

# SuperDOS Update

## Highlights:

- 1** Product Announcement
- 2** Basic-2C Configuration Requirements
- 3** SuperDOS Performance Benchmarks
- 4** Bluebird Hardware Policies

# Special Edition

## Product Announcement

### Basic-2C for SuperDOS Available

Niakwa is pleased to announce the immediate availability of Basic-2C for the SuperDOS operating system.

SuperDOS is a multiuser operating system, developed by Bluebird Systems, for IBM PCs, XT's, AT's, the IBM PS/2 Series and selected compatible microcomputers.

### A Bluebird Perspective

Bluebird Systems was founded in 1982 by Hal Tilbury in response to the need in business for fast, more cost-effective, multi-user, business applications software for the then-emerging microcomputer products. Mr. Tilbury and systems engineer Bob Rantzow, who first brought SuperDOS to Mr. Tilbury, recognized the importance of transaction-based processing in daily business operations. To keep pace with the demands of running any small or medium-sized company, management needs power and flexibility in its computer systems. Multiple workstations and the ability to perform multiple tasks concurrently are necessary for optimal productivity and efficiency in business.

The SuperDOS operating system created the environment that could meet these critical needs. Bluebird acquired the rights to market SuperDOS from its developers, Tom Lee and Dave Houge. SuperDOS became the foundation for all of Bluebird's software products because of its ability to maximize the microcomputer's potential for speed, power, and functionality.

Mr. Tilbury also recognized that a large resource of proven business applications software, written in high-level minicomputer languages, existed in the marketplace. Bluebird's next step was to provide a bridge that would allow these popular minicomputer languages to run on a microcomputer.

Bluebird's Business BASIC, announced with SuperDOS, provided a link to Data General VARs, with its ability to migrate programs originally written in Data General's Business BASIC to IBM micros running under SuperDOS. In early summer of 1985, the second language compiler, DBComp, was introduced. Originally developed by Sunbelt Computer Systems, DBComp allows programs written in Datapoint's DATABUS language to run on IBM micros using SuperDOS. A full ISO Level 0 standard Pascal was recently added to Bluebird's library of language compilers.

Bluebird Systems' ability to deliver highly refined business-oriented software and a fast multi-user operating system on low-cost popular microcomputer systems has tremendous appeal to Value-Added Resellers. VARs can offer their minicomputer-developed applications software, often customized to particular vertical markets, on IBM PC systems with SuperDOS. This greatly increases the VAR's price-competitiveness while protecting a very sizeable investment in software development.

Bluebird's reseller channel is key to the company's success. Over 200 VARs worldwide offering SuperDOS-based systems reach a broad cross-section of markets with their vertical products.

SuperDOS, originally developed for the 8-bit Z80 microprocessor, was completely rewritten to support the specifications of the IBM PC, XT and the AT. As an IBM Authorized VAD, Bluebird now is in the unique position of providing the best hardware, operating system, and application software to discreet vertical markets. In addition, Bluebird supports its end-users (and VARs) with pre-sale and post-sale training classes, hot-line telephone service, and subscription service for software enhancements. In addition, Bluebird now offers special-purpose, high-performance add-ons like the SuperBOARD/386 Accelerator and the 24-user expansion chassis.

The "80386" accelerator -- one of the most innovative and timely hardware products available -- replaces the CPU responsibilities of the "286" chip in IBM's AT systems. The result is speed and computational power at the upper limits of microcomputer performance. The utilization of products like the SuperBOARD/386 Accelerator typifies Bluebird Systems' dedication to the fullest application of microcomputer-based data automation and information analysis -- directed toward helping Bluebird's customers achieve greater success in their respective markets.

Today, Bluebird Systems, Inc. is at the leading edge of multi-user, multi-tasking products using today's popular microcomputers.

## SuperDOS Overview

SuperDOS is a high-performance, multi-user, multi-tasking operating system designed specifically for business transaction processing. Running under SuperDOS, the IBM PC, XT or AT is converted into a powerful multi-user business computer capable of outperforming much more expensive minicomputers.

Developed from the ground up to optimize the microcomputer's potential for speed and expandability, SuperDOS delivers impressive performance and supports up to 10 simultaneous users (in the form of ASCII terminals) on Intel 8088 and 8086-based processors including the IBM PC-XT and PS/2 Model 30, and up to 49 users and over 660MB of disk storage on Intel 80286/80386-based processors including the IBM AT and Wyse family of IBM compatible micros.

Active programs reside in main memory to provide instant access to all authorized users. Multi-tasking is achieved as SuperDOS constantly and automatically switches memory segments to give time to each terminal.

SuperDOS further matches the minicomputer with advanced features for file handling, true record locking, efficient disk access, complete system security at the operating system level, maximized memory utilization and support for a wide variety of useful peripheral devices.

