
GRAPHICS PRO TURBO 1600™
GRAPHICS PRO TURBO™
GRAPHICS XPRESSION™
WINTURBO™
WINBOOST™

User's Guide

Version 2.0

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Disclaimer

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The VLB and PCI *mach64* accelerators have been designed to support the VESA VL-Bus and PCI local bus standards respectively. Some computers use proprietary local bus circuitry and therefore may not be fully compatible with the MFR's local bus cards. Although tested successfully in a wide variety of computer systems, the MFR can not be held responsible for any incompatibilities which may occur between this card and the system configuration you plan to use. We recommend that you check with the dealer or distributor for your computer system before installing your card.

CONGRATULATIONS! You have purchased the most advanced 64-bit graphics and multimedia acceleration technology available on the market today — the ATI *mach64* graphics accelerators — providing high performance 64-bit graphics, accelerating up to 16.7 million colors (at 1280x1024) and 1600x1200 resolution (at 65,000 colors). A complete display mode description is provided in *Appendix C*. This User's Guide describes the use of:

- *GRAPHICS PRO TURBO 1600*
- *GRAPHICS PRO TURBO*
- *WINTURBO*
- *GRAPHICS XPRESSION*
- *WINBOOST*

Even when displaying 16.7 million colors, these cards outperform previous generations of accelerators displaying only 256 colors. Availability of colors and resolutions is determined by the type and amount of memory installed, and the product which you purchased.

Video Memory — The *GRAPHICS PRO TURBO 1600*, *GRAPHICS PRO TURBO*, and *WINTURBO* feature high-bandwidth VRAM memory, delivering instant response and superior image definition without compromising performance.

With 4MB, the *GRAPHICS PRO TURBO 1600* and *GRAPHICS PRO TURBO* give you workstation-class resolutions, higher color depths in more display modes, and larger virtual desktops.

The award-winning *GRAPHICS XPRESSION* and *WINBOOST*, available with DRAM memory, provide unprecedented value for fast 64-bit graphics acceleration in multiple environments, including DOS, Windows, Windows NT, and OS/2.

Refresh Rates — *mach64* accelerator cards provide flicker-free graphics at refresh rates up to 100Hz. Please refer to Appendix C for refresh rate information applicable to your card.

Colors — *mach64* accelerator cards support up to 16.7 million colors. Please refer to Appendix C for color support details.

These *mach64* products are more than just hardware accelerator cards. They come complete with extensive drivers and comprehensive award-winning software utilities designed to enhance your productivity.

What's in the Package

Your package includes the following hardware, software, and documentation:

- *mach64* accelerator card.
- Installation program and display driver disks.
- User's Guide.

What You'll Need

- **Computer System** — Intel 386, 486, Pentium, or compatible. A Plug-and-Play compatible system is necessary to take advantage of Plug-and-Play features found in the *GRAPHICS PRO TURBO 1600*, *GRAPHICS PRO TURBO PCI*, *GRAPHICS XPRESSION PCI*, *WINTURBO PCI* and *WINBOOST PCI*.
- **Expansion Slot** — 16-bit ISA (or EISA), VESA Local Bus (up to 33MHz), or 32-bit PCI Local Bus.
- **Operating System** — DOS 5.0 or higher, Windows 3.1, Windows NT, OS/2 2.1 or OS/2 Warp.
- **Monitor** — VGA, supporting minimum 640x480 resolution. A Plug-and-Play compatible monitor which supports VESA's Display Data Channel 1 specifications (DDC1) is required to take advantage of the DDC1 features provided by the *GRAPHICS PRO TURBO 1600*.
- **Display Drivers** — Any standard VGA or VESA drivers normally supplied with your software. For best performance, install *mach64* drivers that are supplied with this card.

Chapter 2

Hardware Installation

Your *mach64* accelerator card supports one of the following bus types: ISA, VL-Bus, or PCI.

Before installation, check the specifications of your monitor for signal compatibility and supported features with this card. Please consult the *Video Mode Table* in the Appendix for information on resolutions and colors.

Warning!

- Static electricity can damage sensitive electronic components. Discharge your body's static electric charge by touching a grounded surface — e.g., the metal area of the computer chassis — before performing any hardware procedure.
- Do not use a pencil to set DIP switches in your computer; graphite residue is harmful to the computer circuitry.
- The manufacturer assumes no liability for any damage, caused directly or indirectly, by improper installation of any components by unauthorized service personnel. If you do not feel comfortable performing the installation, consult a qualified computer technician.
- Damage to system components, the accelerator card, and injury to yourself may result if power is applied during installation.

Preparing for the Installation

If you launch applications automatically during system bootup **and** you use special drivers that are not 640x480 VGA, you may encounter conflicts with the card. We recommend that you first reconfigure those applications to use standard VGA driver or disable the launching of applications during bootup before installing the card.

If your computer has an integrated display controller on the motherboard, you must disable it before installing the *mach64* accelerator to avoid conflict (except on PCI systems). Consult your system documentation for instructions.

If your *mach64* accelerator has been previously configured on another computer system or for a different monitor, make sure the card is reset to factory defaults before removal from that system. FACTORY DEFAULTS is described on page 2-10.

Installing the Hardware

Procedure

1. Power off the computer, then disconnect the monitor cable.
2. Remove the computer cover. If necessary, consult your computer system manual for removal instructions.
3. To replace an existing add-on display adapter, first remove its expansion slot screw, then grasp it firmly by the top edge and pull it straight up out of the expansion slot.
4. Ensure that your computer is configured to power up in color. Consult your computer system documentation for information.
5. Select an empty expansion slot for the *mach64* accelerator. With the slot cover removed, grasp the card by the top edge and carefully seat it firmly into the slot. Fasten the retaining bracket with a screw.
6. Re-install the computer cover.
7. Connect the monitor cable to the Video Output connector of the *mach64* accelerator.

Making Backup Disks

The hardware is configured using the INSTALL program on the *mach64* installation disks shipped with the accelerator. Please make working copies and store the original disks for backup purposes.

Configuring the Hardware

All new cards are configured to basic VGA (640X480) parameters to ensure successful initial operation with most systems. The *Quick Installation Overview* section on page 2-5 outlines the required steps for configuring your card so that you will get the full range of resolutions and refresh rates that your monitor can support, and enhanced drivers for your applications.

