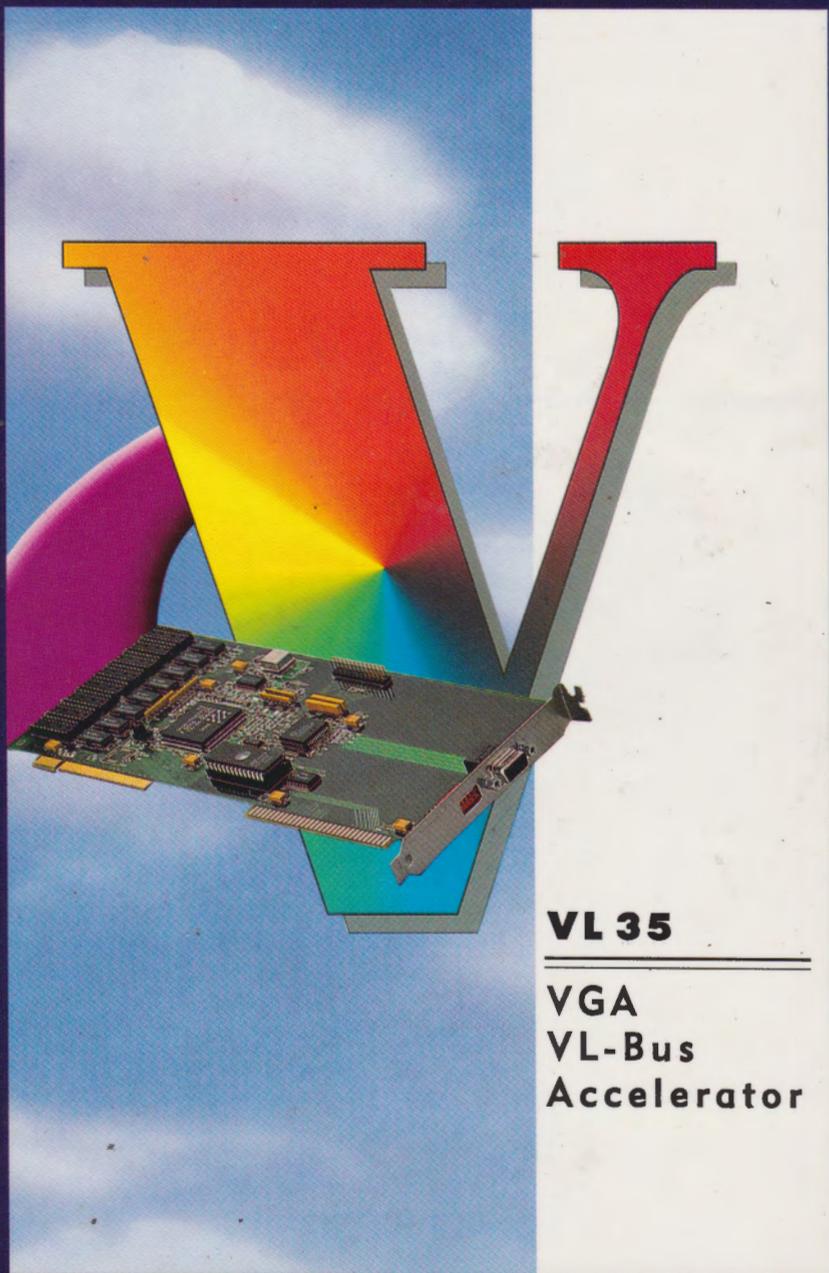


# USER'S MANUAL



**VL 35**

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**VGA  
VL-Bus  
Accelerator**

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# VL35

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## VESA Local Bus VGA User's Manual

# Radio Frequency Interference Statement

## FCC Notice

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. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If interference problems do occur, please consult the system equipment owner's manual for suggestions. Some of these suggestions include relocation of the computer system away from the television or radio or placing the computer AC power connection on a different circuit or outlet.

Changes or modifications to this product could result in non-FCC compliance, and void the user's authority to operate this equipment.

This product was tested and certified with a shielded inter-connecting cable; therefore, a shielded cable is required to be used with this product.

## CSA Notice

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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

## VDE Declaration for Class B

Hiermit wird bescheinigt, dass der WD90C33 VL Bus Card for Windows in Ubereinstimmung mit den Bestimmungen der Vfg 243/1991 funk-entstoert ist. Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerates angezeigt und die Berechtigung zur Überprüfung der Serie auf Einhaltung der Bestimmungen eingeraeumt.

We hereby certify that the WD90C33 VL Bus Card for Windows complies with the RFI suppression requirements of Vfg 243/1991 for Class B devices. The German Postal Service is notified that equipment is being marketed. The German Postal Service has the right to re-test the equipment and verify compliance.

## C.I.S.P.R.

The electromagnetic emissions from the equipment tested are within the Class B specification limits defined by C.I.S.P.R. Publication 22 for Information Technology Equipment. The unit also meets the additional requirements defined by Vfg 243/1991 General License, ISM equipment and equipment used in information processing systems.

10/93

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# Introduction

## Features

The WD90C33 VL-Bus Card is a super VGA display adapter that accelerates the performance of Windows and windowing programs. Opening, closing, scrolling and resizing of windows are instantaneous. It is a competitively priced, high-performance DRAM solution for 32-bit VL-Bus systems (80386, 80386DX, and 80486 microprocessors) that offers 24-bit color.

For applications that require a photographic-quality display, superior results are not solely dependent upon display resolution. The number of color shades available can greatly enhance display quality. The WD90C33 VL-Bus Card's 24-bit color provides a palette of 16.7 million colors.

VESA VL-Bus delivers an increased 32-bit data transfer rate from the CPU to the VGA subsystem and a larger display memory bandwidth. The WD90C33 VL-Bus Card outdistances ISA bus accelerator cards in pixel display capability and performance enhancement of DOS applications.

Built in features include:

- *Hardware cursor and bit block transfer.*
- *Line draw.*
- *X/Y addressing.*
- *Trapezoidal fill.*
- *Clipping.*
- *1 MByte of on-Card memory; upgradeable to 2 Mbytes of memory.*
- *Emulates IBM PS/2, VGA, MCGA, CGA, MDA and Hercules display adapters.*
- *Supports extended text modes: 80 by 50, 80 by 43, 80 by 34, 80 by 25, 132 by 50, 132 by 44, 132 by 28, and 132 columns by 25 lines.*
- *Provides enhanced display drivers for DOS-based applications: AutoCAD, AutoShade, 3D Studio using ACad release 12 drivers, Cadvance, Generic Cadd, Lotus 1-2-3 and Symphony, PCAD, Microsoft Word, WordPerfect.*
- *Compatible with Windows 3.0 and 3.1.*
- *Supports interlaced and non-interlaced monitors.*
- *Supports the simultaneous use of two monitors; co-exists with either an MDA adapter or a CGA adapter.*
- *Allows VGA data pass-through to or from any other an adapter.*

The WD90C33 VL-Bus Card is packaged with software utilities and drivers to bring the functions and features of the latest VGA standards to VESA VL-Bus computer systems.

DRIVERS FOR WINDOWS 3.X					
	640 x 480	800 x 600	1024 x 768	1280 x 960	1280 x 1024
16 colors	●	●	●	●	●
256 colors	●	●	●		● <sup>2</sup>
32K colors	● <sup>1</sup>	● <sup>1</sup>			
64K colors	●	●			
16.7M colors	●				

<sup>1</sup> 32K color drivers specifically for PageMaker and Ventura Publisher are selectable during the installation process.  
<sup>2</sup> Requires 2 Mbytes of memory.

# Quick Installation

## Quick Installation

The following instructions are intended for experienced users who are knowledgeable about Windows and the installation of VGA adapter cards, drivers, and software applications. For those who would like more complete instructions, please turn to the section entitled "Hardware Installation" on Page 11.

### Installing the Hardware

1. Configure Switch SW1 and Jumpers W1, W2 and JP1:3 if necessary. The default switch and jumper settings are indicated by an asterisk (\*).

**Make sure your selections for switches 1 through 4 match your monitor specifications.**

The setting of switches 1 through 4 apply only to the modes indicated in the table and are ignored by all other modes. For further details concerning each mode, refer to Appendix C.