## SuperDOS Languages

SuperDOS supports high level language compilers that allow application software, originally developed on minicomputers, to be ported over to run on IBM microcomputers. Sophisticated applications written in Data General's popular Business BASIC, Datapoint's Databus/Datashare, ISO Standard Pascal, and now Basic-2C, can be fully compiled to run on the IBM family of microcomputers.

### Business Basic

Business BASIC is a broadly enhanced superset of Data General's BASIC, that produces fast and compact compiled code to increase overall system efficiency.

### DBcomp

DBComp is highly source code compatible to Datapoint Corporation's Databus language.

### Pascal

Pascal implements a superset of ISO Level 0 standard Pascal. This software compiles up to 7,000 lines per minute with excellent error-recovery capabilities, and produces fast machine code in Microsoft object format linkable with other Pascal and/or assembly language modules. The Pascal compiler supports structured constants, constant expressions, separate compilation, and four memory modules. In addition, it supports random and blocked file I/O, file and record locking and SuperDOS multi-keyed ISAM.

## New Features In Basic-2C

The SuperDOS release of Basic-2C incorporates several significant enhancements to the Basic-2C language. Note that these enhancements will be present on all future releases of Basic-2C. Please refer to appendix F of the Basic-2C Supplement for SuperDOS for complete technical documentation of these new features. Here is a summary of the new features:

1. Wang 2236 terminals are now supported by Basic-2C. All features of the 2236 are supported. Note that other hardware versions of Basic-2C will likely require an additional hardware device to convert the non-standard XON/XOFF sequences used by the 2236 into standard sequences understood by the native operating system. The device is not required for SuperDOS. Please refer to the article on "Terminals Supported" for further details.

2. Diskimage files up to 4000MB are now supported. This has been accomplished by use of three byte addresses within the Basic-2C diskimage index

(previously unused bytes 7 and 8 of each index entry are used).

3. \$PACK/\$UNPACK have been extended to allow for storage of signed or unsigned binary numbers using the field format specification.

4. LINPUT and INPUT have been extended to optionally accept characters above HEX(80). This enhancement is primarily intended for non-English users.

5. Printer translation capabilities are now supported via a \$PRINTER system variable. The translation capabilities are similar in concept to the screen translation capabilities in prior versions.

6. 132 column mode can now be accessed on terminals which have this capability (WYSE 50 and WYSE 60 for example).

7. Output from PRINT functions of the HELP and ERROR processor can now be directed to a specified Basic-2C print address.

8. Alternate character fonts supplied on various terminals can now be accessed under Basic-2C by specification of the desired font via a \$OPTIONS byte. This allows access to non-English characters on terminals where these are not part of the standard font.

9. Basic-2C now contains built-in math coprocessor support for transcendental functions (LOG, EXP, SIN, COS, TAN, ARCSIN, ATN, LGT, A^B) through the setting of a specified byte in the \$OPTIONS system variable. Also, the \$MACHINE system variable has been extended to indicate whether a math coprocessor is available on the machine.

10. Through the specific setting of a byte in the \$OPTIONS system variable, the 'normal' and 'dim' modes on terminals which do not support the 'bright' attribute as high intensity bright may be controlled by Basic-2C programs.

11. Limited support for direct input from serial devices without the need of the 2227 emulation driver has been introduced in this release. This support is intended to be sufficient for simple interface requirements to serial devices such as plotters, digitizers, bar code readers, cash registers, etc. However, applications which require the more sophisticated features of the 2227 emulation driver will not be supported on this release. Note that existing programs will require modification to utilize this feature.

## Basic-2C Features Not Supported

The following Basic-2C features are not supported on this release:

1. The extended user partition is supported, with the following restrictions: because of SuperDOS task size restrictions, a maximum of two users can be assigned the extended partition. In addition, use of the extended partition for any user will significantly reduce the number of other users who can obtain a full 56k single segment partition. This restriction will go away with the next release of Basic-2C under SuperDOS.

2. The Science and Communication Drivers package is not supported on this release of Basic-2C. However, this release of Basic-2C does contain built-in support for the math coprocessor and limited serial input capabilities. See "New Features in Basic-2C" for details.

## Porting Considerations Under SuperDOS

Since access to Wang 2200 format 'raw' diskettes is fully supported under SuperDOS, porting programs and data to a SuperDOS system is a very simple procedure. Use of the Niakwa General Backup and Recovery utilities, as well as the General File Copy utility can be utilized to transfer programs and data via Wang 2275 format diskettes.

To port programs and data from a Basic-2C-compatible system which does not support 'raw' diskette access, some form of serial communications which can transfer 8 bit binary data will be required. To date, we are aware of only one product which can be used to transfer files to SuperDOS directly, and this product operates only on IBM or compatible PCs. Refer to the Computer Concepts announcement, elsewhere in this newsletter, for details on this particular serial communications package.