Your operating system may provide its own utilities for installing and configuring enhanced drivers. Please refer to the documentation that comes with your operating system for information.

Notes

- The monitor must be turned on before you apply power to the computer system. This allows the accelerator card to detect the Monitor Type from the monitor. If no monitor information is detected, the accelerator card will default to support color VGA. Monitor Type information from **Plug-and-Play monitors** are detected during monitor selection and configuration by the INSTALL program.
- Run the *mach64* INSTALL program (see page 2-4) and select SYSTEM INFORMATION (see page 2-5) to check for possible conflicts. Ports used by this card are listed in Appendix B.
- Hardware interrupts (IRQ) are listed in Appendix B. They are reserved for future use.

Viewing Readme First

A general README file containing installation, configuration, and support details which were not available when this User's Guide was prepared and additional product information is provided on the *mach64* installation disk #1. Please view this file before proceeding with the *mach64* installation. Insert Disk #1 into drive A and type:

A: <Enter> (substitute B: for A: if using drive B:)
README <Enter>

Running the INSTALL Program

This INSTALL program is used to check the system for possible conflicts, to set monitor type, to install enhanced display drivers and utilities, to run card diagnostics, and to customize hardware parameters for maximum performance.

Card configuration is based on multiple choices from screen menus. Where possible, your selections will be automatically checked by the program for compatibility, thus ensuring conflict-free operation. Checking is started by selecting SYSTEM INFORMATION in the Main Menu.

Notes

- For OS/2, go to *IBM OS/2 2.1, WARP* on page 3-7.
- For Windows NT, go to *Microsoft Windows NT 3.x* on page 3-5.
- If Windows 3.1x is running, do not run the INSTALL program in a full-screen DOS shell. Quit Windows and run from the DOS prompt.
- Online help for driver installations are provided for all enhanced drivers — Windows, OS/2, AutoCAD, MicroStation, MS Word, WordPerfect, and VESA BIOS Extension support.

Procedure

1. Turn on the monitor, then the computer. If an error appears, recheck the installation of your accelerator card, then see *Appendix A* for diagnostics and troubleshooting information.
2. If this is your first time installation, select Step a). We recommend that you install the utilities (see page 2-10) and follow Step b) using the hard drive on subsequent INSTALL sessions:
 - a) FLOPPY DRIVE — Insert Disk #1 into drive A, then type:
A: < Enter > (For drive B, substitute **B:** for **A:**)
CD < Enter >
 - b) HARD DRIVE — Change to the directory containing the *mach64* utilities. If the directory is C:\MACH64, type:
C: < Enter >
CD\MACH64 < Enter >

3. Start the installation program by typing:

INSTALL < Enter >

Note

- Driver installation and card setup functions are provided in the Main Menu. This menu is the starting point for installing *mach64* enhanced drivers and utilities, and for accessing configuration and testing functions which help you complete the installation. The INFO BOX (located next to the Main Menu) provides in-depth information on the currently selected menu item.

Quick Installation Overview

Main Menu
System Information
Quick Setup
Drivers Installation
Utilities Installation
Diagnostics
Advanced Setup

The *mach64* accelerator card can be configured quickly in three steps as described below. Once completed, your card and enhanced driver will be ready for basic operation. Utilities Installation, Diagnostics, and Advanced Setup — are additional setup/diagnostic features intended for users with setup experience and wishing to do more than just setting up the card.

1. Select SYSTEM INFORMATION from the Main Menu.

The program will check the system for possible conflicts with the card, and display both the card and system configurations in the INFO BOX. In case of a conflict, it will issue a warning and suggest possible corrective actions.

If both your computer and the *mach64* are Plug-and-Play compatible: your system will automatically allocate system resources and resolve possible conflicts between your Plug-and-Play compatible *mach64* accelerator card and other expansion cards.

Notes

- Due to design limitations inherent in the ISA bus architecture, the information obtained by SYSTEM INFORMATION may differ from the actual hardware installed in your system. If in doubt, check the hardware directly.
- If you have an upgradable VRAM accelerator card such as the 2MB GRAPHICS PRO TURBO, the INFO BOX will also list the product number required for ordering a VRAM memory upgrade kit.

2. Select QUICK SETUP from the Main Menu.

Select QUICK SETUP to configure the accelerator card to work with your monitor. As you highlight each monitor, the display specifications for that monitor type are listed in the INFO BOX. Proper monitor selection is necessary for correct resolution and refresh rate operation. You have four options to choose a correct Monitor Type. Details are given on page 2-7, in the section:

- *Selecting Your Monitor Type*

a) Select the listed monitor if your monitor is in the Monitor Selection Menu.

b) Select DDC1 Monitor if your monitor supports the VESA Display Data Channel 1 specification, and you have a DDC1-compatible accelerator card such as the *GRAPHICS PRO TURBO 1600*.

With the DDC selection, the accelerator card will detect incoming monitor data and configure all the display modes for optimal operation (i.e., proper resolutions, refresh rates, display size and position).

c) Select VDIF... if you have a VDIF file for your monitor and wish to use its parameters to automatically configure the *mach64*. Additional VDIF details are provided later in this chapter, in the section:

- *VDIF Files*

d) Select Custom... if none of the above applies to you, or you wish to manually configure the settings. Please refer to the information provided later in this chapter in the section:

- *Custom Configuration*

3. Select DRIVERS INSTALLATION from the Main Menu.

The DRIVERS INSTALLATION will bring up the INSTALL ENHANCED DRIVERS menu for installing *mach64* enhanced drivers, and to read driver installation notes. Please refer to *Chapter 3, Installing Enhanced Drivers* for detailed instructions.

Selecting Your Monitor Type

The *mach64* accelerator should be configured to complement the full range of display capabilities of your monitor. For optimal operation, it is important that you select the correct Monitor Type, and properly configure all its supported modes.

