

## Altos Update

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## Product Announcement

Niakwa and Bluebird Systems are pleased to announce the availability of Basic-2C on the Altos line of Intel-based computers operating under the Unix V operating system. Basic-2C licensees will now be able to run their Basic-2C software on the Altos 80386 Series 500, 1000 and 2000 family of multi-user systems.

We are also proud to announce Bluebird's status as an authorized "Super VAR" for Altos hardware products within the United States. Bluebird will offer the full Altos product line when purchased with Basic-2C. Bluebird's sales productivity programs will be available for Basic-2C VARs who offer Altos through any domestic Bluebird sales office.

This newsletter will detail Bluebird's hardware distribution policies for Altos as well as give a perspective on Altos configuration and porting considerations and provide performance benchmark test results for your review.

## Altos Perspective

Altos Computer Systems of San Jose, California was founded in 1977 and has grown to sales in excess of \$175 million. In addition to its quick growth, Altos has shown a profit every quarter for the first ten years of its existence.

The company has no direct sales force. Instead, it sells exclusively through its VAR and Distribution programs, consisting of 60 direct and 1,200 indirect VARs.

## Altos Perception

In lieu of providing our own opinion of Altos Computer Systems, we elected to reprint the ratings given Altos by its own VARs.

VARBUSINESS, the magazine for value-added resellers and dealers, recently published its "1988 Annual Report Card Review". In this special issue, twelve major computer manufacturers were rated by over 1300 VARs. 120 of these VARs sold Altos systems.

Listed below is the Altos Report Card and the overall ratings of the 12 hardware vendors. The vendors were rated on a scale of 1 to 10, with 1 being the poorest grade and 10 the best.

VENDOR	GRADE	OVERALL AVERAGE
1. Apple	B	7.06
2. Altos	B	7.04
3. Prime	B	7.01
4. Texas Instruments	B-	6.86
5. Hewlett-Packard	B-	6.84
6. NCR	C	6.29
7. Data General	C-	6.11
8. DEC	C-	5.98
9. Unisys	D+	5.81
10. AT&T	D+	5.67
11. Wang	D	5.48
12. IBM	D	5.40

### ALTOS REPORT CARD

	Grade
1. Breadth of product line	7.18
2. Quality of products	8.49
3. Availability of products	8.33
4. Price/performance satisfaction	7.89
5. Satisfaction with profit margins	7.30
6. Processes orders promptly	7.87
7. Meets delivery schedules	7.88
8. VAR technical support services	6.41
9. Satisfaction with technical support charges	5.68
10. VAR marketing support services	6.04
11. Satisfaction with marketing support charges	6.02
12. Provision for hardware maintenance	6.16
13. Quality of information provided	6.55
14. Willingness to address VAR problems	6.36
15. Ability to address VAR problems	6.36
16. Commitment to VAR program	7.32
17. Interest in avoiding cross-channel conflict	7.53
18. Overall impression of vendor	7.61
<b>OVERALL AVERAGE</b>	<b>7.04</b>

