

# MIGRATING FROM PC-DOS SYSTEMS TO OS/2® SYSTEMS – HARDWARE CONSIDERATIONS

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## WHAT IS OS/2?

OS/2 represents the first new operating system for the IBM® and compatible architecture PCs since their introduction. The hardware has outgrown PC-DOS sometime ago, and now OS/2 has arrived with capabilities to take advantage of the more powerful hardware.

What exactly is OS/2? OS/2 is in fact an entirely new operating system. Its first release is based on the Intel® 80286 and above processors when residing in an IBM or compatible architecture computer. There will be other releases of OS/2 for other hardware. In fact, OS/2 Version 2.0 will be released shortly, and it will be for the Intel 80386 and later processors. Additionally, OS/2 will most likely be released for other processors and other architectures. The Motorola® 680X0 UNIX® machines and various RISC machines are good candidates for ports of OS/2.

The point is that OS/2, unlike a myriad of other products such as Windows, Desqview®, VM/386™ and many others, does not work in conjunction with PC-DOS. Instead, it replaces it altogether. OS/2 boots the processor from the ground up and while it has many compatibilities with PC-DOS, that system is not required for OS/2. OS/2 is the only system for the 286 which offers:

- True multitasking
- Graphical User Interface
- The processor runs exclusively in protected mode, so it may access 16 meg of memory with no performance penalty.
- PC-DOS file compatibility

OS/2 has been through two releases already and it might be appropriate here to review the different versions. There are two variants of all releases of OS/2 - Standard Edition and Extended Edition. The difference is this: Extended Edition offers various extensions or add on capabilities. These include:

**Communication Manager** - allows the PC to interact with a communication board and emulate a 3270 terminal. This serves in essentially the same capacity as the IRMA™ card

and C78 program with which you may be familiar, except that the software to drive the board is now part of OS/2.

**LAN Requester** - allows the PC to interact with a Local Area Network card. Like the Communication Manager, the software to drive the board is now part of OS/2.

**Database Manager** - OS/2 includes a Structured Query Language (SQL) database as part of its resources. The Database Manager sets up this resource.

The resources required for Version 1.2 of OS/2 are:

	RAM	Disk Space
Version 1.2 Standard Edition	3.0	14.5
Extended Edition add-ons		
Communication Manager	2.0	10.8
LAN Requester	.5	5.0
Database Manager	5.0	15.0
Total for add-ons	8.5	30.8
Total for all Version 1.2	11.5	45.3

## UPGRADE PATHS TO OS/2

It is important to understand that there is no generic version of OS/2. That is, you cannot buy Microsoft® OS/2. This is sold only to PC makers such as IBM, COMPAQ®, Dell® and others. The PC maker then adapts the source code of OS/2 to his own machine and sells it as IBM OS/2, COMPAQ OS/2, DELL OS/2, etc.

When shopping for a new PC, inquire of the dealer if that PC maker has, or will have a version of OS/2. If it will not, you have no guarantee of ever being able to run OS/2. If you presently own a compatible PC, contact the dealer or manufacturer and find out if the maker has or will have a version of OS/2 before attempting an upgrade. This can save you many headaches.

Obviously, the easiest way to upgrade to OS/2 is to buy a new machine. Before attempting to upgrade an old machine, price a new one from a maker who has or will have a version of OS/2. Then when you are pricing the components for upgrading your old machine, you have a

benchmark to rate the upgrade expense against. It is entirely possible to spend as much on an upgrade as a new machine would have cost. Additionally, be sure to take into account the difference in performance in a newer machine and your old one. You may well end up with a machine that will run OS/2, but that has dismal performance. Last, don't forget to include your own (or your hardware person's) labor when calculating the price of an upgrade.

If you are upgrading by purchasing a new machine, I strongly recommend purchasing a 386 or 386sx processor. They will both run Version 2.0 of OS/2, and you will not be locked out of further upgrades. The longer life of the 386 machines should more than make up for any increase in purchase price.

If you are upgrading an existing machine, a 386 add-in board may not be a good idea. This will introduce a possibility of incompatibility into your system which may preclude running OS/2 at all. When upgrading an existing machine, the principal consideration is compatibility. If your machine maker offers a version of OS/2, yours is a relatively easy task. If, however you have a PC from a maker who does not offer a version of OS/2, you may have problems. To run IBM OS/2, your machine must be hardware compatible with an IBM PC. A discussion of compatibility is in order.

There are essentially two levels of compatibility to be concerned with here: BIOS level compatibility and Hardware level compatibility.

#### **BIOS level compatibility:**

The BIOS (Basic Input Output System) resides in a ROM (Read Only Memory) chip on the mother board. Most software that runs on the PC makes calls to the BIOS. If the hardware of the system is different than a standard IBM, but the BIOS code has been modified so that it functions the same way, it should look like an IBM to most software. As long as the software is not making specific hardware calls which bring out differences in design, this type of system should function like an IBM.