SW1 - Switches 1 and 2 (800 by 600 by 16 or 256 Color Mode Setting Only)		
Switch 1	Switch 2	Monitor Retrace Timings
OFF *	OFF *	Vert: 56 Hz, Non-interlaced Horz: 35.3- KHz
ON	OFF	Vert: 72 Hz, Non-interlaced Horz: 48.2+ KHz
OFF	ON	Vert: 60 Hz, Non-interlaced Horz: 38.0+ KHz
ON	ON	Vert: 56 Hz, Non-interlaced Horz: 35.3- KHz

SW1 - Switches 3 and 4 (1024 by 768 Mode Setting Only)		
Switch 3	Switch 4	Monitor Retrace Timings
OFF *	OFF *	Vert: 86.7 Hz, Interlaced Horz: 35.4+ KHz
ON	OFF	Vert: 70 Hz, Non-interlaced Horz: 56.6- KHz
OFF	ON	Vert: 60 Hz, Non-interlaced Horz: 48.5- KHz
ON	ON	Vert: 72 Hz, Non-interlaced Horz: 59.7- KHz

SW1 - Switch 5 Fonts	
OFF*	Standard Fonts
ON	TUV Fonts

Note: TUV is the German standard for character spacing. May not be compatible with some DOS applications.

JUMPER W1	
80386 CPU	Pins 1-2
80486 CPU	Pins 2-3*
* Default setting - jumper plug installed on pins 2 and 3.	

JUMPER W2	
Data or Code Status	
Disconnected from the VL bus	Pins 1-2*
Connected to the VL bus	Pins 2-3
* Default setting - jumper plug installed on pins 1 and 2.	

JUMPER BLOCK JP2	
72 Hz in mode 3,12,5E,5F	Jumper 1 off
60 Hz in mode 3,12,5E,5F	Jumper 1 on *
Local bus timing is 1 wait state and 4 clocks	Jumper 2 off
Local bus timing is 0 wait state and 2 clocks	Jumper 2 on *
Configuration performed by EEPROM	Jumper 3 off
Configuration performed by SW1/JP1	Jumper 3 on *
Default is with jumper on	

The WD90C33 VL-Bus Card is configured for a high-performance 486 system. If you have a 386 system, change the jumper settings as indicated above.

Always remember to power down your system when making any jumper configuration changes.

2. Install the WD90C33 VL-Bus Card in a VESA VL-bus expansion slot. Verify that the unused system bus connector does not touch any components on the system Card.
3. Plug in your monitor and place the monitor's ON/OFF switch in the ON position.

*Note: Don't turn the system power on until you have completed this step or your system may not be able to properly identify your monitor type.*

4. Turn the system on. If the system is not currently configured for a standard VGA adapter, run system Setup.

*Note: Due to the local bus timing requirements of some motherCards, 2 clocks may not be sufficient to boot the system. To correct for this problem, change Jumper 2 to the OFF position and reboot the system. (This will set the local bus timing to 4 clocks.)*

## Installing Drivers for Windows

1. Start Windows 3.1 with the standard VGA driver installed.
2. Select RUN from the File Menu.
3. Insert the Windows 3.1 disk in your floppy drive.
4. Type: **[Drive]:WDSETUP** on the command line and click OK. Then double click on the directory where the drivers are located.
5. Select one or more drivers from the Video Driver Setup window. Choose drivers that match the capabilities of your monitor, otherwise unpredictable display results may occur. Click on the "Add Drivers" button to activate your choices.
6. When the program finishes installing your driver(s), click on the "Close" button. The Video Driver Setup window displays a list of the installed drivers. Select the Windows driver you wish to use and choose "Exit to DOS" or "Restart Window."

### Notes:

- 32K color drivers are now provided specifically for PageMaker and Ventura Publisher. When these drivers appear in the Video Driver Setup window, they are identifiable by the phrase "Ventura, PageMaker only." Although Ventura and PageMaker report only 4,096 colors, full 32K color is available using these special drivers.
- After driver installation, the icon for WDSETUP appears in the Program Manager's Main Group window when you re-start Windows. To change the resolution from within Windows, double click at this icon to restart WDSETUP.
- Use the HELP button for online guidance and information.
- If you inadvertently select a driver that is not compatible with your monitor, you may experience unpredictable display results and will not be able to bring up Windows. Follow these instructions to re-enter Windows:
  - At the DOS prompt, change to the Windows directory by typing: CD\WINDOWS and press [Enter].
  - From the Windows directory type: **SETUP** and press [Enter].
  - Select "Display" from the Setup menu, then "VGA."

- Select "Accept the Configuration."
- Restart Windows and double click the WDSETUP icon to choose another driver.

## Installing Drivers for DOS Applications

1. Place the DOS drivers disk (Disk 2) in your floppy drive.
2. Select the floppy drive with the diskette as your current drive and type: **INSTALL** [Enter]
3. Make your selection for installation and follow the screen prompts to install the driver or utility.
4. Refer to your software documentation and to the corresponding sections in this manual to configure your software to recognize the new driver.

*Note: Rerun INSTALL for each driver or utility you wish to install.*

# Hardware Installation

## *Before You Start*

---

### *Package Contents*

Your WD90C33 VL-Bus Card for Windows kit contains:

- *This manual*
- *The WD90C33 VL-Bus Card*
- *Two 5.25-inch, high-density, utility/driver diskettes*

You will perform the following steps to install your WD90C33 VL-Bus Card:

- *Gather necessary supplies.*
- *Identify your system and monitor type.*
- *Reconfigure the WD90C33 VL-Bus Card, if necessary.*
- *Install the WD90C33 VL-Bus Card.*
- *Perform Setup.*
- *Install Windows drivers and/or DOS drivers, depending on your specific needs.*
- *Configure your software application to recognize the new driver.*

### *Gather Necessary Supplies*

- *Medium flat-blade screwdriver and Phillips screwdriver*
- *Computer manuals*
- *Monitor documentation/specifications*
- *DOS User's Manual*
- *Software applications and accompanying documentation*
- *Blank, formatted diskettes for creating working copies of utility/driver diskettes*
- *If your analog VGA monitor has a 9-pin connector, you will need a 15-pin adapter. Contact your display equipment dealer.*

### *Identify Your System and Monitor Type*

- *Your system must be a VESA VL-bus compatible system (386 or 486).*
- *Determine whether your analog VGA monitor is an interlaced or non-interlaced monitor. You will need to know its vertical and horizontal retrace frequencies. Consult your monitor documentation. If you are unable to identify your monitor type, please contact your monitor dealer.*

### *Handling Procedures*

Static electricity can severely damage your equipment. Handle the WD90C33 VL-Bus Card and any other device in your system with care and avoid contact with components on the card.

Always work on an antistatic surface to avoid possible damage to the card from static discharge. The packing material placed on a table top makes a good antistatic work surface.

We assume no responsibility for any damage to the WD90C33 VL-Bus Card which results from failure to follow installation instructions or failure to observe safety precautions.

## Board Layout

Figure 1 shows the layout of the WD90C33 VL-Bus Card. Please note important items on the card.

- **Analog Video Connector:** The monitor is connected to this 15-pin female connector.
- **DIP Switch:** The WD90C33 VL-Bus Card is fitted with a five-lever DIP switch for configuring the Card for certain modes. A jumper block JP1 is optional. (See page 17.)
- **Video Feature Connector:** This connector and associated circuitry is equivalent to the connector provided by IBM's PS/2 Display Adapter. The video feature interface can be used to intercept or generate data and signals associated with the palette/DAC and monitor interface.
- **VESA VL-Bus Slot Connectors:** The WD90C33 VL Bus Card communicates with the computer through two VL-bus connectors which plug into the VL-bus expansion slot in your computer system. **This Card must be installed in a VESA 32-bit, VL-bus expansion slot.**
- **Jumpers:** The WD90C33 VL-Bus Card has five jumpers, W1, W2., JP1:3.
- **System Expansion Slot Connectors:** This connector is used by the system CPU to read the BIOS from the WD90C33 VL-Bus Card.

## Jumper Settings

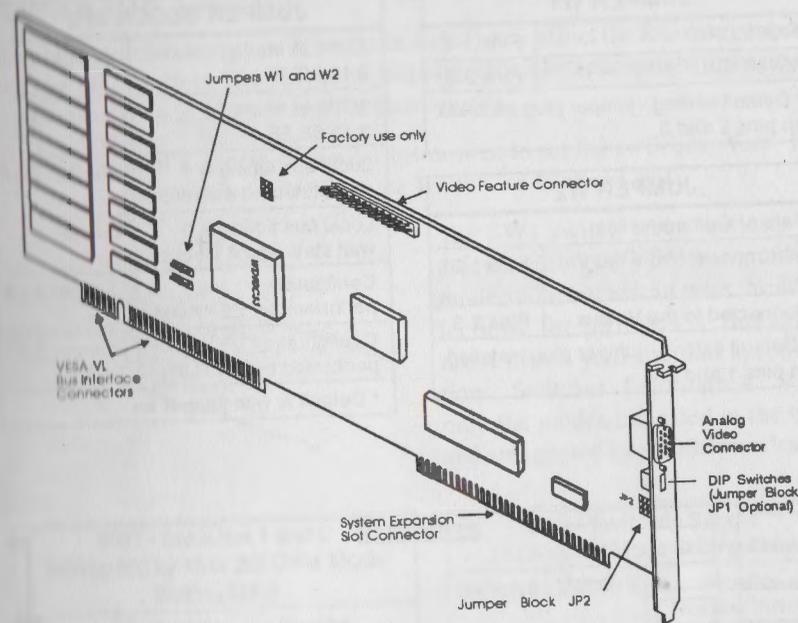


Figure 1. WD90C33 VL-Bus Card

### Preparing the WD90C33 VL-Bus Card

The WD90C33 VL-Bus Card has five jumpers for establishing:

1. W1 - 386/486 CPU.
2. W2 - Data/Command line connected/disconnected to the VL-Bus.
3. JP2-1 - 60Hz or 72 Hz mode is to be used.
4. JP2-2 - Selects 2 clocks or 4 clocks to be used for control signals. 2 clocks provide better performance.
5. JP2-3 - For configuration option

JUMPER W1	
80386 CPU	Pins 1-2
80486 CPU	Pins 2-3*
* Default setting - jumper plug installed on pins 2 and 3.	

