

FCC-B Radio Frequency Interference Statement

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 when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2

Shielded interface cables and AC power cords, if any, must be used in order to comply with the emission limits.

VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.

Edition

September 1994

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Chapter 1

Introduction

The PCI PENTIUM SI3 All-In-One system board is a high-performance personal computer system board based on a 3.3V version of the Pentium™ microprocessor — the P54C microprocessor. The system board supports the Peripheral Component Interconnect (PCI) Local Bus standard with a 188-pin PCI/ISA BUS riser slots.

A cache subsystem can be configured for 256K, 512K or 1M cache memory to improve overall throughput.

The system board uses the highly integrated SIS 551X chipset to support the PCI/ISA and 32-bit Enhanced PCI IDE. The ATI mach64 and WINBOND W83787/W83768 provide all other on-board peripherals.

System Board Specifications

| | |
|-----------------------------|--|
| CPU | Supports Intel P54C - 75 MHz/90 MHz/100 MHz/120 MHz/133 MHz |
| Cache Memory | Supports 256K, 512K, or 1M cache memory |
| Main Memory | Supports four memory banks using four 72-pin SIMM modules with 4M, 8M, 16M, 32M, 64M, and 128M FP / EDO DRAM Supports 32-bits DRAM memory operation Up to 512 Mbytes on-board memory |
| Slot | One 188-pin PCI / ISA bus riser slot |
| On-Board Peripherals | PS/2 keyboard and PS/2 mouse On-board ATI mach64 VGA chip with 1MB / 2MB option display memory On-board peripherals include two serial port, one parallel port, FDC controller, and a 2- |

Chapter 1 — Introduction

| | |
|-------------------|-----------------------------|
| | channel PCI IDE controller |
| Battery | 3V on-board Lithium battery |
| Dimensions | 26 cm x 22 cm x 4 layers |
| Mounting | 7 mounting holes |

System Board Layout

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Figure 1-1: System Board Layout.

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Chapter 2

Hardware Installation

This chapter provides information on hardware installation and configuration.

Clock Selection: SW1

Set switch SW1 according to the following values: P54C-75MHz; 90 MHz; 100MHz; 120MHz ; or 133MHz. Refer to the following table for configuration options.

SW1 setting

| CPU Internal Clock | SW1 1 2 3 (Int/Ext Ratio) | SW1 4 5 6 (External Clock) |
|-----------------------------------|--|---|
| 75 MHz | O O O (1.5) | O O S (50MHz) |
| 90 MHz | O O O (1.5) | S O S (60MHz) |
| 100 MHz | O O O (1.5) | S S S (66MHz) |
| 120 MHz | O S O (2) | S O S (60MHz) |
| 133 MHz | O S O (2) | S S S (66MHz) |
| 80 MHz (see note) | O O O (2) | O S O (40MHz) |
| 120 MHz (see note) | S O O (3) | O S O (40MHz) |

O ⇒ **Open** = off

S ⇒ **Short** = on

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The two settings are reserved for future M1 CPUs.

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Figure 2-1 : SW1 Settings.

CPU Voltage Selector: JV2

For jumpers JV2 select either a 3.38 or 3.52 volt power source for the P54C.

| CPU Voltage | JV2 |
|-------------|-----|
| 3.38V | S |
| 3.52V | O |

O ⇒ Open

S ⇒ Short

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Figure 2-2 : CPU Voltage Selector JV2.

Cache Size and Memory Locations

The system board supports 256K, 512K, and 1M of cache memory. You can configure the cache memory in the following two ways:

1. Install 32K8 or 64K8 SRAM chips in Data RAM sockets U2 - U9.
2. Install 8K8, 16K8, or 32K8 SRAM chips in Tag socket U27.

| Cache Size | Tag RAM (U27) | Data RAM (U2-U9) |
|------------|---------------|------------------|
| 256K | 8K8 (16K8) | 32K8 |
| 512K | 16K8 | 64K8 |
| 512K | 16K8 | 64K8 |
| 1M | 32K8 | 128K8 |

Cache Selection: JS1, JS2

You can then set jumpers JS1 and JS2 as shown in the table below. Note that the speed required for SRAM chips is 15ns.

| Cache Size | 256K | 512K (128AK) | 512K (129AK) | 1M |
|------------|------|--------------|--------------|-----|
| JS1 | 2-3 | 3-4 | 2-3 | 1-2 |
| JS2 | 1-2 | 3-4 | 2-3 | 2-3 |

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Figure 2-3: JS1 and JS2 Cache Size Settings.

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1. Tag RAM (U27) uses 128AK.
2. Tag RAM (U27) uses 129AK.

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All Data SRAM used on the system board are special SRAM that use 5 volts for power input. However, all other I/O pins use 3.3 volts level for access interface.

Suitable SRAM include:

1. WINBOND W24M257AK-15 (32K8 mixed mode)
2. WINBOND W24M512AK-15 (64K8 mixed mode)

-
3. WINBOND W24M1024AK-15(128K8 mixed mode)

Tag RAM used below:

1. WINBOND W24128AK-15 (16K8)
2. WINBOND W24129AK-15 (16K8)
3. Aster AE88128AK-15 (16K8)
4. WINBOND W24257AK-15 (32K8)
5. WINBOND W24M257AK-15 (32K8)

Memory Bank Configuration

The system board supports four memory banks and provides four 72-PIN, single in-line on-board memory module (SIMM) sockets, numbered SIMM1 — SIMM4.

Each socket accepts single density or double density (D)SIMM in the following sizes: 4M(S), 8M(D), 8M(S), 16M(S), 32M(D), 64M(S), and 128M(D).