## Altos 80386 Series Perspective

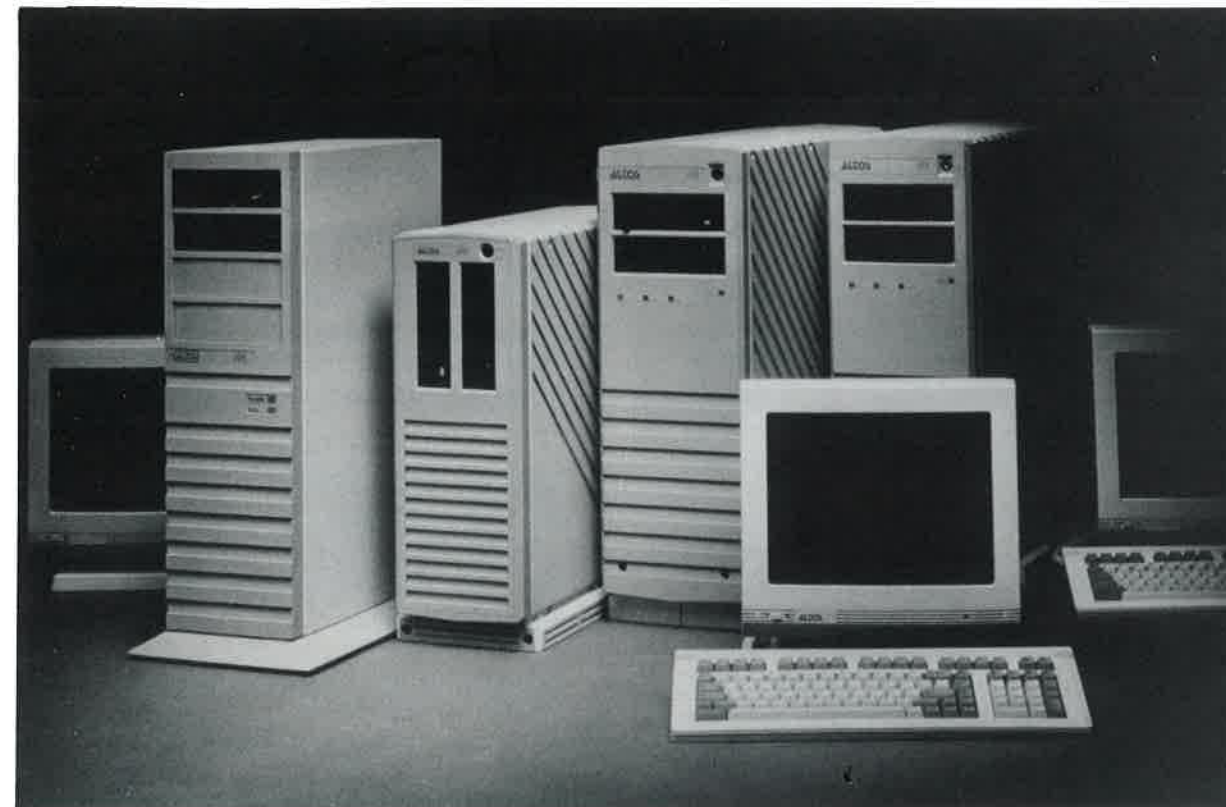
The Altos 80386 Series of processors, first released in 1987, includes three product families, the 500, 1000 and 2000.

The Altos 80386 Series uses the Altos System V operating system which is based upon SCO Xenix V.

Altos System V is upwardly compatible with Xenix 3 and Xenix V applications.

The Altos 80386 Series supports from 1-64 users and incorporates numerous disk drive options that can yield almost a gigabyte of on line storage.

For your review, the chart below lists specifications for the models 500, 1000, and 2000 and is followed by a detailed discussion of each family.



## Altos 386 Series

Model	500	1000	2000
Processor	80386	80386	80386
Processor Speed	16Mhz	16Mhz, 25Mhz	16Mhz, 20Mhz
Cache Memory	0	32KB	32KB
Math Co-processor	80387 (opt.)	80387 (opt.)	80387
Memory - Minimum	2MB	2MB	4MB
Memory - Maximum	16MB	16MB	16MB
Memory - Modules Avail.	2, 4, 8MB	4, 8MB	4, 8MB
Diskette - Floppy Drive Size Available	1.2MB, 5.25 in 40, 70MB	1.2MB, 5.25 in 40, 90, 140, 300MB	1.2MB, 5.25 in 80, 170, 380MB
Tape Cartridge Size Available	60MB	125/150MB	60, 125/150MB
Number of Users	8	24	64

## Altos 386 Series 500

The Series 500, supporting up to 8 users is considered the entry-level member of the Altos 386 Series line of multi-user systems. It utilizes an expandable modular design and employs a standard AT Bus.

The Series 500 is designed around the Intel 16 MHz 80386 microprocessor, with 2 MB of user memory. System memory can be expanded to up to 16 MB on-board and additional users can easily access the Series 500 via the optional 8 user I/O board. To assure quick response in a multi-user environment, a dedicated 80186 microprocessor located on the I/O board speeds transactions between display terminals and the Series 500.

## Altos 386 Series 1000

The Altos 386 Series 1000 supports up to 24 users. The 80386 CPU is available in 16Mhz or 25Mhz configuration with zero wait states and a 32KB cache memory, a feature not normally found in this class of computers. This cache memory enables the CPU to access data and operate much more efficiently.

An intelligent 80186 I/O and storage device controller enhances system performance by off-loading terminal and LAN processing from the CPU while managing I/O peripheral devices.

For calculation-intensive applications, the optional 80387 floating point processor may be added.

The Series 1000 offers greater memory capacity than virtually any other system in its class. System memory is expandable up to 16MB, enough to satisfy most requirements. Mass storage may be increased to 300MB internally, while two 8-port expansion boards provide support for up to 16 additional serial devices.

The architecture of the Series 1000 combines both the advantages of a single board computer at a low entry-level cost and the benefits of modularity for expandability and growth. The main logic board includes communications ports and space for memory. In addition, the system provides three memory expansion slots, support for two communications slots and space for up to four storage device modules.