Display mode specification on the highlighted monitor is always listed in the INFO BOX to assist you when you are selecting an entry for a compatible monitor. Depending on your system, your Monitor Selection Menu may differ from the one shown here. Monitor Type is selected from the Monitor Selection Menu as follows:

Monitor Selection Menu	
VGA	640 x 480
NEC 4FG	15" 1024 x 768
NEC 5FG	17" 1280 x 1024
DDC1 Monitor	
Read VDIF ...	
Custom ...	

Procedure

1. Start the INSTALL program (For the procedure, see page 2-4).
2. Select QUICK SETUP and press < **Enter** >. A Monitor Selection Menu similar to the one shown above appears.
3. Using < **↑** > or < **↓** >, scroll the monitor list to highlight your monitor. If found, press < **Enter** > to select. If your monitor is not listed, choose one of the following:
 - a) Highlight a monitor entry, if the specification in the INFO BOX is compatible to your monitor, press < **Enter** > to select. Otherwise,
 - b) If you have a DDC1-compatible *mach64*, and your monitor is DDC1 compatible, select DDC1 MONITOR. Otherwise,

- c) If VESA Display Information Format file (VDIF) is available for your monitor, follow the procedure in the *VDIF Files* section on page 2-8. Otherwise,
- d) You will manually configure and test each display mode separately for optimal settings. Refer to the *Custom Configuration* section on page 2-8 for details.

Note

- A higher refresh rate reduces screen flicker more, and therefore reduces eye strain. Not all refresh rates are supported at all color depths. Consult *Appendix C, Video Mode Tables* for details.

VDIF Files

VDIF files are VESA Display Information Format files. They contain all the necessary configuration parameters for getting optimal resolution and refresh rate operation from the specified monitor. Consult your monitor manufacturer for availability of VDIF files.

If you have a VDIF file for your monitor, select it. The INSTALL program will read the VDIF file and automatically configure the card to properly work with your monitor.

Procedure

1. Start the INSTALL program (For the procedure, see page 2-4).
2. Select QUICK SETUP and press < **Enter** >.
3. Insert into a floppy drive the disk containing the VDIF file.
4. Select READ VDIF... and press < **Enter** >.
5. Type in the location of the VDIF file (typically A: or B:). INSTALL will read the file and configure the card to support your monitor according to the VDIF specification.

Custom Configuration

If your monitor is not listed in the Monitor Selection Menu, or you are not using DDC or VDIF, you can set up display modes, i.e., *resolutions* and *refresh rates*, on the card using the CUSTOM... option. This option is useful even if you had selected a monitor from the list. For example, you

can modify the screen centering or refresh rate on one resolution, and not change the other resolutions.

Procedure

1. Start the INSTALL program (For the procedure, see page 2-4).
2. Select QUICK SETUP and press < **Enter** >.
3. Select CUSTOM... and press < **Enter** >.
4. Pick a resolution, then a refresh rate. You will see a box outline.

Warning!

- An incorrect Monitor Type setting may damage your monitor. Review your monitor specifications before making a selection from the Monitor Selection Menu.
- Do not exceed the monitor specifications. Using a refresh rate (i.e., vertical frequency) that is higher than specified may damage your monitor. The manufacturer will not be liable for any damage caused by incorrect settings. Consult your monitor manual to determine the highest refresh rate for each resolution that your monitor supports.
- A scrambled screen indicates your monitor is not capable of the selected display mode. In which case, you should immediately press < **Esc** > to exit.

Tip: If the monitor produces a scrambled display, try a lower refresh rate. If it is already at the lowest refresh rate, set that resolution to “Not Supported.”

5. Adjust the size and position of the box outline. Press < **Enter** > to accept.
6. Repeat steps 2 and 3 until you are satisfied with the box outline for all the resolutions. When finished, remember to exit and save the settings.
7. If you decide to discard the current changes during the process, press < **Esc** > and confirm as prompted.

Utilities Installation

Select UTILITIES INSTALLATION from the Main Menu to copy *mach64* utilities and INSTALL program to your hard drive. We recommend that you accept all default paths suggested during the installation.

Diagnostics

Select DIAGNOSTICS from the Main Menu to test the various operations and circuitry of the accelerator card. The diagnostics screen can be displayed at any supported resolution and color depth for testing. These tests support mouse and keyboard operations. Directions are displayed on the screen. Errors found by testing are discussed in *Error Codes and Messages* in *Appendix A*.

Advanced Setup

If you have an ISA *mach64* accelerator card and wish to fine tune its settings for your monitor and system type, select ADVANCED SETUP from the Main Menu. On-screen context sensitive help is displayed as you highlight each Advanced Menu item.

Warning!

- The Advanced Configuration option allows you to use certain features that may add additional performance to your card. However these options may not be compatible with your system.
- If problems appear after an advanced option is changed, returning the card to factory defaults will rectify the situation.

Factory Defaults

The card can be reset to factory defaults by pressing < **Shift** > + < **F7** >.

Saving Your Configuration

Once you have finished configuring the necessary parameters described above, *save* them by pressing < **F10** >.

Chapter 3

Installing Enhanced Drivers

Latest Driver Information

A README file is provided for each application driver on the *mach64* installation disks. These files summarize the latest product revisions, and contain directions for installation and use of enhanced drivers. To read the latest driver information, select DRIVERS INSTALLATION from the Main Menu (described in *Running the INSTALL Program* on page 2-4), pick the appropriate application from the list, and select READ INSTALLATION NOTES.

For added convenience, after the *mach64* drivers have been installed, you can load and print the README files in the directory of the software application using any word processor.

Installing Drivers

Note

- You may require your application software disks during driver installation.

Applications use device drivers to display data on the screen. The *mach64* accelerator supports IBM standard VGA and VESA drivers that normally come with most major software packages. ATI supplies *mach64* drivers that give you more screen *resolutions* and *color depths* than standard device drivers.

In order to fully utilize the enhanced speed, resolution, color depth, and other features of this card, you should use the supplied *mach64* drivers.

Un-Installing Drivers

This installation program allows you to effortlessly un-install *mach64* drivers for Windows and OS/2, and return your application or operating system environment to VGA support. Details are given in the respective sections.

Microsoft Windows 3.1, Windows NT

The *mach64* drivers for Windows and Windows NT will deliver increased performance at high resolutions and color depths. You need to install these drivers using the applicable procedures below.