BIOS level compatibility will be a problem when upgrading to OS/2. When OS/2 loads, it loads a copy of BIOS from disk, and this BIOS code expects to find hardware identical to IBM. If it does not, results will be unpredictable, but most likely, it will not run. If your machine is compatible on the BIOS level, it is not a good idea to try to upgrade to OS/2 unless your PC maker offers a version of OS/2.

#### **Hardware Level Compatibility:**

Hardware level compatibility means that several important design features such as Direct Memory Access (DMA) channels, Interrupt Request channels (IRQ), I/O port addresses, and bus interface are the same as on an IBM. If this is the case, then IBM OS/2 should run on your machine. So upgrade may be possible even if your PC maker does not offer a version of OS/2.

Unfortunately, it is not always easy to tell what level of compatibility your PC has. The best way is to talk to the PC maker. If this is not possible, you may get an idea by the software you have run. If you have had very little or no problem with software running on your machine specifically software which makes calls to the hardware, such as utility programs, memory managers and such, you probably have a hardware compatible machine. If, on the other hand, you have had instances of software which will not run on your PC for unexplained reasons, your PC is probably compatible on the BIOS level and you should stay away from OS/2.

The problem with the compatibility issue is that it is possible to have a hardware compatible PC (indeed, an IBM PC) which is incompatible because of a board which has been added. All of the subsystems of the machine must be hardware compatible with the PC OS/2 was designed for or you may have problems upgrading.

Some subsystems you must consider are: The serial communication board, the video display and controller, and hard disk and controller.

#### **The Serial Communication board:**

The IBM PC/XT uses a serial port with a National Semiconductor 8250 UART (Universal Asynchronous Receiver Transmitter). The AT uses a newer National Semiconductor chip, the 16450 UART. Under PC-DOS, these boards could be mixed with no problem and some AT compatibles were shipped with the older 8250 UART. However, under OS/2, you need the newer 16450 chip, or serial communications will be impossible. This is especially important since the cheapest kind of mouse available uses the serial communications port.

#### **The Video Display and Controller:**

VGA displays are especially sensitive to OS/2. Some of the earlier VGA boards had limited compatibility with IBM. Specifically, graphics

adapters have an on-board BIOS, and graphics adapters may exhibit BIOS rather than hardware compatibility. If your PC maker offers a version of OS/2 it may very well require a specific VGA adapter, especially if your PC maker also makes VGA cards.

## **Hard Disk and Controller:**

### **Controllers**

There are several kinds of hard disk controllers available today - ST506, ESDI, SCSI, and variants on these such as caching, RLL and MFM. It goes without saying that OS/2 is sensitive to the type of controller used. The only real guideline to use here is to talk to the maker of the controller and find out if the controller is compatible with OS/2 or if the maker offers a driver which will interface it to OS/2. At the time of the writing of this paper, OS/2 would not support SCSI controllers.

The reason the discussion of controllers is important is that simply installing a larger hard disk and more memory may simply highlight the bottleneck taking place in the flow of data through the controller. Simply installing a larger disk with a lower access time will not bring about a noticeable performance increase in an older machine in which the controller will not support a 1 to 1 interleave. To properly tune the machine the controller may well need to be upgraded when a new disk is installed. I would not recommend running OS/2 on any machine where the controller forces the disk to be interleaved. Performance will simply be too poor.

### **Hard Disks**

As you can tell from the earlier resources table, most PCs will need a larger disk to run OS/2. The problem is that the drive tables on older PCs usually do not support the newer larger drives, and any drive not recognized in the setup drive table will not run under OS/2. Therefore it is necessary to do a low level format of a hard drive using the entries in the drive table. The problem is this: Suppose the drive you have purchased has 1024 cylinders and 17 heads. This would figure out to  $1024 \text{ (cyls)} * 17 \text{ (heads)} * 17 \text{ (sectors/track)} * 512 \text{ (bytes/sector)} = 151,519,232 \text{ bytes}$ . The problem is that the older AT drive table supports only 15 heads and that entry supports only 900 cylinders. So if the hard disk is low level formatted at this setting it has  $900 \text{ (cyls)} * 15 \text{ (heads)} * 17 \text{ (sectors/track)} * 512 \text{ (bytes/sector)} = 117,504,000 \text{ bytes}$ . So

you have lost more than 34 megabytes due to inability to low level-format the drive correctly. The problem will be worse on a larger drive.

The only correction for this situation is to correct the drive table and that is built into the motherboard ROM. A way to accomplish this is to use a device known as a ROM Dubbing board. These fit into the machines bus and patch the ROM drive table. Using these boards can allow you to run most kinds of hard drives available. Golden Bow<sup>®</sup> and Geneva Enterprises both sell this type of board.

## **SUMMARY:**

This paper is intended to provide a guideline to the reader who may want to upgrade his hardware to OS/2. It has attempted to point out some of the potential pitfalls of OS/2 upgrades and allow the reader to identify when an upgrade will be easy and when it might be difficult.

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