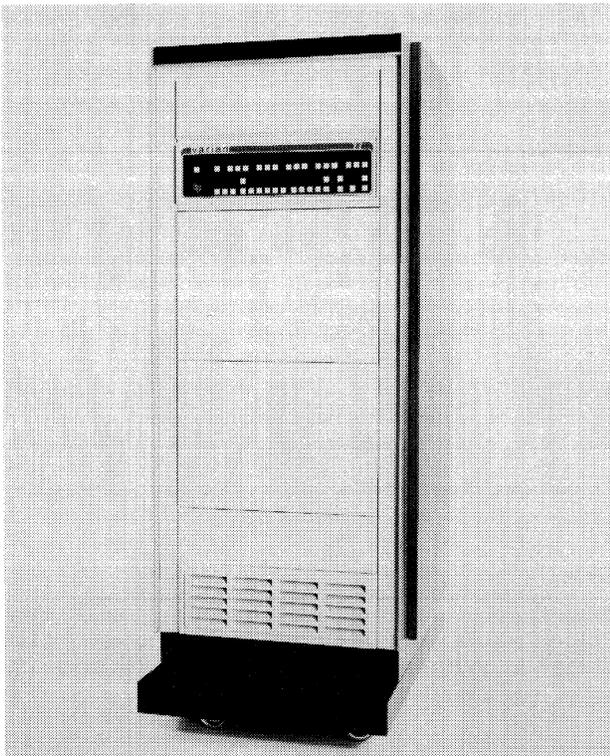


Sperry Univac V77 Family Communications Capabilities



The V77-600 processor, depicted above, can support up to 256K bytes of main memory and 256 communications lines.

MANAGEMENT SUMMARY

In June 1977, Varian Data Machines was merged into the Univac Division of Sperry-Rand and is now called the Sperry Univac Minicomputer Operation. Varian introduced the V70 Series in 1974 and in December 1976 released the V77 series with increased memory and other options. Soon after Sperry Univac's acquisition of Varian, software packages were announced making the V77 line compatible with Univac hardware, and thereby enrolled the V77 line in Univac's Distributed Communications Architecture (DCA). In December 1978, Univac's Minicomputer Operation announced the V77-800, a significantly improved model which extends the V77 line upwards. Since then, additional enhancements to both the V77 hardware and software offerings, including new disc drive, matrix printer, line printer, and magnetic tape unit models and new system and applications software modules, have been added. A new line adapter that supports multiple protocols (UDLC, SDLC, HDLC, and ADCCP) has also been introduced.

The V77 family can support slightly over one million words (or over two megabytes) of main memory, depending on the model and system configuration. The systems can perform as remote nodes and front-ends for each other in a V77 network, as independent processing systems, or as remote communications and distributed

A family of four minicomputer models with varying processor speeds that support communications lines with speeds up to 9600 bps, except for BSC communications, which are supported at up to 50,000 bps.

The higher end of the model line can perform not only as stand-alone processing systems, but also as front-ends to other V77 processors and as remotely or locally-connected distributed processing nodes in either Univac, IBM, or public packet-switching networks.

A total of up to 256 communications lines can be physically attached to one system. Dual-port memory facilitates network arrangements that can minimize data transfers between two or more local processors. Data files can be given high-priority direct memory access.

A V77-200 system with 32K words, a systems console, one disc drive, and support for 32 communications lines cost \$45,090. A V77-600 with the same configuration except for 128K words of memory costs \$68,990. The maintenance contract charge for the 200 system is \$363 per month and \$607 per month for the 600 system.

CHARACTERISTICS

VENDOR: Sperry Univac Minicomputer Operation (formerly Varian), 2722 Michelson Drive, Irvine, California 92664. Telephone (714) 833-2400.

DATE OF ANNOUNCEMENT: V77-200/400/600 — November 1976; V77-800 — December 1978.

DATE OF FIRST DELIVERY: V77-200/400/600 — November 1976; V77-800 — July 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Sperry Univac.

CONFIGURATION

The V77 family of minicomputers includes four basic models, each with a different processor, to provide four levels of price and performance.

The V77-800 features a microcode processor cycle time of 150 nanoseconds, and contains a 1K-word, 150-nanosecond cache memory; this is more than twice the speed of the V77-600's cache memory. The V77-800 is reported to have double the performance of the V77-600, which is the next fastest V77 model.

Sperry Univac V77 Family Communications Capabilities

TABLE 1. V77 FAMILY COMPARISONS

Model	Maximum Main Memory	Cache Memory	Writeable Control Store	Data Communications Multiplexer Supported	Operating System
V77-200	64K bytes	No	No	Type 1	Vortex 1 (1)
V77-400	512K bytes	No	1K words; 32-bit	Type 1	Vortex 2 (2)
V77-600	1024K bytes	1K words; optional	2K words; 64-bit	All	Vortex 2 (2) (3) or Summit (3)
V77-800	2048K bytes	1K words; integrated (48-bit)	12K bytes plus 2K bytes PROM	All	Vortex 2 (2) (3) or Summit (3)

(1) Includes Fortran IV compiler; requires 64K bytes main memory minimum.

(2) Includes Megamap and Fortran IV compiler; requires 96K bytes main memory minimum and disk storage; if TOTAL Data Base System included, 128K bytes main memory is required.

(3) With PRONTO Network Control Executive or Telecommunications and Commercial Software Package; requires 256K bytes main memory minimum.

➤ processors in either Univac, IBM, or packet-switching networks. A complete software library supports these applications, as well as time sharing, HASP/RJE, data base management, or pure communications processing.

The intermediate-speed and high-speed V77 models are attractive from a communications standpoint because they support shared memory. When a V77 is used as a front-end to another V77 host, shared memory between them gives the host immediate access to data stored by the front-end from communications lines. The extra step of moving data from the front-end to the host's memory is eliminated. Similarly, data released by the host for front-end processing is available to the front-end without first having to be transferred to the front-end memory. Shared memory arrangements also permit establishment of a network where a secondary host or a secondary front-end is able to access data awaiting prime processor action when the prime processor fails; this is a definite fallback advantage.

The ability to give special high-priority direct memory access to disc files, at transfer rates up to 604K (16 bit) words per second, should be of interest to networks that require especially heavy access to random files.

Binary Synchronous Communications protocol is supported at speeds up to 50,000 bps. Other control protocols are supported at speeds up to 9600 bps. Adapters supporting the UDLC and SDLC bit-oriented protocols are also available.

The utilization of different minicomputers for each of the four models of the V77 family is a departure from the V70 product line where essentially one minicomputer served almost all models.

The offering of predefined starting configurations simplifies system building within an architecture that is ➤

➤ The V77-600 features a 165-nanosecond, 64-bit word microcode processor which was essentially an improved version of the V76 model of the V70 minicomputer series. The 600 can execute a macroinstruction in two or three microcycles. Cache memory is available as an option with the 600.

The intermediate-speed V77-400 has a 220-nanosecond, 32-bit word microcode processor. The processor executes a macroinstruction in three or four microcycles.

The slowest-speed V77-200 has a 165-nanosecond, 24-bit word microcode processor. This processor requires two to three microcycles to execute a macroinstruction.

The V77-800 has an average main memory cycle time of 600 nanoseconds. Main memory for the other three models features the same 660 nanosecond cycle time. All processors have a 16-bit word organization.

In addition to the processor differences, the models differ in their: maximum allowable memory size; internal data transfer methods; firmware options; number of memory ports; and supportability of cache memory, memory parity, memory protect, and floating-point options.

Multi-line communications controllers are available to handle synchronous and asynchronous lines in either full- or half-duplex modes with speeds up to 9600 bps. Binary Synchronous Communications protocol lines are supported up to 50,000 bps. Standard interfaces include RS-232-C, CCITT V.24, 20 ma and 60 ma current loop and telegraph network-compatible.

Vortex Telecommunications Access Method (VTAM) modules drive the communications controllers, handle the communications lines for supported protocols, and provide for network control and modification.

Along with the announcement of the V77-800 in December 1978 came the release of a new operating system, Summit, which can run on either the 600 or 800 models and includes all Vortex II features. Additionally, Summit can operate with a number of separately-priced software features including compilers for Fortran 77 and Pascal compilers and QL/77, an inquiry language that works with the TOTAL data base management system. Not all of these features can be used on the 600, because of its limited memory. Summit ➤

Sperry Univac V77 Family Communications Capabilities

- already devoid of complicated exceptions and conditions, making it easy to tailor a configuration.

USER REACTION

It is against Sperry-Univac policy to provide user names; however, three V77 users did respond to the Computer Systems survey Datapro conducted in early 1980. All were using V77-600 models, which had been installed for an average of 15 months. Two of the users each had one V77-600, and the third had 6 units. Applications for which these systems were being used included accounting, manufacturing, transportation, word processing, distributed processing, transaction processing, and engineering/scientific applications.

Because of the small number of respondents, it is inappropriate to calculate user ratings based on these users' responses. Instead, we will present a narrative summary of their experiences, as follows:

These users had widely varying opinions of their V77 systems. The most satisfied user, whose ratings were consistently in the excellent-to-good range, felt that response time was good, that Univac had correctly represented the V77's compatibility with the user's predecessor system, that the productivity aids provided with the system helped keep programming costs down, and that delivery was on schedule and installation/start-up was smooth. The only negative comment by this user was that the vendor had underestimated the disc requirements of the system.

The second user, whose ratings fell mostly in the good-to-fair range, agreed that response time was good, and that the productivity aids were helpful. He also noted that he felt that the power of the system's multiprogramming capabilities was a real asset. On the negative side, he felt that Univac's enhancements to the system (hardware and software) were hard to keep up with.

The third user, whose ratings fell primarily in the fair-to-poor range, reported that the system as proposed by Univac was too small for his applications, that deliveries of both hardware and software had been late, that costs had exceeded the expected total, and that Univac did not live up to its promises in terms of software and support. He specifically pointed out that he had had "excessive problems with Eagle discs."

With as widely varying a group of opinions as these users represent, it would be unwise to draw any firm conclusions from their experiences. However, the specific advantages and disadvantages they have found should provide a starting point for future investigation. □

- includes an interactive monitor for time-sharing, text editor, PRONTO, and the communications access method.

A V77 system is built around a mainframe chassis with plug-in slots for additional memory modules, communications multiplexers, and I/O controllers. Generally, a V77

system consists of a mainframe chassis with 24 slots. A supplemental chassis can be configured within the mainframe chassis for an additional 24 slots and, should more be required, an expansion cabinet is available which provides still another 24 slots. The plug-in components are detailed throughout this report along with the number of slots required.

V77-800

The V77-800 represents the largest member of the V77 family. Main memory ranges from 128K to 2 megabytes with an average cycle time of 600 nanoseconds, somewhat faster than the other V77 models. The performance doubling compared to the V77-600 is achieved through the faster memory (600- vs. 660-nanosecond cycle), faster processor (150- vs. 165-nanosecond cycle), and faster cache memory (150- vs. 370-nanosecond cycles); cache memory is a standard feature on the 800, and optional on the 600.

Main memory for the 800 is single-port, and can be shared among up to four 800 systems via memory bus attachments.

The V77-800 also features as standard the Megamap memory management system, which is available as an option on either the 400 or 600 systems. Megamap is not available, or required, with the V77-200 because main memory is limited to 32K words (64K bytes).

Both the V77-800 and 600 can be configured to support up to 256 communications lines. Both utilize the same Data Communications Multiplexers and line adapters, and can support the same peripheral and I/O devices (including up to 4800 megabytes of disc storage each).

Not all of the software available on the 800 with the Summit operating system is available on the 600. For example, the 600 loaded with the Summit system cannot support the Fortran 77 or Fortran IV compiler.

V77-600

The foundation of the V77-600 architecture is a dual-port memory and up to three busses that permit variable, or even customized, arrangements of data transfer paths. Each 16K-, 32K-, 64K-word memory module has an "A" port and a "B" port.

In a typical single processor arrangement, only the "A" port is used. It is attached to the Memory Bus A and is the only access to memory. The bus is also attached to a 370 nanosecond Cache Memory. In addition to being a funnel for all transfers to and from memory, the Cache Memory, with 1024 words, will have the most recently used instructions and data readily available for processor use; the information is accessible in little more than half the time required to retrieve it from the 660 nanosecond main memory. The Cache Memory is also attached to the Megamap and the Option Board features. The latter feature, in turn, is attached to one of the two processor lines. Data, instructions, and memory address commands traveling from the processor to memory "functionally" go through the gauntlet of: processor to Option Board, Option Board to Megamap for any address extension necessary, then to the Cache Memory, to the Memory Bus A, and finally into memory through Port A. Information traveling from memory to the processor runs the same gauntlet in the other direction.

The largest memory addressable by the basic instruction repertoire is 32K words. When the memory size is greater than 32K, the Megamap option is required. This memory management feature divides physical memory into 1K-byte pages. ➤

Sperry Univac V77 Family Communications Capabilities

TABLE 2. DATA COMMUNICATIONS MULTIPLEXERS

Type	Feature Number	No. of Lines Supported	Line Adapters	For Models
I	F3000-99	8	2 (only 1 sync.)	V77-200
I	F3000-98	8	2 async./sync.	V77-400/600/800
III	F3052-01	32	8 async./sync.*	V77-600/800
IV	F3052-02	64	16 async./sync.*	V77-600/800

*Requires Expansion Cabinet and occupies one slot.

► The I/O Bus is attached to I/O device controllers. Controllers are provided for communications lines, disc drives, magnetic tape drives, diskette drives, printers, and display stations.

Data being transferred between a device attached to the I/O Bus and memory can be transferred directly or through program control (interrupt). The method is dependent on the type of controller employed and VTAM software support. Direct memory transfer is accomplished without the time-consuming processor intervention. Devices that cause interrupts can be assigned one of eight priorities for processor servicing.

The Cache Memory is an optional feature that the manufacturer estimates increases the transfer rate of 90 percent of the data between memory and the processor.

The mainframe chassis is available in two sizes. The seven-inch high version accommodates the control panel, the processor, 256K words of memory, and the Option Board and provides accommodation for the I/O and Memory Expansion Chassis. Seven bus slots are required to accommodate the above features. The 14-inch high version is identical to the 7-inch version, except that an additional 9 slots are available for certain options, such as memory, Megamap, Cache Memory, and Floating-Point.

When more memory than can be accommodated in the mainframe is required, the Memory Expansion Chassis is required.

