

Orchid Technology, Inc.

**PCturbo 186 High Speed
Processor System
Owner's Handbook**



ORCHID TECHNOLOGY

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Orchid Technology is committed to bringing to market high performance, low cost products in response to the market needs of business computer users. Orchid products are designed to increase overall productivity of IBM and compatible computers while protecting the users' investment in current and future hardware and software.

Marketing Charter
High Performance Division
Orchid Technology

ABOUT ORCHID TECHNOLOGY

In 1982, Orchid Technology was formed in Milpitas, California. The first product we offered was a low-cost Local Area Network called **PCnet**. It was the first of its kind for the IBM PC and compatibles, and has since been the flagship product for Orchid throughout the company's history. One year later, Orchid was the first to introduce **Diskless Boot Capability** for PCs on the network, thus further decreasing the costs of sharing data and resources.

In early 1984, Orchid introduced the **BLOSSOM** New Generation Multi-function Card which offered one thing above all the other products of its type on the market - upgradeability to PCnet on the same board.

By late 1984 Orchid Technology has already gained a reputation for bringing high performance products to market at low cost. By the time IBM had introduced the PC AT high speed computer, Orchid has already been shipping the **PCturbo186 Processor** board in response to the performance needs of the millions of computer users who already owned a PC.

To better respond to product design and marketing needs, Orchid segmented its product lines into two divisions in October 1984. Both the **Networking Products Division (NPD)** and the **High Performance Division (HPD)** are located at Orchid Corporate Headquarters in Fremont, California.

Orchid products are used in large corporations, small businesses, scientific and educational institutions, government and military agencies, and in homes worldwide.

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INTRODUCTION TO THE PCturbo 186 PROCESSOR

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1.1 THE NEED FOR HIGHER PERFORMANCE

Today's computer user needs more raw processing power than ever before to handle not only the increasing amount of information, but also the sophistication of modern computer software. As is evidenced by some of the popular business software available for PCs today, such as Lotus Symphony and Ashton-Tate Framework, the power requirements of the software is determining the hardware needs of the user - a significant new trend for the microcomputer industry.

1.2 THE SOLUTION - PCturbo 186

For the millions of IBM PCs and compatible PCs already in the field, performance was previously limited to the power of the 8088 microprocessor and 640K of RAM memory. That is, until Orchid introduced the PCturbo 186 Processor System. The PCturbo is a multi-faceted solution to the performance problem. Unlike other techniques, the PCturbo works together with the computer power you already own to enhance processing speed as well as the I/O (peripheral devices) handling power of your computer. And because of the PCturbo's inherent design compatibility, it can be used in many different types of microcomputers, including some of the new high speed computers.

1.3 PCTurbo TECHNOLOGY - FEATURES FOR MODERN COMPUTING

In addition to innovative hardware, the PCTurbo system includes several advanced software features which, when combined, give performance enhancement beyond that which can be accomplished with hardware alone.

To improve disk accessing times (a common bottleneck in PC systems), **Disk Caching** and **Electronic RAM Disk** are provided. And to help you "tweak" your particular computer system, we'll help you in assigning various **disk buffers** to optimize disk I/O even further.

All these features are ultimately designed for one purpose: to bring more computing power to the *personal* computer user. With the cost of PCs constantly decreasing, raw processing power no longer needs to be split among multiple users. Instead, attention can finally be given to increasing the productivity of the individual personal computer user.

1.4 THE TURBO GENERATION

Welcome to the Turbo Generation! You are now among the most productive group of computer users and are working with some of the most advanced hardware and software technology to be found in the personal computer arena. You will find a sticker proclaiming your dedication to higher productivity packed with the software in the back of this manual. Place it on your keyboard or front panel to let others know about the performance that lies within your PC.

EXPRESS INSTALLATION OF THE PCTurbo 186 BOARD

2.1 REQUIRED HARDWARE CONFIGURATION

The PCTurbo is designed to work with most standard configurations of IBM PCs and compatibles (for more information about compatible systems, see Appendix D - Updates and compatibility notes). The required minimum system configuration indicated below must be available for operation of the PCTurbo system.

- **Host Computer:**

RAM Memory:	256 Kbytes minimum
Disk Storage:	At least one floppy drive
Display:	Color or Monochrome

- **PCTurbo 186:**

RAM memory:	256 Kbytes minimum
-------------	--------------------

As shown, a *minimum* of 256K of RAM memory must be available in both the host PC as well as PCTurbo board.

If at this time you have a RAM Extension Daughtercard which needs to be attached to the PCTurbo board, refer to the **OPTION A** section now for instructions on how to do so.

Also at this time, if you have a Serial Port Daughtercard which needs to be attached to the PCTurbo board, refer to the **OPTION B** section now for instructions on how to do so.

Setting the PCturbo Memory Switches

The PCturbo has a small block of four miniature switches which are used to set the memory size of the card. Most PCturbo boards come pre-set by the factory. However, now is a good time to double check that these switches are set properly.

Locate the switch block on the bottom edge of the board. The block is usually red with small white switches. Notice the direction labelling on the block. Most blocks are designed such that if the switch is in the UP position it is turned ON, the DOWN position means it is turned OFF.

The memory switch settings are as follows:

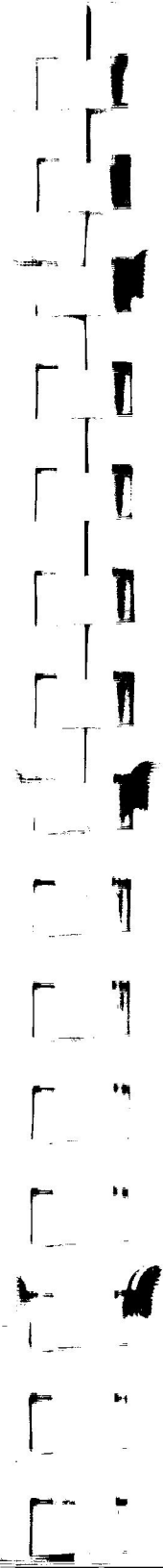
Memory Installed	Switch Number and Setting			
	1	2	3	4
256 Kbytes (PCturbo full Memory, no Extension Card)	DOWN	UP	DOWN	UP
384 Kbytes (Extension Card Attached)	DOWN	UP	UP	DOWN
512 Kbytes (Extension Card Attached)	DOWN	UP	UP	UP
640 Kbytes (Extension Card Attached)	DOWN	UP	DOWN	DOWN
768 Kbytes Put the video jumper in the Hercules position when using 768K.	DOWN	DOWN	DOWN	DOWN

If the switch settings do not reflect the actual amount of RAM you have installed, change them now.

Special Video Operations

If you have a Hercules Graphics Card or an equivalent high resolution graphics card, or if you are using dual displays (one color, one monochrome), you must set the Video Jumper on the PCturbo board. If you are using a standard IBM Color Display Adapter or Monochrome Display Adapter or equivalent, you may proceed to section 2.2 now.

The video jumper is located just to the right of the memory switch block, near the bottom edge of the PCturbo board. It is normally factory pre-set at the "IBM" position (standard display). If you have one of the special video configurations described above, move this jumper to the "HERCULES" position now.



INSTALLATION

INSTALLATION

2.2 INSTALLING THE Pcturbo BOARD INSIDE THE PC

If you are unfamiliar with the procedure of installing expansion cards in your PC, be sure to consult the *Guide To Operations Manual* which came with your PC for assured results. The following steps are general and apply directly to most popular microcomputer systems compatible with the Pcturbo.

Required Tools: Medium size flat blade screwdriver

Step 1.

TURN OFF ALL POWER SWITCHES AND UNPLUG THE POWER CORD.

Disconnect all the cables connected to the back panel of PC. This includes the keyboard, screen, and any printers, modems or other peripherals which may be attached. *Take notice of where these cables will re-attach later if you are not familiar with their placement.*

Step 2.

Using a flat blade screwdriver, remove all the screws which hold down the top cover of the PC. If you are not sure which ones should be removed, refer to the *Guide To Operations Manual* for the PC.

Step 3.

Choose the slot in your computer where you wish to place the Pcturbo card. *It is most desirable to use a slot as close as possible to the power supply unit (rightmost in a PC, leftmost in a Compaq) for best operating results.* Once you've selected the optimum slot, remove the metal slot cover (referred to as an "Option Retaining Bracket" by some PC manuals) by loosening and removing the screw at the top which holds it in place. Set the screw aside for later, in order to retain the Pcturbo board in place.

Step 4.

A black plastic adapter guide is supplied to align the board at the front of the computer's chassis. Insert this plastic piece into the two holes provided on the front panel inside of the chassis. The "wiper arms" of the adapter guide should be facing down.

Step 5.

You are now ready to plug the board into the chassis. Holding the Pcturbo board by placing one hand on each end, slide it gently into the chosen slot, being careful that the metal bracket on the end of the board fits snugly into the opening in the back panel of the chassis. Check to see that the board is properly seated in the expansion slot on the motherboard and is making good contact. Also check to see that the front end of the board is properly held by the black plastic guide towards the front of the chassis.

Step 6.

Re-install the screw laid aside on step #3 into the top of the metal bracket to hold the board firmly in place.

Step 7.

You are now finished with installing the hardware of the Pcturbo System. Replace the top cover, its retaining screws, and all cables previously removed in step #1. Proceed to the next section for the software installation of the Pcturbo System.

2.3 INSTALLING THE PCturbo SYSTEM SOFTWARE

In this section you will be creating a "PCturbo Boot Diskette" by following a very simple procedure. This diskette is used by the computer upon powering up, to activate the PCturbo board. If you have a hard disk system, it will be modified so as to boot automatically, by having the PCturbo software installed on the hard disk such that it is the first thing loaded upon power-up. In all following discussions about the "PCturbo Boot Diskette", reference to the PCturbo bootstrap software will apply identically to hard disk based system (such as the IBM PC XT) as to floppy based systems.

2.3.1 INSTALLING ON IBM AND COMPATIBLE COMPUTERS

If you are installing on an IBM PC, XT, or most other IBM "PC line" computer systems, simply follow the instructions for standard installation. Please note, however that some PC compatible systems, as well as certain peripheral hardware (e.g. some non-IBM hard disk controllers) conflict with the default configuration of the PCturbo board, and need to be considered in the installation process.

If you are uncertain whether you have a potential hardware conflict in your system, first try the standard installation procedures. If you then experience any unusual problems, you will have to re-install the software and select the non standard DMA configuration.

The PCturbo is compatible with both DMA Channel #1 and DMA Channel #3. The default installation uses DMA #3, which is compatible with all IBM PCs and most peripheral hardware. Some computers such as the Compaq Plus, and particularly other compatibles which contain hard disks, will require that the PCturbo use DMA #1.

In the following software installation, an automated **INSTALL** program will pause at some point in the process and prompt you to respond whether or not it should install the standard DMA configuration. This is the only time you will need to select the DMA channel.

2.3.2 PCturbo SOFTWARE INSTALLATION

The diskette which came with the board contains all the necessary files that the PCturbo needs for operation. We will refer to this diskette as the "PCturbo Distribution Diskette".

For the following steps it is assumed that the user has some familiarity with PC-DOS (or MS-DOS), in particular the COPY and DISKCOPY commands. If you need to brush up on these commands, refer to the *IBM Disk Operating System Manual*.

Step 1.

Make a copy of the PCturbo Distribution Diskette and set the original diskette in a safe place, as a backup.

The easiest method for doing this is to use the DISKCOPY command. For example, place a PC-DOS diskette in drive A and type

```
A> DISKCOPY A: B:
```

Remove the DOS diskette and replace it with the distribution diskette. In drive B place a blank diskette. Strike any key to proceed with the copy (you will be prompted on the screen).

You now have a copy of the original distribution diskette. Label it "PCturbo Distribution Diskette" and use this diskette (not the original) in the following procedures.

Step 2.

If you normally boot from a diskette, you will need to use a copy of your boot diskette in order to install the PCturbo software. In the same fashion as in Step 1, make a copy of this diskette. Label this diskette "PCturbo boot diskette".

Step 3.

Power-up the PC as you would normally and get the "A>" prompt on the screen. Remove any diskette from drive A and replace it with the diskette you created in Step 1 ("Pcturbo Distribution Diskette"). If you normally boot off the hard disk proceed to Step 4 now.

If you have a dual floppy system, place the diskette you created in Step 2 (labelled "Pcturbo Boot Diskette") in Drive B.

Step 4.

From the "A>" prompt, type the following:

```
A> INSTALL
```

Follow the prompts displayed on the screen until the installation is completed.

Step 5

You are now finished installing the Pcturbo software.

If you are on a hard disk system, the Pcturbo software has been installed onto your hard disk. Return to the "A>" prompt now, and proceed to the next section.

If you are on dual floppy system, remove the diskette from Drive B and place it in Drive A. This will be your Pcturbo Boot Diskette which should be used for starting up the computer everytime. Return to the "A>" prompt now, and proceed to the next section.

2.4 FIRING UP THE TURBOCHARGER!

If the insatallation was successful, you should now be able to enter the "Turbo Mode" with a single command. From the DOS prompt, simply type

```
TURBO
```

The Pcturbo should now activate and the following status screen will be displayed:

```

Pcturbo PC Interface Program  Version XXx
© Copyright 1984 More Computing, Inc. All Rights Reserved
Licensed exclusively to Orchid Technology, Inc.

Pcturbo Hardware/Software settings:
Processor Clock Speed ..... X MHz
Total on-board memory ..... XXX Kb
DMA Channel # ..... X

PC Memory Cache Allocation:
FATs, directories ..... XX Kb
User files ..... XXX Kb

Pcturbo AVAILABLE USER MEMORY: XXX Kb

Hit any key to continue....

```

If any "STARTUP ERRORS" appeared at this time, refer to **Appendix F** for resolution of the condition.

After pressing any key, the screen will blank for a few seconds and then the following screen will appear:

```
Turbo ROM Version XXX
©Copyright 1984,1985 More Computing, Inc. All Rights Reserved.
Licensed Exclusively to Orchid Technology, Inc.
PCDEVICE.SYS Version XXx Loaded
```

```
A>
```

Congratulations! Once this screen has appeared, you have successfully entered the "Turbo Mode".

This screen may be followed by a welcome message confirming that you are indeed in the Turbo Mode. Try a few operations at this time to see the remarkable difference in before/after performance. For example, type **DIR** from the A> prompt a few times; you should immediately notice the increased responsiveness of the screen display.

The INSTALL program has modified the AUTOEXEC.BAT file that was on your boot diskette.

In order to separate the functions and programs which need to be run on the PC and those that are suitable for Turbo Mode, the INSTALL program has created two new batch files, **PCEXEC.BAT** and **TURBEXEC.BAT**.

The PCEXEC.BAT contains all commands which were previously in the AUTOEXEC.BAT file, if one existed on the original boot diskette. The TURBEXEC.BAT is where you place commands which are to occur only when in the PCTurbo Mode. For the time being, you have everything necessary to get started with PCTurbo operations. Chapter 3 will discuss things you can do with automatic execution batch files in greater detail.

Before going on to the next chapter, feel free to experiment a little bit with the new Turbo speed. To return to the PC Mode, simply type GOPC at the DOS prompt. You see the following message,

Transferring To The PC...

appear in the screen. The GOPC command has placed you back in the control of the 8088 processor.

To return to Turbo Mode, simply type TURBO at the DOS prompt. You will see the screen that you were in when you last left Turbo Mode. Notice that you return to the same DOS directory or subdirectory that you were in when you left Turbo Mode.

If you typed TURBO while you are already in Turbo Mode you will see the message:

Turbo Currently Active!

Try familiar operations in both modes and compare the relative speeds between the PC Mode and the Turbo Mode.

The next chapter will get into more details about the operation of the PCTurbo Board. All of the PCTurbo commands and special productivity software will be covered.

2.5 CALCULATING THE RAM REQUIREMENTS OF YOUR SYSTEM

If your system was configured by your dealer, you may skip the following discussion and proceed to chapter 3 now. If you are uncertain about your RAM requirements or curious as to how the requirements are calculated, then read on.

As a rule of thumb, to know how much RAM memory you will need to add in order to use your applications software, first determine the requirements of the software (usually indicated in the manual that came with it). If not already included in this number, add the 29k requirement for DOS Version 2.1 (other versions may be higher). Finally, add about 25k for the Pcturbo software requirements. The resulting number is the total required RAM for the Pcturbo board itself, as described in the following examples.