The Series 1000 will support up to one 5.25-inch full-height or two 5.25-inch half-height hard SCSI disk drives internally. All systems include a 1.2MB floppy disk drive, and, except for the entry-level configuration, each offers a 125/150MB SCSI 1/4-inch streaming tape drive. The basic configurations include a half-height 40MB disk drive. Other configurations include a half-height 90MB or a full-height 150MB disk drive or either a full height 150MB or 300MB disk drive. Maximum internal capacity is 300MB, provided by one full height 300MB disk drive.

## Altos 386 Series 2000

The Altos 386 Series 2000 is a high-performance 32-bit supermicrocomputer.

Based on the Intel 80386 micro-processor, the Series 2000 employs a multi-processor architecture. The CPU is available in 16Mhz or 20Mhz configuration with zero wait states. The series 2000 also has 32 KB cache memory. Intelligent file and communications processors further enhance system performance with support for up to 64 users.

Modular in design, the Series 2000 can be upgraded. The system includes 4 MB of RAM, a 65 MB (formatted) high-performance ESDI disk drive, and 20 RS-232 ports. In addition, both a 1.2 MB floppy disk drive and a 60 MB 1/4-inch streaming tape drive are provided in all standard configurations.

Expansion options extend system capacity to as much as 16 MB of RAM, over a gigabyte of unformatted internal mass storage, and connectivity for up to 128 interactive devices, all enclosed within a compact floor-standing cabinet which fits under a desk or table.

# Configuration and Porting Consideration

## Basic-2C Features

The Basic-2C language is fully supported on the Altos Series 500, 1000, 2000 systems. This includes support for the recent Basic-2C language enhancements incorporated with Revision 2.01.18 of Basic-2C. For information regarding these enhancements, please refer to Appendix F of your Basic-2C Supplement for Xenix on approved Intel 80286/80386 based computers.

## Supported Terminals

The following terminals are supported for use with Basic-2C on the Altos Series 500, 1000 and 2000 systems running the Altos System V Operating System.

Altos III  
 Altos V  
 Wyse 50  
 Wyse 60  
 DEC VT100 Series  
 DEC VT200 Series  
 Wang 2X36 DE/DW \*  
 Console (Series 500 only)

Some of the above terminals, although they work well with Basic-2C, are not necessarily well suited for use in the Altos System V native environment. The following terminals have been found to work well within the Altos System V environment.

Altos III  
 Altos V  
 Wyse 50  
 DEC VT100 Series  
 Console (Series 500 only)

\* Not supported on all configurations. See related article for details.

## Wang 2x36 Terminals Supported

With extensive cooperation from Altos, Niakwa is pleased to announce that Wang 2x36 terminals will be supported on the Altos series 1000 under Altos System V.

Terminals supported will be the Wang 22x6DE/DW terminals. These include the Wang 2236DE/DW, Wang 2336DW and Wang 2436.

On current versions of the System V operating system, support of Wang terminals is limited to the following Altos serial boards (additional boards may be supported in the future):

1. 8 port boards on the Altos 1000

The 2x36 terminals will work with the 2.01.18 revision of Basic-2C on the systems specified above. However, some additional files are required. These files are contained on the diskette labeled "Wang 2x36 Support Files for Altos System V" which is included with the Altos System V Development Package.

## Features Supported:

1. Local printers are fully supported when accessed from within Basic-2C.
2. 'True' box graphics are supported.
3. Character compression is utilized for faster screen output.
4. Full screen and keyboard (both DE and DW) character sets are supported.
5. Cabling. Existing Wang terminal cables may be used with the addition of a 9-pin to 25-pin adapter cable at the serial port. In our testing, a standard IBM AT 9-pin to 25-pin adapter cable worked well. Note that cable lengths supported by the Wang 2200 are not supported on Altos. Altos supports only standard RS232 cable length/ baud rate combinations.

Note, while fully supported for use with Basic-2C, the Wang 2x36 terminal is not well suited for use with native System V applications.



## Basic-2C Features not Supported

Access to 320k "RAW" diskettes is not supported. Note that access to 360k and 1.2MB "RAW" diskettes is supported.

## Basic-2C Configuration Requirements

Basic-2C version 2.01.18 for operation under the Altos System V operating system is designed to operate on the Altos Series 500, 1000, and 2000. The Altos System V Operating System Release 5.3as1 or greater is required on the Altos Series 500 and Release 5.3bt0 or greater is required on the Altos Series 1000 and 2000. Hardware specifications are listed below:

**CPU:** Altos Series 500, 1000 and 2000

### MEMORY:

Please note that the following discussion is intended to give the reader a general overview of configuration requirements. To properly configure an Altos System please refer to Altos Addendum in the Basic-2C Xenix Supplement.

