

5-6m-
MS-DOS for
PS/2's

Confidential Interoffice Memo

Date: 10/16/91
To: Executive Staff
From: Brad Chase

Subject: Response if IBM ships DR DOS
cc: Starwars, octaman, buckf, doschamp, richab, richt, charlotz, tomie, ericst, marionj, johab

I. Situation

IBM is rumored to be announcing at Comdex that they will offer DR DOS as an option either on a) all their machines or more likely b) on all their 286s and "low-end 386s." It is possible they will offer DR DOS immediately and also possible they make it available in January. Further we expect them to tie DR DOS to a strong statement of support for OS/2 2.0. We do not have any data on their international plans.

Our expectation is that they will not bundle/pre-install, but that they will offer DR DOS 6 (perhaps to be called IBM DOS 6) as an option in addition to IBM DOS 5. In that case, it is likely they will price IBM DOS 5 at its current \$165 and DR DOS at \$99 (SRP).

Please send feedback to bradc or "starwars" (the email alias team working on this project).

II. Plan

Microsoft announce two retail products immediately following any IBM announcement of DR DOS support: 1) MS-DOS 5 for PS/2s¹ and 2) MS-DOS 5 for PS/2s/Windows 3.0 packaged together. To make both products even more enticing than the IBM offering they will include a coupon for the upcoming new version of Qualitas' BlueMax (just announced 9/30 and shipping at Comdex). This coupon will entitle the user to purchase BlueMax 6 for \$19.95 plus shipping and handling. BlueMax lists for \$124.95 and should have a street price around \$80-\$90. BlueMax is a popular memory management product designed specifically for IBM PS/2s. It frees up significant upper memory (over 80K) on IBM PS/2s. The coupon agreement with Qualitas is an exclusive for up to one year.

The MS-DOS 5 for PS/2 product will only work on new IBM PCs.

III. Rationale

The success of our MS-DOS and Windows strategy relies on maintaining MS-DOS 5 as the operating system standard. While some customers will go with whatever IBM recommends and other customers will go with IBM or MS-DOS 5 because they are the solid standard, there is some group of customers in between. This group is much more likely to choose the MS-DOS standard if MS-DOS 5 is priced the same (or less) than DR DOS.

Any announcement by IBM that they are shipping DR DOS makes their commitment to MS-DOS suspect. Consequently, the key objective of these SKUs is clear. Customers of new IBM machines need to know that the MS-DOS platform will be available from a vendor that is aggressively supporting it. Obviously, it is also an important part of our overall strategy; we help fortify the success of MS-DOS and Windows by ensuring MS-DOS 5 is well supported and easily obtained.

If we can keep most customers on the MS-DOS platform, there is less risk that IBM's endorsement of DR DOS will entice other OEMs to offer DR DOS.

IV. Opportunities

We believe IBM sells about 1.2 million machines per year in the United States alone. The table below estimates US revenue per year of the program at different unit sales levels:²

	100K	200K	300K	400K	500K	600K	700K	800K	900K	1000K
Revenue	\$3.9M	\$7.9M	\$11.8M	\$15.7M	\$19.6M	\$21.6M	\$27.5M	\$31.4M	\$33.3M	\$39.3M

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The revenue opportunity is significant. Even more so if IBM PCs sells a similar volume outside the US.

¹ Since IBM-DOS is pre-installed on PS/2s we are not targeting these machines. We will be able to add a tagline to the box indicating the product works on PS/2s if we need to.

² Assumes \$45.50 per unit revenue for each MS-DOS 5 (RTS/2s) sold. Assumes 25% of the sales will be the combination with Windows and that 25% of the combo product sales are incremental Windows sales. Also assumes that average incremental revenue per Windows sale is \$63.

Plaintiff's Exhibit

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V. Issues

There are numerous issues that must be carefully managed if we announce these SKUs:

Issue	Response
PC manufacturers perceiving that this is the first step to Microsoft taking MS-DOS retail. Other PC manufacturers wanting to get out of the MS-DOS business and using this announcement as their rationale.	OEM/product marketing will communicate our intentions to our key OEMs (before Comdex) and reassure them we have no such plans. We will create a one <u>separate</u> page white paper explaining why we are doing these SKUs. Press release will clearly indicate our support of the OEM channel and how the OEM channel is the best answer for customers.
Confusion among customers over what to buy and among retailers over what to sell. To Upgrade we have one SKU, for a new IBM PC we have two other SKUs, for non IBM machines we do not have any SKU - the user must go to the PC manufacturer.	Channel/Product marketing to present the new program via conference calls and documents to MS reps and key resellers. Training for RAXs at November District meetings and for all reps at the RKO in January.