JUMPER W2	
Data or Command line	
Disconnected from the VL bus	Pins 1-2*
Connected to the VL bus	Pins 2-3
* Default setting - jumper plug installed on pins 1 and 2.	

JUMPER BLOCK JP2	
72 Hz in mode 3,12,5E,5F	Jumper 1 off
60 Hz in mode 3,12,5E,5F	Jumper 1 on*
Local bus timing is 1 wait state and 4 clocks	Jumper 2 off
Local bus timing is 0 wait state and 2 clocks	Jumper 2 on*
Configuration performed by EEPROM	Jumper 3 off
Configuration performed by SW1/JP1	Jumper 3 on*
* Default is with jumper on	

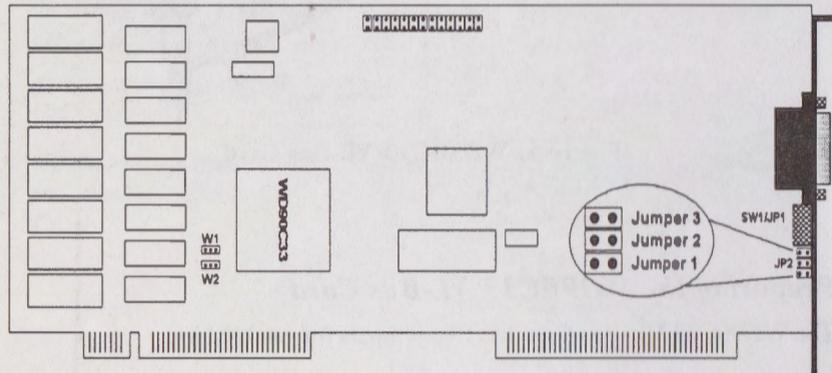


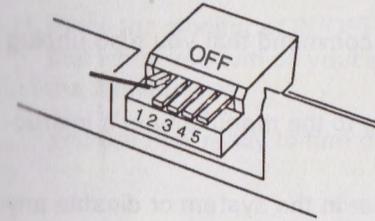
Figure 2. Jumper and Switch Locations

## DIP Switch Settings

### Setting DIP Switches

The DIP switch settings (switches 1 through 4) only affect the following modes: 800 by 600 by 16 or 256 color and 1024 by 768. The appropriate driver must also be installed in order to invoke these modes.

Use the point of a pencil, or similar instrument to set the switches. *Note: The UP position = OFF (or OPEN) on the WD90C33 VL-Bus Card.*



The SW1 switch tables indicate the default settings (\*) for the monitor's mode and retrace/scan rates. Your selections for switches 1 through 4 must match your monitor specifications. Switches 1 through 4 affect only the modes indicated in the table and are ignored by all other modes.

SW1 - Switches 1 and 2 (800 by 600 by 16 or 256 Color Mode Setting Only)		
Switch 1	Switch 2	Monitor Retrace Timings
OFF *	OFF *	Vert: 56 Hz, Non-interlaced Horz: 35.3- KHz
ON	OFF	Vert: 72 Hz, Non-interlaced Horz: 48.2+ KHz
OFF	ON	Vert: 60 Hz, Non-interlaced Horz: 38.0+ KHz
ON	ON	Vert: 56 Hz, Non-interlaced Horz: 35.3- KHz

SW1 - Switches 3 and 4 (1024 by 768 Mode Setting Only)		
Switch 3	Switch 4	Monitor Retrace Timings
OFF *	OFF *	Vert: 86.7 Hz, Interlaced Horz: 35.4+ KHz
ON	OFF	Vert: 70 Hz, Non-interlaced Horz: 56.6- KHz
OFF	ON	Vert: 60 Hz, Non-interlaced Horz: 48.5- KHz
ON	ON	Vert: 72 Hz, Non-interlaced Horz: 59.7- KHz

SW1 - Switch 5 Fonts	
OFF*	Standard IBM Fonts
ON	TUV Fonts
Note: TUV is the German standard for character spacing. May not be compatible with some DOS applications.	

SW1 may be replaced by Jumper Block JP1

## Installing the WD90C33 VL-Bus Card

---

Please consult Appendix A before proceeding with these installation steps if you are installing for any of the following situations:

- You wish to use a dual monitor configuration.
  - Your system motherCard has built-in video functions.
  - You wish to use the 8514/A pass-through connector.
1. **Turn off the system power.** It is recommend that you also unplug the power cord.
  2. Remove the system cover according to the manufacturer's instructions.
  3. Remove any other VGA/EGA adapter in the system or disable any VGA/EGA video on the motherCard. Refer to Appendix A.
  4. If necessary, remove a system expansion slot cover by removing its screw and lifting out the slot cover. Retain the screw for later use.
  5. Verify that the system video switches are properly set (refer to your system documentation).
  6. Verify that the DIP switches and jumpers ( W1, W2, JP1:3.) on the WD90C33 VL Bus Card are properly set as described in the preceding configuration sections.
  7. Hold the card by its top corners and slide it into the VESA VL-bus compatible expansion slot (refer to your system manual). Line up the card so that it fits into the slot guides at either end. The Card connector pins should line up with the expansion slot underneath. Press down on the card until it is firmly seated in the expansion slot. The bracket should be flush with the screw hole.
  8. Verify that the unused system bus connector does not touch any components on the Card. Then secure the card with the screw that was previously removed in Step 4.
  9. Replace and secure the system cover.
  10. Plug the monitor connector into the 15-pin D-shaped video connector on the WD90C33 VL-Bus Card and secure with the mounting screws.

If your analog VGA monitor has a 9-pin connector, you will need a 15-pin adapter which you can obtain from your computer equipment dealer.

Please read your monitor documentation to verify that your monitor is configured properly for an analog VGA signal. Some multi-frequency monitors have a switch to select "TTL" or "analog" operation; set this switch for analog operation.

11. Place the monitor's ON/OFF switch in the ON position. This ensures that when you turn on your system, it will be able to properly identify the monitor type.

You are now ready to turn on your system.

## System Setup

---

After physically installing the WD90C33 VL-Bus Card in a VESA VL-bus compatible system, the computer must be set up to recognize the new adapter. Use the Setup program supplied with your system and follow these steps:

1. Run Setup to configure the system. Consult the system user's manual.
2. In the section where video support is specified, the program may ask if the monitor currently being used will be the primary monitor. Answer "YES."
3. If presented with a list of video options, select the option for "VGA."  
*Note: If you are replacing a VGA card, your system should already be configured for VGA.*
4. Save the changes you made to your Setup program.

At the conclusion of the Setup program, the computer restarts with the new changes.

### Avoiding System Memory Conflicts

The WD90C33 VL-Bus Card uses address space A000 through C7FF for display memory and the extended video BIOS. If you have any other devices which currently use this address space, please reconfigure them to use address space other than A000 through C7FF. Consult the owner's manual for the device.

## Software Installation

Software Installation is presented in two sections:

- **Driver Installation for Windows-based Applications.**
- **Driver Installation for DOS-based Applications.** Note that the DOS driver installation procedures are followed by application specific installation notes.

Whether you are installing drivers for Windows or for DOS, please follow these guidelines:

- All of the drivers and utilities must be installed by using the installation program provided on the drivers diskettes.
- Install Microsoft Windows 3.1 and your DOS-based software applications before you install drivers.
- Use the *DISKCOPY* command to make working copies of the diskettes.

The WD90C33 VL Bus Card package contains two high-density, 5.25-inch diskettes of utilities and drivers for enhancing VGA performance.

- **DOS Drivers** contains the *INSTALL* program for installing the drivers for DOS-based applications and utilities.
- **Windows 3.1 Drivers** contains the *WDSETUP* program for installing drivers for Windows 3.1.

