

digital

Service Maintenance Manual

VENTURIS 486 PC

K-MN-SD00000-07-JG00.B



**MCS LOGISTICS
ENGINEERING
-
NIJMEGEN
THE NETHERLANDS**

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Revision History

Revision 0.0	This was the original release of the Service Maintenance Manual describing the VENTURIS 486 and VENTURIS Pentium series computers in its original configuration.
Revision A01	<p>This revision of the Service Maintenance Manual incorporates technical information on two different main logic boards. VENTURIS 400 and FP400 computers presently being manufactured are supplied with a different main logic board than with the original VENTURIS 400 and FP400 computers.</p> <p>NOTE 1: The terms "version 1.0 board" or "v. 1.0 board" are used throughout this Service Maintenance Manual to refer to the main logic board originally supplied with the VENTURIS 400 and FP400 computers. The terms "version 2.0 board" or "v. 2.0 board" are used to refer to the main logic board presently being supplied with VENTURIS 400 and FP400 computers.</p> <p>NOTE 2: The original Service Maintenance Manual was split into two Service Maintenance Manuals for the VENTURIS 486 PC family (EK-A0813-SV.A01) and VENTURIS PENTIUM PC family (EK-A0814-SV.A01).</p>
Revision B01	This revision of the Quick Reference Guide incorporates updated configuration for the VENTURIS 486.

Preface

The Digital VENTURIS 486 PC Family Service Maintenance Manual is a troubleshooting guide that can be used for reference when servicing the VENTURIS 486 line of PC's.

Digital Equipment Corporation reserves the right to make changes to the Digital VENTURIS 486 series without notice. Accordingly, the diagrams and procedures in this document may not apply to the computer(s) to be serviced since many of the diagnostic tests are designed to test more than one product.

**CAUTION**

Digital recommends that only A+ certified engineers attempt to repair this equipment. All troubleshooting and repair procedures are detailed to support subassembly/module level exchange. Because of the complexity of the individual boards and subassemblies, no one should attempt to make repairs at component level or to make modifications to any printed wiring board. Improper repairs can create a safety hazard. Any indications of component replacement or printed wiring board modifications may void warranty or exchange allowances.

Chapter 1

Product Description

Product Introduction

VENTURIS 486 computers are high-performance personal computers equipped with the latest in computing technology. They can be used as stand-alone computers, as clients, or as servers in a network environment. These computers are the most value packed low-profile desktop computers in their class.

The version 1.0 VENTURIS 486 computer's main logic board incorporate the following state-of-the-art technology:

- ◆ **Advanced Microprocessor**
486 @ 33 MHz SX, 50 MHz SX2, 66 MHz DX2, 100 MHz DX4.
- ◆ **Plug and Play**
Optional Plug and Play compatible expansion boards are automatically configured for easy installation.
- ◆ **Advanced Power Management**
Reduces the computer's energy consumption and operating costs.
- ◆ **Onboard Video**
S3 Trio 32 (86C732-P) technology to take full advantage of the computer's CPU and power management features.

The version 2.0 main logic board adds or modifies the following features:

- ◆ **External Cache**
Sockets for installing up to 256 KB external cache upgrades.
- ◆ **Voltage Regulation**
3 V dc voltage regulator integrated on the main logic board.
- ◆ **BIOS and BIOS Setup Utility**
Phoenix™ 4.04 BIOS includes new "quiet boot" and custom sign-on banner options.
- ◆ **Main Logic Board Jumpers**
New jumper locations and additional jumpers supporting new features.
- ◆ **Main Logic Board Connectors**
Locations of the main logic board keyboard and mouse connectors have changed.
- ◆ **Device Mapping**
Memory, I/O, and computer interrupt mapping have changed.

Product Models Information

EC = English, French, German, Italian and Spanish.

ED = Danish, Dutch, English, Finnish, French (France excluded), Norwegian and Swedish.

VENTURIS 486 Slimline Models

<i>Product</i>	<i>Model</i>	<i>FDD</i>	<i>HDD</i>	<i>Memory</i>	<i>Cache</i>	<i>Options</i>
VENTURIS 433	FR-851EC-AD	1.44MB	-	4MB	None	
	FR-851E*-WB	1.44MB	270MB	4MB	None	
	FR-851E*-WC	1.44MB	540MB	8MB	None	
	FR-851E*-01	1.44MB	270MB	4MB	None	DE205-AB Ethernet Card
VENTURIS 450	FR-852EC-AD	1.44MB	-	4MB	None	
	FR-852E*-WB	1.44MB	270MB	4MB	None	
	FR-852E*-WC	1.44MB	540MB	8MB	None	
VENTURIS 466	FR-854EC-AD	1.44MB	-	4MB	None	
	FR-854E*-WB	1.44MB	270MB	4MB	None	
	FR-854E*-WC	1.44MB	540MB	8MB	None	
	FR-854E*-WD	1.44MB	420MB	8MB	None	
	FR-854E*-WE	1.44MB	840MB	8MB	None	
	FR-854E*-WG	1.44MB	420MB	8MB	None	Quad Speed CD-ROM
	FR-854WW-CD	1.44MB	420MB	8MB	None	Quad Speed CD-ROM
	FR-854WW-CE	1.44MB	840MB	8MB	None	Quad Speed CD-ROM
	FR-854WW-CF	1.44MB	420MB	4MB	None	
	FR-854E*-13	None	270MB	4MB	None	DE203-AB Ethernet Card
FR-854E*-14	None	270MB	4MB	None	DE204-AB Ethernet Card	
FR-854E*-15	None	270MB	4MB	None	DE205-AB Ethernet Card	
VENTURIS 4100	FR-855EC-AD	1.44MB	-	4MB	None	
	FR-855E*-WB	1.44MB	270MB	4MB	None	
	FR-855E*-WC	1.44MB	540MB	8MB	None	
	FR-855E*-WD	1.44MB	420MB	8MB	None	
	FR-855E*-WE	1.44MB	840MB	8MB	None	
	FR-855E*-CD	1.44MB	420MB	8MB	None	Quad Speed CD-ROM
	FR-855WW-CD	1.44MB	420MB	8MB	None	Quad Speed CD-ROM
	FR-855WW-CE	1.44MB	840MB	8MB	None	Quad Speed CD-ROM
FR-855WW-CF	1.44MB	420MB	4MB	None		

VENTURIS 486 Full Profile Models

<i>Product</i>	<i>Model</i>	<i>FDD</i>	<i>HDD</i>	<i>Memory</i>	<i>Cache</i>	<i>Options</i>
VENTURIS FP450	FR-861EC-AD	1.44MB	-	4MB	None	
	FR-861E*-WB	1.44MB	270MB	4MB	None	
	FR-861E*-WC	1.44MB	540MB	8MB	None	
VENTURIS FP466	FR-862EC-AD	1.44MB	-	4MB	None	
	FR-862E*-WB	1.44MB	270MB	4MB	None	
	FR-862E*-WC	1.44MB	540MB	8MB	None	
	FR-862E*-WD	1.44MB	420MB	8MB	None	
	FR-862E*-WE	1.44MB	840MB	8MB	None	
	FR-862WW-CD	1.44MB	420MB	8MB	None	
	FR-862WW-CE	1.44MB	840MB	8MB	None	
	FR-862WW-CF	1.44MB	420MB	4MB	None	
VENTURIS FP4100	FR-863EC-AD	1.44MB	-	4MB	None	
	FR-863E*-WB	1.44MB	270MB	4MB	None	
	FR-863E*-WC	1.44MB	540MB	8MB	None	
	FR-863E*-WD	1.44MB	540MB	8MB	None	
	FR-863E*-WE	1.44MB	840MB	8MB	None	
	FR-863E*-WG	1.44MB	420MB	8MB	None	Quad Speed CD-ROM

Chapter 2

System Utilities & Configuration

System Utilities

This chapter describes how to use the utilities and video drivers supplied with the VENTURIS 486 computer. In most cases, these utilities and drivers have been factory installed as image files on the hard disk drive. However, before attempting to use any of the utilities or install any of the video drivers, copy all image files onto diskettes using the Create Installation Diskettes tool in *Getting Started*. Afterwards, use these diskettes to run any of the utility programs and/or to install drivers.

When utilities and video driver diskettes have been purchased, refer to the supplied MS-DOS/Windows documentation for information on creating back-up diskettes.

System utilities consist of:

- ◆ PHLASH.EXE – enables to upgrade or restore the computer's BIOS via Flash ROM.
- ◆ EPP3SMC.EXE – enables to configure the computer for EPP operation.
- ◆ Logitech mouse drivers – enable the computer to operate using a Logitech mouse.
- ◆ VGA utilities and DOS video drivers consisting of:
 - ◇ SMTR.EXE – enables to select the monitor type that matches the monitor's available resolution and refresh rates.
 - ◇ SMODE.EXE – enables to emulate or display non-standard VGA modes.
 - ◇ DOS and CAD application video drivers – provides installation instructions and, where applicable, the usage and performance tips for several S3 Trio 32 (86C732-P) video drivers.
 - ◇ README.TXT - contains information on the display drivers and instructions for configuring the computer to operate with a high resolution monitor. Additional product information not available at the time of manual printing might also be available.
 - ◇ Windows 3.x video drivers: - these files consist of S3 Trio 32 (86C732-P) video drivers.

When unfamiliar with utility programs and video drivers and their uses, carefully read and understand this chapter before attempting to use any of the utilities or installing video drivers.

PHLASH.EXE

All VENTURIS 486 computers have BIOS software in a read-only, non-volatile memory (ROM) chip. The BIOS initializes hardware and boots the operating system when the computer is switched on. The BIOS also provides access to other devices such as keyboard and disk drives.

The computer comes equipped with flash memory. This means the computer's BIOS can be restored simply by running the PHLASH.EXE utility contained on the supplied System Utilities diskette. The computer's BIOS can also be upgraded to future releases by running PHLASH.EXE along with any flash BIOS update diskette if necessary.



CAUTION

When not familiar with utility programs and their uses, carefully read and understand all of the listed topics before attempting to use PHLASH.EXE.

Have the following items available:

- ◆ Blank 3½-inch 1.44 MB formatted diskette
- ◆ Diskette copy of the system utilities

Creating a Crisis Recovery Diskette

A crisis recovery diskette should always be prepared before attempting to upgrade the BIOS. This diskette is used to reprogram the BIOS in case the flash process fails. To create a crisis recovery diskette:

- 1) Turn on the computer and allow the POST to complete. If POST detects an error refer to “*Troubleshooting*” and take the appropriate steps to correct the problem. After the problem has been resolved, restart the computer.
- 2) Insert the system utilities diskette that was created from Getting Started and make sure the following files are in the UPGRADE directory:

```
MINIDOS.SYS
PHLASH.EXE
DEVTBLS.DAT
PHLASH.INI
VENTURIS.ROM
MAKEBOOT.EXE
MAKECRD.EXE
```

NOTE This diskette also contains multilingual BIOS files that can be used to change the language type in Setup.

- 3) Create the same directory on the hard disk drive and then copy the above files to it.
- 4) Insert a blank formatted diskette into drive A.
- 5) On drive A, make a directory for the files previously copied.
- 6) From drive C: type **MAKECRD**. This copies the files to drive A.
- 7) Remove the crisis recovery diskette from drive A and store it in a safe place.

Using the Crisis Recovery Diskette

The crisis recovery diskette must be used only if the computer's BIOS fails or if a BIOS upgrade was unsuccessful.

- ◆ POST detects an error after a normal boot cycle or a BIOS upgrade.
- ◆ The BIOS in the bootblock memory executes.
- ◆ The computer beeps several times.
- ◆ The diskette drive begins searching for the crisis recovery diskette.

If the computer's BIOS fails:

- 1) Set the recovery jumper (**J21 on v1.0 & v 2.0 board**) to *enabled*.
- 2) Insert the crisis recovery diskette into drive A and power on the computer.
- 3) After the BIOS is restarted, turn off the power and remove the crisis recovery diskette from drive A.
- 4) Turn the power back on for normal operation.

Upgrading the Computer BIOS

NOTE If this is the first time using these utility programs and/or video drivers it is recommended to follow the procedures in the order given.

The following utilities and video drivers enable to upgrade or restore the computer's BIOS and take full advantage of its enhanced video features:

- 1) Turn on or reboot the computer. If POST detects an error, refer to "*Troubleshooting*" for possible causes and suggested solutions.
- 2) If necessary, run PHLASH.EXE to upgrade or restore the computer's BIOS.
- 3) Run EPP3SMC.EXE to configure the computer for EPP operation.
- 4) Run SMTR.EXE to select the monitor type that matches the monitor's available resolution and refresh rates.
- 5) If necessary, run SMODE.EXE to emulate or display a non-standard VGA mode.
- 6) Install any applicable DOS or CAD application drivers.
- 7) Install any Windows 3.x video drivers.

Perform the following steps to update the computer's BIOS in the flash memory:

- 1) Turn on the computer and allow the POST to complete. If POST detects an error refer to "*Troubleshooting*" and take the appropriate steps to correct the problem. After the problem has been resolved, restart the computer.
- 2) Create a crisis recovery diskette when not already done so. Refer to "*Creating a Crisis Recovery Diskette*".
- 3) Insert the system utilities diskette.
- 4) At the MS-DOS prompt, enter the following commands (press [Enter] after each command):

```
a:
  cd\UPGRADE
  PHLASH /e
```

A screen appears on the monitor warning that you are about to erase the computer's BIOS.

- 5) Press [Enter] to continue. Else, press [Esc] to cancel.
Once [Enter] has been pressed, PHLASH.EXE automatically updates the computer's BIOS.
After the flashing process completes, the computer automatically reboots itself so changes immediately take effect.
- 6) Remove the system utilities diskette.

EPP3SMC.EXE

EPP3SMC.EXE can be executed as an MS-DOS command or added to the CONFIG.SYS file as a device driver. In either case, use the BIOS Setup utility to set the parallel port to EPP mode.