VI. DR DOS analysis

We are aggressively testing DR DOS 6 with released products so we can better understand its weaknesses and substantiate why MS-DOS 5 is a better, more solid product. A synopsis of our initial findings has been attached. It will focus on a number of key areas:

1. DR DOS is not DOS. They admit on their forum they do not implement all of the MS-DOS undocumented calls and they also did not implement some of the MS-DOS APIs. Since software and hardware vendors design and test their products based on MS-DOS customers face the inherent risks of running another operating system when they choose DR-DOS.
2. Exacerbating this problem is that DR-DOS 6 is sloppy and not as well-tested as MS-DOS 5. Early reports from the DR DOS Comserve forum and our test effort indicate that DR DOS may have compatibility and/or set-up problems with a large number of the top applications (Wordperfect 5.1, Wordperfect Office, Lotus for Windows, QEMM, 386 to the Max, Windows, Central Point Utilities). Even good features, their compression and undelete utilities, are poorly implemented and can corrupt a users hard disk.

We are supplementing our own internal test effort with a more detailed testing effort using a third party testing company (OXCAL). We will have more detailed data and a document ready to distribute by Comdex.

VII. Product Issues

MS-DOS for PS/2s will be nearly identical to IBM DOS 5. We have added almost all the "fixes" IBM made to IBM-DOS in order to compete with IBM trying to claim the MS-DOS 5 product is "incompatible"

VIII. Pricing and Distribution

Suggested Retail Pricing will be determined when we have more data about the IBM announcement but our current plans are to price the SKUs at an SRP of \$99/\$225 respectively. Both products will go through normal distribution channel but we will provide IBM resellers a configuration incentive (via rebates) to encourage them to pre-install our product (about 50% of IBM DOS is currently pre-installed by the reseller for their customers) and to make our product a profitable alternative. The table below summarizes our current expectation of the final pricing to the resellers. This pricing has been determined with two key issues in mind a) OEM pricing schedules b) Being competitive with the IBM offering of DR DOS while maintaining the MS-DOS price point:

	Expected Cost to Reseller*	Config Funds	Net Price
MS-DOS 5 for PS/2s	\$49.50	\$2	\$41.50
Win/DOS for PS/2s	\$112.50	\$13	\$99.50

* As we can not predict exact distributor mark-up, this figure might increase by a few dollars

IX. PR

We have already prepared drafts of a press release announcing these SKUs (copies attached). We will be prepared to modify the press release and distribute at our press breakfast the Tuesday of Comdex if IBM announces on Monday. We are also preparing a press release with quotes showing the support of PC manufacturers. Finally we will have a plan to distribute the results of our DR DOS 6 test effort.

X. International

We have been filling in the subsidiaries and international marketing on the details of our plans and are getting their input while stressing the confidentiality of the situation.

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Appendix 1 - DE/Novell/IBM reaction

We should be prepared for a reaction to our MS-DOS 5 for PS/2s. The range of possibilities and implications:

A. IBM pre-installs DR DOS on 286 & some 386s

This would be nasty. We would hope for user revolt and continue to encourage resellers and customers to insist on MS-DOS 5.

B. IBM pre-installs Network Lite on 286 & some 386s

We should expect this. We are exploring a relationship with a DOS peer to peer vendor to have an answer (or to move b4 them).

C. IBM matches our reseller pricing with IBM DOS 5

Unlikely but if it happens this would be positive and remove the price differences between DR and IBM-DOS. We would continue to sell MS-DOS 5 for PS/2s

D. IBM matches our reseller pricing with DR DOS

This will be difficult to counter. We would continue to sell MS-DOS 5 for PS/2s and assess if we have to make price changes. Our BlueMax offer is not easily matched. This advantage is an exclusive.

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Appendix 2 - Marketing Activities

We are brainstorming on ways to continue to build the MS-DOS brand name and exploring numerous marketing ideas (example: changing discount structure to get the MS-DOS 5 Upgrade street price below \$50, local press advertising) for the January - June time frame. A separate proposal will be forthcoming.

Other fall and beyond activities include:

- Business Press Advertising
- Enthusiast Press Advertising
- Technical Seminars
- Reseller Advertising
- FastTips PSS Program
- Instore Displays
- Reseller visits
- User Groups
- Easy Distribution Program for smaller OEMs
- Improved Volume Purchase Program
- Incremental funding for key resellers
- Program to use merchandising funds accumulated from advertising.
- Expanded distribution for the Upgrade into mass merchants
- PR effort including -Tips & Tricks articles, Corporate wins release, non-enthusiast effort, & more
- MS-DOS 5 Upgrade Worldwide Challenge (internal contest)

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Appendix 3 - Draft of Press Release in case IBM announces support for DR DOS

MS-DOS 5 and Windows & MS-DOS 5 Packages Available for IBM
PS/2
The New Microsoft Packages Include Special Discount Offer For
New Qualitas BlueMax

REDMOND, Wash. -- DATE TBD -- Microsoft today announced two systems software packages for IBM PS/2R machines. The two packages are Microsoft MS-DOS 5 for IBM PS/2 and Microsoft Windows™ & MS-DOS 5 for IBM PS/2 packaged together. The new Microsoft packages will be available through resellers for sale only for IBM PS/2 machines. The U.S. suggested retail prices are \$99 and \$225, respectively.