Microsoft Windows 3.1x

An ATI DeskTop is installed automatically when you install the enhanced driver for Windows. Depending on the *mach64* product, your ATI DeskTop may not have all of the features described here:

- **Flexdesk+** — is a handy control panel that allows you to change the color depth, screen size, and desktop size attributes of the driver within Windows.
- **DPMS** — allows your Display Power Management Signaling compatible monitor to save up to 80% energy and extend monitor life.
- **DeskScan** — allows you to pan and scroll across an off-screen work space of up to 2048x1536 resolution and zoom in zoom out functions for more detail when using smaller monitors.
- **WinSwitch** — switches display modes instantly. No more compromising between high resolution modes for detailed text work and true color modes for rich, photographic colors. Toggle between modes without having to quit Windows, even with 2MB *mach64* accelerator cards.
- **Color Correction** — enables the user to adjust the screen color to match the printed copy.
- **Screen Adjustment** — enables the user to adjust the screen size, centering, and monitor configuration when Windows is running. Additional help information is available in the ATI DeskTop, when you select Help On - Screen Adjustment.

- **MVA** — Windows Motion Video Acceleration (MVA) enhances Indeo and QuickTime. MVA uses an image smoothing technique that stretches an image to a larger, more usable size while eliminating pixel *blockiness*.
- **On-Screen Help** — Context sensitive help and readme files clearly explain how to customize your accelerator card configurations under Windows. Use the HELP ON function or press < F1 > for help.

Installation Procedure

1. Ensure that your card has been installed and configured as described in the *Quick Installation Overview* section of Chapter 2 before continuing with this procedure.
2. Start Microsoft Windows to ensure it is properly installed, then quit Windows.
3. Run the *mach64* installation program (see page 2-4) and select DRIVERS INSTALLATION from the Main Menu.
4. From the list of applications:
 - a) Select MICROSOFT WINDOWS. When the menu appears, select READ INSTALLATION NOTES for help and tips on the installation.
 - b) Select INSTALL WINDOWS 3.1 DRIVER and read the notes.
 - c) Follow the screen instructions to completion.
5. After file copying is done, note the Windows setup instructions on the screen, then press < Esc > to exit.
6. Exit the INSTALL program and restart Windows.
7. The ATI DeskTop icon is created automatically during driver installation. Select it to customize the look-and-feel of Windows.

The ATI DeskTop

The ATI DeskTop is a control panel from which enhanced Windows driver features are configured. Helpful information and configuration tips may be viewed using the Readme icon described in this guide. Depending on the *mach64* product, your ATI DeskTop may not have all of the features described here.

DeskTop Feature	Description
ATI Logo 	Double click this logo to display an information dialog and to generate a problem report which includes pertinent data on your system and card configuration to help solve your problem. Have the report ready before contacting your vendor.
Product Logo 	Each installed Product Group in the DeskTop contains a unique Product Logo and one or more Feature Icons. The <i>mach64</i> accelerator product logo is shown here.
Feature Icons*	Double click a Feature Icon to launch the associated control panel:  FlexDesk+  DPMS  DeskScan  WinSwitch  Color Correction  Screen Adjustment  Motion Video Acceleration <p>* Depending on the <i>mach64</i> product, your ATI DeskTop may not have all of the Feature Icons described here.</p>
Help On 	Click this icon, then click any other icon in the product group to display Help information on the selected item.
Read Me 	Click this icon then click a <i>product logo</i> or <i>feature icon</i> to view the readme file on that item.

DeskTop Feature	Description
OK 	Click this icon to exit the DeskTop.
Menu Bar	Provides pull-down menus for keyboard operation. The Windows keyboard convention applies.
Status Bar	The Status Bar provides information on the selected icon. It is located at the bottom of the DeskTop.

Microsoft Windows NT 3.5

The *mach64* driver for Windows NT is shipped with Windows NT. Before installing the *mach64* driver, you must have installed Windows NT and selected VGA display.

For Windows NT 3.1 driver installation information, please refer to the documentation shipped with Windows NT 3.1. The procedure below will install the latest *mach64* driver for Windows NT 3.5, shipped with the accelerator card.

Installation Procedure

1. Run the Windows NT DISPLAY program located in the Control Panel.
2. Select CHANGE DISPLAY TYPE...
3. Select CHANGE...
4. Select OTHER...
5. Specify the location of the ATI driver, e.g., A:\NT35.
6. Select ATI GRAPHICS ACCELERATORS.
7. Select INSTALL and confirm appropriately.
8. Restart Windows NT 3.5 to use this *mach64* driver. Select a desired display mode in the Display applet.

TIP: Select LIST ALL MODES... to see all supported modes.

De-Installation Procedure

You may un-install the *mach64* driver for Windows NT using either of the steps shown here:

1. In the WINNT\SYSTEM32\DRIVERS directory, rename the ATI.SYS file, for example, to ATI.ATI. When you restart Windows NT, it will not find ATI.SYS, and boot up in VGA.
2. Run the Windows NT DISPLAY program in the Control Panel and select a non-ATI driver, for example, a VGA-Compatible driver. When you restart Windows NT, it will boot up with the non-ATI driver you just selected.

AutoCAD R10 386, R11, R12, R13

Installation Procedure

1. Run AutoCAD (protected mode) to ensure that it is properly installed on your system. Note the location of the AutoCAD program files before you start the *mach64* installation program. You will need this information later.
2. Run the *mach64* installation program (see page 2-4) and select DRIVERS INSTALLATION from the Main Menu.
3. From the list of applications, select AutoCAD. When asked for the source drive and directory, type in the information and insert the requested diskettes. When the menu appears, select READ INSTALLATION NOTES for help and tips on the installation.
4. Follow instructions on the screen to install the enhanced driver.
5. When driver installation is completed, exit the installation program. A driver reference document called MANUAL.TXT and an information file called README.DLD are copied to your AutoCAD Drivers directory. You may read or print these files using your favorite word processor.
6. Run ADIACAD.BAT to “set” the necessary driver parameters in the DOS environment as follows:

ADIACAD < Enter >

ADIACAD.BAT was created by the *mach64* installation program for your convenience. The parameters it sets must be in the DOS

environment before you start AutoCAD.