You can use one piece of 72 PIN SIMM (32 bits DRAM) in SIMM1 or SIMM3.

The maximum memory configuration is: **512M=SIMM1/2 (128M x 2) + SIMM3/4(128Mx2)**

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You must install two of the same type of EDO or FP in the SIMM sockets SIMM1/SIMM2 or SIMM3/SIMM4 when you mix the EDO and fast page DRAM. For example:

SIMM1

SIMM2

SIMM3

SIMM4

EDO
FP

EDO
FP

FP
EDO

FP
EDO

Chapter 2 — Installation

See table below for allowable SIMM type configurations.

| SIMM1 & SIMM2 | SIMM3 & SIMM4 |
|-----------------------------|-----------------------------|
| (S)or(D) type only on SIMM1 | — |
| — | (S)or(D) type only on SIMM3 |
| (S) same type *2 | — |
| — | (S) same type *2 |
| (D) same type *2 | — |
| — | (D) same type *2 |
| (S) same type *2 | (S) same type *2 |
| (S) same type *2 | (D) same type *2 |
| (D) same type *2 | (S) same type *2 |

| | |
|------------------|------------------|
| | |
| (D) same type *2 | (D) same type *2 |

(S) : Single Bank
SIMM

(D) : Double Bank
SIMM

PS/2 keyboard connector: PSK1

PSK1 is a standard six-pin female mini-DIN Connector. You can plug a PS/2 keyboard cable directly into this connector. See *Figure 1-1* for connector locations.

PS/2 mouse connector: PSM1

You can attach a PS/2 mouse with a six-pin mini-DIN connector directly to the system board with this connector - PSM1.

Serial Port Connector:COM1,COM2

The system board provides two 9-pin male serial port connectors. The interrupt request of COM1 is fixed to IRQ4. Interrupt of COM2 and the selection of I/O ports (3F8,2F8,3E8,2E8) can be set by BIOS SETUP program. Please refer to *chapter 3 - Peripheral Setup*.

Parallel Port Connector: PRN

The system board provides a standard 25-pin female connectors. The printer port also supports Enhanced Parallel Port (EPP) and Extended Capabilities Port (ECP).

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Case Connector Block: JFP

The Turbo LED, Turbo Switch, Hardware Reset, Keylock, Power LED, Sleep Switch, Speaker and HDD LED all connect to the JF Connector Block as shown below. See figure 1-1 for JF's

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location.

Figure 2-4: Case Connector Block - JF.

Power Supply Connector: J 1

The power supply connector is a twelve-pin male connector. Dual connectors from the power supply can fit in only one direction. Make sure to attach the connectors with the two black wires at the center, as show in the diagram below. See Figure 1-1 for the connector's location.

Figure 2-5: Attaching Power Supply Connectors.

| Pin | Description | Pin | Description |
|-----|-------------|-----|-------------|
| 1 | Power Good | 7 | Ground |
| 2 | +5V DC | 8 | Ground |
| 3 | +12V DC | 9 | -5V DC |
| 4 | -12 V DC | 10 | +5V DC |
| 5 | Ground | 11 | +5V DC |
| 6 | Ground | 12 | +5V DC |

External Battery Connector: JB1

A battery must be used to retain the system board configuration in CMOS RAM. You can use either the on-board battery or an external battery. If you use the on-board battery you must short

pins 2-3 of JB1. For an external battery, the battery's cable connector attaches to pins 1 and 4 of JB1.

Chapter 2 — Installation

You can also clear the system CMOS by shorting pins 3-4 for a brief moment and then placing the jumper cap back on pins 2-3.

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Figure 2-6: Setting the External Battery Connector - JB1.

CPU Fan Connector: JFAN

This 4-pin connector connects a power source of +12V to your CPU's cooling fan. Please refer to **Figure 2-6**. Check the voltage range and polarity of your cooling fan before you connect it.

PIN1: +12V

PIN3: GND

PIN2: GND

PIN4: +5V

Power Saving Switch Connector: JG1

Attach a power saving switch to this connector. When the switch is pressed, the system goes immediately into standby mode. Press any key and the system wakes up.

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You should enable the Power Management Mode to use this function.

Floppy Disk Connector: FDD

The system board provides a standard floppy disk connector, FDD. You can attach a floppy disk cable directly to this connector. See **Figure 1-1** for connector locations.

Hard Disk Connectors: HDD1, HDD2

The system board has a 32-bit Enhanced PCI IDE Controller that provides two HDD connectors, HDD1 (primary) and HDD2

(secondary). You can connect up to four hard disk drivers to HDD1 and HDD2.

VGA Connector: VGA

The system board has a VGA Controller - ATI mach64 graphics accelerator that supports a VGA port with PCI bus interface. Plug a VGA monitor into this connector.

On-Board VGA Selection: JVG1

| On-Board VGA | JVG1 |
|---------------------|-------------|
| Enable | 1-2 |
| Disable | 2-3 |

Disable JVG1 if you want to install an external VGA adapter card.

VGA Feature Connector: CN1

CN1 is a standard 26-pin VGA Feature connector. You can attach peripherals that specify this type of connector to CN1.

VGA DRAM Configuration

Install VGA DRAM memory as below.

| VGA MEMORY | INSTALLED MEMORY |
|-------------------------|---|
| 1MB (Default) | 256K*4-bit 8pcs on U35-U38,U41-U44 |
| or 1MB (Default) | 256K*16-bit 2pcs on U33,U34 |
| Extend to 2MB | Add 256K*16-bitX2 on U31,U32 |

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Chapter 3

BIOS Setup

System configuration and chipset internal register information are stored in the CMOS RAM. This information is retained by a battery when the power is off.

You can modify this system information with the system's BIOS setup program.

