noticed that DR DOS hides its true identity from DOS applications. When you enter the VER command, the system displays "DR DOS 5.0." However, the internal function (30h) that tells applications the version number of DOS, reports Version 3.31.

This white lie actually has some advantages. If you're upgrading from DOS 3.3 (by far the most popular version of MS-DOS), you won't have to install new network drivers for LANs, such as Novell's NetWare. (If you install MS-DOS or PC-DOS 4.01, you'll need to switch from Net3 to Net4.)

We rate compatibility excellent.

DOCUMENTATION:
DR DOS' documentation comprises two booklets: a users' guide and a ViewMax guide. Digital Research also includes a laminated quick-reference card. The users' guide was reasonably well organized and had an adequate number of examples (though we would like to have seen further examples for some of the more complicated commands). The perfect-bound users' guide tended to close when laid on a desktop. We rate documentation good.

SETUP:
DR DOS comes with a polished menu-driven Install utility to guide you through the installation and setup process. The utility lets you automatically install DR DOS on a floppy disk, unformatted hard disk, or MS-DOS formatted hard disk. With each menu of installation options, the utility marks the default selection, which helps when you are unsure what to choose. There is also context-sensitive help for each option. You can also choose to automatically overwrite MS-DOS command files with the equivalent DR DOS files.

Although the installation is generally easy to use, we found some of the options confusing. For instance, one of the setup menus gives three options: Maximize application memory at the expense of functionality, Balance application memory and functionality, or Maximize performance and functionality at the expense of application memory. It was not clear from the installation menu what kind of setup each possible answer would produce. Overall, however, we rate ease of setup very good.

EASE OF LEARNING:
Because Digital Research's operating system has the same look and feel as MS-DOS, experienced PC users will have no difficulty learning DR DOS. This operating system also promotes ease of learning by providing ViewMax for those who want to use it and on-line help for those who prefer the command line. The most significant improvement we would like to see would be on-line help for internal commands (which are by far the most used) as well as the less frequently used external commands. Ease of learning rates very good.

EASE OF USE:
DR DOS rates better than standard MS-DOS in this category due to the ViewMax graphic shell and the command-line history facility. The new and enhanced commands also make it faster to copy, view, and delete files than in MS-DOS. We rate DR DOS good in ease of use.

ERROR HANDLING:
DR DOS' error messages are different from those in MS-DOS. The messages are still terse, and users may have to refer to the manual for definitions. (This is another area that's ripe for an on-line help facility.) Overall, we didn't see much improvement over MS-DOS. We rate error handling satisfactory.

SUPPORT:
Support policies: Digital Research supplies unlimited free technical support during business hours, Pacific time, but the lines are not toll free. (Microsoft, in comparison, has a 900 number.) DRI also offers a 60-day money-back guarantee. We rate support policies good.

Technical support: Of the four calls made to Digital Research's technical support (scattered throughout the business day), we averaged 8 minutes on hold before connecting with a technician. The technicians were knowledgeable and answered some relatively tough questions promptly. We rate technical support good.

VALUE:
DR DOS has a list price of $199. Through August of this year, there is a $79 upgrade special from any version of MS- or DR DOS to DR DOS 5.0.

DR DOS takes MS-DOS' solid foundation and adds more functions and better ease of use. Although Version 5.0 could still use refinement, DR DOS is a big improvement over existing products.

The long-term value of DR DOS 5.0 depends on what Microsoft puts into its next release of DOS. For now, we rate DR DOS' value very good. □

Brett Glass was one of the original architects of the IEEE 802.5 Token Ring LAN, and currently hosts the OS/2 conference on The Well. He can be reached electronically as [72267,3673] on CompuServe, "glass" on BIX, and rogue@well.sf.ca.us *on Usenet and the ARPA Internet.*

Missing: Debug Compatibility

We found only one incompatibility in DR DOS: It does not have the DOS Debug utility. Instead, DR DOS comes with a modernized CP/M debugger called Symbolic Instruction Debugger (SID).

Although SID is slightly more powerful than DOS Debug, added capability is not what most users need. Because many SID commands are quite different from DOS Debug's, it's not possible to use DOS Debug scripts — files published in books, magazines, and on BBSes — to enter programs in hexadecimal format. You can modify DOS Debug scripts to work with SID, but the process is beyond the knowledge of most users.

Unfortunately, even if you have a copy of DEBUG.COM from PC-DOS or MS-DOS 3.3, it won't run under DR DOS because of the difference in version numbers. We found only two ways to get DOS Debug working under DR DOS: Borrow it from Compaq DOS 3.31, or patch DOS 3.3's Debug to look for Version 3.31 instead.

IBM Hits the Ground Running With Clever 486SX-Based PC

Intel CPU provides slower, lower cost alternative to full-power 486 machines.