Tip: If you are already using a batch file to start AutoCAD, consider adding the contents of ADIACAD to your batch file.

7. Start AutoCAD and reconfigure AutoCAD to use the new enhanced display list driver. Please refer to your AutoCAD manuals for information on how to select/change a video driver.

IBM OS/2 2.1, WARP

Note

- The *mach64* accelerator hardware must be correctly configured before attempting driver installation. If necessary, return to *Configuring the Hardware* on page 2-3 for information.

Installation Procedure

1. Start OS/2. Ensure that it is using the Video Graphics Array driver and that no other OS/2, DOS, or Windows applications are running.
2. Open an OS/2 full-screen command prompt.
3. Insert the *mach64* installation disk #1 into a floppy drive.
4. Type:
A: < Enter > (For drive B, substitute **B:** for **A:**)
OS2INST < Enter >

Note

- Do not switch out of full screen while running diagnostics tests. Doing so will result in a corrupted display.
5. Select INSTALL DEVICE DRIVERS from the Main Menu.
 6. Select IBM OS/2 from the list of applications.
 7. Select READ INSTALLATION NOTES for help and tips. Otherwise, select the Install option to copy the *mach64* driver and related files to C:\MACH_OS2, the default directory.
 8. Open an OS/2 Window or OS/2 full-screen command prompt.

9. Type: **DSPINSTL** < **Enter** >.
10. When the Display Driver Install panel appears, select PRIMARY DISPLAY. Choose OK to bring up the driver selection list.
11. Select ATI MACH64 (ENHANCED) from the list. Choose OK.
12. When the source directory panel appears, choose CHANGE and specify the location of the *mach64* driver (C:\MACH_OS2).
13. Select SET, then INSTALL.
14. After the driver is installed, do an OS/2 shut down.

Notes

- If an existing OS/2 driver resolution (set for another card) is not supported by the *mach64* as configured, the OS/2 display will revert to VGA (640x480).
 - In the OS/2 driver setup, you can choose only those resolutions that are supported by the *mach64*, determined by the Monitor Type, and resolutions you had configured using the ATI INSTALL program. For selection and configuration details, please refer to *Selecting Your Monitor Type* on page 2-7.
15. Re-start OS/2. It will default to 640x480 in 256 colors. To change screen resolution and/or color depth, perform the following steps:
 - a) Open the OS/2 System folder.
 - b) Open the System Setup folder.
 - c) Open the System object.
 - d) Select SCREEN tab in the System-Settings notebook.
 - e) Select a desired resolution and color depth from the list.
 - f) Close the System-Settings notebook.
 - g) Do an OS/2 shutdown, then restart OS/2.
 16. Refer to the README.OS2 file in the C:\MACH_OS2 directory for *mach64* configuration details.

De-Installation Procedure — OS/2 2.1

1. Open an OS/2 window or OS/2 full-screen command prompt.
2. Type: **DSPINSTL** < **Enter** >

3. When the Display Driver Install panel appears, select PRIMARY DISPLAY and choose OK to bring up the driver selection list.
4. Select Video Graphics Array (VGA) from the list. When prompted, insert the requested IBM OS/2 Display Driver disk into the drive and specify the VGA driver source directory.
5. Select INSTALL.
6. After the driver is installed, do an OS/2 shutdown.
Continue with the following steps if you wish to remove *mach64* files from your hard disk.
7. Restart OS/2.
8. Open an OS/2 full-screen command prompt.
9. Insert the *mach64* installation disk in the floppy drive and type:
A: < Enter > (For drive B, substitute **B:** for **A:**)
OS2INST < Enter >
10. Select INSTALL DEVICE DRIVERS from the Main Menu.
11. Select IBM OS/2 from the list of applications.
12. Select UN-INSTALL OS/2 DRIVER. Follow the screen instructions.

De-Installation Procedure — OS/2 WARP

1. Open the OS/2 System folder.
2. Open the System Setup folder and the Selective Install object.
3. Select PRIMARY DISPLAY. The Display Driver Install panel appears.
4. Select the Video Graphics Array (VGA) driver and choose OK. The OS/2 Setup and Installation panel appears.
5. Select INSTALL.
6. Specify the VGA driver source directory and follow the screen instructions.
7. When the VGA driver is installed, do an OS/2 shutdown.
Continue with the following steps if you wish to remove *mach64* files from your hard disk.
8. Restart OS/2.
9. Open an OS/2 full-screen command prompt.

10. Type:
 A: < **Enter** > (For drive B, substitute **B:** for **A:**)
 OS2INST < **Enter** >
11. Select INSTALL DEVICE DRIVERS from the Main Menu.
12. Select IBM OS/2 from the list of applications.
13. Select UN-INSTALL OS/2 DRIVER.
14. Follow the instructions on the screen.

Intergraph MicroStation 4.0, 5.0

Installation Procedure

1. Ensure that MicroStation is properly installed on your system before continuing with this procedure.
2. Run the *mach64* installation program (see page 2-4) and select DRIVERS INSTALLATION from the Main Menu.
3. From the list of applications, select MICROSTATION. Enter the source drive and directory information, then insert the disk as prompted. When the menu appears, select READ INSTALLATION NOTES for help and tips.
4. Follow instructions on the screen to complete the installation.
5. When driver installation is completed, press < **Esc** > to exit.
6. A MicroStation driver reference document and an information file called README.USD are copied to the MicroStation Drivers directory on your hard disk. You may read or print these files using your favorite word processor.

Microsoft Word (for DOS) 5.x, 6.0

The *mach64* drivers for Microsoft Word support 640x480, 800x600, and 1024x768 screen resolutions in 16 colors.

Installation Procedure

1. Ensure that Word is properly installed on your system before continuing with this procedure.
2. Run the *mach64* installation program (see page 2-4) and select DRIVERS INSTALLATION from the Main Menu.
3. From the list of applications, select MICROSOFT WORD.
4. Select an appropriate Word program version. Select READ INSTALLATION NOTES for tips and additional details.
5. Follow the instructions on screen to complete the driver installation.
6. When driver installation is completed, press < Esc > to exit.
7. Refer to the README.WRD file that has been copied into your Word directory for instructions and driver configuration details.