A System Console and a Real-Time Clock are integral with the basic V77-600.

In a two-processor arrangement, memory can be shared. A Memory Bus is attached to each of the two memory ports. Each bus is attached to one of the two processors (via Cache, Option Board, etc.). Each processor can be simultaneously accessing different modules of memory under this arrangement. When both processors attempt to access the same module simultaneously, the processor whose Memory Bus is attached to Port A of the memory will receive first priority. The bus attached to Port B will always have to wait until the Port A access is completed.

V77-200

The V77-200 is designed for applications requiring 8K, 16K, or 32K 16 bit words of main memory. The memory size limitation eliminates the need for the Megamap feature. V77-200 main memory is single-port. Cache memory, Writable Control Storage, and Priority Memory Access are not supported by this model; Direct Memory Access and the system console are standard. Using a 4-Channel Interface Controller, the V77-200 can be connected to a V77-600. The V77-200, then, can be utilized as a tightly coupled front-end processor to the V77-600 host.

V77-400

The V77-400, although equipped with a slower speed processor, is functionally the same as the V77-600, except that it does not support Cache Memory, Priority Memory Access, or Floating-Point. A system console is included with the basic system.

This model supports a dual port memory controller and can share memory with a V77-600, thus lending itself to use as a tightly coupled front-end communications processor to a V77-600 host. ►

TABLE 3. LINE ADAPTERS FOR THE DATA COMMUNICATIONS MULTIPLEXERS

Type of Line Interface	Supported Modem Type	Model No.	No. of Lines	Timing	Mode	Speed, bps
RS-232-C, CCITT V24	Bell 103, 202	F3001-00	4	Async.	F/H	Up to 9600
RS-232-C; direct connection to CPU (within 50 feet)	—	F3001-01	4	Async.	F/H	Up to 9600
20/60 ma current loop; direct connection to CPU (50 to 500 feet)	—	F3001-02	4	Async.	F/H	Up to 9600
20/60 ma relay current loop; telegraph network compatible	—	F3001-03	4	Async.	F/H	300
RS-232-C, CCITT V24	Bell 201, 208	F3001-04	4	Sync.	F/H	Up to 9600
RS-232-C; BSC protocol	Bell 201, 208, 300	F3001-05	1	Sync.	F/H	Up to 9600; 50,000*
RS-232-C; UDLC, SDLC, HDLC, & ADCCP protocols	Bell 201, 208	F3060-00	1	Sync.	F/H	Up to 9600
RS-232-C, CCITT V24	Bell 103, 202	F3001-07	4	Async.	F/H	Up to 9600
Auto Call Unit	Bell 801	F3001-06	4			

*Wideband Interface (F3006-00) required for Bell 300 at 50,000 bps.

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► CONNECTION TO HOST COMPUTER

When a V77 is used as a front-end processor and another V77 is the host, the front-end can merely place data destined for the host into memory shared by both the host and the front-end. Conversely, data destined for a communications line is placed by the host in the shared memory. Control words resident in the shared memory and constantly monitored by both processors serve as a means for inter-processor communications. Alternatively, a conventional V77-V77 Channel Interface can connect the front end and host.

All memory need not be shared. Each processor can have one Memory Bus attached to the shared memory and another Memory Bus attached to the non-shared memory.

Software modules are available which allow V77 operation within either Univac, IBM, or public packet-switching networks. One package, for example, allows Uniscope terminals, and software, to operate with V77 systems, and permit V77's to communicate as distributed systems with Univac hosts. Such communications emulates Univac 1004 remote batch protocol. Another package permits V77 access to an IBM 360/370 system in 3270 emulation, and yet another permits V77 operation as a HASP/RJE workstation. Another package provides X.25 compatibility permitting V77 access to Canada's DATAPAC public packet-switching network.

TRANSMISSION SPECIFICATIONS

Multi-line controllers are offered for support of communications lines. Three Data Communications Multiplexers (DCM) are offered to support 8, 32, or 64 lines. One of the DCM's come in two versions; one version is for systems with the Megamap feature, and the second is for systems without Megamap. Nine types of Line Adapters are provided for attachment to the Data Communications Multiplexers. Depending upon the adapter selected, RS-232-C, CCITT V24, 20/60 ma current loop, or 20/60 ma relay current loop interfaces are supported. One adapter provides BSC protocol, one supports UDLC, SDLC, ADCCP, and HDLC protocols and the others are for other character control protocols. Where applicable, the required character control protocol and line speed can be selected programmatically. All Line Adapters, except the BSC and UDLC Line Adapter, can support up to four lines operating at up to 9600 bps. The BSC Line Adapter can support only one line at up to 50,000 bps. The UDLC Line Adapter can support only one line at up to 9600 bps. Table 2, Line Adapters for the Data Communications Multiplexers, lists the line interfaces offered.

Each of the Data Communications Multiplexers requires two slots in either the mainframe chassis or the expansion cabinet. Both the V77-200 and V77-400 are limited to a single eight-line multiplexer, which is located in the mainframe chassis for either system. The V77-600 and V77-800 can each support up to four 64-line multiplexers, yielding up to 256 communication line interfaces. Whether the multiplexers are housed in the main or expansion cabinet, or both, will depend on the number of slots that are occupied by I/O controller units. The maximum system configurations for the 600 and 800 of 256 lines assumes that each system is devoted almost entirely to communications processing. The addition of I/O controller units will proportionately decrease the number of multiplexers (and lines) that can be configured.

SOFTWARE

The V77 operating system is VORTEX, a multi-programming, disc-oriented system. For systems with a minimum of 16K and a maximum of 32K words of memory, VORTEX

I is the operating system. VORTEX II is used for systems with more than 32K words of memory. The difference is that VORTEX II provides software support for the Megamap feature necessary to develop addresses greater than 32K.

The Summit operating system, announced in December 1978, is an expansion of VORTEX II. It is designed to operate on either the V77-600 or V77-800 system, although each will also function with VORTEX II. Integrated within Summit are the PRONTO transaction manager, a modification of the VORTEX Telecommunications Access Method (VTAM), an interactive monitor for time-sharing applications, and the capability to perform all the program development and operating system functions that were available with VORTEX II. Communications is enhanced with Summit by the addition of separately-priced modules which include a DCA package offering V77 models the capability of communicating with Univac 90 or 1100 Series computers in a Distributed Communications Architecture environment. A complete DCA package is available which provides support for a mix of transaction and interactive processing and remote job entry. Other options available with Summit are the TOTAL data base manager, QL/77 (an inquiry language which works with TOTAL), and both Pascal and Fortran 77 compilers.

Utilizing the Megamap memory, VORTEX II or Summit divides main memory into 512-word pages. Each user application can utilize up to 64 pages of memory, or 32K words. This limitation is imposed by the maximum self-relative address containable in the instruction format. The Megamap system keeps track of the actual memory locations of each user page. Importantly, the pages for a particular user application need not be contiguous pages.

A set of modules that handle the telecommunications function are designated the Vortex Telecommunications Access Method (VTAM). One module, the Communication Control Module, is required to drive the communications controllers. A copy of the module is required for each type of communications controller attached to the system. For instance, the Data Communications Multiplexers would require a copy of this module to operate them. This module performs the I/O handler function.

Another VTAM module is the Terminal Control Module. This module performs the terminal handling function for each type of terminal attached to a specific line (Line Adapters).

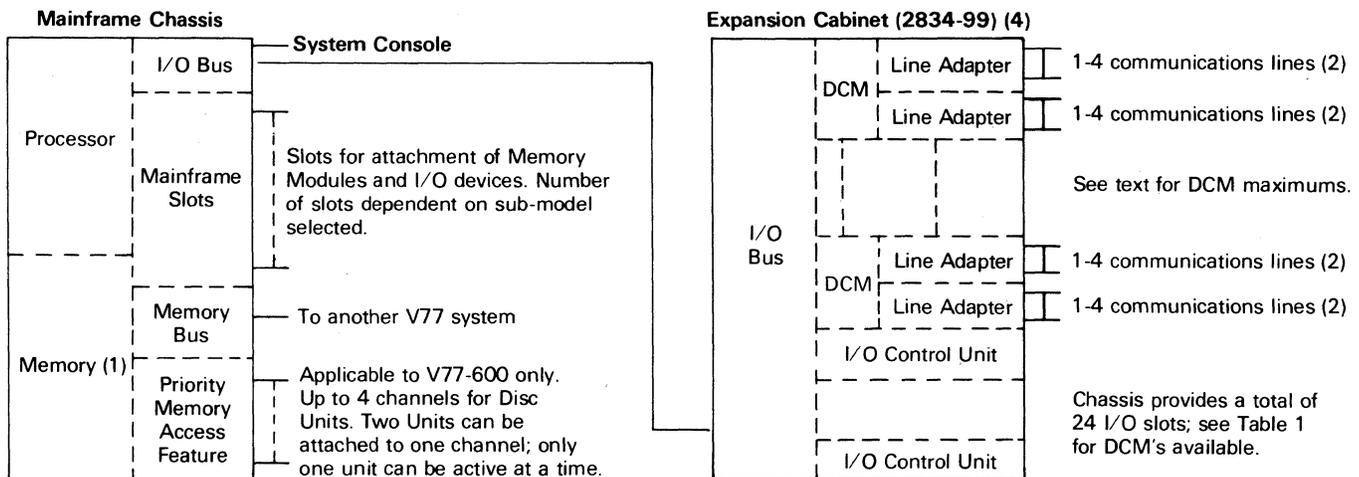
The Network Control Module performs the logical link function and provides the operator with an interface to the communications system. Using a Network Definition Language, the operator can instruct this module to alter the network configuration. In this manner, lines or terminals can be dropped or added, logical links can be rerouted, and the status of a line can be ascertained.

Univac provides application packages that interface with VTAM. Included are:

- HASP/RJE — Permits a V77 to serve as a remote workstation for an IBM 360/370.
- TEN04 — Emulates a Univac 1004 terminal.
- PRONTO — Provides interface control between communications and file access function. It can multi-task transactions and access files sequentially, index sequentially, or via TOTAL. TOTAL is the VORTEX data base management system. PRONTO permits a V77 to operate as a host to buffered asynchronous or IBM 3270-type terminals. A V77, with PRONTO, can also operate as a communications interface between an IBM 360/370 and multiple terminals. ►

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Configuration



(1) All memory resides in the processor cabinet. Maximum of 64K bytes for V77-200, 512K bytes for 400, 1 megabyte for 600, and 2 megabytes for 300. Memory capacity over 512K bytes requires Memory Expansion Chassis. Cache memory can be added to the V77-600 and 800.

(2) See Table 2 for number of slots of each line interface type requires. See Price List for the number of slots required for other attachable peripherals.

► Programming languages offered include COBOL, FORTRAN 77 and FORTRAN IV, RPG II, and DASMR (a macro assembler). MIDAS is the microassembler used when the system includes the Writable Control Storage option.

Several recently introduced packages include the VORTEX Interactive Package (VIP), the Global Resource Access Manager (GRAM), and the MANMAN Manufacturing Management System. VIP provides multiple-terminal V77-600 and -800 systems with the capability to edit source files on-line and submit background jobs, and includes a set of file utilities; VIP can also be used as the base for QL/77 inquiry language programs and other optional software. GRAM consists of several routines that provide terminal-to-program, program-to-program, and distributed processing module-to-program interfacing between a V77 system and a DCA host. Both VIP and GRAM run under PRONTO. MANMAN is an on-line interactive data base management package for V77-600 and -800 systems that provides a set of seven applications for manufacturing environments: inventory control, purchasing work-in-progress, bill of material, material requirements planning, capacity planning and scheduling, and cost accounting.

MEMORY

Within the V77-600, dual-port memory can be expanded to two million bytes in 128K-byte increments.

Within the V77-400, dual-port memory can be expanded to 512K bytes in 64K-byte increments.

Within the V77-200, 16K, 32K, or 64K bytes of single-port memory is available.

The Memory Management System, Megamap, is required on the V77-400, 600, and 800 when memory exceeds 32K words. This feature, along with software support provided in VORTEX II, provides the addressing scheme that permits attachment of over one million memory words, equivalent to over two million bytes.

Cache Memory is available for the V77-600 (370-nanosecond cycle time, and V77-800 (150-nanosecond cycle

time). Cache Memory is interjected between the processor and main memory and can almost double the speed for 90 percent of the processor/main memory transfers. This is accomplished by continually loading the 1024 words of this special memory with the most recently used instructions and data in anticipation of use by the processor.

Available only on the V77-400, 600, and 800, the Writeable Store (WCS) option permits user incorporation into firmware subroutines of instructions that are frequently used in his applications or that are time critical. When frequently used instructions are microcoded, the overall overhead of the system is reduced. WCS is available for the V77-400 and 600 in a single 1024-word increment. Up to 12K bytes of WCS is available for the V77-800. The V77-800 can also support 2K bytes of PROM in conjunction with WCS.

PROCESSOR FEATURES

The Priority Interrupt Module feature permits assignment of processing priority to up to 64 interrupt-type devices attached to the I/O Bus. Each device can be assigned one of eight priorities. The registers to store the mid-stream processing of a lower priority device in order to service a higher-priority interrupt are included. Each module occupies one slot on the Cardframe Chassis.

When direct memory access devices are attached to the I/O Bus, the Block Interlace Controller feature is required. This feature will accommodate up to ten devices. A maximum of eight Block Interlace Controllers can be added to one system and will handle a total of eight devices. Each controller occupies one slot on the chassis.

The Priority Memory Access feature provides for high-speed data transfer between discs (or special interfaces) and memory. This feature provides direct memory transfer of blocks of data over four channels. Each channel has a hard-wired priority. Although two disc units can be physically attached to a channel, only one unit can be active at a time. The PMA feature requires the presence of Block Transfer Controller. A maximum of four such controllers are allowed, with each controller occupying three slots of the Cardframe Chassis.

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► PERIPHERAL DEVICES

Up to four magnetic tape drives can be added to one magnetic tape controller, which occupies six slots of the I/O Cardframe Chassis. The units support 9-track, 800 bpi recording at either 25 ips or 37.5 ips with read after write. Drives with 1600 bpi and 800/1600 bpi formats that operate at 75 ips and 125 ips are also available.

Up to four disc drives can be added to one disc controller, which occupies from one to three slots of the Cardframe Chassis, depending on the disc model. Capacity of up to 145 million 16 bit words per spindle is available at a transfer rate of 806K words per second.