Transferring files to SuperDOS using serial communications, such as directly from a Wang 2200 system, can be accomplished by first transferring to the PC-DOS partition within the SuperDOS system. Then use the SuperDOS utility program PCFILE to automatically copy the file(s) to the SuperDOS partition.

## Supported Terminals

The following terminals are supported with Basic-2C under SuperDOS:

### 1. Wang 2236 Terminals

This is the first release of Basic-2C which supports the use of Wang 2236 terminals.

Specific features supported are:

A. Existing 2200 terminal cables may be used. However, Wang specifications for cable length (2,000 feet at 19200 baud) are not supported. SuperDOS supports only RS232 standards for cable length/baud rate combinations. Our testing indicates that 2236 terminals work well at 19200 baud with cable lengths up to 200 feet, but these results may vary, depending upon environmental factors.

B. The Wang 2236DE, 2236DW, and 2336DW are all supported. Although we have not tested a Wang 2436, reports from our Beta test sites indicate that this works well also.

Third party Wang compatible terminals and terminal emulation products will likely work, but are not supported by Niakwa. Note that Computer Concepts Corporation has announced support of their PC2200 terminal emulation/file transfer package under Basic-2C on SuperDOS. See below for details.

C. Local printers are supported.

D. 'True' box graphics are supported.

E. Character compression is utilized for faster screen output.

F. Full screen and keyboard (both DE & DW) character sets are supported.

Note that the Wang 2236 terminal, while fully supported by Basic-2C, is not well supported by native SuperDOS utilities and programs.

2. **Wyse 60**  
The Wyse 60 is one of the best terminals for use with Basic-2C. Specific features are:

A. 16 special function keys are available, both shifted and unshifted, giving a total of 32 programmable function keys. Existing special function strips designed for Wang 2236 terminals will work well.

B. Downloadable fonts are supported. Therefore, the Basic-2C screen character set, including pixel graphics, is fully supported.

C. Basic-2C screen attributes are fully supported in all combinations.

D. 'Character' box graphics only are supported.

E. Local serial printers are supported.

F. 132 column mode for screen output is supported.

G. Baud rates up to 38400 are supported.

H. The Wyse 60 is well supported by native SuperDOS utilities and programs.

3. **Wyse 50 Terminal**  
Although a good terminal for Basic-2C, the Wyse 50 lacks two features present in the Wyse 60:

A. Downloadable fonts are not supported on the Wyse 50. Therefore, the Basic-2C alternate character set is not well supported.

B. The Wyse 50 supports only a single screen attribute. Therefore, any of the four Basic-2C attributes, or any combination of attributes, is displayed as this single attribute. All other features are identical to the Wyse 60.

4. **Other Terminals**  
Other terminals supported by prior versions of Basic-2C are supported for use with Basic-2C on SuperDOS. However, these terminals are not well suited for use with native SuperDOS utilities or programs. These terminals are:

Altos 3  
Altos 5  
DEC VT100  
DEC VT200 series  
Wang 2110A

## Terminal Emulation/File Transfer Utility For Basic-2C Under SuperDOS

Computer Concepts Corp., author of the PC2200 terminal emulation and file transfer utility for IBM PCs and compatibles, has announced the availability of PC2200 for SuperDOS environments.

Using the new version of PC2200, Basic-2C users operating under SuperDOS may utilize IBM PCs and compatibles to emulate Wang 2236 terminals in either a local or remote environment. Standard Wang terminal cables may be used to connect a PC to the SuperDOS host computer, however, gender changers must be used at each end.

As with the original version of PC2200, all standard 2236DW features are supported, including PRINT SCREEN, local printing, and box graphics. Also supported is the redirection of the /204 printer channel to any DOS file specification in the PC-DOS partition of the SuperDOS system.

PC2200's file transfer utility provides for the transfer of files between a 2200 and the SuperDOS host computer's PC-DOS partition, or, from a PC workstation with a hard disk to the host system's SuperDOS partition, reducing the amount of disk storage required on the host system.

For more information on PC2200, contact:

Greg Dean  
Computer Concepts Corp.  
8375 Melrose Drive  
Lenexa, KS 66214 USA  
(800) 255-6350 outside Kansas  
(913) 541-0900 in Kansas

## Pricing

The Basic-2C Development Software and Runtime Packages for SuperDOS will be priced the same as all other Basic-2C products. See your Niakwa price list for details.

Basic-2C Development software and RunTime Packages may be ordered from either Bluebird Systems or Niakwa.