Once you complete the initial driver installation, the *WDSETUP* icon will appear in the Window's Main Group. You will be able to easily invoke the setup program to switch between different Windows drivers, or add and delete drivers.

### Driver Installation Notes for Windows:

- All drivers for Windows are compressed files and can only be installed using *WDSETUP*.
- The following files will be added to your Windows directory when you run *WDSETUP* for Windows:
  - *WDSETUP.EXE*
  - *WDSETUP.HLP*
  - *WDSETUP.INF*
- Microsoft Windows 3.1 with the standard VGA driver must be installed on your system before installing new drivers.
- We recommend that you use only the drivers provided. Microsoft Windows drivers will run correctly, but are far slower and do not take full advantage of the acceleration features offered by the WD90C33 VL-Bus Card.
- Select drivers according to your needs. Those drivers which support the higher number of colors will be slower. If speed is sometimes more important than the variety of colors, you may want to install more than one driver and switch between drivers for different kinds of work.
- If you inadvertently select a driver that is not compatible with your monitor, you may experience unpredictable display results and you will not be able to bring up Windows. To re-enter Windows, follow these steps:
  - At the DOS prompt, change to the Windows directory by typing:  
**CD\WINDOWS**
  - From the Windows directory type: **SETUP**
  - Select "Display" from the Setup menu, then "VGA."
  - Select "Accept the Configuration."
  - Restart Windows and double click on the icon to select another driver.

## Installation of a Driver for Windows

### Single User

The following instructions presume that you are using Window's Program Manager.

1. Start Microsoft Windows 3.1. The Program Manager screen is displayed.
2. Select RUN from the File Menu.
3. Insert Windows 3.1 disk in a floppy drive.
4. Type: [Drive]:\WDSETUP on the command line and click OK. This loads the installation program for the Windows 3.1 driver. Select Add Video Drivers from the pull-down menu.

Double click on the directory where the drivers are located (normally A:, but could also be another floppy drive or a drive on a network).

The Video Driver Setup window lists the drivers that are available.

5. Scroll through the Video Drivers Setup window and click on the driver(s) you want transferred to your hard disk. Once you have made your selection(s), double click on the "Add Drivers" button to install these drivers.
6. When the screen indicates that the program has finished installing your selection(s), click on the "Close" button.
7. The Video Driver Setup window displays a list of the installed drivers. Select the Windows driver you want to use now and choose "Exit to DOS" or "Restart Windows" to activate your choice.

When you restart Windows, the WDSETUP icon will appear in the Windows Main Group (if you are running the Program Manager). Windows will use the video driver you selected. If you experience any display problems, you may have inadvertently selected a driver which is not compatible with your monitor. Please refer to the notes on the preceding page.

The Help Menu is available to you whenever you wish to update your driver list.

### Network User

1. The network administrator copies the entire Windows driver diskette to a network directory.
2. Each network user must run WDSETUP by indicating the location of the directory and typing **WDSETUP** on the command line.

Example: **D:\NETWORK\WDSETUP**  
[Click OK]

3. When the Add Video Drivers window appears, double click on the drivers directory and follow the preceding instructions for a single user, starting with Step 5.

When finished, the WDSETUP icon will appear in the network user's Main Group window.

## Changing, Adding, and Deleting Drivers

After the initial installation, use the WDSETUP program to change drivers, or add and delete drivers.

### Selecting a different driver from the list of installed drivers

1. Double click on the icon in the Windows Main Group of the Program Manager.
2. Select the driver you wish to use from the Video Driver Setup menu.
3. Restart Windows or exit to DOS. The new mode is now available when you restart Windows.

### Adding a driver to the list of currently installed drivers

1. Double click on the icon. The Video Driver Setup window appears..
2. Click on "Add Video Driver" under the Setup menu.
3. Specify the location of the driver by double clicking on the drive or directory.
4. Scroll the window and click on the driver(s) you wish to add.
5. Click on the "Add Drivers" button to begin the installation process.
6. Click on the "Close" button when the installation process is completed. The updated list of drivers appears in the Video Driver Setup window.

---

*Note: If you try to add a driver type with the same name as one on your current installed list, the screen will ask you if you want to copy the new driver over the old driver. Selecting "yes" will overwrite the current driver.*

7. You may now close the Video Driver Setup window by choosing "Close" from the system menu (the driver is now available for later use) or you may select the new driver now by clicking on it. Select "Restart Windows" or "Exit to DOS."

#### *Adding a Microsoft-supplied driver*

You may add your current Microsoft Windows driver to your list of drivers for Windows.

1. Consult your Windows documentation and follow the Windows procedures for installing drivers.
2. Start Windows.
3. Double click on the icon. The Video Drivers Setup menu appears.
4. From the setup menu, click on "Add Current Video Mode."

The driver now appears on the updated list of drivers.

5. Choose "Close" from the System menu.

#### *Deleting a driver from the list of installed drivers*

1. Double click on the icon. The list of drivers appears.
2. Click on the driver you wish to delete.
3. Select "Remove Selected Video Mode" from the Setup menu.

The updated list of available drivers appears. Note that the driver is removed from the list, but it is not removed from your hard drive.

4. Choose "Close" from the System menu.

---

## *Drivers/Utilities Installation for DOS*

The DOS Drivers diskette contains drivers for the following DOS-based applications: AutoCAD, AutoShade, 3D Studio, Cadvance, Generic Cadd, Lotus 1-2-3 and Symphony, MicroStation, PCAD, VersaCAD, Microsoft Word, WordPerfect and DOS utilities.

### *Driver Installation Notes for DOS:*

- *Install your software applications before you use the DOS INSTALL program.*
- *Make a back-up copy of DOS drivers disk.*
- *Do not write-protect DOS drivers disk.*
- *Install the drivers according to the instructions in this manual. Be sure to specify the full path name when prompted for the driver. Note that many applications require the driver to be in the same directory as the application itself.*
- *Install software for VGA video.*
  - *If the software does not display video properly, try using the VGA Mode Switching Utility, VGAMODE.EXE, to set the card to a different hardware-compatible video standard that supports such software in CGA or Hercules modes. Please refer to Appendix D for information about VGAMODE.EXE.*
  - *Hercules-compatible software and some CGA-compatible games require that the card be set to the appropriate standard.*
- *Software that requires a specific video mapping may need the VGAMODE.EXE utility to set the card to the color or monochrome VGA mode. The default mapping of the card depends on the type of display being used. For a PS/2 model 8513 color display, the default mapping is color. For a PS/2 model 8503 monochrome analog display, the default mapping is monochrome.*
- *In a normal installation, the driver is decompressed and copied to the directory that you specify. The directory is created if it does not already exist. This process is verified by the following screen messages: Installing, Reading, Verifying, Writing, Decompressing.*
- *The installation program is executed from a floppy drive or a network directory. This is your source drive. You cannot install to the source drive.*

---

## *Installation of a Driver for DOS*

Use the following general steps to install drivers and utilities:

1. Insert DOS drivers disk into drive A (or specify another floppy drive). At the DOS prompt, select the floppy drive as the current drive and type: **INSTALL** [Enter]

Important messages, general warnings, and any recent changes or updates will be displayed on the monitor. Read this information carefully. Press any key to continue and display the main selection menu.

2. Select the application program for which you wish to add drivers.

Use the arrows or page-up and page-down keys to highlight your choice. Press [Enter] to confirm the selection.

Use the spacebar to select NO or YES. Press [Enter] to confirm the selection.

3. The **INSTALL** program prompts you for the location of the application for which you wish to install drivers. Select the correct drive (target) and type in the complete path. Remember you cannot install to the source drive (usually drive A). **If you must run the **INSTALL** program from a hard disk, be sure to copy the library files (.lif) from the diskette to the root directory.**

4. Follow the screen prompts to install the drivers and utilities.

**Due to the number of possible configurations, read the appropriate software application section in this manual as well as your software manual.** Some drivers are installed automatically, allowing the application to run in the new resolution immediately after the driver is installed. Other applications may require you to run a configuration program in order to recognize the new driver.

---

## *Installation of Utilities*

The DOS drivers disk contains the following programs to maximize the performance capabilities of the WD90C33 VL-Bus Card:

VGAMODE.EXE (VGA Mode Switch Utility)

VESA.EXE (VESA Utility)

WDANSI.SYS (device driver)

**Place** DOS drivers disk in a floppy drive, select the drive, and type: **INSTALL** [Enter]

### *VGAMODE.EXE, VESA.EXE and WDANSI.SYS*

**VGAMODE.EXE, VESA.EXE, and WDANSI.SYS** utilities may be installed by selecting *Utilities* from the DOS **INSTALL** menu and following the onscreen prompts. Use the space bar to toggle between YES and NO for individual choices or use Y or N to tag all options. Press [Enter] to accept your utility selections.