Cartridge disc is also available; up to 20 megabytes per unit is provided. Each controller occupies three slots. The transfer rate is 312K bytes per second.

Teleprinters, card readers/punches, display stations, and printers are also available and are listed in the price list.

PRICING

Univac's V77 systems are available only on a purchase basis. A service contract is available for full service within 100 miles of a Univac service center. The cost is based on a monthly service charge for each feature incorporated into the system. There is a minimum charge of \$150 per month.

There is a one time field installation charge that depends on the features installed with a \$300 minimum.

Software is unbundled and is purchased for a one time charge. The amount of post-purchased software support is dependent upon the level of support associated with the package. After purchase, the class of support ranges from continually supplying new releases (class 1) to limited correction support (class 3). The latter class applies to low volume software packages.

		Purchase Price	Monthly Maintenance
	Processors and Memory—		
2808-96	Basic V77-800; 24 mainframe slots; includes cache memory	\$43,050	\$440
F3054-00	128K bytes Memory	5,000	50
F3054-01	256K bytes Memory	9,000	90
F3057-00	2K bytes Writeable Control Store	4,000	40
F3053-00	Floating Point Processor	4,000	40
2834-96	V77-800 Expansion Cabinet	2,363	5
2806-93	Basic V77-600; 16 mainframe slots	32,045	320
2806-96	Basic V77-600; 16 mainframe slots; includes cache memory	36,045	360
F3063-01	128K bytes Memory	7,000	70
F3063-00	256K bytes Memory	12,000	120
F3028-00	1K Cache Memory	4,000	35
F3034-01	1K words Writeable Control Store (64-bit)	4,000	35
F3034-02	2K words Writeable Control Store (64-bit)	7,500	60
2834-97	V77-600 Expansion Cabinet	2,250	5
2804-99	Basic V77-400; 2 universal slots	17,695	152
F3020-08	16K bytes Memory	1,450	17
F3020-10	32K bytes Memory	2,200	25
F3020-12	64K bytes Memory	4,000	42
F3034-03	1K words Writeable Control Store (32-bit)	3,000	32
2802-99	Basic V77-200; one universal slot	12,945	121
F3020-08	16K bytes Memory	1,450	17
F3020-10	32K bytes Memory	2,200	25
F3020-12	64K bytes Memory	4,000	42
	Data Communications Multiplexers—		
F3000-99	8-Line, Async./Sync., up to 9600 bps; for V77-200	2,025	25
F3000-98	8-Line, Async./Sync., up to 9600 bps; for V77-400/600/800	2,025	25
F3052-01	32-Line, Async./Sync., up to 9600 bps; for V77-600/800	4,000	40
F3052-02	64-Line, Async./Sync., up to 9600 bps; for V77-600/800	5,500	55
	Line Adapters—		
F3001-00	4-Line, Async., RS-232-C, CCITT V24	750	7
F3001-01	4-Line, Async., RS-232-C, Direct	750	7
F3001-07	4-Line, Async., RS-232-C, CCITT V24, 6 speed programmable	1,200	11
F3001-02	4-Line, Async., current loop	750	7
F3001-03	4-Line, Async., relay current loop	1,000	7
F3001-04	4-Line, Sync., RS-232-C, CCITT V24	1,500	11
F3001-05	1-Line, Binary Synchronous (BSC), RS-232-C	1,500	11
F3006-00	50,000 bps operation; Wideband Interface	250	6
F3001-06	4-Line, Automatic Call Unit (Bell 801)	1,000	11
F3060-00	1-Line, UDLC, SDLC, HDLC, ADCCP; RS-232-C	1,500	11
	Peripherals		
F3012-00	Disc Memory Controller; for up to 4 Disc Memory Drives on V77-600	9,500	83
F3012-02	Disc Memory Controller; for disc Memory Drives on V77-400 and -800 Computers	8,000	77
F3012-04	Dual Access Option for Disk Drive; supports 3 Disc Drives (requires 2 controllers)	3,500	35
F3012-05	Dual Access Option for Disk Drive; supports 7 Disc Drives (requires 2 controllers)	4,000	46
2825-00	Disc Memory Drive; 15.3 million 16-bit words	13,000	219
F3038-00	Disc Pack	750	—

Sperry Univac V77 Family Communications Capabilities

Peripherals (Continued)		<u>Purchase Price</u>	<u>Monthly Maintenance</u>
2842-00	Disc Memory Drive; 30.6 million 16-bit words	16,000	242
F3013-00	Disc Pack	750	—
2826-00	Disc Memory Drive; 58.1 million 16-bit words	25,000	368
F3014-00	Disc Pack	1,500	—
2843-00	Disc Memory Drive; 116.3 million 16-bit words	32,000	380
F3015-00	Disc Pack	1,500	—
F3067-01	Disc Memory Controller; for 4 disc memory drives on V77-600	7,000	50
F3067-00	Disc Memory Controller; for 4 disc memory drives on V77-400/800	7,000	50
F3067-03	Four-Drive Disc Expander; permits attachment of 4 Model 8433 disc drives to F3067 controller	1,000	10
8433-20	Disc Memory Drive; 145MB	19,500	175
F2021-01	Dual Access Option; supports one disc drive (requires two controllers)	3,000	20
F1223-01	Disc Pack	1,820	—
F3310-93	Cartridge Disc Unit and Controller; 9.3MB fixed/removable storage	11,250	110
F3310-96	Additional Cartridge Disc Unit	7,000	70
F1229-01	Disc Cartridge	200	—
F3094-99	Cartridge Disc Unit and Controller; 9.3MB fixed/removable storage	14,050	113
F3094-04	Additional Cartridge Disc Unit; max. 3	9,000	83
F3016-00	Disc Cartridge	200	—
F3359-99	Cartridge Disc Unit and Controller; 15MB fixed disk storage plus 5MB removable	18,250	127
F3359-93	Additional Cartridge Disc Unit; max. 3	13,000	115
F1229-01	Disc Cartridge	200	—
2834-98	Tape/Disc Expansion Cabinet; holds 2 magentic tape drives, or 1 tape drive and two cartridge disc drives, or up to 5 cartridge disc drives	1,200	—
2812-00	Card Reader; 300 cpm, includes controller (1 standard slot); for V77-200/400	4,500	51
2812-99	Card Reader; 300 cpm, includes controller; for V77-600/800	4,750	47
2813-00	Card Punch; 35 cpm, includes controller (3 standard slots); for V77-200/400	11,500	100
2819-99	Printer; 165 cps, includes controller	6,850	86
2820-99	Line Printer; 300 lpm, includes controllers	14,100	121
2820-96	Line Printer; 600 lpm, includes controller	18,400	133
0789-81	Line Printer and Controller; 180 lpm	10,584	80
0789-78	Line Printer and Controller; 300 lpm	12,500	122
0789-75	Line Printer and Controller; 640 lpm	15,650	143
0786-71	Matrix Printer; 200 cps unidirectional; includes vertical format unit	4,750	66
0786-68	Matrix Printer; 200 cps bidirectional; includes vertical format unit	6,000	66
F3088-99	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 25 ips (4 standard slots)	9,250	86
F3088-03	Additional Magnetic Tape Unit; up to 3	7,000	76
F3089-99	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 37.5 ips, read after write (4 standard slots)	9,250	86
F3089-04	Additional Magnetic Tape Unit; up to 3	7,000	76
0870-99	Magnetic Tape Unit and Controller; 9 track, 800/1600 bpi, 75 ips (4 standard slots)	15,150	153
0870-35	Additional Magnetic Tape Unit; up to 3	10,700	113
0876-89	Magnetic Tape Unit and Controller; 9 track, 800/1600 bpi, 125 ips; dual density	28,465	192
0876-87	Additional Magnetic Tape Unit; up to 3	21,215	102
2839-00	Display Terminal; 64-character set	2,145	21
2839-03	Display Terminal; 128-character set	2,345	23
2840-00	Display Terminal; buffered; 128-character set	2,745	27
2840-03	Display Terminal; buffered; 128-character set; with buffered printer interface	3,145	31
0786-59	Matrix Printer; 200 cps unidirectional; for attachment to 2840-03 terminal	4,250	40
2845-00	Terminal Controller; emulates IBM 3271; supports up to 32 2846-00 terminals	6,300	65
2846-00	Display Terminal; emulates IBM 3277	4,300	40
2847-00	Impact Printer; 40 to 70 cps; for attachment to 2846-00 terminal	9,900	105
F3070-00	Control Unit Adapter; for every four 2846-00 beyond the first four	150	2

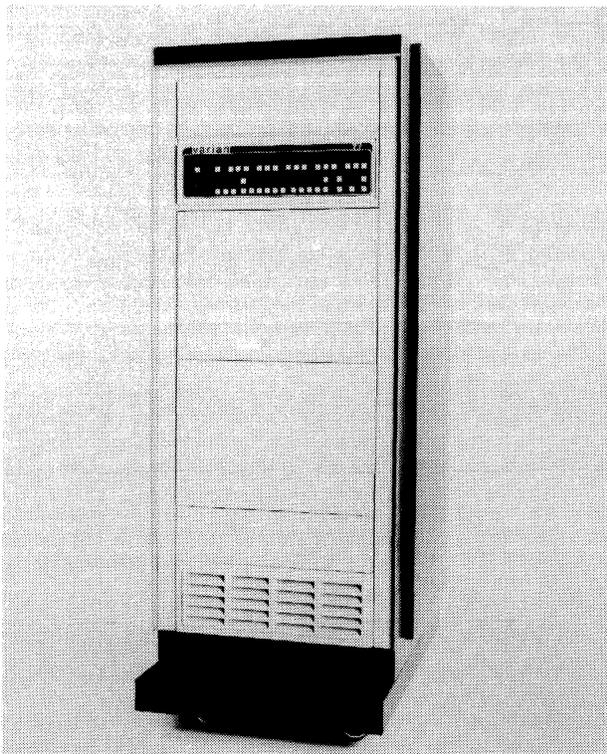
SOFTWARE Price List Inserts

<u>ID #</u>	<u>Item</u>	<u>One Time Charge</u>
6300-00	VORTEX Real Time Operating System	\$ 1,000
6301-00	VORTEX II Real Time Operating System	1,000
6308-00	VORTEX Telecommunications Access Method (VTAM)	500
6333-00	VORTEX II On-Line Test	500
6334-00	VORTEX Interactive Package (VIP)	1,500
6324-01	Summit Operating System	6,000
6324-05	Summit Commercial Software Package	21,000

Sperry Univac V77 Family
Communications CapabilitiesSOFTWARE
Price List Inserts

<u>ID #</u>	<u>Item</u>	<u>One Time Charge</u>
6309-00	ISAM	500
6310-00	Data Management Package (OSAM, Sort/Merge, Move, Copy)	2,500
6311-00	PRONTO Network Control Executive	4,000
6328-02	QL/77 Inquiry Language	3,000
6315-01	Maintain III	200
6316-02	Maintain III Test Update	200
6303-00	TOTAL Data Base Management System	9,500
6330-02	Text Processing System	1,000
6334-00	System Test	500
6346-00	Global Resource Access Manager (GRAM)	1,000
6553-00	MANMAN Manufacturing Management System	50,000
6323-02	CP77 Time Sharing System	1,500
6305-00	RPG II/VIDEO Package	2,000
6304-00	COBOL	5,000
6326-02	FORTRAN 77	5,000
6329-02	PASCAL	2,000
6345-00	FORTRAN IV; for V77-800 only	2,000
6312-00	Telecommunication and Commercial Software Package	16,000
6317-00	HASP/RJE Application Program	3,000
6320-00	TENO4/RJE	2,500
6311-06	Univac Host Access Module; Uniscope emulation	4,000
6311-09	IBM Host Access Module; 3270 emulation	4,000
6347-00	RJE for Univac 1100	3,000
6332-00	RBT/RJE	2,000
6331-02	DCA Communications System	3,000■

Sperry Univac V77 Family Communications Capabilities



The V77-600 processor, depicted above, represented the high end of the V77 line until the recent announcement of the V77-800, which is said to have double the performance of the V77-600. Either system can support up to 256 communications lines.

MANAGEMENT SUMMARY

In June 1977, Varian Data Machines was merged into the Univac Division of Sperry-Rand and is now called the Sperry Univac Minicomputer Operation. Varian introduced the V70 Series in 1974 and in December 1976 released the V77 series with increased memory and other options. Soon after Sperry Univac's acquisition of Varian, software packages were announced making the V77 line compatible with Univac hardware, and thereby enrolled the V77 line in Univac's Distributed Communications Architecture (DCA). In December 1978, Univac's Minicomputer Operation announced the V77-800, a significantly improved model which extends the V77 line upwards. It is scheduled for delivery in July 1979.

The V77 family can support slightly over one million words (or over two megabytes) of main memory, depending on the model and system configuration. The systems can perform as remote nodes and front-ends for each other in a V77 network, as independent processing systems, or as remote communications and distributed processors in either a Univac or IBM network. A complete software library supports these applications, as well as time sharing, HASP/RJE, data base management, or pure communications processing.

A family of four minicomputer models with varying processor speeds that support communications lines with speeds up to 9600 bps for character-oriented protocols except BSC, which is supported at up to 50,000 bps.

The higher end of the model line can perform not only as stand-alone processing systems, but also as front-ends to other V77 processors and as remotely or locally-connected distributed processing nodes with either Univac or IBM mainframes.

A total of up to 256 communications lines can be physically attached to one system. Dual-port memory facilitates network arrangements that can minimize data transfers between two or more local processors. Data files can be given high-priority direct memory access.

A V77-200 system with 32K words, a systems console, one disc drive, and support for 32 communications lines cost \$49,050. A V77-600 with the same configuration except for 64K words of memory costs \$58,100. The maintenance contract charge for the 200 system is \$471 per month and \$575 per month for the 600 system.

CHARACTERISTICS

VENDOR: Sperry Univac Minicomputer Operation (formerly Varian), 2722 Michelson Drive, Irvine, California 92664. (714) 833-2400.

DATE OF ANNOUNCEMENT: V77-200/400/600 — November 1976; V77-800 — December 1978.

DATE OF FIRST DELIVERY: V77-200/400/600 — November 1976; V77-800 — July 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Sperry Univac.

CONFIGURATION

The V77 family of minicomputers includes four basic models, each with a different processor, to provide four levels of price and performance.