Video Drivers & Utilities

The following topics describe how to use the video utilities and install video drivers on the computer.

SMODE.EXE
SMTR.EXE
DOS Video Drivers
Windows 3.x Drivers

Setting High Resolution Mode for the Monitor Display

To use the high resolution modes on the computer, perform the following steps:

- 1) Use the BIOS Setup utility to set correctly the Video System option.
- 2) Use SMTR.EXE from the VGA Utilities and DOS Video Drivers diskette to set correctly a Monitor Type.
- 3) Use Windows Setup to copy the appropriate video driver into Windows.



CAUTION

Do not connect a low resolution monitor to a system that has been configured with high-resolution video drivers. High resolution drivers can damage a 640 x 480 monitor.

SMODE.EXE

The SMODE utility allows the main logic board's video circuitry to emulate and display non-standard VGA modes. With SMODE, software applications written for the following non-VGA modes may be ran:

- ◆ Monochrome adapter (MDA)
- ◆ Color graphics adapter (CGA)
- ◆ Expanded graphics adapter (EGA)
- ◆ Hercules monochrome graphics adapter (HGC)

The following procedure describes how to access SMODE:

- 1) Turn on or reboot the computer and allow POST to complete.
- 2) Insert the VGA Utilities and DOS Video Drivers diskette into drive A.
- 3) Type **A** : then press [Enter].
- 4) Type **CD \UTILS** and press [Enter].
- 5) Run the SMODE.EXE utility following the instructions on the monitor screen.

<i>If you want to</i>	<i>Type SMODE followed by</i>	<i>Example</i>
Display a non-standard VGA mode	<hex mode #> VGA	SMODE 55 VGA
Emulate a non-VGA mode	Either EGA, CGA, MDA, or Hercules	SMODE MDA

NOTE VGA modes and corresponding hexadecimal numbers are listed in the release notes supplied with the computer. SMODE MDA allows the main logic board's video circuitry to emulate a monochrome adapter.

SMTR.EXE

The video controller's monitor type selection must match the monitor's available resolution and refresh rates. These monitor resolution and refresh rates are listed in the monitor's support documentation and in the SMTR.EXE utility.



CAUTION

Do not select a monitor type setting that exceeds the monitor's resolution, refresh rate (vertical synchronization), and interlace or non-interlace specifications. Refer to the monitor's support documentation for performance specifications.

To select the correct monitor type:

- 1) Turn on or reboot the computer and allow POST to complete.
- 2) Insert the VGA Utilities and DOS Video Drivers diskette into drive A.
- 3) Type **A** : then press [Enter].
- 4) Type **CD \UTILS** and press [Enter].
- 5) Type **SMTR** and press [Enter].
- 6) Select the correct monitor type following the instructions on the monitor screen.
For example, if you want to run the monitor at a resolution of 1024 768, select 1024x768@70Hz/NL.
- 7) Exit the SMTR.EXE utility following the instructions on the monitor screen.

DOS Video Drivers

These files contain installation instructions and, where applicable, the usage and performance tips for various DOS and CAD applications.

Installing DOS or CAD application video drivers differ with each software application. Specific instructions are located in the README.TXT file and in the appropriate DOS or CAD application directories and files.

Windows 3.x Drivers

These files contain the available S3 Trio 32 (86C732-P) video drivers for Windows 3.x. Depending on how the computer is configured and what software applications are planned to be used, it may be necessary to install one or more of these drivers to optimize the capabilities of the computer.

Before installing a video device driver, read and understand the information in any associated README file.

To install a Windows 3.x video driver, perform the following:

- 1) Type **CD WINDOWS** at the **C:\>** prompt, then press [Enter].
The following prompt appears: **C:\WINDOWS>**.
- 2) Type **SETUP** and press [Enter].
The computer displays the SETUP screen.
- 3) Select the **Display** option and press [Enter].
- 4) Toggle through the **Display** option to select the appropriate Windows 3.x driver.
- 5) Select the desired video resolution then press [Enter].
- 6) If the appropriate video driver resides on a separate diskette, toggle through the **Display** option to select **Other** (Requires disk provided by hardware manufacturer).
- 7) Insert the diskette that contains the appropriate video driver and press [Enter].
- 8) Select the desired video resolution then press [Enter].

NOTE The resolution and refresh rate must be the same as the selection made using the **SMTR.EXE** utility. The video setup screen appears again with the S3 driver.

- 9) Press [Enter] to accept the configuration.
- 10) The MS-DOS prompt appears when SETUP completes.
- 11) Type **WIN** and press [Enter] to start Microsoft Windows.

BIOS Setup Utility

The information listed below explains how to configure the computer using the BIOS Setup utility. If the computer was delivered with factory-installed software, it has already been configured.

When familiar with utility programs and their uses, refer to the material in the options table when updating the computer. Otherwise, carefully read and understand all the information in this chapter before attempting to modify the computer's configuration settings.

Running the BIOS Setup Utility

The BIOS Setup utility enables to select and permanently store information about the computer's hardware and software in the battery-backed memory of the CMOS RAM. This information takes effect each time the computer boots and can be changed each time you run setup.

Use the BIOS Setup utility when experiencing problems with the hard disk or need to reconfigure the computer. In addition, the BIOS Setup utility might need to be used to modify the configuration after adding or removing hardware, or changing computer settings.

To run the BIOS Setup utility:

- 1) Turn on the computer and allow POST to complete.
- 2) Make a note of any configuration errors listed, and then press **[F2]** to display the main menu.
- 3) Follow the instructions on the monitor screen and any on-line help pop-up screens to configure the computer.

NOTE	<ol style="list-style-type: none">1) The VENTURIS 486 computer is currently equipped with a new main logic board that contains a Phoenix 4.04 BIOS.2) Additional/modified BIOS Setup utility options are displayed in <i>bold italics</i> for the Version 2.0 Main Logic Board.3) BIOS Setup Menu Fields and Settings often change with new BIOS version releases. Always use on-screen information for the latest BIOS Setup functionality.
-------------	---

Helpful Hints

- ◆ Several keyboard function keys and numeric keypad keys are assigned to help select menus and options, change option values, and display help information. These keys are displayed at the bottom of the main menu and from the General Help pop-up screen.
- ◆ Item-specific help is available anytime during the setup process and appears at the right of the setup screen each time an option is highlighted. This on-line help provides information about a highlighted option.
- ◆ Select "*Save Changes & Exit*" to save all Setup values.
- ◆ Select "*Discard Changes & Exit*" to exit Setup without recording any changes.
- ◆ Select "*Get Default Values*" to set all Setup options to their default values.
- ◆ Select "*Load Previous Changes*" to restore all CMOS values from the last session.
- ◆ Select "*Save Changes*" to save all selections without exiting Setup.
- ◆ Press **[Esc]** to exit the Setup utility.

BIOS Setup Utility Options

Main Menu Options

<i>Menu Field</i>	<i>Settings</i>	<i>Comments</i>
System time	Current time	Displays the current time.
System date	Current date	Displays the current date.
Language	English Español Français Deutsch Italiano	The system utilities diskette contains all the languages listed as possible settings. Use the PHLASH.EXE program and the desired language BIOS file to load a different language. The BIOS Setup utility choices are English and one other language. For example, English and French, English and German, depending on the language kit that has been ordered.
Diskette A / Diskette B	1.44 MB, 3½ 2.88 MB, 3½ Not Installed 360 KB, 5¼ 1.2 MB, 5¼ 720 KB, 3½	Sets the size and density of diskette drives.
Video system	EGA / VGA CGA 80x25 Monochrome	Sets the video controller type.
System memory	Not user selectable	Displays the amount of base (conventional) memory each time the computer boots.
Extended memory	Not user selectable	Displays the amount of extended memory each time the computer boots.

Main Menu Options, Addendum for Version 2 Main Logic Board

<i>Menu Field</i>	<i>Settings</i>	<i>Comments</i>
Extended memory report	Compatibility	Selects the BIOS report mechanism for memory amount. Select Compatibility when using a conventional operating system.
	Non- compatibility	Select Non-Compatibility for extended memory above 64 MB under Windows NT v3.1.
Quiet boot	Enabled	Enabled inhibits the display of POST messages and instead, displays the Digital logo.
	Disabled	Disabled allows the display of POST messages when booting.

Boot Options

Menu Fields	Settings	Comments
Boot sequence	A: then C: C: then A: C: only	Each time the computer boots, it will load the operating system from the sequence selected.
SETUP prompt	Enabled Disabled	Enables or disables the <F2> setup prompt each time the computer boots.
POST errors	Enabled Disabled	Enabling this options causes the computer to pause and display a setup entry or resume the boot prompt if an error occurs at boot. Disabling this option causes the computer to always attempt to boot regardless of a setup entry or error.
Floppy check	Enabled Disabled	Enabling this option causes the computer to verify the diskette type each time the computer boots. Disabling this option speeds up the boot process.
Summary screen	Enabled Disabled	Enabling this option causes the computer to display configuration parameters (in the form of a summary screen) during boot.

Fixed Disk Setup Options

IDE Adapter 0/1 Master/Slave

Menu Fields	Settings	Comments
Autotype fixed disk		Press [Enter] to detect and fill in the installed hard disk drive parameters in the remaining fields.
Type	None to 39 User	Selecting None to 39 automatically fills in the remaining fields in this menu. Selecting User prompts to fill in the remaining fields with the installed hard disk drive's parameters.
Cylinders	0 to 4095	Displays the number of cylinders.
Heads	1 to 64	Displays the number of heads.
Sectors/track	0 to 63	Displays the number of sectors/tracks.
Landing zone	0 to 4095	Displays the number of cylinders specified as the landing zone for read/write heads.
Write precomp	0 to 4095 None	Displays the number of cylinders that have their write timing changed.
Multi-sector transfers	2 blocks 4 blocks 8 blocks 16 blocks Auto	Determines the number of sectors per block for multiple sector transfers. Auto refers to the size the disk returns when queried.
LBA control mode	Disabled Enabled	Enables or disables the LBA hard disk drive addressing option.
32 bit I/O	Disabled Enabled	Enables or disables the 32-bit hard disk drive data transfer option.

Fixed Disk Setup Options (continued)

<i>Menu Fields</i>	<i>Settings</i>	<i>Comments</i>
Transfer mode	Fast PIO3 Standard Fast PIO1 Fast PIO2	Selects the method of data transfer to and from the hard disk drive Autotype the hard disk drive to select the optimum transfer mode.
Drive read ahead	Enabled Disabled	This option enables or disables the drive read ahead option.

Keyboard Features

<i>Menu Fields</i>	<i>Settings</i>	<i>Comments</i>
Numlock	Auto On Off	Turns Numlock on or off each time the computer boots.
Key click	Disabled Enabled	Enables or disables the audible key click feature.
Keyboard auto-repeat rate	2/sec 6/sec 10/sec 13.3/sec 18.5/sec 21.8/sec 26.7/sec 30/sec	Sets the number of times a second to repeat a keystroke while holding the key down.
Keyboard auto-repeat delay	1/4 sec 1/2 sec 3/4 sec 1 sec	Sets the delay time after a key is held down before it begins to repeat a keystroke.

Memory and Cache Options

<i>Menu Fields</i>	<i>Settings</i>	<i>Comments</i>
Internal cache	Enabled Disabled	Enables or disables the computer's internal cache.
External cache	Enabled Disabled	Enables or disables the computer's external cache.
System BIOS shadow	Enabled Disabled	Enables or disables the computer's BIOS shadowing option.
Cache System BIOS	Enabled Disabled	Enables or disables the computer's BIOS caching option.
Video BIOS shadow	Enabled Disabled	Enables or disables the computer's video BIOS shadowing option.

Memory and Cache Options (continued)

Menu Fields	Settings	Comments
Cache Video BIOS	Enabled Disabled	Enables or disables the computer's video BIOS caching option.
Shadow Option ROM's: C800h- CFFFh D000h- D7FFh D800h- DFFFh	Enabled Disabled	Allows to enable or disable shadowing of individual segments of ROM to increase computer performance.
AT bus space	Disabled F80000h, .5MB F00000h, 1MB E00000h, 1/2MB C00000h, 4MB	Memory hole not available upper memory is contiguous. Sets the memory hole at address F80000 with 0.5 MB memory available. Sets the memory hole at address F00000 with 1 MB memory available. Sets the memory hole at address E00000 with 1 or 2 MB memory available. Sets the memory hole at address C00000 with 4 MB memory available.

Advanced Chip Set Control

Menu Fields	Settings	Comments
VGA feature connector	Enabled Disabled	Use with VGA and non-VGA add-in cards to inform card not to claim VGA palette writes. Use to inform VGA add-in cards to claim VGA palette writes.
Monitor type	Auto Color Monochrome	Select color or monochrome if auto fails to detect the monitor type connected to the computer.

Advanced Chip Set Control, Addendum for Version 2 Main Logic Board

<i>Menu Fields</i>	<i>Settings</i>	<i>Comments</i>
VGA palette snoop	Enabled Disabled	This option controls how VGA devices handle accesses to their palette areas. Enabling this option causes special palette behavior (a device must not respond to normal accesses). Disabling this option causes a device to treat palette accesses like any other device access. Enable VGA Palette Snoop when a second video adapter is connected to the feature connector of the installed VGA adapter for multi-media devices.
Onboard VGA IRQ	Enabled Disabled	Select Enabled if the application requires VGA IRQ.

Integrated Peripherals

<i>Menu Fields</i>	<i>Settings</i>	<i>Comments</i>
Mouse port	Disabled Enabled	Enables or disables the mouse port.
Parallel port	Auto Disabled 378, IRQ 7 3BC, IRQ 7 278, IRQ 5	Enables or disables the onboard port at the specified address.
Parallel port mode	Compatible mode	Compatible mode - standard printer connection.
	Bi-directional mode	Bi-directional mode - PS/2 compatible mode and able to receive data.
	ECP mode	Extended character port mode.
	EPP V1.7 EPP V1.9	Extended parallel port mode.
Serial port 1	Auto Disabled 3F8, IRQ 4 2F8, IRQ 3 3E8, IRQ 4 2E8, IRQ 3	Enables or disables onboard serial port 1 at the specified address.
Serial port 2	Auto Disabled 3F8, IRQ 4 2F8, IRQ 3 3E8, IRQ 4 2E8, IRQ 3	Enables or disables onboard serial port 2 at the specified address.