"IBM's support of DR DOS makes their commitment to MS-DOS suspect," said Steve Ballmer, senior vice president of systems software at Microsoft. "Yet customers and the PC industry have invested 10 years and billions of dollars building an open MS-DOS standard. Customers for new IBM PS/2 machines need to know that MS-DOS will be readily available to them, from a vendor that will aggressively support it. This is why we are offering these two new packages for IBM PS/2s."

Industry Based on MS-DOS-compatible Hardware and Software

The PC industry has based its systems on Microsoft MS-DOS since the first DOS personal computer shipped in 1981. Microsoft MS-DOS has shipped with more than 70 million personal computers worldwide, making it the most popular software in the history of personal computing and spawning an industry of more than 20,000 applications that run with the operating system.

"Compatibility of existing and future applications is crucial to all users," continued Ballmer. "Software developers write their DOS applications to be compatible with MS-DOS, not other operating systems, and ensuring compatibility is our number one testing goal. More than 7,000 beta testers in the largest beta test program in the history of the PC industry have helped to ensure that MS-DOS 5 is the compatible and reliable DOS standard for the industry."

The MS-DOS 5 Upgrade alone, which was first shipped in June of this year, has already sold more than 2 million copies worldwide. Further, yet uncounted are copies shipped by more than 140 PC manufacturers that have licensed MS-DOS 5. In addition, Microsoft has shipped more than 6 million copies of Microsoft Windows.

Special Offer Included in Microsoft Packages

Both new Microsoft packages for IBM PS/2s include a discount offer for Qualitas™ BlueMax version 6, the new version of a memory management utility designed especially for IBM PS/2s. The memory management software frees more than 40K of upper memory on most IBM PS/2 machines. Coupons in the packages entitle the owner to purchase BlueMax version 6 for only \$19.95 plus shipping and handling, 80 percent off the suggested retail price of \$124.95.

Pricing and Availability

Both Microsoft MS-DOS 5 for IBM PS/2 and Microsoft MS-DOS 5 & Windows 3.0 for IBM PS/2 will be available by mid-November 1991. The packages include bootable disks and are only for sale with new PS/2 computers; they will not operate on other machines. MS-DOS 5 for other new PCs is available through 140 PC manufacturers worldwide. The MS-DOS 5 Upgrade, which is for updating all machines running DOS including IBM PS/2s, is available through thousands of authorized resellers for a suggested retail price of \$99.95.

Microsoft Corporation (NASDAQ "MSFT") develops, markets and supports a wide range of software for business and professional use, including operating systems, network products, languages and applications, as well as books, hardware and CD-ROM products for the microcomputer marketplace.

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All prices listed are U.S. suggested retail prices.

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Appendix 4 - Very early draft of data we have gathered on DR DOS.

IMPORTANT - The means for communicating to the press that we are a much more solid product (than DR DOS) has yet to be finalized. Please do not distribute this document outside the company - it is a very early draft and you will get updates this week. It is attached here just to provide some data as to the many problems we are finding with DR DOS 6.

A LOOK AT DR DOS 6.0

In this document we will take an in-depth look at DR DOS 6.0, the new operating system from Digital Research. Where appropriate, we'll compare and contrast DR DOS 6.0 with Microsoft MS-DOS 5 and point out the differences between the two.

This document is divided into 2 sections. The first poses the question "What does it mean to be the Standard?" MS-DOS is often referred to as the worldwide PC operating system standard, but what exactly does that entail, and why is it important to be standard? We hope to answer these questions.

The second section takes a detailed look at each of the key features in DR DOS 6.0.

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WHAT DOES IT MEAN TO BE THE STANDARD?

There are many elements that make MS-DOS the worldwide standard. Let's look at what they are and how each affects the end user.

Compatibility Testing

Assuring application compatibility is obviously critical in being the standard. Using an independent test lab, XXCAL Laboratories of Los Angeles, we ran DR DOS 6.0 through a test suite quite similar to a suite run by XXCAL on MS-DOS 5. We ran the tests using the default configuration installed by the DR DOS 6.0 Install program and modified it when necessary. The detailed configuration and methodology for each problem is in Appendix 7. All problems occurred on an 80386 system except where noted.