The newly-announced V77-800 features a microcode processor cycle time of 150 nanoseconds, and contains a 1K-word, 150-nanosecond cache memory; this is more than twice the speed of the V77-600's cache memory. The V77-800 is reported to have double the performance of the V77-600, which is the next fastest V77 model.

The V77-600 features a 165-nanosecond, 64-bit word microcode processor which was essentially an improved version

Sperry Univac V77 Family Communications Capabilities

TABLE 1. V77 FAMILY COMPARISONS

<u>Model</u>	<u>Maximum Main Memory</u>	<u>Cache Memory</u>	<u>Writeable Control Store</u>	<u>Data Communications Multiplexer Supported</u>	<u>Operating System</u>
V77-200	64K bytes	No	No	Type 1	Vortex 1 (1)
V77-400	512K bytes	No	1K words; 32-bit	Type 1	Vortex 2 (2)
V77-600	1024K bytes	1K words; optional	2K words; 64-bit	All	Vortex 2 (2) (3) or Summit (3)
V77-800	2048K bytes	1K words; integrated (48-bit)	12K bytes plus 2K bytes PROM	All	Vortex 2 (2) (3) or Summit (3)

(1) Includes Fortran IV compiler; requires 64K bytes main memory minimum.

(2) Includes Megamap and Fortran IV compiler; requires 96K bytes main memory minimum and disk storage; if TOTAL Data Base System included, 128K bytes main memory is required.

(3) With PRONTO Network Control Executive or Telecommunications and Commercial Software Package, requires 256K bytes main memory minimum.

➤ The intermediate-speed and high-speed V77 models are attractive from a communications standpoint because they support shared memory. When a V77 is used as a front-end to another V77 host, shared memory between them gives the host immediate access to data stored by the front-end from communications lines. The extra step of moving data from the front-end to the host's memory is eliminated. Similarly, data released by the host for front-end processing is available to the front-end without first having to be transferred to the front-end memory. Shared memory arrangements also permit establishment of a network where a secondary host or a secondary front end is able to access data awaiting prime processor action when the prime processor fails; this is a definite fallback advantage.

The ability to give special high-priority direct memory access to disc files, at transfer rates up to 604K (16 bit) words per second, should be of interest to networks that require especially heavy access to random files.

No feature is yet provided that supports a bit-oriented line control protocol, but Univac has stated that adapters supporting UDLC and SDLC will be available in early 1979. Binary Synchronous Communications protocol is supported at speeds up to 50,000 bps. Other control protocols are supported at speeds up to 9600 bps.

The utilization of different minicomputers for each of the four models of the V77 family is a departure from the V70 product line where essentially one minicomputer served almost all models.

The offering of predefined starting configurations simplifies system building within an architecture that is already devoid of complicated exceptions and conditions, making it easy to tailor a configuration. □

➤ of the V76 model of the V70 minicomputer series. The 600 can execute a macroinstruction in two or three microcycles. Cache memory is available as an option with the 600.

The intermediate-speed V77-400 has a 220-nanosecond, 32-bit word microcode processor. The processor is a new Varian development for the V77 family that executes a macroinstruction in three or four microcycles.

The slowest-speed V77-200 has a 165-nanosecond, 24-bit word microcode processor. This processor requires two to three microcycles to execute a macroinstruction.

The V77-800 has an average main memory cycle time of 600 nanoseconds. Main memory for the other three models features the same 660 nanosecond cycle time. All processors have a 16-bit word organization.

In addition to the processor differences, the models differ in their: maximum allowable memory size; internal data transfer methods; firmware options; number of memory ports; and supportability of cache memory, memory parity, memory protect, and floating-point options.

Multi-line communications controllers are available to handle synchronous and asynchronous lines in either full- or half-duplex modes with speeds up to 9600 bps. Binary Synchronous Communications protocol lines are supported up to 50,000 bps. Standard interfaces include RS232C, CCITT V24, 20 ma and 60 ma current loop and telegraph network-compatible.

Vortex Telecommunications Access Method (VTAM) modules drive the communications controllers, handle the communications lines for supported protocols, and provide for network control and modification.

Along with the announcement of the V77-800 in December 1978 came the release of a new operating system, Summit, which can run on either the 600 or 800 models and includes all Vortex II features. Additionally, Summit can operate with a number of separately-priced software features including compilers for Fortran 77 and Pascal compilers and QL/77, an inquiry language that works with the TOTAL data base management system. Not all of these features can be used on the 600, because of its limited memory. Summit includes an interactive monitor for time-sharing, text editor, PRONTO, and the communications access method.

A V77 system is built around a mainframe chassis with plug-in slots for additional memory modules, communications multiplexers, and I/O controllers. Generally, a V77 system consists of a mainframe chassis with 24 slots. A supplemental chassis can be configured within the main-

Sperry Univac V77 Family Communications Capabilities

frame chassis for an additional 24 slots and, should more be required, an expansion cabinet is available which provides still another 24 slots. The plug-in components are detailed throughout this report along with the number of slots required.

V77-800

Scheduled for delivery in July 1979, the V77-800 represents the largest member of the V77 family. Main memory ranges from 128K to 2 megabytes with an average cycle time of 600 nanoseconds, somewhat faster than the other V77 models. The performance doubling compared to the V77-600 is achieved through the faster memory (600- vs. 660-nanosecond cycle), faster processor (150-vs. 165-nanosecond cycle), and faster cache memory (150-vs 370-nanosecond cycles); cache memory is optional for both the 600 and 800.

Main memory for the 800 is single-port, and can be shared among up to four 800 systems via memory bus attachments.

The V77-800 also features as standard the Megamap memory management system, which is available as an option on either the 400 or 600 systems. Megamap is not available, or required, with the V77-200 because main memory is limited to 32K words (64K bytes).

Both the V77-800 and 600 can be configured to support up to 256 communications lines. Both utilize the same Data Communications Multiplexers and line adapters, and can support the same peripheral and I/O devices (including up to 4800 megabytes of disc storage each).

Not all of the software available on the 800 with the new Summit operating system is available on the 600. For example, the 600 loaded with the Summit system cannot support the Fortran 77 compiler.

V77-600

The foundation of the V77-600 architecture is a dual-port memory and up to three busses that permit variable, or even customized, arrangements of data transfer paths. Each 16K-, 32K-, or 64K-word memory module has an "A" port and a "B" port.

In a typical single processor arrangement, only the "A" port is used. It is attached to the Memory Bus A and is the only access to memory. The bus is also attached to a 370 nanosecond Cache Memory. In addition to being a funnel for all transfers to and from memory, the Cache Memory, with 1024 words, will have the most recently used instructions and data readily available for processor use; the information is accessible in little more than half the time required to retrieve it from the 660 nanosecond main memory. The Cache Memory is also attached to the Megamap and the Option Board features. The latter feature, in turn, is attached to one of the two processor lines. Data, instructions, and memory address commands traveling from the processor to memory "functionally" go through the gauntlet of: processor to Option Board, Option Board to Megamap for any address extension necessary, then to the Cache Memory, to the Memory Bus A, and finally into memory through Port A. Information traveling from memory to the processor runs the same gauntlet in the other direction.

The largest memory addressable by the basic instruction repertoire is 32K words. When the memory size is greater than 32K, the Megamap option is required. This memory management feature divides physical memory into 1K-byte pages.

The I/O Bus is attached to I/O device controllers. Controllers are provided for communications lines, disc drives,

magnetic tape drives, diskette drives, printers, and display stations.

Data being transferred between a device attached to the I/O Bus and memory can be transferred directly or through program control (interrupt). The method is dependent on the type of controller employed and VTAM software support. Direct memory transfer is accomplished without the time-consuming processor intervention. Devices that cause interrupts can be assigned one of eight priorities for processor servicing.

The Cache Memory is an optional feature that the manufacturer estimates increases the transfer rate of 90 percent of the data between memory and the processor.

The mainframe chassis is available in two sizes. The seven-inch high version accommodates the control panel, the processor, 256K words of memory, and the Option Board and provides accommodation for the I/O and Memory Expansion Chassis. Seven bus slots are required to accommodate the above features. The 14-inch high version is identical to the 7-inch version, except that an additional 9 slots are available for certain options, such as memory, Megamap, Cache Memory, and Floating-Point.

When more memory than can be accommodated in the mainframe is required, the Memory Expansion Chassis and system power supply are required.

A System Console and a Real-Time Clock are integral with the basic V77-600.

In a two-processor arrangement, memory can be shared. A Memory Bus is attached to each of the two memory ports. Each bus is attached to one of the two processors (via Cache, Option Board, etc.). Each processor can be simultaneously accessing different modules of memory under this arrangement. When both processors attempt to access the same module simultaneously, the processor whose Memory Bus is attached to Port A of the memory will receive first priority. The bus attached to Port B will always have to wait until the Port A access is completed.

V77-200

The V77-200 is designed for applications requiring 8K, 16K, or 32K 16 bit words of main memory. The memory size limitation eliminates the need for the Megamap feature. V77-200 main memory is single-port. Cache memory, Writable Control Storage, and Priority Memory Access are not supported by this model; Direct Memory Access and the system console are standard. Using a 4-Channel Interface Controller, the V77-200 can be connected to a V77-600. The V77-200, then, can be utilized as a tightly coupled front-end processor to the V77-600 host.

V77-400

The V77-400, although equipped with a slower speed processor, is functionally the same as the V7-600, except that it does not support Cache Memory, Priority Memory Access, or Floating-Point. A system console is included with the basic system.

This model supports a dual port memory controller and can share memory with a V77-600, thus lending itself to use as a tightly coupled front-end communications processor to a V77-600 host.

CONNECTION TO HOST COMPUTER

When a V77 is used as a front-end processor and another V77 is the host, the front-end can merely place data destined for the host into memory shared by both the host and the front-end. Conversely, data destined for a communications

Sperry Univac V77 Family Communications Capabilities

TABLE 2. DATA COMMUNICATIONS MULTIPLEXERS

Type	Feature Number	No. of Lines Supported	Line Adapters	For Models
I	F3000-99	8	2 (only 1 sync.)	V77-200
I	F3000-98	8	2 async./sync.	V77-400/600/800
II	F3000-97	16	4 async./sync.*	V77-600/800
III	F3000-96	32	8 async./sync.*	V77-600/800
IV	F3000-95	64	16 async./sync.*	V77-600/800

*Requires Expansion Cabinet and occupies one slot.

► line is placed by the host in the shared memory. Control words resident in the shared memory and constantly monitored by both processors serve as a means for inter-processor communications. Alternatively, a conventional V77-V77 Channel Interface can connect the front end and host.

All memory need not be shared. Each processor can have one Memory Bus attached to the shared memory and another Memory Bus attached to the non-shared memory.

Software modules are available which allow V77 operation within either Univac or IBM networks. One package, for example, allows Uniscope terminals, and software, to operate with V77 systems, and permit V77s to communicate as distributed systems with Univac hosts. Such communications emulates Univac 1004 remote batch protocol. Another package permits V77 access to an IBM 360/370 system in 3270 emulation, and yet another permits V77 operation as a HASP/RJE workstation.

TRANSMISSION SPECIFICATIONS

Multi-line controllers are offered for support of communications lines. Four Data Communications Multiplexers (DCM) are offered to support 8, 16, 32, or 64 lines. One of the DCM's come in two versions; one version is for systems with the Megamap feature, and the second is for systems without Megamap. Eight types of Line Adapters are provided for attachment to the Data Communications Multiplexers. Depending upon the adapter selected, RS 232C, CCITT V24, 20/60 ma current loop, or 20/60 ma relay current loop interfaces are supported. One adapter provides BSC protocol, and the others are for other character control protocols. Where applicable, the required character control

protocol and line speed can be selected programmatically. All Line Adapters, except the BSC Line Adapter, can support up to four lines operating at up to 9600 bps. The BSC Line Adapter can support only one line at up to 50,000 bps. Table 2, Line Adapters for the Data Communications Multiplexers, lists the line interfaces offered.

Each of the Data Communications Multiplexers requires two slots in either the mainframe chassis or the expansion cabinet. Both the V77-200 and V77-400 are limited to a single eight-line multiplexer, which is located in the mainframe chassis for either system. The V77-600 and V77-800 can each support up to four 64-line multiplexers, yielding up to 256 communication line interfaces. Whether the multiplexers are housed in the main or expansion cabinet, or both, will depend on the number of slots that are occupied by I/O controller units. The maximum system configurations for the 600 and 800 of 256 lines assumes that each system is devoted almost entirely to communications processing. The addition of I/O controller units will proportionately decrease the number of multiplexers (and lines) that can be configured.

SOFTWARE

The V77 operating system is VORTEX, a multi-programming, disc-oriented system. For systems with a minimum of 16K and a maximum of 32K words of memory, VORTEX I is the operating system. VORTEX II is used for systems with more than 32K words of memory. The difference is that VORTEX II provides software support for the Megamap feature necessary to develop addresses greater than 32K.

The Summit operating system, announced in December 1978, is an expansion of VORTEX II. It is designed to operate ►

TABLE 3. LINE ADAPTERS FOR THE DATA COMMUNICATIONS MULTIPLEXERS

Type of Line Interface	Supported Modem Type	Model No.	No. of Lines	Timing	Mode	Speed, bps
RS 232C, CCITT V24	Bell 103, 202	F3001-00	4	Async.	F/H	Up to 9600
RS-232C; direct connection to CPU (within 50 feet)	—	F3001-01	4	Async.	F/H	Up to 9600
20/60 ma current loop; direct connection to CPU (50 to 500 feet)	—	F3001-02	4	Async.	F/H	Up to 9600
20/60 ma relay current loop; telegraph network compatible	—	F3001-03	4	Async.	F/H	300
RS 232C, CCITT V24	Bell 201, 208	F3001-04	4	Sync.	F/H	Up to 9600
RS 232C; BSC	Bell 201, 208, 300	F3001-05	1	Sync.	F/H	Up to 9600; 50,000*
RS 232C, CCITT V24	Bell 103, 202	F3001-07	4	Async.	F/H	Up to 9600
Auto Call Unit	Bell 801	F3001-06	4			

*Wideband Interface (F3006-00) required for Bell 300 at 50,000 bps.