*Please refer to Appendix D for more information about these utilities.*

AUTODESK PRODUCT	DRIVER	COLORS	COMMANDS TO SET DOS ENVIRONMENT
AutoCAD R12	1024 x 768	256	Driver is c:\xxx\rcpdla18.exp. Driver is c:\xxx\rcpdla88.exp. Driver is c:\xxx\rcpdla68.exp. Append its path to ACADDRV. SET ACADDRV=c:\xxx;...
	800 x 600		Set DSPADI=c:\xxx\11pdlv14.exp
	640 x 480		Set DSPADI=c:\xxx\11pdlv84.exp
AutoCAD 386 R11 Display List	1024 x 768	16	Set DSPADI=c:\xxx\11pdlv18.exp
	800 x 600		Set DSPADI=c:\xxx\11pdlv88.exp
	1024 x 768	256	Set DSPADI=c:\xxx\11pdlv18.exp
	800 x 600		Set DSPADI=c:\xxx\11pdlv188.exp
AutoCAD 386 R11 Non-Display List	1024 x 768	256	Set DSPADI=c:\xxx\11pdlv18.exp
	800 x 600		Set DSPADI=c:\xxx\11pdlv188.exp
	640 x 480		Set DSPADI=c:\xxx\11pdlv168.exp
AutoShade Version 2 & 3D Studio	1024 x 768	256	Set DSPADI=c:\xxx\11pdlv18.exp
	800 x 600	256	Set DSPADI=c:\xxx\11pdlv88.exp
	640 x 480	256	Set DSPADI=c:\xxx\11pdlv68.exp
	800 x 600	32K	Set DSPADI=c:\xxx\11pdlv188.exp
	640 x 480	32K	Set DSPADI=c:\xxx\11pdlv168.exp
AutoShade Version 1	1024 x 768	256	(Driver is c:\xxx\rd1024.exe. See "Configuring AutoShade Version 1")
	800 x 600	256	(Driver is c:\xxx\rd800.exe. See "Configuring AutoShade Version 1")
	640 x 480	256	(Driver is c:\xxx\rd480.exe. See "Configuring AutoShade Version 1")
	640 x 400	256	(Driver is c:\xxx\rd400.exe. See "Configuring AutoShade Version 1")

Table 1. DOS Environment Variables

The DOS drivers disk provides display list and non-display list drivers for AutoCAD 11 and a Protected-mode Autodesk Driver Interface (PADI) driver for AutoCAD 12.

## AutoCAD Release 12

1. Place the DOS drivers disk in a floppy drive, select the drive as the current drive, and type: **INSTALL** [Enter]
2. Select "AutoCAD/AutoShade" from the DOS INSTALL menu.
3. Select "AutoCAD Release 12."
4. Select the drive where the driver(s) is to be located.
5. Use the spacebar to select NO or YES. Press [Enter] to confirm selection.
6. Type in the complete path for the driver(s).
7. Wait while drivers are being installed onto your drive. When prompted, press return to continue.

## Configuring AutoCAD 12

AutoCAD Release 12 uses a much different method of locating device drivers than Release 11. Release 12 ignores the DSPADI environment variable, and instead looks for drivers in those directories listed in the environment variable ACADDRV.

1. Set the environment variable as follows:

```
set ACADDRV=C:[Directory];C:\ACAD\DRV
```

where *Directory* is the location of the drivers. ACADDRV is a variable that looks for drivers in every path you specify. You must either modify your AUTOEXEC.BAT file or type these commands before each AutoCAD session.

Set the environment variables as shown in Table 1 on page 30.

2. To reconfigure AutoCAD from within your AutoCAD directory, enter: **ACAD-r**  
  
From the main menu, select "Configure AutoCAD"
3. Select "Configure Video Display."

4. The current video display is given. Answer **Y** when asked if you want to change your current display.
5. Select the video display driver "VGA 90C33" and the desired resolution from the menu.

The driver configuration menu appears next.

### Changing Driver Options

After starting configuration, a screen appears displaying to configuration options. Use the arrow keys to move the cursor. Press **ENTER** to select an option. Some parameters such as "Single screen" be changed from false to true by pressing **ENTER**. After **ENTER** is pressed for options such as "text color" which has number values, a window displays the values available. Use the arrow keys to choose a value and then press **ENTER** to load it into the parameter.

FUNCTION	PRESS
Move cursor	Up, Down, Left, or Right Arrow
Select option	ENTER Key
Increment numeric value	Down Arrow
Decrement numeric value	Up Arrow
Add 10 to numeric value	Right Arrow
Subtract 10 from numeric value	Left Arrow
Load altered value into parameter	ENTER Key

Features of the configuration screen include the following:

1. Colors can be altered by changing the hue, saturation, or value.
2. The entire configuration including any color changes is saved to the disk so that it can be used in subsequent AutoCAD sessions.
3. You can select from several configurations which are saved in the configuration data file by selecting "Configuration No. 1", "Configuration No.2". etc. These titles can be changed. While the title is highlighted, press the **BACKSPACE** key to erase, and then type in the new title. When finished, press the **ENTER** key. The changes you make are saved with the rest of the configuration in the data file.
4. When finished with the configuration, select "Exit". If you wish to discard your changes to the configuration, select "Discard changes".

### AutoCAD Release 11

1. Place the DOS drivers disk in a floppy drive, select the drive as the current drive, and type: **INSTALL** [Enter]
2. Select "AutoCAD/AutoShade" from the DOS **INSTALL** menu.
3. Select "AutoCAD386 R11" or "AutoCAD 386 Display List."
4. Use the spacebar to select desired resolutions.
5. Select the drive where the driver(s) is to be located.
6. Type in the complete path for the driver(s).
7. Wait while drivers are being installed onto your drive. When prompted, press return to continue.

### Configuring AutoCAD 11

1. Under your AutoCAD subdirectory, refer to the **README.TXT** file for important **SET** commands that must be executed now before proceeding to the next step. Type your **SET** commands.

If, for example, you install driver **11PDLV18.EXP**, define the following variable:

```
SET DSPADI=[Drive]:\ACAD11\11PDLV18.EXP
```

*Note:* You must either modify your **AUTOEXEC.BAT** file or type these commands before each AutoCAD session.

**Set the environment variables as shown in Table 1 on page 30.**

2. When you have finished typing your **SET** commands, start AutoCAD by typing : **ACAD**  
Then select "Configure AutoCAD" from the main menu.
3. Select "Configure Video Display" and choose **[Y]** to change the video display selection.
4. Select the video display.

**ADI P386 v. 4.0/4.1 display.**

See "Changing Driver Options" on page 32 for additional information.

5. You can now configure AutoCAD for colors, text height and width, and dual or single screen. Make your selections, then highlight the "EXIT" box and press [Enter]. EXIT will save your configuration choices.
6. Follow the on-screen prompts and exit to the main menu. Type [Y] to save the configuration changes.

AutoCAD is now configured to use the driver you selected.

*Note: If you experience slow performance when running AutoCAD 11, refer to your AutoCAD manual for assistance.*

## *AutoShade Version 2 by Autodesk Incorporated*

### *AutoShade Version 2 Configuration*

1. Set the environment variable as shown in Table 1 on page 30.
2. Type the special configuration command, **SHADE-r**, to start up AutoShade.
3. Select the correct pointing device.
4. For display device, select:  
"P386 Autodesk Device Interface Display Driver."
5. For rendering display device, select:  
"P386 Autodesk Device Interface Rendering Driver."
6. Answer YES to "Do the display and AutoDesk RenderMan rendering devices share a single screen?"
7. Answer YES to "Do the display and AutoShade rendering devices share a single screen?"
8. Answer NO to "Does FLIPSCREEN require a redraw?"  
See "Changing Driver Options" on page 32 for additional information.
9. Select a hard copy device option.
10. AutoShade is configured and you are now in the interactive screen.

### *AutoShade Version 1 Configuration*

The drivers for AutoShade Version 1 are executable programs. First run the driver. For example, for the 640 by 480 driver enter: **rd480**

1. Type the special configuration command, **SHADE-r**, to start up AutoShade.
2. Select the correct pointing device.
3. For display device, select:  
"IBM VGA Display Driver."
4. For rendering display device, select "Autodesk Device Interface Rendering Driver"
5. Answer YES to "Do the display and AutoShade rendering devices share a single screen?"
6. Answer YES to "Does FLIPSCREEN require a redraw?"
7. Select a hard copy device option.
8. AutoShade is configured and you are now in the interactive screen.