Integrated Peripherals (continued)

Menu Fields	Settings	Comments
Diskette controller	Enabled Disabled	Enables or disables the onboard diskette controller.
Exchange diskette drives	Disabled Enabled	Enables to logically exchange physical diskette drive designations.
Diskette write protection	Disabled Enabled	Enables or disables the selected diskette drive's write protect option.
IDE adapter 1	Enabled Disabled	Enables or disables the onboard IDE controller.

Large Disk Access Mode

Menu Fields	Settings	Comments
Large disk access mode	DOS Other	Select DOS when MS-DOS has been installed. Select Other another operating system has been installed.

Power Options

Menu Fields	Settings	Comments
Power management	Enabled Disabled	Enables or disables the computer's power management options.
Monitor suspend timer	Disabled 1 min.,5 min. 10 min.,20 min. 30 min.	Allows to disable the monitor suspend feature, or after a set period of keyboard, mouse, or keyboard controller inactivity, allows to place the monitor in a suspend state (minimum power saving state).
Monitor off timer	Disabled 1 min.,5 min. 10 min.,20 min. 30 min.	Allows to disable the monitor off feature, or after a set period of keyboard or mouse inactivity, allows to place the monitor in an off state (one-half power saving state).
Hard disk suspend timer	Enabled Disabled	Allows to disable or enable the hard disk suspend timer feature or after a set period of disk drive inactivity (approximately 21 minutes), allows the hard disk drive to spin down its motor to save power.
System suspend timer	Disabled 30 min. 1 hour 1.5 hours 2 hours 3 hours 6 hours 12 hours	Allows to disable the system suspend feature, or after a set period of computer inactivity, allows to place the computer in a suspend state (maximum power saving state).
Quick suspend	Enabled Disabled	Enabling this option allows to put the computer in suspend mode by pressing [Ctrl] + [Alt] + [Esc].

Security Options

Menu Fields	Settings	Comments
Supervisor password is	Enabled Disabled	Tells whether or not the supervisor's password is enabled or disabled.
User password is	Enabled Disabled	Tells whether or not the user's password is enabled or disabled.
Set supervisor password	Press [Enter]	Enables to set a supervisor password.
Set user password	Press [Enter]	Enables to set a user password.
Password on boot	Enabled Disabled	Enables or disables the enter password on boot option.
Diskette access	Supervisor User	Enables to control who has access to diskette drives.
Fixed disk boot sector	Normal Write protect	Enables to write protect the boot sector on the hard disk drive.
Network server	Enabled Disabled	Enabling this option keeps the computer from being accessed during network operation.
System backup reminder	Disabled Daily Weekly Monthly	Enables or disables the system backup reminder message.
Virus check reminder	Disabled Daily Weekly Monthly	Enables or disables the virus check reminder message.

Security Options, Addendum for Version 2 Main Logic Board

Menu Fields	Settings	Comments
Custom sign on banner is	Not user selectable	Tells if the custom sign on banner is enabled or disabled.
Custom sign on banner	Press [Enter]	Press [Enter] to enter a custom sign on banner that displays during POST. For example, you might enter "Welcome to John's machine". Up to two lines of text may be entered; the maximum number of characters is 50 per line.

Chapter 3

Service Procedures

Safety Requirements

**WARNING**

Static electricity collects on non-conductors such as paper, cloth, or plastic. A static discharge can be damaging even though you often cannot see or feel it.

The following safety precautions must be observed to insure product and personal safety and prevent damage to circuit boards and/or components:

- ◆ Always wear an ESD wrist strap when handling ESD sensitive material and be sure it is properly connected.
- ◆ Keep circuit boards and components away from non-conductors.
- ◆ Keep clothing away from circuit boards and components.
- ◆ Keep circuit boards in anti-static bags.
- ◆ Be cautious when AC power is exposed when working on an assembly.
- ◆ Always use an ISOLATION TRANSFORMER when diagnosing any terminals, monitors or power supplies when AC power is applied.
- ◆ Be cautious of very high voltage potentials when working with monitors.

There should be an approved insulating mat (for technician safety) in front of any workbench where monitors, terminals or power modules are being serviced when power is applied.

NOTE Do NOT wear ESD straps when working on terminals, monitors or power supplies when AC power is applied. This is to avoid the hazard of electrical shock.

Recommended Tools

The following tools will be needed for servicing Digital PC systems. Note that test equipment must be in calibration.

- ◆ Multimeter (4 1/2 digit)
- ◆ A philips screwdriver
- ◆ An antistatic wrist strap

Other Needed Materials

Cleaning agent should be an all purpose cleaner that is used in-house.

Required Special Tools

None.

Remedial Diagnostic Test Software

- ◆ *QAPLUS/fe* , PC Advanced Diagnostic Software, latest version.
Partnumber : 22-00908-06

Recommended Virus Detection and Cleanup Software

- ◆ *F-PROT*, Virus Detection and Cleanup Software, latest version.

Network locations:

North America, South America, Australia and New Zealand:

MINOTR::USER6:[VIRUS.F-PROT]

Europe, Africa, Middle and Far East:

VARDAF::EUROPUB:[VIRUS_SCANNER.F-PROT]

ECO/FCO Information

BIOS version information.

Refer to the Digital DECpc Bulletin Board Support , for the latest information on BIOS upgrades

Network locations:

North America, South America, Australia and New Zealand:

PCBUHD::DKB300:[WC30.BBSFILES]

Europe, Africa, Middle and Far East:

SUTRA::D6:[PUBLIC].

Unlocking and Removing Cover

**WARNING**

You might injure yourself or damage the computer when attempting to remove the cover before unplugging ac and monitor power cords.

The computer's cover must be removed prior to installing any hardware option.

To remove the cover:

- 1) Unlock cover.
- 2) Lift both side locks out, then turn towards front of computer to release cover from chassis.
- 3) Carefully slide cover toward front of chassis until it clears lip of front bezel.
- 4) Carefully lift cover from chassis.

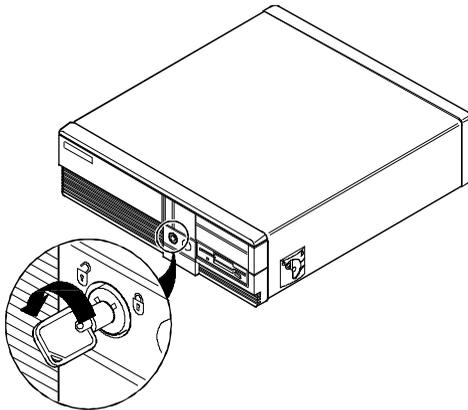
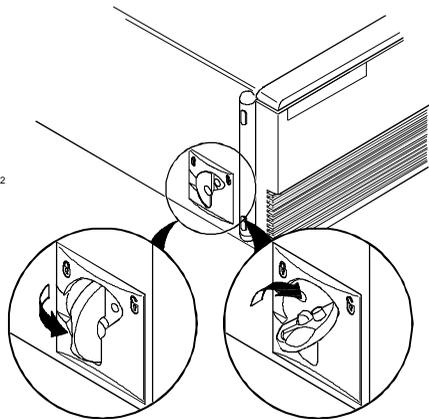


Figure 3 - 1 Unlocking the Cover

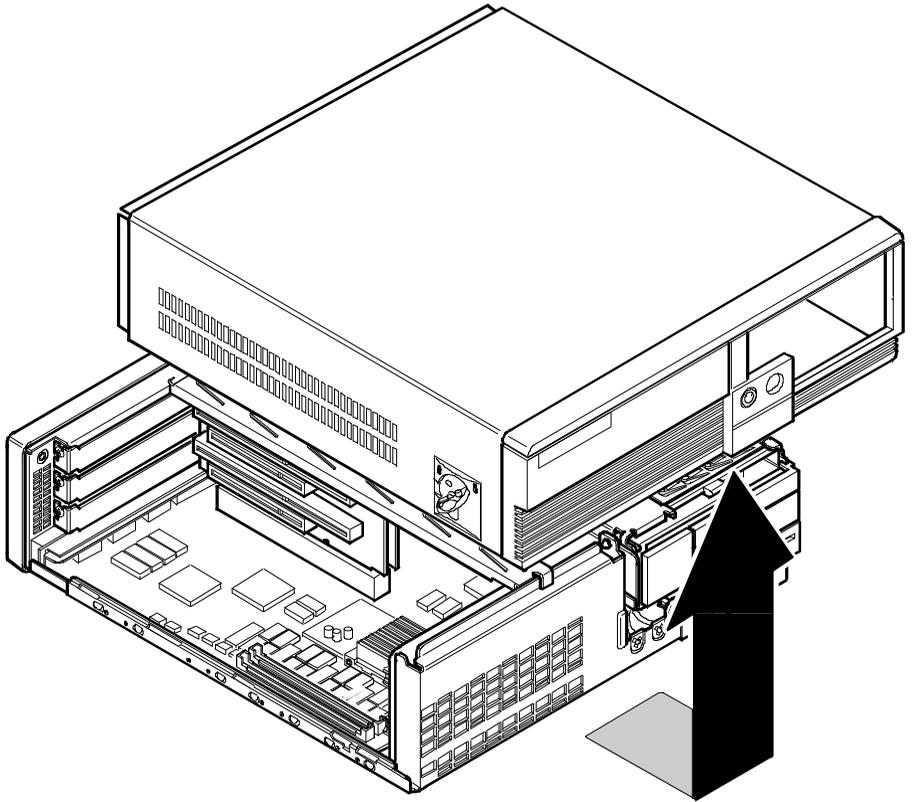
DEC00278-2



DEC00343-2

Figure 3 - 2 Releasing the Cover

Unlocking and Removing Cover (continued)



DEC00505-2

Figure 3 - 3 Removing the Cover

Computer Components

VENTURIS 486 Slimline Models

<i>Legend</i>	<i>Description</i>
A	Power supply
B	Main logic board (Version 1.0 or 2.0)
C	3½-inch diskette drive
D	Front access drive bay
E	Front internal drive bay
F	Riser card (3 ISA expansion boards)
G	Rear internal drive bay (under power supply)

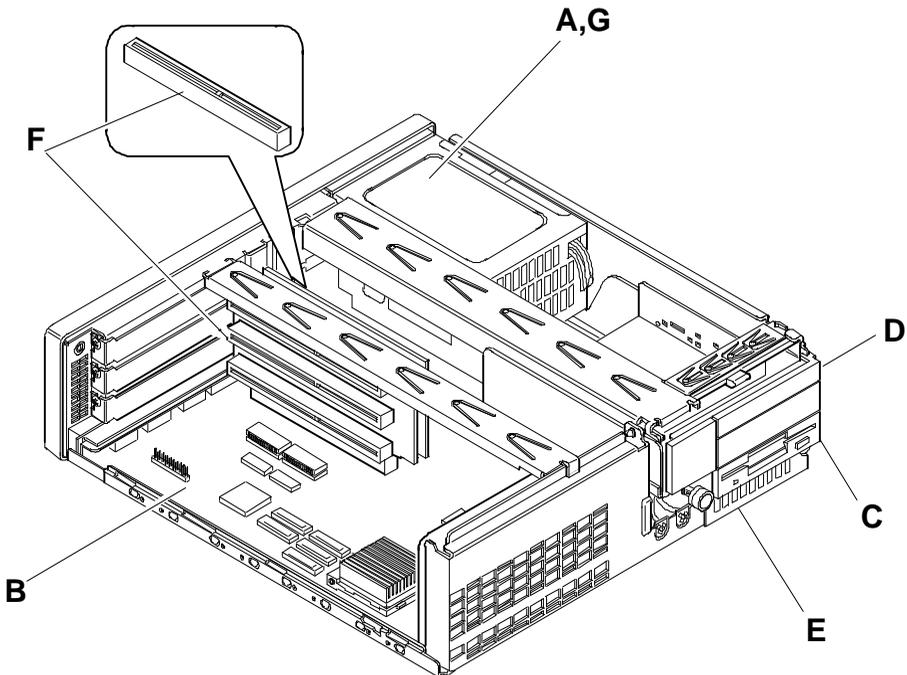
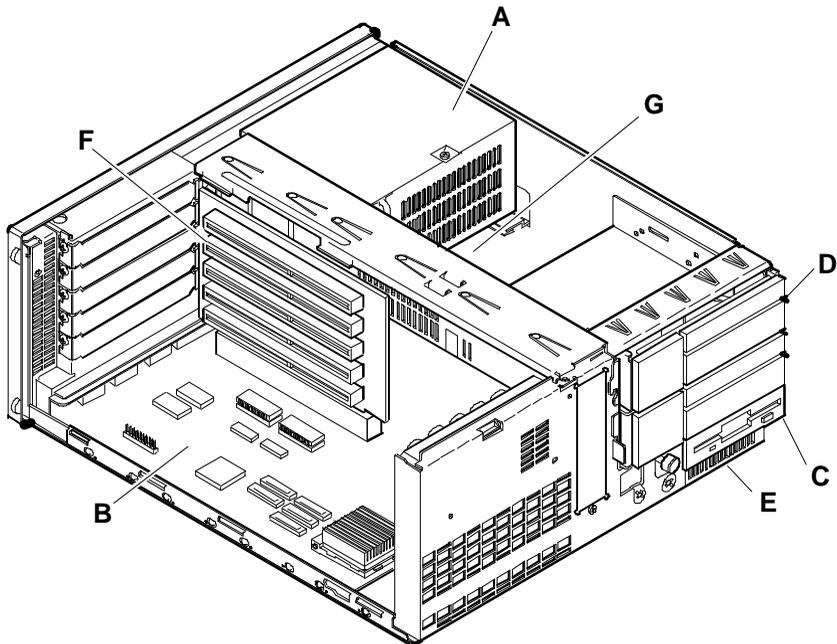


Figure 3 - 4 VENTURIS 486 Slim Line Models

VENTURIS 486 Full Profile Models

Legend	Description
A	Power supply
B	Main logic board (Version 1.0 or 2.0)
C	3½-inch diskette drive
D	Front access drive bay
E	Front internal drive bay
F	Riser card (5 ISA expansion boards)
G	Rear internal drive bay (under power supply)

**Figure 3 - 5 VENTURIS 486 Full Profile Models**

Expansion Slots

The computer automatically assigns the necessary resources to any installed Plug and Play-compatible expansion board so it operates at maximum performance. If installation of non-Plug and Play expansion boards is planned, you might need to manually set jumpers on the board based on the computer resources already allocated.