Calculations of memory requirements under System V are somewhat more complex than for many other systems. In attempting to determine memory requirements, three primary factors should be considered:

- The amount of memory used by the operating system.
- The amount of shared memory required by the Basic-2C RunTime.
- The amount of memory required for each user using the Basic-2C RunTime.

These factors are discussed in detail below. Following that discussion are some examples of typical memory configurations. Following the examples are some additional notes on memory utilization under System V.

#### A. UNIX Overhead

UNIX overhead is the memory used by the System V operating system, buffers and special processes. The amount of memory used by these buffers and processes is based upon a calculation of the total system memory, the size of disk

storage, the number of users, the number of ports, etc. Unfortunately the calculation to determine the amount of "Overhead" depends upon many configurable parameters. Therefore, we have supplied the following examples to be used as a guide to estimate the amount of required memory for a given configuration.

**Examples:**      Series 500    Series 1000    Series 2000

**Unix Overhead**    2656K            2241K            3664K

The Series 500 is configured with 4MB of memory, a 71MB disk drive, and an 8 port board with all ports active.

The Series 1000 is configured with 4MB of memory, a 90MB disk drive, and an 8 port board with all ports active.

The Series 2000 is configured with 8MB of memory, a 170MB disk drive, and a 5 port multi-drop board with 24 ports active.

#### B. RunTime Overhead

There are two available RunTime Programs (RTI, RTP), each requiring a different amount of memory. The following chart indicates the approximate memory requirements of each, for Rev. 2.01 of Basic-2C running under Altos System V:

	Interpretive RunTime	Non-interpretive RunTime
Base RunTime (Shareable)	141k	88k
<b>C. Per User Overhead</b>		
Non-shareable RunTime (RunTime)	199k	197k

**NOTE:** The figures include a 32k allocation for graphics memory (only used on the Wang APC) and a 64k allocation for the -s memory option (whether or not -s is specified). Because System V uses paging versus swapping requirements on some configurations may be substantially reduced. Refer to note 1 on the next page for details.

Plus

Required for "INVOKE" ? ?

**NOTE:** The "?" indicates that the memory required is that of the task specified via the "INVOKE" option.

#### D. Example Memory Requirement Calculations

In calculating the memory requirements for a given installation, multiply the per user requirements by the number of users and add the overhead. For example, an 8 user system using the Interpreter and no allotment for the INVOKE feature running Altos System V would be calculated as follows (sample configurations from Section A are used):

##### Series 500 under Altos System V

- A. Unix Overhead = 2656k
  - B. Runtime Overhead = 141k
  - C. Per User Memory - 199k x 8 users = 1592k
- Total Memory Requirements = 4389k

##### Series 1000 under Altos System V

- A. Unix Overhead = 2241k
  - B. Runtime Overhead = 141k
  - C. Per User Memory - 199k x 8 users = 1592k
- Total Memory Requirements = 3974k

##### Series 2000 under Altos System V

- A. Unix Overhead = 3464k
  - B. Runtime Overhead = 141k
  - C. Per User Memory - 199k x 8 users = 1592k
- Total Memory Requirements = 5197k

#### Notes:

- Since the Altos System V Operating System uses paging as opposed to swapping when physical memory is exceeded, the performance degradation encountered when physical memory is exceeded is much less severe than on systems which perform swapping. Paging means that portions of memory are paged (written) to disk when physical memory is full. Swapping means that an entire task is swapped (written) to disk when memory is full. Paging is substantially more efficient when areas of memory are reserved for each task but not used. In the case of the RunTime, the 32k (Wang APC graphics area) for each user would be paged out and never recalled. Furthermore, if the -s option is not used, the 64k -s segment would also be permanently paged out if physical memory was exceeded. The examples above show how to calculate physical memory requirements so that no paging is required. The point of this discussion is that some rounding down can be done. For example, if your calculations show that you need 4.5MB for an 8 user system, but you are not using -s, 4MB will be adequate.
- The minimum memory requirement for any Altos System V configuration is 2MB.
- If both the Interpreter and Non-Interpretive RunTime versions are to be used on the same system, the "shareable" portion of both must be included in the calculations.