Examples of Pcturbo on-board RAM requirements:

EXAMPLES 2-1

Application Software	225K
DOS	29K
Pcturbo Systems Software	25K
Minimum Pcturbo RAM requirement	279K

Depending on the type of display adapter you have in your system, you may need to add an additional RAM requirement for the video buffer. The following rules apply to this:

- Monochrome or Color Adapter - no additional requirement.
- Hercules Adapter - add 48K to the total requirement.
Note: Board jumper must be set to activate Hercules.
Ref: Appendix K.
- Dual Displays - add 48K to the total requirement.
Note: Hercules jumper must be set for this configuration.

EXAMPLES 2-2

Application Software	192K
DOS	29K
Pcturbo System Software	25K
Monochrome Display Buffer	18K
Total Pcturbo RAM requirement	246K

EXAMPLES 2-3

Application Software	235K
DOS	29K
Pcturbo System Software	25K
Hercules Display Buffer Requirement	48K
Total Pcturbo RAM requirement	337K

NOTE:

Always round up to the nearest the 128K block. In the above examples, the actual RAM requirement would be 384K. Standard RAM sizes are 256, 384, 512, and 640K.

As we will see in the next chapter, the RAM memory which is available to the host PC (that which is installed on the motherboard of the PC *including* any multifunction cards or RAM cards in the system) is utilized for advanced features such as Disk Caching and RAM Disk. Although 256K is the minimum requirement for the host PC, additional RAM can be used by these features to increase overall system processing speed. The host PC, like the Pcturbo board, can accommodate a maximum of 640K of RAM. Remember that this RAM is totally separate and independent of the RAM onboard the Pcturbo board.

Examples of host PC RAM memory usage:

EXAMPLE 2-4

Total RAM in host PC	256K
DOS Requirement	- 29K
PCturbo Software Requirements (TURBO.COM)	-112K
RAM Available to Disk Cache	115K

EXAMPLE 2-5

Total RAM in host PC	640K
RAM Drive # 1	-240K
RAM Drive # 2	- 75K
DOS Requirement	- 29K
Hercules Adjustment	- 48K
PCturbo Software Requirements (TURBO.COM)	-112K
RAM Available to Disk Cache	136K

OPERATION OF THE PCturbo 186**3.1 CONCEPTS OF THE PCturbo ARCHITECTURE****Note:**

If your computer is based on a microprocessor other than the 8088, this entire discussion still applies exactly the same. All references to PC, host, base machine, and 8088 are analogous to the motherboard in your system.

The PCturbo is more than just an accelerator board, it is a *system* designed to improve overall performance by using several unique and powerful software features. The entire PCturbo system is a coordination of the following:

- The high speed 80186 processor in the PCturbo
- The 8088 in your PC as an I/O processor
- Automatic Disk Caching
- Electronic RAM Disk

To best visualize the interaction of the PCturbo and the PC, think of them as two completely independent computers running in the same chassis. The computer on the PCturbo is an Intel 80186 microprocessor with its own RAM memory (up to 640K) and ROM BIOS. The computer in the PC is an Intel 8088 microprocessor with its very own RAM memory (up to 640K) and its own ROM BIOS. The two computers are separate and autonomous from one another, while coexisting in the same chassis.

In the Turbo Mode, 80186 processor in the PCturbo is totally dedicated to running your application software. As opposed to a normal personal computer, the PCturbo doesn't have to deal with constant interruptions from I/O devices requesting attention. Whenever a "device interrupt" does occur, the PCturbo intercepts it and sends it down to the 8088 in the host PC, which is standing by to handle it on its own. This allows the 80186 in the PCturbo to process your application quickly and without interruption.

So, while the PCTurbo runs your program, the 8088 sits back and handles all the I/O devices such as disk, keyboard, screen, and printer. Besides taking care of the I/O, the 8088 can have as much as 640K of RAM memory at its disposal. Some of the things it can do with this memory include **electronic RAM Disk** manipulation, and more importantly, the **disk cache**. These are all software enhancements which aid the 8088 in speeding up the I/O requests of the software application running on the PCTurbo.

Providing a disk cache with the PCTurbo gives a PC power that is often found on large mainframe computers. The cache (pronounced like "cash") is an advanced software algorithm which keeps track of the most frequently accessed sectors on the disk and holds them in a RAM buffer. When reading data from the disk, most often that data will already be residing in a high speed RAM buffer in the 8088 memory bank, available to your application software far faster than if it were fetched from the disk drive. Additionally, the cache uses a technique called *Road-ahead* which allows it to automatically pick up the next logical sector when reading the disk, in anticipation that your application will need it. If the sector is indeed needed by the application, it is passed to the PCTurbo and also stored in the cache buffer (in case it's needed again later); otherwise it is simply disregarded and one sector in the cache buffer is freed. Caching is especially helpful with large data files which may be scattered into hundreds of sectors all over the disk.

Disk caching is similar to RAM Disk in some ways, different in others. For example, whereas a RAM Disk is volatile (will lose its data when the power is turned off or suddenly lost), caching is a non-volatile method. The cache is constantly updating the disk drive instantaneously as your program writes it out. In fact, your application software writes its data to the 8088, where it is instantaneously written to the disk drive and updated in the cache buffer. This sharing of work allows the PCTurbo to continue on with its application even faster.

Particularly when working with floppy-disk sized applications, RAM disk is sometimes even more efficient than disk caching. RAM disk holds complete files in memory whereas the cache may only hold the most frequently accessed sectors. The only drawback with RAM disk is its volatility. If you turn off the computer without copying the contents of the RAM disk back to the disk drive first, there is a chance that some data will be lost. Read-only applications are best for RAM disk.

3.1.1 CONFIGURING THE CONFIG.SYS FILE

Under MS-DOS or PC-DOS, device drivers are used to let DOS know how to handle devices which weren't built into the computer at first. Device drivers load immediately after DOS, when you first turn on your system. To let DOS know which device drivers you wish to load, there is a special file on the boot disk called CONFIG.SYS in which you list their names.

The PCTurbo does not require any special files to be placed in CONFIG.SYS for normal operation. However, it does have an equivalent file called the TURBO.SYS which it uses for its own device drivers. Since PCTurbo really is a second computer inside your PC, it loads its own copy of DOS when you type TURBO.

If you have an external hard disk, or some other peripheral which may require device drivers to be loaded, you may already be familiar with the CONFIG.SYS file. If you are not sure that you have one, you can look at the directory of the diskette (or hard disk) from which you normally boot your system and see if there is a CONFIG.SYS file. If there is, you can display its contents on the screen by typing the following from DOS:

(be sure the prompt is set to A> if you normally boot from floppy, or C> if from the hard disk)

TYPE CONFIG.SYS <return>

Besides acting as a list for the device drivers, the CONFIG.SYS has other features as well. You can read more about them in the DOS manual which came with your system.

Of interest to PCTurbo users is the BUFFERS command, which lets you allocate a RAM buffer to hold the FATs (file allocation tables) and directories of the disk in a RAM buffer for increased performance. As beneficial as the BUFFERS feature is, it is poorly documented in most DOS manuals, and so is not often used. A system which includes the PCTurbo benefits from the BUFFERS even more than the PC can alone, since it can have BUFFERS on both the PC side and on the PCTurbo side.

It is recommended that at least 10 BUFFERS be allocated in the CONFIG.SYS if it has not already been allocated. If you already have a CONFIG.SYS file, use your favorite editor or EDLIN (documented in the DOS manual) to insert the following line.

BUFFERS=10

If you don't have CONFIG.SYS file yet, and would like to create one with the BUFFERS statement in it, then set the drive prompt to drive A> (or drive C> if you normally boot from the hard disk), and type the following lines:

COPY CON: CONFIG.SYS <return>
BUFFERS=10 <return>

Now press the F6 key and then <return> to write this file to disk.

This procedure takes the BUFFERS statement and puts it in a file called CONFIG.SYS which will be read whenever you reboot your system. Each BUFFER corresponds to 512 bytes of the PC's RAM memory. That is, 10 BUFFERS equals about 5K of RAM that has been allocated to the DOS Disk Buffer.

See chapter 4 (High Speed Driving Tips) for more information about the Disk Buffers and the CONFIG.SYS file.

3.1.2 CONFIGURING THE TURBO.SYS FILE

If you installed the PCturbo properly as described in Section 2 of this manual, then you already have a TURBO.SYS file on your boot diskette. Its contents should look like this:

```
DEVICE=PCDEVICE.SYS
BUFFERS=10
FILES=20
```

You'll notice that the first line describes a file called PCDEVICE.SYS as a device driver that DOS should load when the turbo is turned on. The second line is the same as the BUFFERS statement in the CONFIG.SYS, simply allocating 5K of the PCturbo RAM memory for the DOS Disk Buffer.

To the PCturbo, the PC chassis into which it is plugged looks like one big peripheral device I/O handler. The file PCDEVICE.SYS gives the DOS which is resident on the PCturbo all the information it needs to talk to the 8088 in the host PC.

For now, we've covered everything you need to know about the CONFIG.SYS, TURBO.SYS, and the BUFFERS statement. In Section 3.2.3 (RAM Disk Configuration) these will be discussed again. Also, you may refer to Section 4 (High Speed Driving Tips) later on for more information about the BUFFERS feature.

3.2 USING THE SPECIAL FEATURES OF THE PCturbo

The PCturbo System is a package hardware and software product engineered for optimum performance when used together properly. Among the software which will be discussed here are the following programs:

- OPTION Automated Option Selection Program
- Disk Caching for fixed and removeable drives
- Electronic RAM Disk

There are other programs (including TURBO.COM and GOPC.COM) which are covered in greater detail in **Section 3.3 - System Commands**

3.2.1 THE OPTION PROGRAM

In striving for an easy to use product, we've included a program called OPTION along with the productivity software of the PCTurbo System. To set up these software programs you don't need to know how to edit system files or do anything special. The OPTION program is a simple, menu driven program which allows you to access all the special features of the PCTurbo quickly and easily.

However, for the more technically oriented users, there are detailed sections included on how to use each of the productivity programs directly from DOS, batch files, etc. For such users the OPTION program may be an example of how to customize business computer systems with an easy to use front end.

The following are some of the things you can do with the OPTION program:

- Set up and allocate up to four RAM Disks of various sizes on both the PC and PCTurbo
- Configure the Disk Cache for fixed or removable drives
- Change the DMA Channel used by the PCTurbo
- Modify other PCTurbo options such as scroll lock and processor priority

Before using the OPTION program, read the sections of this chapter that refer to the functions you wish to access. Once you are familiar with the functions you may choose to either use the OPTION Program to access it or go directly through DOS as directed in each section.

To invoke the OPTION program, simply type OPTION from the DOS prompt. The screen will give you all further instructions. The options are described in detail on page 3.23.

3.2.2 Disk Caching

As explained in the beginning of this chapter, the Disk Cache is a sophisticated software mechanism which stores the most frequently accessed disk sectors in a section of RAM memory on the PC side, thus increasing the speed of disk data access.

The Disk Cache has three states of operation:

- OFF Completely inactive
- ON Active for fixed disk only (hard disks)
- REM Active for both fixed and removeable disks (hard disks and floppies)

The status of Disk Cache can be set in one of two ways:

- As a parameter to the TURBO command
- Using the OPTION program

Each of these ways will be discussed in subsequent sections.

Most users will probably never need to change the caching status after it is chosen the first time. In fact, the majority of users will never need to use anything other than the default factory setting of ON for their caching needs. Disk Caching is so transparent that it is often unnoticed, yet it provides one of the greatest factors in the PCTurbo's performance formula.

USING THE TURBO COMMAND TO CHANGE CACHING STATUS

The TURBO command can take several parameters, including two which control for the Disk Cache status. When the TURBO command is invoked by itself, the system default setting for the Disk Cache is used. The default is ON, which means that any hard disk connected to the system will automatically be cached. Upon entering the Turbo Mode, this is confirmed with a message on the screen.

The ON status applies mostly to devices such as the hard disk in an IBM XT, a Tallgrass drive, or any other "fixed spindle" disk. It also includes a few intelligent removeable drives (not including standard floppies) which are equipped with "media check" capability (e.g. Iomega Bernoulli Box). The PCTurbo reads this media check to see if a removeable disk (e.g. cartridge disk) has been removed from the drive.

It is crucial for correct operation that the Disk Cache be made aware of any disks which are removed from their drives. If not, errors will occur and the disk media as well as the applications program being used at the time may be endangered. As long as the Cache status is **ON** or **OFF**, and is not specified as **REM**, there is no danger of this occurring.

It is important that REMovable caching be performed only by experienced users. Besides the importance of flushing the buffer whenever a diskette is changed (by hitting CTRL-BRI-AK), certain programs cannot operate correctly with a REMovable cache. In addition, once inside an application program, it is not possible to access DOS in order to issue the buffer flushing. If you choose to use the REMovable disk cache, please do so with caution, making sufficient backups before trying anything new.

USING THE OPTION PROGRAM:

The OPTION program can be used to select any of the three status levels for the Disk Cache by simply answering two Yes/No questions. Once a status has been selected, it can be changed using the OPTION program or the TURBO command with the appropriate parameter.

3.2.3 ELECTRONIC RAM DISK

As described in earlier sections, a RAM Disk is a high speed, simulated disk which resides in an area of RAM memory in the computer. The assigned RAM memory can come from either the host PC memory or the PCTurbo's onboard memory, depending on how you choose to set it up. Ordinarily, the location and the size of the RAM Disk is dictated by the amount of spare RAM memory left over in your system.

Providing there is enough spare RAM available, you can set up RAM Disks to be in both the PC memory and the PCTurbo memory. However, while RAM Disks on both sides can be accessed while in Turbo Mode, PC Mode will only let you access RAM Disks set up in the PC memory area.

You can have up to four separate RAM Disks (on both Turbo and PC sides), each one of variable size. For applications where there is a floppy disk filled with data, an ideal RAM Disk would be 360K in size. In such a situation, you may wish to copy all the files from the floppy to RAM Disk upon powering up. This can be done manually or set up in an AUTOEXEC.BAT as an automatic routine.

Data Safety

It is important to remember that the RAM Disk area is *volatile*, meaning that if you lose power suddenly, all files on the RAM Disk will be lost. That is why RAM Disk is best suited for read-only applications where there is a lot of reference data but any updates would be written to a real disk drive.

If you decide to use the RAM Disk for writing updated data as well (risking volatility), be careful to copy back any updated files to a real disk before turning off the system. You may wish to purchase an uninterruptable Power Supply (UPS) with battery backup for your system. These power supplies will regulate the line voltage and prevent power loss during a black-out or brown-out for up to 20 minutes (leaving plenty of time to back up RAM Disks).

DOS Paths

Here's a little hint when using RAM Disks: set up the DOS PATH command so that the RAM drive is always searched first for any disk accesses. Since the RAM Disk is many times faster than real drives, you may wish to place programs as well as data on it. If you load any file more than once per session, you should consider placing the file on RAM Disk upon power-up. Using the PATH command ensures that the RAM Disk will be checked automatically to see if a file is located on it whenever it can't be found on the default drive. See the IBM Disk Operating System Manual for more information on this command. As an example, the path command might look something like this.

```
PATH E:\
```

where E is one of the RAM drives.

Setting Up The RAM Disk

If you wish to take the easy route, simply run the OPTION program and follow the menus to set RAM Disks on either the PC side and the PCTurbo side, or both. The OPTION program goes into the CONFIG.SYS (for PC side RAM Disks) or TURBO.SYS (for PCTurbo side RAM Disks) and adds a device driver with its accompanying parameters. If you're interested in what the details of this operation consists of, read on. Otherwise you may skip to the next subsection.

The RAM Disk is essentially a device driver which is included in the CONFIG.SYS or TURBO.SYS file. The driver, called RAMDISK.SYS is included on your PCTurbo Boot Diskette. The device driver entry line looks something like this:

```
DEVICE=RAMDISK.SYS N,S1,S2,...
```

where N is the number of RAM Disks being set up. S1 is the size (in Kbytes) of the first RAM Drive; S2 the second... up to Drive S4. These will be associated with logical drive letters (C, D, etc.) according to standard DOS rules.

Example of CONFIG.SYS file entry:

```
DEVICE=RAMDISK.SYS 3, 140, 75, 150
```

This will add three RAM Drives, all allocated from spare RAM on the PC side. The drive letters will be assigned beginning after the last existing physical drive. If this example is used on a dual drive PC, drive C will be 140K in size, D will be 75K and E will be 150K. On an XT, the drive letters will be D, E and F.

IMPORTANT NOTE:

When RAMDISK.SYS is included in the TURBO.SYS (for RAM Disks on the Turbo side), it must be installed **after** the PCDEVICE.SYS entry.