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on either the V77-600 or V77-800 system, although each will also function with VORTEX II. Integrated within Summit are the PRONTO transaction manager, a modification of the VORTEX Telecommunications Access Method (VTAM), an interactive monitor for time-sharing applications, and the capability to perform all the program development and operating system functions that were available with VORTEX II. Communications is enhanced with Summit by the addition of separately-priced modules which include a DCA package offering V77 models the capability of communicating with Univac 90 or 1100 series computers in a distributed Communications Architecture environment. A complete DCA package is available which provides support for a mix of transaction and interactive processing and remote job entry. Other options available with Summit are the TOTAL data base manager, QL/77 (an inquiry language which works with TOTAL), and both Pascal and Fortran 77 compilers.

Utilizing the Megamap memory, VORTEX II or Summit divides main memory into 512-word pages. Each user application can utilize up to 64 pages of memory, or 32K words. This limitation is imposed by the maximum self-relative address containable in the instruction format. The Megamap system keeps track of the actual memory locations of each user page. Importantly, the pages for a particular user application need not be contiguous pages.

A set of modules that handle the telecommunications function are designated the Vortex Telecommunications Access Method (VTAM). One module, the Communication Control Module, is required to drive the communications controllers. A copy of the module is required for each type of communications controller attached to the system. For instance, the Data Communications Multiplexors would require a copy of this module to operate them. This module performs the I/O handler function.

Another VTAM module is the Terminal Control Module. This module performs the terminal handling function for each type of terminal attached to a specific line (Line Adapters).

The Network Control Module performs the logical link function and provides the operator with an interface to the communications system. Using a Network Definition Language, the operator can instruct this module to alter the network configuration. In this manner, lines or terminals can be dropped or added, logical links can be rerouted, and the status of a line can be ascertained.

Univac provides application packages that interface with VTAM. Included are:

- **HASP/RJE**— Permits a V77 to serve as a remote work station for an IBM 360/370.
- **TEN04**— Emulates a Univac 1004 terminal.
- **UT 200**— Emulates a CDC UT200 User Terminal.
- **PRONTO**— Provides interface control between communications and file access function. It can multi-task transactions and access files sequentially, index sequentially, or via TOTAL. TOTAL is the VORTEX data base management system. PRONTO permits a V77 to operate as a host to buffered asynchronous or IBM 3270-type terminals. A V77, with PRONTO, can also operate as a communications interface between an IBM 360/370 and multiple terminals.

Programming languages offered included COBOL, FORTRAN, RPG II, and DASMR (a macro assembler). MIDAS

is the microassembler used when the system includes the Writable Control Storage option.

MEMORY

Within the V77-600, dual-port memory can be expanded to two million bytes in 128K-byte increments.

Within the V77-400, dual-port memory can be expanded to 512K bytes in 64K-byte increments.

Within the V77-200, 16K, 32K, or 64K bytes of single-port memory is available.

The Memory Management System, Megamap, is required on the V77-400, 600, and 800 when memory exceeds 32K words. This feature, along with software support provided in VORTEX II, provides the addressing scheme that permits attachment of over one million memory words, equivalent to over two million bytes.

Cache Memory is available for the V77-600 (370-nanosecond cycle time, and V77-800 (150-nanosecond cycle time). Cache Memory is interjected between the processor and main memory and can almost double the speed for 90 percent of the processor/main memory transfers. This is accomplished by continually loading the 1024 words of this special memory with the most recently used instructions and data in anticipation of use by the processor.

Available only on the V77-400, 600, and 800, the Writeable Store (WCS) option permits user incorporation into firmware subroutines of instructions that are frequently used in his applications or that are time critical. When frequently used instructions are microcoded, the overall overhead of the system is reduced. WCS is available for the V77-400 and 600 in a single 1024-word increment. Up to 12K bytes of WCS is available for the V77-800. The V77-800 can also support 2K bytes of PROM in conjunction with WCS.

PROCESSOR FEATURES

The Priority Interrupt Module feature permits assignment of processing priority to up to 64 interrupt-type devices attached to the I/O Bus. Each device can be assigned one of eight priorities. The registers to store the mid-stream processing of a lower priority device in order to service a higher-priority interrupt are included. Each module occupies one slot on the Cardframe Chassis.

When direct memory access devices are attached to the I/O Bus, the Block Interlace Controller feature is required. This feature will accommodate up to ten devices. A maximum of eight Block Interlace Controllers can be added to one system and will handle a total of eighty devices. Each controller occupies one slot on the chassis.

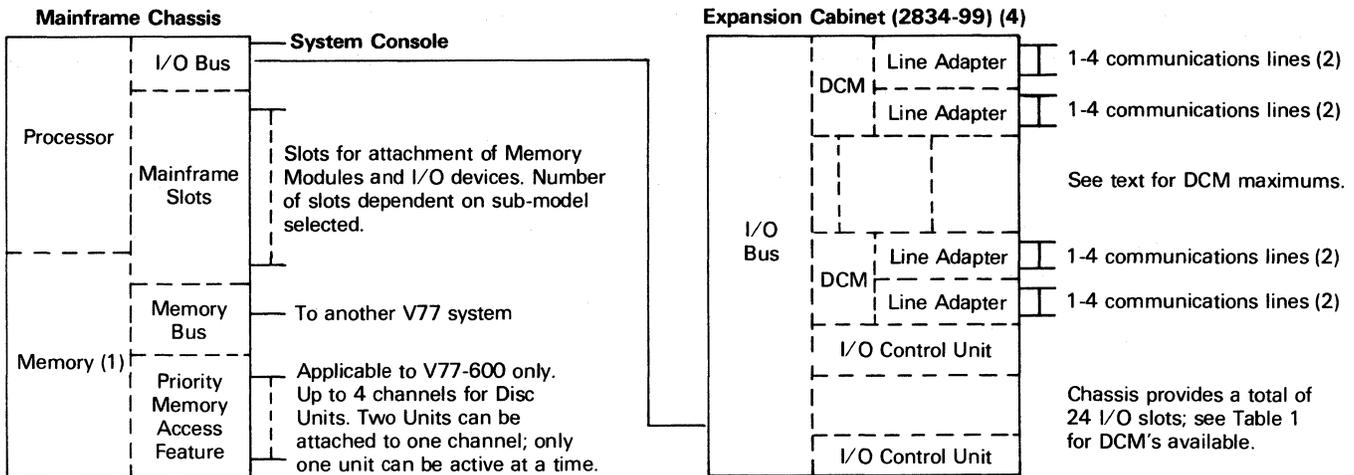
The Priority Memory Access feature provides for high-speed data transfer between discs (or special interfaces) and memory. This feature provides direct memory transfer of blocks of data over four channels. Each channel has a hard-wired priority. Although two disc units can be physically attached to a channel, only one unit can be active at a time. The PMA feature requires the presence of Block Transfer Controller. A maximum of four such controllers are allowed, with each controller occupying three slots of the Cardframe Chassis.

PERIPHERAL DEVICES

Up to four magnetic tape drives can be added to one magnetic tape controller, which occupies six slots of the I/O Cardframe Chassis. The units support 9-track, 800 bpi recording at either 25 ips or 37.5 ips with read after write. Drives with 1600 bpi and 800/1600 bpi formats that operate at 45 ips and 75 ips are also available.

Sperry Univac V77 Family Communications Capabilities

Configuration



- (1) All memory resides in the processor cabinet. Maximum of 64K bytes for V77-200, 512K bytes for 400, 1 megabyte for 600, and 2 megabytes for 300. Memory capacity over 512K bytes requires Memory Expansion Chassis. Cache memory can be added to the V77-600 and 800.
- (2) See Table 2 for number of slots of each line interface type requires. See Price List for the number of slots required for other attachable peripherals.

► Up to four disc drives can be added to one disc controller, which occupies from one to three slots of the Cardframe Chassis, depending on the disc model. Capacity of up to 128.9 million 16 bit words per spindle is available at a transfer rate of 604K words per second.

Fixed Head Disc is also available; up to 246K words per unit is provided. Each controller occupies three slots. The transfer rate is 105K words per second.

A single drive and a dual drive diskette unit are offered for all V77 modles. Primarily, the units are intended for V77-200 models as used data entry devices. Each drive has a capacity of 295K 16 bit words.

Teleprinters, card readers/punches, paper tape readers, display stations, printers, and plotters are also available and are listed in the price list.

PRICING

Univac's V77 systems are available only on a purchase basis. A service contract is available for full service within 100 miles of a Univac service center. The cost is based on a monthly service charge for each feature incorporated into the system. There is a minimum charge of \$150 per month.

There is a one time field installation charge that depends on the features installed with a \$300 minimum.

Software is unbundled and is purchased for a one time charge. The amount of post-purchased software support is dependent upon the level of support associated with the package. After purchase, the class of support ranges from continually supplying new releases (class 1) to limited correction support (class 3). The latter class applies to low volume software packages.

		Purchase Price	Monthly Maintenance
2808-99	Processors and Memory— Basic V77-800; 24 mainframe slots 128K bytes Memory 256K bytes Memory 12K bytes Writeable Control Store	\$28,000 5,000 9,000 4,000	\$221 50 95 42
2806-99	Basic V77-600; 16 mainframe slots	20,175	171
F3020-01	32K bytes Memory	3,150	29
F3020-03	64K bytes Memory	5,350	50
F3020-05	128K bytes Memory	9,900	95
F3028-00	1K Cache Memory	4,150	45
F3034-01	1K words Writeable Control Store (64-bit)	4,000	35
F3034-02	2K words Writeable Control Store (64-bit)	7,500	60
2804-99	Basic V77-400; 2 universal slots	18,400	152
F3020-08	16K bytes Memory	1,450	17
F3020-10	32K bytes Memory	2,200	25
F3020-12	64K bytes Memory	4,000	42
F3034-03	1K words Writeable Control Store (32-bit)	3,000	32
2802-99	Basic V77-200; one universal slot	13,200	121
F3020-08	16K bytes Memory	1,450	17
F3020-10	32K bytes Memory	2,200	25
F3020-12	64K bytes Memory	4,000	42
F3037-00	Memory Expansion Chassis; 7 slots; for V77-600; requires power supply	1,100	150
2834-99	Expansion Cabinet; requires Power Supply	3,000	14
F3035-03	System Power Supply	4,150	45

Sperry Univac V77 Family Communications Capabilities

		<u>Purchase Price</u>	<u>Monthly Maintenance</u>
Data Communications Multiplexers—			
F3000-99	8-Line, Async./Sync., up to 9600 bps; for V77-200	2,025	25
F3000-98	8-Line, Async./Sync., up to 9600 bps; for V77-400/600/800	2,025	25
F3000-97	16-Line, Async./Sync., up to 9600 bps; for V77-600/800	3,000	33
F3000-96	32-Line, Async./Sync., up to 9600 bps; for V77-600/800	4,475	44
F3000-95	64-Line, Async./Sync., up to 9600 bps; for V77-600/800	6,425	77
Line Adapters—			
F3001-00	4-Line, Async., RS-232C, CCITT V24	750	7
F3001-01	4-Line, Async., RS 232C, Direct	750	7
F3001-07	4-Line, Async., RS 232C, CCITT V24, 6 speed programmable	1,200	11
F3001-02	4-Line, Async., current loop	750	7
F3001-03	4-Line Async., relay current loop	1,000	7
F3001-04	4-Line, Sync., RS 232C, CCITT V24	1,500	11
F3001-05	1-Line, Binary Synchronous (BSC), RS 232C	1,500	11
F3006-00	50,000 bps operation; Wideband Interface	250	6
F3001-06	4-Line, Automatic Call Unit (Bell 801)	1,000	11
Peripherals			
F3012-99	Disc Memory Controller; for up to 4 Disc Memory Drives on 77-600/800 (3 Universal and one processor Slots)	9,825	75
F3012-98	Disc Memory Controller; for disc Memory Drives on 77-400 Computers (3 Universal slots)	8,325	70
F3012-04	Dual Access Option for Disk Drive; supports 3 Disc Drives (requires 2 controllers)	3,500	35
F3012-05	Dual Access Option for Disk Drive; supports 7 Disc Drives (requires 2 controllers)	4,000	40
2825-00	Disc Memory Drive; 17 million 16-bit words	13,000	190
F3038-00	Disc Pack	750	—
2825-03	Disc Memory Drive; 33.9 million 16-bit words	16,000	210
F3013-00	Disc Pack	750	—
2826-00	Disc Memory Drive; 64.4 million 16 bit words	25,000	320
F3014-00	Disc Pack	1,500	—
2826-03	Disc Memory Drive; 128.9 million 16 bit words	32,000	330
F3015-00	Disc Pack	1,500	—
2827-99	Disc Memory and Controller; 4.68 million 16 bit words; one fixed and one removable disc (2 standard slots)	14,050	113
2827-04	Disc Memory Slave Unit; up to 3	9,000	83
F3012-00	Disc Pack	200	—
2812-00	Card Reader; 300 cpm, includes controller (1 standard slot)	4,500	44
2813-00	Card Punch; 35 cpm, includes controller (3 standard slots)	11,500	100
2819-99	Printer; 165 cps, include controller	6,850	86
2820-99	Line Printer; 300 lpm, includes controllers	14,100	121
2820-96	Line Printer; 600 lpm, includes controller	18,400	133
2821-99	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 25 ips (4 standard slots)	8,950	78
2821-96	Additional Magnetic Tape Unit; up to 3	7,200	60
2821-93	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 37.5 ips, read after write (4 standard slots)	10,450	86
2821-90	Additional Magnetic Tape Unit; up to 3	8,200	66
2836-99	Magnetic Tape Unit and Controller; Dual-Density; 9 track 800/1600 bpi, 75 ips	14,900	128

SOFTWARE

		<u>One Time Charge</u>
6300-00	VORTEX Real Time Operating System	\$ 1,000
6301-00	VORTEX II Real Time Operating System	1,000
6303-00	TOTAL Data Base Management System	9,500
6305-00	RPG II/VIDEO Package	2,000
6304-00	COBOL	5,000
6308-00	VORTEX Telecommunication Access Method (VTAM)	500
6309-00	ISAM	1,500
6310-00	Data Management Package (QSAM, Sort/Merge, MOVE Copy)	2,500
6311-00	PRONTO	6,000
6319-00	Commercial Software Package	15,000
6312-00	Telecommunication & Commercial Software Package	21,000
6317-00	HASP/RJE Application Program	3,000
6320-00	TENO4/RJE	2,500
6311-03	V77 Host Access Module	4,000
6311-06	Univac Host Access Module; Uniscope emulation	6,000
6311-09	IBM Host Access Module; 3270 emulation	8,000
—	Summit Operating System	6,000
—	CP77 Time Sharing System	1,500
—	Distributed Communications Architecture (DCA) Module	4,000
—	RJE for Univac 1100	2,000
—	FORTRAN 77 Compiler	5,000
—	QL/77: Inquiry language for PRONTO	3,000
—	Pascal Compiler	2,000■

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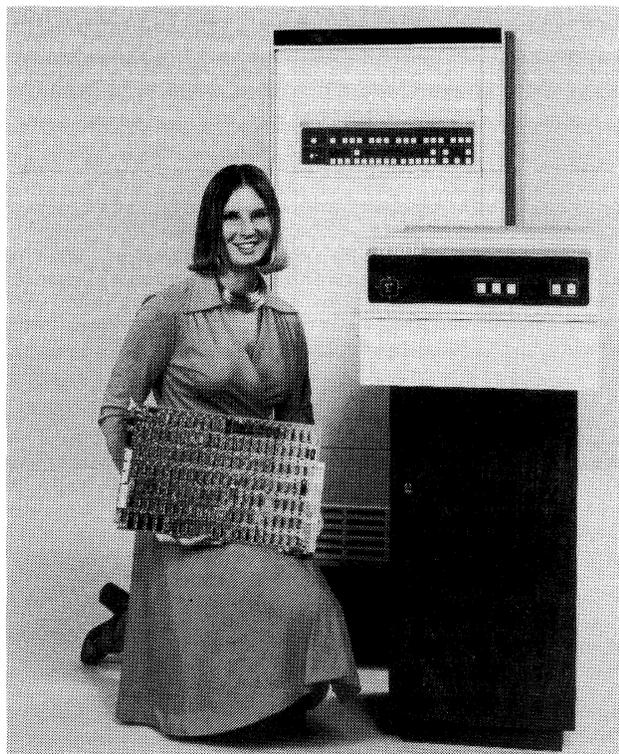
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Varian V77 Family Communications Capabilities



The powerful V77-600 stands in the background, allowing other family members, the V77-400 with the pedestal cabinet and the V77-200 held by the model, to bask in the foreground.