AMI BIOS Setup

The AMI BIOS Setup program employs a menu driven graphical user interface. This intuitive program can be controlled by both a mouse and a keyboard.

Enter the AMI Setup program's Main Menu as follows:

Chapter 3 — BIOS Setup

1. Turn on or reboot the system. The following screen appears with a series of diagnostic checks.

```
AMI-BIOS (C) 1993 American Megatrends Inc.,  
AF7x mmddy
```

```
XXXXXXXX KB OK
```

```
Hit <DEL>, if you want to run SETUP
```

```
(C) American Megatrends Inc.  
51-0703-001169-00101111-101094-SiS551x-H
```

2. When the message “*Hit DEL if you want to run SETUP*” appears, press the [DEL] key to enter the AMI BIOS setup program and the following screen appears:

```
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```

3. You can use the keyboard or a mouse to choose among options. Modify the system parameters to reflect the options installed in the system. (See the following sections for more information.) Press Alt-H for Help.

With a Keyboard

Use the [TAB] key to select a windows group, and then the left and right arrow keys [←→] to choose an item, and press [ENTER]. Use the up and down arrow keys [↓] to modify an item and select values, and then press [ENTER]. After completing your changes, press [ESC] to leave the current operation and return to the previous level.

With a Mouse

Point the cursor at an item in a windows group you wish to modify and double-click the left mouse button. When items to modify appear, use the cursor to select values and then press the left mouse button to complete the changes. Use the cursor to press the exit box in the Window group's upper left corner to leave the current operation and return to the previous level.

4.

Press the [ESC] key until the Exit Setup window appears, or use the mouse to click the exit box in the screen's upper left corner. When the Exit Setup window appears: choose "*Save Changes and Exit*" to save your changes and reboot the system, or choose "*Do not save changes and exit*" to ignore your changes and exit the program, or choose "*Continue*" to go on with the CMOS Setup.

Main Menu Options

The Main Menu has four windows: *Setup*, *Utility*, *Security*, and *Default*. Each window has several icons.

Setup Window

The Setup window has five icons that allow you to set system configuration options.

Standard Setup

1. Double-click on the Standard icon and the following window appears:
2. Select "Date/Time" using the mouse or keyboard. Modify selected fields with the [+] / [-] keys or press + or - with the mouse. For other items use the up and down keys or the mouse. Some fields let you enter numeric values directly.
3. After you have finished with Standard Setup, press

[ESC] or click the exit box to return to the Setup Window.

Advanced Setup

1. Double-click on the **Advanced** icon and the following window appears:
2. Select items using the mouse or keyboard. With the mouse, use the cursor to select values and then press the left mouse button to complete the changes. With the keyboard, modify selected fields with the [↓] keys and press [ENTER].

A short description of the window's items follows:

Typematic Rate **Choose Enabled or Disabled. Enable this option to adjust the keystroke repeat rate.**

System Keyboard **Choose Absent or present. When Absent is chosen. The keyboard is not tested at boot-up. When Present is chosen and a keyboard is not attached to the system, a keyboard error message appears on the screen.**

Mouse Support **Choose Enabled or Disabled for PS/2 mouse.**

Primary Display **The default is VGA/EGA. Choose your**

monitor type

Above 1MB
Memory Test

Choose Enabled or Disabled. Enable this option to invoke the POST memory routines on the RAM above 1MB. Disable this option and the BIOS only checks the first 1MB of RAM.

Memory Test Tick
Sound

Choose Enabled or Disabled.

Parity Error Check

Choose Enabled or Disabled.

Extended BIOS
RAM Area

The choice “0:300” (i.e. Segment:offset=0:300) is recommended for most cases. However, if the system is involved with Novell Network, choose “DOS 1KB” to avoid conflicts with DOS.

(Novell uses 0:300 for operation system programming.)

| | |
|-----------------------------------|--|
| Hit “Del” Message Display | Choose Enabled or Disabled. |
| Wait for “F1” if Any Error | Choose Enabled or Disabled. Enable this option to display “<i>press [F1] to continue</i>” when a POST nonfatal error occurs. Disable this message to eliminate the need for any user response to a non-fatal error condition message. |
| System Boot Up Num Lock | Choose Enabled or Disabled. “<i>Enabled</i>” puts the numeric keypad in NUM LOCK mode at boot-up. “<i>Disable</i>” puts the numeric keypad in arrow key mode at boot-up. |
| Floppy Drive Seek at Boot | Choose Enabled or Disabled. The default is Disabled to provide a fast boot and to reduce the possibility of damage to the heads. |

**Floppy Drive
Swapping**

Choose Enabled or Disabled. When you enable this option, drives A and B will be exchanged.

**System Boot-Up
Sequence**

The AMI BIOS first attempts to boot from drive A: and then, if unsuccessful, from hard disk C: You can reverse the sequence with this option.

**System (Video
Adapter ROM)
BIOS Cacheable**

Choose Enabled or Disabled.

**Password
Checking**

Choose Setup, or Always. Use this feature to prevent unauthorized system boot-up or unauthorized use of BIOS Setup.

Setup —If there is a password set, the Password prompt only appears if you attempt to enter the Setup Program. If there is no set password, the Password Checking option is disabled.

Always — Each time the system boots the password prompt appears.

Internal Cache

This option enables and disables the internal cache memory, Level 1 cache (L1), of the Pentium CPU.

External Cache

Choose Disabled, Wr. Back, or Wr. Thru.

**Video Shadow,
Shadow C800-DC00**

ROM shadow copies BIOS code from slow ROM to faster RAM. BIOS can then execute from RAM. BIOS is