Example of TURBO.SYS file:

```
DEVICE=PCDEVICE.SYS
DEVICE=RAMDISK.SYS 2, 50, 75
FILES=16
BUFFERS=25
```


3.3 SYSTEM COMMANDS

You've already experimented somewhat with the PCturbo's major system commands, **TURBO** and **GOPC**. In addition to these two commands, there is also the **OPTION** command. All three will be detailed in this section.

3.3.1 The TURBO Command

Format: TURBO [/P] [/E] [/S] [/D] [/C] [/R]

Usage: To change from the PC to the PCturbo.

This is the command you use to transfer from PC Mode to Turbo Mode. (To return to PC mode, type GOPC.)

The TURBO command requires the file TURBO.COM on your PCturbo boot disk.

The *first* time you type TURBO after turning on the system, these things will happen:

- DOS will be loaded onto the PCturbo
- The AUTOEXEC.BAT file will be executed
- Operation will transfer to the PCturbo
- The TURBEXEC.BAT file will be executed

The display will indicate the system status. (If it displays an error message, see Appendix E — PCturbo Error and Warning Messages.) The TURBEXEC.BAT is the PCturbo's equivalent to the AUTOEXEC.BAT file. It will only be executed the first time you enter Turbo Mode in any computing session. After that, you can switch back and forth between PC and Turbo Modes without altering system status. When you switch back into Turbo Mode, even the current sub-directory will remain the same as when you left.

NOTE: If the TURBO command is used while already in Turbo Mode, it will display a message indicating that Turbo Mode is already active.

OPTIONS:

The TURBO command has several options that can be specified when the command is invoked. They are not necessary for normal operation, but are provided for special situations, such as special hardware and software. To specify the options, type TURBO followed by a slash (/) and the letter used to indicate the option. The options can be placed in any order and more than one can be specified at a time. (When using more than one option, place a slash before *each* option.)

All of the options (except for /P, /E, and /S) remain in effect until the next time you go back to PC mode. This means that you must specify any options you want *each* time you enter Turbo mode.

NOTE: If you frequently use an option, you can make it a default for the TURBO command using the OPTION program described in this section.

/P **EXAMPLE: turbo/p**

This option suppresses the pause after PCTurbo Status Screen. Normally, you are asked to press any key after reading the screen. When you type **turbo/p** you will go right into Turbo Mode without having to press a key. This is particularly useful in a PCLXLC.BAT file so that the system will go into Turbo Mode on power up.

NOTE: The /P option is only effective the *first time* the TURBO command is invoked.

/E **EXAMPLE: turbo/e**

This option overrides any error messages issued by the TURBO command when it is first executed. This option is provided only as a convenience for users with a non-standard configuration that would generate an unnecessary error message, such as NON-IBM GRAPHICS CARD. It is not recommended for any other situations. Do *NOT* use this option unless you are positive that your system is working properly.

NOTE: The /E option is only effective the *first time* you go into Turbo mode.

/S **EXAMPLE: turbo/s**

Enables the Scroll Lock key in Turbo Mode. Normally this key is used as a pause key in Turbo Mode. (This provides a simple test to see if you are in Turbo Mode without exiting your program.) Some software requires the Scroll Lock key, so this option can be used to enable its normal operation.

NOTE: This option is only effective the *first time* the TURBO command is invoked. It is best to use the OPTION command to set and clear this function.

/D **EXAMPLE: turbo/d**

Specifies that PCTurbo's Serial Daughtercard is used for DOS COM1. This means that serial devices, such as printers, modems, etc., can be plugged into the daughtercard and used with the PCTurbo. Some programs access the serial port directly, without going through DOS (most serial mouse software and interrupt-driven communications programs fall into this category). These programs will use the port on the Serial Daughtercard *regardless* of the setting of this option.

The section titled Option B describes the Serial Daughtercard in more detail.

/C **EXAMPLE: turbo/c**

Hard disks (and "intelligent" removable disks like the Iomega Bernoulli Box) are automatically cached in normal PCTurbo operation. This option disables *all* disk caching; neither removable nor fixed disks (hard disks) are cached when this option is used.

/R **EXAMPLE: turbo/r**

In normal PCTurbo operation, caching is only used for fixed disks and "intelligent" removable disks like the Iomega Bernoulli Box. This option allows removable disks (floppies and cartridges) to be cached in addition to hard disks and intelligent removables.

This option can add extra speed to many applications *if used correctly*. But it must be used with caution. There is a danger of losing valuable data if the floppy diskette is replaced without informing the PCTurbo of the change.

Before you change a floppy diskette or cartridge, press **CONTROL-C** or **CONTROL-BREAK** from the DOS prompt. This will inform the PCTurbo of the change so that it can flush its buffers and prepare for a new disk.

IMPORTANT NOTE: It is the user's responsibility to inform the PCTurbo whenever removable diskettes or cartridges are changed. Failure to do so may result in loss of data.

Removable media caching is not recommended for the novice.

Several common programs ask for a diskette to be changed or inserted at a point in the program when it is impossible to use CONTROL-BREAK without terminating the program and re-entering DOS first. The DOS FORMAT and BACKUP programs are examples. If you need to use these commands and removable caching has been selected, you should switch back to PC mode before executing them.

If you use removable caching, test it on backup copies of your applications software and data disks. Some programs appear to work but will fail when asked to perform some rarely used function such as a monthly or yearly report. Be sure to test every area of the program before using removable caching with your real data.

3.3.2 THE GOPC COMMAND

Format: GOPC

The GOPC command is used whenever you wish to transfer from the Turbo Mode back to the PC Mode.

If invoked while already in the PC Mode, the command informs you that you are already executing in the PC mode.

It is important to remember that both the PC and the PCturbo are running separate, independent copies of DOS. This means that if you are working in Turbo Mode, move into a subdirectory, and then invoke GOPC to go back to PC Mode, you will no longer be in the same subdirectory. In fact, you will be returned to the directory you were in when you last left PC Mode. If you return once again to the Turbo Mode you will again be in the subdirectory you were using when you last left the Turbo Mode. Therefore, it is recommended that you always check the current directory after switching between Turbo and PC Modes.

DOS provides the convenient capability of allowing you to change the prompt to include extra information (besides just the current drive letter). You can read up on the PROMPT command in the Disk Operating System manual from your PC. As an example, the following command will display the complete current directory, including the full path name, behind the caret (>) symbol:

A>prompt \$p\$g <RETURN>

If you like the effect of this prompt symbol, you may wish to include it in the PCEXEC.BAT or TURBEXEC.BAT file for everyday use.

3.3.3 The DOPC Command

Format: DOPC [string]

Maximum string length: 15 characters including blanks and separators.

Usage: To change into PC Mode and run the program specified on the command line.

This command works like the GOPC command, except that the string on the command line is placed in the keyboard buffer. This is just like having the string automatically typed after entering PC mode, which means that you can change into PC mode and run a program all in one step. Notice that the string is limited to 15 characters, including any spaces or separators.

Example: To change into PC mode and run a program called TEST.COM, type the following from the DOS prompt:

```
dopc test
```

The program named on the command line can be a batch file. The contents of the file will be executed on the PC side. If the file ends with the TURBO command, execution will automatically return to the PCTurbo after executing the contents of the file.

3.3.4 The TMODE Command

Format: TMODE [/P] [/S]

Usage: To assign priority to **P**rocessing or **S**creen updates

Accessible by OPTION program: Yes

This command is used to select faster program processing or smoother screen display.

tmode/p The /p parameter assigns higher priority to program processing. Program priority allows for slightly faster execution speed.

tmode/s The /s option chooses screen priority for smoother screen updates. This is especially important when running programs with a lot of screen updates, such as spreadsheets or graphics programs, or when using a mouse.

The default for this command is program priority. The OPTION program can be used to change the default.

3.3.5 THE TPRINT COMMAND

Format: TPRINT filename [/Sn] [/Pn] [/C] [/T]

Note: Use only one option at a time; either /Sn, /Pn, /C, or /T.

Usage: Replaces the DOS PRINT command while in Turbo mode. Prints a file in the background using the PC's processor.

The TPRINT command allows background printing on the PC without interfering with processing on the PCTurbo. Use it instead of the DOS PRINT command while you are in Turbo Mode.

This command prints the file named on the command line. The output can be directed to either serial or parallel port 1 or 2 using the following syntax:

- /Sn** Prints using serial port n (where n is 1 or 2 indicating COM1 or COM2).
- /Pn** Prints using the parallel port n (where n is the number of the port indicating LPT1 or LPT2).

To cancel the TPRINT command and terminate the printout, use *either* of the options listed below. They both have the same effect. Do not include a file name when stopping the printout.

/C or /T Stops printing.

You cannot use more than one option at a time.

Examples:

tprint test.doc

Prints the file **test.doc** in the current directory using the default printer port.

tprint c:test.doc/s2

Prints the file **test.doc** in the current directory of drive **C:** using serial port COM2: on the PC.

tprint/c

Stops printing.

3.3.6 DETAILS ABOUT THE OPTION PROGRAM

The OPTION command provides an easy way to change the defaults of the TURBO command. This allows you to tailor Turbo Mode to your particular needs. Suppose, for example, you frequently use the TURBO command with the /S parameter (TURBO/S) to enable the Scroll Lock key. You can use the OPTION program to make the default with Scroll Lock enabled. You will no longer have to use the /S parameter when you type the TURBO command.

Another use for the OPTION program is setting up RAM disks in the PCTurbo's memory or the PC's memory.

The OPTION program is menu-driven with almost all of your responses made by pressing function keys.

You will need a PCTurbo boot disk with the following programs:

OPTION.EXE
TURBO.COM
TURBO.SYS
PCDEVICE.SYS
RAMDISK.SYS

If the OPTION program cannot find a file it needs, it will tell you.

To run the OPTION program, simply type OPTION from the DOS prompt. The screen will indicate which function keys to press to perform the various functions. The functions are described below. The first screen allows you to choose whether to change the defaults or to configure RAM disks.

Press function key F-1 to change defaults or F-3 for RAM disks.

Installing RAM Disks

The OPTION command can be used to install RAM disks. You can install RAM disks on the PC and the Pcturbo. A RAM disk in the PC's memory can be used from the PC as well as the Pcturbo. A RAM disk on the Pcturbo can be used *only* by the Pcturbo. The PC and the Pcturbo can each have as many as four RAM disks.

NOTE: Read Section 3.2.3 before you attempt to configure a RAM disk.

The first screen of the OPTION program allows you to configure RAM disks. Press F-3 if you wish to do so. You will be asked whether you wish to place them in the memory on the PC or the Pcturbo. You will then be asked how many RAM disks you wish to configure and their sizes. You can answer 0 to number of RAM disks to remove existing disks.

If you press F-1 on the first screen, you will be given the following options:

Changing The DMA Channel

Some peripherals conflict with the DMA channel used by the Pcturbo. See Appendix D (Updates and compatibility Notes) for a complete discussion of peripheral compatibility and the DMA channel. If you need to change the DMA channel used by the Pcturbo, you may select from either Channel #3 (factory default or the alternate, Channel #1).

The OPTION program allows you to change the DMA channel simply by pressing a function key. The screen will indicate the current DMA channel. Pressing F-1 will toggle between the two choices (Channel 1 and Channel 3). When the desired choice is displayed, press F-0 to move to the next screen, then press it again to exit the program.

Startup Pause

Press F-2 to suppress the pause after Pcturbo Status Screen. Normally, you are asked to press any key after reading the screen. This option allows you to go into Turbo Mode without having to press a key. This is particularly useful in a PCEXEC.BAT file so that the system will go into Turbo Mode on power-up.

SCROLL LOCK option

When using the Pcturbo the SCROLL LOCK key becomes a pause key. Pressing the SCROLL LOCK key causes an inverse **PAUSE . . .** message to appear on the upper right corner of the screen. Pressing any other key will release the pause. This convenience has two functions: (A) it only takes one keystroke as opposed to the CTRL-NUM LOCK sequence, and (B) it is the fastest test from within applications programs to see if you are in the Turbo Mode.

Some programs use the SCROLL LOCK key for other purposes. You can disable the pause feature using the OPTION command. The default status of the Scroll Lock is OFF. Press F-3 to disable and enable the normal operation of the SCROLL LOCK key.

NOTE: For this option to take effect, you must exit the OPTION program and *reboot* the system.

Setting Disk Cache Status

By default, the Pcturbo automatically enables hard disk caching. Removable drive (floppy) caching can be selected by using the OPTION command or by using the TURBO/R command. Some users may also wish to disable disk caching functions entirely, which can also be accomplished by either command (See Section 3.3.1). These are the caching options:

- OFF — Caching is completely disabled
- ON — Hard Disk Caching enabled
- ALL — Hard Disk and Removable Caching enabled

WARNING: You must hit CTRL-BREAK (or CTRL-C) whenever you change a removable disk. Failure to do this may result in serious data loss.

The screen will indicate the current caching status. Pressing F-4 will circle through the three options listed above. Be sure to heed the warning message about caching removable media.

NOTE: Removable caching is not recommended for novice users. You must press CTRL-BREAK every time you change a disk; but some programs require you to change disks when this key is not active. See subsection 3.3.1 on the TURBO command for more information on this.

If you press F-9 on the screen described above, you will be given the following set of options:

DMA Screen Updates

If your display adapter allows DMA to the screen, the PCTurbo can write directly to it for faster screen updates. (The early model PC with the 64k mother board and the Hercules card do not allow DMA.) The INSTALL program tests for DMA capability and automatically sets the default for the TURBO command. You can change the default by pressing F-1.

Serial Port Configuration (DOS COM1 Assignment)

Pressing F-2 allows you to choose whether serial output is directed to a serial port installed on the PC or to the PCTurbo's Serial Daughtercard.

The default setting is to send COM1 output to the serial port connected to the PC so that the Serial Daughtercard can be used for input devices such as a mouse.

The section titled Option B describes the Serial Daughtercard in more detail.

NOTE: For this option to take effect, you must exit the OPTION program and *reboot* the system.

Fast Color Mode (Color Display Update Speed)

The PCTurbo has a very fast screen updating method which is designed to reduce the flicker of the normal IBM Color Display.

The screen update is optimized for your system during the INSTALL program. If you are experiencing unusual screen updates or excessive flicker or static, you may want to try an alternate screen update routine provided for the PCTurbo.

The OPTION program allows you to turn the Fast Color / Graphics mode off and on by pressing F-3.

Note: When the Fast Color mode is turned off you may not experience the PCTurbo's full performance increase with certain applications software. It is best to experiment both ways and see which is best for your needs.

Choosing Program or Screen Priority

This option is used to select faster program processing or smoother screen display.

Program priority allows for faster execution speed.

Screen priority allows for smoother screen updates. This is especially important when running graphics programs or using a mouse. Screen-intensive programs will run slightly slower, but most programs will run with no perceptible loss of speed.

The default for this command is program priority. Press F-4 to change between program and screen priority.

NOTE: For this option to take effect, you must exit the OPTION program and reboot the system.

Press F-9 to exit the program.

3.4 THE AUTOEXEC.BAT FILE

The Disk Operating System (PC-DOS or MS-DOS) which came with your system has a feature which you are probably already familiar with known as the Automatic Execution Batch File or AUTOEXEC.BAT File. The AUTOEXEC is simply a file containing commands which are to be executed automatically upon booting a diskette. The file itself is normally stored along with other files on your Boot Diskette. Upon system power-up, DOS and any device drives (the CONFIG.SYS) are loaded first. If there is a file named AUTOEXEC.BAT existing on the Boot Diskette, it is loaded next. Otherwise, control of the system is returned to the user by displaying the DATE and TIME functions, followed by the "A>" prompt.

For Pcturbo users, the AUTOEXEC.BAT file can be an extremely useful tool. Particularly for customized systems, the AUTOEXEC.BAT and its companion PCEXEC.BAT and TURBEXEC.BAT files can eliminate routine startup procedures the user would otherwise be typing into the keyboard every time the system is turned on.

The INSTALL procedure which was followed in Section 2 also manipulated the AUTOEXEC.BAT, PCEXEC.BAT and TURBEXEC.BAT files. If you weren't aware of this, you may wish to examine the contents of these files at this time. To examine the files, simply use the following command from the DOS prompt:

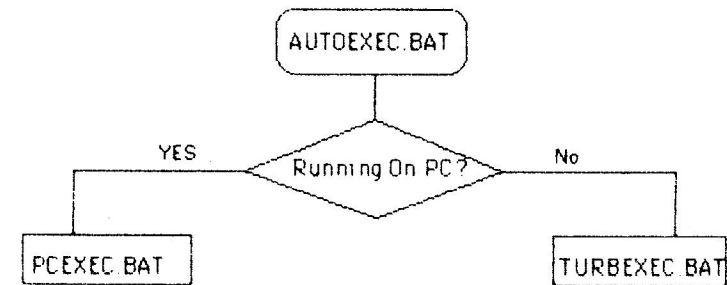
A> **TYPE AUTOEXEC.BAT** <return>

TYPE out the PCEXEC.BAT and TURBEXEC.BAT files as well, in the same manner.