## Questions and Answers

Q. Is the Niakwa Runtime Package included if I buy hardware from Bluebird?

A. No. The Niakwa RTP for SuperDOS is a separate product and is priced the same as any other Basic-2C RTP.

Q. Did Niakwa stop selling hardware as a result of the Bluebird acquisition?

A. No. Niakwa's decision to stop selling hardware made good business sense. The distribution of hardware had reached the point where we could no longer buy systems and resell them to you at a competitive price with a fair profit to us.

Q. Do I need a RunTime Package for SuperDOS?

A. Yes. The gold key diskette has been eliminated, but not the Runtime package. The Niakwa RunTime security for SuperDOS will reside on the SuperDOS

"PAL" chip. The "PAL" chip is an actual chip that is installed on the SuperDOS security board. This means that you will not have to worry about damaged or lost gold key diskettes after you have loaded the Basic-2C RunTime Package onto your system.

Q. Can I upgrade my installed single-user IBM PC to a SuperDOS multiuser system?

A. Yes. Bluebird supports IBM PC's, AT's, the PS/2 Model 30 and they plan to support most other PS/2 models in the future. However, you must be careful because not all disk and tape drives are supported by SuperDOS. Call your Bluebird representative to verify that the configuration will be supported before you sell it.

Q. What about clones?

A. Bluebird supports Wyse PC's. Other IBM compatibles may work with SuperDOS, but they will not be supported by Bluebird. One of the dangers in selling a nonsupported configuration is that the end-user may become "rev locked." His hardware may not work with future releases of SuperDOS -- locking him into today's version of SuperDOS.

Q. Can I run my MS/DOS software on a SuperDOS system?

A. Yes and No. "Well behaved" MS/DOS software can operate from the system console, but not from each terminal. Remember SuperDOS is a true multi-user operating system that supports ASCII terminals. It is not a network. If you need MS/DOS software at workstations, use PC's. A PC can be a SuperDOS workstation or operate standalone as a PC.

# Basic-2C Configuration Requirements

## 1. CPU Requirements

Basic-2C will operate on the IBM PC, XT, or AT or on any compatible supported by Bluebird for use with SuperDOS. See separate article below for details on SuperDOS approved machines.

## 2. Operating System Requirements

SuperDOS version 12.3.102 or higher is required for use on the IBM AT or compatible machines.

SuperDOS version 3.3.102 or higher is required for use on the IBM PC or compatible machines.

In addition, the Bluebird Business Basic token processor version 12.3.13 (for AT class machines) or 3.3.13 (for PC class machines) is required.

Note that the software versions listed here are the current versions as of this publication date. However, if later versions are available when you purchase your system, these later versions should be used.

## 3. Memory Requirements

### Task Orientation:

SuperDOS is a task-orientated operating system with fixed-size memory allocation defined at boot time for each task. Memory allocation under SuperDOS is static. That is, the total amount of memory assigned to all defined tasks cannot exceed the amount of physical memory present on the system. There is no program 'swapping' or 'paging' as on Xenix or DEC VMS.

### Available Memory:

SuperDOS supports two types of memory, 'base' memory and 'expanded' memory. Currently, any one system may contain up to 640k 'base' memory and 2MB 'expanded' memory.

'Base' memory contains all system software, that is, MS-DOS, SuperDOS, Basic-2C (RTI or RTP). In addition, certain optional tasks must also reside in base memory. This includes a task for using the SuperDOS tape backup, a task for running native MS-DOS programs, and a task for running the compiler (B2C).

'Base' memory may also contain cache buffers. Cache buffers are utilized by SuperDOS to reduce physical I/O to the disk. SuperDOS should be configured with the highest number of cache buffers as allowed by other requirements for 'base' memory.

In systems with only 'base' memory, all terminal tasks also reside there.

'Expanded' memory, when present, contains only terminal tasks. There is a task size limit of 64k for tasks assigned to 'expanded' memory.

Note that in configurations with only 512k 'base' memory, the first 128k of 'expanded' memory, if present, is allocated to 'base' memory bringing the total 'base' memory up to 640k. However, when this is done, the remaining portion of the first 512k of expanded memory is not available for any use. Thus, for example, a system with 512k 'base' memory (such as an IBM AT) and 1MB of 'expanded' memory yields usable memory of 640k 'base' and 512k 'expanded' memory.

### Basic-2C Memory Requirements:

#### (Compiler Requirements)

The compiler (B2C) requires a task size of at least 128k. This means that any terminal which is going to use B2C must be configured in 'base' memory. Because 'base' memory is used for so many other functions, and because the compiler is not frequently needed in most end-user sites, we recommend that a separate configuration be used when access to B2C is required.