WordPerfect (for DOS) 5.1, 6.0

Installation Procedure — WordPerfect 5.1

The *mach64* drivers for WordPerfect 5.1 support 800x600 and 1024x768 screen resolutions in 16 colors.

1. Run WordPerfect to ensure that it is properly installed on your system before continuing with this procedure.
2. Run the *mach64* installation program (see page 2-4) and select DRIVERS INSTALLATION from the Main Menu.
3. From the list of applications, select WORDPERFECT.
4. If prompted, insert the driver distribution disk. You may have to enter the source drive and directory information.
5. You may select READ INSTALLATION NOTES for more information.

6. Select INSTALL WORDPERFECT 5.X DRIVER. Type the directory where WordPerfect is installed. Press < **Enter** > to copy the necessary driver files to that directory.
7. When driver installation is completed, press < **Esc** > to exit.
8. Run the WordPerfect Setup program to select this enhanced driver, as follows:
 - a) Run WordPerfect, press < **Shift** > + < **F1** > for the Setup option.
 - b) Press < **D** > for Display.
 - c) Press < **G** > for Graphics Screen Type.
 - d) Select the *mach64* driver and press < **Enter** >.
9. Refer to the README.WP file that has been copied into your WordPerfect directory for instructions and driver configuration details.

Installation Procedure — WordPerfect Version 6.0

This card supports the VESA BIOS Extension which supports several high resolution VESA display modes. Please read additional installation notes by following “WordPerfect Version 5.1 Installation Procedure” steps 1 to 5, above.

1. The *mach64* accelerator must be set up for the resolution you intend to use. If necessary, refer to *Quick Installation Overview* on page 2-5 for configuration information.
2. Run the WordPerfect Setup program to select a VESA display mode as follows:
 - a) Run WordPerfect, press < **Shift** > + < **F1** > for the Setup option.
 - b) Press < **D** > for Display.
 - c) Press < **G** > for Graphics Screen Type.
 - d) Press < **S** > for Screen Type.
 - e) Select “VESA VBE” (VESA BIOS Extension) and press < **S** >.
 - f) Select one of the displayed modes and press < **S** >.
A Driver Warning dialog may appear; if so, consult the WordPerfect documentation for information.
 - g) Press < **Enter** > as prompted. When you exit the Setup program, you should be in the selected mode. If not, repeat Step 1 to check if the card is correctly configured for this resolution.

VESA BIOS Extension

The VESA BIOS Extension (VBE) feature is provided by a DOS TSR program called M64VBE.COM. This program supports software running on VESA modes using the unique *mach64* features, beyond those provided by standard VGA hardware. If your software and/or games conform to the VBE standard, you should load M64VBE.COM first.

This VBE utility is located on installation disk #1. It is also copied to the *mach64* directory during utilities installation. To load this utility, go to the directory containing M64VBE.COM and type:

M64VBE <Enter>

To display its supported keywords, type M64VBE ? <Enter>. To unload it, type M64VBE U <Enter>. (Please refer to your DOS documentation for conditions on unloading TSRs.)

Chapter 4

Monitor Power Management

The *mach64* accelerator supports a VESA power management control specification called **DPMS** — Display Power Management Signaling. Monitors that comply with DPMS can provide energy savings up to 80% compared to non DPMS compliant monitors. This also translates into extended monitor life.

DPMS control functions are provided for DOS and Windows operations. This chapter describes the *DOS* version, a Terminate-and-Stay-Resident program. TSR means it runs in the background once activated. The *Windows* version provides control via a Windows type control panel in the ATI DeskTop, described on page 3-4.

Notes

- Monitors that do not support VESA DPMS can be damaged by activation of the DPMS feature. Check your monitor specifications.
- Do not use screen saver when DPMS is enabled. The screen saver will conflict with DPMS operation.

DPMS (for DOS)

When you run DPMS for the first time, without parameters, DPMS will set the Standby, Suspend, and Off timers to *default* values. If DPMS has been loaded, running it again without parameters will display the current timer values, as follows:

```
Standby timer: 15 minutes
Suspend timer: 30 minutes
Off timer: 60 minutes
```

If you run DPMS with at least one timer parameter, DPMS will set that value and disable the unspecified timers. An example is shown on page 4-2.

Monitor Power Management

DPMS parameters are to be included in the command separated by spaces, as follows:

```
DPMS parameter parameter <Enter>
```

Example:

To set the Standby timer to 5 minutes, and disable the Suspend and Off timers:

```
DPMS STBY 5 <Enter>
```

DPMS Parameters

Parameter	Usage
stby <i>x</i>	Places the monitor into Standby mode after <i>x</i> minutes and seconds. For example, <i>x</i> for two minutes and ten seconds is specified as 2:10. Standby is the first level of power conservation. The monitor is instantly ready if activity is detected.
susp <i>x</i>	Places the monitor into Suspend mode after <i>x</i> minutes and seconds. The monitor conserves more energy at this level than at Standby.
off <i>x</i>	Places the monitor into Off mode after <i>x</i> minutes and seconds. The monitor is at the highest level of energy conservation.
nomouse	Does not detect mouse activity.
quiet	Suppresses DPMS messages.
unload	Un-installs DPMS from system memory.
help	Displays help messages.

Appendix A

Diagnostics & Troubleshooting

Diagnostics

All installed graphics modes in the *mach64* accelerator can be viewed and tested, by running the INSTALL program (page 2-4) from the DOS prompt, or by running a diagnostics program called M64DIAG.EXE. Do not run it in a windowed or full-screen DOS box.

In the INSTALL program, select TEST GRAPHICS ADAPTER from the DIAGNOSTICS ... option of the Main Menu. The Test Graphics Adapter menu has the following options:

- VGA Tests ...
- Accelerator Tests ...

Any time you suspect there is a problem, especially during installation, run the above tests. The information provided in this appendix will enable you to solve most problems.

Troubleshooting

Because a typical computer system consists of many different parts, difficulties may arise from a combination of items, from software or hardware installation, to monitor compatibility. Listed below are several checks you can make to help determine what the problem is.