You will notice some very interesting things about these files when you examine them. The AUTOEXEC.BAT file is designed to run twice, once when entering PC Mode and once when first entering the Turbo Mode. Therefore, its contents are commands which can run on either side. The PCEXEC.BAT on the other hand contains commands which are only to be run while in the PC Mode. It runs only once, and only immediately after the AUTOEXEC.BAT is run through. Its sister file the TURBEXEC.BAT contains only commands which are to be run on the Turbo side. It too only runs once, and only immediately after the AUTOEXEC is run through during initial entry into the Turbo Mode.

After examining these files, you may decide that they are sufficiently customized for your needs, and you may proceed to Section 3.5. Otherwise read on.

In the following subsections, a detailed explanation of how batch files are customized will be given. To aid in simplifying Pcturbo operations, a few new "batch commands" have been provided (on the Pcturbo Boot Diskette) which supplement those already provided by DOS.



3.4.1 ADVANCED FEATURES - THE BATCH COMMANDS

Note: For a complete understanding of the DOS batch commands set, read your PC-DOS or MS DOS manual which was provided with your computer. This section will assume you are already familiar with the basic working of DOS and the AUTOEXEC.BAT file.

Provided on your PCTurbo Boot Diskette are the following supplementary "batch commands":

- ISPC
- ISTURBO
- ASK

These additional commands will help you to customize batch files to work smoothly and efficiently with the PCTurbo. For example, the ISPC and ISTURBO commands allow you to specify actions to occur specifically in PC mode or Turbo mode, yet they are not restricted to PCEXEC and TURBLXC batch files. The ASK command makes interactive user prompting for Yes/No questions simple.

ISPC AND ISTURBO BATCH COMMANDS

Format: ISPC
IF ERROR LEVEL 1 THEN.....

Usage: In AUTOEXEC.BAT or any other Batch File

Both the PC and the PCTurbo load the AUTOEXEC.BAT file once, upon starting up. However, not all commands in the AUTOEXEC.BAT need to be executed in both modes. For example, if the AUTOEXEC contains a command line which selects a printer redirection using the MODE command, it should only be invoked when in the PC Mode (invoking it again in the Turbo Mode will likely cancel out the redirection). There are several other situations where you may need to precede a command line in the AUTOEXEC with either the ISPC or ISTURBO command. These commands allow you to determine which mode the computer is in and then proceed with the next step or skip to the one after it.

The easiest way to accomplish this separation of PC Mode and Turbo Mode is, of course, to use the PCEXEC.BAT and TURBEXEC.BAT files. However, there are some advanced applications where it might be preferable to use the AUTOEXEC.BAT exclusively.

Both the ISPC and ISTURBO commands take no arguments. Their output is in the form of the DOS Batch "errorlevel" value. Essentially how this works is that the errorlevel will be set at 1 if the last command returned a true condition or a 0 for a false condition.

In the case of ISPC, the errorlevel returned would be a 1 if the batch file was executing in the PC Mode, or a 0 if it was already in the Turbo Mode. Conversely, in the case of ISTURBO the errorlevel returned would be a 1 if the batch file was executing in the Turbo Mode, or a 0 if it was in the PC Mode. The command line is usually followed by a *conditional* command, which will be executed if the ERRORLEVEL is as specified.

Here's an example of how this might work in a Batch File:

```
echo off
isturbo
if errorlevel 1 echo EXECUTING ON THE PCTurbo!
if not errorlevel 1 echo EXECUTING ON THE PC!
```

This batch file can be executed on either the PC or PCTurbo and will display the appropriate message.

Here's another example. Say you wanted to set a display mode, then go into turbo mode, and then execute a program called MYPROG. Your batch file might look something like this:

```
echo off
date
prompt $p$q$g
ispc
if errorlevel 1 MODE CO80
ispc
if errorlevel 1 TURBO/P
isturbo
if errorlevel 1 MYPROG
```

Using the ISPC and ISTURBO commands to determine which CPU is currently running, the batch file can take the user through all the steps of getting started every morning without having to remember which commands are needed or their sequence. Together with the ASK command (next page) fully customized batch files can be setup easily for all your boot diskettes.

ASK BATCH COMMAND

Format: ASK [/R] *message*

Usage: In AUTOEXEC.BAT or any other Batch File

The ASK command will display whatever message is included in the command line and then waits for the user to type in a single character response to the message. If a "Y" or "y" is typed, the DOS errorlevel is set to 1. Otherwise, if a "N" or "n" is typed, the errorlevel will be set to 0.

This is convenient for letting the user make decisions as the batch file goes along. Here's an example:

```
echo off
ask Do you wish to display the directory (y/n)?
if errorlevel 1 DIR/W
ask Bypass the DATE function (y/n)?
if not errorlevel 1 DATE
ask Do you wish to Turbocharge (y/n)?
if errorlevel 1 TURBO
```

If you prefer to require the user to press the RETURN key after the yes or no response, the ASK/R command can be used instead of ASK. When "/R" is specified, the ASK will perform the same as above, only with the difference that the RETURN key will need to be pressed before accepting the response.

3.5 THE MEMTEST DIAGNOSTIC PROGRAM

Format: MEMTEST

Usage: To test for intermittent RAM problems that are not found by the start-up diagnostics.

This program tests for intermittent memory problems. The PCturbo performs a memory check on startup, but sometimes a RAM IC is intermittent and won't fail until after the startup test. You can run MEMTEST if you suspect that this is the case.

NOTE: MEMTEST will alter the memory, so be sure to copy the contents of any RAM disks onto a hard disk or a floppy.

You must be in PC mode to run MEMTEST. After entering PC mode, simply type MEMTEST to begin the test.

If MEMTEST finds a memory problem, it will display a message indicating which IC is bad. A "hard failure" (an IC that doesn't work at all) will cause MEMTEST to stop with a message indicating that the problem will show up on the startup diagnostics.

Some problems are temperature sensitive and will show up only when the PC is warm. You may wish to run MEMTEST after the PC has been on for at least 30 minutes to allow it to heat up enough for the problem to manifest.

HIGH SPEED DRIVING TIPS

4.1 THE FINE ART OF HIGH SPEED DRIVING

Different application software programs behave in different ways when running on various hardware configurations. Typical factors which may affect the speed of a program include the amount of RAM in your PC, the amount of RAM in your PCturbo, the configuration of your RAM disks and cache options, to name a few.

The entire PCturbo *system* performance is based strongly on the coordination of the following features:

- Fixed media Disk Caching
- Removable media Disk Caching
- Electronic RAM disk
- DOS BUFFERS

The balance of all these features to provide peak performance is what this section is all about.

4.2 WHEN TO USE THE DISK CACHE FEATURE

Except in cases where the use of RAM Disks are more effective, there are rare instances where the Disk Caching feature could not be used to improve system performance. Particularly where repeat disk access is common, the cache can be as much as 30% of the total speed improvement ratio. Even when loading files only once, there is significant benefit to having the cache activated. The multiple-sector read-ahead technique of the cache improves the read time of *any* data file.

It is important to realize that the cache is automatically activated for fixed disk drives when you type TURBO. What is not immediately obvious is that the cache needs to be manually activated for removeable devices, such as floppy drives. This is done mainly as a safety feature, but can be made automatic using the OPTION command (see section 3.3.6 to change default settings). By not turning on the **Removeable Media Caching feature** when appropriate the full power of the PCturbo is not being harnessed.

See section 3.2.2 (Disk Caching) for details on how to activate the removeable cache if you have not already done so.

4.3 EFFECTIVE USE OF RAM DISK

Many applications programs make frequent accesses to the disk drive for overlay files, numeric tables, program modules, and other read-only files. For these instances, RAM disk is ideal. By loading all those files into a RAM disk before entering your application, repetitive disk accesses will happen quickly in RAM instead. An excellent example of this is Wordstar, which needs to pull in overlays several times per document. By loading the overlays into a RAM disk before loading Wordstar (this can be done easily in a batch file), you can avoid those time consuming disk accesses which normally happen in the midst of your editing.

Most popular software packages allow you to place large read-only file such as libraries and spell checkers on disk drives other than the default document or program drive. This is ideal for RAM disk, wherein you can load those large files onto a RAM drive and let the software package know to search there instead of the default drive for its data.

There are some instances where RAM drives can be used for files which are not read-only. It is really a matter of personal preference. If your system is equipped with a UPS (uninterruptable power supply) or other failsafe power supply, you may feel that it is safe to use RAM drives for all your work, and then copy the updated files back to permanent media before shutting off your system. The volatility of RAM drives is essentially based on two common problems, power failures and the operator's forgetfulness in copying updated files from the RAM drive back to floppy or hard disk before closing down for the day.

Remember, the time it takes to access a RAM drive is no less than 10 times faster than the speed of a hard disk access, and can be as high as 50 times faster than floppy disk.

If you already have another RAM Disk program from some other vendor, we recommend that the one provided with the PCTurbo be used instead of it. Not only is the Orchid RAM Disk one of the best available for the PC, but it also was specifically considered in the design of the PCTurbo board. Since our RAM Disk is loaded as a device driver, no switches need to be reset on the motherboard of your PC. Additionally, since it is a device driver module, it is also more DOS compatible, and efficient in general, than other types of RAM Disks.

Finally, if you decide to use RAM Disk(s) in your system, you need to evaluate whether placing them on the PC side or the Turbo side is most efficient.

The effect of placing RAM Disks on the PC side is that the Disk Cache will be automatically reduced in size. On the other hand, placing the RAM Disks on the Turbo side will reduce the amount of workspace available to your application program, possibly reducing performance or variable space (e.g. spreadsheet size).

4.4 BALANCING THE DOS DISK BUFFERS

The DOS that comes with your PC has a little known feature called the **BUFFERS** statement. Normally inserted as a line in the **CONFIG.SYS** file on your boot disk, the **BUFFERS** command designates how many 512 byte blocks of RAM you'd like to allocate for holding the disk directory in memory (the DOS default is 3 buffers). There is an obvious speed benefit to having the directory in memory since whenever a file is accessed, the directory information is required to locate the file's component sectors. You can read Section 3.1.1 (Configuring The **CONFIG.SYS**) for more information on this.

A typical **BUFFERS** statement might look like this:

```
BUFFERS = 10
```

Where the number of buffers can be as low as 0 or as high as 99. If for example, if you ask for 50 buffers, that's equal to 50 x 512 bytes of RAM, or 25K of total RAM which would be allocated to holding the directory and FATs (File Allocation Tables).

Depending on the type of drives you have in your system and the software you use, different buffer sizes will result in different performance increases. When using the PCTurbo, you can have an additional buffer area by placing the **BUFFERS** statement in the **TURBO.SYS** file as well. It is beneficial to try out different combinations of buffer sizes in both the **CONFIG.SYS** and **TURBO.SYS** files until an optimum balance is discovered.

The balance between the buffers on both sides cannot be predicted very easily. Therefore, it is recommended that different combinations be tried and benchmarked until the perfect balance is found. Some different combinations you may want to try are:

CONFIG.SYS buffers	TURBO.SYS buffers
10	10
25	25
50	50
50	10
10	50
50	25

As a minimum, balance of 10:10 is recommended, with 25:25 being the best choice for average use. Remember, each buffer equals 512 bytes which will be allocated out of the PC's RAM memory if specified in CONFIG.SYS, or the PCTurbo's RAM if in the TURBO.SYS file. Be sure that you have sufficient RAM available on both the PC side and Turbo side to accommodate larger buffers.

Once you are comfortable with the PCTurbo and your applications software, be sure to experiment with these buffers for performance peaking. It can really be worth the time involved.

4.5 PEAKING PERFORMANCE - SUMMARY

The proper use of all the special features of the PCTurbo system is essential for absolute peak performance increase. Once you are comfortable with PCTurbo operation, begin experimenting with all the tips mentioned above until you find the balance of your system. Due to the nature of certain software packages, you may find significant variations in performance increase. Typically, an increase of 50% to 300% is normal. There are few cases where increase will be below this range (sometimes, turning off the cache can help in those cases). There have been reported cases of greater than 400% increase, particularly when the RAM Disk or Disk Cache is used efficiently.

User's Notes:

PCturbo RAM EXTENSION CARD

A.1 Functional Description

The PCturbo RAM Extension Card is a daughterboard option for the PCturbo 186 which extends its on-board memory above the 256K RAM capacity of the motherboard. The daughtercard contains three socketed banks, each with a capacity of 128K. By filling in these banks with standard 64K RAM chips, the daughtercard can handle a maximum of 384K additional RAM. When attached to the PCturbo motherboard, this yields the maximum 640K of RAM addressable by DOS.

RAM Bank Size	128 Kilobytes per Bank
Available RAM Banks	Socketed for 3 Banks
Maximum RAM capacity	384 Kilobytes
RAM component type	4164 chips (64K)
RAM speed	150ns

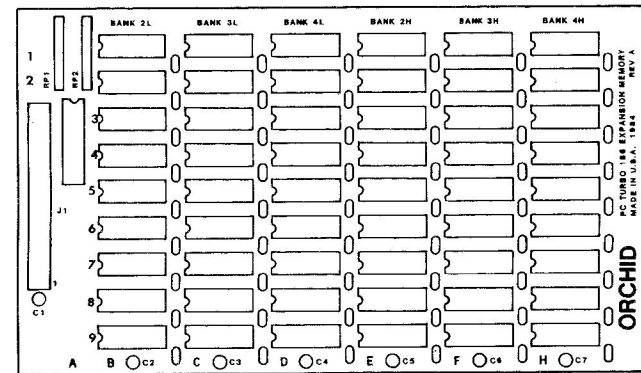


Figure A-1 - Expansion Memory Board

TIPS

OPTIONS

A.2 Installation of the RAM Chips

If you purchased your RAM Daughtercard with all of its memory pre-installed, you may skip this section and proceed with the installation of the card.

Additional RAM memory may be added to the daughtercard in increments of 128K. Each additional 128K increment requires 18 64K dynamic RAM memory chips. When additional memory is installed, you must modify the settings of the **Memory Size Switch** (shown at the end of this section).

IMPORTANT NOTE:

It is vital for proper operation of the PCturbo that all of the RAM chips on the Turbo board be of the same type, manufacturer, and access speed. Mixing brands of chips on one card can cause intermittent memory failures. Refer to the **Orchid Approved RAM Vendor List** packed with your board or contact your dealer.

NOTE:

Precautions must be taken while handling the dynamic RAMs, as they may be damaged by electrostatic discharge. If you are unfamiliar with handling IC chips, you should have your service dealer do the installation.

When installing RAM chips, make sure that the chip lettering is oriented in the same direction as the lettering on the socket columns. The chips have an indentation on their left side; this should face the 40 pin board connector on either the main or expansion memory boards.

The expansion memory board has six columns of memory sockets. Memory must be installed in the following specific order:

- First 128K:** Fill columns **B** and **E** - Bank 2L and 2H
- Next 128K:** Fill columns **C** and **F** - Bank 3L and 3H
- Last 128K:** Fill columns **D** and **H** - Bank 4L and 4H

To install the expansion memory board, first insert the two small nylon stand-offs into the holes on the expansion board beside memory column H. (These holes are on the opposite side of the board from the connector.) Then position the board over the main PCturbo board so that the RAM memory expansion connector on the PCturbo mates with the expansion memory board connector. Make sure that the connectors line up exactly. Then firmly push the white stand-offs connected to the expansion board into the mating holes in the PCturbo board.



A.3 Attaching The RAM Extension Card To The PCturbo

If possible, your dealer should install this daughtercard option on to the PCturbo 186 motherboard. This installation procedure is very simple, however, and so you may choose to install it yourself. No special tools are required for installing the card.

Step 1

Hold the RAM Extension daughtercard in your hand while inserting the plastic spacer pegs into the four holes (one on each corner of the board).

Step 2

Holding the PCturbo 186 motherboard in the other hand, align the RAM Extension Daughtercard as shown in Figure A-1 at the beginning of this section. Plug the 40-pin connector on the edge of the daughtercard into the 40-pin socket on the edge of the motherboard (opposite the bracket end).

