

# *MicroDrive/Turbo* IDE Card

High Speed DMA Hard Disk Controller  
for Apple IIe and Apple IIGS Computers

## User's Manual

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# Limited Warranty

The developer and manufacturer (the D&M) warrants this product against defects in materials and workmanship for a period of one year. This warranty applies only for you, the original purchaser. This warranty applies only if the product was used under normal conditions.

During the warranty period the D&M will repair (or, at its option replace), at no charge, components that prove to be defective, provided the product is returned to the D&M, shipping forth and back is prepaid, and the product is properly packed.

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## Thirty day money back guarantee:

If you are not satisfied with your purchase, you may return this product within thirty (30) days if accompanied by the sales receipt. You will get a refund on the value of the product only, not the shipping/handling costs. This guarantee does not apply to complete hard drive products (*MicroDrive*/Turbo filecard). This product cannot be returned for a refund if it is damaged in any way.

## Help and support:

We will do our best to help you and we want you to be a satisfied customer. We want to hear from you. Please report any problems to us. We appreciate your comments and questions.

We will continue supporting the *MicroDrive*/Turbo Card as long as the Apple II is alive and we can find a way to reach the Apple II community.

Apple II forever!

# *MicroDrive/Turbo Card User's Manual*

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# About the *MicroDrive/Turbo Card*

Congratulations! You have purchased the ultimate IDE hard drive controller for the Apple IIe and Apple IIGS.

The *MicroDrive/Turbo Card* is the only IDE controller that supports DMA (Direct Memory Access) technology and speed for true 1:1 interleave. What this means is that you can expect unparalleled speed and performance on IDE drives (up to 7 times of other IDE controllers). No more jealous looking at SCSI hard drive owners. Now even your Vulcan hard disk controller can be RAMFast!!

The *MicroDrive/Turbo Card* is a very inexpensive solution to let all Apple II users take advantage of the simple and inexpensive interface design of IDE hard drives. Any known IDE hard disk controller for the Apple II family only supports a limited number of hard drives, whereas the *MicroDrive/Turbo Card* supports virtually any drive available!

Last not least the *MicroDrive/Turbo Card* is the smallest high-performance hard disk controller ever built for the Apple II computer.

## Features:

Fully ProDOS and GS/OS compatible. Use all your Apple II applications with your *MicroDrive/Turbo Card*.

Compatible with Apple IIGS and Apple IIe enhanced.

Compatible with the full range of Apple memory, up to 8 Mbytes on the Apple IIGS.

Compatible with all known hardware used today with Apple II computers, such as: ZIP GSX, TransWarp GS, PC Transporter, RAM Cards from Apple, Applied Engineering, CV-Tech, Harris, Q-Labs, Sequential Systems, Pacemark Technologies etc.

GS/OS driver with GS/OS caching support included.

Can boot a minimum GS/OS System (6.0x) in twelve seconds, with accelerator in nine seconds.

Low power design (all CMOS circuits) assures reliable operation.

Wastes no time for self-initialization compared to standard SCSI interfaces! Gives a very short warm-up time.

Allows to boot any partition.

Up to 16 partitions on one drive, or 8 plus 8 partitions at a time on two IDE drives.

Universal controller replacement for the Vulcan & Vulcan Gold Controller Card, even for InnerDrive systems.

The only IDE hard disk controller (except Turbo IDE Card and the *MicroDrive Card*) for the Apple II that supports two IDE hard disks.

The only IDE hard disk controller for the Apple II that allows to use virtually any IDE hard drive. Other controllers only do support a very limited number of drives.

## *MicroDrive/Turbo Card* Design:

Hardware, firmware, installation software and GS/OS device driver

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# Getting Started with the *MicroDrive*/Turbo Card

## What you should have received:

- The *MicroDrive*/Turbo Manual you're just reading.
- The green *MicroDrive*/Turbo interface card with golden fingers.
- The *MicroDrive* Utilities Disk which is a standard Apple 800K disk.

## In addition, depending on your order, you may have received:

- A mounting kit for putting the *MicroDrive*/Turbo Card and a 2.5" notebook hard drive together. This kit also includes a short flat ribbon cable to connect your mounted 2.5" drive with your *MicroDrive*/Turbo Card. There is no need for an additional power supply cable. The flat ribbon cable includes the power supply lines for a notebook style hard disk.
- A flat ribbon cable (3 ft.) for connecting an external 3.5" IDE hard disk.
- A hard disk mounted on the *MicroDrive*/Turbo Card, ready for use with your Apple. If you have received such a plug-and-play configuration, there isn't much work left for you to have the drive ready. All you need to do is to set the DIP switches, insert the card in a slot in your computer and boot from a GS/OS or ProDOS 8 system volume for installing your system software on your *MicroDrive* hard disk.