#### (RunTime Requirements)

In order to maximize the number of users who can execute the Basic-2C RunTime, the RunTime program under SuperDOS has been split into two sections, a 'shareable' section which must reside in 'base' memory as a background task, and a 'user' section. The 'user' section contains some non-shareable overhead required by the RunTime plus the user partition. The 'user' section resides primarily in the terminal task for each user. Memory requirements for these sections can be found in figure 1.

As can be seen, the memory requirements for the 'user' section exceed the maximum task size of 64k for 'expanded' memory. Therefore, in order to be able to provide full 56k partitions to tasks assigned to 'expanded' memory, the RunTime program allows the overflow memory to be assigned to the 'shareable' section. In order for this to take place, the task size for the 'shareable' section must be defined as large enough to accommodate the number of 56k partitions required.

The size of the overflow areas required is 20.5k for RTI and 20k for RTP. The calculation for determining the size of the task for the 'shareable' section of the RunTime can be found in figure 2, where n is the number of users requiring a 56k partition.

For example, an installation requiring sixteen 56k partitions would require a task size of:

$$468k \text{ for RTI } (140 + 20.5 * 16) \text{ or } 404k \text{ for RTP } (84 + 20 * 16).$$

	Interpretive RunTime (RTI)	Non-Interpretive RunTime (RTP)
A. 'Shareable' Section Base RunTime (Shareable)	140k	84k
B. 'User' Section Non-shareable RunTime User Partition Total Base Requirements (per user)	28.5k Up to 56k Up to 84.5k	28k Up to 56k Up to 84k

Figure 1

	Interpretive RunTime	Non-Interpretive RunTime
Base RunTime	140k n*20.5k	84k n*20k

Figure 2

Memory	RTI		RTP	
	56k Partition	35k <sup>(1)</sup> Partition	56k Partition	35k <sup>(1)</sup> Partition
Base System 512k	2 users <sup>(2)</sup>	2 users <sup>(2)</sup>	3 users <sup>(2)</sup>	3 users <sup>(2)</sup>
Base System 640k	4 users <sup>(2)</sup>	4 users <sup>(2)</sup>	4 users <sup>(2)</sup>	5 users <sup>(2)</sup>
Expanded System 512k + 1MB <sup>(3)</sup> Option Board	9 users	9 users	9 users	9 users
Expanded System 640k + 1MB <sup>(3)</sup> Option Board	16 users <sup>(2)</sup>	17 users	16 users <sup>(2)</sup>	17 users
Expanded System 512k + 2MB <sup>(3)</sup> Option Board	16 users <sup>(2)</sup>	25 users	16 users <sup>(2)</sup>	25 users
Expanded System 640k + 2MB <sup>(3)</sup> Option Board	16 users <sup>(2)</sup>	33 users	16 users <sup>(2)</sup>	33 users

Figure 3

### Number of Basic-2C Users Supported:

As can be seen by the discussion above, the calculation of memory requirements under SuperDOS is fairly complex. The chart in figure 3 may help simplify this.

### Explanatory Notes:

(1)The shareable section of the RunTime must be allocated enough memory for at least two overflow areas, even on systems where no user partition greater than 35k is required.

(2)These configurations will leave no room for optional tasks in base memory. If any optional tasks, such as tape backup, ability to run DOS programs, or use of B2C are required, the number of Basic-2C users must be reduced. In addition, these configurations will have minimal cache buffers configured.

Reducing the number of Basic-2C users will make 'base' memory available for other users as follows:

For 'base' memory only systems, 64k will be made available for every Basic-2C user removed. For systems with 'expanded' memory, 20.5k (20k for RTP) will be made available for every Basic-2C user removed.

## SuperDOS Performance Benchmarks

### Overview

Niakwa has conducted an extensive performance evaluation of SuperDOS systems. The purpose of this evaluation is to give Basic-2C licensees a realistic guideline as to the performance that can be expected from Basic-2C applications running under SuperDOS.

As a convenience to our licensees, previously published benchmarks for Altos and Digital are included. In addition, benchmark results for a Novell system were added.

### Hardware Used

**WANG**  
Wang 2200 CPU  
512k of main memory  
80MB Phoenix Disk Drive  
Configured for up to 8 terminals  
Terminals running at 19200 baud

**ALTOS**  
Altos 2086 CPU  
4MB of main memory  
80MB Winchester Disk Drive  
Configured for up to 16 terminals  
Terminals running at 19200 baud except console running at 9600 baud

(3)Option board refers to the "high-speed expanded memory" option board.

### 4. Disk:

There are no special requirements for disk type or capacity. The Basic-2C Development and RunTime Package software will require approximately 800k of disk space. SuperDOS and system related utilities will use approximately 500k of disk.

### 5. Diskette:

No diskette drive is required for Basic-2C operation. However, a diskette drive is required for installation of Basic-2C software. Basic-2C software will be available on either 5-1/4" or 3.5" media. 'Raw' 2200 format diskettes are supported on 5-1/4" drives.