In summary, while testing DR DOS 6.0 we found significant problems in applications which include 3 of the top 5 on the 10/29/91 PC Magazine best seller list - WordPerfect, QEMM and Windows (#1 doesn't count - it's the MS-DOS 5 Upgrade). The significant problems are as follows:

File copy in WordPerfect Office corrupts disk using DR DOS compression

After installing the WordPerfect Office 2.0 and successfully using the Appointment Calendar, Calculator, Notebook and Scheduler, the tester invoked the File Manager and attempted to copy a text file on the compressed drive. The system hung. After a cold boot the system responded with "Missing Operating System." Rebooting off a floppy, the tester found applications missing from the hard disk and some corrupted files had been.

After reformatting and reinstalling all software, the test ran successfully on an uncompressed disk.

WordPerfect 5.1 Installation hangs with PC Kwik loaded on 80286 system

After invoking the Install program, the system hung on the first file transfer. Install ran successfully after disabling PC Kwik.

The same test ran successfully using MS-DOS 5 and Smartdrive.

Windows 3.0 Setup hangs with PC Kwik loaded on 80286 system

After invoking the Setup program, the system hung on the first file transfer. Setup ran successfully after disabling PC Kwik.

The same test ran successfully using MS-DOS 5 and Smartdrive.

720K floppy formatted under MS-DOS becomes unreadable after use in DR DOS 6.0 system

The tester took a floppy disk formatted under MS-DOS 7 and inserted it into a 720K drive A: on a DR DOS 6.0 system. After copying a file to the disk and returning it to the MS-DOS 5 system, the disk was unreadable. This behavior occurred on any write to the disk (copy, file save, etc.). It did not occur on 1.44 mb floppies, nor if the 720K drive were drive B: instead of A:. No workaround was found.

Running Lotus 123 for Windows hard hangs system with PC Kwik loaded

After installing Lotus 123 for Windows and rebooting the system, the tester double-clicked the Lotus icon in the Windows program manager. After displaying the Lotus opening panel, the system hard hung. 123 ran successfully after disabling PC-Kwik.

The same test ran successfully using MS-DOS 5 and Smartdrive.

PC Tools Deluxe 7.0 unable to Restore data

After installing PC Tools Deluxe 7.0 and backing up the hard disk to 1.44 mb floppies, the tester was unable to restore the data to the hard disk. No workaround was found for this problem.

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The same test ran successfully using MS-DOS 5.

Dir command reboots system after running Optimize in QEMM 6.0

After installing QEMM 6.0 to the hard disk, the tester ran the Optimize program. After it completed, the tester typed the command DIR CONFIG in the root. This caused the system to spontaneously reboot. No workaround was found for this problem.

The same test ran successfully using MS-DOS 5.

PC Labs Benchmarks 5.6 hard hangs during DOS File Access test with PC Kwik loaded on 80286 system

After invoking PC Labs Benchmarks and running the BIOS Disk Seek and DOS Disk Access tests to completion, the DOS File Access test hard hung the system. After removing HIDOS.SYS, which forces DR DOS 6.0 to load in conventional memory, the test ran to completion.

The same test ran successfully using MS-DOS 5 and Smartdrive.

Maximize from 386Max hangs with PC Kwik or Superstor (compression) loaded

After installing 386Max 5.1, Maximize refused to run. After disabling PC Kwik, Maximize initialized but hard hung after the second pass of installation. After disabling Superstor, Maximize ran to completion.

The same test ran successfully using MS-DOS 5 and Smartdrive.

Handling Known Incompatibilities

MS-DOS 5 was tested for a full year in the largest beta test in PC history before its release June 1991. Digital Research released 3 versions of DR DOS 5.0 in 8 months (6/90, 8/90, 2/91).

During testing we modified MS-DOS 5 whenever possible to maintain compatibility. For example, late in our testing we introduced a bug that prevented Smartdrive from loading into UMBs using QEMM or 386Max. It would, however, load into UMBs using EMM386.EXE, the memory manager in MS-DOS 5. Nevertheless, we fixed the bug after consulting with Quarterdeck and Qualitar, it was one of the last fixes we made.

But sometimes it was impossible to change a byte in MS-DOS without causing incompatibility problems. However, because of our beta test we discovered problems well in advance, and worked with software vendors on revisions. We even shipped some in the product like Netware's NETS.COM and Disk Manager's DMDRVR.BIN. We also documented the problems we found extensively in our README.TXT and APPNOTE.TXT files. After all, a 7000-site beta test generates dirty laundry, and we aired it out. Nevertheless, MS-DOS 5 has proven to be a rock-solid product even after selling 2,000,000 units in the first 90 days.

Although it had known problems like any new operating system, DR DOS 5.0 did not come with a README file. For example, Lantastic customers who complained to Digital Research would receive a fax acknowledging the problems (see Appendix 7), but clearly this was after they had taken the trouble to find known bugs. While DR DOS 6.0 does come with a README, it lists information for only 2 applications, Autocad and Windows.