VENTURIS 486 Slim Line Models Expansion Slots

The VENTURIS 486 Slim Line computer models contain four slots for installing up to three industry-standard 16-bit ISA expansion boards and one ISA "Personality" expansion board. The three industry-standard slots are located on the computer's riser card.

<i>Expansion Slot</i>	<i>Slot Type</i>	<i>Description</i>
J4	ISA	Supports full-length industry-standard 16-bit ISA expansion boards. Uses the top expansion slot at the rear panel.
J3	ISA	Supports full-length industry-standard 16-bit ISA expansion boards. Uses the middle expansion slot at the rear panel.
J2	ISA	Supports half-length industry-standard 16-bit ISA expansion boards. Uses the bottom expansion slot at the rear panel.
J26	ISA	Supports non-standard, half-length ISA expansion boards. Uses the "Personality" slot at the rear panel.

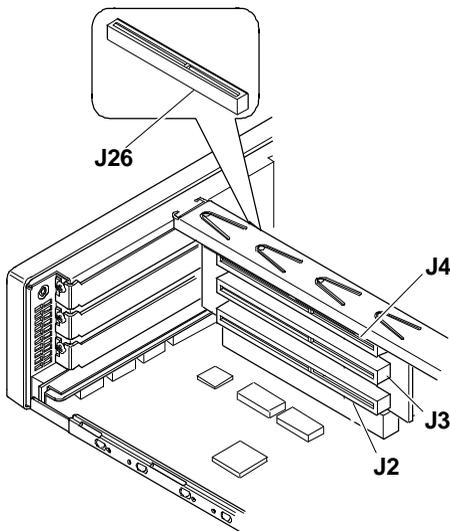


Figure 3 - 6 VENTURIS 486 Slimline Models Expansion Slots

VENTURIS 486 Full Profile Models Expansion Slots

The VENTURIS 486 Full Profile computer models contain six slots for installing up to five full-length and one half-length ISA expansion boards. These five slots are located on the computer's riser card; the sixth (personality slot) is on the main board.

Expansion Slot	Slot Type	Description
J3 to J6	ISA	Supports full-length industry-standard 16-bit ISA expansion boards. Uses the top four expansion slots at the rear panel.
J2	ISA	Supports half-length industry-standard 16-bit ISA expansion boards. Uses the fifth expansion slot at the rear panel.
J26	ISA	Supports full-length industry-standard 16-bit ISA expansion boards. Uses the personality slot on the main logic board.

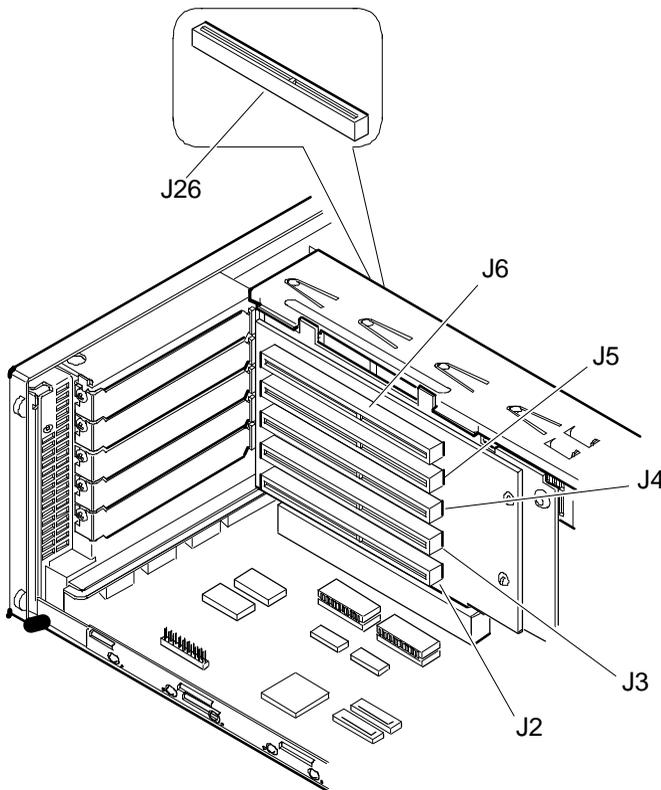


Figure 3 - 7
VENTURIS 486 Full
Profile Models
Expansion Slots

Main Logic Board Jumpers

Jumper pins allow to set specific computer parameters. They are set by changing the pin location of jumper blocks. Note that the square pin of each jumper block is pin 1. A jumper block is a small plastic-encased conductor (shorting plug) that slips over the pins. To change a jumper setting, remove the jumper from its current location. Place the jumper over the two pins designated for the desired setting. Press the jumper evenly onto the pins. Be careful not to bend the pins.



CAUTION

Do not touch any electronic component unless you are safely grounded. Wear a grounded wrist strap or touch an exposed metal part of the system box chassis. A static discharge from your fingers can result in permanent damage to electronic components.

VENTURIS 486 version 1.0 Main Logic Board Jumper Settings

Settings shown in *bold italics* are factory defaults.

Feature	Description	Setting
CPU type	AM486DXL, AM486DXL2 <i>Others</i>	J1 and J2, jumpered <i>J1 and J2, open</i>
MFG testing	MFG test <i>Normal</i>	J3, jumpered <i>J3, open</i>
CPU type	AM486DXL, AM486DXL2 <i>Others</i>	J4, pins 2 and 3 jumpered <i>J4 pins 1 and 2 jumpered</i>
CPU type	P24T, P24D, AM486DXL, AM486DXL2 <i>Others</i>	J9, pins 1 and 2 jumpered <i>J9, pins 2 and 3 jumpered</i>
CPU type	AM486DXL, AM486DXL2 <i>Others</i>	J10, pins 2 and 3 jumpered <i>J10, pins 1 and 2 jumpered</i>
CPU clock	40 MHz 66, 100 MHz <i>50 MHz</i>	J14, jumpered J15, open J14, open J15, jumpered <i>J14, open</i> <i>J15, open</i>
Snoop select	<i>Enable</i> Disable	<i>J18, pins 1 and 2 jumpered</i> J18, pins 2 and 3 jumpered
Onboard VGA	<i>Enable</i> Disable	<i>J19, pins 2 and 3 jumpered</i> J19, pins 1 and 2 jumpered
Recovery mode	Recovery mode <i>Normal</i>	J21, jumpered <i>J21, open</i>
Password clear	Password clear (MFG test) <i>Normal mode</i>	J23, jumpered <i>J23, open</i>

VENTURIS 486 version 1.0 Main Logic Board Jumper Locations

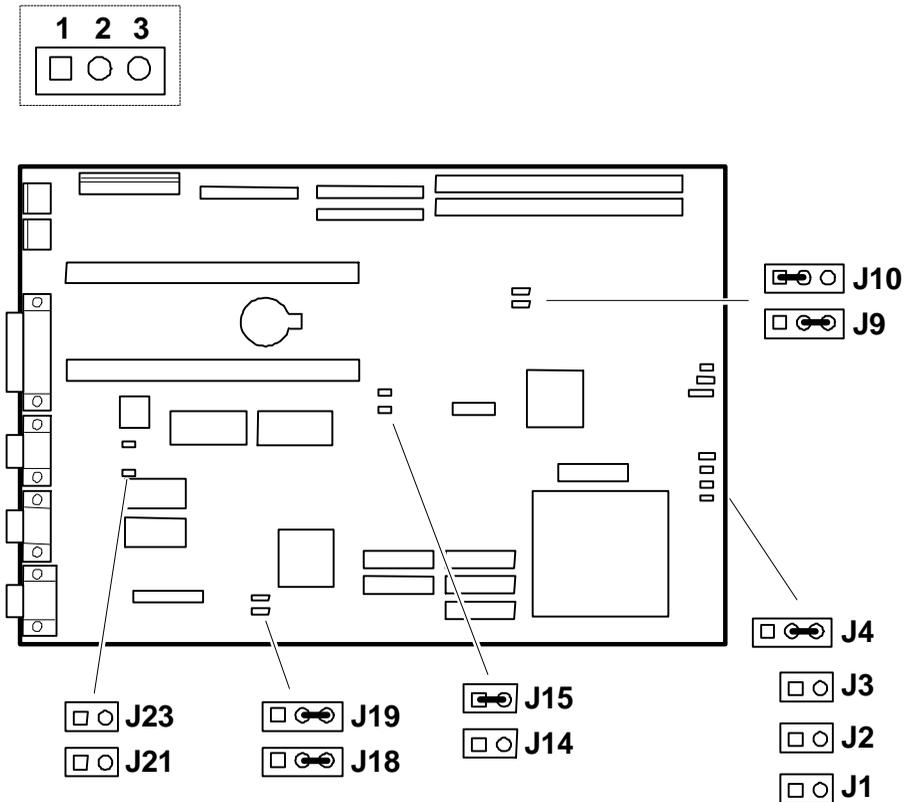


Figure 3 - 8 VENTURIS 486 version 1.0 Main Logic Board Jumpers Locations

VENTURIS 486 version 2.0 Main Logic Board Jumper Settings

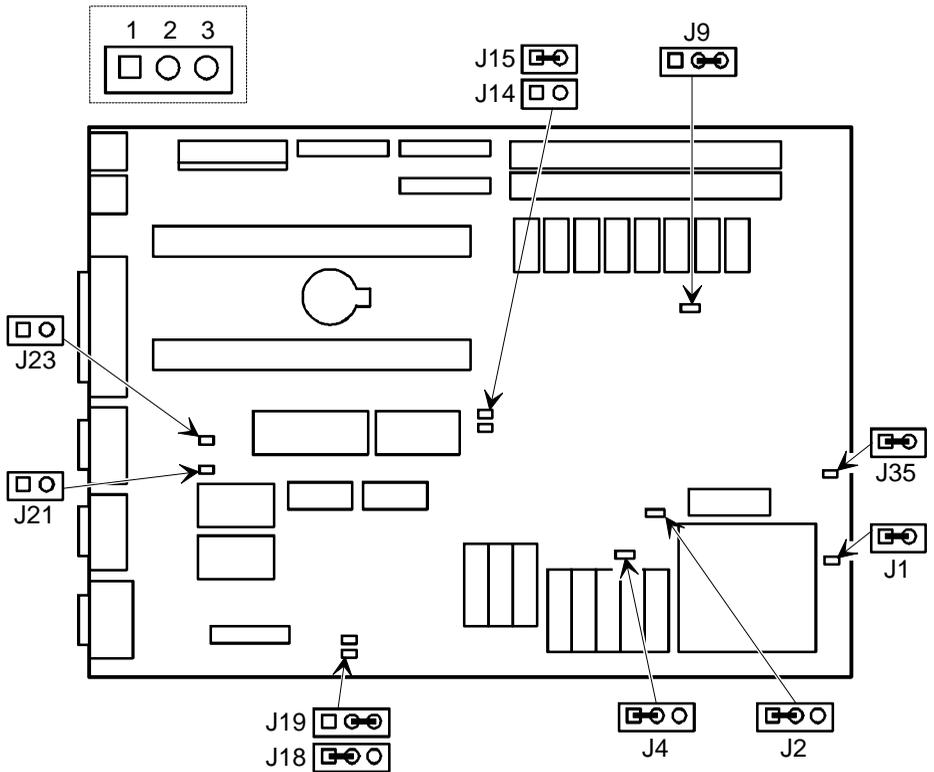
Settings shown in *bold italics* are factory defaults.

Feature	Description	Setting
CPU clock	25 MHz	J14, open J15, open
	<i>33 MHz</i>	<i>J14, open</i> <i>J15, jumpered</i>
	40 MHz	J14, jumpered J15, open
CPU select	P24D, P24T <i>Others</i>	J9, pins 1 and 2 jumpered <i>J9, pins 2 and 3 jumpered</i>
CPU select	<i>AMD DX2</i> Others	<i>J35, jumpered</i> J35, open
Cache size select	<i>128 KB</i>	<i>J2, pins 1 and 2 jumpered</i> <i>J4, pins 1 and 2 jumpered</i>
	256 KB	J2, pins 2 and 3 jumpered J4, pins 2 and 3 jumpered
WT/WB select	<i>Write-through</i> Write-back	<i>J1, jumpered⁽¹⁾</i> J1, open ⁽²⁾
Recovery mode	Recovery mode <i>Normal</i>	J21, jumpered <i>J21, open</i>
Password clear	Password clear (MFG test) <i>Normal mode</i>	J23, jumpered <i>J23, open</i>
VGA	Disabled	J19, pins 1 and 2 jumpered
	<i>Enabled</i>	<i>J19, pins 2 and 3 jumpered</i>
Snoop	<i>Enabled</i>	<i>J18, pins 1 and 2 jumpered</i>
	Disabled	J18, pins 2 and 3 jumpered

(1) Write-through setting for A486DX2-66NV8T.

(2) Write-back setting for CPUs: P24D, A486DX2-66SV8B.