## Precautions with your *MicroDrive* hard disk:

- Please be careful with your hard disk. A hard disk is a very sensitive device which requires careful handling! Never expose to shocks and also handle with care when moving in and out of your computer. Always turn off your computer when inserting or removing cards.

## What you should do first before doing anything else:

- Make a copy of the *MicroDrive* utilities disk and keep the original disk in a safe place!
- Delete the file PRODOS which can be found on this non-modified copy of the utilities disk. (Note: This file PRODOS on this disk is a copy of the INSTALL.SYSTEM program itself. You can skip this step and leave this disk as it is. In this case you can boot the disk to run INSTALL.SYSTEM directly, but you cannot use this boot process to run other programs on this installation disk. If you ran the installation program in this way, you will have to reboot from another system volume for using other programs)
- Use the Finder or another GS/OS utility to copy ProDOS 8 (=P8, the 8-bit disk operating system found in the /SYSTEM folder on every bootable GS/OS System Disk) and the INSTALLER (located on the /INSTALL disk of GS/OS System 6) on your copy of the *MicroDrive* utilities disk.
- Rename the file P8 on your utilities disk to PRODOS (to make the disk bootable). Note: the disk is bootable „as is“ (even if you don't copy ProDOS 8 to the disk), but you can only launch the installation program in this way.
- If you want to be perfect, you can do a printout of the README files that perhaps could be found on the disk (containing late news and additional program descriptions which could not be included with this document).
- Please be sure to read the whole manual carefully. Many hints can be found all over in this document, and there is no way to include all information on a single sheet of paper.

## Installing Your *MicroDrive*/Turbo Card

Again, read this manual carefully before attempting to install your *MicroDrive*/Turbo Card. Please be very careful when working with your computer and the *MicroDrive*/Turbo Card. Do not touch the gold fingers and do not bend the gold pins of the header connectors. Note that we cannot be responsible for malfunctions due to careless handling on any kind of connectors.

If you have an external hard disk, connect the hard drive cable to the *MicroDrive*/Turbo Card. Do not bend the connector pins!! Be very careful especially when removing the cable from a connector!

Turn off the Apple's power switch. Never insert or remove a card while your computer is turned on. You should, however, leave it plugged in to allow the power supply to absorb any static electricity from your body. Also, be sure that any other power supply involved (e.g. the hard drive's) is turned off!

Remove the cover from your Apple.

Touch the power supply case in the Apple to discharge any static electricity from your body. Make sure you do this because static can cause a great deal of damage to the computer chips on interface cards and in your computer.

Select the slot into which you are going to install the *MicroDrive*/Turbo Card. Align the card edge with the slot and use the heel of one hand to slowly push the card down into the slot.

## Setting up the Hard Disk

**Important Note:** Configuring a hard drive requires a user's manual. If you don't have purchased your hard disk along with the *MicroDrive*/Turbo Card, we cannot be responsible for the lack of a manual for your hard disk. If you have purchased a hard disk without manual and you don't know how to set it up correctly, please don't expect that we can help you! We won't. There may be a ten thousands of hard drives and you really can be sure that we don't know anything about your specific drive.

### **Don't buy a hard disk drive shipped without manual!!**

You can use two IDE style hard drives with your *MicroDrive*/Turbo Card. Both drives must be connected in the same way with only one cable which has two plugs on the hard drive's cable end. The total cable length should be no more than about 3 ft.

**If something doesn't work as expected: first try to find out whether your hard drive works on a MS-DOS machine.**

### **Power supply for the hard disk drives**

Only one 2.5 inch (Notebook style) drive can be supplied by the card. External hard drives attached to the *MicroDrive*/Turbo Card must be supplied by an external power supply. You must not supply those drives via the card's power connector. The *MicroDrive*/Turbo Card was intentionally designed to not supplying power for external disk drives. Due to excessive current flow, the data integrity and proper functioning of the *MicroDrive*/Turbo Card would suffer if power would be drawn via the card and the slot connector. This is a matter of precaution, nevertheless you can use your Apple's power supply (using the lines coming out of the case directly) to supply one single hard disk. The Apple's power supply however is not powerful enough to supply two 3.5" hard drives!