Implementing APIs

To quote Digital Research's synopsis on the DR DOS Compresserve forum, "DRDOS is not totally compatible with MSDOS. There are too many undocumented functions and calls."

It's no secret that most commercial applications rely on undocumented APIs in MS-DOS. So even if an existing application runs on DR DOS, what about a future application? What if it uses undocumented APIs that DR DOS fails to provide? In short, while DR DOS may run with a current version of an

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application, there is no guarantee it will run with future versions. QEMM 6.0 (discussed earlier), which shipped just weeks before DR DOS 6.0, is an archetypical example.

In addition, however, Digital Research chose not to implement some documented APIs in MS-DOS 5. Several new APIs in MS-DOS 5 provide UMB support for applications. Using them, programs like the Norton Utilities 6.0, PC Tools Deluxe 7.0 and Attachmate Extra! automatically load themselves into UMBs. Norton, for example, considered this functionality important enough to advertise (see Appendix 7). DR DOS 6.0 does not support these APIs, thereby reducing the functionality of these programs.

Software Vendor Testing

While DR DOS may run with a current version of an application, there is no guarantee it will run with future versions because the attitude of some software vendors is that if DR DOS is truly MS-DOS compatible, then they shouldn't have to test on it. To quote an October 14, 1991 article from Inforworld on the release of PC Tools Deluxe 7.1:

The company has clearly positioned PC Tools to work with Microsoft's DOS 5.0 and has never promised compatibility with DR DOS 6.0, according to Smith [Corey Smith, president of Central Point Software]

"Promising compatibility" with DR DOS should not be necessary if it is truly MS-DOS compatible. If it is not compatible, then it is in fact a different operating system that also runs MS-DOS applications, much like OS/2 Lx or PC-MOS.

Conforming to Existing Standards

In designing MS-DOS 5, we also conformed to other industry standards in order to protect customer investments. For example, you can load MS-DOS 5 high using any XMS-compliant memory manager, such as QEMM or 386Max, in place of HIMEM.SYS, the XMS driver provided in MS-DOS 5. However, even if you are using another memory manager, you cannot load DR DOS 6.0 (or DR DOS 5.0) high without also using HHDOS.SYS, the XMS driver provided in DR DOS 6.0. This means you must use two memory drivers, which means increased conventional memory overhead (about 5K) and increased chance for random problems caused by memory driver conflicts.

Undelete is another example. As was added by Microsoft to MS-DOS 5, Digital Research also added undelete in DR DOS 6.0, but using a different implementation. MS-DOS 5 deletes a file using the same method as previous versions of MS-DOS, and so utilities like PC Tools and the Norton Utilities can undelete files deleted under MS-DOS 5. Vendors also consider this functionality important enough to advertise (see Appendix 7).

DR DOS 6.0 implements deletion in a non-standard way. When deleting a file with DELWATCH, DR DOS marks as "pending delete," that is, deleted but save the file's space on the disk. To truly delete it and free up space, you use the DELPURGE command. The first implication of Digital Research's non-standard implementation is that popular utilities do not recognize files beginning with 05 as deleted, and so cannot undelete them.

The second implication is more serious. Suppose you use a removable disk under DR DOS 6.0, such as a floppy or Bernoulli, and delete some files on it. In typical sneaker net fashion, you take the disk to an MS-DOS machine to copy some files and check the free disk space using CHKDSK. Since DR DOS has flagged pending delete files with a non-standard 05, the MS-DOS CHKDSK becomes confused and reports that your disk contains lost clusters. You would then run CHKDSK /F to free these clusters, and they would be reused once you copy the files off the MS-DOS system to your disk. After returning to the disk to your DR DOS 6.0 system, you would eventually DELPURGE the pending deleted files to free the clusters used by them. But recall that these clusters were previously freed and then reused by files copied on the MS-DOS system. DELPURGE would then corrupt your disk.

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The problem is worse on a DR DOS 6.0 - OS/2 dual-boot system. After deleting files under DR DOS, you then boot OS/2. Its MS-DOS standard CHKDSK would also become confused, and rebooting and running DELPURGE under DR DOS would corrupt the hard disk itself.

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A LOOK AT THE KEY FEATURES IN DR DOS 6.0

Digital Research has added new features to DR DOS 6.0, some that are not in MS-DOS 5, some that are. Let's take a closer look at some of them.

Installation

Unlike the MS-DOS 5 Upgrade, the DR DOS 6.0 install program does provide control over specific configuration options. We chose deliberately to target the large class of users by limiting choice in installation. That is not to say, however, that it is impossible to provide greater choice in an installation program. With choice, however, comes complexity, and if not implemented carefully greater choice can leave the user's system in a confused state after installation.