VENTURIS 486 version 2.0 Main Logic Board Jumper Locations



DEC00558-3

Figure 3 - 9 VENTURIS 486 version 2.0 Main Logic Board Jumpers Locations

Computer Memory Configurations

Adding more memory allows the computer to run larger, more complicated software and to run it faster.

VENTURIS 486 Memory Configurations

The VENTURIS 486 computer comes with at least 4 MB of memory. This amount can be increased up to 68 MB. However, when adding additional memory make sure to:

- ◆ Install 32-bit SIMMs having an access time of 70 ns or less. Supported SIMM sizes: 4 MB, 8 MB, 16 MB, and 32 MB.
- ◆ Fill bank 1 before bank 2.

<i>Onboard</i>	<i>Bank 1</i>	<i>Bank 2</i>	<i>Total</i>
4 MB			4 MB
4 MB	4 MB		8 MB
4 MB	4 MB	4 MB	12 MB
4 MB	8 MB		12 MB
4 MB	4 MB	8 MB	16 MB
4 MB	8 MB	8 MB	20 MB
4 MB	16 MB		20 MB
4 MB	4 MB	16 MB	24 MB
4 MB	8 MB	16 MB	28 MB
4 MB	16 MB	16 MB	36 MB
4 MB	32 MB		36 MB
4 MB	4 MB	32 MB	40 MB
4 MB	8 MB	32 MB	44 MB
4 MB	16 MB	32 MB	52 MB
4 MB	32 MB	32 MB	68 MB

VENTURIS 486 version 1.0 SIMM Socket Locations

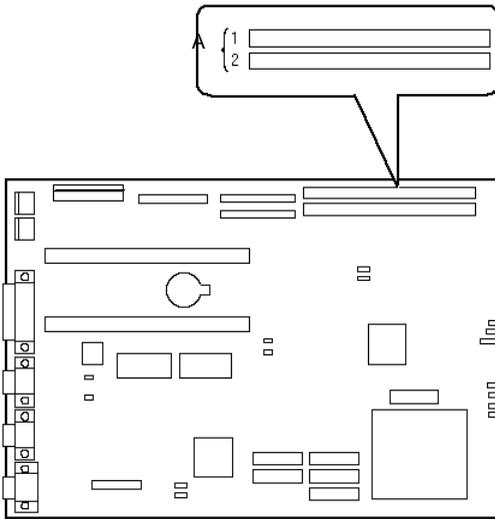


Figure 3 - 10 VENTURIS 486 Version 1.0 board SIMM Socket Locations

VENTURIS 486 version 2.0 SIMM Socket Locations

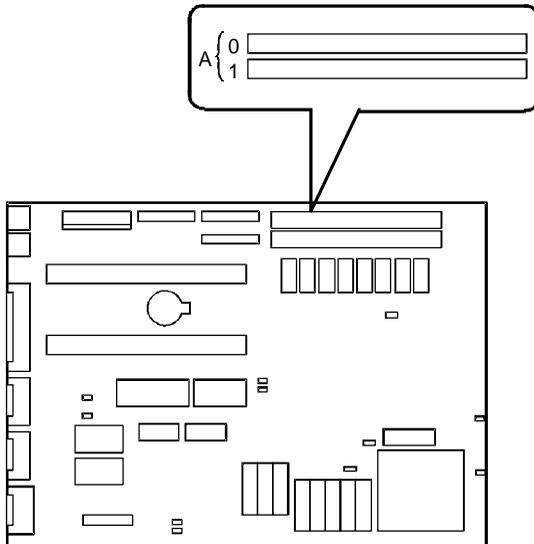


Figure 3 - 11 VENTURIS 486 version 2.0 board SIMM Socket Locations

Part Removal and Replacement

Opening the VENTURIS 486 Slimline Device Bay & Power Supply Subassembly

Open the device bay & power supply subassembly in order to install, remove, or connect certain components and peripheral devices. To open the subassembly:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Slide *front locking mechanism* to right to release subassembly.
- 5) Lift up on subassembly and *lock in place*.

Figure 3 - 12
Release Front
Locking Mechanism

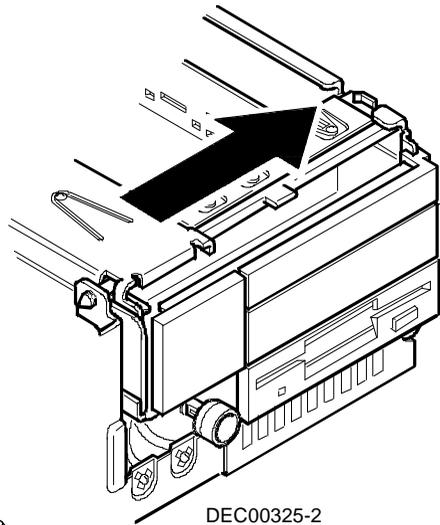
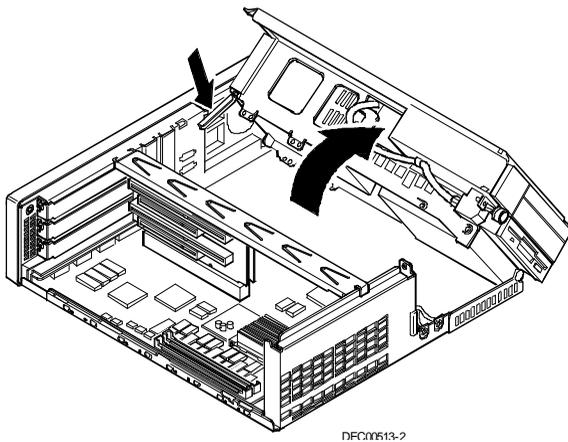


Figure 3 - 13 Lock in Place

Opening the VENTURIS 486 Full-Profile Device Bay & Power Supply Subassembly

Open the device bay & power supply subassembly in order to install, remove, and/or connect certain components and peripheral devices. To open the subassembly:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Pull tab (A) toward front of computer to release subassembly.
- 5) Lift up on subassembly and *lock in place*.

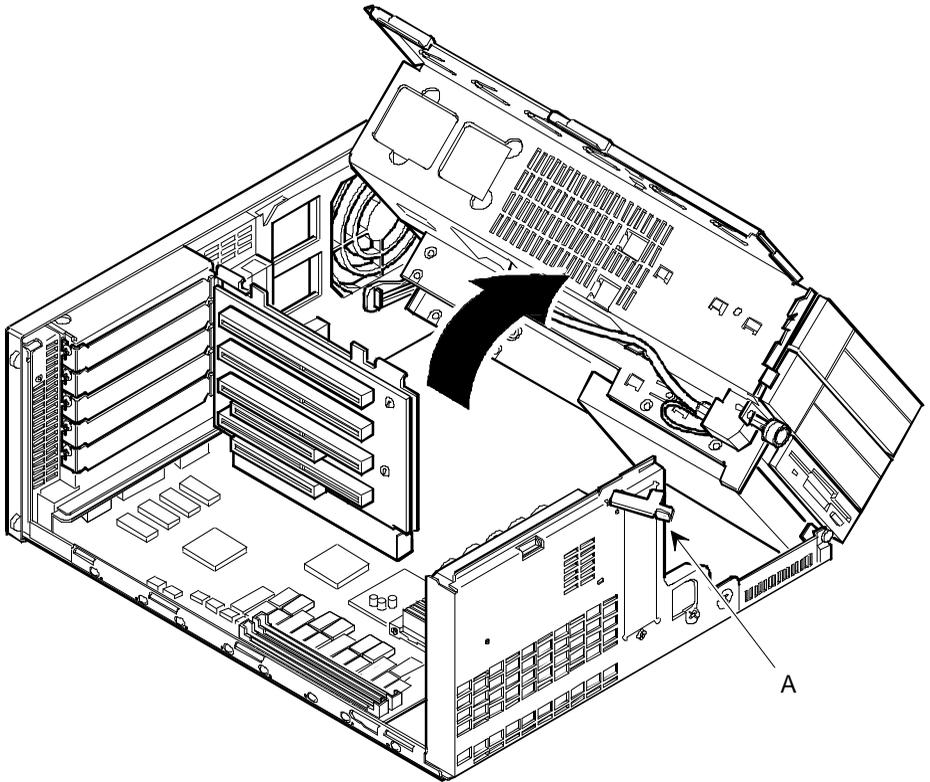


Figure 3 - 14 Opening the VENTURIS 486 Full-Profile Device Bay & Power Supply Subassembly

Removing the 3½-Inch Diskette Drive (All Models)

To remove the 3½-inch diskette drive:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Remove two screws securing the right side of diskette drive to chassis.
- 5) Open the device bay & power supply subassembly.
Refer to “Opening the Device Bay & Power Supply Subassembly”.
- 6) Disconnect power and ribbon cables.
- 7) Remove two screws securing the right side for SL models and left side for FP models of diskette drive to chassis.
- 8) Slide the diskette drive out of the front of the chassis.

Figure 3 - 15
Removing the 3½-inch Diskette
Drive on the VENTURIS 486 Slim
Line models

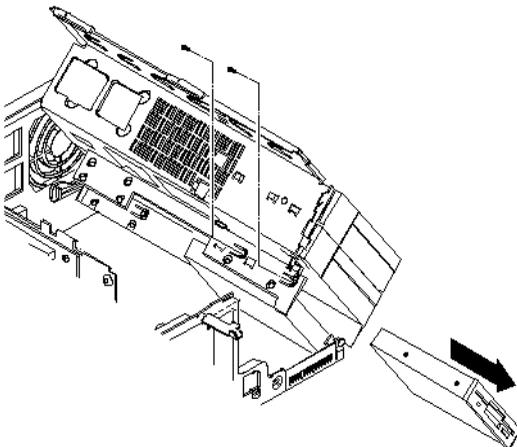
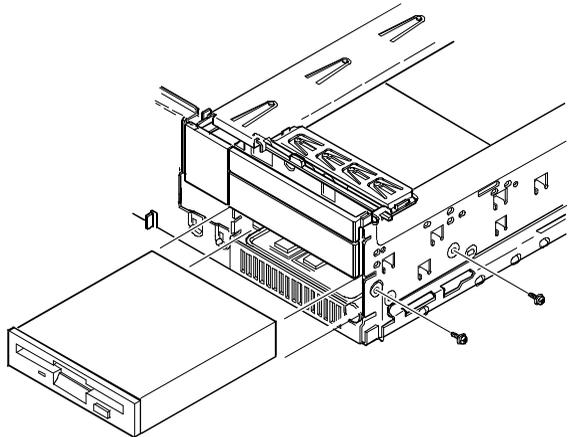


Figure 3 - 16 Removing the
3½-inch Diskette Drive on the
VENTURIS 486 Full-Profile
models

Removing the VENTURIS 486 Main Logic Board

To remove the main logic board:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Remove all connectors.
- 5) Remove all expansion boards.
- 6) Remove the riser card and bracket.
- 7) Remove screws and lift the board out.

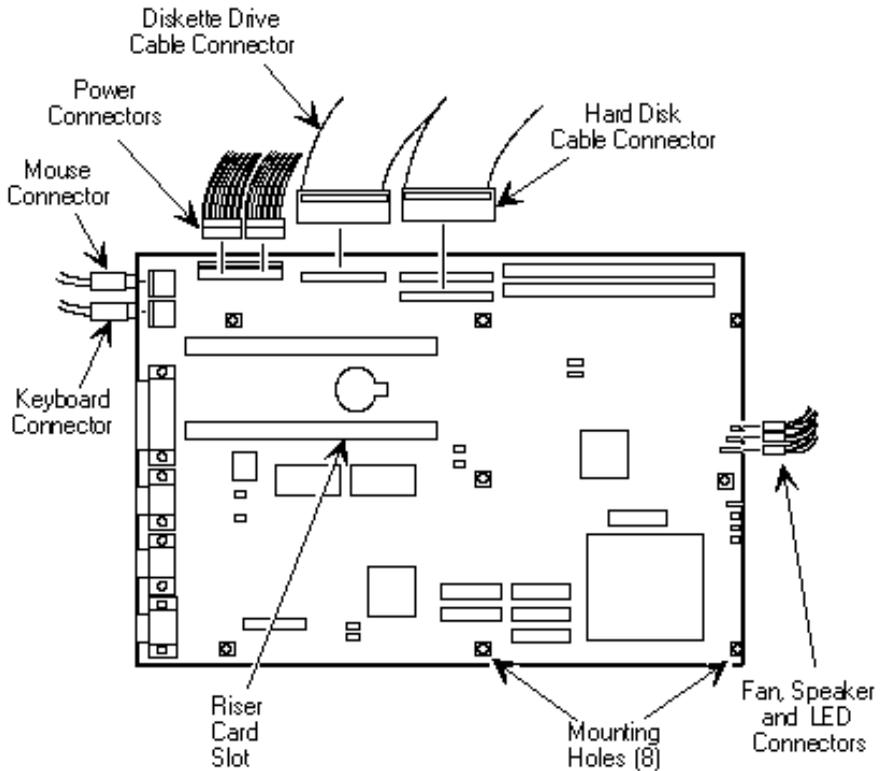


Figure 3 - 17 Removing the VENTURIS 486 Main Logic Board

Removing the VENTURIS 486 Slimline Power Supply

To remove the power supply:

- 1) Perform the steps necessary to open the device bay and power supply subassembly.
- 2) Remove power supply, IDE, and diskette cabling from main logic board noting their proper orientation.
- 3) While holding the device bay and power supply subassembly, carefully *release the rear latch*.
- 4) Carefully slide entire subassembly away from chassis and place upside down on antistatic surface.
- 5) Loosen two screws securing power on/off switch to chassis.
- 6) Remove screws securing power supply to chassis.
- 7) Remove power supply and power on/off switch from the subassembly.