shadowed if a segment is enabled and it has BIOS present.

**Primary IDE AUTO
Detection**

When this item is enabled, the Primary IDE will boot automatically. You don't have to set the HDD type.

Onboard PCI IDE

Default both, Primary, Secondary, or Disabled.

IDE Prefetch

Choose Enabled or Disabled.

**Offboard (Add-on)
PCI IDE**

If you want to use an external PCI IDE, you can enable this option.

**Primary
(Secondary)
controller 32-bit
Xfer**

**Choose Enabled for 32 bits transfer,
Disable for normal (16 bits) transfer**

**Primary
(Secondary)
Master (Slave):
Advanced PIO**

Choose Auto or Mode1-Mode4.

**Block Mode
LBA Mode**

**When you execute IDE SETUP this
option will be Auto set (the user doesn't
need to set it). Note that in some HDD
Block Modes, this option can't be
enabled.**

**Secondary
Controller Hard
Disks**

**When you execute IDE SETUP this
option will be automatically set. The
IDE CD-ROM doesn't use this option.**

1st Priority IRQ for PCI/PnP **The 1st priority IRQ will allow the use of PCI VGA.**

2nd (3rd, 4th) IRQ **The IRQ will be automatically set for a PCI Card if one is installed.**

ISA Memory **This option allows ISA Memory Card use.**

Block Base **Choose Disabled or set value to C800-D000.**

PCI IRQ14 (IRQ15) Type **Choose Level or Edge.**

Choose Yes or No.

Boot to PnP Operation system

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The system BIOS has built-in BIOS for PCI NCR53C810 and Adaptec AHA-7850. In case one of these PCI cards is installed, the system BIOS auto-scans the ROM address, and installs the BIOS in the first available address. The ROM address selected is then automatically shadowed, bypassing the setting in the BIOS setup.

3. After you have finished with Advanced Setup, press [ESC] or click the exit box to return to the Setup Window.

Chipset Setup

1. Double-click on the Chipset icon and the window below appears:
2. Select items using the mouse or keyboard. With the mouse, use the cursor to select values and then press the left mouse button to complete the changes. With the keyboard, modify selected fields with the [↓] keys and press [ENTER].

A short description of the window's items follows:

μ § *“CPUCLK” in the following items is 16.6ns for 60MHz
and 15.1ns for 66 MHz.*

**Auto
Configuration** **Choose Enabled or Disabled.**

**Standard DRAM
CAS Precharge
Time** **Choose 2 CPUCLK or 1 CPUCLK.**
For 60 MHz:
 2 CPUCLK=2x16.6ns=33.2ns
 1 CPUCLK=1x16.6ns=16.6ns
For 66 MHz:
2CPUCLK=2x15.1ns=30.2ns
1CPUCLK=1x15.1ns=15.1ns

**Standard DRAM
RAS Precharge
Time** **Choose 5 CPUCLK or 4CPUCLK.**
For 60 MHz:
 5 CPUCLK=5x16.6ns=83ns
 4CPUCLK=4x16.6ns=66.4ns
For 66 MHz:
 5 CUPCLK=5x15.1ns=75.5ns
 4 CPUCLK=4x15.1ns=60.4ns

**EDO DRAM CAS
Precharge Time** **Choose 1 CPUCLK or 2 CPUCLK.**

**EDO DRAM RAS
Precharge Time**

Choose 3 CPUCLK or 4 CPUCLK.

Cache Tag Size:

Choose 7 bits for WB, 8 bits for WT.

Burst SRAM Type

**For Pipelined burst SRAM. Choose
Pipeline or Burst..**

**Asynchronous
SRAM Leadoff
Time**

Choose R/W:4/4 or R/W:3/3.

Asynchronous

**Choose 2 CPUCLK or 3 CPUCLK. The
Default is 2 CPUCLK.**

SRAM Burst Time

**Synchronous SRAM
Leadoff Time**

Choose 4 CPUCLK or 3 CPUCLK.

**Non-Cacheable
Block (2)**

Choose DRAM or PCI Bus. This option allows you to set the first (second) non-cacheable area from the on-board system memory (DRAM) OR MEMORY CARD.

Block Size

Choose 64K, 128K, 512K, 1M, 2M, 4M or 8M. This option sets the memory size of the first (second) non-cacheable area.

ISA Bus Clock

Choose PCICLK/4, PCICLK/3, or 7.159MHz.

**16 Bits I/O Cycle
Recovery Time**

Choose 2 BUSCLK-5BUSCLK.

**8 bit I/O Cycle
Recovery Time**

Choose 3 BUSCLK-8BUSCLK.

**16 Bit I/O Wait
States**

Choose 1 or 0

**PCI Master Read
(Write) Advanced
Snoop**

Choose Enabled or Disabled.

CPU to PCI Post

**Choose Disabled, 4 CPUCLK or 3
CPUCLK**

Write

**CPU to PCI Burst
Write**

Choose Disabled or Enabled.

**Max Burst Rang in
PCI Master**

Choose 256, 512, 1K, 2K or 4KB.

Power Management Setup

1. Double-click on the Power Mgmt icon and the following window appears:
2. Select items using the mouse or keyboard. With the mouse, use the cursor to select values and then press the left mouse button to complete the changes. With the keyboard, modify selected fields with the [↓] keys and press [ENTER].

A short description of selected window items follows:

- Power Management/APM** Choose Enabled or Disabled.
- IDE Time Out** Choose Disabled, or 10sec-15Min.. Note that some HDDs can't use this option.
- Win 95 Instant-On Support** Choose Enabled or Disabled.
- Standby Time Out** Choose Disabled , or 10sec-30min.
- Suspend Time Out** Choose Disabled, or 10 sec - 30 min.

Chapter 3 — BIOS Setup

**Standby Mode
Clock Speed**

**Choose CLK/4, CLK/8, CLK/12 or
CLK/16.**

Green PC Monitor

Choose Absent or Present.

**Green PC Monitor
State**

Choose Blank, Standby, Suspend or Off.

Video Power Down Mode Choose Disabled, Standby, or Suspend.

IDE Power Down Mode Chose Disabled, Standby, or Suspend.
Note that some HDDs can't use this option.

Video Access Choose Ignore or Monitor.

Parallel ports Choose Ignore or Monitor.

IRQ3-IRQ15 Activity Choose Ignore or Monitor.

Peripheral Management Setup

The PCI Pentium S4 system board has a on-board super I/O that supports 2 serial ports and 1 parallel port. It also provides an FDC controller that supports diskette drive A/B exchange feature. This Setup utility screen lets you control the on-board I/O ports and FDC.

1. Double-click on the **Peripheral Mgmt** icon and the following window appears.
2. Select items using the mouse or keyboard. With the mouse, use the cursor to select values and then press the left mouse button to complete the changes. With the keyboard, modify selected files with the [↓] keys and press [ENTER].

A short description of selected windows items follows:

Programming Mode **Choose AUTO or MANUAL**