Step 3

Clamp the boards together inserting the other ends of the plastic spacers into the corresponding holes on the motherboard. Check to see that all the clips are firmly in their sockets and the connectors are properly aligned.

Step 4

Reset the DIP switches (small red and white device on the lower edge of the motherboard) to reflect the new installed RAM capacity of the PCturbo board. See Table A-1 for the correct settings.

Step 5

Reinstall the PCturbo card in your system as described in section 2.2 (Installing The PCturbo 186 Board Inside The PC).

Step 6

You are now finished installing the PCturbo RAM Extension Card. Run the **MEMTST** Memory Diagnostic Program (Section 3.5) to check that all the RAM in the new daughtercard is working properly.

If any error conditions occur, remove the PCturbo board and recheck all the RAM sockets, memory switches, and connectors. If the problem persists, contact your dealer immediately.

Table A-1 Memory DIP Switch Settings

Total PCturbo RAM	Switch 1	Switch 2	Switch 3	Switch 4
256K (No Daughtercard)	OFF	ON	OFF	ON
384K	OFF	ON	ON	OFF
512K	OFF	ON	ON	ON
640K	OFF	ON	OFF	OFF
768K	OFF	OFF	OFF	OFF

Put the video jumper in the Hercules position when using 768K of RAM.

OFF = DOWN
ON = UP

User's Notes:

**OPTION B - PCturbo SERIAL PORT
AND COLOR ENHANCEMENT
DAUGHTERCARD**

B.1 Functional Description

The PCturbo Serial Port and Color Enhancement Card is a daughterboard option for the PCturbo 186 which provides a single IBM compatible serial port. In addition the card contains the circuitry which will enhance the screen scrolling speed of color displays. This card is 100% functionally compatible with the IBM Asynchronous Interface Card. There are the added benefits of being connected directly to the fast 16-bit TurboBus connector, allowing higher performance, and without taking an extra expansion slot.

Baud Rate Capability	300 to 19,200 Baud
Serial Interface Type	Asynchronous RS-232
Connector Type	DB-25 male

Note on compatibility: The PCturbo serial port is addressable as COM1 only. COM2 is not available with this model of the Serial daughtercard. Also, if you are using an IBM Color Display adapter, the light pen feature will be disabled when this daughtercard is used. This is part of the speed-up method for faster graphics and scrolling.

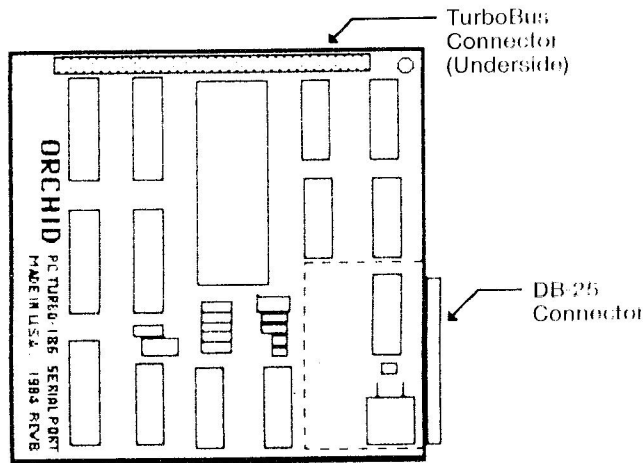


Figure B-1: PCTurbo SERIAL PORT AND COLOR ENHANCEMENT DAUGHTERCARD

B.2 Attaching The Serial Port Card To The PCTurbo

If possible, your dealer should install this daughtercard option onto the PCTurbo 186 motherboard. This installation procedure is very simple, however, and so you may choose to install it yourself. No special tools are required for installing the card.

Step 1

Reset the Serial Port Jumper on the PCTurbo board to reflect the newly installed serial port. See Figure B-2 for the correct setting.

Step 2

Hold the Serial Port Card in one hand while positioning the PCTurbo 186 board in the other. Match up the DB-25 connector on the Serial Card with the D-shape hole in the bracket at the end of the PCTurbo board.

Step 3

While carefully inserting the DB-25 connector into the bracket, line up the 50-pin TurboBus connector and slowly push the two cards together.

Step 4

Reinstall the PCTurbo card in your system as described in Section 2.2 (Installing The PCTurbo 186 Board Inside The PC).

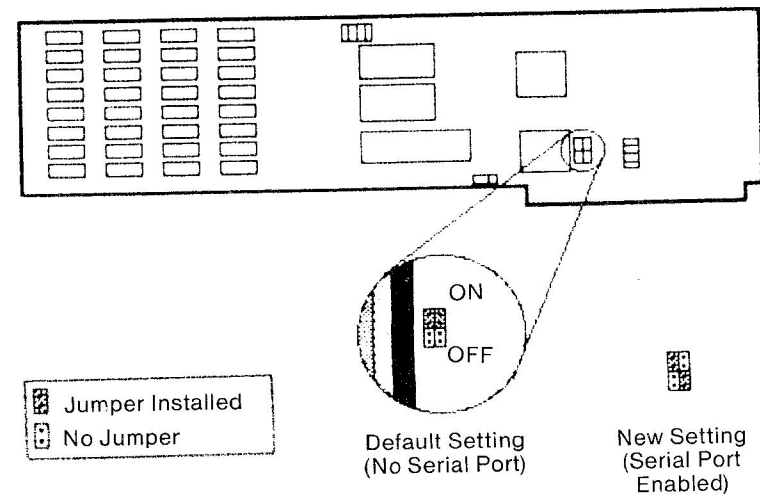


Figure B-2: Serial Port Jumper Settings

B.3 Assigning with the INSTALL Program

When no Serial Daughtercard is installed, the PCturbo sends serial output to the PC. With the Serial Daughtercard you have a choice of connecting serial devices to the Daughtercard or to the serial port on the PC.

Some programs access the serial port directly, without going through DOS. All interrupt-driven communications programs fall into this category. They include Cross Talk, Smart Talk, and PCTalk. Serial mouse programs also access the port directly. Devices must be connected to the Serial Daughtercard to be used with these programs.

Some programs access the serial port through the operating system. Output to a serial printer often uses standard DOS routines. These programs can access the serial port on either the PC or the PCturbo; the method of choosing is shown below.

The INSTALL program lets you choose which serial port to use. (The TURBO and OPTION commands also allow you to select either of these choices.)

DEFAULT — Serial communication is through the port on the PC.

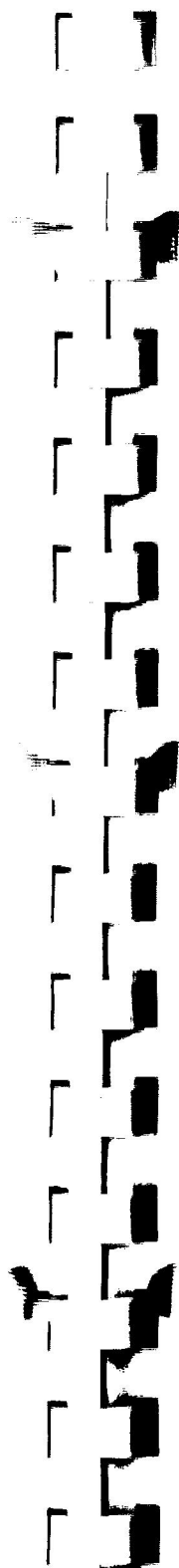
- Software that accesses the serial port through DOS will be able to use the device connected to the serial port on the PC. You will probably want to connect your serial printer this way. This also means that the printer can be accessed from PC mode.
- Software that writes directly to the serial port will use the port on the PCturbo Serial Daughtercard. You can connect a modem or mouse to the daughtercard.

OPTIONAL — Serial communication is through the port on the PCturbo Serial Daughtercard.

- Serial devices cannot be accessed from the PC while connected to the daughtercard.

If you wish to use a serial mouse and a serial printer, use the following procedure:

- Plug the mouse into the PCturbo's Serial Daughtercard.
- Plug the printer into the PC's serial port.
- Run the INSTALL program and choose the DEFAULT configuration, in which serial output is sent the PC.



User's Notes:

8087/SERIAL PORT DAUGHTERCARD FOR THE ORCHID PCTURBO 186

Turbos that have been factory modified to accept the 8087-2/Serial Port Daughtercard are known as the PCturbo 186/87.

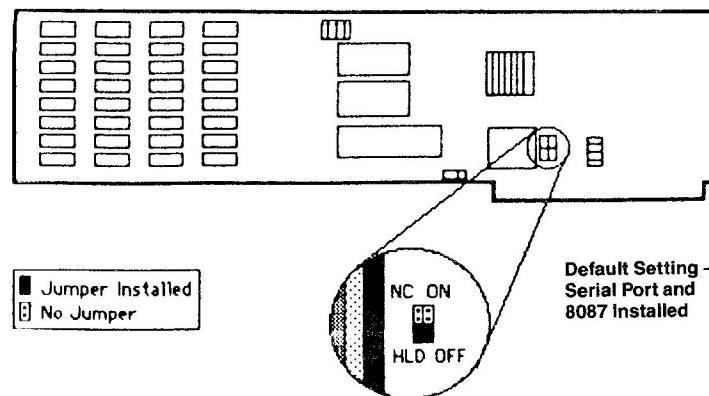
The PCturbo 186/87 allows software to use the 8087-2 math co-processor in Turbo mode. Software supporting 8087s adds a speed increase of 2 to 2.4 on top of the 2 to 4 increase you have already been experiencing in Turbo mode.

This 8087-2 is used in Rev. B PCturbo boards with EPROMs and software labeled Version 2.1 or higher. (Appendix H explains the differences between Rev. A and Rev. B boards.) Be sure you use the software diskette labeled Version 2.1 when installing and booting the PCturbo 186/87.

NOTE: If you must operate without the 8087-2 IC installed (i.e., without 8087-2 capability), leave the daughtercard installed and leave the jumpers in the settings shown below.

A PCturbo that has been modified to accept the 8087-2 will not run without the daughtercard installed. Do not remove the 8087-2/Serial Port Daughtercard once it has been installed in your PCturbo.

The PCturbo 186/87 uses the jumper settings shown below. Do not remove the jumpers when operating without the 8087-2.



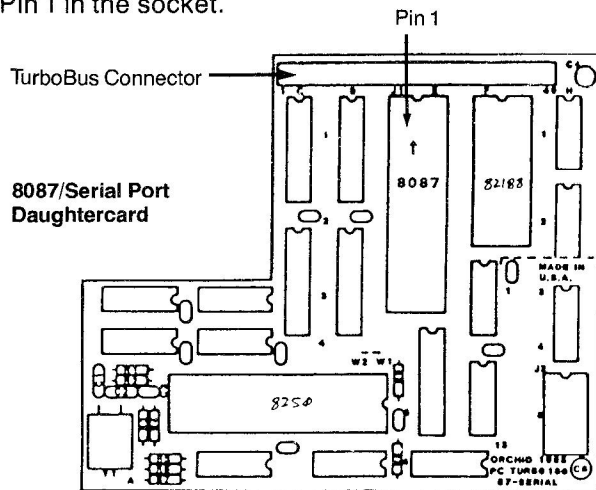
Installing the 8087-2 IC in the Daughtercard:

The 8087-2 integrated circuit for use in this daughtercard is sold separately. It is available from Orchid Technology as part number TA-511-02. If you order it from another source, be sure to specify Intel part number 8087-2 (8MHz). Only ICs with the -2 after the part number can be used.

If you do not have an 8087-2 IC in the daughtercard, follow these directions to install it:

CAUTION: Be careful handling the 8087-2 integrated circuit. Do not bend its leads.

1. Orient the IC in the right direction as you install it into the socket: The indentation on the end of the IC should aim toward the indentation in the socket; it should point toward Pin 1 in the socket.



2. Being careful not to bend its leads, insert the 8087-2 into its socket. Be sure that all of the leads are in the socket's holes as you insert the IC.
 - If you are installing the PCTurbo 186/87 in a PC with narrow slot spacing (the IBM XT for example), you should place *high-temperature* electrical insulating tape over the metal top of the 8087-2 to prevent it from causing an electrical short if it touches another board. The 8087-2 ICs available from Orchid Technology have this tape.

Installing the PCTurbo 186/87

To install the PCTurbo 186/87 in your PC:

1. Turn off your PC's power.
2. Remove the PC's cover as described in the *Guide to Operations*.
3. Place the PCTurbo 186/87 into an expansion slot in the PC.

NOTE: If you are installing the PCTurbo in the PC for the first time, read Chapter 2 for instructions about switch settings and the installation program you must run.

4. Put the cover back onto the PC and fasten it in place.

NOTE: You *must* run the installation program as described in the *PCTurbo User's Manual* on page Option B-4. Be sure to indicate that you have a serial port installed.

Chapter 3 has additional information on using the serial port with the TURBO and OPTION commands.

Your PCTurbo 186/87 is now ready to use the 8087-2 Math co-processor and the serial port.

Operating the PCTurbo Without the 8087-2

The PCTurbo 186/87 has been factory modified so that it will not operate without the daughtercard installed. Do *not* remove the 8087-2/Serial Port Daughtercard once it has been installed.

If you must operate *without* the 8087-2 IC in its socket, leave the daughtercard installed and leave the jumpers set as shown in this section. The daughtercard's circuitry will automatically detect whether or not the IC is in its socket.

User's Notes:**APPENDIX A — COMMAND SUMMARY**

Command: **ASK**

Format: ASK [/R] message
IF ERRORLEVEL 1 xxx

Purpose: Used in batch files to display the message and prompt user for Y/N response.

Arguments: /R requires the user to type a carriage after the response.

The message will be displayed on the screen.

The command xxx will be executed if the user responds by typing Y.

Command: **DOPC**

Format: DOPC [command]

Purpose: Changes to PC mode and executes the command specified on the command line.

Arguments: [command] is the command; it can be the name of a program, batch file, EXE file, or any valid DOS command. The command can be as many as 15 characters long.

Command: **GOPC**

Format: GOPC

Purpose: Invokes PC mode.

Arguments: None.

Command: **INSTALL**

Format: INSTALL

Purpose: Quick installation of the Pcturbo boot diskette.

Arguments: None.

Command: **ISPC**

Format: ISPC
IF ERRORLEVEL 1 xxx

Purpose: Used in batch files to detect PC mode.

Arguments: The command xxx is executed if you are in PC mode.

Command: **ISTURBO**

Format: ISTURBO
IF ERRORLEVEL 1 xxx

Purpose: Used in batch files to detect Turbo mode.

Arguments: The command xxx is executed if you are in Turbo mode.

Command: **MEMTEST**

Format: MEMTEST

Purpose: Checks Pcturbo memory for intermittent RAM failures.

Arguments: None.

Command: **OPTION**

Format: OPTION

Purpose: Menu-driven utility used to set Turbo mode defaults and configure RAM disks.

Arguments: None.

Command: **TMODE**

Format: TMODE [/P] [/S]

Purpose: To assign higher priority to the program or the screen updates.

Arguments: /P — Program has priority for fastest execution.
/S — Screen has priority for smoother screen updates.

Command: **TURBO**

Format: TURBO [/P] [/E] [/S] [/D] [/C] [/R]

Note: More than one option can be specified at a time; Options can be made in any order.

Purpose: Change into Turbo mode.

Arguments: /P Disables startup pause on entering Turbo mode.
/E Overrides startup error messages.
/S Allows SCROLL LOCK to function normally.
/D Sends DOS COM1 output to Serial Daughtercard.
/C Disk Caching OFF.
/R Removable media and hard disks are cached.

Command: **TPRINT**

Format: TPRINT filename [/Sn] [/Pn] [/C] [/T]

Purpose: Use instead of DOS PRINT command to print file on the PC while running the Pcturbo.

Arguments: /Sn where n is 1 or 2 — uses COM1 or COM2
/Pn where n is 1 or 2 — uses LPT1 or LPT2
/C — Stops printing
/T — Stops printing

Note: Use only one argument at a time.

User's Notes:

**FILES USED BY THE PCTURBO 186
PROCESSOR SYSTEM**

The following is a listing of files that are used by the Pcturbo 186 Processor System.