**If you are using an external power supply for your hard drive(s), be sure to use the same wall outlet as your Apple computer does (to avoid ground loop problems).**

# Preparing Your Hard Drive

In this section, you will find a description how to install a hard disk “from scratch“, i.e. if you have a new or used hard disk that isn't yet known to your Apple II system. If you have received the *MicroDrive/Turbo Card* complete with hard disk, you will only have to install your System software on your hard disk. *MicroDrive* hard drive systems always come fully prepared for work, i.e. the hard disk is partitioned and every partition is pre-formatted. Here is how to start “from scratch“:

Make a copy of the *MicroDrive/Turbo Card Utilities* disk as described in the introduction of this manual. Use this copy now (we call it installation disk).

Copy the GS/OS driver from the installation disk to your GS/OS boot volume (disk or hard disk or what else). Use any copy program to copy the driver to the **/your.disk/SYSTEM/DRIVERS** folder (**your.disk** is the name of your GS/OS boot disk, for example **/INSTALL** if the System 6 installer disk will be used) The driver is not required now, but later it will speed up the installation process of GS/OS on the IDE drive (everything works fine even without a GS/OS driver, but somewhat slower. You have been warned).

Boot the installation disk to run the configuration program **INSTALL.SYSTEM**. Do not use a GS/OS program launcher now.

After you have launched the program, the screen gets blanked. If your hard disk is „virgin“, you will notice a short time of hard disk activity while the screen says „one moment please....“. At this time, the installer program scans your hard disk to find the operating parameters (number of cylinders, number of heads and number of sectors per track).

After this primary and automatic setup process has finished, you will find the parameters of your hard disk displayed on the top of the screen, right below the screen title. The only work that is left for you is to setup the number of partitions and their sizes. Press the <E> key to enter the partition editor. Now you can press <A> to add a partition or <D> to delete the current partition highlighted. Note that you cannot add a new partition as long as the last partition created is still zero blocks large. If the number of blocks is greater than zero, the partition is considered as valid, and a new one can be added. Use the left and right arrow keys with or without the Open-Apple and Closed-Apple Keys to adjust the sizes of the partitions. The up and down keys let you choose the partition to be modified. While you are setting up the partition sizes, you will find the total free number of blocks for your hard disk being growing or shrinking. You can add as many blocks as you like until the total free number of blocks is zero. You can hear a small beep if something goes out of range (e.g. the partition size eats up the remaining space of the hard disk). When you have finished creating your partition set, press <ENTER> or <ESC> to leave the partition editor. The light bar goes back to the list of menu items.

Now it's time to save the information you just created. Use menu item **WRITE CONFIGURATION** to write your partition map and operating parameters to hard disk. The program should report success.

Leave the installer program by pressing **ESC** or using the menu item **QUIT** and confirm quitting. This is the only way you should shutdown this program.

Reboot your Apple (this is required before the IDE drive(s) can be recognized by your card). At this time, trying to boot from a partition of the *MicroDrive/Turbo Card* ends in the message "Volume not formatted" or "Unable to load ProDOS". This is OK. At this point of the installation process you will still have to boot from an other System volume such as a System Disk or an other hard disk.

Use any formatting utility to format your partitions. You can use GS/OS and the **FINDER**, the **Advanced Disk Utilities** or **PROSEL-16** for formatting your volumes. Also, ProDOS 8 utilities such as **Copy II Plus**, the **CAT.DOCTOR** from the ProSel-8 package, or the **Apple ProDOS 8 System Utilities** can be used for this purpose. The default boot volume is volume (partition) number one. Holding down the **OA** key or the **Option** key while booting lets you choose an alternate boot volume by pressing the corresponding key for the volume number. Please note that under ProDOS 8 you can get access to the volumes beyond number 2 only if you are using ProDOS version 2.0 or later (contained in GS/OS System 6.0 or later). You can use older versions of ProDOS 8, however

you can only use the first 2 volumes of your hard disk configuration, the ones which are mapped into the slot where your *MicroDrive*/Turbo Card is located.

After a complete GS/OS system has been installed on the first partition, the *MicroDrive*/Turbo Card is ready for booting. To install GS/OS correctly you must use the GS/OS Installer, the Finder or another 16-bit program (such as ProSel-16) which is able to copy resource forked files. Please do not forget to copy the GS/OS driver from the installation disk to the \*/System/Drivers folder on any of your boot volumes ( \* stands for the name you choose when formatting the volume). Only with the GS/OS driver installed you will get optimum performance out of your *MicroDrive*/Turbo Card.