In installing DR DOS 6.0 as an upgrade, we noticed the following:

- It seems to mangle config.sys and autoexec.bat: Install basically inserts its own commands and ignores everything else in your configuration files by skipping over old lines. For example, on rebooting after installation we couldn't access the network or use the mouse since Install had modified the autoexec.bat to skip these commands. Substantial hand-modification was necessary.
- It doesn't detect unformatted partitions: We found during the MS-DOS 5 beta that many people unknowingly store data on unformatted partitions because MS-DOS versions 3.3 and earlier let you. But MS-DOS 5 and DR DOS 6.0 can't access unformatted partitions. The MS-DOS 5 Upgrade Setup detects these partitions and warns the user to back them up, format them, and restore the data before running Setup. DR DOS 6.0 doesn't, and so after installation these partitions are inaccessible.
- It hangs when upgrading certain OEM DOS versions, including NEC DOS 3.3 and AST DOS 3.3

Memory Management

In their comparison sheet entitled "DR DOS 6.0 vs. MS-DOS 5 Upgrade", Digital Research lists the following free memory numbers:

	DR DOS 6.0	MS-DOS 5
Running on an 8088	612K free	521K free
Running on an 80286	628K	555K
Running on an 80386	627K	613K

These numbers are deceiving since they measure the exception case as opposed to the rule. First, the 8088 numbers assume a LIM 4.0 board has been installed, when in fact few 8088 systems have true LIM 4.0 boards (as opposed to LIM 3.2) installed. Second, the 80286 numbers assume a NEAT or LEAP system, but Chips & Technologies estimates that only 10% of the 80286 installed base is NEAT or LEAP-based. For example, none of the top 80286s by installed base - IBM PC AT, PS/2 30-286, PS/2 50z, and Compaq Deskpro 286 - are NEAT or LEAP-based.

So to unbiased the comparison, we ran the following memory numbers on the system in each class with the highest installed base, and the test configurations are available in Appendix 7.

	DR DOS 6.0	MS-DOS 5	MS-DOS 5 + Bluemax 6.0
80386 - PS/2 55SX	625K	613K	E
Free memory below 640K			
Free UMB memory	A	B	F
Total free memory below 1 mb	C	D	G
80286 - PC AT	619K	621K	NA
8088 - PC XT	565K	570K	NA

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In short, in terms of free memory provided, there is little material difference between DR DOS 6.0 and MS-DOS 5. In terms of compatibility, however, MS-DOS 5 memory management is superior. See the Compatibility Section above for more details on DR DOS 6.0 memory management.

Compression

This is perhaps the most important new feature in DR DOS 6.0, and certainly the most important feature in DR DOS 6.0 that is not in MS-DOS 5. The compression technology is known as SuperStor, and was licensed from AddStor, Inc., a software startup in California.

Compression is obviously useful to many users, and SuperStor appears to provide useful data compression. The question is, however, at what cost? On-the-fly compression is inherently dangerous. Even when sold as a separate utility, the expectation is that compression will be safe. But when sold as part of the base operating system, as is the case with DR DOS 6.0, the expectation is that compression will be nearly perfect. And we know from our compatibility testing above that SuperStor does have some compatibility problems.

But let's look at SuperStor in more detail. It implements compression like many other popular compression utilities by creating two volumes, C: and D:, on the C: partition. The D: partition is uncompressed, and contains files that must remain uncompressed like CONFIG.SYS and Windows swap files. The C: volume contains all other data (executables, data files, etc.) in compressed form, and is actually one giant file called SSPARTSS.SWP. Both C: and D: reside on the same partition even though they are separate volumes.

In looking at the details of this implementation, we noticed a few things:

- SuperStor seems to lack robustness. In some simple tests we ran, slight corruption of SSPARTSS.SWP, such as one break in the cluster chain, corrupts the entire compressed volume and all files on it. SuperStor appears to have no built-in error recovery. This conclusion is consistent with AddStor's recommendation that you avoid using third-party defraggers on the compressed volume as it "may undo SuperStor's tightly woven file structure."
- SSPARTSS.SWP is treated like any other file even though it is hidden and read-only. Simply using the attrib and delete commands, it's easy to delete it and lose an entire drive's worth of data. This is not a very far-fetched possibility since, from our experience, users dislike strange files in their root directories ("What is WINA20.3467" is a very common MS-DOS 5 product support question), and particularly when, like SSPARTSS.SWP, they are not documented.
- Unlike Stackcr, for example, none of the DR DOS 6.0 utilities incorporate special support for compressed drives. Running CHKDSK on a severely damaged compressed drive will report no errors, and can even cause the compressed volume to become cross linked with the non-compressed volume that resides on the same partition.
- There are other side effects of placing both compressed and uncompressed volumes on the same partition. For example, suppose a user has some sensitive information on their D: drive they want to expunge using, say, Norton's WIPINFO. This should be fine since the D: drive isn't their compressed C: drive. They are two different drives, right? Of course, if you run WIPINFO on D: you in fact wipe out the entire partition, which includes all the compressed data since C: is just a hidden, read-only file on the D: drive. Most customers won't be able to make subtle distinctions about what can and can't be done to compressed and uncompressed drives.