System Lockup

- If you are using a memory manager such as QEMM or 386MAX you need to modify the command line in the CONFIG.SYS file so that the address of the graphics card video BIOS, C000 - C7FF, is excluded. For example, add "EXCLUDE = C000 - C7FF" to the command line.
- Remove all unnecessary boards.

- Disable shadow RAM.
- Ensure that the board is seated correctly and that the card has been installed using the proper utilities.
- Try the card in a different system and reset to factory defaults using the INSTALL program. If the card works in another system, the problem is likely due to incorrect configuration.

Test Patterns OK; Applications Do Not Sync

- The wrong monitor type has been selected. Change the settings in the INSTALL program.

Windows Driver Not Installing Properly

- Windows must be running in 386 Enhanced Mode. Incompatible memory managers may prevent Windows from starting in enhanced mode. If this occurs, remove the offending driver or memory manager.

AutoCAD Driver Not Installing Properly

- If using a 386, ensure that AutoCAD has been configured for the appropriate ADI driver. The protected mode driver requires extended memory.

Error Codes and Messages

Problems and solutions for some common errors found by the test program are provided for your reference as follows:

Problem	Solution
Memory aperture test failure or Diagnostics program locks or Reboots during aperture test	If you receive an error message indicating that the memory aperture location is conflicting with your system memory, restart the INSTALL program as follows: INSTALL APMAP <Enter> . Now when you enable Memory Aperture, you must select a location <i>above but not overlapping</i> System Memory (S), BIOS (B) or Reserved (R) locations. Not applicable for ISA cards.
Desired resolution is disabled and displayed in gray	A mode displayed in gray means that the BIOS is told this mode is not available, based on the card configuration. Re-install using custom monitor selection.
Menu item is disabled and displayed in gray	The test program has determined that the mode or test is not available under the current configuration. Aperture tests are not available if the aperture is disabled, and CRT mode and pixel depth are determined by current installation, DAC type, memory size, and memory type.
Adapter not detected	This message should only occur when a <i>mach64</i> ASIC is not detected. If this message occurs and a <i>mach64</i> board is present, it may indicate an I/O conflict, conflicts between the Extended Memory Manager (EMM) and the video ROM. Try removing all other boards from the system and booting from a plain DOS disk. Try excluding the video BIOS address (C0000-C7FFF) from the memory manager. Refer to the documentation furnished with the memory manager software for information.
Any FIFO test error	The effects of a bad command FIFO should be visible. (e.g., the screen does not come up, or it displays garbage.)
Quick memory test error	Run Detailed RAM Test to confirm the error and identify the address of the error.
Detailed memory test error.	Run Detailed RAM Test several times to confirm the error and take notes of any messages and error codes.

Problem	Solution
DAC LUT test failure.	An error has occurred while testing the DAC LookUp Table. The problem should be visible on the top color bar of any 8bpp mode.
ROM checksum error.	An error has been detected in the ROM.
Draw sequence failure.	An error has occurred in the draw engine. If the error is intermittent, it might indicate a marginal RAM failure. The effects of this failure may not be immediately apparent.

Appendix B

Specifications

System Requirements — Intel 386/486/Pentium or compatible computer system (8086/8088/286 not supported) with one of:

- 16-bit ISA (or EISA) Bus.
- 32-bit VESA Local Bus (up to 33MHz).
- 32-bit PCI Local Bus.

Operating Environments — one of:

- DOS 5.0 or higher or Windows 3.1.
- Windows NT.
- OS/2 2.1 or OS/2 Warp.

Video Display Buffer

- GRAPHICS PRO TURBO 1600 — 2MB & 4MB VRAM.
- GRAPHICS PRO TURBO — 2MB & 4MB VRAM.
- GRAPHICS XPRESSION — 1MB & 2MB DRAM.
- WINTURBO — 2MB VRAM.
- WINBOOST — 1MB & 2MB DRAM.

Sync Signals

- Separate horizontal and vertical sync at TTL levels.

Video Memory Address

- A000 - BFFF plus the memory aperture address enabled through the INSTALL program.

Video BIOS Address

- C000 - C7FF.

Video Port Address

- 102, 1CE, 1CF, 2E8, 2EC, 2ED, 2EE, 2EF, 3?4, 3?5, 3?8, 3?9, 3?A, 3?B, 3C0, 3C1, 3C2, 3C3, 3C4, 3C5, 3C6, 3C7, 3C8, 3C9, 3CA, 3CC, 3CE, 3CF, 3DC, and all aliases; 46E8.
(?=B for monochrome, ?=D for color operation)

Video Output Connector

- 15-pin D shell (Female), IBM standard.

VGA Feature Connector

- 26-pin header, VGA Out only, VESA standard.

Video interrupt (Reserved for future use):

- ISA — 2, 3, 5 or 10, jumper selectable.
- VLB — 2, 3 or 5, jumper selectable.
- PCI — system auto-configurable.

Power

- +5V \pm 5%, @ 1.3A typical.

Ambient Temperature

- Operating — 50° to 122° F (10° to 50° C).
- Storage — 32° to 162° F (0° to 70° C).

Relative Humidity

- Operating — 5% to 90% non-condensing.
- Storage — 0% to 95%.

MTBF

- 120,000 hours.

Appendix C

Video Mode Tables

You will find the *mach64* video mode specifications in two tables, one for accelerators using VRAM, the other for accelerators using DRAM memory. In the table, each row describes a single screen configuration.

When discussing color depth, 8 bits per pixel (8bpp) is the same as 256 colors. Therefore, the relation between bpp and colors is as follows:

- 8bpp = 256 colors.
- 16bpp = 65,000 colors.
- 24bpp = 16.7 million colors.

The *mach64* also supports 15bpp (32,000 colors). Any resolution and refresh settings that support 16bpp will support 15bpp. Please refer to the mode tables for details.