If you want to use two drives with your *MicroDrive*/Turbo Card, you must repeat those steps listed before for your second drive. Just boot the *MicroDrive* Installer program and press <ENTER> after highlighting menu item DRIVE CHANGE. After this, continue setting up the partition map and repeat the other steps.

## Changing Your Hard Disk Configuration

If you want to change anything, first boot the *MicroDrive*/Turbo Card installation disk and run the file INSTALL.SYSTEM. The installer automatically reads the configuration block from your hard disk. Now you can make changes on your partitions or on the boot volume number, as an example.

We recommend making hard disk backups for reason of data security. In the case something went wrong, it is also useful to have written down the complete setup parameters of your configuration.

You may change any item without the risk of loosing data, **except the parameters listed here:**

- The number of cylinders, heads and sectors
- The number of blocks assigned to each volume
- The number of volumes for your hard disk

When you have finished modifying your configuration, save the configuration block by writing it back to your hard disk (menu item Write Configuration).

Every time you want to do that, you will get a warning message to remind you that you may loose your data on the hard disk. The message appears whether or not you made changes to the cylinders, heads and sectors and the volume parameters. As mentioned before, there is no danger for your hard disk data **as long as you have not touched** these parameters.

## Modifying Partitions

If you want to change a partition in size, the data on this partition will be lost. In addition, the contents of any partition with a number greater than the one you may want to change will be lost. So be **very** careful when doing changes and

**!! make a backup first !!**

If you reduce the number of partitions, the data on any partition greater than the new number will be lost.

**After changing any partition size it is absolutely necessary to (high-level) format the modified partition and all the partitions with the higher numbers! (use the Finder, the Advanced Disk Utilities or another disk utility).**

**Do not forget this step, it is required even if you can still read the old contents of this partition! Only after re-formatting the volume directory reflects the actual size of the new partition.**

# Installing the GS/OS Driver

The instructions found in this section are not applicable to Apple IIe users. On the Apple IIe, no driver is required for using the card with any hard disk. The built-in firmware on the card does all the work required.

For best performance and versatility it is recommended to install the *MicroDrive/Turbo* GS/OS driver on your System volume (the floppy disk or the hard disk partition you boot from). If you don't install the driver, your *MicroDrive/Turbo* Card won't give you the fastest speed you could expect. However, the card also works fine with no GS/OS driver installed.

To install the GS/OS driver, just use any file copy utility and copy the driver from the utilities disk to your

`/my.disk/SYSTEM/DRIVERS/`

folder. "my.disk" is the place holder for the name of your boot volume. This can be an Apple system disk, your hard disk, or a RAM disk. If you are planning to use more than one volume as a bootable system volume, please be sure to copy the driver into every `SYSTEM/DRIVERS/` folder. The driver's functions are available after the next reboot of a GS/OS system volume. You also can use the GS/OS INSTALLER to install the driver a bit more conveniently. For this purpose, a copy of the INSTALLER (present on the GS/OS system disk `/INSTALL`) should be launched from the *MicroDrive* utilities disk.

Using the GS/OS Installer:

After you have launched the Installer, click on the **Customize** button. The Installer will look for any scripts present on your volumes (must be located in a `SCRIPTS` folder) and then will show the *MicroDrive* GS/OS driver option in the left window. Now click on the **Disk** button several times until you can see the name of your volume where you want to install the driver (at the top of the window you can find „Disk to update:“ and the volume currently selected). Now you can click on the **Install** button and the driver will be installed on your volume. You must repeat these steps for any volume where you intend to use the *MicroDrive/Turbo* Card with the GS/OS driver for optimum performance.

Please note that a GS/OS driver is never available under ProDOS 8 operation (in fact this is why it is called GS/OS driver). The driver is active only as long as GS/OS is active. If you launch a ProDOS 8 application, the driver "sleeps" until you return to GS/OS operation. This is true for any block device driver under GS/OS, this is not a fault or a special feature of the *MicroDrive/Turbo* Card driver.

## The Installer Menu Items in Detail

### M - Mode Change

You can choose one of two modes for partitioning your drive(s): If you have only one drive connected to your card, you can have up to 16 volumes on a single hard disk, otherwise you are restricted to eight volumes on each of two hard drives connected to your card. The (limited) number of volumes available does not give you any limitations on useable hard disk space, you can use up to 2 Gigabytes on 8 volumes.

### C - Drive Change

Selects the current drive you are working on. After a time-out value of several seconds, the installer informs you about a possible fact that a second hard drive could not be accessed.