Choose AUTO and the BIOS checks if there is another ISA super I/O card installed in the ISA slot. If there is an ISA super I/O card and it uses COM1 & COM2, then the on-board serial port will be set to COM3 & COM4. If there is no ISA super I/O card or if the ISA super I/O card is using COM3 & COM4, then the on-board serial port will be set to COM1 & COM2. For the parallel port, the BIOS checks first if there is an ISA card that uses LPT1, in which case the on-board serial

port will be disabled. Otherwise it will be set to LPT1.

Choose MANUAL to set these items manually.

On Board FDC

Choose Enabled or Disabled. This items enables the on-board FDC.

**Serial Port1
(Port 2)**

Choose COM1, COM3, or Disabled. The COM2 I/O port is 2F8h; the COM3 I/O port is 2E8h. COM2 and COM4 use IRQ3.

Serial Port 2 IRQ

When Programming Mode is set at “Manual”, this option can be set at different IRQs. It can be set from IRQ3 to IRQ15.

Parallel Port

Choose LPT1 or Disabled. The LPT1 I/O port is 378h and uses IRQ7.

Parallel Port IRQ

Choose IRQ7 for 378H, or IRQ5 for 3BCH.

Parallel Port Mode **Choose Extended or Normal. You can set the Parallel Extend Mode only when this item is set to Extended.**

Parallel Extend Mode **Choose EPP&SPP, ECP, ECP&EPP. The parallel port supports the standard parallel port, bi-directional parallel port (SPP) Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP).**

EPP Mode: When the EPP & SPP mode is selected the standard and bi-directional modes are also available. The EPP operates on a two phase cycle. First the host selects the register within a device for subsequent operations. Second, the host performs a series of read and/or write byte operations to the selected register. There are four operations supported by EPP: Address Write, Data Write, Address Read and Data Read. All operations are performed asynchronously.

ECP Mode: The port is software and hardware compatible with existing parallel ports so that it may be used as a standard printer mode if ECP is not required. It provides an automatic high burst-bandwidth channel that supports DMA for ECP in both the forward (host to peripheral) and reverse (peripheral to host) direction.

**ECP/EPP Mode
DMA**

**For the ECP/EPP Mode DMA, choose
DMA₀ — DMA₃.**

3. After you have finished with **Peripheral Management Setup**, press [ESC] or click the exit box to return to the Setup Window.

Utility Window

The Utility window has two icons that perform the following functions.

IDE Setup

If Drive C: — Drive E: is an IDE drive, the BIOS automatically detects the hard disk drive parameters, which appear in this screen, allowing you to easily setup the drive.

Double-click one of these icons and the following message appears:

Accept Parameters?

Click either Yes or No.

Color Set

Double-click this icon and a list box appears allowing you to choose among four color schemes for the BIOS screen.

Security Window

The Security Window has two icons that perform security functions.

Password

1. Double-click this icon and the Password keyboard appears.
2. Enter a 1-6 character password, by using either a mouse, a pen stylus, or by typing on your keyboard. The password does not appear on the screen when typed.

If you do not type any characters, and just press the [ENTER] key twice, the password is disabled.

3. The BIOS prompts you to re-enter the password to confirm.
4. Make sure “Password Checking” in the Advanced Setup is configured for “Always: or “Setup” See the section above on “Advanced Setup.”

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Keep a safe record of the new password. If you forget or lose the password, the only way to access the system is to disconnect the CMOS battery. You do this by setting the jumper cap on JB1 to short pins 3-4 and then returning the jumper cap to pins 2-3.

Anti-Virus

Double-click this icon and a list box appears, allowing you to enable or disable the Virus Protection feature. When Enabled the

BIOS issues a warning when any program or virus sends a Disk Formal command or tries to write to the boot sector of a hard disk drive.

Default Window

The default window has three icons that represent different BIOS default settings.

Original

Double-click this icon to recall your last set of previous settings. This option is convenient if you change settings and decide you wish to return to the previous setting.

Optimal

Double-click this icon for settings that provide the best performance characteristics.

Failsafe

Double-click this icon for settings that provide a more workable computer. If the computer will not boot, select this option and try to diagnose the problem after the computer boots. These settings do not give optimal performance.

This concludes Chapter Three.



Chapter 4

VGA Reference

CONFIGURING THE HARDWARE

Viewing Reassume First !

A generator 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 driver A and type :

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

Running the INSTALL Program

The 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 this Main Menu.

Procedure

- If this is your first time installation, select Setup a). We recommend that you install the utilities onto your hard drive and follow Setup B). On subsequent INSTALL sessions:
 - a) Floppy Drive - Insert Disk#1 into driver A, then type:
A:<Enter> (For driver 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>
- Starting the installation program by typing:
INSTALL<Enter>

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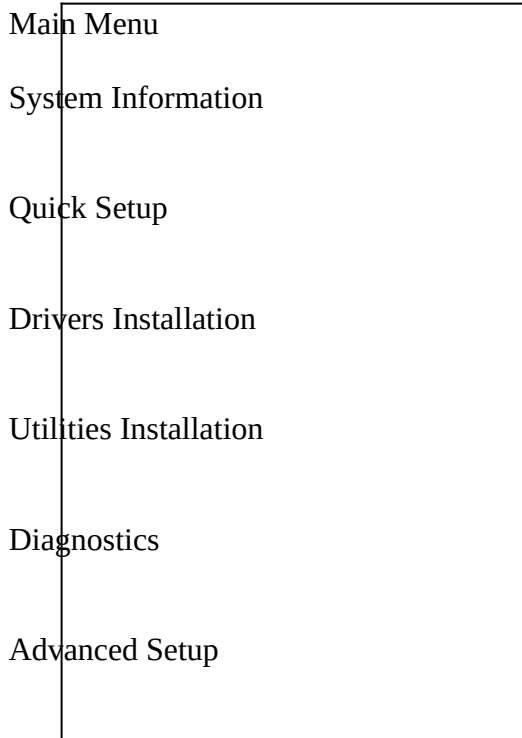
Note:

Driver installation and card setup functions are provided in the Main Menu. This menu is the starting point for installing mach64 enhanced driver and utilities and for accessing configuration and

Chapter 4 — VGA REFERENCE

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



SYSTEM INFORMATION