- Legend: B — Required on the Pcturbo Boot Disk.
 N — Not required for operation. Use if desired.
 O — Required for OPTION program use.
 I — Used for installation only. Temporary file

Filename	Type	Function
AUTOEXEC.BAT	B	Automatic batch file executed after DOS is loaded
CONFIG.SYS	N	Holds names of device drivers for PC-DOS
DOPC.COM	N	Switches to PC mode and runs specified program
GOPC.COM	B	Invokes the PC Mode
INSTALL.EXE	I	Creates Boot Diskette
MEMTEST.EXE	N	Memory Test Program
OPTION.EXE	O	Changes Turbo Mode defaults
PCDEVICE.SYS	B	Device driver used by Pcturbo 186
*PCEXEC.BAT	B	Batch file executed on the PC after the AUTOEXEC
RAMDISK.SYS	O	RAM Disk device Driver
*TURBEXEC.BAT	B	Batch file executed on the Turbo side after the AUTOEXEC is executed
TURBO.COM	B	Invokes the Turbo Mode
TURBO.SYS	B	Holds names of device drivers for Pcturbo 186
TMODE.COM	N	Selects program or screen priority

*Not on distribution disk, created by INSTALL.

The following files are essential on the Pcturbo Boot Diskette:

AUTOEXEC.BAT	GOPC.COM	PCDEVICE.SYS
PCEXEC.BAT	TURBO.COM	TURBO.SYS
TURBEXEC.BAT		



User's Notes:

Pcturbo 186 TECHNICAL SPECIFICATIONS

Hardware:

Microprocessor:	Intel 80186
Clock speed:	8 Megahertz
RAM Speed:	150ns Dynamic 4164s
RAM on Board:	256K on Pcturbo Board, 384K on daughtercard for a total of 640K on-board the Pcturbo
Total System RAM:	1.28 Megabytes maximum
Internal Data Bus:	Full 16-bit wide
Turbo Bus:	50 pin General Purpose Interface Bus*
Bus Requirements:	Switchable DMA Channel 1 or 3, Interrupt #7
I/O Concurrency:	Works in tandem with the host PC. 8088 acts as I/O handler controlling disks, screens, printers, and other peripherals. Also controls Disk cache and RAM Disks.
Compatible Systems:	IBM PC, PC XT, PC3270 and others See Appendix D for more information.

***NOTE:**

For additional technical information, a Pcturbo Technical Reference Manual is available for certified Dealers/Distributors, VARs, VADs, OEMs, and Third Party Developers. This document is sold on annual fee basis, and is only available directly from Orchid Technology.

System Software:

DOS Levels: PC-DOS 2.0, 2.1, or 3X and MS-DOS
 Self Diagnostics: MEMTEST memory Diagnostics included

Built-in Productivity Software:

Disk Caching Enhanced with multi-sector, read-head techniques for higher performance. Dynamically self-assigns all excess RAM for the cache buffer. No configurations necessary.

Electronic RAM Disk Up to four RAM drives assignable. Software is in form of device driver, for better efficiency and compatibility. No switches need to be reset on the motherboard as with other RAM drives.

UPDATES AND COMPATIBILITY NOTES

On occasion new updates are sent out to users on how to adapt certain software packages to perform better with the PCTurbo 186. This section is a collection of such updates. If you receive new pages from Orchid, insert them in this section for future reference.

As a rule of thumb, always look through these notes before calling Orchid Technical Support with a compatibility question - chances are there may already be a solution documented in this section.

COMPATIBLE PCs WHICH HAVE BEEN TESTED TO WORK THE PCTurbo 186

The following computers have been tested at the Orchid Compatibility Labs and are approved as being compatible with the PCTurbo 186:

IBM	PC
IBM	XT
IBM	PC3270
COMPAQ	Portable
COMPAQ	Plus
Columbia	1600-1
Columbia	1600-4 Hard Disk
ITT	XTRA*

NOTE:

If you have a specific question relating to PCTurbo compatibility with PC compatibles, please contact Orchid's Quality Assurance/Compatibility Testing Dept.

*May require using IBM PC-DOS 2.1 instead of ITT MS-DOS 2.11

USING PRINT SPOOLERS WITH Pcturbo

If you are using any print spooling with the Pcturbo, be sure that it is loaded BEFORE entering the Turbo Mode. This allows printing to be done in a background mode, improving overall productivity. If the spooler is normally included in the **CONFIG.SYS**, do NOT include it in the **TURBO.SYS** file. If the spooler is normally called in the **AUTOEXEC.BAT**, make sure that it is placed in the **PCEXEC.BAT** File.

USING EXTERNAL HARD DISK DRIVES WITH Pcturbo

If you have been experiencing any compatibility problems between your Pcturbo and any external hard disk drives, a common cause for these problems is DMA Channel conflict. Some drive manufacturers allow you to switch a jumper on the interface card to redirect the DMA. However, since there are a few that don't give you that ability, we added a software switch to the Pcturbo board so that you can direct the DMA of the Pcturbo instead.

If you think that a DMA conflict may be the cause of your problem, you can change the default Pcturbo DMA Channel using the **OPTION** program as documented in Section 3.2.1

Pcturbo WITH THE HERCULES GRAPHICS CARD AND EQUIVALENTS

The Pcturbo card is compatible with most Hercules-type graphics cards. However, if you intend to have both cards in the same system, you will need to reset the video jumper on the Pcturbo board. See Appendix K for instructions on how this is done.

USING DUAL DISPLAYS ON THE Pcturbo

The Pcturbo 186 can support dual displays simultaneously (one color, one monochrome). If you have dual displays, you will need to set the video jumper on the Pcturbo board the same as if you had one of the Hercules-type cards. See Appendix K for instructions on how this is done.

Using Pcturbo In An EXPANSION CHASSIS

When installing Orchid Technology boards in your IBM PC or compatible computer, avoid putting them into an expansion chassis if possible. In some cases, the exacting timing and power signal requirements of peripheral cards are too sensitive for operation in an external chassis. Orchid boards should be placed in PCs themselves in order to insure reliable operation.

It is possible to use an expansion chassis in some cases where the combination of hardware in your system is electrically compatible. However, this can only be determined by experimentation, so be sure to make adequate backups of any hard disk data before trying it out. Alternatively, there may be cards in your PC which do not have the rigid electrical requirements outlined above and so may be moved into the expansion chassis to make a slot available for your Pcturbo board inside the PC.

We also recommend putting Orchid boards in the slots in your PC chassis that are as close as possible to the power supply, whether in the PC or the expansion chassis.

BOOTING COPY PROTECTED SOFTWARE AND DIFFERENT OPERATING SYSTEMS

Some software comes with a copy protection or a nonstandard Operating System, and requires to be booted directly from drive A. In such a case, there is a way to boot that diskette with the PCturbo.

IF you normally boot from Floppy Drive A:

- Step 1 Boot your system with a DOS diskette.
- Step 2 Place your PCturbo Boot Diskette in Drive B
- Step 3 Place the copy-protected diskette in drive A
- Step 4 With the default drive set at A>, type

A> **B:TURBO**

IF you normally boot from Hard Drive C:

- Step 1 Boot your system with a DOS diskette.
- Step 2 Place the copy-protected diskette in drive A
- Step 3 With the default drive set at A>, type

A> **C:TURBO**

When having any difficulty with loading new software in the Turbo Mode, always try using the above technique as a work-around.

In the case that this technique doesn't work, it is possible that the software in question may be making direct hardware calls which are unavailable on the PCturbo. If you suspect this to be the case, you may wish to contact the vendor for verification.

PARADISE DISPLAY CARD

The Paradise systems Modular Graphics Card (MGC) works with the PCturbo when used as follows:

1. Place a copy of the Paradise software MGC.COM Version 2.01 onto the PCturbo boot disk.
2. Use the DOS DEBUG utility to patch MGC.COM. If DEBUG.COM and MGC.COM are both on the A> drive, type:

MGC.COM Version 2.01:

```
A>debug mgc.com      <RETURN>
-e13f8              <RETURN>
XXXX:13F8          74.eb <RETURN>
-w                 <RETURN>
WRITING 1A80 BYTES
A>
```

MGC.COM Version 2.03:

```
A>debug mgc.com      <RETURN>
-e13fa              <RETURN>
XXXX:13FA          74.eb <RETURN>
-w                 <RETURN>
WRITING 1A80 BYTES
A>
```

(The **bold face** lower case letters are entered from the keyboard.)

3. Place MGC.COM in the first possible lines in both the PCEXEC.BAT and TURBEXEC.BAT files.
4. Reboot your system.

NOTE: The above patch allows MGC.COM to load whether you have a Paradise card installed or not. If you remove your Paradise card, you must remove MGC.COM from the PCEXEC.BAT and TURBEXEC.BAT files.

USING TALLGRASS HARD DISK DRIVES

When using Tallgrass Hard Disks, be sure to turn off the Duplicate Directories feature. This should be done before formatting the hard disk.

USING PC/FOCUS

PC/Focus by Information Builders is an extremely large and powerful package ideally suited for the PCTurbo. The default version of PC/Focus requires exactly 640k. A PCTurbo equipped with 640k has an effective capacity of 622k. There are two way of dealing with this problem:

- Use the 512k version of PC/Focus. At the DOS prompt, type

focus 512

- If the 512k version is inadequate for your needs, ask the Orchid sales department about the Extended RAM Daughterboard for your PCTurbo. This will increase your PCTurbo's total RAM to 768k giving it an effective RAM of 640k. This allows you to run the default 640k version of PC/Focus.

TECMAR GRAPHICS MASTER

The TECMAR GM (Graphics Master) works with the PCTurbo when emulating the standard IBM displays or when running color graphics on the monochrome display. There are two considerations when using the GM:

- The TECMAR utility GMBIOS must be run on the PC before booting the PCTurbo. This means that the special keystroke functions used to adjust the display must be done while in PC mode.
- The GM's display buffer is twice as large as the 64k display buffer the PCTurbo uses. The bottom 64k (A000: to AFFF:) is incompatible with the PCTurbo. This area is used for enhanced graphics including the GM's standard PCPAINT program. This means that the enhanced features of the GM are not available on the PCTurbo.

COMPATIBILITY WITH EVEREX EDGE

The EVEREX display card can look like either a monochrome or color adapter.

- In MONOCHROME mode it emulates a Hercules card, except that it has 132 column capability and it allows DMA, which makes it faster.
- In COLOR mode it emulates an IBM color card, except that it can display more colors.

Color mode requires no special attention to run on the PCTurbo.

In monochrome mode, the EVEREX may show a flicker (which they refer to as "black snow"). To eliminate this, move the jumper on the EVEREX labeled PICTURE ADJUSTMENT MODE (SNOW) to the ON position. This will cause the screen updates to be somewhat slower; approximately as fast as color mode.

The 132 column display (in monochrome mode) requires the following technique:

1. Boot the PCTurbo with the EVEREX in regular 80 column mode.
2. Type **gopc** to return to PC mode.
3. Select 132 column mode using the EVEREX commands (**set132** or **132x25**).
4. Go into Turbo mode.
5. Select 132 column mode using the same command typed in Step 3.

NOTE: The above steps must be repeated whenever you change between PC and Turbo modes.

COMPAQ GWBASIC

COMPAQ GWBASIC Version 2.0 gives syntax errors on automatic program startup due to its looking for a specific ROM location. To allow it to load properly:

1. Copy the files named FIXGW2 from the PCturbo disk to the disk containing the BASICA.EXE program.
2. Run the FIXGW2 batch file. It will automatically make the patch.
3. Erase all of the FIXGW2 files from the disk containing the BASICA.EXE program.

COMPATIBILITY WITH THE DOS PRINT COMMAND

The DOS command PRINT does not work on the PCturbo. The TPRINT command is provided to replace it. The TPRINT command has the advantage that it can be used while in Turbo mode for background printing on the PC that does not slow down the PCturbo. See section 3.3.5 THE TPRINT COMMAND for a complete description of how to use TPRINT.

APPENDIX E - PCturbo ERROR AND WARNING MESSAGES

This appendix lists some of the possible informational as well as error messages that the PCturbo can produce.

Informational Messages

1. Disk Caching DISABLED

This message appears when disk caching has been disabled either by the "/C" flag (on the TURBO command) or when OPTION has been used to change the default cache status to "OFF"

2. Disk Caching ENABLED on removeable drives. YOU MUST hit CTRL-BREAK when changing disk/diskettes.

This message appears when the "/R" flag has been used (on the TURBO command) or when OPTION has been used to change the cache default to "ALL" status. Read about the TURBO command in section 3 for complete details on how this may affect operations.

3. Resetting the Turbo Board...

The turbo interface program has detected an abnormal state for the PCturbo board and has reset itself.

4. Transferring To The PC...

This message is to inform you that control has been passed back to PC. The message is generated by the GOPC.COM.

5. Turbo currently active!

This message is posted whenever the TURBO command has been given while the system is already in turbo Mode.

Startup Errors

These messages indicate an error condition which prevents the PCturbo board from executing.

1. Cannot Reset Turbo Board.

The PCturbo software is not properly executing. This condition can only be remedied by turning the power to the PC off and on again. Pressing the Reset Button on the back of the PCturbo board might also work in some cases.

2. Either the interrupt vector used by this program is not free or this program is not the same version as the one used.

The PCturbo interface program uses the PC hardware interrupt number 7 and expects this interrupt to be unused. It checks the vector location for this interrupt and if it is neither zero nor pointing at an "interrupt return" instruction this message is printed.

3. Not enough memory to load program

The PCturbo interface software does not have enough RAM to operate in. The minimum requirement is a 256K PCturbo memory. However, it may require more if other optional software is used.

4. Turbo board not initialized (reset) properly

same as message # 1

PCturbo Board Errors

The following messages are generated by the PCturbo interface program executing on the PCturbo. These can be caused by hardware failures, incorrect switch and jumper settings, or program malfunction errors.

1. An UNRECOVERABLE MEMORY FAILURE (parity error) has occurred on the Turbo Board.

A parity error has occurred in the PCturbo RAM banks. This can be caused by either an extraordinary power surge (or static) or by an internal hardware failure. Internal failures can be either permanent or intermittent.

The first step when this error occurs is to run the MEMTEST program as specified in Section 3.5 of this manual. If an error cannot be found, it is most likely an intermittent RAM failure. Be sure to cycle the test at least ten times or more in such a case. If the bad chip is located, contact your dealer immediately to have it replaced.

2. Bad ROM Checksum

This is a catch-all error message for major hardware failures which are not diagnosable by software. This can include such problems as bad chips or other board defects. As a first step, check to see that the board is plugged into the slot properly. If this does not solve the problem, call Orchid Technical Support at (415) 490-8586.

3. Bank X RAM failed read/write tests

The bank number in the message will indicate which rows of RAM have a potential hardware malfunction. If it is bank 0, the PCturbo board will not be able to load its interface software. If it is a higher bank, you may be able to use the MEMTEST program to help diagnose the problem.

PCturbo Interrupt Errors

The PCturbo Interrupt Error occurs when a program executing on the PCturbo performs an inappropriate instruction. When this type of error occurs, the location of the instruction that caused the problem is printed in the form

CS:IP = SSSS:XXXX

This says that at the time of the error, the executing program's CS register was SSSS (hex) and the program counter was XXXX.

Most error conditions are best described by the **Intel 86/88 186/188 User's manual 1983, ISBN 0-8359-3033-5**.

1. Illegal Opcode, Escape Code

The program has attempted to execute an illegal instruction. This can be caused by a hardware failure or a program fault.

2. Unexpected Interrupt (vector 0XH)

An interrupt vector with 0XH has occurred. These interrupts correspond to hardware interrupts on the PC and should never occur on the PCturbo. This indicates a system software or hardware failure.

3. Unknown fatal error

An interrupt of unknown source has occurred. This indicates a system software or hardware failure.

PC INTERFACE ERRORS

The following messages indicate **abnormal** system operation and are generated by the turbo interface program executing on the PC. These are caused either by hardware or system software failures.

1. DMA Boundry

The interface program has requested a disk DMA transfer which crosses an absolute 64K memory address boundry.

2. DMA Rx buf crosses 64K bdry: SSSS:NNNN L XXXX DMA Tx buf crosses 64K bdry: SSSS:NNNN L XXXX

The interface program has requested a DMA receive (Rx) or transmit (Tx) transfer which crosses the 64K memory boundry at SSSS:NNNN, length XXXX.

3. DMA Rx timeout. DMA Tx timeout.

A DMA transfer was initiated but did not complete within the standard time limit.

4. Int > IF requested. Unsupported Device call attempted.

Internal interface program validity checks have been violated.

User's Notes:

**APPENDIX F - TROUBLESHOOTING
THE PCturbo**

This section will give examples of typical errors, their causes, and possible solutions. If you have an error which is not explained here, check Appendix D and Appendix E before calling Orchid Technical Support.

1. BASIC programs won't run.

Cause: IBM BASICA will not run on any compatible PC or on the PCturbo card because of proprietary checks in high ROM.

Solve: Use a GWBASIC version of BASICA. Most other BASICs will work well.