### 6. Terminals:

See separate article "Terminals Supported"

### 7. Printers

Both parallel and serial system printers are supported. In addition, local printers are supported for terminals with printer ports -- either serial or parallel.

### DIGITAL

Digital MicroVAX II CPU  
5MB main memory  
71MB Winchester Disk Drive - model RD53  
8 terminals running at 9600 baud

Note, we were unable to obtain necessary hardware for a full 16 terminal Digital system test.

### NOVELL

File Server:  
Multitech (Acer) 1100 (80386 processor, 16MHz)  
1MB memory  
40MB Miniscribe disk drive  
Workstations:  
Multitech (Acer) 700 (8088-1 processor, 8MHz)  
Topology:  
Arcnet

### SuperDOS

Three configurations were tested.

1. IBM AT  
80286 processor, 6MHz  
512k base memory  
2MB memory expansion board  
71MB Priam disk drive  
16 Wyse 60 terminals running at 38400 baud

2. IBM AT with 386 accelerator board

80386 processor, 16MHz  
512k base memory  
2MB memory expansion board  
71MB Priam disk drive  
16 Wyse 60 terminals running at 38400 baud

3. Wyse PC 286, Model 2200

80286 processor, 10MHz  
640k base memory  
2MB memory expansion board  
71MB SCSI disk drive  
16 Wyse 60 terminals running at 38400 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 instructions 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 in figure 4.

### General Interpretation Of SuperDOS Results

In addition to the three hardware configurations tested, two separate software configurations were tested. In one configuration, labeled 'base', the tasks executing Basic-2C were assigned to 'base' memory. A maximum of 4 Basic-2C users is supported in this configuration. In the second configuration, all tasks executing Basic-2C were assigned to 'expanded' memory.

The differences in the results between 'base' and 'expanded' configurations on the Wyse 2200 and IBM AT with the 386 accelerator board are due to the fact that the

speed of memory transfer operations in the expanded memory board is not improved by faster processors. Therefore, CPU instructions which are primarily memory transfer operations (such as MAT COPY and ALPHA LET) are bound by the speed of the expanded memory.

Note that I/O operations to disk and screen are not significantly affected by 'base' versus 'expanded' considerations. Only a limited subset of CPU operations is affected.

'Base' results for the IBM AT without the 386 accelerator are identical to 'expanded' results and are therefore not listed separately.

### Test 1 - CPU Performance

In the CPU intensive test, SuperDOS was determined to be from 4 to 13 times faster than the Wang 2200, depending on the exact hardware and configuration utilized. 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 up to 9-10 times the Wang 2200 with a typical Basic-2C program instruction mix (note: for CPU intensive instructions only).

### Test 2 - Screen Performance

The results of the screen test show that screen output performance is strongly related to CPU performance when higher numbers of terminals are used under SuperDOS. The results range from 25% faster than a Wang 2200 using the IBM AT with the 386 accelerator to 40% slower than the Wang 2200 on the AT without the 386 accelerator at 8 terminals.

Note that the effect of the higher baud rate is very evident with results at 1 and 2 terminals, but is lost as terminals are added and the operation becomes CPU bound.

### Test 3 - Disk Performance

As seen by the results, SuperDOS delivers excellent disk performance on the IBM AT with the 386 accelerator board and the Priam drive with results up to 35% better than the Wang 2200.

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 SuperDOS 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.

The results indicate that SuperDOS performs from 10% faster (IBM AT - no 386 board, 8 users) up 2.7 times faster (IBM AT, with 386 accelerator, 4 users) than a Wang 2200.

