it can teach a user by providing operating instructions from the time he enters the command OPEN LEARN. The user chooses a password scheme to protect his files from unauthorized access.

PRICING

EQUIPMENT: All necessary control units and adapters are included in the indicated prices for the following typical configurations, and the quoted rental prices include equipment maintenance. The following prices are based upon use of the 9480 Processor.

SMALL TAPE SYSTEM: Consists of 64K 9480 Processor (with standard console keyboard-printer, multiplexer channel, and selector channel), 600-cpm Card Reader, 250-cpm Card Punch, 900/1100-lpm Printer, and four Uniservo 12 (68KB) Tape Units with control. Monthly rental and purchase prices are \$8,173 and \$268,737, respectively.

TYPICAL DISC SYSTEM: Consists of 96K 9480 Processor, 600-cpm Card Reader, 250-cpm Card Punch, 900/1100-lpm Printer, and four 8424 Disc Drives with control. Monthly rental and purchase prices are approximately \$9,837 and \$326,127, respectively.

TAPE/DISC SYSTEM: Consists of 131K Processor with Storage Protection and Second Selector Channel, 600-cpm Card Reader, 250-cpm Card Punch, 900/1100-lpm Printer, two 8424 Disc Drives with control, and six Uniservo 12 (68KB) Tape Units with control. Approximate monthly rental and purchase prices are \$13,572 and \$451,939, respectively. (The prices for this "Tape/Disc System" are about the same as the cost of a 131K 9400 system that uses 8414 disc drives in the same quantity, yielding half the disc file capacity of this 9480 system.)

SOFTWARE AND SUPPORT: UNIVAC has not "unbundled" 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. ►

UNIVAC 9400 and 9480

► **LONG-TERM LEASES:** In addition to the basic 1-year agreement, UNIVAC offers extended-term leases for 9480 systems at significantly lower monthly rates. Under a 5-year "level-payment" agreement, the monthly equipment charge is 75% of the 1-year rental rate shown in the accompanying

price list. 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. ■

Equipment Prices

		Purchase Price	Monthly Maint.	Rental (1-year lease)*
9400 PROCESSOR AND MAIN STORAGE				
3019-00	9400 Processor (includes Operator's Console, Keyboard/Printer, Interval Timer, and Multiplexer Channel)	33,280	144	803
F1092-00	Selector Channel 1	7,830	32	189
F1092-01	Selector Channel 2	7,830	32	189
F1091-00	Storage Protection Feature	4,350	21	105
7010-94	Storage; 24,576 bytes	55,465	240	1,338
7010-95	Storage; 32,768 bytes	79,390	347	1,915
7010-96	Storage; 49,152 bytes	107,230	464	2,587
7010-97	Storage; 65,536 bytes	123,760	538	2,986
7010-98	Storage; 98,304 bytes	157,035	682	3,789
7010-99	Storage; 131,072 bytes	182,920	794	4,413
7010-75	Storage; 196,608 bytes	238,896	974	5,688
7010-74	Storage; 262,144 bytes	278,586	1,114	6,633
7071-73	65,536-Byte Storage Expansion (131K to 196K)	55,976	180	1,275
7010-72	65,536-Byte Storage Expansion (196K to 262K)	39,690	140	945
9840 PROCESSOR AND MAIN STORAGE				
3019-98	9480 Processor (includes Operator's console, Keyboard/Printer, Internal Timer, Multiplexor Channel, Selector Channel, and 65,536 bytes of Main Storage)	131,600	670	3,290
F1092-01	Selector Channel 2	7,830	32	189
F1091-00	Storage Protection (write)	4,350	21	105
F1893-01	32,768-byte Storage Expansion	20,335	50	490
7028-99	65,536-byte Storage Expansion	36,520	100	880
F1983-99	65,536-byte Storage Expansion (used with two F1893-01's and one 7028-99 to reach 262,144 bytes)	36,520	100	880
MASS STORAGE				
5024-00	Disc File Control (for up to eight 8411 drives)	20,010	85	460
8411-00	8411 Disc Drive; 7.25 million bytes	19,920	80	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 Feature (for 8411 drives)	300	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
F1043-00	Dual Channel Feature (for 5024-02)	3,700	15	85
F1214-00	Disc Pack (for 8414 drives)	440	NA	20
F1371-99	Dual Access Feature (per 8414 drive)	2,160	5	45
5024-99	8424 Controller (for up to four 8424's)	48,345	310	1,165
8424-00	8424 Disc Storage (dual drive; 58 million bytes per drive)	29,880	170	720
F1771-01	Dual Access (per 8424-00 unit)	4,320	10	90
F1043-00	Dual Channel	3,700	15	85
F1214-01	Disc Pack (for 8424 drives)	375	—	20
INPUT/OUTPUT UNITS				
0858-99	Uniservo VI C Subsystem; includes 9-track Control, Master and 1 Slave Tape Unit	32,190	230	771
0858-98	Uniservo VI C Subsystem; includes 7-track Control, Master and 1 Slave Tape Unit	32,190	230	771
F0828-00	7-Track Feature (for 0858-99)	2,130	5	55
F0827-00	Data Conversion (for 0858-98)	2,130	5	55
F1021-99	7-to-9-Track Conversion (for 0858-98)	200*	—	—
0858-14	Uniservo VI C Slave Tape Unit; 9-track	10,470	74	252
0858-10	Uniservo VI C Master Tape Unit; 9-track	17,350	123	420
0858-01	Uniservo VI C Slave Tape Unit; 7-track	10,470	74	252
0858-00	Uniservo VI C Master Tape Unit; 7-track	17,350	123	420
F1021-00	7-to-9-Track Conversion (for 0858-00 or 0858-01)	100**	—	—
5017-99	Uniservo 12 Magnetic Tape Control (for up to sixteen 9-track, 1600-bpi, nonsimultaneous Uniservo 12 Tape Units)	22,165	90	510
5017-00	Uniservo 12/16 Magnetic Tape Control (for up to sixteen 9-track, 1600-bpi, nonsimultaneous Uniservo 12 and/or Uniservo 16 Tape Units)	22,825	100	550