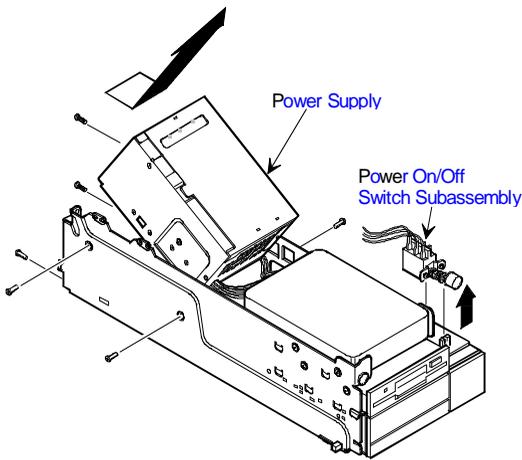


Figure 3 - 18 Removing the on Power Supply on the VENTURIS 486 Slimline models

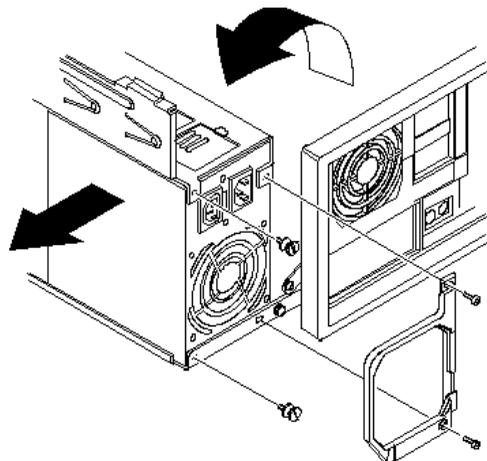


Figure 3 - 19 Removing the Power Supply on the VENTURIS 486 Full-Profile models

Removing the VENTURIS 486 Riser Card & Bracket

To remove the riser card and bracket:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Remove all expansion boards.
- 5) Carefully lift riser card and bracket from computer.

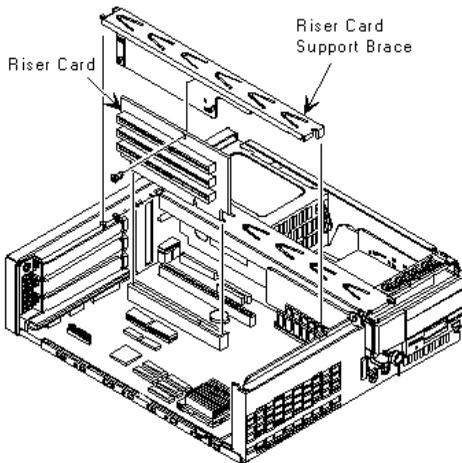


Figure 3 - 20 Removing the Riser Card & Bracket the VENTURIS 486 Slimline models

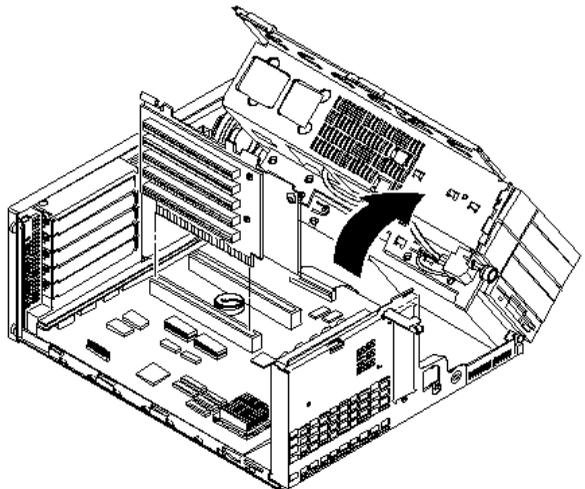


Figure 3 - 21 Removing the Riser Card & Bracket on the VENTURIS 486 Full-Profile models

Installation Procedures

Installing External Cache Memory on VENTURIS 486 v1.0 board

The version 1.0 Main Logic Board supports a 128 KB of write-back external cache to improve the performance of the enhanced CPU. The secondary cache memory consists of four 32 KB x 8, 15 ns cache SRAM chips and two 32 KB x 8, 15 ns cache tag SRAM chips.

<i>Cache Upgrade</i>	<i>Main Logic Board Cache Sockets</i>	<i>Main Logic Board Cache Tag Sockets</i>
0 KB	X	X
128 KB	E25 -E27, E37	E11, E38

To install a cache SRAM chip:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Locate appropriate DIP sockets on main logic board.
- 5) Remove SRAM chips from anti-static bag, handling each chip only by edges.
- 6) Install new external cache and tag cache SRAM chips, aligning notches in DIP socket.
- 7) Replace and lock cover.
- 8) Connect external devices and restore power.
- 9) If necessary, run BIOS Setup utility and enable external cache option.



CAUTION

Installing external cache memory incorrectly might cause the computer to malfunction.

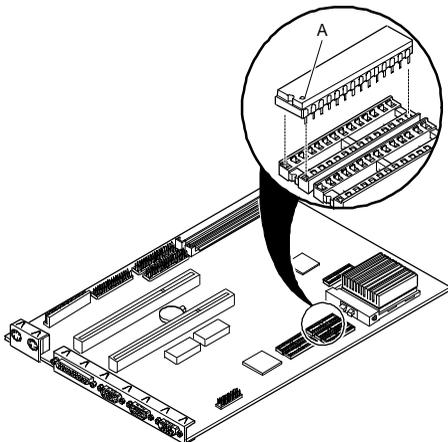


Figure 3 - 22 Installing External Cache Memory on VENTURIS 486 version 1.0 board

Installing External Cache Memory on VENTURIS 486 v2.0 board

The version 2.0 Main Logic Board computer supports up to 256 KB of write-back external cache memory to improve the performance of the installed CPU.

<i>Cache Upgrade</i>	<i>Main Logic Board Cache Sockets</i>	<i>Main Logic Board Tag RAM Socket</i>
0 KB to 128 KB	E25 - E27, E37	E11
128 KB to 256 KB	E69, E70 - E72	

NOTE The 128 KB cache memory kit includes six SRAM chips. Only install five chips in the designated RAM sockets. Save the extra chip for future use.

To install external cache memory:

- 1) Turn off the computer, disconnect external devices, ac power, and monitor power., unlock and remove cover.
- 2) Locate appropriate external cache memory sockets on main logic board.
- 3) Carefully remove RAM chips from antistatic bay, handling each chip only by their edges.
- 4) Install new external cache memory data and tag RAM chips, aligning notches on chip with notches in socket (A, Figure 3 - 23).
- 5) Replace and lock cover.
- 6) Connect external devices and restore power.
- 7) If necessary, run BIOS Setup utility and enable external cache option.



CAUTION

Installing external cache memory incorrectly might cause the computer to malfunction.

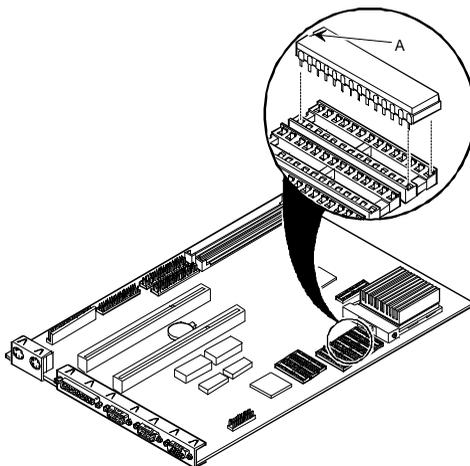


Figure 3 - 23 Installing External Cache Memory on the VENTURIS 486 version 2.0 board

Installing a Higher Performance CPU

The VENTURIS 486 (V1.0 and V 2.0) main logic board is equipped with a 486 processor installed in a ZIF socket.

To install a higher performance CPU:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Lift up on lever to release old CPU.
- 5) Remove old CPU.
- 6) Install new CPU.
- 7) Make sure pin 1 on CPU(A) is aligned with pin 1 on ZIF socket.
- 8) Return release lever to its original position and then set all appropriate CPU jumpers (*Refer to "VENTURIS 486 Main Logic Board Jumpers"*).
- 9) Replace and lock cover.
- 10) Connect external devices and restore power.

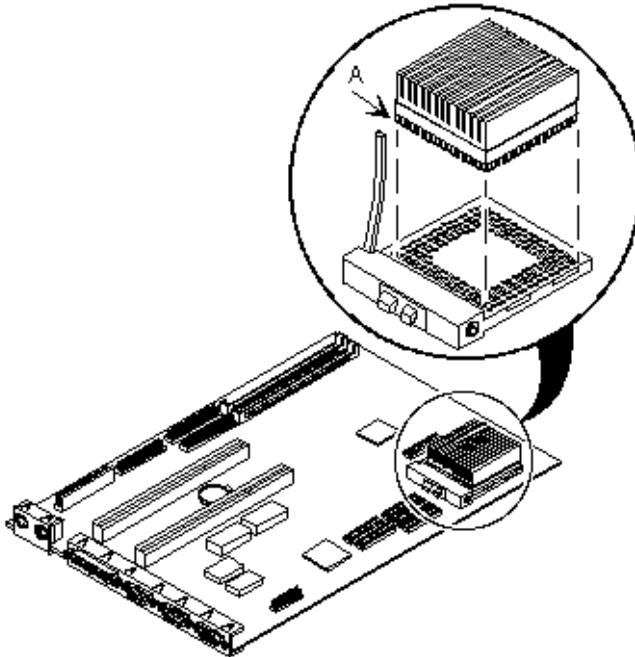


Figure 3 - 24 Installing a Higher Performance CPU on the VENTURIS 486 models

Installing Video Memory on the VENTURIS 486 Full Profile models

The VENTURIS 486 Full Profile models comes standard with 1 MB of video memory. This amount can be increased to 2 MB by installing a 1 MB video memory DRAM chip in the designated socket on the main logic board.

To install the video memory upgrade chip:

- 1) Turn off the computer.
- 2) Disconnect external devices, ac power, and monitor power.
- 3) Unlock and remove cover.
- 4) Remove upgrade chip from packaging and install in socket.
- 5) Make sure pin 1 on chip is aligned with pin 1 on socket.
- 6) Replace and lock cover.
- 7) Connect external devices and restore power.
- 8) Reboot the computer to configure it for additional video memory.

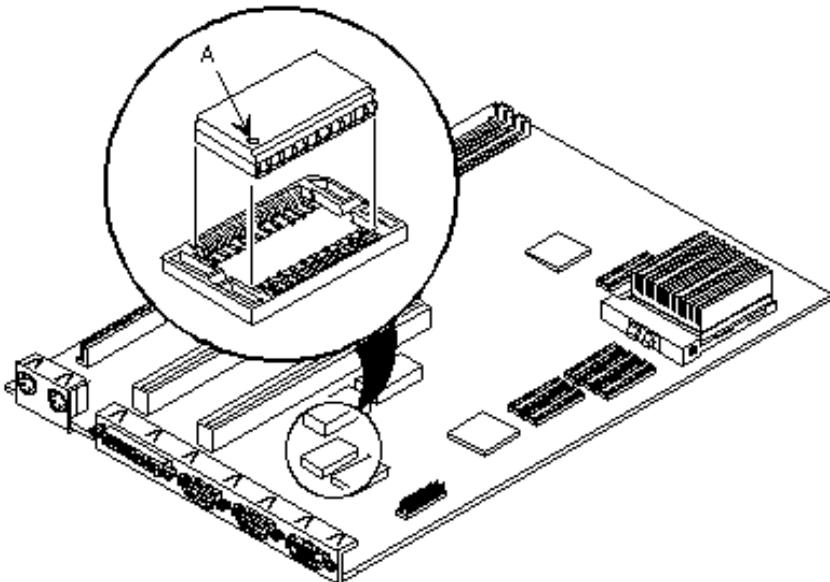


Figure 3 - 25 Installing Video Memory on the VENTURIS 486 Full Profile models

Replacement Procedures

Replacing the Computer Battery on the VENTURIS 486 models

The VENTURIS 486 computer battery runs the computer clock and retains any setup information when it is turned off. If the computer ever fails to retain the correct date, time, or configuration settings when it is turned on, replace the computer's battery.

**WARNING**

There is a danger of battery explosion if a lithium battery is incorrectly replaced. To prevent damage to the computer, be sure the + side faces up when installing a new battery. Also, be sure to replace the battery with either a Toshiba CR2032, 3 V dc, lithium battery or equivalent.

Depending on your locality, the computer's battery might be considered hazardous waste. Make sure you follow any state or local statute to properly dispose of the old battery.

To replace the battery, perform the following:

- 1) Record computer configuration settings using the BIOS Setup utility.
- 2) Turn off the computer.
- 3) Disconnect external devices, ac power, and monitor power.
- 4) Unlock and remove cover.
- 5) Carefully lift up on retaining clip and remove old battery.
- 6) Install new battery.
When installing new battery, make sure + side faces up.
- 7) Replace and lock cover.
- 8) Connect external devices and restore power.
- 9) Run BIOS Setup utility to reconfigure computer using recorded configuration settings from step 1.

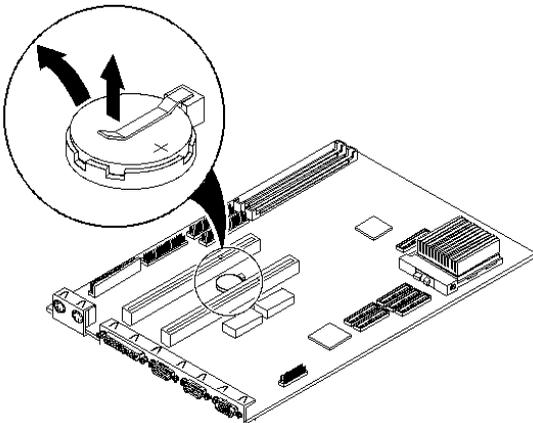


Figure 3 - 26 Replacing the Computer Battery on the VENTURIS 486 models

Connecting Diskette and IDE Devices

NOTE If only one IDE device is installed, make sure to use the ribbon cable connector furthest from the main logic board connector.

Also, when IDE devices have been installed in both internal drive bays, make sure that the ribbon cable has no twists between the two IDE drives.