Figure 4

	ALTOS 2086 80286 8Mhz	DEC	Novell 80386 16Mhz	Wang 2200	BLUEBIRD IBM/AT 80286 6Mhz	BLUEBIRD IBM/AT 386 80386 16Mhz	BASE CONFIG BLUEBIRD IBM/AT 386 80386 16Mhz	BASE CONFIG BLUEBIRD WYSE PC286 80286 10Mhz	BASE CONFIG BLUEBIRD WYSE PC286 80286 10Mhz
<b>CPU INTENSIVE</b>									
ONE TERMINAL	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG	AVG
FOR/TO	6.54	8.76	21.14	59.00	12.00	7.00	3.00	10.00	7.00
IF/THEN	11.24	11.99	28.56	80.00	18.00	10.00	5.00	13.00	9.00
ADD	8.52	10.25	24.50	75.00	15.00	9.00	4.00	11.00	9.00
CONVERT	6.66	6.71	18.67	8.00	7.00	3.00	2.00	5.00	4.00
ALPHA LET	2.64	9.19	23.46	42.00	11.00	9.00	4.00	10.00	6.00
MAT COPY	6.12	5.96	20.92	40.00	9.00	10.00	4.00	9.00	5.00
<b>TWO TERMINALS</b>									
FOR/TO	13.07	17.36	21.14	118.00	24.40	14.00	7.00	18.50	14.00
IF/THEN	22.17	23.99	28.56	160.00	33.50	19.00	10.00	26.50	19.00
ADD	17.24	20.48	24.50	150.00	29.50	18.50	9.50	23.00	17.00
CONVERT	13.57	13.48	18.67	17.00	14.00	6.00	3.00	10.00	7.50
ALPHA LET	14.62	18.39	23.46	84.00	21.00	19.00	9.00	20.50	12.00
MAT COPY	12.68	12.12	20.92	80.00	19.00	18.00	7.00	19.00	10.50
<b>FOUR TERMINALS</b>									
FOR/TO	25.60	34.39	21.14	240.00	48.25	27.50	15.00	37.00	27.00
IF/THEN	44.93	47.98	28.56	320.00	67.75	38.00	20.00	52.00	39.00
ADD	34.90	41.47	24.50	300.00	58.25	36.00	18.25	45.25	32.25
CONVERT	25.30	26.96	18.67	32.00	27.50	13.00	7.50	20.50	15.75
ALPHA LET	30.80	36.80	23.46	169.00	42.25	36.75	16.75	40.25	24.75
MAT COPY	25.90	24.49	20.92	160.00	37.25	35.75	14.25	37.25	21.25
<b>EIGHT TERMINALS</b>									
FOR/TO	53.04	68.43	21.14	480.00	95.75	54.38	NP	73.88	NP
IF/THEN	86.18	95.81	28.56	640.00	135.13	76.38	NP	104.13	NP
ADD	68.13	82.17	24.50	600.00	115.38	71.38	NP	91.23	NP
CONVERT	52.58	53.76	18.67	64.00	54.88	25.88	NP	40.00	NP
ALPHA LET	62.56	73.65	23.46	340.00	84.25	73.25	NP	80.13	NP
MAT COPY	50.83	49.21	20.92	320.00	74.63	71.25	NP	74.00	NP
<b>SIXTEEN TERMINALS</b>									
FOR/TO	102.00	NP	21.14	NA	191.00	108.75	NP	147.75	NP
IF/THEN	181.00	NP	28.56	NA	270.00	153.75	NP	207.75	NP
ADD	144.00	NP	24.50	NA	230.24	143.25	NP	181.63	NP
CONVERT	103.00	NP	18.67	NA	109.20	51.88	NP	80.19	NP
ALPHA LET	122.00	NP	23.46	NA	168.00	147.69	NP	160.44	NP
MAT COPY	NP	NP	20.92	NA	149.00	143.44	NP	149.31	NP

NA= NOT AVAILABLE NP= NOT PERFORMED

Figure 4

	ALTOS 2086 80286 8Mhz	DEC	Novell 80386 16Mhz	Wang 2200	BLUEBIRD IBM/AT 80286 6Mhz	BLUEBIRD IBM/AT 386 80386 16Mhz	BASE CONFIG BLUEBIRD IBM/AT 386 80386 16Mhz	BASE CONFIG BLUEBIRD WYSE PC286 80286 10Mhz	BASE CONFIG BLUEBIRD WYSE PC286 80286 10Mhz
<b>SCREEN INTENSIVE</b>									
ONE TERMINAL	37.00	61.00	23.89	49.00	39.00	28.00	28.00	34.00	34.00
TWO TERMINALS	62.50	68.00	NP	69.00	69.50	39.00	39.00	50.50	50.50
FOUR TERMINALS	121.00	137.00	23.89	133.50	135.00	77.00	77.00	99.75	99.75
EIGHT TERMINALS	246.00	280.00	23.89	198.00	279.75	155.25	NP	199.00	NP
SIXTEEN TERMINALS	435.00	NP	23.89	NA	557.25	310.00	NP	397.00	NP
<b>RANDOM DISK I/O</b>									
ONE TERMINAL	27.00	18.00	24.66	16.00	14.00	11.00	11.00	14.00	14.00
TWO TERMINALS	42.00	27.00	NP	31.00	27.00	22.00	21.00	29.00	26.50
FOUR TERMINALS	80.00	51.00	82.68	62.00	51.00	44.00	42.00	57.50	55.00
EIGHT TERMINALS	163.00	94.00	165.73	122.50	105.00	88.00	NP	120.75	NP
SIXTEEN TERMINALS	321.00	NP	328.19	NA	212.00	191.00	NP	249.50	NP
<b>OVERALL MIX</b>									
ONE TERMINAL	14.00	22.00	15.00	22.00	15.00	11.00	10.00	13.00	11.00
TWO TERMINALS	22.00	25.00	NP	33.50	25.00	16.00	13.50	20.00	17.00
FOUR TERMINALS	28.00	41.00	21.00	64.00	47.00	30.00	23.00	37.50	31.00
EIGHT TERMINALS	63.00	84.00	33.48	108.00	93.00	61.00	NP	75.75	NP
SIXTEEN TERMINALS	113.00	NP	61.30	NA	220.00	124.00	NP	151.00	NP

### Some additional notes on performance:

One aspect of performance that is difficult to measure, but is often the most important measure of system's acceptance by users, is the system's responsiveness to operator interaction.