MANAGEMENT SUMMARY

Evolution of the V70 series minicomputers, which have been marketed by Varian since 1974, has produced the V77 family, with more memory and options than previously available. The V77 family can support slightly over one million words (or over two million bytes) of main memory.

The intermediate-speed and highest-speed V77 models are attractive from a communications standpoint because they support dual-port memory. The dual ports permit two local processors to share or have access to the same memory module. When a V77 is used as a front-end to another V77 host, shared memory between them gives the host immediate access to data stored by the front-end from communications lines. The extra step of moving data from the front-end to the host's memory is eliminated. Similarly, data released by the host for front-end processing is available to the front-end without first having to be transferred to the front-end memory. Shared memory arrangements also permit establishment of a network where a secondary host or a secondary front end is able to access data awaiting prime processor action when the prime processor fails; this is a definite fallback advantage.

A family of three minicomputer models with varying processor speeds that support communications lines with speeds up to 9600 bps for character-oriented protocols except BSC, which is supported at up to 50,000 bps.

A total of up to 256 communications lines can be physically attached to one system. Dual-port memory facilitates network arrangements that can minimize data transfers between two or more local processors. Data files can be given high-priority direct memory access.

A V77-200 system with 32K words, a systems console, one disc drive, and support for 32 communications lines costs \$38,125. A V77-600 with the same configuration except for 64K words of memory costs \$50,575. The maintenance contract charge for the 200 system is \$381 per month and \$474 per month for the 600 system.

CHARACTERISTICS

VENDOR: Varian Data Machines, a division of Varian Associates, 2722 Michelson Drive, Irving, California 92664. (714) 833-2400.

DATE OF ANNOUNCEMENT: November 1976.

DATE OF FIRST DELIVERY: December 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Varian Data Machines.

CONFIGURATION

The V77 family of minicomputers includes three basic models, each with a different processor, to provide three levels of price and performance. The highest-speed V77-600 is based on a 165 nanosecond, 64 bit microword processor. This processor is essentially an improved version of the V76 model of Varian's V70 minicomputer series. The V77-600 can execute a macroinstruction in two or three microcycles.

The intermediate-speed V77-400 has a 220 nanosecond, 32 microword processor. The processor is a new Varian development for the V77 family that executes a macroinstruction in three or four microcycles.

The slowest-speed V77-200 has a 165 nanosecond, 24 bit microword processor. This processor is also newly developed and requires two to three microcycles to execute a macroinstruction.

Main memory for all three basic models features the same 660 nanosecond cycle time and 16 bit word organization.

Varian V77 Family Communications Capabilities

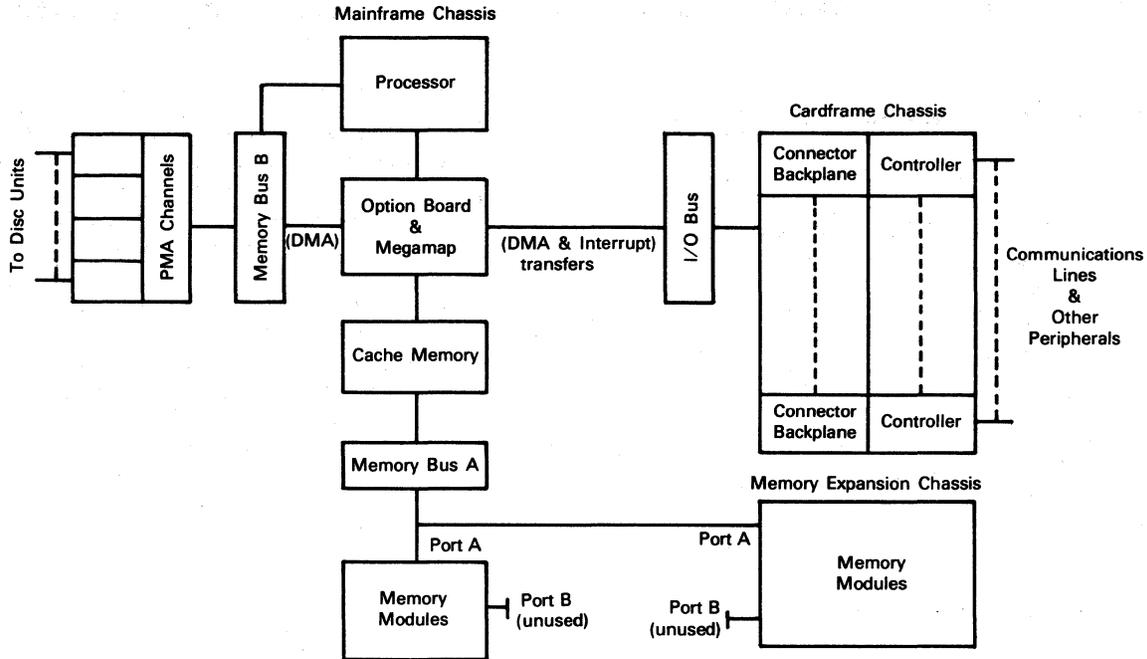


Figure 1. Typical V77-600 Single-Processor Bussing Structure

▷ The ability to give special high-priority direct memory access to disc files, at transfer rates up to 604K (16 bit) words per second, should be of interest to networks that require especially heavy access to random files.

While no feature is yet provided that supports a bit-oriented line control protocol, Varian has stated that it intends to support SDLC. Binary Synchronous Communications protocol is supported at speeds up to 50,000 bps. Other control protocols are supported at speeds up to 9600 bps.

The utilization of different minicomputers for each of the three models of the V77 family is a departure from the V70 product line where essentially one minicomputer served almost all models.

The offering of predefined starting configurations simplifies system building within an architecture that is already devoid of complicated exceptions and conditions, making it easy to tailor a configuration.

The destiny of Varian Data Machines is, at the moment, being determined in the board rooms of Varian Associates and the Sperry Rand Corporation. While both parties explore the possibility of Varian Data Machines becoming part of the Sperry Univac organization, the industry can do little but wait, watch, and calculate the odds for a June wedding. □

▶ In addition to the processor differences, the models differ in their: maximum allowable memory size; internal data transfer methods; firmware options; number of memory ports; and supportability of cache memory, memory parity,

memory protect, and floating-point options. The basic processor models with certain options are offered with unique sub-model numbers. For instance, a basic V77-600 with Priority Memory Access is designated the V77-601.

Single and multi-line communications controllers are available to handle synchronous and asynchronous lines in either full- or half-duplex modes with speeds up to 9600 bps. Binary Synchronous Communications protocol lines are supported up to 50,000 bps. Standard interfaces include RS232C, CCITT V24, 20 ma and 60 ma current loop and telegraph network-compatible.

VTAM is the telecommunications access method software for the V77's operating system, VORTEX. VTAM modules drive the communications controllers, handle the communications lines for supported protocols, and provide for network control and modification.

V77-600 Architecture

The foundation of the V77-600 architecture (see Figure 1) is a dual-port memory and up to three busses that permit variable, or even customized, arrangements of data transfer paths. Each 16K, 32K, or 64K word memory module has an "A" port and a "B" port.

In a typical single processor arrangement, only the "A" port is used. It is attached to the Memory Bus A and is the only access to memory. The bus is also attached to a 370 nanosecond Cache Memory. In addition to being a funnel for all transfers to and from memory, the Cache Memory, with 1024 words, will have the most recently used instructions and data readily available for processor use; the information is accessible in little more than half the time required to retrieve it from the 660 nanosecond main memory. The Cache Memory is also attached to the Megamap and the Option Board features. The latter feature, in turn, is attached to one of the two processor lines. Data, instructions, and memory address commands traveling from the processor to memory "functionally" go through the

Varian V77 Family Communications Capabilities

gauntlet of: processor to Option Board, Option Board to Megamap for any address extension necessary, then to the Cache Memory, to the Memory Bus A, and finally into memory through Port A. Information traveling from memory to the processor runs the same gauntlet in the other direction.

The largest memory addressable by the basic instruction repertoire is 32K words. When the memory size is greater than 32K, the Megamap option is required. This memory management feature is capable of expanding the addressable space to 1,048,576, which is the maximum amount of memory that can be attached to the system.

In addition to the processor and the Cache Memory being attached to the Option Board, the I/O Bus and the Memory Bus B are attached. In this arrangement, the Memory Bus B is a misnomer. It is really a bus providing a direct connection between the processor, the Priority Memory Access (PMA) option, and the Option Board (for access to memory). The PMA provides four channels for attachment of high speed I/O interfaces or devices such as disc units. With the PMA, data can be block transferred between disc and memory without the discs having to contend for access on an equal footing with the other I/O's. The four channels have hard-wired priorities for servicing by Memory Bus B. The second processor line is attached to Memory Bus B for direct control of disc transfers.

The I/O Bus is attached to the Option Board and backplanes in the I/O Cardframe Chassis. The Cardframe Chassis has 24 slots for attachment of I/O devices. An Expansion Chassis provides an additional 24 slots. The chassis have multiple standard backplanes; various Connector Planes are available, dependent upon the I/O devices to be added to the system. The controllers necessary to drive the selected devices are attached to the Connector Plane and to the devices themselves. Controllers are provided for communications lines, disc drives, magnetic tape drives, diskette drives, printers, and display stations.

Data being transferred between a device attached to the I/O Bus and memory can be transferred directly or through program control (interrupt). The method is dependent on the type of controller employed and VTAM software support. Direct memory transfer is accomplished without the time-consuming processor intervention. Devices that cause interrupts can be assigned one of eight priorities for processor servicing. Up to 64 such devices can be so assigned.

The Cache Memory is an optional feature that the manufacturer estimates increases the transfer rate of 90 percent of the data between memory and the processor. When the cache memory is not included in the configuration, Memory Bus A is connected to the Option Board & Megagroup features.

The mainframe chassis is available in two sizes. The seven-inch high version accommodates the control panel, the processor, 256K words of memory, the Option Board, and fans and provides accommodation for the I/O and Memory Expansion Chassis. Seven bus slots are required to accommodate the above features. The 14-inch high version is identical to the 7-inch version, except that an additional 9 slots are available for certain options, such as memory, Megamap, Cache Memory, and Floating-Point.

When more memory than can be accommodated in the mainframe is required, the Memory Expansion Chassis is required. The System system power supply also requires its own chassis.

A Teletype/CRT controller, a Programmer's Console and a Real-Time Clock are integral with the basic V77-600.

In addition to the vendor supplied microcode, the user can optionally add up to 4096 words of his own microcode to a 64-bit, 190-nanosecond Writable Control Store.

In a two-processor arrangement, as shown in Figure 2, memory can be shared. A Memory Bus is attached to each

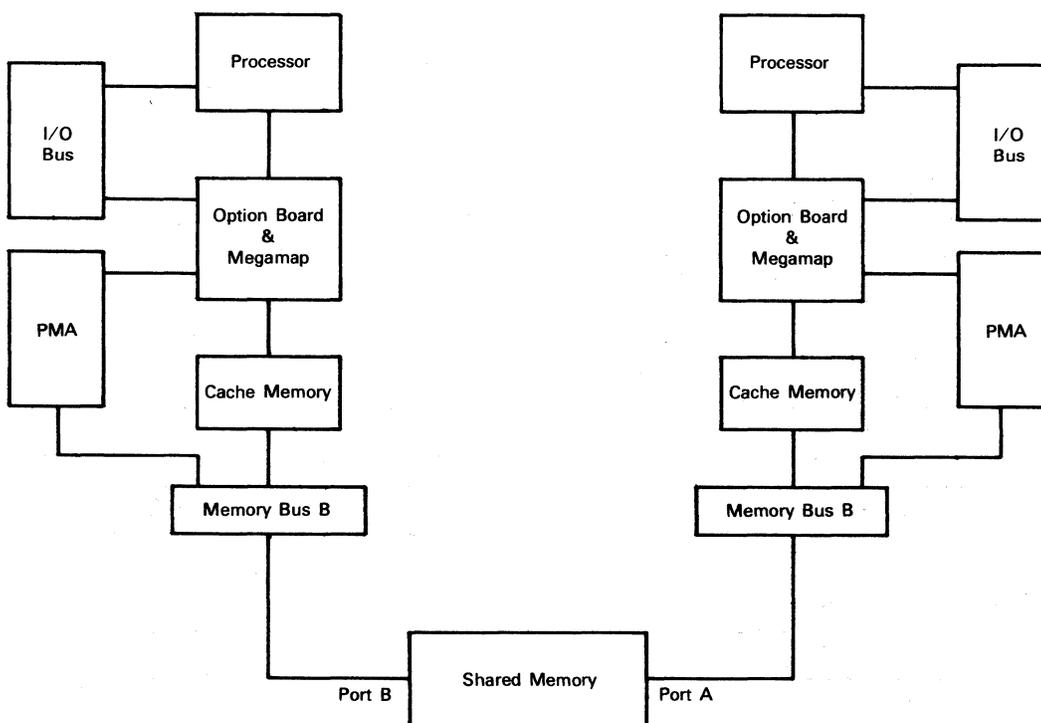


Figure 2. Typical V77-600 Dual-Processor Bussing Structure

Varian V77 Family Communications Capabilities

TABLE 1. DATA COMMUNICATIONS MULTIPLEXORS

Multiplexor Model (1)	No. of Lines Supported	Timing	Speed, bps	No. of 3518 Backplanes (2)	No. of 3519 Backplanes (3)	Total Chassis slots Occupied
70-5200, 10	8	Async./Sync.	Up to 9600	1	—	4
70-5201, 11	16	Async./Sync.	Up to 9600	1	1	8
72-5202, 12	32	Async./Sync.	Up to 9600	1	2	12
72-5203	64	Async./Sync.	Up to 9600	1	4	20

(1) 70-5200 to 03 for systems without Megamap; 70-5210 to 13 for systems with Megamap.