Table 1. VRAM Accelerator Mode Table

GRAPHICS PRO TURBO 1600, GRAPHICS PRO TURBO, AND WINTURBO											
Display Screen Resolution	Refresh Rate (Hz)	Horizontal Frequency (kHz)	Pixel Clock (MHz)	Colors (Bits Per Pixel)							
				2MB VRAM				4MB VRAM			
				8	16	24	*32	8	16	24	*32
640x480	60	31.4	25.2	√	√	√	√	√	√	√	
640x480	72	37.7	31.2	√	√	√	√	√	√	√	
640x480	75	37.5	31.5	√	√	√	√	√	√	√	
640x480	90	47.9	39.9	√	√	√	√	√	√	√	
640x480	100	52.9	44.9	√	√	√	√	√	√	√	
800x600	48 <i>int.</i>	33.8	36.0	√	√	√	√	√	√	√	
800x600	56	35.1	36.0	√	√	√	√	√	√	√	
800x600	60	37.8	40.0	√	√	√	√	√	√	√	
800x600	70	44.5	44.9	√	√	√	√	√	√	√	
800x600	72	48.0	50.0	√	√	√	√	√	√	√	
800x600	75	46.8	49.5	√	√	√	√	√	√	√	
800x600	90	57.0	56.6	√	√	√	√	√	√	√	
800x600	100	62.5	67.5	√	√	√	√	√	√	√	
1024x768	43 <i>int.</i>	35.5	44.9	√	√	-	-	√	√	√	
1024x768	60	48.3	65.0	√	√	-	-	√	√	√	
1024x768	70	56.4	75.0	√	√	-	-	√	√	√	
1024x768	72	58.2	75.0	√	√	-	-	√	√	√	
1024x768	75	60.0	78.8	√	√	-	-	√	√	√	
1024x768	90	76.2	100	√	√	-	-	√	√	-	
1024x768	100	79.0	110	√	√	-	-	√	√	-	
1152x864	43 <i>int.</i>	45.9	65.0	√	√	-	-	√	√	√	
1152x864	47 <i>int.</i>	44.8	65.0	√	√	-	-	√	√	√	
1152x864	60	54.9	80.0	√	√	-	-	√	√	√	
1152x864	70	66.1	100	√	√	-	-	√	√	√	
1152x864	75	75.1	110	√	√	-	-	√	√	√	
1152x864	80	76.3	110	√	√	-	-	√	√	√	
1280x1024	43 <i>int.</i>	50.0	80.0	√	-	-	-	√	√	-	
1280x1024	47 <i>int.</i>	50.0	80.0	√	-	-	-	√	√	-	
1280x1024	60	63.9	110	√	-	-	-	√	√	-	
1280x1024	70	74.6	126	√	-	-	-	√	√	-	
1280x1024	74	78.8	135	√	-	-	-	√	*1	-	
1280x1024	75	79.9	135	√	-	-	-	√	*1	-	
1600x1200	60	76.2	156	*1	-	-	-	*1	*1	-	
1600x1200	66	82.7	172	*1	-	-	-	*1	*1	-	
1600x1200	76	95.2	198	*1	-	-	-	*1	*1	-	

*1 - Supported by GRAPHICS PRO TURBO 1600 only.
 *32 - 24bpp color data processed using a 32bpp data format.

Table 2. DRAM Accelerator Mode Table

GRAPHICS XPRESSON AND WINBOOST											
Display Screen Resolution	Refresh Rate (Hz)	Horizontal Frequency (kHz)	Pixel Clock (MHz)	Colors (Bits Per Pixel)							
				1MB DRAM				2MB DRAM			
				8	16	24	*32	8	16	24	*32
640x480	60	31.4	25.2	√	√	√	-	√	√	√	√
640x480	72	37.7	31.2	√	√	√	-	√	√	√	√
640x480	75	37.5	31.5	√	√	√	-	√	√	√	√
640x480	90	47.9	39.9	√	√	-	-	√	√	√	-
640x480	100	52.9	44.9	√	√	-	-	√	√	*1	-
800x600	48 <i>int.</i>	33.8	36.0	√	√	-	-	√	√	√	√
800x600	56	35.1	36.0	√	√	-	-	√	√	√	√
800x600	60	37.8	40.0	√	√	-	-	√	√	√	√
800x600	70	44.5	44.9	√	√	-	-	√	√	*1	-
800x600	72	48.0	50.0	√	√	-	-	√	√	*1	-
800x600	75	46.8	49.5	√	√	-	-	√	√	*1	-
800x600	90	57.0	56.6	√	-	-	-	√	-	-	-
800x600	100	62.5	67.5	√	-	-	-	√	-	-	-
1024x768	43 <i>int.</i>	35.5	44.9	√	-	-	-	√	√	-	-
1024x768	60	48.3	65.0	√	-	-	-	√	√	-	-
1024x768	70	56.4	75.0	√	-	-	-	√	√	-	-
1024x768	72	58.2	75.0	√	-	-	-	√	√	-	-
1024x768	75	60.0	78.8	√	-	-	-	√	√	-	-
1024x768	90	76.2	100	-	-	-	-	√	-	-	-
1024x768	100	79.0	110	-	-	-	-	√	-	-	-
1152x864	43 <i>int.</i>	45.9	65.0	√	-	-	-	√	*1	-	-
1152x864	47 <i>int.</i>	44.8	65.0	√	-	-	-	√	*1	-	-
1152x864	60	54.9	80.0	√	-	-	-	√	*1	-	-
1152x864	70	66.1	100	-	-	-	-	√	-	-	-
1152x864	75	75.1	110	-	-	-	-	√	-	-	-
1280x1024	43 <i>int.</i>	50.0	80.0	-	-	-	-	√	-	-	-
1280x1024	47 <i>int.</i>	50.0	80.0	-	-	-	-	√	-	-	-
1280x1024	60	63.9	110	-	-	-	-	√	-	-	-
1280x1024	70	74.6	126	-	-	-	-	√	-	-	-
1280x1024	74	78.8	135	-	-	-	-	√	-	-	-
1280x1024	75	79.9	135	-	-	-	-	√	-	-	-

*1 - Supported by products using the ATI8800GX or ATI 88800CX *mach64* accelerator component. To determine which product you have, run the ATI INSTALL program (see page 2-4) and select System Information to see the product information in the INFO BOX for details.

*32 - 24bpp color data processed using a 32bpp data format.

Appendix D

FCC Compliance Statement

Notes

This device complies with FCC Rules Part 15. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with manufacturer's instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

- 
- The use of shielded cables for connection of the monitor to the graphics card is required to assure compliance with FCC regulations.
 - Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

DOC Compliance Statement

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.