To connect diskette and IDE devices, perform the following:

- 1) Unlatch device bay and power supply subassembly.
- 2) Lift up on subassembly and lock in place.
- 3) Connect supplied ribbon cable to appropriate device. If necessary, refer to the illustration in the appropriate data cable connection topic listed below.
- 4) Connect appropriate power cable to device.
- 5) Release device bay and power supply subassembly rear latch.
- 6) Close subassembly and then secure to chassis using front locking mechanism.
- 7) Replace and lock cover.
- 8) Connect external devices and restore power.
- 9) Run BIOS Setup utility to configure computer.

NOTE Make sure the cable is connected with correct orientation. Most cables and sockets are keyed so you cannot connect them backwards. If the cable or device is not keyed, connect pin 1 of cable to pin 1 of device's socket.

Pin 1 of the cable is on the edge with colored stripe. Pin 1 of the device's socket should be marked with a number or symbol at one end of the socket or with a number or symbol printed on the circuit board near one end of the socket. If necessary, refer to the device's documentation for pin 1 orientation.

Diskette Data Cable Connections

<i>Legend</i>	<i>Diskette Drive Component</i>
A	Power supply
B	Power connections
C	Diskette drive connections
D	Main logic board diskette drive connection
E	Diskette drives

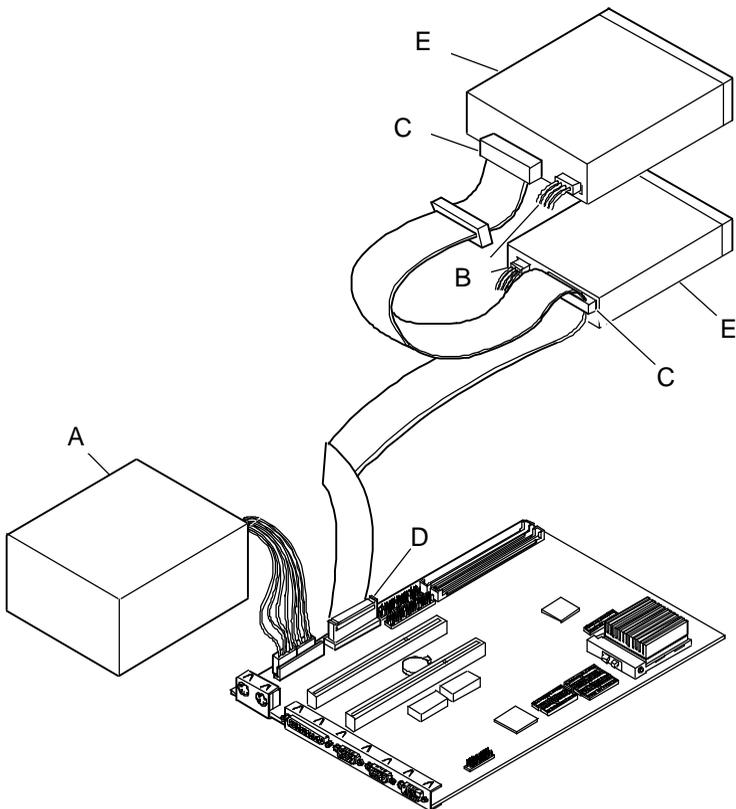


Figure 3 - 27 Diskette Data Cable Connections

IDE Data Cable Connections

Legend	IDE Drive Component
A	Power supply
B	Power connections
C	IDE hard disk drive connections
D	Main logic board IDE drive connections
E	IDE hard disk drive
F	IDE CD-ROM drive

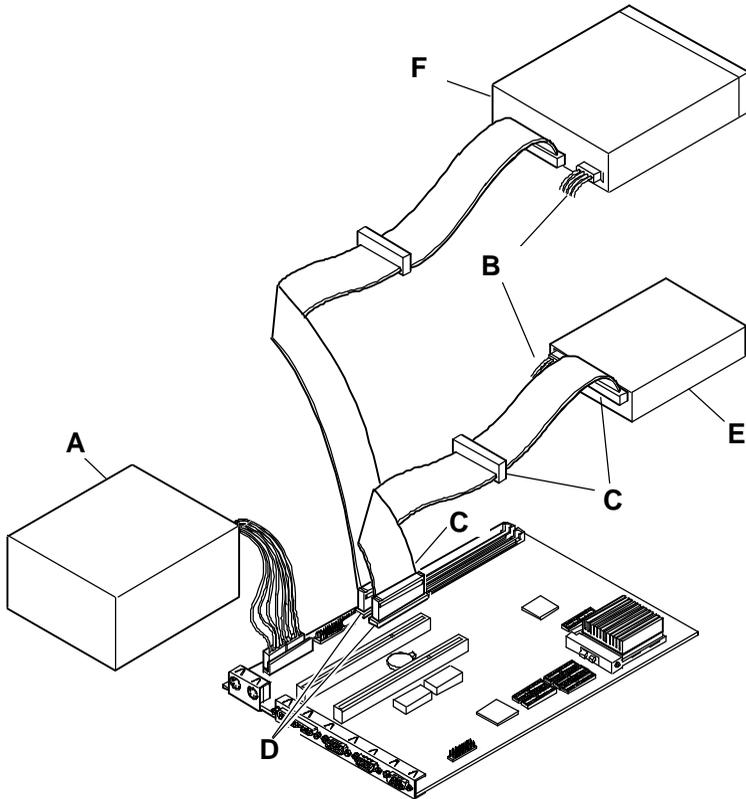


Figure 3 - 28 IDE Data Cable Connections

Chapter 4

Troubleshooting

The following pages provide initial troubleshooting procedures and tables listing specific problems, probable causes, and recommended actions to take if the computer fails after configuration or after installation of optional hardware or software.

Refer to the documentation supplied with additional options when experiencing problems with specific options that have been installed.

Initial Troubleshooting

Follow the following general procedures to troubleshoot the VENTURIS 486 PC family of computers:

- ◆ Press [Ctrl] + [Alt] + [Del]. If the computer fails to boot, turn it off, wait until all hard disk drives spin down completely, and then turn it back on.
- ◆ If the POST detects an error refer to “*Troubleshooting*” and take the appropriate steps to correct the problem. After the problem has been resolved, restart the computer.
- ◆ Run the BIOS Setup utility.
- ◆ Make sure all necessary changes have been made to the CONFIG.SYS and AUTOEXEC.BAT files.
- ◆ Make sure all necessary video, printer, and application device drivers are properly installed.
- ◆ Ensure that all cables and connections are secure.
- ◆ Run the *QAPLUS/fe* advanced diagnostic software.
- ◆ If these steps do not identify and/or correct the problem, perform the specific troubleshooting procedures appropriate to the circumstances.

NOTE If you need to return a failed component, pack it in its original container and return it to Digital for service.

Fill in the appropriate fields of the Part Exchange Form with the relevant error information!!

Beep Codes

When POST finds an error and cannot display a message, the computer's speaker emits a series of beeps to indicate the error. During POST, if the video configuration fails or if an external ROM module fails a checksum test, then the computer beeps three times.

<i>BeepCode</i>	<i>Error</i>
1 long - 2 shorts	Video configuration fails External ROM module fails a checksum test

The following table lists other fatal error and their associated beep codes.

Each code represents the number of short beeps that are grouped together.

Fatal errors (errors that lock up the computer) are generally the result of a failing main logic board or some other add-on component (SIMM, BIOS, computer battery, etc.).

<i>BeepCode</i>	<i>Error</i>
2-2-3	BIOS ROM checksum
3-1-1	Test DRAM refresh
3-1-3	Test keyboard controller
3-4-1	Test 512K base address lines
3-4-3	Test 512K base memory
2-1-2-3	Check ROM copyright notice
2-2-3-1	Test for unexpected interrupts

POST and Boot Messages

The POST displays messages to alert to errors in hardware, software, and firmware or to provide operating information about the computer.

Each time the POST displays a message on the screen, the computer's speaker beeps twice. If an error occurs before the monitor is initialised, specific beep codes sound to alert to a problem. The following table lists a general grouping of system messages. In addition, each message is accompanied by text describing the message and in most cases, a recommended solution to the problem.

NOTE *Italics* indicate variable parts of a message such as memory addresses, hexadecimal values, and so on.

These messages can differ at each occurrence.

POST and Boot Messages (continued)

Message	Description/Solution
nnnn Cache SRAM Passed	Where <i>nnnn</i> is the amount of computer cache (in kilobytes) that tested successfully.
Diskette drive A error Diskette drive B error	Run the BIOS Setup Utility. Check all connections. If the problem persists-replace the diskette drive.
Entering SETUP	BIOS Setup Utility runs.
Extended RAM Failed at offset: nnnn	Extended memory failed or configured incorrectly. Make sure SIMMs are installed correctly. If the problem persists replace the defective RAM. Run the BIOS Setup utility and restore all settings to original values.
nnnn Extended RAM Passed	Where <i>nnnn</i> is the amount of extended memory (in kilobytes) that tested successfully.
Failing Bits: nnnn	<i>nnnn</i> is a map of the bits at the RAM address which failed the memory test. Run the BIOS Setup Utility and restore all settings to original values.
Fixed Disk 1 Failure Fixed Disk Controller failure	Run the BIOS Setup Utility. Check all connections.
Incorrect Drive A type - run SETUP	Diskette drive A and/or B not correctly identified in the BIOS Setup utility.
Incorrect Drive B type - run SETUP	Run the BIOS Setup Utility and properly identify diskette drive A and/or B.
Invalid NVRAM media type	NVRAM access failed. Run the BIOS Setup Utility and restore all settings to original values. If the problem persists replace the defective component.
Keyboard controller error Keyboard error Keyboard locked - Unlock key switch	Check the keyboard connection. If the connection is secure the keyboard or keyboard controller might have failed. If the problem persists replace the defective component.
Monitor type does not match CMOS - Run SETUP	Run the BIOS Setup utility and set the correct monitor type.
Operating system not found	The operating system cannot be found on drive A or drive C. Run the BIOS Setup Utility and correctly identify drive A or drive C. Correctly install the operating system. Refer to the supplied operating system documentation.
Parity check 1 nnnn	Parity error found in the computer bus. The BIOS attempts to locate the address and display it on the monitor screen.
Parity check 2 nnnn	Run the BIOS Setup Utility and restore all settings to original values. If the problem persists replace the defective component.
Press <F1> to resume, <F2> to Setup	This message appears after any recoverable error message. Press <F1> to reboot or <F2> to enter the BIOS Setup utility to make any necessary changes.
Real time clock error	Real-time clock failed BIOS test. Replace the battery and then run the BIOS Setup Utility to restore previous configuration information.
Shadow RAM Failed at offset: nnnn	Shadow RAM failed. Run the BIOS Setup Utility and disable failed shadow memory region.

POST and Boot Messages (continued)

Message	Description/Solution
nnnn Shadow RAM passed	Where <i>nnnn</i> is the amount of shadow RAM (in kilobytes) that tested successfully.
System battery is dead Replace and run SETUP	Replace the battery and then run the BIOS Setup utility to restore previous configuration information.
System BIOS shadowed	This indicates that the computers BIOS was successfully copied to shadow RAM.
System cache error - Cache disabled	RAM cache failed. Run the BIOS Setup Utility and restore all settings to original values. If the problem persists replace the defective component.
System CMOS checksum bad - run SETUP	Run the BIOS Setup Utility and ensure that all settings are correct. Save the configuration even no changes have been made. If the problem persists replace the defective component.
System RAM failed at offset: nnnn	System RAM failed. Run the BIOS Setup Utility and restore all settings to original values. If the problem persists replace the defective component.
nnnn System RAM passed	Where <i>nnnn</i> is the amount of system RAM (in kilobytes) that tested successfully.
System timer error	The computers timer test failed. Run the BIOS Setup Utility and restore all settings to original values. If the problem persists replace the defective component.
UMB upper limit segment address: nnnn	Displays the address of the upper limit of UMB. This indicates the released segments of the BIOS that can be reclaimed by a virtual memory manager.
Video BIOS shadowed	This indicates that the computers video BIOS was successfully copied to shadow RAM.

Computer Troubleshooting

Problem	Possible Cause	Action
No response when the computer is turned on	Main logic board failure.	Replace main logic board.
	Main logic board jumpers incorrectly set.	Set all appropriate jumpers. Refer to “ <i>Main logic board jumpers</i> ”.
	CPU has failed.	Replace CPU.
Power is on, but there is no screen display	Brightness and contrast controls are not correctly set.	Adjust the brightness and contrast controls.
	The monitor-off timer has shut the monitor off.	Press [Shift] to reactivate monitor.
	Monitor cable is incorrectly installed.	Check all monitor connections.
	Incorrect VGA drivers installed.	Install the correct VGA drivers. Refer to “ <i>Utilities & Video Drivers</i> ”.
Computer operates incorrectly after installing optional expansion board	Video controller has failed.	Replace the video controller.
	Expansion board installed incorrectly.	Remove expansion board and reinstall.
	Did not run ICU to configure expansion board before installation.	Run the ICU to properly configure expansion board and then reboot the computer. Refer to the supplied ICU documentation.
Computer operates incorrectly after installing optional SIMMs	Expansion board has failed.	Remove expansion board and reboot. If computer boots without errors, replace expansion board.
	Did not rerun BIOS Setup utility.	Rerun BIOS Setup utility.
	BIOS Setup utility changes not saved before exiting.	Rerun BIOS Setup utility and save changes.
Computer operates incorrectly after installing optional external cache module	SIMMs have failed.	Remove SIMMs and reinstall Make sure banks 1 and 2 are filled with the correct SIMM size, speed, and type. Replace SIMMs.
	External cache module installed incorrectly.	Remove external cache module and reinstall.
	External cache module has failed.	Replace external cache module.