The program will check and display system configurations in the INFO BOX. in case of conflict, it will issue a warning and suggest

possible corrective actions.

Quick Setup

Select Quick Setup to configure the VGA accelerator to work with your monitor. As you highlight each monitor, the display specifications for that monitor selection, Additional details are given later in this chapter in the section:

- Selecting Your Monitor Type

Select the listed monitor - if your monitor is listed in this manu. Otherwise, the following paragraphs will assist you in selecting a proper Monitor Type.

Select DDC1/2B - The VESA Display Data Channel 1 or 2B specificity on if your monitor supports either DDC1 or DDC 2B. This selection enables the VGA accelerator to detect incoming monitor data and configure for optimal operation (i.e. proper resolutions, refresh rates, display size and position) for all support display modes.

Select VDIF... - if you have the 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

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

Driver Installation

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

Selecting Your Monitor Type

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The mach64 accelerator should be configured to complement the full range of display capabilities of your monitor. For optimal operation it is important you select the current Monitor Type for your monitor in the Monitor Selection Menu.

Display modes 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. The DDC BIOS RESET, READVDIF.. or CUSTOM... options are selected as follows:

| Monitor Selection Menu | |
|------------------------|---------------|
| VGA | 640x480 |
| NEC 4FG | 15" 1024x768 |
| NEC 5FG | 17" 1280x1024 |
| DDC1 Monitor | |
| Read VDIF | |
| Custom | |

Procedure

1. Select QUICK SETUP and press <enter>. This will display a Monitor Selection Menu similar to the one shown above.
2. 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 DDC1/2B compatible mach64, and your Monitor is DDC1 or DDC2B compatible, select DDC1 MONITOR or DDC2 MONITOR respectively. Otherwise,
 - c. If VESA display information Format file(VDIF) is available for your Monitor, follow the procedure in the VDIF files section
 - d. You will manually configure and test each display mode separately for optimal settings. Refer to the Custom Configuration section

Custom Configuration

If your Monitor is not listed in the Monitor selection Menu, or you are not using DDC, you can setup display modes, i.e. resolutions and refresh rates, on the card using the custom... option. This option is useful even if you had select a Monitor from the list. For example, this option can modify the screen centering or refresh rate on one resolution to your preference, while keeping all other resolution unchanged..

Procedure

1. Select CUSTOM... and press <enter>.
2. Select a resolution and press <enter>.
3. Pick a refresh rate that matches the specification of your monitor and press <enter>. 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 : Try a lower refresh rate. If the monitor produces a scrambled display at the lowest refresh rate, set that resolution to "Not Support."

4. Adjust the size and position of the box outline, then press <enter> to accept.
5. Repeat this procedure form setup 2 for all desired resolution. then press <Esc> to exit, and save the settings.

Utilize 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 DIAGNOSTIC form 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

Advance Setup

If you wish to fine tune the settings for your monitor and system type, select ADVANCE SETUP from the Main Menu. On-screen context sensitive help is provides you highlight each Advance Menu item.

Installing Enhance Drivers

Microsoft windows 3.1, Windows NT

The ATI DeskTop

An ATI DeskTop is install automatically when you install the enhanced driver for Windows. DeskTop features are follows:

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• Flexdesk+ is a handy control penal that allows you to change depth, font display, desktop size, monitor configurations screen size, screen position, color , and calibrate display color.

μ § • DPMS allows your Display Power Management Signaling compatible monitor to save up to 80% energy and extend monitor life

μ § • Desk Scan - allow you to pan and scroll across an off-screen work space of up to 2048x1536 resolution for more

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detail when using smaller monitors.

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- Win Switch - switches display modes instantly. no more compromising between high resolution modes for detailed text work and true color mode for rich, photographic colors. Toggle between windows modes without having to close applications, even with 2MB mach64 accelerator cards.

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- Screen Adjustment - enables the user to adjust the screen size and position when windows is running.

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- 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. Start Microsoft Windows to ensure it is properly. installed, then quit windows
2. Run the mach64 installation program and select DRIVER INSTALLATION from the Main Menu.
3. 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). Follows the screen instructions to completion.
4. After file copying is done, note that the Windows setup instruction on the screen, then press <Esc> to exit.
5. Exit the INSTALL program and restart windows.
6. The ATI DeskTop icon is created automatically during driver installation. Select it to customize the look-and-fell of Windows.

FlexDesk+

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FlexDesk+ is for configuring the operation modes and parameters of the mach64 accelerator. the availability of options in FlexDesk+ is panel allows you to configure Colors(colors depth), Screen size (resolution), Desktop size (Virtual Desktop size), Advance settings and Default parameters (factory setting), A Status Bar at the bottom of the panel display help information as you make your selection.