### *3D Studio 2.0 Configuration*

1. Set the environment variable as shown in Table 1 on page 30.
2. Go to the \3DS directory and edit the 3DS.SET file as shown in steps 2 through 5.
3. Change the line that starts with "RENDER-DISPLAY = " to read:  
**RENDER-DISPLAY = RCPADI**
4. Change the line that begins "MAIN-DISPLAY = " to read:  
**MAIN-DISPLAY = RCPADI**  
Delete any leading semicolon (;) that may be present.
5. Insert a semicolon (;) in front of the line that begins "MATERIAL-DISPLAY = " to read:  
**MATERIAL-DISPLAY =**
6. Save the file and exit the edit.
7. Delete the file 3DADI.CFG, if present.
8. Type 3DS to start 3D Studio.
9. A screen displays to offer you the choice to change display driver parameters. Press **END**, then **ENTER** to ignore this screen.
10. The same screen will display again for the rendering driver. Press **END**, then **ENTER**.

See "Changing Driver Options" on page 32 for additional information.

## 3D Studio 1.0 by Autodesk Incorporated

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### 3D Studio 1.0 Configuration

1. Set the environment variable as shown in Table 1 on page 30 .
2. Go to the \3DS directory and edit the 3DS.SET file as shown in steps 2 through 5.
3. Change the line that starts with "DEFAULT-DISPLAY = " to read:  
**DEFAULT-DISPLAY = VGA320X200**
4. Change the line that starts "RENDER-DISPLAY = " to read:  
**RENDER-DISPLAY = RCPADI**
5. Change the line that begins "MAIN-DISPLAY = " to read:  
**MAIN-DISPLAY = RCPADI**  
Delete any leading semicolon (;) that may be present.
6. Insert a semicolon (;) in front of the line that begins "MATERIAL-DISPLAY = " to read:  
**;MATERIAL-DISPLAY =**
7. Save the file and exit the edit.
8. Delete the file 3DADI.CFG, if present.
9. Type 3DS to start 3D Studio.
10. A screen displays to offer you the choice to change display driver parameters. Press END, then ENTER to ignore this screen.
11. The same screen will display again for the rendering driver. Press END, then ENTER.

See "Changing Driver Options" on page 32 for additional information.

## Cadvance Version 3.0 by ISICAD, Incorporated

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To install Cadvance for use with the WD90C33 VL-Bus Card in the 1024 by 768 graphics mode or 800 by 600 (16 or 256 colors) graphics mode, install the appropriate driver from DOS drivers disk as follows:

1. If you want to save the existing screen driver, rename the GS-DRV file in the Cadvance directory prior to running INSTALL.

*Note: If modifying the program on a floppy disk, be sure to use a duplicate of the Cadvance disk.*

2. Run the INSTALL program on DOS driver disk in a floppy drive.
3. Choose your driver resolution, destination drive, and directory name during the installation process.

Cadvance will now display the enhanced resolution driver.

The following instructions are provided to configure Generic Cadd Version 3 for use with the new drivers:

1. Run the INSTALL program on DOS drivers disk in a floppy drive.
2. Choose your driver(s) resolution, destination drive, and directory name during the installation process.

*Note: You may choose one or all of the listed display drivers. Select [Y] to select all drivers or press the space bar to toggle each selected driver to a YES or NO selection.*

3. Run Generic Cadd's CONFIG.EXE. Press any key after the current configuration is displayed.
4. Select [1] for video graphics display.
5. Press [Enter] to view the second and third list of screen drivers.
6. Choose the appropriate VGA driver by typing the driver number and [Enter].
7. Respond [Y] to save the selected drivers.
8. Select Exit to DOS by pressing [ESC].

The Generic Cadd Version 3 installation is now complete for the selected driver mode. Generic Cadd can be started in the normal manner.

### **Lotus 1-2-3, Version 2.x and Symphony**

Caution: When adding new drivers to the Lotus 1-2-3 or Symphony install program, there will be a file created called SINGLE.LBR. If using Lotus 1-2-3 Release 2.0 or Symphony Release 1.1, make sure there is not already a file called SINGLE.LBR on the Utilities/Install Disk or in the Lotus hard disk subdirectory. If there is such a file, delete it prior to running INSTALL to add the new drivers. If using 1-2-3 Release 2.1 or Symphony 1.2, it is not necessary to delete the SINGLE.LBR file.

1. Run the INSTALL program on DOS drivers disk in a floppy drive.
2. Select the applicable driver.
3. Choose your destination drive, directory name, and driver resolution during the installation process.
4. Run Lotus's INSTALL.EXE file and choose: ADVANCED OPTIONS
5. Then choose "Add New Drivers to Library" to add the .DRV files to the SINGLE.LBR files.
6. Select: "Modify Current Drivers Set" to list the new drivers on the menu.
7. Select the desired driver and save changes. Lotus 1-2-3 and Symphony will now display the enhanced resolution driver.
8. Please refer to your Lotus manual for additional installation procedures for the drivers.

### **Lotus 1-2-3, Version 3.1**

To install Lotus 1-2-3, version 3.1, for use with the WD90C33 VL-Bus Card in the 800 by 600 16 or 256 color or 1024 by 768 by 16 graphic mode, install the appropriate driver from DOS drivers disk as follows:

1. To save the existing screen driver and other support files, rename the following files in the Lotus directory prior to running INSTALL:

L13VEGAS.DLD  
VGA25CC.VBD  
VGA34CC.VBD  
VGA60CC.VBD

2. Run the INSTALL program on DOS drivers disk in a floppy drive.

3. Choose your destination drive, directory name, and driver resolution during the installation process. Lotus will now display the enhanced resolution driver.

### To install PCAD:

1. Run the INSTALL program on DOS drivers disk in the floppy drive.
2. Choose your driver resolution, destination drive, and directory name during the installation process.
3. Use an ASCII text editor (such as Edlin or Edit) to edit the PCADDRV.SYS file. Edit the display line as follows:

**Display\pcad\tkcards\dwdpvga.driv**

where **dwdpvga.driv** is an 800 by 600 by 16 color or 256 color driver and **dpvga1k.driv** is a 1024 by 768 driver.

PCAD will now display the enhanced resolution driver.

To configure Word 5.0 and 5.5 for use with the 800 by 600 16-color display driver provided on the diskette:

1. Run the INSTALL program on DOS drivers disk in a floppy drive.
2. Choose your destination, directory name, and driver resolution during the installation process.
3. Consult your Word documentation if you are using a special keyCard driver. Otherwise, choose YES to select the default keyCard driver.
4. You must rename the screen driver filename as shown on the install program. (WDSCREEN.VID must be renamed SCREEN.VID).

Word will now display in the enhanced resolution.

### **WordPerfect 5.0 and 5.1 with Graphics Screen Driver**

Follow the instructions below to configure WordPerfect for the supported graphics screen drivers. According to the resolution selected, the INSTALL program copies the necessary graphics screen drivers to the directory where WordPerfect (WP.EXE) resides.

1. Run the INSTALL program on DOS drivers disk in a floppy drive.
2. Choose your driver resolution, destination, and directory name during the installation process.
3. Type: **WP**
4. Enter the Setup menu (Shift + F1).
5. Choose the display.
6. Select graphics screen type.
7. Select the driver.
8. Exit the program.

WordPerfect will now display in the enhanced resolution.

## **Appendices**

### **Two-Monitor Systems**

The WD90C33 VL-Bus Card may be used in conjunction with another video Card and monitor combination. The second video card and monitor pair must be either a monochrome display adapter and monochrome monitor or a color graphics adapter and RGB color monitor. These are the only multiple monitor and video card installations that will work with the WD90C33 VL-Bus Card. *The WD90C33 VL-Bus Card is always the primary video display adapter. When the system boots up or reboots, it is always the default display.*

When installing the adapter with another video adapter, the WD90C33 VL-Bus Card is restricted to modes that do not conflict with those of the complimentary video Card. IBM and compatible computer systems only allow one video card to be mapped as a monochrome card and one to be mapped as a color card.

Thus, if using the WD90C33 VL-Bus Card in conjunction with a monochrome display adapter and monochrome monitor, the WD90C33 VL-Bus Card is limited to color mapped modes. The monochrome VGA modes, Hercules graphics, and MDA modes will not be available on the WD90C33 VL-Bus Card.

If using the WD90C33 VL-Bus Card in conjunction with a color graphics adapter and RGB monitor, the WD90C33 VL-Bus Card is limited to monochrome operation.

Use the DOS MODE command to switch between the two video cards. Whether you are installing a single or dual video card system, always set system Card switches (if applicable) and/or run the SETUP program for the installation of a VGA card. Consult your system manuals.

*The WD90C33 VL-Bus Card can not be used in conjunction with an EGA card or another VGA card of any type.*

### **Systems with Built-in Video**

Some systems include on-Card video functions. Installing the WD90C33 VL-Bus Card in a system that features a built-in video function, requires special considerations. In order to use the complete range of compatible video modes available with the WD90C33 VL-Bus Card, it is necessary to completely disable the system's built-in video function. This procedure may require physically removing an add-on Card from one of the expansion slots or changing some DIP switch or jumper settings on the system Card. Please refer to the documentation included with the computer system, or check with the dealer or manufacturer to determine how to prepare your computer system for use with a VGA type video Card.