These scenarios are more than hypothetical. Many DR DOS 6.0 users on CompuServe have reported losing entire compressed drives because SSPARTSS.SYS became corrupted.

Finally, the compression driver is rather large. On CompuServe Digital Research confirmed that part of it must remain in conventional memory, and that its minimum conventional footprint is 28K.

In general, putting new features into an operating system is easy. The hard part is testing them to make sure they work in the myriad configurations out there.

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Disk Caching

The cache provided with DR DOS 5.0 was somewhat inadequate since in most scenarios it was still slower than MS-DOS 3.3, MS-DOS 4.01 and MS-DOS 5 uncached, and since it also slowed disk I/O in many instances (see "DOS 5: What's in it for you?", PC Magazine, 9/24/91). Consequently, Digital Research replaced it in DR DOS 6.0 with a well-known third-party cache, PC Kwik.

Although speed is clearly important, compatibility is arguably the most important feature of a disk cache. From our third party testing discussed above, it's quite clear that PC Kwik destabilizes DR DOS 6.0.

Of course, cache speed is also important. Outside tests indicate that PC Kwik is better in some circumstances, and Smartdrive is better in others. To quote from "Caches Accelerate Windows 3.0 Speed" (PC Week, 2/18/91):

However, while PC-Kwik performed well on the write-intensive Windows database suite and DOS benchmarks, it turned in abysmal times on the read-intensive Windows application suite, even after considerable parameter adjustments...As a result, PC-Kwik should be used as a SMARTDRV replacement only by users of write-intensive database or CAD applications, not by users of read-intensive general purpose applications.

In short, PC Kwik is faster with DOS applications, and Smartdrive faster with Windows applications. Take your pick.

Task Swapper

We have not tested the task swapper extensively, and so cannot comment on its compatibility. From a quick look, however, it looks like an improvement on the task swapper in MS-DOS 5. It swaps to extended memory without requiring a RAM disk, supports cut-and-paste, and swaps from the command line. When measured against a comparable MS-DOS 5 configuration (i.e. configured to swap to RAM disk using extended memory), speed appears to be a toss-up between the two.

DOS Book

DOS Book is DR DOS 6.0's on-line documentation system. On-line documentation is a good idea, and we liked DOS Book's ability to display in full and partial screen, and retain information on the screen after exiting.

We did find the implementation of DOS Book somewhat befuddling. The organization of the 65 Basic topics was confusing since they aren't alphabetized, grouped or listed in any apparent order. There was also no search capacity, and disappointingly the troubleshooting section was only a repetition of the error messages in the manual as opposed to true troubleshooting tips (see Chapter 4 of the Getting Started manual, README.TXT or APPNOTES.TXT in the MS-DOS 5 Upgrade)

Undelete

See the earlier section "Conforming to Existing Standards" for details on undelete.

Unformat

Also in MS-DOS 5, Unformat was also added to DR DOS 6.0. We evaluated it on 5 different 286 systems, and it failed to work on two. See Appendix 7 for configuration information.

Uninstall

Like the uninstall in MS-DOS 5, the uninstall in DR DOS 6.0 brings you back to the version of DOS you were using before you installed the new version.

We did notice something odd about the uninstall in DR DOS 6.0: It does not DELPURGE pending delete files before uninstallation. So when you return to your old version (MS-DOS or even DR DOS), your

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hard disk could become corrupted because of the non-standard way DR DOS 6.0 deletes files. See the earlier section "Conforming to Existing Standards" for more details on this problem.

Security

We've thought about adding security to MS-DOS, but have found it a vexing problem. When customers ask us for operating system security, they mean certifiable security of the type we will provide in Windows NT. This level of security is very difficult to provide in MS-DOS since the FAT file system is an extremely open and well-known standard, and anyone with the Norton Disk Editor will eventually break a FAT security system. Since customers haven't asked for non-certifiable security, we haven't chosen to add it to MS-DOS.

Login security is new to DR DOS 6.0, and it prevents unauthorized access to one's PC. Not surprisingly, it's pretty easy to crack. There are two ways to do this:

If the PC is on -

1. REM out the line `INSTALL=C:\DRDOS\LOGIN.EXE C:\DRDOS` in the `config.sys`.
2. Reboot the system. You will see that login security is disabled.

If the PC is off -

1. Create a boot floppy that contains a utility like the Norton Disk Editor.
2. Boot off the floppy
3. Edit the following---
4. Reboot the system. You will see that login security is disabled.

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Appendix 5 - Final draft of rude Q&A

DR-DOS 6 RUDE Q&A
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Q. What do you think of DR-DOS 6?