FlexDesk+ Advanced Settings

This parameter specifies logical dots per inch(LDPI). Being logical, i.e., not physical dots, the effect will differ depending on screen size. Automatic Mode chooses the optimal environment setting for the select screen size. The Small, Large and DIP setting are 96, 120 and 128 LDPI respective.

DPMS (for Windows)

VESA DPMS-Compliant monitor conserve electrical energy by powering down after a period of inactivity. you can use the DPMS panel (in windows) to configure the auto-shutdown timing sequence for your DPMS compliant monitor.

Microsoft Windows NT 3.x

The ***mach64*** drivers for Windows NT is shipped with Windows NT. Before installing the ***mach64*** driver, you must have installed Windows NT and selected VGA display. After driver installation, you may view the README.NT file for more details.

Installation Procedure

1. Run the Windows NT Setup program located in the Program Manager Main windows. Select CHANGE SYSTEM SETTING from the OPTIONS pull down menu.
2. Specify the location of ATI driver. If you have the latest ATI installation disk marked "Windows NT Driver" insert into your floppy drive.
3. Select Other, and supply the Setup program with the location of the NT files, for example, A:\NT(B:\NT if using drive B). The program will install the ATI driver.
4. Restart Windows NT

De-installation Procedure

You may de-install the mach64 driver for Windows NT using either of the setups 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 Setup program and select a non-ATI driver, for example, a VGA-Compatible driver. when you restart Windows NT, it will boot up with the noon-ATI driver you just selected.

AutoCAD 386 R10,R11,R12,R13

Installation Procedure

1. Run AutoCAD 386(protect 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 and select DRIVER INSTALLATION from the Main Menu.
3. From the list application, select AutoCAD. when asked for the source driver 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 enhance driver.
5. When driver installation is completed, exit the installation program. Refer to the README.DLD files that has been copied into your AutoCAD directory for instructions and driver configuration details.
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 files to start AutoCAD, consider adding the contents of ADIACAD to your batch file.
7. Start AutoCAD and re configure 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 3.0

The ***mach64*** accelerator hardware must be currently configured before attempting driver installation. if necessary,

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return to Configuring the Hardware for information.

Installation Procedure

1. Start OS/2. Ensure that it is using the Video Graphics Array driver and no other OS/2, DOS, or Windows application are running.
2. Insert the mach64 installation disk#1 into a floppy drive.
3. Open an OS/2 full-screen command prompt.

Note

Do not switch out of full screen to run diagnostics tests. Doing so will result in a corrupted display.

4. Type:
A:<enter>(For driver B, substitute B: for a:)
OS2INST<enter>
5. Select INSTALLATION DEVICE DRIVER from the Main Menu.
6. Select IBM OS/2 from the list of applications.
7. For up-to-date information, select READ INSTALLATION NOTES. Otherwise, select the install option to copy the mach64 driver and related files to the C:\MAC_OS2 directory.
8. Open an OS/2 windows or OS/2 full-screen command prompt.
9. Type: DSPINSTALL<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 shutdown.
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;

Notes

The resolution you select for the OS/2 driver must be a supported and enabled resolution as defined by the Monitor Type setting chosen for the card in mach64 installation program. If the OS/2 driver resolution selected here is not support ,the Monitor setting in Selecting your Monitor Type on to confirm correct configuration.

- 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-Setting 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 windows 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 driver and specify the VGA driver source directory.

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5. Select INSTALL.
6. After the driver is install, do an OS/2 shutdown.
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 driver B. substitute B: for A:)
OS2INST<enter>
10. Select INSTALL DEVICE DRIVER from the Main Menu.
11. Select IBM OS/2 from the list of applications.
12. Select UN-INSTALL OS/2 DRIVER then follow instruction on the screen.

De-Installation Procedure - OS/2 Warp 3.0

1. Open the OS/2 System folder.
2. Open the System Setup folder and the Select Install object.
3. Select PRIMARY DISPLAY and bring up the Display Driver Install panel.
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 driver B. substitute B: for A:)
OSINST<enter>

11. Select INSTALL DEVICE DRIVER from the Main Menu.
12. Select IBM OS/2 from the list of applications.
13. Select UN-INSTALL OS/2 DRIVER, then follow the instruction on the screen.

Intergraph Microstation 4.0, 5.0

Installation Procedure

1. Ensure that MicroStation is properly on your system before continuing with this procedure.
2. Run the mach64 installation program and select DRIVERS INSTALLATION from the Main Menu.
3. From the list application, select MICROSTATION. Enter the source drive and directory information, then insert the disk as prompted. When the manu appears selects, select READ INSTALLATION NOTES for help and tips on the installation.
4. Follow the instructions on screen to complete the driver installation.
5. When driver installation is completed, press <Esc> to exit.
6. Refer to the README.USE file that has been copied into your MicroStation directory for instructions and driver configuration details.