## D - DMA Mode

Toggles between four different DMA modes for your specific needs:

If you have **up to four megabytes of DMA compatible** expansion memory in your GS, you can choose **DMA ENABLED, or ROM 01, or ROM 03**. Recommended option is ROM 1 or ROM 3 respectively.

If you have **more than four megabytes of DMA compatible** expansion memory in your GS, then you must choose the correct ROM Version, **ROM 01, or ROM 03**.

If you have any memory expansion card for the Apple IIGS which is **not DMA compatible** then you need to choose **DMA DISABLED**.

If you have an Apple IIe, choose **DMA DISABLED** or **DMA ENABLED**. These are the only valid options for this machine. You will get weird results if you try a different option on the Apple IIe. Please note that any accelerator for the Apple IIe is **not** DMA compatible and you must choose **DMA DISABLED** for such a hardware or you will have problems.

## B - Boot Volume

Lets you tell the Apple and your IDE Card which volume will be taken for the boot process. This adjustment is valid as long no key is pressed during boot access on the *MicroDrive/Turbo Card*. The boot volume will be set to the first one in the chain of volumes that can be accessed on the card. This option is not active if you are booting from a different device (i.e. other hard disk, RAM disk or floppy disk etc...)

## E - Partition Editor

Lets you go to the partition editor sub-menu. This menu is fairly self-explanatory. Just press the "?" key and you will get a small help menu which explains everything.

## N - Number of Sectors per IRQ

This is a feature menu item which has been used for older IDE drives and Turbo IDE Card firmware versions. It has no special meaning for functionality with the *MicroDrive/Turbo Card* and its software/firmware.

## M - Manual Hard Disk Parameters

If the automatic process of recognizing the hard disk geometry fails, or if you have very special needs for configuring your hard disk, you will need this menu item for manually setting up the hard disk parameters. Please don't use this setup if you do not know exactly what you are doing.

## V - Verify Hard Disk

Checks to see whether the setup is correct and looks for bad sectors. If there are bad sectors they should be locked out by a system utility like ProSel-16 or Salvation Deliverance. Any new IDE drive should have no bad sectors. If you have bad sectors on a new drive you should return it to your dealer. All modern IDE drives (made in 1995 or later will try to remap bad sectors on their own, so in such a case you will see a bad block very rarely. This verify test is also a (not very complete) check that your Apple, your *MicroDrive/Turbo Card* and your hard disk work together peacefully.

If you encounter bad block at the end of the valid cylinder range, this could be a hint that the automatic hard disk setup has found some more tracks on your hard disk than the manufacturer has specified. In this case, reduce the number of cylinders by one or more using the manual setup feature.

## I - Identify Hard Disk

Reads manufacturer information from hard disk and displays it on the screen. Could give you some useful or even valuable information about your hard disk.

Some older hard drives (such as the mechanisms built into the Vulcan drives) will not accept the command for getting manufacturer's information and therefore the program will give you an error message. This is not a fault or problem of the installation software.

### **W - Write configuration to Hard Disk**

Saves the current hard disk configuration block from the installer memory to a reserved space (system area) on your hard disk.

### **Q - Quit Installer**

Brings you back to the point from where you launched the Installer. If you have booted the Installer directly from your installation disk without using ProDOS, you will be given the opportunity to specify a boot slot.

If you have modified your partition table in number or size, you will get a warning message if the information was not saved to your hard disk.

Alternatively, you can press the ESC key from any menu position. In this case, the program assumes you know what you are doing (and you want to do nothing which alters your configuration on your hard disk) and leaves without any comments and acknowledgment.

## A Different Look at The Installer

The INSTALL.SYSTEM program is a PRODOS 8 system file which is designed to run under any circumstances (i.e. it can be launched under ProDOS 8 or GS/OS without the need of any further accessories). INSTALL.SYSTEM can be launched from any environment without the need of BASIC.SYSTEM. It even can be launched directly by booting the *MicroDrive* installation disk.

The INSTALL.SYSTEM program also can be run from any program launcher that supports launching SYS files (for example the built-in PRODOS 8 launcher or the GS/OS Finder).

If you prefer to run the INSTALL.SYSTEM program from a program launcher, you can keep a copy on your hard disk.

After the program's startup, it tries to read the configuration data from the first hard drive and displays it on the 80-column screen. Now you can change any parameters as you like. After you have changed any parameters, please don't forget to save your new configuration using WRITE CONFIGURATION. However, you have the option leaving the program without saving anything.