A. DR-DOS is not DOS, the standard that the industry has come to trust and rely on.

It would appear that DRI is attempting to catch up to MS-DOS 5. Most of their new features such as the task swapper, undelete, improved memory management, new disk caching, etc., look an awful lot like the features in MS-DOS 5. Even the significant price drop (from \$199 to \$99) seems reactionary.

But DR-DOS is not "DOS." DRI didn't implement all the MS-DOS APIs nor all the function calls. While DR-DOS does run many MS-DOS applications, our own review suggests that it has a significant compatibility problem with a range of the leading applications and utilities.

Q. IBM and DRI say DR-DOS is the definitive DOS in the marketplace? What do you say to that?

A. The facts speak for themselves. MS-DOS has 70 million users and DR-DOS has a small fraction of that. Software vendors test against MS-DOS, which isn't true with most companies and DR-DOS. 140 PC manufacturers have committed to MS-DOS 5; they account for more than 90 percent of the machines shipped. The assertion isn't based on fact.

On top of that, DR-DOS is not "DOS." We understand DRI didn't implement all the MS-DOS APIs nor all the function calls. While DR-DOS does run many MS-DOS applications, our own review suggests that it has a significant compatibility problem with a range of the leading applications and utilities.

Q. IBM is bundling DR-DOS. What do you think of that?

A. It is unfortunate that IBM is trying to force users onto a non-standard DOS. Our own review of DR-DOS suggests that its compatibility is a significant problem with a range of the leading applications and utilities.

MS-DOS is the operating system that all DOS application vendors test against and support. It's the one customers have come to trust.

Q. IBM says it will include DR-DOS technology in OS/2 in order to offer a better DOS than DOS. What do you think about that?

A. We are skeptical. Our internal tests show that compatibility will continue to be an issue for DR-DOS with version 6.

We did not hear much information about the product during the beta test cycle which indicates that the product was probably tested with a small number of users. Given the tens of thousands of DOS applications and the multitude of PC configurations out there it is unlikely the product has been sufficiently tested.

We thought IBM learned this lesson with us with MS-DOS 4. It was a hard-learned lesson for us, one that prompted us to put MS-DOS 5 through the largest beta test in the history of the PC industry.

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Q. Why are you responding this way? Microsoft's never offered a bootable version to the public before.

A. IBM's support of DR DOS makes their commitment to MS-DOS suspect. Yet customers and the PC industry have invested 10 years and billions of dollars building an open MS-DOS standard. Customers for new IBM PS/2 machines need to know that MS-DOS will be readily available to them, from a vendor that will aggressively support it.

It is also important to note that this bootable version will operate only on IBM PS/2s, so it will not affect the business of other PC manufacturers.

Q. PC manufacturers are upset about this move by Microsoft. What is your response to them?

A. Since this bootable version will work only on IBM PS/2s, this move should not affect the business of other PC manufacturers.

IBM's apparent strategy of attempting to introduce another operating system into the DOS market would be extremely detrimental to customers, software vendors and hardware vendors. We strongly believe that, given a choice, IBM customers will prefer MS-DOS.

Q. A lot of people think that DR DOS is the technically superior DOS. What do you say to that?

A. DR DOS asserts their technical superiority by pointing to certain of their features which they obtained from third parties. MS-DOS 5 technical superiority comes from its greater reliability and excellent memory management - features that are at the core of the MS-DOS operating system, which we believe make MS-DOS 5 technically superior.

Q. Why do you say that DR DOS is not DOS? It runs DOS applications.

A. Our tests show that DRI didn't implement all the MS-DOS APIs nor all the function calls. While DR DOS does run many MS-DOS applications, our own review suggests that it has a significant compatibility problem with a range of the leading applications and utilities.

Q. Do you think that Novell's resources will help DR DOS be successful?

A. (jokingly) Digital Research has always been a competitor as has Novell, we now have one less competitor.

MS-DOS has been the standard for 10 years and we have learned a lot in that time that has helped make MS-DOS 5 so successful. Novell's purchase of DR DOS and the resources they bring to bear still do not change the fact that there is no compelling reason for customers to switch and in fact many compelling reasons for customers not to.

Q. What about their use of memory? DR DOS claims to get well over 600kb free, even on 8086 and 8088 machines

A. We believe our memory management is superior. MS-DOS 5 is smaller under 1 megabyte, works better with the leading third party memory managers and, as opposed to the DR DOS approach, provides better safeguards to minimize risk to end users

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Q. What about this new compression, that sounds neat.

A. Compression is technology that often creates incompatibilities because it manipulates the hard disk in a low-level way -- one mistake and your hard disk data is destroyed, yet DRI got their implementation from a little known company with an unproven track record. Problems discovered in our internal tests and DR's own CompuServe confirm that DRI's may not have made the best choice.

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