Computer Troubleshooting (continued)

Problem	Possible Cause	Action
Computer fails to retain setup information	Computer battery has failed.	Replace computer battery.
Computer does not recognize an internal or external SCSI device	SCSI device jumpers incorrectly set. SCSI cable not terminated. Terminating resistors not removed from the SCSI device. SCSI adapter failure. SCSI ID conflicts. There might be a boot sector virus. Hard disk boot sector is missing.	Refer to the supplied SCSI device kit installation instructions. Terminate each end of the SCSI bus. Check power and SCSI cables. Remove terminating resistors. Replace SCSI adapter. Set SCSI IDs correct. Run appropriate software to detect and remove viruses. For DOS, boot from a DOS diskette then enter the following commands: c: cd\dos fdisk/mbr
Computer does not boot from an internal SCSI hard disk drive	Operating system software is not installed on the SCSI hard disk drive. Requested partition does not exist. Computer not configured for SCSI hard disk drive operation.	Install the appropriate operating system on the SCSI hard disk drive. Partition the SCSI hard disk drive and then reload the operating software. Run the BIOS Setup utility and set the IDE controller option to "Disabled." This disables the IDE interface. Note: When both IDE and SCSI hard disk drives have been installed, the computer uses the IDE hard disk drive as the boot device.
No response to keyboard commands	Keyboard is password protected. Keyboard is connected to the mouse port.	Enter the keyboard password. Power down the computer and connect the keyboard to the keyboard port.

Computer Troubleshooting (continued)

Problem	Possible Cause	Action
No response to mouse commands	Mouse is password protected.	Enter the keyboard and mouse password.
	Mouse is connected to the keyboard port.	Power down the computer and connect the mouse to the mouse port.
	Mouse driver not installed.	Install the appropriate mouse driver.
Computer does not boot from an IDE hard disk drive	Operating system software is not installed on the IDE hard disk drive.	Install the appropriate operating system.
	IDE hard disk drive is not correctly formatted or the requested partition does not exist.	Format the IDE hard disk drive or partition the IDE hard disk drive using the supplied operating system software.
	There is no software on the requested partition.	Install software on the requested partition.
	IDE hard disk drive jumpers incorrectly set.	Refer to the supplied IDE hard disk drive kit installation instructions.
	IDE drive type incorrect.	Run the BIOS Setup utility to identify the correct drive type.
	Loose cables.	Secure all cable connections.
	Onboard IDE interface disabled.	Run the BIOS Setup utility and set the IDE controller option to "Enabled."
	IDE hard disk is connected to the wrong IDE connector.	Connect the boot disk to the inner IDE connector on the main logic board.
	There might be a boot sector virus.	Run appropriate software to detect and remove viruses. (F-PROT recommended).
	Hard disk boot sector is missing.	For DOS, boot from a DOS diskette then enter the following commands: c: cd\dos fdisk/mbr

Computer Troubleshooting (continued)

Problem	Possible Cause	Action
Computer does not boot from a target diskette drive	Drive ID incorrectly set.	Make sure the drive ID is correctly set.
	Diskette drive not enabled.	Run the BIOS Setup utility to enable the diskette drive.
	Diskette boot option disabled.	Run the BIOS Setup utility and set the proper boot sequence.
	Onboard diskette controller disabled.	Run the BIOS Setup utility and set the diskette controller option to "Enabled".
	Diskette does not contain start-up files.	Insert a diskette with the correct start-up files.

Disk Drive Troubleshooting

Problem	Possible Cause	Action
IDE/SCSI hard disk drive cannot read or write information	Incorrect disk drive jumper settings.	Refer to the supplied kit installation instructions.
	Loose or incorrectly installed cables.	Make sure all cables are correctly installed.
	IDE drive type incorrect.	Run the BIOS Setup utility to identify the correct drive type.
	Onboard IDE interface disabled.	Run the BIOS Setup utility and set the IDE controller option to "Enabled".
	IDE/SCSI hard disk drive is not correctly formatted or partitioned.	Format and partition as required using the supplied operating system.
Target diskette drive cannot read or write information	Onboard diskette controller disabled.	Run the BIOS Setup utility and set the diskette controller to "Enabled".
	Diskette write protection is enabled.	Run the BIOS Setup utility and set the diskette write protection to "Disabled".

Monitor Troubleshooting

Problem	Possible Cause	Action
Monitor power indicator is not on	Monitor is turned off.	Turn on the monitor.
	Power indicator is defective.	Replace the failed component.
No screen display	Configuration error.	Run the BIOS SETUP UTILITY to configure the computer for VGA operation. Set the jumper for VGA operation. Refer to "Main Logic Board Jumpers".
	Monitor brightness and contrast controls are incorrectly set.	Adjust the monitor brightness and contrast controls.
No monitor display while loading Windows video drivers	Monitor type incorrectly set.	Set the correct monitor type. Refer to appropriate video driver documentation.
Distorted-rolling-or flickering screen display-or wrong/uneven color	Monitor incorrectly adjusted.	Adjust accordingly.
	Monitor signal cable incorrectly installed.	Straighten any bent connector pins and then reconnect.
Color monitor displaying monochrome	Computer was turned on before the monitor was turned on.	Turn off the computer, turn on the monitor, then turn the computer back on.
	Video jumper incorrectly set.	Set the jumper for VGA operation.
Monitor fails to switch to high-resolution mode	Appropriate high-resolution video drivers are not installed or incorrectly installed.	Correctly install all appropriate high-resolution video drivers. Refer to the documentation supplied with the monitor and/or video drivers.
Monitor display not centered while loading Windows video drivers	Monitor type incorrectly set.	Set the correct monitor type. Refer to appropriate video driver documentation.

QAPLus/FE Error Messages

Component	Messages	Solution
CPU	Arithmetic Function Failed. General Functions Failed. Exception Interrupt in Protected Mode. Refresh Failure. Logic Functions Failed.	Reset CPU. Replace CPU.
Hard disk	Butterfly Cylinder Access Test Failed. Cylinder 0 Errors. Random Cylinder Access Failed. Linear Cylinder Access Failed.	Low-level format hard disk. Replace disk.
Hard drive/controller	Controller Diagnostic Test Failed. Questionable Controller Card. Hard drives failed.	Run Setup, Check connections, Reset controller, Replace controller, Replace disk.
Floppy diskette	Media Mismatch. Drive Not Ready. Write Protected Media. Unformatted Media.	Use known good diskette. Check size and density of diskette. Close drive door. Remove write protection. Format diskette.
Floppy drive	Floppy Drives Failed.	Check connections, Replace drive.
Battery/clock	Clock Stopped. Invalid Date. RTC Interrupt Failed.	Run Setup. Replace battery/clock.
CMOS	CMOS Clock Test Failed.	Change time from Setup menu in QAPLUS.
Serial port	COM port failed. Serial Chip Error. Serial Compare Error. Serial Timeout Error.	Check COM device. Check connections. Replace COM device. Replace COM device.
Video adapter	Video Failed. Error in Video Buffer.	Replace video adapter. Replace video adapter.

Chapter 5

Device Mapping

This section provides a series of tables listing mapping and address information related to computer memory and various main logic board devices (keyboard controller, interrupt controller, DMA controller, etc.).

The computer's memory and address locations are allocated at the factory to operate within a standard PC environment. However, due to the number of optional devices and/or expansion boards that are available, sometimes memory and address locations need to be changed. For example, some network expansion boards require a specific memory location. If that location is already allocated, a memory conflict results and the expansion board will not operate as expected. Note that some memory, I/O and interrupt locations can be changed using the BIOS Setup utility.



CAUTION

Before changing any memory or address location, refer to the documentation supplied with the optional device, expansion board, or software application and make sure adequate information is available.

Memory Map

Address Range	Function	Notes
00000 to 9FFFF	Base memory	640 KB
A0000 to BFFFF	Video RAM	128 KB
C0000 to C7FFF	VGA BIOS	32 KB
C8000 to DFFFF	BIOS extension ROM (AT bus used)	96 KB
E0000 to FFFFF	BIOS segment	128 KB
100000 to 43FFFFF	System BIOS memory	67 MB

I/O Address Map

Range (hexadecimal)	Function
000 - 00F	DMA controller one
020 - 021	Interrupt controller one
040 - 043	Interval timer
060 - 06F	Keyboard controller
070 - 07F	Real-time clock (RTC), NMI
080 - 08F	DMA page register
0A0 - 0A1	Interrupt controller two
0C0 - 0CF	DMA controller two
0F0	Clear math coprocessor busy
0F1	Reset math coprocessor
0F8 - 0FF	Math coprocessor
170 - 177	Secondary IDE controller
1F0 - 1F7	Primary IDE controller
278 - 27A	LPT2
2E8 - 2EF	COM4
2F8 - 2FF	COM2
376 - 377	Secondary IDE controller (alt status, device address)
378 - 37A	LPT1
3B0 - 3DF	VGA register
3BC - 3BE	LPT3
3E8 - 3EF	COM3
3F0 - 3F7	Diskette controller
3F6 - 3F7	Primary IDE controller (alt status, device address)
3F8 - 3FF	COM1
46E8	VGA enable register
42E8, 4AE8, 82E8, 86E8, 8AE8, 8EE8, 92E8, 96E8, 9AE8, 9EE8, A2E8, A6E8, AAE8, AEE8, B2E8, B6E8, BAE8, BEE8, E2E8, E2EA	VGA enhanced mode registers

Computer Interrupt Levels

<i>Interrupt Number</i>	<i>Interrupt Source</i>
IRQ0	Timer tick
IRQ1	Keyboard controller
IRQ2	Cascade interrupt
IRQ3	COM2, COM4 (if enabled)
IRQ4	COM1, COM3 (if enabled)
IRQ5	LPT2
IRQ6	Diskette drive (if enabled)
IRQ7	LPT1, LPT3 (if enabled)
IRQ8	RTC
IRQ9-IRQ11	Reserved
IRQ12	Mouse interrupt (if enabled)
IRQ13	Math co-processor
IRQ14	IDE adapter 0 (if enabled)
IRQ15	IDE adapter 1 (if enabled)

DMA Channel Assignment

<i>Channel</i>	<i>Controller</i>	<i>Function</i>
0	1	Refresh
1	1	Not used
2	1	Diskette controller (if enabled)
3	1	Not used
4	2	Cascade DMA
5	2	Not used
6	2	Not used
7	2	Not used

PCI Configure Space Address Map

(VENTURIS 486 Full Profile Models Only)

<i>Device Number (hex)</i>	<i>Function</i>
00	CPU bridge
01	ISA bridge
08	Onboard PCI IDE
09	Onboard PCI VGA
0B	PCI slot 1
0C	PCI slot 2

Chapter 6

Pass / Fail Criteria

As Final Acceptance Test the following tests should be run to meet the Pass/Fail criteria:

1) **Successful completion of the POST tests.**

2) **Successful completion of the following QAPLUS/fe module tests (one pass):**

- ◆ System Board (all tests)
- ◆ Memory (all tests)
- ◆ Video (all tests)
- ◆ Hard Disk (all tests, **except: Sequential write/read (destructive test !!) and Sequential write/random read (destructive test !!)**)
- ◆ Floppy Disk (all tests)
- ◆ Keyboard (all tests)
- ◆ COM Ports (all tests)
- ◆ LPT Ports (all tests)
- ◆ Pointer Device (all tests)

3) **Successful bootstrap of the on the computer installed Operating System.**

Operating Systems Supported:

- ◇ MS-DOS version 6.22 and earlier
- ◇ OS/2 version 3.0 and earlier
- ◇ Windows for Workgroups 3.11 and earlier
- ◇ Windows NT Client
- ◇ Windows 95
- ◇ SCO UNIX System V release 3.2.4 and earlier
- ◇ Novell Netware 3.12 and 4.1 and earlier

Remove any software that was put on the hard drive to enable repair of the system before shipping.

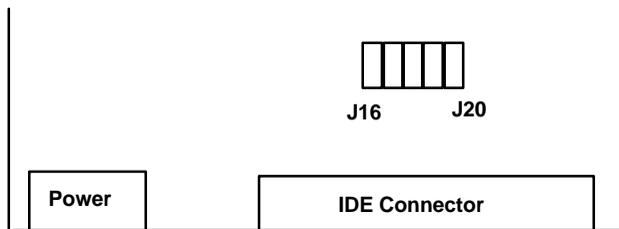
When completed carefully clean the outside of the unit with cleaning solution.

Appendix A

Service Notes

Service Note 1

Problem	VENTURIS will not see 340MB (RE24M-E) Maxtor Drive.
Solution	Remove spare Jumper from J19 and install it on J16.



Appendix B

Useful Information

Related Documentation

Order Number	Description.
EK-A0830-RG	VENTURIS 486 PC Family Quick Reference Guide
EK-A0815-RG	SMM Spares Catalogue
ER-850WW-UA	VENTURIS 400 User's Guide (English)
ER-850WW-UP	VENTURIS 400 User's Guide (French)
ER-850WW-UI	VENTURIS 400 User's Guide (Italian)
ER-850WW-UG	VENTURIS 400 User's Guide (German)
ER-850WW-US	VENTURIS 400 User's Guide (Spanish)
ER-860WW-UA	VENTURIS FP400 User's Guide (English)
ER-860WW-UP	VENTURIS FP400 User's Guide (French)
ER-860WW-UI	VENTURIS FP400 User's Guide (Italian)
ER-860WW-UG	VENTURIS FP400 User's Guide (German)
ER-860WW-US	VENTURIS FP400 User's Guide (Spanish)

On-Line Bulletin Boards

The most current product information and technical support is also available on line. The most current device drivers, Setup diskettes and technical tips can be found on all of these bulletin boards.

- ◆ **DECpc Bulletin Board Server**

DECpc BBS provides an easy-to-use, menu-driven bulletin board providing on-line access to the latest PC product information, device drivers, shareware and freeware.

Network Location for ;

North America, South America, Australia and New Zealand

PCBUHD::DKB300:[WC30.BBSFILES]

Europe, Africa, Middle and Far East:

SUTRA::D6:[PUBLIC].

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