(2) Each 3518 Connector Backplane supports two Line Adapters and occupies four slots in the Cardframe Chassis.

(3) Each 3519 Connector Backplane supports two Line Adapters and occupies four slots in the Cardframe Chassis.

► of the two memory ports. Each bus is attached to one of the two processors (via Cache, Option Board, etc.). Each processor can be simultaneously accessing different modules of memory under this arrangement. When both processors attempt to access the same module simultaneously, the processor whose Memory Bus is attached to Port A of the memory will receive first priority. The bus attached to Port B will always have to wait until the Port A access is completed.

To illustrate the variability of arrangements possible, the PMA in Figure 2 is not attached as described in Figure 1. Instead, it is attached to the same bus that is connected to memory. In Figure 2, the I/O Bus has been given the second line to the processor and, therefore, enjoys the kind of processor service that the PMA enjoyed in Figure 1.

V77-200 Architecture

The V77-200 is designed for applications requiring 8K, 16K, or 32K 16 bit words of main memory. The memory size limitation eliminates the need for the Megamap feature. V77-200 main memory is single-port. Cache memory, Writable Control Storage, Programmer's Console, and Priority Memory Access are not supported by this model; Direct Memory Access is standard. Using a 4-Channel Interface Controller, the V77-200 can be connected to a V77-600. The V77-200, then, can be utilized as a tightly coupled front-end processor to the V77-600 host.

V77-400 Architecture

The V77-400, although equipped with a slower speed processor, is functionally the same as the V7-600, except that it does not support Cache Memory, Priority Memory Access, Floating-Point, or the Programmer's Console.

This model supports a dual port memory controller and can share memory with a V77-600, thus lending itself to use as a tightly coupled front-end communications processor to a V77-600 host.

CONNECTION TO HOST COMPUTER

When a V77 is used as a front-end processor and another V77 is the host, the front-end can merely place data destined for the host into memory shared by both the host and the front-end. Conversely, data destined for a communications line is placed by the host in the shared memory. Control words resident in the shared memory and constantly monitored by both processors serve as a means for inter-processor communications. Alternatively, a conventional V77-V77 Channel Interface can connect the front end and host.

All memory need not be shared. Each processor can have one Memory Bus attached to the shared memory and another Memory Bus attached to the non-shared memory.

TRANSMISSION SPECIFICATIONS

Single-line and multi-line controllers are offered for support of communications lines. The communications controllers are mounted in the I/O Cardframe Chassis or its expansion chassis. Four Data Communications Multiplexors (DCM) are offered to support 8, 16, 32, or 64 lines. The four DCM's come in two versions; one version is for systems with the Megamap feature, and the second is for systems without Megamap. Eight types of Line Adapters are provided for attachment to the Data Communications Multiplexors. Depending upon the adapter selected, RS 232C, CCITT V24, 20/60 ma current loop, or 20/60 ma relay ►

TABLE 2. LINE ADAPTERS FOR THE DATA COMMUNICATIONS MULTIPLEXORS

Type of Line Interface	Supports Modem Type	Model No.	No. of Lines	Timing	Mode	Speed, bps
RS 232C, CCITT V24	Bell 103, 202	70-5301	4	Async.	F/H	Up to 9600
RS-232C; direct connection to CPU (within 50 feet)	—	70-5302	4	Async.	F/H	Up to 9600
20/60 ma current loop; direct connection to CPU (50 to 500 feet)	—	70-5303	4	Async.	F/H	Up to 9600
20/60 ma relay current loop; telegraph network compatible	—	70-5304	4	Async.	F/H	300
RS 232C, CCITT V24	Bell 201, 208	70-5305	4	Sync.	F/H	Up to 9600
RS 232C; BSC	Bell 201, 208, 300	70-5306	1	Sync.	F/H	Up to 9600; 50,000 (1)
RS 232C, CCITT V24	Bell 103, 202	70-5308	4	Async.	F/H	Up to 9600
Auto Call Unit	Bell 801	70-5307	4			

(1) 70-5801 option required for Bell 300 at 50,000 bps.

(2) Includes Auto Answer.

Varian V77 Family Communications Capabilities

TABLE 3. SINGLE LINE CONTROLLERS

Type of Line	Supports Modem Type	Model No.	Timing	Mode	Speed, bps	Number of Chassis slots Utilized
RS 232C, CCITT V24	Bell 103, 202	70-5401	Asyn.	F/H	Up to 9600	1
	Bell 103, 202	70-5402	Asyn.	F/H	Up to 9600	1 (1)
	Bell 201	70-5403	Sync.	F/H	Up to 50,000	2 (2)
Universal Serial Controllers (3)						
RS 232C	—	70-5601	Asyn.	—	—	1
20/60 ma current loop	—	70-5602	Asyn.	—	—	1
20 ma relay current loop	—	70-5603	Asyn.	—	—	1
Auto Call Unit Controller	Bell 801	70-5701	Asyn.	—	—	1

(1) Supports dual data set.

(2) DMA Data Transfer; requires Feature 70-5504 for full-duplex; occupies two additional slots.

(3) Requires Integral Power Supply Feature that occupies 8 chassis slots.

current loop interfaces are supported. One adapter provides BSC protocol, and the others are for other character control protocols. Where applicable, the required character control protocol and line speed can be selected programmatically. All Line Adapters, except the BSC Line Adapter, can support up to four lines operating at up to 9600 bps. The BSC Line Adapter can support only one line at up to 50,000 bps. Table 2, Line Adapters for the Data Communications Multiplexors, lists the line interfaces offered.

Each Data Communications Multiplexor requires four slots in the Cardframe Chassis. Since the chassis has no backplane, a specific connector plane, the Data Communications Connector Plane (DCM), is required to provide the appropriate connections for the four slots. Two of the slots provide the electrical connection for the multiplexor, and the two remaining slots provide the connection for two Line Adapters. For non-BSC protocol lines, two adapters so connected support eight communications lines. When the Data Communications Multiplexor is for 16, 32, or 64 lines, additional Line Adapters must be mounted in the chassis. A second specialized connector plane, the Line Adapter Connector Plane (LAD), is required to provide the electrical connection. This backplane can support four Line Adapters, or a maximum of 16 lines. The backplanes each utilize four chassis slots. Four such backplanes and 16 Line Adapters would be required for 64 lines. (See Table 1.)

The Single-Line Controllers, Table 3, utilize one or three chassis slots and include their own backplane.

SOFTWARE

The V77 operating system is VORTEX, a multi-programming, disc-oriented system. For systems with a minimum of 16K and a maximum of 32K words of memory, VORTEX I is the operating system. VORTEX II is used for systems with more than 32K words of memory. The difference is that VORTEX II provides software support for the Megamap feature necessary to develop addresses greater than 32K.

Utilizing the Megamap memory, VORTEX II divides main memory into 512-word pages. Each user application can utilize up to 64 pages of memory, or 32K words. This limitation is imposed by the maximum self-relative address containable in the instruction format. The Megamap system keeps track of the actual memory locations of each user page. Importantly, the pages for a particular user application need not be contiguous pages. With TSS, the Vortex Time Sharing Sub-system, up to 16 users, each utilizing up to 64 pages of memory, can be active simultaneously.

A set of modules that handle the telecommunications function are designated the Vortex Telecommunications Access Method (VTAM). One module, the Communication Control Module, is required to drive the communications controllers. A copy of the module is required for each type of communications controller attached to the system. For instance, the Data Communications Multiplexors would require a copy of this module to operate them. This module performs the I/O handler function.

Another VTAM module is the Terminal Control Module. This module performs the terminal handling function for each type of terminal attached to a specific line (Line Adapters).

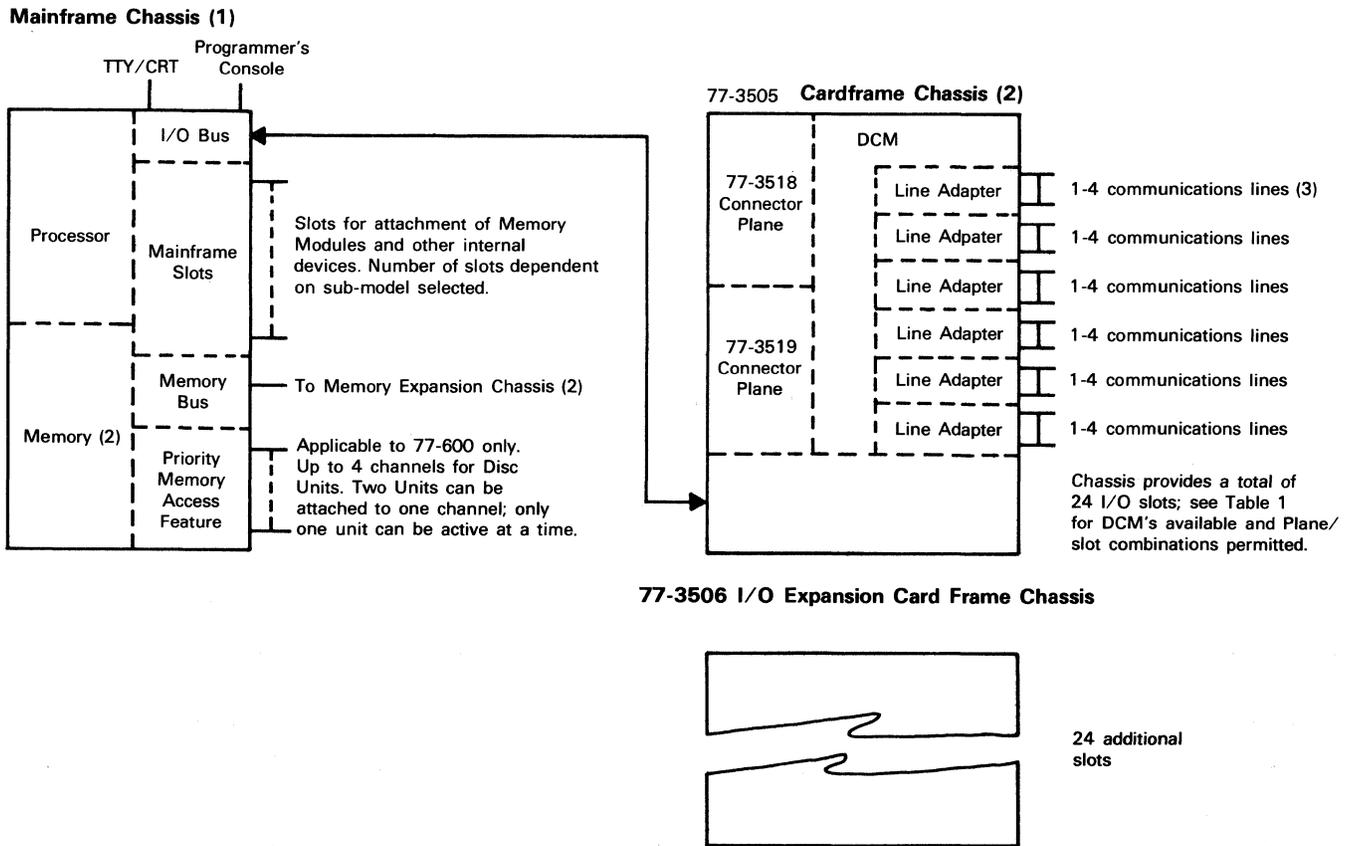
The Network Control Module performs the logical link function and provides the operator with an interface to the communications system. Using a Network Definition Language, the operator can instruct this module to alter the network configuration. In this manner, lines or terminals can be dropped or added, logical links can be rerouted, and the status of a line can be ascertained.

Varian provides application packages that interface with VTAM. Included are:

- HASP/RJE— Permits a V77 to serve as a remote work station for an IBM 360/370.
- TEN04— Emulates a Univac 1004 terminal.
- UT 200— Emulates a CDC UT200 User Terminal.
- TSS— Gives users of up to 16 local or remote terminals access to interactive time-shared BASIC, a timeshared editor, and the VORTEX II background job stream. The number of users as well as their priority, timeslice, memory allocation, and other variables are under operator control.
- PRONTO— Provides interface control between communications and file access function. It can multi-task transactions and access files sequentially, index sequentially, or via TOTAL. TOTAL is the VORTEX data base management system. PRONTO permits a V77 to operate as a host to buffered asynchronous or IBM 3270-type terminals. A V77, with PRONTO, can also operate as a communications interface between an IBM 360/370 and multiple terminals.

Varian V77 Family Communications Capabilities

Configuration



- (1) The mainframe, I/O Cardframe, and Memory Expansion Chassis are resident in the same cabinet.
- (2) Maximum of 32K words in Model 200; maximum of 1024K words in other models. Cache memory can be added to the Model 600.
- (3) See Tables 2 and 3 for number of slots of each line interface type requires. See Price List for the number of slots required for other attachable peripherals.

► Programming languages offered include COBOL, FORTRAN, RPG II, and DASMR (a macro assembler). MIDAS is the microassembler used when the system includes the Writable Control Storage option.

MEMORY

Within the V77-600, dual-port memory can be expanded to 1024K words in 16K, 32K or 64K word increments. Memory can be obtained with or without parity. When parity is selected, each 16 bit word has two additional bits of parity, one for each eight bits (one byte).