BY TIM ZITTLE TEST CENTER
AND ANNE KALICZAK
ASSOCIATE REVIEWS EDITOR

IBM has stolen Compaq's traditional thunder by being first to release a personal computer based on a new Intel CPU. IBM's 486SX-based computer is a lower cost alternative to a fully powered 486-based machine.

The 486SX chip offers nothing new in technology; it is basically a slower version of the 486DX without the built-in math coprocessor. In our tests, the 20-MHz 486SX-based computer was faster than a 25-MHz 386 machine, but much slower, as expected, than a 25-MHz 486 computer. (We will publish a product comparison of 486SX computers in the June 24 issue.)

Many vendors are announcing 486SX systems, and the chief attraction for buyers will be the low cost. (Intel's reasons for developing the chip include moving the market away from rival AMD's 386 clones.)

Overall, IBM's PS/2 Model 90 XP 486SX is a fine machine. It has a clever modular design and, like other IBM Model 90s, includes XGA video on the motherboard.

We encountered an odd incompatibility with Lotus 1-2-3, Release 3.1. This particular version of 1-2-3 assumes that the 486 chip has a built-in coprocessor, and when it encounters the 486SX — a 486 without a math coprocessor — it hangs. Fortunately, it's simple to get around this problem by starting 1-2-3 with the command "123-s," which fools the program into thinking it is running on a 386 chip (See "Bug Found in 1-2-3, Release 3.1 Running on 486SX PCs," May 13, Page 5).

We didn't find any other incompatibilities in the course of testing, but we assume that any other programs that expect a math coprocessor when they see a 486 will have a similar problem.

We ran our standard benchmark test suite on the IBM Model 90 486SX. (See "How We Test," April 1, Page 53.) The IBM 486SX outperformed the IBM PS/2 Model 70 386/25 but was slower than the PS/2 Model 70 486/25 Power Platform in CPU-intensive operations. However, in disk-intensive tests the 486SX was the clear winner over both the IBM 486 and 386 systems, thanks to the 512K of cache

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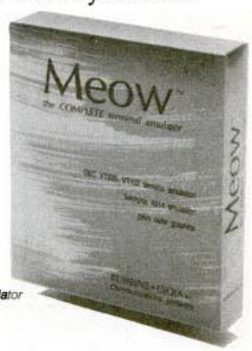

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IBM's PS/2 Model 90 486SX combines high-quality workmanship, speed, built-in XGA, SCSI, and upgrade options for less than a Model 70 486/25.

on the machine's SCSI disk controller.

We tested Windows performance in standard VGA mode and in XGA mode with IBM's included driver. XGA tested faster than VGA, and we base our score on the XGA results.

The IBM 486SX, like most PS/2s, employs the Micro Channel Architecture bus and comes standard with 4 megabytes of RAM, XGA video, and a SCSI adapter.

The system includes a modular processor card that can be easily replaced with a more powerful CPU. IBM currently offers an upgrade path to a 486/25 or 486/33, and a 487 SX-20 coprocessor option is slated to be available sometime in July.

The system contains four standard 32-bit Micro Channel slots, one with a video extension, as well as two proprietary memory slots and the CPU slot. After our configuration only three 32-bit slots were left free, but the system has the capability to support up to seven SCSI hard disk drives.

This system is very easy to set up. Attached thumb screws replace the easily lost case screws common in other systems. And there is even a special floppy drive removal tool that conveniently hangs on the interior wall of the system. CPU, memory, and coprocessor options reside on easy-to-change proprietary cards, and there are no switches to find or chips to remove.

IBM traditionally offers support through the dealer channel and authorized entities for the length of the original warranty, after which they offer direct support based on a service contract. There is a service support line, 1-800-IBM-SERV, which is available 24 hours a day.

IBM is usually on the top of the price scale, and we found that with preliminary pricing information from other 486SX vendors, this is still the case. The 486SX system is priced at $8,945, just $395 less than a similarily configured IBM Model 70 B-21 486/25 Power Platform (which does not include XGA or SCSI capabilities) and $1,505 more than the Model 70 386/25 A-21. (Street price for the 486SX unit might range from $6,000 to $6,700.) However, the Model 90 XP 486SX is a very well-thought-out system that delivers 486-class performance without a significant loss in other areas.

TEST CENTER'S FIRST 486SX. This review is the first to test the capabilities of any 486SX. We will provide an in-depth look at a number of 486SX machines in our June 24 evaluation; the scores reported in this review could change at that time due to the relative performance of other 486SX computers.