### **New Hard Disk Setup**

When there is no valid configuration data found at start-up, the program assumes that a new hard disk was connected and needs to be configured. In this case, the program automatically does all the necessary things to set up a valid configuration including default operating parameters (this is basically the same thing as pressing CTRL-R, re-scan hard disk parameters). The only thing you have to do is to set up one or more partitions by entering the partition editor and to save your configuration data on the hard disk. As the last step, use a formatting utility like the FINDER, the Advanced Disk Utilities or PROSEL-16 to format your partitions.

The INSTALL.SYSTEM program does not check your second drive (slave) if it is present. If you need a second drive to be configured, choose menu item DRIVE CHANGE and the program will behave just like it has when dealing with the first drive.

## Miscellaneous

### Powering up the Hard Drives

For correct operation with the *MicroDrive/Turbo Card* it is required that it has at least one hard disk connected and powered up. The *MicroDrive/Turbo Card* will let hang your computer if this is not the case, because the firmware cannot detect any hardware which is not active.

### Using Two Hard Drives

In the world of AT clones (as it is with the IDE drives connected to the *MicroDrive/Turbo Card*) you can have two drives connected to an IDE interface. Drive one is called the MASTER drive, and drive two is called the SLAVE drive. The master/slave condition is determined by the hard disk's jumper settings. There is no difference in connecting the hard disk to the IDE interface - same cable, same plug.

### Setting the hard drives' jumpers

In a one-drive configuration your drive should be jumpered as MASTER, and NO SLAVE PRESENT. In a two-drive configuration: the first drive should be configured as MASTER (with jumper SLAVE PRESENT set). The second drive should be jumpered as SLAVE. In some cases you need to set additional jumpers as HOST SLAVE PRESENT or DRIVE SLAVE PRESENT. Be sure to power up both drives at the same time. Please be sure to get a data sheet for the drives you are using, otherwise you will be lost if you don't know how to jumper your drives.

### IDE Cable

The IDE cable must not be longer than 3 (three) foot. The IDE standard dictates this restriction. Do not fold the cable to get a "U" (regarding the cross section). Otherwise the signals cannot be transferred properly over the lines. A second drive must not be located more than about 4 (four) inches from the first IDE hard disk connector (i.e. both drives must be located at the end of a single IDE cable). You cannot use two cables with a single controller (Y-cable configuration not allowed).

### Booting from a different volume

Using the *MicroDrive/Turbo Card*, you can choose any volume for the boot volume. Just hold down the Open Apple Key or the Option Key at boot time. At the bottom of the screen you can see a message which tells you how many volumes you have. Now press any number "1" through "9" and "A" through "G" for the corresponding volumes 1 through 16. Be aware that you must have a bootable operating system on the desired boot volume or you will get an error message such as UNABLE TO LOAD PRODOS. At any time, when no key is pressed, rebooting will use the default boot volume as specified with the INSTALL.SYSTEM program.

The default boot volume can be stored on both drives with different values. The boot volume parameter only takes effect when coming from drive number one. This is for reason of compatibility in the case you want to exchange the drives (yes, you can do that with no problems) or you once prefer to use only one drive (this could also be your second drive). Be aware that although you can boot from a partition on drive two, the operating parameters from drive one will be used.

## Software Compatibility

Some programs (especially copy protected games and programs that will not run from the Finder or require their own boot process) are not aware of the Apple IIGS Memory Manager and therefore will not run from hard disk because the *MicroDrive/Turbo Card* requests memory from the Memory Manager. When the memory is overwritten by those programs, the *MicroDrive/Turbo Card* software will crash (examples: The Immortal, PHOTONIX). We do not feel responsible for such a situation. Please complain at the guys who did not want to write Apple IIGS software that adheres to the standards published by Apple Computer.

If you can find a program that doesn't work with the *MicroDrive/Turbo Card* and it proves to be OK with Apple's guidelines, you will receive a free update on any software or firmware part of the *MicroDrive/Turbo Card* that requires updating.

## Using the Macintosh HFS File System

You may have noticed that earlier versions of our IDE card did not allow to create partitions greater than 32 Mbytes. This was (and is) the upper limit for the ProDOS File System. The partition size has been limited by our installation software, although there was no basic technical restriction to create larger ones.