#### E. OTHER CONSIDERATIONS

Under the Altos System V operating system, the number of terminals that can be executing the Basic-2C RunTime Package concurrently is limited by the amount of user memory available combined with the size of the swap space created when the operating system is installed. Refer to the Altos System V addendum in the Basic-2C Xenix Supplement for more information on SWAP SPACE requirements.

**DISKETTE:** The Altos Series 500, 1000, and 2000 are equipped with 5 1/4" 1.2MB diskette drives. Basic-2C does not support 'RAW' 320k 2200 format diskettes under Altos System V. However, it will support 'RAW' 360k, 720k and 1.2MB format diskettes.

**DISK:** There are no special requirements, but allow 8MB for the Altos System V operating System. The Basic-2C RunTime and Development packages will require approximately 1MB of disk storage.

**TERMINALS:** See related section on supported Terminals.

**PRINTERS:** Under the Altos System V operating system on the Altos Series 500, 1000, and 2000 both system and local printers are supported. Both parallel and serial system printers are supported. In addition, access to the System V print spooler is supported.

## Porting Considerations

To port your programs and data from an existing system to the Altos Series 500, 1000, and the 2000, we have provided the following series of porting techniques to be used as a guide. Please note that the Altos Series 500, 1000, and 2000 do not support the use of 320k 2200 format diskettes.

**WANG 2200/CS Systems** - For the Wang 2200/CS systems, you have two possible ways of porting to the Altos systems. You may transfer your programs and data to the Altos systems by using 360k 'RAW' diskettes (refer to the Xenix Supplement for details). Programs and data can also be transferred to an IBM PC via serial communications and then to the Altos system via serial communications. See below for details on serial communications.

**Xenix Systems (i.e. Wang, SCO and Altos 1086/2086/3086)** - For Xenix systems, you may use 360k, 720k, and 1.2MB 'RAW' diskettes to transfer your programs and data to the Altos systems. Data and programs can also be transferred from the Altos 1086/2086/3086 via tape cartridge. Refer to the Altos System V Release notes for details and compatibility information.

**Serial Communications** - On systems which have serial communications, you may use a file transfer utility to transfer your programs and data between one computer system, generally a PC and an Altos system.

## Bluebird's Distribution and VAR Policies

Bluebird Systems is pleased to announce its status as an authorized SuperVAR for Altos computer products. The Altos Series 500, 1000 and 2000 multi-user computer systems with Basic-2C can now be purchased directly from Bluebird at competitive prices.

Bluebird has established all of the policies and procedures necessary to enable VARs to present these fully integrated systems to their customers. Complete information on the following subjects is detailed in the Bluebird Marketing Bulletin, dated January 23, 1989:

- \* **Altos Pricing**
  - competitive prices and attractive discounts
- \* **Order Processing Procedures**
  - efficient call-in procedure with order confirmation
- \* **Hardware Availability**
  - state of the art technology in a wide selection of computers
- \* **Delivery Information**
  - accurate delivery dates with acknowledgement of order
- \* **Staging**
  - comprehensive system integration including software loading, testing and system burn-in
- \* **Warranty Issues**
  - standard warranty plus optional extended warranty period
- \* **D.O.A. Policy**
  - repair or replacement of any defective machine or peripheral equipment
- \* **Hardware Maintenance**
  - expert maintenance and repair of equipment by qualified Altos service providers
- \* **Technical Support**
  - hardware and operating system support from professionals expert in the Altos environments

- \* **Sales Support**
  - help with product specs, system configurations, policies, procedures, and other necessary information
- \* **VAR Productivity Programs**
  - a series of programs designed to help your VAR organization be more productive and profitable

To receive your copy of Bluebirds January 23 Marketing Bulletin contact your Bluebird Area Manager. If you are not sure who your Area Manager is contact Bluebird at (619) 438-2220.

# Altos System V Performance Benchmarks

## Overview

Niakwa has conducted an extensive performance evaluation of the Altos 386 series operating under Altos System V. The purpose of this evaluation is to give Basic-2C licensees realistic guidelines as to the performance that can be expected from Basic-2C applications running under System V on Altos 386 series machines.

## Hardware Used

Benchmarks were performed on three different configurations.