If the compatible system has a built-in video function that is equivalent to the IBM Monochrome adapter or the IBM Color/Graphics adapter, it may be possible to use the built-in video in conjunction with the WD90C33 VL-Bus Card as described in the previous section on two monitor systems. Treat the built-in video as if it were a standard monochrome card or color/graphics adapter.

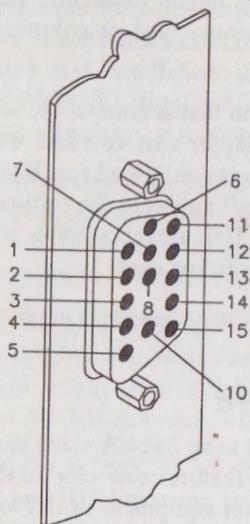
Some systems may have a built-in video function that is compatible with the Hercules graphics standard. Such a video adapter can co-exist with the WD90C33 VL-Bus Card when the built-in video is configured for IBM MDA memory mapping (sometimes referred to as "diag" mode) or the equivalent of Hercules HGC HALF graphics mode. In general, Hercules compatible adapters should be treated as if they are a standard monochrome card.

*Note: Software that requires the Hercules HGC FULL graphics mode can not be used.*

### **Systems with an 8514/A Video Card**

You may connect your WD90C33 VL-Bus Card to an 8514/A video card via a 26-pin pass-through cable attached to the video feature connector on the WD90C33 VL-Bus Card. Contact your computer equipment dealer to obtain the required cable.

Connector Pinouts and Video Signals



VIDEO PORT CONNECTOR PINOUT	
PIN	FUNCTION
1	Red Video
2	Green Video
3	Blue Video
4	Monitor ID Bit 2 (not used)
5	Ground
6	Red Return (ground)
7	Green Return (ground)
8	Blue Return (ground)
9	Key (no pin)
10	Sync Return (ground)
11	Monitor ID Bit 0 (not used)
12	Monitor ID Bit 1 (not used)
13	Horizontal Sync
14	Vertical Sync
15	Not Used

Monochrome type monitors use Green Video for all video input and ignore Red Video and Blue Video.

Monitor ID Bits are not used by the VGA adapter. Monitor type is determined on power-up by an automatic monitor detection circuit.

Video Signals

Black level = 0V

Full intensity level = +0.7V

Horizontal and Vertical Synchronization are TTL level

$V_{OL} \leq 0.6V$

$V_{OH} \geq 2.4V$

Standard Text and Graphics Modes

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start
0,1	A/N	16/256K	320 by 200 †	8 by 8	25.06	31.32-	69.8+	E8000
0,1*			320 by 350 †	8 by 14				
0,1+			360 by 400 †	9 by 16	28.06	31.32+	69.8-	
2,3			640 by 200 ††	8 by 8	25.06	31.32-	69.8+	
2,3*	APA	4/256K	320 by 200 †	8 by 8	25.06	31.32+	69.8-	E0000
2,3+			720 by 400 ††	9 by 16				
4,5	A/N	mono	720 by 360 ††	9 by 14	28.06	31.32+	69.8-	A0000
6			640 by 200 ††	8 by 8				
7	APA	16/256K	320 by 200 †	8 by 8	25.06	31.32+	69.8-	A0000
7+			720 by 400 ††	9 by 16				
D	APA	16/256K	320 by 200 †	8 by 8	25.06	31.32+	69.8-	A0000
E			640 by 200 ††	8 by 14				
F			mono	640 by 350 ††	8 by 14	31.32+	69.8-	
10			16/256K	640 by 350 ††	8 by 16	31.32-	69.8+	
11	APA	2/256K	640 by 480 †††	8 by 16	25.06	31.32-	69.8+	A0000
12			16/256K	640 by 480 †††				
13	APA	256/256	320 by 200 †	8 by 8	25.06	31.32-	69.8+	A0000

\* Provided for EGA compatibility

+ Standard char. cells for VGA

† 40 by 25 char.

†† 80 by 25 char.

††† 80 by 30 char.

Table C-1. Standard Text and Graphics Modes

Extended Modes

Mode (Hex)	Character Resolution	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start
21	132 by 44	16/256K	1188 by 396	9 by 9	44.74	30.87-	67.4+	E8000
41	80 by 34		720 by 476	9 by 14	28.18	31.32-	59.7-	
47	132 by 28		1188 by 448	9 by 16	44.74	31.27-	59.6-	
54 (10A)	132 by 44		1188 by 396	9 by 9		30.87-	67.4+	
55 (109)	132 by 25		1188 by 400	9 by 16			68.8+	
66	80 by 50		640 by 400	8 by 8	28.18	31.32-	69.8+	
67	80 by 43		640 by 344					
69	132 by 50		1056 by 400		44.74	30.88-	68.8+	

Supported VESA modes are shown in parentheses.

Table C-2. Extended Text Modes

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start
5E (100)	APA	256/256K	640 by 400	8 by 16	25.05	31.32-	69.8+	A0000
5F (101)			640 by 480				59.7-	

Supported VESA modes are shown in parentheses.

Table C-3. Extended 256-Color VGA Modes

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start	
58/6A (102)	APA	16/256K	800 by 600	8 by 8	36.15	35.30-	56.5-	A0000	
56 Hz						40.09	37.96+		60.8+
60 Hz						50.14	48.19+		72.1+
5C (103)	APA	256/256K	800 by 600	8 by 8	36.15	35.30-	56.5-	A0000	
56 Hz						40.09	37.96+		60.6+
60 Hz						50.14	48.19+		72.1+

Supported VESA modes are shown in parentheses.

Table C-4. 800 by 600 Modes

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start	
5D (104) Int	APA	16/256K	1024 by 768	8 by 16	44.74	35.40+	87.2+	A0000	
NI - 60 Hz						65.22	48.53-		60.0-
NI - 70 Hz						75.17	56.60-		70.2-
NI - 72 Hz						76.96	57.95-		72.0-
60 (105) Int	APA	256/256K	1024 by 768	8 by 16	44.74	35.40+	86.7+	A0000	
NI - 60 Hz						65.22	48.53-		60.2-
NI - 70 Hz						75.17	56.60-		70.2-
NI - 72 Hz						76.96	57.95-		72.0-

Supported VESA modes are shown in parentheses.

Table C-5. 1024 by 768 Modes

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start
64 (106) Int	APA	16/256K	1280 by	8 by	77.96	48.10+	85.5+	A0000
6F (107) Int *			1024			16	48.83+	

Supported VESA modes are shown in parentheses.

\* Mode 6F is optional and requires the installation of a second MByte of DRAM memory.

Table C-6. 1280 by 1024 Mode

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start
6C Int	APA	16/256K	1280 by 960	8 by 16	76.96	48.10+	85.5+	A0000

Table C-7. 1280 by 960 Mode

Mode (Hex)	Type	Colors	Resolution	Font	VCLK (MHz)	Hsync ± (KHz)	Vsync ± (Hz)	Buffer Start	
61	APA	32,768	640 by 400	--	50.14 *	31.48-	70.1-	A0000	
62 (110)			640 by 480	--		59.9-			
63 (113)			800 by 600	--	75.17 *	36.84-	56.2-		
6E (112)			16M	640 by 480	--	75.17	31.22-		59.5-
71			64K	640 by 400	--	50.14	31.48-		59.9-
72 (110)				640 by 480	--				
73 (114)				800 by 600	--	75.17	36.84-		56.2-

\* The PCLK sent to the RAMDAC is actually one-half of this value. Setting 3D5H index 30 bit 5 divides the CCLK VGA input supplied from the clock chip to produce a divided-by-two PCLK.

Table C-8. 32K, 16.7M Color Modes

## Appendix D - Utilities

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The DOS drivers disk contains the following programs to maximize the performance capabilities of the WD90C33 VL-Bus Card:

VGAMODE.EXE (VGA Mode Switch Utility)

VESA.EXE (VESA Utility)

WDANSI.SYS (device driver for high-resolution text modes)

Use the INSTALL program on the DOS drivers disk to copy these utilities to your hard disk.

### VGA Mode Switch Utility

VGAMODE.EXE allows you to select the video hardware standard of the card either from a menu or directly from the DOS prompt line.

The VGAMODE.EXE program determines which video standard the card emulates. The default video standard is VGA text mode. Using the VGAMODE.EXE utility, this setting may be overridden, providing the software supports CGA, MDA or Hercules video standards in addition to color and monochrome VGA modes.

VGAMODE.EXE also lets you LOCK the Card into a particular configuration in order to soft reboot to that configuration rather than the default VGA mode.

You may wish to embed a particular mode in a batch file upon startup of a specific application.