2. Cannot print with a print spooler

Cause: Either the print spooler was not configured properly (should be loaded on the PC side via PCEXEC.BAT), or the spooler is incompatible with the PCturbo.

Solve: Check the AUTOEXEC.BAT and the other batch files to make sure the spooler is not loaded twice or on the Turbo side. If this is not the problem, you may need to get a different print spooler program.

3. PCturbo hangs intermittently

Cause: Can be either incompatible hardware or software, DMA channel conflict, or power problem.

Solve: Possibly remedied by changing DMA channel to #1. If hardware incompatibility is suspected, remove all non-standard peripherals and replace one by one until the conflicting device is located. If power problem, remove other cards in the system one by one to confirm.

4. PCTurbo won't load a particular program

Cause: Certain programs are copy protected or make direct hardware calls to the BIOS which are inappropriate on the PCTurbo

Solve: Contact the vendor of the software and inquire if there is a non-copy-protected version or a version which is compatible with most PC compatibles.

5. Crossed Boundry Errors

Cause: See Appendix E

Solve: Sometimes solved by adding 2K to the buffers statement in the CONFIG.SYS (add 4 buffers).

6. Screen I/O too slow on the color display

Cause: Need to select fast display mode or add a Serial Port And Color Enhancement Daughtercard.

Solve: Use the "/F" flag on the TURBO command. The effect will be a faster display but it may flicker somewhat. In addition, the Serial Port Daughtercard has some circuitry onboard which can also enhance display speeds in color mode significantly.

7. Parity Check Error

Cause: Most probably caused by bad RAM chips either in the PC or on the PCTurbo.

Solve: Use MEMTEST as described in section 3.5. Test RAM on the 80186.

APPENDIX G - TECHNICAL SUPPORT PROCEDURES AND POLICIES

Orchid Technology is committed to providing our dealers and distributors with the proper level of support for our products so that they may in turn support you, the customer. In rare cases where a customer requires technical support beyond the capabilities of his dealer or distributor, Orchid will support that customer directly only if the following steps have been taken first.

If you are experiencing any technical difficulty, follow these steps specifically:

The Owner's Handbook is the first place to look for help with a technical problem. In the majority of cases, a quick look into the manual can avoid wasting your valuable time and phone call charges to the Orchid Technical Support Department.

If you cannot solve the problem yourself, call your dealer or distributor from which the product was purchased. It is the responsibility of the dealer or distributor to support their customers fully. If the dealer or distributor does not have the immediate answer to your problem, he will contact Orchid Dealer Technical Support directly.

If your dealer or distributor is not being cooperative in solving your problem, then you may call Orchid Technical Support to report this. If you have taken all the possible steps to solve your problem and are still not satisfied, Orchid will support you directly.

When calling Orchid Technical Support, have the following information available:

1. Name of the product you're calling about
2. Name of your dealer or distributor
3. The serial number on the board(s)
4. Date of purchase
5. Software and hardware version numbers
6. Your complete hardware and software configuration
7. Specific steps we would need to reproduce your problem

Orchid Technical Support can be reached at the phone number printed on the cover of this manual. When you call, indicate to the operator which product you are calling about so that the appropriate Technical Support Analyst can take care of you. Particularly during heavy traffic periods, your call might not be taken immediately. A Technical Support Analyst will return your call as soon as possible. Technical Support Department hours are 9:00 A.M. to 4:00 P.M. Pacific time (12:00 to 7:00 P.M. EST). The department is open for calls Monday through Friday.

IMPORTANT

Always send in your Warranty Registration Card as soon as you install the product. As a general rule, Technical Support help will be quicker if we already have your information on file. Registered customers also receive periodic bulletins and updates from Orchid. If we have your name on file, you will always receive the latest product updates as they become available.

PCturbo 186 VERSION DIFFERENCES

The PCturbo 186 which was in production at the first printing of this manual is the current REV B version. Since some users may have both REV B boards and some of the original REV A boards, this appendix was included to outline the differences between these two hardware versions.

The PCturbo software has also been through several revisions, including both the EPROM set and the PCturbo system software diskette. For REV B owners, the EPROM set will be numbered as Version 2.0 or higher, and the software diskette will also have a Version 2.0 or higher number. If you ever receive a software update from Orchid there will be pages provided for this section which will outline differences with lower versions.

Differences Between REV A and REV B Hardware

The following is a list of enhancements which REV B hardware has over the REV A board.

1. About 20 IC chips were condensed into one custom VLSI gate array CMOS chip for lower power consumption and heat dissipation.
2. The board has been reduced from a 6-layer to a 4-layer phenolic.
3. The "skirt" on the bottom edge of the board has been removed to allow for fitting into any IBM PC AT slot.
4. The display circuitry has been modified to handle smoother screen scrolling, particularly for color displays.
5. Support for simultaneous dual displays (one color, one monochrome) has been added.

6. The TurboBus connector has been expanded to 50 pins allowing for a full expansion capacity. The connector has been relocated to the top right corner of the board, near the bracket.
7. Several components were changed to CMOS equivalents for lower power consumption.
8. REV B has the capability of taking a new Serial Port And Color Enhancement Daughtercard. This card provides one IBM compatible serial port and circuitry to enhance the speed of color displays.
9. Several modifications were made to provide compatibility with certain third party software and peripheral products.
10. EPROMs and the PCturbo System Software have been updated to Version 2.0 or higher.

Note:

The REV A and REV B PCturbos each have their own software and EPROM versions. All REV A boards will have an EPROM version 1.X and software version 1.X. The REV B boards will come with EPROM version 2.X and software version 2.X.

GLOSSARY OF TECHNICAL TERMS

AUTOEXEC.BAT The file which the PC will normally read immediately after it loads DOS. It may contain, at the user's option, a list of commands to be executed automatically on power-up. Section 3.4 contains information on the PCEXEC.BAT and the TURBEXEC.BAT files, which are used with AUTOEXEC.

BATCH FILE A DOS file containing a step-by-step list of commands to be processed automatically upon execution of the file. Batch files are useful when setting up a sequence of steps which need to take place regularly. Batch files, like the AUTOEXEC.BAT file, are convenient and efficient in handling various start-up procedures.

BOOT DISKETTE The diskette used when turning on the computer which contains a copy of DOS and all the files necessary to get the hardware in the system active and communicating with the other parts of the computer. A boot diskette may be simply a DOS diskette or may even contain the applications software to be used in the session.

CLOCK SPEED The actual clock speed of the microprocessor inside the computer. For example, the 8088 in the IBM PC runs at a 5 MHz clock speed, or 5 million clock cycles per second. The 80186 on the PCturbo runs at 8 MHz.

CONFIG.SYS The file which DOS looks at to find out which device drivers it needs to load. Normally, this file resides on the boot disk of your system. The CONFIG.SYS also may contain the BUFFERS=XX and FILES=XX statements.

COPROCESSOR Either a single chip or a board which is plugged into a computer in order to share some of the processing work of the main microprocessor, yielding higher performance. Most coprocessors require that software be modified in order to recognize it. The PCturbo 186 is not in that category of coprocessors since it works with software which is available off the shelf, without modification. Since the 80186 on the PCturbo becomes the master processor in the PC, the PCturbo is therefore classified as a *Processor*.

DATA PATH The part of the computer's Interface Bus on which data is passed between different parts of the computer. In the IBM PC the data path is 8-bit wide, or 8 parallel lines. In the PCturbo the path is 16-bit wide, yielding higher performance, accuracy, and memory capacity.

DEVICE DRIVER A file used by DOS to describe a non-standard device to the system. Normally loaded via the CONFIG.SYS file, device drivers are specifically written for most peripheral options.

DISK BUFFER An area in RAM used by the DOS to hold certain data from the disk drive which needs to be accessed often and quickly. Also, the area in RAM which buffers the most recently read data from the disk while the software is preparing to receive it.

DISK CACHE A RAM-based intelligent disk buffer commonly found on mainframe systems. The cache is similar to a RAM drive except for two differences: the cache is non-volatile, and it automatically buffers any data that is requested at least once. In the PCturbo, the disk cache dynamically uses all available PC RAM memory for its own use.

DISK OPERATING SYSTEM (DOS) A software system which is loaded when a computer is powered-up, giving the computer the information and resources it needs in order to handle higher level functions such as disk drive access. The DOS is a standard part of most computer systems. In the IBM PC the DOS is known as PC-DOS; and most PC compatibles use a slightly different version known as MS-DOS.

DMA CHANNEL The "Direct Memory Access" channel is used by the different parts of a computer to pass data back and forth to the microprocessor or other peripherals, at extremely high speeds. The PCturbo can use either DMA Channel #1 or #0 and is tri-stated to be able to coexist with other devices which may use the same channel.

ELECTRONIC RAM DISK An emulated disk drive which is based on RAM memory. Since RAM is much faster than permanent disk media, performance can increase significantly when RAM drives are employed. The basic procedure is to copy the files to be used during a session into the RAM drive, complete the session with RAM drives instead of permanent drives, and then copy the contents of the RAM drive back onto the permanent drives when finished. The last step is necessary since RAM drives are volatile, and so a permanent media must be used to record the modified files created on the RAM drive.

FILE ALLOCATION TABLES (FATs) A designated area on the diskette or disk media which stores information about which sectors on that disk are used by which files, and which sectors are available for future files.

I/O (INPUT/OUTPUT) The passing of data back and forth between the computer and its peripheral devices. I/O operations include reading and writing to disks, writing to printers, reading from the keyboard, and writing to the screen.

INTERFACE BUS The electronic connection which attaches all the components of a computer to the microprocessor. In the PC, the bus attaches the RAM, ROM, Keyboard, Display, Disk, and any other devices which are connected to the unit. The PCturbo plugs into the bus of the PC in order to communicate with all its other parts. However, because the PCturbo is in itself a computer, it too has a bus of its own. The bus on the PCturbo is 16-bit wide (versus 8-bit on the PC), and so an 8-to-16 convertor is part of the PCturbo circuitry.

INTERRUPT A method used by the computer and its peripherals to request certain data or functions. The PCturbo uses interrupt line # 7 to talk to the 8088 in the PC, and vice-versa. When an interrupt occurs, the microprocessor stops whatever it is doing to service the device calling the interrupt. An example is whenever a key struck on a keyboard, an interrupt is generated which makes the microprocessor stop for a few microseconds to read the character from the buffer.

KIPS Acronym for Kilo (thousand) Instructions Per Second. A standard benchmark for processor performance. Although the performance of a computer is related to many factors, the KIPS rate is a good baseline for comparison between processors. The 8088 in the PC is rated at 285 KIPS, whereas the 80186 on the Pcturbo is rated at 1000 KIPS.

LOCAL AREA NETWORK (LAN) A system where all types of PCs can be tied together with coaxial cable and special interfacing for the purpose of sharing data and physical resources such as disks and printers. Orchid's PCnet is a low cost, high performance LAN which is compatible with the IBM PC and compatibles.

MAINFRAME A step above minicomputers, mainframes can serve hundreds of users, providing tremendous processing power and resources. Mainframes typically require several operators just to keep them going, and are quite expensive.

MICROPROCESSOR The heart of all microcomputers, the microprocessor is an integrated circuit which performs the "brainwork" of the computer. In the IBM PC the microprocessor is the Intel 8088; in the Pcturbo it is the Intel 80186.

MINICOMPUTER A step above the supermicro, minis are more powerful and expensive. Most minicomputers are designed to handle many users simultaneously, with data and physical resources shared among all users.

MULTIUSER A system whereby more than one user is attached to the system. Multiuser systems are high performance computers which also allow sharing of data and resources between the users.

PC (PERSONAL COMPUTER) Any small personal computer in general. More specifically, PC refers to the IBM Personal Computer and the compatible brands. Most PCs run PC-DOS or MS-DOS operating system.

PERIPHERAL DEVICE Any device which is attached to the main computer but was not part of the standard base configuration for that model. Peripherals include external disk drives, displays, printers, mouse pointers, among others.

RAM MEMORY (Random Access Memory) The temporary memory inside a computer where the current DOS, applications programs, and data is held while being processed. Since RAM is volatile its contents need to be stored on permanent media before shutting down the system. The PC and the Pcturbo both use the same 4164 dynamic 64K RAM chips. Nine 4164 chips make up 64K of actual RAM memory.

ROM BIOS (Read Only Memory) The Read-Only-Memory which contains the Basic-Input-Output-Systems. The BIOS is the software code which tells the hardware in a computer what to do on the lowest levels. Both the PC and the Pcturbo have their own ROM BIOS software.

SECTOR A single block of data consisting of 512 bytes of data.

SUPERMICRO A step above the microcomputer, supermicros typically handle one to five users and process data at a very high speed. By certain standards, installing the Pcturbo in an IBM PC XT upgrades its performance aspects to that of a supermicro.

TRACK A single circular section of a disk, composed of 16 or more sectors. Tracks on a disk are concentric, beginning at the hub of the disk and extending out to the edge.

TURBO.SYS The file which is read by the DOS residing on the Pcturbo board which contains the names of device drivers which need to be loaded. The TURBO.SYS also may contain the BUFFERS=XX and FILES=XX statements.

VIDEO BUFFER The area in RAM where software writes what is to be put on the display screen. The video display adapter circuit constantly reads this video buffer many times per second, and places its contents in readable form on the screen.

User's Notes:

APPENDIX J - EXAMPLES OF BATCH FILES

The following is an example of the AUTOEXEC, PCEXEC, and TURBEXEC batch files.

A typical set of batch files may look something like this:

AUTOEXEC.BAT

```
echo off
cls
date
time
path c:\dos
prompt $p$q
ispc
if errorlevel 1 pcexec
if errorlevel 0 turbexec
```

PCEXEC.BAT

```
echo Running files on the PC side now.
mode co80
```

TURBOEXEC.BAT

```
echo Running files on the Turbo side now.
sk
dir/w
chkdsk
...
c:
cd\myprog
Your program loads here.
```


Explanation:

The AUTOEXEC.BAT file should contain all commands which are global environmental changes, such as PATH commands, PROMPTS, and such things which you wish to remain constant between the PC Mode and Turbo Mode.

The AUTOEXEC should end with an ISPC command which will direct whether the PCEXEC or the TURBEXEC should be loaded next (depending on the current Mode).

If the system is currently in the PC Mode, the PCEXEC.BAT file will be executed next. Commands which need to be loaded only on the PC side go in this file. Examples are Print Spoolers and MODE commands that affect peripheral devices controlled by the 8088 (modems, printers, etc.)

Be careful not to load background programs which trap interrupts or write to the disk, in the PCEXEC file. For example, Sidekick is a program which if run on the PC side may cause severe errors while you are executing your application software on the Turbo side. Even though these 'background' type programs may seem to work when loaded on the PC side, it is not recommended.

When the system enters Turbo Mode, the AUTOEXEC is run once again. As soon as it is finished, it will call the TURBEXEC.BAT file. The TURBEXEC should go through all the commands which only need to be run once, and are compatible with Turbo speed. You may decide to call your application software up from within the TURBEXEC file so that the morning startup process is completely automated.

Appendix K - Jumpers And Switch Settings

This section provides the following information:

- Layout of PCturbo board components.
- Definition of all user-settable jumper locations.
 - Hercules Video Jumper
 - Serial Port Jumper
- Definition of all factory-set jumper locations.
- Definition of Memory Size Switches.