### 1. Altos 500

80386 processor operating at 16 Mhz  
 4 MB 32 bit memory  
 70 MB ST506 drive - average access time 30 MS  
 8 port intelligent serial board  
 8 terminals running at 19200 baud

### 2. Altos 1000

80386 processor operating at 16 Mhz  
 32 kb cache memory  
 4 MB 32 bit memory  
 90 MB SCSI disk - average access time of 19 MS  
 8 port intelligent serial board  
 8 terminals running at 9600 baud

### 3. Altos 2000

80386 processor operating at 16 Mhz  
 32 kb cache memory  
 8 MB 32 bit memory  
 170 MB ESDI disk - average access time of 23 MS  
 Intelligent Multidrop communications subsystem.  
 80286 processor. RS422 interface. With two 8 port TCUs.  
 16 terminals operating at 9600 baud

## Benchmark Programs

Four tests were devised for the evaluation, and each was executed on all systems with an increasing number of terminals. The tests used were:

**1. CPU Intensive:** This test involved iterating various constructs of the Basic-2C language to test memory operations of the CPU only. The following operations were performed:

FOR/TO LOOP	200,000 iterations
IF/THEN	100,000 iterations
Scalar ADD	100,000 iterations
CONVERT	10,000 iterations
Alpha LET	50,000 iterations
MAT COPY	30,000 iterations

**2. Screen Intensive:** This test focused on screen speed and screen I/O system performance. Ten thousand iterations of the PRINT AT instruction were performed.

**3. Disk Intensive:** This test focused on disk and I/O system performance. Five hundred iterations of random DATALOAD BA's were performed within a 10,000 sector diskimage.

**4. Overall Mix:** This test combined all of the above tests to illustrate overall system performance. A general accounting system was used which read a disk file of customer records, sorted them according to operator supplied parameters, and printed the results to the screen for the entire customer file (TOM SPEED I). Detailed timings of each test can be found on the following pages.

## Hardware used for Benchmarks

	CPU Mod. #	Clock Speed	Processor	Memory	Disk	Terminals	Baud Rate
Altos	2086	8 mhz	80286	4MB	80MB	Altos V	19.2K
Bluebird - IBM	AT-386	16.67 mhz	80386	2MB	71MB	Wyse 60	38.4K
Bluebird-Wyse	PC-2200	10 mhz	80286	2MB	71MB	Wyse 60	38.4K
Bluebird-Wyse	3216	16.67 mhz	80386	2MB	330MB	Wyse 60	38.4K
Dec	MicroVAX II	N/A	Prop.	5MB	71MB	VT220	9600
Honeywell	XPS-100 Model 20	16.67 mhz	68020	6MB	72MB	HDS 3	19.2K
IBM-SCO	IBM AT	6 mhz	80286	4MB	44MB	Wyse 60	19.2K
NEC	Astra XL/32	16.67 mhz	68020	6MB	130MB	Wyse 60	4800
Novell	Acer 1100	16.67 mhz	80386	1MB	70MB	Acer 700 8086	N/A
Wang	2200 MVP	N/A	Prop.	512k	80MB Phoenix	2236DE	19.2K
Altos	500	16 mhz	80386	4MB	71MB	Wyse 60 Altos V	19200
Altos	1000	16 mhz	80386	4MB	90MB	Wyse 60 Altos V	9600
Altos	2000	16 mhz	80386	8MB	170MB	Wyse 60 Altos V	9600



### General Performance Benchmarks

	Altos 2086		IBM AT 286		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200	500	1000	2000	500	1000	2000
CPU INTENSIVE																					
ONE TERMINAL	6.54	11.62	4.00	7.00	4.00	4.00	4.00	4.00	8.76	4.00	4.00	4.00	21.14	59.00	4.86	3.08	3.04	4.86	3.08	3.04	
FOR/TO	11.24	18.62	6.00	11.00	6.00	6.00	6.00	6.00	11.99	9.00	9.00	7.00	28.56	80.00	7.22	5.08	4.98	7.22	5.08	4.98	
IF/THEN	8.52	15.34	6.00	9.00	5.00	5.00	5.00	5.00	10.25	8.00	8.00	7.00	24.50	75.00	6.04	4.12	4.02	6.04	4.12	4.02	
ADD	6.66	7.04	2.00	4.00	2.00	2.00	2.00	2.00	6.71	3.00	3.00	2.00	18.67	8.00	2.44	1.76	2.04	2.44	1.76	2.04	
CONVERT	2.64	11.04	4.00	7.00	5.00	5.00	5.00	5.00	9.19	7.00	7.00	7.00	23.46	42.00	4.08	4.06	4.00	4.08	4.06	4.00	
ALPHA LET	6.12	9.56	4.00	5.00	2.00	2.00	2.00	2.00	5.96	6.00	6.00	4.00	20.92	40.00	3.38	2.86	2.60	3.38	2.86	2.60	
MAT COPY																					