UNIVAC 9400 and 9480

Equipment Prices

INPUT/OUTPUT UNITS (Continued)		Purchase Price	Monthly Maint.	Rental (1-year lease)*
F0825-00	Dual Channel Feature (for 5017-00 or 5017-99; permits non-simultaneous operation on either of two Selector Channels)	3,700	15	85
F1131-99	Uniservo 16 Capability (for 5017-99)	1,660	10	40
F1029-99	Simultaneous Operation (for 5017-99)	13,487	60	325
F1029-00	Simultaneous Operation (for 5017-00)	15,147	70	365
F0823-99	7-Track NRZI Capability (for 5017-00 or 5017-99)	4,785	15	110
F0826-00	9-Track NRZI Capability (for 5017-00 or 5017-99)	4,785	15	110
0861-00	Uniservo 12 Master Tape Unit; 9-Track, 1600 bpi (includes logic for up to 3 Slave Units)	14,650	107	353
0861-01	Uniservo 12 Slave Tape Unit; 9-track, 1600 bpi	11,745	74	283
0861-04	Uniservo 12 Master Tape Unit; 7-track, 200/556/800 bpi (includes logic for up to 3 Slave Units)	12,699	107	306
0861-05	Uniservo 12 Slave Tape Unit; 7-track, 200/556/800 bpi	10,440	74	252
F0934-99	Simultaneous Feature (for 0861-00)	3,265	16	78
F0934-98	Simultaneous Feature (for 0861-04)	3,265	16	78
F0935-00	Dual Density Feature (for 0861-00)	2,175	10	52
F1041-00	7-to-9-Track Conversion (converts 0861-04 to 0861-00)	1,951	—	47
F1042-00	7-to-9-Track Conversion (converts 0861-05 to 0861-01)	1,305	—	31
0862-02	Uniservo 16 Tape Unit; 9-track, 1600 bpi	18,675	110	450
0862-02	Uniservo 16 Tape Unit; 7-track, 200/556/800 bpi	18,675	110	450
F0936-99	Simultaneous Operation (for 0862-00 or 0862-02)	870	—	20
F0937-00	Dual Density Feature (for 0862-00)	2,175	—	50
F1040-00	7-to-9-Track Conversion (converts 0862-02 to 0862-00)	100**	—	—
0716-95	Card Reader and Control; 600 cpm	9,752	55	235
0716-99	Card Reader and Control; 1000 cpm	13,680	90	299
	Card Reader Optional Features:			
F1487-00	Short Card Feature; 51 columns	1,425	10	38
F1487-01	Short Card Feature; 66 columns	1,425	10	38
F1488-00	Validity Check Feature	720	—	15
F1498-00	Alternate Stacker Fill Feature	480	—	10
F1530-99	Dual Translate; adds ASCII	960	5	21
0604-99	Card Punch and Control; 250 cpm	15,660	96	378
F0875-00	Read/Punch Feature (for 0604-99)	4,970	50	121
0920-02	Paper Tape Control (for F1033-02 & F1032-02)	7,540	27	181
F1033-02	Paper Tape Reader; 300 char/sec	1,600	16	38
F1034-00	Reader Spooler (for F1033-02)	1,600	5	38
F1032-02	Paper Tape Punch; 110 char/sec	5,480	22	132
F1035-00	Punch Takeup Spooler (for F1032-02)	655	5	15
0768-00	Printer and Control; 900/1100 lpm	40,675	337	981
0768-99	Printer and Control; 1200/1600 lpm	50,465	417	1,217
F1071-00	1600/1200-lpm Rate (converts 0768-00 to 0768-99)	9,790	80	236
0768-02	Printer and Control; 840/1000/2000 lpm	46,545	379	1,123
F1522-00	Print Code Expansion Feature	240	—	5
2703-00	Optical Document Reader; 300 dpm	42,000	187	918
F1108-00	600-dpm Speed Upgrade (for 2703-00)	10,560	32	231
F1163-00	Modulus 10 Check Digit (for 2703-00)	960	5	21
F1106-00	Mark Read—EBCDIC (for 2703-00)	7,920	37	173
F1106-01	Mark Read—ASCII (for 2703-00)	7,920	37	173
F1149-00	Punch Card Read Feature (for 2703-00)	2,640	10	57
F1154-00	Validity Check Feature (for 2703-00)	480	—	10
F1001-00	Channel Adapter; permits connection of a UNIVAC 9200 or 9300 Processor	3,700	15	85
F0943-99	Channel Adapter; permits connection of a UNIVAC 1004 or 1005 Processor	3,855	16	93
DATA COMMUNICATION SUBSYSTEMS				
F1093-00	Communications Adapter (for Processor)	1,960	5	47
F1000-00	Line Terminal Control 1 (for DCS-1)	4,570	16	110
8575-00	Line Terminal Control 4 (for DCS-4)	10,500	44	254
F1094-00	Line Terminal Control 4A (for DCS-4); housed in 9400 Processor cabinet	10,000	42	241
8575-01	Line Terminal Control 16 (for DCS-16)	22,185	96	535
F1537-00	Line Terminal Control 1C (for binary synchronous; not supported by UNIVAC software)	6,000	26	131

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.