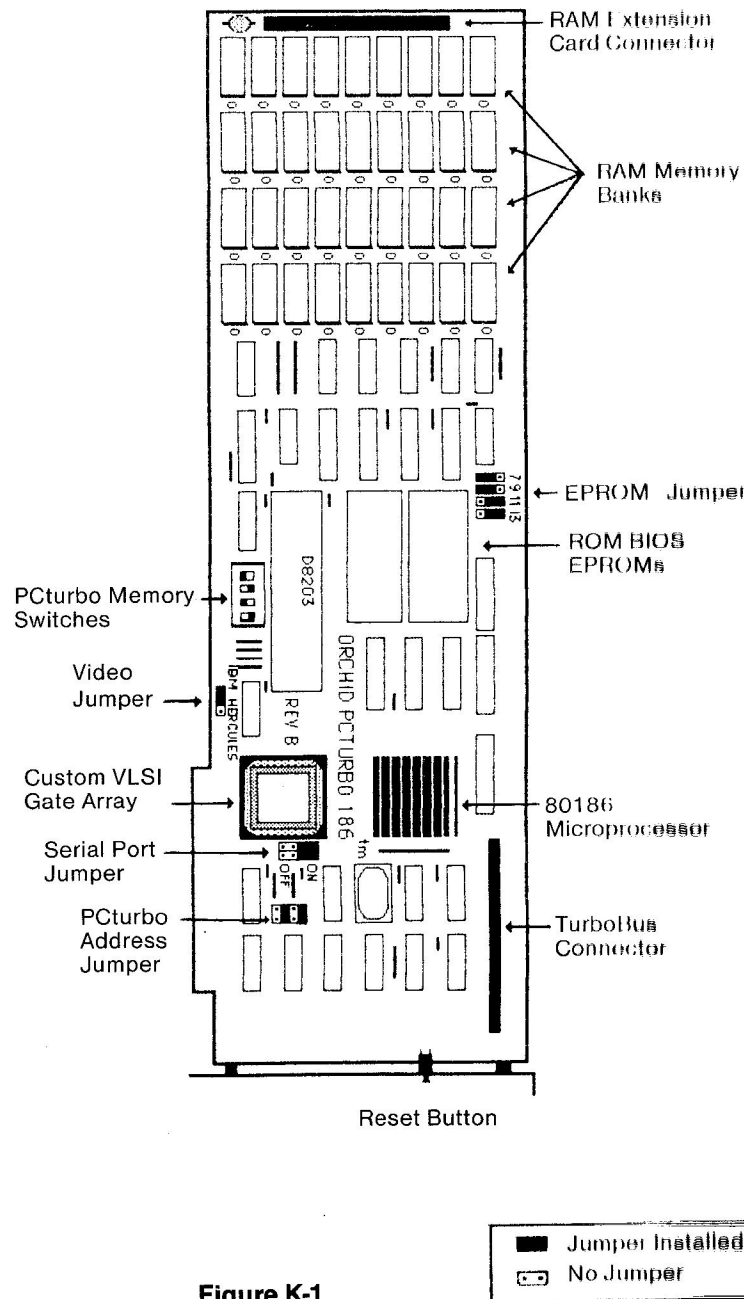


Figure K-1

Figure K-1 illustrates the layout of the Pcturbo-186 printed circuit board. This diagram represents the Revision B level of the Pcturbo hardware.

80186 Microprocessor.

This is the heart of the Pcturbo board. Beneath the socket cover is an 8MHz 80186 chip. Under no circumstances should the socket be opened. Doing so will void the warranty and most probably damage the Pcturbo board.

Custom VLSI Gate Array CMOS Chip.

This chip was custom designed by Orchid Technology and is an integral component in the Pcturbo circuitry. As with the 80186 chip, the gate array should never be removed except by the factory. Removing the chip will void the warranty and most likely damage the Pcturbo board.

RAM Memory Expansion Connection.

At the left of the board is a 40-pin connector, which is used to connect the memory expansion piggy-back board. The piggy-back board fits over the left half of the Pcturbo unit and is secured by the connector and two board stand-offs.

RAM Memory.

To the immediate right of the 40-pin connector are four columns of RAM memory sockets, nine sockets per column. Memory chips are installed in columns A and C by the factory. These columns form Bank 0 of system memory containing 128 Kbytes. Bank 1 consists of columns B and D. With memory installed in both banks, the board contains a total of 256 Kbytes memory.

EPROM Memory.

The board includes two EPROM memories which contain the PCTurbo BIOS code. Note that the socket closest to the board edge contains the EPROM marked "LOW" and the other socket contains the "HIGH" EPROM.

Hercules Video Jumper.

This is the jumper which is moved in the case that you have a Hercules Graphics Card installed in the PC. This jumper should also be moved if you have a graphics card which is considered equivalent to the Hercules, or if you have a dual display setup, or 768K of RAM. See the subsection in this appendix for detail diagram.

Serial Port Selection Jumper.

This jumper is moved in the case that you have a Serial Port And Color Enhancement Daughtercard installed on the PCTurbo. See the subsection in this appendix for detail diagram.

Board Reset Switch.

A Board Reset Switch is provided on the metal end-plate. Once the board is installed, this switch is accessible from the rear of the computer. It is not used in the normal operation, and should not be pressed unless requested by the PCTurbo software.

Memory Size Switches.

A set of 4 miniature switches is used to set the total amount of memory installed on the PCTurbo.

User-Settable Jumpers

Refer to Figure K-1 for the default factory settings of all jumpers on the board.

Hercules Video Jumper

If your system contains Hercules Graphics Card, an equivalent to the Hercules, or dual displays (monochrome and color), or 768K of RAM, you will need to set this jumper. See Figure K-1 for the position of this jumper. It is located near the bottom edge of the PCTurbo board, near the VLSI chip.

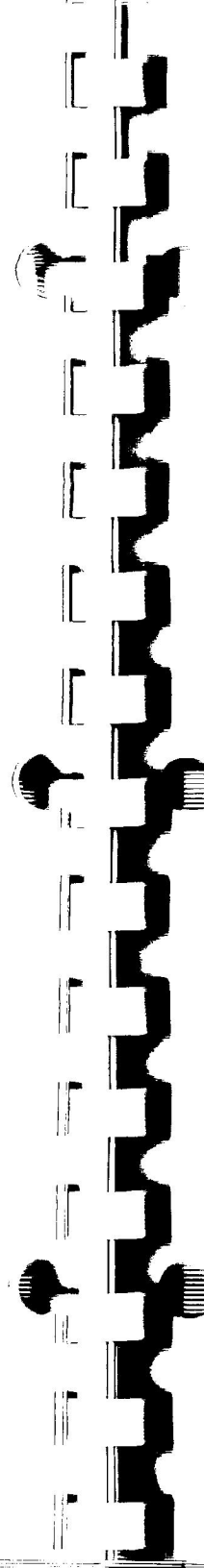
The default setting is "IBM" which includes all monochrome and color displays. To change the setting to "HERCULES" simply pull the small plastic jumper plug off the IBM position, and replace it in one pin over to the right.

Serial Port Jumper

If you have the PCTurbo Serial Port And Color Enhancement Daughtercard then you will need to move a single jumper on the PCTurbo board before installing the daughtercard. Locate the jumper block containing the Serial Port jumper in Figure K-1. Note that there is a jumper plug placed in the "ON" position. Remove this plug and move it down two pins, to the "OFF" position. Be careful not to move the nearby jumper. It is factory set and needs to remain in its present position.

Factory Set Jumpers

There are a total of nine jumpers on the board which are factory set. These include the EPROM jumpers and the PCTurbo I/O Address jumpers. Under no condition should these jumpers be moved. Doing so may render the PCTurbo board unusable.



Memory Switch Setting

Whenever memory is added or removed from the PCTurbo board, the Memory Size Switches must be changed to indicate the new configuration. Refer to Figure K-1 for the position of this set of four switches. The switch housing indicates the ON position with an arrow. The ON position corresponds to the UP direction. The memory switch settings are as follows:

Memory Installed	Switch Number and Setting			
	1	2	3	4
256 Kbytes (PCTurbo full Memory)	OFF	ON	OFF	ON
384 Kbytes (One Bank Expansion Board Memory)	OFF	ON	ON	OFF
512 Kbytes (Two Banks Expansion Board Memory)	OFF	ON	ON	ON
640 Kbytes (Three Banks Expansion Board Memory)	OFF	ON	OFF	OFF
768 Kbytes Put the video jumper in the Hercules position when using 768K.	OFF	OFF	OFF	OFF

OFF = DOWN
ON = UP

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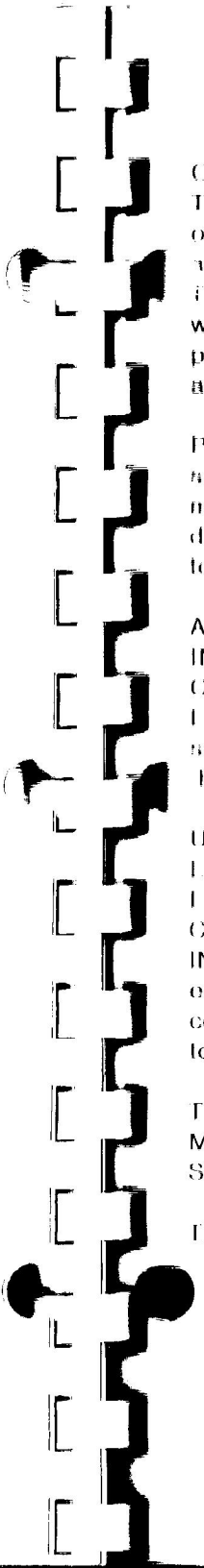
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Pcturbo has been known not to work with various copy-protected software packages, modified versions of PC-DOS or MS-DOS operation systems, and programs which make certain direct hardware BIOS calls.

We also cannot guarantee that manufacturers of products that currently work with Pcturbo will not, at some future date, change their products so as not to function properly with Pcturbo.

PRTSPOOL Command

Purpose: Provides a RAM buffer for print spooling.

Format: PRTSPOOL <LPTn:>[<options>]

Type: Resident

Usage: Standalone

Remarks: The print spooling program provides buffered output of print data to a parallel printer while permitting concurrent processing of other programs.

The program is executed once at the beginning of each computing session. Files to be printed are output to the PRTSPOOL buffers at maximum I/O speed. PRTSPOOL sends output to the printer at the speed of the printer. PRTSPOOL operates in the "background" and frees the operating system for other tasks, such as the execution of another program.

PRTSPOOL Command Formats

Parallel Printer Port (LPTn) Format:

```
X>PRTSPOOL LPTn:[/M=xxx][/U=xxx][/P][/R]
[/RP][/S][/C][/LPP=][/B]<Enter>
```

Output Port Specification Parameters

LPTn:

Selects one of the three parallel ports: LPT1, LPT2, or LPT3.

Memory Allocation Parameters

/U=xxx

Reserves a minimum of xxxK bytes of memory for the application program and its work space. If no /U parameter is specified, PRTSPOOL reserves 64K. This memory will not be used by the PRTSPOOL program.

The purpose of the /U parameter is to make sure that you leave enough room for your application software to execute properly. If your application software manual says the program requires 128K of memory to execute, you should use /U=128 in your command syntax. This ensures that at least 128K of RAM is available, within which your application software will reside and execute.

/M=xxx

Allocates xxx bytes of memory for use as the PRTSPOOL print buffer. If no /M=xxx parameter is specified, the spool buffer size defaults to 64K. (Using spool buffers of less than 4K bytes is not recommended for efficient operation.)

/M

This is similar to the /M=xxx option, except that ALL remaining memory which has not been reserved for application program space will be allocated to the spool buffer. This is a powerful option in that it allows for absolutely no wasted memory space after making the other necessary memory allocations.

Printer Formatting and Spooler Control Parameters

The following commands may be invoked from DOS while spooling is taking place to control the printer and the spool buffer output. If your printer has its own internal input buffer, some of the commands may take some time to take effect as the printer empties its own internal buffer.

/LPP=xx

Sets the number of lines per page (default is 66). This option works with option /R and /RP below. The spooler will not insert new lines into the print stream.

/S

Stop output of print data. No data will be lost and data transmission may be restarted at will using /C.

/C

Restart output of print data, if previously stopped by /S.

/B

This option enables the /RP and /R options below. It is recommended that the /B option only be specified when the spool buffer is at least 16K bytes in size. Additional buffer space is used to "save" the extra page or two of print data and, in smaller buffer configuration, could consume all available spool buffer space.

/R

The printer output will be restarted at the beginning of the current page, if enabled by the /B option.

/RP

The printer output will be restarted at the beginning of the previous page, if enabled by the /B option.

/P

Immediately purge all data from the PRTSPOOL print buffer.

PRTSPOOL Command Examples

The examples below should clarify the use of the PRTSPOOL command. We recommend that you review these commands before you try to use PRTSPOOL. In all of the following examples, it is assumed there is sufficient memory available to execute the command, and that a "MODE LPT1:" command has been executed previous to initializing PRTSPOOL. If there is not enough memory available for the spooler, the message "INSUFFICIENT MEMORY" is displayed.

Parallel Printer Command Examples

Example 1:

Allocates (by default since no /U parameter was used) a minimum of 64K bytes of memory for user application program. Sets up a 64K-byte (default) spool buffer for the parallel printer connected to port LPT1.

X>PRTSPOOL LPT1: <Enter>

Example 2:

Allocated (by default) a minimum of 64K bytes of memory for user application program. Sets up a 16K-byte spool buffer for the parallel printer connected to LPT1. Sets lines per page to 60. Enables subsequent use of the /R and /RP options.

X>PRTSPOOL LPT1:/M=16/LPP=60/B <Enter>

Page Reprint Control Functions

If the /B option has been selected, PRTSPOOL will monitor the printer output data stream for form feed (go to the top of the next page) and line feed (go to the next line) characters. (NOTE: a form feed character determines the top of page while a line feed character specifies the end of a line and may also be used, by counting the number of linefeeds per page, to determine the top of page.)

When the /R or /RP options are invoked, PRTSPOOL will immediately continue output at the beginning of the specified page. This can be used to restart your output at a convenient reference point (the top of the current or previous page) should the printer jam or otherwise malfunction.

Obviously, the /R and /RP options can have no meaningful effect until at least one page has been printed.

Recommended sequence when selecting /R and /RP options:

(NOTE: /B options must be executed prior to /R or /RP options)

1. From DOS, enter "PRTSPOOL/S" command to stop printer output.
2. Adjust the printer paper to place it at the top-of-form position, etc. If the printer has a control to set the top-of-form ("TOF Set" or equivalent), use it.
3. Enter "PRTSPOOL /R" or "PRTSPOOL /RP" to restart printing at the current or previous page.

Determining PRTSPOOL Status (PC Mode only)

Once PRTSPOOL has been activated, status may be checked at any time by entering the appropriate PRTSPOOL command. The current printer configuration and spool buffer status will be displayed for reference at the completion of any "PRTSPOOL [parameter]" command operation. While spooling is going on, simply entering "PRTSPOOL" from DOS will also give its status.

Changing Printer Configuration

The PRTSPOOL directed printer port configuration may be changed when the spool buffer is empty. However, the memory and buffer configuration (/M or /M=xxx) options may only be modified after rebooting the computer.

Examples of Valid Subsequent PRTSPOOL Commands

These are commands which the operator may issue after PRTSPOOL has already been brought up and is in use. Note that these commands do not deal with the size of the spool buffer.

Example 1:

Stop the printing, and set lines per page equal to 66.

A>PRTSPOOL/S/LPP=66

Example 2:

Restart printing beginning from the previous page.

A>PRTSPOOL/RP

Example 3:

Enable the /R and /RP print options.

A>PRTSPOOL/B

Example 4:

Display PRTSPOOL status.

A>PRTSPOOL

PRTSPOOL Utility Batch Files

PRTSPOOL may be invoked from an AUTOEXEC.BAT file just like ISPC, TURBO, etc. The only real restriction is that the PRTSPOOL command must be executed in the PC mode. Refer to the "Batch Processing" section of your DOS manual for more detailed information on batch files.

You may want to add one or more batch files to your working DOS disk which will allow you to invoke the printer control options or display PRTSPOOL status automatically when you type in a short command while under DOS.

Hints for PRTSPOOL Program Application

The PRTSPOOL program is designed to be transparent to PC data files. The output of data files is done via the LPTn parallel ports.

Once the PRTSPOOL program has been started, you can output data or files using DOS COPY commands or BASICA PRINT commands via the parallel port. The screen print function will also work.

If you are using word processing programs that have custom printer selections, you may only use their parallel printer option if you want to use PRTSPOOL for output. Most of these word processing programs have their own serial port handling routines and these may not be compatible with the PRTSPOOL program. This may also be true of any other application software which allows you to set up its output parameters.

THIS INCOMPATIBILITY IS NOT CAUSED BY A PROBLEM WITH THE PRTSPOOL PROGRAM!

PRTSPOOL: Rules For Use

The following specifications must be adhered to when using PRTSPOOL.

1. The switches inside the computer must be set for the total number of drives.
2. If you wish to reconfigure the /U or /M parameters you must reboot the computer and start from scratch.

PRTSPOOL functions correctly with DOS. Beyond that, there are no guarantees! This is especially true for PRTSPOOL when used with a serial printer and with a program (such as a word processor) which has its own serial printer driver routine "built-in". In a case like this, there may be conflicts between the two programs which prevent proper operation. Another potential area of incompatibility is with applications programs which expect to be loaded and executed out of a specific memory range. Such programs may not allow themselves to be displaced to a different address by PRTSPOOL.

PRTSPOOL will function correctly only with IBM's PC DOS. It will not work with any other operating system.

If you have problems with PRTSPOOL when running with certain application programs, you may have to do some experimenting with the memory allocation commands, including restricting both utilities to memory available above the limit set the system board switches. You may also have to reserve very large user areas with the /U option.