TWO TERMINALS	13.07	23.13	7.50	14.50	7.00	7.00	7.00	7.00	17.36	8.00	8.00	9.00	21.14	118.00	9.50	6.08	6.03	9.50	6.08	6.03	
FOR/TO	22.17	37.11	12.50	23.50	12.00	12.00	12.00	12.00	23.99	19.00	19.00	14.00	28.56	160.00	14.50	10.09	9.98	14.50	10.09	9.98	
IF/THEN	17.24	30.86	10.50	19.00	10.00	10.00	10.00	10.00	20.48	15.00	15.00	13.00	24.50	150.00	12.00	8.14	8.04	12.00	8.14	8.04	
ADD	13.57	14.05	3.50	8.50	4.00	4.00	4.00	4.00	13.48	7.00	7.00	4.00	18.67	17.00	4.00	3.76	4.00	4.00	3.76	4.00	
CONVERT	14.62	22.03	9.50	14.00	9.00	9.00	9.00	9.00	18.39	14.00	14.00	15.00	23.46	84.00	10.50	8.07	8.00	10.50	8.07	8.00	
ALPHA LET	12.68	19.06	7.50	12.50	5.00	5.00	5.00	5.00	12.12	13.00	13.00	8.00	20.92	80.00	7.50	5.86	5.59	7.50	5.86	5.59	
MAT COPY																					

	IBM AT 286		Bluebird		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200	500	1000	2000	500	1000	2000
CPU INTENSIVE																					
ONE TERMINAL	53.04	95.43	29.63	58.25	29.00	29.00	29.00	29.00	68.43	32.00	32.00	36.00	21.14	480.00	38.37	23.95	23.79	38.37	23.95	23.79	
FOR/TO	86.18	149.06	48.00	94.63	47.00	47.00	47.00	47.00	95.81	76.00	76.00	58.00	28.56	640.00	56.11	41.08	39.16	56.11	41.08	39.16	
IF/THEN	68.13	124.61	40.25	77.88	39.00	39.00	39.00	39.00	82.17	60.00	60.00	51.00	24.50	600.00	48.04	32.14	32.68	48.04	32.14	32.68	
ADD	52.58	51.30	15.88	34.63	16.00	16.00	16.00	16.00	53.76	28.00	28.00	17.00	18.67	64.00	18.71	14.94	12.27	18.71	14.94	12.27	
CONVERT	62.56	89.23	36.13	58.88	36.00	36.00	36.00	36.00	73.65	54.00	54.00	61.00	23.46	340.00	42.67	33.07	30.92	42.67	33.07	30.92	
ALPHA LET	50.83	76.85	30.00	52.00	21.00	21.00	21.00	21.00	49.21	51.00	51.00	32.00	20.92	320.00	30.99	23.01	22.85	30.99	23.01	22.85	
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### General Performance Benchmarks (cont.)

	Altos 2086		IBM AT 286		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200	500	1000	2000	500	1000	2000
CPU INTENSIVE																					
ONE TERMINAL	102.00	168.23	82.13	115.38	58.00	58.00	58.00	58.00	NP	67.00	67.00	83.68	21.14	NA	N/P	N/P	49.12	N/P	N/P	49.12	
FOR/TO	181.00	276.28	149.94	190.81	92.00	92.00	92.00	92.00	NP	154.00	154.00	131.60	28.56	NA	N/P	N/P	87.78	N/P	N/P	87.78	
IF/THEN	144.00	238.49	122.88	156.44	77.00	77.00	77.00	77.00	NP	123.00	123.00	113.43	24.50	NA	N/P	N/P	63.90	N/P	N/P	63.90	
ADD	103.00	104.25	43.19	69.69	31.00	31.00	31.00	31.00	NP	54.00	54.00	40.12	18.67	NA	N/P	N/P	28.03	N/P	N/P	28.03	
CONVERT	122.00	164.14	115.56	118.31	70.00	70.00	70.00	70.00	NP	107.00	107.00	129.50	23.46	NA	N/P	N/P	64.24	N/P	N/P	64.24	
ALPHA LET	NP	143.34	105.63	105.06	42.00	42.00	42.00	42.00	NP	107.00	107.00	77.50	20.92	NA	N/P	N/P	41.21	N/P	N/P	41.21	
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NA = NOT AVAILABLE NP = NOT PERFORMED