BENCHMARKS — INFO WORLD

IBM PS/2 486, 386 Computers

	Model 90 XP 486SX	Model 70[1] 386/25 A-21	Model 70-B21[2] 486/25 Power Platform
Clock speed	20 MHz SX	25 MHz	25 MHz
CPU-intensive speed	23:06	24:35	14:09[3]
Disk-intensive speed	40:49	55:20	51:42[3]
Multitasking speed	02:38	2:42	N/A
Multitasking speed[4]	02:11	N/A	N/A

All times in minutes:seconds.
[1]Reviewed April 1, Page 45.
[2]Reviewed March 12, 1990, Page 49.
[3]These times reflect a former test plan. Numbers are for general comparison only.
[4]Multitasking score with the Windows XGA drivers loaded.

REPORT CARD — INFO WORLD

20-MHz 486SX MICRO CHANNEL COMPUTER

IBM PS/2 Model 90 XP 486SX 0G9

Criterion	(Weighting)	Score
Performance		
Speed — CPU-intensive	(150)	Good
Disk-intensive	(100)	Good
Multitasking	(125)	Good
Compatibility	(150)	Very Good
Minor snag with 1-2-3 3.1; one processing speed.		
Expandability	(75)	Good
Upgradable to 486/25 or 486/33; 32 megabytes RAM; supports seven SCSI drives.		
Documentation	(50)	Satisfactory
Sparse quick-reference manual, index, and troubleshooting guide; includes system setup sheet and configuration disks.		
Setup	(75)	Very Good
Modular system; special tool included for disk drive removal.		
Serviceability		
System design	(50)	Very Good
Small footprint; Micro Channel Architecture; patches on processor daughter board.		
Support policies	(50)	Satisfactory
Technical support	(75)	Good
Score based on reader survey.		
Value	(100)	Satisfactory
Final score		**6.3**

PRODUCT SUMMARY

Company: IBM Corp., Old Orchard Road, Armonk, NY 10604; (800) IBM-2468.
List Price: $8,945 as configured; sold through dealer channels, authorized industry remarketers, and marketing representatives.
Features: 20-MHz 80486SX CPU; XGA adapter; built-in SCSI adapter; two serial, one parallel, one PS/2 mouse port; Intel 80487SX math coprocessor support; 194-watt power supply.
Peripherals: Enhanced keyboard.
Storage and Memory: 160-megabyte IBM hard disk with SCSI 1:1 controller and 256K of disk cache; 1.44-megabyte 3½-inch floppy drive; 4 megabytes of 70-nanosecond RAM (SIMMs on expandable daughterboards, 32 megabytes maximum); 8K of RAM cache on the 486SX chip.
Pros: Small footprint, low profile; simple disassembly; large SCSI storage options; built-in XGA.
Cons: Slim manual; patches on CPU daughter board.
Summary: The Model 90 XP 486SX is a solid performer. It is modular, easy to upgrade, and includes a wealth of storage options.

REVIEW RESPONSES

Color Hand-Held Scanners

Our CS-4096 Color Hand Scanner was not included in your April 29 product comparison of gray-scale and color hand-held scanners (Page 51).

I would like to point out to your readers that our product has been shipping since February 25. It requires Windows 3.0 and includes three Windows applications: Astral Picture Publisher Plus, a 24-bit image editor; ImagePrep, CPI's well-heeled file and color-to-gray-scale conversion utility; and Migraph CS-4096 Scanner Utility.

The first two software products cost $990, with a street price of about $650. The CS-4096 Color Scanner Bundle retails for $895.

The Migraph color scanner interface implements several interrupts and 64 switch-selectable addresses in order to resolve conflicts with any other device using reserved or nonreserved addresses, including SCSI and bus/mouse interfaces.

Kevin Mitchell
President
Migraph Inc.
Federal Way, WA

Next Nitpicking

I have a small nit to pick with *InfoWorld* regarding its Nextstation review (May 6, Page 73). The statement, "The NextStep environment does not have TSRs or Desk Accessories," is not true. This is the same as saying that Unix doesn't have a DIR command because Unix calls it LS instead.

The idea of a TSR or a DA is to give the user access to some application from within some other application.

The only reason MS-DOS or Macintosh need TSRs or DAs is that they are fundamentally single-tasking systems. Any Unix system, such as the Nextstation, is a multitasking system, so it doesn't need TSRs or DAs. Any application is always available from within any other application.

It would be more accurate to say that *all* Nextstation applications are TSRs.

Lee Sailer
Kinzuid Inc.
Jamestown, PA

Professional Write Plus

Software Publishing Corp.'s Professional Write Plus (reviewed May 13, Page 87) is an extension of the Professional Write product line onto the Windows platform. Professional Write for DOS continues to be an important component of SPC's presence in the word processing arena.

Carolyn Karr
Software Publishing Corp.
Mountain View, CA

In the May 13 review of Professional Write Plus, we published an incorrect phone number. To reach Software Publishing Corp., dial (415) 962-8910.
— Editors

InfoWorld welcomes comments about its reviews. Letters are subject to editing for space and clarity. Please address correspondence to the Reviews Editor, InfoWorld, 1060 Marsh Road, Menlo Park, CA 94025.

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