Microsoft Word (for DOS) 5.x, 6.x

The ***mach64*** drivers for Microsoft Word Support 640x480, 800x600, and 1024x768 screen resolution 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 and select DRIVER INSTALLATION from the Main Menu.
3. From the list of applications, select MICROSOFT WORD.
4. Select an appropriate Word program version. Select READ

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- INSTALLATION NOTES for tips and additional details.
5. Follows 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 driver for WordPerfect 5.1 support 800x600 and 1024x768 screen resolution 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 and select DRIVER INSTALLATION from the Main Menu.
3. From the list of application, 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 enhance driver
 - 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 instruction and driver configuration details.

Installation Procedure - WordPerfect Version 6.0

This card supports the VESA SVGA BIOS extension which supports several high resolution VESA display modes. Read additional installation notes using setup 1 to 5 in the "WordPerfect 5.1" installation procedure above.

1. The mach64 accelerator must be set up for the resolution you intend to use. If necessary, refer to Quick Installation Overview 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 the display 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 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 TSR 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.

To load this VBE program, type M64VBE<enter>. To display its supported keywords, type M64VBE ?<enter>. To unload it, type M64VBE U ↵. (Please refer to your DOS documentation for condition on unloading TSRs.)

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 saving 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.

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 again without parameters will display the current timer values, as follows:

Standby timers: 15 minutes

Suspend timers: 30 minutes

Off timers: 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 the following page. For more information, refer to the README.DPM file.

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

DPMS parameters parameters <Enter>

Example:

To set the Standby timer to 5 minutes, and disable the

Suspend and Off timers: DPMS STBY

5<enter>

DPMS Parameters

| | |
|----------|---|
| stby xxx | Places the monitor into Standby mode after xxx minutes and seconds. for example, xxx for two minutes and ten seconds is specified as 2:10 Standby is the first levels of power conservation. The monitor is instantly ready if activity is detected |
| susp xxx | Places the monitor into Suspend modes after xxx minutes and seconds. The monitor conserves more energy at this level than at standby. |
| off xxx | Places the monitor into Off mode after xxx minutes |

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| | |
|---------|--|
| | and seconds. The monitor is at highest level of energy conservation. |
| nomouse | Does not detect mouse activity. |
| quit | Support DPMS messages. |
| unload | Un-installs DPMS from system memory. |
| help | Display help messages. |

Video Mode Tables

The video modes table on the following page list all the supported resolutions and refresh rates. each row describes a single screen configuration.

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

8 bpp = 256 colors

16 bpp = 65,535 colors.

24 bpp = 16.7 million colors.

The mach64 also support 15bpp (32,767 colors). Any resolution and refresh settings that support 16bpp will

support 15bpp. Please refer to the modes tables for details.

| GRAPHICS EXPRESSION AND WINBOOST | | | | | | | | | | | |
|----------------------------------|---------|--------|-------|-------------------------|----|----|---------|-----------|----|----|-----|
| Display | Refresh | Horiz | Pixel | Colors (Bits Per Pixel) | | | | | | | |
| Screen | Rate | Freq. | Clock | 1MB DRAM | | | | 2 MB DRAM | | | |
| Resolution | (Hz) | (KHz) | MHz | 8 | 16 | 24 | *3 2 | 8 | 16 | 24 | *32 |
| 640x486 | 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 | 33.8 | 36.0 | √ | √ | — | — | √ | √ | √ | √ |
| 800x600 | 56 | 35.1 | 36.0 | √ | √ | — | — | √ | √ | √ | √ |

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| | | | | | | | | | | | |
|----------|------|------|------|---|---|---|---|---|---|---|---|
| 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 | 35.5 | 44.9 | √ | — | — | — | √ | √ | — | — |
| 1024x768 | 60 | 48.3 | 65.0 | √ | — | — | — | √ | √ | — | — |
| 1024x768 | 70 | 56.4 | 75.0 | √ | — | — | — | √ | √ | — | — |
| 1024x768 | 72 | 58.2 | 75 | √ | — | — | — | √ | √ | — | — |

| | | | | | | | | | | | |
|-----------|------|------|------|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| 1024x768 | 75 | 60.0 | 78.8 | √ | — | — | — | √ | √ | — | — |
| 1024x768 | 90 | 76.2 | 100 | — | — | — | — | √ | — | § | — |
| 1024x768 | 100 | 79.0 | 110 | — | — | — | — | √ | — | — | — |
| 1152x864 | 43-I | 45.9 | 65.0 | √ | — | — | — | √ | √ | — | — |
| 1152x864 | 47-I | 44.8 | 65.0 | √ | — | — | — | √ | √ | — | — |
| 1152x864 | 60 | 54.9 | 80.0 | √ | — | — | — | √ | √ | — | — |
| 1152x864 | 70 | 66.1 | 100 | — | — | — | — | √ | — | — | — |
| 1152x864 | 75 | 75.1 | 110 | — | — | — | — | √ | — | — | — |
| 1280x1024 | 43-I | 50.0 | 80.0 | — | — | — | — | √ | — | — | — |
| 1280x1024 | 47-I | 50.0 | 80.0 | — | — | — | — | √ | — | § | — |
| 1280x1024 | 60 | 63.9 | 110 | — | — | — | — | √ | — | — | — |

Chapter 4 — VGA REFERENCE

| | | | | | | | | | | | |
|-----------|----|------|-----|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| 1280x1024 | 70 | 74.6 | 126 | — | — | — | — | √ | — | — | — |
| 1280x1024 | 74 | 78.8 | 135 | — | — | — | — | √ | — | — | — |
| 1280x1024 | 75 | 79.9 | 135 | — | § | — | — | √ | — | — | — |