Within the V77-400, dual-port memory can be expanded to 1024K words in 16K and 32K word increments. Parity is optional.

Within the V77-200, single-port memory can be expanded to 32K words in 8K, 16K, or one 32K word increment. Parity is not available.

The Memory Management System, Megamap, is required on the V77-400 and 600 when memory exceeds 32K words. This feature, along with software support provided in VORTEX II, provides the addressing scheme that permits attachment of over one million memory words, equivalent to over two million bytes.

Available only on the 600, the 370-nanosecond Cache Memory is interjected between the processor and main memory and can almost double the speed for 90 percent of

the processor/main memory transfers. This is accomplished by continually loading the 1024 words of this bipolar memory with the most recently used instructions and data in anticipation of reuse by the processor.

Available only on the V77-400 and 600, the Writable Control Store option permits user incorporation into firmware sub-routines of instructions that are frequently used in his applications or that are time critical. When frequently used instructions are microcoded, the overall overhead of the system is reduced. Writable Control Storage is available for the V77-400 in 1024-word (32 bits) increments up to 3072 words per system. For the 600, Writable Control Storage is available in modules of 512-, 1024-, or 2048-word (64 bits) increments up to 4096 words per system.

PROCESSOR FEATURES

The Priority Interrupt Module feature permits assignment of processing priority to up to 64 interrupt-type devices attached to the I/O Bus. Each device can be assigned one of eight priorities. The registers to store the mid-stream processing of a lower priority device in order to service a higher-priority interrupt are included. Each module occupies one slot on the Cardframe Chassis.

When direct memory access devices are attached to the I/O Bus, the Block Interlace Controller feature is required. This feature will accommodate up to ten devices. A maximum of eight Block Interlace Controllers can be added to one system and will handle a total of eighty devices. Each controller occupies one slot on the Cardframe Chassis.

Varian V77 Family Communications Capabilities

The Priority Memory Access feature provides for high-speed data transfer between discs (or special interfaces) and memory. This feature provides direct memory transfer of blocks of data over four channels. Each channel has a hard-wired priority. Although two disc units can be physically attached to a channel, only one unit can be active at a time. The PMA feature requires the presence of Block Transfer Controller. A maximum of four such controllers are allowed, with each controller occupying three slots of the Cardframe Chassis.

PERIPHERAL DEVICES

Up to four magnetic tape drives can be added to one magnetic tape controller, which occupies six slots of the I/O Cardframe Chassis. The units support 9-track, 800 bpi recording at either 25 ips or 37.5 ips with read after write. Drives with 1600 bpi and 800/1600 bpi formats that operate at 45 ips and 75 ips are also available.

Up to four disc drives can be added to one disc controller, which occupies from one to three slots of the Cardframe Chassis, depending on the disc model. Capacity of up to 128.9 million 16 bit words per spindle is available at a transfer rate of 604K words per second.

Fixed Head Disc is also available; up to 246K words per unit is provided. Each controller occupies three slots. The transfer rate is 105K words per second.

A single drive and a dual drive diskette unit are offered for all V77 models. Primarily, the units are intended for V77-200 models as used data entry devices. Each drive has a capacity of 295K 16 bit words.

Teleprinters, card readers/punches, paper tape readers, display stations, printers, and plotters are also available and are listed in the price list.

PRICING

Varian equipment is available only on a purchase basis. A service contract is available for full service within 100 miles of a Varian service center. The cost is based on a monthly service charge for each feature incorporated into the system. There is a minimum charge of \$150 per month.

There is a one time field installation charge that depends on the features installed with a \$300 minimum.

Software is unbundled and is purchased for a one time charge. The amount of post-purchased software support is dependent upon the level of support associated with the package. After purchase, the class of support ranges from continually supplying new releases (class 1) to limited correction support (class 3). The latter class applies to low volume software packages. ■

		Purchase Price	Monthly Maint.
MODEL 600 PROCESSORS			
V77-600	7-inch chassis; 9 mainframe slots	6,150	53
V77-601	7-inch chassis; 7 mainframe slots, PMA	6,550	57
V77-602	14-inch chassis; 16 mainframe slots	6,750	53
V77-603	14-inch chassis; 16 mainframe slots, PMA	7,150	57
77-2502	16,384 words MOS; Dual Port, 660 ns	2,900	27
77-2503	With parity	3,150	29
77-2504	32,768 words MOS; Dual Port, 660 ns	4,800	45
77-2505	With parity	5,300	50
77-2506	65,536 words MOS; Dual Port, 660 ns	8,900	85
77-2507	With parity	9,900	95
MODEL 200 PROCESSORS			
V77-200	Basic V77-200 Processor; one universal slot	1,200	15
77-2532	8,192 words MOS Memory; 600 ns cycle time, occupies one universal slot	1,350	17
77-2533	With parity	1,450	17
77-2540	16,384 words MOS Memory; occupies one universal slot	2,000	25
77-2541	With parity	2,200	25
77-2542	32,768 words MOS Memory, occupies one universal slot	3,600	42
77-2543	With parity	4,000	42
MODEL 400 PROCESSORS			
V77-400	Basic V77-400 Processor; 2 universal slots	2,650	30
77-2520	Memory Controller for up to 262,144 words of Dual Port MOS Memory; 600 ns	1,200	15
77-2532	8,192 words MOS Memory	1,350	17
77-2533	With parity	1,450	17
77-2540	16,384 words MOS Memory	2,000	25
77-2541	With parity	2,200	25
77-2542	32,768 words MOS Memory	3,600	42
77-2543	With parity	4,000	42
MEMORY EXPANSION CHASSIS			
77-9110	Memory Expansion Chassis; 7 slots	1,100	—
77-9111	Memory Expansion Chassis; 7 slots for memory shared by 2 or 3 processors	1,500	—
77-9112	Memory Expansion Chassis; 14 slots for memory shared by 2 or 3, 4, or 5 processors	2,500	—

Varian V77 Family Communications Capabilities

	<u>Purchase Price</u>	<u>Monthly Maint.</u>
DATA COMMUNICATIONS MULTIPLEXORS		
Non-Megamap Multiplexors—		
70-5200	8-Line, Async./Sync., up to 9600 bps	1,500 25
70-5201	16-Line, Async./Sync., up to 9600 bps	2,000 28
70-5202	32-Line, Async./Sync., up to 9600 bps	3,000 39
70-5203	64-Line, Async./Sync., up to 9600 bps	4,000 66
Megamap Multiplexors—		
70-5210	8-Line, Async./Sync., up to 9600 bps	1,500 25
70-5211	16-Line, Async./Sync., up to 9600 bps	2,000 33
70-5212	32-Line, Async./Sync., up to 9600 bps	3,000 44
70-5213	64-Line, Async./Sync., up to 9600 bps	4,000 77
Line Adapters—		
70-5301	4-Line, Async., RS-232C, CCITT V24	750 7
70-5302	4-Line, Async., RS 232C, Direct	750 7
70-5308	4-Line, Async., RS 232C, CCITT V24, 6 speed programmable	1,200 11
70-5303	4-Line, Async., current loop	750 7
70-5304	4-Line, Async., relay current loop	1,000 7
70-5305	4-Line, Sync., RS 232C, CCITT V24	1,500 11
70-5306	1-Line, Binary Synchronous (BSC), RS 232C	1,500 11
70-5801	50,000 bps operation	250 6
70-5307	4-Line, Automatic Call Unit (Bell 801)	1,000 11
SINGLE LINE CONTROLLERS		
70-5401	Async., RS 232C, CCITT V24	650 6
70-5402	Async., RS 232C, CCITT V24, dual data set	900 10
70-5403	Sync., RS 232C, CCITT V24	1,500 11
UNIVERSAL SERIAL CONTROLLERS		
70-5601	Async., RS 232C	600 6
70-5602	Async., current loop	600 6
70-5603	Async., relay current loop	600 6
70-5701	Auto Call Controller	1,250 9
CONNECTOR PLANS		
77-3505	Cardframe chassis; 24 slots (includes fan tray)	425 5
77-3506	Expansion Cardframe Chassis; 24 slots	150 3
77-3518	Connector Plane; requires 4 chassis slots for DCM and two Line Adapters	525 —
77-3519	Connector Plane; requires 4 chassis slots for four Line Adapters	475 —
77-3510	Connector Plane; requires 4 chassis slots for four Universal I/O Controllers	325 —
77-3511	Connector Plane; requires 8 chassis slots for eight Universal I/O Controllers	475 —
77-3514	Connector Plane; requires 4 chassis slots for standard I/O Controllers	475 —
77-3515	Connector Plane; requires 8 chassis slots for 8 Standard I/O Controllers	500 —
77-3516	Connector Plane; requires 12 chassis slots for 12 Standard I/O Controllers	625 —
77-3517	Connector Plane; requires 16 chassis slots for 16 Standard I/O Controllers	775 —
77-3509	General Purpose Wire Wrap Connector Plane (unwrapped) for 4 special I/O controllers	375 —
77-3540	Fan Tray; Cooling for two Cardframe Chassis	290 3
PROCESSOR FEATURES		
77-3003	Automatic Program Load for disc that operates with PMA (2 I/O chassis slots)	950 11
77-3100	Block Transfer Controller for PMA Feature (2 I/O chassis slots)	1,500 11
77-3101	Priority Interrupt Module for Program Control transfer; accommodates 8 priority levels	300 3
77-3102	Buffer Interlace Controller for DMA; accommodates 10 peripheral controllers (1 I/O chassis slot)	250 3
77-3204	Data Save Tray for up to 4 #77-3205; 6 buffer packs	75 —
77-3205	Data Save Battery Pack for 262,144 memory words	200 5
77-3206	Extended Duration Data Save Battery Pack	200 5
77-3207	Data Save & System Restart for up to 262,144 words memory with System Power Supply	325 5
77-3301	Megamap; Memory Management for one million words of memory (1 mainframe chassis slot)	1,900 20
77-3400	Floating Point Processor (3 mainframe chassis slots)	4,950 39
77-3500	Cache Memory 1,024 words, 370 ns (3 mainframe chassis slots)	4,000 35
Model 600 Writable Control Store—		
77-4002	512 words, 64 bits, 190 ns, (one mainframe chassis slot)	5,000 39
77-4003	1,024 words, 64 bits, 190 ns, (one mainframe chassis slot)	4,000 35
77-4004	2,048 words, 64 bits, 190 ns (one mainframe chassis slot)	7,500 60
77-4005	Model 400 Writable Control Store; 1024 words, 32 bits, 220 ns (one chassis slot)	3,000 32

Varian V77 Family Communications Capabilities

	Purchase Price	Monthly Maint.
POWER SUPPLIES		
77-4050	1,400	17
77-4052	1,650	20
77-4060	3,850	40
77-4061	4,150	45
77-4065	500	5
77-4066	2,350	23
77-4067	1,000	12
77-4068	300	5
77-4075	475	—
TELETYPEWRITERS		
70-6100	2,050	50
70-6102	4,250	40
70-6104	6,400	45
ROTATING MEMORY		
70-7500	21,000	175
70-7501	16,000	150
70-7502	500	—
70-7520	32,500	275
70-7521	26,500	240
70-7530	52,000	400
70-7531	45,600	300
70-7522	750	—
70-7540	9,500	75
70-7541	8,000	70
70-7545	3,500	35
70-7546	4,000	40
70-7551	13,000	190
70-7552	750	—
70-7553	16,000	210
70-7554	750	—
70-7555	25,000	320
70-7556	1,500	—
70-7557	32,000	330
70-7558	1,500	—
70-7603	13,800	110
70-7604	9,000	83
70-7605	200	—
70-7610	10,000	94
70-7611	7,500	72
70-7612	200	—
70-7613	11,500	105
70-7614	8,000	80
70-7700	10,000	72
70-7701	11,500	72
70-7702	13,000	88
70-7620	5,000	48
70-7621	4,250	38
70-7622	4,300	42
70-7623	3,450	34
70-7624	120	—
CABINETS		
77-9204	1,150	—
77-9205	1,600	—
77-9206	1,200	—
77-9207	1,650	—

Varian V77 Family Communications Capabilities

		<u>Purchase Price</u>		<u>Monthly Maint.</u>
CARD & PAPER TAPE READERS				
70-6200	Card Reader; 300 cpm, includes controller (1 standard slot)	4,500		44
70-6201	Card Punch; 35 cpm, includes controller (3 standard slots)	11,500		100
70-6301	Paper Reader; 300 cps, includes controller (1 standard slot)	2,300		25
DISPLAY STATIONS				
70-6401	Keyboard & alphanumeric CRT (Teletype replacement)	2,850		28
PRINTERS				
70-6710	Printer; 165 cps, include controller	6,600		83
70-6721	Line Printer; 300 lpm, includes controllers	13,200		113
70-6723	Line Printer; 600 lpm, includes controller	17,500		125
MAGNETIC TAPE				
70-7100	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 25 ips (4 standard slots)	7,500		75
70-7101	Additional Magnetic Tape Unit; up to 3	6,000		60
70-7102	Magnetic Tape Unit and Controller; 9 track, 800 bpi, 37.5 ips, read after write (4 standard slots)	9,000		83
70-7103	Additional Magnetic Tape Unit; up to 3	7,000		66
				<u>One Time Charge</u>
SOFTWARE				
70-9500	VORTEX Real Time Operating System		\$ 1,000	
70-9505	VORTEX II Real Time Operating System		1,000	
70-9506	VORTEX II Time Sharing Subsystem		3,500	
70-9507	TOTAL Data Base Management System		9,500	
70-9514	RPG II/VIDEO Package		2,000	
70-9509	COBOL		5,000	
70-9550	VORTEX Telecommunication Access Method (VTAM)		500	
70-9551	ISAM		1,500	
70-9952	Data Management Package (QSAM, Sort/Merge, MOVE Copy)		2,500	
70-9554	PRONTO		14,000	
70-9590	Commercial Software Package		15,000	
70-9555	Telecommunication & Commercial Software Package		27,500	
70-9580	HASP/RJE Application Program		3,000	
70-9581	TENO4/RJE		2,500	
70-9582	UT200/RJE		2,500	
70-9520	Standalone Software System		—	
70-9530	Standalone FORTRAN/DASMR		100	
70-9565	Standalone BASIC		100	
70-9560	V77-600 Microprogramming Software Package		100	
70-9570	MAINTAIN II		—	
70-9571	Test Package Update		—	