The only reason to open the 32 Mbytes limit was the availability of the HFS File System on the Apple II. However, there are several important reasons which should keep you back from using the HFS File System for regular hard disk usage:

- 1) Due to GS/OS design limitations, you never can boot from HFS partitions. And thus, setting a boot partition size to more than 32 Mbytes doesn't make sense in any way.
- 2) If something goes wrong with a misbehaving program, due to a „weak“ computer, or due to a power supply glitch, and your HFS partition gets damaged, you don't have any chance to repair the directory structure. There aren't any utilities which can do that. The only choice you have is to re-format the damaged partition, with a complete loss of data. You may have some chances to rescue (backup) the remaining undamaged data, but there is no guarantee.
- 3) Writing to a HFS partition is very slow, and thus any speed advantage has gone with using a hard disk (writing to a HFS volume is also slow when using diskettes and other storage media).
- 4) Using a HFS partition at read operations is not faster than using a partition with the ProDOS File System.
- 5) HFS partitions cannot be used under ProDOS 8, because ProDOS 8 cannot find any file on the HFS directory structure.

Looking at the items 1...5 we cannot see any other advantages but the larger size for using HFS volumes.

**As a summary, we cannot recommend using the HFS feature at all. There are even reports that the HFS FST doesn't always work reliably, even in a patched version. For the Apple IIGS, it's a nice feature when moving data between different computers, but not much more. In addition, the ProDOS file system has proved to be very stable and bug-free.**

If you have read our comments regarding the HFS file system carefully and nevertheless wish to use its advantages, go ahead and do it. Our installation utility with its partition editor is prepared to let you setup hard drive partitions as large as the hard disk will allow to do. However, please never send us any complaints if something has gone wrong with your data on your hard disk.

As a small warning, if you are in the partition editor, you are getting two "!" at the volume positions where you have exceeded the 32 Mbytes (65535 blocks) limit. This should warn you that you might think about our comments regarding the HFS file system. If you format this partition with the ProDOS file system you will loose any hard disk space which is beyond the (65535 blocks) limit.

# Using Your Vulcan or InnerDrive Hard Drive

This section is intended for Vulcan users and InnerDrive/OverDrive users (including other Applied Ingenuity hard drive products with IDE drives) who want to upgrade their system with the *MicroDrive/Turbo Card*. If you have any IDE drive other than a Vulcan or InnerDrive you don't need to follow these instructions.

## Back Up!

If you are planning to replace the Vulcan Controller Card or the InnerDrive Controller, first make a complete backup of your hard disk data! The partitioning scheme of the *MicroDrive/Turbo Card* is not compatible with these drives. You will have to begin like just having purchased a new drive.

We cannot give you much recommendation about backup programs, but the cheapest way to make backups is to use the Archiver from GS/OS System 6. If you want to backup your data, you should be sure to make **file-by-file backups**. Only this kind of backup guarantees that you can restore your data on a different hard disk with different volume sizes (this will most likely occur).

## Setting Up your hard disk

After you have made the necessary backups and the *MicroDrive/Turbo Card* is connected to your Vulcan, you can run the program INSTALL.SYSTEM on the *MicroDrive/Turbo Card* Utilities Disk. Just go ahead as it is described in the section „Preparing your hard drive“ in this manual. It is possible that you cannot follow these instructions because some old hard drives cannot be setup automatically. If you are getting error messages after INSTALL.SYSTEM has tried to find the hard drive's operating parameters, you must set the parameters yourself by using menu item **Manual Hard Disk Parameters**.

You must enter the **native hard disk parameters**. If you are not sure about the hard disk parameters of your Vulcan or InnerDrive, you will need to contact us. Please let us know the hard disk model you are using (manufacturer, model number and capacity) and we will try to find the correct operating parameters. In many cases you can use menu item GET HARD DISK INFO to find the correct parameters.

# Troubleshooting

We have tested each card thoroughly before it went to our customers, so your card should work flawlessly. And we have tried to cover every aspect of the installation process here in this manual. Our records show that most problems are related to hard drives which have been configured incorrectly. A few problems occurred because some users didn't follow our hints in the manual. A few problems are remaining due to hidden firmware bugs on several old hard drives which sometimes show a really strange behavior (note that the IDE „standard“ is not a standard as you might expect, and several early IDE hard drives had serious problems).

We don't claim to be the perfect company, so in rare cases problems may occur which cannot be solved by the customer. Please check out whether you have done your installation according to the guidelines found here in this manual. If we receive hardware to be repaired and we find it is OK, we'll have to charge you for checking out that it is OK.

So before you come up and complain that your new hardware doesn't work, please check out once again:

Did you read this manual completely? Is there anything you didn't read at the first glance?

Does your "third party hardware" (hard disk) work correctly? Check the drive in question in an MS-DOS computer if possible. Please double check the connections from the *MicroDrive/Turbo Card* to your hard disk.