	Altos 2086		IBM AT 286		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200	500	1000	2000	500	1000	2000
CPU INTENSIVE																					
ONE TERMINAL	37.00	85.74	25.00	31.00	20.00	20.00	20.00	20.00	61.00	36.00	36.00	142.00	23.89	49.00	30.60	61.34	76.04	30.60	61.34	76.04	
FOR/TO	62.50	171.50	31.50	44.50	22.00	22.00	22.00	22.00	68.00	43.00	43.00	142.00	NP	69.00	39.16	61.42	76.17	39.16	61.42	76.17	
TWO TERMINALS	121.00	341.90	61.00	88.00	43.00	43.00	43.00	43.00	137.00	84.00	84.00	142.00	23.89	133.50	77.34	61.48	72.24	77.34	61.48	72.24	
IF/THEN	246.00	688.21	120.88	160.38	87.00	87.00	87.00	87.00	280.00	168.00	168.00	172.00	23.89	198.00	188.69	106.18	120.75	188.69	106.18	120.75	
ADD	435.00	NP	299.38	349.63	170.00	170.00	170.00	170.00	NP	349.00	349.00	330.60	23.89	NA	N/P	N/P	233.05	N/P	N/P	233.05	
CONVERT																					
ALPHA LET																					
MAT COPY																					

	Altos 2086		IBM AT 286		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200	500	1000	2000	500	1000	2000
CPU INTENSIVE																					
ONE TERMINAL	27.00	14.26	11.00	14.00	10.00	10.00	10.00	10.00	18.00	16.00	16.00	14.00	24.66	16.00	10.68	11.30	9.60	10.68	11.30	9.60	
FOR/TO	42.00	26.88	21.00	28.00	18.00	18.00	18.00	18.00	27.00	32.00	32.00	26.00	NP	31.00	21.05	21.84	18.74	21.05	21.84	18.74	
TWO TERMINALS	80.00	49.61	41.50	58.00	37.00	37.00	37.00	37.00	51.00	63.00	63.00	52.00	82.68	62.00	42.02	43.72	39.33	42.02	43.72	39.33	
IF/THEN	163.00	137.25	84.50	121.00	81.00	81.00	81.00	81.00	94.00	127.00	127.00	104.00	165.73	122.50	92.67	92.52	81.96	92.67	92.52	81.96	
ADD	321.00	1207.56	190.13	249.31	154.00	154.00	154.00	154.00	NP	258.00	258.00	211.75	328.19	NA	N/P	N/P	192.77	N/P	N/P	192.77	
CONVERT																					
ALPHA LET																					
MAT COPY																					

	Altos 2086		IBM AT 286		Bluebird		Bluebird		Dec		Honeywell		NEC		Novell		Wang		Altos 80386 Series		
	80286	AVG	IBM AT 286	SCO XENIX	IBM/AT 386	Bluebird	Bluebird	Wyse PC286	Wyse PC3216	MicroVAX	XPS-100	ASTRA	ASTRA	80386	2200						

## General Interpretation of Results

### Test 1 - CPU Performance

Altos 500 CPU performance is shown to be from 3 to 12 times faster than the Wang 2200 while Altos 1000 and 2000 CPU performance is shown to be from 4 to 20 times faster than the Wang 2200. As shown, only a limited number of Basic-2C instructions were tested. However, in our view, it would be reasonable to expect a performance improvement for CPU intensive operations of about 2-3 to 9-12 times the Wang 2200 with a typical Basic-2C program instruction mix (note: for CPU intensive instructions only).

Note that the significant difference between the results on the 500 and the 1000 or 2000 illustrates the performance benefit of cache memory on the 1000 and 2000.

### Test 2 - Screen Performance

With 1, 2 or 4 terminals, the Altos 500 significantly outperformed the Wang 2200. However, at 8 terminals the Altos 500 performed only slightly better than the Wang 2200 (5% improvement). Note that in testing the Wang 2200, two serial boards were required for 8 terminals versus a single board on the 500. The Altos 1000 outperformed the Wang 2200 at 8 terminals by 40%. The Altos 2000 outperformed the Wang 2200 at 8 terminals by 35%. The results on the 1000 and 2000 illustrates the benefits of the intelligent multidrop subsystem utilized on the 2000 and the intelligent serial boards used on the 1000. At lower numbers of terminals, the Altos 1000 and 2000 results show the effect of operation at a lower baud rate.

### Test 3 - Disk Performance

As seen by the results, all three machines deliver excellent disk performance with results at 8 terminals improved 25% over Wang for the 500 and 1000 and 33% for the 2000.

Note that as always with Basic-2C, disk write operations will be slower than disk read operations.

### Test 4 - Overall Mix

Results of this test are the most important indicator of Altos System V performance. This test mixes all aspects of system performance, CPU speed, screen speed, and disk I/O speed (not quite so random) in a typical processing environment.





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