In this area, SuperDOS performs very well. There are two reasons for this:

1. SuperDOS uses a very short timeslice (5 ms). This means that even on a heavily loaded system, a given task is never 'asleep' for very long.

2. Keyboard input is interrupt driven and is given a higher priority than other operations. This means that keystrokes are processed immediately, even if heavy batch processes are running on other tasks.

In addition, it should be noted that SuperDOS produces very smooth timeslicing with each terminal getting an equal share of system resources (except for prioritized keyboard entry as described above). In all of our performance testing, timings on all terminals for a given test were always within a 5% range.

# Bluebird Hardware Policies

## Hardware Maintenance Policy

All hardware products purchased from Bluebird Systems are eligible for an on-site hardware maintenance contract. In the United States this service is provided by Intelogic Trace. An extensive network of over 300 local field service offices is in place to serve you.

Hardware service contracts in Canada are available from Synergy Computer Services.

## Warranty

Bluebird Systems provides a minimum 90-day warranty on all hardware products. The 90-day warranty provides for depot (mail or carry-in) maintenance. Certain manufacturers offer longer warranty periods. Where applicable, these extended warranty periods are passed through to resellers.

A limited on-site warranty is available for all systems staged by Bluebird Systems.

## Staging

Bluebird Systems offers a comprehensive system integration service called staging. Derived from procedures perfected in delivering its own turnkey systems, Bluebird assembles all hardware, loads system software, tests and burns-in the system prior to delivery to the reseller. All components and cabling are distinctively labeled to correspond to an easy-to-read installation guide. Staging virtually eliminates hardware malfunctions during the critical early stages of installation and ensures timely delivery to the customer.

In the unlikely event of an early systems failure, the staging service includes on-site warranty for 60 days at no additional charge.

## Lead time

Bluebird Systems expects to be able to deliver all products within two weeks of ordering. An acknowledgement of all orders placed with Bluebird will be mailed to the reseller indicating the scheduled ship dates. Rush orders requiring overnight delivery can be handled for a small fee.

## DOA Policy

Bluebird Systems has a Dead-on-Arrival (DOA) policy in the event hardware products arrive inoperable. Equipment that arrives DOA can be handled in two ways. Your first option is to return the equipment to Bluebird Systems via their return instructions. Upon receipt and testing of the defective equipment, a new unit will be shipped to you. Your second option, where time is of the essence, is an expedited DOA replacement.

For a nominal handling charge, a replacement unit will be shipped prior to receipt and testing of the defective unit.

Systems staged by Bluebird Systems (See STAGING) are automatically covered by on-site maintenance.

## Transit Insurance

As a protection to you, transit insurance will be charged on each shipment unless covered by other means.

## Hot-Line Subscription Service

In order to provide resellers with the latest in technical support information and software improvements, Bluebird Systems offers both Hotline and Subscription Services. Technical support representatives are available 12 hours per day to answer system configuration and software support questions. Subscription Service includes monthly technical newsletters, scheduled software releases and an on-line communication service which allows resellers to access up-to-date software fixes between releases.

## System Training And Education

Instructional classes on both the SuperDOS operating system and the Basic-2C language and environment are offered by Bluebird Systems and Niakwa Management Services, respectively.

Since SuperDOS instruction manuals cannot be found in the computer section of your local bookstore, Bluebird strongly recommends attendance at its regularly scheduled training classes.

This is to provide instruction on the high-performance and related features of their multi-user, multi-tasking operating system.

## Whom Do I Call With Problems ?

No matter how easily and efficiently your system may be functioning today, there is always the possibility that some circumstance may occur tomorrow which will cause you to require assistance. This assistance could range from simple questions relative to the installation and operation of your application software, to more disconcerting problems such as malfunctioning hardware or possible system 'bugs'.

When assistance is required, the first thought that usually comes to mind is "Whom do I call for help?". The answer is: Niakwa's Technical Support Department. We have a technical support staff who is ready and able to assist you with whatever problems you may encounter with Basic-2C under SuperDOS. We can help determine whether the problem is hardware or software-related, and take the steps necessary to remedy the situation or explain the circumstance to you.