Be sure that the connector pins are not bent in any way, on the *MicroDrive/Turbo Card* as well as on your hard disk. Double check the connectors! We have pulled out expensive hard drives from the trash, marked "defective". We have re-aligned the connector pins - and the hard drives worked again flawlessly!

Be sure to try out the manual setup (INSTALL.SYSTEM) if the automatic setup doesn't work or if the setup process gave you any strange impressions.

**Describe as detailed as possible !**

If your problems cannot be solved in this way and you don't know how to continue, please send us e-mail or write via snail mail. Please do not send anything back to us without an RMA number. We will refuse to accept any shipment without RMA number.

Please describe your complete configuration (this is a very important thing, otherwise we cannot fix problems):

Your *MicroDrive/Turbo Card*'s firmware revision and revision numbers from software on the utilities disk.

Your computer: Apple IIe, Apple IIGS, which ROM # and the serial number printed on the motherboard (located at the upper right corner, beside slot 7).

Any card which is installed in your Apple IIe or IIGS, slot number of each card, revision number and software revision number.

The hard disk manufacturer and model number you are using.

Apple IIGS Control Panel slot setup (internal/your card) for each slot.

Give us exact information about what kind of memory expansion card you are using (revision number and serial number required).

Describe the symptoms where the error occurs. What software did you use? Describe the steps in detail to duplicate the problem.

# Error Messages at Boot Time

To boot from the *MicroDrive*/Turbo Card, the firmware must be able to access the first hard disk (master) connected to the card. Even if you want to boot from a volume on the second hard disk (Drive 2), the first hard disk must be powered up, must be configured as a master drive and must have a valid setup. The current operating parameters (Boot Volume, DMA Mode) will always be the ones from the master drive (Drive 1), regardless of the volume number you may want to boot from.

If an error occurs during the very first part of the boot process, the *MicroDrive*/Turbo Card informs you about the error by displaying one of the following error messages and gives you control over your computer at the Applesoft Basic prompt.

## Drive 1 Error:

The *MicroDrive*/Turbo Card cannot get access to the first hard disk. There are many reasons that may cause this error:

- there is no hard disk connected.
- the hard disk is not powered up.
- the hard disk is jumpered as a slave drive.
- two hard disks are connected and both are set up as master drives.
- the hard disk has a defect.
- the first hard disk is not ready for interaction with the computer within 15 seconds after power up.

## Missing configuration data

The *MicroDrive*/Turbo Card cannot load a valid configuration from the first hard disk (master). A setup using the installation program `INSTALL.SYSTEM` is required to create a valid configuration. Also, the sector on the hard disk containing the configuration data could be physically damaged..

## Error reading boot sector

A read error occurred when trying to load the *MicroDrive*/Turbo Card's boot sector (not the ProDOS boot sector). This is because the boot sector is damaged (bad checksum) or has no valid code for the continuation of the boot process. This sector is always automatically written to the hard disk when writing a configuration to the hard disk by the *MicroDrive*/Turbo Installer. This feature could be used for a "refresh" if the boot sector has been destroyed occasionally.

## Volume not formatted

The *MicroDrive*/Turbo Card was able to load configuration data, but it could not find anything that looks like a ProDOS boot sector. This sector is usually present after a volume has been high-level formatted by a system utility like the Finder etc. Note that this error message is related to the volume you want to boot from, not to the boot sector of the *MicroDrive* configuration data.

## Unable to load ProDOS (ProDOS error message)

This message appears when the ProDOS boot routine (located on the boot sector of any ProDOS volume and loaded into the computer's memory at boot time) has found one of the following errors:

- the boot routine cannot find a valid directory structure on the boot volume (directory may be damaged)
- the boot routine cannot find a file with the name PRODOS in the root directory of the current boot volume. The file PRODOS usually is the ProDOS 8 operating system or the file that launches GS/OS.
- while loading ProDOS, a read error occurs because of a bad sector belonging to the file PRODOS.

## Relocation/ Configuration Error (ProDOS error message)

This message appears after the ProDOS boot routine has finished execution (loading ProDOS) and corrupted data was found in memory while installing the ProDOS 8 disk operating system.

# Warranty Registration

Please fill out this warranty registration. You must return the completed form or we cannot give you warranty support or regular service.

## Purchaser

Name :  
Address :  
City :  
State, Zip :

## Vendor

Company/Name :  
Address :  
City :  
State, Zip :

## Product

Name :  
Date of purchase :  
Serial number :

## Misc. Infos

Computer type :  
Other cards installed, :  
slot number of each :  
card :

comments, wishes,  
suggestions,  
improvements,  
bugs found

Please send this registration form to:

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