### CAUTION

Some of the VGA commands allow you to change frequencies or to switch to higher resolutions which require higher frequencies. To avoid the possibility of damaging your monitor or causing it to malfunction, always make sure your monitor can support the frequency specifications of such commands.

Run this program either from your floppy drive or from a directory on your hard drive:

1. Insert the DOS drivers disk into a floppy drive, select the drive as the current drive, and type:

**[Drive]:\VGAMODE [Enter]**

A menu lists the options available.

- 
2. Use the up and down arrow keys to select the feature you wish to access. When the desired feature has been selected (highlighted), press the [Enter] key.
  3. Choose "Exit to DOS" to quit.

VGAMODE.EXE may be accessed directly from the DOS prompt line to bypass the menu. This is useful for incorporating VGAMODE.EXE commands into a batch file. To take full advantage of the VGAMODE.EXE utility, replace ANSI.SYS in your CONFIG.SYS file with WDANSI.SYS

The commands listed in Table D-1 may be executed at the DOS prompt.

COMMAND	DESCRIPTION
VGAMODE[Enter]	Brings up the VGAMODE.EXE menu.
VGAMODE VGA[Enter] <b>CAUTION!</b>	If you select VGAMODE VGA, two menus available are: Set Card Option and Set Extended Modes. Be sure to look at the Set Card Option menu first to verify that your monitor's hardware specifications will support the extended mode you want to select from the Set Extended Modes menu. This is particularly true of higher resolutions which use higher frequencies. <b>Your monitor may not function properly or can be damaged if it does not support the higher frequency.</b>
VGAMODE CGA[Enter]	Sets the card to CGA operation.
VGAMODE MDA[Enter]	Sets the card to emulate the Hercules Graphics Card with no graphics memory allocated.
VGAMODE HERC0[Enter]	Sets the card to emulate the Hercules Graphics Card with one page of graphics memory allocated.
VGAMODE HERC1[Enter]	Sets the card to emulate the Hercules Graphics Card with both pages of graphics memory allocated.
VGAMODE COLOR[Enter]	Changes the Card to color VGA mapping as needed.
VGAMODE MONO[Enter]	Changes the Card to monochrome VGA mapping as needed.
VGAMODE 13225[Enter]	Switches the board to color, 25-line, 132-column text mode.
VGAMODE 13244[Enter]	Switches the board to color, 44-line, 132-column text mode.
VGAMODE 200[Enter]	Sets the number of lines used for VGA text mode to 200.
VGAMODE 350[Enter]	Sets the number of lines used for VGA text mode to 350.

Table D-1. DOS Commands for VGAMODE.EXE Utility

COMMAND	DESCRIPTION
VGAMODE 400[Enter]	Sets the number of lines used for VGA text mode (modes 0, 1, 2 & 3) to 400 (the standard VGA setting).
VGAMODE 400256[Enter]	Switches the board to 640 by 400 resolution in 256 colors.
VGAMODE 480256[Enter]	Switches the board to 640 by 480 resolution in 256 colors.
VGAMODE 600256[Enter]	Switches the board to 800 by 600 resolution in 256 colors.
VGAMODE 600[Enter]	Switches the board to 800 by 600 resolution in 16 colors if you are currently in color mode.
VGAMODE 56[Enter] <b>CAUTION!</b>	Set 800 by 600 modes for 56 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE 60[Enter] <b>CAUTION!</b>	Set 800 by 600 modes for 60 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE 72[Enter] <b>CAUTION!</b>	Set 800 by 600 modes for 72 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE 768[Enter]	Switches the board to 1024 by 768 resolution in 16 colors.
VGAMODE INTERLACE[Enter]	Set 1024 by 768 modes as interlaced.
VGAMODE 60NON-INTERLACE[Enter] <b>CAUTION!</b>	Set 1024 by 768 modes as non-interlaced, 60 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE 70NON-INTERLACE[Enter] <b>CAUTION!</b>	Set 1024 by 768 modes as non-interlaced, 70 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE 72NON-INTERLACE[Enter] <b>CAUTION!</b>	Set 1024 by 768 modes as non-interlaced, 72 Hz. <b>Make certain your monitor can support this frequency.</b>
VGAMODE RESTART[Enter]	Same as VGAMODE REBOOT.

Table D-1. DOS Commands for VGAMODE.EXE Utility (Continued)

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## VESA Utility

VESA.EXE is a terminate and stay resident (TSR) program that allows the WD90C33 VL-Bus Card to comply with the Video Electronics Standards Association (VESA) Version 1.2 so that it is compatible with VESA drivers. This program is an extension to the VGA BIOS video services and can be installed by running the VESA.EXE program prior to running any VESA compatible application programs.

## WDANSI.SYS

The WDANSI.SYS is an ANSI-compatible device drive which makes high-resolution text modes available to application programs. The modes supported by this utility include 80 columns by 34, 43 or 50 rows and 132 columns by 25, 28, 44, and 50 rows.

---

## Appendix E - Glossary

**analog monitor:** A variety of video displays that use continuously variable color control voltages to allow an extremely large number of colors to be displayed while requiring only a few inputs.

**BIOS or ROM BIOS:** Acronym for Basic Input-Output System. These are the programs that are permanently stored in the computer system in ROM (Read Only Memory) providing the power-on self test and the ability to recognize and use the VGA adapter in the system. The VGA adapter has a BIOS extension that provides a set of software functions for controlling the VGA video system.

**color display:** A type of monitor capable of displaying information in color, sometimes referred to as an RGB monitor. The letters R, G, and B refer to the arrangement of electrical signals necessary to drive this device and to the primary colors: red, green and blue, from which all other colors are derived. The VGA adapter is capable of displaying 64 different levels of each primary color: red, green and blue on a color display. The combinations of these red, green and blue signals allow 262,144 different possible colors to be displayed.

**default mode:** The default mode refers to the set of capabilities and resolutions currently available as well as the current display mode of the VGA adapter upon system startup. The default display mode of the VGA adapter is always VGA text mode unless using the VGAMODE.EXE utility to lock and reboot the card in another mode.

**driver:** The part of a software application program that deals with a specific piece of equipment in the system. Some applications have different drivers for different types of video Cards. The VGA adapter includes drivers to allow several popular software packages to use the 132-column text and extended graphics modes.

**expansion slot connector:** This is a bus which connects the VGA adapter to the system. Through this connector the VGA adapter communicates with the computer system and vice-versa.

**fixed frequency monitor:** An analog monitor that operates using a fixed horizontal synchronization frequency. Vertical synchronization frequency is variable to change the resolution displayed on screen.

**Hercules graphics:** Single color graphics at a resolution of 720 horizontal dots by 348 vertical dots.

**interlaced monitor:** This type of monitor scans every other line with each pass of its beam. It alternates between even numbered lines and odd numbered lines.

**mapping:** Mapping refers to areas in the computer's memory where a particular video mode stores its data. The VGA standard allows all video modes to be displayed on all supported monitors so the mapping is no longer dependent on the type of monitor being used. Nevertheless, note the current mapping of the VGA adapter and ensure that the software is configured properly for the currently available modes. The mapping of the VGA adapter can be changed from color to monochrome or monochrome to color by using the VGAMODE.EXE utility program described in Appendix D.

**monochrome display:** A type of monitor that displays video information in a single color. The VGA adapter defaults to monochrome mapping when used with a monochrome monitor.

**multi-frequency monitor:** A monitor that allows variable horizontal and vertical synchronization frequencies. Such a monitor typically supports a large range of video signals. Please check with the monitor manufacturer or dealer if you are unsure of your monitor's specifications.

**non-interlaced monitor:** This type of monitor scans every line with each pass of its beam. (See definition: interlaced monitor.)

**PADI:** Protected-mode Autodesk Driver Interface driver

**palette:** A range of colors. VGA supports a color palette with up to 256 simultaneous colors selected from a range of 262,144 possible colors.

**primary display:** In a two-monitor system, the one that is active when you start the system. The primary display is always the VGA adapter.

**resolution:** The precision with which a display image can be reproduced, usually measured in terms of the number of horizontal and vertical lines that can be distinguished.

**super VGA:** Standard 800 by 600 resolution, 16-color mode as defined by VESA (Video Electronics Standards Association).

**system expansion slot:** This is a bus into which the VGA card is connected. Through this connector the card communicates with the system CPU.

**VESA:** Video Electronics Standards Association.

**VGA:** The video standard supported on IBM's PS/2 computer systems and the IBM PS/2 Display Adapter. The VGA video standard drives analog display monitors and provides access to 262,144 different colors on color monitors. (VGA stands for Video Graphics Array.)

**VLBI:** Video Local Bus Interface

**video memory:** Random access memory (RAM) that is used by the VGA to store information used to generate the screen display. The VGA adapter comes with 1 Mbyte of video memory.

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